Small flagellates in the Black Sea

by

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Nowadays greater attention is paid to the role of small Flagellates in sea basins. It's peculiarly marked their meaning in food chains. However, the having data on this item are still scanty that's why they do not allow to estimate monads foremost quantitatively and to determine their essential role in the productivity of sea basins. The given literature values on the amound and/or the biomass include more often not only small Flagellates but some Coccolithineae, Dinoflagellatae, Protococcineae and other small and the smallest algae not having legible systematical features in fixed state and that's why they are so difficult to be determined [PITSIK, 1950, 1951, 1954, 1955; WOOD & DAVIS, 1956; MOROSOVA-VODYANITSKAYA, 1957; BELOGORSKAYA, 1959; BERNARD, 1964, 1967; *et al.*] In a number of cases only relative significance of small flagellattes is noted in sea bases [MILLER, MOARE & KVAMMER, 1953; BERNARD, 1961, 1963; WOOD, 1963*a*, 1963*b*, 1965; *et al.*].

Summary data (mayor for south seas) are obtained after ordinary treatment of preserved phytoplankton samples [MOROSOVA-VODYANITSKAYA, 1948, 1954; PITSIK, 1950, 1951, 1954, 1955; KONDRATYEVA, 1963; DENISENKO, 1963, 1964; MIHAILOV & DENISENKO, 1963; MIHAILOV, 1964; *et al.*). However the record of small flagellates wasn't a special task of researches in these cases and this was made passingly.

Earlier attempts to study south seas' monads specially were made by the Institute of Biology of South seas (Sevastopol, USSR). There were aquired some results not only on the quantitative record of small flagellates in fresh materials [MIHAILOVA & LANSKAYA, 1960] but also on the tempro of their « multiplication » in cultures [MOROSOVA-VODYANITSKAYA & LANSKAYA, 1959; LANSKAYA, 1963] as well as on their chemical composition [LANSKAYA & PSHENINA, 1961; LANSKAYA, VITYUK & ROJHANSKAYA, 1964].

At present time the research of small flagellates is resumed by the laboratory of phytoplankton (the Institute of Biology of South seas, Sevastopol). Next questions must be dissolued : specy composition study, quantitative record, selection of fixator and others.

Revealed, monads have a wide specy variety in the region of the Sevastopol Bay of the Black Sea. The representatives of Chrysomonadineae, Volvocinea, Cryptomonadineae, Xanthophyta, Euglenidae are widely distributed among them and they maybe met in this or that composition all year round.

1965-1967 investigation showed small flagellates from the Sevastopol Bay, as a rule, form three maxima in their development during a year. The first one is usually marked in February (1965, 1966) but sometimes (as it was in 1967) the maximum takes place in March when the monads' amount reaches 1142 ml cells (570 mg) per m^3 (fig. 1).

The second, summer maximum-is more often in July-August (1965, 1967). However, the summer uprising in monads' development was noted as the end- beginning April-May, e.g. late spring. In the period of summer maximum the amount was 755 ml. cells or 400 mg/m^3 (1967).

The third, autumn maximum, we recorded in September-October though, that's guite possible, its terms maybe shifted. The monads' amount was 1103 ml. cells (600 mg/m^3).

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Sevastopol Bay small flagellates develop in their major biomass in the upper 5 m layer. With depth development's intensity drops according to linear dependence. So, in the layer 0-5 m there were sometimes more than 70 p. 100 of them (1966), in the layer 5-10 m maximum indicator didn't exeed 48,3 p. 100 (1965) and in the botton layer- 35 p. 100 (only in unique cases-1967) and, as a rule, about 20 p. 100 and less.

The highest average annual values (353 ml cells, 176 mg/m^3) were got. in 1967 (we compare three investigated years 1965, 1966, 1967) and minima (220 ml cells, 110 mg/m^3)- in 1965.

In March 1965 and 1967 the content of phosphates was considerably higher to those of 1965 in a research point (There are no data for 1966). In 1967 there were 42 mg/m^3 phosphates on surface and 20 mg/m^3 at bottom, in 1965-2,0 and 0,5 mg/m^3 correspondingly. As related to silicon in 1965 its quantity totalled 550 mg/m^3 on surface and 630 mg/m^3 at botton. In 1967 anological values were 320 and 460 mg/m^3 correspondingly.

The highest water temperature was in 1966 whereas more intensive development of some flagellates was noted in 1967.

Minimum data both for water temperature and monads' development were obtained in 1965. Perhaps mineralisation of organic substances passed weakly at the lowered temperature, that's why the lack of biogenic elements was felt in development of plankton algae. This maybe testified with the lowered phosphate content in March 1965 and hightened one in 1967.

It's early to ask how the summary amount of small flagellates relates to the rest biomass of phytoplankton in a season aspect. Parallel counting of the rest phytoplankton wasn't carried out by us. However it's known in the Sevastopol Bay the maximum amount and the biomass of phytoplankton (major Bacillariophyta) are noted in February-May. Summer uprise in development of vegetal plankton is the result of mass appearance of Dinoflagellates algae and autumn peak is characterised with a new uprise in development of Bacillariophyta. Maximum data of the amount and the biomass of phytoplankton are noticed on December-January.

As it's seen season dynamics of phytoplankton it total and of a collecting group of small flagellates is approximatelly the same.

Differencies to be sure mustn't be as small flagellates do not represent particular systematical group but they refer to separate groups that are a part of phytoplankton composition.

Researches made on the fresh material in 1967 [MIHAILOVA & LANSKAYA, 1960] showed, the highest quantity of small flagellates (Sevastopol Bay) was in July-August (166 ml cells/m^3). Some increase of the quantity, though less, was marked in March (to 120 ml cells/m^3) and in November (to 89 ml/m^3). However in a number of cases our data were one order higher. In total the lowest average annual value to have obtained during three investigated years (in 1955-220 ml cells, 110 mg/m^3) 2,5 times exceeded the average annual one (calculated from data of the above-mentioned authors) and the highest value (353 ml cells, 176 mg/m^3 in 1967) over 4 times more.

Values that were obtained on the fixing material for 1938-1939 [MOROSOVA-VODYANITSKAYA, 1948] seemed to be 3-4 orders lower to ours in some cases. Though these values include the amount of spores, it seems to us, that these values take an unsignificant place in the total mass. Maximum quantity was noticed for July (materials of 1938-1939) — 800 thousand cells/m^3 — and a little bit less in February- 420 th cl/m^3. In other periods the quantity of small flagellates didn't exceed 350 thousand cl/m^3, that made up 0.01-0.6 p. 100 to the total phytoplankton quantity. The average annual amount of small flagellates (MOROSOVA-VODYANITSKAYA data are used for calculation) is 749 times less to the lowest average annual value obtained in 1965, and 1139 times less to the highest one.

In comparison with the data obtained for the open area of the Black Sea [MOROSOVA-VODYANITSKAYA, 1954; KONDRATYEVA, 1963; *et al.* our data are 1-3 orders higher.

Big differences in values got on the fresh and fixing materials prove uselessness of the present sample fixing method for the record of small flagellates.

Different authors took uneven quantity of formalin (10-25 cm^3/1) and they didn't take into consideration the long-term of samples' saving and this played the role in divergences of the obtained data.

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