

## HYGROPHILIC AND HYDROPHILIC VEGETATION ON THE ARGEȘ RIVER (PITEȘTI, ARGEȘ)

VALERIU ALEXIU

Argeș County Museum, Armand Călinescu Street, no. 44, 110047, Pitești, Argeș, Romania,  
e-mail: alexiuv@yahoo.com

**ABSTRACT.** Survey of hygrophilic and hydrophilic vegetation on the Argeș River, in the vicinity of Pitești was emphasized existence of 11 vegetal association's belonging to next classes: *Potamogetonetea*, *Phragmitetea* and *Molinio-Arrhenatheretea*. The associations are described in point of floristics, sinmorphologies and syntaxonomics.

**Key words:** hygrophilic, mesohygrophilic, hydrophylic, coenotic integration, plant association, macrophytes, life forms, geoelements.

**REZUMAT.** *Vegetația hidrofilă și higrofilă de pe râul Argeș (Pitești, Argeș).* Au fost identificate 11 asociații vegetale din clasele: *Potamogetonetea*, *Phragmitetea* și *Molinio-Arrhenatheretea*. Asociațiile de plante au fost descrise din punct de vedere floristic, sinmorfolologic și sintaxonomic.

**Cuvinte cheie:** higrofil, mezohigrofil, hidrofil, integrare cenotică, asociație vegetală, macrofite, bioforme, geoelemente.

### INTRODUCTION

In this area, the investigation concerning aquatic and paludous flora and vegetation as well as mesophylic laws were made up beginning from 2012. The floriferous inventory was made up according to data recorded during the investigation period "in situ". We used methodology of the Central-European phytosociological school elaborated by J. Braun-Blanquet and adapted to the vegetation peculiarities from our country.

The surveys, quantitative and qualitative estimates have been effectuated according to recommendations by Al. Borza and N. Boșcaiu (Borza & Boșcaiu, 1965). The vegetal associations have been identified with the help of characteristics species, of relevant and differential species. This associations have been named according to syntaxonomic recommendations from "Fundamental concepts of phytocenology" (Géhu & Rivas-Martinez, 1981) and "Code of phytocenological nomenclature" (Barkman et al., 1976). For classification of the cenotic units have

been used recommendations elaborated by Centre of Phytocenology Bailleul (Géhu, 1992) and Camerino (Pedroti, 1994). The association synthetic tables were made up according to phytosociological surveys effectuated in this territory.

## RESULTS AND DISCUSSIONS

The floriferous composition analysis from the perimeter of these lakes has emphasized the existence of 68 aquatic and paludous species (Tab. 1). The presence of a greatest number of species, in this territory (characteristic of the aquatic phytocenosis) is explained both by seed dispersal and also by the lack of variation of the most ecological factors. If the moisture is regarded, of the whole determinate species, 24 are hydrophytes, 17 hygrophytes, 17 mesohygrophytes and 10 mesophytes. Ecologically, the most abundant was the group of emergent plants (17.64%), while submerged and floating group was represented only 11.8% and 5.9% respectively, due to a great ecological variety of emergent semiaquatic plants being adapted to a various influence of two environments (water and land), therefore making a transition group from hydrophytes to hygrophytes. The biotypes spectrum shows that within the ecological group of aquatic and semiaquatic plants, hemicryptophytes were dominated (66.19%) while geophytes and helohydatophytes were far less abundant (14.08% and 12.67%, respectively).

The analysis of geoelements using their biological spectra has come out the dominance Eurasian species (44.44%), demonstrating that this area belongs to the Eurosiberian region according to the floriferous zoning by Al. Borza and N. Boşcaiu (Borza & Boşcaiu, 1965). The cosmopolitan and circumpolar species represents a significant percentage 25% and 22.22%. The adventives plants introduced accidentally or by a human activity into these aquatic biotopes were far less represented 1.38%.

Table 1 - Abstract of species.

HYDROPHYLLIC SPECIES	
<i>Typha latifolia</i>	EMERGED
<i>Typha angustifolia</i>	
<i>Sparganium erectum</i>	
<i>Phragmites australis</i>	
<i>Glyceria maxima</i>	
<i>Carex pseudocyperus</i>	
<i>Carex acutiformis</i>	
<i>Alisma plantago-aquatica</i>	
<i>Butomus umbellatus</i>	
<i>Berula erecta</i>	
<i>Rorippa amphibia</i>	
<i>Schoenoplectus lacustris</i>	

Continues.

Table 1 - Continuation.

HYDROPHYLIC SPECIES	
<i>Lemna minor</i>	FLOATING
<i>Lemna trisulca</i>	
<i>Potamogeton natans</i>	
<i>Hydrocaris morsus-ranae</i>	
<i>Potamogeton crispus</i>	SUBMERGED
<i>Polygonum amphibium</i>	
<i>Myriophyllum spicatum</i>	
<i>Ceratophyllum demersum</i>	
<i>Elodea canadensis</i>	
<i>Najas marina</i>	
<i>Potamogeton pectinatus</i>	
<i>Potamogeton lucens</i>	
MESOPHYLIC, MESOHYGROPHYLIC, HYGROPHYLIC SPECIES	
<i>Veronica anagallis-aquatica</i>	HYGROPHYLICS
<i>Veronica beccabunga</i>	
<i>Iris pseudacorus</i>	
<i>Mentha aquatica</i>	
<i>Carex riparia</i>	
<i>Galium palustre</i>	
<i>Lysimachia vulgaris</i>	
<i>Polygonum hidropiper</i>	
<i>Equisetum palustre</i>	
<i>Myosotis scorpioides</i>	
<i>Eleocharis palustris</i>	
<i>Salix cinerea</i>	
<i>Lycopus europaeus</i>	
<i>Juncus articulatus</i>	
<i>Cardamine amara</i>	
<i>Scrophularia umbrosa</i>	
<i>Calystegia sepium</i>	MESOHYGROPHYLICS
<i>Stellaria palustris</i>	
<i>Scirpus sylvaticus</i>	
<i>Lythrum salicaria</i>	
<i>Alopecurus pratensis</i>	
<i>Juncus inflexus</i>	
<i>Juncus effusus</i>	
<i>Carex remota</i>	
<i>Mentha longifolia</i>	
<i>Agrostis stolonifera</i>	
<i>Deschampsia caespitosa</i>	
<i>Bidens tripartita</i>	
<i>Eupatorium cannabinum</i>	
<i>Epilobium hirsutum</i>	

Continues.

Table 1 - Continuation.

MESOPHYLIC, MESOHYGROPHYLIC, HYGROPHYLIC SPECIES	
<i>Stachys palustris</i>	MESOHYGROPHYLICS
<i>Scutellaria galericulata</i>	
<i>Ranunculus repens</i>	
<i>Festuca arundinacea</i>	
<i>Trifolium repens</i>	MESOPHYLICS
<i>Trifolium pratense</i>	
<i>Plantago major</i>	
<i>Conium maculatum</i>	
<i>Cucubalus bacifer</i>	
<i>Althaea officinalis</i>	
<i>Saponaria officinalis</i>	
<i>Potentilla reptans</i>	
<i>Urtica dioica</i>	
<i>Galium aparine</i>	

With regard to the vegetation analysis were identified 11 vegetal associations, affiliated to 7 alliances, 3 orders and 3 classes (Tab. 2).

The emergent and submerged aquatic phytocenosis from these lakes, with quiet waters and variable depths, belaying to the *Potamogetonetea* class. As part of this class were identified three vegetal associations: *Elodeetum canadensis* Eggler 1933, *Hydrocharidetum morsus-ranae* Van Langendonck 1935 și *Potametum natantis* Soó 1927 (Tab. 3). The submerged phytocenosis attach to the substratum are composed by *Ceratophyllum*, which forms compact populations, removed the other species. Most of vegetative mass of submerged species develop into the water; while on the surface appear only flowers and inflorescences. As part of submerged plants which populate biotopes of these three lakes, the most representative are: *Polygonum amphibium*, *Myriophyllum spicatum*, *Potamogeton pectinatus*, *Ceratophyllum demersum*, *Potamogeton lucens*, in point of phytocenological presence. The emergent (*Phragmites australis*) and floating species (*Potamogeton natans*, *Lemna minor*, *Lemna trisulca*) record a significant presence. *Phragmition* alliance groups hydrophilic phytocenosis which are developed at the border of lakes, on the substratum with argillaceous texture, with accumulation of the organic substance on the surface. As part of this alliance was identified four vegetal associations: *Scirpo-Phragmitetum*, W. Koch 1926, *Typhetum angustifoliae* Pign. 1953, *Typhetum latifoliae* G. Lang 1973 and *Glycerietum maximae* Hueck 1931 (Tab. 4).

In the biotopes of this lakes, the best curdled was the cenosis of *Typhetum angustifoliae* association, being situated near to lakeside, where the silting is favoured because of the alluvial deposits and organic remains.

In the phytocenosis with *Phragmites australis* has been recorded penetration of the *Schoenoplectus lacustris*, which contributes to the biological purification of the poluate waters, being used in the structure of biological filters.

As part of *Magnocaricion* alliance, the best representative phytocenosis are those with *Carex vulpina*, which realize passing to the water meadow laws in point of sindynamic aspect (Tab. 4).

Regarding the presence of the characteristic species which belongs to the *Phragmition* and *Magnocaricion* alliances are dominated hydrophilic (*Typha angustifolia*, *Typha latifolia*, *Glyceria maxima*, *Iris pseudacorus*, *Alisma plantago-aquatica*), hygrophilic (*Equisetum palustre*, *Galium palustre*) and mesohygrophilic species (*Scirpus sylvaticus*, *Stachys palustris*, *Epilobium hirsutum*, *Juncus effusus*, *J. articulatus*, *J. inflexus*, *Cardamine amara*). The water meadow laws situate in stations with excess of humidity, characteristics of the investigated area, belongs to the *Magnocaricetalia* order. The mesohygrophilic and hygrophilic phytocenosis belonging to this order are set up on the flat, damp lands, which are covered with fertile soils. The species from this stations which are dominated in point of phytocenological presence are: *Agrostis stolonifera*, *Scirpus sylvaticus*, *Potentilla reptans*, *Ranunculus repens*, *Lysimachia vulgaris*, *Mentha longifolia*.

Table 2 - Vegetal associations which are identified.

- POTAMOGETONETEA PECTINATI R.Tx. et Prsg. 42
- Potamogetonetalia pectinati W. Koch 1926
- Potamogetonion pectinati (Koch 1926) Görs 1977
1. *Elodeetum canadensis* Egger 1933
- Hydrocharition morsus-ranae Rüb. 1933
2. *Hydrocharidetum morsus-ranae* Van Langendonck 35
- Nymphaeion albae Oberd. 1957
3. *Potametum natantis* Soó 1927
- PHRAGMITETEA Tx. et Prsg. 1942
- Phragmitetalia Koch 1926
- Phragmition Koch 1926
4. *Scirpo-Phragmitetum* W. Koch 1926
  5. *Typhetum angustifoliae* Pign. 1953
  6. *Typhetum latifoliae* G. Lang 1973
  7. *Glycerietum maximae* Hueck 1931
- Magnocaricion W. Koch 1926
8. *Caricetum ripariae* Knapp et Stoffer 1962
  9. *Caricetum vulpinae* Nowinski 1927
- MOLINIO-ARRHENATHERETEA Tx. 1937
- Molinetalia W. Koch 1926
- Agrostion stoloniferae Soó (1933) 1971
10. *Agrostidetum stoloniferae* (Ujv. 41) Burduja et al. 56
- Calthion palustris Tx. 1937
11. *Scirpetum sylvatici* Schwick. 1944

Table 3 - Associations of *Potamogetonalia pectinati* W. Koch 1926 order: 1 - *Elodeetum canadensis* Eggler 1933; 2 - *Hydrocharidetum morsus-ranae* Van Langendonck 1935; 3 - *Potametum natantis* Soó 1927.

Biof.	Geoelem.	Association Location	1			2			3		
			A	B	C	A	B	C	A	B	C
<b>Potamogetonion et Potamogetonalia</b>											
Hd	Circ	<i>Myriophyllum spicatum</i>	-	III	-	II	III	-	-	II	-
Hd	Cosm	<i>Potamogeton pectinatus</i>	-	II	-	-	I	-	-	I	-
Hd	Cosm	<i>Ceratophyllum demersum</i>	-	-	-	I	II	-	-	III	-
Hd	Adv	<i>Elodea canadensis</i>	-	V	-	-	-	-	-	-	-
Hd	Eua	<i>Potamogeton lucens</i>	-	-	-	I	I	-	-	I	-
HH	Cosm	<i>Najas marina</i>	-	-	-	-	I	-	-	-	-
<b>Hydrocharition morsus-ranae</b>											
Hd	Eua	<i>Hydrocharis morsus-ranae</i>	-	I	-	III	IV	-	-	-	-
<b>Nymphaeion albae</b>											
HH	Cosm	<i>Polygonum amphibium</i>	-	-	-	II	I	-	-	V	-
Hd	Circ	<i>Potamogeton natans</i>	-	-	-	I	II	-	-	IV	-
<b>Variae</b>											
Hd	Cosm	<i>Lemna minor</i>	-	III	-	-	III	-	-	II	-
Cosm	E	<i>Phragmites australis</i>	-	II	-	III	III	-	-	III	-
Cosm	E	<i>Typha latifolia</i>	-	-	-	I	-	-	-	I	-
HH	Eua	<i>Butomus umbellatus</i>	-	-	-	-	I	-	-	II	-
HH	Eua	<i>Sparganium erectum</i>	-	-	-	I	-	-	-	-	-
Cosm	E	<i>Typha angustifolia</i>	-	II	-	-	II	-	-	-	-
HH	Circ	<i>Alisma plantago-aquatica</i>	-	I	-	-	I	-	-	-	-

Localization: A - Bascov Lake; B - Mărăcineni Lake; C - Ștefănești Lake.

Table 4 - Association of *Phragmition* Koch 26 and *Magnocaricion* W. Koch 26 alliances 4 - *Scirpo - Phragmitetum* W. Koch 1926; 5 - *Typhetum angustifoliae* Pign. 1953; 6 - *Typhetum latifoliae* G. Lang 1973; 7 - *Glycerietum maximae* Hueck 1931; 8 - *Caricetum ripariae* Knapp et Stoffer 1962; 9 - *Caricetum vulpinae* Nowinski 1927.

Biof.	Geoelem.	Association Location	4			5			6			7			8			9		
			A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
<b>Phragmition</b>																				
HH	Eua	<i>Glyceria maxima</i>	-	-	-	-	I	-	I	-	II	IV	-	V	-	-	-	-	-	-
HH	Cosm	<i>Typha latifolia</i>	-	-	-	-	-	III	-	IV	-	-	-	-	I	-	-	-	-	-
HH	Cosm	<i>Typha angustifolia</i>	-	-	-	-	V	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Magnocaricion</b>																				
H- HH	Circ	<i>Carex pseudocyperus</i>	-	-	-	-	-	-	-	-	-	-	-	-	II	-	-	-	-	-
HH	Eua	<i>Carex acutiformis</i>	-	-	-	-	-	-	-	-	-	-	-	-	IV	-	-	-	-	II
H	Eua	<i>Lysimachia vulgaris</i>	-	I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I

Continues.

Table 4 - Continuation.

Biof.	Geocl.	Association Location	4			5			6			7			8			9		
			A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
		<b>Phragmitetalia</b>																		
HH	Cosm	<i>Phragmites australis</i>	IV	IV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	II
G	Eur	<i>Iris pseudacorus</i>	-	-	-	-	-	-	-	-	-	I	-	I	-	I	-	-	-	I
H	Cosm	<i>Lythrum salicaria</i>	-	-	-	-	-	-	-	-	-	-	-	-	I	-	-	-	-	II
		<b>Glycerio-Sparganion et Nasturtio-Glycerietalia</b>																		
HH- H	Eua	<i>Veronica beccabunga</i>	I	I	-	-	-	-	-	-	-	-	-	-	-	I	-	-	-	I
		<b>Magnocaricetalia</b>																		
HH	Eua	<i>Carex riparia</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
HH	Eua	<i>Carex vulpina</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	III
		<b>Phragmitetea</b>																		
HH	Circ	<i>Scirpus sylvaticus</i>	II	I	-	-	-	-	-	-	-	-	-	-	-	I	-	-	-	I
G	Circ	<i>Equisetum palustre</i>	-	I	-	-	-	-	I	-	-	-	-	-	-	I	-	-	-	I
H- HH	Eua	<i>Myosotis scorpioides</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	I	-	-	-	-
HH	Eua	<i>Mentha aquatica</i>	I	II	-	-	-	-	I	-	-	-	-	I	-	II	-	-	-	I
HH	Eua	<i>Rorippa amphibia</i>	-	-	-	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-
H	Eua	<i>Ranunculus repens</i>	I	-	-	-	-	-	-	-	-	-	-	-	-	I	-	-	-	II
HH	Eua	<i>Lycopus europaeus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	I	-	-	-	I
G- HH	Cosm	<i>Polygonum amphibium</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
HH	Cosm	<i>Alisma plantago-aquatica</i>	-	-	-	-	I	-	-	-	I	-	-	-	-	I	-	-	-	I
H	Circ	<i>Galium palustre</i>	-	-	-	-	-	-	I	-	I	I	-	-	-	I	-	-	-	II
		<b>Variae</b>																		
Th	Eua	<i>Bidens tripartita</i>	I	I	-	-	-	-	-	-	I	-	-	-	-	-	-	-	-	-
Th- TH	Eua	<i>Polygonum hydropiper</i>	-	-	-	-	-	-	-	-	-	I	-	I	-	-	-	-	-	-

Localization: A - Bascov Lake; B – Mărăcineni Lake; C – Ştefăneşti Lake.

Table 5 - Association of *Agrostion stoloniferae* Soo (1933) 1971 and *Calthion palustris* Tx. 1937 alliances 10 – *Agrostidetum stoloniferae* (Ujv. 1941) Burduja et al. 1956: 11 – *Scirpetum sylvatici* Schwick. 1944.

Biof.	Geoel.	Association Location	10			11		
			A	B	C	A	B	C
		<b><i>Agrostion stoloniferae</i></b>						
H	Euc	<i>Festuca arundinacea</i>	-	-	-	I	-	-
H	Circ	<i>Agrostis stolonifera</i>	-	IV	V	-	-	-
G	Eua	<i>Elymus repens</i>	-	-	-	II	-	-
G	Eur	<i>Carex hirta</i>	-	-	I	I	-	-
		<b><i>Calthion palustrae</i></b>						
HH-G	Circ	<i>Scirpus sylvaticus</i>	-	II	-	III	-	-
H	Cosm	<i>Deschampsia caespitosa</i>	-	-	-	-	-	-
		<b><i>Molinietalia</i></b>						
H(G)	Eua	<i>Mentha longifolia</i>	-	-	I	II	-	-
G	Circ	<i>Equisetum palustre</i>	-	-	-	I	-	-
H	Circ	<i>Epilobium palustre</i>	-	-	-	I	-	-
		<b><i>Molinio Arrhenatheretea</i></b>						
H	Cosm	<i>Potentilla reptans</i>	-	III	II	I	-	-
H	Eua	<i>Ranunculus repens</i>	-	II	II	-	-	-
H	Eua	<i>Trifolium repens</i>	-	I	II	-	-	-
HH-H	Eua	<i>Mentha aquatica</i>	-	I	-	-	-	-
H-TH	Eua	<i>Trifolium pratense</i>	-	-	-	I	-	-
H	Eua	<i>Rumex crispus</i>	-	-	I	-	-	
		<b><i>Phragmitetea</i></b>						
HH-H	Eua	<i>Veronica beccabunga</i>	-	I	-	I	-	-
H	Circ	<i>Galium palustre</i>	-	-	-	I	-	-
H-HH	Eua	<i>Lysimachia vulgaris</i>	-	I	-	I	-	-
HH	Cosm	<i>Phragmites australis</i>	-	-	-	I	-	-
H	Circ	<i>Cardamine pratensis</i>	-	-	-	I	-	-
		<b><i>Variae</i></b>						
H	Eua	<i>Plantago major</i>	-	I	-	-	-	-
H-G	Cosm	<i>Urtica dioica</i>	-	-	I	-	-	

Localization: A - Bascov Lake; B – Mărăcineni Lake; C – Ștefănești Lake.

## CONCLUSIONS

1. The floriferous compositions of the investigated territory has shown the presence of 68 species of macrophytes which are specific to aquatic, paludous and damp laws ecosystems.
2. The identified phytocenosis belaying to 11 associations affiliated to 7 alliances, 3 orders and 3 classes.



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