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Factors controlling secondary productivity (Level 1 and 2) of polluted temperate coastal waters (Izmir Bay, Aegean Sea): a multivariate model

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In coastal areas that are characterized by well-mixed water column depending on the continuous water movements, inputs of nutrients by rivers and sewages cause a complexity in the planktonic food web. Typically, there exist excessive amounts of phytoplankton in such waters. However, this high primary productivity has not reflected to level 1 and 2 secondary productivity just enough because of complex relationships among species and eu- or hypertrophicated environment such as pollution caused high mortality in certain development stages, different tolerance to different pollutants, variations in feeding habits during the pollution process, pollution controlled competition and even the decreasing of zooplankton filtration rates due to dense phytoplankton cells etc. (BOUGIS, 1976).

In the present study, it was analyzed and discussed how far the eutrophication or hypertrophication have affected zooplankton abundance. The results were represented as a multivariete model.

The samples evaluated in this study were collected with a 5 liter universal series water sampler down to 15 m. depth by 0.5, 2.5, 5.0,10 and 15 m. intervals from 6 stations on a 6 km. line monthly or bimonthly.

As summarized in Table I, individual number of total zooplankton which were mainly produced by nauplii, copepodites and adults of Oithona nana, Acartia clausi and veliger larvae of bivalves, were statistically related with orthophosphate phosphorus, dinoflagellate abundance, density, diatom abundance, total inorganic nitrogen and silica respectively (Figure 1).

In accordance with multiple regression function, the fact that the orthophosphate phosphorus was the most significant parameter, proved that the importance of phosphorus excretion by zooplankton in eu- or hypertrophicated environments. It was clearly determined that the zooplankters feed both dinoflagellates and diatoms due to the phytoplankton succession and variations in density but preferably consumed dinoflagellates. There existed an inverse relationship between total inorganic nitrogen in which the most important ammoniotelic zooplankton excretion products were found, and zooplankton individual number because these compounds were basically included in the system as toxic non-ionic ammonia form by sewages, riverine inputs and degradation of biological materials in such environments.

Silica that might be an important selective factor affecting the ecology of estuarine and coastal phytoplankton (HECKY and KILHAM, 1988) was the least important factor for the zooplankton abundance.

Table I:Statistical parameters of the multiple regression of Zoopl.nb $=(PO_4^{-3}\text{-}P^{1.424})(Din.^{0.129})(10^{0.117}\sigma_t)(Dia.^{-0.057})(\Sigma N^{-0.660})(Si^{-1.014})$

Variables	Regression coefficient	Standard errors	Lower limit	Upper limit	F
PO_4^{-3}-P(µg-at l^{-1})	1.42397	0.16030	1.10636	1.74159	141.41
Din.(cells nb.l^{-1})	0.12874	0.03471	0.05996	0.19751	11.76
Density(σ_t)	0.11701	0.00772	0.10171	0.13231	28818.07
Dia.(cells nb. l^{-1})	-0.05719	0.02479	-0.10631	-0.00807	5.32
ΣN(µg-at l^{-1})	-0.65952	0.09763	-0.85296	-0.46607	172.26
Si(µg-at l^{-1})	-1.01405	0.08366	-1.17982	-0.84828	1143.40
Full regression	F=5048.7	p<0.0000	R^2=0.996		$\sigma_{s.}$=0.1521

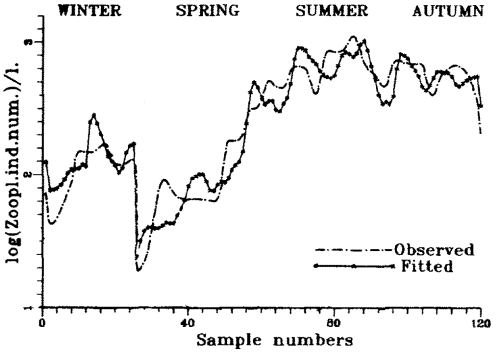

Fig. 1: Graphic representation of the model.

The assimilation of soluble silica by diatoms before each grazing period must give rise to the negative relationship.

REFERENCES.

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