PHYTOPLANKTON PIGMENT/CARBOHYDRATE RELATIONSHIPS IN THE NORTHERN ADRIATIC

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Wide variety of biochemical compounds, including proteins, lipids, carbohydrates and photosynthetic pigments, have been used to study biological situation in estuarine and coastal environments. Determinations of chlorophyll and carotenoid pigments in the marine environment have proved to be particularly useful for providing additional information about the chemotaxonomic composition of phytoplankton and species specific distribution of phytoplankton biomass (BARLOW *et al.*, 1993). On the other hand, recent investigations have shown that carbohydrates represent a major pool of dissolved organic carbon in the oceans. Moreover, polysaccharides are thought to play an important role in formation of larger organic aggregates. Large-scale gelatinous mucus aggregations observed in the Adriatic Sea consisted mainly of polymeric carbohydrates (POSEDEL and FAGANELI, 1991). In addition, it was suggested that copepod grazing can strongly be inhibited by diatom carbohydrate-like exudates (MALEJ and HARRIS, 1993). The aim of this study was to investigate the relationships between the phyto-plankton biomass and concen-trations of carbohydrates (CHO) in the northern Adriatic.

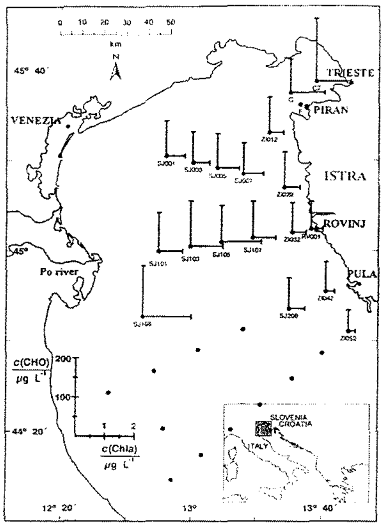

Figure 1. Annual mean Chl a and CHO concentrations in the water column of the N. Adriatic in 1992.

Sea water samples for phytoplankton pigment and carbohydrate determinations were collected on several stations (Fig. 1) in approximately monthly intervals during 1992 at standard oceanographic depths (0, 5, 10 and 20 m). After filtration through a Whatman GF/F filter pigments were determined by reversed-phase HPLC according to a modified method by Mantoura and Llewellyn (BARLOW *et al.*, 1993), whilst total CHO were determined from unfiltered samples using the standard phenol-sulphuric method. Distributions of the annual mean concentrations of both chlorophyll a and total CHO in the top 10 m of the sea water column (Fig. 1) indicate strong influence of the river inputs on the observed concentration levels with maxima recorded close to the freshwater plume of the Po River and in the Gulf of Trieste.

Since hydrographic conditions in 1992 were not particularly favourable for the formation of a high phytoplankton biomass compared with some previous years the concentrations of CHO were rather low (< 0.5 mg/l). Nevertheless, a comparison of seasonal fluctuations of phytoplankton biomass and CHO concentrations in the Gulf of Trieste (Fig. 2) suggested their positive correlation in some seasons. A pronounced CHO spring peak in the surface layer was accompanied by a concomitant peak of fucoxanthin (fuc), a characteristic accessory pigment from diatoms. Similar situation was observed in the bottom layer. By contrast, seasonal peak of 19'-hexanoyloxyfucoxanthin (hex), accessory pigment characteristic of Prymnesiophytes, was not followed by similarly enhanced concentrations of CHO. A linear regression analysis (log-lin) between the diatom counts and total CHO concentrations showed a week but significant correlation between the two parameters (r = 0.43). This suggested that not only phytoplankton biomass concentration but also its physiological status played an important role in determining CHO levels in the northern Adriatic.

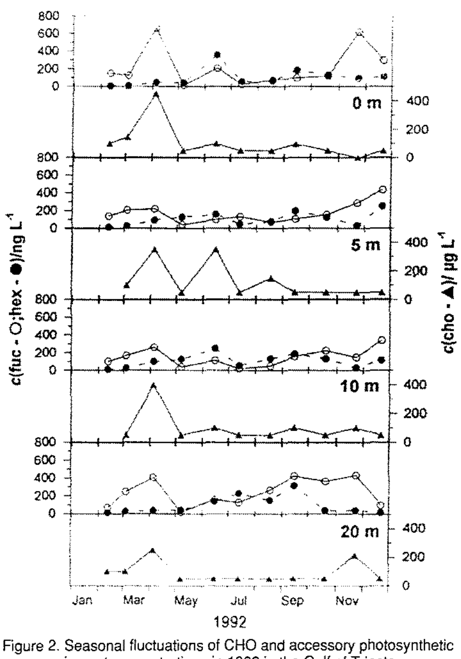

Figure 2. Seasonal fluctuations of CHO and accessory photosynthetic pigment concentrations in 1992 in the Gulf of Trieste.

REFERENCES

BARLOW R.G., MANTOURA R.F.C., GOUGH M.A. and FILEMAN T.W., 1993. Pigment signatures of the phytoplankton composition in the northeastern Atlantic during the spring 1990 diatom bloom. *Deep-Sea Res.* II, 40:459-477.

MALEJ A. and HARRIS R.P., 1993. Inhibition of copepod grazing by diatom exudates: a factor in the development of mucus aggregates? *Mar. Ecol. Prog. Ser.*, 96 : 33-42.

POSEDEL N. *AND* FAGANELI J., 1991. Nature and sedimentation of suspended particulate matter during density stratification in shallow coastal waters (Gulf of Trieste, northern Adriatic) *Mar. Ecol. Prog. Ser.*, 77 : 135-145.

AN ESTIMATE OF PELAGIC AND BENTHIC OXYGEN CONSUMPTION AND NUTRIENT REGENERATION RATES FROM ELNA DATA IN THE ADRIATIC SEA

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Oxygen and nutrient fluxes as determined from sediment core incubations reflect respiration and nutrient regeneration rates in the seabed. Rates inferred from a temporal series of hydrographic profiles of oxygen and nutrients instead represent the result of both pelagic and benthic processes. Both types of data are available from two ELNA cruises (June-July 1993) in the Adriatic sea, thus providing an opportunity to compare rates of water column versus benthic respiration/regeneration. Bottom sediments, collected by a boxcorer, were subsampled in triplicate and the subcores were incubated onboard. All boxcore stations were deeper than 25 m and included the Po area, the Italian coast from Ravenna to Ancona, and the Jabika Pit. Oxygen and nutrient (SiO2, NH1, NO3, NO2) concentrations from the incubation cores were monitored over a 1-2 day period. In each case, the rate of change was determined by a linear fit . The rates obtained tended to be comparable or lower than published values (GORDIANI *et al.*, 1992), but most of these previous *in situ* measurements were made at shallower depths. The ΔSi:ΔO and ΔSi:ΔN ratios showed no consistent trend suggesting that the recycling of silicate is decoupled from the other nutrients, as noted earlier by DEGOBBIS and GILMARTIN (1990). In many cases, the ΔO:ΔN ratio deviated from the Redfield ratio, especially in the Po area. For the water column data, we selected a number of hydrographic stations in the vicinity of the boxcore stations (within a ~ 10 km radius). Volume integrations for the lower layer were made, and rates were determined by difference. Stoichimetric ratios for the changes are compared with those from the incubations. The importance of pelagic vs. benthic processes in recycling of organic matter in the Northern Adriatic is discussed.

REFERENCES

DEGOBBIS D. and GILMARTIN M. , 1990. *Oceanol. Acta*, 13 (1) : 31-45

GIORDANI P. et al., 1992. In : Volleweider R. A., Marchetti R. and Viviani R. (eds), "Marine Coastal Eutrophication, Elsevier, New York, pp. 251-275.