Acta Adriat., 23 (1/2): 75—88 (1982) YU ISSN: 0001—5113
AADRAY

QUALITATIVE AND QUANTITATIVE ANALYSIS OF THE PHYTOPLANKTON IN THE SOUTHERN ADRIATIC, SEPTEMBER—OCTOBER 1979.

KVALITATIVNA I KVANTITAVNA ANALIZA FITOPLANKTONA JUŽNOG JADRANA U RUJNU I LISTOPADU 1979. GODINE

Damir Viličić and Radimir Balenović

Biological Institute Dubrovnik

Five groups of phytoplankton species distributed in regions with specific ecological conditions were established. Biomass of the phytoplankton was expressed as total cell volume per liter. The biomass at neritic stations showed 5.3 and 1.7 times higher values than in the open sea station. Bacillariophyceae were quantitatively the most significant group of microplankton at all stations. Nanoplankton, averaged 93.6% of the total number of phytoplankton cells. However its biomass was on the average only 15.4%. Nanoplankton biomass was increased at neritic polluted station.

INTRODUCTION

Phytoplankton of the southern Adriatic, especially of the open sea, have not yet been analyzed in detail. The data about the phytoplankton in the southern Adriatic waters can be found in several older works (Schiller, 1913a, 1913b, 1925; Schussnig, 1915) and in a few more recent works (Pucher-Petković, 1957, 1960; Denisenko, 1963; Buljan et al. 1973; Revelante and Gilmartin, 1977).

In this paper the results of the qualitative and quantitative study of the phytoplankton come from the research done at three stations in the southern Adriatic (Fig. 1). The sampling was carried out during the autumn of 1979. The investigation was performed at one offshore station (Station 1), and at two neritic stations (Station 2 and 3). Station 1 is 25 Nm from Dubrovnik in the direction of 210° (position: 42°20'N, 17°54'E). Station 2 is located in Malo More between the peninsula of Pelješac and the coast in the vicinity of the settlement of Sreser (position: 42°58'N, 17°27'E). To the west of that station is the mouth of the Neretva river, and to the east there is Mali Ston Bay, an oyster farming region. The entire region is scarcely inhabited and the surrounding sea is not polluted. However, at the upper layers the influence of the Neretva river is significant. Station 3 is in the harbour of Dubrovnik (Gruž harbour) (position: 42°40'N, 18°5'E), which is influenced by the sewage waters of the town.

MATERIALS AND METHODS

The samples for the phytoplankton analysis were taken on October 11th at Stations 1 and 3, and on September 19th at Station 2 (Fig. 1). The plankton net with 53 μm mesh netting was used for taking the net samples. At Station 1 the vertical hauls were taken at two levels, from 100 to 50 m, and from 50 m to the surface. At Stations 2 and 3 hauls were made from the bottom to the surface. The phytoplankton from the sea surface (0—0.2 m) were collected at all stations by using the neustonic net of the same mesh netting. The cells smaller than 53 μm sometimes remained in the net samples (e. g. some species of the group Coccolithineae). Such species were also identified and included in the list of microplankton species (Table 1). The unarmoured Dinoflagellatae have not yet been identified, but their quantitative values are included in Table 2. Taxonomic nomenclature is adapted in accordance with Hendey (1974), Schiller (1930, 1933, 1937) and Gemeinhardt (1930).

Nansen bottle samples were taken for the quantitative analysis of the phytoplankton and for salinity determinations. The phytoplankton counts were obtained by the inverted microscope method (Utermöhl, 1958). All samples were preserved with 2 per cent nutralized formaldehyde solution.

The distribution of microplankton species is presented in Table 1, and provides information about the species dominance and the character of local growth conditions. The figures in the station columns (+ to 5) indicate the orientational values of the population density, as follows:

figure		cells/l
+	=	$< 10^1$
1	=	$10^1 - 10^2$
2	=	$10^2 - 10^3$
3	=	$10^3 - 10^4$
4	=	$10^4 - 10^5$
5	=	$10^5 - 10^6$

Table 2 shows cell densities of phytoplankton groups (number of cells per litre) which are for easy reference expressed in logarithms.

Assuming that the biomass is equal to the total cell volume, the latter was calculated according to the following equation (Smayda, 1978):

$$\sum_{i=1}^{m} V = (V_1)(N_1) + (V_2)(N_2) + \ldots\ldots\ldots\ldots (V_m)(N_m)$$

where V is the total cell volume, m equals the number of species found, i represents species i (i = 1, 2, ... m) in terms of its mean cell volume (V_i), and N_i represents the number of individuals of species i. The calculated cell volumes refer to the individuals found in the same analyzed samples.

Salinity was determined by the arginometric titration method (Knudsen, 1901, Oxner, 1920), standardized against Copenhagen standard sea water. Temperatures were measured with reversing termometers.

RESULTS AND DISCUSSION

Ecological differences of the investigated stations could have resulted from variations in salinity and temperature (Fig. 2). Relatively constant and high values of salinity (38.3 to 38.8‰) were characteristic for the open sea (Station 1). In Gruž harbour (Station 3) the differences between the deeper layers and surface were more distinct (36.7 to 38.7‰). In Malo More (Station 2) the salinity was very stratified and lower especially at the surface, as a result of the Neretva river discharge (33.2 to 38.6‰). The horizontal gradient of salinity (and probably of other ecological properties not yet measured) was characteristic of the entire investigated region. As a consequence, the qualitative and quantitative differences of the phytoplankton were evident. The distributional range of the microplankton species is presented in Table 1 where the species are grouped in five distinct sets (I, II, III a, III b, III c). The species in group I were found in open sea station; group III a in the neretic region; group III b in the Malo More region; group III c in the Gruž harbour, and group II in all the above mentioned locations. Within each of the five groups the species are listed according to the decreasing number of positive findings (frequency). In the similar way, Revelante and Gilmartin (1978) defined several groups of species and described the characteristic species as being indicators of the open sea or local environmental conditions in some regions of Parramatta estuary in Australia. Following more detailed future investigations the validity of the existence of the presented groups will be determined. Perhaps informations about the indicators will be established.

The following species of Bacillariophyceae: *Chaetoceros diversum, Dactyliosolen mediterraneus, Hemiaulus haucki, Nitzschia seriata, Rhizosolenia alata* f. *gracillima. Thalassiothrix frauenfeldii,* and some others, were frequently found at all stations (Table 1). In addition to these wide spread species the most frequent and characteristic Bacillariophyceae are shown in the open sea *(Asterolampra marylandica, Chaetoceros simplex),* in Malo More region *(Chaetoceros tortissimum, Ch. vixvisibilis),* and in Gruž harbour *(Lithodesmium undulatum, Skeletonema costatum).* The most frequent wide spread species of Dinoflagellatae was *Peridinium globulus.*

In Table 1, where figures + to 5 show the population densities, the species have been evaluated from rare to abundant. The most abundant Bacillariophyceae (in addition to the wide spread species of *Nitzschia seriata, Rhizosolenia alata* f. *gracillima* and *Thalassiothrix frauenfeldii)* are presented at Station 2 *(Chaetoceros decipiens, Ch. compressum, Ch. vixvisibilis, Nitzschia delicatissima, Rhizosolenia stolterofothii),* and at Station 3 *(Leptocylindrus danicus, Lithodesmium undulatum, Skeletonema costatum, Thalassiosira decipiens).*

A marked increase in microplankton and nanoplankton quantity from the open sea to the neritic sea can be observed (Table 2). The relationship between the cell density and the biomass of various microplankton groups can be seen in Table 3 and 4. The biomass of Dinoflagellatae was approximately equal at all three stations, although the cell densities were higher at neritic stations. Bacillariophyceae was the most important group of microplankton in terms of cell density and biomass. This agrees with the studies reported in the middle Adriatic (Ercegović, 1936; Pucher-Petković, 1966) in the southern Adriatic (Denisenko, 1963; Revelante and Gilmartin, 1977) and in the Aegean Sea (Ignatiades, 1976). The Chaetoceros species

were observed in great density in the open sea station (Table 1). This was also found by Denisenko (1963) in the Strait of Otrant during the same season.

The highest total phytoplankton biomass was found at Station 2 showing a 5.1 times higher value than in the open sea (Station 1), and a 3 times higher value than in Gruž harbour (Station 3) (Table 3). The productivity at Station 2 was high, probably because of the Neretva river influence. The nanoplankton cell densities and biomass were found to be the richest in the polluted Gruž harbour. Nanoplankton, averaged 93.6% of the total phytoplankton cell number. However, its biomass was on the average only 15.4% (Table 5). The nanoplankton fraction in the total biomass was the greatest at the open sea station bellow the 50 m depth and in the polluted Gruž harbour. Similar characteristics were observed in Chrysophyceae (Coccolithineae and Silicoflagellatae). One of the possible explanations for this phenomenon is the heterotrophic ability of some species, which in organically enriched habitates develop in larger quantities.

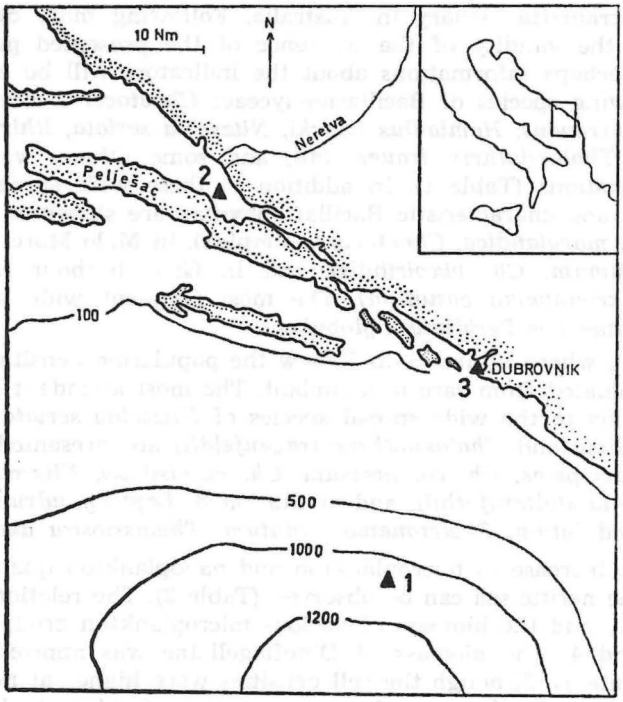


Fig. 1. Station locations in the southern Adriatic Sea
Station 1 = open sea, Station 2 = Malo More,
Station 3 = Gruž harbour

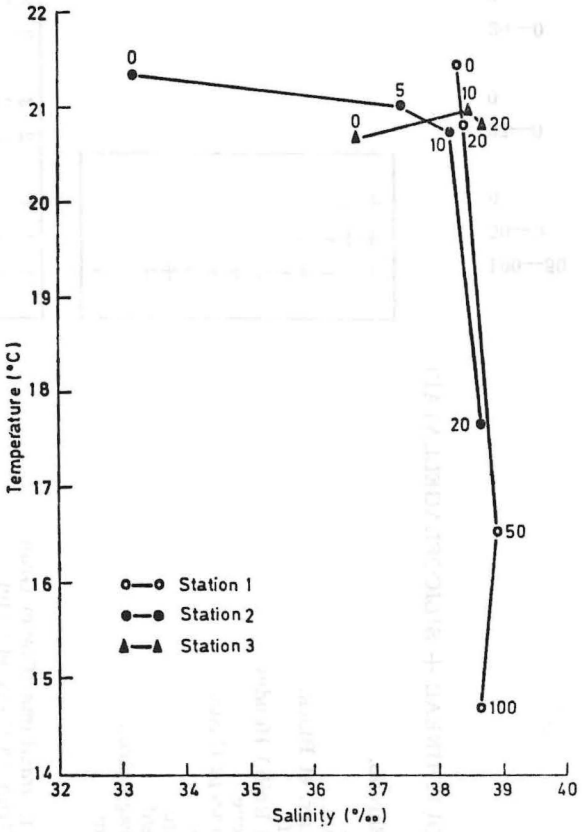
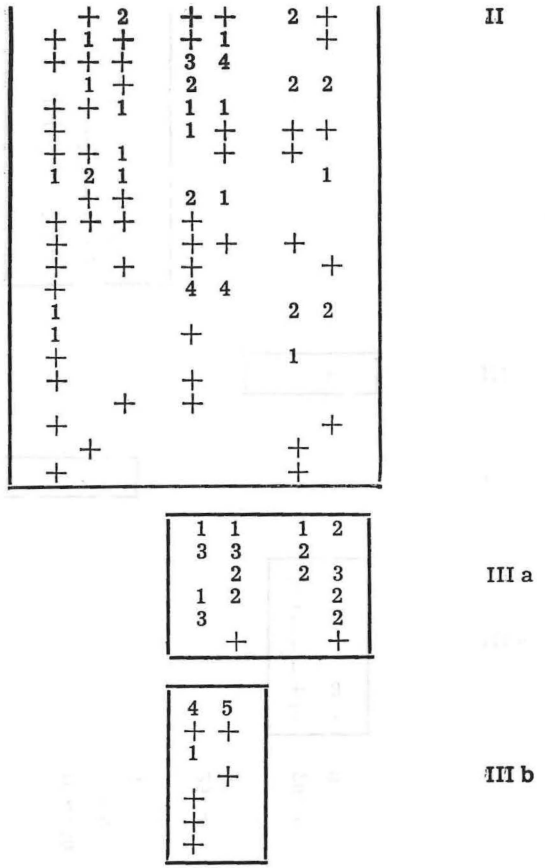


Fig. 2. Temperature and salinity values at different depths (T-S diagrams) from each sampling station

Table 1. Distributional range of microplankton species (omitting unidentified Bacillariophyceae — pennatae, and unarmoured Dinoflagellatae). For the figure explanations in the station columns (+ to 5) see the text!

Station 1 = open sea, Station 2 = Malo More, Station 3 = Gruž harbour

	Stations								
	1			2		3			
	100—50	50—0	0	25—0	0	20—0		0	
BACILLARIOPHYCEAE									
CHRYSOPHYCEAE (COCCOLITHINEAE + SILICOFLAGELLATAE)									
Asterolampra marylandica Ehrenb.	+	+	+						
Chaetoceros simplex Ostenf.	+	+	+						
Scyphosphaera apsteinii Lohm.	1	1							
Rhabdosphaera clavigera Murr. et Black.	+	+							
Thorosphaera elegans Ostenf.	1								
Asteromphalus heptactis (de Bréb.) Hendey	+								
Bacteriastrum elongatum Cleve	+								
B. hyalinum Lauder var. *princeps* Castr.	+								
Chaetoceros messanense Castr.	+								
Coscinodiscus lineatus Ehrenb.	+								
Discosphaera thomsonii Ostenf.	+								
Rhizosolenia acuminata (Pérag.) Gran	+								
Rhabdosphaera hispida Lohm.	+								
Rhizosolenia alata Brightw. f. *gracillima* (Cleve) Gran	1	3	3	2	3	3	3		
Thalassiothrix frauenfeldii Grun. in Cleve et Grun.	1	2	2	2	2	2	3		
Nitzschia seriata Cleve	+	2	2	3	2	2	3		
Syracosphaera pulchra Lohm.	1	1	2	2	2	1	2		
Hemiaulus hauckii Grun. ex Van Heurck	+	+	1	1	2	+	+		
Dactyliosolen mediterraneus Pérag.	+	+	1	2	+	+	+		
Chaetoceros diversum Cleve	+	+	+	+	+	+	+		
Rhizosolenia stolterfothii Pérag.	+	+	+	2	3	2			
Rh. imbricata Brightw. var. *shrubsolei* (Cleve) *Schiller*	+	1	1	1	2	+			



Chaetoceros rostratum Lauder
Rhizosolenia alata Brightw. f. *indica* (Pérag.) Gran
Chaetoceros decipiens Cleve
Leptocylindrus danicus Cleve
Rhabdosphaera tignifer Schiller
Bacteriastrum delicatulum Cleve
Rhizosolenia calcar-avis Schultze
Rhabdosphaera oblonga Lohm.
Guinardia flaccida (Castr.) Pérag.
Chaetoceros wighami Brightw.
Ch. affine Laud.
Guinardia blavyana Pérag.
Chaetoceros compressum Laud.
Calcioslenia granii Schiller
Chaetoceros curvisetum Cleve
Dictyocha fibula Ehrenb.
Coscinodiscus excentricus Ehrenb.
Rhizosolenia robusta Norm. ex Pritch
Chaetoceros convolutum Castr.
Coscinodiscus perforatus Ehrenb.
Striatella unipunctata (Lyngb.) Agardh

Nitzschia longissima (de Bréb.) Ralfs
N. delicatissima Cleve
Thalassiosira decipiens (Grun.) Jörg.
Rhizosolenia fragilissima Berg.
Cylindrotheca closterium (Ehrenb.) Reiman et Lewin
Achnanthes longipes Agardh

Chaetoceros vixvisibilis Schiller
Ch. tortissimum Gran
Cerataulina pelagica (Cleve) Hendey
Chaetoceros lorenzianum Grun.
Ch. dadayi Pav.
Licmophora sp.
Triceratium schadboltianum Grev.

Table 1. — continued

	Stations 1			2		3		
	100—50	50—0	0	25—0	0	20—0	0	
Lithodesmium undulatum Ehrenb.						2	2	III c
Skeletonema costatum (Grev.) Cleve						+	3	
Surirella gemma (Ehrenb.) Kütz.						1		
Gyrosigma sp.						1		
Diploneis bombus Ehrenb.						1		
Hemiaulus sinensis Grev.						+		
Melosira sulcata (Ehrenb.) Kütz.						+		
PRASINOPHYCEAE								
Halosphaera viridis Schm.	+	+						I
CYANOPHYCEAE								
Phormidium sp.						+	+	III c
DINOFLAGELLATAE								
Kofoidinium velelloides Pav.	+	+	1					
Ceratium pulchellum Schröder	+	+	+					
Oxytoxum constrictum (Stein) Bütschli	+	1						
O. scolopax Stein	+	1						
Dinophysis hastata Stein	+	+						
Podolampas palmipes Setin	+	+						
Cladopyxis caryophyllum (Kof.) Pav.	+	+						
Ceratium concilians Jörg.	+		+					
Prorocentrum scutellum Schröder			1					
Peridinium pallidum Ostenf.			1					
Centrodinium eminens Böhm.			+					

Ceratium gravidum Gourr.
C. teres Kof.
C. arietinum Cleve
Ceratocorys armata (Schütt) Kof.
Phalacroma acutum (Schütt) Pav.
Goniaulax digitale (Pouchet) Kof.
G. hyalina Ostenf. et Schm.
Heterodinium milnerii (Murr. et Whitt.) Kof.
Oxytoxum reticulatum (Stein) Schütt
Ornithocercus quadratus Schütt
Exuviaella compressa Ostenf.
Peridinium brochii Kof. et Sw.
Phalacroma reticulatum Kof.
Ph. argus Stein
Pyrocystis elegans Pav.

Peridinium globulus Stein
Ceratium furca (Ehrenb.) Clap. et Lachm.
C. macroceros (Ehrenb.) Cleve
C. carriense Gourr. var. *volans* (Cleve) Jörg.
Prorocentrum micans Ehrenb.
Ceratium fusus (Ehrenb.) Dujard.
C. extensum (Gourr.) Cleve
C. candelabrum (Ehrenb.) Stein
Dinophysis caudata Seville-Kent
Ceratium pentagonum Gourr.
C. trichoceros (Ehrenb.) Kof.
C. massiliense (Gourr.) Jörg.
Goniodoma polyedricum (Pouchet) Jörg.
Goniaulax polygramma Stein
Pyrophacus horologicum Stein
Peridinium steinii Jörg.
Histioneis joergensenii Schiller
Peridinium oceanicum Vanhöffen
Ceratocorys gourretii Paulsen
Ceratium symmetricum Pav.
C. hexacanthum Gourr.
C. setaceum Jörg.
Phalacroma mitra Schütt
Peridinium leonis Pav.
Phalacroma parvulum (Schütt) Jörg.

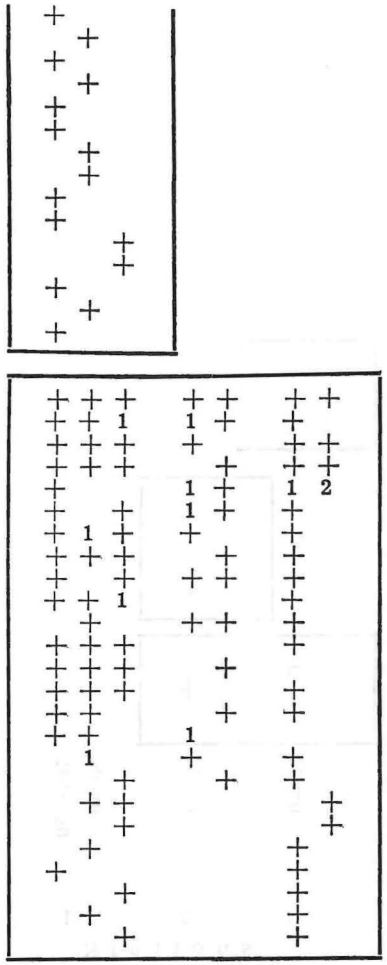


Table 1. — continued

Ceratium tripos (Müll.) Nitzsch
Peridinium crassipes Kof.
P. diabolus Cleve

Peridinium spiniferum Schiller
P. pyriforme Pauls.
P. conicum (Gran) Ostenf. et Schm.
P. depressum Bail.
Ceratium longirostrum Gourr.

Goniaulax polyedra Stein
Ceratium karstenii Pav.
Peridinium pellucidum Bergh.) Schütt

Table 2. Number of cells per liter (N) and total cell volume per liter (V) of the main phytoplankton groups.
BAC = Bacillariophyceae, DIN = Dinoflagellatae, CHR = Chrysophyceae, MIC = microplankton — total, NAN = nanoplankton — total
Station 1 = open sea, Station 2 = Malo More, Station 3 = Gruž harbour

		log N [cells x l^{-1}]					log V [μm^3 x l^{-1}]				
station	(m)	BAC	DIN	CHR	MIC	NAN	BAC	DIN	CHR	MIC	NAN
	0	3.73	2.48	2.34	3.79	5.56	7.96	7.37	5.75	8.06	6.70
1	20	3.69	2.59	2.72	3.79	5.37	7.86	5.94	6.26	7.88	6.51
	50	2.79	2.86	3.33	3.56	5.18	6.94	6.58	6.68	7.25	6.33
	100	2.04	1.85	2.60	2.79	5.18	5.90	4.90	6.26	6.54	6.32
	0	5.66	3.35	2.86	5.68	6.41	8.97	6.47	6.34	8.98	7.46
2	5	5.06	3.17	2.81	5.07	5.69	9.54	7.07	6.39	9.55	6.84
	10	5.19	3.16	3.20	5.20	5.88	8.48	6.21	6.73	8.49	7.02
	20	4.26	3.06	2.68	4.30	5.80	7.47	6.94	6.21	7.82	6.95
	0	4.13	3.67	3.20	4.31	6.47	8.06	7.51	6.87	8.19	7.61
3	10	3.97	3.33	2.90	4.11	5.98	8.03	6.47	6.77	8.07	7.13
	20	3.99	2.98	3.13	4.10	6.48	8.17	6.03	7.00	8.20	7.62

Table 3. Comparisons of the phytoplankton cell densities and biomass among the investigated stations. The data refer to the layers from the depth of 20 m to the surface.
Station 1 = open sea, Station 2 = Malo More, Station 3 = Gruž harbour

	cell density			biomass		
	2:1	3:1	2:3	2:1	3:1	2:3
Bacillariophyceae	18.0	2.0	8.7	5.0	1.5	3.4
Dinoflagellatae	4.5	6.5	0.7	1.0	1.0	1.0
Chrusophyceae	2.3	3.5	0.7	2.5	7.5	0.3
microplankton — total	18.5	2.5	7.8	5.5	1.5	3.6
manoplankton — total	3.0	7.0	0.4	2.9	7.0	0.4
total	3.6	6.7	0.5	5.1	1.7	3.0

Table 4. Percentage composition of the main microplankton groups in terms of cell density (A) and biomass (B).
BACI = Bacillariophyceae, DINO = Dinoflagellatae, CHRY = Chrysophyceae
Station 1 = open sea, Station 2 = Malo More, Station 3 = Gruž harbour

		(A)			(B)		
station	depth (m)	BACI	DINO	CHRY	BACI	DINO	CHRY
	0	87.4	4.8	3.5	79.4	20.0	0.4
1	20	80.9	6.1	8.5	95.6	1.1	2.4
	50	16.9	17.5	61.4	49.7	21.4	27.0
	100	19.3	11.2	64.5	22.9	2.2	52.1
	0	97.3	0.5	0.1	99.0	0.3	0.2
2	5	97.1	1.2	0.5	99.5	0.3	0.1
	10	97.6	0.8	0.9	97.2	0.5	1.7
	20	88.9	5.6	2.3	82.4	13.1	2.4

Table 4. — continued

	0	65.6	23.0	7.8	73.5	20.7	4.7
3	10	73.7	16.8	6.2	91.5	2.5	5.0
	20	77.2	7.5	10.7	92.2	0.6	6.2
mean 1		51.1	9.9	34.4	61.9	11.2	20.5
mean 2		95.2	2.0	0.9	94.9	3.5	1.1
mean 3		72.2	15.8	8.2	85.8	7.9	5.3
total		72.2	9.2	14.5	80.7	7.5	8.9

Table 5. Percentage composition of microplankton (MICR) and nanoplankton (NANO) in terms of cell density (A) and biomass (B).

		(A)		(B)	
station	depth (m)	MICR	NANO	MICR	NANO
	0	1.7	98.3	95.6	4.4
1	20	2.5	97.5	95.7	4.3
	50	2.2	97.8	88.0	12.0
	100	0.4	99.6	39.6	60.4
	0	18.9	81.1	97.0	3.0
2	5	23.8	76.2	99.8	0.2
	10	21.0	79.0	96.6	3.4
	20	3.1	96.9	86.7	13.3
	0	0.7	99.3	73.5	26.5
3	10	1.3	98.7	88.5	11.5
	20	0.4	99.6	73.9	26.1
mean 1		1.7	98.3	79.7	20.3
mean 2		16.7	83.3	95.0	5.0
mean 3		0.8	99.2	78.6	21.4
total		6.4	93.6	84.6	15.4

REFERENCES

Buljan, M., Hure, J. i T. Pucher-Petković. 1973. Hidrografske i produkcione prilike u Malostonskom zaljevu. Acta Adriat., 15 (2): 1—60.

Denisenko, V. V. 1963. Nekotorie dannie o sezonnih i sutočnih izmenenijah fitoplanktona Adriatičeskogo morja. Dokladi Akademii nauk SSSR, T. 151 (5): 1193—1194.

Ercegović, A. 1936. Études qualitative et quantitative du Phytoplancton dans les eaux cotières de l'Adriatique oriental moyen au cours de l'année 1934. Acta Adriat., 1 (9): 1—126.

Gemeinhardt, K. 1930. Silicoflagellatae Rabenhorst's Kryptogamenflora von Deutschland, Österreich und der Schweiz, 10 (2). Akademische Verlagsgesellschaft m. b. H., Leipzig: 87 p.

Hendey, M. N. 1974. A revised check-list of British marine diatoms. J. mar. biol. Ass. U. K., 54: 277—300.

Ignatiades, L. 1976. The standing stock of diatoms and dinoflagellates in the oligotrophic waters of southern Aegean Sea. Int. Revue ges. Hydrobiol., 61 (2): 193—199.

Knudsen, M. 1901. Hydrographical tables. G. E. C. Gad. Copenhagen: 63 p.

Oxner, M. 1920. Manuel pratique de l'analyse de l'eau de mer. I. Chloruration par la méthode de Knudsen. Bull. Comm. int. Mer. Médit., 3: 1—36.

Pucher-Petković, T. 1957. Étude du phytoplancton dans la région de l'île de Mljet dans la période 1951—1953. Acta Adriat., 6 (5): 1—56.

Pucher-Petković, T. 1960. Effect de la fertilisation artificielle sur le phytoplancton de la région de Mljet. Acta Adriat., 6 (8): 1—24.

Pucher-Petković, T. 1966. Vegetation des diatomees pelagiques de l'Adriatique moyenne. Acta Adriat. 13 (1): 1—97.

Revelante, N. and M. Gilmartin. 1977. The effects of northern italian rivers and eastern Mediterranean ingressions on the phytoplankton of the Adriatic sea. Hydrobiologia, 56 (3): 229—240.

Revelante, N. and M. Gilmartin. 1978. Characteristics of the microplankton and nanoplankton communities of an Australian coastal plain estuary. Aust. J. Mar Freshwater Res., 29: 9—18.

Schiller, J. 1913a. Botanische Untersuchungen bei den 3. Terminfahrten S. M. S. »Najade« in Adriatischen Meere. Berichte der Permanenten internationalen Komission für die Erforschung der Adria, Nr. 3: 47—54.

Schiller, J. 1913b. Vorläufige Ergebnisse der Phytoplankton-Untersuchungen auf den Fahrten S. M. S. »Najade« in der Adria. II. Flagellaten und Chlorophycean. Sitzber. d. K. Akad. d. Wiss. math.-nat. Kl., Abt. 1 (122): 621—630.

Schiller, J. 1925. Die planktontischen Vegetationen des adriatischen Meers. A, Die Coccolithophoriden-Vegetation in d. J. 1911/14. Arch. f. Prot., 51: 1—130.

Schiller, J. 1930. Coccolithinae. Rabenhorst's Kryptogamenflora von Deutschland, Österreich und der Schweiz, 10 (2). Akademische Verlagsgeselschaft m. b. H., Leipzig: 184 p.

Schiller, J. 1933. Dinoflagellatae. Rabenhorst's Kryptogamenflora von Deutschland, Österreich und der Schweitz, 10 (3), 1. Akademische Verlagsgeselschaft m. b. H., Leipzig: 617 p.

Schiller, J. 1937. Dinoflagellatae. Rabenhorst's Kryptogamenflora von Deutschland, Österreich und der Schweiz, 10 (3), 2. Akademische Verlagsgeselschaft m. b. H., Leipzig: 590 p.

Schussing, B. 1915. Bemerkungen zu einigen adriatischen Planktonbacillarieen. Sitzber. d. K. Akad. d. Wiss. math.-nat. Kl., Abt. 1 (124): 377—406.

Smayda, T. J. 1978. From phytoplankters to biomass. In Phytoplankton mannual, 273—279. Ed. by A Sournia. UNESCO, Paris: 337 p.

Utermöhl, H. 1958. Zur Vervollkommnung der quantitativen Phytoplankton Methodik. Mitt. Int. Ver. Theor. Angew. Limnol., 9: 1—38.

KVALITATIVNA I KVANTITAVNA ANALIZA FITOPLANKTONA JUŽNOG JADRANA U RUJNU I LISTOPADU 1979. GODINE

Damir Viličić i Radimir Balenović

Biološki zavod Dubrovnik

KRATAK SADRŽAJ

Kvalitativnom i kvantitativnom analizom fitoplanktona i prikazom osnovnih hidrografskih parametara ukazuje se na biološke i ekološke razlike između otvorenog mora (postaja 1), obalnog mora koje nije pod neposrednim utjecajem čovjeka (postaja 2) i obalnog zagađenog mora (postaja 3).

U vrijeme istraživanja utvrđeno je pet osnovnih skupina fitoplanktonskih vrsta prema vezanosti za specifične ekološke uvjete. Nakon detaljnijih istraživanja moći će se sa većom sigurnošću govoriti o postojanosti ovih skupina ili o mogućem prisustvu indikatora.

Biomasa fitoplanktona izražena je kao ukupni volumen stanica. Odnos biomase između obalnih postaja i postaje na otvorenom moru iznosi 5,1 (postaja 2 : postaja 1), odnosno 1,7 (postaja 3 : postaja 1).

Skupina Bacillariophyceae najznačajnija je na svim postajama, kako po broju stanica tako i po biomasi. Nanoplankton sudjeluje sa prosječno 93,6% od ukupnog broja stanica, a u biomasi sa prosječno samo 15,4%. Biomasa nanoplanktona povećana je u zagađenom obalnom moru.