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M. ŠTĚPÁNEK:

KRYTENKY (TESTACEA) TŮŇKY NA HRÁDKU U KUNRATIC (PRAHA)

TESTACEA OF THE POND OF HRÁDEK AT KUNRATICE (PRAGUE)

PRAHA 1952

NÁKLADEM NÁRODNÍHO MUSEA V PRAZE

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M. ŠTĚPÁNEK

Krytenky (Testacea) tůňky na Hrádku u Kunratic (Praha)

Тестацея пруда в Градку в Кундратицах (Прага)

(Předloženo 5. X. 1951.)

Doc. dr. E. BARTOŠ mě upozornil na tůňku v lese u Kunratic jižně od Prahy a vyzval, abych zpracoval její kořenonožce.

Ve zkoumaných vzorcích jsem nalezl 7 druhů měňavek (Amoebina), 79 druhů krytenek (Testacea), a 5 druhů slunivek (Heliozoa).

V této práci si všímám jen krytenek (Testacea).

Druhy nové pro československou zvířenu jsou označeny jednou hvězdičkou, druhy nové pro Evropu dvěmi a druhy nově popsané třemi hvězdičkami.

*

Автор исследовал фауну Тестацея лесного пруда в Градку в Кунратицах.

1. Обнаружил 79 видов, форм и вариаций Тестацея.

2. Из этого: а) 21 форм новых для фауны ЧСР:

Cochliopodium digitatum GREEFF, *Cochliopodium erinaceum* PENARD, *Arcella hemisphaerica* f. *undulata* DEFLANDRE, *Arcella vulgaris* var. *penardi* DEFLANDRE, *Arcella vulgaris* f. *undulata* DEFLANDRE, *Centropyxis aculeata* var. *oblonga* DEFLANDRE, *Centropyxis arcelloides* PENARD, *Difflugia amphora* LEIDY, *Difflugia avelana* PENARD, *Difflugia capreolata* PENARD, *Difflugia elongata* PENARD, *Difflugia glans* PENARD, *Difflugia gramen* PENARD, *Difflugia* [*oblonga*] *brevicolla* CASH, *Difflugia* [*oblonga*] *curvicaulis* PENARD, *Difflugia* [*oblonga*] *manicata* PENARD, *Difflugia* [*oblonga*] *nodosa* LEIDY, *Difflugia* [*oblonga*] *scalpelum* PENARD, *Difflugia rubescens* PENARD, *Difflugia tuberculata* WALLICH, *Pontigulasia compressa* RHUMBLER, *Pontigulasia spectabilis* PENARD.

б) 1 новая форма фауны Европы:

Centropyxis aculeata var. *dentistoma* DECLOITRE.

в) 7 новых форм с точки зрения науки:

Difflugia bartoši sp. nov., *Difflugia* [*oblonga*] *angusticollis* semi-sp. nov., *Difflugia* [*oblonga*] *caudata* semi-sp. nov., *Difflugia* [*oblonga*] *schizocaulis* semi-sp. nov., *Difflugia* [*oblonga*] *vas* semi-sp. nov., *Difflugia sculpturata* sp. nov., *Lecqueresia* [*spiralis*] *combinata* semi-sp. nov.

3. Пересмотрел вид *Difflugia U oblonga* EHRENBERG и составил ряд вариаций в схематическую таблицу (карт. 3).

4. Вид *Difflugia U oblonga* EHRENBERG в материале труда состоит из 11 малых видов (semi-species), из них как новые описывает:

Difflugia [*oblonga*] *angusticollis* semi-sp. nov., *Difflugia* [*oblonga*] *caudata* semi-sp. nov., *Difflugia* [*oblonga*] *schizocaulis* semi-sp. nov., *Difflugia* [*oblonga*] *vas* semi-sp. nov.

5. Прежние виды:

Difflugia acuminata EHRENBERG, *Difflugia brevicolla* CASH, *Difflugia curvicaulis* PENARD, *Difflugia manicata* PENARD, *Difflugia nodosa* LEIDY, *Difflugia scalpelum* PENARD, нельзя считать хорошими видами, только на часть вида *Difflugia U oblonga* EHRENBERG.

6. Ряды и вариации:

Difflugia acuminata var. *inflata* PENARD, *Difflugia acuminata* var. *umbilicata* PENARD, *Difflugia bacillifera* PENARD, *Difflugia curvicaulis* var. *inflata* DECLOITRE, *Difflugia lanceolata* PENARD, *Difflugia mammilaris* PENARD, *Difflugia oblonga* var. *atricolor* PENARD, *Difflugia oblonga* var. *claviformis* PENARD, *Difflugia oblonga* var. *bryophila* PENARD, *Difflugia oblonga* var. *cyphodera* JUNG, *Difflugia oblonga* var. *lacustris* PENARD, *Difflugia oblonga* var. *longicollis* GASSOWSKY, *Difflugia oblonga* var. *venusta* PENARD, *Difflugia sphincta* JUNG, являются экологическими вариациями вида *Difflugia U oblonga* EHRENBERG.

7. Обобщил вид *Lecqueresia spiralis* SCHLUMBERGER и *Lecqueresia modesta* RHUMBLER в вид *Lecqueresia U spiralis* SCHLUMBERGER, на основании вариационных рядов и нового малого вида *Lecqueresia* [*spiralis*] *combinata* semi-sp. nov.

8. Обнаружил, что стеклянные шарики возникающие при сгорании угля (смотри работу д-р В. Покорного) употребляют некоторые виды рода *Difflugia* LECLERC к покрытию скорлупы и новый вид *Difflugia sculpturata* имеет покрытие скорлупы только из этих шариков.

Testacea of the Pond of Hrádek at Kunratice (Prague).

Docent E. BARTOŠ drew my attention to the pond in the forest at Kunratice south of Prague and invited me to study its Testacea. The pond (fig. 1) lies south of Prague in the forest of Kunratice, at an

Fig. 1.

altitude of 292 m. above sea level, above the stream which flows through the fish-pond Šeberák. The hill is composed of Algonkian, argillaceous, green Příbram Shales, on which lies here and there a fairly thick layer of clay. The pond lies on such a thick layer of clay, but on the eastern shore the shaly substratum also crops out. The covering layer was formed of these disintegrating shales, and consists of small stones and sherds. The pond is surrounded by mixed forest. Close to the north-western shore grow sallows, one of which grows half in and half out of the water, with its branches dipping into the water. The water is stagnant, shallow, without inflow and outflow, so that its level is maintained only by precipitations. From time to time, in periods of severe draught, it has dried out to the bottom (in 1947, 1948), and this strongly influences the composition of its fauna. In its southwestern part the pond is divided by a kind of dam; in times of low water this dam emerges above the surface of the water, and thus two pools are formed, one of an area of about 7×6 m. and a smaller one of an area of 3×3 m.The pond was thus divided when I collected my samples. The clayey soil in the larger pool is covered with a thick layer of mud, humus and fallen leaves from the neighbouring birches; in the smaller pool the clay is covered with leaves and moss only near the eastern and northern shores, on which there is also sphagnum. In the larger pool grow sporadically reeds, calamus, and at the shores grass; here and there moss with sphagnum.

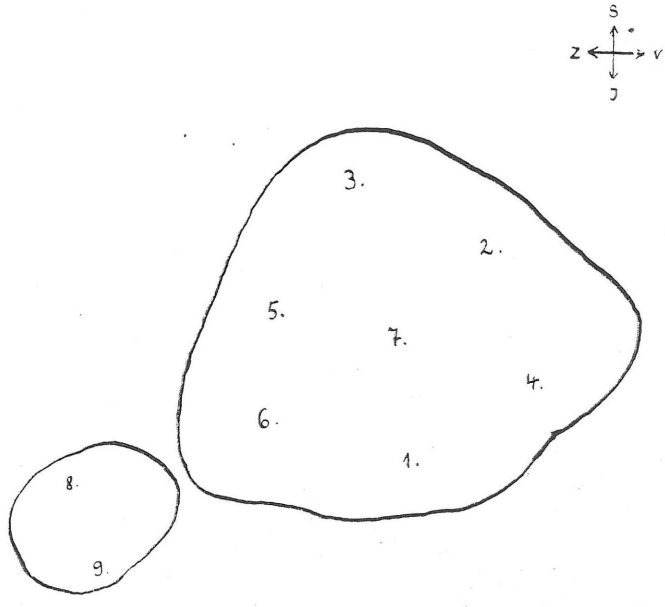


Fig. 2.

I took the samples on November 11, 1950, and divided the pool for the purpose into several typical areas (fig. 2), from each of which I took one sample by plankton net. Part of the samples I fixed at once on the spot with 3% formaline, part I left alive for preliminary examination. On January 23, February 16, and April 10, 1951, I collected further control samples, whose analyses are, however, not included in the present paper. The samples taken I numbered as follows:

Large pool: no. 1: Mud at the shore.
no. 2: Grass growing 1 m. from the shore.
no. 3: Fallen leaves in the water and mud.
no. 4: Roots of reeds in the mud.
no. 5: Grass and moss in the water and mud.
no. 6: Branches of sallow in the water and mud.
no. 7: Plankton and floating leaves.

Small pool: no. 8: Sphagnum half in the water and mud.
no. 9: Wood sticking in the clayey shore.

The number of the samples will be given in brackets behind the corresponding species. On the day of the collection of the samples (around noon) the following measurings were taken:

air temperature	9° C,
water temperature	8° C,
pH (Merck)	6,3

At home I squeezed out the samples into a vessel, centrifuged, and observed in drops on a carrier glass. From each sample I took 25 drop tests, examined the specimens and counted them.

In the samples examined I found 7 species of Amoebina, 79 species of Testacea and 5 species of Heliozoa. The present paper deals only with the Testacea.

In the genus *Difflugia* LECLERC I found fairly often very minute (0.003—0.009 mm.) globules of a transparent substance, which the specimens of the genus *Difflugia* LECLERC used for building their tests together with sherdy building material. Already PENARD and other authors found these globules, as I surmise from their descriptions and drawings. I took them at first to be products of the test, but by various mechanical and chemical tests I ascertained that they are of a very resistant material. The surface of the globules is smooth, of a glassy lustre, transparent, greenish o yellowish brown. Some are filled with an air bubble, so that they have only a thin shell. I found their explanation in a paper by POKORNÝ of 1950. They are products formed in the burning of coal; and unfar the pond there actually rises the high chimney of the boiler-house of the Masaryk Homes at Krč. Dr. Vl. POKORNÝ informed me that the vitreous globules are very light, and the wind easily carries them also over great distances. It is interesting that the Difflugiae use this material for the building of their tests, which are then very ornamented.

The genus *Difflugia* LECLERC is in this locality interesting by its variability. In addition to sharply defined species of this genus I found series of transitional forms. I drew several dozens of specimens, which represent typical samples of these series and compiled from them a phyletic table (Fig. 3). In studying the species of the genera *Difflugia* and *Lecqueresia* I used the modern nomenclature, as it is used by KIRIAKOFF for the *Lepidoptera* and by GILLARD for the Rotatoria. In doing so I combine in one ultraspecies several hitherto very unclear species of the genus *Difflugia* LECLERC and a whole number of varieties, and I designated this ultraspecies in agreement with GILLARD by the name of *Difflugia U oblonga* EHRENBERG. Similarly I proceeded also with the genus *Lecqueresia* SCHLUMBERGER, where I took as basis *Lecqueresia U spiralis* SCHLUMBERGER. The new division and nomenclature serve better to express the variability of these genera (or species) than the former division and nomenclature.

The species new for the Czechoslovak fauna are designated by one asterisk, the species new for the European fauna by two asterisks, and the species new for science by three asterisks. A survey of the species found, their frequency and number in the different samples (1—9) is given in the appended table.

Survey of the Species Found (with remarks, if any).

* *Cochliopodium digitatum* GREEFF (2,5).

The surface of the body is covered with a rather stiff membrane, which, as I have observed myself, can liquefy except for an insignificant part. The membrane forms long tubular processes, from whose liquefied ends short, digitiform pseudopodia are exserted. In some place, usually

Comparison in numbers and in % of the Testacea in the different samples:

Name of the species	Numbers of the samples																		In all	
	1		2		3		4		5		6		7		8		9			
	specimens	%	specimens	%	specimens	%	specimens	%	specimens	%	specimens	%	specimens	%	specimens	%	specimens	%	specimens	%
Cochliopodium digitatum	—	—	9	0,5	—	—	—	—	3	+	—	—	—	—	—	—	—	—	12	+
Cochliopodium erinaceum	—	—	1	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	+
Arcella catinus	2	+	2	+	—	—	—	—	3	+	7	1	—	—	—	—	—	—	14	+
Arcella discoides	23	2	15	1	21	2	20	4	44	3,5	29	3,5	8	3	17	3	2	0,5	179	2,5
Arcella hemisphaerica typ.	105	9	156	8	31	3	15	3	35	3	67	8	—	—	38	7	7	2	454	6
Arcella hemisphaerica f. undulata	—	—	2	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	+
Arcella vulgaris var. penardi	11	1	9	0,5	13	1,5	7	1	23	2	27	3	12	4	7	1	1	+	110	1,5
Arcella vulgaris forma undulata	—	—	2	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	+
Centropyxis aculeata	23	2	81	3,5	55	6	72	12	128	10	9	1	14	5	17	3	3	1	402	5,5
Centropyxis aculeata var. dentistoma	—	1	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	+
Centropyxis aculeata var. oblonga	—	—	4	+	—	—	—	—	—	—	1	+	—	—	—	—	—	—	5	+
Centropyxis aerophila var. sphagnicola	1	+	—	—	2	+	—	—	22	1,5	2	+	6	2	—	—	—	—	33	+
Centropyxis arcelloides	—	—	—	—	—	—	—	—	—	—	1	+	—	—	—	—	—	—	1	+
Centropyxis cassis	112	9	7	0,5	13	1,5	5	1	11	1	1	+	4	1	18	3,5	15	5	186	2,5
Centropyxis discoides	15	1	47	2,5	5	0,5	13	2,5	52	6	23	3	—	—	18	3,5	12	4	185	2,5
Centropyxis ecornis	15	1	6	+	4	+	7	1	9	0,5	8	1	2	0,5	1	+	4	1	56	0,5
Centropyxis eurystoma	8	0,5	2	+	—	—	—	—	4	+	—	—	—	—	—	—	—	—	14	+
Centropyxis gibba typ.	1	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	+
Centropyxis gibba var. inermis	—	—	—	—	—	—	—	—	—	—	1	+	—	—	—	—	—	—	1	+
Centropyxis labiata	—	—	—	—	—	—	1	+	—	—	—	—	—	—	—	—	—	—	1	+
Centropyxis orbicularis	48	4	57	4	187	20,5	100	20	44	3,5	3	+	—	—	44	9	57	19	545	7
Centropyxis spinosa	2	+	7	0,5	3	+	1	+	—	—	4	0,5	—	—	3	0,5	—	—	20	+
Cryptodifflugia oviformis	—	—	1	+	4	+	2	+	—	—	—	—	—	—	—	—	—	—	7	+
Cyphoderia margaritacea	—	—	1	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	+

Difflugia amphora	—	—	—	—	—	—	—	—	11	1	—	—	6	2	—	6	1	17	6	40	0,5
Difflugia avelana	—	—	—	—	—	—	—	—	7	0,5	—	—	—	—	2	+	4	1	13	+
Difflugia bartoši	—	—	—	—	1	+	—	—	—	—	—	—	—	—	—	—	1	+	2	+
Difflugia capreolata	—	—	1	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	+
Difflugia corona	12	1	10	0,5	6	0,5	1	+	—	—	6	1	—	—	—	—	6	2	41	0,5
Difflugia elegans	—	—	—	—	—	—	—	—	—	—	2	+	—	—	—	—	—	—	2	+
Difflugia elongata	—	—	1	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	+
Difflugia glans	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	+	1	+
Difflugia globulosa	—	—	—	—	1	+	—	—	—	—	—	—	—	—	1	+	5	2	7	+
Difflugia gramen	—	—	—	—	—	—	—	—	—	—	—	—	4	1	19	4	4	1	27	+
Difflugia lebes	1	+	4	+	4	+	3	0,5	2	+	—	—	—	—	3	0,5	14	5	31	0,5
Difflugia leidyi	4	+	12	0,5	2	+	2	+	25	2	12	1,5	4	1	1	+	1	+	63	1
Difflugia limnetica	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	0,5	—	—	4	+
Difflugia lobostoma	—	—	—	—	—	—	—	—	—	—	—	—	—	—	44	9	6	2	50	0,5
Difflugia lucida	—	—	—	—	—	—	—	—	—	—	2	+	—	—	—	—	1	+	3	+
Difflugia [oblonga] oblonga . . .	89	7	50	4	38	4	50	10	32	2,5	12	1,5	—	—	66	11	33	11	370	5
Difflugia [oblonga] nodosa . . .	—	—	—	—	—	—	5	1	—	—	—	—	—	—	—	—	—	—	5	+
Difflugia [oblonga] brevicolla . .	5	0,5	20	1	2	+	1	+	—	—	5	0,5	—	—	—	—	1	+	34	0,5
Difflugia [oblonga] augusticollis .	—	—	2	+	—	—	3	0,5	—	—	—	—	—	—	—	—	—	—	5	+
Difflugia [oblonga] vas	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	+	1	+
Difflugia [oblonga] manicata . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	2	6	+
Difflugia [oblonga] scalpelum . .	—	—	1	+	3	+	—	—	4	+	—	—	—	—	—	—	1	+	9	+
Difflugia [oblonga] acuminata . .	46	4	81	5	18	2	31	6	—	—	1	+	4	1	26	5	16	5	223	3
Difflugia [oblonga] caudata . . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	+	1	+
Difflugia [oblonga] schizocaulis .	4	+	6	+	2	+	8	1,5	—	—	—	—	—	—	—	—	—	—	20	+
Difflugia [oblonga] curvicaulis . .	13	1	25	1,5	8	1	10	2	—	—	2	+	2	0,5	3	0,5	3	1	66	0,5
Difflugia rubescens	—	—	—	—	—	—	4	1	—	—	54	7	—	—	—	—	—	—	58	0,5
Difflugia sculpturata	—	—	—	—	—	—	—	—	1	+	—	—	—	—	—	—	—	—	1	+
Difflugia tuberculata	22	2	68	4	7	0,5	18	3	57	4,5	4	0,5	12	4	3	0,5	6	2	197	2,5
Difflugia urceolata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	+	5	2	7	+
Lecqueresia [spiralis] spiralis . .	3	+	73	4	1	+	6	1	46	3,5	4	0,5	2	0,5	3	0,5	1	+	139	1,5
Lecqueresia [spiralis] combinata .	—	—	14	1	—	—	2	+	—	—	15	2	—	—	—	—	—	—	31	0,5

Name of the species	Numbers of the samples																		In all	
	1		2		3		4		5		6		7		8		9			
	speci-mens	%	speci-mens	%	speci-mens	%	speci-mens	%	speci-mens	%	speci-mens	%	speci-mens	%	speci-mens	%	speci-mens	%	speci-mens	%
Lecqueresia [spiralis] modesta	16	1	2	+	23	2	3	0,5	4	+	—	—	1	+	1	+	1	+	51	0,5
Pontigulasia bryophila	—	—	1	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	+
Pontigulasia compressa	—	—	—	—	—	—	—	—	—	—	1	+	—	—	—	—	—	—	1	+
Pontigulasia spectabilis	36	3	15	1	12	1	16	3	18	1,5	34	4	2	0,5	3	0,5	7	2	143	2
Heleopera petricola	—	—	1	+	—	—	2	+	—	—	2	+	3	1	—	—	—	—	8	+
Nebela bohemica	—	—	—	—	—	—	—	—	1	+	—	—	—	—	—	—	—	—	1	+
Nebela collaris	9	0,5	1	+	—	—	1	+	—	—	7	1	—	—	—	—	1	+	19	+
Nebela tubulosa	4	+	—	—	—	—	1	+	8	0,5	2	+	—	—	4	0,5	—	—	19	+
Assulina muscorum	1	+	2	+	8	1	—	—	1	+	1	+	—	—	1	+	—	—	14	+
Corythion dubium	13	1	1	+	17	2	4	1	20	1,5	5	0,5	—	—	9	2	—	—	69	1
Euglypha acantophora	126	10	252	14	58	6	24	5	87	6'5	127	16	4	1	9	2	1	+	688	9
Euglypha brachiata	—	—	—	—	—	—	—	—	1	+	—	—	—	—	—	—	—	—	1	+
Euglypha ciliata	11	1	3	+	1	+	—	—	1	+	1	+	—	—	3	0,5	—	—	20	+
Euglypha cristata	1	+	—	—	—	—	—	—	19	1,5	—	—	—	—	—	—	—	—	20	+
Euglypha filifera	—	—	—	—	—	—	1	+	1	+	—	—	—	—	—	—	—	—	2	+
Euglypha laevis	22	2	1	+	19	2	4	1	5	+	2	+	2	0,5	5	1	8	3	68	1
Euglypha strigosa	—	—	1	+	1	+	—	—	—	—	—	—	—	—	—	—	—	—	2	+
Sphenoderia dentata	1	+	5	+	4	+	4	1	—	—	3	+	—	—	—	—	—	—	17	+
Sphenoderia fissirostris	22	2	17	1	30	3	—	—	13	1	13	1,5	—	—	—	—	1	+	96	1
Sphenoderia lenta	12	1	—	—	15	1,5	—	—	—	—	—	—	—	—	—	—	—	—	27	+
Trinema complanatum	16	1	1	+	3	+	1	+	—	—	3	+	1	+	—	—	—	—	25	+
Trinema euchelys	112	9	305	17	87	9,5	24	5	275	21	80	10	62	21	51	10	14	5	1010	15
Trinema lineare	205	18	368	20	234	26	46	9	252	19,5	228	28,5	149	50	49	10	10	3	1541	20,5
In all	1172	96,5	1764	95,5	943	96	518	95,5	1279	87	811	97	304	99,5	481	88,5	278	87,5	7530	96
Number of species in the sample	39		50		38		38		36		41		21		33		38		79	

opposite the pseudopodia, a rather large area of the body is without membranous cover. The plasm is coarse-grained, grayish black. It is difficult to observe the contents. In the plasm in one nucleus of globular shape. The number of pseudopodia varies. Measurements: diameter of the body without pseudopodia 60—90 μ; length of the pseudopodia 8—10 μ.

* *Cochliopodium erinaceum* PENARD (2).

From the globular, rather stiff membrane, which on one side is open and flat, the plasm exudes and pours over the whole surface of the test, and at the same time it forms several lobe—and finger—shaped pseudopodia. The plasm spilled over the surface forms also tiny digitiform pseudopodia. All plasm outside the membrane is very diluted. The colour of the plasm is brown, towards the margin yellowish. The plasm contains many inclusions, oil globules, some vacuoles, and one broadly ovoid to spherical nucleus. Measurements: diameter of the body 28 μ.

Arcella catinus PENARD (1, 2, 5, 6).

The low test, irregular to lobate when seen from above, with an aperture decorated all round with a minute spiral drawing, is yellowish to brownish. Measurements: diameter of the test 49—75 μ; diameter of the aperture 14—26 μ; height of the test 30—48 μ.

Arcella discoides EHRENBERG (1—9).

Flat, circular test with the aperture slightly pressed inwards and rather large (larger than one third of the diameter of the test). In the plasm are numerous Diatomacea, Rotatoria or their tests, and from among Testaceae especially species of the genus *Euglypha (E. acantophora, E. ciliata, E. laevis)* and of the genus *Trinema (T. lineare, T. enchelys)*. In one large specimen of the species I found six tests of the species *Euglypha brachiata*. Measurements: diameter of the test 108—231 μ; diameter of the aperture 35—87,5 μ; height of the test 24—32 μ.

Arcella hemisphaerica PERTY (1—6, 8, 9).

The test is hemispherical and higher, with an aperture moderately pressed inwards. The colour of the test is predominantly brown, only in young specimens is it light yellow. Measurements: diameter of the test 44—45 μ; diameter of the aperture 16 μ; height of the test 35—40 μ.

Arcella hemisphaerica forma *undulata* DEFLANDRE (2).

It agrees with the type in shape and size, but differs from the type by the undulated surface of the test in the same way as *Arcella vulgaris* forma *undulata* differs from its type. Its colour is yellowish to brown. Measurements: diameter of the test 45—59.5 μ; diameter of the aperture 14—16 μ; height of the test 36—38 μ (fig. 13 E).

• *Arcella vulgaris* var. *penardi* DEFLANDRE (1—9).

Loaf-shaped brownish test with the aperture pressed inwards and sometimes with a collar turned over outwards. In the plasm are two

spherical nuclei. Measurements: diameter of the test 52—59,2 μ; diameter of the aperture 14—16 μ; height of the test 35—38 μ.

* *Arcella vulgaris* forma *undulata* DEFLANDRE (2).

Like the type, differing only by the undulated surface of the test. From above it appears dentate, but the denticles do not project beyond the margin. The structure of the test is as in the type. The plasm is granular with numerous vacuoles and two nuclei. Measurements: diameter of the test 105 μ; diameter of the aperture 21 μ; height of the test 42 μ (fig. 13 F).

Centropyxis aculeata (EHRENBERG) STEIN (1—9).

The test is irregular with spines and with the aperture moderately pressed inwards. The aperture is circular, centrical. On the side where the spines grow out, the test is slightly more convex. The surface is covered with sand grains, and smaller ones cover also the surface of the spines. From the end of aech spine a sligthly longer sand grain projects. The number of spines is very variable. The colour is brown to black. Measurements: lenght 91 μ; width 84 μ; height 49 μ; diameter of the aperture 26 μ.

** *Centropyxis aculeata* var. *dentistoma* DECLOITRE (2).

Agress with the type and description of L. DECLOITRE. It differs from the type by having four denticles on the margin of the aperture. The colour is brown, the test is only rarely covered with sand grains. Measurements: diameter of the test 150 μ; diameter of the aperture 45 μ. So far this species had been found only in Africa.

* *Centropyxis aculeata* var. *oblonga* DEFLANDRE (2, 6).

Resembles the type, from which it differs only by the position of the aperture and by its being somewhat more elongated. The aperture is more elliptic, in the type more circular, but also here there is a strong variability. The measurements and colouring agree with the type.

Centropyxis aerophilla var. *sphagnicola* DEFLANDRE (1, 3, 5—7).

The test is circular with an elliptic aperture, whose side closer to the middle is drawn deeply into the test so that it forms a kind of partition. The surface is covered with tiny sand grains. The colour is predominantly brown. Measurements: diameter of the test 40 μ; height of the test 19 μ; width of the aperture 21 μ.

* *Centropyxis arcelloides* PENARD (6).

Very similar to the test of the species *Arcella vulgaris*, from which it differs by the colouring and surface of the test, which is closely covered with sand grains. It differs also in the number of nuclei. It has only one spherical nucleus. The aperture is absolutely centrical, moderately pressed into the test. The colour is dark brown. The only specimen found was, however, much smaller than the specimens described by PENARD and DEFLANDRE, by about two thirds. For the rest

they agree on the whole morphologically and in colouring. Measurements: diameter of the test 35 μ; diameter of the aperture 21 μ; height of the test 21 μ.

Centropyxis cassis WALLICH (1—9).

Similar to the species *Centropyxis orbicularis,* but considerably narrower and also not so convex. At the lowest end is an aperture lined on the circular wall with regular sand grains even when for the test is little covered. The inferior margin of the aperture is always straight. The colour is brown. Measurements: lenght 56,5—77 μ; width 42—70 μ; length of the aperture 28—52 μ; width of the aperture 10—28 μ; maximum height of the test 28—42 μ.

Centropyxis discoides PENARD (1—6, 8, 9).

Very low, circular test with centrical aperture and with several excrescences on the periphery. The excrescences always have a grain of sand at their tip. In all cases observed the test is very sparsely covered with sand grains. The colour is yellowish brown to dark brown. Measurements: diameter of the test 75—146 μ; diameter of the aperture 24—56 μ; length of the max. excrescence 28—35 μ.

Centropyxis ecornis LEIDY (1—9).

The test is low, circular, without excrescences, always very slightly covered with sand grains. The colour is yellow to black. The aperture is almost in the middle of the test, rather large, and in all cases observed shallowly lobate, similar to the aperture given in his article by LEIDY. Measuremens: diameter of the test 106 μ; diameter of the aperture 45 μ (fig. 13. A).

Centropyxis eurystoma DEFLANDRE (1, 2, 5).

Test highly convex, loaf-shaped, with a centrical aperture. The surface is covered with different sand grains, of which in all cases the 3—5 largest ones were attached to the top of the test or near it. The colour is brownish. Measurements: diameter of the test 58—62 μ; diameter of the aperture 32—33 μ; height of the test 47—50 μ.

Centropyxis gibba DEFLANDRE (1).

Unusually high species with an elliptic aperture. From the convex part of the test bristly excrescences project .The colour is brown. The surface of the test is sparsely covered with sand grains. Measurements: length 102 μ; width 87 μ; height 92 μ.

Centropyxis gibba var. *inermis* BARTOŠ (6).

The test is ovate ,at one side obliquely truncate. Here is the aperture through whose middle goes the partition, and thus it forms really two elliptic apertures for exserting the pseudopodia. The test is covered very closely with sand grains on the upper side of the posterior end. The colour is brown. The specimen found had the following measurements: length 87 μ; width 72 μ; height 54 μ (fig. 13. C).

Centropyxis labiata PENARD (4).

The test is low ,loaf-shaped, with a reniform aperture somewhat sunk inside the test. The covering of the test is dense and is composed of sherds and sand grains. The colour is light brown. Measurements: diameter of the test 95 μ; length of the aperture 28 μ; width of the aperture 11 μ. In this specimen I did not get the original description; therefore I placed it according to the checking of Dr. E. BARTOŠ (fig. 13 B).

Centropyxis orbicularis DEFLANDRE (1—6, 8, 9).

The test is loaf-shaped, flat on the underside, in a side-view posteriorly convex. The aperture is towards the middle of the test at the margin almost straight, while on the opposite side it runs along the margin of the test. The test is covered with minute sand grains and is brown. Measurements: diameter of the test 70—80 μ; height of the test 38.5—40 μ; width of the aperture 14—21 μ; length of the aperture 31,5—42 μ.

Centropyxis spinosa CASH (1—6, 8, 9).

The large, almost circular test is very low, with many excrescences (up to 12), always only very sparsely covered with foreign bodies. The aperture is always circular. The measurements are very constant: diameater of the test 122 μ; diameter of the aperture 56,5 μ height of the test 24 μ; length of the excrescences 28 μ.

Cryptodifflugia oviformis PENARD (2—4).

Tiny, ovoid, on the sides flattened test, of a brownish colouring, partly covered with detritus. The test is somewhat strengthened around the aperture. Measurements: length 20—35 μ; width 12—17 μ; aperture 7—9 μ (fig. 13 K).

Cyphoderia margaritacea EHRENBERG (2).

Retort-shaped, yellowish test with a circular aperture. The surface has a dot-structure. In the plasm, which is coarsely granular and hyaline, is one spherical nucleus. The plasm is fixed in the posterior part of the test only by one excrescence. Measurements: length 123 μ; width 40 μ; neck at the base 18 μ; diameter of the aperture 16 μ. It was found only in one living specimen.

* *Difflugia amphora* LEIDY (5, 7—9).

Relaively very variable form, from which the spherical specimens differ strikingly by having a great many symbiotic algae in the plasm and on the surface of the test (*Difflugia schuurmani* VAN OYE?). Specimens lacking these algae are of a slender shape, and often their test is covered with discs as in the genus *Nebela* or the species *Lecquersia spiralis* SCHLUMBERGER. Also the collar is of very different shapes. In spherical specimens with algae of the surface the collar is almost like the one in the species *Difflugia schuurmani* VAN OYE or even in the

species *Cucurbitella mespilliformis* PENARD. The slimmer types are free of algae, and their surface is very often covered with vitreous blobules. The may in which the collar sits is, however, in all specimens the same, and agress with that of the specimens described by PENARD. The aperture is either circular or moderately lobate. Measurements: length 77—123 μ; width 42—122 μ; diameter of the aperture 21—49 μ (fig. 9. C-E).

* *Difflugia avellana* PENARD (5, 8, 9).

The elongatedly ovoid test is strongly flattened on the sides, with a small elliptic aperture at the narrower end. The nucleus is spherical. The test is covered with different material according to the substratum on which the different specimens lived. We find on the test detritus, sand grains, sherds, Diatomaceae, and vitreous globules. Also the colouring varies, from light brown to black. The tests of Diatomaceae fixed to the test often project beyond its margin so that it appears bristly. Measurements: length 122—140 μ; width 77—105 μ; height 35—52 μ; diameter of the aperture 28—35 μ (fig. 12. A-B).

*** *Difflugia bartoši* sp. nov. (3, 9).

The test is reminiscent in its general aspect, of course without the typical conical excrescences, of the species *Difflugia (oblonga) brevicolla* CASH. It is also rather similar to the tests of the species *Acipyxis inflata* forma *imanata* JUNG and *Acipyxis erinacea* JUNG, from which it differs by the distinct neck and the regularly arranged excrescences. But I did not find in any specimens a sand grain on an excrescency, as the two species described by JUNG have. Morphologically it is closest to the species *Argynia schwabei* JUNG and *Argynia tylophora* JUNG, but it does not agree with them in the structure of the test. The two species mentioned have a disc-structure of the test, as have all the species of the genus *Nebela*. It looks like the massive head of a mace. Two forms occurred, one with two rows of excrescences and the other with only one row.

From the almost globular body of the test starts a moderately narrowed neck with a circular aperture. On the underside are ten conical excrescences arranged in two circles above and below the equator of the spherical part of the test. In the upper circle, i. e. the one nearer the neck, are four conical excrescences oriented as if they were arranged in the corners of a square. These excrescences project a little upwards. In the lower circle are six such excrescences, again as if placed in the corners of a regular hexagon, but in relation to the upper ones they are somewhat inclined downwards. Seen from above none of the excrescence of the upper circle covers any of the lower circle of excrescences. On the whole we can say that the axes of the conical excrescences stand always perpendicular to the axis of the test. The colour of the test is grayish black, with rather large sand grains, and with several green symbiotic algae inside. There is one spherical nucleus. The plasm is granular to foamy, with numerous inclusions and large vacuoles. This form had the following measurements :length 245,5 μ; width 192,5 μ;

legth of the neck 35 μ; diameter of the aperture 70 μ; diameter of the nucleus 22 μ.

The second form found is somewhat different, but I place it because of the agreeing characters also in this species. The big spherical body of the test narrows into a neck which is rather narrow in comparison with so broad a body. The aperture is regular, circular. From the body of the test conical excrescences grow; they are here reminiscent of the species *Difflugia corona* WALLICH, from which it differs, however, by the thin and rather long neck. The excrescences project in the middle of the spherical body and are inclined from the neck downwards. Their base is very broad. They are again placed as if in the corners of a square. Thus this form differs from the first by the number of excrescences and by their position. This difference is not so great that we should have to separate the two forms specifically, as for the rest they agree in general espect, number of nuclei and composition of the plasm. Also the colouring of the nuclei is almost the same. The hollow of the test penetrates in both cases into the conical excrescences, as I ascertained by crushing tests. When we do not take the number of excrescences into consideration the first specimen may have to be regarded as only a small form of the second. The colouring of the second form is brownish black. Inside the test I did not ascertain, however, any symbiotic algae, as I did in the first form. All these specimens do not correspond to any known species; I regard them as a new species. Measurements of the second specimen: length 385 μ; width 297,5 μ; length of the neck 70 μ; width of the neck 75 μ; diameter of the aperture 70 μ; diameter of the nucleus 25 μ (fig. 10. J-K).

Its designation is in honour of my teacher Dr. E. BARTOŠ, who gave me so much valuable advice and help.

* *Difflugia capreolata* PENARD (2).

The elongated test is in the middle strongly narrowed, in the neck it widens again so that the aperture corresponds approxiamately to the diameter in the place of the maximum narrowing of the test; it is circular. The test is covered on the surface with sand grains and sherds. In size it differs from the specimens described by PENARD by more than one half (it is smaller); for the rest it agrees with it completely. The colour is gray. Measurements: length 112 μ; width 52,5 μ; diameter of the aperture 21 μ; length of the neck 42 μ; max. width of the neck 31 μ; min. width of the neck 17,5 μ (fig. 10. H).

Difflugia corona WALLICH (1—4, 6, 9)

The test is usual spherical in shape, but may sometimes be moderately elongated. All specimens found had always only one conical excrescence on the test, in its axis opposite the aperture. This excrescence has two shapes, either it is only a tubercle or it may be a large elongated spine. The aperture is circular and in most cases with a well denticulated margin. The surface of the test varies from a dense cover of sand grains to a sparse cover with Diatomaceae. Also the colouring varies, from light brown to black. Measurements: diameter of the test

105—175 μ; diameter of the aperture 35—70 μ; length of the excrescence 5—35 μ. (Figs. 12. C—D.)

Difflugia elegans PENARD (6)

The test of the shape of a vase has a contracted neck and is provided in the lower part with a point. The aperture is circular. The test is covered either with Diatomaceae tests or with sand grains. In this species I found the greatest number of vitreous globules, and these made the test look most attractive. The colouring is brown to blackish brown. Measurements: length 70—105 μ; width 45,5—63 μ; diameter of the aperture 24,5 μ; length of the spine 17,5 μ. Also in this species already PENARD figured objects similar to our vitreous globules (fig. 10. F—G).

* *Difflugia elongata* PENARD (2)

I found only one specimen of this species. It agrees in almost all characters with the type described by PENARD, only in size it corresponds more to the species *Difflugia urceolata* CARTER. The test is elliptic, more elongated, with the collar turned down over the margin. The inner part of this collar is not covered with sand grains so that where it is turned down it forms a light yellow rim around the aperture. The aperture is regular, circular, and inside the plasm are numerous symbiotic algae. On the test there are usually some tests of Diatomaceae. I could not identify any nuclei. I do not exclude the possibility that this type belongs in the vicinity of type A 2, as I have given it in the phyletic table. Measurements: length 227 μ; width 175 μ; diameter of the aperture 105 μ; height of the collar 17,5 μ. (Fig. 9 B.)

* *Difflugia glans* PENARD (9)

The elongated tiny test is sparsely covered with sherds. At the aperture it is somewhat thickened, and the thickening appears in a side-view as a darker margin. Around the aperture are arranged kernel-shaped sand grains. The aperture is circular. There is one nucles in the plasm. The colour is brown. Measurements: length 70 μ; width 42μ; diameter of the aperture 20μ. On the whole it agrees with the type desribed by PENARD. (Fig. 11. C).

Difflugia globulosa DUJARDIN (3, 8, 9)

The spherical or also elliptic test with a circular aperture has the whole surface covered with sand grains. These specimens correspond to the specimens described by PENARD as a small form. I did not find even in one specimen a purely chitinose test, as described by PENARD. The colour is in all dark brown. Measurements: diameter of the test 59,5 μ; diameter of the aperture 24,5 μ. (Fig. 11 A—B.)

* *Difflugia gramen* PENARD (7—9)

The ovoid test is on the narrow side broadly open, with a trilobate aperture, around whose margin there are minute sand grains regularly arranged. The nucleus is spherical, with a large nucleol-endosome. In the plasm, which is coarsely granular and foamy, are numerous foreign

bodies. The test is in all cases observed densely covered with minute sand grains. The colour is gryish black. Measurements: length 112 µ, width 105 µ, diameter of the aperture 42 µ.

Difflugia lebes PENARD (1—5, 8, 9)

The specimens of this species belong among the largest Difflugiae. All specimens found correspond accurately in their exterior and interior characters to the specimens described by PENARD in his paper of 1902 (on p. 271, figs. 1 and 6). It is a broad, almost globular test with the aperture almost as wide as the diameter of the test. The nuclei in the coarsely granular plasm are globular with several chromatinose granules, which give the impression of nucleols. The surface is covered with large sand grains or sherds. The colour is predominantly dark brown or black. Measurements: length 340—420 µ, width 290—380 µ, diameter of the aperture 220—340 µ. They were the largest specimens of the genus *Difflugia* LECLERC which I found at the locality. Very often they were simply crowded with symbiotic algae. They exsert long, strong, digitiform pseudopodia, always at least 2—3 simultaneously. I did not find the smaller variety as PENARD describes it in fig. 6 of the paper cited above.

Difflugia leidyi WAILES (1—9)

The test is very variable, but always only sparsely covered with sand grains or with tests of Diatomaceae. Usually, however, the surface of the test is bare or much covered with deritus, so that the test is non-transparent. The shape is usually ovoid, often with a neck indicated, sometimes also with a collar moderately turned down outwards. When there are tests of Diatomaceae on the test, they project bristly beyond the margin. I found also many vitreous globules on many tests. In one case the test was covered with long fibres, which here and there were intertwined to a tuft. There is one nucleus; it is spherical, with a granular structure. The colour of the test is yellow to dark brown. Measurements: length 36—87,5 µ, width 34—59 µ, diameter of the aperture 21—34 µ. (Figs. 11. G—K.)

Difflugia limnetica LEVANDER (8)

The test is similar to that of the species *Difflugia gramen* PENARD, also the opening is lobate (3—4 lobes) or cordate, but around the opening is an always low, distinct collar moderately turned down outwards. The nucleus is spherical. The pseudopodia are long, digitiform, often veil-like ramified. The colour of the test is grayish black. The covering of the test consists of minute sherds. Measurements: length 90 µ, width 85 µ, diameter of the aperture 51 µ. (Fig. 9. G.)

* *Difflugia lobostoma* LEIDY (6, 9)

Test globular, sometimes moderately elongated, with an aperture which has 3—4 lobes. The test is covered with very large sand agains. The colouring is gray to black. Sometimes green symbiotic algae occur in the plasm. Measurements: diameter of the test 156—175 µ, diameter of the aperture 35—53 µ. (Fig. 9. H.)

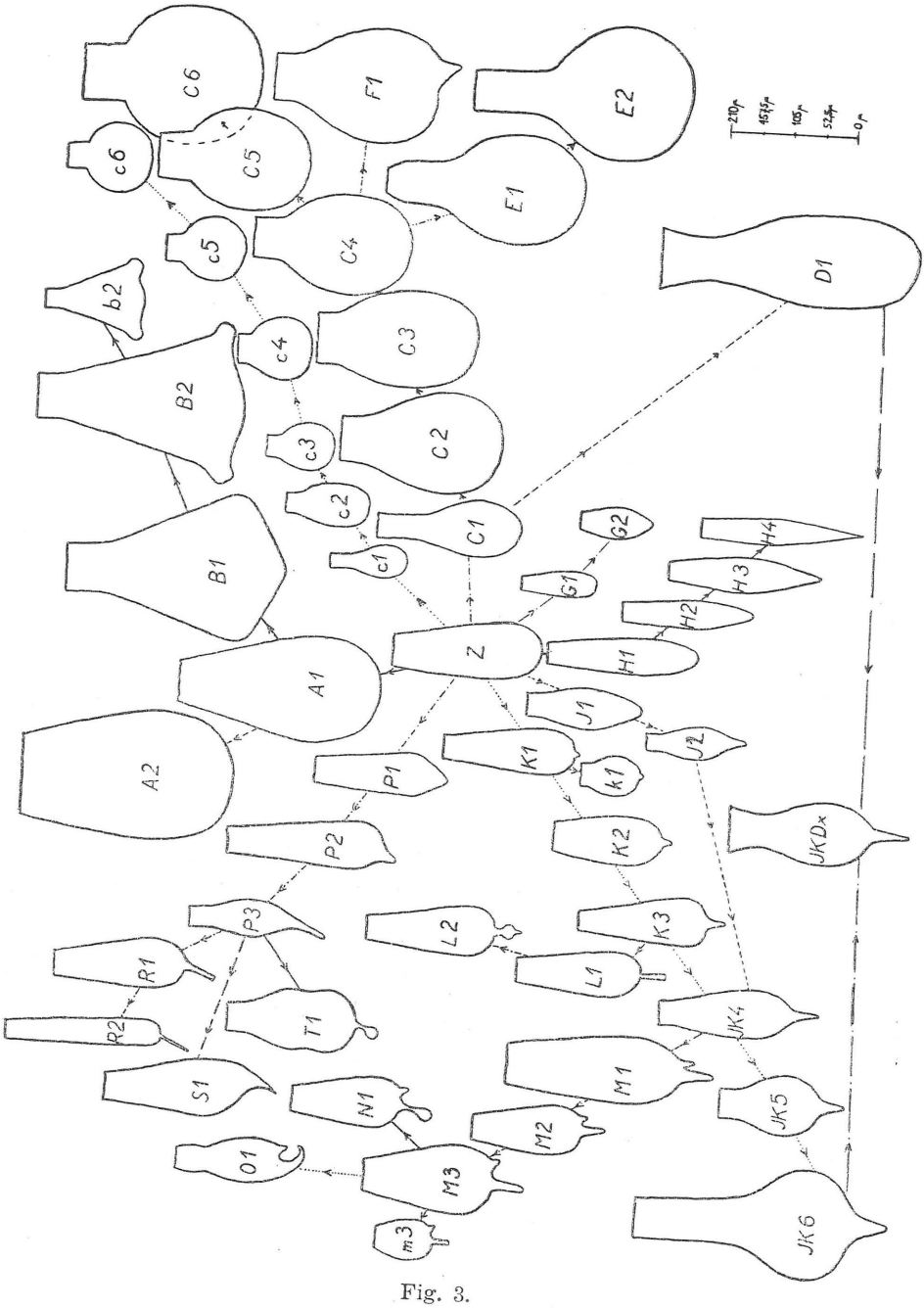
Difflugia lucida PENARD (6, 9)

Broadly ovoid test, strongly compressed so that in a side view its width appears as one half to one third of the width as seen from the front. The aperture is elliptic, sometimes with torn margins. The covering of the test is formed either by sherds or by detritus with fibres. The pseudopodia are long, digitiform; the plasm has many inclusions and one spherical nucleus. The colouring of the test is light brown to grayish black. Measurements: length 122—140 μ, width 84—105 μ, height 42—50 μ, length of the aperture 42—56 μ, width of the aperture 28—48 μ. (Fig. 10. A—C.)

Difflugia U oblonga EHRENBERG

The accurate definition of the different species of the genus *Difflugia* LECLERC was mostly made only after exterior characters (i. e. size, material which is used for building the test, the amount of it on the surface of the test, etc.). Only some rhizopodologists (e. g. PENARD) took into consideration also the inner structure, i. e. the composition of the plasm and especially the nucleus, as well as its shape and the number of nuclei. Thus it is obvious that the genus *Difflugia* LECLERC because of its great tendency to variability came to form whole series of species, varieties and forms, according to how an observer observed it in a different geographical place. Slight deviations in the shape of the test were described immediately as a new species.

I studied the differences in the outer structure of the test as well as in the inner structure of the plasm and nucleus in many specimens of different species of one microlocality, which I divided still further into different areas according to the composition of the substratum. I can only say that the picture of the substratum is on the whole reflected in the structure of the test (not entirely in the shape). Therefore many specimens of the same species, in places only a few dozen centimetres distant from each other, appeared so different in the surface of their test that also their general shape was somewhat changed. I found whole series of transitions from one species to another. By studying and comparing the pictures in the literature I ascertained that the specimens of different species of the different rhizopodologists form also such series of transitions from one defined species to another. Further it is interesting that a given place has almost always only one specific population of a species, and that this population is slightly different from another population of the same species but from another place. Thus e. g. the species *Difflugia (oblonga) acuminata* EHRENBERG I found in some places with a very short and blunt excrescence, a little farther off lived a population with a longer or shorter excrescence, sometimes pointed, in other cases rounded; when, however, we place specimens from different places side by side, we obtain a series at the extreme ends of which we have specimens very little similar to the basic type, and still less to each other. Therefore it is only by compiling whole such series of specimens of one locality that we can judge to which species the specimens belong. The inner characters are here,


c6
C6
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C4
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C2
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B1
c1
A1
Z
A2
P1
K1
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P2
K2
P3
L2
K3
R1
L1
R2
T1
JK4
S1
M1
N1
JK5
M2
O1
M3
JK6
m3
D1
G2
G1
H4
H3
H2
H1
J1
J2
JKDx
210
157,5
105
52,5
0

Fig. 3.

however, only slightly different. The size of the nucleus increases or decreases, or the number of chromatinose granules within the nucleus varies. Nevertheless it is obvious that all these specimens belond to one species. The material which I had at my disposal gave me on the whole a fairly accurate picture of the variability of the species *Difflugia U oblonga* EHRENBERG, which I study more in detail according to modern taxonomy. Nevertheless I do not consider this picture final, because it includes only specimens from one locality so that we cannot judge the variability on the basis of geographical distribution.

From the specimens studied of the species hitherto regarded as such of the genus *Difflugia* LECLERC I regard the species *Difflugia U oblonga* EHRENBERG as the initial one; for when we follow these specimens the relative means of all shapes and characters is *Difflugia (oblonga) oblonga* EHRENBERG, not only qualitatively but also quantitatively. From this basic type several branches developed quite separately and evidently under the influence of the environment, even if some stages of these branches are reminiscent in some of their characters of similar characters in specimens of other branches. These phylogenetically different specimens differ, however, quite clearly in their inner structure. The phylogenetic branches divide still further so that the last specimens I found of these ramifications have no longer anything in common with the basic type, at most the material on the test, which they take from the substratum on which they live together.

I divided and designated the whole of the forms and varieties grouped around the species *Difflugia oblonga* EHRENBERG in the following way:

Difflugia U oblonga EHRENBERG

Difflugia (oblonga) oblonga EHRENBERG
Difflugia (oblonga) nodosa LEIDY
Difflugia (oblonga) brevicolla CASH
Difflugia (oblonga) angusticollis semi-sp. nov.
Difflugia (oblonga) vas semi-sp. nov.
Difflugia (oblonga) manicata PENARD
Difflugia (oblonga) scalpeum PENARD
Difflugia (oblonga) acuminata EHRENBERG
Difflugia (oblonga) caudata semi-sp. nov.
Difflugia (oblonga) schizocaulis semi-sp. nov.
Difflugia (oblonga) curvicaulis PENARD

These semi-species are mutually well defined, but in evaluating all of them together they cannot be pronounced to be good species, and therefore I have combined them in the species *Difflugia U oblonga* (ultraspecies). Schematically all these semi-species are shown in the phylogenetic table (fig. 3). I give below the detailed description and analysis for each semi-species.

Difflugia (oblonga) oblonga EHRENBERG (1—9)

In the material this species is represented by two series of specimens, one series of large specimens (length 200—336 μ, width 100—192,5 μ; diameter of the aperture 60—126 μ), and one series of small specimens (length 90—140 μ, width 42—72 μ, diameter of the aperture 14—40 μ). In the table the larger series is designated by the letter Z, and the small series by the latter G 1. The specimens of this form I regard as basic for the whole large species. They are of elongated tubular shape, closed and rounded posteriorly, and in the direction towards the aperture slightly narrowing. The surface of the test is covered according to the material provided by the environment and also according to the quantity present in the environment. Thus I found specimens with a dense covering; these specimens often cover the test with tests of Diatomaceae, or with the same bodies as used by *Lecqueresia (spiralis) spiralis* SCHLUMBERGER. In the material we can thus find an imperceptible transition to specimens similar to the species *Difflugia oblonga* var. *lacustris* PENARD. In some cases I observed the fission of this species. It is interesting that on the new specimen the building material settles in most cases first at the aperture, and in the case of a scarcity of material the sherds do not cover the remaining surface of the test at all, or they cover it only very scantily. Thus we often find specimens with differently formed tests. In some places of the locality I found specimens conform with the species *Difflugia oblonga* var. *lacustris* PENARD (this conformity arosa under the influence of the environment) and with the populations of the species *Difflugia (oblonga) oblonga* EHRENBERG, which lived in this place and formed tests conform with the tests of the specimens described as *Difflugia oblonga* var. *lacustris* PENARD. Therefore I include this variety in the species *Difflugia (oblonga) oblonga* EHRENBERG. The main reason for including var. *lacustris* in this species is, however, that it does not differ in the least by the inner structure of the plasm and nucleus from the species *Difflugia (oblonga) oblonga* EHRENBERG.

Also the specimens with a test covered with the tests of Diatomaceae form a continuous transition to the species *Difflugia bacillifera* PENARD, so that we cannot say that this species has a justified place in the system, especially as we can pass from it by an entirely gradual transition to further semi-species of the specific collective *Difflugia U oblonga* EHRENBERG. Also other *Difflugia* which I found showed in the material of the test a continuous transition from sand grains to Diatomaceae, and they cannot be regarded as good species and not even as semi-species. A more significant difference would be given by the somewhat different shape of the chromatinose granules in the nucleus. But the difference is so slight that as compared with other species it can be neglected. In the specimens which morphologically resemble the basic type we do not find a difference in the chromatinose granules. It is slightly perceptible in the specimens of the branches C and c, i. e. in those in which a neck begins to outline itself. Thus there are reasons enough to place also the species *Difflugia bacillifera* PENARD to the collective of species *Difflugia (oblonga) oblonga* EHRENBERG.

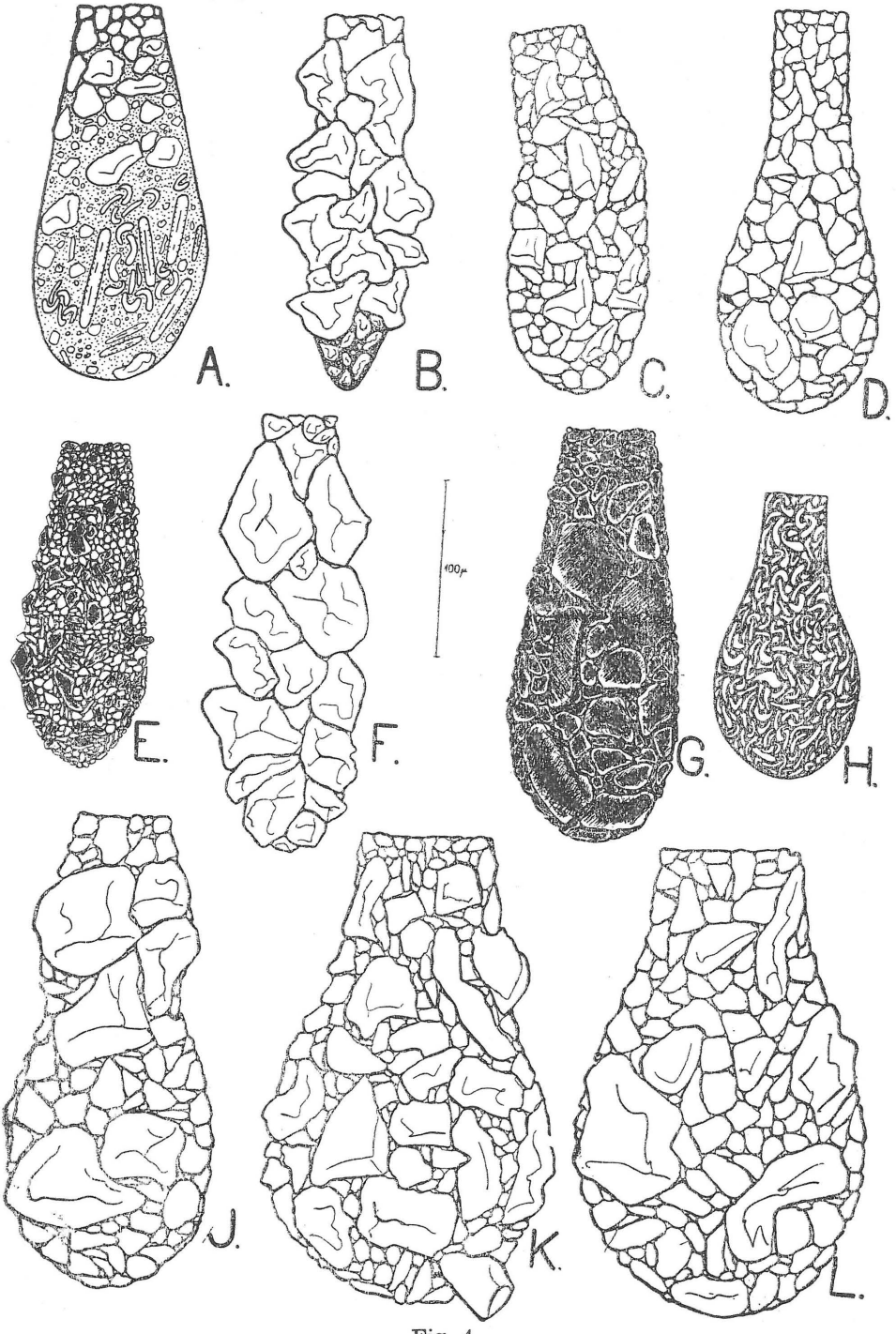

Fig. 4.

Also *Difflugia oblonga* forma *cyphodera* JUNG is a slight deviation from the basic type. I found in our material a series of transitions from specimens with a slight indication of a bending of the test to the specimen figured by JUNG, 1942 (p. 277, Abb. 5 c). It is, however, possible that the bending of the test was caused by minute water currents at the time of the development of the young specimen, which was then moderately bent (viz BARTOŠ, 1939). It is indicated by the absolute agreement in the inner structure of the plasm with the basic type. As W. JUNG in his paper does not given a description of the plasm and nucleus, I cannot say for certain whether the specimens described by him also belong to the collective of the species *Difflugia (oblonga) oblonga* EHRENBERG or not; our specimens certainly belong to it.

The smaller form given in the literature as *Difflugia oblonga* var. *bryophila* PENARD differs from the basic form in size; morphologically and in its inner structure it is, apart from a trifling deviation in the size of the nucleus, absolutely conform to the type. It can be regarded as the small form of the species *Difflugia (oblonga) oblonga* EHRENBERG; as however in modern taxonomy a small form is not designated, it is included in this species.

Some specimens which at the extreme ends of their series correspond to the species *Difflugia lanceolata* PENARD, a species which EHRENBERG and LEIDY regarded however as the species *Difflugia acuminata* EHRENBERG, I place also in the collective of the species *Difflugia (oblonga) oblonga* EHRENBERG, as there are no really marked differences between them. For the rest also PENARD compares them with the species *Difflugia oblonga* EHRENBERG. Also with regard to the inner structure they are on the whole not different. They are most a lateral ramificitation of the phyletic series.

Further we have to place in the basic species the initial stages of the different phyletic branches, even when these begin to differ somewhat from the basic type. Of branch A belongs here form A 1, which opens the series of gigantic specimens. The test lengthens and broadens in its lower part, even though the aperture remains relatively unchanged. From this form the phyletic branch divides. Form A 2 still belongs, in its direct continuation, but in A 2 the aperture is already considerably broadened so that the form is very different. In the further continuation of this branch the test becomes ventricose so that it is strongly reminiscent of the species *Difflugia lebes* and *Difflugia elongata* PENARD. It differs from them by the number of nuclei, so that it can be seen at once that we have here different species. Of branch B belongs here the transition form between A 1 and B 1. The aperture remains in these specimens the same; there appear indications of a neck, and the lower part of the test broadens. The branches C and c correspond to these specimens by their initial shape, and are reminiscent of the species *Difflugia oblonga* var. *lacustris* and var. *bryophila* PENARD and *Difflugia bacillifera* PENARD in the papers: PENARD 1902, p. 216, figs. 3—4; p. 231, figs. 1—3; H. R. HOOGENRAAD and A. A. DE GROOT 1935, p. 451, Fig. 7 a—f; 1940,

p. 116, Fig. 55 a—c; p. 126, Fig. 64 a—c, g; W. JUNG 1942, p. 277, Abb. 6 a—b.

Of branch c, i. e. of the small forms, we can reckon to the collective of the species *Difflugia (oblonga) oblonga* EHRENBERG from the table the forms c 1 and c 2, and from the series of large specimens the forms C 1 and C 2. In the branches the initial forms widen the lower part of the test, so that a long elongated neck results, which in branch D begins to turn outward at the aperture. Here belongs H. R. HOOGENRAAD's and A. A. DE GROOT's form figured in the paper of 1940 on p. 126, Fig. 64 g, and designated as *Difflugia oblonga* var. *longicollis* GASSOWSKY. In the forms c 2 and C 2 the neck shortens, the specimens of branch G, even in the case of small forms of the basic type, show an interesting idiosyncracy: even in places rich in various fragments, sherds, and sand grains they stick these particles mainly round the aperture. The specimens of the form G 1 completely resemble the basic form.

In the specimens of branch H the diameter of the test strikingly narrows while the length of the test remains on the whole the same. A very bizarre aspect is exhibited by specimens from places where there are only rather large building particles, which then project far beyond the test. In this group I place the specimens of the form H 1 or close to it. Though the two further branches somewhat differ in the forms close to the basic form, yet it is obvious from the phyletic series that they lead to the origin of the species *Difflugia (oblonga) acuminata* EHRENBERG. They are the specimens of the first stages of the series J, K and k. In branch J the lower part of the test begins to lenghten into a kind of tip. Here belong the specimens of the form J 1. In these branches there is a specially great variability in size. The table shows the forms which had the greatest number of specimens.

I place here also the specimens which are given in the literature as good species or varieties, but which do not differ from the basic form of the species *Difflugia (oblonga) oblonga* EHRENBERG in the fundamental structure of the test and plasm on the basic of a series of transition specimens. They are: PENARD's *Difflugia oblonga* var. *venusta* and var. *claviformis*, given in the paper of 1902, p. 218, figs. 4—5. The form under no. 4, *Difflugia oblonga* var. *claviformis* PENARD, is just such an initial defined branch J, whereas the form in fig. 5, *Difflugia oblonga* var. *venusta*, represents a form analogous to form J 1 of my series. In this form a neck appears, though less distinct than in form c 1 or C 1. Further we have here the form described in the same paper on p. 233, fig. 9, designated as var. *Difflugia acuminata* EHRENBERG. Also the form on p. 251, fig. 3, designated as form of the species *Difflugia lanceolata* PENARD, belongs here, as there is no other difference than a slight change in the shape of the chromatinose granules in the nucleus. Of the forms described by H. R. HOOGENRAAD and A. A. DE GROOT in the paper of 1935 belong here the types figured in figs. 2 a—c on p. 440 and described as *Difflugia oblonga* var. *lacustris* PENARD. They are obviously specimens from places with insufficient building material. In themselves they represent

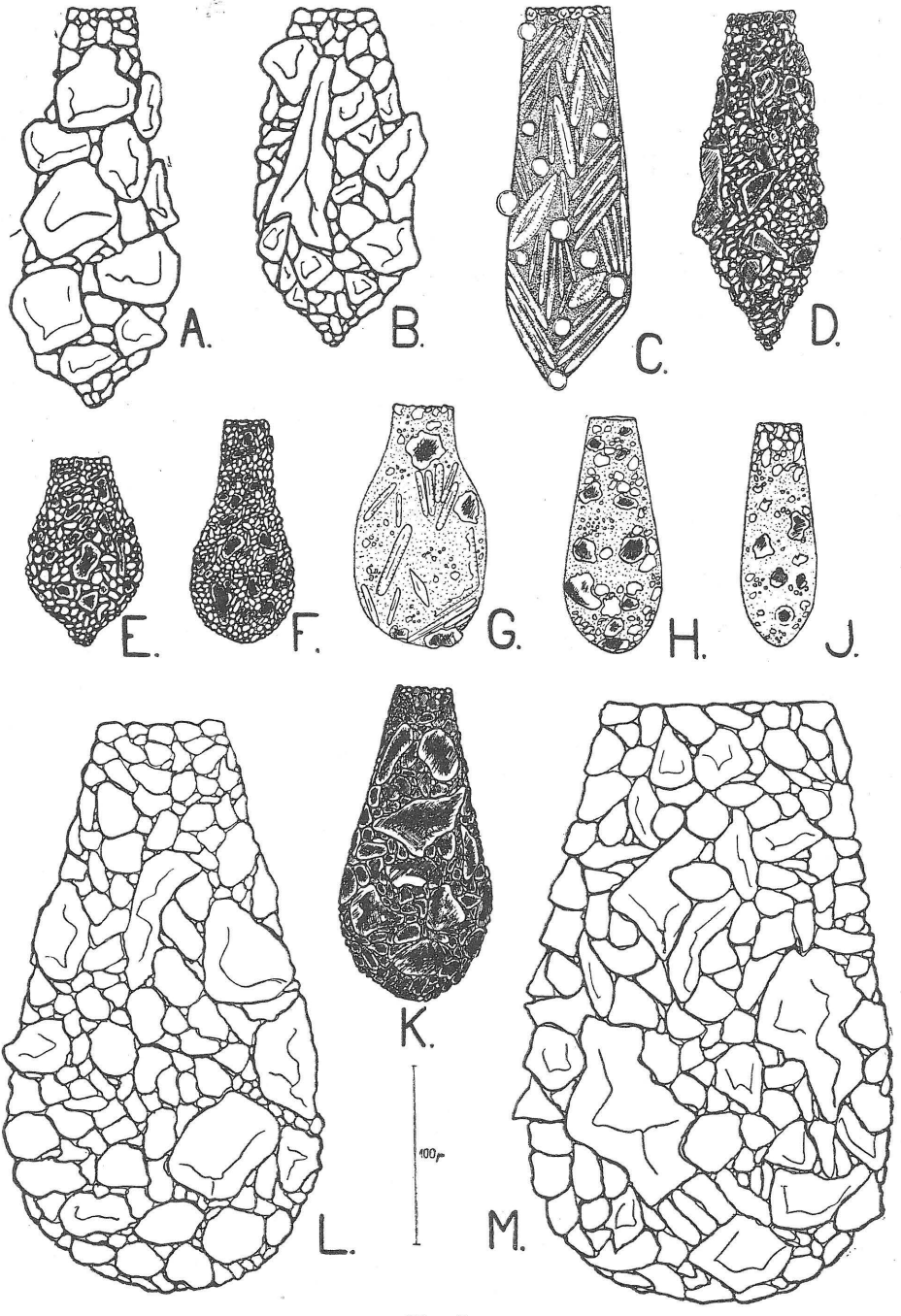

Fig. 5.

a part of the phyletic series in which the form closest to the form *Difflugia (oblonga) oblonga* EHRENBERG would be that figured as 2 a, then would follow the form 2 c, and finally the form 2 b, in which we can already observe the independent lengthening of the tip. Also the form figured on p. 442 of the same paper, fig. 3 i, designated as *Difflugia acuminata* EHRENBERG, belongs here, even though its outer aspect is different owing to the influence of the material on the test. These are specimens from moss, and this explains the poorness of the test. From a later paper of the same authors, of 1940, I place in the collective of the species *Difflugia (oblonga) oblonga* EHRENBERG the forms figured on p. 133, figs. 65 a—b, designated as *Difflugia oblonga* var. *lacustris* PENARD. The specimens are covered with sand grains only round the aperture and close to it.

W. JUNG in his paper of 1942 gives on p. 279, Abb. 7.a a form which, though somewhat more ventricose than the shape J 1, still belongs to our collective. I observed such specimens also, but on the whole only very rarely. They appear to be some extreme ramification of the variation branch. But also in this case I found sufficient material to prove that the species described by W. JUNG as *Acipyxis inflata* PENARD comb. nov. belongs to the closer affinity of *Difflugia (oblonga) oblonga* EHRENBERG. The specimens of branches K and k differ in the beginning of the branch from the specimens of branch J by first forming on the lower part of the test a small verruca which elongates more and more until this form connects in the form JK 4 with the variation branch J, where the tip begins to be strangulated off; the tip, however, had a different development. In the beginning of this branch appears also a defined small form, but it disappears in the continuation of the phyletic series by an imperceptible transition from the small specimens to large ones. This may be due to the fact that I did not find any of those transition specimens which would have supplemented the continuous series. The same applies to branches C and c, where for the sake of showing the difference of the possible sizes clearly I figured one of the smallest and one of the largest specimens.

The specimens near type K 1 and k 1 belong also to the species *Difflugia (oblonga) oblonga* EHRENBERG. Of Penard's forms I place here the form described in the paper of 1902, p. 218, fig. 3, as *Difflugia oblonga* var. *claviformis* PENARD; further the forms figured on p. 233, fig. 2, as *Difflugia acuminata* EHRENBERG, and no. 10, designated as *Difflugia acuminata* var. *inflata* PENARD. One may say that these forms represent the transition between the initial forms of the branches J, K and k. In the paper of the same author, of 1905, is figured on p. 20 a form which I also place in this group, and which PENARD described as *Difflugia oblonga* var. *claviformis* PENARD, and the types on p. 23 described as *Difflugia mammillaris* PENARD. They are again extreme ramifications of branch K und k.

Finally there is here the variation branch P, in which in a similar way as in branches H and J the end of the test lengthens and becomes pointed, and later also strangulated; it is possible that there forms still one ramification of the variation series as seen in branches K

and k, but in this case the tip forms or lengthens outside the axis of the test, i. e. obliquely sidewards, as may be seen in form P 1 and the following ones.

All specimens mentioned agree in their inner structure. Their outer shape and aspect differ according to whether they are due to phyletic variability or different conditions of the environment in which they live. Thus the covering of the test may differ from sherds to sand grains, or from practically naked tests proper to a covering with tests of Diatomaceae or even of vitreous globules. Most specimens have all these different kinds of material mixed on the test. Also in the size of the specimens there is so considerable a variability that it is difficult to say where the large form begins and the small form ends. I place therefore all the forms mentioned in the species *Difflugia (oblonga) oblonga* EHRENBERG, even though it is clear that it is difficult to define any sharp limits (Fig. 4. A—L and 5. A—M).

* *Difflugia (oblonga) nodosa* LEIDY (4)

The form figured in fig. 3 as B 2 corresponds on the whole to the description of PENARD. The test is of conical shape with a distinct neck and with two lateral ear-shaped processes in the lower part of the test, which has not a flat but a slightly pointed base. In some cases the test is moderately squeezed. There is one rather large nucleus, up to 56 µ, with numerous chromatinose granules. The plasm is coarsely granulate. It is interesting that I found also a small form of this species but no specimens which would form a transition series from the large form to the small form. Thus the two forms remain sharply defined. Measurements of the large specimen: length 332,5 µ, width 210 µ, width of the neck 35 µ, length of the neck 70 µ. Small specimen: length 158 µ, width 88 µ, width of the neck 15 µ, length of the neck 52 µ. In both cases the covering of the test was composed of sand grains and sherds. The large specimen carried specially big sand grains. Between the forms A 1 and B 1 indicated in the variation table still some specimens were found which explain the evolution in this direction. As the size of the excrescences increases from form B 1 to B 2, so also the base grows wider, and the neck defines itself in the direction from type A 1 to B 1. The inner structure of the plasm and nucleus is, however, in all of them almost the same. To form B 1, which marks the transition, we have to reckon also the form figured on p. 126, fig. 64 f in the paper of 1940 by H. R. HOOGENRAAD and A. A. DE GROOT. This specimen is a more advanced stage of the form B 1 in the direction towards the species *Difflugia (oblonga) nodosa* LEIDY, which the authors describe as *Difflugia var. nodosa Leidy* (= *Difflugia crassa* CASH?). The measurements of the other specimens found are: length 346—360 µ, width 212—230 µ, diameter of the aperture 63 µ, length of the neck 80—120 µ. The forms B 2 and b 2 I do not separate from each other, as we have here probably a small form (Fig. 9. J—L).

* *Difflugia (oblonga) brevicolla* CASH (1—4, 6, 9)

Beginning with the forms C 3 and c 3 the width of the test increases in the specimens figured on the variation plate, while the

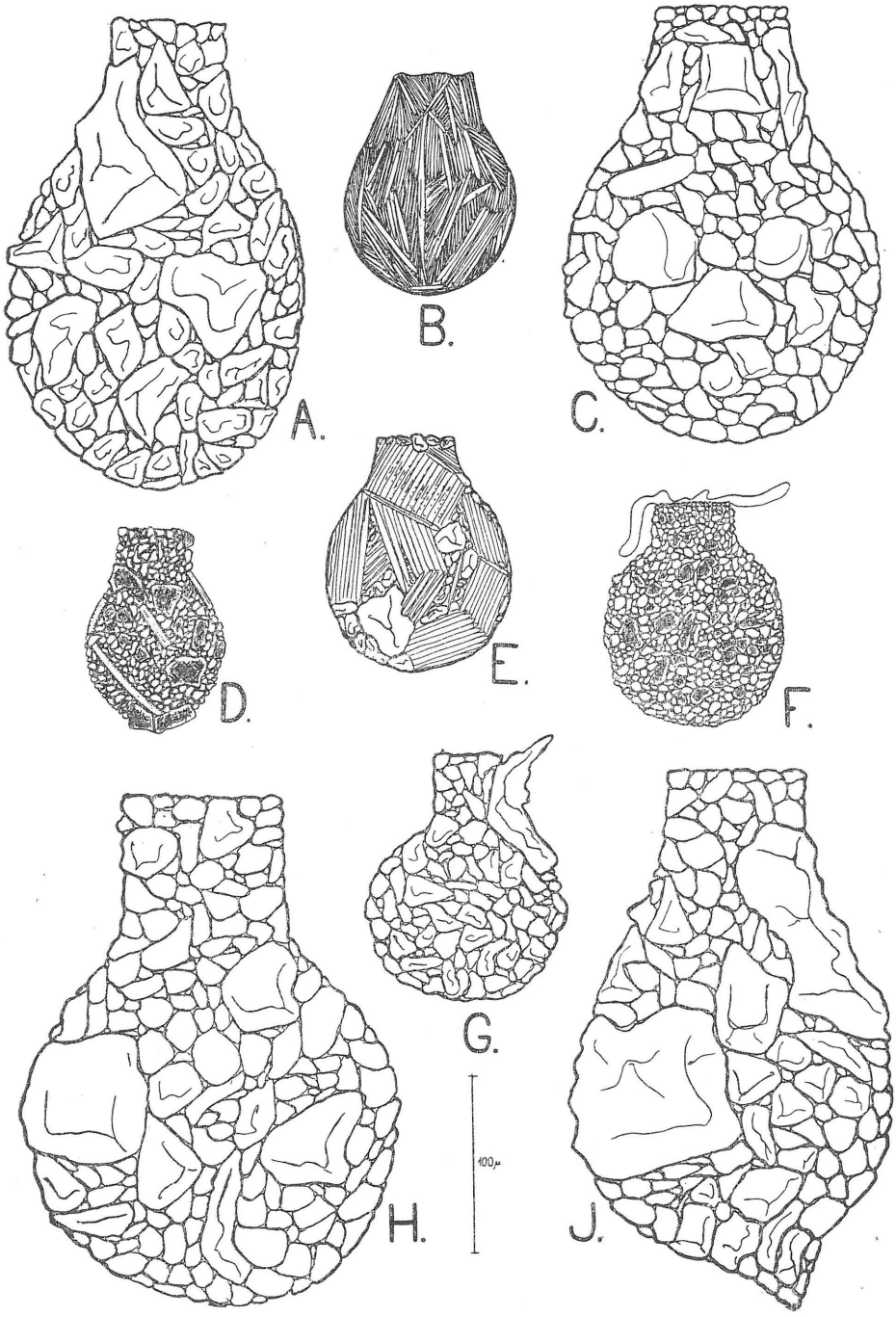

Fig. 6.

neck forms more and more clearly, and in the final forms of the series it is already considerably wide though not yet high, yet sharply set off from the spherical part of the test. Between the large and small specimens I found in many cases transition forms. Forms C 3 and c 3 resemble still very much the forms C 2 and c 2; in this case it is difficult to fix the limit between the semi-species *Difflugia (oblonga) oblonga* EHRENBERG and *Difflugia (oblonga) brevicolla* CASH. On the whole it may be said that the specimens do not differ from each other in their structure except for differences in shape. The covering of the test is different also in the same forms and, as we may infer, also in the populations, where it is mainly the environment, i. e. the substratum, which causes this differentiation. Especially the smaller specimens use for covering the test the tests of Diatomaceae, and I found some specimens with an exclusively Diatomacean covering. But in no case did the tests of the Diatomaceae project beyond the margin of the test, as is a frequent phenomenon in the species *Difflugia leidyi* WAILES. The larger specimens (but often also small ones) often used large sand grains, which reached as much as one third of the total size of the test.

I give the measurements for the forms figured in fig. 3, but they are not determinative and constant, as there exists a whole scale of transitions. Forms c 3 and C 3: length 112—262,5 µ, width 87,5—157,5 µ, diameter of the aperture 42—70 µ. Forms c 4 and C 4: length 122,5—265,5 µ, width 98—160 µ, diameter of the aperture 27—64 µ. Forms c 5 and C 5: length 122—245 µ, width 98—175,5 µ, diameter of the aperture 41—70 µ. Forms c 6 and C 6: length 140—280 µ, width 105—210 µ, diameter of the aperture 35—68 µ, length of the neck 35—88 µ.

The colouring passes from light brown to black. The specimens had usually inside the plasm numerous green, symbiotic algae. The pseudopodia are long-digitiform, relatively rather broad. There is one nucleus, with numerous lenticular chromatinose granules. The plasm is granular, with inclusions (also crystals). All specimens had relatively few vacuols. To form C 4 I should place the specimen designated F 1 and differing only by the conical processus growing outside the axis of the test. For the rest it is conform in the structure of the test and inner composition with the specimens of form C 4. Its measurements are: length 280 µ, width 175 µ, diameter of the aparture 70 µ, processus 12 µ. Of the specimens in the literature would belong here the specimen figured by PENARD in his paper of 1902 on p. 216, fig. 5, described as var. of the species *Difflugia pyriformis* PERTY, further on p. 218 of the same paper, fig. 2, described as *Difflugia oblonga* var. *atricolor* PENARD. This variety belongs among the small specimens of series c, between forms c 5 and c 6. H. R. HOOGENRAAD and A. A. DE GROOT in their paper of 1940 described and figured on pp. 126 and 129, figs. 64 c—d, forms which I place also to branch C of the variation table. The first specimen was described as *Difflugia oblonga* EHRENBERG and the second as *Difflugia brevicolla* CASH? Among the small specimens I place also the species *Difflugia sphincta* JUNG, described

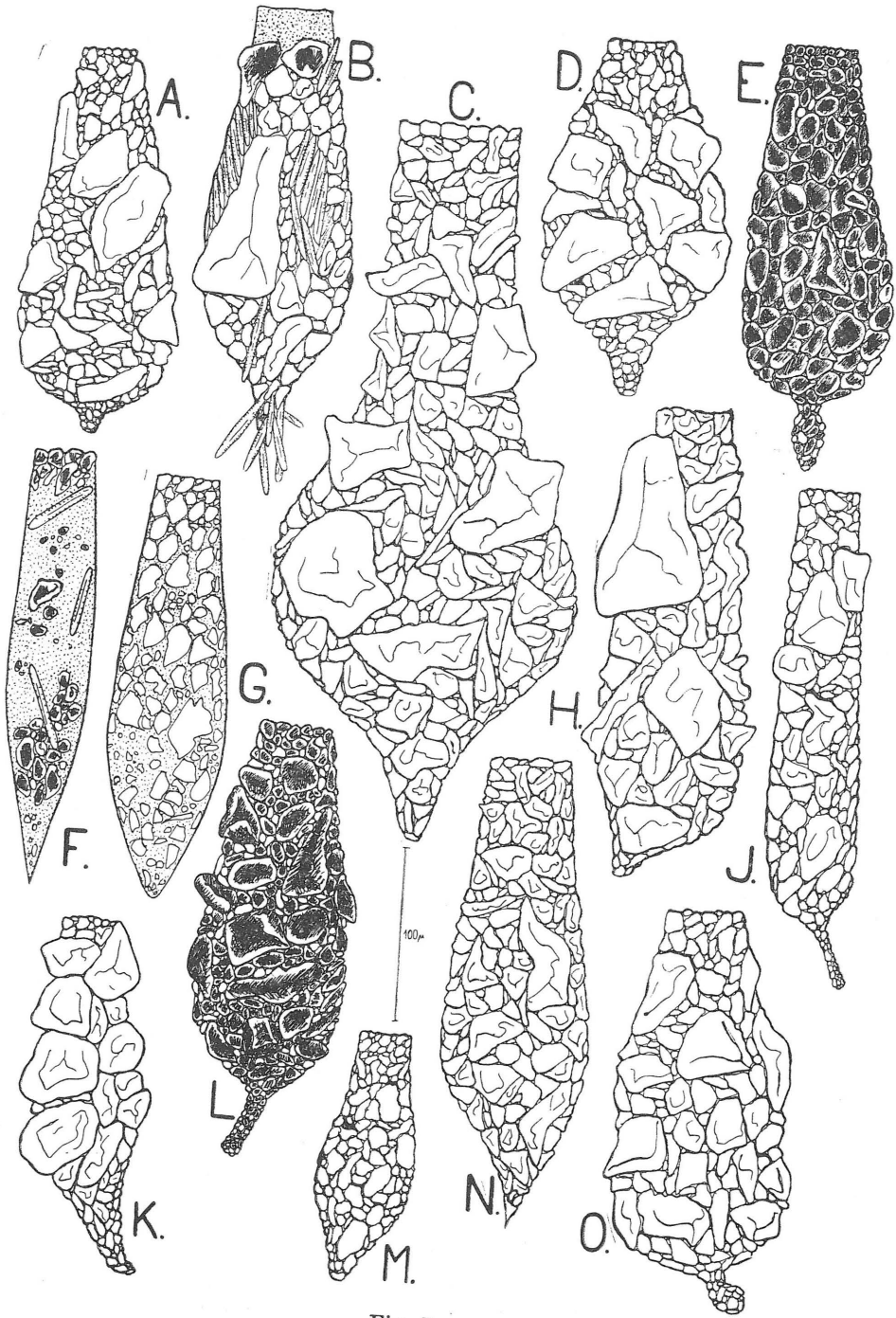

Fig. 7.

by W. JUNG in his paper of 1942 on p. 278, Abb. 16. As I found several specimens which had a larger or smaller number of sand grains glued to them in a similar way, I do not regard this species as defined, and place it also to the species *Difflugia (oblonga) brevicolla* CASH. The specimen figured by me as F 1 is somewhat reminiscent of some forms of the species *Acipyxis inflata* forma *imanata* JUNG, but differs from them by a distinct neck and only one processus of the test. On the whole we may say that *Difflugia (oblonga) brevicolla* CASH. is a collective of transition forms which differ considerably from each other. (Fig. 6 A—H.)

*** *Difflugia (oblonga) angusticollis,* semi-sp. nov. (2, 4).

The specimens of this species differ from the species *Difflugia (oblonga) brevicolla* CASH. by the long and thin neck, which sits on the spherical part of the test, as shown by the specimen E 2 figured. In the direction towards the form E 1 the neck somewhat shortens until in form C 4 it disappears entirely. The greatest difference is however found in the nucleus. Though the shape remains the same and also the number of chromatinose granules, nevertheless the shape of the chromatinose granules changes from form C 4 to form E 2. If in shape C 4 the chromatinose granules are usually almost lenticular, then in shape E 1 they pass into fusiform ones, and in type E 2 they are entirely without any characteristic shape. The chromatinose granules of form E 1 are reminiscent of those of the species *Difflugia lebes* PENARD. The colouring of the specimens is brown to black. As far as I have been able to observe the covering of the test was composed exclusively of sherds and sand grains. Measurements: length 315—367,5 µ, width 175—210 µ, diameter of the aperture 42—70 µ. Type E 1: length of the neck 90 µ, width of the neck 75 µ. Type E 2: length of the neck 110 µ, width of the neck 72 µ. The configuration of the neck in form E 1 figured is interesting; it is still considerably narrowed close to the aperture. Of PENARD's specimens I place here the form figured on p. 216, fig. 6, of his paper of 1902, as a variety of the species *Difflugia pyriformis* PETRY.

Though in its outer aspect the species *Difflugia (oblonga) angusticollis* differs slightly from the species *Difflugia (oblonga) brevicollis* CASH., the innner structure gives it a separate position in the collective of forms of the species *Difflugia U oblonga* EHRENBERG (fig. 8 H—J).

*** *Difflugia (oblonga) vas* semi-sp. nov. (9).

Morphologically it resembles a vase. It has an elongated test, at the neck slightly narrowed, but as a whole again widening towards the aperture. The covering of the test is composed predominantly of medium-sized sand grains. Thus it does not differ morphologically distinctly from the basic type, except perhaps by its striking size. The composition of the plasm and nucleus is, however, very different. The plasm is reminiscent by its structure of the genus Pelomyxa GREEF, of the naked rhizopoda. It is coarsely granular, with numerous, strongly refracting globules, with granules, rods and crystals. The plasm in the pseudopodia

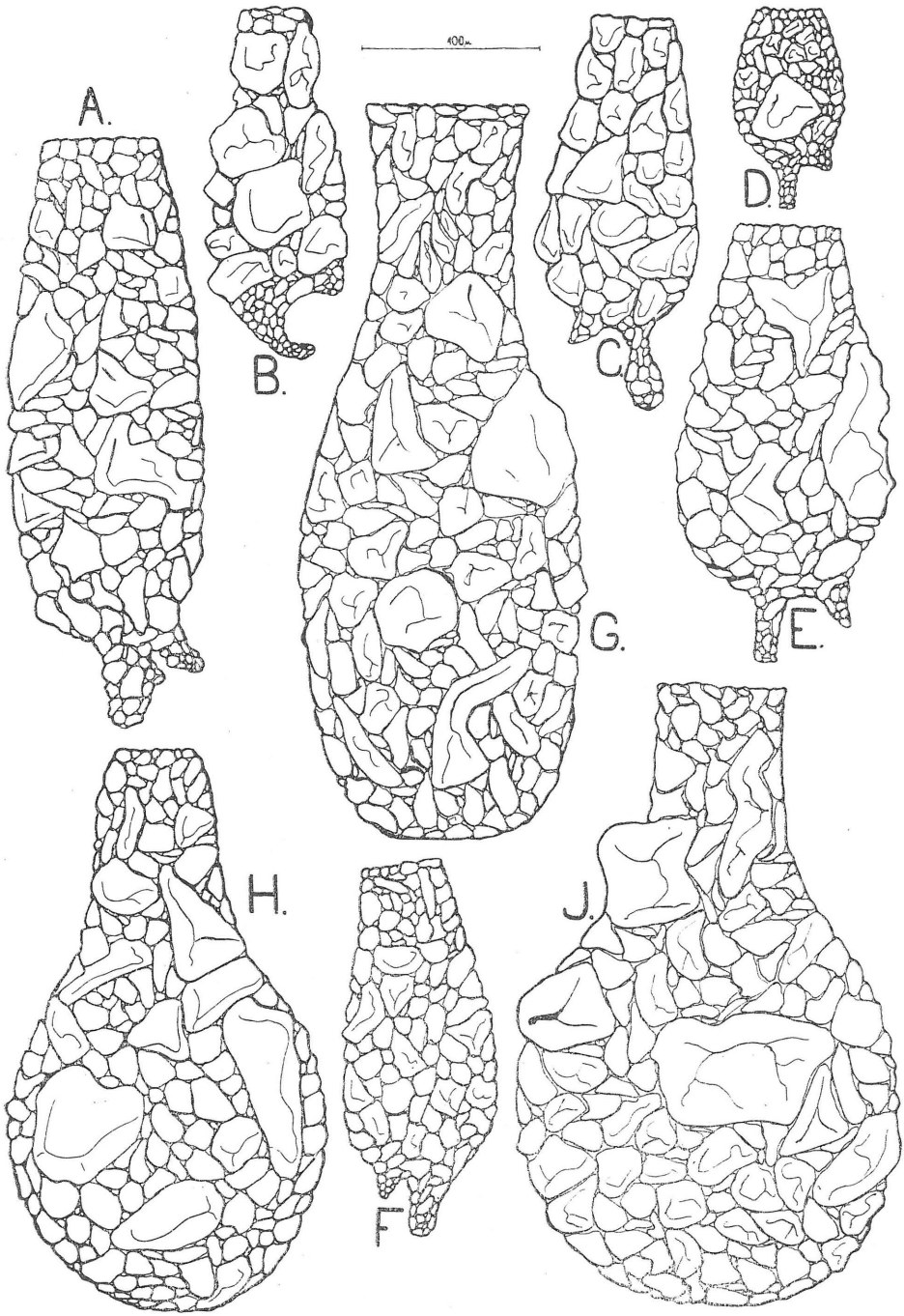

Fig. 8.

is, however, always without inclusions and is translucent. The nucleus is also very different from the nucleus of *Difflugia (oblonga) oblonga* EHRENBERG. It is literally overcrowded with minute, lenticular, chromatinose granules, which are arranged on the inner wall of nucleus at the periphery, just as the chromatinose granules in the nucleus of the species *Difflugia bacillifera* PENARD. The nucleus as a whole is spherical with a diameter of 59 µ, i. e. it is rather large. Only one pseudopod is exserted, but it ramifies into numerous tiny, digitiform lateral pseudopodia.

This species is related to the species *Difflugia (oblonga) oblonga* EHRENBERG *(Difflugia bacillifera* PENARD), but differs in the structure of the plasm and nucleus. In the accessible literature I did not find similar specimens, and therefore I regard it as a good semi-species. The colouring is dark brown. Measurements: length 420 µ; width 160 µ; diameter of the aperture 88 µ; diameter of the nucleus 59 µ (Fig. 8 G).

* *Difflugia (oblonga) manicata* PENARD (9).

The final stage of the variation branch G is the form designated as G 2 and described in the literature as *Difflugia manicata* PENARD. It is an interesting form; even in places very rich in different material suitable for the building of the test (as the place of sample 9) it never covers its test completely. Instead it always glues a wealth of sand grains round the aperture of its test, which is then strangely bristly. The specimen I found agrees entirely with the specimen described and figured by PENARD in 1902, on p. 226, figs. 1, 2, 4 and 5. The nucleus is different from the nucleus of type G 1, where there are still some chromatinose granules, which reduce in the further variation direction to G 2, as I ascertained in several transition specimens. The whole series G is reminiscent by its outer aspect of the species *Difflugia oblonga* var. *lacustris* PENARD in its smaller form. The nucleus is different; it has one, fairly large, globular nucleolus-endosome. I found the specimen figured in the variation table under letter G 2 encysted. The aperture of the test is stopped up by a layer of detritus. The cyst has a very strong, transparent membrane. The plasm inside is dark brown, with minute granules inside. The nucleus is spherical. Measurements: length 105 µ; width 52,5 µ; diameter of the aperture 21 µ; diameter of the cyst 38,5 µ; thickness of the layer stopping up the aperture in the neck about 7 µ; diameter of the nucleus 15 µ. The colouring of the test is light brown. (Fig. 10 L)

* *Difflugia (oblonga) scalpelum* PENARD (2, 3, 5, 9).

Both forms, H 3 and H 4, which I place in this species, are elongated, running out in a sharp tip, but always in the axis of the test. The nucleus and plasm resemble on the whole the nucleus of the species *Difflugia (oblonga) manicata* PENARD. But in the covering they differ from each other, even when they were found at the same place. The covering is very varied: sherds, sand grains, Diatomaceae, discs and detritus. Often they are thus reminiscent of the species *Difflugia oblonga* var. *lacustris* PENARD. When we follow the variation series H

we see that after form H 2 begins the reduction of the chromatinose granules so that already in form H 3 we find specimens with only one endosome inside the nucleus, which is characteristic just for this species. The plasm does not differ on the whole from the plasm of the species *Difflugia (oblonga) oblonga* EHRENBERG. PENARD, however, described also specimens with the tip bent outside the axis as typical for this species. Because of the inner structure of the nucleus, which agrees more with the forms of the series P, I place also here these specimens. Of PENARD's specimens I place here the specimens figured on p. 244, figs. 2, 5 and 7, of his paper of 1902. Further I place here the specimens approaching the form figured on p. 233, fig. 7, and, of course with certain reservations, it is possible to place here also the form of his paper of 1905, p. 24, described as *Difflugia scalpelum* PENARD. When we examine branch H only from a morphological point of view we see how the test narrows; the aperture remains on the whole the same, but the end lengthens into a long and sharp tip. The specimens closer to form H 4 narrow already from the aperture so that they resemble a long, isosceles triangle with a very narrow base. The size is relatively constant. Measurements: length 227,5—245 μ; width 52—70 μ; diameter of the aperture 35 μ; the colouring is predominantly gray. Because of the continuous and distinct transition to the specimens of the species *Difflugia (oblonga) oblonga* EHRENNBERG I place the species *Difflugia scalpelum* PENARD in the collective of the species *Difflugia (oblonga) oblonga* EHRENBERG as a closely related species. (Fig. 7, F—G).

Difflugia (oblonga) acuminata EHRENBERG (1—9).

The limit between the species *Difflugia (oblonga) oblonga* EHRENBERG and the species *Difflugia (oblonga) acuminata* EHRENBERG is probably formed by the second stage of the branches J, K and k. In these branches the lower end of the test either narrows into a pointed processus, which later is strangulated at its base, or it grows already strangulated in the form of a verruca, and lengthens only later. The shape of the rest of the test corresponds either to the basic form or to forms close to c 1, C 1, G 1, H 1 and H 2. The different origin of the pointed excrescence is interesting; it is formed in two ways. The length of these forms is very variable. In the variation plate are figured only specimens of those forms which were the most abundant. To branch J belonged a much smaller number of the specimens found. Most specimens belonged to the branches K and k. The average size of the specimens is: length 140 μ; width 52,5 μ; diameter of the aperture 24,5 μ. The tests have the most different coverings and are most frequently brown. I found also some moderately bent specimens, similarly as in the species *Difflugia (oblonga) oblonga* EHRENBERG. In nucleus and plasm they agree with the species *Difflugia (oblonga) oblonga* EHRENBERG, and differ only by the smaller number of spherical chromatinose granules.

In the whole course of the variation branch J it is difficult to indicate the accurate limits of the different forms. From form J 2 the end of the test elongated in a tip begins to be strangulated off, and in

form JK 4 a distinctly separated excrescence forms. It is of course a question whether the variation branch J is not a separate variation offshoot directed towards the species *Difflugia elegans* PENARD, as seems to be indicated by the similarity of the plasm, the nuclei and the chromatinose granules as well as by the general aspect. As, however, I found only a few specimens of the species *Difflugia elegans* PENARD I cannot decide whether it is possible to place this species in the collective of the species *Difflugia (oblonga) acuminata* EHRENBERG. But I place here certainly PENARD's species *Difflugia mammillaris* PENARD, which in all its outer and inner characters corresponds to this variation brasch. It is immaterial that I did not find such ventricose specimens as PENARD, as those specimens which I found form a continuous variation series, which by its course indicates the possiblity of such specimens as described by PENARD. In their inner composition they do not differ hardly at all.

Here belongs also the form figured by H. R. HOOGENGRAD and A. A. DE GROOT in 1935, p. 442, fig. 3 h, and it is possible to say also form 3 g, which, however, is closer to branch K. From the paper of these authors, of 1940, the species figured on p. 112, fig. 52 b belongs also here. Of the forms figured in W. JUNG's paper of 1942 I place here the form on p. 279, Abb. 7 b, designated as *Acipyxis inflata* PENARD. This form is, however, already connected with the form JK 4.

The specimens of branch K beginning with form K 2 begin to lengthen the verruca at the end of the test until it is a rather long excrescence, which in the form JK 4 somewhat widens at the base. A lateral variation branch separates off from form K 3; in this branch the processus of the test does not widen at the base, but at the end or in the middle so that a small mallet is formed. PENARD described this type as variety *umbilicata*. Types K 2 to K 3 resemble in their outer appearance the species *Difflugia (oblonga) oblonga* EHRENBERG, except for the excrescence. Their average size is: length 200—250 µ; width 87,5—91 µ; diameter of the aperture 24—42 µ. The length of the excrescence is in form K 3 about 35 µ. The test is covered by the most diverse material, often mixed. Specimens covered with tests of Diatomaceae have usually one Diatomacea placed on the end of their tip like a bayonette on a rifle. Sometimes they have several Diatomaceae arranged bristle-like round the tip. The plasm and nucleus are the same in the whole variation series so that only specimens from the ends of the variation series are distinguished from the species *Difflugia (oblonga) oblonga* EHRENBERG. Here we find again a smaller number of chromatinose granules as well as their subspherical shape. Thus our specimens agree with the description of PENARD except for negligible exceptions.

Here belong the following specimens: PENARD 1902, p. 233, figs. 1—2; 1905, pp. 14—15, the specimens described as *Difflugia acuminata* var. *inflata* PENARD; pp. 19—20, the specimen described as *Difflugia pyriformis* var. *claviformis* PENARD. H. R. HOOGENRAAD and A. A. DE GROOT 1935, p. 442, fig. 3 g; 1940, p. 112, fig. 52 a.

The lateral variation branch L forms a lateral ramification to

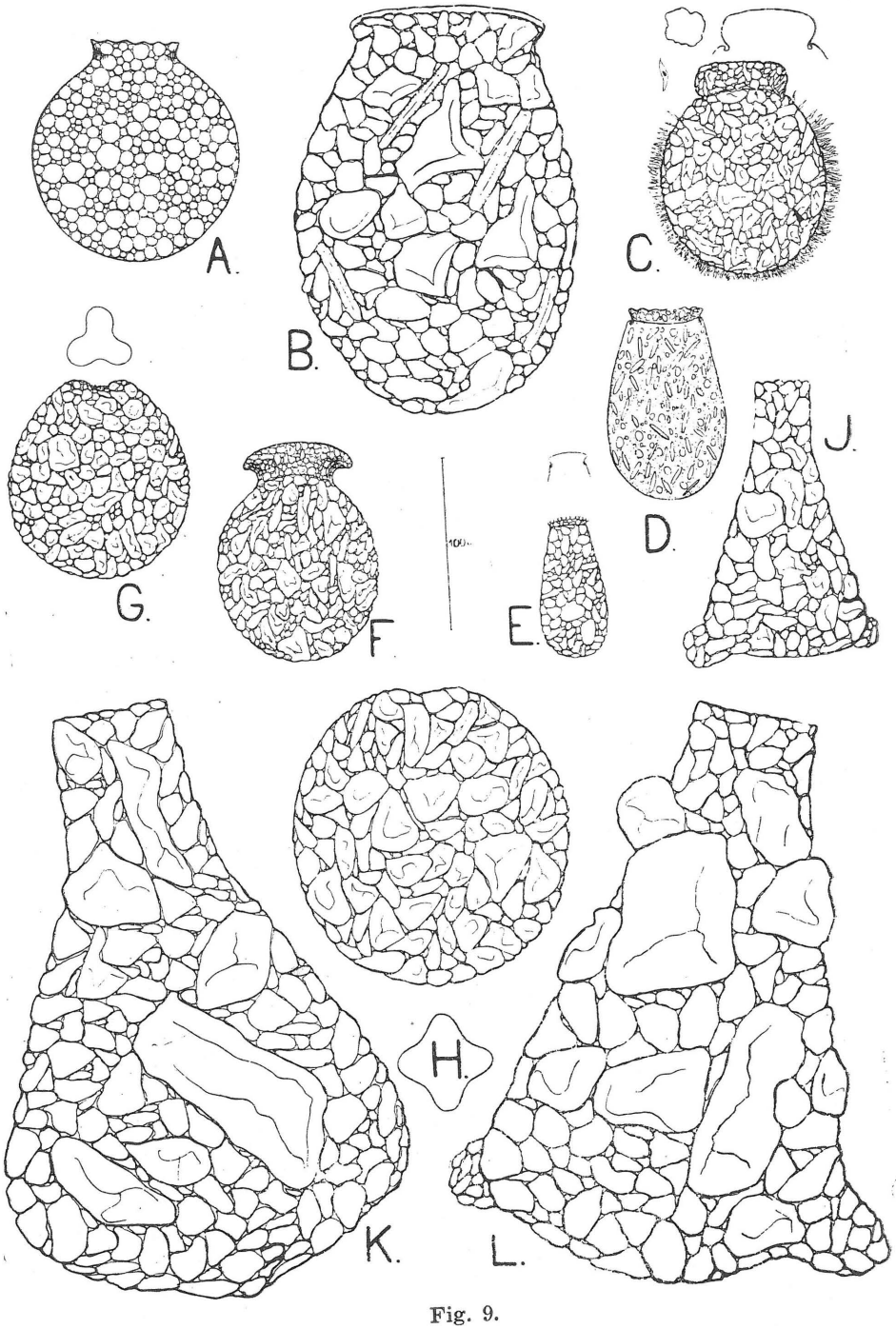

Fig. 9.

PENARD's var. *umbilicata*. The form J 1 is morphologically still corresponding to the forms of branch K, but in the further variation the swelling of the excrescence is already very striking.

The further continuation of the variation branch, from form K 3 to form JK 4 develops a form composed of forms of both branches. At the same time the number of chromatinose granules in the nucleus decreases already distinctly and their size increases. In the outer aspect this is accompanied by a broadening of the lower part of the test and the appearance of indications of a neck, which is already clearly visible in form JK 5. The size of these specimens is: length 182—245 µ; width 88—105 µ; diameter of the aperture 35—42 µ. The form JK 5 corresponds fully to PENARD's description of var. *inflata*. The covering of the test is very diverse. A brown colouring predominates. From form JK 5 to form JK 6 the neck lengthens strikingly, and the lower part of the test becomes rounded.

The form JK 6 is already very different from the other specimens of this series morphologically as well as in the inner structure of the nucleus. In this specimen there are already only four chromatinose granules of a spherical shape, and this indicates a development in the direction of the variation branch JKD. Measurements of this specimen: length 320 u; width 175,5 µ; width of the neck 78 u; length of the neck 175 µ; diameter of the aperture 70 µ; length of the excrescence 70 µ. The colouring is blackish brown.

With this I have described approximately the delimitation of the species *Difflugia (oblonga) acuminata* EHRENBERG. The limits are not rigid and unchangeable. Each specimen has to be evaluated in view of the variation in a great number of specimens, for only thus is its accurate taxonomic placement possible (fig. 7 A—E).

*** *Difflugia (oblonga) caudata* semi-sp. nov. (9).

This interesting form designated as JKD x combines in its outer appearance and inner structure the form JK 6 and the form D 1, i. e. forms of branches which are rather distant from each other. Even though it is less round the lower part of the test is similar to the one in form JK 6. The upper part, i. e. the neck, is arcuately broken as we see it in form D 1. The surface is covered with sherds and sand grains of medium size. The colouring is light gray. Measurements: length 287 µ; max. width 105 µ; min. width 56 µ; diameter of the aperture 70 µ; length of the tip 42 µ. With regard to the inner structure several elements are connected in this species. The plasm corresponds to the plasm of form D 1 and to the plasm of the species *Difflugia elegans* PENARD. The nucleus corresponds most closely to the nucleus of the species *Difflugia praestans* PENARD, which would place this species in the neighbourhood of the species *Difflugia (oblonga) acuminata* EHRENBERG. An affinity with the species *Difflugia (oblonga) acuminata* EHRENBERG is indicated by the manner of forming pseudopodia. It will be seen that the plasm and nucleus combine characters of several different species. As, however, I found only one specimen of this new species it is difficult to decide in view of variation whether it belongs to the circle

of the species *Difflugia U oblonga* EHRENBERG or not. As, however, it combines characters (when we discount the similarity of the nucleus with the species *Difflugia praestans* PENARD) of species within the circle of the species *Difflugia (oblonga) oblonga* EHRENBERG, I place it to this species. In the literature the specimens described as *Difflugia elegans* PENARD are reminiscent of it, but it differs from them in the inner structure. Thus I regard it as semi-sp. nov. I did not find any other simliar specimens in the accessible literature. (Fig. 10 M.)

* *Difflugia (oblonga) curvicaulis* PENARD (1—4, 6—9).

The variation branch P as far as to form P 3 gives a clear picture of this species. The characteristic feature is the tip constantly increasing in size, growing outside the axis of the test. The general shape of the test is similar to that of the species *Difflugia (oblonga) oblonga* EHRENBERG, but only to form P 2. The covering of the test is most varied. The colouring of the test is predominantly blackish brown. The nucleus and plasm correspond to the species *Difflugia (oblonga) acuminata* EHRENBERG, and when we follow the variation series we find a reduction of the number of chromatinose granules, of course less distinct than in the form JK 6. The pseudopodia are digitiform and are exserted simultaneously in a fairly great number. The measurements of the forms P 2 and P 3 are: length 205—260 µ; width 67—86 µ; diameter of the aperture 32—42 µ. Of the species and forms given in the literature there belong here: PENARD 1902, p. 243, figs. 1, 2; p. 256, fig. 3, described as *Difflugia mammillaris* PENARD. And of 1905, p. 17. H. R. HOOGENRAAD and A. A. DE GROOT, 1935, p. 440, fig. 2d—f; 1940, p. 122, fig. 57.

In the further sequence of the variation branch P it comes to a division into several branches different in their outer shape, but remaining the same with regard to the structure of the plasm and nucleus except for negligible changes in the number of the chromatinose granules in the nucleus. It is especially the variation branch R in which we see a similar phenomenon as in the variation branch K where it separates to branch L. The processus of the test is strangulated off and is sharply set off against the test so that it resembles a piece of string. In the further continuation of the variation branch the specimens narrow strongly as we saw it in variation branch H. The covering of the test is mostly composed of sand grains, but not necessarily so. Measurements: length 245—269,5 µ; width 52—87 µ; diameter of the aperture 35—40 µ. The colouring of the specimens is blackish brown.

The variation branch S corresponds to specimens which PENARD describes as *Difflugia scalpelum* PENARD, but differs from them in the structure of the nucleus. The nucleus has always several chromatinose granules; even though their number is smaller than in the form P 3, yet this is different from the number of chromatinose granules in the species *Difflugia (oblonga) scalpelum* PENARD, where there is only one endosome. Thus these specimens have to be placed to the species *Difflugia (oblonga) curvicaulis* PENARD. In its outer aspect the variation branch S differs from the form P 3 by the always sharp end of the elongated lower part of the test in a tip.

Finally there is here the variation branch T, which is an analogy to the variation branch L running out from the variation branch K. It differs by the test being as if strangulated in the middle. The excrescence is always inflated into a mallet. I found only a small number of specimens of the variation branches S and T. Measurements: S 1: length 262,5 µ; width 87 µ; diameter of the aperture 42 µ. Measurements of T 1: length 231 µ; width 101 µ; diameter of the aperture 42 µ. The colouring is in both cases brown. In the plasm and nucleus they do not differ at all from the form P 3. Between the forms P 3 and S 1 I place still the specimen of L. DECLOITRE, 1951, p. 106, fig. 16, described as *Difflugia curvicaulis* var. *inflata* DECLOITRE. As is clear from several specimens between the forms P 3 and S 1 which I observed, there is here a somewhat more ventricosely developed test. For the rest it corresponds to the specimens which I place in the species *Difflugia (oblonga) curvicaulis* PENARD. As all specimens of the forms P 2, P 3, R 1, R 2, S 1 and T 1 agree in their inner structure I include them in one group, which I designate as *Difflugia (oblonga) curvicaulis* PENARD (fig. 7 H—O).

*** *Difflugia (oblonga) schizocaulis* semi-sp. nov. (1—4).

The last form of the collective of the species *Difflugia U oblonga* EHRENBERG are the specimens of the variation branch M and its extreme ramifications N and O. It is an interesting group with regard to its out ward appearance. The inner structure differs from the species *Difflugia (oblonga) acuminata* EHRENBERG or *Difflugia (oblonga) curvicaulis* PENARD only in the shape of the chromatinose granules, which are fusiform elongated. The number of chromatinose granules descreases from form M 1 do form M 3. The lateral variation branches N and O change sligthly the colour of the nucleus and have at most four chromatinose granules in the nucleus. It is far more interesting to follow the outer aspect of this variation branch in its gradual withdrawal from the forms of branch K. Thus I observed between the forms JK 4 and M 1 some specimens in which the strikingly strong excrescence was moderately flattened in its part at the test. In other specimens of this type the second excrescence was only slightly indicated as a lateral offshoot of the first or as a small verruca beside the first excrescence. The whole looked as if the excrescence split into two parts. The chromatinose granules of this form are elongated.

The form M 1 is a further stage where the second, though smaller, excrescence sits separately on the lower part of the test. The main excrescence is here always in the axis of the test. The specimens between the forms M 1, M 2 and M 3 thus clearly show the development of this variation branch. The second excrescence withdraws from the first and remains smaller. The chromatinose granules in the nucleus of the specimens beyond the form M 2 are already of typical fusiform shape. The shape of the test and the size, except for form m 3, remain on the whole the same as in the species *Difflugia (oblonga) acuminata* EHRENBERG or *Difflugia (oblonga) curvicaulis* PENARD. The form M 3 occurs also in the small form. The test is most frequently grayish black. Measurements:

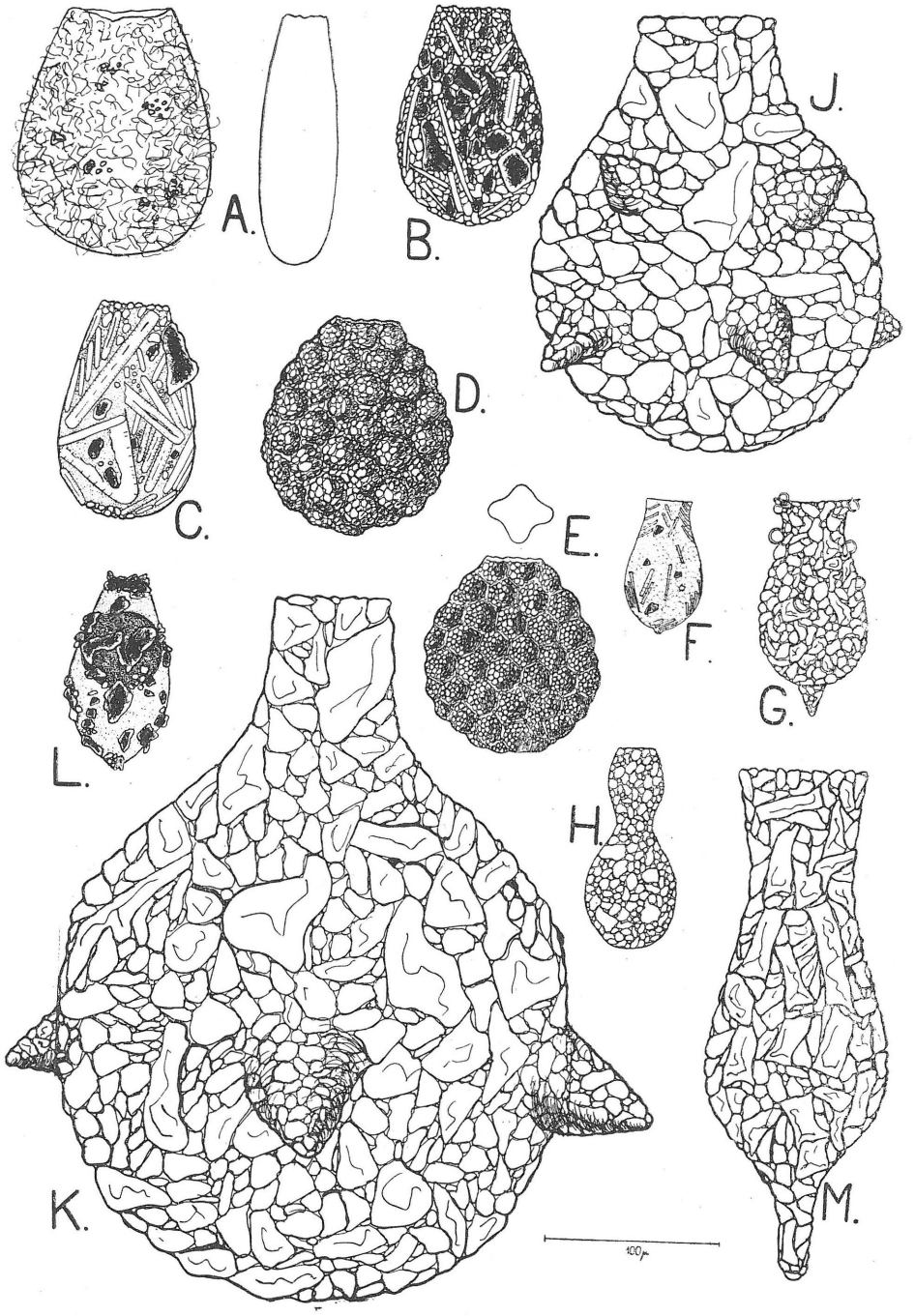

Fig. 10.

length 175—332 μ; width 87—122 μ; diameter of the aperture 45,5—63 μ length of the larger excrescence 35—52,5 μ; width of the excrescence at the base 28—35 μ. Form m 3: length 91 μ; width 63 μ; diameter of the aperture 35 μ; length of the larger excrescance 17,5 μ.

These forms resemble the specimens described by W. JUNG in 1942, p. 279, Abb. 7c—f, as the species *Acipyxis inflata* PENARD and *Acipyxis inflata* forma *imanata* JUNG. They differ from them by the constant number of two excrescence, whereas W. JUNG's specimens have regularly more. It is of course difficult to evaluate the affinity of the two species, for W. JUNG does not give in his paper a description of the plasm and nucleus. Also *Acipyxis erinacea* JUNG, p. 280, Abb. 8a—b, of the same paper, shows certain similar characters. Forms M 1—M 3 are far more reminiscent of the specimen on p. 305, fig. 42a, d, described as *Argynia schwabei* JUNG, but do not belong to the same genus.

The variation branches N and O represent the extremes of the variation branch M. The specimens of the variation branches N and O combine characters of the variation branches M and P. The similarity of the forms N 1 and T 1 and of O 1 and S 1 is striking. The form O 1 differs by the indented neck. By their inner structure these specimens correspond more to the variation branch M, and I place them therefore to it. The specimens of form N 1 differ by the mallet at the end of the bigger excrescence in the same way as we have seen it in the specimens of the forms L 2 and T 2. Its measurements are: length without excrescence 175 μ; excrescence 49 μ; diameter of the aperture 45 μ. The colouring is grayish black. The test is covered with sand grains.

Form O 1 resembles in its outer aspect more the specimens of the variation branch S. It differs from them by a second, smaller excrescence almost at the side of the test, and by the structure of the plasm, which is closer to the specimens of the variation branch M. Measurements: length 165 μ; width 70 μ; diameter of the aperture 35 μ. The colouring is blackish brown, and the covering is composed of fairly large sand grains.

In the literature at my disposal I did not find any remark, about similar specimens, and as they differ from all other specimens observed in several characters I regard them as semi-sp. nov. (Fig. 8 A—F).

* *Difflugia rubescens* PENARD (4, 6).

The membranous, more elongated test is yellowish, moderately wrinkled, with a perceptible neck, which passes gradually into the test proper. The test has sporadic sand grains or fragments of Diatomaceae glued to it. Often the lower part of the test is enveloped in a soft, foamy substance. Almost all specimens I found were encysted. The cysts are of a lenticular shape; I found this species only in two samples. One sample contained only four specimens of this species, but in the other sample they formed 7% of all Testaceae. The latter sample was scraped off from branches of a sallow, submerged in the water and mud. The measurements correspond to those of PENARD's type. (Fig. 11 D—F).

*** *Difflugia sculpturata* sp. nov. (4).

By the general structure of the test it resembles very much the specimens of the genus Nebela. The shape of the test is spherical, with a low collar, which is moderately inclined away from the circular aperture and undulated like a frill at the margin. Seen from above the aperture looks as if bordered by a circular wavy line. Vitreous globules of different colouring are glued to the surface of the light, almost transparent, smoke-coloured, tough and very thick test. The globules are cemented by a substance and only half to one third of their diameter projects from the cementation layer of the test; they form a mosaic composed of discs of different size and different colour tinge.

Morphologically it resembles the species *Difflugia corona* WALLICH or *Difflugia urceolata* CARTER. It is distinguished from the former by having no conical excrescences, and especially by the apertural collar being turned outwards. *Difflugia corona* WALLICH has no collar. Also the thickness of the test is greater than in *Difflugia corona* WALLICH, and the shape and size of the nucleus are different. It differs less from the species *Difflugia urceolata* CARTER. The specimen described by PENARD has globular bodies even on the test, although only sparsely. It differs also by the thickness of the test, its structure, and especially by the nuclei. *Difflugia urceolata* CARTER has according to PENARD one large nucleus with many fusiform chromatinosa granules. The new species has inside the not very large nucleus only one large spherical nucleolus-endosome, which occupies about one third of the space inside the nucleus. I did not find an undulate collar in any specimen of the species *Difflugia urceolata* CARTER. The size of the new species is half the size given for the species *Difflugia urceolata* CARTER.

As I lack an accurate description of the structure of the plasm and nucleus it is difficult to decide whether the new species is not conspecific with the species *Difflugia hydrostatica* ZACHARIAS. From the species *Difflugia hydrostatica* var. *lithophila Penard* it differs by having a distinctly different structure of the plasm and nucleus, when we disregard the composition of the test. The nucleus in the species *Difflugia hydrostatica* var. *lithophila* PENARD has a rather large nucleolus, which fills more than half the space inside the nucleus, whereas the new species has a distinctly smaller nucleolus. *Difflugia sculpturata* sp. nov. differs from both these species by the thickness of the test. The plasm is coarsely granular, with a few vacuols. The colour of the test is in transmitted light gray, in incident light different on the different globules according to their refractive index. Measurements: diameter of the test 120 μ, diameter of the aperture 49 μ. (Fig. 9 a.)

* *Difflugia tuberculata* WALLICH (1—9)

The ovoid test is at the narrower end provided with an aperture surrounded by a collar of a brownish organic matter. The surface of the test is verrucose so that the whole test appears undulated when seen

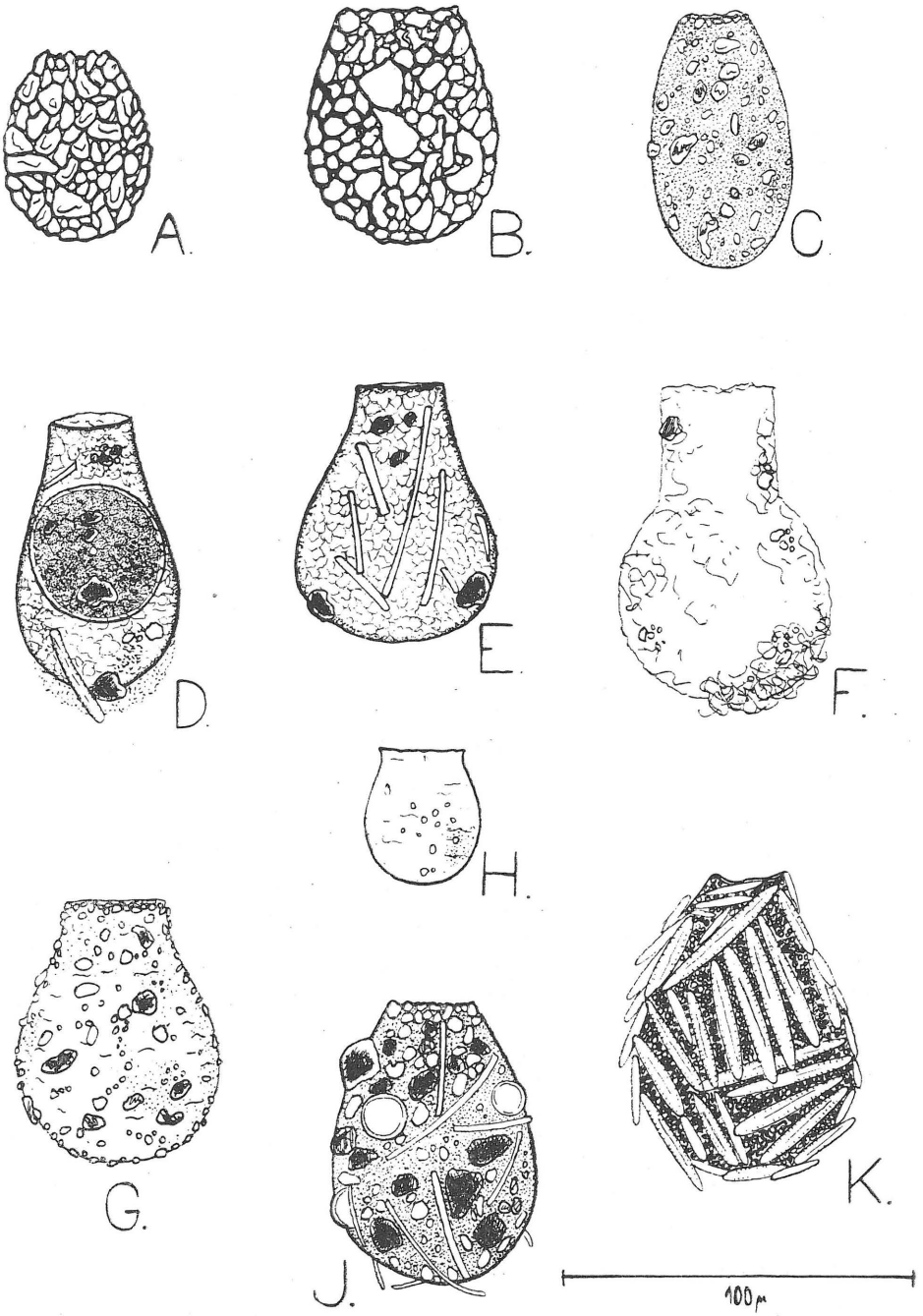

Fig. 11.

from above or from the side. The aperture is circular or lobate. The verrucae are either not separated or there are rod-shaped sherds between them forming six-cornered areas from which tubercles grow, or in addition oval sand grains are inserted between the rods in the place where they meet. The colour of the test is gray to black. Measurements length 110—119 µ, width 92—105 µ, diameter of the aperture 35—41 µ. (Fig. 10 D—E.)

Difflugia urceolata CARTER (8, 9)

The test is spherical, with a circular aperture round which is a high lip turned over outwards, and whose margin is often decorated with vitreous globules. The specimen figured by PENARD has also such globules on the lip of the test. Apart from this the covering of the tests is composed of sand grains or Diatomaceae, and very often of both. The nucleus is spherical, with a great number of minute fusiform chromatinose granules. Measurements: length 120 µ, width 94,5 µ, diameter of the aperture 42 µ, diameter of the margin of the collar 53 µ. (Fig. 9 F.)

Lecqueresia (spiralis) spiralis SCHLUMBERGER (1—9)

The spirally wound test is covered with different rod-shaped lamellas as we see it in the specimens of the genus Nebela. The circular aperture continuous sometimes in an inflated neck sitting on the side of the test. Measurements: diameter of the test 105 µ, width of the neck 35 µ, length of the neck 52,5 µ. It agrees completely with the specimens described in the literature. (Fig. 12 E.)

*** *Lecqueresia (spiralis) combinata* semi-sp. nov. (2, 4, 6)

In its general appearance it resembles the species *Lecqueresia (spiralis) spiralis* SCHLUMBERGER as well as the species *Lecqueresia (spiralis) modesta* RHUMBLER. It is somewhat more elongated and combines the structures of both species. It has on its test places covered with sand grains like *Lecqueresia (spiralis) modesta* RHUMBLER and others with lamellas like *Lecqueresia (spiralis) spiralis* SCHLUMBERGER. The colour of the test varies according to the composition of the covering. Where there are lamellas it is light gray to black, and where there are sand grains brown. The shape and attachment of the neck are also different in specimens of the same form so that no reliable determination can be made on the basis of this character. Decisive is again the structure of the plasm and nucleus. The species *Lecqueresia (spiralis) spiralis* SCHLUMBERGER and *Lecqueresia (spiralis) modesta* RHUMBLER are clearly distinguished from each other by their plasm and nucleus. The specimens I found form a continuous series of transition just as in the species *Difflugia U oblonga* EHRENBERG. The extreme points of this variation series are represented by defined specimens of the two species mentioned above. In about the middle of this variations series is a group of specimens which combine characters of both species, but have some characters of their own as e. g. the mixed structure of the surface of the test. Compared with the specimens of the two extreme species

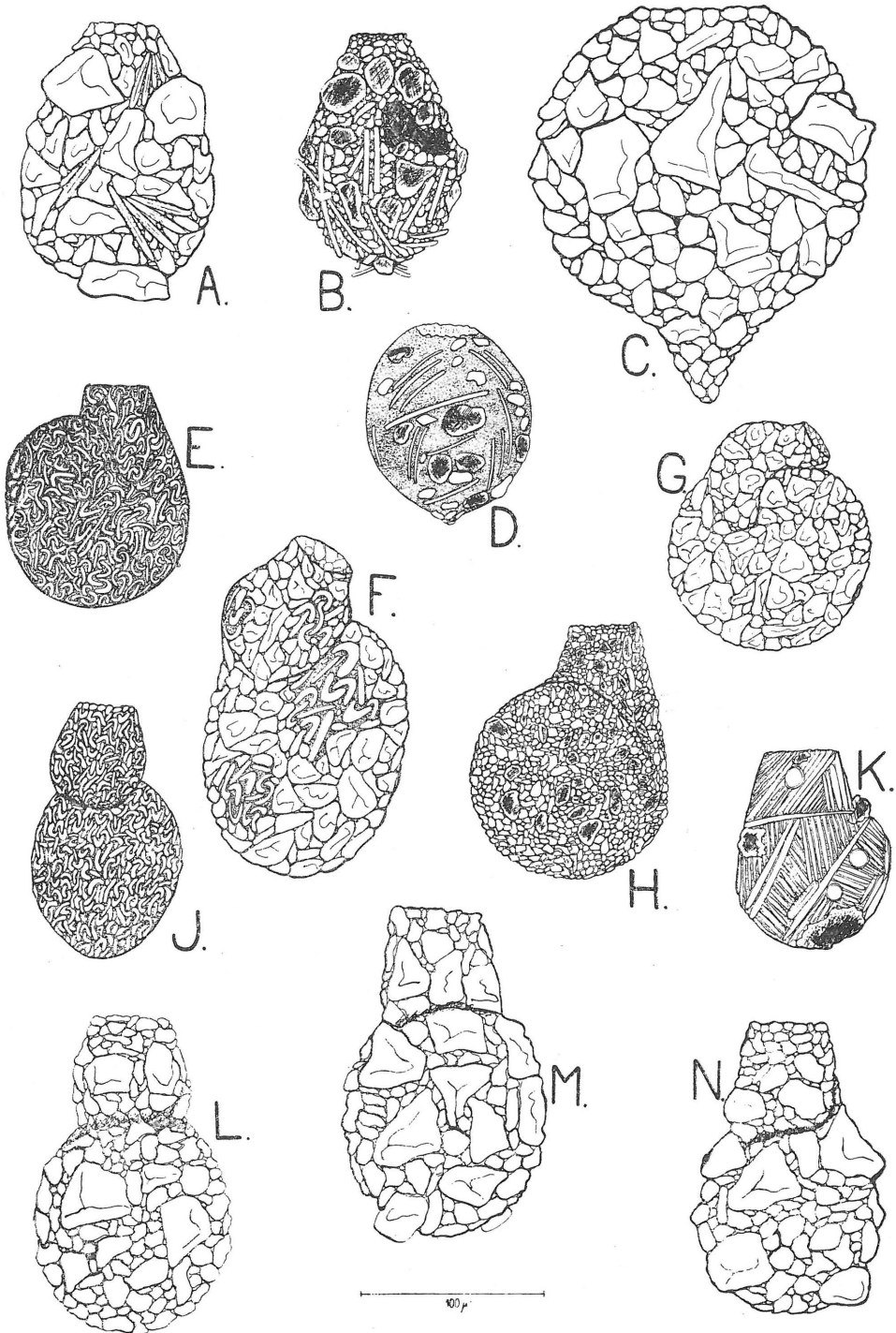

Fig. 12.

the structure of the test is different, so that I place these specimens in the collective species *Lecqueresia U spiralis* SCHLUMBERGER as an independent semi-spec. It is of course difficult to establish the accurate limits of these species. Measurements: length 175 μ, width 126 μ, length of the neck 105 μ, width of the neck 56 μ, diameter of the aperture 37 μ; these are averages. (Fig. 12 F.)

Lecqueresia (spiralis) modesta RHUMBLER (1—5, 7—9)

It agrees with the type described by RHUMBLER. In the specimens observed I saw transitions from a broad base of the neck to a narrow one according to the shape of the neck. When the neck is inflated in the middle it is narrow at its base; if not then it widens from the aperture to the base conically. Also the shape of the winding of the test is very different. The colour is brownish black or gray. Measurements: diameter of the test 105—125 μ, length of the neck 42—70 μ, width of the neck 30—35 μ. (Fig. 12 G—H.)

Pontigulasia bryophila PENARD (2)

The test consists of two parts. The ovoid lower part of the test narrows above into a small circular aperture and the moderately inflated neck sits on this with its broader side. Seen from above into the aperture of the test it seems as if the test was partitioned by a dissepiment with one opening. The specimen found different from the type described by PENARD by the structure of the test, whose surface carries bodies similar to those of *Lecqueresia (spiralis) spiralis* SCHLUMBERGER. The opening in the dissepiment was not circular, but elliptic. The colour is light gray. Measurements: length 148 μ, width 84 μ, length of the neck 50 μ, width of the neck 52 μ, diameter of the aperture 35 μ. (Fig. 12 J.)

* *Pontigulasia compressa* RHUMBLER (6)

I found only one specimen. The test is strangulated and opened by an elliptic aperture on one side below the neck. The test is strongly flattened so that it is reminiscent of some species of the genus *Difflugia* LECLERC. In the neck is a narrow bridge, which divides the neck into two openings for the exsertion of the plasm. The test is covered with many Diatomaceae and vitreous globules. The colour is light brown. Measurements: length 108 μ, width 87,5 μ, height 48 μ, diameter of the aperture 35 μ. (Fig. 12 K.)

* *Pontigulasia spectabilis* PENARD (1—9)

The test is in the narrowed place partitioned by a dissepiment with four openings, of which usually only one is open. The others are closed by a slightly lighter matter than that of the dissepiment proper. It is difficult to determine this species without damaging the test. The surface of the test is covered with sand grains of different shapes and sizes; the largest are usually around the narrowed place of the test. The colour is gray to black. The nucleus is spherical, with a fairly large number of chromatinose granules. Measurements: length 157—

175 μ, width 98—105 μ, neck 42—59 μ, diameter of the aperture 35 μ. (Fig. 12 L—N.)

Heleopera petricola LEIDY (2, 4, 6, 7)

The test has a broad aperture and is strongly flattened. The structure of the test is reminiscent of the lamellas of the genus Nebela. Small sand grains often sit on the posterior part of the test. The cysts are of lenticular shape and dark brown. Measurements: length 86 μ, width 40 μ, aperture 17,2 μ, cyst 35 μ.

Nebela bohemica TARÁNEK (5)

The ovoid test is moderately flattened from the sides and on one side strongly narrowed. Here is the aperture, round which is rather high membranous collar. There are numerous foreign inclusions and one nucleus in the plasm. The surface is coyered with circular or elliptic lamellas. The colour is brown. It agrees fully, also in size, with the specimens described by TARÁNEK.

Nebela collaris LEIDY (1, 2, 4, 6, 9)

The ovoid test is flattened from the sides, with a collar moderately indented on the sides. All tests I examined were only sparsely covered with various lamellas and sand grains. The tests were usually gray. Measurements: length 108 μ, width 72 μ, aperture 28 μ.

Nebela tubulosa PENARD (1, 4—6, 8)

The test is strongly flattened and covered with elliptic lamellas. The aperture is almost like a slit. The colour of all specimens is brownish. Measuremens: length 168—175 μ, width 98—105 μ, height 42—56 μ, aperture 35 μ.

Assulina muscorum GREEFF (1—3, 5, 6, 8)

The thin patelliform test is of elliptic shape, often bent, and covered with elliptic, little perceptible lamellas. Denticles of the same substance as the test sit round the slit-shaped aperture. Measurements: length 70—76 μ, width 50—56 μ, aperture 21 μ. The colour is brown.

Corythion dubium TARÁNEK (1—4, 5, 6, 8)

The ovoid test is flattened from the side. The aperture is elliptic. On the test are circular lamellas, little perceptible, which do not touch. Measurements: length 31—35 μ, width 24—25 μ, height 3,5—10,5 μ, diameter of the aperture 10,5 μ.

Euglypha acantophora EHRENBERG (1—9)

This species is variable in the length of the test and of its diameter as well as in the number of spines (1—8). The lamellas at the aperture are denticulated. In contradistinction to the other Euglyphae it is circular in cross-section. The cysts are spherical, covered with lamellas. Measurements: length 45—80,5 μ, width 28—59 μ, diameter of the aperture 17,5—21 μ, diameter of the cyst 21 μ, lamella 10,5 μ.

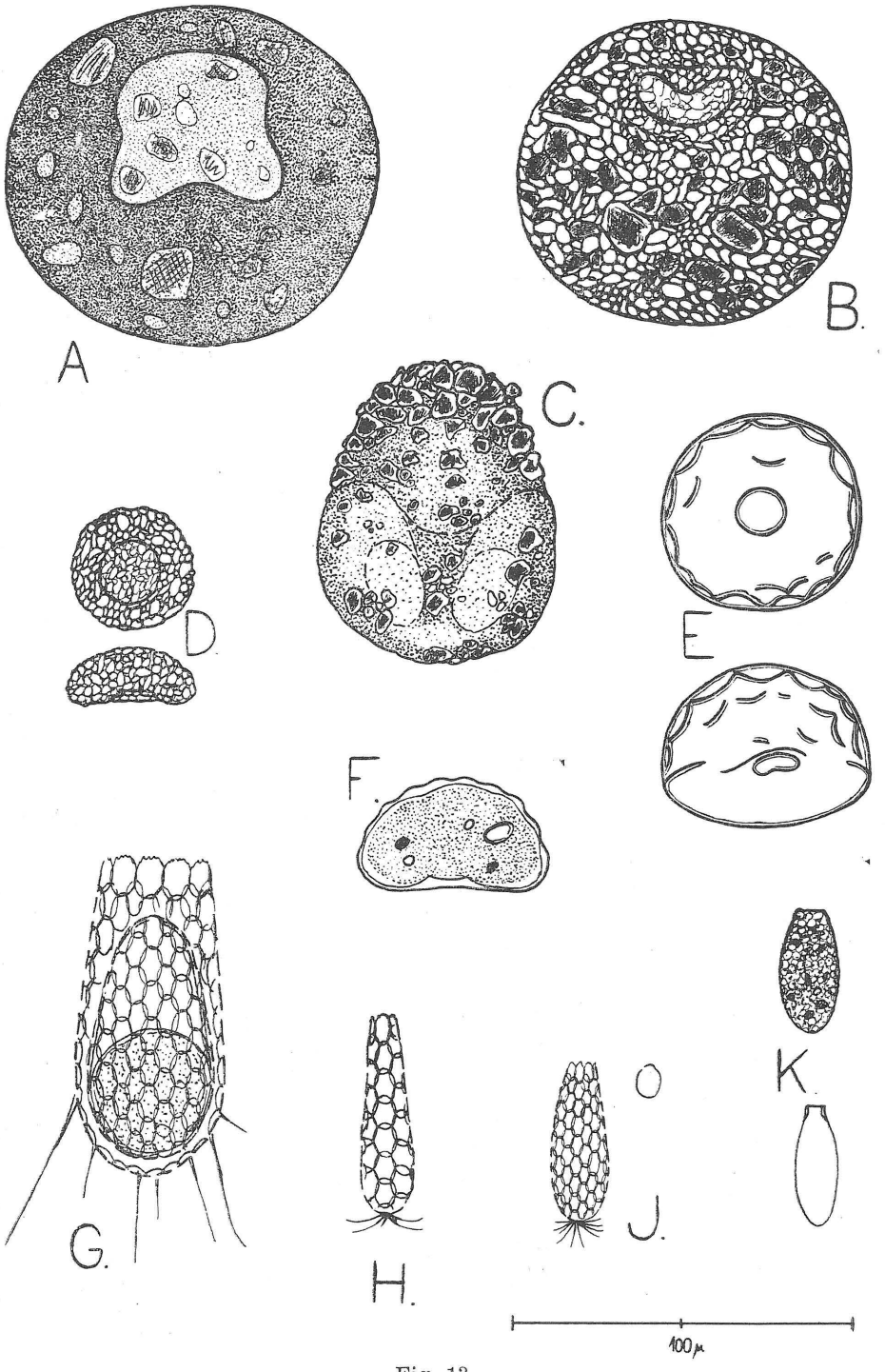

Fig. 13.

Euglypha brachiata LEIDY (5)

One specimen only, with cyst, which is also provided with lamellas like the test. The cyst is of elliptic shape. The aperture of the test is wide, elliptic. The lamellas around it are denticulated. On the lower part of the test are eight spines, which project on all sides. Measurements: length 86 μ, width 45 μ, diameter of the aperture 35 μ, length of the envelop 72 μ, width of the envelop 38 μ, diameter of the cyst 36 μ. The plasm has a greenish colouring. (Fig. 13 G.)

Euglypha ciliata EHRENBERG (1—3, 5, 6, 8)

Ovoid test flattened on the sides, covered with elliptic lamellas. The lamellas round the aperture have only one digitiform excrescence. I found specimens with and without spines. Measurements: length 56—70 μ, width 31—35 μ, height 21 , aperture 14—17,5 μ, length of the spines 6—7 μ.

Euglypha cristata LEIDY (1—5)

Narrow elongated test with a circular aperture surrounded by denticulated lamellas. At the posterior end of the test is a bundle of spines (4—10). The elliptic lamellas overlap, and there are 3—5 of them in the width and 7—9 in the height of the test. Measurements: length 45,5—52 μ, width 15—17,5 μ, diameter of the aperture 7 μ. (Fig. 13 H—J.)

Euglypha filifera PENARD (4, 5)

The test is elliptic, with lamellas of the same shape. The aperture is circular to elliptic. The spines sit on the lamellas at the farther walls. The lamellas round the aperture are denticulated. There are 5—8 spines. Measurements: length 59—65 μ, width 24—35 μ, aperture 11—14 μ, length of spines 17—18 μ, length of lamellas 7 μ, width of lamellas 3,5 μ.

Euglypha laevis PERTY (1—9)

Minute ovoid test with elliptic lamellas. The lamellas round the circular aperture are denticulated. Measurements: length 38,5—45 μ, width 17—28 μ, diameter of the aperture 7—10 μ.

Euglypha strigosa EHRENBERG (2, 3)

The test is ovoid, with a broad aperture. The lamellas at the aperture are denticulated and separated from the others by a band of a brown substance. This is a thickened layer of the cementing substance. The nucleus is spherical. I did not find the spines described by PENARD. Measurements: length 73,5 μ, width 49 μ, aperture 21 μ.

Sphenoderia dentata PENARD (1—4, 6)

The test is elliptic, elongated into a denticulated collar. The lamellas are circular and moderately elliptic. The number of denticles is 6—11. The pseudopodia are long filiform. Before they form, a tiny digitiform pseudopod is first exserted and from in the long threads of plasm form. Measurements: length 45 μ, width 32,5 μ, aperture 12 μ, diameter of the lamellas 7 μ.

Sphenoderia fissirostris PENARD (1—3, 5, 6, 9)

Very similar to the species *Sphenoderia lenta* SCHLUMBERGER. It differs by the size of the lamellas on its surface. It has a maximum of 5 lamellas in the width and lamellas in the height of the test. Most specimens were found in fission. Measurements: length 35—43 μ, width 28—35 μ, aperture 14—17,5 μ, length of the lamellas 10,5 μ, width of the lamellas 7 μ.

Sphenoderia lenta SCHLUMBERGER (1—3)

The test is elliptic, covered with minute circular lamellas. The aperture is slit-shaped, with a low, two-lipped collar. Measurements: length 40 μ, width 30 μ, length of the aperture 12 μ.

Trinema complanatum PENARD (1—4, 6, 7)

Flat rectangular test covered with circular lamellas. The aperture is elliptic. Measurements: length 40—52,5 μ, width 22—32 μ, height 18—21 μ, aperture 10—13 μ, diameter of the cyst 28 μ. I found this species only on a mud substratum near or directly on growing plants.

Trinema enchelys EHRENBERG (1—9)

Species second in number of the pond. The test is of an elongated-elliptic shape, flattened on the sides, and very variable in size and shape. The same applies to the aperture. All specimens are covered with clearly visible circular lamellas. The nucleus is always spherical. The lamellas never overlap. Measurements: length 56—79 μ, width 31—45,5 μ, height 12—28 μ, diameter of the aperture 10,5—19 μ.

Trinema lineare PENARD (1—9).

The test is minute and narrow, with a circular aperture. The circular lamellas do not overlap. It is the most numerous species of this locality. Measurements: length 30—38,5 μ, width 14—17,5 μ, diameter of the aperture 7—10 μ, diameter of the lamellas 3—3,5 μ.

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SUMMARY.

The author surveyed the Testacea fauna of the pond of Hrádek at Kunratice.

1. He found 79 species, forms and varieties of Testaceae.

2. Of these are:

a) 21 forms new for the fauna of Czechoslovakia: *Cochliopodium digitatum* GREEFF, *Cochliopodium erinaceum* PENARD, *Arcella vulgaris* var. *penardi* DEFLANDRE, *Arcella vulgaris* forma *undulata* DEFLANDRE, *Centropyxis aculeata* var. *oblonga* DEFLANDRE, *Centropyxis arcelloides* PENARD, *Difflugia amphora* LEIDY, *Difflugia avelana* PENARD, *Difflugia capreolata* PENARD, *Difflugia elongata* PENARD, *Difflugia glans* PENARD, *Difflugia gramen* PENARD, *Difflugia (oblonga) brevicolla* CASH, *Difflugia (oblonga) curvicaulis* PENARD, *Difflugia (oblonga) manicata* PENARD, *Difflugia (oblonga) nodosa* LEIDY, *Difflugia (oblonga) scalpelum* PENARD, *Difflugia rubescens* PENARD, *Difflugia tuberculata* WALLICH, *Pontigulasia compressa* RHUMBLER, *Pontigulasia spectabilis* PENARD.

b) 1 form new for Europe: *Centropyxis aculeata* var. *dentistoma* DECLOITRE.

c) 7 forms new for science: *Difflugia bartoši* sp. nov., *Difflugia (oblonga) angusticollis* semi-sp. nov., *Difflugia (oblonga) caudata* semi-sp. nov., *Difflugia (oblonga) schizocaulis* semi-sp. nov., *Difflugia (oblonga) vas,* semi-sp. nov., *Difflugia sculpturata* sp. nov., *Lecqueresia (spiralis) combinata* semi-sp. nov.

3. He carried out a revision of the species *Difflugia U oblonga* EHRENBERG and arranged its variation series in a diagrammatic table (fig. 3).

4. The species *Difflugia U oblonga* EHRENBERG is represented in the material from the pond by 11 semi-species. Of these are listed as new:

Difflugia (oblonga) angusticollis semi-sp. nov., *Difflugia (oblonga) caudata* semi-sp. nov., *Difflugia (oblonga) schizocaulis* semi-sp. nov., *Difflugia (oblonga) vas,* semi-sp. nov.

5. *The former species:*

Difflugia acuminata EHRENBERG, *Difflugia brevicolla* CASH, *Difflugia curvicaulis* PENARD, *Difflugia manicata* PENARD, *Difflugia nodosa* LEIDY, *Difflugia scalpelum* PENARD

cannot be considered good species, but are only part of the species *Difflugia U oblonga* EHRENBERG.

6. The species and varieties:

Difflugia acuminata var. *inflata* PENARD, *Difflugia acuminata* var. *umbilicata* PENARD, *Difflugia bacillifera* PENARD, *Difflugia curvicaulis* var. *inflata* DECLOITRE, *Difflugia lanceolata* PENARD, *Difflugia mammillaris* PENARD, *Difflugia oblonga* var. *atricolor* PENARD, *Difflugia oblonga* var. *bryophila* PENARD, *Difflugia oblonga* var. *claviformis* PENARD, *Difflugia oblonga* var. *cyphodera* JUNG, *Difflugia*

oblonga var. *lacustris* PENARD, *Difflugia oblonga* var. *longicollis* GASSOWSKY, *Difflugia oblonga* var. *venusta* PENARD, *Difflugia sphincta* JUNG,

are only ecological varieties of the species *Difflugia U oblonga* EHRENBERG.

7. He included the species *Lecqueresia spiralis* SCHLUMBERGER and *Lecqueresia modesta* RHUMBLER in the species *Lecqueresia U spiralis* SCHLUMBERGER on the basis of the variation series and of the new semi-species *Lecqueresia (spiralis) combinata* semi-sp. nov.

8. He found that vitreous globules formed by burning coal (vid. the paper of VL. POKORNÝ) are used by some species of the genus Difflugia LECLERC to cover their test, and that the new species *Difflugia sculpturata* has the covering of the test built exclusively of these globules.

*

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TEXT TO THE FIGURES:

Fig. 1: Pond of Hrádek at Kunratice.

Fig. 2: Ground-plan of the pond with numbers of the samples indicated.

Fig. 3: Variation series of the species *Difflugia U oblonga* EHRENBERG.

Fig. 4. A—L. *Difflugia [oblonga] oblonga* EHRENBERG.

Fig. 5. A—M. *Difflugia [oblonga] oblonga* EHRENBERG.

Fig. 6. A—J. *Difflugia [oblonga] brevicolla* CASH.

Fig. 7. A—E. *Difflugia [oblonga] acuminata* EHRENBERG.
F—G. *Difflugia [oblonga] scalpelum* PENARD.
H—O. *Difflugia [oblonga] curvicaulis* PENARD.

Fig. 8. A—F. *Difflugia [oblonga] schizocaulis semi-sp. nov.*
G. *Difflugia [oblonga] vas semi-sp. nov.*
H—J. *Difflugia [oblonga] angusticollis semi-sp. nov.*

Fig. 9. A. *Difflugia sculpturata sp. nov.*
B. *Difflugia elongata* PENARD.
C—E. *Difflugia amphora* LEIDY.
F. *Difflugia urceolata* CARTER.
G. *Difflugia limnetica* LEVANDER.
H. *Difflugia lobostoma* LEIDY.
J—L. *Difflugia [oblonga] nodosa* LEIDY.

Fig. 10. A—C. *Difflugia lucida* PENARD.
D—E. *Difflugia tuberculata* WALLICH.
F—G. *Difflugia elegans* PENARD.
H. *Difflugia capreolata* PENARD.
J—K. *Difflugia bartoši sp. nov.*
L. *Difflugia [oblonga] manicata* PENARD.
M. *Difflugia [oblonga] caudata semi-sp. nov.*

Fig. 11. A—B. *Difflugia globulosa* DUJARDIN.
C. *Difflugia glans* PENARD.
D—F. *Difflugia rubescens* PENARD.
G—K. *Difflugia leidyi* WAILES.

Fig. 12. A—B. *Difflugia avelana* PENARD.
C—D. *Difflugia corona* WALLICH.
E. *Lecqueresia [spiralis] spiralis* SCHLUMBERGER.
F. *Lecqueresia [spiralis] combinata semi-sp. nov.*
G—H. *Lecqueresia [spiralis] modesta* RHUMBLER.
J. *Pontigulasia bryophila* PENARD.
K. *Pontigulasia compressa* RHUMBLER.
L—N. *Pontigulasia spectabilis* PENARD.

Fig. 13. A. *Centropyxis ecornis* LEIDY.
B. *Centropyxis labiata* PENARD.
C. *Centropyxis gibba var. inermis* BARTOŠ
D. *Centropyxis arcelloides* PENARD.
E. *Arcella hemisphaerica forma undulata* DEFLAN.
F. *Arcella vulgaris forma undulata* DEFLANDRE.
G. *Euglypha brachiata* LEIDY.
H—J. *Euglypha cristata* LEIDY.
K. *Cryptodifflugia oviformis* PENARD.

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