Turkish Journal of Zoology

Volume 34 | Number 2 Article 2

1-1-2010

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TÜBİTAK

Research Article

Turk J Zool
34 (2010) 135-149
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doi:10.3906/zoo-0709-1

A preliminary study of the freshwater fauna of testate amoebae of southeast Azerbaijan

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Received: 05.09.2007

Abstract: During 2005-2007, 75 species of the freshwater testate amoebae were found in the vicinities of Lenkoran (SE Azerbaijan). The morphology of 14 species is described. One genus and 3 species are new to science (*Difflugia pisciformis* sp.n., *D. pseudoclaviformis* sp.n., *Lenkorania* gen.n., *Pseudodifflugia magna* sp.n.). Eleven species are new for the fauna of the Caucasus and Azerbaijan.

Key words: freshwater testate amoebae, fauna, the Caucasus

Introduction

The fauna of aquatic testate amoebae of Azerbaijan remains poorly known. Prior to our investigations (Alekperov and Snegovaya, 1999, 2000, 2001, 2002; Snegovaya and Alekperov, 2005), the aquatic testate amoebae were only studied by Veisig and Alizade (Alizade, 1934; Veisig, 1940) in 1930-1940, during a number of general hydrobiological surveys. With regards to the vicinities of Lenkoran (SE Azerbaijan), there are no modern data at all. Yet, this region clearly differs from others in its wet subtropical conditions and very original flora and fauna with lots of endemic species.

Materials and methods

The fauna of testate amoebae has been studied in several inland water bodies, such as small rivers, ponds, and the large freshwater reservoir, 'Khanbulanchay'. A total of 120 samples of plankton, periphyton, and benthos were collected and processed.

The testate amoebae were caught by microcapillars and studied both in vivo and by means of the glycerin-gelatin technique (Alekperov et al., 1994, 1996).

All descriptions are based on observations of living specimens and an analysis of the material impregnated by silver nitrate and glycerin-gelatin technique. The type material of all new species is deposited in the collection of the Protistology Laboratory of the Institute of Zoology of the National Academy of Sciences of Azerbaijan, Baku City.

Statistics was performed using the program SigmaStat 2.0 ($\bar{X}$: arithmetic mean; M: median; SD: standard deviation; SE: standard error; CV: coefficient of variation (%); Max: maximum; Min: minimum; n: number of specimens).

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Results and discussion

Descriptions

Family Arcellidae Ehrenberg, 1843

Arcella dentata Ehrenberg, 1838

(Figures 1-3; Table 2)

This is a very characteristic species of *Arcella*. The shell diameter 100-110 μm, apertural depth 15-20 μm. The shell yellow, often dark brown. The aboral shell margin has 12-13 radial spines. The aperture circular (30-35 μm), apertural surface invaginated, with small pores around the aperture.

Endoplasm colorless, usually 2-3 lobose pseudopodia, and different bright green inclusions. There are 2 nuclei and 3-7 contractile vacuoles.

Our specimens of *A.dentata* differ from those described from the Moldovan and Czech freshwaters (Bartoš, 1954, Vikol, 1992) in having smaller shell diameters (Moldovan population having 150 μm, Czech population-120-150 μm versus our specimens 100-110 μm).

Family Centropyxidae Jung, 1942

Ellipsopyxis lamottei Bonnet, 1974

(Figures 4-6, Table 3)

For the first time, this species was found in the soils of the vicinities of Lamto (Ivory Coast) by Bonnet (1974). Then, *E. lamottei* was found in the submerged aquatic mosses and humid soil mosses of a national park in Thailand (Golemansky and Todorov, 2000). According to Foissner (2006), the genus *Ellipsopyxis* is restricted to Indonesia and South America. Therefore it is the first record of the *Ellipsopyxis* for the fauna of the Middle East region.

This rare species was found only twice on a station with aquatic mosses. Below we give its short description.

The shell oval, flattened anteriorly. Length of shell – 103-135 μm, width – 71-75 μm. In the middle of the ventral side, there is a large (25-38 μm) invaginated oval aperture, bordered by small idiosomes. The anterior area around the aperture makes a funnel-shaped invagination, with the aperture in the middle.

The shell surface is covered with sand particles of various size and shape. There are 2-3 lobose pseudopodia. Endoplasm light brown, without inclusions. One nucleus, several (3-7) contractile vacuoles.

Family Cyclopyxidae Schönborn, 1989

Cyclopyxis ambigua Bonnet and Thomas, 1960

(Fig. 7-9; Table 4)

This species was found in the sediments of the Kamishevka River.

The shell circular in ventral and dorsal views, and hemispherical in lateral. The shell diameter 67-80 μm. The shell width 45-60 μm. The aperture small (12-15 μm), usually circular, slightly invaginated, and located in the central part. The shell chitinoidal, its surface covered with polygonal siliceous particles.

Before our investigations, this species has been collected from soils only.

Family Difflugiidae Wallich, 1864

Protocucurbitella danubialis Živkovic, 1976

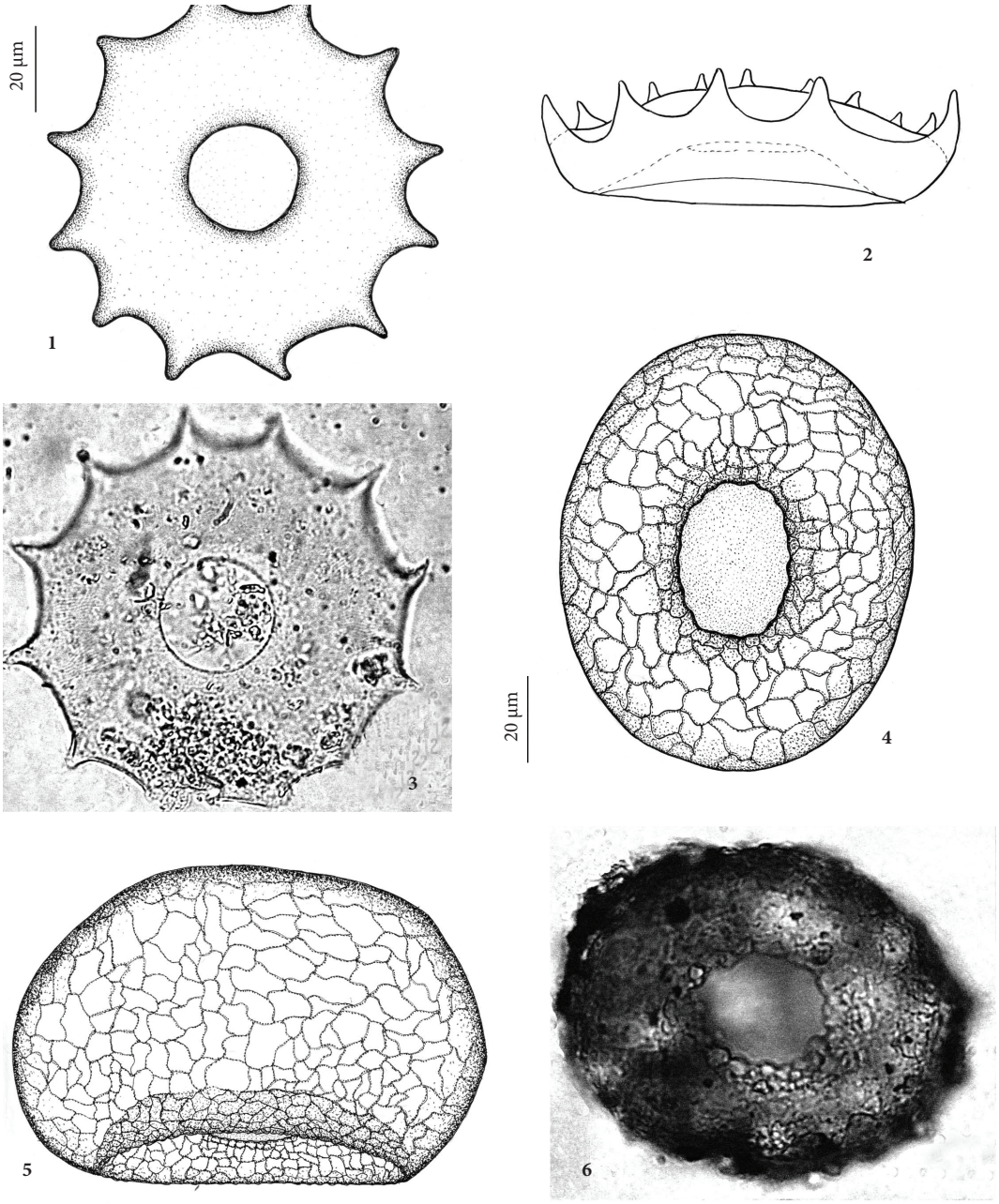
(Figures 10-13; Table 5)

The genus *Protocucurbitella* was described by Gauthier-Lievre and Thomas (1958) from Africa (Uganda and Upper Volta), without fixing the type species. These authors described the species *P. coroniformis*, with 2 varieties: *P. coroniformis* v. *pusilla* and *P. coroniformis* v. *ecornis*, differing in the aperture morphology and in the presence/absence of caudal spines.

Later, Živkovic (1975) found a new species, *P. danubialis* Živkovic, 1975, from the River Danuba and declared it as an endemic species of Yugoslavia. Yet, Chardez and Gaspar (1984) found *P. danubialis* in Belgium (near Arden). Chardez (1987) described a new species *P. mitrata*.

We collected *P. danubialis* from the sapropel sediments in the shallow bay of the River Kamishevka. Below we are briefly redescribing this species.

The shell length 168-190 μm, width 120-150 μm. The shell barrel-shaped, with truncated apical end, and 1-5 aboral spines of 30-40 μm long. Apical aperture is circular and surrounded by a denticular. The tooth-like structures are composed of small particles. Its number between 8 and 14. Mineral plates near aperture smaller than those covering other parts



Figures 1-6. 1 - *Arcella dentata* Ehrenberg, 1838, apertural view; 2 - *A. dentata,* lateral view; 3 – *A. dentata* Ehrenberg, 1838, apertural view (photo); 4 - *Ellipsopyxis lamottei* Bonnet, 1974, apertural view; 5 – *E. lamottei,* lateral view; 6 - *E. lamottei* Bonnet, 1974, apertural view (photo).

of the shell surface. Mineral particles of a polygonal shape.

Endoplasm granulate, light brown. There are 2-5 lobopodia. According to Dehktyar (1993), *Protocucurbitella* is a synonym of *Difflugia*. We have studied the original diagnosis and later descriptions of some representatives of *Protocucurbitella* and decided that this genus is valid and its definition was done correctly.

At present, there are 4 species of *Protocucurbitella*: *P. coroniformis* (the type species) Gauthier-Lievre and Thomas, 1958, *P. danubialis* Živkovic, 1975, *P.*

Table 1. A specific composition and distribution of the testate amoebae of SE Azerbaijan.

	1	2	3	4
Fam. *Arcellidae* Ehrenberg, 1830				
1. Arcella conica (Playfair, 1918)	+		+	
2. A. discoides Ehrenberg, 1872	+		+	+
3. A. artocrea Leidy, 1876	+		+	
4. A. gibbosa Penard, 1890	+		+	
5. A. megastoma Penard, 1926			+	
6. A. megastoma arcuata Deflandre, 1928*			+	
7. A. dentata Ehrenberg, 1832	+		+	
8. A. hemispherica Perty, 1852	+		+	
9. A. vulgaris Ehrenberg, 1832	+		+	+
10. A. bathystoma Deflandre, 1928	+		+	
11. A. gibbosa laevis Deflandre, 1928	+		+	
12. *A. arenaria* Greef, 1866	+		+	
Fam. *Cyclopyxidae* Schonborn, 1989				
13. Cyclopyxis kahli Deflandre, 1929	+	+		
14. C. intermedia Kufferath, 1932*		+		
15. C. ambigua Bonnet and Thomas, 1960		+		
16. Trigonopyxis arcula (Leidy, 1879)			+	
Fam. *Centropyxidae* Deflandre, 1953				
17. Centropyxis spinosa Cash, 1905	+		+	+
18. C. aerophila Deflandre, 1929	+		+	+
19. C. ecornis (Ehrenberg, 1838)	+		+	+
20. C. elongata (Penard, 1890)	+	+		+
21. C. aculeata (Ehrenberg, 1838)	+			
22. C. platystoma Bonnet, Thomas, 1956		+		
23. C. kurakchayensis Snegovaya, Alekperov, 2005	+			
24. C. hirsuta Deflandre, 1929			+	
25. C. discoides (Penard, 1902)	+		+	+
26. C. marsupiformis (Wall, 1864)	+		+	
27. C. cassis (Wallich, 1864)		+	+	
28. C. constricta (Ehrenberg,1838) Deflandre, 1929		+	+	+
29. Plagiopyxis minuta phanerostoma Bonnet, 1959*		+		
30. P. declivis Thomas, 1958		+		
31. Ellipsopyxis lamottei Bonnet, 1974*	+			
Fam. *Difflugiidae* Wallich, 1864				
32. Protocucurbitella danubialis Živkovic, 1976*	+			
33. Difflugia distenda (Penard, 1899) Ogden 1983	+		+	+
34. D. amphoralis cornuta Gauthier-Lievre, Thomas, 1958*	+		+	
35. D. lucida Penard, 1890	+		+	+
36. D. mamillaris Penard, 1902	+		+	+
37. D. lithophila (Penard, 1902)	+		+	
38. D. dificilis Thomas, 1954	+		+	+

Table 1. (Cont.)

	1	2	3	4
39. D. tuberculata (Wallich, 1864)	+			
40. D. corona Wallich, 1864	+	+	+	+
41. D. corona ecornis Gauthier-Lievre and Thomas, 1958	+		+	+
42. D. bicornis Penard, 1902	+			
43. D. elegans Penard, 1890	+		+	+
44. D. elegans teres Penard, 1899	+		+	+
45. D. bryophila (Penard, 1902)			+	
46. D. lanceolata Penard, 1902			+	+
47. D. acutissima Deflandre, 1931	+		+	+
48. D. acutisimella Chardez, 1985	+			
49. D. gigantea Chardez, 1967	+		+	
50. D. pyriformis Perty, 1849	+		+	+
51. D. linearis (Penard, 1890)	+			
52. D. smilion Thomas, 1953*	+			
53. D. longicollis (Gassowsky, 1936)	+		+	
54. D. curvicaulis Penard, 1899	+		+	+
55. D. capreolata Penard, 1902	+			
56. D. gramen Penard, 1902	+	+	+	+
57. D. muriformis Gauthier-Lievre and Thomas, 1958	+		+	
58. D. lobostoma Leidy, 1874	+		+	+
59. D. lobostoma multilobata Gauthier-Lievre and Thomas, 1958	+		+	
60. D. globulosa Dujardin, 1837	+			
61. D. globularis Wallich, 1864	+			
62. D. urceolata Carter, 1864			+	+
63. D. scalpellum Penard, 1899	+		+	
64. D. sarissa Li Sun Tai, 1931*	+			
65. D. baculosa Schönborn, 1966*	+		+	
66. D. pristis Penard, 1902	+		+	
67. D. pseudoclaviformis sp.n.	+			
68. D. pysciformis sp.n.	+			
69. Zivkovicia compressa (Carter, 1864) Ogden, 1987	+			+
Fam. Lesquereusidae Jung, 1942				
70. Lesquereusia modesta Rhumbler, 1895	+			+
Fam. Pseudodifflugiidae De Saedeleer, 1934				
71. Pseudodifflugia magna sp.n.	+			
72. Lenkorania microstoma (Playfair, 1918)		+		
Fam.Cyphoderiidae de Saedeleer, 1934				
73. Cyphoderia ampula (Ehrenberg, 1840)	+	+	+	
74. C. ampula papillata Wailes and Penard, 1911*	+			
75. C. ventricosa Chardez, 1991*	+			

1 – Kamishevka River, 2 – Pond near Sapnakeran Village, 3 - Groups of small basins near Azfilial settlement, 4 - Water reservoir 'Khanbulanchay'.

* - species new for the Caucasus

Table 2. Biometric characteristic of *Arcella dentata* Ehrenberg, 1838.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Diameter of shell	104.7	105.0	4.448	1.407	4.2	100.0	110.0	10
Diameter of aperture	33.6	35.0	2.066	0.653	6.1	30.0	35.0	10
Length of spines	9.20	10.0	1.033	0.327	11.2	8.0	10.0	10
Depth of aperture	16.8	16.5	1.989	0.629	11.839	15.0	20.0	10
Thickness of shell	17.2	16.0	2.486	0.786	14.5	15.0	20.0	10

Table 3. Biometric characteristic of *Ellipsopyxis lamottei* Bonnet, 1974.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	124.8	127.5	9.028	2.855	7.2	103.0	135.0	10
Width of shell	73.8	75.0	1.687	0.533	2.3	71.0	75.0	10
Diameter of aperture	31.3	30.0	4.373	1.383	14.0	25.0	38.0	10
Breadth of shell	69.5	70.0	6.433	2.034	9.2	60.0	80.0	10
Depth of aperture	14.4	15.0	0.966	0.306	6.7	13.0	15.0	10

Table 4. Biometric characteristic of *Cyclopyxis ambigua* Bonnet and Thomas, 1960.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Diameter of shell	73.2	72.5	4.492	1.420	6.1	67.0	80.0	10
Breadth of shell	53.5	52.5	6.258	1.979	3.7	45.0	60.0	10
Diameter of aperture	14.1	15.0	1.449	0.458	10.3	12.0	15.0	10
Depth of aperture	10.0	10.0	1.633	0.516	16.3	8.0	12.0	10

Table 5. Biometric characteristic of *Protocucurbitella danubialis* Živkovic, 1976.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	178.8	180.0	9.004	2.847	5.00	168.0	190.0	10
Breadth of shell	137.0	135.0	12.517	3.958	9.1	120.0	150.0	10
Diameter of aperture	91.8	90.0	2.394	0.757	2.6	90.0	95.0	10
Length of legs	35.5	35.0	4.378	1.384	12.3	30.0	40.0	10

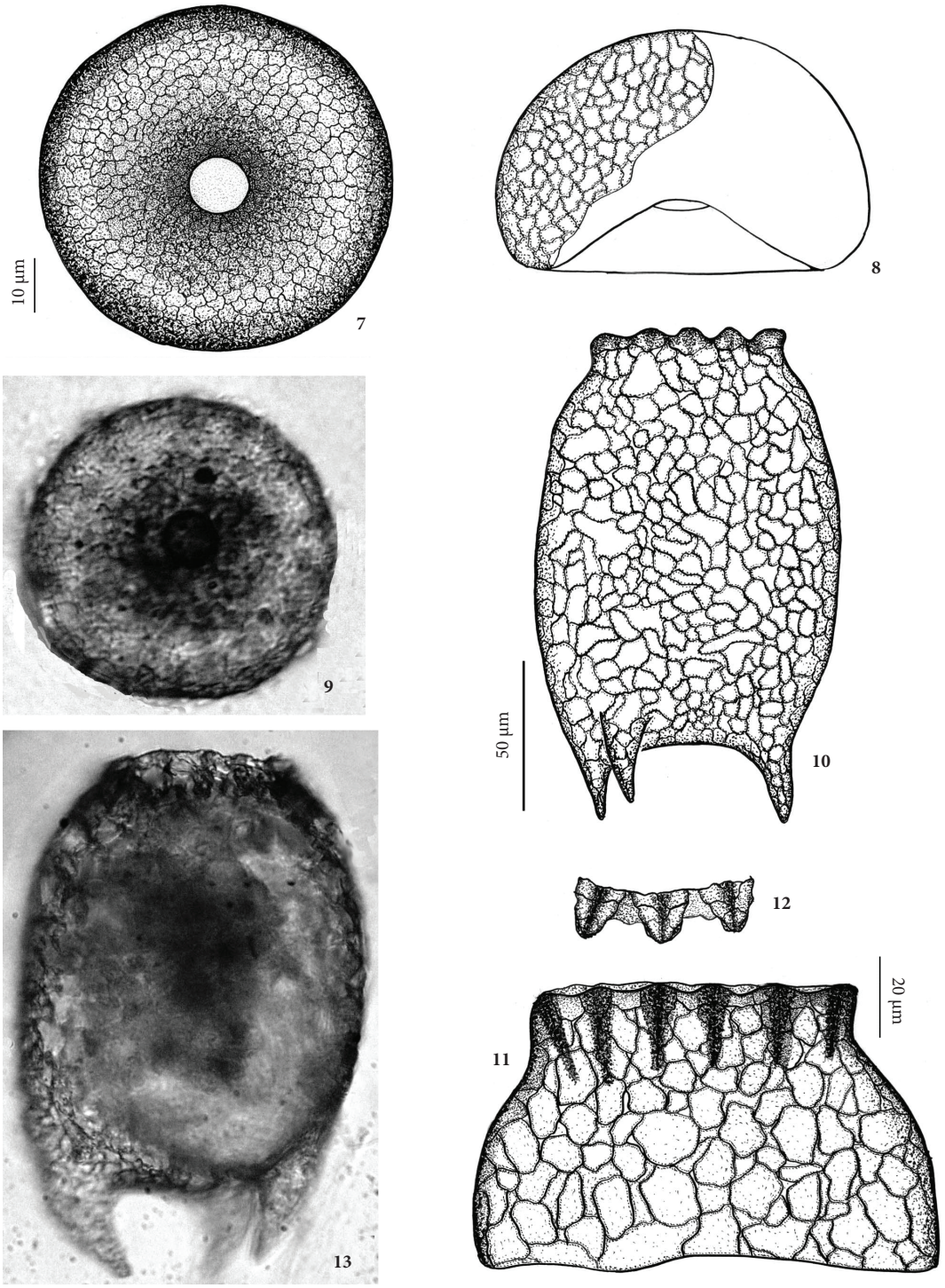
longicornis Živkovic, 1975, and *P. mitrata* Chardez, 1987.

Difflugia sarissa Li Sun Tai, 1931

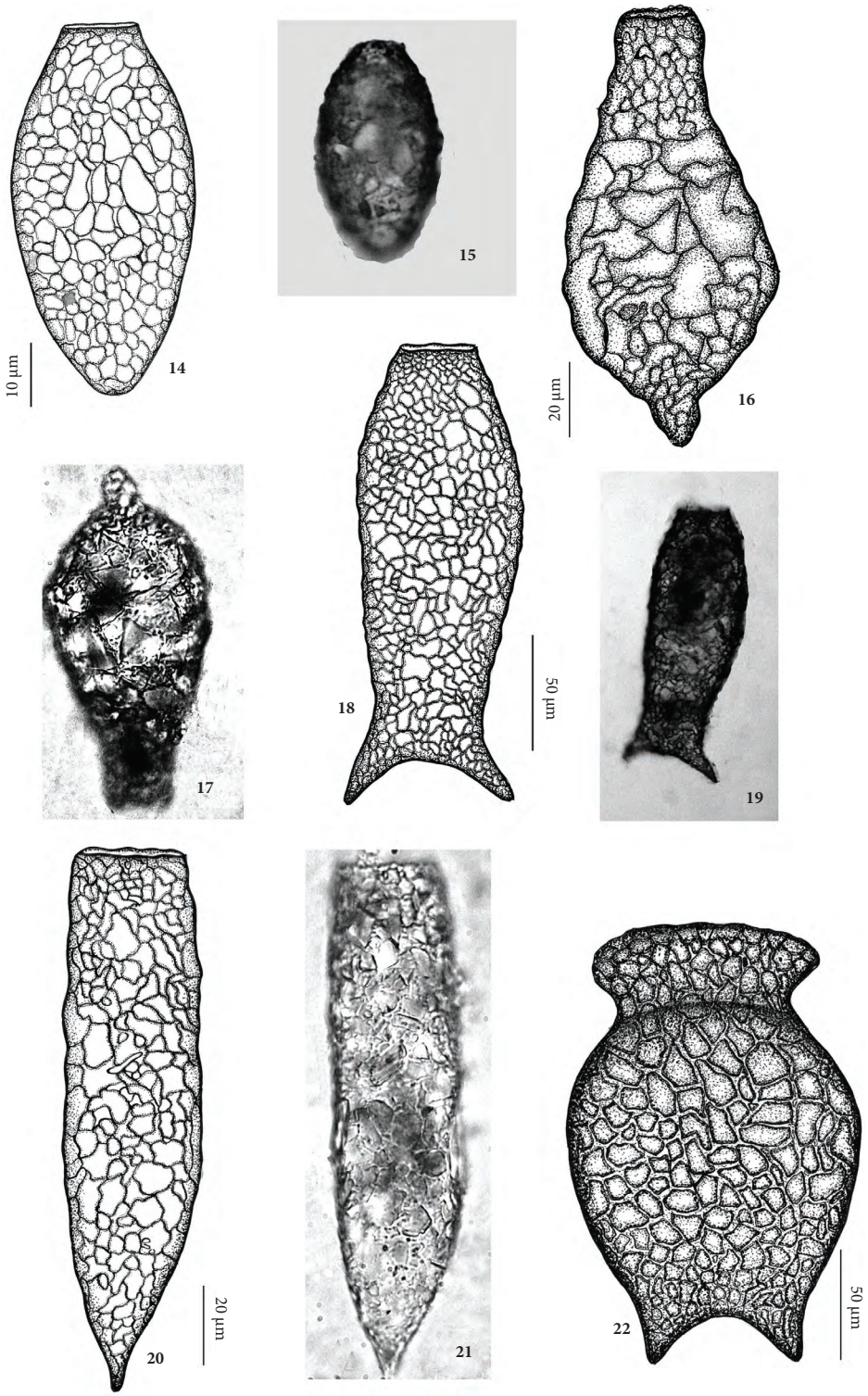
(Figures 14-15; Table 6)

This is a relatively rare species. After the first description, it has been found only by Gautier-Lievre and Thomas (1958) and then by Chardez (1966). Golemansky (1962) described *D. sarissa* v. *minima* from the Guinean tropical forest soils. Below we are describing our specimens of *D. sarissa* v. *minima* founded in a small pond near the town of Lenkoran.

The shell length 55-70 μm, width 20-30 μm. The shell roughly circular (not compressed) in transverse cross-section, tapering towards both anterior and posterior ends from its widest point at about the middle of the shell. Anterial aperture relatively small (8-11 μm) and circular. The shell surface covered with irregularly shape siliceous particles. Living cells not observed.



Figures 7-13. 7 - *Cyclopyxis ambigua* Bonnet and Thomas, 1960, apertural view; 8 - *C.ambigua*, lateral view; 9 – *C. ambigua* Bonnet and Thomas, 1960, apertural view (photo); 10 - *Protocucurbitella danubialis* Živkovic, 1976, general view; 11 – *P. danubialis,* apertureal view; 12 - *P. danubialis,* idiosomes; 13 – *P. danubialis* Živkovic, 1976, general view (photo).



Figures 14-22. 14 - *Difflugia sarissa* Li Sun Tai, 1931, general view; 15 – *D. sarissa* Li Sun Tai, 1931, general view (photo); 16 – *D. pseudoclaviformis* sp.n., general view; 17 – *D. pseudoclaviformis* sp.n., general view (photo); 18 – *D. pisciformis* sp.n., general view.; 19 – *D. pisciformis* sp.n., general view (photo); 20 – *D. smilion* Thomas, 1953, general view; 21 – *D. smilion* Thomas, 1953, general view (photo); 22 – *D. urceolata* Carter, 1864, general view.

Table 6. Biometric characteristic of *Difflugia sarissa* Li Sun Tai, 1931.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	64.5	65.0	5.503	1.740	8.5	55.0	70.0	10
Width of shell	26.0	25.0	3.944	1.247	15.2	20.0	30.0	10
Diameter of aperture	9.7	10.0	0.949	0.30	9.8	8.0	11.0	10

Our specimens of *D. sarissa v. minima* show morphological characteristics corresponding to those described by Golemansky (1962).

Difflugia pseudoclaviformis sp.n.

(Figures 16-17; Table 7)

Diagnosis. The shell pyriform, with aboral conical protuberance. *D. pseudoclaviformis* sp.n. is similar to *D. claviformis* Penard, 1899 and *D. microclaviformis* (Kourov, 1925), but differs from both in having a smaller shell size (twice or more times smaller).

Holotype. Slide L-1.

Type location. In the sediments of the River Kamishevka.

Description. The shell light grey, pyriform, with distinct aboral conical protuberance (20 μm). The shell length 120-145 μm, width 65-80 μm. Aboral protuberance has a rather smooth outline and is composed of small to medium pieces of quartz and a network of organic cement, which is often seen as a part of the shell matrix. The aperture (25-30 μm) circular, surrounded by small particles. The bigger shell plates are located in its middle part. Endoplasm colorless, granular and occupies 1/5 part of the inner shell cavity. Two or 5 long lobopodia and 1-3 contractile vacuoles.

Difflugia pisciformis sp.n.

(Figures 18-19; Table 8)

Diagnosis. *Difflugia pisciformis* sp.n. has oblong shell. Caudal part has 2 small horns, resembling the fish caudal fin.

Holotype: Slide: L – 2.

Type location. In the sediments of the River Kamishevka.

Description. The shell elongated. Length 195-220 μm, width 88-100 μm. Spherical anterior aperture has the diameter of 35-45 μm, surrounded by small, mainly globular particles. Caudal part with 2 small (25-30 μm) horns, composed of medium to large pieces of angular quartz, with some small particles used in the shaping of horns. The shell surface rough, with patches of organic cement forming a part of the shell matrix. Endoplasm light brown, often with small oval green particles. There are 1-3 short lobopodia and several 3-5 contractile vacuoles.

The described species is similar to *D. bircuris* Gauthier-Lievre and Thomas, 1958, found first from the Ivory Coast (Gauthier-Lievre and Thomas, 1958). Our species clearly differs from it and from all other representatives of *Difflugia* in having shaped shell with its posterior part resembling the fish caudal fin.

Difflugia smilion Thomas, 1953

(Figures 20-21; Table 9)

This species was described from French and Belgian freshwaters (Thomas, 1953). Then it was found in Algeria and Ivory Coast (Gauthier-Lievre and Thomas, 1958).

Our specimens were collected from aquatic plants in a small pond.

Table 7. Biometric characteristic of *Difflugia pseudoclaviformis* sp.n.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	136.0	140.0	8.097	2.56	6.0	120.0	145.0	10
Width of shell	73.5	72.5	5.297	1.675	7.2	65.0	80.0	10
Diameter of aperture	27.5	27.5	2.635	0.833	9.6	25.0	30.0	10
Length of neck	35.0	35.0	1.333	0.422	3.8	33.0	37.0	10
Length of tail	22.1	23.0	1.449	0.458	6.6	20.0	23.0	10

Table 8. Biometric characteristic of *Difflugia pisciformis sp.n.*

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	206.5	200.0	10.014	3.167	4.8	195.0	220.0	10
Width of shell	94.8	95.0	5.514	1.744	5.8	88.0	100.0	10
Diameter of aperture	39.5	40.0	4.378	1.384	11.1	35.0	45.0	10
Length of legs	28.0	30.0	2.582	0.816	9.2	25.0	30.0	10

Table 9. Biometric characteristic of *Difflugia smilion* Thomas, 1953.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	177.0	175.0	9.189	2.906	5.2	165.0	190.0	10
Width of shell	52.0	50.0	6.749	2.134	13.0	40.0	60.0	10
Diameter of aperture	41.2	40.0	2.781	0.879	6.8	37.0	45.0	10
Length of tail	24.0	25.0	1.414	0.447	5.9	21.0	25.0	10

Length 165-190 μm, width 40-60 μm. The shell spear-shaped, with sharp caudal end. Spherical aperture (37-45 μm) located anteriorly. The shell surface composed of quartz particles of different shapes. The cytoplasm colorless and occupies a small part of the inner shell cavity. There are 1-3 short lobopodia and 3-6 contractile vacuoles.

Our specimens show morphological characteristics corresponding to the species described both from Europe and from North Africa (Thomas, 1953; Gauthier-Lievre and Thomas, 1958).

Difflugia urceolata Carter, 1864

(Figure 22; Table 10)

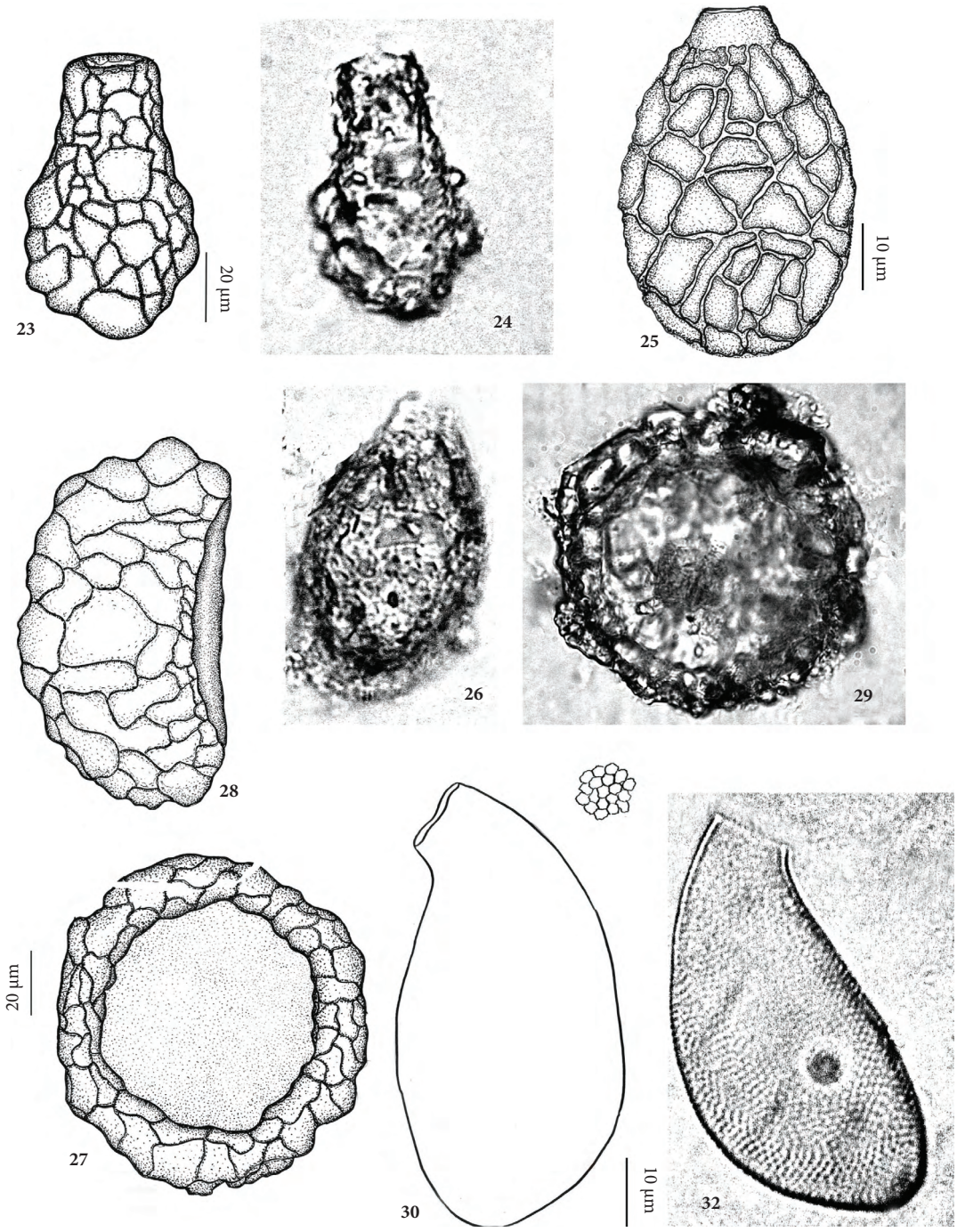
This is a very widespread species, well-redescribed recently by Bulgarian specialists (Todorov, Golemansky, 2007). According to these authors, *D. urceolata* is one of the largest species of the genus, having a very characteristic shape. Two varieties of *D. urceolata* have been described: namely, *D. urceolata* v. *olla* Leidy, 1879 and *D. urceolata* v. *sphaerica* Playfair, 1917. Below we have provided a short morphological characteristic of our specimens of *Difflugia urceolata* found from the Khanbulanchay water reservoir.

The shell length 185-220 μm, width 115-140 μm. The amphora-shaped shell usually with 2, sometimes with 3 horns on its aboral end. At the anterior end, there is a short (20 μm) neck surrounded by a collar of variable breadth. The apical aperture (50-60 μm) large and circular. The shell surface is composed of angular quartz particles. Organic cement in network-shape, seen infrequently. Endoplasm usually light yellow, with 1-3 short lobopodia.

According to Todorov and Golemansky (2007), it is not possible to distinguish the 2 varieties of *D. urceolata* because there are many intermediate forms between the nominative species and these 2 varieties. This is why both of them should be considered synonyms of the nominative species, *D. urceolata*. We agree with this opinion, for our data have shown that *D. urceolata* is a size-polymorphic species and the aforementioned 2 varieties should be treated as eco-phenotypic variations of the same species.

Table 10. Biometric characteristic of *Difflugia urceolata* Carter, 1864.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	205.0	200.0	13.744	4.346	6.7	185.0	220.0	10
Width of shell	129.0	130.0	8.433	2.667	6.5	115.0	140.0	10
Diameter of aperture	55.5	55.0	4.378	1.384	7.9	50.0	60.0	10



Figures 23-32. 23 – *D. pristis* Penard, 1902, general view; 24 – *D. pristis* Penard, 1902, general view (photo); 25 - *Lenkorania microstoma* (Playfair, 1918), general view; 26 – *L. microstoma* (Playfair, 1918), general view (photo); 27 - *Pseudodifflugia magna* sp.n., apertural view; 28 – *P. magna* sp.n., lateral view; 29 – *P. magna* sp.n., apertural view (photo); 30 - *Cyphoderia ventricosa* Chardez, 1991, general view; 31 – *C. ventricosa*, part of shell structure; 32 – *C. ventricosa* Chardez, 1991, general view (photo).

Difflugia pristis Penard, 1902

(Figures 23-24; Table 11)

This is one of the smallest *Difflugia* species. We found it in a small pond near Sapnakeran Village.

The shell length 42-50 μm. The shell elongated, light brown, tapering from the mid-body position towards the apical aperture (8-12 μm). The shell surface is thin and covered with flattish pieces of quartz. There is no diatom frustule on the shell surface. The quartz particles are packed closely together. The aperture circular, with a regular margin. Endoplasm colorless.

Our specimens of *D. pristis* are similar to those described from freshwaters of Hungary (Varga, 1963).

Fam. Pseudodifflugiidae De Saedeleer, 1934

Lenkorania gen.nov.

Diagnosis. Small to medium sized, the shell oval or drop-shaped. The anterior aperture small, with well defined neck. The whole anterior area is generated by organic cement without pieces of quartz. Other parts of the shell surface are incrusted with sand particles of different shapes. *Lenkorania (Pseudodifflugia) microstoma* (Playfair, 1918). There are several thin filopodia. Feeding herbivorous. The type species *Lenkorania (Pseudodifflugia) microstoma* (Playfair, 1918) comb.nov.

The type species of the new genus *Lenkorania* was originally found and described from Australia as a representative of *Pseudodifflugia*. The latter genus with following diagnosis: Small size, with agglutinate test in general appearance similar to *Difflugia,* but with filopodia. Test firm, chitinoid or completely covered with attached quartz grains. Shape often variable ovoid to sub-spherical. Feeding herbivorous. Type species: *P.gracilis* Schlumberger, 1845. At present, 8 species belong to *Pseudodifflugia* and differ from each other mainly by the shape and size of shells. Yet, *P. microstoma* has a very characteristic anterior area formed by organic cement and free of extraneous particles, the key diagnostic characters of the new genus *Lenkorania*.

Lenkorania microstoma (Playfair, 1918)

comb.n. (Figures 25-26; Table 12)

To date the species has been known from 3 regions only: Australia (Playfair, 1918, the original description), Romania (Godeanu, 1972), and Azerbaijan (present data). Below we are describing the specimens of *L. microstoma* found in a small forest pond in the vicinities of Lenkoran City

The shell length 55-60 μm, width 40-45 μm. The drop-shaped shell, with rounded aboral region and narrowly-necked anterial end. Spherical aperture (8-9 μm), with small (10 μm) neck produced by organic cement without extraneous particles. The whole shell surface below neck is incrusted with small to medium angular pieces of quartz; small areas of organic cement are seen between particles. Endoplasm, transparent, granular. Nucleus spherical.

Our specimens of *L. microstoma* differ from those described from Romania (Godeanu, 1972) in having a bigger shell (55-60 μm versus 30-38 μm).

Table 11. Biometric characteristic of *Difflugia pristis* Penard, 1902.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	46.0	46.0	2.789	0.882	6.1	42.0	50.0	10
Width of shell	23.4	24.0	1.838	0.581	7.9	21.0	25.0	10
Length of neck	8.9	8.5	0.994	0.314	11.2	8.0	10.0	10
Diameter of aperture	10.2	10.0	1.476	0.467	14.5	8.0	12.0	10

Table 12. Biometric characteristic of *Lenkorania microstoma* (Playfair, 1918).

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	58.5	60.0	2.415	0.764	4.1	55.0	60.0	10
Breadth of shell	42.0	40.0	2.582	0.816	6.1	40.0	45.0	10
Diameter of aperture	8.3	8.0	0.483	0.153	5.8	8.0	9.0	10

***Pseudodifflugia magna* sp.n.**

(Figures 27-29; Table 13)

Diagnosis. The shell light brown, circular in apertural and hemispherical in lateral view. It is composed of sand particles. The aperture circular, bordered by an arrangement of smaller sand particles embedded in an organic matrix. From other representatives of *Pseudodifflugia* differs in having the bigger shell of a distinctive shape. From the closely related species *P. gracilis* Sclumberger, 1845, *P .magna* sp.n. differs in having the larger shell (120 μm versus 26-60 μm) and aperture (70 μm versus 15-30 μm).

Holotype: Slide: L – 2, 3.

Type location. In the sediments and from aquatic plants of the River Kamishevka.

Description. The shell diameters 100-125 μm, shell circular in apertural view, and hemispherical laterally. The big aperture (65-80 μm) roughly circular. The whole shell surface is covered with extraneous sand particles. Endoplasm light brown, granular; usually, with 2-3 pseudopodia.

Family Cyphoderiidae de Saedeleer, 1934

***Cyphoderia ventricosa* Chardez, 1991**

(Figures 30-32; Table 14)

This species was first found in freshwaters of Belgium, on sapropel silt (Chardez, 1991). We found *C.ventricosa* in a small River Kamishevka.

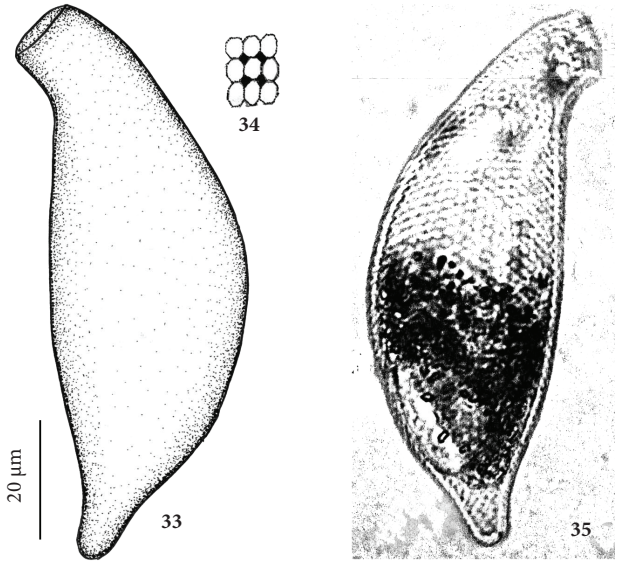
The shell length 65-75 μm, width 35-50 μm. The shell colourless, retort-shaped and circular in transverse section. Posterior part bag-like. Circular aperture subanterial (10-20 μm), neck shorter than that of *C. ampulla papillata* Wailes and Penard, 1911 (see below). The shell is composed of elliptic siliceous shell place. Endoplasm colorless. Thin 1-5 pseudopodia.

Our specimens show the morphological characteristics clearly correspond to *C. ventricosa* described from Belgium.

***Cyphoderia ampulla papillata* Wailes and Penard, 1911 (Figures 33-35; Table 15)**

This infraspecies was collected from the ferns (*Phragmites communis*) in a shallow bay of the River Kamishevka.

The shell length 100-130 μm, width 40-60 μm, with the characteristic tail-like caudal end (12-20 μm). The shell colorless or light yellow, retort-shaped and



Figures 33-35. 33 - *Cyphoderia ampulla papillata* Wailes and Penard, 1911, general view; 34 – *C. ampulla papillata*, part of shell structure; 35 – *C. ampulla papillata* Wailes et Penard, 1911, general view (photo).

Table 13. Biometric characteristic of *Pseudodifflugia magna* sp.n.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Diameter of shell	113.5	120.0	11.797	3.731	10.4	100.0	125.0	10
Diameter of aperture	71.5	70.0	6.258	1.979	8.8	65.0	80.0	10
Thickness of shell	69.6	70.0	1.506	0.476	2.1	67.0	72.0	10

Table 14. Biometric characteristic of *Cyphoderia ventricosa* Chardez, 1991.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	68.4	67.5	2.989	0.945	4.4	65.0	75.0	10
Width of shell	39.3	38.0	4.322	1.367	11.0	35.0	50.0	10
Diameter of aperture	13.7	13.0	2.669	0.844	19.5	10.0	20.0	10

Table 15. Biometric characteristic of *Cyphoderia ampula papillata* Wailes and Penard, 1911.

Character	$\bar{X}$	M	SD	SE	CV	Min	Max	n
Length of shell	109.8	106.5	10.207	3.228	9.3	100.0	130.0	10
Breadth of shell	45.5	43.5	5.720	1.809	12.6	40.0	60.0	10
Diameter of aperture	14.6	13.0	3.569	1.137	24.4	12.0	22.0	10
Length of tail	14.6	13.5	3.062	0.968	21.0	12.0	20.0	10

circular in transverse section. The aperture circular (12-22 μm) and surrounded by a row of shell plates. The shell is composed of oval or polygonal flattened, siliceous shell plates, which are arranged in diagonal rows on the organic matrix looking like small dark square-shaped particles. Endoplasm light yellow. Usually 3-8 pseudopodia.

Our specimens of *C. ampulla papillata* are similar to those described by Wailes and Penard (1911).

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