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Meiobenthos of the deep part of the White Sea

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Abstract

Meiobenthos abundance and taxonomic composition were studied in the deep part of the White Sea at the depth of 270 m. Among 16 high rank taxa, which were distinguished in the samples, Foraminifera and Nematoda were most abundant. Nematodes were represented by 55 species from 18 families. In terms of abundance and species composition, spatial heterogeneity within the small area of ¼ m^2 can be much more prominent than that within the whole area studied (ca. 10 square miles). Thereby, the major component source of species diversity for this biotope is alpha-diversity (or the local diversity in a single point) while beta-diversity (variation between localities within the area of square miles) is less significant. Total meiobenthic biomass including foraminiferans might be estimated as being about 1 g/m^2 dry weight, which is about 10 % of the macroinfaunal biomass of the same area.

Introduction

In the last decades the White Sea meiobenthic communities were investigated in many aspects including taxonomy and ecology. After thirty years of studies, the White Sea became a model area for the studies on meiobenthic community structure and dynamics (Galtsova 1991). However, most of these studies were conducted in the intertidal and, rather seldom, in the upper subtidal zones. The deepest part of the area still is nearly a "white spot" for meiobenthology even from a taxonomical point of view (Mokievsky 2000). Only a few samples were collected from the central basin of the White sea: in the course of a large-scale survey on foraminiferan distribution, Mayer (1980) collected several samples in the northern part of the Central Basin down to the depth of 270 m. Amongst 161 species, which are known for the White sea, 95 occur there. The fraction of calcareous forms increases with the depth up to 40 % at 190-290 m. Total foraminiferan density reaches the highest values (200-300 and more ind/10 cm^3) in Kandalaksha Bay in depths from 15 to 110 m. In the deep part (more than 200 m) the mean density of living foraminiferans was less than 51 ind/10 cm^3.

The most recent studies covering the majority of meiobenthic taxa were done in the central part of Kandalaksha and Onega Bays, where the

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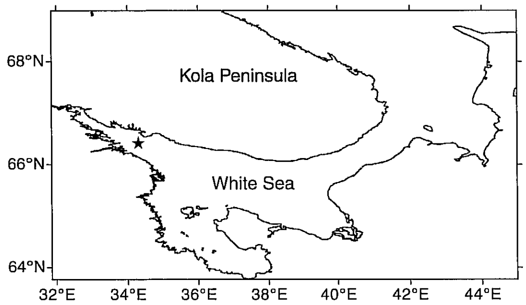

Fig. 1. The sampling site (★) in the White Sea.

meiobenthos abundance and composition were studied down to the depth of 300 meters (Galtsova & Sheremetjevsky 1985, Galtsova & Vladimirov 1988).

Goals of the present study are to fill gaps in our knowledge of meiobenthic abundance, taxonomic composition and distribution in the pseudobathyal zone of the White Sea and to contribute to a better understanding of the deep-water ecology of the sea. Material was obtained during a multidisciplinary study of the ecology and biology of the Central Basin of the White Sea (**C**entral **B**asin E**x**pedition – **CBX**). Here we provide composition and diversity data for meiobenthos collected at one of the deepest stations of this expedition.

Material and methods

Meiobenthos samples were obtained in an area of about 10 square miles around the station CBB-20 in June 1999. This station at the depth of 270 m is located in the middle part of Kandalaksha trench (66°25'N, 34°22'E) (Fig. 1). Sediment samples were collected using a minicorer with four plastic tubes of 30 cm^2 area which can keep an intact column (core) of about 20 cm of muddy sediment together with its overlaying water and a thick fluff layer. There were nine corer samples taken from three minicorer casts. Meiobenthos was collected from the tubes by syringes with cut off tips of 3 cm^2 inner opening. Each syringe sample was divided by 5 layered subsamples of 1 cm depth. Overlaying water was removed through 50 µm screen and the fluffy layer after settling down was collected together with the upper centimetre of the sediment.

All 45 subsamples were processed separately to reveal fine vertical and horizontal spatial heterogeneity of meiobenthic abundance. On board, they were preserved by 4 % neutral formaldehyde and then transported to the laboratory. A sieving method was implemented for the extraction of organisms to make the results comparable with deep-sea data of other authors. For this, five sieves of standard mesh sizes (32, 63, 125, 250 and 500 µm) were used. Before sieving, the samples were stained in Rose Bengal solution and, after it, processed under a stereoscopic microscope for counting of the organisms. After the counting the principal taxa, all nematodes and harpacticoid copepods were extracted and mounted on slides for detailed taxonomic investigation.

Most nematodes and harpacticoids were identified to species or genera. Total length and maximal width of nematodes were measured by camera lucida to calculate the exact size and biomass. Modified Andrássy formula was used for calculation from width (W) and length (L) to body volume (V):

$$V = 0.625 \cdot W^2 \cdot L$$

Nematodes from each fraction were measured separately, and mean body volume was recalculated for each size class. Mean body volume from each sieve was multiplied by 1.13 to obtain the wet weight. Dry weight was estimated as 0.25 of wet weight.

Statistical treatment of the data included the following indices and methods (Magurran, 1988). For measuring the similarity between samples, two indexes were calculated. Jaccard similarity index was used for qualitative data:

$$IJ = \frac{a}{(a+b+c)},$$

where a = number of common species for two comparing lists, b = number of unique species for the first list, c = the same for the second one.

Chekanovsky-Soerensen index was used for quantitative data:

$$ICS = \Sigma S \; min\;(pi; pj),$$

where p_i and p_j are the relative abundances of each species in samples i and j respectively (the smallest value was taken from each pair).

The first index measures the similarity in taxonomic composition solely and the second one shows also the likeness in the community structure.

Cassie Index $CI = (v^2 - m) / m^2$ (where v = variance, m = mean) was implemented as a simple measure, which does not depend on sample size for scale dependent heterogeneity, and the Shannon index was accomplished for species diversity estimation.

A type of species rank distribution approximated by different models (MacArthur's (1960) "broken stick", Log-normal, geometrical series etc) is considered to be a sophisticated tool to get more information on the community structure. In this study all cases fit good to the power function

$$Y = aX^z,$$

where Y = abundance of X-rank species and z shows the concentration of dominance (the relative rate of the most abundant species).

Species-area curves were constructed for revealing the expected number of species according to the sample size and investigated area.

Statistical calculations were done by standard PC software for routine computation and by the applied ecological program package "Ecos", designed by A.I. Azovsky (Moscow State University, Dept. of Hydrobiology) for more specific cases.

Results

Meiobenthos abundance. In total, 16 major taxa were distinguished in the samples. Foraminifera and Nematoda were strongly predominant, with Foraminifera being the most abundant group in all samples. Among the Metazoa, the nematodes comprised ca. 62 % of all organisms. The second dominant metazoan group were harpacticoid copepods. Polychaeta, Porifera, Cnidaria, Turbellaria, Kinorhyncha, Ostracoda, Acarina Halacaroidea and some other groups were found as well (Table 1). One sample showed an outstanding high abundance rate of Rotifera – 1380 ind/ 10 m² (414 inds in a single subsample from 3-4 cm depth). In other samples the abundance of this taxon was pretty low – only 7 specimens in total were found elsewhere.

Mean meiofauna abundance varied by a factor of 2 from cast to cast, from 1210 to 2351 ind/10 cm². The most abundant taxa, such as Foraminifera, Nematoda and Harpacticoida, show nearly the same variations in space. Among the samples within the same cast, variation in abundance was even higher (Table 1).

Table 1. Abundance of main meiobenthic taxa in samples on the station CBB-20 (ind/10 cm²)

	cast 1	CI	cast 2	CI	cast 3	CI	all casts	%	CI
Foraminifera Calcar.	112	2.51	68	2.70	44	1.12	74.7	3.937	0.19
Agglutinated Foram.	619	1.01	317	0.37	283	0.83	406.3	21.42	0.20
Allogromiidae	614	0.23	368	0.30	358	1.01	446.7	23.53	0.10
Total Foraminifera	1345	0.36	753	0.19	988	0.81	1028.7	54.24	0.083
Nematoda	701	0.21	305	0.10	326	0.83	444.0	23.41	0.25
Harpacticoida	115	0.18	32	1.07	155	0.73	100.7	5.308	0.38
nauplii	93		26		130		83.0	4.376	
Kinorhyncha	12		12		7		10.3	0.545	
Ostracoda	25		15		10		16.7	0.879	
Aplacophora	1		0		0		0.3	0.018	
Turbellaria	8		2		10		6.7	0.351	
Polychaeta	27		40		27		31.3	1.652	
Bivalvia	2		0		5		2.3	0.123	
Porifera	9		1		1		3.7	0.193	
Boreohydra symplex	2		4		2		2.7	0.141	
Halacaroidea	3		3		4		3.3	0.176	
Rotifera	6		1		414		140.3	7.399	
Oligochaeta	0		1		0		0.3	0.018	
Gastrotricha	0		0		2		0.7	0.035	
Unrecognised forms	1		15		48		21.0	1.107	
Total meiobenthos	2351	0.32	1210	0.19	2129	0.82	1896.7	100	0.10
Total Metazoa	1005	0.27	457	0.17	1141	1.15	867.7	45.75	0.17

Table 2. List of nematodes species found on the station CBB-20 (mixed groups underlined).

Family	Genus, species	% of total
Comesomatidae	*Sabatieria ornata* Ditlevsen 1918	12.45
Xyalidae	*Filipjeva filipjevi* Tchesunov 1988	7.14
Chromadoridae	*Acantholaimus* sp.	5.13
Desmoscolecidae	*Desmoscolex* sp.	4.21
Sphaerolaimidae	*Sphaerolaimus gracilis* De Man 1876	3.30
Chromadoridae	*Trochamus* sp.	2.38
Diplopeltidae	*Campylaimus* sp. 1	2.56
Chromadoridae	*Atrochromadora parva* (De Man 1893)	2.20
Desmoscolecidae	*Tricoma* sp. 1	2.20
Diplopeltidae	*Intasia monohystera* Tchesunov & Miljutina 2008	1.83
Ceramonematidae	*Pselionema simplex* De Coninck 1942	1.65
Desmoscolecidae	*Tricoma* sp. 2	1.65
Aegialoalaimidae	*Aegialoalaimus* sp.	1.28
Fusivermidae	*Fusivermis fertilis* Tchesunov 1996	1.28
Sphaerolaimidae	*Sphaerolaimus* sp.	1.28
Xyalidae	*Daptonema* sp.	1.28
Chromadoridae	*Neochromadora* sp.	1.10
Leptolaimidae	*Leptolaimus* sp.	1.10
Oxystominidae	*Oxystomina* sp.	0.92
Xyalidae	*Filipjeva* sp.	0.92
Desmoscolecidae	*Desmoscolex petaloides* Lorenzen 1972	0.73
Fusivermidae	*Fusivermis* sp.	0.73
Microlaimidae	*Microlaimus* spp.	0.73
Xyalidae	*Daptonema modestum* Tchesunov 1991	0.73
Aegialoalaimidae	Gen. sp.	0.55
Comesomatidae	*Cervonema proximamphidium* Tchesunov 2000	0.55
Comesomatidae	*Sabatieria* sp. 1	0.55
Desmoscolecidae	*Desmoscolex paragranulatus* Decraemer & Tchesunov 1996	0.55
Desmoscolecidae	*Hapalomus* sp. 1	0.55
Diplopeltidae	*Campylaimus* sp. 2	0.55
Diplopeltidae	*Campylaimus inaequalis* Cobb 1920	0.55
Diplopeltidae	*Pararaeolaimus* sp.	0.55
Sphaerolaimidae	Gen. sp.	0.55
Xyalidae	*Amphimonhystera* sp. 1	0.55
Xyalidae	*Theristus* sp.	0.55
Diplopeltidae	Gen. sp.	0.37
Leptolaimidae	Gen. sp.	0.37
Oxystominidae	*Halalaimus* sp.	0.37
Xyalidae	*Filipjeva arctica* Ditlevsen 1928	0.37
Anoplostomatidae	*Anoplostoma* sp.	0.18
Camacolaimidae	*Camacolaimus* sp.	0.18
Comesomatidae	Gen. sp.	0.18
Comesomatidae	*Sabatieria* sp. 2	0.18
Cyatholaimidae	Gen. sp.	0.18
Diplopeltidae	*Diplopeltula incisa* Southern 1914	0.18
Leptosomatidae	*Crenopharynx* sp.	0.18
Xyalidae	*Amphimonhystera* sp. 2	0.18
Oncholaimidae	Gen. sp.	0.18
Oxystominidae	Gen. sp.	0.18
Siphonolaimidae	*Siphonolaimus* sp.	0.18
Xyalidae	*Filipjeva* sp.	0.18
Microlaimidae	Gen. sp.	8.60
Monhysteridae	Gen. sp.	6.96
Xyalidae	Gen. sp.	4.76
Chromadoridae	Gen. sp.	3.48
	incerta sedis	7.69

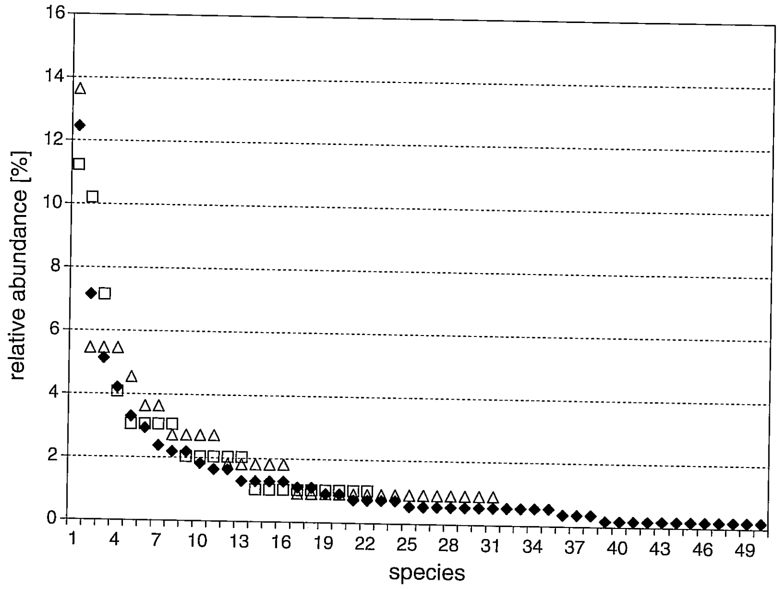

Fig. 2. Rank distribution curves for one 3-cm³ sample (□), for three samples from one cast (△) and for all nine samples (◆).

Taxonomic composition of main groups. Nematodes were represented by 55 species from 18 families (Table 2). Taxonomical diversity of harpacticoid copepods is lower: five families with 12 species were found (Table 3). Among them *Microsetella norvegica* (Boeck, 1864) (Ectinosomatidae) and *Stenhelia longicaudata* Boeck 1872 (Stenheliidae) were dominant.

Rotifera comprised two species (identified by G. I. Markevich) – *Lecane inermis* (Bryce 1892) (Lecanidae) and *Encentrum marinum* (Dujardin 1841) (Dicranophoridae), which were found nearly in equal numbers. A single species of Cnidaria was identified as *Boreohydra simplex* Westblad 1937 (Boreohydridae).

The most abundant nematode species in all the samples were the widely distributed *Sabatieria ornata* Ditlevsen 1918 (Comesomatidae), while second rank was shared by *Acantholaimus* sp. (Chromadoridae), *Filipjeva filipjevi* Tchesunov 1988 (Xyalidae) and *Desmoscolex* spp. (Desmoscolecidae). The relative abundance of these species varied from 0 to 10 %. The assemblage of dominants also included *Sphaerolaimus gracilis* De Man 1876 (Sphaerolaimidae), *Trochamus* sp. (Chromadoridae) and *Campylaimus* spp. (Diplopeltidae). One species from this group *Atrochromadora parva* (De Man 1893) (Chromadoridae) was abundant in one sample (5 % of total number) only, while everywhere else it was represented by single specimens. All other species were found in fairly small numbers (less than 5 %); 19 were found by one specimen each, whereas the other 15 were represented by two or three specimens. Twenty one species were found in all three casts. Rank distribution curves (Fig. 2, mixed groups such as unidentified Monhysteridae, Microlaimidae and others are excluded) show the high rate of equivalence within species ranks; no one represented more than 20 % of total abundance.

Among the dominant species of nematodes, one *(Sphaerolaimus gracilis)* is an evident predator, feeding upon smaller nematodes, whereas all the other abundant species seem to feed upon much smaller particles like bacteria *(S. ornata)* or bacteria and protists *(Chromadoridae* spp., *Microlaimus* spp., *F. filipjevi)*.

Spatial heterogeneity in different scales. The Cassie index (CI) as a simple measure of spatial heterogeneity was calculated for the most abundant groups in different spatial scales from ca. 0.25 m² (samples from one corer cast) to several dozens of square miles (distance between the most distant casts in the station area) (Table 1). For the most taxa as well as for total meiobenthos and metazoan meiobenthos (both total and by groups), CI values are greater within a single

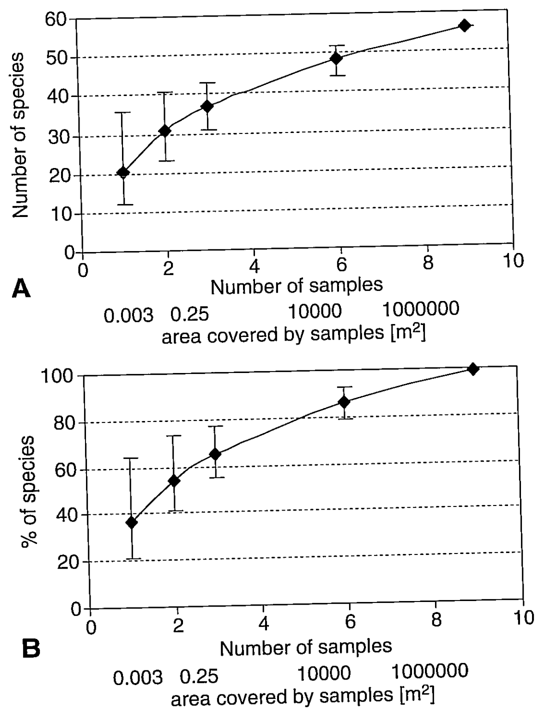

Fig. 3. Mean number of nematodes species found in random sequences of the samples of each one, two and in three casts (max and min values shown by whiskers). On the x-axis first row shows the exact number of samples of 3 cm² (total sampled area), the second row represents the relevant area, which these samples were taken from. **A**, true number; **B**, percent of total.

cast (maximal distance between samples from one minicorer approaches 0.5 m) than within the whole area. The spatial heterogeneity of total nematodes and harpacticoids abundance is nearly of the same rate in both scales.

Nematode species composition in different samples enables more precise analysis. The numbers of species per sample varied from 13 to 38 (mean number is 20.4), and the number of species per cast ranged from 31 to 43. Variation in species composition within each cast is more prominent than between different casts. Jaccard similarity indices for qualitative data show that species composition could differ as much as 50 % or even more in the nearest samples. The differences between distant samples may be much lower. Mean value for Chekanovsky similarity index for all samples is 0.436 ± 0.094. The similarities between samples in one corer varied from 0.279 to 0.618 (mean 0.443). The mean similarity between casts is 0.643 ± 0.07, and the values ranged from 0.636 to 0.649. Similarity between the most distant casts (1st and 3rd) is somewhat lower than between the closest pairs of casts though these differences are statistically not significant.

A remarkable characteristic of the nematode assemblage in the White Sea deep is the type of rank distribution curves at different scales of the sampled area. The shape of species rank distribution curves do not depend on the sample size (Fig.2). This distributions fit well (R^2 varied from 0.93 to 0.94) to the power function $Y = aX^z$ with nearly the same coefficients: for one, three and nine samples a = 15.6, 15.2, 23.3 and z = –0.91, –0.86 and –1.17 respectively. It indicates, that all the samples are taken from the same community with the identical set of dominant species. Otherwise the type of rank distribution has to shift from a simple hyperbolic distribution to a more complicate type (like "broken stick" and related) as soon as the sampled area will cover more than one type of assemblage (Burkovsky & al. 1994).

All these facts show that heterogeneity within the small area of ca. 0.25 m² can be much more prominent than that within the larger area. As it was mentioned above, variations in the set of dominant species of nematodes also occur to be more prominent within the replicates from one cast than between casts. We may assume that in terms of diversity, the main component of species diversity for this biotope is alpha-diversity (or the local diversity in a single point), while beta-diversity (variation between localities within the area of square miles) is less significant. It is even more visible on the curves for the number of nematode species found in a certain sampled area (Fig. 3). The three samples from a single cast contribute about 50 % (up to 80 %) of the total number of species, and every two casts (six samples) taken together in any consequences yield up to 95 % of the complete set of species found. The simple logarithmic function $N = 9.3 \cdot ln(S) + 35$ fits well ($R^2 = 0.98$) to maximal number of species (N) found in certain number of samples (S). Approximation by unlimited functions in general is not sufficient for species number estimations, but in particular cases, even this simple approach emphasises that a tenfold increase of the number of samples will lead up just to 25 % increase of species found.

Vertical distribution. The vertical distribution within 5-cm columns varied greatly from cast to cast and even within the samples from one corer. The upper three centimetres contain 54 to 97 % of the total meiofauna. In the samples from the first cast 90 % of organisms were found in the uppermost centimetre while in all samples from the third cast the abundance decreased more slightly with the sediment depth; the second cast shows an intermediate type of distribution (Fig. 4A). The slight curve of the third cast was affected by the mentioned Rotifera, which were present in a great number only in one subsample – at the depth of 4 cm. The distribution of total abundance of nematodes within the sediment column is smoother and more or less similar within each cast, but significant differences occur between casts (Fig. 4B). As for total meiobenthos and nematodes, about 50 % of Foraminifera prefer to inhabit the upper first centimetre of sediments (Fig. 4C). Among them, most of Allogromiida were found in the upper two centimetres of the sediment; and the distribution of these foraminiferans was similar in all samples. Calcareous foraminiferans were most abundant in intermediate layers, while the agglutinated forms dominated in the deepest layers. However, vertical distribution patterns of foraminifers varied even within one cast.

Harpacticoids were found to 5 cm depth. Both total abundance and species number were maximal within the first upper 1 cm layer (Table 3). Five species have not been found deeper than in the first surface centimetre layer. Two species dominated – *Microsetella norvegica* and *Stenhelia longicaudata* (57 and 19 % of the total harpacticoids abundance, respectively). *S. longicaudata* penetrated down to 4 cm depth, while about 70 % of the individuals concentrated at the surface (Table 3).

Table 3. Mean numbers of Harpacticoida (ind/10 cm²).

	Layers in sediment, cm				
	1	2	3	4	5
Ectinosomatidae					
Microsetella norvegica		6	25	5	14
Halectinosoma sp. 1	7				
Halectinosoma sp. 2	3		1		
Bradia scotti		2			
Diosaccidae					
Stenhelia longicauda	12	1	3	2	
Amphiascoides sp.	2				
Camtocamptidae					
Mesochra sp.	2				
Ameiridae					
Sarsameira major	5				
Proameira sp.			1		
Nitocrella sp.		1	1		
Paronannopidae					
Archisenia sibirica	2		2		
Danielsenia sp.	1				
Calanoida spp.	3				
Total	34	10	33	7	14

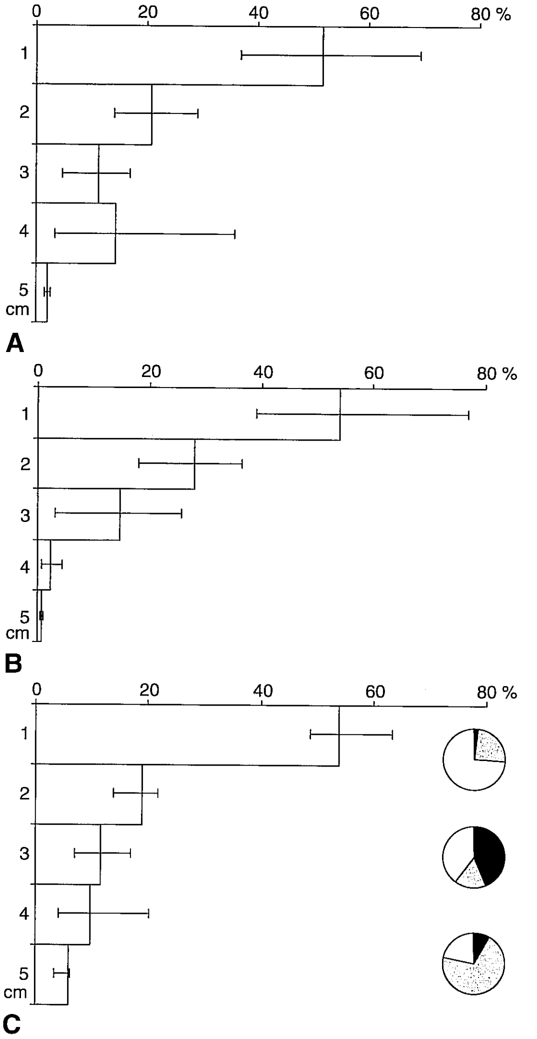

Fig. 4. Vertical distribution of the total meiobenthos (**A**), nematodes (**B**) and foraminiferans (**C**) within the sediment column. Bars represent mean values, max and min values shown by whiskers. Circles show the relative abundance of Allogromiida (□), calcareous (■) and agglutinated (□) foraminifers in 1st, 3rd and 5th centimetres.

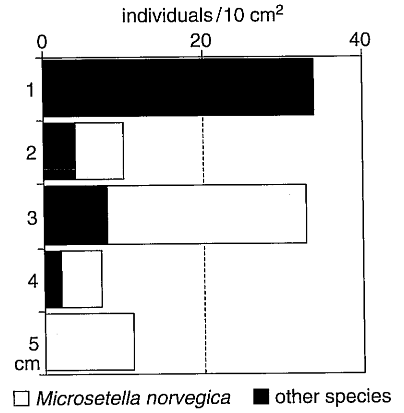

Fig. 5. Vertical distribution of harpacticoid copepods within the sediment column.

The abundance and distribution of *M. norvegica* needs particular attention. It is the only species found so deep (up to 5 cm depth) in silt. Unlike other species *M. norvegica* was the most abundant at 3 cm depth and, besides, the species was absent at the sediment surface layer (Fig. 5). Their mean abundance was 50 individuals per 10 cm^2. Traditionally this species was described as a principally planktonic form with more or less occasional occurrence in benthic habitats. According to Kosobokova (pers. comm.), in plankton there were up to 10 000 individuals of *M. norvegica* under 1 m^2 of water surface in the central basin of the White Sea. Thus, abundance of this species in sediment is 5 times greater (50 000 inds/m^2) than in the whole water column above. Our present data indicate that *M. norvegica* cannot be regarded as a strictly planktonic species.

Meiobenthos size structure and biomass estimations. The size spectrum for total meiobenthos, Foraminifera, Metazoa and their dominant taxa was reconstructed on the basis of their distribution on the sieves of different mesh size. Total meiofauna main mesh size classes are 63-125 µm and 32-63 µm (Fig. 6). For the total set of data the modal size class of Foraminifera is 63-125 µm. There are almost no differences in the size spectra of different groups of Foraminifera. Among harpacticoids the most abundant group belongs to the size class of 125-250 µm. Some organisms are larger, but a very small number of harpacticoids of less than 125 µm was found. The smallest Metazoan taxon is Rotifera, most of which were found in the sieves of 32-63 µm mesh size. Nematodes are represented mainly by medium sized organisms;

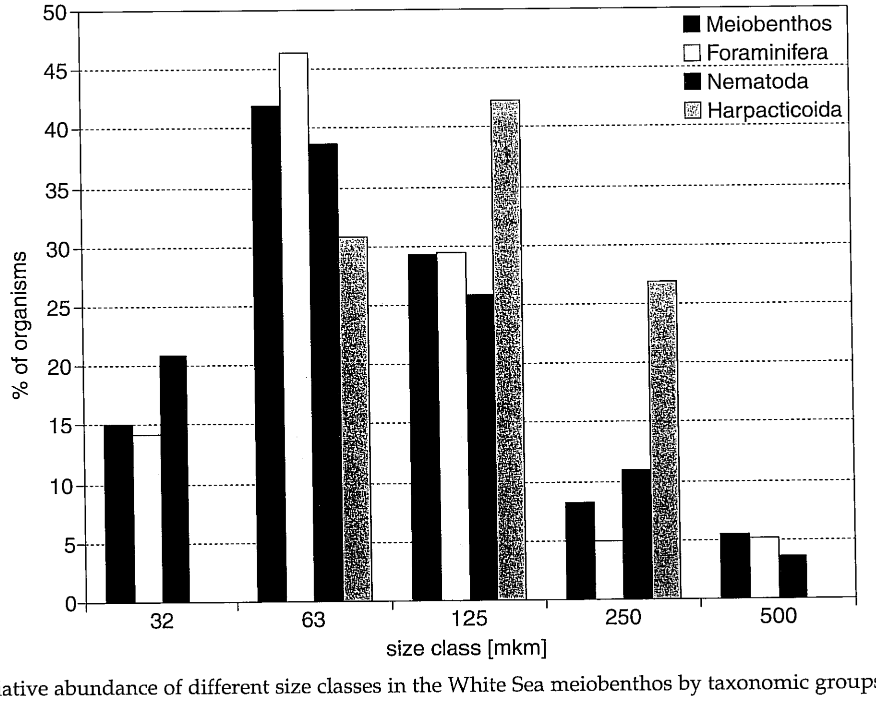

Fig. 6. Relative abundance of different size classes in the White Sea meiobenthos by taxonomic groups.

38 to 55 % belong to the size class 63-125 µm. In terms of length of these filiform organisms, their distribution has a prominent bimodal shape. The first and greatest modal class consists of animals with lengths from 300 to 800 µm; the second mode is represented by 1000-1200 µm long individuals. Being recalculated in logarithm base two form of body volume, nematode size distribution looks like unimodal with median log class of –1 (which is equal to 0.5 nl of body volume). Comparing with the nematode community of the White Sea intertidal fine sand flat, the modal size of the deep-water nematodes were two classes smaller (Mokievsky & Malych 2002) (Fig. 7).

Total nematode biomass was 0.502 (±0.10) g dry weight per m². Total meiobenthos biomass including foraminiferans and harpactiocoids might be estimated as being twice greater - about 1 g/m² dry weight which is equal to 4 g/m² wet weight. That number is comparable with figures obtained for macrobenthos. Macrobenthos wet biomass at the same station was 38.54 g/m² (Naumov & Fedyakov 2000).

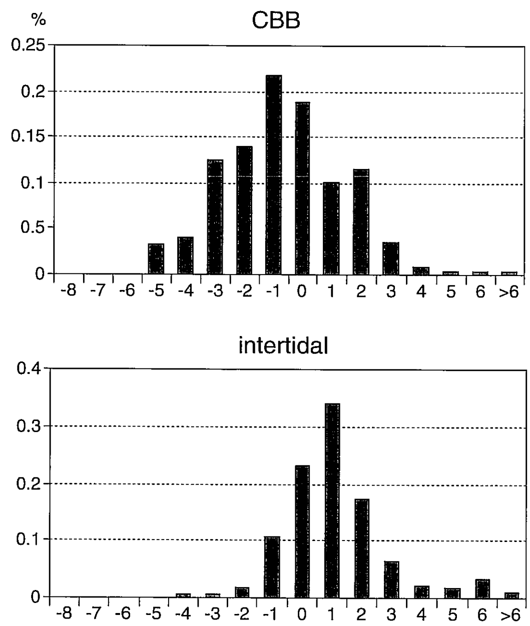

Fig. 7. Nematode size structure on the station CBB in comparison with the same of the White Sea intertidal zone. Axis X – body volumes (nl) in log base two form (log_2V, where V is body volume in nl.).

Discussion

Before this study, there were only 3 papers (Galtsova & Sheremetevsky 1985, Galtsova & Vladimirov 1988, Mayer 1980) and a general review (Galtsova 1991) providing information about meiobenthos of the deepest part of the White Sea. According to the study, eumeiobenthos was represented there by Foraminifera, Nematoda, Harpacticoida, Ostracoda and Halacarida. The pseudomeiobenthos included Polychaeta, Oligochaeta, Bivalvia, Gastropoda, Nemertini, Isopoda, Cumacea, and Insecta. The dominance of different taxa changes with the depth: in the intertidal and the subtidal zones nematodes have much greater abundance than other groups, while in depths below 150 m Foraminifera become more abundant also in terms of biomass. Total density of meiobenthos varied on a depth transect from 6.3 to 3168 ind/10 cm², biomass ranged from 0.05 to 91 g/m². The maximal rates occurred from the intertidal down to depths of 7-10 meters and then decreased rapidly. At 300 m the meiobenthos biomass fell down to 0.05-1.00 g/m² and the total abundance varied from 10 to 100 ind/10 cm². The approximate density of the eumeiobenthos in the deepest part of the Onega Bay was 50000 organisms per m² (Galtsova 1991); but our results are more than 200000 organisms per m². We assume that such a great difference comes from different methods implemented for the processing of samples. It was shown (Thiel 1983, Mokievsky & Malych 2002) that the figures of meiobenthos abundance in deep-water biotopes strongly depend on the low limit of sieving mesh size, which has been implemented in a study. The reduction of the mesh size from 90 to 42 µm could lead to tenfold increase of organisms counted. In case of the White Sea Basin, most meiobenthic organisms belong to the 63 µm mesh size class, and the rate of organisms which could pass through a 125 µm screen is more than 50 % of the total.

The relation between main groups of meiobenthos in the Onega Bay is very similar to our data – the percentage of Foraminifera increases with the depth, and the abundance of nematodes decreases correspondingly. But, correlation between different groups of foraminifers from the north part of White Sea basin (Mayer 1980) differs with our results. Mayer showed that the fraction of calcareous foraminifers increased in the deepest part of the sea, but the percentage of this group of Foraminifera in our samples stands low (about 8 %).

The size spectrum of the White Sea deep basin nematodes is shifted left (to lower classes) than those of intertidal fine sands. Measured in body volumes, the modal class for the White Sea intertidal is about 4.05 nl (Mokievsky & Malych 2002) while on the CBX station the mean body volume is about 1.36 ± 0.26 nl. At the same time, it is clear that nematodes in the White Sea depth are rather bigger than those inhabiting the bathyal and abyssal of the North Atlantic and the Arctic. The mean body volumes there are about 0.424 nl (Tseitlin & al 2001).

The structure of nematode assemblages looks more similar to the true deep sea rather than to the White Sea intertidal und upper subtidal zones. In the latter cases the nematode assemblages are characterised by a strong predominance of a single species (up to 60 % of total abundance), while in deep-sea assemblages rank curves slope very gently. In the Norwegian Sea in the depth from 900 to 3000 m the number of species per 3 cm^2 varied from 20 to 44 and no species has more than 20 % of relative abundance (Jensen 1988). Puerto Rico Trench and Hatteras Abyssal Plain provide even more gentle slopes of relative abundance (Tietjen 1989).

Being compared with the true deep-sea of the North Atlantic or Pacific and with the White Sea upper subtidal zone, the meiobenthos of the deep part of the White Sea holds an intermediate position in most of its characters.

The estimated total meiobenthos biomass exceeds the 10 % of biomass of the macrobenthos in correspondent sites. Thus, meiobenthic groups have to be regarded very important in ecological processes in the deep part of the White Sea.

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