

TEMPORAL AND SPATIAL VARIATIONS OF PHYTOPLANKTON COMMUNITIES FROM THE INNER PART OF THE GULF OF NAPLES; SUMMER 1983

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Summary - High values for cell concentrations, together with a marked spatial and temporal variability for phytoplankton populations, were the most peculiar features for the inner part of the Gulf of Naples in summer 1983.

Résumé - Le phytoplancton de la partie la plus interne du Golfe de Naples pendant l'été 1983 a été caractérisé par des valeurs très élevées des concentrations et par une notable hétérogénéité spatiale et temporelle.

To determine the species composition and temporal succession of phytoplankton communities, weekly samples were collected in the inner Gulf of Naples from June 2 to September 1, 1983. Physico-chemical, chlorophyll and zooplankton data were also collected in this period and are discussed elsewhere (Modigh et al. and Ianora et al., this volume).

Temporal variations for surface phytoplankton populations were studied at stations 1 and 4, both located along the 50 m isobath. Sta. 1 was situated 1 mile off Naples harbour while Sta. 4 was 5 miles to the SW of Sta. 1 and less than 1 mile off the west coast of the bay. Additional surface stations were analysed for August 4 and are presented below. The first two samplings showed slight differences in terms of abundance ($\leq 14 \times 10^6$ cells l^{-1}) and species composition for both stations. Flagellates (40-74%) and dinoflagellates (15-31%) constituted the greater part of the total cell numbers, whereas diatoms were less abundant (4-19%).

During the period following these samplings a series of fluctuations in abundance were recorded at the two stations. The variations were more pronounced at Sta. 1 (3.5 to 112×10^6 cells l^{-1}) with maximal values often exceeding those of Sta. 4 (0.2 to 9×10^6 cells l^{-1}) by an order of magnitude. Phytoplankton communities at the two stations were also different. Small diatoms, including *Thalassiosira* spp., *Chaetoceros simplex*, *Leptocylin-drus* spp., were generally dominant at Sta. 1, in most cases exceeding 50% of the entire population. Phytoflagellates, mainly represented by small forms ($< 10 \mu$), varied from 13 to 38%, whereas dinoflagellates were less

abundant (2-11%). Species as *Emiliana huxleyi* and *Eutreptiella* spp. at times contributed considerably to the total abundance. Maxima were always due to more than one species resulting in relatively high values for species diversity (2.57 to 3.45). Higher percentages of phytoflagellates (20-57%), dinoflagellates (4-35%) and coccolithophores (2-38%) characterized Sta. 4 for the same period. Diatoms were proportionally less abundant as compared to Sta. 1.

Differences in total cell numbers and species composition at the two stations were more notable from July onwards. On July 26, when maximum water temperatures ($\sim 28^{\circ}\text{C}$) occurred, the greatest abundance (112×10^6 cells l^{-1}) was recorded at Sta. 1 dominated by a bloom of *Chaetoceros simplex* (46%). Another peak in cell number (37×10^6 cells l^{-1}) mainly due to *Skeletonema costatum* (42%) was recorded at Sta. 1 during the last sampling collection following a heavy rainfall (24mm). Both bloom species at Sta.1 were not recorded for the same collections at Sta. 4.

High nutrient levels were measured throughout the sampling period at Sta. 1 presumably due to the presence of numerous sewage outfalls into the harbour. In contrast, lower and less variable nutrient concentrations characterized Sta.4 (Modigh et al., this volume). Meteorological events may have greater impact as to nutrient enrichment of the more "stressed" areas near Sta.1 resulting in the differences observed between the two stations studied.

After July 5, additional stations were sampled in the eastern part of the embayment, which received the major part of the sewage outfall of the city of Naples. Stations located in this area generally showed variable chlorophyll *a* (0.1 to $47 \mu\text{g l}^{-1}$) distribution patterns, with high concentrations extending at times southeasterly from harbour waters. Phytoplankton composition determined at 17 stations on August 4 showed an even greater heterogeneity. Low chlorophyll *a* values ($0.4 \mu\text{g l}^{-1}$) in the western zone of the bay were associated with small flagellates, dinoflagellates and coccolithophores. Diatoms comprised only 15% of the total abundance. The eastern zone had high chlorophyll values ($\leq 36 \mu\text{g l}^{-1}$) associated with two different communities. Small diatoms, forming up to 90% of the population, were dominant at stations located near Naples harbour. The same diatoms dominated at SE stations located between the 50 and 100 m isobaths. Further inshore, these species were proportionally less abundant ($\leq 36\%$) whereas higher percentages of small flagellates ($\leq 40\%$) and dinoflagellates ($\leq 37\%$) were recorded.

These preliminary results suggest the following:

- for summer 1983, the inner part of the Gulf of Naples was characterized by a marked heterogeneity in species distribution and temporal successional patterns for phytoplankton resulting from the variability of physico-chemical environment;

- short-lived, small diatoms blooms superimposed on small flagellates populations characterized the zone nearest Naples harbour where the highest chlorophyll values were recorded;
- as a whole, phytoplankton composition maintained relatively high values for species diversity notwithstanding the "stressed" environment.

