Cercetări Marine	I.R.C.M.	Nr.11	77 - 83	1978

MONTHLY DYNAMICS OF PHYTOPLANKTONIC ASSIMILATORY PIGMENTS IN THE ROMANIAN BLACK SEA COASTAL WATERS BETWEEN CONSTANȚA AND AGIGEA DURING 1977

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ABSTRACT:

The amounts of phytoplanktonic assimilatory pigments from the area less influenced by the Danube of the Romanian Black Sea coastal waters were recorded every month (at Constanta) and every ten days (at Agigea) in order to follow the quantitative dynamics of phytoplankton and its blooms during 1977.

The study of phytoplanktonic assimilatory pigments was carried on with a view to complete the knowledge on the quantitative dynamics of phytoplankton along the Romanian coast (1). In comparison with the preceeding year, more frequent samplings were performed in the zone of Constanța - Agigea: every month on profile East - Constanța and every ten days in the nearshore zone of Agigea. Thus, the investigated area was framed by the profile East - Constanța, with 5 stations, totalizing 16 sampling horizons, and the zone of Agigea, with 3 stations, and 6 horizons; in all, 344 samples were processed.

MATERIAL AND METHOD

The study of assimilatory pigments was carried on by

the usual technique based on RICHARDS and THOMPSON's method (5), as modified by STRICKLAND and PARSONS (6) and others (3, 4, 7). Calculation of chlorophyll pigment concentration was performed according to the trichromatic equations recommended by UNESCO (7). Calculation of carotenoid pigment relative concentration followed RICHARDS and THOMSON's formulae (5).

Concentrations of chlorophyll pigments a, b and c are given in mg m^{-3} and those of astacin (C_A) and non-astacin (C_N) carotenoid pigments, in MSPU l^{-1}. Averages of pigment values over the stations and profiles were calculated on the basis of the scheme of MOROSOVA-VODIANITSKAYA (2) for the quantitative study of phytoplankton; averages through the water columns (horizons) were made arithmetically.

Chlorophyll a/c and b/a+b ratios and C_N/chlorophyll a (D_{480}/D_{665}) were calculated from the monthly means.

RESULTS AND DISCUSSIONS

The results of the spectrophotometrical determinations of assimilatory pigment concentration and distribution in the zone of Constanța - Agigea during 1977 are synthetized as monthly mean values (Tables 1 and 3) and as percentage values of chlorophyll a of the total chlorophyll pigments (Table 2).

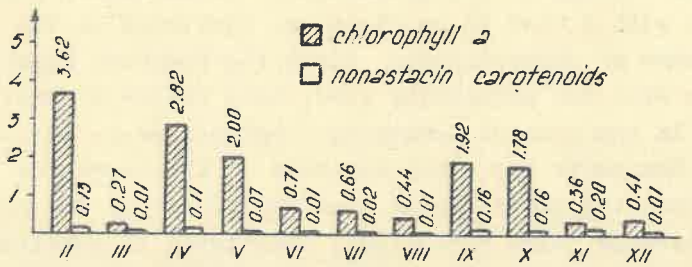

Fig. 1 - Histogram of monthly mean concentration values of chlorophyll a (mg m^{-3}) and non-astacin carotenoids in 1977 (MSPU l^{-1}) on profile East - Constanța.

Table 1

Monthly mean concentration values of chlorophyll ($mg\ m^{-3}$) and carotenoid ($MSPU\ l^{-1}$) pigments on profile East Constanţa in 1977

Month	Chl. a	Chl. b	Chl. c	C_A	C_N	Chl. a/c	Chl. b/a+b	C_N/chl. a (D_{480}/D_{665})
II	3.62	1.58	0.84	0.26	0.13	4.30	0.30	0.03
III	0.27	0.15	0.26	0.15	0.01	1.03	0.35	0.03
IV	2.82	0.70	0.96	0.17	0.11	2.93	0.19	0.03
V	2.00	1.10	1.64	0.38	0.07	1.21	0.35	0.63
VI	0.71	0.52	1.20	0.35	0.01	0.59	0.42	0.01
VII	0.66	0.43	1.13	0.37	0.02	0.58	0.39	0.03
VIII	0.44	0.38	0.57	0.21	0.01	0.77	0.46	0.02
IX	1.92	0.55	0.72	0.12	0.16	2.66	0.22	0.08
X	1.78	0.55	0.73	0.16	0.15	2.43	0.23	0.08
XI	0.36	0.30	0.74	0.20	0.20	0.48	0.45	0.55
XII	0.41	0.40	0.98	0.22	0.01	0.41	0.49	0.02

Table 2

Procentage values of chlorophyll a of the total chlorophyll pigments ($mg\ m^{-3}$) on profile East-Constanţa in 1977

Month	Total values	0	10	25	35-50 m
II	23.48	41.4	18.4	3.7	1.3
III	4.03	16.5	7.2	4.8	2.9
IV	27.72	24.4	16.8	3.4	1.1
V	25.14	4.8	19.2	2.0	1.2
VI	13.48	7.1	5.6	3.9	2.5
VII	11.61	8.5	9.1	3.6	2.2
VIII	6.69	6.5	6.6	10.6	4.3
IX	13.18	29.9	9.8	15.4	3.6
X	12.04	30.1	22.6	3.6	2.8
XI	7.00	9.3	6.3	4.1	4.2
XII	6.37	6.7	6.1	5.5	-

Table 3

Monthly mean concentration values of chlorophyll (mg m^{-3}) and carotenoid (MSPU l^{-1}) pigments in the zone of Agigea in 1977

Month	Chl.a	Chl.b	Chl.c	C_A	C_N	Chl. a/c	Chl. b/a+b	C_N/chl.a (D_{480}/D_{665})
I	o.21	o.13	o.o9	o.1o	o.1o	2.33	o.38	o.47
II	o.3o	o.23	o.6o	o.14	o.o2	o.5o	o.43	o.o6
III	o.55	o.28	o.52	o.17	o.o3	1.o5	o.33	o.o5
IV	.4o	o.58	1.96	o.26	o.18	2.24	o.11	o.o4
V	1.57	o.62	o.83	o.16	o.o2	1.89	o.28	o.o1
VI	1.33	o.81	1.54	o.39	o.o2	o.86	o.37	o.o1
VII	o.87	o.45	o.86	o.34	o.oo	1.o1	o.34	o.oo
VIII	o.58	o.4o	o.86	o.27	o.o4	o.67	o.4o	o.o6
IX	2.41	o.89	1.13	o.59	o.19	2.13	o.26	o.o7
X	o.52	o.25	o.39	o.1o	o.o5	1.33	o.39	o.o9
XI	o.39	o.29	o.38	o.14	o.oo	1.o2	o,42	o.oo
XII	1.1o	o.31	o.24	o.14	o.o2	4.58	o.21	o.o1

During the period of January-December, on profile East-Constanţa, the highest values of chlorophyll a - the main indicator of phytoplankton assimilatory capacity and of primary production achievement, implicitely - were 3.62 mg m^{-3} in February, 2.82 mg m^{-3} in April and 2.oo mg m^{-3} in May (Fig.1). As compared to the data obtained in the months of 1976 when samplings had been made (February, May and October), in 1977 chlorophyll a values were higher (1). Chlorophyll a is accompanied by lower amounts of chlorophyll c, and chlorophyll a/c ratio is accordingly increased, especially in February (4.3o). Chlorophyll b/a+b ratio - as indicating a considerable fraction of dead phytoplankton - is small all the year round. D_{480}/D_{665} ratio - which renders the degree of population diversity - is also diminished; the poor pigmentary diversity which this latter ratio shows is due to and points out the pronounced quantitative dominance of chlorophyll a over the other assimilatory pigments.

The vertical distribution of assimilatory pigments in

profile East - Constanţa shows maximum values of chlorophyll a in the upper water layer all the year round; maximum percentage values of chlorophyll a of the total chlorophyll pigments are found at horizons 0 and 10 m. Maximum values of chlorophyll b and c are also to be found mostly in the upper layer. The astacin and non-astacin carotenoid pigments are more homogeneously distributed through the water column, taking relatively low values.

Assimilatory pigment concentration values and their quantitative relations indicate the presence of blooming phenomena in spring (February and April) and the existence of large phytoplankton biomasses in autumn (late September and October).

The data on assimilatory pigment concentration in the shallow zone of Agigea show a maximum chlorophyll a value of 4.40 mg m^{-3} in April, comparatively lower values, of 1.57 mg m^{-3} in May, 1.33 mg m^{-3} in June and 2.41 mg m^{-3} in October, and sub-unit values in the rest of the months (Fig.2). As compared with those of 1976, chlorophyll a values were higher in April, May, July and September (1). Chlorophyll c values were low in this zone, too, and higher chlorophyll a/c ratios occured in January (2.33), April (2.24) and late September (2.13). Chlorophyll b/a+b and D_{480}/D_{665} ratios were also low.

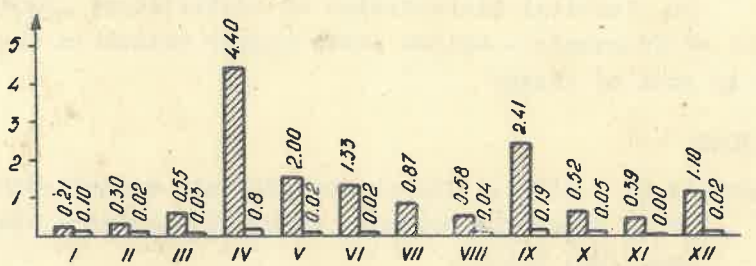

Fig.2 - Histogram of monthly mean concentration values of chlorophyll a (mg m^{-3}) and non-astacin carotenoids (MSPUl^{-1}) in the zone of Agigea in 1977 (same key as to Fig.1)

As a consequence of strong hydrodynamics in the shallow nearshore zone (0-10 m) of Agigea, vertical distribution of assimilatory pigments does not show the regularity which was made evident with this respect on profile East - Constanţa (0-50 m).

Pigmentary concentration values and quantitative relations for Agigea indicate starting of the blooming phenomenon in April and increased phytoplankton biomasses in late September.

CONCLUSIONS

1. Maximum chlorophyll a concentration values were recorded in February (3.62 mg m^{-3}), April (2.88 mg m^{-3}) and May (2.00 mg m^{-3}) on profile East - Constanţa, and in April (4.40 mg m^{-3}) and late September (2.41 mg m^{-3}) in the zone of Agigea.

2. The frequency of low mean values of chlorophyll a concentration in 1977 as compared with 1976 points out lower biomasses of planktonic microflora in comparison with those of the preceeding year in the zone of Agigea.

3. Chlorophyll a concentration values were lower as related to those of the preceeding year in both areas.

4. Monthly mean values of assimilatory pigments in the zone of Constanţa - Agigea indicate occurence of the frequent spring blooming phenomena in February and April and respectively, in April.

5. Vertical distribution of assimilatory pigments in the zone of Constanţa - Agigea shows higher values in the upper layers in most of cases.

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