NOTES ON THE RELATIONSHIP BETWEEN BIOLOGICAL ENVIRONMENTAL VARIABLES

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Abstract

A set of environmental variables including temperature, phosphate, ammonia and the phytoplankton and zooplankton standing stocks were collected from Saronicos Gulf, Aegean Sea. The dependance of the various standing stocks (chlorophyll a, phytoplankton cells, zooplankton individuals) on each other and on the temperature, phosphate and ammonia were examined by step-wise multiple regression analysis.

Materials and Methods

Sampling was performed in an inshore environment of the Saronicos Gulf, Aegean Sea, from three stations along the sewage outfall gradient. Surface water samples were collected in June, September, October, November 1979 and February 1980. Location of stations as well as methodology for phytoplankton, phosphate and ammonia estimations have been given elsewhere (STATHOULOPOULOU and IGNATIADES, 1980). Chlorophyll a determinations were made after SCOR/ UNESCO (1966). Zooplankton samples were collected by horizontal hauls using a WP_2 net. Temperatures were also recorded.

Results and Discussion.

This paper presents an attempt to resolve the multiple interaction of the following parameters:
1) phytoplankton cells, 2) chlorophyll a 3) zooplankton (mainly copepods) 4) phosphate 5) ammonia 6) temperature.
The step-wise multiple regression analysis was done using a computer program developed at the Nuclear Research Center "Demokritos", The procedure generated a number of regressions by adding one variable at a time. Only significant variables were included in the final regression.

The regression equations have as follows:

A. For chlorophyll a as dependent variable:

$$Y = 0.07X + 2.79 \qquad \text{where } X=N\text{-}NH_3$$

B. For zooplankton as dependent variable:

$$Y = 0.03X_1 - 0.03X_2 + 2.50 \qquad \text{where } X_1=N\text{-}NH_3, \; X_2=T^oC$$

C. For phytoplankton cells as dependent variable:

$$Y = 0.18X_1 + 0.09X_2 + 3.63 \qquad \text{where } X_1=P\text{-}PO_4, \; X_2=T^oC$$

The results showed that:

1) There is no direct relationship between the phytoplankton and zooplankton standing stocks, and this may be attributed to the eutrophication conditions prevailing in the area (Moraitou-Apostolopoulou and Ignatiades, 1980).

2) Relationship of zooplankton with ammonia and temperature. Similar information has been given by Le Borgne (1978).

3) Phytoplankton standing stock data expressed by chlorophyll a concentrations showed dependence on ammonia whereas data expressed by cell concentrations showed dependence on temperature and phosphorus. Those differences show that each one of those parameters (chlorophyll a, cell numbers) has its own specificity and cannot be replaced by the other (Karydis, Moschopoulou and Ignatiades, 1982).

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