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BIOTOPIC DISTRIBUTION OF NAKED AMOEBAS (PROTISTA) IN UKRAINIAN POLISSYA AREA

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Biotopic Distribution of Naked Amoebas (Protista) in Ukrainian Polissya Area. Patcyuk M. K., Dovgal I. V. — Forty-one species of naked amoebas were found in the different types of waterbodies of Zhytomyr and Volyn' parts of Ukrainian Polissya region. The major part of species of naked amoebas in this region demonstrated the prevalence to living in a certain type of water body that possible depends on the hydrochemical and trophic parameters of water. The limnetic and floodplain species complexes of amoebas are distinguished in Ukrainian Polissya.

Key words: naked amoebas, biotop, type of waterbody, Ukrainian Polissya.

Биотопическое распределение голых амёб (Protista) в **Украинском Полесье. Пацюк М. К., Довгаль И. В. —** В водоёмах разного типа Житомирского и Волынского Полесья Украины был обнаружен 41 вид голых амёб. Большая часть видов голых амеб в регионе демонстрирует определенные предпочтения к обитанию в отдельных типах водоема, что, вероятно, связано с комплексом гидрохимических и трофических факторов. Выделены два видовых комплекса голых амеб: озерный и связанный с поймами рек.

Ключевые слова: голые амёбы, биотоп, тип водоема, Украинское Полесье.

Introduction

The naked amoebas is a group of morphologically and ecologically similar but not affined organisms; taxa of naked amoebas at present time are incorporated into several macrotaxa of eukaryotes (Adl et al., 2005). The naked amoebas inhabit different aquatic biotopes with various conditions. However, some aspects of autecology of the naked amoebas including their biocoenotic distribution are scantily known. It is a widespread opinion that the species of free-living protists including naked amoebas have a cosmopolitan distribution and are ubiquists (Fenchel, 1987). The aim of this article is to analyze relative prevalence of different amoeban species to certain types of waterbodies under conditions of Ukrainian Polissya.

Material and methods

The material was collected by the first author during 2010 and 2011 in 124 localities in Zhytomyr and Volyn parts of Ukrainian Polissya (fig. 1); 395 samples were collected in 44 rivers, 32 flood-plain waterbodies, 20 soil-reclamation canals, 28 flood-plain bogs and 23 lakes (Lakes of Shatsk). Samples (water with roiled sediments) were collected by hand and transported in the glass vessels to the laboratory without fixation. Cloning of amoebas was performed in Petri dishes on non-nutrient agar with Page's (1988) method. Amoebas were investigated using the microscope Axio Imager M1 with differential interferential contrast at the center of collective usage of scientific equipment «Animalia» of Schmalhausen Institute of Zoology, Kyiv. Identification of amoebas was performed in two stages. Firstly was defined for which morphotype shared the organism (Smirnov, Goodkov, 1999; Smirnov, Brown, 2004), and then species were identified, where possible (Page, 1988, Smirnov et al., 2007; Smirnov, 2008).

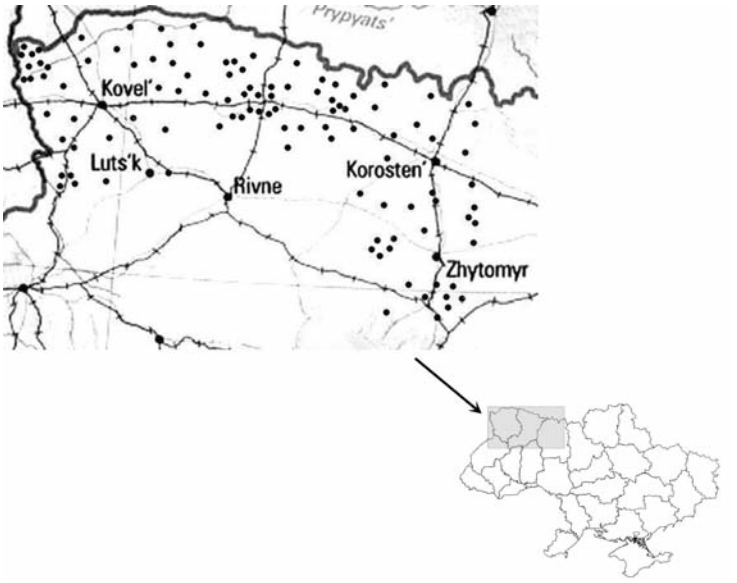

Fig. 1. Collecting sites (marked by black spots) of naked amoebas in the investigated region.

Рис. 1. Пункты сбора материала (отмечены черными точками) по голым амебам в регионе исследования.

The similarity between species compositions in different waterbodies was estimate using cluster analysis with PAST 1.92 software (Hammer et al., 2001) using Chekanowski-Serensen's (Dice in PAST) and Shymkevich-Simpson's (Simpson in PAST) indexes (Pesenko, 1982).

The frequency of naked amoebas occurrences was estimated as part of samples which contain the species per general number of samples.

In this work we used the typification of continental waters after Konstantinov (1986) and Romanenko (2001).

Results and discussion

Fourty-one species of the naked amoebas were found in the different types of waterbodies in the region. Twenty-four species of Gymnamoebia were found in floodplain waterbodies, only 8 species observed in soil-reclamation canals and 14 species in bogs whereas both in rivers and Lakes of Shatsk were found 20 species (table 1).

Twenty-three species were recorded in single type of waterbodies. Thus, 12 species, *Amoeba proteus* Leidy, 1878, *Polychaos* sp., *Thecamoeba sphaeronucleolus* (Greeff, 1891) Page, 1977, *Saccamoeba wakulla* Bovee, 1972, *Mayorella penardi* Page, 1972, *Mayorella viridis* Leidy, 1874, *Rhizamoeba* sp. (2), *Cochliopodium* sp. (2), *Stygamoeba* sp., *Pellita digitata* (Greef, 1866) Smirnov et Kudryavtsev, 2004, *Arachnula impatiens* Cienkowski, 1876 and *Penardia mutabilis* Cash, 1904 were found only in lakes; 3 species: *Thecamoeba quadrilineata* Carter, 1856, *Thecamoeba verrucosa* (Echrenberg, 1838) Gläser, 1912 and *Korotnevella diskophora* Smirnov, 1999 were found only in floodplain waterbodies; 2 species: *Ripella* sp. and *Rhizamoeba* sp. (1) in bogs whereas 2 other species: *Mayorella* sp. (2) and *Willaertia* sp. found in rivers only.

Such species as *Vexillifera* sp., *Mayorella* sp. (1) and *Saccamoeba* sp. (1) were found in all types of investigated waterbodies and possibly are eurytopic; 18 other species have a wide range of ecological valence.

In the result of the cluster analysis based on Czekanowski-Serensen similarity index (table 2 and fig. 2), the largest share of joint species of naked amoebas was observed between rivers and floodplain lakes (0.81) whereas the least similarity in species compositions was observed between bogs and lakes (0.17).

Table 1. Distribution of the naked amoebas species throughout the different types of waterbodies in Ukrainian Polissya («+» — species presented, «-» — species absent)

Таблица 1. Распределение видов голых амёб по типам водоёмов Украинского Полесья («+» — вид присутствует, «-» — вид отсутствует)

Species	Type of waterbody				
	river	bog	canal	flood-plain	lake
Amoeba proteus Leidy, 1878	−	−	−	−	+
Polychaos sp.	−	−	−	−	+
Deuteramoeba mycophaga Pussard, Alabouvette, Lemaitre et Pons, 1980	+	−	−	+	−
Thecamoeba striata Penard, 1890	+	+	+	+	−
Thecamoeba sphaeronucleolus (Greeff, 1891) Page, 1977	−	−	−	−	+
Thecamoeba quadrilineata Carter, 1856	−	−	−	+	−
Thecamoeba verrucosa (Echrenberg, 1838) Gläser, 1912	−	−	−	+	−
Paradermamoeba levis Smirnov et Goodkov, 1994	+	−	−	+	−
Paradermamoeba valamo Smirnov et Goodkov, 1993	+	−	−	+	−
Stenamoeba stenopodia (Page, 1969) Smirnov, Nassonova, Chao et Cavalier-Smith, 2007	−	+	−	+	−
Saccamoeba stagnicola Page, 1974	+	−	−	+	−
Saccamoeba wakulla Bovee, 1972	−	−	−	−	+
Saccamoeba sp. (1)	+	+	+	+	+
Saccamoeba sp. (2)	+	+	−	+	−
Saccamoeba sp. (3)	+	−	−	+	+
Mayorella penardi Page, 1972	−	−	−	−	+
Mayorella vespertilioides Page, 1983	+	−	−	+	+
Mayorella cantabrigiensis Page, 1983	+	+	−	+	−
Mayorella viridis Leidy, 1874	−	−	−	−	+
Mayorella sp. (1)	+	+	+	+	+
Mayorella sp. (2)	+	−	−	−	−
Korotnevella stella (Shaeffer, 1926) Goodkov, 1988	+	−	−	+	−
Korotnevella diskophora Smirnov, 1999	−	−	−	+	−
Korotnevella sp. (1)	−	−	−	+	+
Korotnevella sp. (2)	−	−	−	+	+
Vexillifera sp.	+	+	+	+	+
Vannella cf. *lata* Page, 1988	+	+	+	+	−
Ripella playtpodia (Glaeser, 1912) Smirnov, Nassonova, Chao et Cavalier-Smith, 2007	−	−	−	−	+
Ripella sp.	−	+	−	−	−
Flamella sp.	+	+	+	+	−
Rhizamoeba sp. (1)	−	+	−	−	−
Rhizamoeba sp. (2)	−	−	−	−	+
Vahlkampfia sp. (1)	+	+	+	+	−
Vahlkampfia sp. (2)	+	+	+	+	−
Willaertia sp.	+	−	−	−	−
Cochliopodium sp. (1)	+	+	−	+	−
Cochliopodium sp. (2)	−	−	−	−	+
Stygamoeba sp.	−	−	−	−	+
Pellita digitata (Greef, 1866) Smirnov et Kudryavtsev, 2004	−	−	−	−	+
Arachnula impatiens Cienkowski, 1876	−	−	−	−	+
Penardia mutabilis Cash, 1904	−	−	−	−	+
Total	**20**	**14**	**8**	**24**	**20**

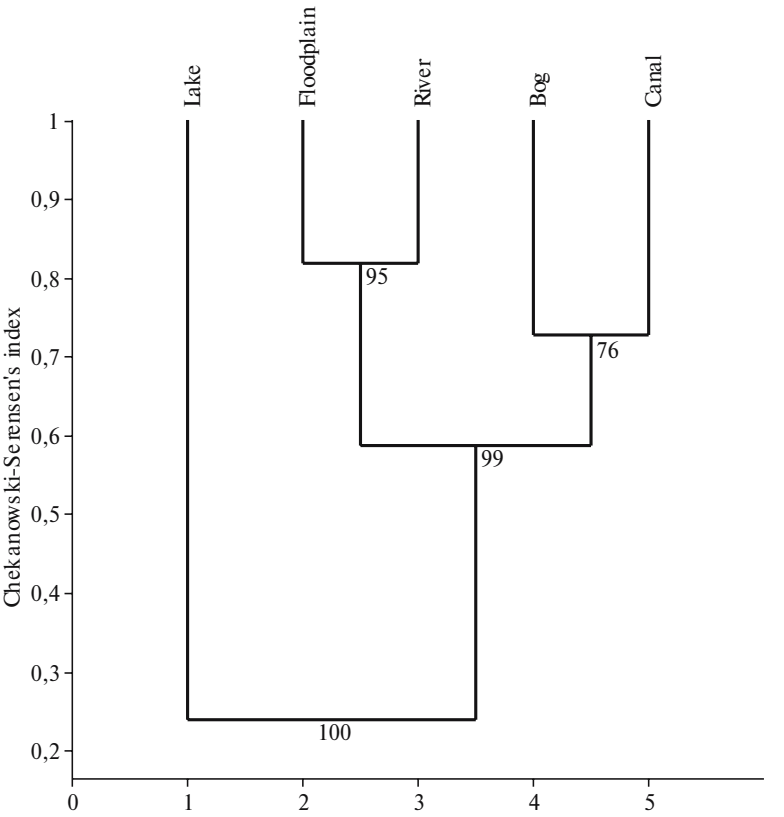

Fig. 2. The similarity between species compositions in different types of waterbodies regarding Czekanowski-Serensen index (in the nodes of dendrogram marked the probabilities of clusters (%) resulting Bootsrap analysis with 1000 repositions).

Рис. 2. Сходство видового состава голых амёб в водоемах разных типов по индексу Чекановского-Серенсена (в узлах дендрограммы указаны вероятности кластеров (в %) по результату Bootsrap-анализа при 1000 перестановок).

The two complexes of amoeba species: limnetic (complex of Lakes of Shatsk) and associated with flood-lands were observed in investigated waterbodies (fig. 2).

In the result of the cluster analysis based on Szymkievicz-Simpson index, which in contrast to Czekanowski-Serensen index has a weak dependence on the levels of knowledge on the biotopes (Pesenko, 1982) the similar consequences were obtained (table 2, fig. 3).

The reliability of obtained results is good supports by Bootstrap analysis: the probabilities of main clusters (which corresponding to limnetic and floodplain specific complexes of naked amoebas) comprise 100 % for both indexes (fig. 2, 3).

Table 2. The similarity between species compositions in different types of waterbodies (over diagonal placed the values of Czekanowski-Serensen index and under diagonal placed the values of Szymkievicz-Simpson index)

Таблица 2. Индексы фаунистического сходства между видовыми комплексами голых амеб водоемов разных типов (над диагональю значения индекса Чекановского-Серенсена, под диагональю — значения индекса Шимкевича-Симпсона)

Type of waterbody	Rriver	Bog	Canal	Floodplain	Lake
River	–	0.64	0.57	0.81	0.25
Bog	0.78	–	0.72	0.63	0.17
Canal	1.00	1.00	–	0.50	0.21
Floodplain	0.90	0.85	1.00	–	0.31
Lake	0.25	0.21	0.37	0.35	–

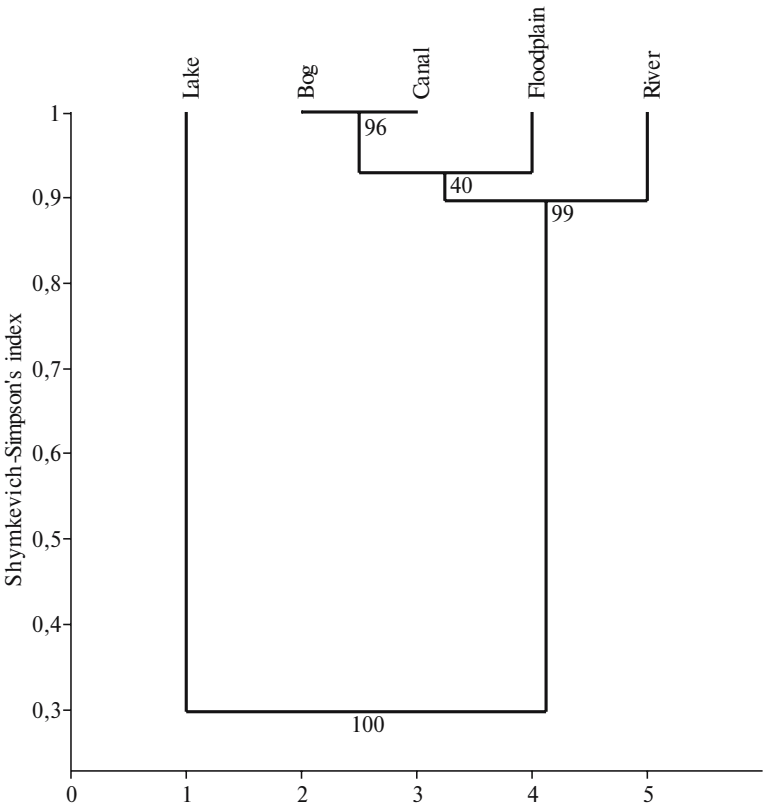

Fig. 3. The similarity between species compositions in different types of waterbodies regarding Szymkievicz-Simpson index (in the nodes of dendrogram marked the probabilities of clusters (%) resulting Bootsrap analysis with 1000 repositions).

Рис. 3. Сходство видового состава голых амёб в водоемах разных типов по индексу Шимкевича-Симпсона (в узлах дендрограммы указаны вероятности кластеров (в %) по результату Bootsrap-анализа при 1000 перестановок).

As noted above the species composition of naked amoebas in Lakes of Shatsk is enough specific (table 2, fig 2, 3). 12 above listed stenotopic species which were found only in these lakes (table 1) define the originality of the limnetic complex of naked amoebas species. This is most likely due to specific environmental conditions in the lakes.

However, some species of naked amoebas recorded as stenotopic in this work are rare and scanty.

For example, the frequency of occurrences of *Amoeba proteus* was 1.5 %, *Polychaos* sp. — 3 %, *Thecamoeba sphaeronucleolus* — 2 %, *Saccamoeba wakulla* 1.89 %, *Mayorella penardi* — 0.5 %, *M. viridis* — 1.21 %, *Rhizamoeba* sp. (2) — 2.98 %, *Pellita digitata* — 3.05 % and *Ripella* sp. — 3.2 % in contrast with the frequency of occurrences of *Cochliopodium* sp. (2) was 7.35 %, *Stygamoeba* sp. — 9.84 %, *Arachnula impatiens* and *Penardia mutabilis* — 6.45 % and *Thecamoeba quadrilineata* 7.3 %.

When taken into account the species of naked amoebas found in several types of water bodies, most of them may be assigned to the complex of floodplain, which is possibly derived from the river fauna.

Based on these data, the majority of naked amoebas in this region demonstrates the prevalence to living in a certain type of water body that possibly depend on the hydrochemical and trophic parameters in these reservoirs.

However, further studies is needed in particular on the influence of abiotic factors (such as temperature, pH, dissolved oxygen and dissolved organic matter) on gymnamoebas and their seasonal variation.

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