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Malacofauna evolution of the Lake Peţea (Püspökfürdő), Oradea region, Romania

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Abstract. In the area of Püspökfürdő a geological section was elaborated by the Prospect Geo 2000 S.R.L. from Oradea, from which 42 pieces of sediment samples from every 20 cm of the section were handed over for malacological examinations. After dual flotation and sorting, the samples yielded 10,945 specimens of 10 species and the upper 40 samples yielded more than 100 specimens (statistically accepted). Only the lower two contained less than 100 specimens but these samples were remarkably fit to the malacological changes of the lower part, thus they were usable during the assessment. As a result of the malacological, paleoecological and statistical examinations 3 paleoecological zones can be separated, each of them showing different environmental conditions. The first paleoecological zone (by faunal composition) indicates a shallow, 15-23°C temperature stream-system, formed during the ice age, probably during the Würmian glaciation. Then, during the second half of the Würmian glaciation, it transformed into a 2-3 metre deep, oligomesotrophic lake system. In this temperate, lime-salt-rich, clean, well trans-illuminated water the SE-European *Fagotia acicularis*, evolved during the Middle Pleistocene, was the sole ruler, its dominance being over 80% in each sample. This species is thermophilous as like as *Theodoxus prevostianus*: based on the presence of both species the examined

area was a refuge of SE-European and Pannonian species at the end of the ice age, due to the relatively mild local environment. Simultaneously, the ice age water environment could be unbalanced, probably because of the shortness of the growth season, i.e. the rate of juvenile specimens in the examined fauna was high (between 50-70%), and therefore the mortality and the selection among the juvenile specimens was significant. A characteristic peak in diversity appeared at the beginning of the Holocene, after which *Fagotia acicularis* was driven into the background and soon disappeared, and parallel with that *Melanopsis parreyssii* appeared and became dominant (over 80%) as *Fagotia acicularis* was during the Pleistocene. The morphological changes among the parts of the genealogical line suggest that *Melanopsis parreyssii* is an eco-form of *Fagotia acicularis*, adapted to the 28-32°C warm thermal conditions. As a result of the genetic analyses on recent snail-shells (Smolen & Falniowski, 2009) it is just possible that this eco-form established itself and started a speciation process during the Holocene. As reflected in the composition of the fauna, the thermal hydro-geological system choked up and the temperature of the thermal water, broken out along tectonic fault lines, slightly increased, to over 30°C . In parallel the area and the water level of the Ice Age origin lake system decreased, and a warm water, eutrophic lake was formed in the examined area. Probably a gully established at the extensive, deeper, Ice Age origin lake system. Thus the lacustrine conditions could only remain at the deepest parts, near the tectonic fault lines of the territory, where the thermal water rush up in a cornet-like shape. This is the model that, in 1863, the Austrian geologist Heinrich Wolf described for the Püspökfürdő lake system, which explains the decrease in the level and mass of the water. Our data prove that the protected, Pannonian endemic mollusc species evolved and survived in this lake, thus the protection of the territory could have been fundamental, but unfortunately, because of the recent hotel constructions, the thermal and the ground water level dangerously decreased, and this is the reason why *Theodoxus prevostianus* became extinct and *Melanopsis parreyssii* is on the brink of extinction.

Introduction

Within the framework of Hungarian-Romanian bilateral collaboration, the members of the consortium elaborated an 8.4 m deep section in the area of the thermal lake Băile 1 Mai, in the area of Püspökfürdő, Oradea (Nagyvárad) region (Fig. 1). The samples were taken in the range of 20 cm for malacological examinations. According to the conditions of the application, they were delivered to the Department of Geology and Palaeontology, University of Szeged, in May, 2012, where detailed quartermalacological examinations were performed. The results of the malacological investigations are shown in this paper.

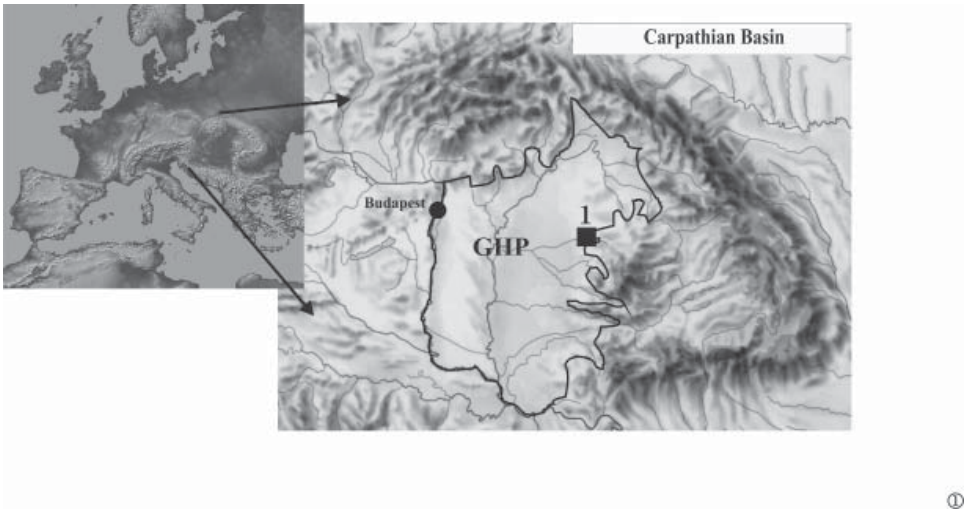

Fig. 1 – Location of the Lake Peţea in the Carpathian Basin (Băile 1 Mai, Oradea, Romania). 1=location of the lake, GHP=Great Hungarian Plain

Material and methods

The samples were wet-screened with dual meshes of 5 and 0.5 mm. Then the snail shells were assorted from the remains and the identified shells and the remaining sediment were packed up and sent back to Oradea.

Accepted identification handbooks were used for the malacological identification (Soós, 1943; Grossu, 1981-1987; Glöer, 2002; Horváth, 1950, Kerney et al., 1983; Glöer & Sîrbu, 2005; Sîrbu, 2006). The identified species were divided into paleoecologic and biogeographic groups (Soós, 1943; Sparks, 1961; Ložek, 1964; Evans, 1972; Sümegi & Krolopp, 2002, Sümegi, 2001, 2003, 2005) (Table 1). During the paleoecological classification, the species' water-cover-demands and dissolved-salt-bearing attributes were identified, and for the terrestrial species the habitat, climate and humidity demands were identified as well (Table 1).

Besides the identification, the abundance and dominance values and the rate of broken/intact and juvenile/adult shells for one litre unit were defined (Table 2a,b; 3a,b). During the malacological analysis, Shannon's diversity values were used (Table 2) and during the biometric analyses only the shells' length and width were identified (Fig. 2).

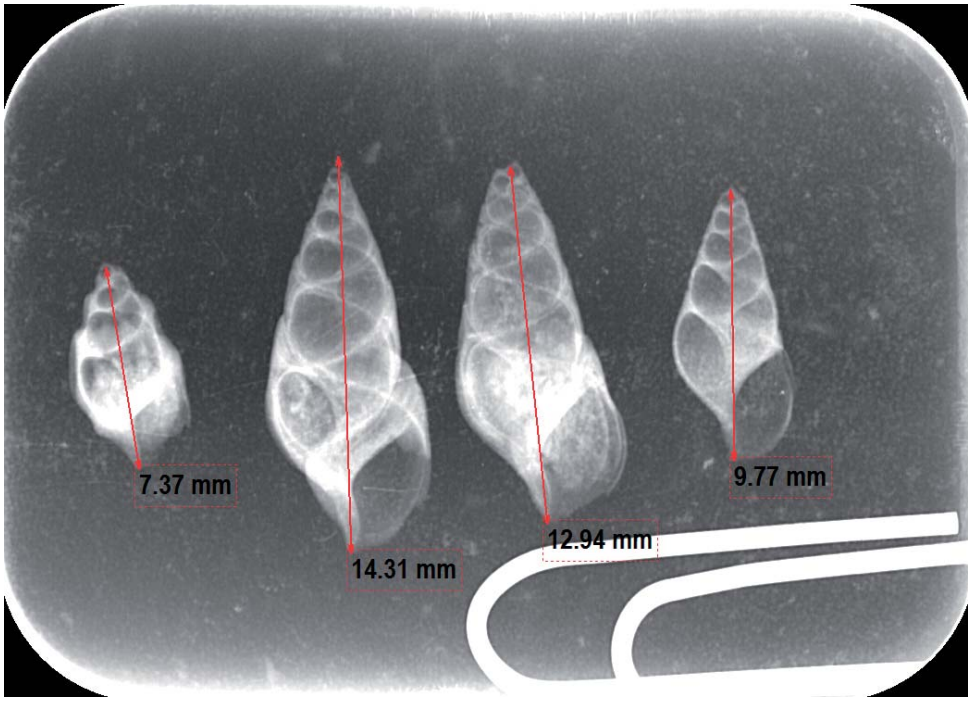

Fig. 2 – The X-ray snapshot used in biometric analysis (from left to right: *Melanopsis parreyssii, Fagotia acicularis* f. *thermalis, Fagotia acicularis* f. *sikorai, Fagotia acicularis* standard form*)*

Paleoecologic changes in the malacofauna, statistical evaluation

The changes of the fauna are shown by its dominance-changes (Sümegi & Krolopp, 2002) and were represented by the Psimpoll software-kit (Bennett, 1992), used mainly in the paleoecological domain (Table 3a and 3b, Fig. 5). Statistical analyses were made by using the malacofauna data, based on Podani's classification and ordination operation which was drawn up for comparison of mollusc faunas (Podani, 1978 and 1979).

The cluster analysis was fulfilled by Bray-Curtis method (Southwood, 1978), for the series-formation the Orlóci-Ward operation applied (Fig. 3). For the similarity and the series-formation analyses the NUCOSA software-kit was used, as designed by Tóthmérész (1993, 1997).

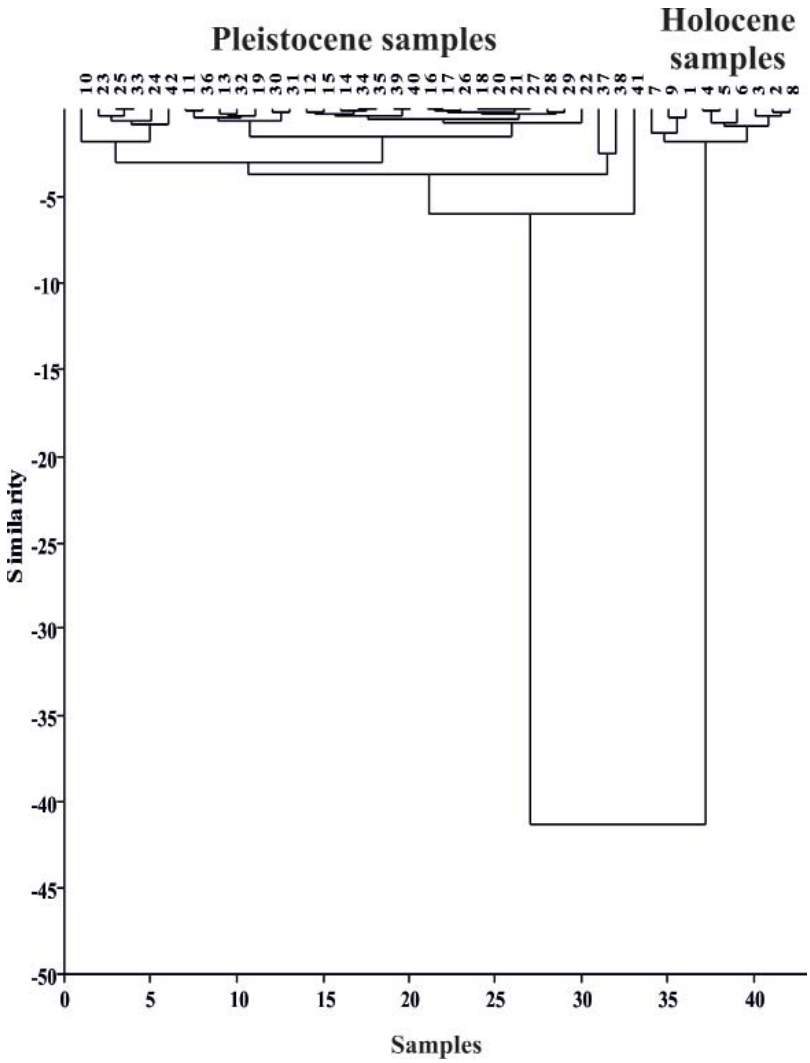

Fig. 3 – Results of malacological examinations on the Püspökfürdő, Băile 1 Mai samples: the cluster diagram of the samples based on the Beta-diversity a.k.a. Bray-Curtis similarity index

Statistical multi-variable biplot correspondence analyses were made on the samples to show the termination of malacological zones and the malacological-based reconstruction of paleoenvironment (Rousseau, 1990; Podani, 1993) (Fig. 4). From this analysis, the termination of samples deposited in the same

environmental conditions could be perceptible, as well as which species were the key factors in paleoecological aspect. These bio-indicator elements were analysed particularly and a comprehensive paleoecological and paleobiographic evaluation is shown below.

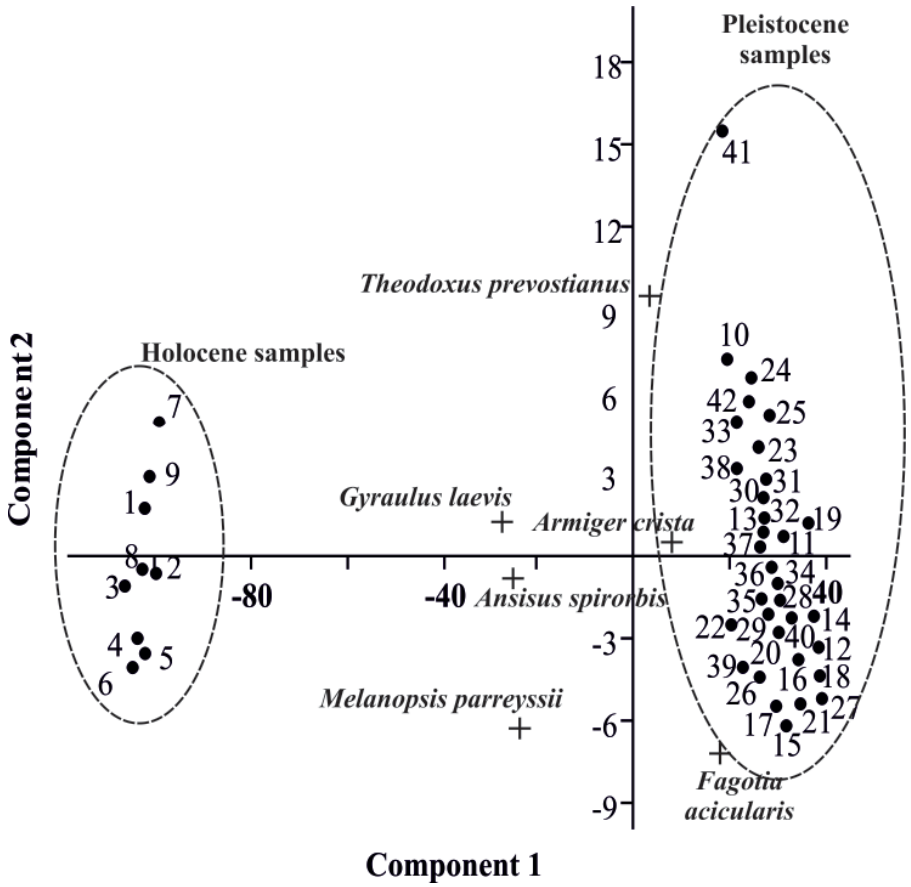

Fig. 4 – Results of malacological examinations on the Püspökfürdő, Băile 1 Mai samples: results of biplot correspondence analysis

Table 1 – Paleoecological classification of mollusc data according to ecological, biogeographic and paleoclimatologic groups

Paleoecological groups	*1. Theodoxus prevostianus*	*2. Fagotia acicularis*	*3. Melanopsis parreyssii*	*4. Planorbis planorbis*	*5.Anisus spirorbis*	*6. Gyraulus laevis*	*7. Armiger crista*	*8. Succinea putris*	*9. Vallonia pulchella*	*10.Perforatella rubiginosa*
Ditch species	+	+	+	+		+	+			
Slum species					+					
Alkaline water resistant species					+					
Spring water environment preferring species	+	+								
Thermal water environment preferring species			+							
Water bank species								+	+	+
Thermophilous species	+	+	+							
Cold-resistant species										+
Xerophilous species										
Hygrophilous species								+	+	+
Holarctic species				+		+			+	
Palearctic species					+		+			
Eurosiberian species								+		+
Pontic species		+								
Pannonian endemic species	+		+							

Table 2a – Abundance of the mollusc fauna from 1 litre sample unit of the Püspökfürdő, Băile 1 Mai profile

Sample number	Depth (cm)	*Theodoxus prevostianus*	*Fagotia acicularis*	*Melanopsis parreyssii*	*Planorbis planorbis*	*Anisus spirorbis*	*Gyraulus laevis*	*Armiger crista*	*Succinea putris*	*Vallonia pulchella*	*Perforatella rubiginosa*	**Total abundance**	**Number of species**	**Shannon-index**
		pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	
1	0 - 20	17	0	121	0	0	0	0	0	0	0	138	**2**	**0,37**
2	20 - 40	38	0	334	1	0	3	0	0	0	0	376	**4**	**0,38**
3	40 - 60	18	0	176	0	0	4	0	0	0	0	198	**3**	**0,40**
4	60 - 80	22	0	251	0	1	4	0	0	0	0	278	**4**	**0,36**
5	80 - 100	24	0	273	0	0	5	0	0	0	0	302	**3**	**0,35**
6	100 - 120	22	0	267	0	0	0	0	1	0	0	290	**3**	**0,28**
7	120 - 140	42	0	253	0	1	7	0	0	0	0	303	**4**	**0,52**
8	140 - 160	21	0	185	0	0	3	0	0	0	0	209	**3**	**0,39**
9	160 - 180	52	0	347	0	1	2	0	0	0	0	402	**4**	**0,42**
10	180 - 200	34	319	9	3	0	1	0	2	0	0	368	**6**	**0,50**
11	200 - 220	10	296	0	0	0	0	0	0	0	0	306	**2**	**0,14**
12	220 - 240	3	268	0	0	0	0	0	0	0	0	271	**2**	**0,05**
13	240 - 260	11	251	0	0	0	0	0	0	0	0	262	**2**	**0,17**
14	260 - 280	5	369	0	1	0	0	0	0	0	0	375	**3**	**0,08**
15	280 - 300	2	327	0	1	0	0	0	0	0	0	330	**3**	**0,05**
16	300 - 320	1	204	0	0	0	0	0	0	0	0	205	**2**	**0,02**
17	320 - 340	1	191	0	0	0	0	0	0	0	0	192	**2**	**0,02**
18	340 - 360	0	179	0	0	0	0	0	0	0	0	179	**1**	**0,00**
19	360 - 380	5	146	0	1	0	0	1	0	0	0	153	**4**	**0,21**
20	380 - 400	0	127	0	0	0	0	0	0	0	0	127	**2**	**0,00**
21	400 - 420	0	126	0	0	0	0	0	0	0	0	126	**4**	**0,00**

Table 2b – Abundance of the mollusc fauna from 1 litre sample unit of the Püspökfürdő, Băile 1 Mai profile

Sample number	Depth (cm)	*Theodoxus prevostianus*	*Fagotia acicularis*	*Melanopsis parreyssii*	*Planorbis planorbis*	*Anisus spirorbis*	*Gyraulus laevis*	*Armiger crista*	*Succinea putris*	*Vallonia pulchella*	*Perforatella rubiginosa*	**Total abundance**	**Number of species**	**Shannon-index**
		pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	pcs	
22	420 - 440	1	123	0	0	0	2	0	0	0	0	126	**3**	**0,11**
23	440 - 460	9	124	0	0	0	0	0	0	0	0	133	**2**	**0,24**
24	460 - 480	31	312	0	0	0	0	0	0	0	0	343	**2**	**0,30**
25	480 - 500	31	371	0	0	0	0	0	0	0	0	402	**2**	**0,26**
26	500 - 520	1	373	0	0	0	0	0	0	0	0	374	**2**	**0,01**
27	520 - 540	0	337	0	0	0	0	0	0	0	0	337	**2**	**0,00**
28	540 - 560	0	377	0	0	0	1	1	0	0	0	379	**3**	**0,03**
29	560 - 580	0	441	0	0	0	1	3	0	0	0	445	**3**	**0,05**
30	580 - 600	21	385	0	0	0	0	1	0	0	0	407	**3**	**0,21**
31	600 - 620	19	351	0	0	0	0	3	0	0	0	373	**3**	**0,24**
32	620 - 640	16	352	0	0	0	0	2	0	0	0	370	**3**	**0,20**
33	640 - 660	30	356	0	0	0	0	0	0	0	0	386	**2**	**0,27**
34	660 - 680	6	354	0	0	0	0	0	0	0	0	360	**2**	**0,08**
35	680 - 700	6	342	0	0	0	0	0	0	0	0	348	**2**	**0,08**
36	700 - 720	9	247	0	0	0	0	0	0	0	0	256	**2**	**0,14**
37	720 - 740	1	119	0	7	0	0	0	0	1	1	129	**5**	**0,33**
38	740 - 760	2	101	0	13	0	0	0	0	1	0	117	**4**	**0,47**
39	760 - 780	1	104	0	1	0	0	0	0	0	0	106	**3**	**0,09**
40	780 - 800	1	103	0	1	0	0	0	0	0	0	105	**3**	**0,09**
41	800 - 820	1	5	0	0	0	0	0	0	0	0	6	**2**	**0,45**
42	820 - 840	4	48	0	1	0	0	0	0	0	0	53	**3**	**0,35**

Table 3a – Dominance values of the mollusc fauna from 1 litre sample unit of the Püspökfürdő, Băile 1 Mai profile

Sample number	Depth (cm)	*Theodoxus prevostianus*	*Fagotia acicularis*	*Melanopsis parreyssii*	*Planorbis planorbis*	*Anisus spirorbis*	*Gyraulus laevis*	*Armiger crista*	*Succinea putris*	*Vallonia pulchella*	*Perforatella rubiginosa*	**Total dominance**
		%	%	%	%	%	%	%	%	%	%	%
1	0 - 20	12,32	0,00	87,68	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
2	20 - 40	10,11	0,00	88,83	0,27	0,00	0,80	0,00	0,00	0,00	0,00	**100,00**
3	40 - 60	9,09	0,00	88,89	0,00	0,00	2,02	0,00	0,00	0,00	0,00	**100,00**
4	60 - 80	7,91	0,00	90,29	0,00	0,36	1,44	0,00	0,00	0,00	0,00	**100,00**
5	80 - 100	7,95	0,00	90,40	0,00	0,00	1,66	0,00	0,00	0,00	0,00	**100,00**
6	100 - 120	7,59	0,00	92,07	0,00	0,00	0,00	0,00	0,34	0,00	0,00	**100,00**
7	120 - 140	13,86	0,00	83,50	0,00	0,33	2,31	0,00	0,00	0,00	0,00	**100,00**
8	140 - 160	10,05	0,00	88,52	0,00	0,00	1,44	0,00	0,00	0,00	0,00	**100,00**
9	160 - 180	12,94	0,00	86,32	0,00	0,25	0,50	0,00	0,00	0,00	0,00	**100,00**
10	180 - 200	9,24	86,68	2,45	0,82	0,00	0,27	0,00	0,54	0,00	0,00	**100,00**
11	200 - 220	3,27	96,73	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
12	220 - 240	1,11	98,89	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
13	240 - 260	4,20	95,80	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
14	260 - 280	1,33	98,40	0,00	0,27	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
15	280 - 300	0,61	99,09	0,00	0,30	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
16	300 - 320	0,49	99,51	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
17	320 - 340	0,52	99,48	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
18	340 - 360	0,00	100,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
19	360 - 380	3,27	95,42	0,00	0,65	0,00	0,00	0,65	0,00	0,00	0,00	**100,00**
20	380 - 400	0,00	100,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
21	400 - 420	0,00	100,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**

Table 3b – Dominance values of the mollusc fauna from 1 litre sample unit of the Püspökfürdő, Băile 1 Mai profile

Sample number	Depth (cm)	*Theodoxus prevostianus*	*Fagotia acicularis*	*Melanopsis parreyssii*	*Planorbis planorbis*	*Anisus spirorbis*	*Gyraulus laevis*	*Armiger crista*	*Succinea putris*	*Vallonia pulchella*	*Perforatella rubiginosa*	**Total dominance**
		%	%	%	%	%	%	%	%	%	%	%
22	420 - 440	0,79	97,62	0,00	0,00	0,00	1,59	0,00	0,00	0,00	0,00	**100,00**
23	440 - 460	6,77	93,23	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
24	460 - 480	9,04	90,96	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
25	480 - 500	7,71	92,29	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
26	500 - 520	0,27	99,73	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
27	520 - 540	0,00	100,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
28	540 - 560	0,00	99,47	0,00	0,00	0,00	0,26	0,26	0,00	0,00	0,00	**100,00**
29	560 - 580	0,00	99,10	0,00	0,00	0,00	0,22	0,67	0,00	0,00	0,00	**100,00**
30	580 - 600	5,16	94,59	0,00	0,00	0,00	0,00	0,25	0,00	0,00	0,00	**100,00**
31	600 - 620	5,09	94,10	0,00	0,00	0,00	0,00	0,80	0,00	0,00	0,00	**100,00**
32	620 - 640	4,32	95,14	0,00	0,00	0,00	0,00	0,54	0,00	0,00	0,00	**100,00**
33	640 - 660	7,77	92,23	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
34	660 - 680	1,67	98,33	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
35	680 - 700	1,72	98,28	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
36	700 - 720	3,52	96,48	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
37	720 - 740	0,78	92,25	0,00	5,43	0,00	0,00	0,00	0,00	0,78	0,78	**100,00**
38	740 - 760	1,71	86,32	0,00	11,11	0,00	0,00	0,00	0,00	0,85	0,00	**100,00**
39	760 - 780	0,94	98,11	0,00	0,94	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
40	780 - 800	0,95	98,10	0,00	0,95	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
41	800 - 820	16,67	83,33	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**
42	820 - 840	7,55	90,57	0,00	1,89	0,00	0,00	0,00	0,00	0,00	0,00	**100,00**

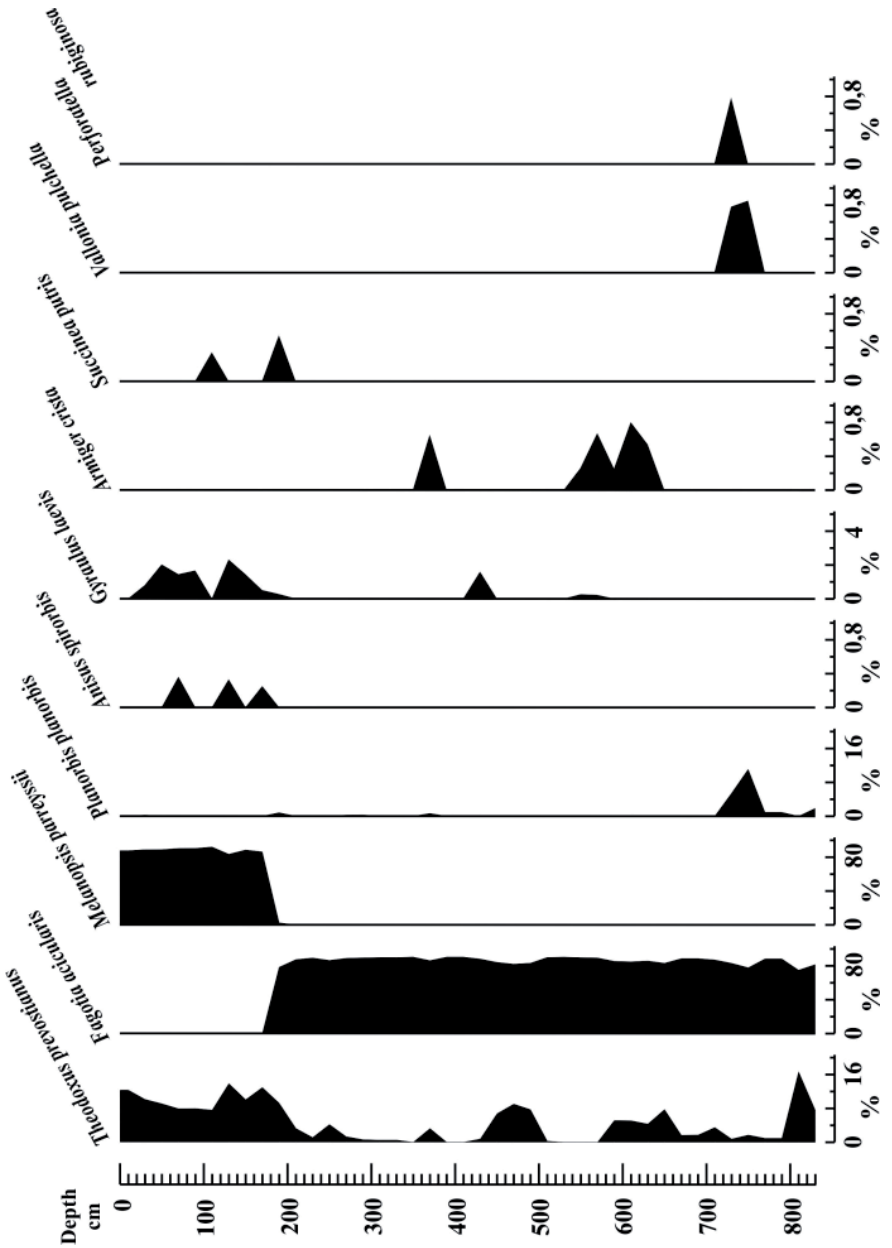

Fig. 5 – Dominance relations of the mollusc fauna from Püspökfürdő, Băile 1 Mai profile previous examinations

Prior examinations

The very first report about the *Melanopsis* species in the Püspökfürdő area was made by the Austrian geologist, Franz Bregrath Ritter von Hauer (Hauer, 1852). On the other hand, according to Phillippi, the finder of *Melanopsis parreyssii* (Phillippi, 1847) (Fig. 6), the found specimen was ensued from Hungary, and the collector was the Austrian naturalist, von Mühlfeld. Unfortunately Phillippi neither mentioned the specimen's exact locality nor when and where von Mühlfeld visited Hungary. Currently it can't be proved but not impossible that the first described specimens of this taxa were from Püspökfürdő, because the shells of that species can be easily found there on the ground, and then this area was a part of Hungary.

Fig. 6 – *Melanopsis parreyssii*, the first report from Philippi's monograph (Philippi, 1847)

The first geological series of the Püspökfürdő area, with the *Melanopsis* taxa in the layers, was published by an Austrian geologist, Heinrich von Wolf (Wolf, 1863). The published series contained a barely formed humic horizon in the immediate vicinity of the thermal lake (Wolf, 1863) (Fig. 7.). Unfortunately, Wolf used neither a compass, a scale nor a map, and because of the significant environmental changes of the past 150 years his description can hardly be used. But some parts of his published series-description could be found in the elaborated sections and boreholes. Thereafter these mollusc species were mentioned during the comprehensive geological analysis of the Oradea region (Szontagh, 1890) and also in the borehole for water layer-series by Béla Zsigmondy.

Regardless of these investigations, the Hungarian natural scientist Mihály Tóth was the first who reported the Quaternary malacofauna of the Püspökfürdő area in the 25th Hungarian Itinerary Congress of Doctors and Naturalists in Oradea, in 1890. He gave a detailed account of the Quaternary malacofauna,

and among other things the changes of the *Melanopsis* species. In his work he reported the mollusc fauna he obtained by layer-rarefying from an approx. 2 m high section. According to the changes of the various *Melanopsis* species, he described an intense development-process with many *Melanopsis* species during the Quaternary. He considered that the thermal lake was formed earlier than the Holocene, and derived the various *Melanopsis* species from a Tertiary common ancestor which survived the glacial period.

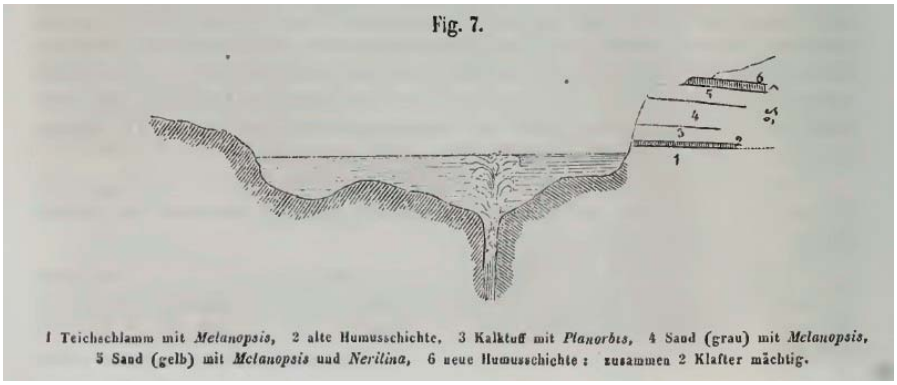

Fig. 7 – The first sketch of the Lake Peţea in Püspökfürdő (Wolf, 1863*)*

Beside Mihály Tóth's work, Spiridon Brusina and Tivadar Kormos examined the Quaternary malacofauna of the Püspökfürdő area, among others the *Melanopsis* and the *Theodoxus* species (Brusina, 1902; Kormos, 1903a,b; 1905a,b). Brusina made no elaborated sections or boreholes, but he made taxonomic investigations only from ground shells and from Tóth's shell-collection (Brusina, 1902). In his work he determined eight taxa, including *Melanopsis parreyssii* as well as 23 varieties of it. Unfortunately, he made no figures nor detailed description for the taxa, only a short word in Latin for each of them (Brusina, 1902). Based on an earlier work of the paleobotanist Móric Staub (Staub, 1892), Brusina considered that the *Melanopsis* taxa are remains of a Tertiary subtropical oasis which survived the glacial period due to the thermal lake in Püspökfürdő.

Tivadar Kormos, based on Zsigmondy's and Mihály Tóth's results, mapped the area's geological and morphological attributes and elaborated an 11 meter high, combined section-borehole layer series. Beside the detailed geological and stratigraphic investigations, Kormos made a detailed examination on the

Theodoxus and *Melanopsis* specimens described by Brusina (Kormos, 1903a,b, 1905a,b). Kormos also examined other ground sections, published maps and geological layer-series and marked his and Mihály Tóth's section as well.

This was the base work for us when we began the examinations on the development of the *Theodoxus* and *Melanopsis* taxa as well as the geological and chronologic development of the Püspökfürdő area. The main conclusions of Kormos were that the *Melanopsis* and *Theodoxus* taxa can be traced back to a Tertiary common ancestor. The recent malacofauna of the thermal lake of Püspökfürdő has a relict, subtropical survivor character, and is evolutionary and genealogically related to the late Tertiary Slavonian malacofauna.

Simultaneously, Kormos noticed that the *Melanopsis* specimens from Püspökfürdő can be genealogically related to the taxa of *Fagotia*: *Fagotia acicularis* and *F. esperi* (Kormos, 1905a). Some researchers consider the latter species, *Esperiana (Microcolpia) daudebartii acicularis* (Fèrussac, 1823) and *Esperiana (Fagotia) esperi* (Fèrussac, 1823), are Pontic (Fehér et al., 2004), but the cyclic appearance of these species in the Carpathian Basin was clearly determined during the Quaternary interglacial periods, not the Tertiary (Krolopp, 1973, 1983).

The basis of the malacological investigations of Kormos was a botanical occurrence in the thermal lake, the Egyptian white water-lily (*Nymphaea lotus thermalis*). The thermal lake was considered a subtropical oasis, a relict of an older geologic age (Kerner, 1887, Simonkai, 1890, Staub, 1903). The Egyptian white water-lily was considered as a Quaternary taxon by the majority of botanists, and this is why Kormos also considered the same age for the other relicts, notwithstanding that several botanists made mentions about the origin of the water-lily of the thermal lake (Borbás, 1894, Richter, 1897). Kormos considered an Egyptian origin both for *Melanopsis* and the Egyptian white water-lily, and noticed that they lived together there, this is why he considered *M. parreyssii* is a Quaternary taxon, and based on the presence of the water-lily at Püspökfürdő, he thought the thermal lake is a subtropical relict area.

Results of paleoecological analyses

All of the 42 examined samples contained a statistically rateable amount of mollusc shells (Table 1, 2a, 2b, 3a and 3b). From the upper 40 samples, the abundance of shells was over the 100 pcs/sample, so the statistical minimum was exceeded (Krolopp, 1983); the lower samples' (no. 41 and 42) abundance was below the statistical minimum, nevertheless they were suitable for characterizing the environmental changes of Püspökfürdő area.

The investigated mollusc fauna contained a total amount of 10,945 specimens of 10 species (Table 2a and 2b). Thus every sample was suitable to describe its abundance and dominance value (Table 2a, 2b, 3a and 3b; Fig. 5), diversity-index (Table 2a and 2b), cluster and biplot analyses (Fig. 3 and 4).

Based on the statistical report, the examined samples represent material accumulated in three radically different environmental situations. From the base of the section (samples no. 37-42; from 720 to 840 cm) terrestrial, mainly riparian elements came to light, mostly the cold-resistant, Eurosiberian *Perforatella rubiginosa* and the mesophilous, Holarctic *Vallonia pulchella* (Fig. 5). Besides the terrestrial species, the abundance and dominance of the eutrophic shallow water preferring, Holarctic *Planorbis planorbis*, and the thermal water preferring, Pannonian endemic *Theodoxus prevostianus* are significant (Table 2a, 2b, 3a and 3b). Although the dominance value of the Pontic *Fagotia acicularis* is outstanding, the presence of the other bio-indicator elements refers to the evolution of a maximum 1-2 m deep, organic-material-rich lake environment.

The temperature of the water could be between 15°C and 23°C (Vásárhelyi, 1956), based on the presence of permanent and mild water temperature and lime-salt-rich water preferring *Theodoxus prevostianus* and *Fagotia acicularis*. The hydrologic system could have consisted of shallow, slow running water and probably that time the thermal-water containing stream-system (Pece-stream) incised into the area. The base mudstone layer eroding stream-system unambiguously developed during the Ice Age.

The second malacological zone was formed between the samples no. 10 and 36 at depths between 200 and 720 cm. This horizon is characterized by the absolute dominance (over 80%) of *Fagotia acicularis* (Fig. 5). The presence of *Armiger crista* signals the Ice Age fauna-horizon, because based on recent malacological examinations this species can be linked to Ice Age layers (Sümegi et al., 2012).

Moreover, the thermal form of *Fagotia acicularis*, the taxonomically non-valid thick-shelled *Fagotia acicularis* f. thermalis appeared beside the standard form in this horizon. This form of *Fagotia acicularis* appears in the colder thermal water (between 15°C and 20°C) in Holocene sediments and also in Riss-Würmian interglacial sediments (Krolopp, 1985). It is also known that the thick-shelled form appears in higher temperature water which is rich in Mg^{+} cations; the Mg^{+} cations infiltrate into the shell and determine its thickening (Sümegi, 2012). Besides the *Fagotia acicularis*, present with high dominance, the Pannonian endemism *Theodoxus prevostianus* appeared in a ratio between 4 and 8 percent. The composition of the mollusc fauna indicates an oligo-mesotrophic lake system with

higher water depth (minimum 1.5 m, maximum 3-4 m), a water temperature of about 15-23°C and a significant content of dissolved carbonate. The examined section probably originated in the deepest point of the former lake-system, this is why the absolute dominance (over 96%) of the branchiate species occurs in every sample (Fig. 5). The pulmonates *Gyraulus laevis* and *Armiger crista* sporadically appeared from this Ice Age malacological horizon (Fig. 5), and their common dominance didn't reach 4% in every sample, so this horizon is characterized by the dominance of branchiate snails (*Theodoxus prevostianus* and *Fagotia acicularis*). Since quite few species appeared in this horizon (mainly two species – *Fagotia acicularis* and *Theodoxus prevostianus*), the diversity values were the lowest in the section. This is quite characteristic of the substrate region of Ice Age oligo-mesotrophic lakes even if the water temperature was optimal: the high level of dissolved Ca^{+} and Mg^{+} cations, the slow running water, the low level of dissolved organic matter and the ancillary water flora predestined a homogenous fauna composition.

Besides the low Shannon-index values, the other characteristic of the Ice Age fauna is the high ratio of juvenile specimens of the malacofauna: for *Fagotia acicularis* (ratio of juvenile specimens between 52% and 71%) and also *Theodoxus prevostianus* (between 53% and 61%). Based on the high rate of juvenile species it could be said that the length of the growth season could rapidly change during the Würmian glacial, thus the surviving chances of the juvenile specimens were quite limited.

This means that the high juvenile rate in the Ice Age samples indicates rapid changes in the environment: because of the shorter growth season the mortality rate was high (and caused extraordinary selection). Unfortunately, this kind of examinations was not previously performed (or not published), but mainly in loessy sediments. Hence the Ice Age fauna is compared here with the Holocene fauna's adult/juvenile ratio of the same section.

The boundary between the ice age (Pleistocene) and our age (Holocene) could have occurred at the 10^{th} sample because this sample contains both *Melanopsis parreyssii* and *Fagotia acicularis*. *Melanopsis parreyssii* alone appeared from the upper 9 samples, while *Fagotia acicularis* was driven into the back (Fig. 5). The change and the formation of a transitional zone of the above mentioned taxa, included in the *Melanopsidae* family is not casual, i.e. the evolution of *Melanopsis parreyssii* is derived from *Fagotia acicularis* by both classic morphologic (Sümegi et al. 2012), and modern genetic analyses (Smolen & Falniowski, 2009).

The disjunction of the two species can be placed in the Holocene. From a paleontological point of view it is quite problematic, partly because the disjunction

is remarkably young (maximum 10 ka), and partly because the transitional forms of the two taxa were believed to be connectives between them (by the 100 year-old malacological notion) (Tóth, 1891, Brusina, 1902, Kormos, 1905a,b).

Simultaneously, it is well-known that the morphological changes are not unambiguous (Pauca, 1937), the transitional forms are rather connected with the environmental changes: the non-stable genetic background was influenced by the thermal water system's dissolved lime-salt concentration and the considerable intake of the Mg^{+} cation (Sümegi et al. 2012).

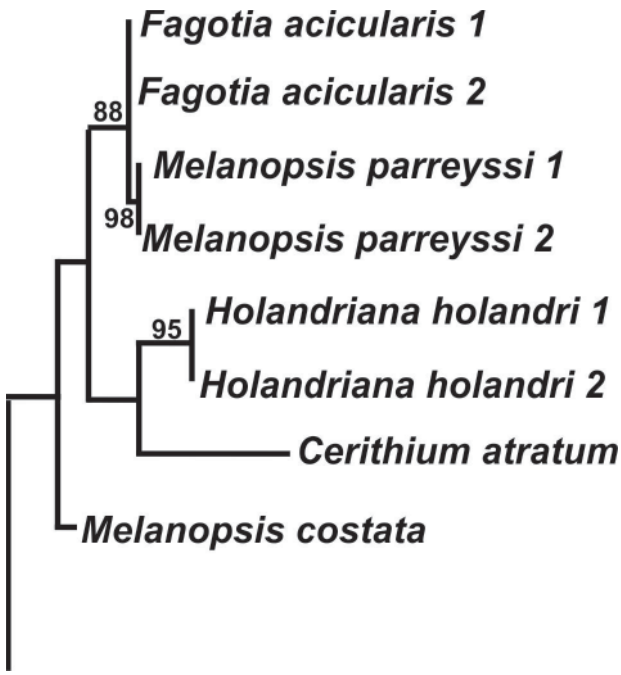

Fig. 8 – Results of genetic analyses on the 18S mitochondrial series of recent Melanopsidae taxa; hypothetic phylogenetic ramifications by the molecular watch (Smolen & Falniowski, 2009)

The genetic analyses (Smolen & Falniowski, 2009) only show the changes of the genetic watch, or the geological time of the probable disjunction, not the real genetic disjunction. Thus the taxonomic classification of *Fagotia acicularis*, *Melanopsis parreyssii* and all previously described species, forms and varieties (Tóth, 1891, Brusina, 1902, Kormos, 1903a,b, 1905a,b) is entirely doubtful, because the spiral markings and stepped shell forms of the freshwater *Melanopsidae* taxa in

thermal water could have been formed because of environmental causes (Krolopp, 1985). Thus the taxonomical segregation of the Pleistocene aged *Fagotia acicularis* and the Holocene aged *Melanopsis parreyssii* is debatable in the future: there is reason for the species-disjunction, as much as for the environmental-effected varieties formation (Sümegi et al. 2012). This is supported by the genetic analyses of the recent *Melanopsidae* 18S mitochondrial series (Fig. 8), which clearly prove the least genetic (geological) time difference between the *Melanopsis parreyssii* and the *Fagotia acicularis* of Püspökfürdő. Despite that, it is arguable that the major morphological differences between *Melanopsis parreyssii* and *Fagotia acicularis* can be found in the *Melanopsidae* taxa of Püspökfürdő (Tóth, 1891, Brusina, 1902, Kormos, 1903a,b, 1905a,b).

Simultaneously, the segregation of *Melanopsis parreyssii* from the considered original ancestor (so-called father group), Late-Tertiary evolved, Minor Asian and Middle Eastern ranged *Melanopsis costata* is quite significant and even quite similar to the *Fagotia acicularis* (Fig. 8), so the genealogical relationship between *Fagotia acicularis* and *Melanopsis parreyssii* is unequivocal.

Thus it is not accidental that the geological and paleontological analyses on the *Melanopsis* shells, connected with the 2012 application, clearly supported the close genealogical relationship between *Fagotia acicularis* and *Melanopsis parreyssii* and their (incipient) disjunction during the last 10,000 years in the Holocene.

For the solving of the taxonomical problems there were two opportunities: *Melanopsis parreyssii* may be considered as a form (eco-morphological taxon) of *Fagotia acicularis* adapted to 32-34 °C thermal water conditions, or it may be a separate species which adapted and established itself in thermal water. Either version is considered as benchmark, the dimension and the geological time of the disjunction are minimal. If the taxa disjunction is the benchmark, it can be said that this species is the youngest endemism which evolved in the historic times in the Carpathian Basin, in the paleobiogeographical Pannonicum (Sümegi, 2012). This means that this species is one of the youngest endemism, which evolved in front of our eyes and unfortunately, because of its isolated and polluted biotope, could become extinct in front of our eyes (Sümegi, 2012).

Furthermore, as proved by our examinations, the ecosystem acted as a temperate refuge (or oasis) during the last glaciation, not as a subtropical one, as stated in previous publications (Kerner, 1887, Simonkai, 1890, Straub, 1892, 1903, Tóth, 1891, Brusina, 1902, Kormos, 1905a,b), because the Tertiary considered *Theodoxus prevostianus* and *Fagotia acicularis* evolved during the Middle-Pleistocene (between 800 and 200 ka) after splitting from the Early-Pleistocene

ancestral group (Krolopp, 1973). Therefore, by the presence of these species, the refuge cannot be inferred as a subtropical, Tertiary one, but a temperate one, formed during the last glaciation (Sümegi, 1999).

Thus the character of the Tertiary refuge cannot be consistent with the presence of *Fagotia acicularis*, but the lake is a temperate refuge-like area dating from the late Middle-Pleistocene interglacial (Sümegi, 1999). Beside *Fagotia acicularis* the presence of *Theodoxus prevostianus* shows that the examined territory was not a subtropical oasis, but a temperate refuge formed by the heat-surplus of the thermal water. In this temperate refuge at Püspökfürdő in the S-SE of the Carpathian Basin, thermophilous mollusc species, such as the freshwater *Theodoxus prevostianus*, *Fagotia acicularis*, *Fagotia esperi* and the terrestrial *Helicigona (Chliostoma) banatica*, could survive during the coldest periods of the ice age (Sümegi, 1999).

Above the both *Melanopsis parreyssii* and *Fagotia acicularis* containing, Pleistocene-Holocene boundary indicating level, an another level with high (over 80%) *Melanopsis parreyssii* dominance was formed. Beside this species, the secondary dominance of *Theodoxus prevostianus* (between 6-10%) is noticeable in the Holocene lake sediment. Beside these taxa the following species appear in this level: the shallow alkaline water preferring *Anisus spirorbis*, the organic-matter-rich water preferring *Gyraulus laevis* and the coastal area preferring *Succinea putris*, which lives on the stems of water plants (reed and bulrush).

In the transitional Holocene-Pleistocene level shows a maximum of diversity assets, because both the retreating Pleistocene taxa and both the expanding Holocene species are present. Considering this, the diversity assets decreased (Table 2a,b) but still remained higher than the Pleistocene assets. A cause for the increased diversity assets could be the congenial Holocene environmental conditions for the molluscs.

Based on the composition of the fauna, the lake system was transformed in the beginning of the Holocene: the water temperature particularly increased (over 28-30°C degrees), and the water-dissolved organic matter content, in-washed from the coastal area, strongly increased. Based on the presence of the shallow water preferring species, the water level decreased, and a shallow, thermal, water plant-covered, eutrophic lake was formed.

The background of this change was the increased amount of rainfall in the end of the ice age, thus the area's hydrological system soon choked up, and for this reason the amount and the temperature of the thermal water, broken out along tectonic fault lines, suddenly rose. The temperature of the lake system was strongly influenced by the deep waters' temperature and the Holocene air temperature

conditions: the increased durations of frostless period, vegetation period and growth season. The changed length of growth season is clearly visible for instance in the change of the ratio of adult/juvenile specimens: the ratio of *Melanopsis parreyssii* juvenile specimens decreased below 40% during the Holocene and was between 26-40% during the last 10,000 years.

This juvenile ratio, compared with the Pleistocene 50% above, is a quite significant change. Similar changes occurred in *Theodoxus prevostianus*: the Pleistocene juvenile ratio (between 50-60%) decreased between 27-32% in the Holocene samples. Thus the mortality rate of the juvenile species strongly decreased during the Holocene, probably due to the increased length and balanced environmental conditions of the growth season.

Following these hydro-geological and climate changes, a eutrophic thermal lake was formed in the second half of the Holocene, where protected endemic species, like Egyptian white water-lily (*Nymphaea lotus thermalis*), *Theodoxus prevostianus*, *Melnanopsis parreyssii*, could establish. This organic matter-rich, thermal system remained up to the present, but because of the anthropic disturbation and pollution, the survival of this unique system is quite problematic. The survival of the ecosystem can be ensured only by initiating strict nature protection orders and setting up a hydro-geological and biological buffer zone in the whole Peţea-valley.

Description of the main mollusc species

Theodoxus prevostianus (C. Pfeiffer, 1928)

Endemic species which evolved in the Middle Pleistocene and remained in some remote streams in the Carpathian Basin (Krolopp, 1973; Sümegi, 1999). Known localities in the Carpathian Basin: Bad Vöslau and Bad Fischau (Austria), Bušeča vas (Slovenia) and Kács (Hungary). This species was eurytopic in the Püspökfürdő area (Wolf, 1863; Kormos, 1903a,b, 1905a,b), and the last living specimens were collected by Sándor Mocsáry in the 1870s. But the species was widespread from the 19th century till 2007 in the Răbăgani region southeast of Oradea (Kimakowicz, 1883-1884; Grossu, 1936; Jurcsák, 1969; Sîrbu & Benedek, 2005). The last Romanian population has become extinct because of a construction in Răbăgani (Sîrbu & Benedek, 2009). In the Püspökfürdő area the destiny of recent specimens is unknown, i.e. no one had found recent specimens after Sándor Mocsáry in the area (Sîrbu, 2006). Thus the extinction of the local population can be estimated in the second half of the 19th century or the beginning of the 20th century.

Fagotia acicularis (Fèrussac, 1823)

Pontic species which spread in the southern part of the Carpathian Basin via the River Danube and its tributaries and is also known from mild and cold streams. By our results *Fagotia acicularis* become extinct from the Püspökfürdő area during the Holocene and this is supported by the recent examinations by Sîrbu (2006). It is presently known from the Răbăgani, the catchment area of River Black-Kőrös (Clessin, 1887), but because of the irrigation of the area the survival of the species is doubtful (Sîrbu, 2006).

Melanopsis parreyssii (Philippi, 1847)

Endemic species, the only known locality is the thermal lake Băile 1 Mai, Püspökfürdő. By the results shown above and the genetic analyses (Smolen&Falniowski, 2009) the hundred-year-old statement of Tivadar Kormos can be proved: *Melanopsis parreyssii* is a sort of differentiated sister-taxon (species or thermal water preferring eco-form) of *Fagotia acicularis*. The length of fossil adult shells was below the values of recent shells (15.52 mm mean vs. 18 mm mean), and the mean width of fossil *Melanopsis parreyssii* shells was 6.81 mm.

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Conservation monitoring of a *Crocus reticulatus Stev*. population on Somlyó-hill, near Oradea (Nagyvárad)

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Abstract. Typical occurrences of *Crocus reticulatus* in Hungary are grasslands on sandy or loess soils and secondary woody vegetation, mainly black locust (*Robinia pseudo-acacia*) plantations which replace original common oak forest-steppes on sandy soils. Such kind of oak forests as *Crocus reticulatus* habitats are very rare. After our former investigations in E-Hungary and on the sandy hills of S-Nyírség (Cîmpia Nirului), we continue the work around the state boundary between Hungary and Romania. The Somlyó-hill (Dealul Şomleu) is situated SE of Oradea, at about 10 km from the city, above Betfia village. Here, the habitat of *Crocus* is very different from that around the sand hills of Nyírség, that is why the location is very interesting from a scientific pont of view. The occurrence is a karstic plateau sloping to S-SE. Here, as local people recalled, some hundreds of *Crocus* flower yearly. Management of the habitat is grazing by sheep and some (illegal) burning. The habitat has a legal status as a protected area. This occurrence is one of the easternmost in the Pannon region, which emphasizes the special character of the Betfia occurrence. The article deals with the population dynamics, variability, and viability of the local population of the species.

Introduction

The distribution of *Crocus reticulatus* is Pontic-Mediterran. The species' area is situated between E-Italy and the Caucasus. The known westernmost oc-

currences are in Kraina and in Friaul and on Monte Spaccato near Trieste (Jávorka 1964). Further east, the northern boundary of its area crosscuts the Pannon region. In Hungary, it occurs West of Danube on the Kisalföld, Bakonyalja, Mezőföld, and the Transdanubian-hills. Between the Danube and Tisa rivers, known localities are on the sand hills of Kiskunság and on Gödöllő-hills. East of Tisa river, the populations are restricted to the sand hills of Nyírség (Jávorka 1964, Farkas 1999, Molnár 2003). Habitats in Hungary are closed grasslands on sandy or loess soils, common oak forest-steppes on sandy soils and secondary woody vegetation, mainly black locust plantations which replace these oak forests.

In the Nyírség region, which includes in recent work the Romanian Érmellék (Cîmpia Ierului) too, the size of the population probably reaches hundreds of thousands of individuals. The main causes of its gradual loss are the mechanized forestry and replacement of former oak forest-steppes with black locust tree plantations. Only relic populations and sub-populations have survived until now in this region. As it was mentioned, the species occurs easternmost around Nyírség, at Valea lui Mihai (Érmihályfalva) (Máthé & Tamássy 1941). They found a larger population in a park-like oak forest-steppe (*Quercetum roboris stepposum*) on a sand-dune in the forest. Recently Carol Karácsonyi has published data from Săcuieni (Székelyhíd) (2002).

Somlyó-hill is a forerunner of Királyerdő (Padurea Craiului) mountains. The habitat of *Crocus* here is a S-SE-sloping karst limestone hillside managed by sheep-grazing and sometimes with burning as we mentioned above. Compared with the widespread sandhill habitats, the karst occurrence is uncommon, therefore we repeated our investigations on this population, too, using the same methods with those we carried out in the Nyírség region formerly (Hamecz 2010, 2011).

Crocus reticulatus is a fragile, early spring plant. Its scientific name originated from the reticulate surface of its bulbs. It has light green leaves with a white midrib, which are 1-2 mm wide. The flowers erect directly from the bulb or from a 1-2 cm long stem-internode. *Crocus* does not have aboveground parts of stem during flowering time. The flowers are usually solitary, rarely forming groups of 2-3 flowers. They have actinomorphyc simmetry. The oblongate or elliptic tepals are variable in colour from whitish to purple. Outer tepals are darker and have 3 brownish or purple stripes on their dorsal side. This is the origin of the Hungarian name and an abandoned scientific one: variegated crocus. The flowers have 1-2 membranous kataphyla. The thready stigma is long, 3-lobed and orange. Flowering period starts in February-March, even through a snow layer. The capsule is 3-sected. It erects high above the ground on the elongated stem of the flower after blossom. It is egg-shaped, acute or acuminate and its sections have membranous

walls and many seeds. The seeds are globose, yellowish-brown or ruddy (Boros 1965; Csapody 1982; Farkas 1999; Molnár 2003). The species is protected in Hungary but unprotected in Romania.

Lajos Simonkai remarked the occurrence of *Crocus reticulatus* on Somlyó-hill in 1890 but without any description of its habitat. Pop & Hodisan (1972) carried out phytocoenological investigations around Oradea and on Somlyó-hill too. In their article we can read a detailed description of open and woody vegetation types of Somlyó. They did not mention any occurrences of *Crocus* from the southern slopes, possibly because they were there in summertime and not earlier. Márton Venczel, a paleontologist at Museum Ţării Crişurilor in Oradea, called our attention on this occurrence. The Museum Ţării Crişurilor is the nature protection manager of the karst hill as a Natura 2000 Habitat Directive site. The karst holes of Somlyó hill are rich in vertebrate-remains dated in lower Pleistocene. Paleontological investigations have been carried out here since the early 20th century (Venczel 1998).

Materials and methods

We mapped the occurrences of individuals on Somlyó-hill in the 3rd week of March 2012 (Fig. 1). Where the density of specimens was higher, we counted them in a settled circle with a 5 m radius. We demonstrate these high-density patches on a Goggle Earth slide. We also drew up data about the morphological characters of 100 individuals in the field. The selected individuals represented as good as possible the whole population. We registered the following features:

- No. of vegetative (sterile) and reproductive (fertile) stems
- No. of leaves per stems
- No. of flowers on fertile stems

After the early springtime data-collection, at the end of June, we made 10 phytocoenological relevés of 5x5 m each on the known GPS-located *Crocus* occurrences. 5 of these relevés were on stony grassland and the other 5 at the ecotone between woody and grassy vegetation.

Results

The Goggle Earth map section (Fig. 2) demonstrates that the grouping of specimens on stony grasslands N and NE above the abandoned limestone-mine, at the wood limits, is larger than in the centre of the studied area. This map reflects the ecological character of this steppe and forest-steppe species which prefers

Fig. 1 - Early spring picture of the closed limestone slope steppic grassland.

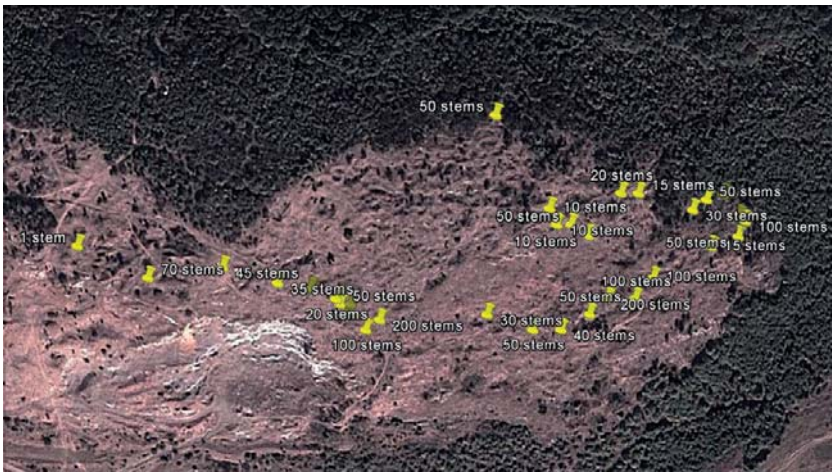

Fig. 2 - *Crocus* occurences on Google map section of the studied area carstic top of Somlyó hill.

exposed, sunny conditions. *Crocus* does not like the karst surfaces where the soil cover is too thin. However, at shelters of bigger rock-outcrops they form groups. We estimate plus 200-300 specimens outside of our 5 m radius counting circles on the hill-slope. The size of the population is near 3,000 individuals.

From investigations on morphological characters, the fact resulted that most individuals start to flower while in the stage with 3-4-leaved stems. Most sterile stems are 2-leaved (Fig. 3). Very few 4-leaved stems were without any flower (Fig. 4). These results are highly consistent with our former ones from Nyírség region, where there were no 2-leaved stems with flowers, and 3-leaved stems without flowers (Hamecz 2011).

Among reproductive stems, only 2 were carrying 2 flowers. This phenomenon is more frequent in Nyírség. There was a flower wearing 13 tepals (Fig. 5). The gynoecium and androecium were also abnormal inside this flower.

We summarize our phytocoenological relevés in Table 1. There was no significant difference of cover values between the inner part of the grassland and the ecotones at the edge of woodlands (85,6 and 84,2 % respectively) (where *Crocus* is growing). Even close to the rocky outcrops, where small bare soil-surfaces were detectable, the cover reached 84,9 %. It seems that these grasslands are more closed recently then they were found by Pop & Hodisan (1972).

Positive processes occur even on the slightly grazed S-SE gentle slopes, where we could count 60 species in our 10 relevés, a much higher number than in 1972: 37 species only. *Festuca valesiaca* cover reached 30 %, while *Bothriochloa ischaenum* reduced to 20 % during this period.

Pop & Hodisan (1972) placed this association into *Andropogonetum ischaemi* Krist 1937 and in the association-group of *Festucion sulcatae* Soó 1940. Based on our relevés we propose to include this grassland according to Borhidi's coenological system (Borhidi 2003) as follows: association class of xeric end meso-xeric grasslands (*Festucetalia valesiacae* Br.-Bl. & R. Tx. Ex Br.- Bl.1949); association group of Pannon steppic and dry grasslands (*Festucion rupicolae* Soó 1940 corr. 1964). The closest relative stands of the association occur on Cserhát-hills (N-Hungary), a limestone talus sloped steppic grassland, *Sedo acris-Festucetum valesiacae* (Penszka 1998).

The occurrence of *Crocus reticulatus* in this habitat is a curiosity. The species was not mentioned neither in this association, nor in this association's relatives until recently (Borhidi 2003).

Table 1. Phytocoenological relevés (10) of Somlyó-hill carstic steppic vegetation. 1-5 grasses without shadow, 6-10 grasses close to the woody vegetation (in edge position)

Relevés No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Cover (%)	93	87	65	98	85	78	70	98	95	80
Species list with covers-%										
Achillea nobilis	x	x	x	x	x	0,5	x	x	2	x
Acinos arvensis	0,7	0,5	x	x	x	0,3	x	x	x	0,5
Allyssum montanum	0,2	x	x	0,3	x	x	x	x	x	x
Andropogon ischaemum	8	7	15	65	25	3	6	45	5	30
Antehmis arvensis	0,2	1,5	0,3	x	x	x	1	x	x	x
Arenaria serpyllifolia	0,2	0,3	x	x	x	x	x	x	x	x
Asperula cynanchica	x	x	x	0,5	x	1,5	5	3	8	x
Bromus tectorum	38	7	1,5	15	8	2	1	x	1	4
Carex praecox	x	x	x	x	x	0,5	0,5	x	x	x
Carthamus lanatus	x	x	x	0,3	x	x	x	x	x	x
Cichonium intybus	x	x	x	x	x	x	x	0,3	x	x
Cirsium arvense	x	0,2	x	x	x	x	x	x	x	x
Condrilla juncea	x	x	x	x	x	x	x	0,3	x	x
Convolvulus arvensis	x	x	x	x	0,5	x	x	x	x	x
Crataegus monogyna	x	x	x	x	x	1	x	x	x	x
Cruciata laevipes	0,2	0,3	x	0,2	0,5	x	x	x	x	x
Crupina vulgaris	x	x	x	0,5	x	x	x	x	x	x
Daucus carota	0,3	x	x	x	x	x	x	x	x	x
Erodium cicutarium	0,3	0,5	x	0,5	0,5	x	x	x	x	x
Eryngium campestre	1	1	1	0,5	0,5	4	15	1,5	1	3
Euphorbia cyparissias	0,5	0,3	2	1,5	1,5	0,5	0,5	x	x	0,5
Festuca valesiaca	23	60	30	3	25	22	28	35	55	38
Filipendula vulgaris	0,2	x	x	x	x	1	x	x	x	x
Fragaria viridis	x	x	x	x	x	7	x	20	7	3
Galium glaucum	x	x	x	x	x	4	x	x	x	x
Geranium columbinum	x	0,3	x	2	x	x	x	x	x	x
Hieracium hoppeanum	x	x	x	x	x	x	1	x	x	x
Hypericum perforatum	x	x	x	x	x	x	x	x	1	x
Koeleria glauca	x	x	x	x	x	x	x	x	x	1
Medicago falcata	0,2	0,2	x	x	x	x	x	x	x	x
Melica transsilvanica	x	x	x	0,1	x	x	x	x	x	x
Nigella arvensis	0,2	x	x	x	x	x	0,3	3	x	0,7
Pastinaca sativa	x	x	x	x	0,3	x	x	x	x	x
Plantago lanceolata	0,7	x	x	x	x	0,3	1,5	2	1	x
Plantago media	x	x	x	x	x	0,3	x	x	x	x
Poa compressa	x	x	x	x	x	0,7	0,5	x	6	x
Polychnemum arvense	x	0,1	0,3	x	x	x	x	x	x	x

Potentilla arenaria	1,5	x	x	x	x	x	1,5	x	0,3	x
Potentilla argentea	1	0,5	x	x	1	1,5	x	x	x	x
Potentilla recta	x	x	x	x	x	x	0,5	x	x	x
Prunus spinosa	x	1	4	x	x	3	x	4	x	0,3
Rubus spp.	x	x	x	x	x	x	2	x	x	x
Sanguisorba minor	x	x	x	x	x	x	x	x	0,1	x
Scabiosa ochroleuca	x	x	x	x	x	x	x	x	0,4	x
Senecio jakobea	x	x	x	x	x	x	0,3	x	x	x
Setaria pumila	0,2	1	0,5	x	x	x	x	x	x	0,5
Sherardia arvensis	x	x	0,1	x	x	x	x	x	x	x
Teucrium chamaedrys	x	0,5	x	x	x	x	4	2	3	0,5
Thymus glabrescens	4	x	15	12	20	12	8	25	20	14
Verbascum lychnitis	0,3	0,2	x	x	x	x	x	x	x	x
Veronica prostrata	x	x	x	x	x	x	x	x	0,5	x
Veronica spicata	x	x	x	x	x	x	x	0,3	x	x
Veronica verna	0,1	0,2	x	x	x	x	x	x	x	x
Vicia grandiflora	x	x	x	0,3	x	x	x	x	x	x
Vicia lathyroides	0,2	x	x	x	x	0,3	x	x	x	x
Viola kitaibeliana	0,2	0,3	x	0,3	0,3	x	x	0,3	x	x
Xanthium spinosum	x	0,2	x	x	x	x	x	x	x	x
Xeranthemum annuum	x	x	x	0,5	x	x	x	x	x	x

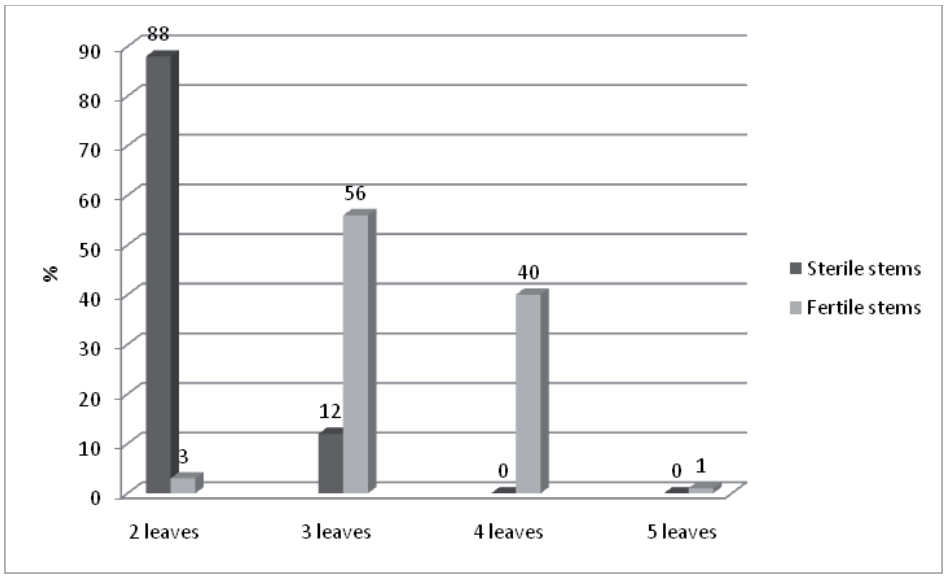

Fig.3 - Connection between leaf number and flowering capacity in the Somlyó-hill crocus population studying 100 individuals

Fig.4 - Sterile *Crocus* with four leaves.

Fig.5 - *Crocus* flower with unusual tepal number.

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A donation from Tiberiu Jurcsák for the Natural History collections of the Ţării Crişurilor Museum in Oradea

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Abstract. This paper aims to publish the data contained in a donation by Tiberiu Jurcsák for the Natural History collections of the Ţării Crişurilor Museum in Oradea. This donation, consisting of several double cardboards, includes botanized pieces, representing species of algae, fungi, lichens, mosses, ferns, Cyanobacteria, Chromista, and Animalia. The collection is considered to date from the second half of the 19th century (in several instances the year 1856 is mentioned), and its collection areas are in many European countries (Croatia, Slovenia, Italy, Slovakia, France, Romania and western Ukraine), but also in Central America (Mexico), South America (Brazil), the Far East (Japan), and Australia. T. Jurcsák was a member of the staff of the museum, the founder and the first head of the Department of Natural Sciences, which he managed until his retirement (1988). After processing the material, we arranged it according to an updated taxonomic classification, specifying the accepted name and the location, date and author of the collection (where mentioned). Thus we present 352 taxa belonging to 183 genera and 112 families.

Introduction

The present work continues to highlight the information contained in the botanical collection of the Ţării Crişurilor Museum, by presenting a donation made by Tiberiu

Jurcsák (1927-1992), a former member of the staff of the museum, the founder and the first head of the Department of Natural Sciences, whose years of activity were exceptional (Dumitraşcu & Paina1986, Grigorescu 1993, Paina 1992). This donation consists of a total of 22 cardboards on which botanized samples were fixed representing species of algae, fungi, lichens, mosses, ferns, and also other organisms belonging to the phyla of Cyanobacteria, Chromista, and Animalia. The material comes from several collectors and different locations, and most of it may have been collected, in our opinion, by Pius Titius Vendel (1801-1884), a monk of the Franciscan Order of the Minorites, whose name is found on some of the cardboards. Sometimes the year and the location of the collection are mentioned, and the method of botanization and the handwriting show this. Our findings in this respect show some parallels between the locations mentioned on some boards by the collector botanist and several moments in the biography of Pius Titius Vendel, a famous botanist collector, who was considered the first Hungarian algologist (Vöröss 1972, 1973). A large part of the material collected by him ended in different schools, institutions, and at other scientists of the time as well (e. g. F. Ardissone, A. Bertoloni, G.B. De Toni, G. Frauenfeld, F. T. Kutzing, G. Zanardini). Parts of this collected material entered the collections of the Natural History Museums in Vienna, Budapest, Paris and Trieste, the Antonian Library in Padua, the Franciscan Monastery in the Cresu island, and the „G. R. Carli" high school in Koper.

Titius Pius Vendel was born on October 23, 1801, in Jasov, near Košice in Slovakia; after becaming a priest in 1828, he taught Latin at Levoča (Lőcse), a town in the historical region Zips (Spiš), in eastern Slovakia. In 1836 he became a teacher in Kanta in Transylvania (today the place is part of Târgu Secuiesc, Covasna county). From 1838 on he was a priest for the Leningen-Westerburg regiment in Pržemysl, Galicia. As a priest chaplain he went to Normandy, and in 1846 he followed the regiment to Split, Croatia.

In 1850 he was in Transylvania again, in Arad, where the Minorite Friars were running a high school where biology was taught among other disciplines. Here he could exhibit his collection of algae, mussels and snails obtained from the Dalmatian coast, and that of butterflies gathered in Galicia. Then he was summoned again to his regiment as a priest chaplain, an opportunity that facilitated the enriching of his collection in the area of the Adriatic Sea, from Venice to Trieste. He stayed in Rome for a while acting as a father confessor in Hungarian at St. Peter's Basilica, and in 1854 he was as a priest in St. Anthony Basilica in Padua; during all this time, he continued his collecting in Dalmatia.

In order to be able to continue his studies on the marine flora and fauna of the northern Adriatic Sea, he moved to the Istrian coast in 1860, living in the monastery of St.Francis of Piran. During his stay he devoted himself to collecting,

studying and describing species of plants, especially algae, as well as other sea and terrestrial organisms, an activity which provided him with a certain reputation in the field of natural sciences, eventually becoming a sought for expert. He is acknowledged for the description and scientific naming of 64 species of algae. He died on December 20, 1884, in Piran, in present day Slovenia.

The collection areas, which are sometimes mentioned on the paper tags of the botanized specimens, indicate the territories where Pius Titius lived, worked, or travelled. The fact that Tiberiu Jurcsák as a specialist came into their possession does not seem to be completely at random (we do not exclude the possibility that he had a certain involvement, as shown by a seal with his name affixed to the cardboards). He understood both the unity that holds them together and the scientific and historical importance of these pieces, and their donation to the museum in Oradea confirms this.

We found in this collection mentions of the following collection sites of botanized species: the North-West Carpathians (the mountains of Slovakia and historic Galicia, the present day Transcarpathia), the western part of Transylvania (Ardeal, Oradea, Săvârşin), the Dalmatian Coast or Croatia (the canton of Split in Dalmatia), Slovenia (the Slovenian Kraina), and the Gulf of Venice (the northern Adriatic Sea, reaching eastward to the Coast of Istria, in Slovenia and Croatia) with the internal bays of Trieste and Piran. In addition to the locations related to the Adriatic Sea, several are related to the Mediterranean Sea (the Gulf of Genoa) and the Atlantic Ocean, as well as pieces originating in areas like the Pyrenees (France), Mexico, Brazil, Australia, and Japan, probably resulting from exchange.

We considered it essential to find out the name of the collector who put together the botanized pieces and, consequently, we tried to decipher the signature found on the margins of the specimens. Such a name can be that of Karl Eduard Ortgies (1829-1916), a German horticulturalist and botanist whose author abbreviation is *Ortgies*. As a horticulturalist he travelled in Europe, maintained an extensive correspondence and compiled catalogues, becoming even the head of the Old Botanical Garden in Zürich. He met Luis van Houtte (1810-1876) and Benedict Roezl (1823-1885), both horticulturalists and botanic collectors who had reached exotic destinations during their travels. Luis van Houtte was a Belgian horticulturalist who, after having worked in Brussels, where he reached a professional fame, became the co-owner of some gardens near Ghent (Gendbrugge), in East Flanders, where he opened a nursery and built greenhouses for multiplication and preservation of exotic plants.

Benedict Roezl was a Czech horticulturalist who worked both for the gardens of Count Thun in northern Bohemia (the western part of the Czech Kingdom within

the Austrian Empire) and, in 1846, for the Ghent gardens of Luis van Houtte, being in charge mostly with the greenhouses and the plants existing in them. He travelled to America and Mexico, collecting there and bringing to Ghent exotic plants of various species. He also gained a professional fame through several studies on the Mexican and American flora (Roezl, 1857). This might explain the presence in the collection of some specimens collected in Mexico, Brazil, and probably, by extension, those coming from Australia and Japan.

Material and methods

The examined material consists of 22 cardboards with the botanized pieces included in the collection of the Ţării Crişurilor Museum in Oradea, as indicated by the inventory number following the botanical denominations. When rendering the names of the species, we considered the accepted scientific name with the mention of the reference source of its first description and its synonyms. To verify and update the data, we used the database of the Royal Botanic Garden Edinburgh – *Flora Europaea*, the *Algaebase* (world-wide electronic publication, National University of Ireland, Galway, http://www.algae base.org), the *uBio Portal* (www.ubio.org/portal/-5k), The Plant List database (http://www.theplantlist.org/), http://www.indexfungorum.org., and the Checklist of Norwegian mosses (http://www.nhm2.uio.no/botanisk/mose/m-taxa.htm). In order to have a systematical presentation of the units, we consulted the study of V. Ciocârlan (2000), which follows the rules and recommendations of the International Code for Botanic Cataloguing, and the site *Systema Naturae 2000* (http://taxonomicom.taxonomy.nl) in order to update the taxonomic classification (following the variant entered after October 17, 2009). We also mentioned the current location of collecting, the locality, the date and the collector's name.

Abbreviations used: n.= number of inventory; ref. = reference index for the first description of the species; leg. = the author who collected and determined the plant; Ord.= order; Fam. = family.

Systematic part

Domain *Bacteria* (Haeckel, 1894) C.R. Woese et al., 1990
Phylum *Cyanobacteria* Stanier, 1974 ex Cavalier-Smith, 2002
Class *Cyanobacteria*
Ord. *Nostocales* T. Cavalier-Smith, 2002, nom. ileg.
Fam. *Nostocaceae* Eichler, 1886
Subfam. *Nostocoideae*

Gen. *Nostoc* Vaucher ex Bornet & Flahault, 1888

***Nostoc commune* Vaucher ex Bornet & Flahault** (n. 8324/22) – ref.: Bornet, E. & Flahault, C. 1886 '1888'. *Annales des Sciences Naturelles, Botanique, Septieme Serie* 7: 177-262; unmentioned location and date, 19th century, no signature, donation T. Jurcsák.
***Nostoc lacustre* Kutzing** (n. 8323/144) – ref.: Boronet, E. & Flahault, C. 1886 '1888'. *Annales des Sciences Naturelles, Botanique, Septieme Serie* 7 : 177-262; syn.: *Nostoc lacustris* Ag.; Carpathians (Transcarpatia, *Kárpátalja*;), freshwater, 19th century, no signature, donation T. Jurcsák.

Fam. *Rivulariaceae* Kutzing, 1843
Gen *Calothrix* C. A. Agardh, 1824 ex E. Bornet & C. Flahault, 1886

***Calothrix wrangelii* C. Agardh** (n. 8329/139) – Status: Accepted Name. Last taxonomic scrutiny Guiry M. D. (created: 11 April 2002 by M. D. Guiry; last updated: 23 Sept. 2004 by M. D. Guiry); syn.: *Calothrix wrangeliana* Kg.; Carpathians (Transcarpatia, *Kárpátalja*), freshwater, 19th century, no signature, donation T. Jurcsák.

Subclass *Oscillatoriophyceae*
Ord. *Oscillatoriales* T. Cavalier-Smith, 2002, nom. ileg.
Fam. *Oscillatoriaceae* Engler, 1898
Gen. *Lyngbya* C. A. Agardh ex Gomont, 1892, nom. cons.

***Lyngbya majuscula* (W. Dillwyn) W. H. Harwey** (n. 8323/118) – ref.: *Lyngbya majuscula* (Dillwyn) Harwey 1833: 370, in Hooker ex Gomont, 1892-1893; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Phylum *Proteobacteria* Garrity et al. 2005
Class *Betaproteobacteria* Garrity et al. 2006
Ord. *Burkholderiales* Garrity et al. 2006
Gen. *Leptothrix* Kutzing, 1843, nom. approb.

***Leptothrix ochracea* (Roth 1797) Kutzing** (n. 8324/36) – ref.: Validly Published (Roth 1797) Kutzing 1843 (Approved Lists 1980); syn.: *Conferva ochracea* Roth, 1797; unmentioned location, 19th century, no signature, donation T. Jurcsák.

Domain *Eucaryota*

Kingdom *Chromista* T. Cavalier-Smith, 1981
Subkindom *Chromobiota* Cavalier-Smith, 1991
Infrakingdom *Heterokonta* (Cavalier-Smith, 1986) Cavalier-Smith, 1995
Phylum *Ochorphyta* (Cavalier-Smith, 1986) T. Cavalier-Smith, 1995
Subphylum *Phaeista* Cavalier-Smith, 1995
Infraphylum *Chrysista* (Cavalier-Smith, 1986) T. Cavalier-Smith, 1995
Superclass *Phaeistia* Cavalier-Smith, 1995
Class *Phaeophyceae*
Ord. *Chordariales*
Fam. *Chordariaceae*
Gen. *Asperococcus* J. V. Lamouroux, 1813

***Asperococcus bullosus* J. V. Lamouroux** (n. 8323/75) – ref.: J. V. Lamouroux (1813: 277, pl.12: fig. 5). *Annales du Muséum d'Histoire Naturelle, Paris* 20: 21-47, 115-139, 267-293, Plates 7-13.; syn.: *Asperococcus bulbosus* Lam. 1822; *Asperococcus bulosus* Bor.**;** Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Dictyosiphon*

***Dictyosiphon capillaceus* Rp.** (n. 8323/97) – ref.: Greville, R. K. (1830). *Algae britannicae*.; syn.: *Dictyosyphon capillaceus* Rp.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Mesogloia* C. A. Agardh, 817

***Mesogloia mediterranea* J. Agardh.** (n. 8323/96) – ref.: Agardh, J. G. (1842: 33-34). *Algae maris Mediterranei et Adriatici*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Spermatochnaceae*
Gen. *Stilophora* J. G. Agardh, 1841, nom. cons.

***Stilophora adriatica* J. Agardh** (n. 8323/20) – ref.: Gerloff, J. & U. Geissler, 1974. Eine revidierte Liste der Meeresalgen Griechenlands. *Nova Hedwigia*, 22: 724-793; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Stilophora rhizodes* (C. Agardh) J. Agardh** (n. 8323/126) - ref.: Agardh, J. G. (1841). *Linnea* 15: 1- 50, 443-457; syn.: *Stilophora tenella* (Esper) P. C. Silva - (8323/126); Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

***Stilophora tenella* (Esper) C. Silva, Basson & Moe** (n. 8323/16) – ref.: P. C. Silva et al. (1996). *University of California Publications in Botany* 79: 1-1259; Acording to De Clerck (2003); syn.: *Dictyota papillosa* Lamouroux; *Stilophora papillosa* (J. V. Lamouroux) J. Agardh; *Stilophora papillaris* Ag.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Cutleriales*
Fam. *Cutleriaceae*
Gen. *Cutleria* R. K. Greville, 1830

***Cutleria penicillata* Kutzing** (n. 8324/65) – ref.: Greville, R. K. (1830) *Algae britanicae;* Croatia, Split, Dalmatia, Adriatic Sea, 19th century, leg. Titius, donation T. Jurcsák.

Ord. *Desmarestiales*
Fam. *Desmarestiaceae*
Gen. *Desmarestia* J. V. F. Lamouroux, 1813, nom. cons.

***Desmarestia aculeata* (L.) Lamouroux** (n. 8323/133) – ref.: *Annales du Muséum d'Histoire Naturelle, Paris* 20: 21-47, 115-139, 267-293, Plates 7-13; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Ord. *Dictyotales*
Fam. *Dictyotaceae*
Gen. *Dictyota* J. V. Lamouroux, 1809

***Dictyota dichotoma* (Hudson) J. V. Lamouroux** (n. 8324/48) – ref.: Lamouroux, J. V. F. (1809), *Journal de Botanique [Desvaux]* 2: 38-44; Croatia, Split (Spalato), Adriatic Sea, 19th century, leg. Titius, donation T. Jurcsák.
***Dictyota dichotoma* (Hudson) J. V. Lamouroux** (n. 8323/48) – ref.: J. V. Lamouroux (1809: 42). *Journal de Botanique [Desvaux]* 2: 38-44; syn.: *Dictyota acuta* Lam.; *Dictyota acuta* Kutzing; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Dictyota dichotoma* (Hudson) J. V. Lamouroux** (n. 8323/46) – ref.: J. V. Lamouroux (1809: 42). *Journal de Botanique [Desvaux]* 2: 38-44; syn.: *Fucus dichotoma* Hudson; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Dictyota fasciola* (Roth) J. V. Lamouroux** (n. 8324/49) – ref.: *Nouveau Bulletin des Sciences, par la Société Philomathique de Paris* 1: 330-333, fig. 2, pl.6; syn.:

Dictyota denticulata (Kutzing) Kutzing; Croatia, Split (Spalato), Adriatic Sea, 19th century, leg. Titius, donation T. Jurcsák.
***Dictyota implexa* (Desfontaines) J. V. Lamouroux** (n. 8323/47) – ref.: J. V. Lamouroux (1809: 42). *Journal de Botanique [Desvaux]* 2: 38-44; syn.: *Fucus implexus* Desfontaines; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Dictyopteris* J. V. F. Lamouroux, 1809, nom. cons.

***Dictyopteris polypodioides* (A. P. De Candolle) J. V. Lamouroux** (n. 8323/90) – ref.: J. V. Lamouroux (1809: 332). *Nouveau Bulletin des Sciences, par la Société Philomathique de Paris* 1: 330-333, fig.2 pl.6; syn.: *Halyseris polypodioides* Agardh *(Ag. — Kg. I. c. 561. ej. Phycol. gener. Tab. 23. Anatomia)*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Dictyopteris polypodioides* (A. P. De Candole) J. V. Lamouroux** (n. 8323/92) – ref.: *Nouveau Bulletin des Sciences, par la Société Philomathique de Paris* 1: 330-333, fig.2, pl.6; syn.: *Halyseris polypodioides* (de Candole) C. Agardh (1820: 142-143); *Halyseris polypodioides* varietas *angustifolia*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Gymnosorus* J. Agardh

***Gymnosorus collaris* (C. Agardh) J. Agardh** (n. 8323/27) – ref.: Agardh, J. G. (1894: 11). *Lunds Universitets Ars-Skrift, Andra Afdelningen, Kongl. Fysiografiska Sallskapets i Lund Handlingar* 29(9): 1-144, 2 plates; syn.: *Padina collaris* (C. Agardh) Greville; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Padina* M. Adanson, 1763, nom. cons.

***Padina pavonica (L.)* Thivy** (n. 8323/31) – ref.: Taylor, W. R. (1960: 234-235). *Marine algae of the eastern tropical and subtropical coasts of the Americas.* pp. xi + 870, 14 figs, 80 plates. Ann Arbor: the University of Michigan Press; syn.: *Padina pavonia* Lam.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Ectocarpales*
Fam. *Ectocarpaceae*
Gen. *Ectocarpus* Lyngbye, 1819, nom. cons.

***Ectocarpus finicularis* Ag.** (n. 8323/59) – ref.: Lyngbye, H. C. (1819). *Tentamen hy-*

drophytollgiae danicae; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Ectocarpus siliculosus* (Dillwyn) Lyngbye** (n. 8324/67) – ref.: Lyngbye, H. G. (1819) *Tentamen hydrophytologiae danicae* 1819: 131, pl. 43B, C*;* Croatia, Split, Dalmatia, Adriatic Sea, 19th century, leg. Titnics, donation T. Jurcsák.
***Ectocarpus tomentosus* (Hudson) Lyngbye** (n. 8323/73) – ref.: Lyngbye, H. C. (1819: 132, pl.44: fig A). *Tentamen hydrophytologiae danicae*; syn.: *Ectocarpus tomentosus* Kg.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Pilayellaceae*
Gen. *Pilayella* Bory de Saint-Vincent, 1823

***Pilayella littoralis* (L.) Kjellman** (n. 8323/134) – ref.: Kjellman, F.R. (1872). *Bidrag till kannedomen om Skandinaviens Ectocarpeer och Tilopterider*. pp. 1-112, 2 plates. Stockholm; syn.: ***Ectocarpus** compactus* (Roth) C.Agardh; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Ord. *Fucales* Kylin
Fam. *Cystoseiraceae*
Gen. *Bifurcaria* Stackhouse, 1809

***Bifurcaria bifurcata* R. Ross (1958)** (n. 8323/112) – ref.: Ross, R. (1958). *Journal of the Linnean Society of London, Botany* 55: 753-754; syn.: *Fucus tuberculatus* Huds. (Hudson [W] (1778). *Flora anglica*); Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Gen. *Cystoseira* C. A. Agardh, 1820, nom. cons.

***Cystoseira baccata* (S.G. Gmelin) P. C. Silva** (n. 8323/111) – ref.: Silva P. C. (1952). *University of California Publications in Botany* 25: 241-323; syn.: *Cystoseira fibrosa* (Hudson) Agardh; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.
***Cystoseira barbata* (Stackhouse) C. Agardh** - (n. 8323 /40) – ref.: Agardh, C. A. (1820: 57). *Species algarum*; syn.: *Abrotanifolia barbata* Stackhouse 1809; Adriatic Sea, 19th century, no signature – donation T. Jurcsák.
***Cystoseira concatenata* (L.) C. Agardh** (n. 8323/41) – ref.: Agardh, C. A. (1820: 57). *Species algarum*; syn.: *Cystoseira foeniculacea* (L.) Greville; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Cystoseira catenella* Ag.** (n. 8324/31) – ref.: Agardh, C. A. (1820 '1821'). *Species*

algarum; unmentioned location, 19th century, no signature, donation T. Jurcsák.
***Cystoseira corniculata* (Turner) Zanardini** (n. 8324/32) – ref.: *Memorie della Reale Accademia delle Scienze di Torino, ser. 2 4: 105-255, pls. I-VIII;* unmentioned location 19th century, no signature, donation T. Jurcsák.
***Cystoseira corniculata* (Turner) Zanardini** (n. 8323/42) – ref.: Zanardini, G. (1841: 243). *Memorie della Reale Accademia delle Scienze di Torino, ser. 2.* 4: 105-255, pls. I-VIII; syn.: *Fucus ericoides* var. *corniculatus* Turner; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Cystoseira crinita* Duby** (n. 8323/38) – ref.: Duby, J. E. (1830; 936). *Aug. Pyrami de candolle Botanicon gallicum*; syn.: *Fucus crinitus* Desfontaines; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Cystoseira foeniculacea* (L.) Greville** (n. 8323/39) – ref.: Greville, R. K. (1830: xxxii, 5-7). *Algae britannicae*; syn.: *Cystoseira abrotanifolia* (L.) C. Agardh; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Cystoseira foeniculacea* (L.) Greville** (n. 8324/34) – ref.: Greville, R. K. (1830). *Algae britannicae*; syn.: *Cystoseira abrotanifolia* (L.) Agardh 1820: 63; unmentioned location and undated, 19th century, no signature, donation T. Jurcsák.
***Cystoseira leptocarpa* Kutz.** (n. 8323/37) – ref.: Kutz. Sp. p. 599, Tab. Phyc. X., t. 46, f.II; syn.: *Cystoseira leptocarpa* Ag.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Cystoseira spinulosa* Kg.** (n. 8323/109) – ref.: Agardh, C. A. (1820 '1821'). *Species algarum.* Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.
Cystoseira sp. (n. 8324/33) – ref.: Agardh, C. A. (1820 '1821). *Species algarum*; unmentioned location, 19th century, no signature, donation T. Jurcsák.

Fam. *Fucaceae*
Gen. *Ascophyllum* Stackhouse, 1809, nom. cons., orth. cons.

***Ascophyllum nodosum* (L.) Le Jolis** (n. 8323/43) – ref.: Le Jolis, A. (1863: 96). *Memories de la Société Impériale des Sciences Naturelles de Cherbourg* 10: 5-168, pls. I-IV; syn.: *Fucus nodosus* L.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Fucus* L., 1753

***Fucus sherardii* (L.) Areschoug** (n. 8323/81) – ref.: Areschoug J. E. (1868: 106). *Botaniska Notiser* 3: 99-115; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Fucus scherardii* L.** (n. 8324/19) – ref.: Linnaeus. *Species Plantarum* 2: 1158.

1753; unmentioned location, 19th century, no signature, donation T. Jurcsák.
Fucus vesiculosus L. (n. 8324/20) – ref.: Linnaeus (1753). *Species plantarum* vol.2 pp. [i], 561-1200, [1-30, index]; unmentioned location, 19th century, no signature, donation T. Jurcsák.

Gen. *Pelvetia* Decaisne & Thuret, 1845

***Pelvetia canaliculata* (L.) Decaisne & Thuret** (n. 8323/45) – ref.: Decaisne J. & Thuret, G. (1845: 13). *Annales des Sciences Naturelles, Botanique, Troisieme série 3.* 5-15, pls. 1-2, 40 figs.; syn.: *Fucus canaliculatus* L.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Sargassaceae*
Gen. *Sargassum* C. A. Agardh, 1820, nom. cons.

***Sargassum acinarium* (L.) Setchell** (n. 8323/4) – ref.: Setchell, W. A. & Gardner, N. L. (1924). *Proceedings of the California Academy of Science, Se*s. 4 12: 695-949, 77 plates; syn.: *Sargassum linifolium* C. Agardh, 1820; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Sargassum bacciferum* (Turner) Agardh** - (n. 8323/137) – ref.: Agardh, C. A. (1820 '1821'). *Species algarum*, Pars prima. Pp. [i-iv], [1]-168. Lundae; syn.: *Sargassum natans* (L.) Gaillon; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.
Sargassum cuneifolium* var. *doriae* (Grunow) Grunow** (n. 8323/8) – ref.: Grunow 1915: 430; syn.: *Sargassum dorianum* DC; ***Sargassum *doriae* Grunow; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Sargassum parvifolium* (Turner) C. Agardh** (n. 8323/6) – ref.: Agardh, C. A. (1820 1821'). *Species algarum*; syn.: *Fucus parvifolius* Turner; *Sargassum parvifolium* Zan.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Sargassum vulgare* Agardh** (n. 8323/5) – ref.: Agardh, C. A. (1820, 1821'). *Species algarum*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Sargassum vulgare* Agardh** (n. 8324/23) – ref.: *Species algarum* rite cognitae, cum synonymis, differentiis specifis et descriptionibus succintctis. Volumen primum. Pars prima. pp. [i-iv], [1]-168. Lundae; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Laminariales*
Fam. *Chordaceae*

Gen. *Chorda* Stockhouse, 1797

***Chorda termis* L.** (n. 8324/21) – ref.: Stackhouse, J. (1797). *Nereis britannica;* unnamed and undated, 19th century, no signature, donation T. Jurcsák.

Ord. *Scytosiphonales*
Fam. Scytosiphonaceae
Gen. *Scytosiphon* C. A. Agardh, 1820, nom. cons.

***Scytosiphon lomentaria* (Lyngbye) Link.** (n. 8324/35) – ref.: *Handbuch zur Erkenung der nutzbarsten und am haufigsten vorkommenden Gewächse. Dritter Theil. pp. i-xviii, 1-536.* Berlin; syn.: *Chorda lomentaria* Lyngbye; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Sphacelariales*
Gen. *Sphacelocarpus*

***Sphacelocarpus labillarelinii* Agardh** (n. 8323/114) – Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Fam. *Cladostephaceae*
Gen. *Cladostephus* C. A. Agardh, 1817

***Cladostephus myriophyllum* Agardh** (n. 8324/13) – ref.: M. D. Guiry, 2011, *Algae Base*; syn.: *Cladostephus myriophyllum* Bory, 1823: 182, nom. illeg; *Cladostephus spongiosus* (Hudson) Agardh f. *verticillatus* (Lightfoot) Prud'homme van Reine; unnamed and undated, 19th century, no signature, donation T. Jurcsák.
***Cladostephus myriophyllum* Agardh** (n. 8323/57) – ref.: *Cladostephus myriophyllum* Bory 1823: 182, nom. illeg.; syn.: *Cladostephus verticillatus* (Lightfoot) Lyngbye; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Stypocaulaceae*
Gen. *Halopteris* F. T. Kutzing, 1843

***Halopteris filicina* (Grattan) Kutzing** (n. 8323/76) – ref.: Kutzing, F. T. (1843: 293). *Phycologia generalis*; syn.: *Sphacelaria disticha* Vahl ex Lyngbye 1819; *Sphacelaria filicina* (Grateloup) C. Agardh; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Halopteris scoparia* (L.) Sauvageau** (n. 8323/77) – ref.: Sauvageau, C. (1904). *Remarques sur les Sphacelariacees.* Vol.2 pp. 321-480. Bordeaux: Feret et fils; syn.: *Sphacelaria scoparia* (L.) Lyngbye; *Stypocaulon scoparium* (L.) Kutzing; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Sporochnales*
Fam. *Sporochnaceae*
Gen. *Nereia* Zanardini, 1846

Nereia filiformis* (J.Agardh) Zanardini** (n. 8323/7) – ref.: *Atti del Settimo Congresso degli Scienziati Italiani in Napoli,* 1845, 2: 899-900; syn.: ***Desmarestia filiformis J. Agardh; *Desmarestia filiformis* Lam.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Clas. *Xanthophyceae* Pascher, 1914
Ord. *Vaucheriales*
Fam. *Vaucheriaceae*
Gen. *Vaucheria* A. P. de Candolle, 1801

***Vaucheria cespitosa* (Vaucher) De Candolle** (n. 8323/141) – ref.: Candolle, A. P. de (1801). *Bulletin des Scians, par la Société Philomathique de Paris* 3: 17-21; syn.: *Vaucheria cespitosa* Kg.; *Vaucheria caespitosa* DC; Slovakia, north-western Carpathians, Gerlachovsky (Gerlos) region, freshwater, 19th century, leg. illegible signature, donation T. Jurcsák.
***Vaucheria cespitosa* (Vaucher) De Candolle** (n. 8324/27) – ref.: *Hedwigia.* 1890; unnamed and undated, freshwater, 19th century, no signature, donation T. Jurcsák.

Subphylum *Diatomeae* (Dumortier, 1821) Cavalier-Smith, 1995
Class *Bacillariophyceae* Haeckel, 1878
Subclass *Bacillariophycidae* (Haeckel, 1878) Mann, 1990
Gen*. Micromega* C. A. Agardh, 1927

***Micromega tenellum* Kutzing** (n. 8323/60) – ref.: Kutzing, F. T. 1844, Die kieselschaligen Bacilarien oder Diatomeen. Nordhausen, 152 pp., 30 pls.; syn.: *Schizonema tenellum* (Kutzing) Meneghini, 1853; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Clas. *Fragilariophyceae* F. E. Round, in F. E. Round et al., 1990

Subclas. *Fragilariophycidae* F. E. Round, in F. E. Round et al., 1990
Ord. *Fragilariales* Silva, 1962
Fam. *Fragilariaceae* Greville, 1833
Gen. *Diatoma* Bory de Saint-Vincent, 1824, nom. cons.

***Diatoma vulgare* Bory de Saint-Vincent** (n. 8324/46) – ref.: *Dictionnaire Classique d'Histoire Naturelle. CRA-D* (Audoin et al. eds) Vol. 5, pp. 461. Paris; unnamed and undated, 19th century, no signature, donation T. Jurcsák; missing.

Kindom *Fungi* T. L. Jahn & F. F. Jahn, 1949 ex R. T. Moore, 1980
Subkindom *Dikaria* D. S. Hibbett et al., in D. S. Hibbett et al., 2007
Phylum *Ascomycota* H. C. Bold, 1975 ex T. Cavalier-Smith, 1998
Subphylum *Pezizomycotina* O. E. Eriksson & K. Winka, 1997
Clas. *Lecanoromycetes* O. E. Eriksson & K. Winka, 1997
Subclas. *Lecanoromycetidae* P. M. Kirk et.al. 2001 ex J. Miadlikowska et al., in D. S. Hibbett et al., 2007
Ord. *Lecanorales* Nannf., 1932
Fam. *Cladoniaceae* Zenker, 1827
Gen. *Cladonia* Hill ex P. Browne, 1756

***Cladonia convoluta* (Lamkey) Anders** (n. 8324/93) – ref.: *Strauch-Blattflecht. Nordbohhm:* 29 (1806); syn.: *Cenomyce endiviifolia* Ach., Lieh. üniv. (1810) p. 528 (conf. Floerk., Berl. Mag. 1810 p. 250, Coem., Clad. Ach. 1865 p. 36). Ach., Syn. Lieh. (1814) p. 250, 342 (endiviaefolia). Flot., Bern. Meuse Lieh. (1818-20) p. 152; *Cenomyce endivifolia* Hook (Fl. Scot. ii. P. 62); *Cenomyce endiviofolia* L.; *Cladonia endiviifolia* (Dicks) Fr. (as "endiviaefolia"); *Cladonia foliacea* var. *endiviifolia* (Dicks) Schaer.; *Lichen convoluus* Lamkey; *Lichen endiviifolius* Dicks.; Croatia, Dalmatia, 19th century, no signature, donation T. Jurcsák.
***Cladonia cornucopioides* (L.) Hoffm.** (n. 8324/74) – ref.: *Deutschl. Fl.,* Zweiter Theil (Erlangen): 128 (1796); Romania,Transylvania (Erdély), 19th century, illegible signature, donation T. Jurcsák.
***Cladonia cupulata* Ach.** (n. 8324/71) – ref.: *Prim. Fl. Holsat.* (Kiliae): 90 (1756); Slovenia, Kraina, 19th century, no signature, donation T. Jurcsák.
***Cladonia pyxidata* (L.) Hoffm.** (n. 8324/72) – ref.: *Deutschl. Fl.,* Zweiter Theil (Erlangen): 121 (1796); Romania, Bihor, Oradea, hills of Oradea, 19th century, illegible signature, donation T. Jurcsák.
***Cladonia racemosa* Hoffm.** (n. 8324/75) – ref.: *Deutschl. Fl.,* Zweiter Theil (Erlangen): 114 (1796); Romania,Transylvania (Erdély), 19th century, illegible signa-

ture, donation T. Jurcsák.
***Cladonia rangiferina* (L.) Weber ex. F.H. Wigg.** (n. 8324/73) – ref.: in Wiggers, *Prim. fl. holsat* (Kiliae): 90 (1780); Slovenia, Kraina, 19th century, illegible signature, donation T. Jurcsák.
***Cladonia utricularis* Hoff.** (n. 8324/76) – ref.: *Prim. fl. holsat.* (Kiliae): 90 (1756); Romania, Transylvania (Erdély), 19th century, illegible signature, donation T. Jurcsák.

Gen. *Lecanora* Ach., 1809

***Lecanora subfusca* (L.) Ach.** (n. 8324/100) – ref.: *Lich. Univ.:* 393. (1810); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Fam. *Parmeliaceae* Zenker, 1827
Gen. *Alectoria* Ach.

***Alectoria jubata* (L.) Ach.** (n. 8324/80) – ref.: Zahlbruckner's Cat. Lich. Univ. 6: 394 | Lamb's Index nom. lich.: 15; syn.: *Bryopogon jubatum* Hoff.; *Bryopogon jubatus* (L.) Link.; *Bryoria jubata* (L.) Bystrek; Slovenia,. Kraina, 19th century, illegible signature, donation T. Jurcsák.
***Alectoria ochroleuca* (Hoffm) A. Massal.** (n. 8324/81) – ref.: *Sched. critic.* 2: 47 (1885); syn.: *Bryopogon ochroleucus* (Hoffm) Link. (1833); *Bryopogon ochroleucum* Ach.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Alectoria ochroleuca* (Hoffm). A. Massal.** (n. 8324/88) – ref.: syn.: *Sched. Critic*. 2: 47 (1855); syn.: *Imbricaria ochroleuca* L.; *Parmelia ochroleuca* (Hoffm) Ach.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Bryoria* Brodo & D. Hawksw.

***Bryoria capillaris* (Ach) Brodo & D. Hawksw.** (n. 8324/82) – ref.: *Op. Bot.* 42: 115 (1977); syn.: *Alectoria capillaris* (Ach) Cromb. (1871); *Bryopogon capillaris* (Ach) Bystrek (1971); *Bryopon capillaceum* Hoffm.; Slovenia,. Kraina, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Cetraria* Ach.

***Cetraria aculeata* (Schred) Fr.** (n. 8324/78) – ref.: *Nov. Sched. Critic. Lich.* 4: 32

(1826); syn.: *Cenomice aculeata* Ach.; *Cladonia aculeata* (Schreb) Baumg.; *Parmelia aculeata* (Schreb) Spreng.; Romania, Bihor, Oradea, hills of Oradea, 19th century, illegible signature, donation T. Jurcsák.
***Cetraria islandica* (L.) Ach.** (n. 8324/84) – ref.: *Method. Lich.:* 293 (1803)*;* syn.: *Cetraria islandica* ssp. *islandica* (L.) Ach.; Slovenia,. Kraina, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Evernia* Ach

***Evernia capillaris* Kaleh** (n. 8324/92) – ref.: *Lich. Univ* : 84, 441 (1809); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Evernia divaricata* (L.) Ach.** (n. 8324/90) – ref.: *Lich. univ*.: 1-196 (1810); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Evernia prunastri* (L.) Ach.** (n. 8324/91) – ref.: *Lich. univ.:* 442, tab. 10, fig. 1 (1810); Slovenia, Kraina, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Flavocetraria* Karnefelt & A. Thell,

***Flavocetraria cucullata* (Bellardi) Karnefelt & A. Thell** (n. 8324/85) – ref.: in Karnefelt, Thell, Randlane & Saag, *Acta bot. Fen.* 150: 81 (1994); syn.: *Cetraria cucullata* (Bellardi) Ach.; **n**orthwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Flavocetraria nivalis* (L.) Karnefelt & A. Thell** (n. 8324/83) – ref.: in Kärnefelt, Thell, Randlane & Saag, *Acta bot. fenn.* **150**: 84 (1994); syn.: *Allocetraria nivalis* (L.) Randlane & Saag; *Cetraria nivalis* (L.) Ach.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Flavoparmelia* Hale

***Flavoparmelia caperata* (L.) Hale** (n. 8324/87) – ref.: *Mycotaxon* 25(2): 604 (1986); syn.: *Imbricaria caperata* (L.) DC. (1805); Slovenia, Kraina, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Melanelia* Essl.,

***Melanelia stygia* (L.) Essl.** (n. 8324/86) – ref.: *Mycotaxon* **7**(1): 47 (1978); syn.: *Imbricaria stygia* (L.) DC., in Lamarck & de Candolle, *Fl. franç.*, Edn. 3 (Paris) **2**: 189 (1805); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region,

19th century, leg. illegible signature, donation T. Jurcsák.

Gen. *Pseudoevernia* Zopf.

Pseudoevernia furfuracea* (L.) Zopf. var. *furfuracea (n. 8324/89) – ref.: *Beih. Bot. Cbi.* 14: 124 (1903); syn.: *Evernia furfuracea* (L.) W. Mann, *Parmelia furfuracea* (L.) Ach.; Slovenia, Kraina, 19th century, illegible signature, donation T. Jurcsák.

Gen. ***Usnea* Dill. ex Adans., 1763**

***Usnea barbata* (L.) Weber ex. F.H. Wigg.** (n. 8324/97) – ref.: Brit. Fl. 1: 206 (1780); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Usnea florida* (L.) Weber ex. F.H. Wigg.** (n. 8324/96) – ref.: *Prim. Fl. holast.* (Killae) 2: 7 (1780); Slovenia, Kraina, 19th century, illegible signature, donation T. Jurcsák.
***Usnea longissima* Ach.** (n. 8324/95) – ref.: *Lich. Univ.*: 626 (1810); Slovenia, Kraina, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Physciaceae* Zahlbr., 1898
Gen. *Anaptychia* Korb.

Anaptycha ciliaris* (L.) Korb. ssp. *ciliaris (n. 8324/101) – ref.: *Sci. Rep. Fac. Agric. Kyoto Prefect. Univ.:* 197 (1853); syn.: *Borrera ciliaris* (L.) Ach., *Lich. univ.*: 496 (1810); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.
***Anaptychia runcinata* (With) J. R. Laundon** (n. 8324/77) – ref.: *Lichenologist* 16(3): 225 (1984); syn.: *Parmelia aquila* (Ach) Ach. (*Method. Lich.:* 201. 1803); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Gen. *Heterodermia* Trevis.

***Heterodermia speciosa* (Wulfen) Trevis** (n. 8324/79) – ref.: *Atti Soc. Ital. Sci. nat.* (Modena) 11: 614 (1868); syn.: *Anaptychia speciosa* (Wulfen) A. Massal; *Parmelia speciosa* (Wulfen) Ach.; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Fam. *Ramalinaceae* C. Agardh, 1821
Gen. *Ramalina* Ach.

***Ramalina calicaris* (L.) Rohl.** (n. 8324/102) – ref.: *Deutschl. Fl.,* Abth. 2 (Frankfurt) 3: 139 (1813); syn.: *Ramalina calicaris* Fries; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.
***Ramalina fraxinea* (L.) Ach.** (n. 8324/94) – ref.: *Lich. Univ.*: 622 (1810); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Ord. *Peltigerales* W. Watson, 1929
Subord. *Collematinaceae* Miadlikovaska
Fam. *Collemataceae* Zenker, 1827
Gen. *Leptogium* (Ach) Gray

***Leptogium lichenoides* (L.) Zahlbr.** (n. 8324/98) – ref.: Cat. Lich. Univers. 3: 136 (1924) [1925]; syn.: *Leptogium lacerum* (Sw) Gray; *Collema lacerum* (Sw) DC; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Subord. *Peltigerineae*
Fam. *Lobariaceae* Chevall., 1826
***Gen. Lobaria* (Schreb) Hoffm.**

***Lobaria pulmonaria* (L.) Hoffm.** (n. 8324/99) – ref.: *Deutschl. Fl.*, Zweiter Theil (Erlangen): 146 (1796); syn.: *Sticta pulmonaria* (L.) Biroli; Slovenia, Kraina, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Peltigeraceae* Dumort., 1822
Gen. *Peltigera* Willd., 1787

***Peltigera verucosa* L.** (n. 8324/105) – ref.: *Fl. Berol. Prodr.* 347 (1787); Romania, Transylvania (Erdély), 19th century, illegible signature, donation T. Jurcsák.

Ord. *Teloschistales* D. Hawksw. & O. E. Eriksson, 1986
Fam. *Teloschistaceae* Zahlbr., 1898
Gen. *Xantoria* (Fr) Th. Fr., 1860

Xantoria parietina* (Th. Fr) var. *parietina (n. 8324/103) – ref.: *Lich. Arct.*: 69

(1860); syn.: *Physcia parietina* (L;) De Not., (1847); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Ord. *Umbilicaricales*
Fam. *Umbilicariaceae* Chevall., 1826
en. *Umbilicaria* Hoffm., 1789

***Umbilicaria deusta* (L.) Baumg.** (n. 8324/104) – ref.: *Fl. Lips.:* 571 (1836); syn.: *Gyrophora flocculosa* Hoff.; *Gyrophora flocculosa* (Wulfen) Turner & Borrer; *Gyrophora deusta* (L.) Ach., *Umbilicaria flocculosa* (Wulfen) Hoffm.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Umblicaria hirsuta* (Sw. Ex. Westr) Ach.** (n. 8324/106) – ref.: *K. Vetensk-Acad. Nya Handi.* 15: 97 (1794); syn.: *Gyrophora hirsuta* (Sw. Ex. Westr) Ach.; **n**orthwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Clas. *Lichinomycetes* V. Reeb et al., 2004
Ord. *Lichinales* henssen & Budel, in Hawksworth & Eriksson, 1986
Fam. *Lichinaceae* Nyl., 1854
Gen. *Lichina* C. Agardh, 1817, nom. cons.

***Lichina confinis* (O.F.Mull) C. Agardh** (n. 8323/125) – ref.: *Spec. Alg.* 1: 105 (1821); syn.: *Lichen confinis* O.F. Mull., *Icon. Plant. Dan.* **5**: 5 (1782); Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Kingdom *Plantae* Haeckel, 1866
Subkingdom *Biliphyta* Cavalier-Smith, 1981
Phylum *Rodophyta* Wettstein, 1922
Subphylum *Macrorhodophytina* T. Cavalier-Smith, 1998
Clas. *Bangiophyceae*

Ord.*Bangiales*
Fam. *Bangiaceae*
Gen. *Bangia* Lyngbye, 1819

***Bangia compacta* Zan.** (n. 8324/57) – ref.: *Bangia compacta* Zanardini; Lyngbye, H. C. (1819). *Tentamen hydrophytologiae danicae*; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Bangia fuscopurpurea* (Dilling) Lyngbye** (n. 8323/10) – ref.: Lyngbye, H. C. (1819; 83, pl. 24 C). *Tentamen hydrophytologiae*; syn.: *Bangia versicolor* Kützing; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Porphyra* C. A. Agardh, 1824, nom. cons.

***Porphyra purpurea* (Roth) C. Agardh** (n. 8324/26) – ref.: Agardh, C. A. (1824). *Systema algarum.* pp. [i]-xxxviii, [1]-312. Lundae; syn.: *Porphyra vulgaris* C. Agardh 1827; no location and data, 19th century, no signature, donation T. Jurcsák.
***Porphyra purpurea* (Roth) C. Agardh** (n. 8323/101) – ref.: Agardh, C. A. (1824: 191). *Systema algarum*. Pp. [i]-xxxviii, [1]-312. Lundae [Lund]; syn.: *Porphyra vulgaris* C. Agardh. nom. ileg.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Erythropeltidales*
Fam. *Erythrotrichiaceae*
Gen. *Erythrotrichia* J. E. Areschoug, 1850, nom. cons.

***Erythrotrichia investiens* (Zanardini) Bornet** (n. 8323/29) – ref.: Bornet E. (1892: 260). *Mémoires de la Société des Sciences naturelles de Cherbourg* 28: 165-376, 2 plates; syn.: *Bangia investies* Zan.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Clas. *Florideophyceae*
Ord. *Ceramiales*
Fam. *Ceramiaceae*
Gen. *Antithamnion* Naegeli, 1847

***Antithamnion cruciatum* (C. A. Agardh) Naegeli** (n. 8324/18) – ref.: Nägeli, C. (1847). *Neue Denkschriften der Allgemeinen Schweizerischen Gesellschaft fur die Gesammten* 9(2): 1-275, pls I-X.; syn.: *Callithamnion cruciatum* C. Agardh; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Ballia* W. Harvey, 1840

***Ballia calitricha* (C. Agardh) Kutzing** (n. 8323/113) – ref.:Agardh, C. A. (1824), *Systema Algarum* (Berling: Lund); syn.: *Balea callitrichia* Ag.; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Gen. *Callithamnion* Lyngbye, 1819

***Callithamnion compactum* E.Y. Dawson** (n. 8323/104) – ref.: Dawson (1962: 29); syn.: *Callithamnion compactum* Ag.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Callithamnion corymbosum* (Smith) Lyngbye** (n. 8323/105) – ref.: Lyngbye, H. C. (1819: 125). *Tentamen hydrophytologiae danicae*; syn.: *Callithamnion versicolor* Ag.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Callithamnion corymbosum* (Smith) Lyngbye** (n. 8324/11) – ref.: Lyngbye, H. C. (1819), *Tentamen hydrophytologiae danicae*, pp.[i]-xxxii, [1]-248, pls.Hafniae [Copenhagen]; syn.: *Callithamnion versicolor* (C. Agardh) C. Agardh; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Ceramium* A. W. Roth, 1797, nom. cons.

***Ceramium circinatum* (Kutzing) J. Agardh** (n. 8324/52) – ref.: Agardh, J. G. (1851). *Species genera et ordines algarum*; syn.:*Ceramium ramulosum* Meneghini; *Echinoceras ramulosum* Men.; - Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Ceramium diaphanum* (Lightfoot) Roth** (n. 8323/108) – ref.: Roth, A.G. (1806: 154), *Catalecta botanica*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Ceramium hospitans* Zanard.** (n. 8324/59) – ref.: *Catalecta Botanica* 1: 146. 1797; syn.: *Hormoceras hospitans* Zan.; Italy, Venice, Adriatic Sea, 1856, leg. Titius, donation T. Jurcsák.

***Ceramium julaceum* (Kutzing) Rabenhorst** (n. 8323/106) – ref.: Kutzing, F. T. (1842 ,1831'). Über *Ceramium* Ag. *Linnaea* 15: 727-746; syn.: *Ceramium julaceum* Kg.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Ceramium sandrianum* Meneghini** (n. 8324/60) – ref.: *Catalacta Botanica* 1: 146. 1797; syn.: *Hormoceras sandrianum* Meneg.; Italy, Friuli-Venezia Giulia, Trieste, 1856, leg. Titius, donation T. Jurcsák.

***Ceramium tenuissimum* var. *pygmaeum* (Kutzing) Hauck** (n. 8324/62) – ref.: *Ceramium tenuissimum* var. *pygmaeum* (Ktzing) Hauck 1888: 460; syn.: *Hormoceras pygmaeum* Kutzing; *Ceramium pygmaeum* (Kutzing) Ardissone; Italy, Friuli-Venezia Giulia, Trieste, Adriatic Sea, 19th century, leg. Titius, donation T. Jurcsák.

***Ceramium virgatum* Roth** (n. 8324/61) – ref.: Roth, A. W. (1811). *Catalecta botanica*; syn.: *Hormoceras rubrum* Huds.; *Ceramium rubrum* (Huds) C. A. Agardh; Italy, Friuli-Venezia Giulia, Trieste, Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Griffithsia* Agardh, nom. cons.

***Griffithsia tenuissima* Agardh** (n. 8323/21) – ref.: Agardh, C. A. (1828). *Species algarum*; syn.: *Griffithsia tenuissima* Zan.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Halurus* Kutzing, 1843

***Halurus equisetifolius* (Lightfoot) Kutzing** (n. 8323/123) – ref.:Kutzing F. T. (1843): 374, *Phycologia generalis*; syn.: *Halurus equisetifolius* Huds.; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.
***Halurus flosculosus* (J. Ellis) Maggs & Hommersand** (n. 8323/19) – ref.: Maggs, C. A. & Hommersand, M. H. (1993: 175). *Seaweeds of the British Isles. Volume 1. Rhodophyta. Part 3A. Ceramiales.* Pp. Xv = 444, 129 figs, map. London; syn.: *Griffithsia setacea* (Hudson) C. Agardh; *Griffithsia setacea* Zan.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Hormoceras* Kutzing

***Hormoceras glomeratum* Lit.** (n. 8323/107) – ref.: Kutzing, F. T. (1842 ,1841'). Über *Ceramium* Ag. *Linnaea* 15: 727-746; syn.: ***Ceramium** glomeratum* De Candolle; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Microcladia* Greville. 1830

***Microcladia glandulosa* (Solander ex Turner) Greville** (n. 8323/120) – ref.: Greville R. K. (1830) : I, 99, *Algae Britannicae*; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Gen. *Plumaria* Kuntze

***Plumaria plumosa* (Hudson) Kuntze** (n. 8323/135) – ref.: Kuntze, O. (1891). *Revisio generum plantarum. Pars 2.* pp. 375=1011. Leipzig.; syn.: *Ptilota elegans* Bonnemaison. 1828: 70; *Ptilota elegans* Grev.; *Ceramium plumosum* (Hudson) Roth, 1806; *Fucus plumosus* Hudson, 1762; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Gen. *Pleonosporium* C. Naegeli, 1862, nom. cons.

***Pleonosporium borreri* (Smith) Naegeli** (n. 8324/17) – ref.: Nägeli, C. (1862 '1861'). *Sitzungsberichte der Koniglichen Bayerischen Academie der Wissenschaften zu München* 1861(2): 297-415, 30 figs, 1 plate; syn.: *Callithamnion seminudum* C. Agardh; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Pterothamnion* Naegeli, in Naegeli & Cramer, 1855

***Pterothamnion plumula* (J. Ellis) Naegeli** (n. 8323/103) – ref.: Nägeli, C. & Cramer, C. (1885: 66) *Pflanzenphysiologische Untersuchungen.* Heft 1. pp. [i-vi], [1]-120, pls. I-X. Zurich; syn.: *Callithamnion plumula* (J. Ellis) Lyngbye; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Spyridia* Harvey, in W. J. Hooker, 1833

***Spyridia filamentosa* (Wulfen) Harvey in Hooker** (n. 8323/28) – ref.: Harvey, V. H. (1833: 337). *The English Flora of Sir James Edward Smith*; syn.: *Spyridia filamentosa* Kg.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Spyridia filamentosa* (Wulfen) Harvey** (n. 8324/45) – ref.: Harvey, W.H. (1833). *The English Flora of Sir James Edward Smith, class XXIV, vol. V, part.I.,* pp. 263-265, 265-266, 326-389, 389-405, London; unmentioned location, 19th century, no signature, donation T. Jurcsák, missing plant.

Gen. *Wrangelia* C. A. Agardh, 1828

***Wrangelia penicillata* (C. Agardh) C. Agardh** (n. 8323/87) – ref.: Agardh, C. A. (1828: 138). *Systema algarum.* pp. [1]-xxxviii, [1]-312. Lundae [Lund]; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Wrangelia penicillata* (C. Agardh) C. Agardh** (n. 8324/15) – ref.: Agardh, C. A. (1824). *Systema algarum.* pp. [i]-xxxviii, [1]-312. Lundae; Croaţia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Dasyaceae*
Gen. *Dasya* C. A. Agardh, 1824, nom. cons., orth. cons.

***Dasya aquatica* L.** (n. 8324/50) – ref.: Costello, M. J. et al. (Ed) (2001). *European register of marine species. Collection Patrimoines Naturels*, 50: pp.20-38; Croatia, Split (Spalato), Adriatic Sea, 1856, leg. Titius, donation T. Jurcsák.

Gen. *Eupogodon* Kutzing, 1845

***Eupogodon planus* (C. Agardh) Kutzing** (n. 8323/17) – ref.: Kutzing, F. T. (1845). *Phycologia germanica,* d. i.; syn.: *Dasyopsis plana* Kg.; *Dasyopsis plana* (C. Agardh) Falkenberg; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Eupogodon planus* (C. Agardh) Kutzing** (n. 8323/99) – ref.: Kutzing, F. T. (1845: 312), *Phycologia germanica,* d. i.; syn.: *Dasya spinella* C. Agardh; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Heterosiphonia* Montagne, 1842, nom. cons.

***Heterosiphonia plumosa* (J. Ellis) Batters** (n. 8323/121) – ref.: Batters E. A. L. (1902). A catalogue of the British marine algae. *Journal of Botany, British and Foreign* 40 (Supplement): 1-107; syn.: *Dasya coccinea* (Hudson) Areschoung; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Fam. *Delesseriaceae*
Gen. *Aglaophyllum* Montagne

***Aglaophyllum delicatulum* (Kutzing) Kutzing** (n. 8323/35) –.ref.: Montagne, J. P. F. C. (1839). Plantae cellulares; syn.: *Aglaophyllum delicatulum* Grev.**;** Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Aglaophyllum lobatum* Kg.** (n. 8323/33) – ref.: Montagne, L. P. F. C. (1839). Plantae cellulares. In *Voyage dans l'Amerique Meridionale* – (d'Orbigny, A. ed), pp. 1-39. Paris; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Erythroglossum* J. Agardh, 1898

***Erythoglossum laciniatum* (Lightfoot) Maggs & Hommesand** (n. 8323/136) – ref.: Maggs, C. A. & Hommersand (1993). *Seaweeds of the British Isles. Volume 1. Rodophyta. Part 3A. Ceramiales*; syn.: *Nitophyllum gmellini* Grev. (Greville, R. K. (1830). *Algae britannicae*); Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.
***Erythroglossum sandrianum* (Zanardini) Kylin** (n. 8323/49) – ref.: Kylin, H. (1924). *Universitatis Lundensis* 20(6): 1-111, 80 figs.; syn.: *Aglaophyllum sandrianum* Kutzing; *Delesseria sandriana* Zanardini; *Delesseria sandriana* Meneghini; *Nitiphyllum sandrianum* (Zanardini) Zanardini; *Phlobophyllum sandrianum* Men.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Hypoglossum* Kutzing, 1843

***Hypoglossum conferoaceum* Kutzing** (n. 8323/98) – ref.: Kutzing, F. T. (1843). *Phycologia generalis*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Hypoglossum hypoglossoides* (Stackhouse) F. S. Collins & Hervey C.** (n. 8323/1) – ref.: Collins, F.S. & Harvey, A.B. (1917: 116). *Proceedings of the American Academy of Arts and Sciences* 53: 1-195, 6 pls.; syn.: *Delesseria hypoglossum* Gr.; *Delessenia hypoglossum* (Woodward) J. V. Lamouroux; *Hypoglossum woodwardii* Kutzing; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Nitophyllum* Greville, 1830, nom. cons.

***Nitophyllum ocellatum* (J. V. Lamouroux) J. Agardh** (n. 8324/44) – ref.: Agardh, J. G. (1842), *Algae maris Mediterranei et Adriatici,* pp. [1]-x, 1-164. Parisiis [Paris]; unmentioned location and undated, 19th century, no signature, donation T. Jurcsák.

Fam. *Rhodomelaceae*

Gen. *Alsidium* C. Agardh, 1827

***Alsidium corallinum* C. Agardh** (n. 8324/43) – ref.: Agardh, C. A. (1827): 639, *Flora* 10(40): 625-640; Croaţia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Alsidium corallinum* C. Agardh** (n. 8323/94) – ref.: C. Agardh 1827: 639. *Flora* 10 (40): 625-640; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Boergeseniella* Kylin. 1956

***Boergeseniella fruticulosa* (Wulfen) Kylin** (n. 8324/4) – ref.: Kylin, H. (1956). *Die Gattungen der Rhodophyceen.* pp. i-xv, 1-673,458 figs. Lund: C. W. K. Gleerups; syn.: *Polysiphonia wulfenii* (Roth) J. Agardh; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Bostriychia* Montagne, in Sagra, 1842, nom. cons.

***Bostriychia scorpioides* (Hudson) Montagne** (n. 8323/127) – ref.: Montagne, C. (1842), Bostrychia, *Dictionnaire Universel d'Histoire Naturelle [Orbigny]* 2 : 660-

661; syn.: *Rhodomela scorpioides* (Hudson); Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Gen. *Chondria* C. A. Agardh, 1817, nom cons.

***Chondria dasyphylla* (Woodward) C. Agardh** (n. 8324/2) – ref.: Agardh, C. A. (1817). *Synopsis algarum Scandinaviae, adjecta dispositione universali algarum*. pp. [i] – xl, [1] – 135. Lundae [Lund]: ex officina Berlingiana; syn.: *Laurencia dasyphylla* (Woodward) Greville; unmentioned location, 19th century, no signature, donation T. Jurcsák.
***Chondria dasyphylla* (Woodward) C. Agardh** (n. 8323/66) – ref.: Agardh, C. A. (1817: XVIII). *Synopsis algarum Scandinaviae,* pp. [i]-xl, [1]-135. Lundae [Lund]; syn.:*Laurencia dasyphylla* (Woodward) Greville, 1830; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Halopithys* Kuetzing, 1843

***Halopithys incurva* (Hudson) Batters** (n. 8324/37) – ref.: Batters, E. A. L. (1902) A catalogue of the British marine algae. *Journal of Botany, British and Foreign 40* (Supplement): 1-107; syn.: *Rytiphlaea pinastroides* (Stackhouse) C. Agardh; unmentioned location and undated, 19th century, no signature, donation T. Jurcsák.
***Halopithys incurva* (Hudson) Batters** (n. 8324/40) – ref.: Batters, E. A. L. (1902) A catalogue of the British marine algae. *Journal of Botany, British and Foreign 40* (Supplement): 1-107; syn.: *Rytiphlaea pinastroides* (Stackhouse) C. Agardh; unmentioned location, 19th century, no signature, donation T. Jurcsák.
***Halopithys incurva* (Hudson) Batters** (n. 8323/26) – ref.: Batters, E. A. L. (1902: 78). *Journal of Botany, British and Foreign* 40 (Supplement): 1-107; syn.: *Halopithys pinastroides* (Stackhouse) Kutzing; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Laurencia* J. V. F. Lamoreaux, 1813, nom. cons.

***Laurencia obtusa* (Hudson) J. V. Lamouroux** (n. 8323/64) – ref.: J. V. Lamouroux, 1813: 130. *Annales du Muséum d'Histoire Naturelle, Paris* 20: 21-47, 115-139, 267-293, Plates 7-13; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Laurencia obtusa* (Hudson) J. V. Lamouroux** (n. 8324/7) – ref.: Lamouroux, J. V. F. (1813). *Annales du Muséum d'Histoire Naturelle, Paris* 20 : 21-47, 115-139, 267-293, Plates 7/13*;* Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Laurencia papillosa* (C.Agardh) Greville** (n. 8323/65) – ref.: Greville, R. K. (1830: III). *Algae britannicae*; syn.: *Chondrophycus papillosus* (C. Agardh) D. J. Garbary & J. T. Herper; *Palisada perforata* (Bory de Saint-Vincent) K. W. Nam; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Laurencia pyramidalis* Bory de Saint-Vincent ex Kutzing** (n. 8323/119) – ref.: Kutzing, F. T. (1849). *Species algarum.* pp. [i]-vi, [1]-922. Lipsiae [Leipzig]; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

***Laurencia striolata* (C. Agardh) Greville** (n. 8324/10) – ref.: Original publication: Greville, R. K. (1830). *Algae britannicae,* pp. [i*-iii*], [i]-lxxxciii, [1]-218, pl.1-19. Edinburgh & London: McLachlan & Stewart; Baldwin & Cradock; unmentioned location and undated, 19th century, no signature, donation T. Jurcsák, deteriorated specimen.

Gen. *Osmundaria* Lamouroux, 1813

***Osmundaria volubilis* (L.) R. E. Norris** (n. 8323/11) – ref.: Norris, R. E. (1991: 14). *Journal of the Linnean Society of London, Botany* 106: 1-40, 60 figs.; syn.: *Dictyomenia volubilis* (L.) Greville; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Osmundea*

***Osmundea pinnatifida* (Hudson) Stackhouse** (n. 8323/54) – ref.: Stockhouse J. (1809: 79). *Mémoires de le Société Imperiale des Naturalistes de Moscou* 2: [50]-97; syn.: *Laurencia pinatiffida* Lam.*; Laurencia pinnatifida* (Gmelin) Lamouroux; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Polysiphonia* R. K. Greville, 1823, nom. rej.

***Polysiphonia arachenoidea* (C. Agardh) Zanardini** (n. 8323/72) – ref.: Zanardini, G. (1840: 203). *Biblioteca Italiana [Milano]* 99: 195-229; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Polysiphonia denudata* (Dillwyn) Grecille ex Havey** (n. 8324/28) – ref.: Harvey W.H. (1833). Div. II. Confervoideae; Div. III. Gloiocladeae; in Hooker 1833: 332.; syn.: *Polysiphonia variegata* (C. Agardh) Zanardini; Italy, Venice, Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Polysiphonia denudata* (Dillwyn) Greville ex Harvey** (n. 8323/68) – ref.: Harvey, W.H. (1833: 332). *The English Flora of Sir James Edward Smith.*; syn.: *Polysiphonia variegata* (C. Agardh) Zanardini; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Polysiphonia elongata* (Hudson) Sprengel** (n. 8323/70) – ref.: Sprengel, K. (1827: 349). *Systema vegetabilium,* vol. 4 pp. [i]-592. Gottingae; syn.: *Polysiphonia robusta* Kutzing; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Polysiphonia fucoides* (Hudson) Greville** (n. 8324/30) – ref.: Greville, R. K. (1824). *Flora edinensis*; syn.: *Polysiphonia violacea* (Roth) Sprengel; Italy, Venice, Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Polysiphonia lanosa* (L.) Tandy** (n. 8323/131) – ref.: Tandy J. (1831), *J. Bot.* 69: 225-227; syn.: *Polysiphonia fastigiata* Gr.; *Vertebrata fastigiata* (Roth) Gray; *Vertebrata lanosa* (L.) Christensen; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.
***Polysiphonia nigricens* (Hudson) Greville** (8323/132) – ref.: Harvey, W. H. (1833). *The English Flora of Sir James Eduard Smith*; syn.: *Polysiphnia fucoides* (Hudson) Greville; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.
***Polysiphonia opaca* (C. Agardh) Moris & De Notaris** (n. 8323/69) – ref.: *Memorie della Reale Accademia delle Scienze di Torino,* ser. 2: 59-I300.; pls. I-VI; syn.: *Polysiphonia ramulosa* (C. Agardh) Sprengel; *Polysiphonia ramulosa* Kg.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Polysiphonia paniculata* Montagne** (n. 8323/130) – ref.: *Annales des Sciences Naturelles, Botanique, Séconde Série* 18: 241-282, pl. 7.; syn.: *Polysiphonia paniculata* Gr.; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.
***Polysiphonia sanguinea* (C. Agardh) Zanardini** (n. 8323/67) – ref.: Zanardini G. (1840: 203). *Biblioteca Italiana [Milano] 99:* 195-229; syn.: *Polysiphonia sanguinea* Gr.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Polysiphonia sertularoides* (Gratelloup) Agardh** (n. 8324/29) – ref.: Agardh, C. A. (1863). *Species genera et ordines algarum* Volumen secundum, Part. 2, fasc.3. pp. 787-1138, 1158-1291. Lundae; syn.: *Polysiphonia grisea* Kutzing, 1843; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Polysiphonia wulfenii* (Roth) J. Agardh** (n. 8323/71) – ref.: Agardh, J. G. (1842) *Algae maris Mediterranei et Adriatici*; syn.: *Boergeseniella fryticulosa* (Wulfen) Kylin; *Polysiphonia vulfeni* J. Ag.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Rhodomela* C. A. Agardh, 1822, nom. cons.

***Rhodomela confervoides* (Hudson) P. C. Silva** (n. 8323 /25) – ref.: Silva, P. C. (1952: 269). *University of California Publications in Botany* 25: 242-323.; syn.: *Rhodomela subfusca* Ag.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Corallinales*
Fam. *Corallinaceae*

Gen. *Corallina* L. 1758

***Corallina officinalis* L.** (n. 8324/24) – ref.: Linaeus C. (1758). *Systema naturae per regnatria naturae, secundum classes, ordine, genera, species, cum characteribus, diferentiis, sinonimis, locis. Tomus I. Editia decima, reformata. Editio decima revisa.* Vol. 1 pp. [i-iv], [1]-823. Holmie [Stockholm]: impensis direct. Laurentii Salvii; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Jania* J. V. F. Lamouroux, 1812

***Jania decaisii* L.** (n. 8324/14) – ref.: Lamouroux, J. V. F. (1812). *Nouveaux Bulletin des sciences, par la Société Philomathique de Paris* 3: 181-188; unmentioned location and undated, 19th century, no signature, donation T. Jurcsák.
***Jania rubens* (L.) Lamouroux** (n. 8323/115) – ref.: Lamouroux J. V. F. (1816), *Hystoire des polypiers coralligenes flexibles*; syn.: *Jania spermophoros* Lam.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Jania rubens* (L.) Lamouroux** (n. 8323/117) – ref.: Lamouroux J. V. F. (1816), *Hystoire des polypiers coralligenes flexibles*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Jania rubens* var. *corniculata* (L.) Yendo** (n. 8323/116) – ref.: Yendo, K. (1905). *Journal of the College of Science, Tokyo Imperial University* 20(12): 1-46; syn.: *Jania plumula* (Zanardini) Zanardini 1844: 1025; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Cryptonemiales*
Fam. *Halymeniaceae*
Gen. *Cryptonemia* J. G. Agardh, 1842

***Cryptonemia lomation* (Bertoloni) J. Agardh** (n. 8323/82) – ref.: Agardh, J. G. (1851: 227). *Species genera et ordines algarum*; syn.: *Cryptonemia lactuca* (C. Agardh) J. Agardh 1842: 100; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Halymenia* C. A. Agardh, 1817

***Halymenia floresii* (Clemente y Rubio) C. Agardh** (n. 8324/25) – ref.: Agardh, C. A. (1817). *Synopsis algarum Scandinaviae,* adjecta dispositione universali algarum. pp. [i] – xl, [1] – 135. Lundae [Lund]: ex officina Berlingiana; syn.: *Halymenia florescia* Ag.; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Halymenia floresia* (Clem) Agardh** (n. 8323/88) – ref.: Agardh, C. A. (1817). *Synopsis algarum Scandinaviae,* pp. [i]-xl, [1]-135. Lundae [Lund]; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Grateloupia* C. A. Agardh, 1822

***Grateloupia verucosa* Agardh** (n. 8323/89) – ref.: Agardh, C. A. (1822). *Species algarum*; Italy, Liguria, Genova (Golfo di Genua), 19th century, no signature, donation T. Jurcsák.

Fam. *Peyssonneliaceae*
Gen. *Peyssonnelia* J. Decaisne, 1841

***Peyssonnelia squamaria* (S.G. Gmelin) Decaisne** (n. 8323/15) – ref.: Decaisne, J. (1842: 168). *Annales des Sciences Naturelles, Botanique, Séconde série* 17: 297-380, pls 14-17; syn.: *Fucus squamarius* S.G. Gmelin; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Gelidiales*
Fam. *Gelidiaceae*
Gen. *Gelidium* J. V. F. Lamouroux, 1813

***Gelidium armatum* Lam.** (n. 8324/58) – ref.: Lamoureaux, J. V. F. (1813). *Annales du Muséum d'Histoire Naturelle, Paris* 20: 21-47, 115-139, 267-293, Plates 7-13; unmentioned location and undated, 19th century, no signature, donation T. Jurcsák.
***Gelidium crinale* (Turn) Lamnouroux** (n. 8324/53) – ref.: *Gelidium crinale* (Turn) Lamour., in Bory Dict. Class. 7: 191, 1825; Italy, Venice, Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Gelidium pinnatum* Ag.** (n. 8323/78) – ref.: Lamouroux, J. V. F. (1813). *Annales du Muséum d'Histoire Naturelle, Paris* 20: 21-47, 115-139, 267-293, plates 7-13; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Gigartinales*
Fam. *Cystocloniaceae*
Gen. *Cystoclonium* F. T. Kutzing, 1843

***Cystoclonium purpureum* (Hudson) Batters** (n. 8323/30) – ref.: Baters, E. A. L. (1902: 68-69). *Journal of Botany, British and Foreign* 40 (Supplement): 1-107; syn.: *Gygartina purpurascens* (Hudson) Lamouroux; *Gygartina purpurascens* Ag.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Rhodophyllis* Kuetzing, 1847, nom. cons.

***Rhodophyllis divaricata* (Stackhouse) Papenfuss** (n. 8323/2) – ref.: Papenfuss, G. F. (1950: 190). *Hydrobiologia* 2: 181-208; syn.: *Rhodymenia bifida* Grev.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Furcellariaceae*
Gen. *Furcelaria* J. V. Lamouroux, 1813, nom. cons.

***Furcelaria lumbricalis* (Hudson) J. V. Lamouroux** (n. 8323/110) – ref.: Lamouroux, J. V. F. (1813). *Annales du Muséum d'Histoire Naturelle, Paris 20 :* 21-47, 115-139, 267-293, Plates 7-13; syn.: *Furcelaria fastigiata* (L.) J. V. Lamouroux; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Gen. *Halarachnion* Kuetzing, 1843

***Halarachnion ligulatum* (Woodward) Kutzing** (n. 8323/84) – ref.: Kutzing, F. T. (1843: 394). *Phycologia generalis*; syn.: *Halymenia ligulata* Grev.; *Halymenia ligulata* (Woodward) C. Agardh; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. Gigartinaceae
Gen. *Chondracanthus* Kutzing

***Chondracanthus acicularis* (Roth) Fredericq** (n. 8323/91) – ref.: Hommersand, M. H., Guiry, Fredericq & Leister 1993; 117. *Proceedings of the International Seaweed Symposium* 14: 105-120, 41 figs.; syn.: *Gigartina acicularis* (Roth) J. V. Lamouroux; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Chondracanthus acicularis* (Roth) Fredericq** - (n. 8324/64) – ref.: Lamouroux,

J. V. F. (1813) *Annales du Muséum d'Histoire Naturelle Paris* 20: 21-47, 115-139, 267-293, Plates 7-13**;** syn.: *Gigartina acicularis* (Roth) Lamouroux; *Gigartina acicularis* (Wulfen) Lamouroux; *Ceramium aciculare* Roth; Croatia, Split, Dalmatia, Adriatic Sea, 19th century, leg. Titius, donation T. Jurcsák.

***Chondracanthus teedei* (Mertens ex Roth) J. V. Lamouroux** (n. 8324/63) – ref.: Kutzing, F. T. (1843) *Phycologia generalis*; syn.: *Gigartina tedii* (Roth) Lamour.; *Gigartina teedei* (Mertens ex Roth) Lamour.; *Ceramium teedei* Mertens ex Roth; Croatia, Split, Dalmatia, Adriatic Sea, 19th century, leg. Titius, donation T. Jurcsák.

Chondracanthus teedei* (Mertens ex Roth) J. V. Lamouroux** (n. 8324/68) – ref.: Kutzing, F. T. (1843) *Phycologia generalis;** syn.: *Gigartina tedii* (Roth) Lamour.; *Gigartina teedei* (Mertens ex Roth) Lamour.; *Ceramium teedei* Mertens ex Roth; Croatia, Split, Dalmatia, Adriatic Sea, 19th century, leg. Titius, donation T. Jurcsák.

***Chondracanthus teedei* (Mertens ex Roth) Kutzing** (n. 8323/18) – ref.: Kutzing, F. T. (1843: 399). *Phycologia generalis*; syn.: *Gigartina teedii* Ag.; *Gigartina teedii* (Mertens ex Roth) J. V. Lamouroux; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Gen.Gigartina* Stackhouse, J. (1809).**

***Gigartina hospitans* Stackhouse** (n. 8324/70) – ref.: Stackhouse, J. (1809). *Mémoires de la Société Imperiale des Naturalistes de Moscou* 2 : (50)-97; Croatia, Split, Dalmatia, Adriatic Sea, 19th century, leg. Titius, donation T. Jurcsák.

***Gigartina lank* Stackhouse** (n. 8324/69) – ref.: Stackhouse, J. (1809). *Mémoires de la Société Imperiale des Naturalistes de Moscou* 2 : (50)-97; Croatia, Split, Dalmatia, Adriatic Sea, 19th century, leg. Titius, donation T. Jurcsák.

***Gigartina mamilosa* (Goodenough & Woodward) J. Agardh** (n. 8323/138) – ref.: Agardh, J. G. (1851). *Species genera et ordines algarum*; syn.: *Gigartina stelata* (Stackhouse) Baters; *Mastocarpus stelatus* (Stackhouse) Guiry; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Fam. *Nemastomataceae*
Gen. *Nemastoma* J. G. Agardh 1842, nom. cons. orth. cons.

***Nemastoma dichotomum* J. Agardh** (n. 8323/85) – ref.: Agardh, J. G. (1842: 91). *Algae maris Mediterranei et Adiatici*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Phyllophoraceae*
Gen. *Ahnfeltiopsis*

***Ahnfeltiopsis linearis* (C. Agardh) P. C. Silva & DeCew** (n. 8324/38) – ref.: Silva, P. C. & DeCew, T. C. (1992), in *Phycologia* 31: 576-580; syn.: *Sphaerococcus linearis* C. Agardh, 1817; unmentioned location and undated, 19th century, no signature, donation T. Jurcsák.

Fam. *Polyideaceae*
Gen. *Polyides* C. A. Agardh, 1822

***Polyides rotundus* (Hudson) Gaillon** (n. 8323/122) – ref.: Gaillon, B. (1828): 365. *Dictionnaire des Sciences Naturelles [Levrault]* 53: 350-406, Tables 1-3; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Ord. *Gracilariales*
Fam. *Gracilariaceae*
Gen. *Gracilaria* Greville, 1830, nom. cons.

***Gracilaria armata* (C. Agardh) Greville** (n. 8323/55) – ref.: Greville 1830. *Algae britannicae*; syn.: *Plocaria armata* Montg.; *Sphaerococcus armatus* C. Agardh; *Gigartina armata* (C. Agardh) J. Agardh; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Gracilaria gracilis* (Stackhouse) M. Steentoft, L. M. Irvine & W. F. Farnham** (n. 8323/93) – ref.: *Phycologia* 34: 113-127, 37 figs.; syn.:*Sphaerococcus confervoides* (F.H.Wiggers) Stackhouse; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Nemaliales*
Fam. *Galaxauraceae*
Gen. *Scinaia* Bivona-Bernardi, 1822

***Scinaia furcellata* (Turner) J. Agardh** (n. 8323/95) – ref.: Agardh J. G. (1851: 422). *Species genera et ordines algarum*; syn.: *Ginnania furcellata* (Turner) Montagne; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Liagoraceae*
Gen. *Liagora* Lamouroux, 1812

***Liagora conplanata* Zan.** (n. 8323/86) – ref.: Zanardini, G. (1851). *Flora* 34: 33-38.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Liagora viscida* (Forsskal) C. Agardh** (n. 8323/36) – ref.: Agardh, C. A. (1822; 395). *Species algarum*; syn.:*Fucus viscidus* Forsskal; *Liagora viscida* Ag.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Nemalion* Duby, 1830

***Nemalion coccineum* (Poiret) Kutzing** (n. 8323/3) – ref.: Duby, J. E. (1830). *Aug. Pyrami de Candolle Botanicon gallicum*; syn: *Nemalion coccineum* Ag.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Palmariales*
Fam. *Palmariaceae*
Gen. *Palmaria* Stackhouse, 1801

***Palmaria palmata* (L.) Weber & Mahr** (n. 8323/128) – ref.: *Beitrage zur Naturkunde 1:* 204-329; syn.: *Halymenia palmata* (L.) C. Agardh; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Ord. *Plocamiales*
Fam. *Plocamiaceae*
Gen. *Plocamium* Lamouroux, 1813, nom. cons.

***Plocamium cartilagineum* (L.) P. S. Dixon** (n. 8324/16) – ref.: Dixon P. S. 1967: 58; pl. 14, 16, The typification of *Fucus cartilagineus* L.. and *F. corneus* Huds. *Blumea* 15: 55-62; syn.: *Plocamium coccineum* (Hudson) Lyngbye; Croatia, Split (Spalato), Dalmatia, Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Plocanium cirrhosum* (Turner) M. J. Wynne** (n. 8323/124) – ref.: Wynne, M. J. (2002). *Plocamium cirrhosum* comb. nov. (Plocamiales, Rhodophyta) to replace *P. costatum. New Zealand Journal of Botany* 40: 137-142; syn.: *Plocamium costatum* (C. Agardh) J.D. Hooker & Harvey; Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.

Ord. *Rhodymeniales*
Fam. *Lomentariaceae*

Gen. *Lomentaria* Lyngbye, 1819

***Lomentaria articulata* (Hudson) Lyngbye** (n. 8323/52) – ref.: Lyngbye, H. C. (1819: 101, pls. 30). *Tentamen hydrophytologiae danicae*; syn.: *Lomentaria articulata* Gr.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Lomentaria articulata* var. *linearis* Zanardini** (n. 8323/51) – ref.: Zanardini, G. (1841: 199). *Memorie della Reale Accademia delle scienze di Torino, ser. 2* 4: 105-255, pls. I-VIII; syn.: *Lomentaria phalligera* (J. Agardh) Endlicher; *Lomentaria phaligera* Kg.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

***Lomentaria diffusa* Stegenga, Bolton & R. J. Anderson** (n. 8323/102) – ref.: Stegenga, H., Bolton J.J. & Anderson, R. J. (1997: 373). *Seaweeds of the South African west coast.* Pp. [2]+ 1-655. Cape Town; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Lomentaria fuligera (n. 8324/8) – ref.: Lyngbye, H. C. (1819). *Tentamen hydrophytologiae danicae*; unmentioned location and undated, 19th century, no signature, donation T. Jurcsák.
***Lomentaria subarticulata* Kg.** (n. 8323/51) – ref.: Lyngbye, H. C. (1819: 101, pls. 30). *Tentamen hydrophytologiae danicae*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Lomentaria veneta* Zan.** (n. 8323/50) – ref.: Lyngbye, H. C. (1819: 101, pls. 30). *Tentamen hydrophytologiae danicae*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Rhodymeniaceae*
Gen. *Botryocladia* (J. Agardh) Kylin, 1931, nom. cons.

***Botryocladia botryoides* (Wulfen) Feldman** (n. 8323/83) – ref.: Feldman , J. (1941; 90). *Revue Algologique* 12: 77-100, Figs. 26-34; syn.: *Gastroclonium uvaria* (J. A. Murray) Kutzing; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Chrysymenia* J. G. Agardh, 1842

***Chrysymenia ventricosa* (J. V. Lamouroux) J. Agardh** (n. 8323/100) – ref.: Agardh, J. G. (1842: 106). *Algae maris Mediterranei et Adriatici*; syn.: *Dumontia ventricosa* J. V. Lamouroux; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Rhodymenia* Greville, 1830, nom. cons., orth. cons.

***Rhodymenia elisii* Harvey** (n. 8323/129) – ref.: Greville, R. K. (1830). *Algae britannicae*; (possible synonymes: *Carpopeltis elata* (Harvey) De Toni; *Rhodymenia elata* Harvey); Atlantic Ocean, 19th century, no signature, donation T. Jurcsák.
***Rhodymenia ligulata* Zanardini** (n. 8323/24) – ref.: Zanardini, G. (1843: 46). *Saggio di classificazione naturale delle Ficee*; syn.: *Rhodymenia ligulata* Grev.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Rhodymenia pseudopalmata* (J. V. Lamouroux) P. C. Silva** (n. 8323/13) – ref.: Silva P. C. (1953). *University of California Publication in Botany,* 25: 241-323; syn.: *Rhodymenia pseudopalmata* (Stackhouse) Greville; *Rhodymenia palmetta* Grev.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Subkingdom *Viridaeplantae* Cavalier-Smith, 1981
Phylum *Chlorophyta* A. Pascher, 1914
Clas. *Bryopsidophyceae* Bessey, 1907
Ord. *Bryopsidales* J. H. Schaffner, 1922
Fam. *Bryopsidaceae* Bory de Saint-Vincent

Gen *Bryopsis* J. V. F. Lamouroux, 1809

***Bryopsis plumosa* (Hudson) C. Agardh** (n. 8323/74) – ref.: Agardh, C. A. (1823). *Species algarum*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Codiaceae* Kutzing
Gen. *Codium* J. Stackhouse, 1797

***Codium bursa* (Olivi, 1792) C. A. Agardh** (n. 8323/80) – ref.: Agardh, C. A. (1817; xxix). *Synopsis algarum Scandinaviae*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Codium tomentosum* (Huds) Stackh.** (n. 8324/56) – ref.: Stackhouse, J. (1797). *Nereis britannica;* Fasc.2. pp. ix-xxiv, 31-70, pls. IX-XIII. Bathoniae [Bath] & Londini [London]; Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Codium tomentosum* (Huds) Stackh.** (n. 8324/79) – ref.: Stackhouse, J. (1797). *Nereis britannica;* Fasc.2. pp. ix-xxiv, 31-70, pls. IX-XIII. Bathoniae [Bath] & Londini [London]; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Derbesiaceae* Hanck
Gen. *Derbesia* A. J. J. Solier, 1846

***Derbesia tenuissima* (Moris & De Notaris) P. L. Crouan & H. M. Crouan -** (n. 8324/55) – ref.: P. L. Crouan & H. M. Crouan (1867). *Florule du Finistere*; syn.: *Bryopsis tenuissima* Moris & De Notaris; *Bryopsis tenuiformis* (!?); Croatia, Split (Spalato), Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Halimedaceae* Link
Gen. *Halimeda* J. V. Lamouroux, 1812, nom.cons., orth. cons.

***Halimeda opuntia* (L.) J. V. Lamouroux** (n. 8323/9) – ref.: Lamouroux, J. V. F. (1816). *Histoire des polypiers coralligenes fléxibles*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Fam. *Udotaceae* J. Agardh
Gen. *Flabellia* H. G. L. Reichenbach, 1841, nom. nov.

***Flabellia petiolata* (Turra) Nizamuddin** (n. 8323/23) – ref.: Nizamuddin, M. (1987). *Nova Hedwigia* 44: 175-188, 21 figs.; syn.:*Flabellaria disfontaini* J. V. Lamouroux; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Clas. *Clorophyceae* Wille
Ord. *Chaetophorales* Wille
Fam. *Chaetophoraceae* Greville

Gen. *Draparnaldia* Bory de Saint-Vincent, 1808

***Draparnaldia glomerata* (Vaucher) C. Agardh** (n. 8324/51) – ref.: Agardh, C. A. (1812). *Disposito algarum Sueciae;* Slovakia, Spis (Szepesseg) region, freshwater, 19th century, leg. illegible signature, donation T. Jurcsák.

Gen. *Pleurococcus* Meneghini, 1837

***Pleurococcus mucosus* Rabenhorst** (n. 8324/47) – ref.: algaebase, org. Taxname: 57310; syn.: *Protococcus mucosus* Kg. (Phyc. Germ. 145); northwestern Carpathians, freshwater, 19th century, leg. illegible signature, donation T. Jurcsák.

Ord. *Chlorococcales* Pascher
Fam. *Hydrodictaceae* Dumortier
Gen. *Hydrodictyon* A. W. Roth, nom. cons.

***Hydrodictyon reticulatum* (L.) Bory de Saint-Vincent** (n. 8324/6) – ref.: Bory de Saint-Vincent. (1824). *Dictionnaire Classique d'Histoire Naturelle.* (Alduin, I. et al. eds.) Vol. 6, pp. 506. Paris; syn.: *Hydrodictyon utriculatum* Roth.; Romania*,* Arad, Săvârşin, freshwater, 19th century, leg. illegible signature, donation T. Jurcsák.

Ord. *Oedogoniales* Heering
Fam. *Oedogoniaceae* de Bary ex Hirn
Gen *Bulbochaete* C. A. Agardh, 1817

***Bulbochete intermedia* De Bary** (n. 8323/143) – ref.: Publication details *Bulbochete intermedia* De Bary, 1854: 72; syn.: *Bulbochete intermedia* Kg.; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, fresh water, 19th century, leg. illegible signature, donation T. Jurcsák.

Gen. *Oedogonium* Hirn, 1900

***Oedogonium capillare* (L.) Kutzing** (n. 8324/5) – ref.: Hirn, K.E. (1900). *Acta Societatis Scientiarum Fenicae* 27: IV + 394, XXVII figs, XLIV plates; ITIS – TSN 9036*;* northwestern Carpathians, fresh water, 19th century, leg. illegible signature, donation T. Jurcsák.
***Oedogonium fugacissimum* (Roth) Rabenhorst (n. 8324**/3) – ref.: Hirn, K. E. (1900). *Acta Societatis Scientiarum Fennicae* 27: IV + 394, XXVII figs, XLIV plates; northwestern Carpathians, 19th century, no signature, donation T. Jurcsák, damaged specimen.
***Oedogonium tenellum* Kg.** (n. 8324/1) – ref.: Hirn, K. E. (1900). *Acta Societatis Scientiarum Fennicae* 27: IV + 394, XXVII figs, XLIV plates; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, fresh water, 19th century, leg. illegible signature, donation T. Jurcsák.
***Oedogonium tenellum* Kützing** (n. 8323/142) – ref.: Publication details *Oedogonium tenellum* Kützing; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, fresh water, 19th century, leg. illegible signature, donation T. Jurcsák.

Ord. *Tetrasporales* Lemmermann
Fam. *Tetrasporaceae* (Nageli) Wittrock

Gen. *Tetraspora* J. H. F. Link ex N. A. Desvaux, 1818

***Tetraspora lacunosa* Cauv.** (n. 8323/140) – ref.: *Algues des environs de Falaise,* Brebisson, L. A. de & Godey, L. L. (1835); syn.: *Tetraspora lubrica* var*. lacunosa* (Duby) Chauvin ex Brebisson; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, fresh water, 19th century, leg. illegible signature, donation T. Jurcsák.

Clas. *Ulvophyceae* K. R. Mattox & K. D. E. Irvine & D. M. John, 1984
Ord. *Cladophorales* Haeckel
Fam. *Cladophoraceae* Wille
Gen. *Cladophora* Kutzing, 1843, nom. cons.

***Cladophora pectinella* Grunow** (n. 8323/56) – ref.: Grunow 1867: 40-41, pl. II; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Conferva* L., 1753

***Conferva articulata* L.** (n. 8324/12) – ref.: Conferva L., *Sp. pl.* **2**: 1164 (1753); unmentioned location and undated, 19th century, no signature, donation T. Jurcsák, obs.: According to Catalogue of Life: 2007 Annual Checklist: Species 2000 & Catalogue of Life Hierarchy, Edition 1 (2007).

Ord. *Dasycladales* Pascher, 1931
Fam. *Dasycladaceae* Kutzing, 1843
Gen. *Dasycladus* C. A. Agardh, 1828

***Dasycladus vermicularis* (Scopoli) Krasser** (n. 8324/54) – ref.: *Annalen des Kaiserlich-Königlichen Naturhistorischen Hofmuseum 13: 443-472, 2 figs.*; syn.: *Dasycladus clavaeformis* (Roth) C. Agardh; *Dasycladus clavaeformis* Meng.; unmentioned location and undated, 19th century, no signature, donation T. Jurcsák.

Fam. *Polyphysaceae* Kutzing
Gen. *Acetabularia* J. V. Lamouroux, 1812, nom.cons.

***Acetabularia acetabulum* (L.) P. C. Silva** - (n. 8323 /32) – ref.: Silva P. C. (1952: 255). *University of California Publication in Botany* 25: 241-323; syn.: *Acetabularia integra* J. V. Lamouroux; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Siphonocladales* (Bleckman & Tansley) Oltmanns
Fam. *Valoniaceae* Kutzing

Gen. *Valonia* C. A. Agardh, 1823

***Valonia utricularis* (Roth) C. Agardh** - (n. 8324/41) – ref.: *Species algarum* rite cognitae, cum synonymis, differentiis specifis et descriptionibus succintctis. Volumen primum. Pars posterior. pp. [vii-viii], [399]-531. Lundae; unmentioned location and undated, 19th century, no signature, donation T. Jurcsák.
***Valonia utricularis* (Roth) C. Agardh** (n. 8323/12) – ref.: Agardh, C. A. (1823: 431). *Species algarum*; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Gen. *Valoniopsis* Borgesen

***Valoniopsis pachynema* (G. Martens) Borgesen** (n. 8323/58) – ref.: Borgesen, F. (1934: 10, figs 1,2). *Kongelige Danske Videnskabernes Selsskab, Biologiske Meddelelser* 11(6): 1-72, 8 figs, 2 plates; syn.: *Valonia confervoides* Harvey ex J. Agardh; *Valonia confervucea* Kit. (?!); Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Ord. *Ulvales* Blackman & Tansley
Fam. *Ulvaceae* J. V. Lamoreaux ex Dumortier
Gen. *Ulva* C. Linnaeus, 1753

***Ulva lactuca* L.** (n. 8324/42) – ref.: Linnaeus, C. (1753) *Species plantarum,* vol.2 pp. [i], 561-1200, [1-30, index], [i, err.]. Holmiae [Stockholm]; unmentioned location, 19th century, no signature, donation T. Jurcsák.
***Ulva lactuca* L.** (n. 8323/14) – ref.: Linnaeus, C. (1753: 1163). *Species plantarum*; vol.2 pp. [i], 561-1200, [1-30, index], [i, err.]. Holmiae [Stockholm]; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
***Ulva linza* L.** (n. 8323/22) – ref.: Linnaeus, C. (1753). *Species plantarum* vol. 2. pp. [i], 561- 1200. Stockholm; syn.: *Phicoseris linza* (L.) Kutzing; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.

Phylum *Charophyta*
Clas*s. Charophyceae*
Ord. *Zynematales*

Subord. *Zygmatineae*
Fam. *Zygmataceae*
Gen. *Spirogyra* Link. in C. G. D. Nees, 1820, nom. cons.

***Spirogyra quinina* Kutzing** (n. 8324/39) – ref.: Publication details: *Spirogyra quinina* Kutzing; Basionym *Zygogonium affine* Kutzing; ITIS – Taxonomic serial no: 7004; unmentioned location and undated, fresh water, 19th century, no signature, donation T. Jurcsák; obs.: detalied distribution with sources: South America (Brasil), Australia and New Zealand.

Phylum *Marchantiophyta*
Clas. *Marchantiopsida*
Ord. *Marchantiales*
Subord. *Marchantiineae*
Fam. *Marchantiaceae*
Gen. *Marchantia* L. 1753

***Marchantia polymorpha* L.** (n. 8324/113) – ref.: ITIS Taxonomic Serial No.: 15587; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Clas. *Jungermanniopsida*
Subclas. Metzeriidae
Ord. *Metzgeriales*
Subord. *Metzgeriineae*
Fam. *Metzgeriaceae*
Gen. *Metzgeria* Raddi, 1818

***Metzgeria furcata* (L.) Dumort. (n. 8324**/107) – ref.: *Rec. d »...OBS, 26, 1835;* northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Metzgeria virens* L.** (n. 8324/108) – ref.: Raddi, Giusepe, *Jungermanniografia Etrusca* 34. 1818; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Subclas. *Jungermanniidae*
Ord. *Jungermanniales*
Subord. *Geocalycinae*
Fam. Plagiochilaceae

Gen. *Plagiochila* (Dumortier) Dumortier, 1835, nom. cons.

***Plagiochila asplenoides* (L.) Dumort.** (n. 8324/142) – ref.: Recueil Observ. Jungerm. 14. 1835; syn.: *Plagiochila major* (Nees) S. Annel; France, the Pyrenees, 19th century, illegible signature, donation T. Jurcsák.

Subord. *Jungermanniinae*
Fam. *Jungermanniaceae*
Gen. *Jungermannia* C. Linnaeus, 1753

***Jungermannia repens* D. Dietr.** (n. 8324/171) – ref.: Deutshcl. Kryptog. Gewachse 6: 149. 1846; syn.: *Jungermannia repens* Kit.; Romania, Bihor, Oradea, Oradea hills, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Scapaniaceae*
Gen. *Scapania* (Dumortier) Dumortier, 1835, nom. cons.

***Scapania undulata* (L.) Dumort.** (n. 8324/156) –- ref.: Recueil Observ. Jungerm. 14. 1835; syn.: *Plagiochila undulata* (L.) Mont. & Nees; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Subord. *Porellinae*
Fam. *Jubulaceae*
Gen. *Frullania* Raddi, 1818

***Frullania capillaris* Stephani** (n. 8324/155) – ref.: Sp. Hep. 4: 597 (1911); syn.: *Frulania capillaris* Ness.; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.
***Frullania dilatata* (L.) Dumort.** (n. 8324/170) – ref.: Recueil Observ. Jungerm. 13 (1835); syn.: *Frullania dilatata* Ness; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.
***Frullania tamarisci* (L.) Dumort.** (n. 8324/169) – ref.: Recueil Observ. Jungerm. 13 (1835); syn.: *Frullania tamarisci* Ness; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Phylum *Bryophyta* A. Braun, in Ascherson, 1860
Clas. *Polytrichopsida*

Ord. *Polytrichales*
Fam. *Polytrichaceae* Schwagr.

Gen. *Atrichum*. P. Beauvois, 1804, nom. cons.

***Atrichum undulatum* (Hedw) P. Beauv.** (n. 8324/117) – ref.: Prodr. Aetheogam. 42. 1805; syn.: *Catharinea undulata* (Hedw) F. Weber & Mohr.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Polytrichum* J. Hedwig, 1801

***Polytrichum formosum* Hedw.** (n. 8324/157) – ref.: Sp. Musc. Frond. 92. pl. 19: f. 1.a (1801); Romania, Bihor, Oradea, Oradea hills, 19th century, illegible signature, donation T. Jurcsák.
***Polytrichum juniperinum* Hedw.** (n. 8324/159) – ref.: Sp. Musc. Frond. 89. pl. 18: f. 6-10 (1801); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Polytrichum piliferum* Hedw.** (n. 8324/158) – ref.: Sp. Musc. Frond. 90. (1801); Romania, Bihor, Oradea, Oradea hills, 19th century, illegible signature, donation T. Jurcsák.

Clas. *Sphagnopsida*
Ord. *Sphagnales*
Fam. *Sphagnaceae* Dum.
Gen. *Sphagnum* Linnaeus, 1753

***Sphagnum acutifolium* Schrad.** (n. 8324/168) – ref.: Spic. Fl. Germ. 59. (1794); Slovenia, Kraina, 19th century, no signature, donation T. Jurcsák.
***Sphagnum subsecundum* Ness** (n. 8324/167) – ref.: Deutschl. Fl., Abt. II, Cryptog. 17 : [3] (1819); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Clas. *Bryopsida*
Gen. *Seratula*

***Seratula filiformis* Kit.** (n. 8324/175) – Slovakia, north-western Carpathians, Gerlachovsky (Gerlos) region, in greenhouses, 19th century, leg. illegible signature, donation T. Jurcsák.

Subclas. *Bryidae*
Superord. *Bryanae*
Ord. *Bryales*
Fam. *Batramiaceae* Schwagr.
Gen. *Plagiopus* Bridel, 1826

***Plagiopus oederiana* (Sw.) Crum & Anderson** (n. 8324/109) – ref.: Brady, 1924, Sci.Rep. Austral. Antarct. Exped., 5, pt. 3 , 22: syn.: *Bartramia oederi* Brid. [Muscol. Recent. 2(3): 135. pl. 2: f.9 (1803)]; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Bryaceae* Schwagr.
Gen. *Bryum* Hedw.

***Bryum elongatum* (Hedw) With.** (n. 8324/154) – ref.: Syst. Arr. Brit. Pl. (ed. 4) 3: 815 (1801); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Fam. *Mniaceae* Schwagr.
Gen. *Mnium* J. Hedwig, 1801, nom.cons.

***Mnium rostratum* Schrad.** (n. 8324/151) – ref.: Bot. Zeitung (Regensburg) 1: 79 (1802); syn.: *Mnium rostratum* Dill.; *Plagiomnium rostratum* (Schrad) T. J. Kop; Romania, Bihor, Oradea, Oradea hills, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Pohlia* J. Hedwig, 1801, nom.cons.

***Pohlia ludwigii* (Spreng. ex Schwagr) Broth.** (n. 8324/152) – ref.: Acta Soc. Sci. Fenn. 19 (12): 27 (1892); syn.: *Bryum ludvigii* Hed.; *Bryum ludwigii* Spreng. ex Schwagr.; **n**orthwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Ord. *Hedwigiales*
Fam. *Hedwigiaceae* Schimp.
Gen. *Hedwigia* P. Beauvois, 1804, nom.cons.

***Hedwigia ciliata* (Hedw.) P. Beauv.** (n. 8324/133) – ref.: Prodr. Aetheogam. 15

(1805)*;* syn.: *Hedvigia ciliaris* Sch.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Ord. *Orthotrichales*
Fam. *Orthotrichaceae* Arn.
Gen. *Orthotrichum* J. Hedwig , 1801

***Orthotrichum crispum* Hedwig** (n. 8324/130) – ref.: Sp. Musc. Frondd. 162 (1801)*;* northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Orthotrichum cupulatum* Brid.** (n. 8324/132) – ref.: Muscol. Recent. 2(2): 25 (1801)*;* syn.: *Orthotrichum cupulatum* Hedw.; France, the Pyrenees, 19th century, illegible signature, donation T. Jurcsák.
***Orthotrichum speciosum* Nees** (n. 8324/131) – ref.: In J.W. Sturm, Deutschl. Fl, 2(3) (fasc.17): 5. 1819; syn.: *Orthotrichum speciosum* Hed.; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Ord. *Splachnales*
Fam. *Meesiaceae* Schimp.

Gen. *Meesia* J.Hedwig, 1801, nom. cons.

***Meesia longiseta* Hedw.** (n. 8324/153) – ref.: Sp. Msc. Frond., 173 (1801); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Superord. *Hypnanae* W. R. Buck & B. Goffinet, 2000 ex W. R. Buck et al. 2005
Ord. *Hypnales*
***Fam. Amblystegiaceae* G. Roth**
Gen. *Amblystegium* W. P. Schimper, in B.S.G., 1853

***Amblystegium serpens* (Hedwig) W. P. Schimper (n. 8324**/128) – ref.: Bryol. Eur. 6 : 553. pl. 564 (fasc. 55-56 Monogr. 9. pl. 3),1853; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Anomodontaceae* Kindb.
Gen. *Anomodon* W. J. Hooker & T. Taylor, 1818

***Anomodon arolipendulus* Hed.** (n. 8324/165) – ref.: Keyser, 1875; Mem. Geol. Surv. Rep. S. Afr. 67: 74.; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

***Anomodon viticulosus* (Hedw) Hook. & Taylor** (n. 8324/166) – ref.: Muscol. Brit. 79 (1818); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.
***Anomodon viticulosus* (Hedw) Hook. & Tayl** (n. 8324/125) – ref.: Muscologia Britannica 79. 1818; syn.: *Neckera viticulosa* J. Hedwig.; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region,), 19th century, leg. illegible signature, donation T. Jurcsák.

Fam. *Brachytheciaceae* G. Roth
Gen. *Eurhynchium* Bruch & Schimper, in Bruch et al., 1854

***Eurhynchium strigosum* (Hoffm. ex F. Weber & D. Mohr) Schimp.** (n. 8324/126) – ref. Bryol. Eur. 5: 218 (fasc. 57-61. Monogr. 2), 1854; syn.: *Erinchium strigosum* Sch.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Isothecium* S.E. Bridel, 1827

***Isothecium myosuroides* (Hedwig) Podp.** (n. 8324/129) – ref.: Conspectus Muscorum Europaeorum 501. 1954; syn.: *Isothecium myersum* Hed.*;* northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Rhynchostegium* Bruch & Schimper, in Bruch et al., 1852

***Rhynchostegium ruscifolium* L.** (n. 8324/FN) – ref.: Bryologia Europaea 5: 197 (fasc. 49-51. Mon. 1). 1852; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák; missing specimen.

Fam. *Fontinalaceae* Schimp.
Gen. *Fontinalis* J.J. Dillenius ex J. Hedwig, 1801

***Fontinalis sp*.** (n. 8324/172) – ref.: Sp. Musc. Frond. 298 (1801); Romania, Bihor, Oradea, Oradea hills, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Hylocomiaceae* (Broth) M. Fleisch.
Gen. *Hylocomium* Bruch & Schimper, in Bruch et al., 1852

***Hylocomium aureum* Kit.** (n. 8324/124) – ref.: Bryologia Europaea 5: 169 (fasc. 49-51. Mon. 1) 1852; unmentioned location and undated, in greenhouses,19th century, leg. illegible signature, donation T. Jurcsák.
***Hylocomium lutescens* Ach.** (n. 8324/143) – ref.: Bryologia Europaea 5: 169 (fasc. 49-51. Mon. 1) 1852; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Hylocomium patens* Dill.** (n. 8324/148) – ref.: Bryol. EuR. T. 492. (1851-1855); Romania, Bihor, Oradea, Oradea hills, 19th century, illegible signature, donation T. Jurcsák.
***Hylocomium squarrosum* (Hedw) Schimp.** (n. 8324/145) – ref.: Bryol. Eur. 5: 177. 492 (fasc. 49-51 Mon. 9.6).1852; syn.: *Rhytidiadelphus squarrosus* (Hedw.) Warnst.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Hylocomium splendens* (Hedw.) Schimp.** (n. 8324/147) – ref.: Bryol. Eur. 5: 173. 492 (fasc. 49-51 Mon. 5).1852; syn.: *Hylocomium splendens* Dill.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Gen. *Rhytidiadelphus triquetrus* (Limpricht) Warnstorf, 1906

***Rhytidiadelphus triquetrus* (Hedw) Warnstorf.** (n. 8324/146) – ref.: Krypt.-Fl. Brandenburg, Laubm. 2: 920-922, f. 1-6 [926]. (1906); syn.: *Hylocomium triquetrum* (Hedw) Schimp **(**Briologia Europaea 5: 177 (fasc. 49-51. Mon.8. 5) 1852); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Hypnaceae* Schimp.
Gen. *Hypnum* J. Hedwig, 1801

***Hypnum acuminatum* (Hedw) P. Beauv.** (n. 8324/140) – ref.: Prodr. Aetheogam. 60 (1805)*;* syn.: *Brachythecium acuminatum* (Hedw.) Austin; *Leskea acuminata* Hedw.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Hypnum commutatum* Hedw.** (n. 8324/134) – ref.: Species Muscoum Frondosorum 284 (1801); syn.:*Palustirlla commutata* (Hedw.) Ochyra; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Hypnum cupressiforme* Hedw.** (n. 8324/141) – ref.: Species Muscoum Frondo-

sorum 291. (1801)*;* Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

***Hypnum molle* Hedw.** (n. 8324/135) – ref.: Species Muscoum Frondosorum 273. 70 f. 7-10 (1801)*;* syn.: *Hygrohypnum molle* (Hedw) Loeske; *Ochyraea mollis* (Hedw) Ignatov; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

***Hypnum longirostrum* Ehrh. ex Brid** (n. 8324/137) – ref.: Muscol. Recent. 2(2): 154 (1801)*;* syn.: *Eurhynchium striatum* (Schreb. ex Hedw.) Schimp; *Hypnum striatum* Schreb. ex Hedw.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

***Hypnum stramineum* Dicks. ex Brid.** (n. 8324/136) – ref.: Muscologia Recentiorum 2(2): 172. 1801; syn.: *Amblystegium stramineum* (Dicks. ex Brid) De Not.; *Calliergon stramineum* (Dicks. ex Brid) Kindb.; *Hypnum stamineum* Sch.; *Hypnum stramineum* Dicks.; *Straminergon stramineum* (Dicks. ex Brid) Hedenäs; *Stereodon stramineum* (Dicks. ex Brid) Brid.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

***Hypnum tamariscifolium* Neck.** (n. 8324/139) – ref.: Novarum et minus cognitarum stirpium pugillus 1771*;* Romania, Bihor, Oradea, 19th century, illegible signature, donation T. Jurcsák.

***Hypnum velutinum* Hedw.** (n. 8324/138) – ref.: Species Muscoum Frondosorum 272 (1801)*;* Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Fam. *Leskeaceae* Schimp.
Gen. *Leskea* J. Hedwig, 1801

***Leskea polymorpha* Hedw.** (n. 8324/110) – ref.: Hedw. Sp. Musc. Frond. 211 (1856); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Fam. *Neckeraceae* Schimp.
Gen. *Neckera* J. Hedwig, 1801, nom. cons.

***Neckera complanata* (Hedw.) Huebner.** (n. 8324/150) – ref.: Muscol. Germ. 576. (1833); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

***Neckera crispa* Hedw.** (n. 8324/149) – ref.: Sp. Msc. Frond. 206 (1801); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Pterigynandraceae* Schimp.
Gen. *Pterigynandrum* J.Hedwig, 1801

***Pterigynandrum filiforme* Hedw.** (n. 8324/111) – ref.: Sp. Musc. Frond. 81 (1801); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.
***Pterigynandrum radicans* Kit.** (n. 8324/177) – ref.: Sp. Musc. Frond. 80 (1801); Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.
***Pterigynandrum secundatum* Hedw.** (n. 8324/112) – ref.: Sp. Musc. Frond. 80 (1801); Romania, Bihor, Oradea, Oradea hills, 19th century, leg. illegible signature, donation T. Jurcsák.

Subclas. *Dicranidae*
Ord. *Dicranales*
Fam. *Dicranaceae* Schimp.
Gen. *Anisothecium* Mitten, 1869

***Anisothecium elegans* (Duby) Ther.** (n. 8324/118) – ref.: Rev. Bryol. Lichenol. 7: 170. 1935; syn.: *Brionella elegans* Kit.; *Dicranella elegans* (Duby) Larrain; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, in greenhouses, 19th century, leg. illegible signature, donation T. Jurcsák.

Gen. *Dicranum* J. Hedwig, 1801

***Dicranum majus* Turner** (n. 8324/120) – ref.: Muscol. Hibern. Spic. 59. 1804; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Dicranum scoparium* Ehrh. ex Hedw.** (n. 8324/123) – ref.: Sp. Musc. Frond. 126. 1801; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
Dicranum sp. (n. 8324/121) – ref.: Sp. Musc. Frond. 126. 1801; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, in greenhouses, 19th century, leg. illegible signature, donation T. Jurcsák.

Gen. *Paraleucobryum* (S. O. Lindberg ex Limpricht) Loeske, 1907

***Paraleucobryum longifolium* (Hedw) Loeske** (n. 8324/122) – ref.: Sp. Musc. Frond. 130. 1801; syn.: *Dicranum longifolium* Ehrh. ex Hedw.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Leucobryaceae* Schimp.
Gen. *Leucobryum* Hampe, 1839

***Leucobryum vulgare* Hampe** (n. 8324/127) – ref.: Linnaea 13: 42. 1839; syn.:*Leucobrium vulgare* Hed.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Ditrichaceae* Limpr.
Gen. *Ditrichum* G. F. Hampe, 1867, nom. cons.

***Ditrichum flexicaule* (Schwagrinchen) Hampe** (n. 8324/119) – ref.: Flora 50 : 182. 1867); syn.: *Trichostomum flexicaule* (Schwagr) Bruch & Schimp; *Cynodontium flexicaule* Schwagr.; *Leptotrichum flexicaule* (Schwagr) Hampe; France, the Pyrenees, 19th century, illegible signature, donation T. Jurcsák.

Ord. *Grimmiales*
Fam. *Grimmiaceae* Arn.
Gen. *Grimmia* J. Hedwig, 1801

***Grimmia funalis* (Schwagr) Bruch & Schimp** (n. 8324/174) – ref.: Bryologia Europaea 3: 119. 247 (fasc. 26-28 Mon. 17 11) 1845; syn.: *Trichostomum funale* Schwagr.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Grimmia tecticola* L.** (n. 8324/144) – ref.: Sp. Musc. Frond. 75. 1801; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Ord. *Pottiales*
Fam. *Pottiaceae* Schimp.
Gen. *Tortula* J. Hedwig, 1801, nom. cons.

***Tortula mucronata* (Brid) Lindb.** (n. 8324/114) – ref.: Ofvers. Forh. Kongl. Svenska Vetensk.-Akad. 24: 239. 1864; syn.: *Cinclidotus mucronatus* (Brid) Guim; *Dialytrichia mucronata* (Brid) Broth.; *Tortula mucronata* Hed.; France, the Pyrenees, 19th century, illegible signature, donation T. Jurcsák.

Phylum *Tracheophyta* Sinnott, 1935 ex Cavalier-Smith, 1998
Subphylum *Lycophytina*
Clas. *Lycopodiopsida* Bartl.

Ord. *Lycopodiales* Dumortier, 1829
Fam. *Lycopodiaceae* Palist de Beauvois ex Mirbel, in Lamarck & Mirbel, 1802
Gen. *Lycopodium* L.

***Lycopodium annotinum* L.** (n. 8324/176) – ref.: Sp.Pl.; 1103 (1753); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Ord. *Selaginellales* Prantl, 1874
Fam. *Selaginellaceae* Polisot de Beauvois, 1805, nom. cons.
Gen. *Selaginella* (L.) Beauv. ex Mart. & Schrank

***Selaginella casia* L.** (n. 8324/164) – ref.: Prodr. Aetheogam. 101. 1805; unmentioned location and date, in greenhouses, 19th century, leg. illegible signature, donation T. Jurcsák.
***Selaginella capillaris* Kit.** (n. 8324/173) – ref.: Journal of Botany, British and Foreign. 21: 3, 1883; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.
***Selaginella circinalis* (L.) Spring.** (n. 8324/161) – ref.: Flora 21; 220 (1838); unmentioned location and date, in greenhouses, 19th century, leg. illegible signature, donation T. Jurcsák
***Selaginella complanata* L.** (n. 8324/162) – ref.: Prodr. Aetheogam. 101. 1805; - unmentioned location and date, in greenhouses, 19th century, leg. illegible signature, donation T. Jurcsák.
***Selaginella helvetica* Spreng.** (n. 8324/163) – ref.: Flora (Regensburg) 21.149. 1805; Slovenia, Kraina, 19th century, no signature, donation T. Jurcsák.
***Selaginella plumosa* (L.) C. Presl.** (n. 8324/160) – ref.: Abh. Kongl. Bohm. Ges. Wiss. 5. 3: 583 (1845); syn.: *Selaginella stolonifera* (Sw) Spring (*Flora* 21: 193, 1838); *Lycopodium stoloniferum* Sw. (Prodr., 138. 1788); unmentioned location and date, in greenhouses, 19th century, leg. illegible signature, donation T. Jurcsák.
***Selaginella scabiosa* Kit.** (n. 8324/116) – ref.: Prodr. Aetheogam. 101. 1805; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.
***Selaginella selaginoides* L.** (n. 8324/115) – ref.: Hort. reg. monac. 1:182. 1829 (J. H. F. Link, Fil. spec. 158. 1841); syn.: *Licopodium selaginoides* L. (Species Plantarum 2: 1101. 1753); *Licopodium selaginella* Kit.; Slovakia, northwestern Carpathians, Gerlachovsky (Gerlos) region, 19th century, leg. illegible signature, donation T. Jurcsák.

Subphylum *Euphylophytina*
Infraphylum „*Moniliformopses*" Kenrick & Crane, 1997, nom. nud.
Clas. *Polypodiopsida* Cronquist et al.
Ord. *Polypodiales* Link
Fam. *Aspleniaceae* Newman
Gen. *Asplenium* C. Linnaeus, 1753

***Asplenium aitoni* Sch.** (n. 8324/FN) – ref.: Sp. Pl. 2: 1078-1082. 1753; Australia, 19th century, no signature, donation T. Jurcsák; missing specimen.
***Asplenium deltargesii* L.** (n. 8324/197) – ref.: Sp. Pl. 2: 1078-1082. 1753; Mexico, 19th century, no signature, donation T. Jurcsák.

***Asplenium dentex* L. V. Buch** (n. 8324/195) – ref.: Publishing author: L. v. Buch Publication: Beschr. Canar. Ins. 189. 1825; Mexico, 19th century, no signature, donation T. Jurcsák.

***Asplenium ruta-muraria* L.** (n. 8324/199) – ref.: Sp. pl. 2:1081. 1753; Slovenia, Kraina, 19th century, no signature, donation T. Jurcsák.

***Asplenium scolopendrium* L.** (n. 8324/200) – ref.: Sp. pl. 2:1079. 1753; syn.: *Scolopendrium officinale* Schwarz; *Scolopendrium vulgare* Sm.; Slovenia, Kraina, 19th century, no signature, donation T. Jurcsák.

***Asplenium triangulare* Kit.** (n. 8324/FN) – northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák, missing specimen.

***Asplenium trichomanes* L.** (n. 8324/198) – ref.: Sp. pl. 2:1080. 1753; Slovenia, Kraina, 19th century, no signature, donation T. Jurcsák.

Fam. *Blechnaceae* (C. Presl, 1851) Copeland, 1947
Subfam. *Blechnoideae*
Gen. *Blechnum* C. Linnaeus, 1753

***Blechnum longifolium* Cav.** (n. 8324/184) – ref.: Cavanilles, Antonio Jose (Joseph), Published in 1802; syn: *Blechnum longifolium* Forst.; Mexico, 19th century, no signature, donation T. Jurcsák.
***Blechnum triangularifolium* T. C. Chambers & P. A. Farrant** (n. 8324/186) – ref.: New Zealand J. Bot. 36(1): 14 (1998); syn: *Blechnum triangulare?;* Mexico, 19th century, no signature, donation T. Jurcsák.

Fam. *Dennstaedtiaceae* J.P. Losty, 1909
Gen. *Pteridium* Rafin

***Pteridium aquilinum* (L.) Kuhn** (n. 8324/180) – ref.: O. Kersten, Reis. Ost-Afr. 3(3):11. 1879; syn.: *Pteris aquilina* L. (Sp. Pl. 2 : 1075, 1753); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Dryopteridaceae* Ching, 1965, nom. cons.
Gen. *Dryopteris* (L.) Schott.

***Dryopteris filix-mas* (L.) Schott.** (n. 8324/205) – ref.: Gen. Fil., sub pl. 9. 1834; syn.: *Aspidium filix-mas* (L.) Schrad; *Polypodium filix-mas* L.; *Tectaria filix-mas* Cav.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Polypodiaceae* Berchtold & J. Presl, 1820
Subfam. *Polypodioideae*
Trib *Polypodeae*
Gen. *Polypodium* C. Linnaeus, 1753

***Polypodium calcareum* Sm.** (n. 8324/196) – ref.: Fl. Brit. 3: 1117-1118. 1804; syn.: *Polypodium dryopteris* L. var. *calcareum* (Sm) A. Gray; *Gymnocarpium robertianum* (Hoffm) Newman; *Tectaria calcarea* (Sm) Copel.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

***Polypodium scandens* G. Forst.** (n. 8324/207) – ref. Florae Insularum Australium Prodromus 81. 1786; syn.: *Polypodium scandens* L.; *Phymatosorus scandens* (G. Forst) Pic. Serm.; Europe, 19th century, no signature, donation T. Jurcsák.
***Polypodium vulgare* L.** (n. 8324/208) – ref.: Sp. Pl. ed. 1 1085 (1753); syn.: *Polypodium vulgare* L. subsp. *vulgare*; **-** Slovenia, Kraina, 19th century, no signature, donation T. Jurcsák, missing specimen.

Trib. *Lepisoreae*
Gen. *Belvisia* Mirabel, in Lamarck & Mirabel, 1802

***Belvisia spicata* (L.) Mirb.** (n. 8324/206) – ref.: Tardieu-Blot, M .L. 1960. Polypodiaces. Fl. Madagasc. 5(14): 93-121; syn.: *Lomaria spicata* Willd. **(**Sp. Pl. ed. quarta. 289. 1810); *Acrostichum spicatum* L.; Slovenia, Kraina, 19th century, no signature, donation T. Jurcsák.

Fam. *Pteridaceae* Kirchn.
Subfam. *Adiantoideae*

Gen. *Adiantum* C. Linnaeus, 1753

***Adiantum aethiopicum* L.** (n. 8324/192) – ref.: Sp. Pl. 2: 1560 (1753); syn.: *Adiantum assimile* Sw. (Schrad. Journ. 1800 [2]. 83. 1801); Mexico, 19th century, no signature, donation T. Jurcsák.
***Adiantum capillus veneris* L.** (n. 8324/194) – ref.: Sp. Pl. 1096. (1753)**;** Europe, 19th century, no signature, donation T. Jurcsák.
***Adiantum cuneatum* Langsd. & Fisch.** (n. 8324/187) – ref.: Pl. Voy. Russes Monde 23, t. 26 (1810); syn: *Adiantum cuneatum* Schltdl. (Linnea 5: 615. 1830); *Adiantum cuneatum* G. Forst; Australia , 19th century, no signature, donation T. Jurcsák.
***Adiantum furcatum* L.** (n. 8324/193) – ref.: Suppl. Pl. 447. 1781. [1881 (IF)]; Mexico, 19th century, no signature, donation T. Jurcsák.
***Adiantum pedatum* L.** (n. 8324/191) – ref.: Sp. Pl. 2: 1095. (1753); Europe, 19th century, no signature, donation T. Jurcsák.
***Adiantum pennatum* L.** (n. 8324/190) – ref.: Sp. Pl. 2: 1094-1097. (1753); Australia, 19th century, no signature, donation T. Jurcsák.
***Adiantum radiatum* L.** (n. 8324/188) – ref.: Sp. Pl. 2: 1094 (1753); Mexico, 19th century, no signature, donation T. Jurcsák.
***Adiantum tenerum* Sw.** (n. 8324/189) – ref.: Prod. 135 (1788); Mexico, 19th century, no signature, donation T. Jurcsák.
***Adiantum trapeziforme* L.** (n. 8324/194 /a) – ref.: Sp. Pl. 1097. (1753)**;** Australia, 19th century, no signature, donation T. Jurcsák, missing specimen.

Subfam. *Pteridoideae*
Gen. *Pteris* C. Linnaeus, 1753

***Pteris algiera* Sort.** (n. 8324/181) – ref.: Species Plantarum 2: 1073, 1753; Gen. Pl. ed.5., 484. 1754; Japan, 19th century, no signature, donation T. Jurcsák.
***Pteris carpatica* L.** (n. 8324/179) – ref.: Index Filicum xlii. 1857; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.
***Pteris elegans* Sw.** (n. 8324/183) – ref.: Kongl. Vetensk. Acad. Handl. 1817(1): 71. 1817; syn.: *Dryopteris nobilis* (T. Moore) C. Chr.; Mexico, 19th century, no signature, donation T. Jurcsák.
***Pteris ensiformis* Burm. f.** (n. 8324/178) – ref.: Fl. Indica 230 (1768); syn.: *Pteris*

crenata Sw. [J. Bot. (Schrader) 1800(2): 65 65. 1801]; Mexico, 19th century, no signature, donation T. Jurcsák.
***Pteris longifolia* L.** (n. 8324/182) – ref.: Species Plantarum 2: 1074, 1753; Brazil, 19th century, no signature, donation T. Jurcsák.

Subfam. *Taenitidoideae*
Gen. *Onychium* Kaulfuss, 1820

***Onychium siliculosum* (Desv.) C. Chr.** (n. 8324/185) – ref.: Icones Filicum fasc. 8: 469. 1906.; syn.: *Pteris chrysocarpa* Hook. et Grev. (Icones Filicum 1(6): t. 107 1828); *Onychium chrysocarpus* (Hook. & Grev.) C. Chr.; *Onychium siliculosum Kaulfuss* var. *chrysocarpum* (Hook & Grev.) Tardieu & C. Chr.; Mexico, 19th century, no signature, donation T. Jurcsák.

Fam. *Tectariaceae* Panigrahi
Gen. *Tectaria* Cavanilles, 1799

***Tectaria aculeata* Lag., Garcia & Clem.** (n. 8324/202) – ref.: Anal. Cienc. 5. 145. 1802; syn.: *Aspidium aculeatum* Dill.; Slovenia, Kraina, 19th century, no signature, donation T. Jurcsák.

Fam. *Thelypteridaceae* Ching ex Pichi-Serm.
Gen. *Phegopteris* (Presl) Fee, 1852

***Phegopteris connectilis* (Mchx.) Watt.** (n. 8324/201) – ref.: Canad. Naturalist & Quart. J. Sci., n. s., 3:29. 1866; syn.: *Polypodium phegopteris* L.; northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Fam. *Woodsiaceae* (Champ) Herter
Gen. *Athyrium* A. W. Roth., 1799

***Athyrium alpestre* (Hoppe) Clairville** (n. 8324/203) – ref.: Man. Herbor. Suisse, 301. 1811; syn.: *Aspidium alpestre* Sch.; *Aspidium alpestre* Hoppe., *Athyrium distentifolium* Tausch. ex Opiz; Slovenia, Kraina, 19th century, no signature, donation T. Jurcsák.

Gen. *Cystopteris* Bernhardi, 1805

***Cystopteris gracilis* Dill**. (n. 8324/204) – ref.: Neues J. Bot. 1(2): 26. (1805); northwestern Carpathians, 19th century, illegible signature, donation T. Jurcsák.

Kindom *Animalia* C. Linnaeus, 1758
Subkindom *Bilateria* (Hatschek, 1888) Cavalier-Smith, 1983
Branch *Deuterostomia* Grobben, 1908
Infrakingdom *Coelomopora* (Marcus, 1958) Cavalier-Smith, 1998
Phylum *Echinodermata* Klein, 1734 ex De Brugiere, 1789
Subphylum *Eleutherozoa* Bell, 1891 (Bather, 1900)
Infraphylum *Echinozoa* Haeckel, in Von Zittell, 1895
Superclas. *Cryptosyringida* Smith, 1984
Clas. *Echinoidea* Leske, 1778
Subclas. *Euechinoidea* Bronn, 1860
Superord. *Atelostomata* Zittel, 1879
Ord. *Spatagoida* Claus, 1876
Subord. *Amphisternata*
Fam. *Loveniidae* Lambert, 1905
Gen. *Lovenia* Desor, 1847

***Lovenia tetrasticha* Meneghini** (n. 8323/61) – ref.: Memor. dell'Istit. Venet. 1845, p. 183, tav. XIV, f. 2; syn.: *Lowenia tetrasticha* Meneghini*; Heteropxis tetrasticha* Heller.; *Antennularia tetrasticha* Gotl. Mark.-Turn.; Adriatic Sea, 19th century, leg. P. Titius, donation T. Jurcsák; obs.: *Lovenia* (pro *Lowenia* Meneghini 1843) Kirchenpauer 1872, Abh. Ver. Hamburg.

Branch *Protostomia* Grobben, 1908
Infrakindom *„Lophotrochozoa"*
Phylum *Bryozoa Ehrenberg, 1831*
Clas. *Gymnolaemata*
Ord. *Cheilostomata*
Subord. *Anasca*
Division *Cellularina*
Fam. *Bugulidae* Gray, 1848
Gen. *Bugula* Oken, 1815

***Bugula neritina* L.** (n. 8323/62) – ref.: Hayward, P.J. (2001). Bryozoa, *in*: Costello, M. J. *et al.* (ed.) (2001); syn.: *Acamarehis neritina* Mang.; *Bugula neitina* Oken.; *Cellularia neritina* Pall.; *Cellaria neritina* Ellis u. Sol.; *Sertularia neritina* L.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák, missing specimen.

Division *Malacostega*

Fam. *Flustridae*
Gen. *Flustra* L., 1767

***Flustra hyalina* Lam.** (n. 8323/63) – ref.: Howson, C. M.; Picton. B. E. (eds.) (1997). *Ulster Museum Publication*, 276; syn.: *Flustra hyalina* Pall.; Adriatic Sea, 19th century, no signature, donation T. Jurcsák.
Flustra zoophitum (n. 8324/66) – ref.: *Flustra* Linnaeus, 1761*;* Croatia, Split, Dalmatia, Adriatic Sea, 19th century, leg. P. Titius, donation T. Jurcsák.

Conclusions

As we have already mentioned, we consider that Tiberiu Jurcsák's donation had a direct connection with Pius Vendel Titius (whose author abbreviation is either *Titius* or *P.V. Titius,* respectively, *Pio*) a botanist known in his time as a collector specialized in algae, mostly collected from the Adriatic Sea. Among the locations mentioned on the boards (where they are mentioned, some of them right near the name of the collector and the year of collection, 1856) and Pius Titius's life journey there is a parallelism guiding us to accurately identify the geographical, administrative and environmental locations.

Titius Pius Vendel (1801-1884), a Franciscan monk, born in Slovakia, near Košice, worked as a teacher in Levoča (Presov region), in Kanta and Arad (Transylvania), and as a chaplain in Galicia, Normandy, and on the Adriatic Coast, where he died in Piran. The location names found on the boards (such as Gerlos, Oradea, Săvârşin, Split, Trieste, Piran, Venice, Genoa), the names of several administrative zones of the Austro-Hungarian Empire (Dalmatia, Kraina, Transylvania), as well as the geographical areas mentioned (the Carpathians, the Mediterranean Sea, the Adriatic Sea, the Pyrenees, the Atlantic Ocean) lead us to a route that partially overlaps the territories where he worked and lived. To this route the locations in western Italy (the Gulf of Genoa) and France (the Pyrenees) are added, as well as the Mediterranean Sea and the Atlantic Ocean, where Titius could theoretically have arrived if we take into account the period when he worked in Normandy and Italy. There might still be the probability of some exchanges of specimens between collectors who could have been botanists. Such a hypothetical alternative might be considered in case of the exotic specimens from Mexico, Brazil, Australia and Japan included in this herbarium.

The area where the specimens of this herbarium were collected is rather large and includes aquatic (marine and lacustrine) species (cyanobacteria, proteobacteria, species of the „chromista" group, algae), as well as terrestrial species

(mosses, lichens, ferns); it stretches from the Atlantic Ocean to the Mediterranean Sea (with two of its inner seas, the Adriatic Sea and the Ligurian Sea), to the Pyrenees and the north-western Carpathians. The collection of these specimens can be dated in the second half of the 19th century (the year 1856 is mentioned on some of the boards), and the collection areas are today in several European countries such as Croatia, Slovenia, Italy, Slovakia, France, Romania, and possibly in today's western Ukraine. In this respect, we considered it useful to use administrative descriptions of the historical boundaries of the countries and provinces of the Austro-Hungarian Empire and to mention geographical details (seas, bays, coasts) in order to clarify possible locations, many of which were not mentioned on the margins of the board.

Most of the species gathered in the collection we refer to belong to the Mediterranean Europe which includes, besides the three great southern peninsulas (the Iberian, the Italian, and the Balkan), a series of islands and parts of the Mediterranean Sea closely linked to the mainland (bays and open seas). We have to mention here the Adriatic Sea with the Gulf of Venice (including the the Venice Lagoon and the bays of Trieste and Piran) and the Ligurian Sea with the Gulf of Genoa.

The great majority of the specimens in the collection are algae collected in the *Adriatic Sea*, which is a branch of the Mediterranean Sea separating the Italian Peninsula from the Balkan one. In the studied collection there is a single specimen (Grateloupia verucosa Agardh) collected from the Gulf of Genoa. Several of the locations mentioned on some herbarium sheets are the Adriatic Sea, the Dalmatian Coast, the Bay of Piran, and the cities Split (Spalato), Trieste and Venice.

- The Slovenian Kraina (Kranjska in Slovenian, Krain in German, Carniola in Italian, Krájna in Hungarian) is a historical territory that was part of the Austrian Empire and of Austria-Hungary as the Duchy of Carniola (Vojvodina Kranjska, Herzogtum Krain), and roughly corresponds to the central region of Carniola in the present state of Slovenia.

As mentioned before, the main collector of the pieces from this collection, especially of those from the northern Adriatic Sea, must have been, in our opinion, Pius Titius Vendel, as he spent most of his life on these shores. Being interested in the biodiversity of the place, especially the marine flora and fauna, he got into contact with other naturalists, sending them collected specimens, determining and describing 64 species of algae.

Among the botanists of the time who studied the flora and fauna of the Adriatic Sea and of the Mediterranean Sea in general, leaving behind important studies, are Agardh, 1839, 1842, 1844; Ardissone, 1874-78, 1883, 1886, Ardisso-

ne et al. 1881, De Toni & Levi. 1887, De Toni, 1888, 1892, 1898, 1907, 1913-17, De Toni & Forti, 1903, Heller, 1868, Kutzing, 1845-1871, Zanardini, 1841, 1843, 1847, 1860, 1871. Some of them wrote about Pius Titius' life and work, as well as about his collections, such as Vöröss,1972, 1973; Battelli, 2002 and Iancu et al., 2008; the last author published in Romania a Catalogue of Bryophytes, together with a group of botanists of the Prahova County Museum of Natural Sciences.

There are several herbaria containing the samples collected by Titius Pius from among the algae of the Ariatic Sea (Titius & Kalchbrenner - *Algae maris Adriatici*; Triest: Zoologische Station *Algae Adriaticae exsiccatae*). Among the studies on the algae of the Mediterranean Sea carried out in the 20th century there are: Feldman-Mazoyer, 1941; Gayral, 1966; Coppejans, 1983; Riedl, 1983; Boudouresque & Perret-Boudouresque, 1987; Delepine et al., 1987; Bressan & Godini, 1990; Cabioc'h et al., 1992.

The Carpathians*,* respectively the north-western Carpathians, including the sub-carpathian region of Ruthenia (*Subcarpatia,* respectively *Transcarpatia*; *Zakarpattia* in Ukrainian*, Kárpátalja* in Hungarian, and *Podkarpatska* in Slovak), are a location frequently mentioned in the collection. Not even in this situation do we exclude the possibility that one of the collectors might be Pius Titius Vendel, taking into account his Slovak origin from near Košice, his teaching practice in the Spiš region, in northeastern Slovakia (there is a mention of the locality *Gerla*, a name that must be that of the Slovak Gerlach – today Gerlachov - in that region), and the time he spent in Transylvania (locality names like *Săvârşin* and *Oradea,* as well as the generic name of Transylvania appear on the margin of some of the boards). To that we may add the period when he was a priest chaplain in the historical Galicia. Some of the labels bear location names as the Carpathians (Karpath) and *Subcarpathia* or *Kárpátalja* (Karpath. alatt).

Some of the references on the flora of the Carpathians published since the 19th century are: F. Pax, 1898-1908; Sagorski E., 1893; Sagorski, E. & Schneider, G., 1891; Schur J.F. 1886; Simonkai L. 1887. Among those published in the 20th century, as well as those published after 2000, are: Dostal J., 1931, 1989; Pawlowski B. 1956, 1970; Paucă & Roman , 1959; Stojko S.M. 1977; Maglocky S. 1983; Marhold K. & Hindak F. 1998; Mirek Z. & Piekos-Mirkowa H., 1992; Maglocky & Ferakova. 1993; Bertova L. et al., 1966–1997; Tasenkevich L. 1998; Tutin et al., 1964-1980; Kricfalusy et al., 1999; Mirek Z. et al., 2002; Urs-Beat Brändli & Jaroslaw Dowhanytsch, 2003; Witkowski et al., 2003; Pop G.P. 2006; Ronikier M., 2011.

The specimens of the herbarium coming from Central and South America, Australia and Japan have a peripheral character, though we do not disregard the

role they had in the collection as a whole. They must have arrived as exchange items between collectors or through acquisitions, in an attempt to diversify the material of the original herbarium. Among the studies of that time, related to the collections made in some exotic areas (Mexico, Brazil, and Australia) that appear in the herbarium, are those of Roezi Benedikt (1867, 188?) for Mexico and South America and that of Frauenfeld (1864) for Australia.

The material presented here is a botanical collection completed around mid 19th century, its main collector is Pius Titius Vendel, a Franciscan monk whose existential route overlaps most of the geographical areas mentioned on the margin of the boards (especially the regions of the Adriatic Sea, the northwest Carpathian Mountains, up to Transcarpathia and Western Transylvania). In general, the material shows a good state of preservation, even though there are several specimens with a high degree of degradation or missing specimens, as mentioned above at the respective position when considered to be important for the unity of the collection.

The collection must have been originally richer, its pieces being important for their pedagogical role and for their utility, as we believe that the collector, according to his signature (author abbreviation), was Karl Eduard Ortgies (1829-1916), a German horticulturist and botanist. The material includes species of Bacteria (cyanobacteria and proteobacteria), *Fungi, Chromista, Plantae* (algae, mosses, lichens, ferns) and *Animalia* (phyla *Bryozoa* and *Echinodermata*), and represents a total of 352 taxa, belonging to 183 genera and 112 families.

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Sceliphron caementarium (Hymenoptera, Sphecidae), new to the Romanian fauna

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Abstract. An imago of the Nearctic mud dauber *Sceliphron caementarium* (Drury 1770) was captured on July 16, 2012, in Oradea, northwestern Romania. It represents the first record of this species in the country, while the establishing of the species remains undocumented.

Introduction

The solitary wasp *Sceliphron (Sceliphron) caementarium* (Drury 1770) is originally native to North America and it is one of the two Nearctic sphecids accidentally introduced into Europe on several occasions: supposedly „during the 19th century" (Rasplus 2010), in 1942 in the Czech Republic, not established (Bogusch & Macek 2005), in 1945 in Versailles, France, not established (Rasplus 2010), in 1974 in southern France, and then it established in France, Portugal and Madeira (Bitsch & Barbier 2006, Rasplus 2010). The other Nearctic sphecid invasive to Europe is *Isodontia mexicana* (Saussure 1867).

The European range of *S. caementarium* expanded gradually in the following countries: Luxembourg (firstly, a nest and emerging imagos in an American

military vehicle) (Schneider & Pelles 1988), Italy, Ukraine (Crimea, a possible separate colonization) (Pulawski 2012), Croatia (Gusenleitner 1996), northern Italy (in 1998 in Trentino-Alto Adige, or southern Tyrol) (Hellrigl 2006), Belgium (Pulawski 2012), Austria (Gusenleitner 2002), Switzerland, Slovenia and Germany (Pulawski 2012). In Croatia it was found also in 2002-2005 (Józan 2009).

In addition to that, two other sphecids, *S. curvatum* (Smith 1870) and *S. deforme* (Smith 1856), have been accidentally introduced into Europe from Asia (Rasplus et al. 2010). *Sceliphron* species are known as mud-daubers, preying on spiders and often confectioning their nests in or aroung buildings. Besides the still unsure case of *S. deforme* (apparently introduced with success in southern Montenegro), the other species of the genus mentioned above became established in the Balkans region and threaten to replace the autochtonous *Sceliphron* species (Ćetković et al. 2004, Rasplus et al. 2010).

In Romania, *S. destillatorium* (Illiger 1807) and *S. spirifex* (Linnaeus 1758) are the only known *Sceliphron* species, the last one being doubtful (Barbier 2012). There are no previous records of the presence of *S. caementarium* in Romania, while the Fauna Europaea online database enlists it in the faunas of France, Italy, Austria, Croatia, Ukraine, and possibly Portugal.

The aim of the present paper was to document the first occurrence of *S. caementarium* in Romania.

Material and methods

On July 16, 2012, during a very hot summer, a mud-dauber imago was observed trying to enter the building of the Ţării Crişurilor Museum, Oradea, by our colleague Iacinta Chiriac. The specimen was captured, prepared, mounted and included in the museum's collection. No nests or other individuals were found. The specimen was identified using the keys published in Schmid-Egger 2005 and Bitsch & Barbier 2006.

Results and discussion

The collected individual, a female (Fig. 1), has a body length of 23 mm. (antennae excluded). Its morphological features matched the typical diagnosis of *S. caementarium* (Schmid-Egger 2005, Bitsch & Barbier 2006): yellow scapi (first antennal segments), yellow tegulae, propodeum and first tergite, black petiole and hind femurs. The wings are all brownish. *S. caementarium* differs from the common *S. destillatorium* by its yellow propodeum, black petiole, black hind fe-

Fig. 1 - The *Sceliphron caementarium* (Drury 1770) imago captured in Oradea on July 16, 2012 (photo dr. M. Venczel).

murs, and brownish wings, while *S. destillatorium* has black propodeum, usually yellow petiole, black and yellow hind femurs, and clear wings (Schmid-Egger 2005, Bitsch & Barbier 2006).

This first known occurrence of *S. caementarium* in Romania may be a vagrant individual and does not represent, of course, a clear proof for the establishment of the species in the Romanian fauna, as no other individuals or nests were found yet. The origin of this individual is unknown, as the species was not recorded in the neighbouring countries, but only in the Crimea peninsula, which is quite far from northwestern Romania and way beyond the Eastern and Western Romanian Carpathians.

Nevertheless, the distribution data for *S. caementarium* in the European countries, especially in the east, look rather incomplete, and its expansion in Hungary and Serbia from the populations known in their respective neighbouring countries seems very likely, thus suggesting a possible eastward way of colonization in Romania, without major natural obstacles. Another hypothetical modality is an accidental, human introduction of nests or imagos, like in the first European colonization instances, due to the recently increasing human transportation and travelling activities.

The impact of invasive mud-daubers, as of alien Hymenoptera in general, has received little attention so far, though issues concerning competition and hybridization with local species have been noticed (Rasplus 2010, Rasplus et al. 2010). The alien mud-daubers may also have an excessive impact on the local

populations of Araneae. In France, *S. caementarium* established itself mainly in the Mediterranean bioregion (Bitsch & Barbier 2006) and it supersedes the native *S. spirifex* (Piek 1986).

It is still unclear whether all the published occurrences represent established populations, though there is a clear trend towards range expansion, especially in southern Europe (Bogusch et al. 2005). The thermophilic character of *S. caementarium*, in connection with its expansion in Europe even at higher latitudes, as in the occurrence in Oradea, may possibly suggest a tendency towards climate warming in Europe.

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New data about the biodiversity of "Pârâul Peţea" natural reserve in Băile 1 Mai, northwestern Romania

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Abstract. During a qualitative faunistical survey in the „Pârâul Peţea" natural reserve, a total of 83 species were observed, out of which 17 are protected and 3 are invasive. 10 Odonata species are recorded for the first time in the reserve, including the rare *Pyrrhosoma nymphula* and southern elements which may indicate climate warming. The recent decrease in the thermal spring flow in the reserve and its impact on the fauna and the survival of the ecosystem are briefly discussed.

Introduction

The „Pârâul Peţea" natural reserve is situated at 9 km southeast from Oradea, has a total length of ca. 1 km and a surface of 10,86 ha, and belongs to IUCN category IV, according to Romanian law OUG 57/2007. The reserve is enclosed in the Natura 2000 site „Lacul Peţea", which follows the course of Peţea rivulet from its origin to the entrance in Oradea (ca. 5 km). The site encloses also Băile 1 Mai spa, with Lake Peţea and its underwater thermal spring.

The following endemic, protected taxa were cited in the reserve: *Nymphaea lotus* var. *thermalis*, the only tropical plant vegetating spontaneously in the temperate area, *Melanopsis parreyssii* (Philippi 1847) and *Scardinius racovitzai*.

According to Annex II of the European Council Directive 92/43/CEE, the habitat is listed as Transylvanian thermal water covered with lotus (31A0*), and the following protected species are listed: *Emys orbicularis, Bombina bombina*, *B. variegata*, *Triturus cristatus, Cobitis taenia, Sabanejewia aurata, Callimorpha quadripunctaria, Drobacia banatica, Unio crassus.* The species protected by national law and quoted in the reserve are: *Hyla arborea, Pelobates fuscus, Rana dalmatina, R. ridibunda, Triturus vulgaris, Lacerta agilis, L. viridis, Natrix natrix, N. tessellata, Vipera berus*.

Following a tendency in the decrease of water level in the reserve in recent years, possibly because of excessive extraction of thermal water, in December 2011 the underwater thermal spring has ceased temporarily its flow. The custodian of the reserve (Ţării Crişurilor Museum) tried to ensure the survival of the ecosystem by pumping thermal water from a nearby drilling. Therefore, the impact of the dramatically low level of the lake and of the decrease in water temperature on the fauna of the reserve was of special interest.

Material and methods

A qualitative survey of the biodiversity in the reserve, aimed mainly at Odonata, Gerromorpha and Nepomorpha, was carried on weekly during March-September 2012, and implied observations, photographs, capturing and collecting with entomological or mesh nets. When collecting was not necessary, the captured individuals were released at the same spot. The animals were determined based on their morphological features according to the available literature (Cârdei & Bulimar 1965, Poisson 1957) and using a digital microscope Aigo GE-5 when necessary. The protection status of the species was verified in legislation and literature (Tatole & al. 2009).

Results and discussion

The presence of the following species was documented in the reserve for the studied period of time:

Class Gastropoda
Fam. Melanopsidae

Melanopsis parreyssii (Philippi 1847) - IUCN Red List CR, critically endangered, endemic for Lake Peţea, abundant in the past; introduced with limited succes in Hungary: Lake Malom in Budapest, and Körösladány; may be affected by habitat

destruction and pollution; in Dec. 2011 the thermal spring ceased temporarily its activity, therefore an aquarium with 20 individuals was set up in the museum for reintroduction of the species if necessary.

Fam. Helicidae

Drobacia banatica (Rossmässler 1838) - IUCN Red List DD, data deficient; Pleistocene relic, strictly protected species in the EU, protected by national law, rare, hygrophilic, occurs in woods in Romania, Hungary and Ukraine, was introduced in Germany; endangered by deforestation, loss of riparian vegetation, drainage.

Class Bivalvia
Order Unionoida
Fam. Unionidae

Unio crassus Philipsson 1788 - IUCN LR/nt, near threatened; protected by national law; occurs in slow flowing waters, needs clean and well oxygenated water, sandy or moderately muddy substrate, affected by high concentrations of organic substances, therefore being an indicator of environment quality; may be affected by pollution, changes in water level, and the invasive species *Sinanodonta woodiana,* which has 2-3 generations, while *U. crassus* has only one.

Sinanodonta woodiana (Lea 1834) - Eastern Asian invasive species.

Class Arachnida
Order Araneae
Fam. Tetragnathidae

Tetragnatha extensa (L. 1758)

Fam. Thomisidae

Misumena vatia (Clerck 1757)

Fam. Araneidae

Argiope bruennichi (Scopoli 1772)

Order Odonata
Suborder Zygoptera
Fam. Calopterygidae

Calopteryx splendens (Harris 1780) - common, prefers slow running waters with open surfaces, is very sensitive to pollution and needs healthy emergent plants for oviposition (Szállassy 2008).

C. virgo (L. 1758) - the first documented occurrence in the reserve.

Fam. Coenagrionidae

Coenagrion puella (L. 1758) - common species, occurs also in eutrophic waters, yet is sensitive to pollution (Szállassy 2008); abundant.

C. pulchellum (Vander Linden 1825) - common, prefers stagnant waters (Szállassy 2008).

Erythromma viridulum (Charpentier 1840) - Pontic-Mediterranean species, first occurrence in the reserve.

Ischnura elegans (Vander Linden 1820) - common, very adaptable, tolerant to pollution (Szállassy 2008); abundant.

I. pumilio (Charpentier 1825)

Pyrrhosoma nymphula (Sulzer 1776) - this species is very rare in Romania; first occurrence in the reserve.

Fam. Lestidae

Sympecma fusca (Vander Linden 1820) - Mediterranean and Central-European species.

Fam. Platycnemididae

- *Platycnemis pennipes* (Pallas 1771) - common, prefers running waters, is vulnerable to the destruction of riparian habitats and pollution (Szállassy 2008); abundant.

Suborder Anisoptera
Fam. Aeshnidae

Aeshna affinis Vander Linden 1823 - common, prefers stagnant waters, is sensitive to pollution (Szállassy 2008); first documented occurrence in the reserve.

A. cyanea (Müller 1764)

A. isosceles (Müller 1767)

Anax imperator Leach 1815 - relatively frequent, prefers stagnant waters, may be eliminated by habitat destruction, especially of aquatic plants serving as support for larvae during metamorphosis (Szállassy 2008); first documented occurrence in the reserve.

A. parthenope (Sélys 1839) - first documented occurrence in the reserve.

Brachytron pratense (Müller 1764) - first documented occurrence in the reserve.

Fam. Libellulidae

Crocothemis erythraea (Brullé 1832) - African species expanding in Europe due to climate change (Kalkman & al. 2010), first documented occurrence in the reserve, abundant.

Libellula depressa L. 1758 - abundant in the reserve; common species, prefers small stagnant waters with open surfaces, but may occur also in semi-polluted habitats, is less abundant in the last stage of lakes, its apparition is encouraged by elimination of the riparian vegetation (Szállassy 2008).

L. fulva Müller 1764 - rare, prefers waters with high organic content, emerging vegetation and riparian shrubs; may be threatened by excessive shadow from the trees on the shore and also by high water temperature, low oxygen levels and pollution (Szállassy 2008).

Orthetrum albistylum Sélys 1848 - relatively frequent, prefers stagnant waters (Szállassy 2008).

O. brunneum (Fonscolombe 1837) - Mediterranean origin.

O. coerulescens (Fabricius 1798)

Sympetrum meridionale (Sélys 1841) - first documented occurrence in the reserve.

S. sanguineum (Müller 1764) - common (Szállassy 2008).

S. striolatum (Charpentier 1840) - first documented occurrence in the reserve.

S. vulgatum (L. 1758) - common, prefers stagnant waters (Szállassy 2008).

Order Hemiptera
Suborder Heteroptera

Most semiaquatic species found in the reserve belong to the ecological group favored by shallow waters, a fact which may be related to the decrease in the spring flow and the level of the thermal lake observed mostly after December 2011.

Infraorder Gerromorpha
Fam. Gerridae

Aquarius paludum (Fabricius 1794) - prefers shallow waters (Hufnagel & al. 1999).

Gerris (s. str.) argentatus Schummel 1832 - common, shore species, prefers relatively deeper waters (Hufnagel & al. 1999, Ilie 2006).

G. (s. str.) lacustris (L. 1758) - prefers shallow waters, tolerant species; dominant in habitats with shore vegetation and heavy anthropic impact (Hufnagel & al. 1999, Oloşutean & Ilie 2010).

G. (Gerriselloides) lateralis Schummel 1832

Limnoporus rufoscutellatus (Latreille 1807) - prefers shallow waters, the species is rare in Hungary (Hufnagel & al. 1999).

Fam. Mesoveliidae

Mesovelia thermalis Horváth 1915 - the reserve is its only habitat in Romania; it lives in the shore area of ponds on the floating vegetation; the association of

Mesovelia sp. with Nymphaeion is due to the abundance of vegetation in that stage of the lakes; eats mainly Ostracods coming to the water surface and tiny insects fallen on the water, inserts its eggs in the stems of semiaquatic plants; the nymphs hatch in 7-19 days depending on temperature, has only four instars, total development takes 12-32 days (Gagiu 2004), the first adults emerge in May-June, has probably 3-4 generations, overwinters probably as egg; almost all published, collected and observed individuals in the reserve are apterous, therefore the population has limited spreading ability; habitat key factors are: thermal water, partly covered riparian aquatic habitat, undisturbed and not polluted, and the presence of tiny arthropods as prey; another European species, *M. furcata* Mulsant & Rey 1852, prefers relatively deeper waters (Hufnagel & al. 1999).

Fam. Veliidae

Microvelia (s. str.) reticulata (Burmeister 1835) - prefers relatively deeper waters and the presence of algae in their microhabitat (Hufnagel & al. 1999).

M. (Picaultia) pygmaea (Dufour 1833) - prefers shallow waters (Hufnagel & al. 1999).

Infraorder Nepomorpha
Fam. Naucoridae

Ilyocoris cimicoides (L. 1758) - common species, prefers deeper waters, with abundant vegetation (Hufnagel & al. 1999, Ilie 2006); only one specimen found.

Fam. Corixidae

Micronecta (Dichaetonecta) pusilla (Horváth 1895) - prefers shallow waters, is influenced by the surrounding terrestrial habitat; the thermal ecological form *M. pusilla episcopalis* (Horváth 1916) was not found (Hufnagel & al. 1999, Wróblewski 1960).

Sigara sp. - prefers deeper waters; only two individuals found.

Superfamily Pentatomoidea
Fam. Pentatomidae

Graphosoma lineatum (L. 1758)

Order Coleoptera
Fam. Cleridae

Trichodes apiarius (L. 1758)

Fam. Scarabaeidae

Trichius fasciatus (L. 1758)

Cetonia aurata (L. 1758)

Fam. Cerambycidae

Dorcadion (Carinatodorcadion) aethiops Scopoli 1763

Fam. Lucanidae

Lucanus cervus (L. 1758) - strictly protected species in the EU, needs maintaining the old or fallen trees.

Dorcus parallelipipedus (L. 1758)

Fam. Coccinellidae

Harmonia axyridis (Pallas 1773) - Asian invasive species, apparently reproducing in the reserve; f. *spectabilis* observed; the first occurrence was in 2011 (Gagiu 2011).

Order Lepidoptera
Fam. Nymphalidae

Inachis io (L. 1758)

Polygonia c-album (L. 1758)

Fam. Sphingidae

Proserpinus proserpina (Pallas 1772) - IUCN Red List DD, data deficient; strictly protected species in the EU.

Fam. Pieridae

Anthocharis cardamines (L. 1758)

Fam. Papilionidae

Iphiclides podalirius (L. 1758) - on the right bank of the rivulet; this species is an indicator of a relatively well preserved habitat with xerothermic pastures and sylvosteppe vegetation.

Fam. Lycaenidae

Lycaena phlaeas (L. 1761)

Class Actinopterygii
Order Cypriniformes
Fam. Cyprinidae

Scardinius racovitzai Müller 1958 - IUCN Red List CR, critically endangered, endemic for Lake Peţea, prefers thermal, shallow waters with muddy substrate and dense vegetation, optimal temperature 28-34 °C., reproduction in February-March, maturity at 2 years for females and one year for males, may be affected by organic pollution and low, colder water caused by excessive extraction of thermal water; in Dec. 2011 the thermal spring ceased temporarily its activity, therefore a 450 l. aquarium with 25 individuals was set up in the museum for reintroduction of the species if necessary; protected by national law.

Rhodeus amarus (Bloch 1782) - protected by national law; may be affected by draining, pollution and the loss of local Unionids needed for reproduction.

Gobio gobio (L. 1758)

Cyprinus carpio L. 1758 - the wild populations are vulnerable, but many are hybridized with domesticated or Asian, introduced subspecies.

Fam. Cobitidae

Cobitis elongatoides Băcescu & R. Mayer 1969 - protected by national law; ben-

thic, in stagnant or slow running waters, may be affected by pollution and drainings.

Class Amphibia
Order Anura
Fam. Ranidae

Rana dalmatina Bonaparte 1840 - strictly protected species in the EU; occurs mainly in forests, reproduction in March, may be affected by pollution, drainings, and introduction of coniferous trees in deciduous forests.

Class Reptilia
Order Testudines
Fam. Emydidae

Emys orbicularis (L. 1758) - IUCN Red List NT, near threatened; strictly protected species in the EU; rare, in stagnant or slow running waters, with shore vegetation, may be affected by habitat destruction, illegal collecting, destruction of clutches by out of control domestic animals, and the introduction of invasive species like *Trachemys scripta*.

Trachemys scripta elegans (Wied-Neuwied 1839) - Nearctic, invasive species, first observed in the reserve in September 2012, possibly reproducing; may have been introduced by irresponsible pet owners or may have escaped from a nearby ornamental, open air pool in Băile Felix spa, which is housing dozens of *T. scripta elegans*, *T. scripta scripta* and *Chrysemys picta* individuals.

Order Squamata
Fam. Lacertidae

Lacerta agilis argus (Laurenti 1758) - strictly protected species in the EU.

Suborder Serpentes
Fam. Colubridae

Natrix tessellata (Laurenti 1768) - strictly protected species in the EU; may be affected by habitat destruction, pollution, road traffic and killings by ignorant people.

N. natrix (L. 1758)

Zamenis longissimus (Laurenti 1768) - strictly protected species in the EU; two individuals observed: a killed adult and a sub-adult (70 cm, 210 g).

Class Aves
Order Coraciiformes
Fam. Alcedinidae

Alcedo atthis (L. 1758) - protected by national law; territorial species, lives near clean waters with abundant riparian vegetation, nests in a gallery dug out in the shore; bioindicator of a good condition of the ecosystem, may be affected by degradation or fragmentation of habitats, disturbings during the reproduction interval and pollution.

Order Piciformes
Fam. Picidae

Picus canus Gmelin 1788 (protected by national law) or *P. viridis* L. 1758 (strictly protected by national law).

Order Anseriformes
Fam. Anatidae

Anas platyrhynchos L. 1758 - occurs in shallow waters, max. 1 m deep.

Order Gruiformes
Fam. Rallidae

Gallinula chloropus (L. 1758)

Order Galliformes
Fam. Phasianidae

Phasianus colchicus L. 1758

Order Passeriformes
Fam. Acrocephalidae

Acrocephalus arundinaceus (L. 1758)

Fam. Aegithalidae

Aegithalos caudatus (L. 1758)

Fam. Corvidae

Pica pica (L. 1758) - large distribution area, including urban areas.

Garrulus glandarius (L. 1758) - occurs in mixed forests, recently also in urban areas because of habitat destruction.

Order Cuculiformes
Fam. Cuculidae

Cuculus canorus L. 1758

Order Pelecaniformes
Fam. Ardeidae

Nycticorax nycticorax (L. 1758) - protected by national law.

Order Falconiformes
Fam. Falconidae

Falco tinnunculus (L. 1758) - strictly protected by national law.

Class Mammalia
Order Soricomorpha
Fam. Talpidae

Talpa europaea L. 1758.

Conclusions

Of the 83 species observed, 17 have a certain degree of protection status, and 3 are invasive. 26 Odonata species were recorded (10 Zygoptera and 16 Anisoptera), and 10 of them were observed for the first time in the reserve, when

compared to the only other faunistical reports for the area (Lehrer & Bulimar 1979, Manci 2012), including *Pyrrhosoma nymphula,* which is rare in Romania.

The presence and probable establishment of 3 Mediterranean and one African species may be linked to a trend of climate warming in Europe. The influence of climate warming on damselfly and dragonfly distribution can be seen also in the area of Belarus and Poland through the expansion of Mediterranean species (Buczyński & Moroz 2008). Though, the well represented *L. fulva*, a species affected by higher water temperature, may be correlated with the recent, dramatic decrease in the thermal spring flow.

A similar correlation occurs from the dominance of semiaquatic Hemiptera species preferring shallow waters over those preferring deeper waters. Therefore, should legal measures not be taken by the authorized institutions, the survival of the ecosystem in the „Pârâul Peţea" reserve seems extremely problematic, when taking into account the recent cease of the thermal spring flow, the surrounding anthropic pressure and the three invasive species recently observed.

Acknowledgements

Thanks are due to Professor Klaus Schönitzer (Zoologische Staatssammlung München) for kindly providing information on *Micronecta pusilla episcopalis* and the Hungarian Micronectinae, and to dr. Márton Venczel for the help in determining the reptiles and birds.. This monitoring survey was part of the HURO/0901/207/2.2.2 project „Comparative analysis of the regional effects of climatic and environmental changes on aquatic habitats".

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In Memoriam
Paul-Erik Damm (1969 - 2012)

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A scrie la trecut despre Paul Damm este o sarcină dificilă, oricâte cuvinte aş folosi, nu vor fi suficiente pentru a-l descrie pe speologul şi omul Paul DAMM. A fost unul dintre colaboratorii importanţi ai Secţiei de Ştiinţele Naturii din cadrul Muzeului Ţării Crişurilor şi ai revistei Nymphaea, prin urmare prezentarea realizărilor sale în domeniul speologiei şi a listei de publicaţii în revista muzeului este un gest firesc.

Paul-Erik Damm s-a născut la 10. iunie 1969, în oraşul Aleşd, judeţul Bihor. După absolvirea ciclului liceal la Liceul Industrial Aleşd, a urmat din 1994 cursurile Facultăţii de Biologie - Geologie, Secţia Mineralogie, din cadrul Universităţii *Babeş-Bolyai* din Cluj-Napoca. În 1998 a participat la „Universitatea de Vară" organizată de Facultatea de Geologie - Universitatea *Eötvös Loránd* din Budapesta, absolvind cursul *Geologia şi hidrogeologia regiunii nord - nord vestice a Ungariei*, iar în ultimul semestru al facultăţii a obţinut o bursă de studii *Erasmus-Socrates* la Universitatea din Lund-Suedia pe o durată de 5 luni, absolvind cursul *Palaeo-ecological methods and chronology* organizat de Departamentul de Geologie a Cuaternarului. În 1999 a obţinut licenţa cu lucrarea *Studiul geologic şi mineralogic al zonei Valea Rea - Cornu Munţilor (judeţul Bihor)*.

Fiind un împătimit al naturii încă din copilărie, la vârsta de 14 ani s-a înscris în Clubul de Speologie „Z" Oradea, devenind discipolul speologului Liviu Vălenaş.

Pentru a-şi perfecţiona cunoştinţele în domeniul speologiei a parcurs mai multe cursuri de perfecţionare: Stagiul *Explorarea Râurilor Subterane* – 1984 – Casa de Piatră, jud. Alba, *Tehnicile speologiei alpine* – Hodobana, jud. Alba şi *Morfologia Carstică* - 1988 – Valea Firii, jud. Cluj. În 1989 a devenit preşedintele Clubului de Speologie „Z" Oradea, aducându-şi o contribuţie importantă în fondarea *Federaţiei Române de Speologie* şi a *Centrului Regional de Supraveghere Ecologică a Munţilor Apuseni.* În cadrul Federaţiei Române de Speologie a condus Comisia de Ştiinţă şi Comisia de Publicaţii.

După absolvirea facultăţii s-a angajat la Institutul de Speologie *„Emil Racoviţă"* – compartimentul Cluj-Napoca ca geolog – asistent cercetare, unde printre altele a efectuat studii privind reabilitarea captării sursei de apă din P. Pişniţa (M. Pădurea Craiului). Din 2000 a lucrat ca geolog, administrator al Complexului Peştera Ungurului – Şuncuiuş, Oficiul Life Oradea, biroul Aleşd, apoi din 2002 s-a angajat ca geolog, responsabil cu probleme legate de hidrogeologie şi protecţia mediului la SC „Transilvania General Import – Export" SRL.

În 2006 a fost cooptat în echipa Administraţiei Parcului Natural Apuseni unde şi-a desfăşurat activitatea până în 2009, când starea de sănătate i s-a agravat. Nu a renunţat însă niciodată la activitatea speologică, asumându-şi un rol important în organizarea taberelor de explorare a sistemelor carstice din Apuseni.

Activitatea speologică şi geologică

Paul Damm a participat activ la explorări speologice, în special în perimetrul Munţilor Apuseni, descoperind noi peşteri, noi galerii, care au fost topografiate şi studiate din punct de vedere carstologic, geologic şi hidrogeologic. Astfel, a descoperit peste 200 de peşteri, printre care şi Avenul V5, cel mai adânc din ţară.

A topografiat şi a efectuat investigarea ştiinţifică a peste 650 peşteri cu o lungime cumulată de peste 200 km, gestionând arhiva topografică a Clubului de Speologie „Z" Oradea.

A realizat cartografierea geologică a perimetrului Valea Rea - Boga – Sebişel, investigarea geospeologică şi cadastrarea peşterilor din zona Gârda – Ordâncuşa – Ocoale. A efectuat şi a publicat 14 sistematizări dedicate peşterilor din diferite zone carstice ale Munţilor Apuseni, evidenţiind prin marcări de ape cu trasori ecologici 9 sisteme. A descoperit primul paleocarst hidrotermal cu mineralizaţie auriferă din România şi mai multe minerale inedite pentru mediul speleal din ţara noastră, descriind în colaborare cu prof. dr. Bogdan Onac peşteri cu geneză hidrotermală, formate în skarne.

Printre descoperirile de importanţă paleontologică şi arheologică se numără două situri cu herpetofaună fosilă, un punct arheologic complex, de locuire

Neolitică, şi P. din Valea Şesii, care adăposteşte un sit paleontologic important cu oseminte de *Capra ibex.*

A coordonat activitatea de explorare-cartare a Avenului V5 (-653 m denivelare), care deţine Recordul Naţional de Adâncime şi a Peşterii din Valea Rea, cel mai mare „muzeu" speleo-mineralogic al României. A participat la explorările şi cercetările ştiinţifice în majoritatea peşterilor importante din Munţii Bihorului (Humpleu, Hodobana, Zăpodie, Zgurăşti etc).

Activitatea ştiinţifică şi publicistică

Paul Damm a participat activ la sesiuni şi congrese ştiinţifice, întâi ca speolog amator, apoi în calitate de reprezentant al unor instituţii de cercetare. Astfel, a susţinut 7 lucrări în cadrul Simpozionului Internaţional *Theoretical and Applied Karstology*, 4 la sesiunile Conferinţei *Karst 2000* – Cluj Napoca şi 28 de lucrări la sesiunile ştiinţifice ale Congresului Naţional de Speologie. Devine redactor al revistei *Speomond* şi colaborează cu publicaţii ca *Theoretical and Applied Karstology, Travaux de l'Institut de Speleologie „Emille Racovitza", Studia Universitas Babeş-Bolyai, Nymphaea - Folia Naturae Bihariae, National Geographic* şi *Revista Ecocarst*. Încă din studenţie a devenit un colaborator fidel al Muzeului Ţării Crişurilor, publicând regulat în revista *Nymphaea*, editată de muzeul orădean.

Activitatea sa publicistică se concretizează prin publicarea, ca autor sau co-autor, a peste 50 de lucrări, după cum urmează:

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La începutul anului 2012, Paul a pierdut lupta cu boala, a plecat într-o altă lume, unde acum povesteşte despre aventura sa speologică din Munţii Apuseni prietenilor speologi Halasi Gábor, Paul Matoş sau Dénes István, plecaţi şi ei prea devreme dintre noi. Paul a plecat, însă realizările sale în domeniul speologiei vor dăinui peste timp, lucrările şi manuscrisele sale vor ghida noi generaţii de speologi amatori prin labirintul explorărilor speologice.

Cei care l-au cunoscut şi l-au apreciat îşi vor aminti mereu de marea aventură a scurtei sale vieţi.

Prof. univ. dr. Iosif Viehmann - *Institutul de Speologie EMIL RACOVIŢĂ, Cluj***:** „Am fost aproximativ şase ani coleg de coardă, scăriţă şi lampă de carbid cu Paul. Am făcut împreună cinci deplasări de teren. În două dintre ele l-a ajutat şi l-a servit şi pe profesorul conf. dr. Ioan Coroiu, specialist în chiroptere, iar în prezent decanul Facultăţii de Biologie – Geologie. Încă în primele zile după instalarea lui în schema Institutului de Speologie „Emil Racoviţă" Cluj, am spus despre Paul

că este ,,*un al doilea VĂLENAŞ*" (Liviu Vălenaş, reputat specialist al carstului din Bihor). Am văzut lucrările publicate de Paul Damm la Bucureşti, Cluj şi Oradea. Şi împreună cu toţi colegii mei ne-am bucurat de achiziţia acestui nou coleg intrat în schema institutului. Aşa tăcut şi modest cum îl ştim, în sesiunile ştiinţifice, congrese sau simpozioane, cuvântarea lui a fost fără echivoc, iar descoperirile sau concluziile personale acoperite de aplauze. Paul Damm n-a fost un om îndeajuns de fericit. Modestia lui nu i-a îngăduit să dea cu pumnul în masă şi să ceară. Nu s-a găsit omul care să-i dea o locuinţă în care să doarmă peste noapte. Nici în Cluj unde slujea ştiinţific ca o albină în căutare de polen, şi-a improvizat condiţiile de viaţă până când a fost cuprins de boli. Internările vremelnice în spitale nu l-au putut întoarce la o viaţă normală. Paul este încolţit de boli de două ori iar a treia oară ne părăseşte fără apel. În el am găsit adevăratul speolog **pasionat**, nepăsător de sine. Memoria lui RACOVIŢĂ şi tainele peşterii pe care el le-a cunoscut ne obligă astăzi să conchidem că locul liber lăsat pe scara avenului vieţii nu va fi curând înlocuit de un alt Paul Damm."

Dr. Cristian Goran – *Institutul de Speologie „Emil Racoviţă", Bucureşti*: „Un moment foarte trist, o situaţie îngrozitoare pentru familie, prieteni, apropiaţi, o mulţime de planuri, idealuri, speranţe care s-au curmat brusc, dar şi sfârşitul unei foarte grele lupte cu propria-i suferinţă, greutăţile celor din jur şi multe altele pe care nici măcar nu le bănuim. Paul Damm a fost un mare Speolog, într-o permanentă luptă. S-a luptat să descopere sute de peşteri, să înţeleagă şi să găsească marile sisteme din Apuseni, să învingă sistemul federal şi apoi să pună umărul la organizarea lui, să reînvie Clubul „Z", să adune speologi din ţară şi străinătate pentru explorarea marilor sisteme carstice din Bihor, să scoată reviste, să iniţieze simpozioane, concursuri, să ofere celor din jur cât mai multe informaţii, idei şi sprijin. Paul Damm a fost un Speolog fanatic şi un neobosit cercetător al carstului din Apuseni, care s-a luptat pentru Speologie şi şi-a dus lupta până la capăt ignorându-şi sănătatea, propiile nevoi sau neputinţe. Câţi sunt în stare de aşa ceva? Pentru tot ce a făcut şi a lăsat speologiei, Paul trebuie apreciat şi omagiat fără rezerve."

Dr. Leél-Őssy Szabolcs – preşedintele *Asociaţiei Maghiare de Cercetare a Peşterilor şi Carstului* (*Magyar Karszt- és Barlangkutató Társulat):* „Pentru prima dată l-am întâlnit pe Paul în prima jumătate a anilor '90, când a participat la un curs de vară la Universitatea Eötvös Loránd, Budapesta. Atunci era deja membru în legendarul Club „Z" Oradea, desfăşura cu succes munca de cercetare, coordona activităţile de explorare la Valea Rea. După o lună ne-am dat întâlnire la Oradea… Pali a trăit pentru Munţii Bihor, pentru împrejurimile Padişului. Uneori am stabilit

întâlnirea, alteori ne-am întâlnit întâmplător. Atunci când (rareori) eu ajungeam pe acele meleaguri, el „întâmplător" era chiar acolo… Ultima dată s-a întâmplat la fel, cu câţiva ani în urmă. Atunci deja era după o boală gravă, ne-am făcut griji pentru el în ciuda vârstei sale tinere… Tabăra din Vărăşoaia începea pe 6 august, iar eu am ieşit din Cheile Someşului pe data de 4 cu vreo 20 de persoane. La baza poienii era un singur cort: al lui Pali, bineînţeles. De departe îmi făcea semn, să mă apropii. Am povestit îndelung, a servit călătorul însetat: n-am ştiut că aceasta va fi ultima noastră întâlnire… Recompensa vieţii sale profesionale a constat în faptul că de la înfiinţarea parcului natural el a putut coordona activităţile speologice. În această calitate am schimbat adesea e-mailuri. Şi el a urmărit atent corespondenţa electronică a speologilor din Ungaria, reacţiona îndată ce se ivea orice problemă legată de Munţii Bihor. Îi anunţa pe toţi speologii maghiari despre toate modificările legate de regulamente, legislaţie. Întotdeauna i-a ajutat cu sfaturi privind obţinerea de avize şi autorizaţii. Într-o lume a cercetării speologice tot mai birocratizată la nivel mondial, el a fost un punct stabil în planificarea turelor în Bihor sau Pădurea Craiului. Nu numai prietenii, dar şi speologii pe care nu-i cunoştea se puteau baza pe altruismul lui. Azi, când scriu aceste rânduri (august 2012 - n.r.), ar fi trebuit să fiu la Peştera Vârfuraş, dar cel care a planificat tura, a început cu întârziere procedura de obţinere a avizelor. Când am aflat că nu putem merge, primul meu gând a fost Pali: dacă ar fi trăit, dacă nu ne-ar fi lăsat înainte de vreme, acum nu am fi avut griji, în mod sigur ne-ar fi ajutat… Păstrându-i memoria veşnică, cu durere în suflet, în numele speologilor din Ungaria, îmi i-au rămas bun de la Pali."

Dr. Horia Mitrofan – *Institutul de Geodinamică Sabba S. Ştefănescu al Academiei Române; membru de onoare al Clubului „Z":* „Dat fiind că nici speologia - ca mai toate lucrurile din ţara asta - nu a beneficiat de o evoluţie normală (aşa cum se întâmpla, de exemplu, prin alte părţi ale Europei), Pali a crescut sub o aură de „romane cavalereşti": produse ale epocii de temeritate şi maliţie „trade-mark Liviu Vălenaş"; din vremurile când cu câteva piese desperecheate de echipament (procurate „pe sub mână", de peste graniţă - dar de cele mai multe ori improvizate pur şi simplu „pe genunchi", chiar de către cei ce le foloseau), o mână de „desperados" descopereau în munţii României peşteri imense, de o complexitate, o dificultate şi o frumuseţe nebănuite. Iar cei care după mai mulţi ani de „peşterit", încă perseverau să se expună unui astfel de regim, ajunseseră – foarte probabil - să fie convinşi că maşinăria lor anatomo-fiziologică este indestructibilă! În plus, erau vremurile în care relatarea explorării, ori harta unei peşteri nu se puteau publica decât în broşurele obscure, litografiate aproape clandestin, în tiraje minuscule. Nu e deci de mirare că speologii aproape fetişizau acest gen de publicaţii: ele au continuat să

apară şi după 1990, timp de mulţi ani, înainte ca interesul pentru sistematizarea şi conştientizarea patrimoniului subteran să dispară aproape complet, sub avalanşa noilor motivaţii post-decembriste. Pali a fost probabil ultimul exemplar al unei specii extincte, refuzând să accepte păienjenişul de compromisuri şi tentaţii al acestor noi vremuri. A rămas fidel vechiului cod de comportament – „pur şi dur" – în care se închegase speologia de la noi."

Eleonora Mircescu – *Fundaţia ECOTOP, Oradea, membru fondator al Clubului „Z":* „În urmă cu doi ani Paul m-a rugat să scriu un articol pentru *Speomond*, despre carstul în lavă din Lanzarotte. Am tot amânat, ba că nu am inspiraţie, ba că nu am chef….las`că îl scriu mâine... Acum e prea târziu. Ca membru fondator al *Clubului de Speologie „Z"* am urmărit de-a lungul anilor activitatea pe care o desfăşurau membrii clubului. Aşa l-am cunoscut pe Pali Damm. De fapt auzisem multe despre el, dar personal ne-am cunoscut la Zenovia, pe malul Crişului Repede în 2001. Eu eram cu o ceată de copii de la *ECOTOP*, el era administrator la Zenovia. Am intrat cu copiii în Peştera Ungurul Mare, am văzut ce era de văzut, apoi am discutat cu Pali despre Valea Rea şi V5. Acum constat că îmi este foarte greu să vorbesc despre el la trecut. Am fost obişnuiţi să îl avem alături ori de câte ori aveam nevoie de câte o informaţie. Era aşa de simplu, să punem mâna pe telefon şi să întrebăm:

- Alo, Pali, cum e galeria belemniţilor din Gălăşeni, merită să intrăm pe ea, continuă?
- Poţi să ne dai schiţa cu ultimele cartări din Gălăşeni?"

Viorel Lascu – *Federaţia Română de Speologie:* „Pali era un neamţ cu spirit de dac. Nu i-a fost frică de moarte, a privit-o în ochi şi a sfidat-o convins că ce laşi în urma ta e mai important decât tihna. In 29 de ani de speologie a adunat seminţe de cunoaştere în speologie şi le-a împrăştiat în văzduhul cunoaşterii spre oameni născând speologi. Era pentru speologi o adevărată bibliotecă, cu o experienţă profesională impresionantă, posedând vaste cunoştinţe geologice, speologice şi de teren, dobândite din 1983 până în prezent, despre Munţii Bihor, Vlădeasa, Pădurea Craiului, Plopiş, Codru Moma. Ca secretar de redacţie al revistei *Speomond* a pus suflet şi energie nemăsurabilă în apariţia în scrisuri a muncii speologilor. Pentru mine Paul este un fel de Petre Ţuţea al speologilor, dispărut prematur. Dacă ar fi scris câte avea în cap şi câte putea să povestească despre peşterile din Apuseni şi nu numai, speologia ar fi fost mult mai bogată astăzi. Ne rămâne datoria de prieteni de a încerca să publicăm câte ceva din ce a adunat în arhivele scrise şi electronice, aşa cum şi-a dorit, spre folosinţa speologilor şi păstrarea în bună stare a peşterilor."

Mulţumiri

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