

THE PLANT COMMUNITIES FROM HERGHELIE MARSH (MANGALIA) NATURAL RESERVE

ASOCIATIILE VEGETALE DIN REZERVATIA NATURALA MLASTINA HERGHELIEI (MANGALIA)

Marius Făgăraș Ph.D. ¹

Key words: Herghelie marsh Mangalia, plant communities, vegetation types, natural habitats, Natural Reserve;

Abstract: *The paper's aim is to present the main vegetation types and the plant communities from Herghelie Marsh, a less-known Natural Reserve situated near Mangalia city, in the proximity of the Black Sea shore. The actual marsh surface is 98 hectares. As a result of our researches, 22 plant communities have been identified and are presented in the coenotaxonomical conspectus; among these, 13 plant associations are newly found in the studied area, unmentioned in the older scientific papers. We describe in this paper only the hygrophilous plant communities belonging to Phragmitetea australis vegetation class, very well represented in the marsh area. Twelve habitat types have been observed already in the researched area according to Habitats Directive and Palearctic Habitats Classifications; some of them are of European interest for conservation.*

INTRODUCTION

Herghelie marsh is situated near Mangalia city, between Venus and Saturn resorts, in the neighbourhood of the Black Sea shore (Fig. 1). It's a former maritime gulf, turned into lagoon and subsequently separated from the sea through maritime sands. At present, the marsh is formed from a silting lake, some islands and large swampy surfaces around the lake. The actual marsh surface is 98 hectares.

Beginning with December 8th, 2005, Herghelie marsh has a botanical and ornithological Natural Reserve status. Recently, it was confirmed as Natura 2000 sit (SCI).

The botanical aspects (flora, plant associations) of this eutrophic marsh are very few and old. In the last detailed study regarding this zone, Pop & Hodișan (1977) described within the marsh area 9 plant associations. In the last thirty years, the flora and vegetation of this area have undergone many changes, as a result of the anthropogenic impact, but also a natural succession of vegetation. In this paper, we have proposed to update the phytocoenological knowledge of this recent Natural Reserve.

MATERIAL AND METHOD

Field researches have been done in the period 2005-2006 during the entire vegetation season. The studied area included the water surface, the marsh banks and the neighbouring higher surfaces.

¹ * Ovidius University of Constantza, The Faculty of Natural and Agricultural Sciences

The associations have been outlined according to the Central-European phytosociological methodology, on the base of some relevés made in different point of studied area.

The nomenclature of plant communities and higher syntaxes is based on the synthesis works *Cenotaxonomia și caracterizarea grupărilor vegetale din România* [10] and *Structura cenotică și caracterizarea ecologică a fitocenozelor din România* [11]. The life forms, floristic elements and ecological categories were established for each species on the base of some books i.e. *Flora ilustrată a României. Pteridophyta et Spermatophyta* [1] and *Conspectul florei cormofitelor spontane din România* [9].

For the representative marsh habitat types within studied area, we mentioned the NATURA 2000 code and the Palearctic Habitats Classification code; in this purpose we had used the book *Habitatele din România* [2, 3].

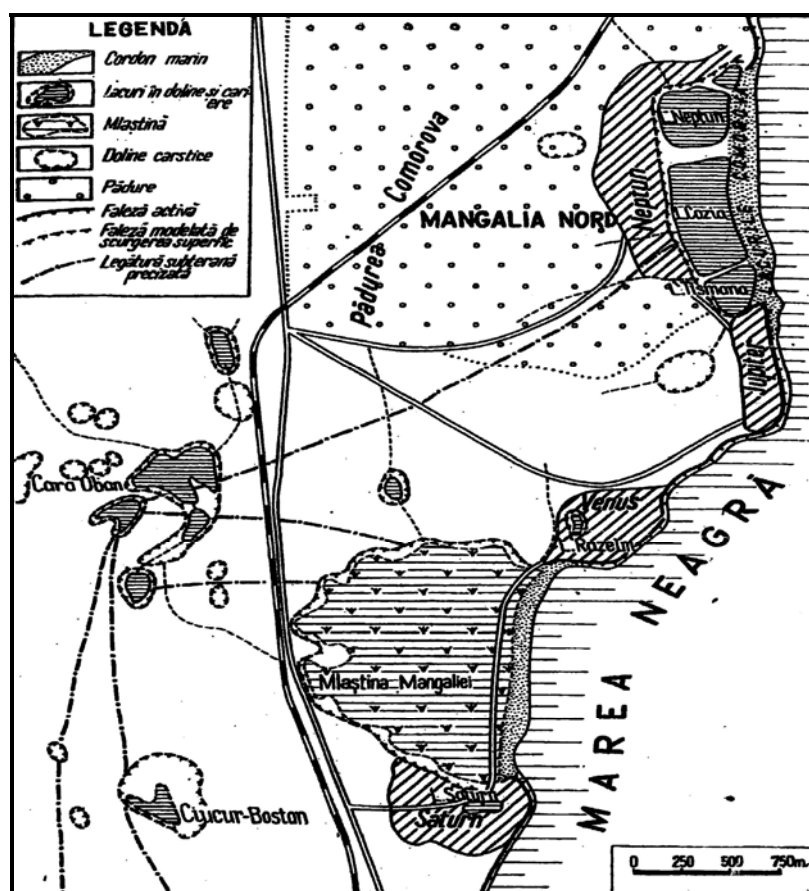


Fig. 1 – The detailed map of Herghelie marsh Natural Reserve

RESULTS AND DISCUSSION

The following main vegetation types have been observed in the studied area:

- fixed or floating hydrophilous plant communities, spread in the lake;
- paludous vegetation, composed of hygrophilous plants, with a large distribution on the swampy surfaces around the marsh banks or within the islands;
- meso-halophilous plant communities, placed on the lightly salted and moderate wet soils;
- xero-mesophilous vegetation, on the higher surfaces from the marsh proximity;

In the investigated area there have been identified 22 plant communities belonging to 9 vegetation classes, 12 orders and 13 alliances; among these, 13 plant associations are newly found in the studied area, unmentioned in the older papers [5]. The identified plant associations are framed out like the next coenotaxonomical conspectus:

LEMNETEA O. de Bolós et Masclans 1955

LEMNETALIA O. de Bolós et Masclans 1955

Lemnion minoris O. de Bolós et Masclans 1955

Lemnetum minoris Soó 1927

Lemnetum trisulcae Knapp et Stoffers 1962

HYDROCHARIETALIA Rübél 1933

Ceratophyllion demersi Den Hartog et Segal 1964

Ceratophylletum demersi (Soó 1927) Hild. 1956

Ceratophylletum submersi (Soó 1928) Den Hartog et Segal 1964

POTAMOGETONETEA PECTINATI R. Tx. et Prsg. 1942

POTAMOGETONETALIA PECTINATI W. Koch 1926

Potamion pussili Vollmar em. Hejny 1978

Najadetum marinae Fukarek 1961

Potamogetonetum pectinati Carstensen 1955

PHRAGMITETEA AUSTRALIS Tx. & Prsg. 1942

PHRAGMITETALIA W. Koch 1926

Phragmition communis W. Koch 1926

Scirpo-Phragmitetum Koch 1926 Tx. 1941

Typhaetum angustifoliae (All.22) Pign. 1943

Typhetum latifoliae G. Lang 1973

Typhaetum laxmanni Nedelcu 1969

Cladietum marisci Allorge 1922 ex Zobrist 1935

Schoenoplectetum lacustris Chouard 1924

BOLBOSCHOENETALIA MARITIMI Hejny in Holub et al. 1967

Cirsio brachycephali – Bolboschoenion (Passarge 1978) Mucina 1993

Bolboschoenetum maritimi Egger 1933

Schoenoplectetum tabernaemontani Soó 1947

BIDENTETEA TRIPARTITAE Tx., Lohm et Prsg. 1950

BIDENTETALIA TRIPARTITI Br.-Bl. et Tx. 1943

Bidention tripartiti Nordh. 1940

Echinochloo-Polygonetum lapathifolii Soó et Csűrös

PUCCINELLIO-SALICORNIETEA Topa 1939

PUCCINELLIETALIA Soó 1940

Puccinellion peisonis (Wendelbgt. 1943) Soó 1957

Puccinellietum distantis Soó 1937

Scorzonero-Juncion gerardi (Wendelbg. 1943) Vicherek 1973

Carici distantis-Festucetum arundinaceae Rapaics 1927

MOLINIO-ARRHENATHERETEA Tx. 1937

POTENTILLO-POLYGONETALIA Tx. 1947

Potentillon anserinae Felföldy 1942

Lythro-Calamagrostetum epigei I.Pop 1968

PLANTAGINETEA MAJORIS Tx. et Prsg. 1950

PLANTAGINETALIA MAJORIS Tx. (1947) 1950

Agropyro-Rumicion crisp Nordh. 1940

Trifolio fragifero-Cynodontetum Br.-Bl. et Bolos 1958

ARTEMISIETEA VULGARIS Lohm. et al. in R. Tx. 1950

ARTEMISIETALIA Lohm. et Tx. 1947

Arction lappae Tx. 1937 emend. Siss. 1946

Conietum maculati I. Pop 1968

ONOPORDETALIA ACANTHII Br.-Bl. & Tx. 1943 emend. Görs.1966

Dauco-Melilotion Görs.1966

Echio-Melilotetum albi R. Tx. 1947

CHENOPODIETEA Br.-Bl. 1951 emend. Lohm., J. Tx. et Tx. 1961

SISYMBRIETALIA J.Tx. 1961

Sisymbrium officinalis R. Tx., Lohm. et Prsg. 1950

Balloto-Malvetum sylvestris Gutté 1966

The hydrophilous plant associations – *Ceratophylletum demersi* (Soó 1927) Hild. 1956, *Ceratophylletum submersi* (Soó 1928) Den Hartog et Segal 1964, *Potamogetonum pectinati* Carstensen 1955 and *Najadatum marinae* Fukarek 1961 occupy the small depth waters (0.5-1.5 m) from the lake banks proximity and make up discontinuous aquatic meadows. The floating plant communities - *Lemnetum minoris* Soó 1927 and *Lemnetum trisulcae* Knapp et Stoffers 1962 are localized on the water surface among the reeds.

The largest swampy surfaces of the marsh are covered by the phytocoenoses of *Phragmition* alliance. The hygrophilous plant communities belonging to this alliance (Tab.2) - *Scirpo-Phragmitetum* Koch 1926, Tx. 1941, *Typhetum latifoliae* G.Lang 1973, *Typhaetum angustifoliae* (All.22) Pign.1943, *Schoenoplectetum lacustris* Chouard 1924 and *Typhaetum laxmanni* Nedelcu 1969 make up a dense vegetation belt around the lake banks and the islands. In the silted areas towards the middle of the marsh and on the southern banks of the lake we found phytocoenosis of *Cladietum marisci* (Allorge 1922) Zobrist 1935 association (Tab.2). They are considered by Pop & Hodişan [5] vestiges of the old marsh vegetation.

In the temporary flooded areas from the eastern side of the lake, on the sandy soils with soluble salts accumulation, there were observed hygro-halophilous plant communities as *Bolboschoenetum maritimi* Egger 1933 and *Schoenoplectetum tabernaemontani* Soó 1947, which belong to *Bolboschoenetalia maritime* order (Tab. 3). Unlike *Phragmitetalia* typical plant communities, the associations of *Bolboschoenetalia maritime* order contain a lot of halophile and optional halophile species.

Phytocoenoses with *Echinochloa crus-galli* and *Polygonum lapathifolium* grow on the edge of the micro-depressions and springs with sulphurous freshwater within marsh area. They belong to *Echinochloo-Polygonetum lapathifolii* Soó & Csűrós associations.

In the eastern side of the marsh (in the Black Sea coastal area proximity) there are light salted sandy soils covered by some halophilous plant associations as *Puccineliatum distantis* Soó 1937 and *Carici distantis-Festucetum arundinaceae* Rapaics 1927.

The higher surfaces from the purlieu of the marsh are occupied both by the xeromesophilous plant communities (*Lythro-Calamagrostetum epigei* I.Pop 1968, *Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958) and ruderal plant associations as *Echio-Melilotetum albi*

R. Tx. 1947, *Balloto-Malvetum sylvestris* Gutté 1966 and *Conietum maculati* I. Pop 1968. The developing of ruderal plant associations has been favoured by the soil dryness and nitrate salts accumulation, as a consequence of the anthropogenic activities from the marsh proximity.

Twelve habitat types have been observed in the studied area (Tab.1); some of them (bolded in table 1) are of European interest for conservation, in accordance with the Habitats Directive (Annex I) [15].

Tab.1 – The main habitat types identified in the researched area

No.	Habitats type (in accordance with the Habitats Directive)	Natura 2000 code	Palaearctic Habitats code	Plant communities
1.	Duckweed covers	3150	22.411	<i>Lemnetum minoris</i> Soó 1927 <i>Lemnetum trisulcae</i> Knapp et Stoffers 1962
2.	Natural eutrophic lakes with Magnopotamion or Hydrocharition type vegetation	3150	22.421	<i>Potamogetonion pectinati</i> W. Koch 1926 Görs 1977 alliance
3.	Athalassic tasselweed communities	1160	23.211	<i>Najadetum marinae</i> Fukarek 1961
4.	Amphibious halo- nitrophile communities	-	22.353	<i>Bolboschoenetum maritimi</i> Eggler 1933 <i>Schoenoplectetum</i> <i>tabernaemontani</i> Soó 1947
5.	Giant Phragmites beds	-	53.113	<i>Scirpo-Phragmitetum</i> Koch 1926, Tx. 1941 <i>Schoenoplectetum lacustris</i> Chouard 1924
6.	Reedmace beds	-	53.13	<i>Typhaetum angustifoliae</i> (All.22) Pign.1943 <i>Typhetum latifoliae</i> G.Lang 1973
7.	Laxmann's reedmace beds	-	53.133	<i>Typhaetum laxmanni</i> Nedelcu 1969
8.	Euro-Siberian annual river mud communities	3270	24.52	<i>Echinochloo-Polygonetum</i> <i>lapathifolii</i> Soó et Csűrös
9.	Sarmatic <i>Carex distans</i> saline meadows	-	15.A2225	<i>Carici distantis-Festucetum</i> <i>arundinaceae</i> Rapaics 1927
10.	Western Pontic <i>Cynodon</i> saline beds	-	15.A21275	<i>Trifolio fragifero-</i> <i>Cynodontetum</i> Br.-Bl. et Bolos 1958
11.	North-Western Pontic <i>Calamagrostis-Scirpus</i> fixed dunes	-	16.22B123	<i>Lythro-Calamagrostetum</i> <i>epigei</i> I.Pop 1968
12.	Ruderal communities	-	87.2	<i>Balloto-Malvetum sylvestris</i> Gutté 1966 <i>Conietum maculati</i> I. Pop 1968

CONCLUSIONS

As a results of our study, in the Herghelie marsh area there have been identified 22 plant communities, classified in 9 vegetation classes, 12 orders and 13 alliances; from these, 13 plant associations are newly found in the studied area, unmentioned by Pop & Hodișan (1977).

The hydrophilous plant communities belonging to *Hydrocharietalia* and *Potamogetonetalia pectinati* orders are well represented in the small depth waters from the proximity of lake banks.

The hygrophilous plant associations of *Phragmitetalia* order cover large swampy surfaces around the lake and on the islands. Interesting phytocoenoses with *Cladium mariscus* have been observed on the silting areas (islands) towards the middle of the marsh and in the southern side of the lake.

In the temporary flooded areas rich in soluble salts there are hygro-halophilous plant communities belonging to *Bolboschoenetalia maritimi* order.

The halophilous plant communities from *Puccinellietalia* order are well represented on the salty sands with moderate moisture between Herghelie marsh and Black Sea coastal area.

In the studied area twelve habitat types have been observed; some of them are of European interest for conservation.

BIBLIOGRAPHY

1. CIOCÂRLAN V., 2000 – *Flora ilustrată a României (Pteridophyta et Spermatophyta)*, Edit. Ceres, București, 1139 pp..
2. DONIȚĂ, N., POPESCU, A., PAUCĂ-COMĂNESCU, M., MIHĂILESCU, S., BIRIȘ, A-I., 2005 – *Habitatele din România*, Edit. Tehnică Silvică, București, 496 pp.
3. DONIȚĂ, N., POPESCU, A., PAUCĂ-COMĂNESCU, M., MIHĂILESCU, S., BIRIȘ, A-I., 2005 – *Habitatele din România - Modificări conform amendamentelor propuse de România și Bulgaria la Directiva Habitare (92/43/EEC)- 2006*, Edit. Tehnică Silvică, București, 95 pp.
4. FĂGĂRAȘ M., 2003 - *The conspectus of plant associations from the Romanian Black Sea shore*, "Ovidius" University Annals of Biology-Ecology, Constanța, 7 (2003): 133-138.
5. POP I., HODIȘAN I., 1977 – *Vegetația Mlaștinei de la Mangalia-Herghelie (Jud. Constanța)*, Contribuții Botanice, Cluj-Napoca: 31-39.
6. PRODAN I., 1934. *Conspectul florei Dobrogei I*, Bul. Acad. de Înalte St. Agronomice, Tipogr. Națională S.A., Cluj, 5, 1, 170 pp.
7. PRODAN I., 1935-1936. *Conspectul florei Dobrogei II*, Bul. Acad. de Înalte St. Agronomice, Tipogr. Națională S.A., Cluj, 6, 57 pp.
8. PRODAN I., 1938. *Conspectul florei Dobrogei III*, Bul.Facult. de Agronomie, Cluj, Tipogr. Cartea Românească., 7, 58 pp.
9. POPESCU A., SANDA V., 1998 – *Conspectul florei cormofitelor spontane din România*, Acta Botanica Horti Bucurestiensis, Edit. Universității din București, 336 pp.
10. SANDA V., POPESCU A., BARABAȘ N., 1998 - *Cenotaxonomia și caracterizarea grupărilor vegetale din România*, Complexul Muz. de Șt. Nat. Bacău, Studii si Comunicări, Biologie vegetală, 14: 5-366.
11. SANDA V., POPESCU A., STANCU I., 2001 – *Structura cenotică si caracterizarea ecologică a fitocenozelor din Romania*, Edit. Conphis, București, 359 pp.

12. SĂVULESCU T. (ed.), 1952-1976 – *Flora României*, vol. I-XIII, Edit. Academiei Române, București.
13. TUTIN T.G. (eds) & colab., 1964-1980 - *Flora Europaea*, Vols. 1-5, Cambridge, Cambridge University Press.
14. TUTIN T.G. (eds) & colab. - *Flora Europaea*, 2nd ed., Vol. 1, Cambridge, Cambridge University Press.
15. ***http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

Tab. 2 - Phragmitum communis W.Koch 1926 alliance

Ass. *Scirpo-Phragmitetum* Koch 1926 Tx. 1941 (R1-6); Ass. *Typhetum latifoliae* G.Lang 1973 (R7-10); Ass. *Typhaetum angustifoliae* (All.22) Pign.1943 (R11-13); *Typhaetum laxmanni* Nedelcu 1969 (R14-15); *Schoenoplectetum lacustris* Chouard 1924 (R16-17); *Cladietum marisci* Allorge 1922 ex Zobrist 1935 (R18);

Survey No.	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	K
Altitude (m)	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	
Vegetation coverage (%)	90	100	100	90	100	90	100	100	90	100	100	100	100	100	90	90	100	100	
Survey area (m2)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Carr. Ass.																			
<i>Phragmites australis</i>	4	5	5	4	5	4	2	1	1	1	1	2	1	2	1	1	+	1	V
<i>Typha latifolia</i>	-	+	-	1	-	+	4	5	4	5	-	-	-	+	2	-	-	+	III
<i>Typha angustifolia</i>	+	-	1	-	-	-	-	-	-	-	5	4	4	-	-	+	+	-	II
<i>Typha laxmanni</i>	-	-	-	-	-	1	-	-	+	-	-	+	-	4	3	-	-	-	II
<i>Schoenoplectus lacustris</i>	1	-	-	+	-	-	-	-	-	-	-	-	1	-	-	4	5	+	II
<i>Cladium mariscus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	I
Phragmition																			
<i>Oenanthe aquatica</i>	-	-	+	-	+	-	-	-	-	-	-	-	+	-	-	-	-	+	II
<i>Glyceria maxima</i>	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	+	-	I
<i>Sium latifolium</i>	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Solanum dulcamara</i>	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	I
Phragmitetalia + Phragmitetea																			
<i>Lythrum salicaria</i>	1	+	-	+	+	1	-	+	+	-	+	-	+	-	-	+	+	+	IV
<i>Lycopus europaeus</i>	1	+	+	-	+	-	-	+	+	+	-	+	+	+	-	-	+	1	IV
<i>Pulicaria dysenterica</i>	-	+	+	1	+	-	+	-	2	1	-	+	-	1	2	-	-	-	III
<i>Calystegia sepium</i>	+	+	-	-	-	+	+	-	+	+	-	-	+	-	-	-	-	+	III
<i>Mentha aquatica</i>	-	-	+	+	+	+	-	+	-	-	-	-	+	-	+	-	-	+	III
<i>Polygonum amphibium</i>	1	+	-	+	-	-	-	-	-	-	1	-	+	+	-	-	+	-	II
<i>Rumex palustris</i>	+	+	-	-	+	+	-	-	-	+	-	-	-	-	-	+	-	-	II
<i>Eupatorium cannabinum</i>	-	-	1	-	+	-	1	-	-	-	+	+	-	-	-	-	-	+	II
<i>Alisma plantago-aquatica</i>	-	-	+	+	+	-	-	+	-	-	+	-	-	+	-	-	-	-	II
<i>Agrostis gigantea ssp. gigantea</i>	-	-	-	-	-	1	-	-	-	-	-	1	-	+	+	+	-	-	II
<i>Lycopus exaltatus</i>	-	-	+	-	-	-	-	-	+	-	+	-	-	-	+	+	-	-	II
<i>Lythrum virgatum</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	+	+	-	-	1	II
<i>Poa palustris</i>	1	-	-	-	-	-	-	-	+	-	-	+	-	-	+	-	-	-	II
<i>Eleocharis palustris</i>	-	-	-	+	-	-	-	-	-	-	+	-	-	-	+	-	-	-	I
<i>Myosotis scorpioides</i>	-	+	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	I
Magnocaricion																			

<i>Epilobium tetragonum</i>	+	-	+	-	-	+	-	-	+	+	-	-	-	-	-	+	-	
<i>Cicuta virosa</i>	-	+	-	-	+		-	+	-	+	-	-	-	-	+	-	-	
<i>Teucrium scordium</i>	-	-	-	-	-	+	-	-	-	-	-	-	+	+	+	-	-	
<i>Carex acutiformis</i>	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	
<i>Galium palustre</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Bidentetea																		
<i>Polygonum hydropiper</i>	-	+	+	-	-	+	-	-	-	+	-	-	-	+	-	+	-	
<i>Bidens tripartita</i>	-	-	-	-	+	-	-	-	-	-	+	-	+	-	+	-	+	
<i>Echinochloa crus-galli</i>	-	-	-	-	+	+	-	-	-	+	-	-	+	-	-	-	-	
<i>Rumex crispus</i>	-	-	+	-	-	+	-	-	-	-	-	+	-	-	+	-	-	
<i>Polygonum mite</i>	-	+	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	
<i>Stellaria aquatica</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	
Agropyro-Rumicion																		
<i>Trifolium fragiferum</i>	-	-	+	+	-	-	-	-	-	-	-	+	-	-	+	-	-	
<i>Potentilla reptans</i>	-	-	-	-	+	-	-	-	-	-	-	+	+	+	-	-	-	
<i>Festuca arundinacea</i>	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	
Plantaginetea																		
<i>Epilobium hirsutum</i>	-	-	-	+	-	-	-	-	-	-	+	+	-	+	+	-	-	
<i>Epilobium parviflorum</i>	-	-	-	+	-	+	-	-	-	-	-	-	+	-	-	-	-	
<i>Plantago major</i>	-	-	+	-	-	-	-	-	+	-	-	-	-	+	-	-	-	
<i>Stachys palustris</i>	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	
Puccinellietalia																		
<i>Aster tripolium ssp. pannonicus</i>	-	-	-	+	-	1	-	-	+	-	-	-	+	-	1	-	-	
<i>Atriplex hastata</i>	-	-	-	+	-	+	-	-	+	-	-	-	-	-	-	-	-	
<i>Lotus tenuis</i>	-	-	-	+	-	-	-	-	+	-	-	-	+	-	-	-	-	
Variae syntaxa																		
<i>Sonchus arvensis ssp. uliginosus</i>	-	-	+	-	-	+	+	+	+	-	-	-	-	-	+	-	-	
<i>Polygonum lapathifolium</i>	+	-	1	-	+	-	-	+	-	-	-	-	+	-	-	-	-	
<i>Bolboschoenus maritimus</i>	-	-	-	1	-	+	-	-	+	-	+	-	+	-	1	-	-	
<i>Xanthium italicum</i>	+	-	+	+	-	-	-	-	+	-	-	-	-	+	-	-	-	
<i>Galega officinalis</i>	-	-	-	1	-	-	+	-	+	+	-	+	-	-	-	-	-	
<i>Polypogon monspeliensis</i>	-	-	-	-	+	+	-	-	-	-	+	+	-	+	-	-	-	
<i>Rumex obtusifolius</i>	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	
<i>Conium maculatum</i>	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	
<i>Schoenoplectus tabernaemontani</i>	-	-	-	-	-	+	-	-	+	-	-	-	-	1	-	-	-	
<i>Apium graveolens</i>	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	

<i>Lemna trisulca</i>	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	+	-	
<i>Lemna minor</i>	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	+	
<i>Anthriscus caucalis</i>	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	+	-	-	
<i>Elaeagnus angustifolia</i>	-	-	-	+	-	-	-	+	-	-	-	-	-	+	-	-	-	-	
<i>Tamarix tetrandra</i>	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	
<i>Matricaria perforata</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	
<i>Mellilotus officinalis</i>	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	
<i>Elymus repens</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	
<i>Cirsium arvensae</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	
<i>Ballota nigra</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<i>Artemisia vulgaris</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	
<i>Calamagrostis epigeios</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	

Date of the releveés: 19.06.2005 (R1, R2, R8, R11, R14); 22.07. 2006 (R3, R5, R7, R10, R12, R16); 02.09.2006 (R4, R6, R9, R13, R15, R17, R18);

Tab. 3 - *Cirsio brachycephali* – *Bolboschoenion* (Passarge 1978) *Mucina* 1993 alliance
 Ass. *Bolboschoenetum maritimi* Egger 1933 (R1-R6); *Schoenoplectetum tabernaemontani* Soó 1947 (R7-R10);

Survey No.	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	K
Altitude (m)	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	
Vegetation coverage (%)	90	100	100	90	100	90	100	100	100	100	
Survey area (m2)	100	100	100	100	100	100	100	100	100	100	
Carr.Ass.											
<i>Bolboschoenus maritimus</i>	4	4	5	3	5	4	1	+	2	1	V
<i>Schoenoplectus tabernaemontani</i>	+	1		+			4	4	3	3	IV
Phragmition											
<i>Phragmites australis</i>	1	1	+	2	+	1	1	2	1	2	V
<i>Typha latifolia</i>	-	+	-	1	-	+	-	-	+	-	II
<i>Typha angustifolia</i>	-	-	+	-	+	-	+	-	-	+	II
<i>Typha laxmanni</i>	+	-	-	-	-	-	-	-	+	1	II
Phragmitetalia + Phragmitetea											
<i>Lythrum virgatum</i>	+	+	+	+	-	1	+	+	-	+	III
<i>Lycopus europaeus</i>	+	+	1	+	+	-	-	+	-	+	III
<i>Pulicaria dysenterica</i>	1	-	-	1	+	+	-	+	+	-	III
<i>Agrostis gigantea</i>	-	+	-	1	-	+	-	+	-	1	III
<i>Calystegia sepium</i>	+	-	+	-	+	-	-	+	-	-	II
<i>Rumex palustris</i>	+	-	-	-	-	+	-	-	+	-	II
<i>Lythrum salicaria</i>	-	-	+	-	+	-	-	-	+	-	II
Magnocaricion											
<i>Teucrium scordium</i>	-	+	-	+	-	-	+	-	-	+	II
<i>Cicuta virosa</i>	-	-	+	-	+	-	-	-	-	-	I
<i>Epilobium tetragonum</i>	-	-	+	-	-	-	+	-	-	-	I
Bidentetea											
<i>Polygonum hydropiper</i>	-	-	-	+	+	-	-	+	+	-	II
<i>Rumex crispus</i>	+	+	-	-	-	-	+	-	-	-	II
<i>Polygonum mite</i>	-	-	-	-	-	+	-	-	-	+	I
<i>Bidens tripartita</i>	-	-	+	-	-	-	-	-	-	-	I
Agropyro-Rumicion											
<i>Trifolium fragiferum</i>	-	+	-	+	-	+	+	-	1	+	III
<i>Festuca arundinacea</i>	-	-	-	+	-	-	-	-	1	+	II
<i>Potentilla reptans</i>	+	-	-	-	-	-	-	+	-	-	I
Puccinellietalia											
<i>Aster tripolium ssp. pannonicus</i>	-	+	-	+	-	1	-	+	1	-	III
<i>Lotus tenuis</i>	-	+	-	-	-	+	-	-	-	+	II
<i>Chenopodium glaucum</i>	+	-	-	-	-	-	-	-	+	-	I

<i>Atriplex hastata</i>	-	-	-	-	-	-	-	+	-	-	-	I
Armerion maritima												
<i>Carex distans</i>	-	+	-	-	-	-	+	-	-	+	+	II
<i>Carex extensa</i>	-	-	+	-	-	-	-	+	-	-	-	I
Variae syntaxa												
<i>Sonchus arvensis ssp. uliginosus</i>	+	-	+	+	+	+	+	-	+	-	+	IV
<i>Polygonum lapathifolium</i>	-	-	+	+	-	-	-	+	-	-	-	II
<i>Polypogon monspeliensis</i>	-	+	-	-	-	-	-	-	-	+	+	II
<i>Xanthium italicum</i>	+	-	-	+	-	-	-	-	+	-	-	II
<i>Elaeagnus angustifolia</i>	-	-	-	-	-	+	+	-	-	+	-	II
<i>Tamarix tetrandra</i>	+	-	-	-	-	+	-	+	-	-	-	II
<i>Conium maculatum</i>	-	+	+	-	-	-	-	-	-	-	-	I
<i>Rumex obtusifolius</i>	-	-	-	+	-	-	-	-	-	-	+	I
<i>Epilobium hirsutum</i>	-	-	+	-	-	-	-	-	+	-	-	I
<i>Plantago major</i>	+									+		I
<i>Apium graveolens</i>	-	-	-	-	-	-	-	-	-	-	+	I
<i>Calamagrostis epigeios</i>	-	-	-	-	-	-	-	-	-	+	-	I
<i>Anthriscus caucalis</i>	-	-	-	-	-	-	+	-	-	-	-	I
<i>Matricaria perforata</i>	-	-	-	-	-	-	+	-	-	-	-	I
<i>Melilotus officinalis</i>	-	+	-	-	-	-	-	-	-	-	-	I
<i>Artemisia vulgaris</i>	-	-	-	-	-	-	-	-	+	-	-	I

Date of the releveés: 19.06.2005 (R1, R5, R7); 22.07. 2006 (R3, R7, R10); 02.09.2006 (R2, R4, R6, R8, R9);