

THE INFLUENCE OF EUTROPHICATION ON THE PERIODICITY OF THE PHYTOPLANKTON
PROROCENTRUM MICANS.

Kalliopi Pagou

Nuclear Research Center "Demokritos", Aghia Paraskevi, Attikis, Greece.

Abstract

The influence of eutrophication on the periodicity of a dinoflagellate was studied using the autocorrelation method. The investigated species was Prorocentrum micans a dominant species in the coastal waters of Saronicos Gulf, Aegean Sea, Greece, during the years 1977-1981. It was shown that the periodicity of its cycle was influenced by the eutrophic conditions of the environment.

Résumé

L'influence de l'eutrophisation sur la périodicité d'une espèce de Dinoflagellés a été révélée par la méthode d'auto-corrélation. L'espèce recherchée était Prorocentrum micans, Dinoflagellé prédominant dans l'eau de la baie de Saronicos en mer Egée durant les années 1977-81. Il a été démontré que la périodicité de son cycle a été influencée par les conditions eutrophiques de l'environnement.

Introduction.

The usefulness of the study of correlogram as a simple and preliminary method for elucidating the oscillatory variations of ecological time series, has been discussed in literature (Legendre and Legendre, 1979).

In the present work this method has been chosen in order to investigate fine differences between the cycles of a phytoplankton species grown in both eutrophic and oligotrophic environments.

Materials and Methods.

Sampling was performed monthly from January 1977 to December 1981 from stations S₁ and S₃ in W. Saronicos Gulf. Station S₁ is characterized by eutrophic and S₃ by almost oligotrophic conditions (Karydis et al. 1983). Water samples were collected from 1 m depth, with a Van Dorn sampler and phytoplankton cells were counted in an inverted microscope. The raw data, after logarithmic transformation, were tested for trend and detrended (Legendre and Legendre, 1979). The autocorrelation coefficients were calculated, using a computer program (Davies, 1971), in a CDC 3300 computer at the N.R.C. "Demokritos".

Results and discussion

The data of Prorocentrum micans concentrations for the period 1977-81 are shown in Fig. 1. It is seen that the only distinct difference that can be detected from diagrams is that the concentration (cells/litter) of Prorocentrum micans in the eutrophic station S₁ (Fig. 1a) was up to 600 times higher than in the oligotrophic station S₃ (fig. 1b). The correlograms for the two stations are given in Fig. 2. The correlogram of Prorocentrum micans for the oligotrophic station S₃ (fig. 2b) shows a typical oscillation having a twelve month period. On the other hand, the correlogram for station S₁ (fig. 2a) fluctuates in a quite different way and it is difficult to define the type and period of its oscillation.

It must be emphasized that certain parameters such as temperature, salinity and incident radiation had similar levels at both stations (Ignatiades, et al., 1980a,b). Therefore, the observed differences in the oscillation patterns of *Prorocentrum micans* might be attributed to the difference in the nutrient levels between the two stations.

It is obvious that the eutrophic conditions of the environment influence directly the periodicity of the phytoplankton species and this can be detected by the correlogram analysis.

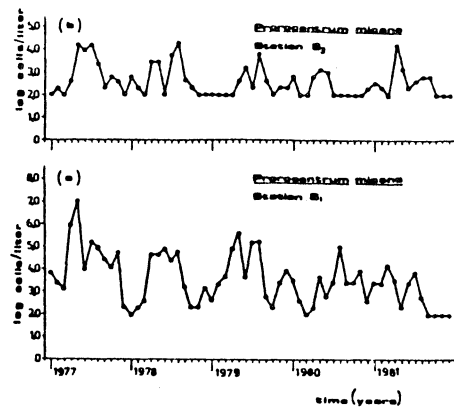


Fig. 1. The annual cycles of *P. micans* for the period 1977-81, at stations S_1 , S_3

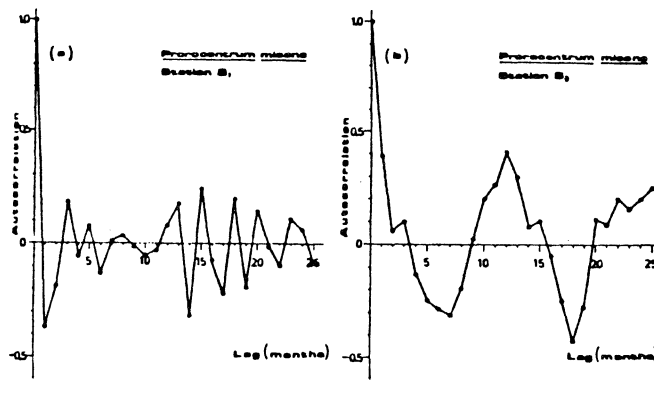


Fig. 2. The correlograms for *P. micans*, at stations S_1 , S_3 .

References

- DAVIES, R.G. 1981. *Computer programming in quantitative biology*. Academic Press, London. xi+492 p.
- IGNATIADES, L., KARYDIS, M., and N. MOSCHOPOULOU. 1980a. *Phytoplankton Ecology of the Saronicos Gulf, Aegean Sea*. DEMO (81/12). Data Report, Part 1: Hydrography, pp 44.
- IGNATIADES, L., MOSCHOPOULOU, N., and A. VASSILIOU. 1980b. *Phytoplankton Ecology of the Saronicos Gulf, Aegean Sea*. DEMO (83/8). Data Report, Part 2: Phytoplankton, pp. 222.
- KARYDIS, M., IGNATIADES, L., and N. MOSCHOPOULOU. 1983. An index associated with nutrient eutrophication in the marine environment. *Estuarine, Coastal and Shelf Science*, 16, 339-344.
- LEGENDRE, L., and LEGENDRE, P. 1979. *Ecologie Numérique*, Tome 2. Masson, Paris, 247 p.