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Relationship between bacteria and oceanographical parameters in the Western Mediterranean Sea

by

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1 - Introduction

Bacteria in the sea play an important role since elements of variable proportionality are extremely conditioned by their activity. The present study includes a global consideration of some biological and chemical parameters with the aim of stuging the ecological relations between the number of heterotrophic bacteria and the main chemicals variables involved with them.

2 - Material and Methods

The data were collected during the MEDITERRANEO I cruise with the R/V "Cornide de Saavedra" off western Mediterranean Sea during November 1976. The biological parameters considered were the number of heterotrophic bacteria as well as the following variables: temperature, phosphate, nitrate, nitrite, silicate, oxigen, sigma-t and ammonia. The number of the heterotrophic bacteria was estimated by the agar pour plate method (VALLESPINOS & TEJERO, 1977). Details of the analytical procedures followed for the different measurements are given in MANRIQUEZ & FRAGA, 1977. Sea water samples were taken with Niskin bottles from surface, 20, 50, 75, 100, 200, 300, 400, 500, 600, 700, 800 and 1000 meters depth from twelve stations. The total amount of processed samples was 156.

The matematical calculations carried out were linear correlation and regression for each pair of variables, and principal component analysis (CUADRAS, 1974). The computing work was done by an IBM 1130.

3 - Results and discussion

The results of the three principal components analyses are summarized in Figure 1. The arrows have been drawn taking as extreme

the points whose coordinates are the correlation coefficients of the parameters with each principal components, obtained by the analysis of the first survey (samples proceeding from surface to 100 meters depth) and of the second survey (taken from 100 to 1000 meters depth). The arrows have been bent to include the point determined by the global analysis of all samples (ESTRADA, 1976). The variance explained by the components was between 38-42% for the first (PCI) and 12-18% for the second one (PCII). As it can be seen nearly all the hydrographic parameters (salinity, temperatute, NO_3, SiO_4, PO_4) are caracterized by negative or positive values of PCI, being this component related to depth.

The second principal component is not be clear, but can be tentatively related to the "biological activity"; the higher loading for PCII correspond to bacteria, nitrites and ammonia.

The direction of the arrow shows the displacement of the variable's positiom wh n the samples are analized of up to 100 m (origin) and those of more of 100 m (extrem). When visualized the behavoiur of both variables in two different areas in the water column, we can see how the nitrites undergo a change of behaviour when they pass from an area to another, being this process due to the fact that those are very correlated with the phytoplankton's activity (BLASCO, 1971). However the ammonia is negatively corelated with the number of bacteria. The rate between these differents forms is the expression of the fluctuation of the biological process in the marine ecosystem where the bacteria play an important role.

4 - Resumé

Pendant la mission MEDITERRANEO I ont été faits 156 échantillons pour étudier les relations entre les bactéries et les sels nutritifs employant l'analysis des composants principaux.

5 - References

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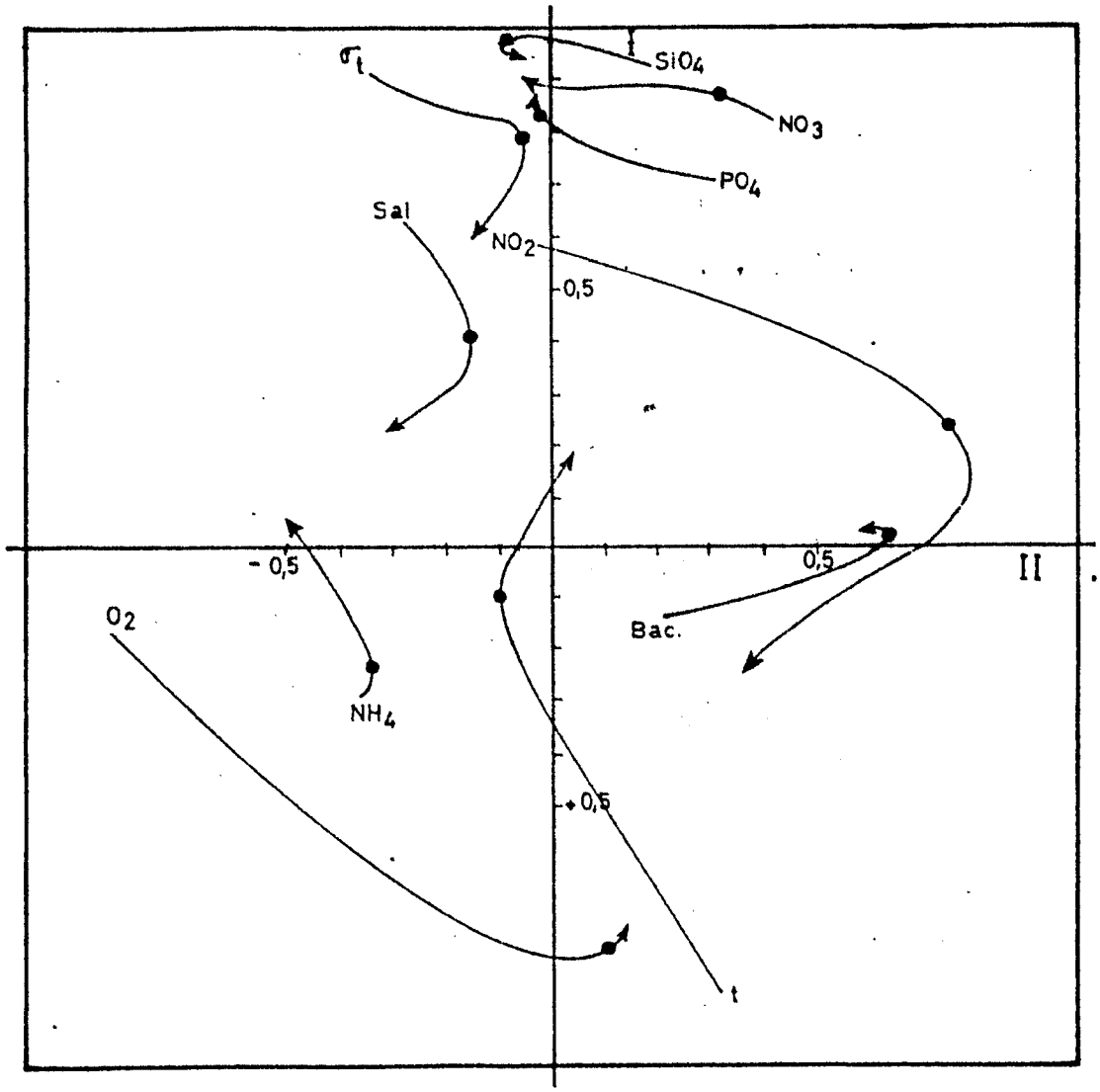

Figure 1. Position of the variables in the space delimited by principal components. The extremes of the arrows are the correlation coefficients of the variables with these two axes. The end indicated samples from 0 to 100 m; the other end indicated by an arrow correspond to the analysis from 100 to 1000 m.