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Testate Amoebae Fauna (Amoebozoa, Rhizaria) from the Benthal of Kamchia Reservoir (Eastern Bulgaria)

Rositsa Davidova, Maria Boycheva

Faculty of Natural Sciences, University of Shumen "Ep. K. Preslavsky", 115 Universitetsca Street, 9700 Shumen, Bulgaria;
E-mail: davidova_sh@yahoo.com

Abstract: The taxonomic diversity, frequency of occurrence and dominant structure of testate amoebae fauna from the benthal of Kamchia Reservoir were studied. A total of 94 species and varieties, belonging to 22 genera were identified. We found that the benthal from the littoral zone and the benthal from the deep-water zone were characterised by similar species diversity (70 and 67 species, respectively), but the deep-zone benthal had a considerably higher diversity regarding the number of genera (16 and 22 genera, respectively). Most of the species found in the reservoir belonged to the genera *Difflugia* (45 species, 47.87%) and *Centropyxis* (11 species, 11.70%). Considering the number of specimens, however, the highest relative abundance had the genera *Trinema* (35.80%), *Corythionella* (17.39%) and *Euglypha* (14.18%), which comprised 67.37% of the specimens. Species like *Trinema enchelys*, *Trinema lineare*, *Corythionella georgiana* and *Euglypha rotunda* were constantly occurring dominant species characterised by high population density and frequency. Additionally a comparison between the testacean fauna of Kamchia Reservoir and other big reservoirs in Bulgaria was made.

Keywords: Testate amoebae, Kamchia Reservoir, diversity, benthal, frequency, relative abundance

Introduction

The first data on the testate amoebae fauna of the Bulgarian reservoirs is found in the works of Angelov (1964) and Naidenow (1964) in the mid-twentieth century. Studying the invertebrate fauna in filtrated water from the water-supply network of the city of Sofia, originating from Beli Iskar Reservoir (Rila Mountain), Angelov (1964) found 16 species of testate amoebae, belonging to ten genera. At the same time, Naidenow (1964) reported the establishment of five species of testate amoebae in the plankton of Batak Reservoir. More detailed studies on the testacean fauna of Beli Iskar Reservoir were conducted by Golemansky, Todorov (1993). The authors found a total of 78 species and varieties of testate amoebae in the water catchment area and the littoral zone of the reservoir, 12 of which belonged to the littoral benthos. Data on testate amoebae from some big Bulgarian reservoirs can be found also in Golemansky *et al.* (2006), who summarised the existing information about the taxonomic diversity and distribution of rhizopodic fauna from various biotopes in the Western Rhodopes. In samples collected from the littoral benthos of the reservoirs Batak, Beglika, Dospat, Toshkov Chark and Shiroka Polyana the authors found 89 species and 24 genera of testate amoebae. Twenty-four or about 27% of the established species were rare, and were not found at any of the other studied locations (natural lakes, peat-bogs, swamps, and soil or epiphytic mosses), therefore the authors defined them as characteristic. Most of them (13) belonged to the genus *Difflugia.* In their studies of the taxonomic composition and ecology of testate amoebae in the benthal and in the pelagial of Ticha Reservoir (North-Eastern Bulgaria) Davidova *et al.* (2008) established 104 species and varieties, seven of which were new for the Bulgarian fauna. In the littoral and the benthal of Batak Reservoir (South-Western Bulgaria) Todorov *et al.* (2008)

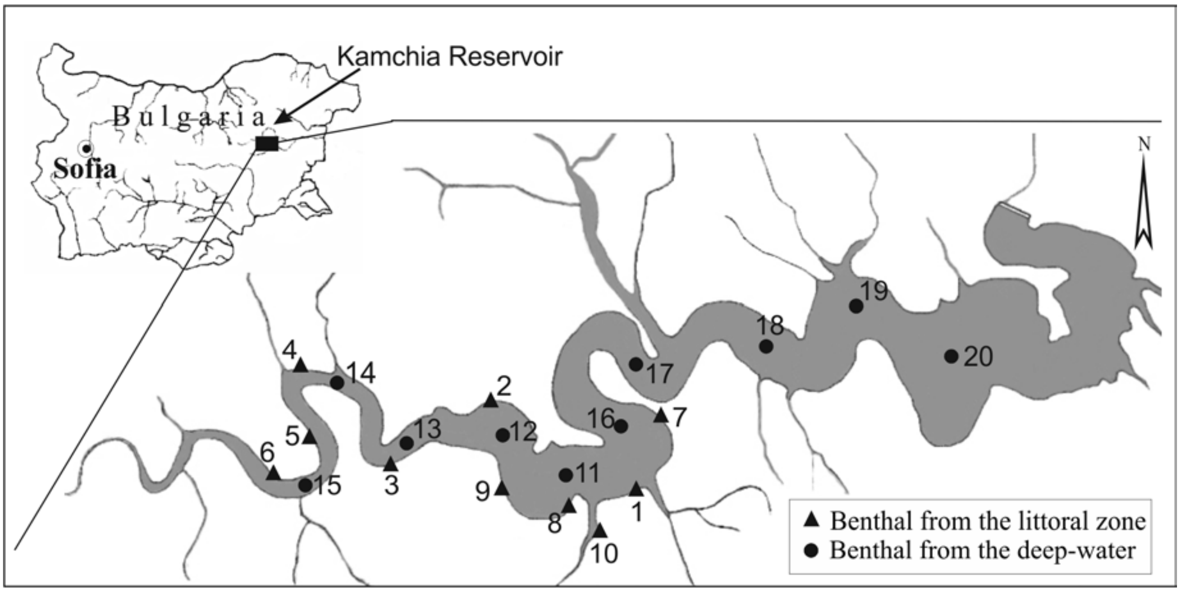

Fig. 1. Study area with the location of the sampling station

found 93 species of 21 genera of testate amoebae and established three species and two varieties that were new for the Bulgarian fauna. Davidova (2010) analysed the species diversity, biotopic distribution, frequency and dominant structure of testate amoebae communities in Rabisha Reservoir (North-Western Bulgaria) and identified a total of 78 species and varieties, belonging to 19 genera. In different biotopes of Ovcharitsa Reservoir (South-Eastern Bulgaria) the same author (Davidova 2011, 2012) found 75 taxa (including species and varieties) of testate amoebae of 18 genera, of which two species were new for the Bulgarian testacean fauna.

All of these studies demonstrate that reservoirs have distinct, rich and diverse testate amoebae fauna and are of considerable interest given their purpose and role in people's lives. Despite the intensive research in the recent years, numerous Bulgarian reservoirs remain unexplored. One of them is Kamchia Reservoir: a big complex reservoir which is of primary importance for the drinking water supply of more than 100,000 people.

The aim of this study is to explore the taxonomic diversity and to analyse the structure of testate amoebae communities inhabiting the benthal of Kamchia Reservoir. The study provides a comparison between the testacean fauna of Kamchia and other big reservoirs in Bulgaria.

Material and Methods

Study area. Kamchia Reservoir was built in 1973-1974 along the Luda Kamchia River in the eastern part of Stara Planina Mountains. It is situated 3 km above the village of Kamchia (26° 52' 11'' E, 42° 52' 11'' N; Fig. 1). The reservoir has a complex geological foundation: it lies on magma, sediment and metamorphic rocks. With its hydromorphological parameters Kamchia Reservoir belongs to the big deep reservoir of the lake type. Its water volume of 233,55 x 10^6 m^3 is formed by the rivers Luda Kamchia, Kotlenska, Glogova, Neikovska, Icherenska, Medvenska and Sadovska. Its catchment area is 1612 km^2. Groundwater does not play a sig-

Table 1. Hydrochemical parameters of the Kamchia Reservoir (based on data from the annual report of the Ministry of Environment and Waters and the Ministry of Health, 2011)

Parameters	Average values
pH	7.39
Conductivity, µS/cm	335.37
O_2, mgO_2/dm^3	8.77
O_2%, measured as oxidation with $KMnO_4$	81.4
Residual organic hydrocarbon, mg/dm^3	5.53
NH_4, mg/dm^3	0.074
NO_3, mg/dm^3	0.11
NO_2, mg/dm^3	0.006
PO_4, mg/dm^3	0.032
Fe, mg/dm^3	0.047
Mn, mg/dm^3	0.0053
Cu, mg/dm^3	0.00238
Zn, mg/dm^3	0.00245
Ni, mg/dm^3	0.00249
Pb, mg/dm^3	<0.0001
Hg, mg/dm^3	<0.0003

nificant role for its water balance. Its average depth is about 15 m, while the maximum depth reaches 80 m. The water is with salinity of <0.5‰. The average data of the main hydrochemical parameters of the water in Kamchia Reservoir are given in Table 1 (data are taken from the annual report of the Ministry of Environment and Waters and the Ministry of Health, 2011). The values of these parameters show that Kamchia Reservoir can be defined as oligotrophic with a tendecy towards being mesotrophic.

Sampling and sample analysis. Sampling was carried out in Octomber 2011 at a total of 20 stations (Fig. 1). Sediment for studying the testacean fauna was collected at different points from both the deep zone and the littoral zone of the reservoir. The materials were grouped as follows:

- Benthal from the littoral zone: benthic samples at a depth from 0.5 to 1 m (10 samples, №№ 1-10).

- Benthal from the deep water: benthic samples at a depth from 5 to 22 m (10 samples, №№ 11-20).

Eckmann's grab was used for the collection of the samples. The collected material was fixed with 4% formaldehyde and examined in the laboratory. Test morphology and measurements of the species were made using a light microscope "Amplival", at 400x magnification. The identification of the testacean taxa was done following Deflandre (1928, 1929), Gauthier-Lievre, Thomas (1958), Decloitre (1962), Ogden, Hedley (1980), Ogden (1983), Ogden, Živcovic (1983).

Data analysis. The frequency of occurrence of each species (pF) was calculated as the percentage of samples in which each species occurred. Based on their occurrence, the species were classified as constant (present in more than 50% of the samples), incidental (present in 25% to 50% of the samples) or accidental (present in less than 25% of the samples). The relative abundance $D=n_i/N \times 100$, where n_i is the number of the specimens of each species and N – the total number of all specimens, was used to establish the dominant structure. All species were divided into 4 groups: subrecedent – D < 1%; recedent – D between 1-2%; subdominant – D between 2-5%; dominant – D > 5%. Jackknife analysis was used in order to establish the expected species richness. It was performed using Biodiversity Software. Statistical analysis was carried out using computer programme STATISTICA 9.0 (StatSoft inc., 2009).

Results

A total of 94 species and variaties belonging to 22 genera of testate amoebae were found in the benthal of Kamchia Reservoir. The list of the established taxa, their relative abundance (D) and frequency of occurrence (pF) in the studied reservoir are presented in Table 2.

Most of the species (66%) found in the reservoir belonged to the genera *Difflugia* (45 species,

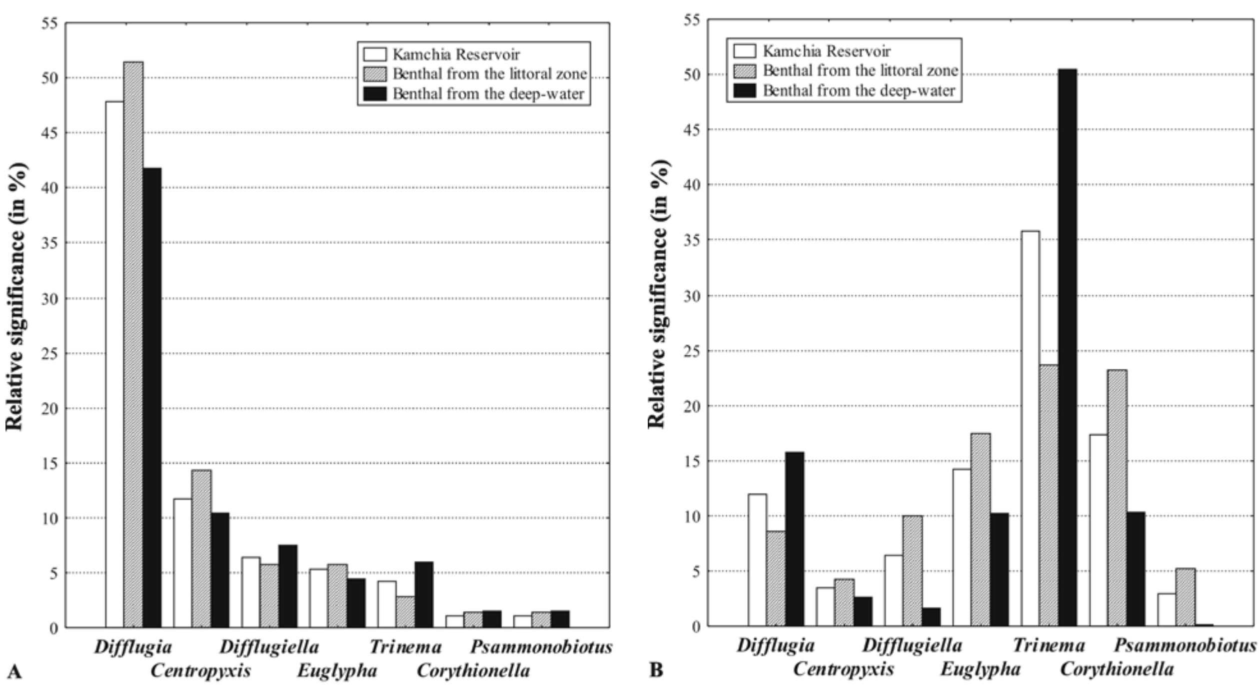

Fig. 2. Line plots indicating the relative abundance, according to the number of species (A) and according to the number of specimens (B) of dominating genera in the testacean communities of the Kamchia Reservoir and of the studied biotopes

Table 2. List of taxa, their relative abundance (D) and frequency of occurrence (pF) in the benthal of the Kamchia Reservoir

Taxa	**Benthal from the littoral zone**		**Benthal from the deep-water zone**		**Total**	
	D	**pF**	**D**	**pF**	**D**	**pF**
Arcella *discoides* Ehrenberg, 1843	0.08	10.0	-	-	0.04	5.0
A. hemisphaerica Perty, 1852	-	-	0.39	20.0	0.18	10.0
A. rotundata Playfair, 1917	-	-	0.10	10.0	0.04	5.0
Centropyxis *aculeata* (Ehrenberg, 1830) Stein, 1857	1.38	70.0	0.49	20.0	1.08	45.0
C. aerophila Deflandre, 1929	0.33	40.0	0.59	30.0	0.46	35.0
C. aerophila v. sphagnicola Deflandre, 1929	0.33	20.0	0.10	10.0	0.23	15.0
C. cassis (Wallich, 1864) Deflandre, 1929	0.24	20.0	0.59	40.0	0.40	30.0
C. constricta (Ehrenb., 1841) Deflandre, 1929	0.08	10.0	-	-	0.04	5.0
C. ecornis (Ehrenberg, 1841) Leidy, 1879	0.66	40.0	-	-	0.37	20.0
C. hirsuta Deflandre, 1929	0.81	50.0	0.20	20.0	0.53	30.0
C. laevigata Penard, 1890	0.08	10.0	-	-	0.04	5.0
C. minuta Deflandre, 1929	-	-	0.30	10.0	0.13	5.0
C. platystoma (Penard, 1890) Deflandre, 1929	0.16	20.0	0.30	20.0	0.22	20.0
C. sylvatica (Deflandre, 1929) Bonnet & Thomas, 1955	0.16	20.0	-	-	0.09	10.0
Corythion *dubium* Taranek, 1881	0.08	10.0	0.20	20.0	0.13	15.0
Corythionella *georgiana* Nicholls, 2005	23.19	70.0	10.35	40.0	17.39	55.0
Cryptodifflugia *compressa* Penard, 1902	-	-	0.10	10.0	0.04	5.0
Cyclopyxis *eurystoma* Deflandre, 1929	0.90	50.0	0.99	50.0	0.94	50.0
C. kahli Deflandre, 1929	0.33	40.0	-	-	0.18	20.0
Cyphoderia *ampulla* (Ehrenberg, 1841) Leidy, 1870	0.41	40.0	0.39	30.0	0.40	35.0
C. loevis Penard, 1902	0.81	10.0	0.69	10.0	0.76	10.0
Difflugia *achlora* Penard, 1902	0.24	30.0	1.08	20.0	0.62	25.0
D. acutisimella Chardez, 1985	0.24	10.0	-	-	0.13	5.0
D. ampullula Playfair, 1918	0.08	10.0	0.59	40.0	0.31	25.0
D. avellana Penard, 1890	0.08	10.0	-	-	0.04	5.0
D. bicornis Penard, 1890	0.08	10.0	-	-	0.04	5.0
D. brevicola Cash, 1909	-	-	0.20	10.0	0.09	5.0
D. bryophilla (Penard, 1902) Jung, 1942	0.08	10.0	0.39	30.0	0.22	20.0
D. capreolata Penard, 1902	0.08	10.0	-	-	0.04	5.0
D. corona Wallich, 1864	0.08	10.0	-	-	0.04	5.0
D. cylindrus (Thomas, 1954) Ogden, 1983	0.50	10.0	-	-	0.27	5.0
D. decloitrei Godeanu, 1972	0.33	10.0	0.59	20.0	0.46	15.0
D. difficilis Thomas, 1954	0.08	10.0	0.20	20.0	0.13	15.0
D. difficilis v. ecornis Chardez, 1956	0.08	10.0	-	-	0.04	5.0
D. distenda Ogden, 1983	0.08	10.0	-	-	0.04	5.0
D. dragana Ogden & Zivkovic, 1983	0.16	20.0	-	-	0.09	10.0
D. elegans Penard, 1890	0.57	50.0	0.30	10.0	0.46	30.0
D. glans Penard, 1902	0.16	10.0	0.10	10.0	0.13	10.0
D. globularis (Wallich, 1864) Leidy, 1877	0.16	10.0	0.30	10.0	0.22	10.0
D. globulosa Dujardin, 1837	0.08	10.0	0.10	10.0	0.09	10.0
D. gramen Penard, 1902	0.33	40.0	3.35	90.0	1.69	65.0
D. lacustris (Penard, 1899) Ogden, 1983	0.24	30.0	0.39	40.0	0.31	35.0
D. lanceolata Penard, 1890	0.08	10.0	0.10	10.0	0.09	10.0
D. lata Jung, 1942	0.08	10.0	-	-	0.04	5.0
D. levanderi Playfair, 1918	0.16	20.0	0.30	10.0	0.22	15.0
D. lithophilla (Penard, 1902) Gauthier-Lièvre & Thomas, 1958	0.41	30.0	0.20	20.0	0.31	25.0
D. lobostoma Leidy, 1879	0.08	10.0	1.08	50.0	0.53	30.0

Table 2. Continued

Taxa	Benthal from the littoral zone		Benthal from the deep-water zone		Total	
	D	pF	D	pF	D	pF
D. lobostoma v. globulus Playfair, 1917	-	-	0.20	10.0	0.09	5.0
D. lucida Penard, 1890	-	-	0.10	10.0	0.04	5.0
D. manicata Penard, 1902	0.66	30.0	2.06	80.0	1.30	55.0
D. mammilaris Penard, 1893	-	-	0.10	10.0	0.04	5.0
D. microstoma (Thomas, 1954) Ogden, 1983	0.08	10.0	-	-	0.04	5.0
D. mica Frenzel, 1892	-	-	0.10	10.0	0.04	5.0
D. oblonga Ehrenberg, 1831	0.16	20.0	-		0.09	10.0
D. parva (Thomas, 1954) Ogden, 1983	-	-	0.20	10.0	0.09	5.0
D. penardi Hopkinson, 1909	0.91	40.0	-	-	0.50	20.0
D. petricola Cash, 1909	0.16	20.0	-	-	0.09	10.0
D. pristis Penard, 1902	0.98	50.0	1.38	80.0	1.17	65.0
D. pulex Penard, 1902	0.57	30.0	1.87	90.0	1.17	60.0
D. sarissa Li Sun Taï, 1931	-	-	0.10	10.0	0.04	5.0
D. schurmanni Oye, 1932	0.16	10.0	-	-	0.09	5.0
D. serbica Ogden & Zivkovic, 1983	0.08	10.0	-	-	0.04	5.0
D. stoutii Ogden, 1983	-	-	0.20	10.0	0.09	5.0
D. styla Ogden & Zivkovic, 1983	0.08	10.0	0.10	10.0	0.09	5.0
D. tenuis (Penard, 1890) Ogden, 1983	0.24	20.0	-	-	0.13	10.0
D. viscidula Penard, 1902	-	-	0.10	10.0	0.04	5.0
***Difflugiella** angusta* Schönborn, 1965	-	-	0.10	10.0	0.04	5.0
D. crenulata (Playfair, 1917) Grospietsch, 1964	-	-	0.10	10.0	0.04	5.0
D. horrida Schönborn, 1965	9.52	80.0	0.89	50.0	5.62	65.0
D. oviformis Bonnet & Thomas, 1955	0.24	10.0	0.39	30.0	0.31	20.0
D. sacculus (Penard, 1902) Deflandre, 1953	0.16	20.0	-	-	0.09	10.0
D. vulgaris (France, 1913) Grospietsch, 1964	0.08	10.0	0.20	20.0	0.13	15.0
***Euglypha** ciliata* (Ehrenberg, 1848) Leidy, 1878	0.08	10.0	-	-	0.04	5.0
E. filifera Penard, 1890	0.16	10.0	-	-	0.09	5.0
E. loevis (Ehrenberg, 1845) Perty, 1849	-	-	0.10	10.0	0.04	5.0
E. rotunda Wailes & Penard, 1911	17.01	40.0	9.96	80.0	13.82	60.0
E. tuberculata Dujardin, 1841	0.24	10.0	0.10	10.0	0.18	10.0
***Heleopera** sylvatica* Penard, 1890	-	-	0.10	10.0	0.04	5.0
***Microchlamys** patella* (Clap. & Lach., 1885) Cockerell, 1911	0.90	30.0	1.58	80.0	1.20	55.0
***Pareuglypha** reticulata* Penard, 1902	-	-	0.39	20.0	0.18	10.0
***Phryganella** hemisphaerica* Penard, 1902	1.71	20.0	0.49	30.0	1.17	25.0
***Pontigulasia** elisa* Penard, 1893	0.16	10.0	-	-	0.09	5.0
P. rhumbleri Hopkinson, 1909	0.24	30.0	0.10	10.0	0.18	20.0
***Plagiopyxis** declivis* Thomas, 1955	0.33	20.0	0.69	40.0	0.50	30.0
***Psammonobiotus** linearis* Golemansky, 1970	5.21	80.0	0.10	10.0	2.90	45.0
***Pseudodifflugia** gracilis* Schlumberger, 1845	-	-	0.39	30.0	0.18	15.0
***Pyxidicula** operculata* (Agardh, 1827) Ehrenberg, 1838	-	-	1.28	10.0	0.59	5.0
***Schoenbornia** viscicula* Schönborn, 1964	-	-	0.39	20.0	0.18	10.0
***Tracheleuglypha** acolla* Bonnet & Thomas, 1955	1.63	70.0	0.49	50.0	1.12	60.0
T. dentata Deflandre, 1938	-	-	0.10	10.0	0.04	5.0
***Trinema** complanatum* Penard, 1890	-	-	0.49	20.0	0.22	10.0
T. enchelys (Ehrenberg, 1838) Leidy, 1878	19.37	90.0	31.56	100.0	24.88	95.0
T. lineare Penard, 1890	4.31	40.0	18.15	80.0	10.57	60.0
T. lineare v. truncatum Chardez, 1964	-	-	0.30	10.0	0.13	5.0
Total species/genera:	70/16		67/22		94/22	

47.87%), *Centropyxis* (11, 11.70%) and *Difflugiella* (6, 6.38%), all of which are part of the big group Amoebozoa (Luhe, 1913) Cavalier-Smith, 1998 (Fig. 2A). Next were the representatives of the group Rhizaria Cavalier-Smith, 2002, order Euglyphida, forming phyllopodes: the genera *Euglypha* (five species, 5.32%) and *Trinema* (four species, 4.26%) (Adl *et al*. 2012). The remaining 17 genera had low diversity and were presented by only one- three species. Regarding the number of specimens, however, the highest relative abundance had the genera *Trinema* (35.80%), *Corythionella* (17.39%) and *Euglypha* (14.18%) which comprised 67.37% of the specimens (Fig. 2B). The high population density of these genera was owing to only one or two species. These were the dominant *Trinema enchelys* (24.88% relative abundance), *T. lineare* (10.57%), *Corythionella georgiana* (17.39%) and *Euglypha rotunda* (13.82%). The relative abundance according to the number of specimens of the genera *Difflugia* and *Difflugiella* was also high: 11.86% and 6.24% respectively. Whereas in *Difflugiella* it was due to the spread of one species (*D. horrida*, 5.62%), in *Difflugia* it resulted from the presence of a large number of species, neither of which was dominant in the reservoir. The remaining 17 genera were presented with low abundance, and belonged to the subdominants (two genera), recedents (five genera) and subrecedents (ten genera).

The analysis of the results showed that 12 (12.77%) of all 94 species found in the reservoir had an occurrence of more than 50% and appeared to be constant species (Table 2). These were *C. georgiana, Cyclopyxis eurystoma, Difflugia gramen*, *Difflugia manicata*, *D. pristis, Difflugia pulex, D. horrida*, *E. rotunda, Microchlamys patella, Tracheleuglypha acolla, T. enchelys* and *T. lineare*. The distribution of the remaining species depending on their frequency of occurrence was as follows: incidental – 14 species or 14.89% and accidental – 68 species or 72.34%.

In the benthal from the littoral zone we established 70 species, belonging to 16 genera. The highest species diversity had the genera *Difflugia* (36 species or 51.43%), *Centropyxis* (ten species or 14.29%), *Difflugiella* (four species or 5.71%) and *Euglypha* (four species or 5.71%; Fig. 2A). These four genera included 77.14% of the identified species. The remaining 12 genera were characterised by low species diversity and were presented by one or two species. Six genera were dominant regarding the number of specimens: *Trinema* (23.68%), *Corythionella* (23.19%), *Euglypha* (17.49%), *Difflugiella* (10.01%), *Difflugia* (8.62%) and *Psammonobiotus* (5.21%; Fig. 2B). These genera included 88.2% of all specimens

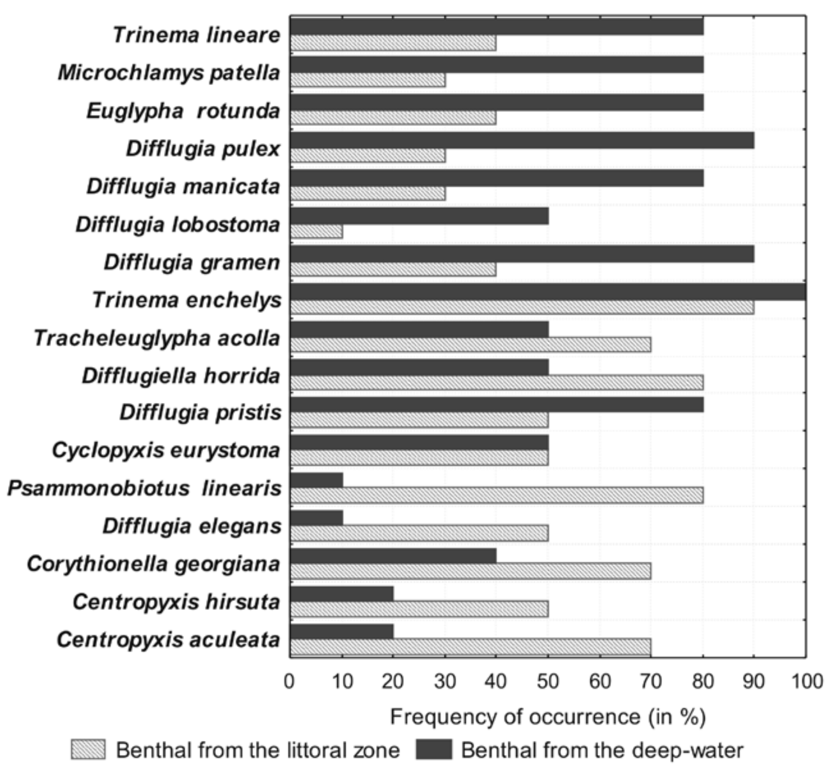

Fig. 3. Comparison between the constant testate amoebae in the benthal from the littoral zone and benthal from the deep-water zone

Table 3. Comparison of relative abundance (%), according to the number of species (D1) and relative abundance, according to the number of specimens (D2) of some genera in five artificial reservoirs in Bulgaria

Genera		Kamchia	Ticha*	Rabisha**	Ovcharitsa**	Batak***
Difflugia	D1	47.9	55.8	41.0	45.3	50.5
	D2	11.9	53.3	40.0	32.0	63.0
Centropyxis	D1	11.7	13.5	15.9	16.0	11.8
	D2	3.5	8.1	12.2	28.0	11.0
Difflugiella	D1	6.4	1.9	6.4	6.7	-
	D2	6.4	0.2	5.6	1.8	-
Arcella	D1	3.2	1.9	3.8	2.7	6.5
	D2	0.3	1.0	0.9	0.1	-
Euglypha	D1	5.3	1.0	5.1	4.0	7.5
	D2	14.2	0.1	0.9	0.2	6.0
Trinema	D1	4.3	1.9	3.9	2.7	2.1
	D2	35.8	7.9	9.5	14.5	4.0
Corythionella	D1	1.1	1.0	1.3	1.3	-
	D2	17.4	13.9	3.5	12.2	-

*According to Davidova *et al.* 2008; **According to Davidova 2010, 2012; ***According to Todorov *et al.* 2008.

found in the benthal from the littoral zone. The remaining ten genera were presented with low relative abundance, and belonged to the subdominants (one genus), recedents (four) and subrecedents (five). The high relative importance of aforementioned six genera is mainly due to the occurrence of one species *T. enchelys* (19.37%), *C. georgiana* (23.19%), *E. rotunda* (17.01%), *D. horrida* (9.52%) and *P. linearis* (5.21%), respectively. These five species were dominant and comprised 74.30% of the specimens found in this biotope.

Ten of the species (14.29%) found in the benthal from the littoral zone were constant: *Centropyxis aculeata*, *C. hirsuta*, *C. georgiana*, *C. eurystoma*, *Difflugia elegans, D. pristis, D. horrida*, *P. linearis*, *T. acolla* and *T. enchelys*. Fifteen (21.43%) of the remaining species were incidental and 45 (64.28%) were accidental (Fig. 3).

In the benthal from the deep-water zone we established 67 species, belonging to 22 genera. Most of the identified species (65.67%) belonged to the genera *Difflugia* (28 species, 41.79%), *Centropyxis* (seven species, 10.45%), *Difflugiella* (five species, 7.46%) and *Trinema* (four species, 5.97%; Fig. 2A). Similar to the benthal from the littoral zone, the remaining higher number of genera (18) was represented by only one to three species. The number of observed specimens showed that the highest relative abundance should be given to the genera *Trinema* (50.49%), *Difflugia* (15.78%), *Corythionella* (10.36%) and *Euglypha* (10.16%). They constituted 86.79% of the specimens (Fig. 2B). The remaining 18 genera belonged to the group of subdominants (one genus), recedents (four) and subrecedents (13). Of all 67 species found, only four were characterised by high population density and were dominant. These were *T. enchelys* (31.56%), *T. lineare* (18.15%), *C. georgiana* (10.35%) and *E. rotunda* (9.96%). They comprised 70.02% of all specimens found in this biotope.

The constant species in the benthal of the deep zone were 12 (17.91% of all species). These were *C. eurystoma*, *D. gramen*, *D. lobostoma*, *D. manicata*, *D. pristis*, *D. pulex*, *D. horrida*, *E. rotunda*, *M. patella*, *T. acolla*, *T. enchelys* and *T. lineare.* The distribution of the remaining species depending on their frequency was as follows: incidental 11 species (16.42%) and accidental 44 species (65.67%; Fig. 3).

Disscusion

In the present work we investigated for the first time the taxonomic diversity and community structure of testate amoebae inhabiting one of the biggest and most important reservoirs in Bulgaria. The results obtained from Jackknife index indicated that no considerable differences were found between the observed species richness ($R_{obs.}$) in the Kamchia Reservoir and estimated species richness ($R_{est.}$). For the benthal from the littoral zone $R_{est.} = 79.87$, and for the benthal from the deep-water zone $R_{est.} = 68.82$. Thus, the observed species richness is between 87.64% and 97.36% of the estimated richness.

Our results revealed that the testacean fauna of the Kamchia Reservoir was rich and represented mainly by typically aquatic and eurybiotic species. Most testate amoebae species observed in this study were commonly found in the natural lakes and artificial reservoirs in the world (Kulikovskaya 1983, Todorov, Golemansky 1998, 2000, Alekperov, Snegovaya 1999, Lansac-Tôha *et al*. 2008, Todorov *et al*. 2008, Lorencová 2009, Alves *et al.* 2010, Bobrov, Wetterich 2012).

The analysis of the biotope distribution revealed that the benthal from the littoral zone and the benthal of the deep-water zone had both similarities and differences in their testate amoebae fauna. The two studied biotopes were characterised by similar species diversity (70 and 67 species, respectively), but the deep zone benthal had a considerably higher diversity in terms of the number of genera (16 and 22 genera, respectively). There was a similarity in the complexes of dominant species, as well. Of all six dominant species found, three (50%) were the same for the two zones. These were *T. enchelys*, *C. georgiana* and *E. rotunda*. The complexes of constant species, however, differrred in the two biotopes: only five (out of 17 found) had a frequency of occurrence higher than 50 % and were constant in both biotopes, *i.e. C. eurystoma*, *D. pristis*, *D. horrida*, *T. acolla*, and *T. enchelys* (Fig. 3). As expected, the relative abundance of the genus *Difflugia* increased in the benthal of the deep zone. This fact was proved by a higher population density of the genus in the deep-zone benthal (15.78%) in comparison with the benthal of the littoral zone (8.62%), on the one hand, and the fact that five (41.67%) of the constant species in this biotope belonged to this genus, on the other. Only two (20%) of the constant species in the benthal from the littoral zone belonged to the *Difflugia* genus.

The obtained results for the Kamchia Reservoir were compared with the data of other studied artificial reservoirs in Bulgaria (Davidova 2008, 2010, 2012, Todorov *et al*. 2008). Analysing the composition of testate amoebae communities in different reservoirs was established that in all of them dominated representatives of the genera *Difflugia* and *Centropyxis* (Table 3). For reservoirs Ovcharitsa, Rabisha, Ticha, Batak and Kamchia the relative abundance, according to the number of species of the genera mentioned above were high and very similar and in the five reservoirs studied were found relatively low diversity of the genus *Arcella* which was presented in all water bodies with several species and low population densities.

Considering the relative abundance, according to the number of specimens of the genera that were found, we could conclude that the dominant role in testate amoebae communities in the freshwater benthal of the artificial reservoirs had the genera *Trinema*, *Corythionella, Euglypha, Difflugia, Difflugiella* and *Centropyxis*. Their share in the formation of communities in the reservoirs was different. It is noteworthy that in comparison with other studied reservoirs, in Kamchia Reservoir the species of the genus *Centropyxis* were comparatively rare and had very low population density. For the reservoir in general the representatives of this genus belonged to the groups of the accidental (seven) and incidental (four) species. As for their relative abundance, all were subrecedents. On the other hand, there was a significant increase in the abundance of the genera *Trinema*, *Corythionella* and *Euglypha* in Kamchia Reservoir. Species like *T. enchelys*, *T. lineare*, *C. georgiana* and *E. rotunda* were characterised by high population density and frequency and belonged to the dominant and constant species. It should also be noted that the present study detected much lower relative abundance of the genus *Difflugia* in comparison with other studied reservoirs in Bulgaria (Table 3). The observed differences in the abundance of some of the genera in the reservoirs were probably due to the differences in the chemical characteristics of the water; its trophic state; presence of macrophytes, submerged vegetation and mosses; the type of sediments and other environmental factors. Generally, the species *T. enchelys* and *E. rotunda* are very tolerant to different environmental conditions. They are species with short life cycles and wide ecological plasticity (Schönborn 1975, Krashevska *et al.* 2010). The obtained results on the rather lower relative importance of the genera *Difflugia* and *Centropyxis* are in accordance with the findings of other authors, which explain the dominance of these genera with the unfavorable conditions, and more specifically with the increasing of organic matter and degree of trophicity in the freshwater lakes (Collins *et al.* 1990, Reindhardt *et al.* 1998, Roe *et al.* 2010, Burdikova *et al.* 2012).

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