PHYTOPLANKTONIC COMMUNITIES IN EUTROPHIC COASTAL LAGOONS OF THE NORTHERN ADRIATIC SEA, ITALY.

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Abstract
Water column samples were collected in some coastal lagoons in the north-western Adriatic Sea (Italy) in order to evaluate the phytoplankton taxonomic composition and cell abundance. These areas are strongly affected by anthropic exploitation and impacted by industrial, agricultural and urban discharges. Except for the records of the Venice Lagoon, where monthly samplings were carried out in two sites from March 2008 to February 2009, in the other basins the samples were collected twice in several stations. Flagellates often represented the bulk of the community, whereas dinoflagellates were almost negligible. Diatoms were occasionally dominant in spring or summer. Cell abundance varied between 0.39 and 30.5 x 10^6 cells/L.
Keywords: Phytoplankton, Nutrients, Lagoons

Introduction
The Italian coastline of the North Adriatic Sea displays a complex system of lagoons (Fig. 1), which receives the river discharges from a wide, densely populated and highly industrialized drainage basin. This determines high nutrients and pollutant inputs. Even though the most exploited basin is the lagoon of Venice, also the other wetlands present important anthropic activities; in particular extensive and intensive aquaculture installations are renowned in the area of the Po river delta lagoons. In order to describe and compare the environmental conditions in that basins water samples were collected to measure phytoplankton communities and nutrient concentrations.

Materials and Methods
Water samples were collected in 19 stations in July 2007 and in May 2008 in the Grado-Marano lagoon, which is characterized by high nitrate and mercury inputs. In the lagoon of Venice the campaigns were carried out in two sites from March 2008 to February 2009. The sampling stations were located between the Venice historical centre, where a sewage treatment plant does not exist, and the Porto Marghera industrial area. In the Veneto area of the Po river delta, water column was sampled in 17 sites in October 2008 and in July 2009. Phytoplankton was determined according the Utermöhl's method [1] and nutrients according the Strickland and Parson's procedure [2].

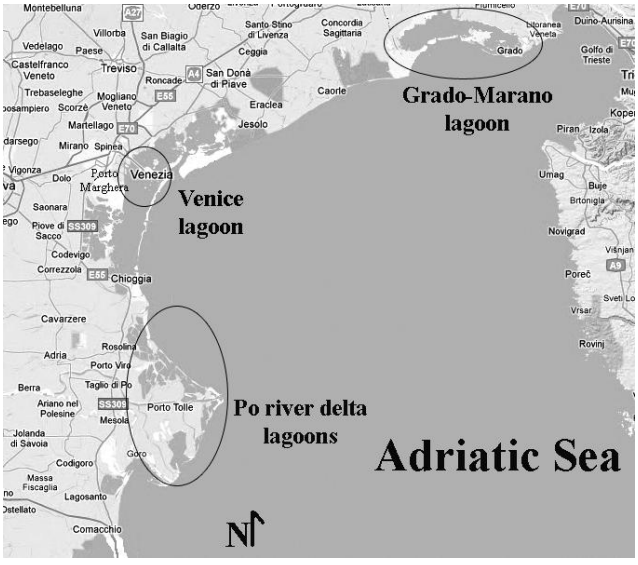

Fig. 1. Map of the study area. Circles marked the sampling basins.

Results and discussion
Phytoplankton cell abundance varied more or less in the same range in the lagoons of Grado-Marano and Venice with minimum of 0.23-0.39 x 10^6 cells/L and peaks of 17.5-22.1 x 10^6 cells/L. In the Po river delta lagoons, maxima values reached up to 30.5 x 10^6 cells/L. Even though the samples were collected in different periods and with different frequency, the results allowed to highlight some particular conditions. In the case of the Grado-Marano lagoon, the highest values was observed in July 2007 close to the river discharge, where nitrate concentration was >50 µM and it was due to *Cylindrotheca closterium* and *Nitzschia frustulum* bloom. In a couple of basins in the Po river delta lagoon system, the phosphorus concentrations were comprised between 5 and 25 µM during the October 2008 sampling campaign, but the phytoplankton community did not exceed 10^6 cells/L, probably because of the low light availability. In the lagoon of Venice the community composition and cell abundance in the two sampling sites appeared to have some interesting differences, mainly due to the different depth and water circulation. The annual mean cell abundance was, in fact, higher in the site near the canal (4.43 x 10^6 cells/L) than in the shallow bottom area (2.80 x 10^6 cells/L). Moreover, both nanoflagellates and *Skeletonema marinoi* blooms were more marked near the canals than in the shallow bottoms, where *Thalassiosira* sp. and Cryptophyceae prevailed. In the Po river delta lagoons, the highest abundance was observed in July 2009, due to a equal contribute of flagellates and diatoms. Except for few cases, flagellates, in particular unidentified nanoflagellates, were always the dominant group. Dinoflagellates, on the contrary, never exceeded 2.4% of cell abundance, being negligible in most of the records. Diatoms displayed high variability ranging between 1.8 and 81.8%. It was observed that diatoms happened to be significantly abundant in summer in the lagoons of Grado-Marano and Venice, and in autumn in the Po river delta lagoons. Even though the species occurrence was quite similar in all the studied sites, small colonial centric diatoms such as *Chaetoceros* spp. prevailed in the Po river delta lagoons whereas in the lagoons of Grado-Marano and Venice benthic diatoms seemed to be more frequent.

References
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