

ONE YEAR OF HYDROBIOCHEMICAL OBSERVATION IN A TRANSECT IN FRONT OF SENIGALLIA (NORTH ADRIATIC SEA)

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In the framework of ELNA project (Eutrophic limits of the Northern Adriatic Sea), a monthly cruise is conducted from February 1993 in a transect in front of Senigallia, in order to monitoring the outflow of the North Adriatic. Stations sampled during each cruise (st. 0, st. 1, st. 2, st. 3, st. 4, st. 5) are located at 0.5, 1.2, 3, 6, 10, 15 NM from the coast. At each station sampling is done with CTD profiler, coupled with a Rosette multisampler, for the measure of temperature, conductivity, dissolved oxygen and fluorescence. Samples for nutrient salts, chlorophylls and phytoplankton determination are taken at significant depths checked on the basis of the CTD profile.

The thermohaline water structure exhibits a well defined seasonal evolution (fig.1). A coastal front present in the winter period confines along the coast the run-off of the northern Adriatic and local rivers, with very low value of salinity and high concentration of total inorganic nitrogen (st. 0, 1 and 2). In the deeper layer of the offshore part of the section it is possible to see the influence of the North Adriatic bottom water.

The spring period is characterised by a surface (0-10 mt.) thermohaline vertical gradient present over all the section. Two principal factors determine this configuration : the air-sea heat exchange begins to be positive for the sea and the river run-off has his maximum in spring.

In summer a two layers system dominates the section : a surface well mixed layer (15 mt. depth) with $T > 23^{\circ}\text{C}$ and $S > 38$ PSU, and a deep layer, from 30 m to the bottom with $T < 14^{\circ}\text{C}$ and $S > 38.0$ PSU. Between the two layers a sharp thermocline is developed.

In fall it was registered a situation similar to spring: a thermohaline vertical gradient is present in the first 10 mt., but with a reversal thermal gradient, that is cold water at the surface, and warm water at the deeper layers. The stability conditions are preserved by the low values of salinity.

In general the nutrients are distributed with a negative gradient from coast to offshore. The nitrate fraction dominates the total nitrogen. A maximum in nitrogen concentration is detected in spring due to increasing runoff. A second strong peak was detected in December, during a period of low phytoplankton density. Good correspondence is found between nitrate trend and phytoplankton density trend, with a typical phase-difference between the two time series. Phosphorus, as orthophosphate, is present in very low concentration, often under the detection limit of analytical method. Phosphorous source for phytoplanktonic metabolism must necessarily be supported by the more consistent organic fraction.

Phytoplankton annual cycle is showed in fig.2. Quantitative data for phytoplankton cell density are expressed as cells/ml; no biomass measurements by now are done. Average values are integrated on water column. Abundance trend shows a maximum value in 2 stations onshore (over 9000 cells/ml) in correspondence of winter-spring diatom bloom, due to *Skeletonema costatum*, a typical winter blooming species in the Adriatic sea. Bloom started in February, extended from st.0 to st. 2 and touches maximum values in March. Next peak in phytoplankton trend was registered during May, and corresponds to an increase of phytoflagellate component that represented over 80% of total abundance. Then another peak appears in correspondence of autumnal season, and was again due to diatoms (*Chaetoceros radicans* with an high diatom species diversity). Annual cycle ends in January again with a maximum; phytocecnosis was now dominated by phytoflagellate component but also diatoms were well represented with *Asterionella glacialis* and *Skeletonema costatum* association.

For total values and for all the groups except Coccolithophorids, decreasing gradient from coast to offshore was regularly found. Stations from 6 nM offshore always seem to be scarcely productive, in terms of phytoplanktonic activity, and are considered representative of an oligotrophic system. Good correspondence was found between chlorophyll data and phytoplankton abundance, for chlorophyll a as well as chlorophyll c.

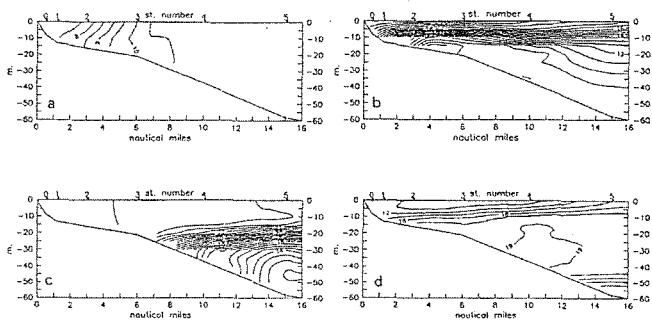


Fig.1. Temperature distribution on the section during winter (a), spring (b), summer (c) and fall (d)

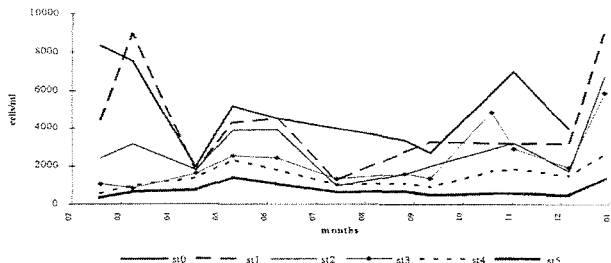


Fig.2. Phytoplankton abundances in cells/ml - Average integrated on water column