

Brief survey of testate amoeba research in Hungary, and a synopsis of species

By

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Abstract. This report summarizes the results hitherto achieved in the study of testate amoebae in Hungary since the beginnings (1876). Part one presents the list of identified taxa: altogether 201 species, 71 subspecies and infraspecific categories have been recorded, 3 species appeared only out of the present borders of Hungary. A list of all mentioned synonyms is given together with the relevant references. As far, 10 new testacean taxa have been described in the district of Hungary. Part two deals with the historical aspect: scientists and sampling areas of special interest are introduced. Geographic distribution of sampling sites and biotope types are described.

Taxonomy, faunistics and ecological research all need reliable grounds, therefore one must emphasize the correctness of species data. For testate amoebae, yet a conspicuous group of protists, the last faunistic synopsis displaying their contribution to the Hungarian fauna was written more than one hundred years ago (28). The large amount of research and literature produced during the present century makes a new synopsis of the Hungarian testaceans now timely, so this report attempts to fulfil this need on the basis of the widely scattered literature. Quite a few papers of the early workers are difficult to achieve, since only few libraries have the relevant volumes. Latter fact is another argument which makes this task most acute.

This paper yields a complete list of testaceans ever recorded in Hungary. The list serves as a reference for protozoologists and provides a useful ground work for the non-specialists.

Part I

Altogether 272 taxa have been reported from Hungary since 1876 (Table 1). Among them 201 valid species appear to be included. Rest of the list contains 37 subspecies and infraspecific categories, as well as 34 synonyms. Three *Euglypha* species, *Pleurophrys helix* Entz and the two varieties of *Diffflugia* described by Daday were recorded exclusively from areas that belong to the neighbouring countries since 1920 (note * in Tables 1, 2).

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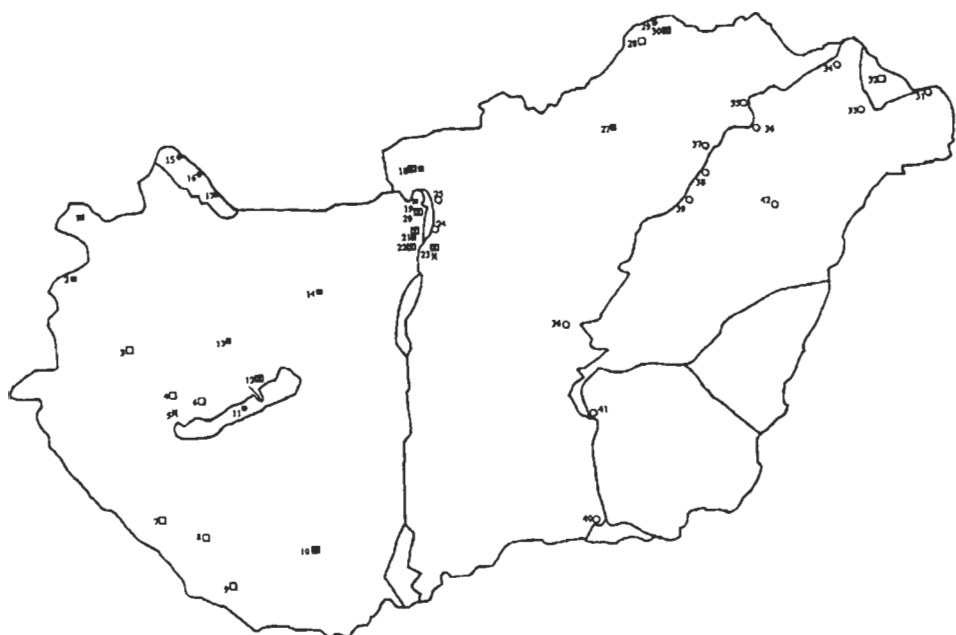


Fig. 1. Geographic distribution of testaceans' sampling areas in Hungary from 1876. Sites situated in the historical Hungary - today parts of neighbouring countries - are also depicted.

Genera *Diffflugia*, *Centropyxis*, *Arcella* and *Nebela* proved to be the richest with 50, 17, 15 and 15 species, respectively. 19 genera comprised only one species, each.

Many authors used somewhat outdated, or not widely accepted taxonomic names during identification. This resulted in a large number of synonyms. This phenomenon seemed most remarkable in the genus *Diffflugia* (especially in the „*oblonga* group“).

Hungarian researchers described 10 species and varieties from Hungary (Table 2). However, these taxonomic names have apparently not been used, or just exceptionally mentioned by other authors since their description (15).

Presumably, subsequent faunal surveys will reveal further testacean species. According to the European literature, over species even some genera will very probably be recorded from Hungary.

Considering the geographic distribution of the sampling sites, one can recognize certain favoured areas of collection (Fig. 1). In the last, and the beginning of this century, these included the edge of the Carpathic Basin, mainly Transsylvania. Throughout the latter area collections and the subsequent surveys were carried out mainly by Géza Entz sen. and Jenő Daday. Entz can be respected as the initiator of the Hungarian testacean research (26). Prior to his carrier, there were no written data on these protists in Hungary. However, only some years later, Margó published his comprehensive book about the fauna of Budapest and its vicinity (48), including six testacean species. Budapest was the other place which attracted much attention of the early scientists. In addition to Margó's volume, 3 more papers participated in the recognition of testaceans in the same area within the next 50 years (46, 47, 50).

The most intensive faunistic surveys on testate amoebae were completed by Daday at that time, although he showed much more interest in the larger representants of the „microfauna“ as termed in those days (16-23). Actually, he carried out the identification of testaceans in the comprehensive volume about the fauna of Nagyvárad (45). He described two varieties from Hungary, however, he made his most important contribution to the group of testaceans processing many samples originating from other continents (24, 25).

After the Second World War, researchers' attention was directed toward certain biotope types. Varga and Biczók focused on the soil biotopes (1-3, 11, 55-61, 63) and they were the first to start experimental researches involving testaceans in Hungary (10-14, 62, 64).

Sphagnum bogs, scanty and declining in Hungary, have been subject of faunistic analyses from time to time (43, 44, 55) displaying the decrease and disappearance of rare species (e.g. *Amphitrema* spp).

Among natural waters, Lake Balaton, River Tisza and River Danube were especially regarded almost from the beginnings (31, 19, 46, 32-41, 4, 6-9, 53). Over faunistic work, various ecological surveys have been carried out on testaceans inhabiting the aquatic biotopes.

Two foreign scientists, Ertl (30) from Czechoslovakia and Grospietsch (42) from Germany completed a nice paper each, collecting samples during their holiday in Abaliget and Hévíz, respectively.

References include all the relevant bibliography on the subject outlined above.

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Table 1. Testacean taxa described in Hungary from 1876
(*: species collected from sampling area that ceased to be Hungarian territory in 1920)

Taxa	References
* <i>Diffugia acuminata</i> var. <i>duplicata</i> Daday, 1892	21;
* <i>Diffugia acuminata</i> var. <i>furcata</i> Daday, 1892	21; 15;
<i>Diffugia balatonica</i> Bereczky, 1973	7;
<i>Diffugia baradlana</i> Varga, 1963	63; 5;
<i>Diffugia oblonga</i> var. <i>curvicollis</i> Varga, 1963	63; 5; 6;
* <i>Euglypha pusilla</i> Entz, 1877	27; 15;
<i>Euglypha tiscia</i> Gál, 1969	37; 38; 39;
* <i>Pleurophrys helix</i> Entz, 1877	27;
<i>Pontigulasia bigibbosa</i> var. <i>minor</i> Varga, 1963	63; 5;
<i>Trinema verrucosa</i> Francé, 1897	31;

Table 1. Testate amoebae recorded in Hungary during the period 1876-1997
(*: species identified from sampling area that ceased to be Hungarian territory in 1920)

Taxa	References
1 <i>Amphitrema flavum</i> Archer, 1877	55;
2 <i>Amphitrema stenostoma</i> Nüsslin, 1884	11; 55;
3 <i>Amphitrema wrightianum</i> Archer, 1869	55;
4 <i>Amphizonella violacea</i> Greeff, 1886	50; 55; 56; 60; 44;
5 <i>Arcella arenaria</i> Greeff, 1886	57; 59; 60; 30; 8; 9; 51; 52;
6 <i>Arcella artocrea</i> Leidy, 1879	10; 11; 13; 55;
<i>Arcella artocrea</i> var. <i>pseudocatinus</i> Deflandre, 1928	30;
7 <i>Arcella catinus</i> Penard, 1890	43; 55; 30; 32; 8; 40;
8 <i>Arcella costata</i> Ehrbg., 1847	55; 3; 59; 38; 39; 40; 41;
9 <i>Arcella conica</i> Deflandre, 1928	4;
10 <i>Arcella dentata</i> Ehrbg., 1830	17; 22; 45; 50; 31; 55; 41; 4; 42;
11 <i>Arcella discooides</i> Ehrbg., 1872	43; 49; 11; 2; 55; 3; 60; 32; 33; 34; 35; 36; 37; 38; 39;
<i>Arcella discooides pseudovulgaris</i> Deflandre, 1928	40; 41; 4; 6; 8; 9; 42; 51; 53;
12 <i>Arcella excavata</i> Cunningham, 1919	42;
13 <i>Arcella gibbosa</i> Penard, 1890	53;
<i>Arcella gibbosa laevis</i> Deflandre, 1928	49; 32; 33; 34; 36; 38; 39; 40; 41; 8; 42;
14 <i>Arcella hemisphaerica</i> Perty, 1852	36; 42;
<i>Arcella hemisphaerica intermedia</i> Deflandre, 1928	49; 55; 3; 37; 32; 33; 34; 36; 38; 39; 40; 41; 42; 53;
<i>Arcella hemisphaerica undulata</i> Deflandre, 1928	42;
15 <i>Arcella megastoma</i> Penard, 1902	42;
16 <i>Arcella mitrata</i> Leidy, 1879	8; 9; 42;
17 <i>Arcella polypora</i> Penard, 1890	46; 50;
= 18 <i>Arcella rotunda</i>	49; 42;
<i>Arcella rotunda</i> var. <i>aplanata</i> Deflandre, 1928	3;
18 <i>Arcella rotundata</i> Playfair, 1918	40;
<i>Arcella rotundata stenostoma</i> Deflandre, 1928	60; 42;
<i>Arcella rotundata aplanata</i> Deflandre, 1928	42;
19 <i>Arcella vulgaris</i> Ehrbg., 1832	32; 33; 34; 36; 36; 37; 38; 39; 42;
<i>Arcella vulgaris</i> var. <i>angulosa</i> Leidy, 18	48; 16; 17; 19; 21; 22; 23; 45; 50; 31; 46; 49; 1; 2; 55;
<i>Arcella vulgaris polymorpha</i> Deflandre, 1928	3; 37; 32; 34; 36; 38; 39; 40; 41; 44; 8; 9; 42; 53;
<i>Arcella vulgaris</i> f. <i>undulata</i> Deflandre, 1928	49;
20 <i>Assulina muscorum</i> Greeff, 1888	4;
21 <i>Assulina scandinavica</i> Penard, 1890	4; 44; 8; 9;
22 <i>Assulina seminulum</i> Ehrbg., 1848	43; 11; 12; 55; 57; 59; 60; 61; 44; 51; 52;
23 <i>Awerinczevia cyclostoma</i> Penard, 1902	55;
24 <i>Bullinula indica</i> Penard, 1907	16; 50; 43; 55; 57; 44;
25 <i>Campascus minutus</i> Penard, 1899	30; 52;
26 <i>Campascus triqueter</i> Penard, 1899	55; 44; 8;
27 <i>Centropyxis aculeata</i> (Ehrbg.) Stein, 1857	42;
<i>Centropyxis aculeata</i> var. <i>discooides</i> Penard, 1890	42;
<i>Centropyxis aculeata grandis</i> Deflandre, 1929	48; 16; 17; 18; 19; 21; 22; 23; 50; 31; 46; 43; 49; 11; 1;
<i>Centropyxis aculeata</i> var. <i>oblonga</i> Deflandre, 1929	2; 3; 55; 63; 32; 33; 34; 35; 36; 37; 38; 39; 40; 41; 4; 5;
28 <i>Centropyxis aerophila</i> Deflandre, 1929	6; 7; 44; 8; 9; 42; 53;
<i>Centropyxis aerophila</i> var. <i>sphagnicola</i> Defl., 1929	11; 1; 2; 3;
<i>Centropyxis aerophila</i> f. <i>kryptostoma</i> Schönborn, 1964	42;
syn 55 <i>Centropyxis arcelloides</i> Penard, 1902	1; 2; 3; 30; 63; 5; 42; 53;
29 <i>Centropyxis cassis</i> Deflandre, 1929	57; 59; 60; 61; 30; 5; 51; 52; 53;
<i>Centropyxis cassis spinifera</i> Playfair, 1918	55; 30; 44; 44; 8; 51; 52; 53;
30 <i>Centropyxis constricta</i> Deflandre, 1929	57; 63; 30; 5;
31 <i>Centropyxis discooides</i> Penard, 1902	51;
32 <i>Centropyxis ecornis</i> Ehrbg., 1838	1; 2; 57; 59; 32; 33; 38; 39; 44;
33 <i>Centropyxis elongata</i> (Penard) Thomas, 1959	42; 51;
syn 56 <i>Centropyxis eurystoma</i> Deflandre, 1929	63; 5;
34 <i>Centropyxis gibba</i> Deflandre, 1929	11; 12; 13; 1; 2; 55; 56; 57; 58; 3; 59; 61; 30; 32; 33;
	34; 35; 36; 37; 38; 39; 40; 4; 5; 6; 7; 44; 8; 9; 42; 52;
	53;
	63; 4; 5; 6; 7; 8; 9; 40; 42; 53;
	17; 55; 57; 59; 42; 53;
	51; 53;
	59;
	63; 5; 6; 7; 42; 53;

Table 1. (cont.)

	Taxa	References
35	<i>Centropyxis hirsuta</i> Deflandre, 1920	4; 5; 6; 7; 8; 9; 42;
36	<i>Centropyxis laevigata</i> Penard, 1890	43; 3; 55; 57; 59; 60; 61; 63; 30; 5;
37	<i>Centropyxis lata</i> Jung, 1942	2; 3;
38	<i>Centropyxis marsupiformis</i> Deflandre, 1929	30; 53;
39	<i>Centropyxis minuta</i> Deflandre, 1929	61; 4; 5; 44; 42; 51;
40	<i>Centropyxis orbicularis</i> Deflandre, 1929	51; 52; 53;
41	<i>Centropyxis patula</i> Stepánek, 1967	5;
42	<i>Centropyxis plagiostoma</i> Bonnet & Thomas, 1955	52;
43	<i>Centropyxis platystoma</i> (Penard) Deflandre, 1929	5; 6; 7; 42; 51; 53;
	<i>Cingodifflugia laevis</i> = <i>Difflugia tuberculata</i> var. <i>laevis</i> Penard, 1912	3;
44	<i>Clypeolina marginata</i> Penard, 1902	57;
45	<i>Cochliopodium ambiguum</i> Penard, 1904	14; 57;
46	<i>Cochliopodium bilimbosum</i> Auerbach, 1856	50;
47	<i>Cochliopodium echinatum</i> Korotnef, 1880	57; 59; 62;
48	<i>Cochliopodium granulatum</i> Penard, 1890	56; 57; 59; 60; 61; 62; 7;
49	<i>Cochliopodium obscurum</i> Penard, 1890	32; 33; 36;
syn 145	<i>Corycia flava</i> Greeff, 1866	60;
50	<i>Corythion dubium</i> Taranek, 1882	43; 55; 57; 59; 60; 61; 44; 42; 51; 52;
51	<i>Corythion pulchellum</i> Penard, 1890	43; 11; 55; 3; 42; 51;
52	<i>Cryptodifflugia compressa</i> Penard, 1902	55;
syn 111	<i>Cryptodifflugia oviformis</i> Penard, 1890	10; 11; 12; 13; 1; 2; 14; 55; 57; 60; 61; 62; 36; 38; 39;
		40; 44;
53	<i>Cryptodifflugia vulgaris</i> Francé, 1913	55; 56; 57; 61;
54	<i>Cucurbitella mespilliformis</i> Penard, 1901	3;
55	<i>Cyclopyxis arcelloides</i> Penard, 1902	3; 63; 5; 6; 7; 42; 52; 53;
56	<i>Cyclopyxis eurystoma</i> Deflandre, 1929	57; 60; 63; 30; 5; 42; 51; 52;
57	<i>Cyclopyxis kahli</i> Deflandre, 1929	30; 8; 42; 51; 52;
58	<i>Cyphoderia ampulla</i> Ehrbg., 1840	17; 18; 55; 30; 4; 5; 6; 7; 44; 8; 9; 42; 53;
59	<i>Cyphoderia laevis</i> Penard, 1902	32; 36; 39; 40; 41; 4; 5; 6; 7; 42; 53;
syn 58	<i>Cyphoderia margaritacea</i> (Ehrbg.) Schlumberger, 1845	21; 23; 45; 43; 1; 2; 3; 32; 33; 34; 35; 36; 37; 38; 39;
		40; 41;
	<i>Cyphoderia margaritacea</i> var. <i>major</i> Penard, 1891	32; 33; 38; 39; 40;
60	<i>Cyphoderia trochus</i> Penard, 1899	37; 32; 33; 35; 38; 39; 40; 6; 7; 9; 42;
61	<i>Difflugia achlora</i> (Penard) Ogden, 1980	53;
62	<i>Difflugia acuminata</i> Ehrbg., 1838	16; 17; 19; 20; 21; 22; 23; 45; 50; 31; 49; 3; 32; 33;
		34; 35; 38; 39; 40; 41; 4; 8; 9; 42; 53;
*	<i>Difflugia acuminata</i> var. <i>duplicata</i> Daday, 1892	21;
*	<i>Difflugia acuminata</i> var. <i>furcata</i> Daday, 1892	21;
syn 78	<i>Difflugia acuminata inflata</i> Penard, 1899	42;
63	<i>Difflugia amphora</i> Leidy, 1867	32; 35; 37; 38; 39; 40; 41; 4; 6; 7; 8; 9; 42; 53;
64	<i>Difflugia avellana</i> Penard, 1890	49; 58; 3; 33; 38; 39; 40; 5; 42; 53;
65	<i>Difflugia bacillariorum</i> Perty, 1849	42;
66	<i>Difflugia bacillifera</i> Penard, 1902	55; 42;
	<i>Difflugia bacillifera</i> var. <i>inflata</i> Penard, 1890	49;
67	<i>Difflugia balatonica</i> Bereczky, 1973	7;
68	<i>Difflugia baradlana</i> Varga, 1963	63; 5;
69	<i>Difflugia bicornis</i> Penard, 1890	53;
70	<i>Difflugia bicurris</i> G.L. & Thomas, 1958	53;
71	<i>Difflugia bidens</i> Penard, 1902	6; 7; 8; 42;
72	<i>Difflugia brevicolla</i> Cash, 1909	55;
73	<i>Difflugia bryophila</i> (Penard) Jung, 1942	51; 52; 53;
74	<i>Difflugia clavata</i> Penard	49;
syn 30	<i>Difflugia constricta</i> Ehrbg., 1841	18; 19; 22; 50; 31; 2;
75	<i>Difflugia corona</i> Wallich, 1864	19; 20; 21; 22; 23; 45; 50; 38; 39; 40; 41; 6; 7; 8; 42;
		53;
76	<i>Difflugia craterella</i> Francé, 1913	59; 61;
77	<i>Difflugia curvicaulis</i> Penard, 1899	49; 32; 38; 40; 53;
	<i>Difflugia curvicaulis inflata</i> Decloitre	53;
78	<i>Difflugia distenda</i> (Penard) Ogden, 1983	53;
79	<i>Difflugia elegans</i> Penard, 1890	37; 32; 35; 38; 39; 40; 5; 6; 7; 8; 9; 42; 53;
	<i>Difflugia elegans</i> var. <i>teres</i> Penard, 1899	5; 7; 53;
80	<i>Difflugia elongata</i> Penard, 1905	42;
81	<i>Difflugia fallax</i> Penard, 1890	11; 13; 1; 2; 3; 55; 5; 6; 7; 53;
82	<i>Difflugia gassowskii</i> (Gassowsky) Ogden, 1983	53;

Table 1. (cont.)

Taxa	References
83 <i>Diffugia glans</i> Penard, 1902	55; 30;
84 <i>Diffugia globulosa</i> Dujardin, 1837	48; 16; 17; 18; 20; 21; 22; 45; 50; 31; 46; 47; 49; 1; 2; 14; 55; 60; 63; 32; 38; 39; 40; 41; 4; 42; 11; 12; 13; 3; 56; 59; 61;
syn 84 <i>Diffugia globulus</i> (Ehrbg., 1848)	
i.p.	
85 <i>Diffugia gramen</i> Penard, 1902	32; 33; 34; 35; 36; 37; 38; 39; 41; 4; 5; 8; 9; 40; 42; 53;
86 <i>Diffugia lacustris</i> (Penard) Ogden, 1983	3; 53;
87 <i>Diffugia lanceolata</i> Penard, 1890	49; 11; 32; 33; 34; 35; 37; 38; 39; 40; 41; 42;
88 <i>Diffugia lebes</i> Penard, 1902	42; 53;
89 <i>Diffugia lemani</i> Blanc, 1892	30; 5; 53;
90 <i>Diffugia limnetica</i> (Levander) Penard, 1902	6; 7; 8; 53;
91 <i>Diffugia linearis</i> (Penard) G.L. & Thomas, 1958	53;
92 <i>Diffugia lithoplites</i> Penard, 1902	55;
93 <i>Diffugia lobostoma</i> Leidy, 1879	22; 46; 47; 49; 11; 13; 3; 33; 38; 39; 41; 4; 8; 9; 42; 53;
94 <i>Diffugia lucida</i> Penard, 1890	43; 55; 60; 63; 30; 5; 6; 7; 44; 42; 51; 52; 53;
95 <i>Diffugia mammillaris</i> Penard, 1893	32; 33; 35; 36; 38; 39; 41; 5; 6; 7; 53;
96 <i>Diffugia manicata</i> Penard, 1902	1; 3; 53;
97 <i>Diffugia mica</i> Frenzel, 1892	42;
98 <i>Diffugia microclaviformis</i> (Kourov) Ogden, 1983	6; 53;
99 <i>Diffugia minuta</i> Rampi, 1950	53;
syn 62 <i>Diffugia oblonga acuminata</i> Ehrbg., 1838	5; 6; 7;
<i>Diffugia oblonga angusticollis</i> Stepánek, 1952	5;
syn 72 <i>Diffugia oblonga brevicollis</i> Cash, 1909	5; 6; 7;
syn 73 <i>Diffugia oblonga bryophila</i> Penard, 1902	30; 5;
<i>Diffugia oblonga caudata</i> Stepánek, 1952	6; 7;
syn <i>Diffugia oblonga claviformis</i> (Penard) Stepánek, 1967	7; 42;
<i>Diffugia oblonga curvicollis</i> Varga, 1963	5; 6;
100 <i>Diffugia oblonga</i> Ehrbg., 1838	55; 57; 58; 3; 60; 63; 30; 4; 5; 6; 44; 8; 9; 42; 51; 52; 53;
syn 86 <i>Diffugia oblonga lacustris</i> , Penard, 1902	42;
syn 96 <i>Diffugia oblonga manicata</i> Penard, 1902	5;
<i>Diffugia oblonga nodosa</i> Leidy, 1879	42;
syn 73 <i>Diffugia oblonga</i> var. <i>bryophila</i> Penard, 1902	30;
syn 77 <i>Diffugia oblonga</i> var. <i>curvicaulis</i> Penard, 1899	7; 44;
<i>Diffugia oblonga</i> var. <i>curvicollis</i> Varga, 1963	63;
syn 162 <i>Diffugia oviformis</i> Cash, 1909	55; 3; 63; 30; 32; 34; 38; 39; 40; 4; 5; 44;
101 <i>Diffugia penardi</i> Hopkinson, 1909	11; 1; 2; 3;
102 <i>Diffugia pristis</i> Penard, 1902	1; 2; 3; 56; 63; 5; 6; 7; 53;
syn <i>Diffugia proteiformis</i> Ehrbg. 1838	48;
93i.p.	
103 <i>Diffugia pulex</i> Penard, 1902	53;
syn 100 <i>Diffugia pyriformis</i> Perty, 1848	16; 17; 18; 21; 23; 45; 50; 31; 46; 47; 43; 49; 1; 2; 3; 57; 32; 34; 38; 39; 40; 41;
syn <i>Diffugia pyriformis</i> var. <i>claviformis</i> Penard, 1899	49;
<i>Diffugia pyriformis</i> var. <i>grandis</i> Penard	49;
syn 73 <i>Diffugia pyriformis</i> var. <i>bryophila</i> Penard, 1902	43; 11;
syn 86 <i>Diffugia pyriformis</i> var. <i>lacustris</i> Penard, 1899	43;
104 <i>Diffugia rubescens</i> Penard, 1902	1; 55; 42; 53;
105 <i>Diffugia scalpellum</i> Penard, 1899	6; 7; 53;
106 <i>Diffugia stouti</i> Ogden, 1983	51;
107 <i>Diffugia tuberculata</i> (Wallich, 1864)	1; 42;
108 <i>Diffugia urceolata</i> Carter, 1864	16; 18; 20; 21; 22; 45; 50; 31; 6; 7; 8; 42; 53;
<i>Diffugia urceolata</i> var. <i>olla</i> Leidy, 1879	21; 53;
109 <i>Diffugia varians</i> Penard, 1902	42;
syn 179 <i>Diffugia vas</i> Leidy, 1879	17;
110 <i>Diffugia viscidula</i> Penard, 1902	3; 6; 7;
111 <i>Diffugiella oviformis</i> (Penard) Bonnet & Thomas, 1955	51; 52;
112 <i>Euglypha acanthophora</i> Ehrbg., 1843	55; 3; 60; 5; 6; 9; 7; 42; 51; 53;
113 <i>Euglypha alveolata</i> Dujardin, 1841	26; 16; 19; 22; 45; 50; 31; 46; 47; 43; 10; 49; 11; 12; 13; 1; 2; 3; 14; 55; 56; 57; 59; 62; 37; 32; 33; 35; 36; 38; 39; 41; 44; 9;
syn 116 <i>Euglypha ampullacea</i> Hertwig & Lesser	31;

Table 1. (cont.)

Taxa	References
114 <i>Euglypha brachiata</i> Leidy, 1879	1; 3; 32; 33; 35; 36; 38; 39; 40; 41;
115 <i>Euglypha ciliata</i> Ehrbg., 1848	16; 22; 50; 46; 43; 11; 55; 57; 58; 3; 59; 32; 33; 36; 38; 39; 41; 4; 44; 52;
<i>Euglypha ciliata</i> var. <i>glabra</i> Leidy, 18	11;
116 <i>Euglypha compressa</i> Carter, 1864	26; 55; 30; 42; 51;
117 <i>Euglypha cristata</i> Leidy, 1879	43; 11; 55; 57; 3; 59; 5; 44; 42; 51; 52;
118 <i>Euglypha filifera</i> Penard, 1890	55; 44; 51;
119 <i>Euglypha globosa</i> Carter, 1865	26; 50;
120 <i>Euglypha laevis</i> Perty, 1849	11; 12; 13; 1; 3; 55; 56; 57; 58; 59; 60; 61; 30; 32; 33; 36; 38; 39; 40; 4; 6; 7; 44; 8; 42; 51; 52; 53;
121 * <i>Euglypha macrolepis</i> Leidy	45;
122 * <i>Euglypha mucronata</i> Leidy, 1878	45;
123 * <i>Euglypha pusilla</i> Entz, 1877	27;
124 <i>Euglypha rotunda</i> Wailes, 1911	11; 13; 14; 42; 51; 52; 53;
125 <i>Euglypha strigosa</i> Ehrbg., 1872	43; 11; 1; 3; 55; 59; 42; 51;
126 <i>Euglypha tiscia</i> Gál, 1969	37; 38; 39; 40;
127 <i>Euglypha tuberculata</i> Dujardin, 1841	30; 5; 51; 52;
128 <i>Geopyxella sylvicola</i> Bonnet, 1955	52;
129 <i>Gromia fluviatilis</i> Dujardin, 1835	48;
syn 129 <i>Gromia terricola</i> Leidy, 1879	46;
130 <i>Heleopera petricola</i> Leidy, 1879	55; 57; 3; 60; 63; 30; 5; 51;
<i>Heleopera petricola</i> var. <i>amethysta</i> Penard, 1902	30;
131 <i>Heleopera picta</i> Leidy, 1879	16; 55; 3; 61;
132 <i>Heleopera rosea</i> Penard, 1890	43; 55; 57; 59; 60; 61; 51; 52;
133 <i>Heleopera sphagni</i> Leidy, 1879	44;
134 <i>Heleopera sylvatica</i> Penard, 1902	59; 51; 52;
135 <i>Hyalosphaenia cuneata</i> Stein, 1857	1; 6; 7;
136 <i>Hyalosphaenia elegans</i> Leidy, 1879	16; 43; 55; 44;
137 <i>Hyalosphaenia gigantea</i> de Graaf, 1952	6; 7;
syn 135 <i>Hyalosphaenia lata</i> Schulze, 1875	45;
138 <i>Hyalosphaenia papilio</i> Leidy, 1879	16; 55; 37; 33; 38; 39;
139 <i>Hyalosphaenia subflava</i> Cash & Hopkinson, 1909	51;
syn 159 <i>Hyalosphaenia tincta</i> Leidy, 1879	22;
140 <i>Lesquereusia epistomium</i> Penard, 1893	42;
141 <i>Lesquereusia modesta</i> Rhumbler, 1855	43; 42; 53;
142 <i>Lesquereusia spiralis</i> Ehrbg., 1840.	23; 45; 43; 32; 39; 40; 42;
143 <i>Lieberkuehnia wagneri</i> Clap. & Lachm., 1859	45; 46;
144 <i>Microcorycia aculeata</i> Greeff, 1896	55;
145 <i>Microcorycia flava</i> Cockerell, 1866	55; 61; 51;
146 <i>Microcorycia radiata</i> Penard, 1912	51;
147 <i>Nebela americana</i> Taranek, 1890	43;
148 <i>Nebela bigibbosa</i> Penard, 1890	52;
149 <i>Nebela bohémica</i> Taranek, 1882	43;
150 <i>Nebela carinata</i> Archer, 1867	22; 55; 57;
151 <i>Nebela collaris</i> Leidy, 1879	16; 45; 50; 31; 46; 43; 11; 2; 55; 56; 57; 59; 60; 32; 38; 39; 40; 41; 44; 8; 52;
152 <i>Nebela crenulata</i> Penard, 1893	59;
153 <i>Nebela dentistoma</i> Penard, 1890	42; 53;
154 <i>Nebela galeata</i> Penard, 1902	55;
155 <i>Nebela lageniformis</i> Penard, 1902	43; 55; 57; 51; 52;
156 <i>Nebela militaris</i> Penard, 1902	55;
157 <i>Nebela retorta</i> (Wailes) Stepánek, 1953	52; 53;
158 <i>Nebela tenella</i> Penard, 1902	43; 62;
159 <i>Nebela tincta</i> Leidy, 1879	55; 44;
160 <i>Nebela tubulosa</i> Brown, 1911	55; 44;
161 <i>Nebela vitraea</i> Penard, 1899	49; 55; 57; 59;
162 <i>Netzelia oviformis</i> (Cash)	53;
163 <i>Paraquadrula discoides</i> (Pen.) Deflandre, 1932	42;
164 <i>Paraquadrula globulosa</i> (Pen.) Deflandre, 1932	42;
165 <i>Pareuglypha reticulata</i> Penard, 1902	32; 33; 36; 38; 39;
166 <i>Paulinella chromatophora</i> Lauterborn, 1895	G. Entz, Jr., 1916, cit: 46; 47; 42; 53;
167 <i>Phryganella acropodia</i> Hopkinson, 1909	51; 52;
168 <i>Phryganella hemisphaerica</i> Penard, 1902	55; 3; 59; 42;
169 <i>Phryganella nidulus</i> Penard, 1902	11; 13; 55; 56; 42;

Table 1. (cont.)

	Taxa	References
170	<i>Phryganella paradoxa</i> Penard, 1902	32; 38; 39; 40; 42; 51;
171	<i>Placocysta spinosa</i> Leidy, 1874	11; 42;
172	<i>Plagiopyxis declivis</i> Thomas, 1955	30; 51; 52; 53;
173	<i>Plagiopyxis intermedia</i> Bonnet, 1959	52; 53;
174	<i>Plagiopyxis labiata</i> Penard, 1910	51;
175	<i>Plagiopyxis oblonga</i> Bonnet & Thomas, 1960	52;
syn 94	<i>Planodiffugia opulenta</i> Jung, 1942	11;
176 *	<i>Pleurophrys helix</i> Entz, 1877	44;
177	<i>Pontigulasia bigibbosa</i> Penard, 1902	44; 42; 53;
	<i>Pontigulasia bigibbosa</i> var. <i>minor</i> Varga, 1963	63; 5;
178	<i>Pontigulasia bryophila</i> Penard, 1902	30; 3; 52;
179	<i>Pontigulasia spectabilis</i> Penard, 1902	43; 11; 1; 32; 38; 39; 40; 42; 53;
180	<i>Pontigulasia spiralis</i> Rhumbler, 1896	22; 38; 6; 7;
181	<i>Pseudochlamys patella</i> Claparede & Lachmann, 1859	50; 31; 47; 14; 60;
182	<i>Pseudodiffugia fascicularis</i> Penard, 1902	3; 36; 38; 40;
183	<i>Pseudodiffugia gracilis</i> Schlumberger, 1845	21; 6; 7;
	<i>Pseudodiffugia gracilis</i> var. <i>terricola</i> Bonnet & Thomas, 1960	51;
syn 83	<i>Pycnochila glans</i> Jung, 1942	11;
184	<i>Pyxidicula operculata</i> Agardh, 1827	55; 36; 38; 39;
syn 163	<i>Quadrula discoidea</i> Penard, 1893	11;
185	<i>Quadrula irregularis</i> Archer, 1877	11;
syn 187	<i>Quadrula symmetrica</i> (Wallich) Cockerell, 1911	11; 3;
	<i>Quadrula symmetrica</i> var. <i>longicollis</i> Taranek, 1882	3;
syn 164	<i>Quadrulella globulosa</i> Penard, 1897	1; 55;
syn 185	<i>Quadrulella irregularis</i> Archer, 1877	2; 30;
186	<i>Quadrulella scutellata</i> Wailes, 1912	42
187	<i>Quadrulella symmetrica</i> (Wallich) Cockerell, 1911	21; 45; 46; 43; 40; 55; 57; 4; 51; 52;
188	<i>Schoenbornia visicula</i> Schönborn, 1964	53;
189	<i>Schwabia regularis</i> Jung, 1942	11; 2;
190	<i>Sexangularia minutissima</i> (Penard) Bartos, 1934	62;
syn 193	<i>Sphenoderia dentata</i> Penard, 1890	11; 12; 13; 1; 2; 3; 55;
191	<i>Sphenoderia fissirostris</i> Penard, 1890	55; 57;
192	<i>Sphenoderia lenta</i> Schlumberger, 1845	43; 11; 12; 55; 44;
193	<i>Tracheleuglypha dentata</i> Moniez, 1888	30; 42; 51; 52;
194	<i>Trigonopyxis arcuata</i> Penard, 1879	55; 5; 44; 52;
195	<i>Trigonopyxis microstoma</i> Hoogenraad, 1948	55;
syn 197,	<i>Trinema acinus</i> Leidy, 1879	26; 31;
50 i.p.		
196	<i>Trinema complanatum</i> Penard, 1890	43; 12; 55; 56; 57; 58; 60; 61; 62; 30; 44; 42; 51; 52;
197	<i>Trinema enchelys</i> Ehrbg., 1838	48; 16; 43; 10; 11; 12; 13; 1; 2; 3; 14; 55; 57; 59; 60; 61; 62; 30; 32; 33; 36; 38; 39; 40; 41; 4; 5; 44; 9; 51; 52; 53;
198	<i>Trinema lineare</i> Penard, 1890	43; 10; 11; 12; 13; 1; 2; 3; 14; 55; 56; 57; 59; 61; 62; 30; 32; 33; 36; 38; 39; 40; 41; 5; 44; 42; 51; 52; 53;
199	<i>Trinema penardi</i> Thomas & Chardez, 1958	51; 52;
200	<i>Trinema verrucosa</i> Francé, 1897	31; 11;
201	<i>Wailesella eboraensis</i> (Wailes) Deflandre, 1928	57; 60;