ECOLOGIA BALKANICA

2012, Vol. 4, Issue 1 June 2012 pp. 73-80

Composition and Structure of Testate Amoebae Fauna (Protozoa: Arcellinida and Euglyphida) in Durankulak Lake (Northeastern Bulgaria)

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Abstract. An ecological study of the testate amoebae fauna in Durankulak Lake (Northeastern Bulgaria) revealed 91 taxa, belonging to 20 genera. The genera *Difflugia* (34 species), *Centropyxis* (14), *Arcella* (6) and *Difflugiella* (6) had the highest species diversity. The species *Trinema enchelys* (31.2% relative abundance), *Euglypha rotunda* (15.1%) and *Microchlamys patella* (6.6%) were present with high population density and were dominants in the lake. The species richness and abundance of testaceans differed considerably among separate localities. By the mean of some basic indices for structure of communities, a characterization of the diversity of testate amoebae was made.

Keywords: Testate amoebae, Durankulak Lake, diversity, frequency, relative abundance

Introduction

Wetlands are one of the greatest natural resources on earth. The function of natural wetlands can be classified by their ecosystem benefits. The United Nations Millennium Ecosystem Assessment and Ramsar Convention found wetlands to be of biosphere significance and societal importance in the following areas: flood control, groundwater replenishment, shoreline stabilisation and storm protection, water purification, reservoirs of bio-diversity, wetland products, cultural values, recreation and tourism, climate change mitigation and adaptation. Wetlands as habitats provide unique living conditions for many plant and animal species. They are characterized by rich taxonomic diversity of organisms, high number of endemic species, and extremely high productivity.

On the other hand, wetlands are among the most endangered places on the planet. They are extremely vulnerable ecosystems - highly sensitive to pollution, changes in water currents, etc. A number of species, whose survival depends mainly on the wetlands, are in danger of extinction.

In the early 20th century wetlands covered about 2000 km² or 2% of the territory of Bulgaria. Most of them have already been drained, heavily modified or converted into fishponds and reservoirs. Today these ecosystems cover only 0.1% of the country and are among the highest priority conservation sites (WETLANDS, 2012).

Durankulak Lake is among the most important and best preserved coastal wetlands in Bulgaria. It is a coastal lake of the firth type, included in the list of the Ramsar Convention as a wetland of international importance for conservation of more than 260 species of endemic, rare and endangered plants and animals.

A number of scientific articles on the biodiversity of the lake have been published up to now (GEORGIEV, 1998), but its testate amoebae fauna have not been an object of

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study. The purpose of this paper is to investigate the taxonomic diversity of testate amoebae in Durankulak Lake and to describe the distribution of testaceans at different localities.

Materials and Methods

Study Area. Durankulak Lake is situated in Northeastern Bulgaria to 4-9 km from the Romanian border and 12-17 km north of the town of Shabla (28° 33' 43'' E, 30° 40' 30'' N) (Fig. 1). It is a shallow, covered firth formed at the beginning of the Holocene (about 10 000 years ago). The main hydrographic parameters of Durankulak Lake are given in Table 1 (GEORGIEV, 1998). The lake widens to the north, and this part of it is locally known as the Kartaliysko swamp, separated from the rest of the lake by a narrow grass-covered mud-bank.

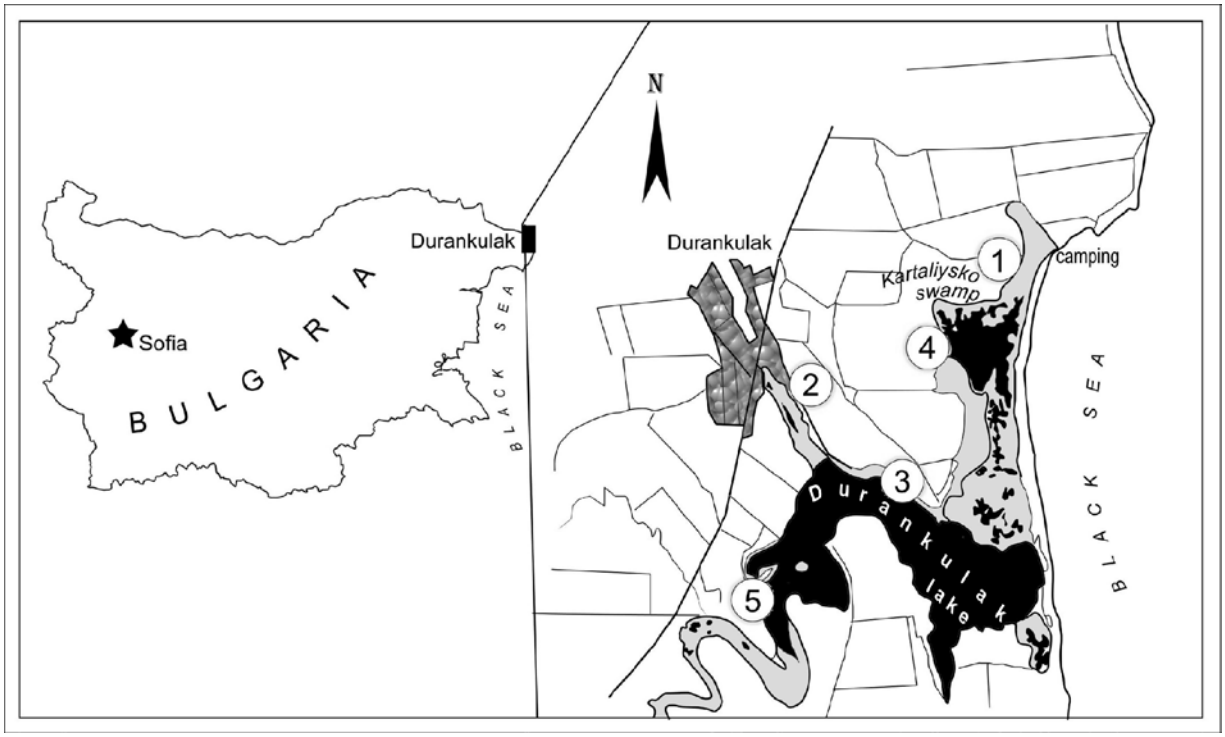

Fig. 1. Map of the study area.

Table 1. Main hydrographic parameters of Durankulak Lake

Parameters	Values
Total area, dec.	4037.4
Open water areas, dec.	2 533.2
Altitude of the water level, from… to…, m a.s.l.	+0.09-+0.60
Depth, m	max. 4.0, average 1.4
Water volume, $m^3 .10^3$	2 500
Main water supply	underground water (80%)
Catchment area, km^2	subterranean - 542

Despite their shared geodesic origin and the marshy area which separates them, both parts of the lake – Durankulak Lake proper and Kartaliysko swamp have a completely different nature and landscape (GEORGIEV, 1998). As for its mineral composition, the water of Durankulak Lake is fresh with high-grade mineralisation. The water in Kartaliysko swamp is brackish, with very high-grade mineralization. The water column in Durankulak Lake is saturated with oxygen from the surface to the bottom (average 86%), whereas oxygen saturation is lower in Kartaliysko swamp,

since it is shallow and closed (average 73%). Heavy ammonium concentration is registered in both parts of the lake, which is typical of hypertrophic water basins. The amount of dissolved and suspended organic matter in Durankulak Lake is normal for an eutrophic lake, whereas the concentration of organic matter in Kartaliysko swamp is considerably higher. Bottom sediments in both reservoirs are formed mainly of clay rich in organic substance – remains of plants and animals. In the northern and south-western parts of the lake there are vast areas of aquatic vegetation, dominated mainly by *Phragmites australis*, *Typha angustifolia*, *Typha latifolia* and *Shoenoplectus triqueter*.

Sampling and sample analysis. Thirty samples of bottom sediments from the littoral zone of the Durankulak Lake were collected in 2010. The lake was visited six times during the year (in January, February, March, August, November and December) and each time samples were collected from five permanent localities, including the open water area and the "branches" of the lake (Fig.1). Station 1 is located at a longer distance from the main open water area, in the northern part of Kartaliysko swamp. This part of the lake is covered with reed and other aquatic vegetation almost completely; its water level is low - less than 1 m, and often dries up. Station 2 is located at the so-called "Village branch", partially covered with aquatic vegetation, and its water level is 1-2 m. Station 3 is in the open water area, with little vegetation and water level of about 4 m. Station 4 is situated in Kartaliysko swamp, with an overgrowth of aquatic vegetation and the water level of 1-2 m. Station 5 is located near the Big Island, at the beginning of "Vaklinski branch" and is overgrown with aquatic vegetation in certain places. The water level in it is about 2m.

Half of each sample was fixed *in situ* with 4% formaldehyde. The other half was kept alive for investigation in vivo. For each sample, 0.1 cm^3 of the sediment was taken and studied after homogenization. The number of the species found in it was calculated in specimens/cm^3.

Data analysis. The frequency of occurrence of the particular species was calculated using the formula: pF = m/n x 100, where m is the number of samples in which one species was found and n is the total number of samples. Different species, depending on pF index, were divided into 3 categories as follows: constant - found in more than 50% of all samples; incidental - found in 25-50% of all samples; accidental - found in less than 25% of all samples (BODENHEIMER, 1955).

The relative abundance of each species was used to determine the dominant structure of testacean communities. The dominance was calculated by the formula: D = n/N x 100, where n is the number of the specimens of every species and N is the total number of all specimens. All species were divided into 4 groups, according to the 4-grade classification of TISCHLER (1955): subrecedent – with relative significance < 1%; recedent – with relative significance 1-2%; subdominant – with relative significance 2-5%; dominant – with relative significance > 5%.

The following indices were used to analyse the structure of the testacean communities and to asses the environmental conditions in the lake (BONNET, 1964; ODUM, 1981):

- Simpson's index (C) for concentration of domination, calculated by the formula: $C = \Sigma (n_i / N)^2$, where n_i is the assessment of significance of every species (number of specimens); N – total assessment of significance (total number of specimens).

- Margalef index (d) of species variety, calculated by the formula: $d = S - 1 / \ln N$, where S is the number of species; N – total number of specimens.

- Fisher-William´s index (α) for species diversity, calculated by the formula: $S = \alpha \ln (1 + N / \alpha)$, where S is the number of species; N – total number of specimens.

Statistical analysis was carried out using software package BIODIV 5.1 (BAEV & PENEV, 1995) and STATISTICA 6 (STATSOFT INC., 2000).

Results and Discussion

Altogether 91 species, varieties and forms from 20 genera were identified (Table 2). The highest species diversity was in the

genera *Difflugia* (34 species), *Centropyxis* (14), *Arcella* (6) and *Difflugiella* (6). About a half (9) of the 20 established genera were represented by 1 species only. The results showed that aquatic testacean fauna in Durankulak Lake is comparatively rich and varied. The species composition of the testate amoebae is typical to the freshwater reservoirs (SCHÖNBORN, 1962, 1965; MORACZEWSKI, 1965, 1967; GOLEMANSKY, 1968; TODOROV & GOLEMANSKY, 1998, 2000; NICHOLLS, 2005; MAZEY & TSYGANOV, 2006; DAVIDOVA, 2010).

Seventeen species or 18.7% were established in all investigated stations in the lake – *Arcella hemisphaerica, Centropyxis aculeata*, *C. ecornis, C. platystoma, Cyclopyxis eurystoma, Difflugia gramen, D. pristis, Difflugiella angusta, D. oviformis, Euglypha rotunda, Microchlamys patella, Phryganella hemisphaerica, Plagiopyxis declivis, Psammonobiotus linearis*, *Tracheleuglypha*

Table 2. List of taxa, their relative significance (D) and frequency of occurrence (pF) in different stations of Durankulak Lake.

Stations / Taxa	1		2		3		4		5	
	D	pF	D	pF	D	pF	D	pF	D	pF
Arcella *discoides* EHRENBERG, 1843	–	–	0.1	50.0	0.1	16.7	–	–	–	–
A disc. v. scutelliformis PLAYFAIR, 1917	–	–	0.4	50.0	–	–	–	–	1.7	16.7
A. gibbosa v. mitriformis DEFLANDRE, 1928	–	–	0.2	33.3	–	–	–	–	–	–
A. hemisphaerica PERTY, 1852	0.4	33.3	1.1	33.3	4.4	33.3	0.1	16.7	0.1	33.3
A. hem. f. undulata DEFLANDRE, 1928	–	–	–	–	–	–	0.1	16.7	–	–
A. rotundata PLAYFAIR, 1917	–	–	0.1	16.7	–	–	–	–	–	–
Centropyxis *aculeata* (EHRENBERG, 1830) STEIN, 1857	0.5	33.3	0.4	50.0	0.6	33.3	2.7	66.7	1.1	50.0
C. aerophila DEFLANDRE, 1929	0.9	50.0	–	–	0.1	16.7	1.4	66.7	0.1	16.7
C. aerophila v. sphagnicola DEFLANDRE, 1929	0.7	16.7	0.1	16.7	–	–	0.1	16.7	0.1	16.7
C. cassis (WALLICH, 1864) DEFLANDRE, 1929	0.7	16.7	–	–	0.2	33.3	0.2	16.7	–	–
C. cassis v. spinifera PLAYFAIR, 1917	–	–	–	–	1.1	33.3	0.4	33.3	–	–
C. constricta (EHRENBERG, 1841) DEFLANDRE, 1929	0.4	16.7	–	–	–	–	0.2	16.7	–	–
C. delicatula PENARD, 1902	–	–	0.9	33.3	–	–	0.2	33.3	0.2	33.3
C. ecornis (EHRENBERG, 1841) LEIDY, 1879	0.2	16.7	0.2	50.0	0.2	33.3	0.2	33.3	0.1	16.7
C. elongata (PENARD, 1890) THOMAS, 1959	0.2	16.7	–	–	–	–	–	–	–	–
C. hirsuta DEFLANDRE, 1929	–	–	–	–	0.3	33.3	0.2	33.3	0.7	33.3
C. laevigata PENARD, 1890	0.2	16.7	–	–	0.1	16.7	–	–	–	–
C. minuta DEFLANDRE, 1929	–	–	–	–	0.1	16.7	–	–	0.1	16.7
C. platystoma (PENARD, 1890) DEFLANDRE, 1929	0.2	16.7	0.9	50.0	0.7	33.3	4.0	16.7	1.0	33.3
C. sylvatica (DEFL., 1929) BONNET & THOMAS, 1955	–	–	0.1	16.7	–	–	0.1	16.7	–	–
Corythionella *georgiana* NICHOLLS, 2005	–	–	0.1	16.7	5.3	16.7	9.5	50.0	1.2	33.3
Cryptodifflugia *compressa* PENARD, 1902	–	–	0.1	16.7	–	–	–	–	–	–
Cyclopyxis *eurystoma* DEFLANDRE, 1929	1.3	50.0	0.7	66.7	0.2	33.3	1.5	66.7	0.2	16.7
C. kahli DEFLANDRE, 1929	–	–	0.1	16.7	–	–	–	–	–	–
Cyphoderia *ampulla* (EHRENBERG, 1841) LEIDY, 1870	–	–	–	–	0.1	16.7	22.0	33.3	–	–
Difflugia *acuminata* EHRENBERG, 1838	–	–	0.1	16.7	–	–	–	–	–	–
D. acutissima DEFLANDRE, 1931	–	–	–	–	0.1	16.7	–	–	–	–
D. ampullula PLAYFAIR, 1918	0.2	16.7	0.1	16.7	–	–	0.2	16.7	0.1	16.7
D. brevicola CASH, 1909	–	–	0.1	16.7	–	–	–	–	–	–
D. cylindrus (THOMAS, 1954) OGDEN, 1983	–	–	–	–	–	–	0.1	16.7	–	–
D. decloitrei GODEANU, 1972	–	–	–	–	–	–	–	–	0.1	16.7
D. difficilis THOMAS, 1954	0.2	16.7	–	–	–	–	0.1	16.7	0.1	16.7
D. dragana OGDEN & ZIVKOVIC, 1983	–	–	0.1	16.7	–	–	–	–	–	–
D. elegans PENARD, 1890	–	–	–	–	0.1	16.7	–	–	–	–
D. glans PENARD, 1902	–	–	0.1	16.7	–	–	0.1	16.7	10.4	16.7
D. globularis (WALLICH, 1864) LEIDY, 1877	0.4	16.7	0.2	33.3	–	–	0.2	16.7	–	–

D. globulosa DUJARDIN, 1837	–	–	0.1	33.3	–	–	–	–	–	–
D. gramen PENARD, 1902	0.5	16.7	0.2	33.3	0.3	16.7	0.3	33.3	4.5	33.3
D. lacustris (PENARD, 1899) OGDEN, 1983	0.7	16.7	1.0	33.3	0.3	33.3	–	–	–	–
D. lanceolata PENARD, 1890	0.5	16.7	0.5	33.3	–	–	–	–	–	–
D. levanderi PLAYFAIR, 1918	0.5	16.7	0.6	50.0	–	–	–	–	–	–
D. lithophilla (PENARD, 1902) G.-L. & THOMAS, 1958	–	–	–	–	0.2	16.7	0.1	16.7	–	–
D. lobostoma LEIDY, 1879	–	–	–	–	–	–	0.1	16.7	0.1	16.7
D. lucida PENARD, 1890	–	–	0.2	16.7	–	–	0.5	33.3	–	–
D. manicata PENARD, 1902	0.4	33.3	0.3	33.3	0.1	16.7	–	–	0.6	50.0
D. microstoma (THOMAS, 1954) OGDEN, 1983	–	–	–	–	–	–	0.3	16.7	1.3	33.3
D. minuta RAMPI, 1950	–	–	0.1	16.7	11.0	33.3	–	–	1.7	33.3
D. minuta v. grandis (RAMPI, 1950) G.-L. & THOMAS, 1958	–	–	0.1	16.7	–	–	–	–	–	–
D. oblonga EHRENBERG, 1831	–	–	0.1	16.7	–	–	–	–	–	–
D. parva (THOMAS, 1954) OGDEN, 1983	–	–	–	–	–	–	–	–	0.1	16.7
D. pauli OGDEN, 1983	–	–	0.1	33.3	–	–	–	–	–	–
D. petricola CASH, 1909	0.2	16.7	0.1	16.7	–	–	–	–	–	–
D. pristis PENARD, 1902	0.9	33.3	0.1	33.3	3.6	33.3	0.4	16.7	1.9	50.0
D. pulex PENARD, 1902	–	–	0.3	33.3	4.8	66.7	4.8	50.0	3.0	50.0
D. sarissa LI SUN TAÏ, 1931	–	–	0.1	16.7	–	–	–	–	–	–
D. stoutii OGDEN, 1983	–	–	0.1	16.7	–	–	–	–	0.1	16.7
D. szczepanskii SCHÖNBORN, 1965	0.5	33.3	–	–	–	–	–	–	–	–
D. ventricosa DEFLANDRE, 1926	–	–	0.2	16.7	0.1	16.7	–	–	0.1	16.7
D. venusta (PENARD, 1902) OGDEN, 1983	–	–	0.1	16.7	–	–	–	–	–	–
Difflugiella *angusta* SCHÖNBORN, 1965	1.1	16.7	0.2	16.7	0.5	33.3	0.1	16.7	2.0	33.3
D. horrida SCHÖNBORN, 1965	–	–	0.2	33.3	1.0	33.3	1.5	16.7	0.2	16.7
D. oviformis BONNET & THOMAS, 1955	1.3	16.7	0.8	50.0	1.3	33.3	3.8	50.0	0.9	16.7
D. ovif. v. fusca (PENARD, 1890) BONNET &THOMAS, 1955	2.4	16.7	–	–	–	–	–	–	–	–
D. patinata SCHÖNBORN, 1965	–	–	–	–	0.4	16.7	–	–	–	–
D. pusilla PLAYFAIR, 1918	–	–	0.2	33.3	1.0	50.0	1.0	33.3	–	–
Euglypha *acanthophora* (EHRENBERG, 1841) PERTY, 1849	–	–	8.8	16.7	0.3	16.7	0.1	16.7	–	–
E. filifera PENARD, 1890	–	–	–	–	–	–	1.2	16.7	–	–
E. rotunda WAILES & PENARD, 1911	5.5	66.7	27.8	83.3	8.0	50.0	6.4	66.7	12.1	50.0
E. tuberculata DUJARDIN, 1841	–	–	5.0	66.7	4.6	50.0	2.2	66.7	4.5	33.3
E. tuberculata v. minor TARANEK, 1881	3.6	16.7	–	–	–	–	–	–	–	–
Euglyphella *delicatula* VALKANOV, 1962	–	–	0.1	16.7	–	–	–	–	–	–
Microchlamys *patella* (CLAP. & LACH., 1885) COCKERELL, 1911	5.1	83.3	7.4	100.0	8.2	66.7	5.0	83.3	5.8	100.0
Paraquadrula *irregularis* (ARCHER, 1877) DEFLANDRE, 1932	–	–	0.1	16.7	–	–	–	–	–	–
Phryganella *hemisphaerica* PENARD, 1902	1.3	33.3	0.2	33.3	0.6	50.0	1.3	50.0	0.5	66.7
Phr. paradoxa PENARD, 1902	–	–	0.5	33.3	–	–	–	–	–	–
Plagiopyxis *declivis* THOMAS, 1955	3.1	50.0	1.4	50.0	1.7	33.3	0.3	33.3	0.7	66.7
Pl. minuta BONNET, 1959	0.9	33.3	0.5	33.3	0.1	16.7	–	–	0.1	16.7
Psammonobiotus *linearis* GOLEMANSKY, 1970	0.9	16.7	0.3	33.3	7.9	50.0	2.5	33.3	2.9	33.3
Pseudodifflugia *compressa* SCHULZE, 1874	0.2	16.7	–	–	0.1	16.7	0.2	33.3	–	–
Ps. fascicularis PENARD, 1902	–	–	0.1	16.7	–	–	–	–	–	–
Ps. fulva ARCHER, 1870	–	–	0.1	16.7	–	–	–	–	–	–
Ps. gracilis SCHLUMBERGER, 1845	–	–	–	–	0.1	16.7	–	–	–	–
Schaudinnula *arcelloides* AWERINTZEW, 1907	–	–	–	–	–	–	0.1	16.7	–	–
Schonbornia viscicula SCHÖNBORN, 1964	–	–	–	–	–	–	–	–	0.1	16.7
Tracheleuglypha *acolla* BONNET & THOMAS, 1955	0.2	16.7	0.8	66.7	1.7	50.0	3.0	83.3	3.0	50.0
Tracheleuglypha dentata DEFLANDRE, 1938	–	–	0.9	50.0	1.4	66.7	–	–	1.2	66.7
Trinema *complanatum* PENARD, 1890	0.5	33.3	–	–	–	–	–	–	–	–
Tr. enchelys (EHRENBERG, 1838) LEIDY, 1878	60.1	100	32.0	100	23.8	100	15.5	83.3	35.2	83.3
Tr. lineare PENARD, 1890	1.6	83.3	2.0	50.0	2.6	50.0	5.0	50.0	–	–
Tr. lineare v. truncatum CHARDEZ, 1964	1.3	16.7	0.1	16.7	0.6	16.7	0.7	33.3	0.1	16.7
Tr. penardi THOMAS & CHARDEZ, 1958	0.2	16.7	–	–	–	–	–	–	–	–
91	**39**		**61**		**44**		**46**		**41**	

acolla, Trinema enchelys and *Tr. lineare v. truncatum*. Of them three species were present with high population density and were dominants in all stations. These are *Trinema enchelys* (31.2% relative abundance), *Euglypha rotunda* (15.1%) and *Microchlamys patella* (6.6%), together made up 52.9% of the total count. One species - *Psammonobiotus linearis* appeared as dominant only in one of the studied stations. The other widespread species were established with a small number of specimens and in terms of their relative abundance, belong to the group of the subrecedent, recedent and subdominant respectively. Thirty-five or 38.5% of the species were found in only one of studied stations, as the most of them (91.2%) had relative significance below 1%. Almost a half of them - 47.1% belong to the genus *Difflugia*.

The species richness and abundance of testaceans differed considerably among separate stations. The number of species per sample varied from eight to thirty-one. The lowest number of species – 39 was observed in station 1 (from 9 to 14 species per sample, on average 11.8 species per sample). In the stations 3, 4 and 5 were established the similar species diversity – in them were found 44, 46 and 41 species respectively, on average 13.7, 14.3 and 13 species per sample, but in station 4 the number of species varies greatly - from 8 to 24 species per sample and in the other stations this number remains relatively constant - from 8 to 18 and from 9 to 15 species per sample. The highest number of species and the greatest variability in species richness is typical for station 2 – 61 (from 13 to 31 species per sample, on average 18.8 species per sample) (Fig. 2A).

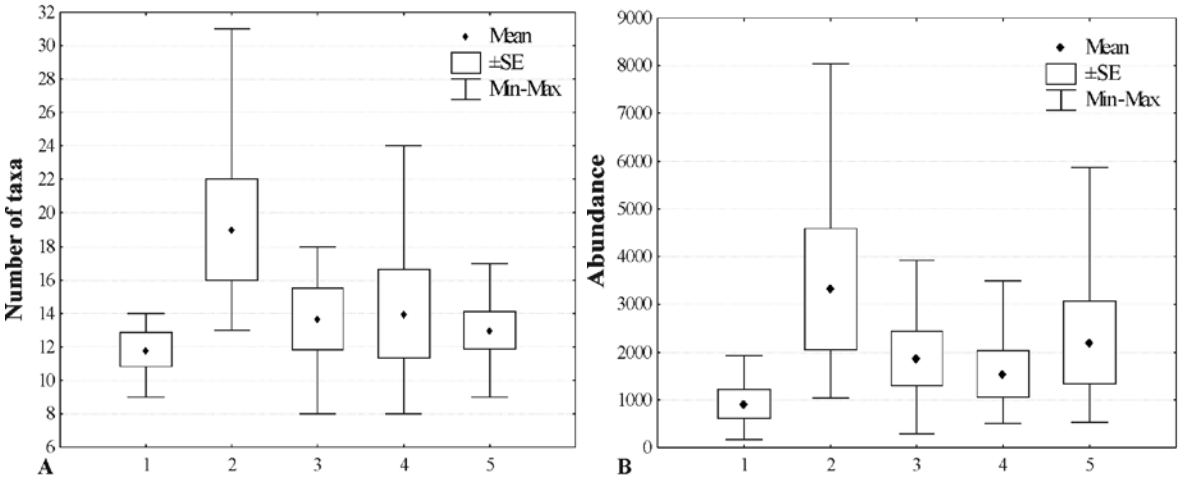

Fig. 2. Box & Whiskers plots comparing the species richness (A) and abundance (B) in studied stations in Durankulak Lake

The lowest testacean abundance was found in station 1 with average 915 specimens/cm^3 (minimum 170 and maximum 1930 specimens/cm^3). The highest value for testacean abundance is characteristic for station 2 – 3323.6 specimens/cm^3 on average (minimum 1030 and maximum of 8040 specimens/cm^3). The communities from the other stations are of medium abundance (average values of specimens per cm^3 are 1541 for station 4, 1868 for station 3 and 2200 for station 5) (Fig. 2B).

The results of the study show that both species diversity and abundance are lowest in station 1. The possible reason for this is that station is located in the utmost northern part of the lake (Kartaliysko swamp, see Study area), which is characterized by relatively unfavorable conditions.

The analysis of the frequency of occurrence and relative abundance revealed that there are essential differences also in the occurrence and dominance of the species in studied stations (Table 2).

In station 1 three species - *Euglypha rotunda* (5.5% relative abundance, 66.7% frequency of occurrence), *Microchlamys patella* (5.1%, 83.3%) and *Trinema enchelys* (60.1%, 100%) were both dominants and constants. One of them - *Tr. enchelys* had an exclusively high relative abundance of 60.1%. Other four species were established with high frequency, but were found in single specimens and have low relative significance.These are *Centropyxis aerophila* (0.9%, 50.0%), *Cyclopyxis eurystoma* (1.3%, 50.0%), *Plagiopyxis declivis* (3.1%, 50.0%) and *Trinema lineare* (1.6%, 83.3%).

Five of the species in station 2 were dominants with a relative abundance of more than 5%. According to their abundance they are: *Trinema enchelys* (32.0%), *Euglypha rotunda* (27.8%), *Euglypha acanthophora* (8.8%), *Microchlamys patella* (7.4%) and *E. tuberculata* (5.0%). Sixteen testaceans are widespread and appear as constant species here. These are the dominants *Tr. enchelys* (100% frequency), *M. patella* (100%), *E. rotunda* (83.3%) and *E. tuberculata* (66.7%), as well as the species *Cyclopyxis eurystoma* (66.7%), *Tracheleuglypha acolla* (66.7%), *Arcella discoides* (50.0%), *A. discoides v. scutelliformis* (50.0%), *Centropyxis aculeata* (50.0%), *C. ecornis* (50.0%), *C. platystoma* (50.0%), *Difflugia levanderi* (50.0%), *Difflugiella oviformis* (50.0%), *Plagiopyxis declivis* (50.0%), *Tracheleuglypha dentata* (50.0%) and *Trinema lineare* (50.0%).

Table 3. Indices for structure of the communities in different stations in the Durankulak Lake.

Index	Stations				
	1	2	3	4	5
d	6.03	7.90	6.12	6.59	5.57
α	9.62	11.9	9.13	10.2	8.03
C	0.38	0.19	0.10	0.09	0.16

Six of the established in station 3 testate amoebae were dominants - *Tr. enchelys* (23.8%), *Difflugia minuta* (11.0%), *M. patella* (8.2%), *E. rotunda* (8.0%), *Psammonobiotus linearis* (7.9%) and *Corythionella georgiana* (5.3%). Their relative share is 64.2% of all the established individuals. According to the occurrence one can see that four of the dominants namely *Tr. enchelys*, *M. patella, E. rotunda* and *Ps. linearis*, as well as other seven species – *Difflugia pulex*, *Difflugiella pusilla*, *E. tuberculata*, *Phryganella hemisphaerica*, *Tracheleuglypha acolla*, *Tr. dentata* and *Tr. lineare*, are the most frequently occurring species.

Six dominant species were found in station 4: *Cyphoderia ampulla* (22.0%), *Tr. enchelys* (15.5%), *Corythionella georgiana* (9.5%), *E. rotunda* (6.4%), *M. patella* (5.0%) and *Tr. lineare* (5.0%). Thirteen of the species found here have frequency of occurrence higher than 50% and belong to the group of the constant ones. These are: *M. patella* (83.3%), *Tr. acolla* (83.3%), *Tr. enchelys* (83.3%), *Centropyxis aculeata* (66.7%), *C. aerophila* (66.7%), *Cyclopyxis eurystoma* (66.7%), *E. rotunda* (66.7%), *E. tuberculata* (66.7%), *Corythionella georgiana* (50.0%), *Difflugia pulex* (50.0%), *Difflugiella oviformis* (50.0%), *Phr. hemisphaerica* (50.0%) and *Tr. lineare* (50.0%).

Only 4 species were dominants in station 5. Three of them namely *Tr. enchelys* (35.2%, 83.3%), *M. patella* (5.8%, 100%) and *E. rotunda* (12.1%, 50.0%) were frequently occurring and appear as constant species too. It should be noted that these species have high relative abundance and frequency in all other stations. The dominant *Difflugia glans* (10.4%, 16.7%) had a comparatively high relative abundance here, but it was established in only one of the studied samples and belong to the group of the accidental species. In the other stations of the lake it is not established or found with small number of individuals. The relative share of the four dominant species is 63.6% of all individuals. Other eight species were established with high frequency – *Phr. hemisphaerica* (66.7%), *Pl. declivis* (66.7%), *Tr. dentata* (66.7%), *C. aculeata* (50.0%), *Difflugia manicata* (50.0%), *D. pristis* (50.0%), *D. pulex* (50.0%) and *Tr. acolla* (50.0%).

The received results about distribution of testate amoebae in the lake are confirmed of the values for indices used to analyse the structure of testacean communities, presented on Table 3. Maximal species

diversity estimated by Margalef (d) and Fisher`s (α) diversity index was measured in station 2. In the other stations, the values of diversity indices are lower. The index for concentration of domination (C) have the lowest value in stations 3 and 4, where dominance is shared between more species. The index C is considerably higher for station 1, where only one species were presented with great number of specimens – *Trinema enchelys*, while the rest are with considerably less abundance (Table 2).

Acknowledgements. This study was carried out under a project № RD-07-336 / 2011 funded by the University of Shumen.

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Received: 03.03.2012
Accepted: 14.04.2012