ZOOPLANKTON AND PHYTOPLANKTON STANDING STOCKS RELATIONS, IN AN OLIGOTROPHIC MARINE ECOSYSTEM *

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Les relations entre le stock phytoplanctonique, mesuré par la chlorophylle - a en mg/m^3, et la biomasse de zooplancton (Zb), estimée par le poids sec en mg/m^3, ont été étudiées dans une zone oligotrophe de la Mer Egée. En été, quand le système est définitivement en équilibre, les deux variables sont significativement corrélées ($r = 0.97$, $P < 0.05$) et leur relation peut être exprimée par une droite de regression répondant à la formule:

$$\log Zb = 1.57 + 0.82 \log Chl\text{-}a$$

Les limites de confiance de la pente, au niveau 95%, sont estimées à ± 0.38 ($P < 0.001$). Les conclusions des ces résultats sont discutées en bref.

The relationships between the phytoplankton standing stock, as Chlorophyll - a values in mg/m^3, and the zooplankton biomass (Zb), as dry weights in mg/m^3, have been studied in an oligotrophic ecosystem of the Aegean Sea. The zooplankton standing stock varied significantly with that of Chl-a to a power <1 in all cases. The coefficient of correlation was very good when the Summer data were considered only ($r = 0.97$, $P < 0.05$) and the regression fitted to these data may be expressed as:

$$\log Zb = 1.57 + 0.82 \log Chl\text{-}a$$

The 95% confidence limits for the regression coefficient have been estimated as ± 0.38, and the significance test showed a $P < 0.001$.

The regression coefficients, obtained from regions with definitely equillibrated conditions, have always been $0 < \beta < 1$. When the regression coefficient obtained from the Summer data (βs), was compared with the one from Winter (βw), it was found that $\beta s > \beta w$, signifying that an equal increase of Chl-a at Summer and Winter, will reproduce more zooplankton biomass during the first

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* This paper will be published in extenso elsewhere.

period than the second one and this may let us to conclude that the potential ecological efficiency is higher in more oligotrophic waters. This conclusion coincides with that reported by several authors, as Greze (1970), Cushing (1971), Blackburn (1973) and clashes with the results of Taniguchi (1973) and Dandonneau's (1975), whose regression coefficients were higher than unity and therefore they concluded that ecological efficiency grows with the sea water fertility.

However, in the oligotrophic region of the Aegean Sea, the quick depletion of nutrient concentrations, after its annual, during late Winter - early Spring, reactivation, results an also rapid stabilization between the zooplankton and the phytoplankton standing stocks, as shown from our data, which present no differences in their phases. This observation may lead us to the conclusion that phytoplankton grows up continuously on a limited amount of nutrients, so that, the phytoplankton production per day must be equal with the daily food requirements of the zooplankton population.

The fact that nutrients must be added daily in the system, allow us to determine that it is very likely that the recycling of the nutrient salts, from the zooplankton excretion, contributes a great deal to sustain the phytoplankton growth; the loss of energy, during the cycle " grazing - assimilation - excretion - photosynthesis " maybe responsible for the slow decrease of the total zooplankton biomass.

LITERATURE.

BLACKBURN, M., 1973. *Limnol. Oceanogr., 18, 4, 552-563.*

CUSHING, D. H., 1971. *Advan. Mar. Biol., 9, 255-334.*

DANDONNEAU, Y., 1975. *Cah. ORSTOM, sér. Océanogr., 13, 3, 239-250.*

GREZE, V. N., 1970. In: *Marine food chains, J. H. Steele (ed.), Oliver - Boyd, Edinburgh, pp 458-467.*

TANIGUCHI, A., 1973. *Mar. Biol., 21, 2, 115-121.*