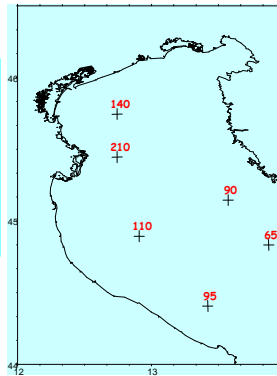


# PHYTOPLANKTON PRODUCTION IN A HIGHLY VARIABLE COASTAL ECOSYSTEM (THE NORTHERN ADRIATIC SEA)

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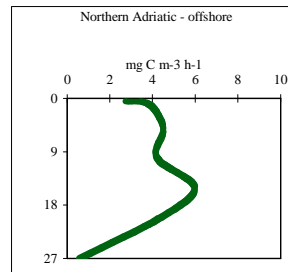
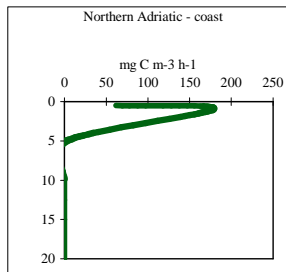
Studies on the phytoplankton production (PP) in the Northern Adriatic Sea (NAS) have been performed since the seventies by different working groups and in the framework of several research projects. In the present work we will focus on the data gathered by the CNR ISMAR since the early nineties, with the main aim of presenting a review of the most relevant results obtained in the last 15 years.

In the NAS the major PP variations occur along the trophic gradient and, typically, a negative correlation between phytoplankton production and salinity has been reported. The range of phytoplankton production in this area is considerable, with annual values ranging between 60 and 90 and 120 and 210  $\text{g C m}^{-2} \text{y}^{-1}$  for offshore and coastal waters, respectively.



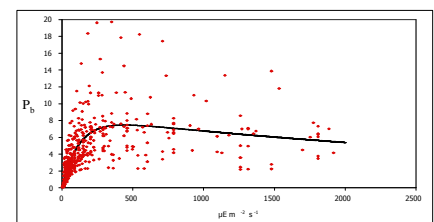
Yearly values of PP ( $\text{g C m}^{-2} \text{y}^{-1}$ )

Oceans: 30-125  
Upwelling: 500  
Shelf: 180  
Estuaries and lagoons: 300



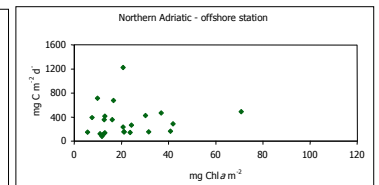
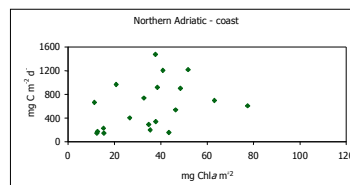
Marked differences in the vertical distribution of PP characterize the trophic gradient: the productive layer is generally restricted to the upper meters at the coastal sites, while offshore it includes frequently the entire water column.

Specific production ( $P_b$ : PP/chlorophyll *a*) frequently exceeding  $5 \text{ mg C mg chl } a^{-1} \text{ h}^{-1}$ , with peaks up to 20, are commonly observed in the NAS, as well as dramatic changes of this parameter, in relation with nutrient dynamics (Pugnetti et al., 2006). The largest part of the NAS is, indeed, characterized by rapid variation of nutrient availability, with alternating N and P limitation, in relation with abrupt changes in the Po River flow, to nutrient distribution in the basin and to phytoplankton uptake.

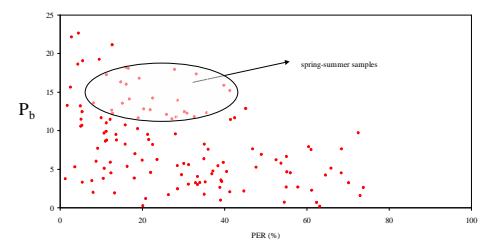


Pugnetti et al., 2006

The complex relation between PP and phytoplankton biomass in this ecosystem makes difficult the parameterization of the production process and hampers the possibility to predict PP from simple covariables (such as light and chlorophyll *a*).



The elevated variability of nutrient inputs may lead in the NAS to an uncoupling between photosynthesis and growth and to a shift from biomass growth to pure polysaccharide production that does not require N and P. Indeed, the average rate of exudate release in the NAS (Percentage Extracellular Release, PER = 20% of total PP, with peaks up to 70%) is close to the highest values reported in the literature. High  $P_b$  ( $> 10 \text{ mg C mg chl } a^{-1} \text{ h}^{-1}$ ) were generally associated with high exudate release ( $> 10\%$  PP) during spring and early summer: in this seasonal period, when mucilage formation might typically occur, we have indications of a potential uncoupling between photosynthetic activity and new biomass production (Pugnetti et al., 2005)



Pugnetti et al., 2005

The relations between daily PP and biomass variations have been recently analyzed too, in order to evaluate the matching between production and biomass loss factors. Production and losses tend to match quite clearly and this indicate the importance of the top-down control in this ecosystem.