# PO RIVER INDUCED LOW PHYTOPLANKTON DIVERSITIES IN THE ADRIATIC SEA

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## Summary

The Adriatic undergoes marked changes in phytoplankton densities and diversity under the eutrophicating influence of northern rivers: fluctuactions easily described but hard to quantify. A four year study is reported which evaluates and uses Shannon diversity indices to provide insights and quantify eutrophication processes in the Northern Adriatic.

La diversité phytoplanctonique est utilisée pour quantifier l'eutrophisation de la mer Adriatique septentionale. Less différences regionales et temporales sont présentées.

Diversity indices are biological indicators which integrate information on densities and types of phytoplankton present, in a single datum: information complementing standing crop data, which primarily reflect the balance between crop production and losses. Phytoplankton samples collected in the Adriatic from 1972-76, and oceanographic data, were used to analyze community changes. A correlation matrix analysis (Table I) identified the Shannon diversity index as the least correlated with species numbers or cell densities, and preferred over the other indices evaluated.

Shannon diversity frequency spectra defined three subregions. The "open" Adriatic had a characteristic spectrum with a maximum in the 3-4 H'class, "eastern" stations had a diversity spectrum shifted down about one H'class, while the "northwestern" spectrum was two H'classes lower.

Temporally, the Northern Adriatic diversity spectrum closely resembled the spectrum characteristic of western

stations during January to March, and May to September, and eastern stations during April, and from October to January, and could be used to trace the influence of river discharge.

These diversity characteristics correlated well with the other data characterizing eutrophication and quantified, in time and space, the dominating influence of the Po River.

Future downward shifts in phytoplankton diversity spectra would be strongly indicative of increased eutrophication or environmental stress: therefore it is urged that this ecological parameter be more frequently assessed in the future.

Table I. The correlation coeficient (r) matrix between number of species (S), number of organisms (N), Margalef index $(d = \frac{S-1}{\ln N})$, Menhinick index $(d = \frac{S}{\sqrt{N}})$, Fisher index $(\alpha = \frac{S}{\ln (1 + \frac{N}{\alpha})})$ and Shannon and Weaver index $(H' = -\Sigma p_i \log_2 p_i)$ obtained from Adriatic phytoplankton samples, with the corresponding Pielou "evenness" index $(e = \frac{H'}{\log_2 S})$

| S | Log N | Margalef | Fisher | Menhinick | Shannon | Pielou |
|---|-------|----------|--------|-----------|---------|--------|
| 1 | 0.50  | 0.96     | 0.94   | 0.42      | 0.20    | -0.25  |
|   | 1     | 0.19     | 0.14   | -0.81     | -0.57   | -0.83  |
|   |       | 1        | 0.99   | 0.29      | 0.48    | 0.04   |
|   |       |          | 1      | 0.33      | 0.51    | 0.08   |
|   |       |          |        | 1         | 0.79    | 0.78   |
|   |       |          |        |           | 1       | 0.86   |

n = 199

R e f e r e n c e s

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