

QUALITATIVE AND QUANTITATIVE CHARACTERISTICS

OF THE ALGA *Eutreptia Lanowii* (STEUER)

IN RELATION TO THE COASTAL POLLUTION PHENOMENON

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ABSTRACT:

Data on the biological cycle and quantitative variations in the species *Eutreptia Lanowii* are here presented. The correlation of this organism with the environmental factors proves its occurrence and development as a consequence of the sea water quality modification in the coastal zone.

Chemical modifications of the sea water in the Romanian coastal zone during the late two decades implied a qualitative and quantitative reorganization of the phytoplanktonic communities. The development of some taxonomical groups having occupied an unimportant place before is one of the new qualitative characteristic features (2). On the first place are the algae belonging to the families *Euglenaceae* and *Chrysophyceae* (3), next followed by representatives of the family *Eutreptiaceae*. The propensity of these algae for mixotrophy, on the one hand, and the parallelism between the chemical modifications of the water and their quantitative increase, on the other hand, prove their connection with the present eutrofication degree.

MATERIAL AND METHODS

Samples were collected from 13 coastal stations along the 5 m depth contour line, in front of the waste sources, and

from a control station located at the 5 n.m. distance off shore. Samples were collected during 1976-1977 period, in the spring, summer and autumn months. The data on the physical and chemical conditions which were used in order to correlate the distribution and the density of this alga, were provided by the chemistry group of the Coastal Pollution Laboratory.

RESULTS AND DISCUSSION

A. DISTRIBUTION AND QUANTITATIVE VARIATIONS

Though rare or unexistent in the Romanian coastal waters, Eutreptia became a frequent organism in this area in 1976-1977. Its biological cycle indicates two massive development stages during the year - in spring and in autumn - with a slight decrease in summer (Figs. 1-2). The variation limits of the cellular density/l show preferential development of the species in certain zones or certain season. Thus, for instance, in March, when its development cycle begins, it was found at few stations (in 1976, at stations in front of the Neptun and Mangalia, ranging within 200 - 12,800 cells/l) and at a low concentration level. During April and May the division was intensified and the spreading area included a greater number of sampling stations. However, high disproportion was noticed between the quantities found at the stations. In April 1976, the species was found at four of the fourteen stations under observations and the density varied between 72,600 cells/l (at station Neptun) and 300 cells/l (at station Vama Veche). In May, 1976, it was identified at eleven stations, with a density varying between 22,800 cells/l (South of Constanța) and zero (at North Eforie). All through the summer, both the number of cells/l and stations where the species was identified decreased: values of 280-2,805 and only at two of the stations during the interval of July-August, 1976. The cellular division is resumed during the autumn months, reaching an average of 60,307 cells/l, but with the same disproportion as during the rest of the year: 118,800 cells/l were found in the sample in front of Mamaia point, as compared with 1,815 cells/l in the sample collected from the Vama Veche point. The number of stations varied between 2 and 4, as a function of the particular conditions of each of the reference years.

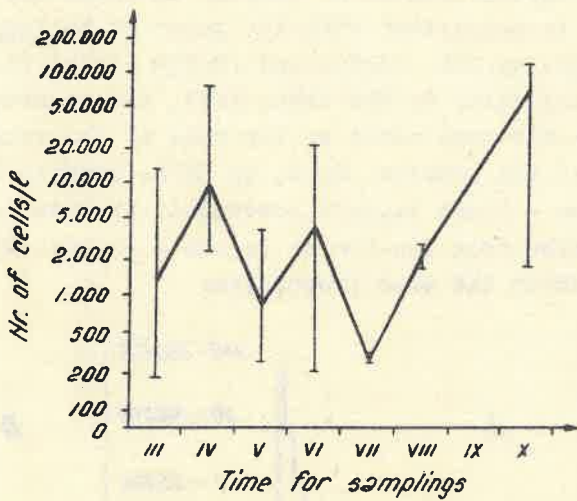


Fig. 1 - Eutreptia mean density and its monthly variation limits, throughout 1976.

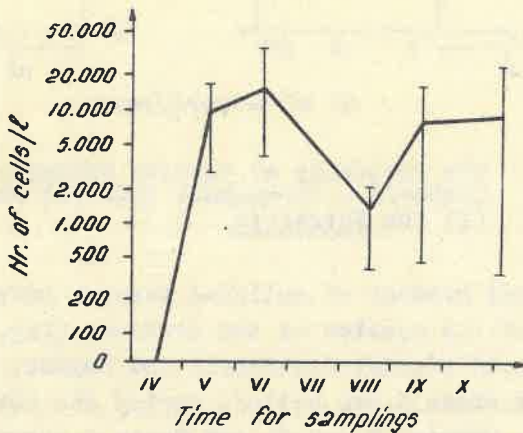


Fig. 2 - Eutreptia mean density and its monthly variation limits, throughout 1977.

The frequency by density classes (Fig.3) points out, on the one hand, a smaller number of samples in which the species was identified, in comparison with the group of Euglenaceae and Chrysophyceae (3): 40.29% (1976) and 22.39% (1977) of the samples contained this organism. On the other hand, the density was much below that which had been noted in the case of the comparison group, in most of the samples. Thus, in 1976, density classes of 100-500 and 1,000 - 5,000 cells/l prevailed, whereas during 1977, the density classes from 100-500 to 10,000 - 50,000 cells/l were represented in about the same proportion.

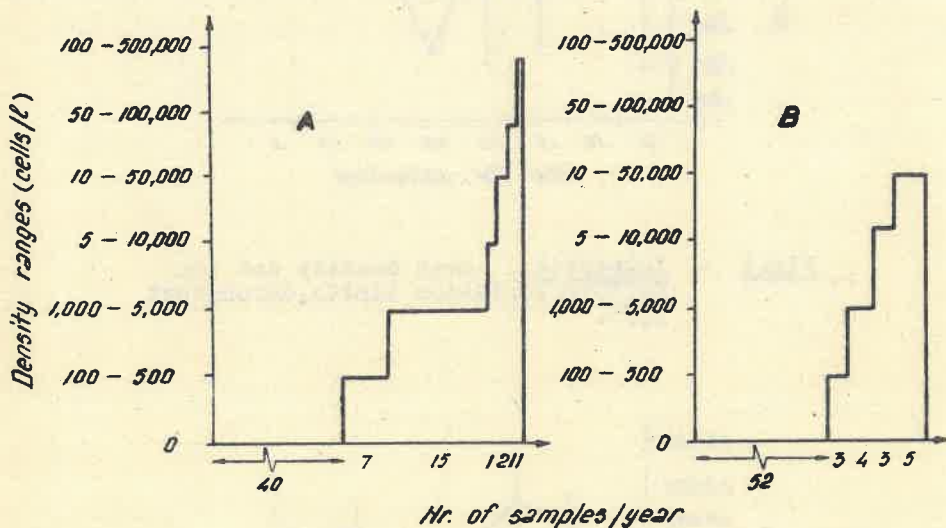


Fig.3 - The frequency of density ranges in cells number/l - throughout 1976 (A) and 1977 (B) for Eutreptia

The annual average of cellular density reveals preferential development of the species at the stations (Fig.4). In front of the stations South Eforie, Costinești and Neptun, the annual average is near or above 5,000 cells/l during the both years. At stations Năvodari, Mamaia, I.R.C.M. and South Constanța, an alternation occurs: in one of the years, the limit of 5,000 cells/l was exceeded, but in the other, the values decreased much below this level. The samples taken in front of the stations Agigea, Vama Veche and Mangalia in both investigated years contained small

quantities of the alga, the average being much below the limit of 5,000 cells/l. At stations Modern Beach and North Eforie, Eutreptia was not identified. Hence, the distribution and most of all, the density of this alga depends to a great extent on the water quality.

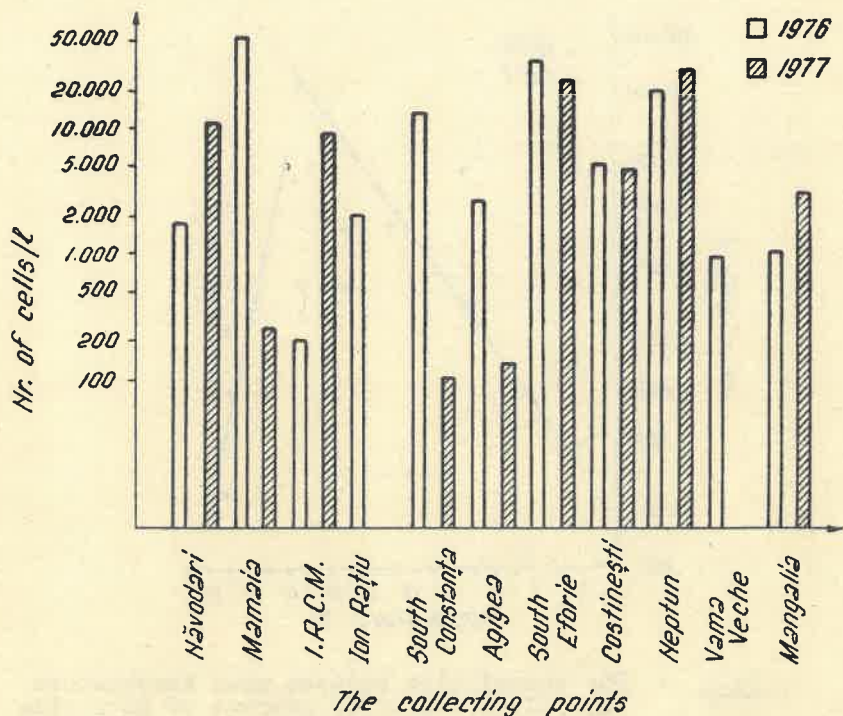


Fig.4 - Annual mean cellular density of Eutreptia along the South area of Romanian sea shore throughout 1976 and 1977 (were omitted those collecting points where the studied organism was not found).

B. CORRELATION FACTORS

There is consistent information regarding the dependence of the flagellates on the thermic factor. For instance for the Chrysophyceae, the survival limits range between 8° and 35°C, with a specification that optimum values correspond to each species (5). For some of these, a temperature rise by 1-2°C is followed by intensification in the absorption of microelements, glycine, va-

line, isoleucine, etc., while the request for B₁₂ vitamine increases about 300 times (1).

The studied species showed the following correlations with the thermic factor (Fig.5).

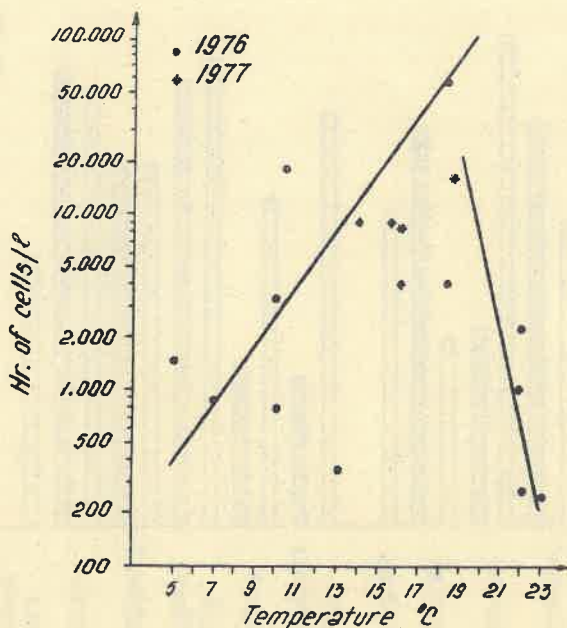


Fig.5 - The correlation between mean temperature and cellular density average of Eutreptia throughout 1976 and 1977.

- The temperature limits within which the organism has been found are 5-23°C.

- The correlation between temperature and the number of cells per liter is significantly positive between 5° and 18°C. Above the latter value, the thermic factor shows a significant negative correlation with the cellular division. Consequently, within 19-23°C to each gradual rise of temperature it corresponds a slowing down of the metabolic processes preceding the cellular division.

- The optimum temperature for the development of the organism ranges within 10-18°C.

- The wide range of temperature at which it survives, as

well as of the optimum temperature, proves the adaptability of the alga as relating to the discussed factor.

The total quantity of organic substance increased during the late two decades from average values of 2.28 (in mg O₂/l) in 1967-1968 (4) to 33.08 or 31.31 in 1976 and 1977, respectively^{x/}. There is a parallelism between the increase in total dissolved organic substance and the development of the Eutreptia L., as a potential consumer of this substratum. But the uniform distribution of the organic substance all through the coastal water zone makes the correlation between organic substance and cellular division to be indifferent. An interrelation of the 5-day BOD values with the cellular division of Eutreptia (Fig.6) sug-

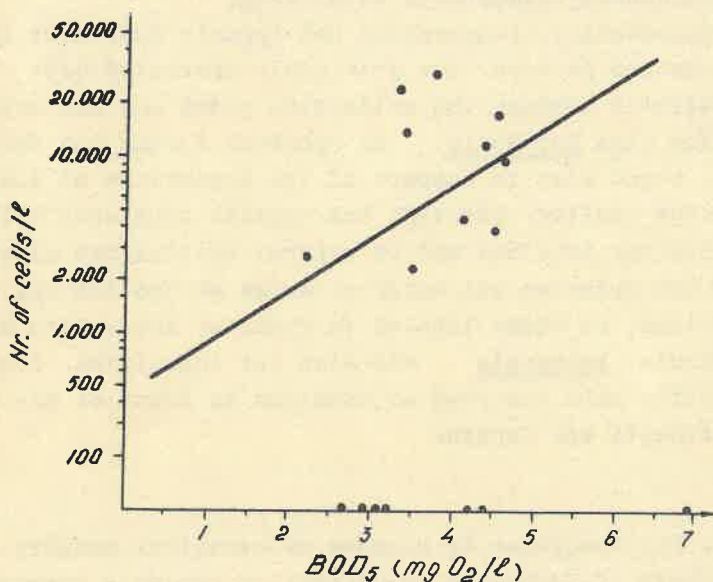


Fig.6 - The correlation between BOD₅ and cellular density average of Eutreptia

gests the dependence of this euglenophyte on the organic substance quality. The samples in which the studied organism was found had a 5-day BOD within 2.4-4.6 (mg O₂/l), the maximum of its density corresponding to a 5-day BOD of 3.2-3.7. The 5-day BOD de-

^{x/} After the data of the Coastal Pollution Laboratory.

crease under 2.4 mg O₂/l, hence the increase of mineralization rate of organic substance, implies a diminution of the Eutreptia cellular density. A supposition may be advanced that Eutreptia develops in an environment where the bacteria have produced the first step of the organic matter decomposition. The decomposition degree corresponds in this case to BOD values of 4-4.7. The organic matter is oxidized from this decomposition stage, if not entirely, at least partially, under the influence of this consumer, too.

The nitrogen (N-NO₃) and phosphorus (P-PO₄) concentrations could not be correlated with the recorded cellular densities. The high values at which they maintain nearly all the year round give constantly disposable substratum.

Consequently, temperature and organic substance quality are the limitative factors. The previously presented data (Fig.4), proving a relation between the collecting point and the average biomass of the alga Eutreptia as recorded during the two studying years, stand also in support of its dependence on the nutritive substratum quality. Although the organic substance values at coastal collecting stations and at control station are close, the presence of the organism was never observed at the latter. Of the coastal stations, at those located in front of the Modern Beach and North Eforie, Eutreptia was also not identified. Constantly large quantities were recorded at stations in front of the South Eforie, Costinești and Neptun.

CONCLUSIONS

1. The frequency by classes of numerical density and the biological cycle of Eutreptia prove that it became a common component of the coastal phytoplankton.

2. Its biological cycle presents two maxima: one in spring and the other in autumn, with a slight reduction of its number in summer.

3. Eutreptia occurs in the coastal waters within the temperature range of 5-23°C; the correlation between cellular density and temperature is positive within 5-18°C, and negative within 19-23°C.

4. The modification of the coastal water environment as

concerns the organic substratum quality permits the development of this alga.

5. Eutreptia has been identified in environments the 5-day BOD values of which have been varying within 2.4-4.6 O₂/l.

6. As its number of cells per liter is diminished below 2.4 BOD, an explanation may be advanced that Eutreptia takes part, alongside with some other related algae, in the process of organic matter mineralization.

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