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DIVERSITY, DISTRIBUTION AND ECOLOGY OF THE FRESHWATER NATURAL HABITATS FROM SOUTHERN OF OLTENIA, ROMANIA

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Abstract

In this paper we made a general presentation of the most important freshwater natural habitats from the Danube and Jiu floodplains, part of Southern of Oltenia, Romania. In the researched area there are the following Natura 2000 habitats: 3130 - Oligotrophic to mesotropic standing waters with vegetation of the Littorelletea uniflorae and/or Isoëto-Nanojuncetea, 3140-Hard oligomesotrophic waters with benthic vegetation of Chara spp., 3150- Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation, 3160- Natural Dystrophic Lakes and Ponds, 3260- Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation, 3270- Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation. Six types of freshwater natural habitats of conservative interest have been identified on the Southern of Oltenia, in the Danube and Jiu floodplains (D. Gafta, O. Mountford coord., 2008). These natural habitats are represented by hydrophilous, hygrophylous and meso-hygrophylous plant communities. The plant communities that edify the freshwater natural habitats from this area have been analyzed and characterized from the chorological, ecological point of views. They were also examined according to their floristic composition and physiognomy, after the conservation status and human impact. Of the rare and vulnerable species we can mention: Vallisneria spiralis, Utricularia minor, Nymphaea alba, Azolla filiculoides, Typha minima. The phytodiversity of the freshwater natural habitats from Sotheren of Oltenia is endangered because the human impact is very high, although this area it is included in the important protected areas from Romania.

Key words*: freshwater, habitats, plant communities, Oltenia.*

INTRODUCTION

When referring to Oltenia, one can notice that the floristic patrimony of this part of the region is very well represented. Because of the very varied pedoclimatic and orographic conditions existing in Oltenia, there are approximately 2,200 species of cormophytes on its lands, which represent 2/3 of our country's vascular flora. The main wetlands in the southern of Oltenia which are found the freshwater natural habitats are the following:

- Poiana Mare, Ciupercenii Noi, Ciupercenii Vechi, Desa, Rast Vechi, Rast - part of the protected aria ROSCI 0039 Ciuperceni- Desa;
- Horezu-Poienari, Sadova, Piscul Sadovei, Grindeni, Bistret, Zaval, Badosi, Bratovoiești, Gingiova, Comosteni, Ostroveni - part of the protected aria ROSCI0045Coridorul Jiului;
- Corabia - part of the protected aria ROSCI0044 Corabia - Turnu Magurele Hunia, Salcia, Vrata - part of the protected aria ROSCI0299 Danube at Gârla Mare – Maglavit (Figure 1).

Due to the diversity of flora and vegetation from the Southern of Oltenia, and to the little scientifical research in the last 30 years regarding the freshwater natural habitats, we considered necessay achievement for these studies.

The biotic conditions on this part of Romania allow the existance of some specific natural habitats, specific plant communities. The natural habitats present a intersting structure and numerous rare plant species registered into Romanian Red Lists Săvulescu, T. (ed.)., 1952-1976; Tutin et al , 1964-1980, 1993). Inventory of this natural capital and establishing coherent management measures in this area which have already suffered huge transformations due to the eco-climat changes, will lead to a better management and preservation of the area.

MATERIALS AND METHODS

The studies on the field involved a good bibliographic documentation regarding the physical-geographical frame: the relief, the geology-lithology, the hydrographic network, the soils and the general and local climate. The plant species nomenclature follows the Flora Europaea and Flora of Romania. The plant communities that edify the freshwater natural habitats from this area have been described by personal observations and on the base of the synthesis book Coenotic structure and ecological characterization of the phytocoenosis of Romania (V. Sanda et al 2001). As for the classification of the vegetal associations, we have used synthesis papers by J.S. Rodwell, J.H.J. Schaminée, L. Mucina, S. Pignatti, J. Dring, D. Moss. To identify the habitats we used the Romanian Manual for interpretation of Eu habitats and Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, Annex I (Habitats Directive).

We gave a special attention to the calculation of the Bray-Curtis dissimilarity index, used to construct Group average (UPGMA) dendrograms and Jaccard coefficient (for binary data) used to construct Simple average (WPGMA) dendrograms (Podani, 2001).

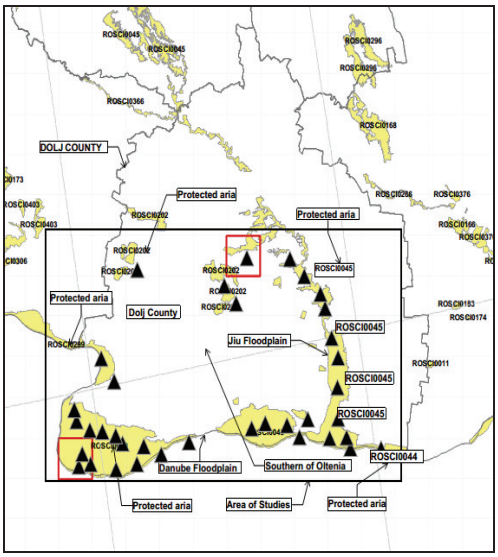

Figure 1. The Map of thematic area

RESULTS AND DISCUSSIONS

As a result of our study, 6 freshwater types of habitats of conservative interest have been observed in the Southern of Oltenia, in the Danube and Jiu floodplains (Table 1).

3130 - Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*

Chorology: Ciupercenii Noi in the Danube floodplain, Horezu-Poienari in the Jiu foodplain, Badosi, Piscu Sadovei – Zacatoarea Lake, at altitudes ranging between 30 m and 70 m, developed on alluvial soil, reaching a coverage of up to 95%.

Typical plant communities of this habitat identified in Southern of Oltenia: *Cyperetum flavescentis* Koch ex Aichinger 1933. The characteristic and dominant species: *Cyperus flavescens, Juncus articulatus, Alopecurus aequalis, Juncus bufonius, Polygonum hydropiper, Rorippa sylvestris, Agrostis stolonifera, Echinochloa crus-gallis* (Niculescu et al, 2014).

In the UPGMA dendrogram of the *Cyperetum flavescentis,* there are pointed out also 2 distinct clusters. In the first sub-cluster there are grouped relevées 1, 2, 3, 4, 5, 6, 7, 9 and 10, especially due to *floristic*. The latter clusters' surveys are grouped surveying 8 - on high dominant values, due to the abundance of *Pulicaria vulgaris* (abundance-dominant (AD) 2). Given this dendrogram, the values of the quantitative index, *Bray-Curtis* varies, reflecting the heterogeneity of the floristic structure of the phytocoenoses of this pant community (Figure 2).

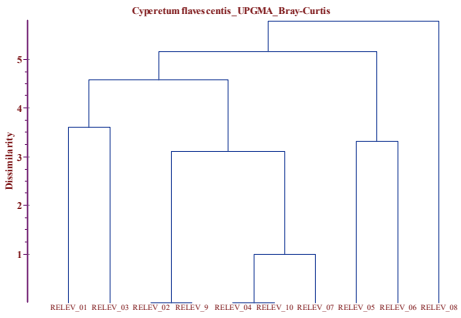

Figure 2

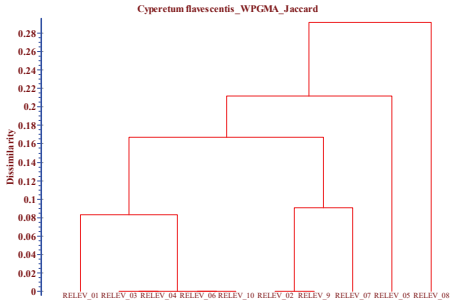

Figure 3

After an analysis of the dendrogram of this plant community, used WPGMA method and Jaccard coefficient, there can be noticed also the separation of the 8th relevées, from the rest of the surveys, which are grouped in a cluster. This cluster is separated in two sub-clusters: the former groups the surveys 1, 2, 3, 4, 5, 6, 7, 9, 10 and the latter, surveying 1 (Figure 3).

3140- Hard oligomesotrophic waters with benthic vegetation of *Chara* spp.

This natural habitat are poorly represented in the Southern of Oltenia.

Chorology: Ciupercenii Noi, Ciupercenii Vechi, Balta Păsărica, Danube floodplain, Corabia, Comosteni, Gingiova, Ostroveni, Horezu-Poienari, Jiu floodplain, at altitudes ranging between 20 m and 60 m, developed on alluvial soil.

Typical plant communities of this habitat identified: *Charetum fragilis* Corillion 1957 (Sanda et al.,2001). This plant community is found on a small surface (0,10ha) and have a smaller phytodiversity:*Chara fragilis, Lemna minor, Ceratophyllum demersum, Myriophyllum spicatum, Alisma plantago-aquatica, Utricularia minor, Vallisneria spiralis.*

3150-Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation

This natural habitat are well-represented in the Southern of Oltenia. The total area for this natural habitat is 408,53 ha.

Chorology: Corabia, Danube floodplain, Ostroveni, Topila Lake, Sadova, Piscul Sadovei, Sadova Lake, Dobreşti, Rast, Rastu Vechi, Badosi, Grindeni, Bistret, Vrata, Arcerului Lake; Bratovoiesti, Desa.

Typical plant communities: *Lemnetum minoris* Soó 1927; *Lemnetum trisulcae* Knapp et Stoffers 1962; *Lemno – Azolletum filiculoides* Br.-Bl. 1952; *Lemno – Salvinietum natantis* Miyawaki et J. Tx. 1960; *Ceratophylletum demersi* Soó1927 nom.nud; *Polygonetum amphibii (natantis)* Soó 1927; *Hydrocharitetum morsus-ranae* van Langendonck 1935; *Potamogetonetum crispi* Soó 1927; *Potamogetonetum nodosi* (Soó 1960) Segal 1964.

In the floristic composition of the ptytocoenoses of this natural habitat meet numerous hygrophile and hydrophile species. These phytocoeonoses have a special composition, being characterised by the dominance of the species: *Lemna minor, Lemna trisulca, Azolla filiculoides, Elodea nuttallii, Salvinia natans, Potamogeton crispus, Sparganium erectum, Butomus umbellatus*, *Ceratophyllum demersum, Alisma plantago-aquatica, Glyceria aquatica, Sagittaria sagittifolia, Nymphoides peltata, Hydrochari morsus-ranae, Myriophyllum spicatum, Schoenoplectus lacustris, Glyceria maxima, Phragmites australis, Stachys palustris, Mentha aquatica, Utricularia vulgaris, Spirodela polyrrhiza, Juncus buffonius, Cyperus fuscus, Typha angustifolia.* The plant communities at altitudes ranging between 20 m and 70 m, developed on alluvial soil and limnosoil, reaching a coverage of up to 100%.

3160-Natural dystrophic lakes and ponds

Chorology: Ostroveni, Pasarica Lake, Hunia, Salcia, Calafat, Bistret, Calugareni Lake, Corabia, Poiana Mare, Bratovoiesti, at altitudes ranging between 20 m and 60 m, developed on alluvial soil, reaching a coverage of up to 90%.

Typical plant communities of this habitat identified in Southern of Oltenia: *Myriophyllo verticillati-Nupharetum luteae* Koch 1926; *Nymphoidetum peltatae* (Allorge 1922) Bellot 1951 (Rodwell, J, 2002; Sanda et al, 2001). The characteristic and dominant species: *Nuphar luteum, Nymphaea alba, Nymphoides peltata, Myriophyllum spicatum, Utricularia vulgaris, Spirodela polyrrhiza, Potamogeton pectinatus, Potamogeton crispus, Myriophyllum verticillatum, Ceratophyllum demersum, Scirpus lacustris, Sparganium erectum.* After the analysis of the Gropup average (UPGMA) dendrogram of the *Nymphoidetum peltatae* (Allorge 1922) Bellot 1951 plant community, there can be noticed that relevés are grouped in

two clusters. For the former sub-cluster, there can be noticed that grouping the surveys 2, 7, 6 and 10 can be explained by the absence of *Potamogeton nodosus*.The latter cluster only groups surveys 1, 3, 5, 4, 8, 9. The branches of the dendrogram are well individualized. The quantitative values of the *Bray-Curtis* species indicating developed floristic heterogeneity (Figure 4).

We gave a special attention to the calculation of the index Jaccard index (for binary data) and to performing the dendograms, by using the method -Simple average (WPGMA) (Figure 5).

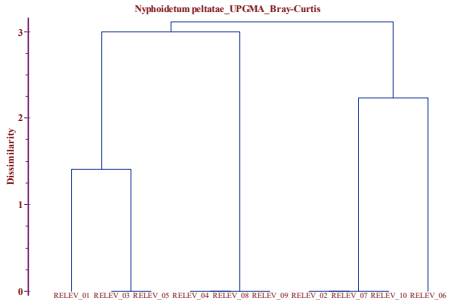

Figure 4

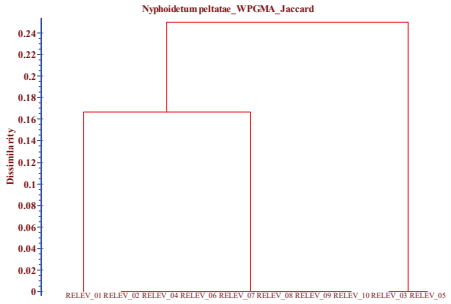

Figure 5

3260-Watercourses of plain to montanelevels with the *Ranunculion fluitantis* and *Callitricho-Batrachion vegetation*

This natural habitat are poorly represented in the Southern of Oltenia.

Chorology: Poiana Mare, Corabia, Ostroveni, Sadova, Bratovoiesti, Desa.

Typical plant communities: *Ranunculetum aquatilis* (Sauer 1947) Géhu 1961. In the floristic composition of the ptytocoenoses of this natural habitat meet numerous hygrophile and hydrophile species. Also, these phytocoenoses have a special composition, being characterised by the dominance of the species: *Ranunculus aquatilis, Lemna minor, Lemna trisulca, Azolla filiculoides, Elodea nuttallii, Salvinia natans, Potamogeton crispus, Ranunculus trichophyllus, Ceratophyllum demersum, Myriophyllum spicatum, Potamogeton pectinatus, Potamogeton crispus, Myriophyllum verticillatum.* The plant communities at altitudes ranging between 20 m and 70 m, developed on alluvial soil and limnosoil, reaching a coverage of up to 90%.

3270-Rivers with muddybanks with Chenopodion rubri and Bidention p.p. vegetation

This natural habitat also are well-represented in the Southern of Oltenia.

Chorology: Corabia, Ostroveni, Topila Lake, Ciupercenii Noi, Sadova, Piscul Sadovei, Badosi, Grindeni, Bistret, Vrata, Arcerului Lake, Bratovoiesti, Desa. Typical plant communities:*Bidenti-Polygonetumhydropiperis* Lohm. in Tüxen 1950; *Polygono lapathifolii-Bidentetum* Klika 1935; *Echinochloo–Polygonetum lapathifolii* Soó & Csűrös 1974; *Bidentetum cernui* (Kobenza 1948) Slavnić 1951.

The phytocoenoses have a special composition, being characterised by the dominance of the species: *Bidens tripartita, Echinochloa crus-galli, Bidens cernua, Polygonum lapathifolium, Polygonum hydropiperis, Glyceria maxima, Phragmites australis, Lycopus europaeus, Stachys palustris, Mentha aquatica, Juncus buffonius, Typha angustifolia, Typha minima, Veronica beccabunga, Lythrum salicaria, Juncus buffonius, Cyperus fuscus, Typha angustifolia, Rorippa sylvestris, Sparganium erectum, Veronica beccabunga, Ranunculus sceleratus, Butomus umbellatus, Agrostis stolonifera, Alisma plantago-aquatica, Epilobium hirsutum.* The plant communities developed on alluvial soil, reaching a coverage of up to 100%.

After an analysis of the dendrogram of the *Echinochloo–Polygonetum lapathifolii* Soó & Csűrös 1974 plant community, there can be noticed the separation of the 2th surveying, from the rest of the relevées, which are grouped in a cluster. This cluster is separated in two sub-clusters: the former groups the relevées 1, 3, 4, 5, 6, 7, 8, 9, 10 and the latter, surveying 2.

The surveys of the former cluster are grouped due to the presence of the species *Butomus umbellatus* (AD=2) and Sparganium erectum (AD=1). The branches of the dendrogram are very well individualized, for the quantitative index of *Bray-Curtis*. This reflects the heterogeneity of floristic composition of the phytocoenoses of this association (Figure 6).

In the dendrogram of the *Echinochloo–Polygonetum lapathifolii* Soó & Csűrös 1974, used the WPGMA method and Jaccard index, there are pointed out also 2 distinct clusters. In the first sub-cluster there are grouped relevées 1, 2, 3, 5, 6, 8, 9 and 10 especially due to *Polygonum lapathifolium*, which abundance-dominant (AD) is 4. The latter clusters' surveys are grouped in two relevées:4 and 7. Given this dendrogram, the values of the Jaccard index, varies, reflecting the heterogeneity of the floristic structure of the phytocoenoses of this pant community (Figure 7).

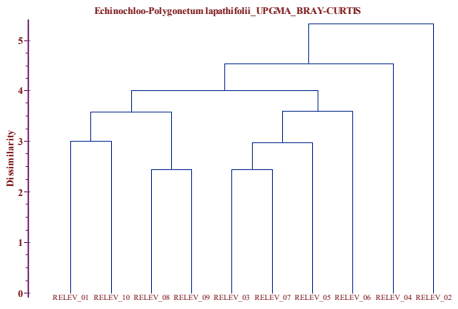

Figure 6

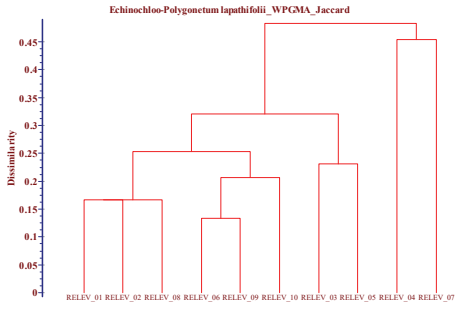

Figure 7

Conservation status and human impact

In the investigated area this habitats is characterized by the following data on the conservation status and human impact:

Conservation status: from favorable up to unfavorably-inappropriate.

Development trend of habitat: from stable up to decreasing.

Human impact and current pressures: G05.07- missing or wrongly directed conservation measures; D.06- Other forms of transportation and communication; F02.01. - Professional passive fishing; F02.03.02- pole fishing; H05.01- garbage and solid waste; F04.02.02- hand collection; E03.01- disposal of household/recreational facility wast; A.06.01.02- non- intensive annual crops for food production; D.06- Other forms of transportation and communication; H05.01- garbage and solid waste; H01.09- diffuse pollution to surface waters due to other sources not listed; E01.01- continuous urbanization.

Future threats: H01.09- diffuse pollution to surface waters due to other sources not listed; E03.01- disposal of household / recreational facility wast; E01.01- continuous urbanization; F02.03.02- pole fishing; Future threats: F02.01. - Professional passive fishing; D.06- Other forms of transportation and communication; F.03.02.09 - other forms of taking animals; H05.01- garbage and solid waste; H01.09- diffuse pollution to surface waters due to other sources not listed; F02.01.-Professional passive fishing; E01.01- continuous urbanization.

CONCLUSIONS

Six types of freshwater natural habitats of conservative interest have been identified on the Southern of Oltenia, in the Danube and Jiu floodplains.

These natural habitats are represented by hydrophilous, hygrophylous and meso-hygrophylous plant communities. Of the rare and vulnerable species we can mention: *Vallisneria spiralis, Utricularia minor, Nymphaea alba, Azolla filiculoides, Typha minima.* The phytodiversity of the freshwater natural habitats from Sotheren of Oltenia is endangered because the human impact is very high, although this area it is included in the important protected areas from Romania.

Table 1. Habitats of European interest in the studied area from Southern of Oltenia

No	*Natural habitats*	*Natura 2000 code*	*Palearctic Hab. code*
1.	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*	3130	22.12 x (22.31 or 22.32)
2.	Hard oligomesotrophic waters with benthic vegetation of *Chara* spp.	3140	(22.12 or 22.15) x 22.44
3.	Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation	3150	22.13 x (22.41 or 22.421)
4.	Natural Dystrophic Lakes and Ponds, 3260 Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	3160	22.14
5.	Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	3260	24.4
6.	Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation	3270	24.52

Figure 8. Freshwater natural habitats Ostroveni (Dolj County)

Figure 9. *Nynphoidetum peltatae* – Ostroveni

Figure 10. Freshwater natural habitats Bisteț (Dolj County)

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*** Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, Annex I (Habitats Directive).