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Contribution to the Phytoplankton study in Ionian Sea (Zakynthos Island)

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Abstract. The present study represents an attempt to describe and evaluate qualitatively and quantitatively the phytoplankton population of Zakynthos strait. Sampling in the above mentioned area (Fig. 1) was performed during January and April 1988. Samples were counted in an inverted microscope.Low values of cell concentrations were usually recorded both in January and April. Data from tables 1 and 2 show that the maximum values of phytoplankton concentration were usually recorded at the depth of 40-50m. Dinoflagellates dominated both January and April samples. In January this group was represented by 24 species, while in April 13 species of dinoflagellates were recorded; "naked dinoflagellates", mostly of the genera Gymnodinium, Amphidinium and Gyrodinium, Gymnodinium simplex, Gymnodinium pygmaeum, and Amphidinium sp, were the most abundant among them. In January diatoms were represented by 21 species, 13 species belonged to the "pennatae" group, which are typical in neritic waters (Kimor and Berdugo, 1966). In April, 21 diatom species were recorded, 14 species belonged to the "pennatae" group. Nitszchia closterium, Navicula spp, Thalassiothrix frauenfeldii, Skeletonema costatum, Rhizosolenia stolterfothii, Thalassiosira sp. were among the dominant diatom species. Coccolithophores, though always present were recorded in very low values; the most common species among them were Syracosphaera pulchra, Calyptrosphaera sphaeroida, Calyptrosphaera insignis, Calyptrosphaera oblonga, Coccolithus sp., Rabdosphaera tubulosa and Pontosphaera huxleyi. Silicoflagellates were rare and were represented mainly by one species, Dictyocha fibula. Finally the group "Other groups" which consisted from two phytoflagellates Rhodomonas sp. and Cryptomonas sp. seemed to play an important role in two stations (St.9 and St.10). The μ-flagellates, though always present in relatively high values, were not included in the evaluation of the total cell concentration, since their contribution to the primary production has not been estimated yet (Smayda 1980).

The low cell concentration of phytoplankton, in combination with the relatively high number of species, confirmed the oligotrophic character of the examined area.

The relatively low values of phytoplankton concentration which were recorded during the April cruise, may reflect a decline of the phytoplankton population after the spring bloom and the beginning of the summer minimum (Rouhiainen & Georgieva, 1982).

The Ionian sea is generally characterized by oligotrophic conditions. The maximum values of cell concentrations were usually recorded at the depth of 50m as well in Central and Southern Aegean (Souchenia, 1961; Rouhiainen & Georgieva, 1982; Pagou and Gotsis-Skretas, 1988).

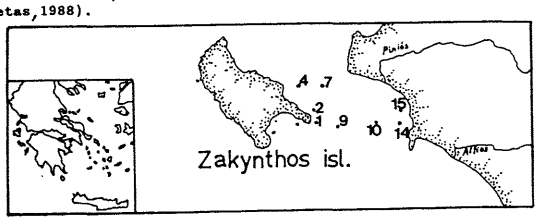

Fig.1 Sampling stations

Table 1. Phytoplankton groups (cells/l) in January 1988.

Taxa	D (m)	St. 1	4	7	10	14	15
Diatoms	0	1080	560	80	800	280	240
	20	1400	720	1120	840	520	600
	40	1240	1120	640	3360	720	680
Dinofl.	0	1240	520	360	800	480	400
	20	1480	1000	680	3720	1480	840
	40	2160	920	1000	1280	2000	600
Coccol.	0	320	360	120	80	80	120
	20	240	240	120	680	360	520
	40	160	720	240	480	440	360
Silic.	0	160	40	40	40	-	-
	20	-	40	120	-	80	40
	40	120	-	-	-	40	-
Other	0	-	-	-	960	-	-
groups	20	-	-	-	800	-	-
	40	-	-	-	1760	-	-
Tot. phyt.	0	2800	1480	600	2680	760	760
	20	3120	2000	2040	6040	2440	2000
	40	3680	2760	1880	6880	3210	1640
μ-flagel.	0	720	160	200	1640	400	240
	20	520	1000	800	2000	760	760
	40	960	560	600	2960	680	880

Table 2. Phytoplankton groups (cells/l) in April 1988.

st.2	D(m)	0	10	20	30	50	
Diatoms		360	720	840	800	1000	
Dinofl.		800	480	1720	1720	3080	
Coccol.		520	80	560	560	360	
Silic.		80	-	40	40	160	
Other gr.		-	-	-	-	-	
Tot. phyt.		1760	1280	3120	3120	4600	
μ-flagel.		800	560	1380	1380	1880	
st.4		0	10	20	27		
Diatoms		760	1240	1240	640		
Dinofl.		1560	1240	1200	1520		
Coccol.		120	120	360	280		
Silic.		80	80	80	-		
Other gr.		-	-	-	-		
Tot. phyt.		2520	2680	2880	2440		
μ-flagel.		2360	1240	1120	1040		
st.9		0	25	50	75	100	150
Diatoms		320	400	760	520	400	80
Dinofl.		1200	1440	1720	1840	680	280
Coccol.		400	640	680	520	200	
Silic.		80	40	120	400	120	
Other gr.		1440	1880	1640	360	280	80
Tot. phyt.		3440	4400	4920	3640	1280	440
μ-flagel.		8650	5252	4360	2880	2600	2210

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Detection of Phytoplankton seasonality trends based on k-dominance curves

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Phytoplankton studies at community level have been widely used to describe temporal and spatial distributions. However, the analysis of data using estimators such as cell numbers, biomass or diversity indexes may not be adequate to extract all information regarding the seasonal trends.

In the present investigation a graphical representation of the k-dominance curves based on samples of ranked species abundance (in decreasing order) was examined as a possible procedure to describe temporal patterns of phytoplankton distribution. The advantage of distribution plots as k-dominance curves is that the detection of differences among assemblages is based on the distribution of species abundances among individuals.

Data from five stations (1) of Saronicos Gulf collected at four seasons were analysed by the univariate analysis including the estimation of the Shannon-Weaver diversity index and the plotting of the k-dominance curves (2).

The results are shown in Figure 2. It is seen that the k-dominance curves detected high species richness in the January samples at all stations. In April all curves had similar horizontal pattern indicating species homogeneity in the area. Phytoplankton heterogeneity was established again in July and continued in October showing also differences among the stations. The seasonal changes in species richness and heterogeneity among stations might be associated with the hydrography of the area and the eutrophication conditions prevailing at cetain stations (1).

The results of species diversity (Table 1) approaching those of k-dominance curves can describe temporal changes in phytoplankton assemblages by presenting the relative importance of each species in a sample and without reducing a serie of data to a single number as a diversity index. Also, they can possibly characterise the eutrophication status of an area.

However, questions of statistical significance of the differences between k-dominance curves inevitably arise and so, the application of univariate tests as well as the statistical evaluation of similarities (3) are under investigation.

Table 1 The Shannon-Weaver diversity Index calculated for five stations

St.	Jan.	Apr.	Jul.	Oct.
S1	2.325	0.473	0.240	0.629
S2	2.659	0.445	1.726	1.825
S3	2.557	0.305	1.546	1.984
S5	1.956	0.177	0.837	1.795
S9	1.891	0.477	0.533	1.952

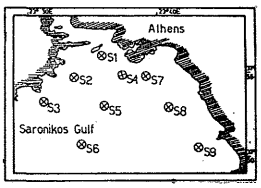

Figure 1 Stations location

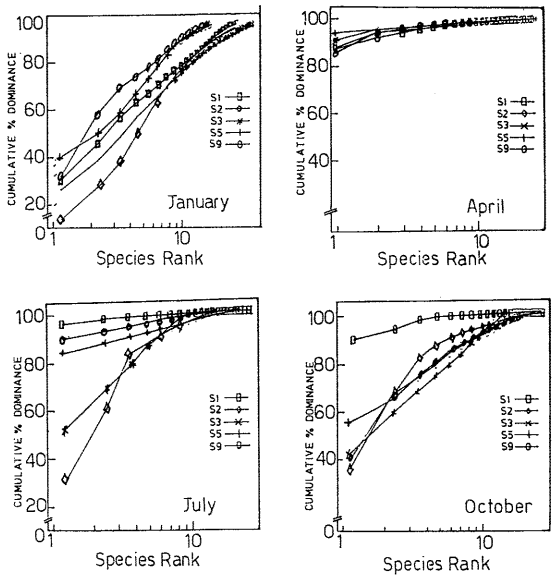

Figure 2 - Series of k-dominance curves of phytoplankton assemblages showing the seasonal trends.

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