RESEARCH ON SEVERAL RARE PHYTOCOENOSES IN THE BANAT VEGETATION

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Abstract: *Our research pursues the study of some rare aquatic and paludicolous phytocoenoses from the Banat vegetation, with a view to completing the data existing in the specialized bibliography for the region indicated and the preservation of certain species. The aquatic and paludicolous vegetation, though deemed by many as known well enough, sometimes shelters rare phytocoenoses and species, whose study is important, from the perspective of preserving biodiversity. After referring to the specialized literature, we have noted that the edified phytocoenoses of Najas minor, Leersia oryzoides and Ceratophyllum demersum, encountered by us at Surduc and Liebling, have not been signalled in Banat until now. Additionally, according to the European habitat classification systems, their conservative value is high, a decisive factor for their study. Also, we have made some comments on edified phytocoenoses of Eleocharis acicularis, which, although were still signalled and described in Banat, today they are interesting due to the changes occurred in the floristic composition. On this occasion we have signalled the presence of the species Lindernia procumbens which, according to O.U. 57/ 20.06.2007, on the regime of the protected natural areas, the preservation of natural habitats, of the wild flora and fauna, is encountered on the list of the species of community interest under strict protection. Our research has been performed in the period 2005-2009 and was based on the principles of the Central-European Phytocoenological School, implying the study on the field of the vegetal communities (consisting in performing phytocoenologic sampling and noting all particularities) and in the laboratory (where we performed the data processing and their analysis and interpretation). We consider it expedient to know these phytocoenoses due to their rarity in the Banat vegetation, their significance in the succesion process and the fact that they shelter conservatively valuable species*

Key words: *phytocoenoses, biodiversity, conservation*

INTRODUCTION

The artificial wet areas in Banat are today clearly better represented than the natural ones (technically reduced to the marshes in Satchinez). Whether it is about lakes, ponds, moors etc., they offer an interesting study at least from the point of view of flora and vegetation. Our researches performed in the area of several accumulation lakes, emphasized the presence of some less known phytocoenoses in the Banat vegetation.

MATERIAL AND METHODS

The research on the aquatic and paludicolous vegetation in some accumulation lakes (in the paper we discuss specifically about the lakes Surduc and Liebling) were performed in the period 2005-2009. They consisted in various field trips, on which occasion we performed samplings that presented us varied phytocoenoses. Also, we have also noted all the particularities we encountered. The field data were processed in the laboratory, according to the principles of the Central-European floristic phytocoenologic school. The similar phytocoenoses were grouped in synthetic charts based on which we then achieved the description of the vegetation, considering several aspects (chorology, floristic composition and sinmorphology, siecology, cenotaxonomy, sindynamics, importance, conservative value).

RESULTS AND DISCUSSION

Following the processing of the field data and analyzing the specialized bibliography, we have noted that the edified phytocoenoses of *Najas minor* All., *Leersia oryzoides* (L.) Swartz. and *Ceratophyllum demersum* L. are rare for the Banat vegetation. They are described in what follows.

Ceratophylletum demersi (Soó 1927) Hild 1956 (Rigid Hornwort association)

Chorology (SANDA, 2002): In our country the association is less signalled (in Moldova, Muntenia, Danube Delta): SÂRBU *et al.*, 2000 (Wolves' Hill), POPESCU *et al.*, 1984 (Muntenia Plain) etc. In Banat they have not been signaled so far.

Floristic composition and sinmorphology: In the 4 samplings performed, we have identified 10 species (table 1). The characteristic and dominant species is of *Ceratophyllum demersum* L. Other species characteristic for the association and which are encountered in our samplings are *Lemna minor* L. and *Potamogeton natans* L. In the phytocoenoses analyzed by us, also appear: *Alisma plantago-aquatica* L., *Eleocharis palustris* (L.) Roemer et Schultes, *Mentha aquatica* L., *Oenanthe aquatica* (L.) Poiret, *Typha latifolia* L.

Sinecology: *Ceratophylletum demersi* is a submerssive-natant association especially encountered in still waters. Rigid Hornwort grows well in colmated, eutrophic waters (the species is nitrophilic), with depths of 0.5 – 1.5 m, near reed or where the paludicolous vegetation is absent. It prefers optimal lighting and sheltered places, where the currents and waves are few. The stalks bear significant nutation and torsion movements. Although the species makes little fruit, it spreads quickly because it has two forms, a summer and a winter one. In spring, on the plants from the previous years new branches grow, summer ones, a few meters long and very thick, forming massive vegetation. The leaves of the summer forms are smaller and softer, and the stalks less fragile. The winter forms are vigorous, large quantities of reserve substances accumulating at their level. Rigid Hornwort forms compact groups, arranged as a buffer for the currents and which helps the laying and forming of a consistent suspensions layer. The analysis of the ecological indexes reveals the hydrophilic character (70%), the micro-mesothermic one (70%), amphitolerant and weakly acid-neutrophilic (50%) of the association. From the bioforms study results that the majority of the species are helohidatophites (90 %), and regarding the floristic elements, the cosmopolite species are predominant (70 %).

Cenotaxonomy: Cls. LEMNETEA W. Koch et Tx. 1934, Ord. *Hydrocharietalia* Rübel 1933, Al. *Ceratophyllion* Den Hartog et Segal 1964

Sindynamics: In the floristic composition of the phytocoenoses, there are associated species of al. *Phragmition*, which indicates a possible evolutive direction. When draining works are carried out in the areas it populates, the association regresses.

Importance: In some authors' opinion, rigid hornwort is noxious, under it a milky precipitate forms which is toxic for fish. When it grows abundantly at the water surface, it hinders the appearance of other species.

Najadetum minoris Ubrizsy 1948, 1961 (association of small linnet)

Chorology (SANDA, 2002): The association is less known in our country (MITITELU, 1971 – Elanului Depression). In Banat it is not signaled.

Floristic composition and sinmorphology: In the 3 samplings performed, we have identified only 4 species (table 2), thus being confirmed the low diversity of this community. The characteristic and dominant species is *Najas minor* All. that often appears alone, without the participation of other species. In our samples, it is accompanied by *Myriophyllum spicatum* L., *Lemna minor* L., *Potamogeton crispus* L.

Table 1

Synthetic chart with phytocoenoses from the association *Ceratophylletum demersi* (SOÓ 1927) HILD 1956

					Altitude (m)	94	94	196	194
					General coverage (%)	85	95	100	95
					Vegetation height (cm)	130	-	180	150
					Area (m²)	2	2	3	4
					Sample number	1	2	3	4
Bioform	Geoelement	U	T	R					
HH	Cosm	6	3	0	*Ceratophyllum demersum* L.	3.5	3.5	5.5	4.5
HH	Cosm	6	0	0	*Alisma plantago-aquatica* L.	-	-	-	+.3
G-HH	Cosm	5	0	4	*Eleocharis palustris* (L.)Roemer et Schultes	-	-	+.1	-
HH-H	Circ	5	3	4	*Glyceria maxima* (Hartman) Holmberg	+.1	-	-	-
HH	Cosm	6	3,5	4	*Lemna minor* L.	-	+	-	-
HH-H	Eua	5	3	0	*Mentha aquatica* L.	1.3	-	-	-
HH	Eua	6	3	0	*Oenanthe aquatica* (L.) Poiret	-	-	-	1.5
HH	Cosm	6	3,5	4	*Potamogeton crispus* L.	1.5	2.5	-	-
HH	Cosm	6	2,5	4	*Potamogeton natans* L.	+	-	-	-
HH	Cosm	6	3,5	0	*Typha latifolia* L.	-	-	1.3	+
					Total species/sample	**5**	**3**	**3**	**4**

Origin of the samples: R_{1-2}, Liebling, 10.06.2007; R_3, Surduc, 22.07.2006, R_4, Surduc, 29.07.2007

Sinecology: The linnet grows in still, rarely flowing waters, deep, clear, sweet or salty. The association sporadically grows in waters with deep logged substratum. The analysis of the ecological indexes shows that the edified phytocoenoses are of hydrophites (100%), micro-mesothermic (50%), weakly acid neutrophilic (100 %). The bioforms are 100 % represented by species of helohidatophites, and as geoelements, the species are cosmopolite (50%), Eurasian or circumpolar (each with a percentage of 25%).

Cenotaxonomy: Cls. POTAMOGETONETEA PECTINATI R. Tx. et Prsg. 1942, Ord. *Potamogetonetalia pectinati* W. Koch 1926, Al. *Potamogetion pussili* Vollmar em. Hejný 1978

Sindynamics: The edified phytocoenoses of small linnet may be replaced by associations from the class PHRAGMITETEA. When dry out and draining works are performed, they regress.

Importance: Sometimes the association biomass is used by birds. Due to the presence of the edifying species, which grows abundantly in some aquatic pools, fishing becomes more difficult. High conservative value.

Leersietum oryzoides Krause1955 em. Pass. 1957 (association of rice cutgrass)

Chorology (SANDA, 2002): The distribution of the association in the country: Dihoru *et al.*, 1973 (Dubova), Mititelu, Barabaş, 1971 (Lilieci), Toma, 1976 (Dornelor Depression), Ştefan, 1995 (Danube Delta), Ştefan, 1991 (Sovata), Schneider-Binder, 1970 (Şura Mică), Gergely, Raţiu, 1980 (Oas Country), Resmeriţă, Raţiu, 1974 (Maramureş), Ştefan, 1996 (Danube Delta). It has not been indicated in Banat so far. We have encountered the association in Surduc (in the summer of 2006). In 2007 we observed the obvious regression of the association, due to flooidng of the place where we previously signalled it. We identified only one phytcoenosis constituted of low vitality and size individuals. In 2008, we noted the same regression of the phytocoenoses, in order that in the summer of 2009, to encounter the species

again. Although it had not reached its climax in development, it was easy to foresee a clear expansion regarding the presence in the area.

Table 2

Synthetic chart with phytocoenoses from the association *Najadetum minoris* Ubrizsy 1948, 1961

					Altitude (m)	196	196	196
					General coverage (%)	100	85	100
					Area (m^2)	5	4	2
					Sample number	1	2	3
Bioform	Geoelement	U	T	R				
HH	Eua	6	4,5	4,5	*Najas minor* All.	5.5	4.5	5.5
HH	Cosm	6	3,5	4	*Lemna minor* L.	-	+	-
HH	Circ (bor)	6	0	4,5	*Myriophyllum spicatum* L.	+.1	+	-
HH	Cosm	6	3,5	4	*Potamogeton crispus* L.	+	-	-
					Total species/sample	**3**	**3**	**1**

Sample origin: R_{1-3}, Surduc, 03.08.2007

Floristic composition and sinmorphology: In the 4 samplings performed, we identified 19 species (table 3). The edifying species is *Leersia oryzoides* (L.) Swartz. Other species characteristic for the association and encountered in our phytocoenoses as well, are: *Alisma plantago-aquatica* L., *Eleocharis palustris* (L.) Roemer et Schultes, *Oenanthe aquatica* (L.) Poiret, *Rorippa amphibia* (L.) Besser.

Sinecology: The association appears at the end of summer (August-September) along still or mild flowing waters, on the shores of lakes, in ditches and marshy depressions. At Surduc, the phytocoenoses grow on flat, open surfaces, with a coverage of 100%. The height of the vegetation varies, between 40-180 cm. The analysis of the association depending on ecological factors indicates the high presence of the meso-hygrophilic species (42,10 %) and hydrophils (26,31 %), micro-mesothermic (57,89 %), amphitolerant (47,36 %). The bioforms are edified by annual terrophytes (47,36 %), followed with the same percentage, 21,05 %, by hemicryptophytes and helohydatophytes. The study of geoelements shows that the Eurasian (57,89 %) and cosmopolit ones (26,315 %) are the best represented.

Cenotaxonomy: Cls. PHRAGMITETEA Tx. Et Prsg. 1942, Ord. *Phragmitetalia* W. Koch 1926 emend. Pign. 1953, Al. *Phalarido – Glycerion* Pass. 1964, syn. *Bidenti – Leersietum* (Poli et J. Tx. 1960) Oberd. Et al. 1967

Sindynamics: It can be replaced by mesophilic associations (dominated by *Bidens* or *Echinochlooa*).

Importance: Though it does not have economic relevance, the association is important in the process of vegetation succesion. Moderate conservative value.

Eleocharidetum acicularis W. Koch 1926 em. Oberd. 1957 (association of spike rush)

Chorology (SANDA, 2002): In our country the association is not very much spread, there being only a few indications of it: Pop, 1968 (Crişurilor Plain), Mititelu, Barabaş, 1971 (Bacău), Popescu *et al.*, 1984 (Muntenia Plain), Cârţu, 1971 (Jiu-Desnăţui), Pop, 1962 (Salonta), Ştefan *et al.*, 1997 (Danube Delta, Galati County) etc. In Banat, it is mentioned by Grigore, 1971 (Timiş-Bega), Boşcaiu, 1966 (Lugoj), Soran, 1956 (at the small pond at Liebling, today dried out). We have encountered the association only in Surduc (at the end of

the lake, towards Fardea), in the summer of 2006, in a depressive area, which had been flooded in spring. As 2007 was very dry and the temperatures recorded very high values, the water level in the accumulation lake Surduc was maintained preventively at high values (the lake supplying water to the city of Timisoara). This fact influenced the emergence of the association; the lands where we had signalled it one year before being covered by water. We have found in the area only a few *Eleocharis acicularis* (L.) Roemer et Schultes and *Lindernia procumbens* (Krocker) Philcox.

Table 3

Synthetic chart with phitocoenoses from the association *Leersietum oryzoides* Krause1955 em. Pass. 1957

					Altitude (m)	196	196	196	196
					General coverage (%)	100	100	100	100
					Height of the vegetation (cm) 1	40	180	130	50
					2	-	80	-	-
					Area (m^2)	4	6	9	3
					Sample number	1	2	3	4
Bioform	Geoelement	U	T	R					
HH	Circ (bor)	6	3	0	*Leersia oryzoides* (L.) Swartz	3.5	5.5	4.5	5.5
HH	Cosm	6	0	0	*Alisma plantago-aquatica* L.	-	+	+	1.3
H	Circ (bor)	5	3	5	*Alopecurus aequalis* Sobol.	-	+	-	-
Th	Eua	4,5	3	0	*Bidens tripartita* L.	+ - 1.3	+.1	+.1	-
Th	Cosm	4	0	3	*Echinochloa crus-galli* (L.) Beauv.	2.5	+.2	1.4	-
G-HH	Cosm	5	0	4	*Eleocharis palustris* (L.) Roemer et Schultes	1.3	-	-	+.3
Th	Eua	5	3	4	*Gnaphalium uliginosum* L.	+	-	-	-
Th	Eua (cont)	2	3	2	*Gypsophila muralis* L.	+	-	-	-
Th	Eua (Med)	4,5	4	0	*Lindernia procumbens* (Krocker) Philcox	+.5	-	-	-
H	Eua (Med)	4	3	5	*Mentha pulegium* L.	+	-	-	-
HH	Eua	6	3	0	*Oenanthe aquatica* (L.) Poiret	-	1-2.5	1.3	+.1
G-HH	Cosm	6	3	0	*Polygonum amphibium* L.	-	+	-	-
Th	Eua (Med)	4,5	3	4	*Polygonum hidropiper* L.	-	-	+	-
Th	Cosm	4	0	3	*Polygonum lapathifolium* L.	+	-	-	-
Th	Eua (Med)	4	3	3	*Pulicaria vulgaris* Gaertner	+.2	-	-	-
H	Eua (Med)	4	0	0	*Ranunculus repens* L.	+	-	-	-
HH	Eua (Med)	6	3	4	*Rorippa amphibia* (L.) Besser	-	-	+	+
H-TH	Eua	3	0	0	*Trifolium pretense* L.	+	-	-	-
Th	Adv	3,5	4	0	*Xanthium italicum* Moretti	+	-	-	-
					Total species/sample	**13**	**7**	**7**	**5**

Origin of the samples: R_{1-3}, Surduc, 29.07.2006, R_4, Surduc, 03.08.2007

Floristic composition and sinmorphology: *Eleocharidetum acicularis* W. Koch 1926 em. Oberd. 1957 is a pioneer association, bare of species. According to some authors it represents fragments of the association *Eleochari-Schoenoplectetum supini.* In the 2 phytocoenoses analyzed by us, we have identified 10 species (table 4). The dominant species is *Eleocharis acicularis* (L.) Roemer et Schultes, accompanied by *Lindernia procumbens* (Krocker) Philcox. In the first sampling we identify the significant participation of the species

Pulicaria vulgaris Gaertner which indicates that the soil becomes slightly affected by salt. Other characteristic species of the association are: *Eleocharis palustris* (L.) Roemer et Schultes, *Plantago media* L., *Lythrum hyssopifolia* L.

Sinecology: The association is frequent in marshes, on the pond shores, in rivers from plain area. It grows well on flat lands around aquatic pools, temporarily flooded (3-4 months a year). From the study of the ecological factors results the mesohygrophilic (50%) towards hygrophilic (30%) character, eurithermal (50%), amphitolerant (50%) with a tendency towards weakly acid neutrophilic (30%) of these communities. As bioforms annual terrophytes are predominant (60%), and the distribution of geographical elements indicates a high percentage for the Eurasian (50%) and cosmopolite (40%) species.

Cenotaxonomy: Cls. LITTORELLETEA UNIFLORAE Tx. 1947, Ord. *Littorelletalia* Uniflorae Koch 1926, Al. *Eleocharition acicularis* Pietsch 1967.

Sindynamics: It may evolve towards meso-hygrophilic pastures.

Importance: By its stolons, the spike rush confines the mud and the sand. The accompanying species *Lindernia procumbens* (Krocker) Philcox is encountered in the list of species of community interest that require strict protection (according to *O.U.G. no. 57 of June 20th 2007 on the regime of protected natural areas, preservation of natural habitats, flora and wild fauna*). Conservative value: high and very high (in the habitats where *Marsilea quadrifolia* DH2 appears).

Table 4

Synthetic chart with phitocoenoses from the association *Eleocharidetum acicularis* W. Koch 1926 em. Oberd. 1957

					Altitude (m)	190	190
					General coverage (%)	95	90
					Height of the vegetation (cm)	60	10
					Area (m²)	4	4
					Sample number	1	2
Bioform	Geoelement	U	T	R			
Th	Circ (bor)	5,5	0	0	*Eleocharis acicularis* (L.) Roemer et Schultes	3.5	3.5
Th	Eua (Med)	4,5	4	0	*Lindernia procumbens* (Krocker) Philcox	1.3	2.5
HH	Cosm	6	0	0	*Alisma plantago-aquatica* L.	-	+
Th	Eua	4,5	3	0	*Bidens tripartita* L.	+.2	+
Th	Cosm	4	0	3	*Echinochloa crus-galli* (L.) Beauv.	1.3	-
G-HH	Cosm	5	0	4	*Eleocharis palustris* (L.) Roemer et Schultes	+.1	-
Th	Cosm	4	3	0	*Lythrum hyssopifolia* L.	-	+
G-HH	Eua	2,5	0	4,5	*Plantago media* L.	+	-
Th	Eua (Med)	4	3	3	*Pulicaria vulgaris* Gaertner	2.5	-
MM-M	Eua	5	3	4	*Salix alba* L.	-	+
					Total species/sample	**7**	**6**

Origin of sampling: R_{1-2}, Surduc, 29.07.2006

CONCLUSIONS

Though deemed by many as known well enough, the aquatic and paludicolous vegetaion sometimes shelters rare phytocoenoses, significant from the perspective of biodiversity preservation.

The edified phytocoenoses of *Najas minor* All., *Leersia oryzoides* (L.) Swartz. and

Ceratophyllum demersum L., are signalled by us for the first time in Banat vegetation.

The edified phytocoenoses of *Eleocharis acicularis* (L.) Roemer et Schultes, thoguh signalled and described in Banat by other authors as well, today they are interesting due to the particularities of the place we found them and by the presence of the species *Lindernia procumbens* (Krocker) Philcox, declared species of community interest under strict protection.

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