

Diversity and biotopic distribution of the Rhizopods (Rhizopoda: *Lobosia* and *Filosia*) from the Western Rhodopes (Bulgaria)

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Abstract. This paper summarizes all the data available until now on the rhizopodic fauna of the Western Rhodopes. New data on the occurrence and distribution of 112 testate amoebae (67 known and 45 new for the studied region) are recorded for the first time. Thus, a total of 197 species and varieties belonging to 44 genera of naked and testate amoebae were recorded in 31 localities from different habitats of the Western Rhodopes. The results of the study show that the genera *Diffugia* (41 species), *Centropyxis* (22), *Nebela* (18), *Euglypha* (17) and *Arcella* (13) predominate in the studied habitats. The most frequently occurring testaceans in all studied habitats and localities are: *Trinema lineare* (70.9% occurrence), *Euglypha rotunda* (61.3%), *E. laevis* (58.1%), *Centropyxis aculeata* (48.4%), *Trinema enchelys* (45.2%) and *Cyphoderia ampulla* (41.9%). Concerning the distribution of the testate amoebae in different habitats it was established that the Natural Lakes, as well as the Peat-bogs and swamps have the greatest diversity (113 species of 34 genera and 96 species of 32 genera, respectively). The comparison among the rhizopodic fauna of the studied region and those of the other mountains in Bulgaria shows that the species diversity of the rhizopods in the Western Rhodopes is the greatest.

Key words: Rhizopoda, Amoebida, testate amoebae, diversity, distribution, ecology, Rhodopes, Bulgaria.

Introduction

PATEFF (1924) reported the first data on the rhizopodic fauna of the Rhodopes. He gave information on 3 species of naked amoebae from the Batak Swamp (Batak Dam at present) and 43 species of testate amoebae from various biotopes and localities in the Rhodopes - mosses, bogs and swamps from Batak and Chernetitsa Mountains (Peshtera, Boykovo, Skobelev), the regions of Velingrad (Chaira and Kamenitsa), Yundola etc. Four years later PATEFF (1928) supplemented the list of the freshwater rhizopods of Bulgaria with another 9 testate amoebae, one of which (*Nebela bipes*) was found in the Rhodopes.

In two publications GOLEMANSKY (1967, 1968) published more detailed information about the diversity, the biotopic distribution and the ecology of the rhizopods

of the Western Rhodopes. GOLEMANSKY (1967) established 83 species and varieties rhizopods in the epiphytic, hygrophilic and hydrophilic mosses in the regions of Velingrad, Pamporovo, Beglika, Batak Dam and Vassil Kolarov Dam. Sixteen of them were new to the Bulgarian fauna. It was established that only 1 species of *Amoeba* and 19 species of testate amoebae inhabit the epiphytic mosses. A considerably richer rhizopodic complex (2 naked amoebae and 63 testate amoebae) was established in the hygrophilic and hydrophilic mosses of the same localities. The investigation of the rhizopodic fauna of the Smolyan Lakes also showed the presence of various rhizopodic fauna (GOLEMANSKY, 1968). About one hundred naked and testate amoebae were found in the studied system of the Smolyan Lakes. Twenty of them were new to the Bulgarian fauna. In two Smolyan Lakes (Blatisto and Lagot Lakes) there are floating sphagnum islands and littoral peat-bogs, the rhizopodic fauna of which was very rich and specific. Both lakes are situated at altitudes between 1300 and 1600 m. A typical testate association of *Flavum*-type was established, which is characteristic for the mountain peat-bogs in Central Europe ("Hochmoore" according to HARNISCH, 1927 and GROSPIETSCH, 1953, 1958).

Some new water, moss and soil samples have been collected from different habitats in the Rhodopes during the last 5 years. As a result of their study many new and unknown rhizopods have been found. Some new localities and data about the biotopic distribution and ecological preferences of a big part of the so far known freshwater rhizopods were established also. The aim of the proposed article is to summarize the information on the rhizopodic fauna of the Western Rhodopes, published by different authors till now, and to supplement it with our new data about its diversity, distribution and ecology.

Materials, habitats and localities

The samples examined by the above cited authors and by us have been collected from 5 main habitats in the Rhodopes: I – Natural Lakes; II – Peat-bogs and swamps; III – Artificial reservoirs; IV – Soil mosses and V – Epiphytic mosses. The studied localities of these habitats and their detailed characteristics are given below.

I. Natural Lakes

1. Smolyan Lakes - Lake Matno Ezero (1600 m): littoral zone – washed immerse and submerge water plants (*Potamogeton natans* L., *Carex rostrata* Stokes, *Alopecurus aequalis* Sobol.), stones, as well as benthic samples at a depth of 0.6 m; (29.06.1967).

2. Smolyan Lakes - Lake Blatistoto Ezero (1500 m): littoral zone – washed immerse and submerge water plants (*Potamogeton natans* L., *Carex rostrata* Stokes, *Juncus* sp., *Ranunculus* sp., *Cyperus* sp.) and wet mosses (mainly *Sphagnum* sp.) from the floating moss island in the central zone of the lake, as well as benthic samples at a depth of 0.8 m; (24.06.1965, 29.06.1967).

3. Smolyan Lakes - Lake Bistrotto Ezero (1500 m): littoral zone – washed immerse and submerge water plants (*Alopecurus aequalis* Sobol., *Potamogeton natans* L.) and benthic samples at a depth of 0.6-0.7 m; (29.06.1967).

4. Smolyan Lakes - Lake Lagot (1450 m): littoral zone – washed immerse and submerge water plants (*Persicaria amphibia* L., *Potamogeton natans* L., *Carex* sp.) and wet mosses (*Sphagnum* sp.) from the floating moss island in the central zone of the lake; (28.06.1967).

II. Peat-bogs and swamps

5. Smolyan Lakes - First swamped terrace (1400 m): washed water plants (*Equisetum palustre* L., *Menyanthes trifoliata* L., *Juncus* sp.) and wet mosses; (28.06.1967).

6. Smolyan Lakes - Ezerov Gyol (1300 m): washed water plants (*Typha latifolia* L. and *Menyanthes trifoliata* L.); (29.06.1967).

7. Peat-bogs and swamps near Sveti Konstantin (close to Peshtera); (1924).

8. Peat-bogs and swamps near Skobeleva Village; (1924).

9. Peat-bogs and swamps from Yundola; (1924).

10. Peat-bogs and swamps near Boykovo Village; (1924).

11. Peat-bogs and swamps from Chaira (close to Velingrad); (1924).

12. Peat-bogs and swamps from Chatama (near to Beglika Dam); (1924).

13. Peat-bogs and swamps near Shiroka Polyana Dam; (03.08.2005).

14. Peat-bogs and swamps near Dospat Dam; (14.05.2005).

III. Artificial Reservoirs (Dams)

15. Batak Dam: littoral zone - benthic samples at a depth of 0.5-10.0 m; (14.04.2005).

16. Beglika Dam: littoral zone – washed water plants and benthic samples at a depth of 0.5-10.0 m; (14.05.2005, 03.08.2005).

17. Dospat Dam: littoral zone - benthic samples at a depth of 1.5 m; (14.05.2005).

18. Toshkov Chark Dam: littoral zone - benthic samples at a depth of 1.5-2.5 m; (14.05.2005).

19. Shiroka Polyana Dam: littoral zone – washed water plants; (03.08.2005).

IV. Soil mosses

20. Velingrad (Summit Ostrets): hygrophilic soil mosses (*Mnium undulatum* Hedw., *Dicranium scoparium* Hedw., *Hypnum cupressiforme* Hedw., *Funaria hygrometrica* Hedw.); (15.06.1965).

21. Yundola: hygrophilic (*Polytrichum junipericum* Hedw.) and hydrophilic (*Calliergonella* sp.) soil mosses; (16.06.1965).

22. Beglika Dam: hygrophilic (*Polytrichum junipericum* Hedw.) and hydrophilic (*Climacium dendroides* (Hedw.) Veb & Mohr., *Calliergonella cuspidata* (Hedw.) Loeske, *Campilium stellatum* (Hedw.) Lang. & C.J., *Drepanocladus uncinatus* (Hedw.) Varnst, etc.) soil mosses; (18.06.1965).

23. Tsigov Chark Dam: hydrophilic soil mosses (*Aulacomnium palustre* Schwaegr.); (17.06.1965).

24. Batak Dam: hydrophilic soil mosses (*Climacium dendroides* (Hedw.) Veb. & Mohr.); (17.06.1965).

25. Toshkov Chark Dam: hydrophilic soil mosses (*Marchantia polymorpha* L.); (17.06.1965).

26. Vasil Kolarov Dam: hydrophilic soil mosses (*Calliergonella cuspidata* (Hedw.) Loeske, *Drepanocladus uncinatus* (Hedw.) Varnst.); (19.06.1965).

27. Devin: hydrophilic soil mosses (*Cratoneurum commutatum* (Hedw.) Roth.); (22.06.1965).

28. Asenovgrad: hygrophilic soil mosses (*Polytrichum junipericum* Hedw.); (25.06.1992).

V. Epiphytic mosses

29. Velinograd (Summit Ostrets): epiphytic mosses on the *Quercus* sp. (*Hypnum cupressiforme* Hedw., *Homalothecium philippeanus* (Spruce) Br. eur., *Frullania dilatata* (L.) Dum. *Orthotrichum* sp.); (15.05.1965).

30. Yundola: epiphytic mosses on the *Picea excelsa* Link. (*Hypnum cupressiforme* Hedw.) and on the *Fagus sylvatica* L. (*Rudula complanata* (L.) Dum., *Frullania dilatata* (L.) Dum., *Orthotrichum* sp.); (15.05.1965).

31. Narechenski Bani: epiphytic mosses on the *Juglans regia* L. (*Leucodon sciuroires* (Hedw.) Br. eur.); (15.05.1965).

Results and Discussion

The rhizopodic fauna of the Western Rhodopes is comparatively rich and varied. A total of 197 species and varieties belonging to 44 genera of naked and testate amoebae have been found till now. Most of them (152) had been known for this region from previous studies (PATEFF, 1924, 1928; GOLEMANSKY, 1967, 1968). New data on the occurrence and distribution of 112 testate amoebae (67 known and 45 new for the studied region) are reported for the first time in this study. The list of all taxa and their biotopic distribution in the studied habitats and localities are presented in Table 1.

The testacean taxocenoses in the studied habitats are mainly composed of aquatic or sphagnophilous species with cosmopolitan distribution (Figs 1-27). The genera *Diffflugia* (41 species), *Centropyxis* (22), *Nebela* (18), *Euglypha* (17) and *Arcella* (13) predominate in the studied habitats. However some differences in the presence of these dominants in the studied habitats are registered. For example, in the Natural Lakes these dominant genera were represented by almost the same number of species – *Nebela* (11), *Diffflugia* (10), *Euglypha* (10), *Arcella* (9) and *Centropyxis* (9). Moreover, about 50% (14) of the remaining 29 genera established there, were represented by one species only.

In the Peat-bogs and swamps, as well as in the Artificial reservoirs, there is a trend of increasing predominance of the genera *Diffflugia* (23 and 30 species, respectively) and *Centropyxis* (14 and 12 species, respectively). The other three genera (*Nebela*, *Euglypha* and *Arcella*) are subdominants in these habitats.

The rhizopodic fauna of the Soil mosses is characterized by the predominance of the species of genera *Centropyxis* (14) and *Euglypha* (12), and by the increasing presence of the genus *Plagiopyxis* (6), instead of the species of the genera *Diffflugia* (5) and *Arcella* (0).

In the Epiphytic mosses about 40% of all observed species are of two genera only – *Euglypha* (6) and *Centropyxis* (4). Eight of the remaining 11 genera, found in this habitat, were represented by one species only.

Concerning the distribution of the testate amoebae in different habitats some differences were found. The greatest diversity was established in the Natural Lakes and in the Peat-bogs and swamps (113 species of 34 genera and 96 species of 32 genera, respectively). A lower

T a b l e 1.
List of the rhizopods and their biotopic distribution in the Western Rhodopes.

T a x a	H a b i t a t s						
	Natural Lakes (Localities: 1-4)	Peat Bogs and Swamps (Localities: 5-14)	Artificial Reservoirs (Dams) (Localities: 15-19)	Soil mosses (Localities: 20-28)	Epiphytic mosses (Localities: 29-31)	Author (s)*	Ecological** preference
	2	3	4	5	6	7	8
Amoebida***							
<i>Amoeba guttula</i> Dujardin, 1841	-	-	-	23,24,27	-	3	M, S
<i>A. lanceolata</i> Pateff, 1924	-	11	-	-	-	9	P
<i>A. laurcata</i> Penard, 1902	-	11	-	-	-	9	P
<i>A. proteus</i> (Pallas, 1766) Leidy, 1878	3	-	-	-	-	9	A, M
<i>A. radiosa</i> Dujardin, 1841	-	-	15	-	-	9	A
<i>A. spumosa</i> Gruber, 1885	-	-	15	24	-	3, 9	A, M
<i>A. striata</i> Penard, 1890	-	-	15	-	-	9	A
<i>A. verrucosa</i> Ehrenberg, 1838	-	-	-	-	29	3	M, S
<i>A. (Mayorella) vespertilio</i> Penard, 1902	2	-	-	24	-	3, 4	A, M
<i>Dactilospherium vitinaeum</i> Hertwig & Lesser, 1874	2	-	-	24	-	3, 4	A, M
<i>Naegleria bistadialis</i> (Puschkarew, 1913)	-	-	-	25	-	3	M, S
Testacealobosia							
<i>Arcella arenaria</i> Greeff, 1866	2	13	-	20,22,26	29,30,31	3, 4, Present study	E
<i>A. catinus</i> Penard, 1890	4	13	-	22	-	3, 4, Present study	A, P, M
<i>A. dentata</i> Ehrenberg, 1838	-	8,10	15	23,24	-	3, 9	A, P, M
<i>A. discoides</i> Ehrenberg, 1843	1,2,3	6,8	16,17	-	-	4, 9, Present study	A, P
<i>A. discoides</i> var. <i>scutelliformis</i> Playfair, 1918	1,2	-	-	22,24	-	3, 4	A, M
<i>A. gibbosa</i> Penard, 1890	2	-	-	-	-	4	A
<i>A. hemisphaerica</i> Perty, 1852	-	13	15,16	-	-	Present study	A, P
<i>A. hemisphaerica</i> f. <i>undulata</i> Deflandre, 1928	2	-	-	-	-	4	A, P
<i>A. megastoma</i> Penard, 1890	1	-	-	-	-	4	A
<i>A. rotundata</i> Playfair, 1918	-	-	15,19	-	-	Present study	A, P
<i>A. rotundata</i> f. <i>undulata</i> Deflandre, 1928	2,3	5,13	15	-	-	4, Present study	A, P
<i>A. vulgaris</i> Ehrenberg, 1832	1,2	10,13	15,16	-	-	4, 9, Present study	A, P
<i>A. vulgaris</i> var. <i>Penardi</i> Deflandre, 1928	-	-	15	-	-	Present study	A, P

1	2	3	4	5	6	7	8
<i>Awerintzevia cyclostoma</i> (Penard, 1902)	-	8	-	-	-	9	P, M
(Syn. <i>Heleopera cyclostoma</i> Penard, 1902)							
<i>Bullinularia indica</i> (Penard, 1907) Deflandre, 1953	-	-	-	28	-	Present study	M
<i>Centropyxis aculeata</i> (Ehrenberg, 1838) Stein, 1857	1,2,3,4	5,6,10,13	15,16	20,21,22,26,27	-	3,4,9, Present study	A, P, M
<i>C. aculeata</i> var. <i>grandis</i> Deflandre, 1929	-	6	-	-	-	4	A, P, M
<i>C. aculeata</i> var. <i>oblonga</i> Deflandre, 1929	2	5	-	25,26	-	3, 4	A, P, M
<i>C. acrophila</i> Deflandre, 1929	1,2,3	13,14	15,16	20,21,22,25,27,28	29	3, 4, Present study	E
<i>C. cassis</i> (Wallich, 1864) Deflandre, 1929	2	13	15	20,21,22,24,25,26	29,31	3, 4, Present study	E
<i>C. constricta</i> (Ehrenberg, 1838) Penard, 1902	1	8,9	15	21,23	30	3, 4, 9	A, P, M
(Syn. <i>Diffugia constricta</i> Ehrenberg, 1838)							
<i>C. deflandriana</i> Bonnet, 1959	-	-	-	28	-	Present study	M, S
<i>C. discoides</i> (Penard, 1890) Deflandre, 1929	-	5,13	15	-	-	4, Present study	A, P
<i>C. cornis</i> (Ehrenberg, 1841) Leidy, 1879	2	13	15,16,19	22	-	3, 4, Present study	A, P, M
<i>C. elongata</i> (Penard, 1890) Thomas, 1959	2	5,13	16	21	-	3, 4, Present study	A, P, M
<i>C. gauthieri</i> Thomas, 1959	-	-	-	28	-	Present study	M, S
<i>C. gibba</i> Deflandre, 1929	-	13	-	-	-	Present study	A
<i>C. laevigata</i> Penard, 1890	2	-	-	-	-	4	A, M
<i>C. marsupiformis</i> (Wallich, 1864) Deflandre, 1929	-	-	15	-	-	Present study	A
<i>C. marsupiformis</i> var. <i>obesa</i> Deflandre, 1929	-	-	15	-	-	Present study	A
<i>C. minuta</i> Deflandre, 1929	-	14	16	20,21,22,25	-	3, Present study	E
<i>C. orbicularis</i> Deflandre, 1929	-	-	-	22	-	3	M, S
<i>C. plagiostoma</i> Bonnet & Thomas, 1955	-	13	-	-	-	Present study	P, M, S
<i>C. platystoma</i> (Penard, 1890) Deflandre, 1929	2	13	15	-	-	4, Present study	A, P
<i>C. sylvatica</i> (Deflandre, 1929) Bonnet & Thomas, 1955	-	12,13	15,16,17	20,21,28	30	3, Present study	E
<i>C. sylvatica</i> var. <i>minor</i> Bonnet & Thomas, 1955	-	-	-	28	-	Present study	M, S
<i>C. vaudeli</i> Bonnet, 1958	-	13	-	-	-	Present study	M, S
<i>Cochliopodium bilimbosum</i> Auerbach, 1856	-	-	-	-	-	Present study	P, M
<i>C. echinatum</i> Korotneff, 1879	2	-	-	-	-	4	A, P
<i>Cochliopodium</i> sp.	3	-	-	-	-	4	A
<i>Cryptodiffugia compressa</i> Penard, 1902	2	-	-	-	-	4	A, P
<i>Cucurbitella mespiliformis</i> Penard, 1902	4	-	-	-	-	4	A, P
<i>Cyclodopsis eurystoma</i> Deflandre, 1929	1,3,4	13	-	20,21,22,23,27	29,30,31	3, 4, Present study	E
<i>C. eurystoma</i> var. <i>parvula</i> Bonnet & Thomas, 1960	-	-	-	20,21,22	-	3	M, P, S
<i>C. kahli</i> Deflandre, 1929	2	13	-	20,21,22,23,28	-	3, 4, Present study	E
<i>Diffugia acuminata</i> Ehrenberg, 1838	1,2,4	6,8,9,10,13	15,16	-	-	4, 9, Present study	A, P

1	2	3	4	5	6	7	8
<i>D. ampullula</i> Playfair, 1918	-	-	15,16,17	-	-	Present study	A
<i>D. avellana</i> Penard, 1890	1	-	-	-	-	4	A
<i>D. bicuris</i> Gauthier-Lievre & Thomas, 1958	-	-	15	-	-	Present study	A
<i>D. bidens</i> Penard, 1902	-	-	15	-	-	Present study	A
<i>D. brevicola</i> Cash, 1909	-	13	16	-	-	Present study	A, P
<i>D. bryophila</i> (Penard, 1902) Jung, 1942	-	13	15,16	-	-	Present study	A, P, M
<i>D. capreolata</i> Penard, 1902	-	-	15	-	-	Present study	A
<i>D. corona</i> Wallich, 1864	-	-	15,16	-	-	Present study	A
<i>D. curvicaulis</i> Penard, 1899	-	-	15	-	-	9	A
(Syn. <i>D. acuminata</i> var. <i>curvata</i> Cash, 1909)							
<i>D. distenda</i> Ogden, 1983	-	-	15	-	-	Present study	A, P
<i>D. elegans</i> Penard, 1890	1,2,3,4	5,6,9,13	15,18	-	-	4, 9, Present study	A, P
<i>D. gasowskii</i> Ogden, 1983	-	13	16	-	-	Present study	A, P
<i>D. glans</i> Penard, 1902	-	-	16	-	-	Present study	A
<i>D. globularis</i> (Wallich, 1864) Leidy, 1877	2	-	-	-	-	4	A, P
<i>D. globulosa</i> Dujardin, 1837	2	-	-	-	-	4	A, P
<i>D. gramin</i> Penard, 1902	-	-	15,16	-	-	Present study	A
<i>D. labiosa</i> Wailes, 1919	-	-	15,16	-	-	Present study	A
<i>D. lacustris</i> (Penard, 1890) Ogden, 1983	-	13	16	-	-	Present study	A
<i>D. lancolata</i> Penard, 1890	1,2,3,4	6	16,18	-	-	4, Present study	A
<i>D. limnetica</i> (Levander, 1900) Penard, 1902	-	11	-	-	-	9	A
<i>D. linearis</i> (Penard, 1890) Gauthier-Lievre & Thomas, 1958	-	-	-	22	-	3	A, M
<i>D. lithophila</i> (Penard, 1902) Gauthier-Lievre & Thomas, 1958	-	5	-	-	-	4	A
<i>D. lobostoma</i> Leidy, 1879	1,2,3,4	6	16	-	-	4, Present study	A, P
<i>D. lucida</i> Penard, 1902	-	13	-	20,22,23,27	29	3, Present study	A, M, S
<i>D. manicata</i> Penard, 1902	-	13	15,16	-	-	Present study	A, P
<i>D. microclaviformis</i> (Kourov, 1925) Ogden, 1983	-	-	15	-	-	Present study	A, P
<i>D. molestia</i> Penard, 1902	-	11	-	-	-	9	A, P
<i>D. nodosa</i> (Leidy, 1879) Ogden & Zivkovic, 1983	-	-	15	-	-	Present study	A
<i>D. oblonga</i> Ehrenberg, 1831 (Syn. <i>Diffugia pyriformis</i> Perty, 1849)	1,2,4	6,7,8,9,10,11,13	15,16	-	-	4, 9, Present study	A, P
<i>D. parva</i> (Thomas, 1954) Ogden, 1983	2,4	-	-	22,23	-	3, 4	A, M
(Syn. <i>D. oblonga</i> var. <i>parva</i> Thomas, 1954)							
<i>D. penardi</i> Hopkinson, 1909	2	5	-	21,22	-	3, 4	A, P
<i>D. petricola</i> Cash, 1909	-	13	15	-	-	Present study	A, P
<i>D. pristis</i> Penard, 1902	-	6,13	16,17,18	-	-	4, Present study	A, P

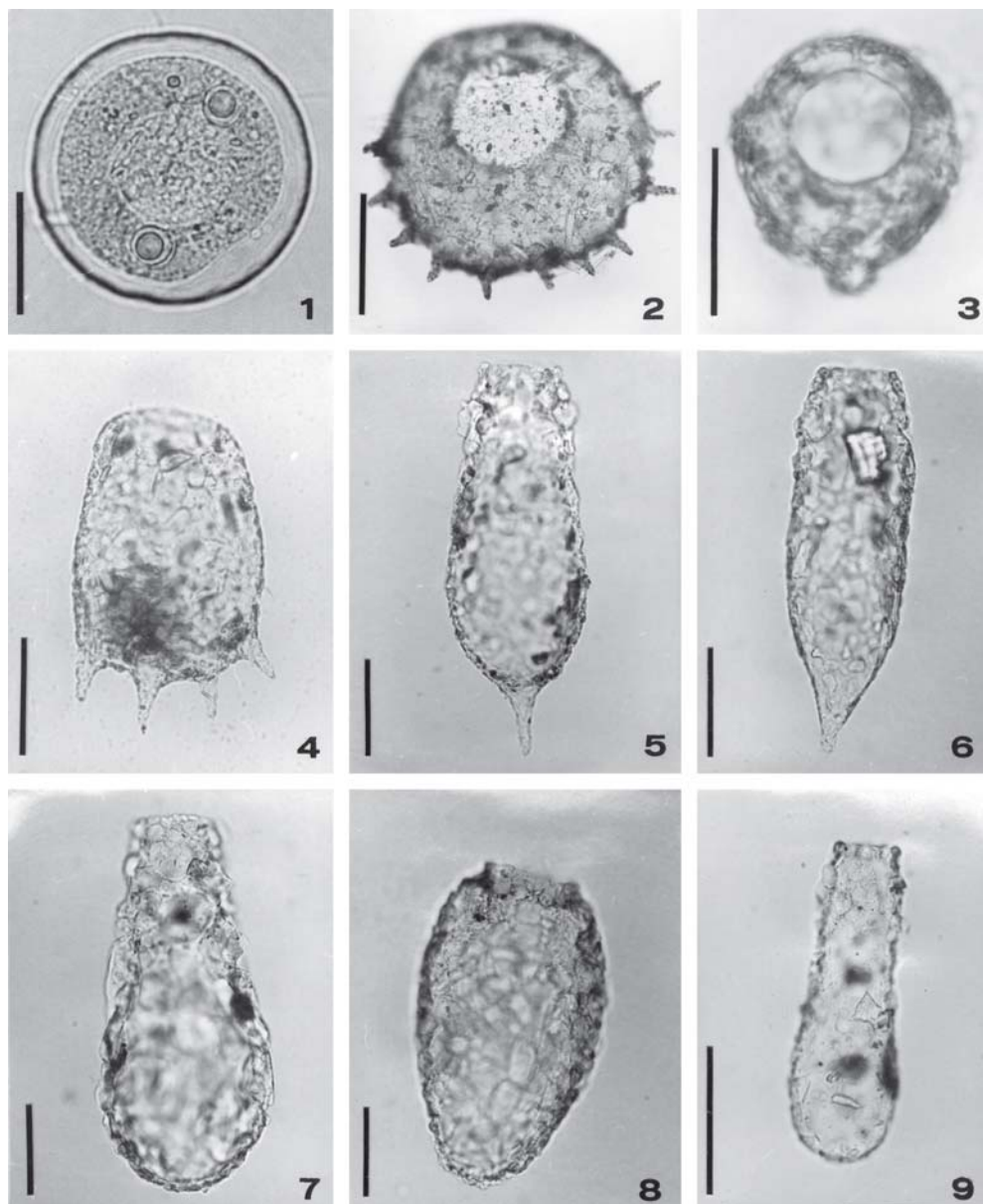
1	2	3	4	5	6	7	8
<i>D. pulex</i> Penard, 1902	-	13	15,16	-	-	Present study	A, P
<i>D. rubescens</i> Penard, 1891	-	5,6	-	24	-	3, 4	A, P, M
<i>D. schurmanni</i> Oye, 1932	-	-	16	-	-	Present study	A
<i>D. uraeolata</i> Carter, 1864	-	10	15	-	-	9, Present study	A, P
<i>D. ventricosa</i> Deflandre, 1926	-	13	16	-	-	Present study	A, P
<i>D. venusta</i> (Penard, 1902) Ogden, 1983	-	13	16	-	-	Present study	A, P
<i>D. viscidula</i> Penard, 1902	-	13	15	-	-	Present study	A, P
<i>Diffugiella oviformis</i> (Penard, 1890) Bonnet & Thomas, 1955	-	-	16	-	-	Present study	A, P, M
<i>D. oviformis</i> var. <i>fusca</i> Penard, 1890	2	13	-	-	-	4, Present study	P, M, S
<i>Heleopera petricola</i> Leidy, 1879	-	8,9,10	-	23,24,27	-	3, 9	P, M
<i>H. rosea</i> Penard, 1890	2,4	13	-	21,22	31	3, 4, Present study	A, P, M
<i>H. sphagni</i> Leidy, 1879	4	-	-	-	-	4	A, P
<i>H. sylvatica</i> Penard, 1890	2	6,13	-	22	-	3, 4, Present study	P, M, S
<i>Hyalosphenia papilio</i> Leidy, 1875	2,4	13	-	26	-	3, 4, Present study	A, P
<i>H. caneata</i> Stein, 1857	-	-	15	-	-	9	A
<i>Lagenodiffugia bryophila</i> (Penard, 1902) Ogden, 1987	2	5,6,8,13	15	21,22,23,24,26,27	-	3,4,9, Present study	A, P, M
(Syn. <i>Pontigulasia bryophila</i> Penard, 1902)							
<i>L. vas</i> (Leidy, 1874) Ogden, 1987	1,3,4,	6,13	-	-	-	4, Present study	A, P
(Syn. <i>Pontigulasia spectabilis</i> Penard, 1902)							
<i>Lesquerusia epistomium</i> Penard, 1902	4	5,10,13	15	-	-	4, 9, Present study	A, P
<i>L. gibbosa</i> Thomas & Gauthier-Lievre, 1859	4	-	-	-	-	4	A, P
<i>L. modesta</i> Rhumbler, 1896	1,3,4	5,6,13	15,16	24	-	3, 4, Present study	A, P
<i>L. spiralis</i> (Ehrenberg, 1848) Butschli, 1890	1,2,4	8,9,10	15	24	-	3, 4, 9	A, P, M
<i>Microclampus patella</i> (Claparede & Lachmann, 1859) Cockerell, 1911	1,2,3,4	5,6,12,13	16,17,19	-	-	4, Present study	E
<i>Microcorycia flava</i> (Greeff, 1866) Penard, 1902	-	11	-	22	31	3, 9	P, M
(Syn. <i>Corycia flava</i> Greeff, 1866)							
<i>Nebela americana</i> Taranek, 1882	-	8	15	-	-	9	A, P
<i>N. bipes</i> (Carter, 1870) Murray	-	8,9,10	-	-	-	10	A, P
<i>N. bohemia</i> Taranek, 1882	2	13	-	26	-	3, 4, Present study	A, P, M
<i>N. collaris</i> (Ehrenberg, 1848) Leidy, 1879	2,4	5,10,13	15	22,26,27	-	3,4,9, Present study	E
<i>N. dentistoma</i> Penard, 1890	2,4	5,8,10,13	15	21,22,23,26,27	-	3,4,9, Present study	E
(Syn. <i>Nebela crenulata</i> Penard, 1893)							
<i>N. flabellulatum</i> Leidy, 1874	2	-	-	-	-	4	A, P
<i>N. galata</i> Penard, 1890	2,4	9,10,13	15	-	-	4, 9, Present study	A, P
<i>N. lageniformis</i> Penard, 1890	2	10,13,14	15	21,22,27	-	3,4,9, Present study	A, P, M

1	2	3	4	5	6	7	8
<i>N. longicollis</i> Penard, 1890	2	-	-	-	-	4	A, P
<i>N. minor</i> Penard, 1902	-	13	-	-	-	Present study	P, M
<i>N. parvula</i> Cash, 1908	2	-	-	21,22	-	3, 4	A, P, M
<i>N. penardiana</i> Deflandre, 1936	4	5,13	-	21,22,23	-	3, 4, Present study	A, P, M
<i>N. speciosa</i> Deflandre, 1936	-	13	-	22	-	3, Present study	P, M
<i>N. tincta</i> (Leidy, 1879) Awerintzew, 1906	2,4	-	-	-	-	4	A, P, M
<i>N. tubulata</i> Brown, 1911	-	13	-	-	-	Present study	P
<i>N. vitrea</i> Penard, 1899	-	13	-	22	-	3, Present study	P, M
<i>N. vitrea</i> var. <i>minor</i> Wailes, 1912	-	-	-	22	-	3	P, M
<i>N. wailesi</i> Deflandre, 1936	2	-	-	-	-	4	A, M, S
<i>Netzelia oviformis</i> (Cash & Hopkinson, 1909) Ogden, 1979	3	-	-	24	-	3, 4	A, P, M
(Syn. <i>Diffugia oviformis</i> Cash, 1909)							
<i>N. tuberculata</i> (Wallich, 1864) Ogden, 1980	2,3,4	6,12,13	15,16,17	-	-	4, 9, Present study	A, P
(Syn. <i>Diffugia tuberculata</i> (Wallich, 1864) Archer, 1867)							
<i>Paraquadrula irregularis</i> (Archer, 1877)	-	-	-	27	-	3	M
<i>Parmulina gyathus</i> Penard, 1902	-	-	-	21	-	3	M
<i>Phryganella acropodia</i> (Hertwig & Lesser, 1874) Hopkinson, 1909	-	13	-	-	29	3, Present study	P, M, S
<i>P. bomisphaerica</i> Penard, 1890	2,4	13	16,17	-	30	3, 4, Present study	A, P, M
<i>P. nidulus</i> Penard, 1901	-	8,10	15	-	-	9	P, M
<i>P. paradoxo</i> Penard, 1902	2	-	-	20	31	3, 4	A, P, M
<i>Plagiopyxis callida</i> Penard, 1910	-	-	-	22	30	3	M, S
<i>P. callida</i> var. <i>grandis</i> Thomas, 1958	-	-	-	21	-	3	M, S
<i>P. declivis</i> Thomas, 1955	3	12,13,14	15,17	28	-	4, Present study	M, S
<i>P. labiata</i> Penard, 1910	-	-	-	20	29,30,31	3	M, S
<i>P. minuta</i> Bonnet, 1959	-	-	-	25	-	3	M, S
<i>P. penardi</i> Bonnet & Thomas, 1955	-	-	-	28	-	Present study	A, P
<i>Pontigulasia elisa</i> (Penard, 1893)	-	-	15	-	-	9	A, P
(Syn. <i>Pontigulasia incisa</i> Rhumbler, 1896)							
<i>Pontigulasia rhumbleri</i> Hopkinson, 1919	-	10,13	15,16	-	-	9, Present study	A
(Syn. <i>Pontigulasia compressa</i> Rhumbler, 1896)							
<i>Pyxidicula patens</i> (Claparede & Lachmann, 1858)	2	-	-	-	-	4	A, P
<i>Quadrullula symmetrica</i> (Wallich, 1864) Schulze, 1863	1,2	10,13,14	15,16	21	-	3,4,9, Present study	A, P
<i>Q. symmetrica</i> var. <i>irregularis</i> Wailes & Penard, 1911	2	-	-	21,22,24,26,27	-	3, 4	A, P
<i>Q. symmetrica</i> var. <i>longicollis</i> Taranek, 1881	2	13	-	26	-	3, 4, Present study	A, P
<i>Wailesella ebouensis</i> (Wailes & Penard, 1911)	-	13	-	-	-	Present study	P

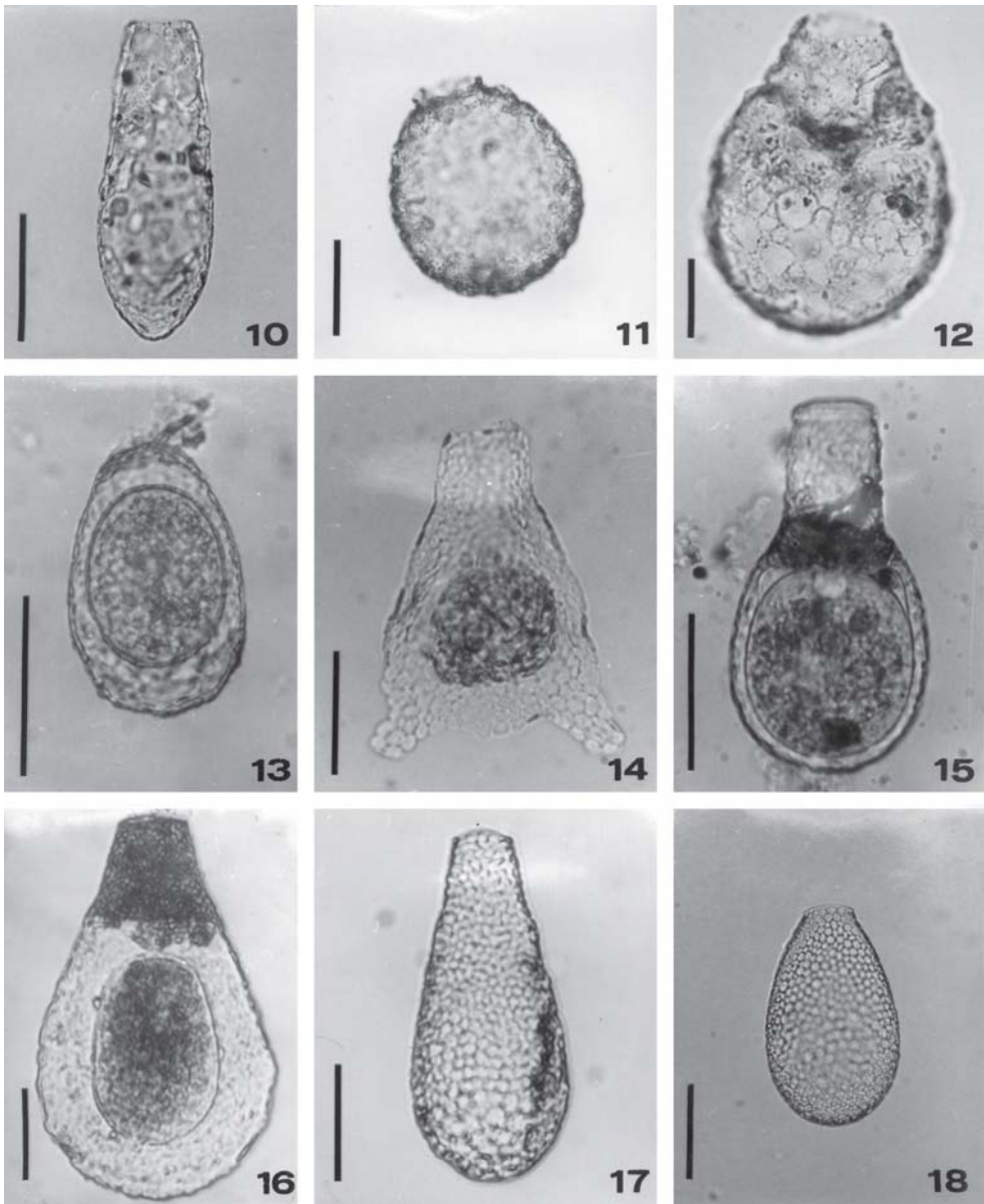
1	2	3	4	5	6	7	8
<i>Zinkovicia compressa</i> (Carter, 1864) Ogden, 1983 (Syn. <i>Pontigulasia bigibbosa</i> Penard, 1902)	1,2	13	16	-	-	4, Present study	A, P
Testaceaflisia							
<i>Amphitrema flavum</i> (Archer, 1877)	2,4	-	-	-	-	4	P
<i>Asulina muscorum</i> Greeff, 1888	2,4	13	-	20,21,22,26	29,30,31	3, 4, Present study	E
<i>A. seminulum</i> (Ehrenberg, 1848) Leidy, 1879	2,4	7	-	-	-	4, 9	P, M
<i>Campascus minutus</i> Penard, 1899	2	13,14	-	-	-	4, Present study	A, P
<i>Clypeolina marginata</i> Penard, 1902	-	-	15	-	-	9	A
<i>Corybion dubium</i> Taranek, 1881	2,3	7,13,14	-	21,22,23,24,26	29,30	3,4,9, Present study	E
<i>C. dubium</i> var. <i>aerophila</i> Declofre, 1950	-	-	-	-	30	3	P, M
<i>Cyphoderia ampulla</i> (Ehrenberg, 1840) Leidy, 1879 (Syn. <i>Cyphoderia margaritacea</i> Ehrenberg, 1840)	1,2	5,6,8,10,13,14	15,18	22,23,27	-	3,4,9, Present study	A, P, M
<i>Euglypha acanthophora</i> (Ehrenberg, 1841) Perty, 1852	1,2,3,4	6	16,19	23	-	3, 4, Present study	A, P, M
<i>E. aspera</i> Penard, 1891	1	8,10	-	-	-	4, 9	A, P
<i>E. brachiata</i> Leidy, 1879	-	9	15	-	-	9	A, P
<i>E. bryophila</i> Brown, 1911	-	13	-	-	-	Present study	P, M
<i>E. ciliata</i> (Ehrenberg, 1848) Leidy, 1879	2	8,13,14	-	22	29,30	3,4,9, Present study	E
<i>E. ciliata</i> f. <i>glabra</i> Wailes, 1915	-	13	-	22	30	3, Present study	P, M
<i>E. compressa</i> Carter, 1864	2	-	-	24	-	3, 4	A, P, M
<i>E. cristata</i> Leidy, 1879	-	13	15	24	-	Present study	P, M
<i>E. compressa</i> f. <i>glabra</i> Wailes, 1915	2,4	13	15	24	-	3,4,9, Present study	A, P, M
<i>E. denticulata</i> Brown, 1912	-	13,14	-	-	-	Present study	P, M, S
<i>E. filifera</i> Penard, 1902	-	13	-	23	-	3, Present study	P, M
<i>E. laevis</i> (Ehrenberg, 1845) Perty, 1852	1,2	6,12,13,14	15,16,17,18	20,21,22,23,24,25	29,30	3,4,9, Present study	E
<i>E. rotunda</i> Wailes & Penard, 1911	1,2,4	5,12,13,14	15,16,17,19	21,22,25,26,27	29,30,31	3, 4, Present study	E
<i>E. strigosa</i> (Ehrenberg, 1871) Leidy, 1879	2,4	-	-	20,21,22,23,26	29,30,31	3, 4	A, P, M
<i>E. strigosa</i> var. <i>heterospina</i> Wailes, 1915	2,4	-	-	23	-	3, 4	A, P, M
<i>E. strigosa</i> var. <i>muscorum</i> Wailes, 1915	-	-	-	22	30	3	P, M
<i>E. tuberculata</i> Dujardin, 1841 (Syn. <i>Euglypha alveolata</i> Dujardin, 1841)	1,2	8,9,13	15,16	21,22,24	-	3,4,9, Present study	A, P, M
<i>Paulindella chromatophora</i> Lauterborn, 1895	-	5,13	15,16	-	-	4, Present study	P, M
<i>Playfarina valkanovi</i> Golemansky, 1966	-	13	-	22	-	3, Present study	P, M
<i>Pseudodiffugia fascicularis</i> Penard, 1902	1,4	6	-	23	-	3, 4	A, P, M
<i>P. gracilis</i> Schlumberger, 1845	2	-	-	-	-	4	A, P
<i>P. gracilis</i> var. <i>tericola</i> Bonnet & Thomas, 1960	-	-	-	28	-	Present study	M, S

1	2	3	4	5	6	7	8
<i>P. virescens</i> Penard, 1902	-	-	15	-	-	9	A
<i>Pseudoflugia</i> sp.	2	-	-	-	-	4	A
<i>Sphenoderia fissirostris</i> Penard, 1902	2,4	-	-	26	-	3, 4	A, P, M
<i>S. lenta</i> Schlumberger, 1845	1	6,10,13	15	-	-	4, 9, Present study	A, P
<i>S. minuta</i> Deflandre, 1931	2,4	-	-	-	-	4	A, P
<i>Tracheleuglypha acolla</i> Bonnet & Thomas, 1955	-	13	15	21,26	-	3, Present study	E
<i>T. dentata</i> (Vejdovsky, 1882) Deflandre, 1953	2,3,4	5	17,19	21,24	-	3, 4, Present study	A, P, M
<i>T. dentata</i> var. <i>elongata</i> (Playfair,1917) Thomas & Gauthier-Lievre, 1959	-	-	-	24	-	3	A, P, M
<i>Trachelocorythion pulchellum</i> Bonnet, 1979	-	13	-	-	-	Present study	P, M, S
<i>Trinema complanatum</i> Penard, 1890	-	8	-	20,22,23,28	-	3, 9	E
<i>T. complanatum</i> var. <i>globulosa</i> Chardez, 1960	2	13,14	-	-	-	4, Present study	A, P, M
<i>T. enchelys</i> (Ehrenberg, 1838) Leidy, 1879	1,2,3,4	5,7,8,10,12,13	15,16	20,22,23	-	3,4,9, Present study	E
<i>T. galeata</i> (Penard, 1890) Jung, 1942	-	-	-	21	29,31	3	M, S
<i>T. lineare</i> Penard, 1890	1,2,3,4	5,6,12,13,14	15,16,17,18,19	20,21,22,23,24,25,26,27	-	3, 4, Present study	E
T o t a l : 197	96	113	89	88	25	-	-

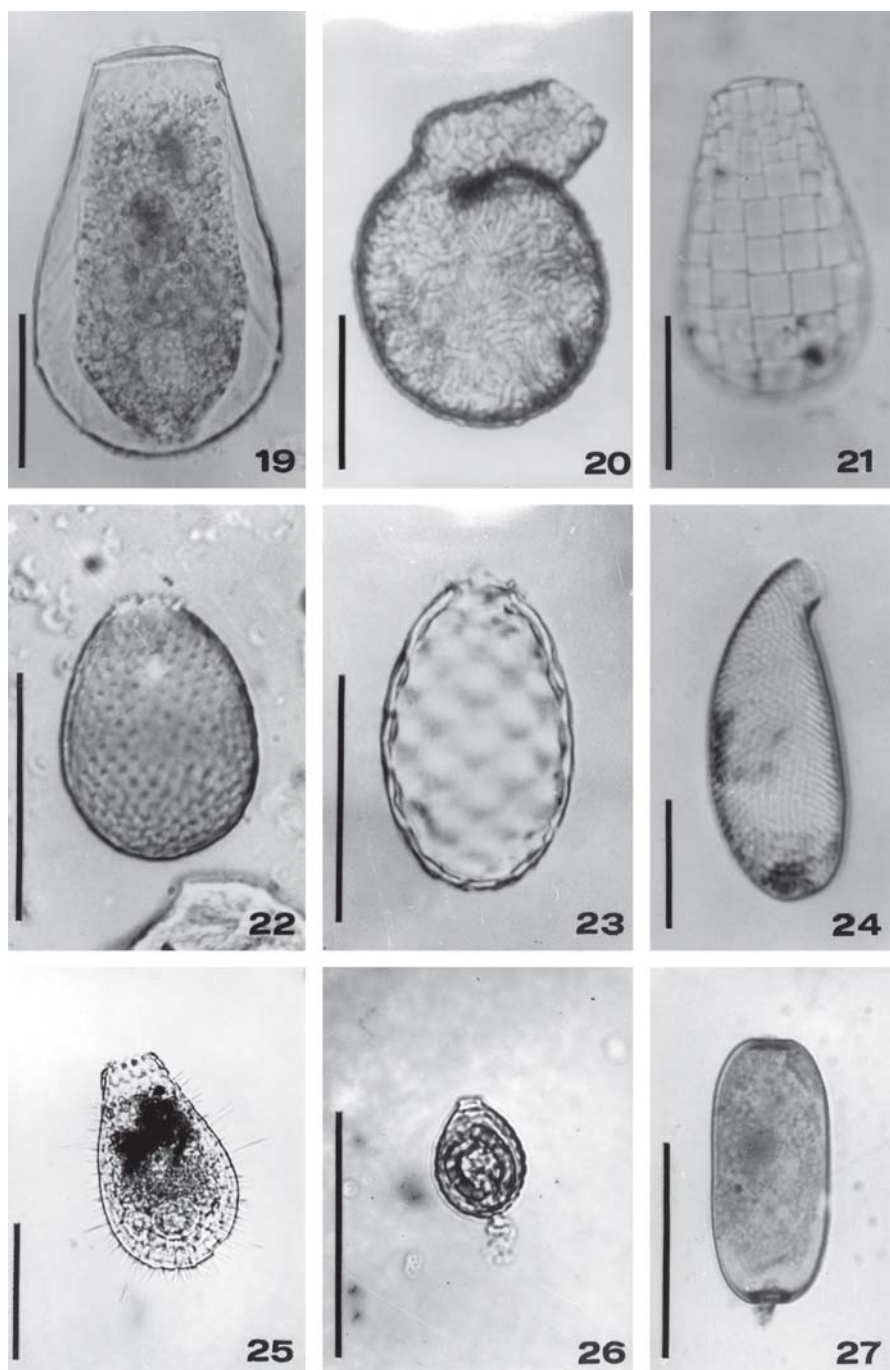
* - The arabic number show the number of publication from the list of references, where the species are recorded;
** - The abbreviations are: A - aquatic, P - peaty-dwelling or sphagnophilous, M - moss-dwelling, S - soil-dwelling, E - eurybiotic.
*** - The names of the naked amoebae are given as they are recorded by the authors.



Figs 1-9. LM photographs of different aquatic and sphagnophilous testate amoebae found in the Western Rhodopes: 1. *Arcella vulgaris* - dorsal view; 2. *Centropyxis aculeata* - ventral view; 3. *Cyclopyxis eurystoma* - ventral view; 4. *Centropyxis marsupiformis* - lateral view; 5. *Diffugia acuminata* - lateral view; 6. *Diffugia ventricosa* - lateral view; 7. *Diffugia oblonga* - lateral view; 8. *Diffugia labiosa* - lateral view; 9. *Diffugia linearis* - lateral view. Scale bars - 50 μ m (in Figs 1-9).



Figs 10-18. LM photographs of different aquatic and sphagnophilous testate amoebae found in the Western Rhodopes: 10. *Diffflugia lanceolata* – lateral view; 11. *Netzelia tuberculata* – lateral view; 12. *Zivkovicia compressa* – lateral view; 13. *Heleopera sylvatica* – lateral view; 14. *Nebela bipes* – lateral view; 15. *Nebela lageniformis* – lateral view; 16. *Nebela galeata* – lateral view; 17. *Nebela penardiana* – lateral view; 18. *Nebela collaris* – lateral view. Scale bars – 50 μm (in Figs 10-18).



Figs 19-27. LM photographs of different aquatic and sphagnophilous testate amoebae found in the Western Rhodopes: 19. *Hyalosphenia papilio* – lateral view; 20. *Lesquereusia epistomium* – lateral view; 21. *Quadrullella symmetrica* – lateral view; 22. *Assulina muscorum* – lateral view; 23. *Tracheleuglypha acolla* – lateral view; 24. *Cyphoderia ampulla* – lateral view; 25. *Euglypha strigosa* var. *heterospina* – lateral view; 26. *Paulinella chromatophora* – lateral view; 27. *Amphitrema flavum* – lateral view. Scale bars – 50 μ m (in Figs 19-27).

diversity was established in the Artificial reservoirs (89 species of 24 genera) and in the Soil mosses (88 species of 29 genera). The fauna of the Epiphytic mosses, compared to that of the previous four habitats, is about four times poorer (25 species of 13 genera only).

The data of Table 1 show that the most frequently occurring testaceans in all studied habitats and localities are: *Trinema lineare* (70.9% occurrence), *Euglypha rotunda* (61.3%), *E. laevis* (58.1%), *Centropyxis aculeata* (48.4%), *Trinema enchelys* (45.2%) and *Cyphoderia ampulla* (41.9%). Only 5 of all 197 established testate amoebae were found in all studied habitats: *Centropyxis aerophila*, *C. cassis*, *C. constricta*, *Euglypha rotunda* and *E. laevis*. Another 26 species were present in 4 of the studied habitats, and about 45% (86 taxa) of all established rhizopods were represented in one habitat only. These characteristic species, which are typical for one habitat and have limited distribution or are entirely absent in other habitats, were represented in the 5 studied habitats in Western Rhodopes as follows: Natural Lakes (24), Artificial reservoirs (24), Peat-bogs and swamps (18), Soil mosses (18) and Epiphytic mosses (2). These characteristic species are mainly from the genera *Diffflugia* (20), *Centropyxis* (11), *Nebela* (8) and *Arcella* (5). It is noteworthy that the characteristic species of the genus *Diffflugia* are represented in the testacean taxocenoses of the Artificial reservoirs (13) and of the Natural Lakes (3), these of the genus *Nebela* – in the Natural Lakes (4) and in the Peat-bogs and swamps (3), of the genus *Arcella* – in the Natural Lakes (3) and in the Artificial reservoirs (2), and of the genus *Euglypha* – in the Peat-bogs and swamps (3).

In conclusion, notwithstanding the limited number of the investigations on the rhizopods of the Western Rhodopes till now, these protozoans are widely distributed and have a comparatively big diversity. In support of that are the data for the rhizopods of the other mountains in Bulgaria. For example, the rhizopodic taxocenoses in the Rila Mountain include 178 taxa, in the Vitosha Mountain – 164 taxa, in the Pirin Mountain – 148 taxa and in the Central Balkan – 108 taxa (GOLEMANSKY & TODOROV, 1990; TODOROV, 1998; DELCHEV et al., 2000a, 2000b).

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Разнообразие и биотопично разпространение на ризоподите (Rhizopoda: *Lobosia* и *Filosia*) от Западните Родопи (България)

ВАСИЛ ГОЛЕМАНСКИ, МИЛЧО ТОДОРОВ, БЛАГОВЕСТ ТЕМЕЛКОВ

(Р е з ю м е)

Обобщени са всички налични до момента данни относно ризоподната фауна на Западните Родопи. За 112 вида текамеби (67 познати от досегашните изследвания и 45 нови за изследвания район) се дават нови данни за тяхното разпространение. Общо за различните изследвани досега хабитати от Западните Родопи се съобщават 197 вида и вариетета от 44 рода на голите и черупчестите амеби. Резултатите от изследванията показват, че в изследваните хабитати доминиращи са роговете *Diffugia* (41 вида), *Centropyxis* (22), *Nebela* (18), *Euglypha* (17) и *Arcella* (13). Най-често срещани се видове във всички изследвани локалитети и хабитати са: *Trinema lineare* (70.9% срещаемост), *Euglypha rotunda* (61.3%), *E. laevis* (58.1%), *Centropyxis aculeata* (48.4%), *Trinema enchelys* (45.2%) и *Cyphoderia ampulla* (41.9%). Относно разпространението на черупчестите амеби в различните типове местообитания е установено, че с най-голямо разнообразие се отличават Естествените езера и Сфазновите мочури и блатата (съответно 113 вида от 34 рода и 96 вида от 32 рода). Сравнението между ризоподната фауна на изследвания район и тази на другите планини в България показва, че видовото разнообразие на ризоподите в Западните Родопи е най-голямо.