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OCCURENCE OF PROROCENTRUM MINIMUM IN THE ADRIATIC SEA

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An organism never before recorded from the eastern Adriatic participated in the ordinary summer phytoplankton blooms in the Šibenik Bay in 1983,1984,1985. It was established to be a very interesting dinoflagellate species *Prorocentrum minimum*. Single occurrences of this species were also recorded from some other localities of the eastern Adriatic coastal area. The same species was also identified from the material collected from the Italian Adriatic coast (Po River estuary) in July 1984. However, this species showed some morphological differences in relation to the one recorded from the Šibenik Bay so that it was concluded to be a variety of *P.minimum* called *P. minimum* var. *triangulatum*. The taxonomy of this species is somewhat confused since some authors reported as different species the some individuals which had some variations in cell shape (PAVILLARD, 1916; LEBOUR, 1925; MARTIN, 1929; PARKE and BALLANTINE, 1957; BURSA, 1959). HULBURT (1965) proposed that they should all be merged into the prior species P. *minimum*(PAVILLARD) SCHILIER, but he suggested the retention of varietal status for the three species: P. *minimum* var. *minimum*, *P.minimum* var. *triangulatum*, *P.minimum* var.*mariae-lebouriae*.

This species has been given recently particular attention since its bloom was on several occasions associated with shellfish poisoning (NAKAZIMA, 1968; KAT, 1979; TANGEN, 1983).

The area of Šibenik Bay is under the combined influence of river and man-made eutrophication. Already high natural productivity of the basin has considerably increased for the last two decades owing to the development of the town and industry. Not more than ten years ago intensive diatom blooms of the so called "Opportunistic" species (*Skeletonema costatum, Leptocylindrus danicus, L. adriaticus, Eucampia cornuta, Nitzschia seriata, N. delicatissima, Thalassionema nitzschioides* and*Cerataulina bergoni)* were recorded. Dinoflagellate species, particularly P. *minimum* and *Scrippsiella trochoidea* have recently been recorded to make up a growing proportion of summer blooms.

Table 1. Proportion of *P. minimum* in the summer bloom in the Šibenik Bay

Year	Phytoplankton n cells l^{-1}	P.minimum n cells l^{-1}	P.minimum %
1983 (August)	$1,6 \times 10^6$	$2,5 \times 10^5$	15,4
1984 (July)	$1,6 \times 10^7$	$3,3 \times 10^6$	20,2
1985 (July)	$3,8 \times 10^6$	$1,1 \times 10^6$	28,5

The analysis of physical and chemical conditions under which *P.minimum* occurs in larger quantities showed a connexion with the temperature-salinity relationship. *P. minimum* bloom takes place exclusively in the surface layer, salinity and temperature of which are significantly different from those in other layers.

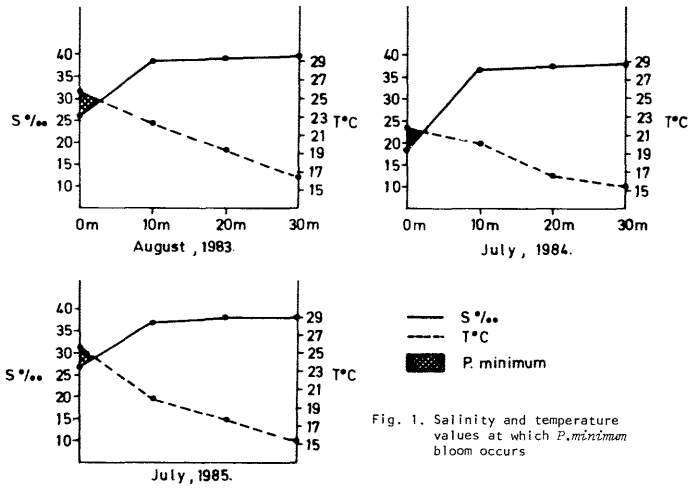

Fig. 1. Salinity and temperature values at which *P.minimum* bloom occurs

As known from the experimental data (IWASAKI, 1979) *P.minimum* bloom may be stimulated by *S.costatum* bloom. In our case we proposed that *P. minimum* bloom was probably stimulated by the bloom of the different diatom species, not only *S.costatum*. It should be pointed out that possible influence of individual "trace metals" was not studied since it is known that they may significantly affect blooms of a large number of organisms. Since the industry of light metals and ferroalloys is particularly developed in this area they may have great significance.

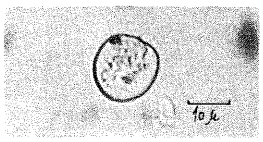

Fig. 2. *P.minimum* var.*minimum*

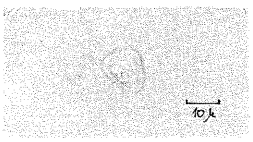

Fig. 3. *P. minimum* var. *triangulatum* (Po River estuary)

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THE PHYTOPLANKTON DIVERSITY AND EVENNESS INDICES IN AN EUTROPHICATED SEA AREA

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ABSTRACT: Phytoplankton community diversity and evenness indices as well as the phytoplanktonic densities are used to characterize the effects of eutrophication in the romanian Black Sea area.

The romanian marine waters are influenced by the outfalls as well as by the Danube River. Chemical and biological modifications were described (MIHNEA, 1978 a,b; 1980; MIHNEA & cowork., 1980). During 1979-1983 and 1985, from February to October 1,366 samples, covering all the southern part of the romanian sea waters, standard depth, up to 30 Nm off coast, were analysed.

The microplankton as well as the nanoplankton were considered. Table 1 presents the index of diversity (Shannon-Wiener eq.), evenness degree (Pielou eq.), species number and phytoplankton density.

Table 1 - Some aspects of the phytoplanktonic community

The year	Degree of freedom (n-1)	Index of diversity $\bar{X}$/year[x]	Evenness degree $\bar{X}$/year[x]	Species number $\bar{X}$/year[x]	Species number The range of variations[xx]	Phytoplanktonic density cell.l^{-1} $\bar{X}$/year[x]	Phytoplanktonic density cell.l^{-1} Monthly average range
1979	140	1.77	0.42	21	4-37	5.09×10^6	0.54 -20.0x10[6]
1980	139	1.66	0.38	20	7-37	6.74×10^6	0.89 -19.6x10[6]
1981	126	1.18	0.38	11	3-31	9.57×10^6	0.18 -54.0x10[6]
1982	335	1.49	0.40	16	2-31	3.68×10^6	0.059-17.2x10[6]
1983	406	2.48	0.55	25	6-53	0.64×10^6	0.069- 2.5x10[6]
1985	214	2.33	0.56	20	4-46	1.44×10^6	0.30 - 5.9x10[6]

The diversity frequency spectra are scaled in H' units of 1.0 and time intervals of a month. The index of diversity as bits $cell^{-1}$ has a mean value of 1.18-2.48. The crude data range between 0.028 and 4.24 but values under 3 have frequency of approximately 80%.

The small values of diversity index were accompanied by reduced ones for the evenness degree: 0.38-0.56 (annual average). Concerning the evenness degree, crude data range from 0.004 to 0.85. The extreme crude values of the two indices coresponded to: (1) blooms when the dominant element represented up to 90% of the community; (2) a moment when an important percentage of the phytoplanktonic species are represented in a rather equal number of individuals.

A mean of 11 to 25 species develop throughout the year; variations of crude data (2-53) were observed as a consequence of natural succesion, physical factors, and sampling distance or depth.

Phytoplanktonic density maintains a high level ($\bar{X}$=0.64-9.75x10^6cell l^{-1} annual average, or 0.069-54x10^6 monthly average) and presents either a rather uniform dispersion (1979-1981), or the tendency to patch (1982-1985).

When plant nutrients associated with river and outfalls discharge create bloom conditions, phytoplankton communities with high biomass, low species diversity and very low degree of evenness develop.

In the eutrophicated Gulf of California GILMARTIN & REVELANTE (1978) found phytoplanktonic densities up to 14x10^3 cell l^{-1} and an index of diversity varied from 0.42 to 4.24.

One can conclude that the romanian sea area has a high degree of eutrophication and are characterized by "a biological noise" in phytoplankton system.

REFERENCES

1. GILMARTIN M., REVELANTE N., 1978 - The phytoplankton characteristics of the barrier Island Lagoons of the Gulf of California. Estuarine and Coastal Marine Science, 7: 29-47.

2. MIHNEA P.E., 1978 a - Qualitative and quantitative characteristics of the alga Eutreptia lanowii Steur in the relation to the coastal pollution phenomenon. Cercetări Marine, IRCM, Constanța, 11: 225-233.

3. MIHNEA P.E., 1978 b - Euglénacées et Chrysophycées en tant qu'organismes entraînés dans la pollution marine littorale. IV[e] Journées Etud.Pollutions, CIESM, Antalya: 471-475.

4. MIHNEA P.E., CUINGIOGLU E., BILAL I., 1980 - Modifications des communautés phytoplanctoniques littorales sous l'influence du phénomene de pollution. V[es] Journées Études Pollutions, CIESM, Cagliari: 869-876.

x/In the table the annual average was reckon on monthly average.

xx/crude values