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DESCRIPTION AND PRESENTATION OF SOME RARE ASSOCIATIONS FROM LĂZĂRENILOR HILLS (NORTH - WEST ROMANIA). STUDY CASE ASSOCIATION *NAJADETUM MINORIS*

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Abstract: This paper aims to describe and present three rare associations (*Najadetum minoris, Potamogetonetum crisp şi Ranunculetum aquatilis)* from Lăzărenilor Hills. The value of this study is the fact that these phytocoenoses weren't previously described, in this area. By the identification, characterization and presentation of the associations above mentioned, this enterprise contributes to the enrichment of scientific patrimony from Romania and from abroad. These associations are found on the red list of missing, endangered, vulnerable and rare vascular plant. Among floral species endangered to disappear, from Lăzăreni Hills, we mention: *Najas minor*, *Potamogeton crispus*, *Ranunculus trichophyllus*, *Callitriche palustris*, *Ranunculus aquatilis*, *Ranunculus peltatus* etc. They also include plants which are found on the same critical list and which need to be protected. This thing is imposed the more so as each day we assist to a sustained aggression of human upon environment, in order to meet his growing needs.

Key words: association, phytocoenoses, phytocoenologic study, floristic study, ecological indexes.

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INTRODUCTION

Lăzărenilor Hills are located in western Romania, occupying the south central part of Bihor County and they neighbor upon the following localities (figure 1).

- to north, Vad - Oradea Breach on the alignment of the localities Cihei, Băile Felix, Rontău, Haieu, Felcheriu, Alparea, Borşa;
- the limit for Pădurea Craiului Mountains is marked by the localities Borşa, Chijic, Copăcel, Surduc, Serghiş, Corbeşti, Topa de Sus, Topa de Jos and Cornişeşti;
- to south, Lăzărenilor Hills come into contact with Holodului Trough and with Low Plain of Crişurilor, to north of the localities Tinca, Râpa, Dumbrava, Holod, Dumrâviţa, Rogoz and Sâmbăta;
- to west, they neighbor upon Miersigului Plain, to east of the localities Apateu, Păuşa, Sititelec, Hausasău de Tinca, Tinca;

The physico-geographical factors were analyzed in terms of their impact on the vegetal carpet based on the existent literature. The Lăzărenilor Hills relief is characterized by relatively low altitudes ranging from 130 m in the west part, in contact with the High Plain of Miersigului and 450 m in the east part, in Tăşadului Hills, in contact with Pădurea Craiului Mountains (Pop, 2005).

Regarding the geological substrate from the literature study, it is illustrated the fact that it is composed of a mesozoic crystalline base, fragmented by a network of fissures in a system of horsts and grabens unevenly deepened, above which deposited the panonian deposits made of clays and clay sands (Ţenu, 1981).

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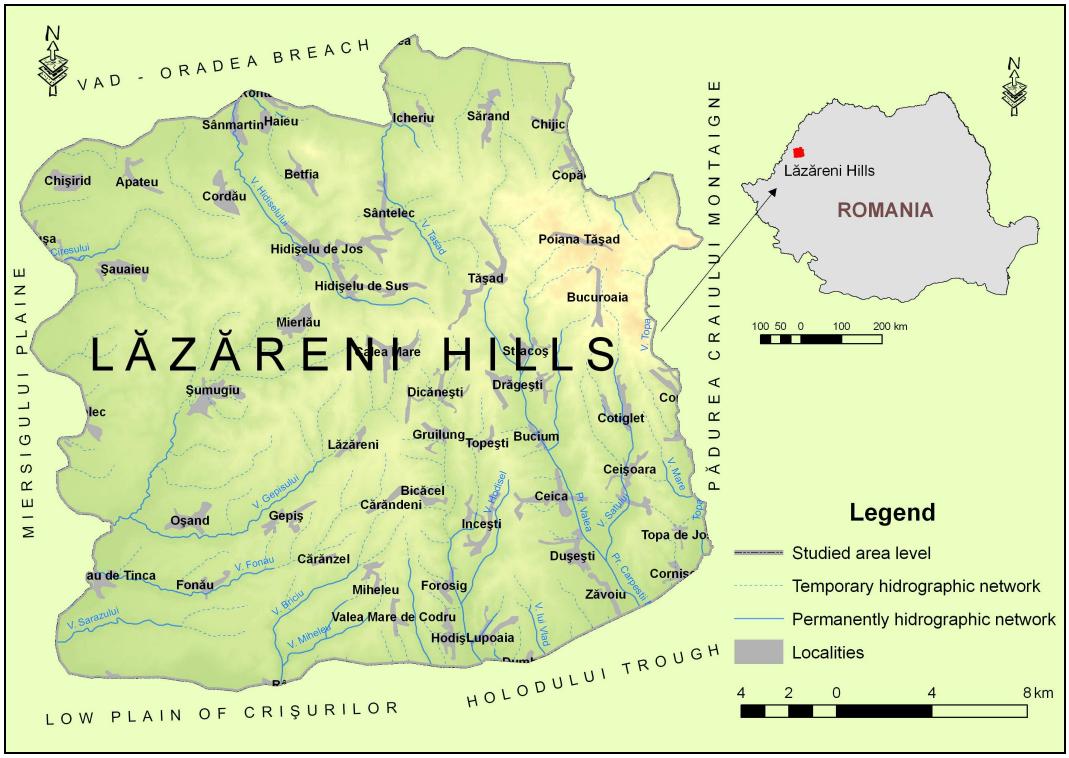

Figure 1. Geographical location of Lăzăreni Hills
(Source: processing after Pop, 2005)

The analysis of potential climate of the habitat studies was made by using information from various specialty papers Dragotă (2006) and Dumiter (2007). Soils represent a support factor in terms of its qualities to maintain life, by the capitalization of various specialty works, among which we mention those published by Sabău et al. (2002) etc.

MATERIALS AND METHODS

In the achievement of this study, we undertook a series of bibliographical and on site investigations and researches between the years 2008 - 2010.

Taxons identified on site were harvested on plates and arranged in the herbarium. Taxons were identified based on specialty determiners by Ciocârlan (2006) and Cod of Botanical Nomenclature (1995).

In the projection of this vegetation study, realized in Lăzăreni Hills, we used the phytocoenological research method of Central European School (Braun-Blanquet, 1964) end adapted to the vegetation particularities of our country (Borza and Boşcaiu, 1965).

Sample surfaces (figure 2) homogeneous from floristic and physiognomic points of views, were chosen from *Najadetum minoris* phytocoenoses, and their size being of 4 - 15 sqm.

To the performance of the synthetic table (table 1), it was considered information regarding the species entering in the floristic composition of the association, the live forms, the floristic element, the ecological factors (humidity, temperature, chemical reaction of soil), the karyotype, the serial number of the survey, the altitude (m.s.m.), the exhibition, the slope, the cover of herbaceous layer (%), the surface (sqm). At the end of the table, were noted and calculated the phytocoenologic indexes, the consistency (K) (whose class ranges from I - V, expressing the degree of coenotic fidelity of each species) and the abundance-dominance index, which helps to the quantitative appreciation of each specie's participation to the association table, following the

evaluation system of Braun-Blanquet and Pavillard, 1928. At the bottom of the table, were mentioned the habitats and the performance date of the surveys. For ordering and grouping the species from the association table to hierarchically superior coenotaxons, alliance, order and class were considered the traditional floral ecological systems of the authors: Ardelean (1999), Borhidi (1996), Pott (1995), Sanda et al. (2008) etc.

RESULTS

The results consisted in the first approach and description of these rare associations, found in three localities (Sâmbăta, Duşeşti and Ceica) from Lăzărenilor Hills.

Najadetum minoris association, found in five phytocoenologic surveys, can elaborate an association table, while *Potamogetonetum crispi* and *Ranunculetum aquatilis* associations are presented only in three phytocoenologic suveys, not having the required number of surveys for elaborating association tables.

Najadetum minoris Association, located in Sâmbăta, Duşeşti and Ceica localities, is a marsh association, poor in species. In Romania, this association is less known, being mentioned in Moldova (Mititelu et al., 1995), in north-western Romania (Ardelean and Karácsonyi, 2003; Burescu, 2001; Burescu, 2003; Drăgulescu, 2005; Karácsonyi, 1995), in Danube Delta (Ştefan et al., 2006) etc.

Phytocoenoses sporadically develop in stagnant waters of some marshes, valleys, creeks, with depths of 0.3 - 0.5 m and which have a logged substrate. The characteristic and dominant specie of the association is *Najas minor* (table 1), with a general coverage of 72.5 % ADm and a maximum constancy (K = V). This plant grows in the submerged sinusia of the phytocoenoses, accompanied by *Potamogeton crispus, Ranunculus trichophyllus, Callitriche palustris,* which are characteristic species of the alliance *Potamion pusilli,* of the order *Potamogetonetalia pectinati* and of the class *Potamogenetea pectinati*.

At the water's surface (figure 2), in the natant layer appears *Ranunculus aquatilis,* and among transgressive species, in emerssive layer are found *Alisma plantago-aquatica* and *Alisma lanceolatum* etc.

Figure 2. *Najadetum minoris* of Topa - Sâmbăta crick - Bihor County

Phytocoenoses analysis in terms of life forms (figure 3) highlights the dominance of helohydatophytes species (72.7 %), followed at a big distance by hemicryptophytes (18.2 %). Geophytes are presented in the association in the lowest percentage (9 %).

The spectrum of floristic elements (figure 4) highlights the considerable weight of cosmopolitan species (54.5 %), followed by Eurasian species (27.3%) and by the European species (9 %), equal with the circumpolar species (9 %).

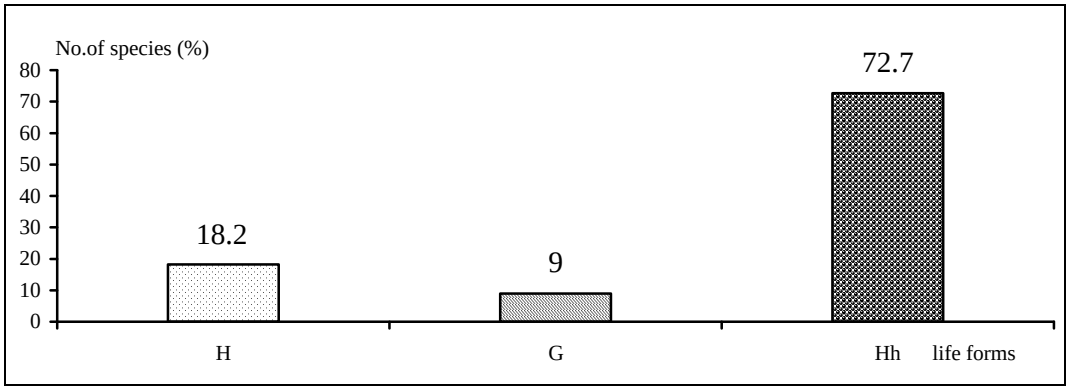

Figure 3. The life form spectrum of association *Najadetum minoris* in the Lăzăreni Hills
H = hemicryptophytes; G = geophytes; Hh = helohydatophytes.

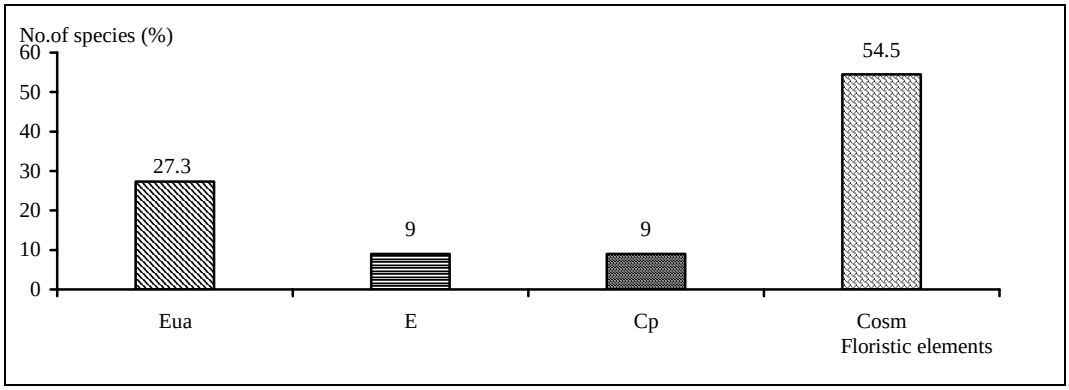

Figure 4. Floristic elements spectrum of the association *Najadetum minoris* in Lăzăreni Hills
Eua = Euroasian; E = European; Cp = Circumpolar; Cosm = Cosmopolitan.

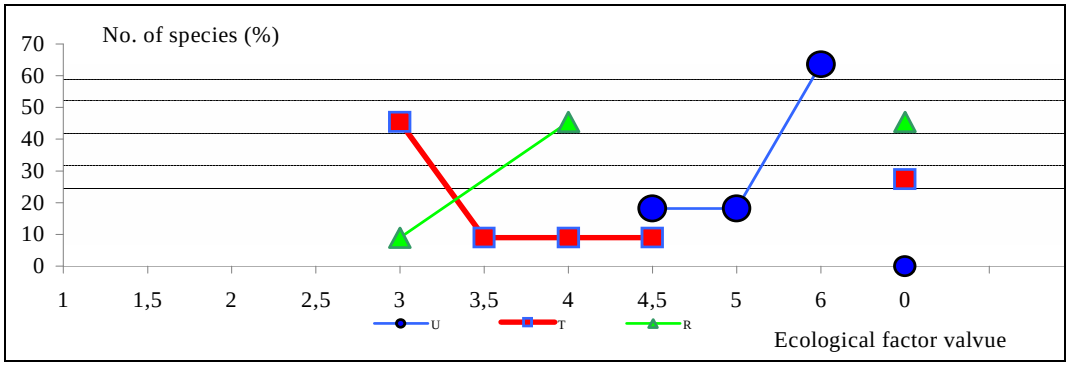

Figure 5. Ecological factors spectrum of the association *Najadetum minoris* in Lăzăreni Hills,
U = humidity; T = temperature; R = chemical reaction of soil.

Analyzing the phytocoenoses in terms of main ecological factors (figure 5), the hydrophilous character prevails (63.6 %), towards hygrophilous (18.2 %), equal with meso-hygrophilous one (18.2 %) of the association. In terms of heat, most species from the association are micro-mesothermophilous (54.4 %), followed by eurythermal amphytolerant species (27.3 %).

Compared to the chemical reactions of water and soil, in the association dominate amphitolerant species (45.4 %), equal with those weakly acid-neutrophilous (45.4 %).

From the analysis of karyological spectrum (figure 6), distinguish the polyploids (63.6 %), followed by dyploids (18.2 %). Dyplo-polyploids couple appears, in association, with a low value (9.1 %) and it is equal with the species whose karyotype is not knows (9.1 %). Dyploids index is of 0.3.

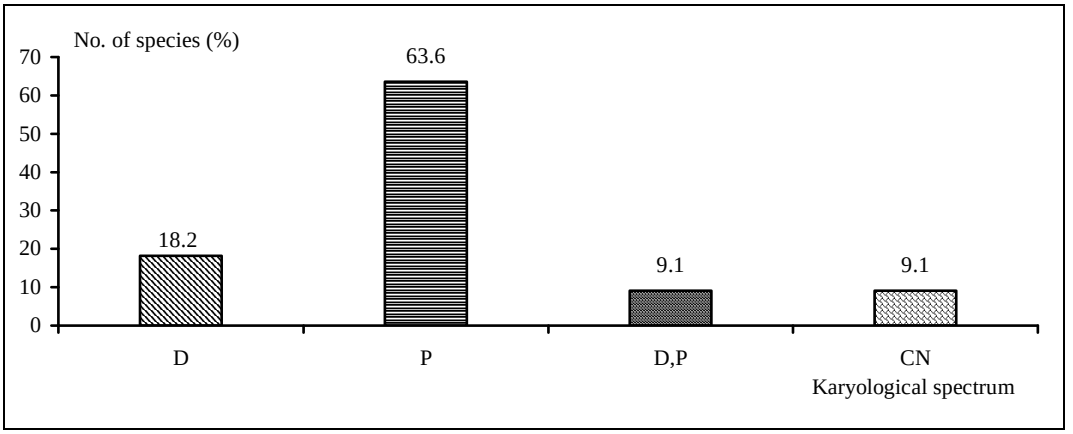

Figure 6. The karyological spectrum of association *Najadetum minoris* in Lăzăreni Hills
D = dyploid; P = polyploid; D.P = Dyplo-polyploid; CN = karyotype is not knows

Table 1. Association *Najadetum minoris* Ubriszy 1941 in Lăzăreni Hills

L.f.	F.e.	U.	T.	R.	2n	Nr. Land Surveys Altitude (m.s.m.) Exposition Slope Coverage (%) Surface (sqm)	1 80 N 1 90 4	2 90 E 2 95 15	3 60 S 3 75 4	4 80 E 5 95 5	5 100 NE 4 70 4	K	ADm
Hh	Eua	6	4.5	4	P	*Najas minor*	5	5	4	5	4	V	77.5
Potamion pusilli; Potamogetonetalia pectinati; Potamogenetea pectinati													
Hh	Cosm	6	4	0	P	*Ranunculus aquatilis*	+	1	+	+	+	V	1.4
Hh	Cosm	6	3.5	4	P	*Potamogeton crispus*	.	+	1	+	+	IV	1.3
Hh	Cp	6	3	0	P	*Callitriche palustris*	+	+	+	.	.	III	0.3
Hh	E	6	3	0	P	*Ranunculus trichophyllus*	.	+	+	1	.	III	1.2
Phragmitetea australis													
Hh	Eua	6	0	4	D	*Alisma lanceolatum*	+	+	+	+	+	V	0.5
G (Hh)	Cosm	5	0	4	D.P	*Eleocharis palustris*	+	+	+	+	+	V	0.5
Hh	Cosm	6	0	0	D	*Alisma plantago-aquatica*	+	.	+	+	+	IV	0.4
Hh	Cosm	5	3	0	P	*Glyceria fluitans*	.	.	+	+	1	III	1.2
Molinio – Arrhenatheretea													
H	Eua	4.5	3	4	P	*Grațiola officinalis*	.	+	+	.	+	III	0.3
H	Cosm	4.5	3	3	CN	*Juncus inflexus*	.	+	.	+	+	III	0.3

Where: L.f. = life forms; H = hemicryptophytes; G = geophytes; Hh = helohydatophytes; F.e. = floristic elements; Eua = Euro-Asiatic; E = European; Cp = Circumpolars; Cosm = Cosmopolitans; U = humidity; T = temperature; R = chemical reaction of soil; 2n = karyological spectrum; D = dyploid; P = polyploid; D, P = Dyplo-polyploid; CN = karyotype is not knows.
Place and date of mapping: 1, marsh with water on the crick Valea, out of Ceica, 28.08.2010; 2, 3 places where water forms a marsh on the edge of Topa - Sâmbăta crick, 20.08.2010; 4, 5 stagnant eye wash on Zăvoiu - Dușești Valley, 20.08.2010;

Potamogetonetum crispi Association was found in the localities Sâmbăta, in Topa crick and in Dușești on Zăvoiu Valley.

The phytocoenoses of this association (figure 7) develop in stagnant waters of some cricks, valleys, antropically influenced, with a depth of 0.2 m till 0.5 m where occupy surfaces with a substrate represented by mud enriched in organic substances.

Floristic inventory of the association includes a limited number of 7 species subordinating to coenotaxons, for *Potamion pusilli* alliance, to *Potamogetonetalia pectinati* order and to *Potamogenetea pectinati* class, with the following species: *Potamogeton crispus, Ranunculus trichophyllus, Ranunculus aquatilis, Najas minor*. In these coenosa, sporadically appear transgressive species from *Phragmitetea australis* class: *Alisma lanceolatum, Glyceria fluitans, Eleocharis palustris.*

Figure 7. *Potamogetonetum crispi* Soó 1927
(Zăvoiu Valley - Duşeşti - Bihor County)

Figure 8. *Ranunculetum aquatilis* Géhu 1961
(Zăvoiu Valley - Duşeşti - Bihor County)

Ranunculetum aquatilis Association it appears in Lăzărenilor Hills in the localities: Sâmbăta and Duşeşti. Coenosa of this association (figure 8) develop in places where water is on surface, in the form of stagnant eye wash, on the fringe of some valleys, cricks, marshes. The water has a lower depth, between 0.1 - 0.2 m and it has a substrate represented by marshlands. *Ranunculus aquatilis* is the dominant specie and it is accompanied by three species belonging to *Ranunculion aquatilis* alliance, to *Callitricho-Batrachietalia* order and to class *Potamogetonetea pectinati*: *Callitriche palustris, Potamogeton crispus, Ranunculus peltatus*.

Meet four transgressive species from class *Phragmitetea australis*: *Eleocharis palustris, Alisma plantago-aquatica, Glyceria fluitans, Mentha aquatica.*

DISCUSSIONS

From the comparative analysis made between this study and other 7 similar studies of Ardelean and Karácsonyi (2003), Burescu (2001; 2003), Drăgulescu (2005); Karácsonyi (1995), Ştefan et al. (2006) it shows that between them there are many similarities and differences.

Similarities regarding the number of species, the biological forms, the florist elements and the ecological indexes were identified by Burescu (2001; 2003). As in the case of this work, *Najadetum minoris* and *Potamogetonetum crispi* associations have a similar number of species, between 7 - 11 species. In association, helohidatophytes, cosmopolites and hydrophytes predominate. A similar situation is also found in *Ranunculetum aquatilis* association.

Differences aiming the number and the type of species were found by Ardelean and Karácsonyi (2003), Burescu (2001; 2003); Drăgulescu (2005), Karácsonyi (1995), Раченкова (2008) and Ştefan et al. (2006).

Compared to works of Burescu (2001; 2003) and Deegan et al. (2007), in *Ranunculetum aquatilis* association, differences were represented by the higher number of species (20 species) in relation to this work (8 species).

In work of Ştefan et al. (2006), *Potamogetonetum crispi* association, located in the region of Belciug and Dranov Lakes, from Biosphere Reservation from Danube Delta, is different from the similar association studied in Lăzărenilor Hills. On one hand, the difference is given by the number of species (20 species found in the perimeter of the lakes mentioned above, compared to 7

species found in Zăvoiu Valley Holm from Duşeşti locality) and on the other hand, by the fact that from all these species only one is common, namely *Potamogeton crispus*.

We found a similar situation in the comparison made between the associations studied in Lăzărenilor Hills and the associations described by Ardelean and Karácsonyi (2003) and Drăgulescu (2005), aiming the region of Ecedea Swamp. There are differences between the number of species forming the structure of *Najadetum minoris, Potamogetonetum crispi, Ranunculetum aquatilis* associations, while the similarities were represented by the presence of 10 common species in their structure *(Alisma lanceolatum, Alisma plantago-aquatica, Callitriche palustris, Eleocharis palustris, Glyceria fluitans, Juncus inflexus, Najas minor, Potamogeton crispus, Ranunculus aquatilis, Ranunculus trichophyllus).*

In *„Biodiversity and Bioresources of the Urals and adjacent territories"* of Раченкова (2008), handling the region of Ural Lake from Russia, for *Najadetum minoris* association we have 5 species, from which 2 are common (*Najas minor, Potamogeton crispus)* and 3 are different *(Utricularia vulgaris, Ceratophyllum demersum, Ceratophylleta demersi).* For *Potamogetonetum crispi* association, we found 11 species (*Potamogeton perfolatus, Potamogeton lucens, Ceratophyllum demersum, Myriophyllum verticillatum, Hydrocharis morsus-ranae, Lemna minor, Nuphar lutea, Nymphaea candida, Sagittaria sagittifolia, Butomus umbellatus, Potamogeton crispus),* from which the last is common with that described in Lăzărenilor Hills.

Potamogetonetum crispus end *Ranunculetum aquatilis* associations were described in work *„Flora şi vegetaţia judeţului Satu-Mare"* of Karácsonyi in 1995. The descriptions aimed the Law Plain of Someş, aboard the collector and draining channels.

As a conclusion, after the comparative analysis between the results of the researches made on field and of those obtained by bibliographic research - documentation, was founded a series of similarities and differences regarding the phytocenosis studied. These were represented by the number of species from the structure of the associations, the surface analyzed, the biological form, the florist elements and the ecological indexes.

These three phytocoenoses from Lăzărenilor Hills have an optimum development in spring, being more representatively developed in April. During the dry months of the year (July-August), they know a decline, as a consequence of the fall of the water level.

By gradually clogging or reducing of water from marshes, during the dry period from summer, it gets to the development of some hydrophilic and meso-hydrophilic phytocoenoses belonging to *Phragmitetea australis* and to *Molinio-Arrhenatheretea* classes.

The economic importance of these associations emerges from their role as source of food and housing for insects, crustaceans and amphibians from marshes (marshes fauna).

These associations are found on the red list of missing, endangered, vulnerable and rare vascular plant (Cristea, 1995; Oprea, 2005). They also include plants which are found on the same critical list and which need to be protected. This thing is imposed the more so as each day we assist to a sustained aggression of human upon environment, in order to meet his growing needs.

More and more, in scientific world circulate questions like: What is the endurance limit of the environment? What is the rehabilitation capacity of the environment? The answers to these questions will represent the touchstone of the scientific world of tomorrow, including of the biologist.

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REFERENCES

Ardelean A. (1999), *Flora şi vegetaţia din Valea Crişului Alb*. University Press Vasile Goldiş, Arad, 311 p;
Ardelean G., Karácsonyi C. (2003), *Flora şi fauna Ecedei de la mlaştină la câmpie*, Editura Daya, Satu Mare, pp. 183 - 190;
Borhidi A. (1996), *Critical revision of the Hungarian plants communities*. Janus Pannonius University, Pécs, pp. 43-94;
Borza A., Boşcaiu N. (1965), *Introducere în studiul covorului vegetal*, Editura Academiei Române, Bucureşti, 340 p;

Braun-Blanquet J. (1964), *Pflanzensoziologie, Spinger Verlag*, Wien-New-York, 3, Aufl, pp. 12-24;
Braun-Blanquet, J., Pavillard, J. (1928), *Vocabulaire de Sociologie Végétale*, 3th edition, Imprimérie Lemair-Ardres, pp. 15-18;
Burescu P. (2003), *Flora şi vegetaţia zonelor umede din nord-vestul României*, Editura Academiei Române, Bucureşti, 474 p;
Burescu P. (2001), *Flora şi vegetaţia luncilor joase ale râurilor din nord-vestul României*, Editura Treira, Oradea, 216 p;
Ciocârlan V. (1990), *Flora ilustrată a României. I, II*, Editura Ceres, Bucureşti, 382 p;
Cocean P. (2002), *Geografie Regională*. Editura Presa Universitară Clujană, Cluj Napoca, 189 p;
Cristea V. (1995), *La conservation de la nature en Roumanie. L´uomo e l´ambiente*, 18, Camerino, pp. 1-140;
Deegan B. M., White S. D., Ganf G. G. (2007), *The influence of water level fluctuations on the growth of four emergent macrophyte species*, Aquatic Botany 86(2007), Elsevier Science B. V., pp. 309-315;
Dragotă C. (2006), *Precipitaţiile excedentare în România*, Editura Academiei Române, Bucureşti, 174 p;
Drăgulescu C. (2005), *Contributions to knowledge of phytodiversity of the swamp Ecedea*, Contribuţii Botanice, XL, Grădina Botanică "Alexandru Borza", Cluj-Napoca, pp. 43-53;
Dumiter A. (2007), *Clima şi topoclima oraşului Oradea.* Editura Universităţii din Oradea, Oradea, 230 p;
Karácsonyi C. (1995), *Flora şi vegetaţia judeţului Satu-Mare*, Editura Muzeului Sătmărean, Satu Mare, 181 p;
Mititelu D., Chifu T., Scaelat A., Aniţei L. (1995), *Flora şi vegetaţia Judeţului Iaşi*, Buletinul Grădinii Botanice, Editura Universităţii Al. I. Cuza, Iaşi, 5: 99 - 124;
Oprea A. (2005), *Lista critică a plantelor vasculare din România*, Editura Universităţii Alexandru Ioan Cuza, Iaşi, 398 p;
Раченкова Е. Г. (2008), *Биоразнообразие и биоресурсы Урала и сопредельных территории*, *(Biodiversity and Bioresources of the Urals and adjacent territories)*, Вестник Оrу №87/май`2008, pp. 101 - 106;
Pop Gr. (2005), *Dealurile de Vest şi Câmpia de Vest*, Editura Universităţii din Oradea, Oradea, 176 p;
Pott R. (1995), *Pflanzengesellschaften Deutschlands*, 2 Aufl., Ulmer Verlag, Stuttgart, pp. 124 - 128;
Sabău N., Domuţa C., Berchez O. (2002), *Geneza, degradarea şi poluarea solului*, Editura Universităţii din Oradea, Oradea;
Sanda, V., Öllerer, K., Burescu, P. (2008), *Fitocenozele din România, sintaxonomie, structură, dinamică şi evoluţie*, Editura Ars Docendi, Bucureşti, 570 p;
Ştefan N., Sârbu I., Mânzu C. (2006), *Contributions to the study of vegetation from the Dranov and Belciug lakes area (Danube Delta Biosphere Reserve) II*, Buletinul Grădinii Botanice, Tomul 13, Iaşi, pp. 11-19;
Ticleanu N. (2008), *Geologie generală. Ediţia II-a Revizuită*, Editura Universităţii, Bucureşti, 206 p;
Ţenu A. (1981), *Zăcămintele de ape hipertermale din Nord-Vestul României*, Editura Academiei Republici Socialiste România;
*** Cod of Botanical Nomenclature (Tokyo 1995), Boissiera, 49, Geneve, 1995, pp. 1 - 85.

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