

CONTRIBUTIONS TO KNOWLEDGE OF PHYTODIVERSITY OF THE SWAMP ECEDEA

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Abstract: The swamp Ecedea, also known in the Middle Ages by the name “Lacus Etsedensis”, used to occupy an area along the river Crasna, from the town Carei near by the point of its flowing into the Someș river. That was a complex ecosystem, enjoying a wide biodiversity, due to the variation of water pools with sand banks, moors and floating reed islets with water meadows and woods, mezo-hygrophyte to xero-mezophyte meadows with weeds or bushes. Though the area of the swamp was less than 1/10 of what the Danube Delta’s area, it enjoyed a wide phytodiversity, which we estimate to about 650 species of cormophytes (which is over 2/3 of the Danube Delta’s index of species). On account of bibliographic information as well as personal observation in the area of the former swamp, a list of 254 cormophyte species (hydro-, hygro-, and mezo-hygrophytes) was derived, to which an extra 45 aquatic and marshy vegetal groups are added.

Once drained, the swamps were turned into an agricultural zone, of which small areas were temporarily subject to floods (reed). There are 710 cormophyte species in the Ecedea plain, of which 35% are hydrophilous, hygrophilous, and mezo-hygrophilous respectively.

Lately, the reconstruction of the Ecedea swamp has been a serious issue, given its continental significance as a wet area. Of the Romanian portion of the former swamp, the most representative parts for a paludal ecosystem are those near the villages Berveni and Căpleni. We have focused on the plants and hydrophilous and hygrophilous vegetation outside the village Berveni, more specifically the spot named Bekek, N-NW of Berveni. Here exists typical paludal vegetation with coenoses of associations *Phragmitetum australis*, *Lythro-Calamagrostietum*, *Schoenoplectetum lacustris*, *Bolboschoenetum maritimi*, *Caricetum ripariae*, *Typhaetum latifoliae*, *Typhaetum angustifoliae*, *Calamagrostio-Salicetum cinereae*. In the water channels, phytocenoses of *Lemnetum minoris*, *Rorippo-Oenanthetum aquatica*, *Glyceretium maximae* etc. thrive.

The former swamp Ecedea

The swamp Ecedea, also known in the Middle Ages by the name “Lacus Etsedensis” was a complex ecosystem, enjoying a wide biodiversity, due to the variation of water pools with sand banks, moors and floating reed islets with water meadows and woods, mezo-hygrophyte to xero-mezophyte meadows with weeds or bushes. The swamp used to occupy an area of 217 km²-432 km² (according to various measurements made by engineers, but also to the alternating wet and dry seasons); the total area being mentioned most often is 360-380 km² [1]. The long drought of 1861-1865 caused the complete drying of the swamp, but the following decade – rich in waterfall – restored it [1].

Ecedea was a eutrophous swamp in which the most common were coenoses of *Phragmitetum*, *Typhaetum*, and *Caricetum*, water pools (up to 4 m deep), but also hay-fields (on higher grounds). The riverside thickets with common alder (*Alnus glutinosa*) occupied mostly the central and the northern areas of the swamp. The most interesting structures were the floating reed islets; they could reach 2-3 m in thickness as well as large areas (yielding three or four haystacks) [1]. There is a probability that the swamp included *Sphagnum* among its species, a moss discovered during the diggings in the peat-bog of Berveni [13], as well as in the present-day vegetation of swamps near Ecedea [1]. Usually in May, the swamp would become drier and drier, so one could cross it in summer time in a horse-, or ox-drawn cart, or even by foot. Although it occupied less than one tenth of the Danube Delta’s area, the former swamp enjoyed a phytodiversity which we estimate to approximately 650 species of cormophytes (over 2/3 of the Danube Delta index of species).

The swamp was drained to prevent the flooding of the neighbouring localities, to expand agricultural land, to fight malaria and cholera, and to facilitate commerce by means of the newly-gained roads. The first attempts to drain it (unsuccessful) were made in 1749-1751, then in 1760, and in 1778-1784. On 4 July 1895, a vast operation was initiated, this time successfully – in 1899, the swamp was gone as a natural ecosystem [1].

The present-day swamp

The draining of the swamp generated lower edaphic, as well as atmospheric humidity that is the amount of vaporized water, which led to also to a decrease in rainfall and, by way of consequence, to a general dryness in said region. In time, more and more salt came to be stored up in the soil. Most of the land falls in the category VII-IX, i.e. rather poor.

The diggings performed after the draining of the swamp show that the peat layer was 1-1.5 m thick (sometimes up to 2.5 m). It is estimated that peat started forming during the superior Holocene, 7000-8000 years ago [1,13]. Unfortunately, fires that followed the draining of the swamp reduced the amount of peat from 60% to 10%-20%. There are villagers who can still remember the times when “the ground would burn” incessantly – a fact that made the local people develop the habit of baking potatoes and corn in the embers on the fields.

After its draining, the swamp turned to agriculture; corn, wheat, hemp, sugar beet, potatoes, or sunflower crops alternated with meadows or, every here and there, with temporarily flooded areas (reed). The soils are, generally speaking, gleic and semi-peat, or gleic and swampy, and water pools. They were formed in a climate of 9.7°C average multi-annual temperature, and 589.3 mm p.a. precipitation amount (according to Carei meteorological station).

The cormophytes of the Ecedea Plain count up to 710 species [1], of which 35% are hydrophilous, hygrophilous, or mezzo-hygrophilous plants.

Ever since the year 1998, the partial restoration of the swamp Ecedea has been more and more of an issue, given its European relevance as a wet zone. A number of Hungarian, Romanian, as well as European projects were initiated. As a collaborator of such a project financed by WWF Austria, I have undertaken botanical research on the Romanian portion of the former swamp; the findings of this research provide the object of this paper.

Of the Romanian portion of the former swamp, the most representative parts for a paludal ecosystem are those near the villages Berveni and Căpleni. The area has been explored during the past few years by P. Burescu [2,3], as a part of his study on the wet areas of NW Romania. We have focused on the plants and hydrophilous and hygrophilous vegetation outside the village Berveni, more specifically the spot named Bekek, N-NW of the Berveni. Here exists typical paludal vegetation consisting of vast reed (*Phragmitetum australis*) areas, as well as coenoses of *Lythro-Calamagrostietum*, *Schoenoplectetum lacustris*, *Bolboschoenetum maritimi*, *Caricetum ripariae*, *Typhaetum latifoliae*, *Typhaetum angustifoliae*; to the NE, in the area named Nyulos, there is a 12-15 ha area of *Calamagrostio-Salicetum cinereae* with *Populus alba* and *Alnus glutinosa*. In the water channels, aquatic and paludal vegetation thrives.

A comparative study of the vegetation of the former and the present-day ecosystem

In order to have a synthetic view of the plant life in the swamp Ecedea before and after its draining, we introduce in Table no. 1 the aquatic and paludal species observed by botanists between 1796 and 2004.

It is easily noticeable that 17 species of hygro- and hydrophilous plants of the 84 that were either collected or cited in c. XVIII-XIX could not be found on the Romanian part of the former swamp. These are: *Aldrovanda vesiculosa*, *Aulacomnium palustre*, *Carex davalliana*, *Carex flava*, *Cirsium rivulare*, *Cyperus flavescens*, *Dianthus superbus*, *Eriophorum angustifolium*, *Marchantia polymorpha*, *Nymphaea alba*, *Pedicularis palustris*, *Peucedanum palustre*, *Ranunculus lingua*, *Ricciocarpus natans*, *Salix aurita*, *Salix rosmarinifolia*, *Thelypteris*

palustris. The list of aquatic and paludal species was completed in c XX and XXI with other 174 species that, in their vast majority, could as well exist in the old swamp Ecedea. We found, near Bervenì, 94 species of the total of 254 mentioned within the whole perimeter of the swamp in more than 200 years.

Table 1: A list of vegetal taxons indicated in the swamp Ecedea before and after its draining

Crt. No.	Species	Ecedea Swamp before draining (sec. XVIII-XIX)*	Ecedea Plain In channels and swamps (sec. XX-XXI)**	Original data	
				Bekek Swamp Bervenì	Channels near Bekek Swamp
1	<i>Acer negundo</i>	.	X	x	x
2	<i>Agrostis stolonifera</i> (A. hispida)	x	x	x	x
3	<i>Aegopodium podagraria</i>	.	x	.	.
4	<i>Aldrovanda vesiculosa</i>	x	.	.	.
5	<i>Alisma gramineum</i> + var. <i>angustiss.</i>	.	x	.	.
6	<i>Alisma lanceolatum</i>	.	x	.	.
7	<i>Alisma plantago-aquatica</i>	.	x	x	x
8	<i>Allium angulosum</i>	.	x	.	.
9	<i>Alopecurus aequalis</i>	.	x	.	.
10	<i>Alopecurus geniculatus</i>	.	X	.	x
11	<i>Alopecurus pratensis</i>	.	x	x	x
12	<i>Alnus glutinosa</i>	x	.	x	.
13	<i>Angelica sylvestris</i>	x	x	.	.
14	<i>Aster sedifolius</i>	.	x	.	.
15	<i>Aster tripolium</i> ssp. <i>pannonicus</i>	.	x	.	.
16	<i>Athyrium filix-femina</i>	.	X	.	.
17	<i>Aulacomnium palustre</i>	x	.	.	.
18	<i>Beckmannia eruciformis</i>	.	x	.	.
19	<i>Berula erecta</i>	.	x	.	.
20	<i>Betula pubescens</i>	x	x	.	.
21	<i>Bidens cernua</i>	.	x	.	.
22	<i>Bidens tripartita</i>	.	x	.	x
23	<i>Bolboschoenus maritimus</i>	.	X	x	x
24	<i>Butomus umbellatus</i>	.	X	.	x
25	<i>Calamagrostis canescens</i>	.	x	.	.
26	<i>Calamagrostis epigeios</i>	x	x	x	.
27	<i>Calliergonella cuspidata</i>	x	x	.	.
28	<i>Callitriche cophocarpa</i>	.	x	x	.
29	<i>Callitriche palustris</i>	.	x	.	.
30	<i>Caltha palustris</i> (ssp. <i>laeta</i>)	x	x	.	.
31	<i>Calystegia sepium</i>	x	x	x	x
32	<i>Cardamine pratensis</i> ssp. <i>matthioli</i>	.	x	.	.
33	<i>Carex acutiformis</i>	.	x	.	.
34	<i>Carex davalliana</i> (C. <i>dioica</i>)	x	.	.	.
35	<i>Carex distans</i>	.	X	.	x
36	<i>Carex disticha</i>	.	X	.	.
37	<i>Carex divisa</i>	.	X	x	.
38	<i>Carex divulsa</i>	.	X	x	.
39	<i>Carex elata</i>	x	x	.	.
40	<i>Carex flacca</i>	.	x	.	.
41	<i>Carex flava</i>	x	.	.	.
42	<i>Carex gracilis</i> (C. <i>acuta</i>)	x	X	.	x
43	<i>Carex hirta</i>	.	x	.	x

44	Carex hordeistychos	x	x	.	.
45	Carex leporina	.	X	.	x
46	Carex melanostachya	.	X	.	.
47	Carex otrubae	.	x	.	.
48	Carex pallescens	.	X	.	.
49	Carex panicea	x	x	.	.
50	Carex pseudocyperus	.	X	.	.
51	Carex remota	.	X	.	.
52	Carex riparia	.	x	x	x
53	Carex vesicaria	.	x	.	.
54	Carex vulpina	.	x	x	x
55	Catabrosa aquatica	.	x	x	x
56	Centaurium pulchellum	.	X	.	.
57	Ceratophyllum demersum	.	X	.	x
58	Ceratophyllum submersum	.	X	.	x
59	Chenopodium ficifolium	.	X	.	.
60	Chenopodium glaucum	.	x	.	.
61	Chenopodium rubrum	.	x	.	.
62	Cicuta virosa	x	x	.	.
63	Cirsium brachycephalum	.	X	x	.
64	Cirsium canum	.	x	x	.
65	Cirsium palustre	x	x	.	.
66	Cirsium rivulare	x	.	.	.
67	Cyperus flavescens	x	.	.	.
68	Cyperus fuscus + var. virescens	x	x	.	.
69	Deschampsia caespitosa	.	x	.	.
70	Dianthus superbus	x	.	.	.
71	Drepanocladus aduncus	x	x	.	.
72	Dryopteris filix-mas	x	x	.	.
73	Echinocystis lobata	.	x	.	.
74	Elatine alsinastrum	.	x	.	.
75	Elatine triandra	.	x	.	.
76	Eleocharis palustris	x	x	x	.
77	Epilobium angustifolium	.	x	.	.
78	Epilobium hirsutum	.	x	x	x
79	Epilobium obscurum	.	x	.	.
80	Epilobium palustre	x	X	.	.
81	Epilobium parviflorum	.	x	.	.
82	Epilobium tetragonum	.	x	.	.
83	Epipactis palustris	x	x	.	.
84	Equisetum palustre	.	x	.	.
85	Eriophorum angustifolium	x	.	.	.
86	Eupatorium cannabinum	x	x	.	.
87	Euphorbia lucida	.	X	.	x
88	Euphorbia villosa	.	X	.	.
89	Festuca arundinacea	.	X	x	.
90	Festuca gigantea	.	X	.	.
91	Festuca pratensis	.	x	x	.
92	Filipendula ulmaria	x	x	.	.
93	Galega officinalis	.	x	.	.
94	Galium palustre incl. ssp. elongatum	.	x	x	x
95	Galium uliginosum	x	x	.	.
96	Gentiana pneumonanthe	.	x	.	.
97	Gnaphalium uliginosum	.	X	.	.
98	Gratiola officinalis	.	x	.	.

99	<i>Glyceria fluitans</i>	.	X	X	.
100	<i>Glyceria maxima</i> + var. <i>arundinacea</i>	X	X	X	X
101	<i>Glyceria plicata</i>	.	X	.	X
102	<i>Gratiola officinalis</i>	.	X	.	.
103	<i>Heleochoa alopecuroides</i>	.	X	.	.
104	<i>Heleochoa schoenoides</i>	.	X	.	.
105	<i>Holcus lanatus</i>	X	X	.	X
106	<i>Hydrocharis morsus-ranae</i>	X	X	.	X
107	<i>Iris pseudacorus</i>	X	X	.	.
108	<i>Juncus articulatus</i>	X	X	.	X
109	<i>Juncus atratus</i>	.	X	.	.
110	<i>Juncus bufonius</i>	X	X	X	.
111	<i>Juncus bulbosus</i>	X	X	.	.
112	<i>Juncus compressus</i> + var. <i>dianthelus</i>	.	X	.	.
113	<i>Juncus conglomeratus</i>	X	X	X	X
114	<i>Juncus effusus</i>	.	X	X	.
115	<i>Juncus gerardii</i> + var. <i>maximus</i>	.	X	.	.
116	<i>Juncus inflexus</i>	.	X	.	.
117	<i>Juncus tenuis</i>	.	X	X	.
118	<i>Lathyrus palustris</i>	X	X	.	.
119	<i>Leersia oryzoides</i>	.	X	.	.
120	<i>Lemna gibba</i>	.	X	.	.
121	<i>Lemna minor</i>	.	X	X	X
122	<i>Lemna trisulca</i>	.	X	.	X
123	<i>Limosella aquatica</i>	.	X	.	.
124	<i>Lindernia procumbens</i>	.	X	.	.
125	<i>Lychnis flos-cuculi</i>	X	X	.	.
126	<i>Lycopus europaeus</i>	X	X	X	X
127	<i>Lycopus exaltatus</i>	.	X	X	.
128	<i>Lysimachia nummularia</i>	.	X	X	X
129	<i>Lysimachia vulgaris</i>	X	X	X	X
130	<i>Lythrum hyssopifolia</i>	.	X	.	.
131	<i>Lythrum salicaria</i>	X	X	X	X
132	<i>Lythrum virgatum</i>	.	X	X	.
133	<i>Marchantia polymorpha</i>	X	.	.	.
134	<i>Marsilea quadrifolia</i>	.	X	.	.
135	<i>Mentha aquatica</i>	.	X	X	X
136	<i>Mentha longifolia</i>	.	X	X	X
137	<i>Mentha pulegium</i>	.	X	.	.
138	<i>Mentha x verticillata</i>	.	X	.	.
139	<i>Myosotis caespitosa</i>	.	X	.	X
140	<i>Myosotis scorpioides</i>	X	X	.	.
141	<i>Myosoton aquaticum</i>	.	X	X	X
142	<i>Myosurus minimus</i>	.	X	.	.
143	<i>Myriophyllum spicatum</i>	.	X	.	.
144	<i>Myriophyllum verticillatum</i>	.	X	.	X
145	<i>Najas marina</i>	.	X	.	.
146	<i>Najas minor</i>	.	X	.	.
147	<i>Nuphar lutea</i>	X	X	.	.
148	<i>Nymphaea alba</i>	X	.	.	.
149	<i>Oenanthe aquatica</i>	.	X	X	X
150	<i>Oenanthe silaifolia</i>	.	X	.	.
151	<i>Orchis laxiflora</i> ssp. <i>elegans</i> & <i>palustris</i>	.	X	.	.
152	<i>Pedicularis palustris</i>	X	.	.	.
153	<i>Peplis portula</i>	.	X	.	.

154	Peucedanum palustre	X	.	.	.
155	Phalaris arundinacea	.	X	.	X
156	Phleum pratense	.	X	.	.
157	Phragmites australis	X	X	X	X
158	Plantago maritima	.	X	.	.
159	Poa palustris	X	X	.	.
160	Poa trivialis	X	X	.	X
161	Polygonum amphibium f. terrestre	.	X	X	X
162	Polygonum hydropiper	X	X	.	X
163	P. lapathifolium incl. ssp. incanum	.	X	.	X
164	Polygonum persicaria	.	X	.	X
165	Populus alba	.	X	X	.
166	Populus nigra	.	X	X	.
167	Potamogeton crispus + f. cornutus	.	X	.	.
168	Potamogeton natans	X	X	.	.
169	Potamogeton nodosus	.	X	.	X
170	Potamogeton pectinatus	.	X	.	X
171	Potentilla anserina	.	X	.	X
172	Potentilla reptans	.	X	X	X
173	Potentilla supina	.	X	.	X
174	Pulicaria dysenterica	.	X	.	.
175	Pulicaria vulgaris	.	X	.	.
176	Ranunculus acris	X	X	X	X
177	Ranunculus flammula	.	X	.	.
178	Ranunculus lateriflorus	.	X	.	.
179	Ranunculus lingua	X	.	.	.
180	Ranunculus aquatilis ssp. radians	.	X	.	.
181	Ranunculus repens	.	X	X	X
182	Ranunculus sardous	.	X	.	.
183	Ranunculus sceleratus	.	X	X	X
184	Ranunculus strigosus	.	X	.	.
185	Ranunculus trichophyllus	.	X	.	X
186	Ricciocarpus natans (Riccia natans)	X	.	.	.
187	Rorippa amphibia + f. aquatica	X	X	X	X
188	Rorippa austriaca	.	X	.	.
189	Rorippa islandica	.	X	.	.
190	Rorippa sylvestris incl. ssp. kernerii	.	X	X	.
191	Rorippa x armoracioides	.	X	.	.
192	Rorippa x astyla	.	X	.	.
193	Rumex aquaticus	X	X	.	.
194	Rumex conglomeratus	X	X	.	X
195	Rumex crispus	X	X	X	X
196	Rumex hydrolapathum	.	X	X	.
197	Rumex obtusifolius	.	X	.	.
198	Rumex palustris	.	X	.	.
199	Rumex sanguineus	.	X	.	.
200	Rumex stenophyllus	.	X	.	.
201	Rumex x stenophylloides	.	X	.	.
202	Sagittaria sagittifolia + f. vallisnerifol.	.	X	.	.
203	Salix alba	X	X	X	.
204	Salix aurita	X	.	.	.
205	Salix cinerea	.	X	X	X
206	Salix fragilis	.	X	X	X
207	Salix purpurea	.	X	.	.
208	Salix rosmarinifolia (S. incubacea)	X	.	.	.

209	<i>Salix triandra</i>	.	X	.	X
210	<i>Salix viminalis</i>	.	X	X	.
211	<i>Salvinia natans</i>	X	X	.	.
212	<i>Sanguisorba officinalis</i>	.	x	.	.
213	<i>Schoenoplectus lacustris</i>	x	x	X	X
214	<i>Schoenoplectus mucronatus</i>	.	x	.	.
215	<i>Schoenoplectus tabernaemontanus</i>	.	X	.	.
216	<i>Scrophularia umbrosa</i>	.	x	.	.
217	<i>Scutellaria galericulata</i>	X	x	.	.
218	<i>Scutellaria hastifolia</i>	.	X	X	X
219	<i>Senecio barbaraeifolius</i>	.	x	.	.
220	<i>Senecio paludosus</i>	X	x	.	.
221	<i>Serratula tinctoria</i>	.	x	.	.
222	<i>Sium latifolium</i>	X	X	.	X
223	<i>Solanum dulcamara</i>	x	X	X	X
224	<i>Sonchus arvensis</i> ssp. <i>uliginosus</i>	x	x	.	.
225	<i>Sonchus palustris</i>	x	x	.	.
226	<i>Sparganium emersum</i>	.	x	.	.
227	<i>Sparganium erectum</i> ssp. <i>neglectum</i>	.	X	.	.
228	<i>Spergularia rubra</i>	.	x	.	.
229	<i>Spirodela polyrrhiza</i>	.	X	.	.
230	<i>Stachys palustris</i>	X	x	X	.
231	<i>Stellaria palustris</i>	.	x	.	.
232	<i>Stratiotes aloides</i>	x	x	.	.
233	<i>Succisa pratensis</i>	.	x	.	.
234	<i>Symphytum</i> off. incl. ssp. <i>uliginosum</i>	x	x	X	X
235	<i>Teucrium scordium</i>	.	x	.	.
236	<i>Thalictrum flavum</i>	X	x	.	.
237	<i>Thalictrum lucidum</i>	.	x	.	.
238	<i>Thalictrum simplex</i>	.	x	.	.
239	<i>Thelypteris palustris</i>	X	.	.	.
240	<i>Trapa natans</i>	X	x	.	.
241	<i>Trifolium hybridum</i>	.	.	X	X
242	<i>Triglochin palustris</i>	x	X	.	.
243	<i>Typha angustifolia</i>	x	x	.	X
244	<i>Typha latifolia</i>	x	x	X	X
245	<i>Typha laxmannii</i>	.	x	.	.
246	<i>Utricularia vulgaris</i>	.	X	.	X
247	<i>Valeriana officinalis</i>	X	x	.	X
248	<i>Veronica acinifolia</i>	.	x	.	.
249	<i>Veronica anagallis-aquatica</i>	.	X	X	.
250	<i>Veronica anagallioides</i>	.	x	.	.
251	<i>Veronica catenata</i>	.	x	.	.
252	<i>Veronica longifolia</i>	x	x	.	.
253	<i>Veronica scutellata</i>	.	x	.	.
254	<i>Wolffia arrhiza</i>	.	x	.	.

* After A. Pokorný [12], A. Kanitz [9], A. Kerner [10], K. Géresi [5], S Jávorka [7,8], S. Lovassy [11], E. Gombocz [6], E. Pop [13-14]. The vast majority of the plant species indicated in the swamp before its draining was collected by P. Kitaibel in 1796, which crossed the swamp in a cart, from Bervení to Nagyecsed.

**After G. Ardelean and K. Karacsony [1], P. Burescu [3] and I. Prodan [15]. The species marked with X reported also by Bervení

Note: The nomenclature is after Tr. Săvulescu (red.) [16].

Present vegetation

Present-day aquatic and paludal vegetation, set up on the former location of the swamp Ecedea (Romanian sector) is represented by the following vegetal groups (the list of coenotaxons is based on the personal observation and information from the studies of P. Burescu [3] and G. Ardelean and K. Karacsony [1]): *Lemnetum minoris**, *Lemnetum gibbae*, *Lemno-Utricularietum**, *Lemno-Salvinieta natantis**, *Hydrochari-Stratiotetum*, *Batrachietum trichophylli**, *Potametum crispum*, *Polygono-Potametum natantis*, *Ceratophylletum demersi*, *Ceratophylletum submersi**, *Myriophyllo-Potametum*, *Potametum pectinati*, *Phragmitetum australis**, *Typhaetum angustifoliae**, *Typhaetum latifoliae**, *Schoenoplectetum lacustris**, *Glycerietum maximae**, *Bolboschoenetum maritimi**, *Caricetum acutiformis*, *Caricetum ripariae**, *Caricetum vesicariae*, *Caricetum distichae*, *Phalaridetum arundinaceae*, *Pulicario-Menthetum pulegii*, *Glycerietum fluitantis**, *Sparganietum erecti*, *Spirodeletum polyrrhizae*, *Marsileaetum quadrifoliae*, *Alismato-Eleocharietum**, *Rorippo amphibiae-Oenanthetum aquaticae**, *Irideto-Caricetum otrubae*, *Festucetum pratensis**, *Agrostio-Alopecuretum pratensis**, *Agrostio-Eleochariti-Alopecuretum geniculati*, *Agrostio-Beckmannietum*, *Polygono lapathifolii-Bidentetum tripartiti**, *Rumicetum limosae*, *Echinochloo-Polygonetum lapathifolii**, *Rumici-Alopecuretum geniculati*, *Lolio-Potentilletum anserinae*, *Juncetum effusi**, *Lythro-Calamagrostietum epigei**, *Salicetum triandrae*, *Calamagrostio-Salicetum cinereae** (*vegetal groups extant on the territory recommended for protection).

The phytocoenological research that we have conducted at Bekek points out the vigour of certain vegetal hygro- and hydrophilous groups that may constitute nuclei for future expansion of paludal and aquatic species. Such nuclei are at present either surrounded by or intertwined with *Solanum tuberosum*, *Beta vulgaris*, *Triticum vulgare*, *Hordeum sativum*, *Helianthus tuberosus*, *Zea mays*, *Cannabis sativa*, crops, fallow grounds, or hay-fields. In fallow-grounds and in cultivated areas, the following weeds are present: *Cirsium arvense*, *Matricaria inodora*, *Lathyrus tuberosus*, *Convolvulus arvensis*, *Agropyron repens*, *Erigeron canadensis*, *Carduus acanthoides*, *Medicago lupulina*, *Rubus caesius*, *Symphytum officinale*, *Roripa silvestris*, *Artemisia vulgaris*, *Descurainia sophia*, *Xanthium italicum*, *Rumex stenophyllus*, *Arctium lappa*, *Hordeum murinum*, *Urtica dioica*, *Trifolium repens*, *Phragmites australis*, *Vicia tetrasperma*, *Lathyrus hirsutus*, *Ranunculus repens*, *Lactuca serriola*, *Capsella bursa-pastoris*, *Rumex crispus*, *Sonchus arvensis*, *Polygonum aviculare*, *Sinapis arvensis*, *Stellaria media*, *Polygonum persicaria*, *Brassica rapa*, *Equisetum arvense* a.o.

In Tables 2 and 3 we introduce the phytocoenological surveys performed in Bekek (N-NW of Bervenii), surveys that reveal the structure of several coenoses that fall into eight of the vegetal groups we have studied most rigorously.

Table 2: The vegetation of present-day swamp at Bekek-Bervenii (Satu Mare County)

Species/Relevé No.	1	2	3	4	5	6	7
<i>Phragmites australis</i>	5	4	4	1	1	-	-
<i>Typha latifolia</i>	+	+	-	4	-	-	-
<i>Lycopus europaeus</i>	+	+	+	+	1	+	+
<i>Glyceria aquatica</i>	+	1	-	+	-	1	-
<i>Oenanthe aquatica</i>	+	1	+	+	+	1	1
<i>Lysimachia vulgaris</i>	-	+	-	-	-	+	-
<i>Carex riparia</i>	+	-	-	+	-	+	-
<i>Mentha aquatica</i>	+	+	+	+	1	2	-
<i>Alisma plantago-aquatica</i>	-	+	-	+	+	1	+
<i>Lysimachia nummularia</i>	+	-	+	-	+	+	-
<i>Cirsium brachycephalum</i>	+	-	-	-	-	-	-
<i>Symphytum officinale</i>	+	+	+		+	+	
<i>Juncus effusus</i>	+	-	-	+	+	-	1

<i>Agrostis stolonifera</i>	+	1	+	-	1	+	2
<i>Ranunculus repens</i>	+	+	+	-	+	+	-
<i>Polygonum lapathifolium</i>	+	-	-	-	-	-	-
<i>Rumex crispus</i>	+	-	+	-	+	+	+
<i>Eleocharis palustris</i>	-	+	+	+	+	-	1
<i>Calamagrostis epigeios</i>	-	-	+	-	4	-	-
<i>Lythrum salicaria</i>	-	-	+	-	1	+	+
<i>Schoenoplectus lacustris</i>	-	-	-	+	-	4	-
<i>Glyceria fluitans</i>	-	-	+	-	+	+	-
<i>Bolboschoenus maritimus</i>	-	-	-	-	-	+	3
<i>Veronica anagallis-aquatica</i>	-	-	+	-	+	-	+
<i>Ranunculus acris</i>	-	-	-	-	+	+	-
<i>Stachys palustris</i>	-	-	+	-	1	+	-
<i>Rorippa amphibia</i>	-	-	-	+	-	+	+
<i>Alopecurus aequalis</i>	+	-	-	-	-	-	+
<i>Juncus buffonius</i>	-	-	-	-	-	-	+
<i>Lathyrus hirsutus</i>	-	-	-	-	+	-	-
<i>Carex vulpina</i>	-	-	-	-	-	-	+
<i>Juncus inflexus</i>	-	-	-	-	-	-	+
<i>Trifolium hybridum</i>	-	-	+	-	+	+	1
<i>Rorippa silvestris</i>	-	-	-	-	+	+	+

Legend: 1-3 *Phragmitetum australis*, 4 *Typhaetum latifoliae*, 5 *Lythro-Calamagrostietum*, 6 *Schoenoplectetum lacustris*, 7 *Bolboschoenetum maritimi*

All surveys performed the swamp Bekek, N-NW of Berveni, 22 May 2004 and 12 June 2004

Table 3: Vegetation in the channels round the swamp Bekek-Berveni (Satu Mare County)

<i>Species/Relevé No.</i>	1	2	3	4	5
<i>Lemna minor</i>	5	4	1	2	-
<i>Lemna trisulca</i>	+	1	+	-	-
<i>Ceratophyllum demersum</i>	+	-	+	-	-
<i>Hydrocharis morsus-ranae</i>	-	+	-	-	-
<i>Potamogeton trichoides</i>	-	+	-	-	-
<i>Alisma plantago-aquatica</i>	+	+	+	-	+
<i>Oenanthe aquatica</i>	+	1	4	3	+
<i>Glyceria aquatica</i>	1	+	1	+	4
<i>Typha latifolia</i>	+	-	+	1	1
<i>Lycopus europaeus</i>	+	+	-	-	+
<i>Rorippa amphibia</i>	-	-	+	1	+
<i>Mentha aquatica</i>	-	-	-	+	+
<i>Lysimachia vulgaris</i>	-	-	-	+	-
<i>Carex riparia</i>	-	-	-	+	+
<i>Glyceria fluitans</i>	-	-	+	-	-
<i>Schoenoplectus lacustris</i>	-	-	-	+	+
<i>Lythrum salicaria</i>	-	-	-	-	+
<i>Symphytum officinale</i>	-	-	-	-	+
<i>Agrostis stolonifera</i>	-	-	-	-	+
<i>Ranunculus repens</i>	-	-	-	-	+

Legend: 1-2 *Lemnetum minoris*, 3-4 *Rorippo-Oenanthetum aquaticae*, 5 *Glycerietum maximae*
Surveys were carried out in the channels round the swamp Bekek, N-NW of Berveni, 22 May and 12 June 2004.

The future natural, protected area

This territory is worth being preserved and integrated into a trans-national, Hungarian-Romanian natural area. One first reason to do so is its vegetation, typical for wet areas, including some rare (for this region) species, such as: *Alnus glutinosa*, *Carex divisa*, *Carex pseudocyperus*, *Cirsium brachycephalum*, *Juncus atratus*, *Juncus bulbosus*, *Urticularia vulgaris* and so on. A second reason: it is part of the former swamp Ecedea. And a third one goes, it is neighboured by other quite interesting, biologically speaking, wet areas, both in Romania (Căpleni) and in Hungary (Nagyecsed). The swamp extends across the state border, in Hungary, where we noticed luxurious arboricolous vegetation, typical for the wet plains (*Salicetum albae-fragilis*, *Salicetum triandrae*, *Salici-Populetum*, *Fraxino-Ulmetum*).

If the over 150 ha Romanian swampy area (111-113 m in altitude) N of Berveni (Bekek + Nyulas), and another 200 ha area (including arboricolous vegetation that is typical for wet areas) in Hungary are declared a natural reserve, we could have a natural habitat that would allow the restoration of the old structure and morphology of the former swamp. In order to raise the level of phreatic as well as surface water, several channels that border the perimeter could be closed up. Plants and animals could emerge from the present-day permanently swampy areas and channels, they would populate a large territory. We could reach a phytodiversity of over 200 aquatic and paludal species (cf. the 303 hydrophilous, hygrophilous, and mezzo-hygrophilous species of the Danube Delta).

The preserved swamp will contribute to the diversification of the local habitats and will play an important role in maintaining the natural balance. We can estimate that it will take two decades after the closing up of the channels that a swamp like that at the middle of the 19th century will be established.

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CONTRIBUȚII LA CUNOAȘTEREA FITODIVERSITĂȚII MLAȘTINII ECEDEA

(Rezumat)

Mlaștina Ecedea, cunoscută în Evul Mediu și sub numele "Lacus Etsedensis" se întindea de-a lungul Crasnei de la Carei până aproape de confluența acestui râu cu Someșul. A fost un ecosistem complex, cu o mare biodiversitate dată de alternanța ochiurilor de apă (bălților) cu grindurile de nisip și insulele, de terenurile înmlăștinite și plaur cu zăvoaiele și pădurile de luncă, de pajiștile mezohigrofile până la xeromezofile cu buruienșurile și tufișurile. Deși reprezenta mai puțin de o zecime din suprafața Deltei Dunării avea o mare fitodiversitate pe care o apreciem la cca. 650 specii de cormofite (peste 2/3 din flora Deltei Dunării). Pe baza informațiilor bibliografice și a observațiilor personale din perimetrul fostei mlaștini s-a întocmit o listă cu 254 cormofite hidro-, higo- și mezohigrofile și 45 asociații vegetale acvatice și palustre.

După asanare mlaștina a devenit teren agricol cu mici suprafețe temporar inundate (trestiișuri). Cormoflora Câmpiei Ecedei apărută în locul fostei mlaștini numără 710 specii din care 35% sunt plante hidrofile, higofile și mezohigrofile.

În ultimul timp se pune tot mai pregnant problema reconstrucției parțiale a mlaștinii Ecedea, dată fiind valoarea sa europeană ca zonă umedă. Din sectorul românesc al fostei mlaștini Ecedea cele mai reprezentative porțiuni pentru un ecosistem palustru aparțin localităților Berveni și Căpleni. Autorul și-a focalizat atenția asupra florei și vegetației higofile și hidrofile de pe hotarul localității Berveni, mai exact locul numit Bekek, la N-NV de sat. Aici există o vegetație palustră caracteristică cu întinse trestiișuri (*Phragmitetum*) și cenoze de trestioară (*Lythro-Calamagrostietum*), rogozișuri (*Schoenoplectetum lacustris*, *Bolboschoenetum*, *Caricetum*), păpurișuri (*Typhaetum*), iar ceva mai la NE în locul numit Nyulos este și un pâlț de 12-15 ha cu răchitiș (*Calamagrostio-Salicetum cinereae*) cu plop alb (*Populus alba*) și exemplare izolate de arin (*Alnus glutinosa*). În apa canalelor se dezvoltă bine fitocenoze ale asociațiilor: *Lemnetum minoris*, *Rorippo-Oenanthetum aquaticae*, *Glycerietum maximae* ș.a.