

The Fauna Of *Testate Amoebae* In Freshwater Basins Of Jalilabad And Yardimli Districts In The Lankaran Natural Area (*Rhizopoda, Testacea*)

E.N. Tahirova

Institute of Zoology, Azerbaijan National Academy of Sciences, passage 1128, block 504, Baku AZ 1073, Azerbaijan; E-mail: tahirovaelyane@mail.ru

The given article shows data about species diversity of *Testate amoebae* according to various biotopes in fresh waters of Jalilabad and Yardimli districts. Totally 55 species of testacean in 8 genera have revealed. Of these, 4 species of testate amoebae (*A. discooides* var. *scutelliformis*, *D. biconcava*, *D. petricola*, *C. oviformis*) were found only in Jalilabad district and have never been observed by us in other regions of Lankaran natural area. Overall, 40 species of testacean were noted in Jalilabad and 36 species in Yardimli district. The regularity of distribution of testate amoebae in different biotopes was studied throughout investigation.

Keywords: Protozoa, testate amoebae, South-Eastern Azerbaijan, biotope, reservoir

INTRODUCTION

Testate amoebae is one of the group of free living protozoa that has organic shell. They are unicellular eukariotic organisms living in fresh waters, soils, mosses, lakes and rivers. In some species the shell is covered with exogenous minerals-xenosoms, detritus or endogenous materials, such as idiosoms, rarely with calcium-phosphate (Meisterfeld, 1977). During zoosenose reconstruction, testacean actively react to the factors such as the level of groundwater, moisture, pH, the composition of biophil elements, the condition of organic substances. The various ecological groups – hygrophil and hydrophilic, xerophil, acidophil, calcephil, sphagnophil and pedobiont are distinguished among these organisms. Their density in 1 sm³ of ponds, sediments and soil can be from a few hundreds to tens of thousands of individuals. Testacean mainly occurs with organic remnants in stagnant areas of water biocenosis (Алекперов и др., 1996).

MATERIALS AND METHODS

The samples were taken from fresh waters of two districts (Jalilabad and Yardimli) of the Lankaran natural area (South-east Azerbaijan) during 2015-2017 years (photo 1). This region differs from other regions by humid subtropical climate. Plankton samples was collected from the upper layers of water with polyethylene bottles, mixing water slightly. Perifiton samples have been gathered from the substrates. Benthos samples were collected from layers of soil up to 5-10 sm deep. The researches conducted using light and scanning

electron microscopes. For scanning electron microscopy (SEM) the cells were transferred to a cover glass with microcapillar tubes, dried and then coated with gold. For species identification were used the monographs of Hedley, Mazey and Siganov (Мазей и др., 2006; Hedley, Ogden and Mordan, 1977; Ogden and Hedley, 1980).

RESULTS AND DISCUSSION

As a result of investigation 55 species of testate amoebae were recorded in fresh water bodies of Jalilabad and Yardimli regions. It should be noted that only 21 out of 55 species listed in the table were found in both regions (Jalilabad and Yardimli). Overall, 40 species of testacean were noted in Jalilabad and 36 species in Yardimli district. (table 1). During our research, 4 species of testate amoebae (*A. discooides scutelliformis*, *D. biconcava*, *D. petricola*, *C. oviformis*) were found only in Jalilabad district and have never been observed by us in other regions of Lankaran natural area (photo 2). Great attention has been paid to the regularity of distribution of testate amoebae in different biotopes (fig.1). Thus, the least species diversity of testacean was recorded in plankton and observed from 2 (water reservoir in Avash settlement of Yardimli district (38°52'40"N, 48°02'27"E)) to 12 species (from the water reservoir in Bajirovan settlement of Jalilabad region). 2 species of testate amoebae were found from the plankton in the reservoir located in Chayusu village of Yardimli district (38°53'05N, 48°10'43"E). However 6 species were recorded in Hasiabad (39°11'66"N, 48°59'52"E) settlement of Jalilabad district. No one species were found from the

plankton in the nameless reservoirs of Komanli (39°08'30"N, 48°54'97"E) and Porsova (38°96'80"N, 48°41'08"E) villages, including river Vilash and Goytapa reservoir. The number of species in perifiton was more than plankton. The highest number of species has been found in shallow, plant-rich reservoirs. The high species diversity has been registered in the water basin in Bajirovan village – 19 species. The least number of species in perifiton is recorded in the fresh water reservoir of Avash village- 7 species. Such dependence has been noted also for eurybiont groups of testacean (*D.gramen*, *D.urceolata*, *D.oblanga*, *D.litophila*, *D.corona*, *P.compressoidea*, *C.aculeata* and etc.), which

found in over two biotopes at the same time and isolated by us into a group of facultative species. The largest species diversity of this group was observed in shallow water reservoirs (reservoirs in Bajirovan, Hasiabad and Chayusu villages). Thus, testate amoebae are slow-moving group of animals and their migration from one biotope to another is considerably simplified in shallow water basins. The largest species diversity of testacean in all reservoirs was observed in benthos. Almost all of the species listed in the table were recorded in benthos. Only in the Goytapa reservoir 2 species of testate amoebae were recorded among benthic organisms (*D.gramen*, *C. aculeata*).



Photo 1. Map of the Azerbaijan and the sampling sites marked by white circles.

Table 1. Species composition of freshwater testate amoebae in investigated regions of the Lankaran natural area.

1	2	3
Species	Yardimli district	Jalilabad district
Phylum Amoebozoa Lühe, 1913, emend. Cavalier-Smith, 1998		
Class Tubulinea Smirnov in Adl et al., 2005		
Order Arcellinida Kent, 1880		
Fam. Arcellidae Ehrenberg, 1843		
1 <i>Arcella discoides</i> Ehrenberg, 1872	+	+
2 <i>A. discoides scutelliformis</i> Playfair, 1918**		+
3 <i>A. hemispherica</i> Perty, 1852	+	+
4 <i>A.catinus</i> Penard, 1890		+
5 <i>A.crenulata</i> Deflandre, 1928		+
Fam. Cyclopyxidae Schonborn, 1989		
6 <i>Cyclopyxis kahli</i> Deflandre, 1929		+
7 <i>C.euristoma</i> Deflandre, 1929	+	+
8 <i>C.penardi</i> Deflandre, 1929	+	
9 <i>C.ambigua</i> Bonnet et Thomas, 1960	+	+

Continued table 1

1	2	3
Fam. Centropyxidae Deflandre, 1953		
10 <i>Centropyxis aculeata</i> Ehrenberg, 1838	+	+
11 <i>C. spinosa</i> Cash, 1905	+	
12 <i>C. aerophila</i> Deflandre, 1929		+
13 <i>C. elongata</i> (Penard, 1890)	+	+
14 <i>C. ecornis</i> Ehrenberg, 1838	+	
15 <i>C. platystoma</i> Penard, 1890	+	+
16 <i>C. hirsuta</i> Deflandre, 1929		+
17 <i>C. cassis</i> (Wallich, 1864)	+	
18 <i>C. hemisphaerica</i> (Bernard, 1879)	+	+
19 <i>C. minuta</i> Deflandre, 1929		+
20 <i>C. silvatica</i> (Deflandre, 1929)	+	
21 <i>P. declivis</i> Thomas, 1958	+	
Fam. Diffugiidae Awerintzev, 1906		
22 <i>Diffugia acuminata</i> Ehrenberg, 1838	+	+
23 <i>D. acuminata v. curvata</i> Cash, 1909	+	
24 <i>D. claviformis</i> Penard, 1899		+
25 <i>D. corona</i> Wallich, 1864	+	+
26 <i>D. difficilis</i> Thomas, 1972	+	+
27 <i>D. elegans</i> Penard, 1890	+	+
28 <i>D. mamillaris</i> Penard, 1893		+
29 <i>D. gramen</i> Penard, 1902	+	+
30 <i>D. scalpellum</i> Penard, 1899	+	
31 <i>D. sarissa</i> Li Sun Tai, 1931	+	
32 <i>D. limnetica</i> Penard, 1902	+	+
33 <i>D. linearis</i> (Penard, 1890) Gauthier-Lièvre et Thomas, 1958		+
34 <i>D. litophila</i> Gauthier-Lièvre et Thomas, 1958	+	+
35 <i>D. oviformis</i> Cash, 1909		+
36 <i>D. penardi</i> Hopkinson, 1909	+	+
37 <i>D. pyriformis</i> Perty, 1849	+	+
38 <i>D. urceolata</i> Carter, 1864	+	+
39 <i>D. pristis</i> Penard, 1902	+	
40 <i>D. oblonga</i> Ehrenberg, 1838	+	+
41 <i>D. oblonga v. parva</i> Thomas, 1954		
42 <i>D. bicornis</i> Penard, 1902		+
43 <i>D. bryophila</i> (Penard, 1902)	+	
44 <i>D. acutissima</i> Deflandre, 1931	+	
45 <i>D. smilion</i> Thomas, 1953	+	
46 <i>D. curvicaulis</i> Penard, 1899	+	
47 <i>D. labiosa</i> Wailes, 1919		+
48 <i>D. lanceolata</i> Penard, 1890		+
49 <i>D. biconcava</i> Ertl, 1964**		+
50 <i>D. petricola</i> Cash, 1909*		+
51 <i>D. girkanica</i> Snegovaya et Alekperov, 2010		+
52 <i>Pontigulasia compressoidea</i> Jung, 1942	+	+
Fam. Lesquereusidae Jung, 1942		
53 <i>Lesquereusia spiralis</i> Schlumberger, 1849	+	+
Fam. Cyphoderiidae de Saedeleer, 1934		
54 <i>Cyphoderia ampula</i> (Ehrenberg, 1840)	+	+
Fam. Cryptodiffugiidae Jung, 1942		
55 <i>Cryptodiffugia oviformis</i> Penard, 1890**		+
Total	36	40

*-new species for the Caucasus fauna

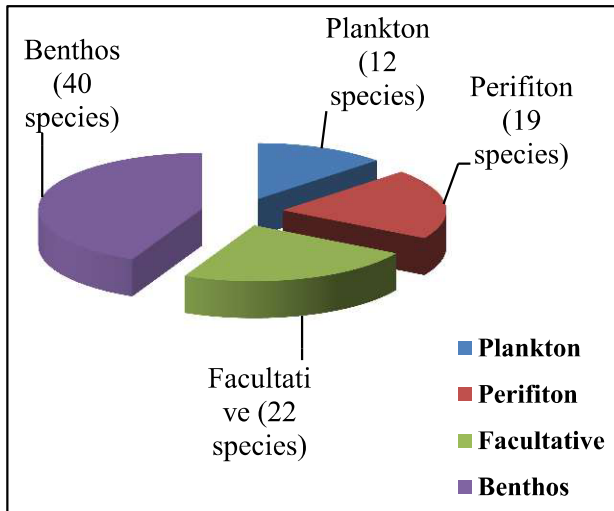
**-species which was firstly found in Lankaran Natural area

It should be noted that, testacean are sufficiently differentiated to the nature of the soil. The following biotopes of benthos are distinguished in the studied reservoirs of Jalilabad and Yardimli districts: sand-shingle, silted sand, silted clay, detritus. The representatives of three dominant families- *Arcellidae*, *Centropyxidae* and *Diffugiidae*, were found in all biotopes of benthos. For example, *A. discoides*, *A. catinus*, *C. aculeata*,

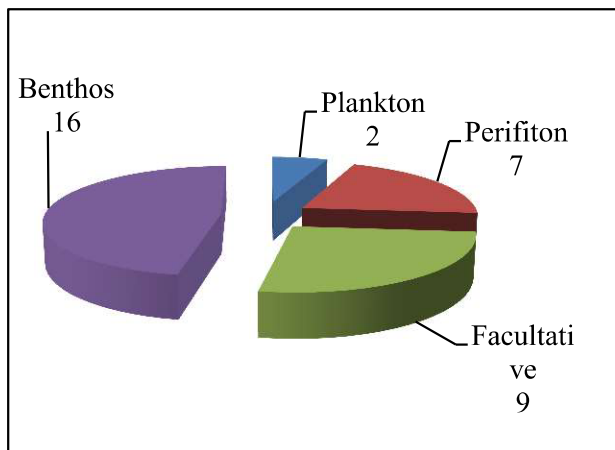
C. elongata, *D. elegans*, *D. corona*, *D. gramen*, *D. claviformis*, *D. difficilis* and etc.

The figure 2 illustrates data on the quantitative indicators of testate amoebae in different soils. The largest species diversity was noted in detritus (38 species) and the least species diversity was observed in silted clay (9 species). In our opinion, the main factor that influence on preference the detritus and silted sand by testate amoebae is a

trophic factor. On the detritus there is a rapid development of bacterio- and algoflora, which is the food of most testate amoebae.



A



B

Figure 1. Species number of testate amoebae in the biotopes of the investigated reservoirs of Jalilabad (A) and Yardimli (B) districts.

Arcellidae Ehrenberg, 1830

***Arcella discoides* var. *scutelliformis* Playfair, 1918 (photo 2.1)**

Diagnosis. This species higher than the type species, the sides of the shell are well rounded in cross section. Pseudostome circular and large enough, without collar, sometimes is surrounded with a ring of small pores. Dorsal side rounded, pseudostomal invagination about half the height of the shell.

Dimensions. Diameter of the shell is about - 50-58 mkm, height 16-24 mkm, pseudostome diameter 19-27 mkm.

Ecology: fresh water, sphagnum, mosses.

***Difflogiidae* Awerintzev, 1906**

***Difflogia biconcava* Ertl, 1964 (photo 2.2)**

Diagnosis: shell is ovoid, with an acuminate rounded cone. The short neck is clearly distinct. In lateral view the shell concave on both sides, aperture circular. The shell consists of a mixture of small and large plates of silica, which form a smooth layer. The nucleus is spherical with large central nucleolus.

Dimensions: Shell length 84-100 mkm, width 58-67 mkm, aperture diameter 25-28 mkm.

Firstly was found in samples from rice fields in Slovakia by Ertl (Ertl M., 1964).

Ecology: fresh waters, rare species.

***Difflogia petricola* Cash, 1909 (photo 2.3)**

Diagnosis: The shell is pyriform, with a short neck. The aperture is circular. The surface is rough and covered with sand and diatom frustules.

Dimensions: Shell length 130-140 mkm, width 70-90 mkm, aperture diameter 28-36 mkm.

This species has been recorded firstly for the Caucasus.

Ecology: fresh waters, common species.

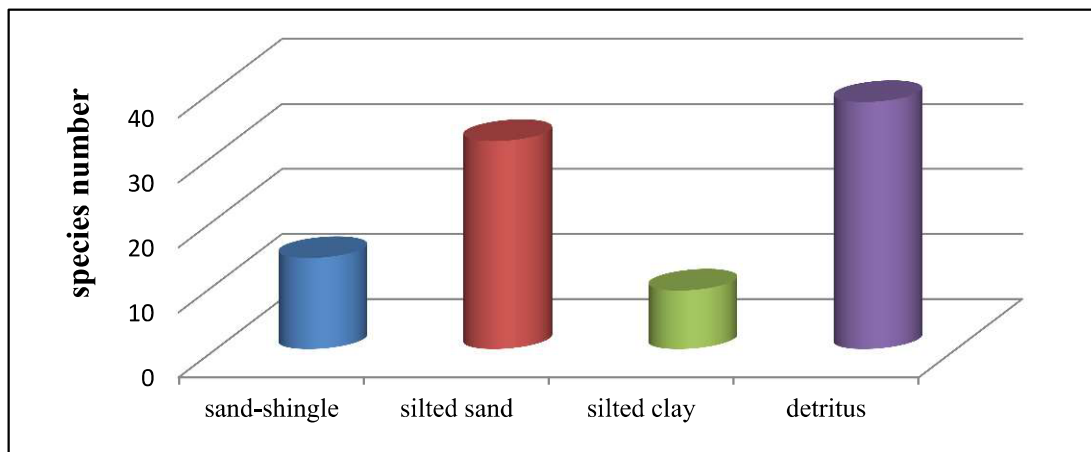


Figure 2. Quantitative indicators of testate amoebae in different soils.

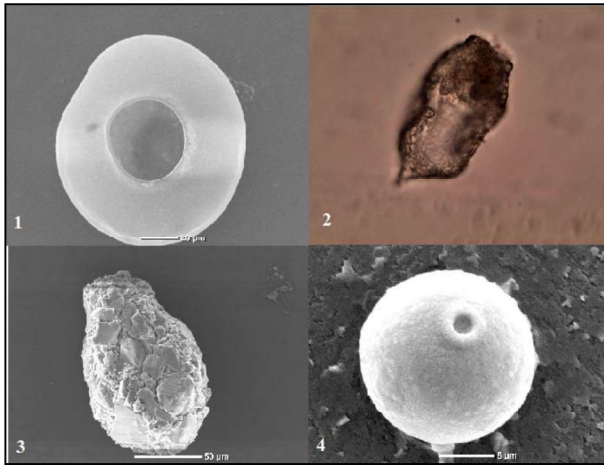


Photo 2. 1 - *A. discoides* var. *scutelliformis* Playfair, 1918, 2 - *D. biconcava* Ertl, 1964, 3 - *D. petricola* Cash, 1909, 4 - *C. oviformis* Penard, 1890 (SEM)

***Cryptodufflugiidae* Jung, 1942**

***Cryptodufflugia oviformis* Penard, 1890 (photo 2.4)**

The cell is very small, ovoid and transparent. The pseudopodial system of active specimens of *C. oviformis* consists of several cytoplasmic extensions, which have small branches. This represents filopodial system. The shell surface is smooth and consists of two layers: organic outer layer is thinner; inner layer is thicker and consists of amorphous calcium phosphate (Hedley et al. 1977). The aperture is circular with a small organic collar.

Dimensions: Shell length 15-16 mkm, width 12-15 mkm, aperture diameter 2-3 mkm.

Ecology: fresh water, usually on waterplants and in sphagnum.

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Lənkəran Təbii Vilayəti Cəlilabad Və Yardımlı Rayonları Su Tutarlarının Çanaqlı Amöblər Faunası (*Rhizopoda, Testacea*)

E.N. Tahirova

AMEA-nın Zoologiya İnstitutu

Məqalədə Cəlilabad və Yardımlı rayonlarının bir sıra kəndləri ərazisindəki su tutarlarında çanaqlı amöblərin müxtəlif biotoplara görə növ müxtəlifliyi haqqında məlumat verilmişdir. Ümumilikdə 8 cinsə aid 55 növ çanaqlı amöb qeydə alınmışdır ki, bunlardan 4 növ (*A. discoides* var. *scutelliformis*, *D. biconcava*, *D. petricola*, *C. oviformis*) yalnız Cəlilabad rayonu ərazisində aşkar edilmişdir və Lənkəran təbii vilayətinin digər rayonlarında indiyədək müşahidə edilməmişdir. Yardımlı rayonu ərazisində cəmi 36 növ, Cəlilabad rayonu ərazisində isə 40 növ çanaqlı amöb tərəfindən qeydə alınmışdır. Tədqiqat zamanı müxtəlif biotoplarda çanaqlı amöblərin paylanma qanunauyğunluğu öyrənilmişdir.

Açar sözlər: Protozoa, çanaqlı amöblər, Cənub-şərqi Azərbaycan, biotop, su tutarı

**Фауна Раковинных Амеб (*Rhizopoda, Testacea*) Водоемов Джалилабадского
И Ярдымлинского Районов Ленкоранской Природной Области**

Э.Н. Тагирова

Институт зоологии НАН Азербайджана

В статье приводятся данные о видовом разнообразии раковинных амеб по разным биотопам пресных водоемов Джалилабадского и Ярдымлинского районов. Всего нами выявлено 55 видов тестаид, относящихся к 8 родам. Из них 4 вида раковинных амеб (*A. discoides* var. *scutelliformis*, *D. biconcava*, *D. petricola*, *C. oviformis*) были найдены только в Джалилабадском районе и никогда не наблюдались нами в других регионах Ленкоранской природной области. Из общего числа видов раковинных амеб, 40 видов были отмечены в Джалилабадском районе и 36 видов - в Ярдымлинском. Изучена закономерность распределения раковинных амеб по различным биотопам.

Ключевые слова: *Protozoa, раковинные амебы, Юго-восточный Азербайджан, биотоп, водоемы*