SPECIFIC DIVERSITY OF WETLAND PHYTOCOENOSES IN TIMIS COUNTY

Alina-Georgeta NEACȘU, G.-G. ARSENE, Ilinca-Merima IMBREA, Alma-Lioara NICOLIN, F.-M. FAUR
Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara
Faculty of Agriculture, Calea Aradului, 119, Timisoara
alne76@yahoo.com

Abstract: *The study presents an overview of the cormophyte diversity that constitutes aquatic phytocenosis and swamp wetlands of the main lake areas of Timis County: Surduc, Liebling, Pișchia and Sânandrei (meanwhile, the Lake Sânandrei was drained). The vegetation in these locations has been the subject of a doctoral thesis (NEACȘU, 2008). This work is based on a number of 134 (phytosociological) surveys, as well as 29 vegetal associations (sensu COLDEA et al., 1997, SANDA et al., 1998). Among these, 7 are aquatic and 22 paludicolous or others. Number of phytocenoses sampled from each association varies by coenosis' occupied area and uniformity, ranging from 1 (e.g. associations Lemno minoris – Spirodeletum W. Koch 1954, Agrostidetum stoloniferae (Ujvárosi 1941) Burduja et al. 1956, Alopecuretum pratensis Regel 1925) and 15 (e.g. association Caricetum ripario – acutiformis Kobenza 1930). Specific diversity variables are shown in the number of species per surveying, species average per surveying, number of species per association, the number of species per site. It was observed that aquatic phytocoenosis are either monospecific or consist of a small number of species, while others have a higher specific diversity. The number of species per surveying is between 1 (e.g. association Najadetum minoris Ubrizsy, 1948, 1961) and 18 species (association Polygono hydropiperi – Bidentetum Lohm. 1950). The number of species in aquatic associations is between 1 (e.g. association Najadetum minoris Ubrizsy, 1948, 1961) and 6 species per surveying (association Polygono - Potametum natantis Soó 1964). The number of species, in the case of phytocoenoses of paludicolous or other associations varies from 3 (e.g. associations Schoenoplectetum lacustris Eggler 1933, Rubo - Salicetum cinereae Sonasak 1963) to 18 species (association Polygono hydropiperi - Bidentetum Lohm. 1950). The number of average species per surveying varies between 2.33 (association Najadetum minoris Ubrizsy 1948, 1961) and 10.1 (association Polygono hydropiperi - Bidentetum Lohm. 1950). The lowest number of species per location, is 2 for locations Pișchia and Liebling, the association Lemnetum minoris (Oberd. 1957) Müller et Gorse 1960, Pișchia location, association Myriophyllo - Potametum Soó 1934. The largest number of species per location is 49 in Surduc, namely the association Polygono hidropiperi - Bidentetum Lohm. 1950. The total number of cormophyte species is 285, the highest floristic diversity occurring in Pișchia (170 species). Among the remarkable species in terms of nature conservation, Lindernia procumbens (Krocker) Philcox is included in the list of species of community interest which require strict protection. Species with low frequency are Peplis portula L., Eleocharis acicularis (L.) Roemer et Schultes, Leersia oryzoides (L.) Swartz, Najas minor All., Oenanthe banatica Heuffel (all found only in Surduc). Some, whose existence is endangered, are part of high conservation value habitats (DONITA et al., 2005).*

Key words: *wetlands, cormophytes, specific diversity, phytocoenosis*

INTRODUCTION

The Banat hydrographic area includes the Ramsar site, Mureș Floodplain and many more natural or artificial wetlands, some included in the category of protected wetland for the preservation of habitats and species. Two of them, located in Timis county, namely Murani marshes - Pișchia (ROSPA 0079) and Lake Surduc (protected natural area of local interest), constitute the subject of this study. The other two areas studied, namely the artificial lakes Sânandrei and Liebling (Timis county) are considered artificial wetlands. The vegetation of these wetlands is represented by aquatic and paludicolous plant communities, hydrophilic and meso-hydrophilic and hygrophilic and

meso-hygrophilic weeds (sometimes mesophilic). The aquatic vegetation includes plant associations that grow in places permanently covered with water and is represented by submerged and natant aquatic plants such as *Lemna minor* L., *Ceratophyllum demersum* L., *Myriophyllum spicatum* L., *Myriophyllum verticillatum* L. etc. Marsh vegetation is represented by plants whose underground vegetative organs (roots, rhizomes) are covered by water and the stems (above ground) develop on the surface. Most common paludicolous plants are: *Phragmites australis* (Cav.) Steudel), *Typha angustifolia* L., *Typha latifolia* L., *Sparganium erectum* L. em. Rchb., *Glyceria maxima* (Hartman) Holmberg), *Sagittaria sagittifolia* L., *Polygonum amphibium* L., *Leersia oeyzoides* (L.) Swartz) etc. Hygrophile and meso-hygrophile vegetation comprises damp to wetland vegetation. Species that withstand excess moisture are: *Juncus inflexus* L., *Juncus effusus* L., *Lythrum salicaria* L., *Lycopus europaeus* L., *Mentha aquatica* L., *Epilobium hirsutum* L., *Ranunculus repens* L., *Agrostis stolonifera* L. etc. The vegetation of hygrophilic weeds mainly comprises of nitrophos associations that develop on the water's edge, in micro-depressions where water accumulates in excess. Organic matter available here favors the nitrophos annual weeds. These communities have a pioneering role in the installation of meso-hygrophilic vegetation. Among the characteristic species of the group are: *Bidens tripartita* L., *Echinochloa crus-galli* (L.) Beauv., *Mentha arvensis* L., *Rumex crispus* L., *Polygonum hydropiper* L., *Rorippa austriaca* (Crantz) Besser) etc.

MATERIAL AND METHODS

Specific diversity analysis was accomplished with the help of the aforementione 134 phytosociological surveys conducted in the field in 2005-2007, in the locations mentioned above. Nomenclature of species follows Flora Europaea Online while the phytosociological system follows SANDA *et al.*, 1998. We considered the following variables: number of surveys, number of species per surveying, average number of species per surveying, number of species per association, the total number of species per site. Next, we discuss phytocoenosis of each association, mentioning the location identified, the number of surveys conducted, the average number of species per surveying, the number of species per association, characteristic species and other features.

RESULTS AND DISCUSSIONS

Wetland vegetation studied (Table 1) consists of hydrophytes submerged plant associations (3), natant (4), emersed and amphibious (5), hydrophilic associations of marsh meadows (4), alluvial weeds (2), vegetation and meso-hydrophilic meadows (3), bushes and swampy shore forests (2), and others (5). Note that this classification model was created based on the one proposed by BURESCU (2003) for wetland vegetation in north-western Romania, with some modifications. Specific diversity statistics of studied wetlands were created for each plant association, considering the number of surveys conducted, the number of species per surveying, species average per surveying, number of species per association, number of species per site. The number of surveys conducted, the number of species per surveying, average number of species per surveying and number of species per association (Table 2) are discussed in the following, during the presentation of the associations. The number of species per surveying is shown in Table 2. In the case of the number of species per site variable, it is found that the lowest number of species per site is 2 for locations Pișchia and Liebling, the associations *Lemnetum minoris* (Oberd. 1957) Müller Gorse et 1960, 2 for location Pișchia, the

association *Myriophyllo - Potametum* Soó 1934. The reduced number of species (3) has been noted in the Liebling association *Trapetum natantis* Müller et Gorse 1960, Pișchia respectively (also 3), the association *Schoenoplectetum lacustris* Eggler 1933. 4 species were identified in Surduc for association *Najadetum minoris* Ubrizsy, 1948, 1961, and also 4 at Liebling, association *Scirpo - Phragmitetum* W. Koch 1926. The largest number of species, 49, was registered in Surduc, association *Polygono hidropiperi - Bidentetum* Lohm. 1950s. 36 species were identified in Sânandrei, for association *Caricetum ripario - acutiformis* Kobenza 1930 and 31, also at Sânandrei, for association *Glycerietum maximae* Hueck 1931. In Figure 1 are plotted the average number of surveying and the number of species per association. Monospecific associations were excluded.

Table 1.

Types of aquatic and paludicolous vegetation in the studied wetlands (Timiș County).

Nr. crt.	Hydrophilic submerged vegetation	Hydrophilic natant vegetation	Hydrophilic emerged vegetation and amphibious plants	Hygrophilic paludicolous meadows	alluvial Weeds	Meso-hygrophilic vegetation and grasslands	Bushes and swampy shore forests
1	*Ceratophylletum demersi* (Soó 1927) Hild 1956	*Lemnetum minoris* (Oberd. 1957) Müller et Görs 1960	*Scirpo – Phragmitetum* W. Koch 1926	*Caricetum ripario – acutiformis* Kobenza 1930	*Bidentetum tripartiti* W. Koch 1926	*Agrostidetum stoloniferae* (Ujvárosi 1941) Burduja *et al.* 1956	*Salicetum albae* Issler 1924 s.l.
2	*Najadetum minoris* Ubrizsy 1948, 1961	*Lemno minoris – Spirodeletum* W. Koch 1954	*Typhaetum angustifoliae* Pignatti 1953	*Eleocharidetum acicularis* W. Koch 1926 em. Oberd. 1957	*Echinochloo – Polygonetum lapathifolii* (Ujvárosi 1940) Soó et Csűrös (1944) 1947	*Leersietum oryzoides* Krause 1955 em. Pass. 1957	*Rubo – Salicetum cinereae* Sonasak 1963
3	*Myriophyllo – Potametum* Soó 1934	*Polygono – Potametum natantis* Soó 1964	*Typhaetum latifoliae* G. Lang 197	*Iretum pseudacori* Eggler 1933		*Alopecuretum pratensis* Regel 1925	
4		*Trapetum natantis* Müller et Görs 1960	*Glycerietum maximae* Hueck 1931	*Eleocharidetum palustris* Schennikow 1919			
5			*Schoenoplectetum lacustris* Eggler 1933				

Others:
- Other weeds and scrubs: *Conietum maculati* I. Pop 1968, *Sambucetum ebuli* (Kaiser 1926) Felföldy 1942, *Pruno spinosae - Crataegetum* Heuck 1931
- Mesophilic meadows: *Poëtum pratensis* Rav., Căzăc. et Turenschi 1956, *Festucetum pratensis* Soó 1938

Phytocenosis of *duckweed*, belonging to the association *Lemnetum minoris* (Oberd. 1957) Müller et Gorse 1960, were found in all 4 locations. Their common feature is that they are cenotic communities with low species diversity (COLDEA *et al.*, 1997) but with an outstanding number of individuals forming a compact blanket on the water's surface. The number of species per association is 6, the average per surveying is 3 species. Besides the edifying species *Lemna minor* L., other characteristic species of the association that we encountered are: *Spirodela polyrhiza* (L.) Schleiden, *Ceratophyllum demersum* L., *Polygonum amphibium* L. At the outskirts of the association helohidatofite sometimes grow large, which protects it (*Glyceria*, *Typha*, *Phragmites* etc.).

Phytocoenosis of *Lemno - Spirodeletum* W. Koch 1954 described in Liebling, consists of 5 species. The characteristic species, *Spirodela polyrhiza* (L.) Schleiden, is accompanied by *Lemna minor* L. forming a thick layer on the water's surface.

Table 2

Statistics of diversity specific to the wetlands vegetation studied (Timiș County).

Nr. crt.	Association name	Nr.survey	Average sp./survey	Nr. sp./assoc	Number of species per site			
					Surduc	Pișchia	Liebling	Sânandrei
1.	*Lemnetum minoris* (Oberd. 1957) Müller et Görs 1960	4	3	6	3	2	5	2
2.	*Lemno minoris – Spirodeletum* W. Koch 1954	1	-	5	-	-	5	-
3.	*Ceratophylletum demersi* (Soó 1927) Hild 1956	4	3.75	10	5	-	6	-
4.	*Eleocharidetum acicularis* W. Koch 1926 em. Oberd. 1957	2	6.5	10	10	-	-	-
5.	*Myriophyllo – Potametum* Soó 1934	3	3.66	7	-	2	4	5
6.	*Najadetum minoris* Ubrizsy 1948, 1961	3	2.33	4	4	-	-	-
7.	*Trapetum natantis* Müller et Görs 1960	3	3.33	6	-	5	3	-
8.	*Polygono – Potametum natantis* Soó 1964	3	3.66	11	-	-	6	7
9.	*Scirpo – Phragmitetum* W. Koch 1926	7	6.28	27	-	13	4	16
10.	*Typhaetum angustifoliae* Pignatti 1953	13	8.76	50	-	20	22	23
11.	*Typhaetum latifoliae* G. Lang 1973	6	7.16	25	5	-	14	12
12.	*Glycerietum maximae* Hueck 1931	10	7.7	39	-	16	8	31
13.	*Schoenoplectetum lacustris* Eggler 1933	2	6	10	-	3	9	-
14.	*Iretum pseudacori* Eggler 1933	2	8.5	14	-	8	9	-
15.	*Eleocharidetum palustris* Schennikow 1919	4	7.25	16	14	5	-	-
16.	*Leersietum oryzoides* Krause 1955 em. Pass. 1957	4	8	19	19	-	-	-
17.	*Phalaridetum arundinaceae* (Horvatič 1931) Libbert 1931	5	8.2	28	-	-	19	9
18.	*Caricetum ripario – acutiformis* Kobenza 1930	15	8.73	56	10	23	16	36
19.	*Bidentetum tripartiti* W. Koch 1926	10	10.1	57	49	11	-	-
20.	*Echinochloo – Polygonetum lapathifolii* (Ujvárosi 1940) Soó et Csűrös (1944) 1947	3	9.66	24	16	12	-	-
21.	*Conietum maculati* I. Pop 1968	1	-	13	-	-	13	-
22.	*Sambucetum ebuli* (Kaiser 1926) Felföldy 1942	2	8	13	-	-	-	13
23.	*Salicetum albae* Issler 1924 s.l.	4	8.5	21	20	-	-	6
24.	*Rubo – Salicetum cinereae* Sonasak 1963	7	6	24	14	-	14	4
25.	*Agrostidetum stoloniferae* (Ujvárosi 1941) Burduja *et al.* 1956	1	-	13	-	-	13	-
26.	*Poëtum pratensis* Răv., Căzăc. et Turenschi 1956	1	-	10	-	-	10	-
27.	*Alopecuretum pratensis* Regel 1925	1	-	9	-	-	9	-
28.	*Festucetum pratensis* Soó 1938	1	-	17	-	17	-	-
29.	*Pruno spinosae – Crataegetum* Heuck 1931	2	8	14	-	-	-	14

At Surduc and Liebling were described four *Ceratophyllum demersi* (Soó 1927) Hild 1956 phytocenosis. The number of species per association is 10, with an average of 3.75 species per surveying. Among the characteristic species of the association we encountered *Lemna minor* L. and *Potamogeton natans* L. Other species present in the phytocoenosis analyzed are *Alisma plantago - aquatica* L., *Eleocharis palustris* (L.) Roemer et Schultes, *Mentha aquatica* L., *Oenanthe aquatica* (L.) Poiret, *Typha latifolia* L.

The *Eleocharis acicularis* W. Koch 1926 em. Oberd. 1957 phytocenosis, were encountered at Surduc. The association is considered pioneering, poor in species. According to some authors, it represents fragments of association *Eleochari - Schoenoplectetum supini* Soó et Ubrizsy in Ubrizsy1948. In the 2 phytocenosis analyzed we found 10 species, the average being 6.5 species per surveying. The dominant species is *Eleocharis acicularis* (L.) Roemer et Schultes, accompanied by *Lindernia procumbens* (Krocker) Philcox. In one of the surveys, we point out the significant participation of *Pulicaria vulgaris* Gaertner species showing a slight soil salinization. Other characteristic species of the association are: *Eleocharis palustris* (L.) Roemer et Schultes, *Plantago media* L., *Lythrum hyssopifolia* L. The association was quoted by SORAN, 1956, also at Liebling, in the „small pond", today drained.

Association *Myriophyllo - Potametum* Soó 1934 was analyzed based on the three phytocenosis from Sânandrei, Liebling and Pișchia. They are poor in species (only 7 per association, with an average of 3.66 species per surveying). Of the characteristic species, we mention: *Myriophyllum spicatum* L., *Potamogeton crispus* L., *Polygonum amphibium* L. Other species present in the association's structure are: *Potamogeton natans* L., *Polygonum amphibium* L.. The occurance in large quantities of the *Potamogeton crispus* L. species is a consequence of anthropogenic influence and determines oxygen deficiency and accumulation of organic material. The association is mentioned in the „large pond" from Liebling, by SORAN, in 1954.

We conducted three surveys, for the small association of inari (*Najadetum minoris* Ubrizsy, 1948, 1961), at Surduc, where we found only 4 species, with an average of 2.33 species per surveying. The characteristic and dominant species is *Najas minor* All. which often occurs alone, without the participation of other species. In our surveys, it is accompanied by *Myriophyllum spicatum* L., *Lemna minor* L., *Potamogeton crispus* L.

We found phytocenosis of water caltrop (*Trapetum natantis* Müller et Gorse 1960) at Pișchia and Liebling. In the two surveys, we identified six species, the average being 3.33 species per surveying. The characteristic species is *Trapa natans* L. Other characteristic species of the association present in our phytocoenosis are *Lemna minor* L. (brought by currents), *Ceratophyllum demersum* L., *Potamogeton crispus* L., *Polygonum amphibium* L. In the summer of 2006, at Pișchia, the species grows abundantly on the shore, due to low water. Moreover, it is well known from the bibliography that the species can withstand wide fluctuations and that in dry years it survives in the marshes. Along water caltrop, a high frequency was noted for *Hybiscus trionum* L., which grows well on land as well as in water. On the bank it is especially present in beaten areas frequented by fishermen. The species was probably brought here by water bearing seeds.

In the accumulations studied, we identified association *Polygono - Potametum natantis* Soó 1964 at Sânandrei and Liebling, with subass. *potametosum natantis* Soó 64. During the three surveys, we identified 11 species, the average being 3.66 species per surveying. *Potamogeton natans* L. dominates the natant layer while *Polygonum amphibium* L. is present sporadically towards the periphery of the association. Among the characteristic species of the association, present in our phytocoenosis, we mention the following:

Potamogeton natans L., *Polygonum amphibium* L., *Ceratophyllum demersum* L., *Lemna minor* L., *Butomus umbellatus* L., *Trapa natans* L., *Potamogeton crispus* L.

The 7 surveys with *Phragmites australis* (Cav.) Steudel. were conducted at Sânandrei, Pişchia and Liebling (association *Scirpo - Phragmitetum* W. Koch 1926). The number of species per association is 27, the average being 6.28 species per surveying. Of the species listed in the literature as characteristic of the association and that we encountered, besides cane, we mention: *Stachys palustris* L., *Glyceria maxima* (Hartman) Holmberg, *Typha angustifolia* L., *Lycopus europaeus* L., *Iris pseudacorus* L., *Symphytum officinale* L., *Calystegia sepium* (L.) R. Br. Other species that occur in the association, coming from shore vegetation, are: *Bidens tripartita* L., *Calystegia sepium* (L.) R. Br., *Calamagrostis arundinacea* (L.) Roth etc. The association was also found in Liebling and surroundings by SORAN (1954).

For the *rush* associations 13 surveys (*Typhaetum angustifoliae* Pignatti 1953), respectively 6 surveys (*Typhaetum latifoliae* G. Lang 1973) were done. The total number of species per association is 50, respectively 25. The species average per surveying is, for the first of them 8.76, 7.16 respectively, in the case of the second. Narrow rush is common in Liebling, Sânandrei, Pişchia, while leaved cattail grows well in Liebling, Sânandrei, Surduc. Besides the characteristic and dominant species, *Typha angustifolia* L., other characteristic species of the association, also present in our studies, are: *Phragmites australis* (Cav.) Steudel, *Lythrum salicaria* L, *Bidens tripartita* L., *Schoenoplectus lacustris* (L.) Palla, *Stachys palustris* L., *Glyceria maxima* (Hartman) Holmberg, *Rorippa amphibia* (L.) Besser, *Phalaris arundinacea* L., *Bolboschoenus maritimus* (L.) Palla, *Lycopus europaeus* L., *Mentha aquatica* L., *Iris pseudacorus* L., *Carex riparia* Curtis, *Calystegia sepium* (L.) R. Br. In the case of phytocoenoses of *Typha latifolia* L. between the characteristic species of the association, that we also encountered, are: *Schoenoplectus lacustris* (L.) Palla, *Typha angustifolia* L., *Glyceria maxima* (Hartman) Holmberg, *Lythrum salicaria* L., *Phalaris arundinacea* L., *Bidens tripartita* L., *Lycopus europaeus* L., *Stachys palustris* L., *Mentha aquatica* L., *Butomus umbellatus* L.

Glycerietum maximae Hueck 1931 was found in Pişchia, Liebling and Sânandrei. The 10 phytocenosis studied have a rich floristic composition, of 39 species arranged in a stratified layout. The average is 7.7 species per surveying. The edifying species is *Glyceria maxima* (Hartman) Holmberg. Accompanying species can be found towards the periphery. Among the characteristic species of the association we mention: *Rorippa amphibia* (L.) Besser, *Phalaris arundinacea* L., *Calystegia sepium* (L.) R. Br., *Schoenoplectus lacustris* (L.) Palla, *Typha angustifolia* L., *Stachys palustris* L., *Lycopus europaeus* L., *Rorippa amphibia* (L.) Besser, *Iris pseudacorus* L., *Mentha aquatica* L., *Bolboschoenus maritimus* (L.) Palla, *Alisma plantago - aquatica* L., *Butomus umbellatus* L.

In the two surveys of *Schoenoplectetum lacustris* Eggler 1933 (made in Liebling, respectively Pişchia) 10 species were identified. The average number of species per surveying is 6. Our phytocoenosis have a poor floristic composition due to the compact layer of dead but not rotted stems from previous years, which prevent the development of too many species. The edifying species is *Schoenoplectus lacustris* (L.) Palla., along with other species that are characteristic of the association such as *Butomus umbellatus* L., *Mentha aquatica* L., *Glyceria maxima* (Hartman) Holmberg, *Lycopus europaeus* L.

In the 2 phytocenosis of *Iretum pseudacori* Eggler, 1933, we identified 14 species, the average number of species per surveying being 8.5. The locations of our surveys are Liebling and Pişchia. The dominant species is *Iris pseudacorus* L. Of the species characteristic for the association found in our phytocoenosis, we mention: *Symphytum officinale* L., *Lythrum salicaria* L., *Lysimachia nummularia* L., *Glyceria maxima* (Hartman) Holmberg, *Typha latifolia* L., *Carex riparia* Curtis, *Bolboschoemus maritimus* (L.) Palla.

At Pişchia and Surduc we identified the phytocenosis of the association

Eleocharidetum palustris Schennikow 1919. We conducted four surveys in which we identified 16 species, the average number of species per surveying being 7.25. Floristic composition is represented in early summer, aquatic species and swamp and meso-hygrophilic species in the late summer - early fall. Characteristic species of the association are: *Oenanthe aquatica* (L.) Poiret, *Alisma plantago - aquatica* L., *Rorippa amphibia* (L.) Besser (occurring in spring when the water level is high), *Bidens tripartita* L., *Echinochloa crus - galli* (L.) Beauv. (occurs in summer, when the soil is dry) etc.

The association *Leersietum oryzoides* Krause 1955 em. Pass. 1957, in the Banat region, is not reported. Of the four reservoirs studied, we reported the association at Surduc (mainly in 2006). In 2007, we found obvious association decline due to flooding of the resort where we reported it previously. We found one phytocoenosis class consists of individuals of reduced size and vitality. Four surveys were conducted in which we identified 19 species, with an average of 8 species per surveying. The edifying species is *Leersia oryzoides* (L.) Swartz. Other characteristic species found in the association and our phytocoenosis are: *Alisma plantago - aquatica* L., *Eleocharis palustris* (L.) Roemer et Schultes, *Oenanthe aquatica* (L.)Poiret, *Rorippa amphibia* (L.) Besser.

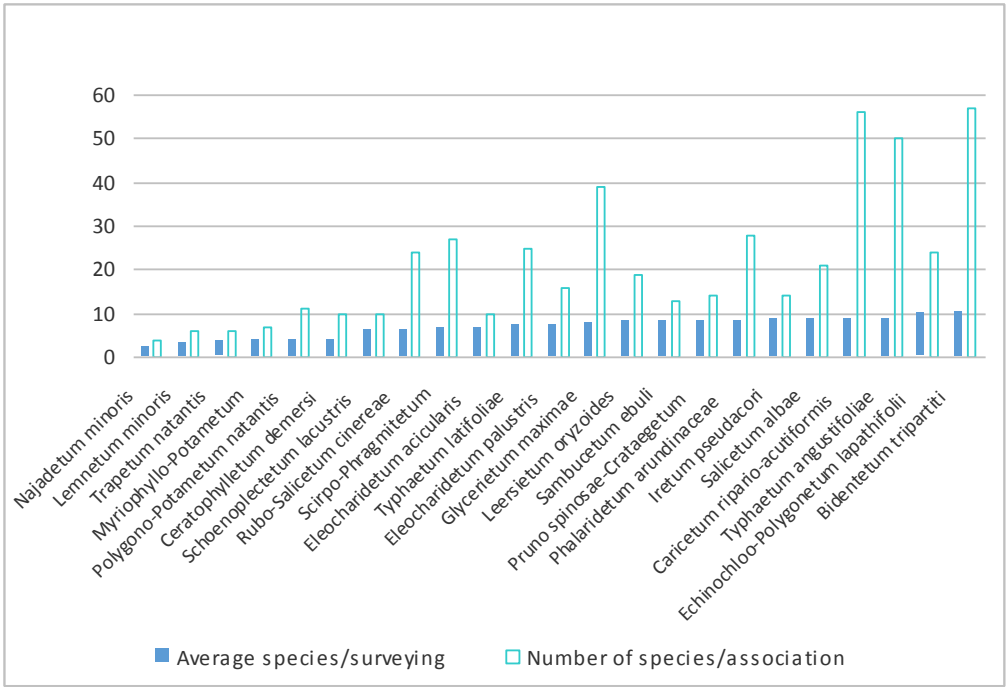

Figure 1. Average species per surveying and number of species per association (except monospecific associations)

In the case of the *Phalaridetum arundinaceae* (Horvatič 1931) Libbert association, we conducted five surveys in Liebling and Sânandrei. 28 species have been identified in the structure of the association, the average being 8.2 species per surveying. Species characteristic of the association are: *Phalaris arundinacea* L., *Agrostis stolonifera* L., *Carex vulpina* L., *Carex riparia Curtis*, *Poa palustris* L., *Stachys palustris* L., *Iris pseudacorus* L., *Mentha aquatica* L., *Glyceria maxima* (Hartman) Holmberg.

The association *Caricetum ripario - acutiformis* Kobenza 1930 was encountred in all four reservoirs studied: Liebling, Pişchia, Sânandrei, Surduc, it being the most frequent association of sedges. In the 15 surveys, 56 species are found, with an average of only 8.73 species per surveying. The characteristic and dominant species is *Carex riparia* Curtis. Other species characteristic of the association found in our phytocoenosis are: *Carex acutiformis* Ehrh., *Carex vulpina* L., *Phalaris arundinacea* L., *Lysimachia vulgaris* L., *Scutellaria hastifolia* L., *Stachys palustris* L., *Mentha aquatica* L., *Iris pseudacorus* L.

The association *Polygono hydropiperi - Bidentetum* Lohm. 1950 (Surduc and Pişchia) shows a quite heterogeneous floristic composition, with many species of weeds characteristic of wetlands (meso-hygrophilic), but also many hidatofite and mesophyte. We conducted 10 surveys in which we identified 57 species, the average being 10.1 species per surveying. Among the species characteristic of the association, cited in the literature and also encountered by us, we mention: *Bidens tripartita* L., *Polygonum hydropiper* L., *Echinochloa crus-galli* (L.) Beauv., *Polygonum mite* Schrank, *Potentilla reptans* L., *Alisma plantago-aquatica* L., *Lycopus europaeus* L., *Lysimachia vulgaris* L., *Xanthium strumarium* L.

We identified the association *Echinochloo-Polygonetum lapathifolii* (Újvárosi 1940) Soó et Csűrös (1944) 1947 at Surduc and Pişchia (the latter in a flooded area, previously a maize crop). In the 3 phytocenosis studied, we identified 24 species, the average being 9.66 species per surveying. The characteristic and dominant species is *Echinochloa crus-galli* (L.) Beauv., accompanied by *Polygonum lapathifolium* L. Other species characteristic of the association are: *Rorippa austriaca* (L.) Besser., *Bidens tripartita* L. Gaertner, *Pulicaria vulgaris*, *Mentha pulegium* L.. The last two species indicate a slight tendancy towards salinity of the resorts.

In phytocoenoses described by us, at Liebling, of *Conietum maculati* I. Pop , 1968, we identified 13 species. The dominant species, *Conium maculatum* L., grows lush due to its high waist covering other species, which in turn disappear from the association in time. Among the characteristic species of the association we noted only *Urtica dioica* L. and *Dipsacus laciniatus* L., with many species that are transgressive (e.g. *Calystegia sepium* (L.) R. Br., *Dactylis glomerata* L., *Rubus caesius* L.); knowing that the association presents a floristic composition, as well as quite heterogeneous physiognomy and structure.

Sambucetum ebuli (Kaiser 1926) 1942 Felföldy was found in Sânandrei. In the two surveys, we identified 13 species, the average number of species per surveying being 8. The edifying species is *Sambucus ebulus* L. Other species characteristic of the association are: *Urtica dioica* L., *Artemisia vulgaris* L., *Galium aparine* L. Many times the danewort forms pure form phytocenosis.

At Surduc and Sânandrei, the phytocoenosis in association *Salicetum albae* Issler 1924 s.l. are structured in the form of clusters. We conducted four surveys, in which we identified 21 species, the average being 8.5 species per surveying. The edifying and dominant species is *Salix alba* L. Other characteristic species of the association are: *Polygonum hydropiper* L., *Rubus caesius* L., *Lysimachia vulgaris* L., *Stachys palustris* L., *Lythrum salicaria* L., *Bidens tripartita* L., *Equisetum arvense* L. On lands where water stagnates longer, marsh species appear (e.g. *Carex riparia* Curtis, *Eleocharis palustris* (L.) Roemer et Schultes, *Lycopus europaeus* L., *Polygonum mite* Schrank).

In the 7 surveys of *Rubo-Salicetum cinereae* Sonasak 1963 made at Surduc, Liebling and Sânandrei, we identified 24 species, with an average of 6 species per surveying. Among the characteristic species of the association, which we found ourselves, we mention: *Salix cinerea* L., *Symphytum officinale* L., *Lythrum salicaria* L., *Lysimachia vulgaris* L.

Frequently reported association in the country *Agrostidetum stoloniferae* (Újvárosi 1941) Burduja *et al.* 1956 was identified by us only Liebling in spring 2006. Phytocoenosis

studied is composed of 13 species. Among the characteristic species of the association, mentioned in the literature, we encountered the following: *Agrostis stolonifera* L., *Symphytum officinale* L., *Lysimachia nummularia* L., *Ranunculus repens* L., *Carex vulpina* L.

In the phytocoenosis of *Poëtum pratensis* Răv., Căzăc. et Turenschi 1956 from Liebling (described roadside), we identified only 10 species. (Depending on the particular region, the floristic composition of the association is sometimes rich and varied.) Species characteristic of the association present in the phytocoenosis analyzed are: *Poa pratensis* L., *Ranunculus repens* L., *Carex vulpina* L., *Cichorium intybus* L.

Also at Liebling (the end of the lake) we found a phytocoenosis of *Alopecuretum pratensis* Regel 1925. In the previous years we did not find the association, the resort, in which we identified it in 2006, was cleared of vegetation to facilitate fishing. The phytocoenosis analyzed consists of 9 species. Among the characteristic species of the association, we mention the following: *Alopecurus pratensis* L., *Poa pratensis* L., *Festuca pratensis* Hudson, *Ranunculus repens* L. In our phytocoenosis also occur: *Carex riparia* Curtis, *Carex sylvatica* Hudson, *Rubus caesius* L., *Salix cinerea* L., *Taraxacum officinale* Weber ex Wiggers.

Phytocoenosis of *Festucetum pratensis* Soó 1938 at Pișchia is quite heterogeneous in terms of flora and is edified by *Festuca pratensis* Hudson. In this structure we have identified 17 species, many of them xero - mesophile (the phytocoenosis described was seen on dry land at the edge of the road).

The phytocenosis in association *Pruno spinosae - Crataegetum* Heuck 1931, were only encountered at Sânandrei, on unrepresentative surfaces. In the two surveys, we identified 14 species, the average number of species per surveying being 8. Species *Prunus spinosa* L. is the characteristic and dominant species. Other species characteristic of the association, which we have noted, are: *Rubus caesius* L., *Rhamnus frangula* L. In terms of physiognomy, these shrubs are arranged in two layers: one dominant shrub, and one herbaceous, which invades.

CONCLUSIONS

1. The number of species per surveying parameter is between 1 (e.g. association *Najadetum minoris* Ubrizsy, 1948, 1961) and 18 (association *Polygono hydropiperi - Bidentetum* Lohm. 1950). In the case of aquatic associations, it varies between 1 (e.g. association *Najadetum minoris* Ubrizsy, 1948, 1961) and 6 species per surveying (association *Polygono - Potametum natantis* Soó 1964). In the case of paludicolous phytocoenoses or other associations, the number of species per surveying varies from 3 (e.g. associations *Schoenoplectetum lacustris* Eggler 1933, *Rubo - Salicetum cinereae* Sonasak 1963 – 2nd survey) and 18 (association *Polygono hydropiperi - Bidentetum* Lohm. 1950).
2. The average number of species per surveying varies between 2.33 for aquatic associations (e.g. *Najadetum minoris* Ubrizsy, 1948, 1961) and 10.1 for others (e.g. *Bidentetum tripartiti* W. Koch 1926).
3. The number of species per association is between 4, if aquatic associations (e.g. *Najadetum minoris* Ubrizsy 1948, 1961) and 57 for others (e.g. *Bidentetum tripartiti* W. Koch 1926).
4. The lowest number of species per location is 2 for Pișchia and Liebling, the association *Lemnetum minoris* (Oberd. 1957) Müller et Gorse 1960 at Pișchia, association *Myriophyllo - Potametum* Soó 1934. The largest number of species per location, 49, was registered at Surduc, the association *Polygono hydropiperi - Bidentetum* Lohm. 1950s.
5. The characteristic of the aquatic phytocoenoses we studied is that they are small and low in species diversity, and also can be monospecific or reduced specific,

but frequently developing an appreciable number of individuals. Other phytocenosis (paludicolous or others), in terms of the same parameter, have higher specific diversity, due to the scale of the surface where they develop and the interference of the two environments (aquatic and terrestrial). It is worth mentioning that all have important roles in vegetation dynamics and species conservation.

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