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About the quantitative distribution of sublittoral Foraminifera in the inlet of Kiten, Bulgarian Black Sea Coast

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A b s t r a c t: Quantitative characteristic of the sublittoral benthic Foraminifera from the Bulgarian Black Sea coast (the inlet of Kiten) is made. 6 benthic samples from the composition of the sand biocenosis of the inlet are used. Four genera are determined: *Ammonia, Elphidium, Quinqueloculina* and *Massilina*. The differences in their quantitative representation in the different depths of the stations are pointed out. On the basis of the grain-measure analysis the influence of the size of the grains on the number of the specimens of genus *Ammonia* and genus *Elphidium* is stated. This fact is additionally substantiated by the quantity of the empty tests and these with cytoplasm for genus *Ammonia*.

K e y w o r d s: Black Sea, Bulgarian coast, sublittoral, sand biocenosis, Foraminifera.

Introduction

Little is known about the recent Foraminifera from the Bulgarian section of the Black Sea. In the catalogue of V a l k a n o v (1957) 19 species were listed. Later V a l k a n o v a (1981) reported 43 recent species for which there were no descriptions. The same were cited also in the monograph "Zoobenthos of the Bulgarian Black Sea Coast" (M a r i n o v, 1990). From the foreign authors D o l g o p o l s k a j a and P a u l i (1931) can be mentioned with descriptions and drawings of 10 species. In M i h a l c h e v i c h ' s guide (1968) 24 species and 2 varieties were given. D i d k o v s k y (1969) specified 3 complexes of Foraminifera in the Bosphorus region, which greatly differed in species composition from the other regions of the Black Sea. The results of studying fossils as well as recent Foraminifera were given in many articles of J a n k o (1975, 1979). Quantitative data and descriptions of late quaternary Foraminifera from the Black Sea were stated in the works of J a n k o and T r o i t s k a j a (1987). The results from the research of 11 species of Foraminifera from the phaseolinoid slime near the Romanian coast were given in the paper of M a r g i n e a n u (1958). M a c a r o v i c i e t a l. (1958) investigated the distribution of Foraminifera in the sediments of the north-west part of the Black Sea. Later research on the quantitative distribution of 9 species of the Romanian coast was made by M a c a r o v i c i and J o n e s i (1962). 26 species were mentioned in the Black Sea miscellany (M i s h e v e t a l., 1978).

The biocenological research on the recent Foraminifera of the Bulgarian Black Sea coast was not reported. The present paper is the first attempt to study the quantitative distribution of foraminifera in the composition of the sand biocenosis of the Bulgarian Back Sea coast.

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Material and Methods

The quantitative report is done on 6 benthic samples collected by skin diving during the period 10 - 23 August 1998. The stations are in 2 profiles: A (stations 1, 2, 3, 4) and B (stations 5, 6). The depth of each of the stations exceeds the previous with 4 meters. These are situated in the inlets to the north and to the south of Kiten (Fig. 1).

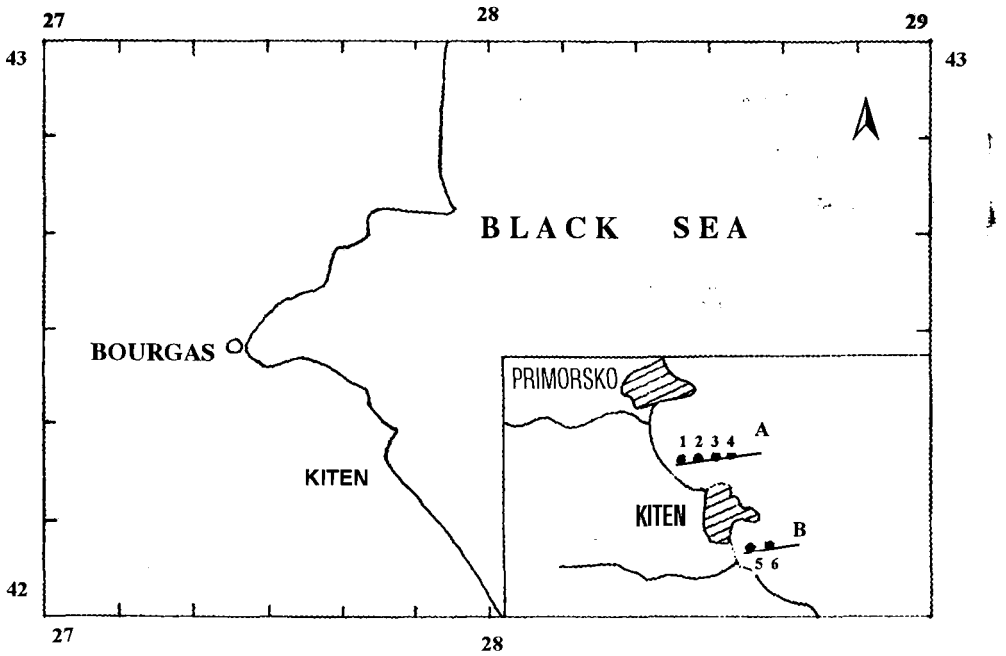


Fig. 1. A map of the profiles (A, B) and their corresponding stations.

The samples are taken from the upper 3-cm layer with the help of a special scapula used for the purpose (S a i d o v a, 1976).

The method of MAMBO is used to determine the salinity (after G o l e m a n s k y, 1980).

The measure of the sand grains of the two profiles is done by using 100 g dried sand samples, sifted by a set of laboratory sieves: 0.08, 0.1, 0.125, 0.160, 0.250, 0.315 and 0.4 mm on a swaying machine for ten minutes (S h v a n o v, 1969).

Certain parts of the material are coloured with 0,05 % water solution of neutral red for two hours using a modified by us method (by R o s k i n, 1951). Only the number of the tests of the genus *Ammonia*, which has been coloured in red, is determined. Counting was not done for the other genera due to a difficulty in determining the colouring of their cytoplasm.

The number of all Foraminiferal tests in the separate sand fractions is counted for 1 g ("Foraminiferal number") after M i k h a l e v i c h (1983) and additionally for 100 g dried sand sediment.

In the present paper the following scheme for zonation of the Bulgarian Black Sea coast is adopted: supralittoral, pseudolittoral and sublittoral zone - published in the dissertation of M a r i n o v (1979).

Results and Discussion

The determined foraminiferal fauna in the sand sublittoral bottom of the referred inlets concerns the "grouping of the pure sand" (K u n e v a - A b a d j i e v a and M a r i n o v, 1966). This grouping to the south of Primorsko is concentrated in separate spots, one of which is in the inlets mentioned above. The surface sediment is pure fine-grained quartz sand, combined with calcariferous particles of organic origin. The determined Foraminifera in the grouping belong to the following genera: *Ammonia*, *Elphidium*, *Quinqueloculina* and *Massilina*. The quantitative characteristic of the different stations according to profiles is shown in Table 1.

The specimens with coloured cytoplasm and empty tests of the genus *Ammonia*, counted one by one, are shown on Table 2.

From Figs. 2-3, based on data of the sift analysis, given in Table 3 and 4, it can be seen that for profile A Mo=0.315-0.16 mm, for profile B Mo=0.4-0.25 mm. The data about Mo show greater percentage of the big fractions for profile B in comparison to profile A.

The number and the percentage of genus *Ammonia* in profile A increase together with the increasing of the depth. At the same time a contrary tendency occurs in the number of genus *Elphidium*. These facts probably are a result of the influence of the increased hydrodynamic and the size of the surface sediment at smaller depths, where the number of the hardy thick-walled tests of the genus *Elphidium* is greater.

The influence of the size of the sand grains is stronger in profile B, where the sand is more coarse-grained. There the number of the genus *Elphidium* reaches 69% of the whole number, while in profile A the percentage is far smaller and decreases with the increasing of the depth. The greater number of *Elphidium* in the smaller depths with higher hydrodynamics can be explained with the presence of more than one mode of

Table 1. Quantitative characteristic of the genera *Ammonia* (A), *Elphidium* (E), *Quenqueloculina* (Q) and *Massilina* (M).

Profile	Station No	Depth (m)	Salinity (‰)	Number in 100 g air-dry weight	Number of every genus per 100 g, (%)		
					A	E	Q + M
Profile A	1	5	16,5	8 115 (100%)	2 898 (36%)	3 188 (39%)	2 029 (25%)
	2	9	16,6	11 286 (100%)	4 637 (41%)	3 696 (33%)	2 953 (26%)
	3	13	16,5	10 906 (100%)	4 155 (38%)	3 808 (35%)	2 943 (27%)
	4	17	16,5	18 650 (100%)	10 587 (57%)	2 633 (14%)	5 430 (29%)
Profile B	5	5	16,4	645 (100%)	129 (20%)	387 (60%)	129 (20%)
	6	10	16,5	722 (100%)	180 (25%)	497 (69%)	45 (6%)

Table 2. Comparison of the quantity of the specimens of *Ammonia* with cytoplasm and without cytoplasm according to the stations of the two profiles (A and B).

Profile	Station No	Depth (m)	Total number of genus *Ammonia* per 100 g, (%)	Number of *Ammonia* with cytoplasm, (%)	Number of *Ammonia* without cytoplasm, (%)
	1	5	2 898 (100%)	1 159 (40%)	1 739 (60%)
	2	9	4 637 (100%)	1 969 (42%)	2 668 (58%)
Profile					
A	3	13	4 155 (100%)	1 731 (42%)	2 424 (58%)
	4	**17**	10 587 (100%)	5 101 (48%)	5 486 (52%)
	5	5	129 (100%)	31 (24%)	98 (76%)
Profile					
B	6	10	180 (100%)	45 (25%)	135 (75%)

Table 3. Results from the sift analysis for profile B.

E, (mm)	φ, (φ = -10lgE)	%	Σ %
1	0		
		3	**3**
0.4	4		
		31	34
0.315	5		
		25	59
0.25	6		
		32	91
0.16	8		
		8	99
0.125	9		
		0.6	99.6
0.1	10		
		0.3	99.9
0.08	11		
		0.1	100

Table 4. Results from the sift analysis for profile A.

E, (mm)	φ, (φ = -10lgE)	%	Σ %
1	0		
		1	**1**
0.4	**4**		
		21	**22**
0.315	5		
		21	43
0.25	6		
		35	78
0.16	8		
		19	97
0.125	9		
		2	**99**
0.1	**10**		
		0.6	99.6
0.08	11		
		0.4	100

E - size of the fractions; φ - lg from the fractions; % - % contents of the fractions

life as is the case with epi- and infauna, while the genus *Ammonia* is only infauna (M u r r a y, 1991). This fact explains the tendency of difference in the number. This is the increased hardiness and the ability of the genus *Elhpidium* to inhabit more coarse-grained surface sediment with higher hydrodynamics in the conditions of sand biocenosis. Vice versa, in more fine-grained surface sediment and deeper waters the genus Ammonia is predominant.

Fig. 2. Cumulative curved line, showing the grain measuring composition of profile B, given in Table 3.

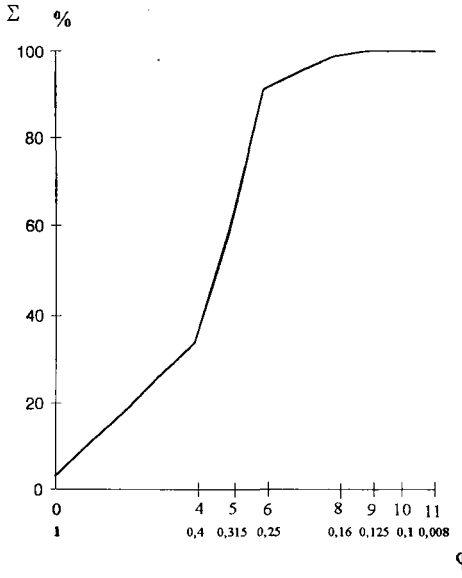
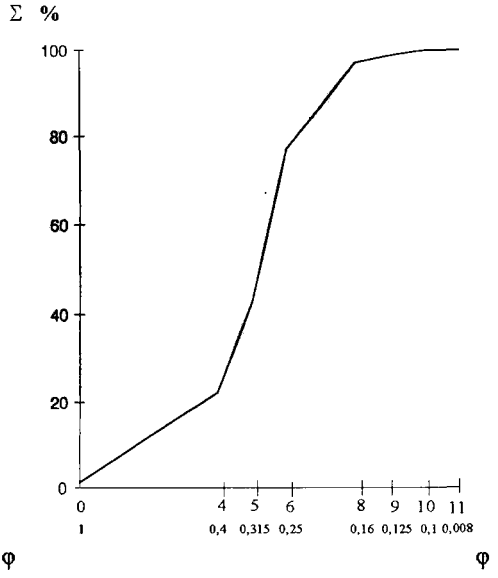


Fig. 3. Cumulative curved line, showing the grain measuring composition of profile A, given in Table 4.



The stated above factors - depth and coarse-grained surface sediment - are favourable to the development and the increasing of the number of the genus *Ammonia*, and the proportion of the empty tests to the living specimens support these facts. That gives us the right to consider that the depth and the size of the sand grains of the surface sediments are the factors, which influence the number of Foraminifera.

In all research stations the number of the empty tests is with a greater percentage. The percentage of the *Ammonia* with cytoplasm fluctuates between 25% and 48% with tendency to increase slightly in deeper waters.

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Върху количественото разпределение на сублиторалните фораминифери в залива на Китен, българско Черноморско крайбрежие

Благовест К. Темелков, Петя Е. Мучинова

(Резюме)

Направена е количествена характеристика на сублиторалните бентосни фораминифери от южното българско черноморско крайбрежие - залив Китен. Чрез 6 бентосни проби в състава на пясъчната биоценоза на залива са установени родовете: *Ammonia, Elphidium, Quinqueloculina* и *Massilina.* Посочени са различията в тяхното количествено представяне за различните дълбочини на станциите. Направен е гранулометричен анализ чрез използване на комплект лабораторни сита с размери: 0.08; 0.1; 0.125; 0.160; 0.250; 0.315; 0.4 mm. На базата на получените резултати се изтъква влиянието на едрината на грунта върху числеността на род *Elphidium.* Посочено е количеството на празните черупки и тези с цитоплазма чрез оцветяване с неутрално червено в подходяща концентрация.