

# VARIABILITY OF PHOTOSYNTHETIC PARAMETERS IN A SHALLOW TEMPERATE COASTAL AREA (GULF OF TRIESTE, ADRIATIC SEA)

Iva Talaber<sup>1\*</sup> and Patricija Mozetic<sup>1</sup>

<sup>1</sup> National Institute of Biology, Marine Biology Station Piran, Slovenia - Iva.Talaber@mbss.org

## Abstract

We studied the relationship between physico-chemical factors and photosynthetic parameters.  $P^B_{max}$  was mostly affected by temperature and phosphate. Overall, photosynthetic parameters showed less variability over the annual cycle in contrast to environmental factors and phytoplankton biomass.

*Keywords: Adriatic Sea, Coastal Waters, Phytoplankton, Primary Production*

## INTRODUCTION

The highly variable hydrological and physicochemical conditions of the northern Adriatic are reflected in a high variability of phytoplankton. There is little information about the effect of environmental factors on photosynthetic properties of phytoplankton [1]. We studied this relationship in a shallow coastal area (Gulf of Trieste) and tried to establish the degree of variability of these parameters.

## MATERIAL AND METHODS

Sampling was carried out biweekly from February 2009 onwards at one sampling site (1.3 NM off the coast, 22 m depth). *P-E* experiments were performed in a light incubator with samples taken from 5 and 15 m depth and inoculated with <sup>14</sup>C. Physicochemical parameters (CTD profiles, nutrients) and Chl *a* concentration were measured at each sampling. The photosynthetic parameters were derived from the experimental data fitted to the continuous exponential model of Platt *et al.* [2] (without the photoinhibition parameter, which was statistically equal to zero in all cases). Coefficient of variation for each variable and coefficients of correlation between variables (*r*) were calculated and the significance of *r* was tested with the two-sample paired *t*-test.

## RESULTS AND DISCUSSION

Photosynthetic capacity ( $P^B_{max}$ ) varied from 0.72 to 6.10 mg C mg (Chl *a*)<sup>-1</sup> h<sup>-1</sup>. The lowest value was found in April during mixed water column conditions, while the highest in July in the subsurface layer of highly stratified water column. Photosynthetic efficiency ( $\alpha$ ) ranged from 0.005 to 0.020 mg C (Chl *a*)<sup>-1</sup> h<sup>-1</sup> ( $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ )<sup>-1</sup>. In general, higher  $\alpha$  were typical for the 15-m depth layer. Coefficients of variation showed that nutrients and Chl *a* biomass were more variable than the photosynthetic parameters suggesting some physiological response of phytoplankton to environmental perturbations in order to maintain similar rates of photosynthetic capacity.

Tab. 1. Coefficients of correlation (*r*) between variables (*n*=23) and corresponding level of significance (\*\* *p*<0.05, \* *p*0.10)

	$T_{in\ situ}$	$E_{PAR(z)}$	$PO_4^{3-}$	$\alpha$	$P^B_{max}$	$E_k$	Chl <i>a</i>
$T_{in\ situ}$	1						
$E_{PAR(z)}$	** 0,49	1					
$PO_4^{3-}$	0,27	0,32	1				
$\alpha$	-0,10	0,11	-0,12	1			
$P^B_{max}$	** 0,49	* 0,38	** 0,46	0,17	1		
$E_k$	* 0,39	0,17	** 0,59	** -0,53	** 0,67	1	
Chl <i>a</i>	-0,17	** -0,45	0,01	0,17	-0,33	-0,29	1

$\alpha$  was not significantly correlated with any of the tested variables (table 1), and also varied independently from  $P^B_{max}$ , which is in agreement with the fact that both parameters are controlled by independent mechanisms of the photosynthesis [3].  $P^B_{max}$  was significantly correlated with temperature, which relates to the enzymatic control of photosynthesis. It was also significantly correlated with phosphate, which is the most limiting nutrient of the northern Adriatic [4]. The Chl *a* concentrations were significantly negatively correlated with  $E_{PAR(z)}$ , which suggests adjustment of Chl *a* cell content to the ambient light through photoacclimation.

## References

- 1 - Mangoni O., Modigh M., Mozetic P., Bergamasco A., Rivaro P. and Saggiomo V., 2008. Structure and photosynthetic properties of phytoplankton assemblages in a highly dynamic system, the Northern Adriatic Sea. *Est.Coast. Shelf Sci.*, 77: 633-644.
- 2 - Platt T., Gallegos C.L. and Harrison W.G., 1980. Photoinhibition of photosynthesis in natural assemblages of marine phytoplankton. *J. Mar. Syst.*, 38: 687-701.
- 3 - Platt T. and Jassby A.D., 1976. The relationship between photosynthesis and light or natural assemblages of coastal marine phytoplankton. *J. Phycol.*, 12:421-30.
- 4 - Degobbi D., Precali R., Ivancic I., Smolaka N., Fuks D. and Kveder S., 2000. Long-term changes in the northern Adriatic ecosystem related to anthropogenic eutrophication. *Int. J. Environ. Pollut.*, 13: 495-533.