SPATIAL DISTRIBUTION OF BENTHIC DIATOMS IN THE SURFACE SEDIMENT OF VENICE LAGOON, ITALY

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Abstract
Surface sediment samples (ca. 2-3 mm) were collected in 65 stations in summer 2002, to investigate spatial distribution of the epipelic diatoms. Total abundance varied between 0.26 and 3.60 x 10^6 cells cm^{-3}. The highest values were recorded in protected areas, far from the deepest canals. A spot distribution, with marked small-scale fluctuations, was often observed. The community was mainly constituted by raphid genera, such as *Navicula* spp. and *Nitzschia* spp., but also centric diatoms were important in some sites. Shannon diversity increased progressively from the mainland to the sea.

Key-words: diatoms, epipelon, sediment, lagoon

Introduction

The ecological role of benthic diatoms, as primary producers and sediment stabilizers, in shallow water, is widely recognized [1]. Moreover, recently, a lot of studies propose to use trophic indices based on benthic diatom communities to assess freshwater quality (i.e. [2]). The present study aims to describe the spatial distribution of diatoms in the lagoon and their ability to scale trophic conditions, also, in brackish waters.

The study area is the central part of Venice lagoon, subject to a high water renewal and strongly affected by many anthropic activities. In this area the mean water depth, except for the canals, does not exceed 1 m. At present macroalgal biomass is almost absent [3], but some zones close to the port entrances are colonised by seagrasses. By considering the whole central lagoon the dominant primary producers are microorganisms, which live in water column or on bottom habitats. In this paper we present the results of a spatial investigation of benthic diatom distribution in the 2-3 mm sediment top layer of the whole central lagoon. Epipelic diatom seasonal distribution has already been investigated in some sites of Venice lagoon, showing abnormal variations, often independent of temperature changes [4].

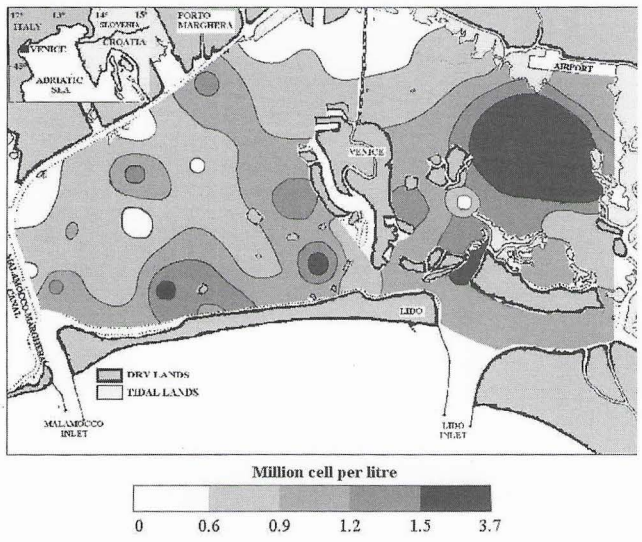
Methods

Sampling sites were located in the area comprised between the Malamocco port entrance, in the south, and the Burano-Torcello wetlands, in the north. Sediment samples (thick ca. 5 cm) were collected by means of a Plexiglas corer in always-submerged zones (1 m deep), out of canals. Undisturbed surface minicores (2-3 mm thick) were stored with hydrogen peroxide for 24 hrs and, then, diluted with synthetic seawater [4]. Diatoms were counted and identified by the light inverted microscope according to Utermöhl's method [5].

Results and Discussion

Diatom abundance, in general, was spread along an increasing gradient from the mainland to the sea. Several spots, contrasting with surrounding distribution, were, however, observed (Fig. 1). The highest values (up to 3.59 x 10^6 cells cm^{-3}) were recorded in protected areas, north of Venice. The abundance was below the average value (1.02 ± 0.54 x 10^6 cells cm^{-3}) along the main canals and in the areas of intense bivalve catching, where minimum cell concentrations occurred (0.26 x 10^6 cells cm^{-3}). On the whole 84 taxa were identified. Rhapid genera were the most abundant as both cell and specie number, whereas arhapid diatoms were almost negligible. Centric diatoms, in particular *Thalassiosira* sp., were widespread near the mainland, south of the translagoon bridge. *Amphora exigua* Gregory, *Amphora veneta* Kützing, *Cocconeis molesta* Kützing, *Navicula lanceolata* Kützing, *Nitzschia lanceolata* Smith and *Nitzschia microcephala* Grunow were the background of benthic community in the whole study area. Other species, such as *Cocconeis scutellum* Ehrenberg, varied zone by zone.

Shannon diversity index was higher along the Lido island than near the mainland. Similarly, communities with a high number of species were grouped near the port entrances. The diversity and the specie number seemed to fit the trophic conditions of the lagoon better than the abundance. In fact, nutrient concentrations are higher close to the mainland, affected by industrial, urban and agricultural sewage inflow [6]. Diatom abundance was probably affected by other factors, such as physical alterations of bottom habitats due to the frequent sediment re-suspension/settlement phenomena. The area, where diatoms were less abundant, was, in fact, affected by oil tanker transit and by intense clam fishing.



References

1 - MacIntyre H.L., Geider R.J., and Miller D.C., 1996. Microphytobenthos: the ecological role of the "secret garden" of unvegetated, shallow-water marine habitats. I. Distribution, abundance and primary production. *Estuaries*, 19: 186-201.
2 - Prygiel J., Whitton B.A., and Bukowska J. (eds.), 1999. Use of Algae for Monitoring Rivers III. Agence d'Eau Artois-Picardie, Douai, France, 271 p.
3 - Sfriso A., Facca C., and Ghetti P.F., 2003. Temporal and spatial changes of macroalgae and phytoplankton in a Mediterranean coastal area: the Venice lagoon as a case study. *Mar. Environ. Res.*, 56: 617-636.
4 - Facca C., Sfriso A., and Socal G., 2002. Temporal and spatial distribution of diatoms in the surface sediments of the Venice lagoon. *Bot. Mar.*, 45: 170-183.
5 - Utermöhl H., 1958. Zur Vervollkomnung der quantitativen Phytoplankton-Methodik. *Mitt. int. Verein. Limnol.*, 9: 1-38.
6 - Sfriso A., Facca C., Ceoldo S., Silvestri S., and Ghetti P.F., 2003b. Role of macroalgal biomass and clam fishing on spatial and temporal changes in N and P sedimentary pools in the central part of the Venice lagoon. *Oceanol. Acta*, 26: 3-13.