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PHYTOCOENOLOGICAL RESEARCH CONCERNING THE HYDROPHYTIC VEGETATION IN THE MEADOWLANDS FROM THE INFERIOR BASIN OF CRIȘUL NEGRU RIVER

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Abstract

In the meadowlands from the inferior basin of Crişul Negru River there are a lot of stagnant water channels, ponds with permanent water storage, drainage and storage basins with rich flora and vegetation suitable for a complex phytocoenological research and an ecologic study of the floor vegetation.

After conducting phytocoenological surveys in the studied area, a number of twenty aquatic and paludal associations have been identified, from which Myriophyllo verticillati–Nupharetum luteae Koch 1926 is examined in this work.

Myriophyllo verticillati–Nupharetum luteae association was analyzed in terms of floristic composition, life forms, floristic elements, ecological indices and karyotype.

Key words: aquatic vegetation, phytocoenoses, floristic composition, ecological indices.

INTRODUCTION

Chorology: this association was mentioned in our country over time in Dobrogea (Tarnavschi, Nedelcu, 1970; Ionescu–Țeculescu, 1971; Popescu et al., 1997); Muntenia (Popescu et al., 1984); Crișana (Burescu, 2003).

The territory chosen for research, had not been studied thoroughly by those who had floristic and phytocoenological concerns and were not made many scientific communications and publications about this area. Studies were found in the author paperwork's (Pop, 1959, 1968), (Popescu, 1963). The complex study of flora and vegetation is absolutely necessary especially in regions with less or no researches.

This study aims to analyze the phytocoenoses of the association *Myriophyllo verticillati–Nupharetum luteae* in terms of floristic composition and by analyzing the floristic elements, life forms, ecological factors and karyotype.

Type of habitat: Natural Habitat of Community interest whose conservation requires the designation of Special Areas of Conservation (ASC), Natura 2000: 3160 Natural dystrophic lakes and ponds.

Code R2207 Danubian Communities of *Nymphaea alba*, *Trapa natans*, *Nuphar luteum* and *Potamogeton natans* (Doniță et al., 2006, Gafta, Mountford et al., 2008).

MATERIAL AND METHODS

The meadowlands from the inferior basin of Crișul Negru River are located North Western Romania. The altitude of the Crişul Negru Plain is comprised between 80–200 m, progressively increasing from the west to the east and reaching the maximum height in the proximity of the hills. This area has a moderate continental temperate climate, the average annual air temperature is +10.3º C with an annual rainfall average of 572 mm.

Framing the association to the corresponding cenotaxonomic units – alliance, order and class was made according to the traditional ecological and floristic systems elaborated by Tüxen (1955), Braun–Blanquet (1964), Borza et Boşcaiu (1965), Soó (1964–1980), as well as on the basis of the most recent works belonging to Mucina (1997), Rothmaler (1994, 2000), Borhidi (1996, 2003), Coldea et al. (1997); Sanda et al. (2008).

The study of the vegetal cover in the meadowlands from the inferior basin of Crișul Negru River was made taking into consideration the phytosociological research method of the European Central School, based on the principles and methods elaborated by Braun–Blanquet (1964) and adapted by Borza and Boşcaiu (1965) to the particularities of the vegetation carpet from our country.

The taxa identified in the field have been recognized by specialty catalogues "Romania's Illustrated Flora" (Ciocârlan, 2009), in conjunction with the information provided by the "International Code of Botanical Nomenclature" (Code de Tokyo, 1993).

The association synthetic table was structured after the methodology proposed by Braun–Blanquet (1964) and developed by Ellenberg (1974); therefore, in the column header of the table for the association analyzed the following have been entered: the serial number of land surveys, altitude (m.s.m.), area (m^2), coverage (%).

At the end of the table, the last two columns included the synthetic phytocoenological indices, constancy (K) and abundance–dominance index (ADm). The constancy (K) highlights the extent of coenotic fidelity of each

species to the phytocoenosis environment of the association, according to the Braun–Blanquet et Pavillard methodology (1928). The abundance and dominance (ADm) highlights the percentage of average coverage achieved by phyto–individuals of a phytocoenosis.

Establishment of the values for ecological indices, bioforms, floristic elements and karyotype were made after the synthesis works elaborated by Raunkiær (1937), Braun–Blanquet (1951), Meusel et Jäger (1992), Ellenberg (1974, 1979), Ellenberg et al. (1992), Soó (1964–1980), Májovsky et Murin (1987), Sanda et al. (1983, 2003), Pop (1977, 1982), Ciocârlan (2009), Cristea et al. (2004).

RESULT AND DISCUSSION

According to the specialty literature (see above material and methods), the *Myriophyllo verticillati–Nupharetum luteae* association was classified in the following coenosystem:

Class: ***Potamogetonetea pectinati*** R. Tüxen et Preising 1942

Order: ***Potamogetonetalia pectinati*** Koch 1926

Alliance: ***Nymphaeion albae*** Oberdorfer 1957

In the studied area, the phytocoenoses of *Myriophyllo verticillati–Nupharetum luteae* inhabit the stagnant water channel in the neighborhood of Cefa locality, the ponds near Rădvani Forest (*Fig. 1*) and permanent water pools near Inand locality. They are developing compactly in deep waters of 0.7–2.5 m, oxygenated, clear, devoid of strong currents, free from winds and prefers mesotrophic waters on a sludge or clay substrate, occupying areas between 10–30 m^2.

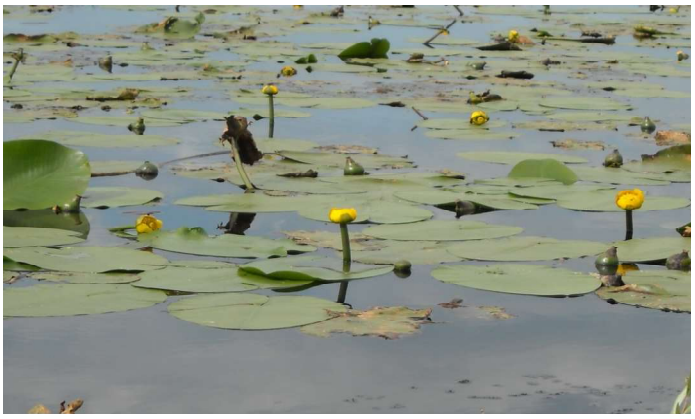

Fig. 1 – Association ***Myriophyllo verticillati–Nupharetum luteae***
Pond near Rădvani Forest, (Bihor County)

The physiognomy of the association is given by *Nuphar lutea*, the characteristic and dominant species for the natant layer, along with the species *Hydrocharis morsus–ranae*, *Trapa natans* and *Potamogeton natans*, which subordinates the association to the ***Nymphaeion albae*** alliance, ***Potamogetonetalia pectinati*** order and the ***Potamogetonetea pectinati*** class. Also in the natant layer there are *Spirodela polyrhiza* and *Lemna trisulca* of the ***Lemnetea*** class (*Table 1*).

In the submerged layer, there are species like *Najas marina* and *Callitriche palustris* (which develops submerged but can also reach the surface of the water), belonging to the ***Potamogetonetea pectinati*** class, but also transgressive species of the ***Lemnetea*** class (*Utricularia vulgaris*, *Ceratophyllum demersum*, etc.).

Table 1

Myriophyllo verticillati–Nupharetum luteae Koch 1926

L. f.	F. e.	W	T	S. r.	2n	No. Land Surveys	1	2	3	4	5	K	ADm
						Altitude (m.s.m.)	100	100	100	104	104		
						Area (m^2)	25	20	10	30	20		
						The coverage of grass layer (%)	70	85	75	75	90		
Hh	Eua(M)	6	0	3.5	D	As. *Nuphar lutea*	4	5	4	4	5	V	72.5
Hh	Cp–Bo	6	3.5	3.5	P	As. *Myriophyllum verticillatum*	1	+	1	1	+	V	3.2
						Nymphaeion albae, Potamogetonetalia pectinati, Potamogetonetea pectinati							
Hh	Eua	6	3.5	3.5	P	*Hydrocharis morsus–ranae*	·	.	+	+	.	II	0.2
Hh	Eua(M)	6	4	4	D–P	*Trapa natans*	.	.	+	+	.	II	0.2
Hh	Cosm	6	4.5	4.5	D	*Najas marina*	+	.	+	.	.	II	0.2
Hh	Cosm	6	2.5	4	P	*Potamogeton natans*	.	.	+	.	+	II	0.2
Hh	Cp–Bo	6	3	0	P	*Callitriche palustris*	+	+	.	.	.	II	0.2
						Lemnetea							
Hh	Cp–Bo	6	0	3.5	P	*Utricularia vulgaris*	.	+	.	.	+	II	0.2
Hh	Cosm	6	3	0	D	*Ceratophyllum demersum*	.	.	+	.	+	II	0.2
Hh	Cosm	6	3.5	0	P	*Spirodela polyrhiza*	.	+	.	.	.	I	0.1
Hh	Cosm	6	0	4	P	*Lemna trisulca*	.	.	+	.	.	I	0.1
						Variae syntaxa							
Th	Cp–Bo	5.5	0	0	P	*Eleocharis acicularis*	+	+	.	.	+	III	0.3
Hh	Eua(M)	6	3	4	D	*Sagittaria sagittifolia*	.	+	.	+	+	III	0.3

Phytocoenological table of ***Myriophyllo verticillati–Nupharetum luteae*** association, where: L. f. – life forms; F. e. – floristic elements; W – soil wet; T – temperature; S. r. – chemical reaction of the soil; 2n – karyotype; Hh – helohydatophytes; Th – annual therophytes; Eua – Eurasian;

Eua(M) – Eurasian Mediterranean; Cp–Bo – Circumpolar Boreal; Cosm – Cosmopolitan; D – diploidy; P – polyploidy; D–P – diplo–polyploidy.
Place and date of surveys: 1 – Stagnant water channel, Cefa locality (Bihor County) 30.07.2016; 2 – 3 Ponds near Rădvani forest (Bihor County) 30.07.2016; 4 – 5 Permanent water pools, Inand locality (Bihor County) 30.07.2016.

The life forms spectrum of the *Myriophyllo verticillati–Nupharetum luteae* association (*Fig. 2*) highlights the overwhelming prevalence of helohydatophytes (92.3%), followed, in a small proportion, by annual therophytes (7.7%).

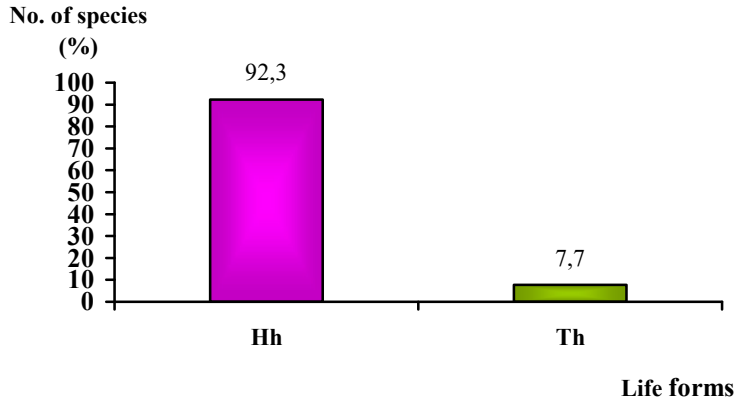

Fig. 2 – The life forms spectrum of ***Myriophyllo verticillati–Nupharetum luteae*** association, where: Hh – helohydatophytes, Th – annual therophytes.

The spectrum of the floristic elements (*Fig. 3*) indicates that the Cosmopolitan species prevails (38.46%), succeeded a short distance away by the Eurasian and Circumpolar Boreal species, each with a share of 30.77%.

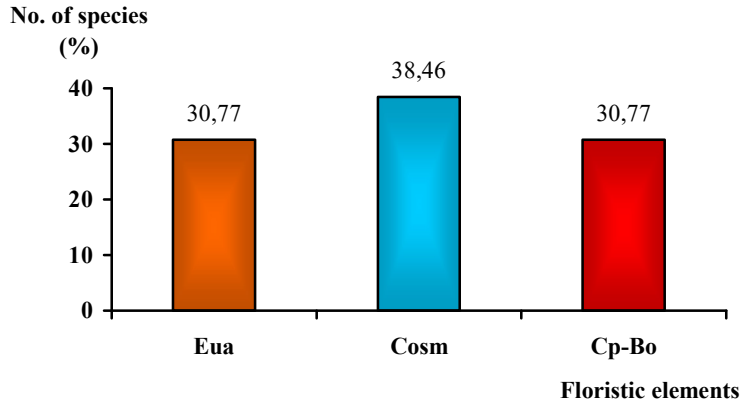

Fig. 3 – Floristic elements spectrum of the ***Myriophyllo verticillati–Nupharetum luteae*** association, where: Eua – Eurasian, Cosm – Cosmopolitan, Cp–Bo – Circumpolar Boreal.

In terms of humidity, the diagram of ecological indices (*Fig. 4*) highlights the hydrophilic character of phytocoenosis (92.4%), respectively hygrophilous (7.6%). From the point of view of the thermal regime, the most numerous are the micro-mesothermal species (46.14%), the amphitolerant species having a share of 30.76%. The chemical reaction of the soil favors the development of slightly acid-neutrophile species (38.46%) and of the amphitolerant and acid-neutrophile ones, each having a percentage of 30.76%.

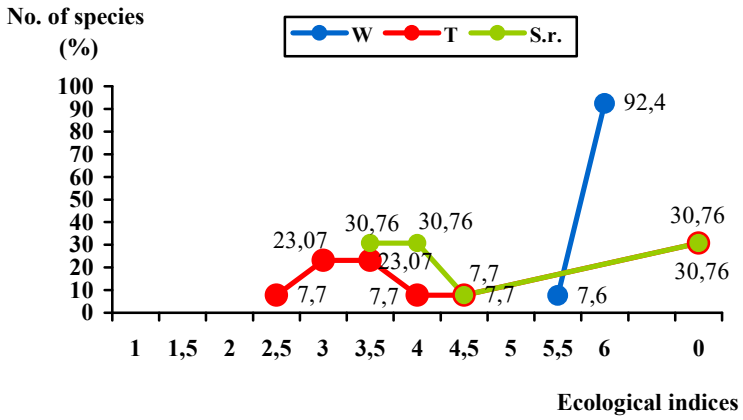

Fig. 4 – Diagram of ecological indices for the ***Myriophyllo verticillati–Nupharetum luteae*** association, where: W – soil wet, T – temperature, S. r. – chemical reaction of the soil.

The karyotype spectrum (*Fig. 5*) reveals the dominance of the polyploid species (61.53%), followed by the diploid ones (30.76%). The diploidy index has a value of 0.49.

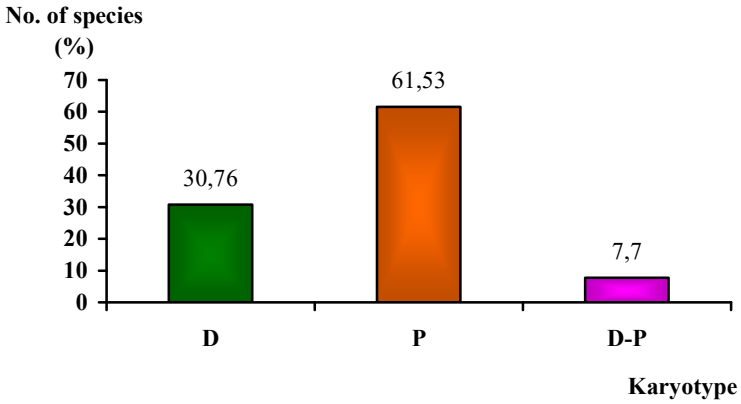

Fig. 5 – The karyotype spectrum of ***Myriophyllo verticillati–Nupharetum luteae*** association, where: D – diploidy, P – polyploidy, D–P – diplo–polyploidy.

CONCLUSIONS

The results obtained from the life forms analysis highlights the overwhelming prevalence of helohydatophytes (92.3%) and in terms of humidity, reveals the hydrophytic character of phytocoenosis (92.4%) being closely related to the existence of lakes, stagnant water channels, ponds and marshes.

From the point of view of the thermal regime, the most numerous are micro-mesothermal species (46.14%) which characterizes the microclimate of the low plain from the inferior basin of Crișul Negru River.

The spectrum of the floristic elements indicates that the Cosmopolitan species prevails (38.46%), which are distributed widely around the world.

The karyotype spectrum reveals the dominance of the polyploid species (61.53%), these being easily adaptable.

Two rare species have been identified within the association: *Trapa natans* and *Utricularia vulgaris*, both in a pond near Rădvani Forest and a permanent water pool near Inand locality.

Myriophyllo verticillati–Nupharetum luteae is a rare association ranked in Natural Habitat of Community interest whose conservation requires the designation of Special Areas of Conservation (ASC), Natura 2000: 3160 Natural dystrophic lakes and ponds – therefore we need to protect them for the preservation of their phytodiversity.

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