

CONTRIBUTION TO THE STUDY OF ROMANIA'S VEGETATION (II)

N. ȘTEFAN*, I. SÂRBU**, A. OPREA**

Mots clé: recherches phytocoenologiques

Résumé: Nos recherches concernant la végétation erbacées ont mené à l'identification de nouvelles associations peu connues sur le territoire de la Roumanie, ainsi que concernant 2 nouveaux coenotaxons: *Nymphaetum albo-candidae* (Hejny 50) Passarge 57, subass. *nymphaetosum candidae* subass. nova et *Nymphoido peltatae-Marsileaetum quadrifoliae* ass. nova. La présentation de ces associations est utile pour la réalisation d'une image plus complète sur la végétation de Roumanie.

As a result of our studies in some wet areas from the eastern part of Romania and from the Danube Delta reserve we have discovered some rare vegetal associations, some new subassociations. All these are registered in this paper with the purpose of completing the chorology of Romanian vegetal associations. Even most of these coenotaxons have been mentioned in the scientific literature in our country, we consider necessary to publish some complete labels in order to have a real image of the structure and composition of these coenotaxons frequently present in nature.

The outline of the vegetal associations

Potametea Tx. et Prsg. 42

Potametalia W. Koch 26

Potamion W. Koch 26 emend. Oberd. 57

1. As. *Potametum trichoidis* Segal 65

Nymphaeion Oberd. 57 emend. Neuhäsl 59

2. As. *Nymphaetum albo-candidae* (Hejny 50) Passarge 57

- subass. *nymphaetosum candidae* subass. nova

3. As. *Nymphoido peltatae-Marsileaetum quadrifoliae* ass. nova

Isoëto-Nanojuncetea Br.-Bl. et Tx 43

Nanocyperetalia Klika 35

Nanocyperion flavescens W. Koch 26

4. As. *Eleocharetum acicularis* (Baumann 11) W. Koch 26; Horvatić 30

*Universitatea „Al.I. Cuza” Iași

**Grădina Botanică „Anastase Fătu” Iași

Puccinellio-Salicornietea Topa 39

Puccinellietalia Soó 40

Cypero-Spergularion Slavnić 48

5. As. *Heleochloetum schoenoidis* Topa 39

6. As. *Crypsidetum aculeatae* (Bojko 32) Topa 39

Beckmannion eruciformis Soó 33

7. As. *Agrostio-Beckmannietum* (Rpcs. 16) Soó 33

1. As. *Potametum trichoidis* Segal 65

This association is developed in the lakes from the Danube Delta or in small ponds, along the Siret river in Moldavia. In Danube Delta these phytocoenoses are installed in deep waters (between 75-170 cm depth), but in the Moldavia these occupy the ponds of which depth are between 40-60 cm depth. The association prefer the still waters or quiet fluently, having a maximum of development in the spring time and a second maximum in the autumn. The substratum is oozy or a gley soil or a limnisoil (in Danube Delta) or is oozy or sapropel (in Moldavia). The association is well developed and in the biotic influenced waters (like in the small ponds from the Siret area).

In the Danube Delta, the cover of vegetation arise to 90 %, with a relatively large number of species. In the Siret area, the dominant species, *Potamogeton trichoidis*, occupies almost the entire volum of the small ponds, with a small number of species in the structure of the phytocoenoses (Table 1).

2. As. *Nymphaeetum albo-candidae* (Hejny 50) Passarge 57

- subass. *nymphaetosum candidae* subass. nova

These phytocoenoses can be found in the oozy bottom lakes not more than 200 cm in depth. They also can be found in sunny places, with still waters, making up clusters of various sizes, especially at the limits of reed thicket association.

The subassociation is well outlined in space and structure; *Nymphaea candida* is a species both edifying and dominant. The other species accompanying this plant belong, in majority, from *Potametea* class, like: *Ceratophyllum demersum*, *Najas marina*, *Potamogeton natans*, *Potamogeton pectinatus*, *Potamogeton crispus*, some of them belong to the *Hydrocharietalia* order, like: *Hydrocharis morsus-ranae*, *Stratiotes aloides*.

This new subassociation was not remarked till now because *Nymphaea candida* was indistinct identified with the close species *Nymphaea alba*.

The nomenclatural relevé is no 4 (Table 2).

3. As. *Nymphoido peltatae-Marsileaetum quadrifoliae* ass. nova

The phytocoenosis of this new association can be found in still waters with fluctuating level in the course of the year, without strong streams, relatively clears, with oozy or sandy-oozy bottom, from 10 cm to 40 cm depth of waters, most frequently between 25-30 cm depth.

This association sets up at the margins of the pools, advancing towards interior up to 5 metres, rarely up to 10 metres. Due to this habitat (biotope) in this association appeared a lot of swamp plants from *Phragmitetea* class: *Mentha aquatica*, *Typha angustifolia*, *Glyceria maxima*, *Polygonum mite*, *Schoenoplectus lacustris* and others, also from *Isoëto-Nanojuncetea* class: *Eleocharis palustris*, *Juncus articulatus*, *Cyperus glaber*, from *Lemnetea* and *Potametea* classes: *Lemna minor*, *L. trisulca*, *Salvinia natans*, *Nymphoides peltata*, too.

This association, in terms of occupied biotope, finds its place between *Isoëto-Nanojuncetea*, *Phragmitetea*, and *Potametea* classes.

The edifying species, *Marsilea quadrifolia*, is in the same time, a dominant one. This plant prefers sunny places, where it achieves the maximum coverage, but it can reach also in the semishadowed places, where the coverage is smaller.

The nr. 5 relevé is a nomenclatural one (Table 3).

4. As. *Eleocharetum acicularis* (Baumann 11) W. Koch 26; Horvatić 30

The communities of *Eleocharis acicularis* are founded on the wet milt near the margins of the swamps, setting up the first belt of vegetation installed after the water's retire.

This is a pioneer association which can form short meadows, poor in plants but achieving a high coverage of the soil with vegetation (90-95 %).

The association is, as water is retiring and humidity decreasing, gradually invaded by other species from the alliance *Agrostion stoloniferae*, towards which it is evolving (Table 4).

5. As. *Heleochoetum schoenoidis* Topa 39

The association was identified in various localities in the eastern part of the country.

The soil, on which this association is installed, is a salted marshy ground, flooded in the spring but dry in the summer time.

The herbaceous stratum covers the soil in 80-90 %, the most covering plants being *Heleochoa schoenoides*; other species, with a higher constancy, are: *Spergularia marginata*, *Atriplex hastata*, *Plantago schwanbergiana*, *Trifolium fragiferum*, all these being indicators for the halophyllic character of this association (Table 5, relevé nr. 1-7).

6. As. *Crypsidetum aculeatae* (Bojko 32) Țopa 39

This association is met on the light or medium salted soils. Most of the species from this association, are compulsory halophylous, some of them being adapted at very strong halophylous habitates. From this last category we remind the most frequent species: *Suaeda maritima*, *Halimione verrucifera*, *Bassia hirsuta*, *Aster tripolium*, *Spergularia marginata*, *Puccinellia distans*, *Limonium gmelini*. All these species have a considerable part at the structure of the phytocoenoses. There are few companion species, light or tolerable halophylous (Table 5, relevé nr. 8-10).

7. As. *Agrostio-Beckmannietum* (Rpcs. 16) Soó 33

The phytocoenoses of this association are installed on plane fields with light depressions where the water is staying for a longer period, because of the clayey stratum situated close to the surface. During summer time the water disappears by evaporation, the soil remaining dry and sometimes furrowed by deep splits.

The soils are clayey, heavy, light salted, alternating humidity conditions.

With the edifying species, *Agrostis stolonifera* and *Beckmannia eruciformis*, were identified other species; among these, the most frequent are: *Trifolium fragiferum*, *Lythrum virgatum*, *Lysimachia nummularia*, *Rumex crispus* (Table 6).

References

1. Sanda V., Popescu A., Doltu M. I., 1980 – Cenotaxonomia și corologia grupărilor vegetale din România, St. Com. Șt. Nat., Muz. Brukenthal, Sibiu, 24, supl.: 11-171
2. Sanda V., Popescu A., 1991 – La cénotaxonomie des phytocénoses halophiles (*Puccinellio-Salicornietea* Țopa 39) de Roumanie (II), Rev. Roum. Biol.-Biol. végét., t. 36, 1-2: 49-58
3. Sanda V., Popescu A., Nedelcu G. A., 1994 – Cenotaxonomia grupărilor de macrofite hidrofile ale clasei *Poanetea* Tx. et Prsg. 42 din România, Acta Botanica Horti Bucurestiensis: 143-160
4. Sârbu I., 1978 – Flora și vegetația din bazinul Chinejii și al Prutului între Rogojeni-Măstăcani. Teză de doctorat. Univ. Iași
5. Ștefan N., Chifu T., Hanganu J., Coroi M., 1996 – Cercetări fitocenologice asupra vegetației acvatică și palustre din Balta Somovei (jud. Tulcea), Bul. Grăd. Bot. Iași: 133-152

Table 1
As. *Potamogeton trichoidis* Segal 65

Nr. of relevé	1	2	3	4	5	6	7	8	9	10
Depth of water, cm	160	120	95	90	100	75	110	90	50	60
Cover of vegetation, %	70	75	80	85	90	80	80	75	95	90
Surface of relevé, m ²	20	25	35	50	25	50	20	25	10	10
<i>Potamogeton trichoides</i>	3	4	4	4	5	4	4	3	5	5
Potamion										
<i>Potamogeton pectinatus</i>	1	+	.	.	.	.	+	+	.	.
<i>Potamogeton lucens</i>	.	.	.	.	.	+	.	.	.	.
<i>Ceratophyllum demersum</i>	+	.	+	+	+	+	.	1	+	+
<i>Neajas maritima</i>	.	.	.	.	+	.	+	.	.	.
<i>Myriophyllum spicatum</i>	.	.	+	.	.	.	+	.	.	.
<i>Vallisneria spiralis</i>	+	.	.	.	.	+	.	.	.	.
<i>Potamogeton natans</i>	.	.	.	.	.	.	.	.	+	+
Potametalia										
<i>Potamogeton crispus</i>	.	.	+	.	.	+	.	.	+	.
<i>Elodea nuttallii</i>	.	+	+	.	.	.	+	+	.	.
<i>Elodea canadensis</i>	+	.	.	.	.	.	.	.	.	+
Potametea										
<i>Nymphaea alba</i>	.	.	+	.	.	.	+	.	.	.
<i>Nymphaea candida</i>	.	.	.	.	.	.	+	.	.	.
<i>Nuphar luteum</i>	.	.	.	.	.	.	.	+	.	.
<i>Utricularia vulgaris</i>	.	.	.	.	.	.	+	.	.	.
Lemnetea										
<i>Salvinia natans</i>	+	.	+	+	+	.	.	.	.	.
<i>Lemna minor</i>	1	+	+	1	.	+	+	+	+	+
<i>Lemna trisulca</i>	.	+	.	.	.	.	.	.	.	.
<i>Spirodela polyrrhiza</i>	.	.	.	+	.	.	+	.	.	.
<i>Stratiotes aloides</i>	.	.	.	.	.	+	.	.	.	.
<i>Hydrocharis morsus-ranae</i>	.	.	.	.	.	+	.	.	.	.
Aliae										
<i>Sagittaria sagittifolia</i>	.	+	.	.	.	.	.	.	.	.
<i>Nitolepsis obtusa</i>	.	+	.	.	+	.	.	1	.	.
<i>Nitella</i> sp.	.	.	.	.	.	.	.	+	.	.
<i>Chara</i> sp.	.	.	.	.	.	.	.	+	.	.

Place of the relevé: 1-channel Dovnica-Delta of Danube; 2-lake Șarbata-Delta of Danube; 3-lake Furtuna-Delta of Danube; 4-stream Baba Rada-Delta of Danube; 5, 8-lake Răducu-Delta of Danube; 6, 7-lake Plin-Delta of Danube; 9, 10-Cosmești-Furceni (Galați county)-ponds along the Siret river.

Table 2
As. Nymphaetum albo-candidae (Hejny 50) Passarge 57
 - subass. *nymphaetosum candidae* subass. nova

Surface, m ²	100	100	100	25	25	10	25	200	200	100
Cover, %	90	90	85	80	80	80	80	85	85	75
Depth of water, cm	150	200	180	180	170	180	160	200	190	180
Nr. of relevé	1	2	3	4	5	6	7	8	9	10
<i>Nymphaea candida</i>	5	5	5	5	4	4	4	5	4	3
<i>Nymphaea alba</i>	+	1	+	+	.	.	.	.	+	1
Nymphaeion										
<i>Trapa natans</i>	.	.	.	.	.	.	.	.	.	+
Potamion et Potametalia										
<i>Najas marina</i>	+	+	+	.	.	.	.	.	.	.
<i>Ceratophyllum demersum</i>	.	+	+	+	+	+	+	+	1	1
<i>Potamogeton pectinatus</i>	.	.	.	+	.	.	.	.	+	1
<i>Potamogeton crispus</i>	.	.	.	.	.	.	.	+	.	+
<i>Potamogeton natans</i>	.	.	.	.	.	.	.	.	.	+
<i>Elodea nuttallii</i>	.	.	.	.	.	.	.	.	+	.
<i>Potamogeton trichoides</i>	.	.	.	.	.	.	.	.	+	+
Lemnion										
<i>Lemna minor</i>	.	.	.	+	.	.	.	.	+	1
<i>Lemna trisulca</i>	.	.	.	.	.	+	+	.	.	.
<i>Spirodela polyrrhiza</i>	.	.	.	.	.	.	.	.	+	.
Hydrocharition										
<i>Hydrocharis morsus-ranae</i>	.	.	.	.	.	+	+	.	.	+
<i>Stratiotes aloides</i>	.	.	.	.	.	.	+	.	.	.
<i>Salvinia natans</i>	.	.	.	.	.	.	.	.	+	+
Phragmition										
<i>Polygonum amphibium</i>	.	.	.	.	.	.	.	.	.	+

Place of relevé: Delta of Danube: 1-3; 8-Lake Rotund (Niculişel); 4-5-Lake Roşca; 6-7-lake Belciug; 9-10-lake Bogdaproste.

Table 3
As. Nymphoides peltatae-Marsileaetum quadrifoliae ass. nova

Surface, m ²	1	2	1	30	10	4	3	3	6	10
Depth of water, cm	30	30	20	30	30	30	40	40	40	30
Cover, %	60	80	90	90	90	70	90	85	85	90
Nr. of relevé	1	2	3	4	5	6	7	8	9	10
<i>Marsilea quadrifolia</i>	3	4	5	5	5	3	5	4	4	4
<i>Nymphoides peltata</i>	.	.	.	+	+	+	.	.	+	+
Nanocyperion et Nanocyperetalia										
<i>Eleocharis palustris</i>	.	.	.	+	+	+	+	+	.	+
<i>Juncus articulatus</i>	.	.	.	+	+	.	.	.	.	+
<i>Cyperus glaber</i>	-	-	-	-	-	-	-	-	-	+
Lemnetea et Lemnion										
<i>Lemna minor</i>	+	+	+	+	+	+	.	+	+	.
<i>Lemna trisulca</i>	.	.	.	.	.	+	.	.	.	.
<i>Azolla caroliniana</i>	.	.	.	.	.	.	.	+	.	.
Hydrocharition										
<i>Salvinia natans</i>	.	.	+	+	+	+	1	+	+	.
Bidentetalia et Bidention										
<i>Polygonum mite</i>	+	+	+	+	.	.	.	+	.	.
<i>Echinochloa crus-galli</i>	+	+	.	.	.	+	.	+	+	+
Phragmitetea et Phragmition										
<i>Mentha aquatica</i>	+	+	+	+	+	+	+	+	+	+
<i>Typha angustifolia</i>	+	.	+	.	.	.	.	.	+	+
<i>Phragmites australis</i>	+	.	.	.	.	.	.	.	.	.
<i>Glyceria maxima</i>	.	+	+	+	+	+	+	+	.	.
<i>Alisma plantago-aquatica</i>	.	+	.	.	.	.	.	.	.	.
<i>Lycopus europaeus</i>	.	+	+	.	.	.	.	.	.	.
<i>Stachys palustris</i>	+	.	.	.	.	.	.	.	.	.
<i>Schoenoplectus palustris</i>	.	.	.	+	+	.	.	+	+	+
Glycerio-Sparganion										
<i>Sparganium erectum</i>	.	.	.	.	.	.	.	.	.	+
Bolboschoenion										
<i>Bolboschoenus maritimus</i>	.	+	.	.	+	2	+	+	.	+
Molinio-Arrhenateretea										
<i>Agrostis stolonifera</i>	.	+	+	+	.	+	.	.	.	+
<i>Trifolium pratense</i>	+	.	.	.	.	.	.	.	.	.

Place of relevé: 1-10: Mila 23, Tulcea county, in Obretin lake

Table 4
As. Eleocharetum acicularis (Baumann 11) W. Koch 26; Horvatić 30

Cover, %	95	95	95	90	85	75	80	90	80	70
Surface, m ²	50	50	50	50	4	6	6	9	3	3
Nr. of relevé	1	2	3	4	5	6	7	8	9	10
<i>Eleocharis acicularis</i>	5	5	5	5	4	3	4	5	4	4
Nanocyperion flavescens										
<i>Mentha pulegium</i>	.	.	.	.	+	+	1	+	+	+
<i>Gnaphalium uliginosum</i>	.	.	.	.	+	.	+	+	+	+
<i>Cyperus fuscus</i>	.	.	.	.	+	1	.	+	.	.
<i>Potentilla supina</i>	.	.	.	.	+	.	.	+	.	.
<i>Ranunculus sardous</i>	.	.	.	.	.	+	+	.	+	+
<i>Juncus articulatus</i>	.	.	.	.	.	.	.	+	.	.
<i>Juncus compressus</i>	.	.	.	.	.	.	.	+	.	.
<i>Samolus valerandi</i>	.	.	.	.	.	.	.	+	.	.
Nanocyperetalia et Isoëto-Nanojuncetea										
<i>Eleocharis palustris</i>	+	.	+	.	.	.	.	.	.	.
<i>Juncus bufonius</i>	.	.	.	.	1	1	+	.	+	+
<i>Pulicaria vulgaris</i>	.	.	.	.	+	+	+	.	+	+
<i>Gypsophila muralis</i>	.	.	.	.	+	.	.	.	+	+
<i>Lythrum hyssopifolia</i>	.	.	.	.	.	.	+	.	.	.
Agrostion stoloniferae										
<i>Agrostis stolonifera</i>	+	+	+	+	.	.	.	.	+	.
Aliae										
<i>Alisma plantago-aquatica</i>	+	.	+	+	.	.	.	.	.	.
<i>Alisma lanceolatum</i>	+	+	.	.	.	.	.	.	+	.
<i>Butomus umbellatus</i>	+	+	+	+	.	.	.	.	.	.
<i>Sagittaria sagittifolia</i>	.	.	+	.	.	.	.	.	.	.
<i>Rorippa sylvestris</i>	+	.	+	.	.	.	.	.	+	+
<i>Bolboschoenus maritimus</i>	.	.	.	.	.	.	.	.	.	+
<i>Trifolium repens</i>	.	.	.	.	.	.	.	.	+	.
<i>Rorippa austriaca</i>	.	.	.	.	.	.	.	.	+	.
<i>Rumex crispus</i>	.	.	.	.	.	.	.	.	+	+
<i>Cynodon dactylon</i>	.	.	.	.	+	+	.	.	.	.
<i>Verbena officinalis</i>	.	.	.	.	+	.	.	+	.	.
<i>Potentilla reptans</i>	.	.	.	.	.	+	+	+	.	.
<i>Poa annua</i>	.	.	.	.	.	.	+	.	.	.
<i>Juncus gerardi</i>	.	.	.	.	.	.	.	+	.	.
<i>Polygonum lapathifolium</i>	.	.	.	.	.	.	.	+	.	.

Place of relevé: 1-4: Slobozia Oancei, pond Maică, Galați county; 5-8: Delta of Danube-between Lake Furtuna and Sulina canal, near Maliuc; 9-10: Cosmești-Deal-Furcenii Vechi, Siret area (Galați county)

Table 5
As. Heleochloetum schoenoides Topa 39; relevé 1-7
As. Crypsidetum aculeatae (Bojko 32) Topa 39; relevé 8-10

Surface, m ²	25	25	15	50	50	100	100	10	15	6
Cover, %	85	80	80	80	75	85	85	70	65	85
Nr. of relevé	1	2	3	4	5	6	7	8	9	10
<i>Heleochloa schoenoides</i>	4	3	4	3	3	5	5	.	.	+
Cyero-Spergularion										
<i>Crypsis aculeata</i>	.	.	.	.	.	.	.	4	3	4
<i>Cyperus pannonicus</i>	+	+	.	.	.	.	.	.	.	.
Puccinellietalia										
<i>Chenopodium glaucum</i>	+	+	.	.	.	+	.	+	.	.
<i>Atriplex hastata</i>	+	1	+	+	+	.	.	.	+	.
<i>Festuca arundinacea</i>	+	.	.	.	.	.	.	.	.	.
<i>Agropyron elongatum</i>	.	+	.	.	.	.	.	.	.	.
<i>Samolus valerandi</i>	.	+	.	.	.	.	.	+	+	.
<i>Plantago schwarzbergiana</i>	.	+	.	+	+	.	.	.	+	+
<i>Lotus tenuis</i>	.	.	+	+	+	.	.	.	+	+
<i>Rorippa sylvestris</i>	.	.	.	+	.	+	+	.	.	+
<i>Lepidium latifolium</i>	.	.	.	.	+	.	.	.	.	.
<i>Taraxacum bessarabicum</i>	.	.	.	.	+	.	.	.	+	+
<i>Suaeda maritima</i>	.	.	.	.	.	+	.	+	1	+
<i>Halimione verrucifera</i>	.	.	.	.	.	.	.	+	.	+
<i>Bassia sedoides</i>	.	.	.	.	.	.	.	+	+	.
<i>Aster tripolium</i>	.	.	.	.	.	.	.	+	1	+
Puccinellio-Salicornietea										
<i>Spergularia marginata</i>	+	1	+	1	1	.	.	+	1	1
<i>Juncus gerardi</i>	+	.	.	1	+	+	+	.	.	.
<i>Alopecurus geniculatus</i>	.	+	.	.	.	.	.	.	.	.
<i>Gratiola officinalis</i>	.	+	.	.	.	.	.	.	.	.
<i>Ranunculus sardous</i>	.	+	+	.	.	.	.	.	.	.

<i>Plantago major</i>	.	.	+	.	+	.	.	+	.	.
<i>Podospermum canum</i>	.	.	.	+	1	.	.	.	.	.
<i>Limonium gmelini</i>	.	.	.	.	.	.	.	.	+	+
Plantaginetea										
<i>Trifolium fragiferum</i>	+	+	+	+	1	.	.	.	+	.
<i>Polygonum aviculare</i>	+	.	.	+	.	+	.	+	+	.
<i>Carex hirta</i>	.	+	.	+	+	.	.	.	.	.
<i>Agropyron repens</i>	.	.	.	+	+	.	.	.	.	.
Aliae										
<i>Carex distans</i>	+	+	.	1	+	.	.	.	+	.
<i>Agrostis stolonifera</i>	+	1	.	1	+	.	.	+	+	.
<i>Polypogon monspeliensis</i>	+	.	+	.	.	.	.	.	.	+
<i>Phragmites australis</i>	+	.	.	.	.	.	.	.	.	.
<i>Bolboschoenus maritimus</i>	+	1	+	.	+	.	.	.	.	.
<i>Alopecurus arundinaceus</i>	+	.	.	.	.	.	.	.	.	.
<i>Lythrum hyssopifolia</i>	.	.	+	.	.	.	.	.	.	.
<i>Mentha arvensis</i>	.	.	+	.	.	.	.	.	.	.
<i>Centaureum pulchellum</i>	.	.	.	+	.	.	.	+	.	.
<i>Puccinellia distans</i>	.	.	.	.	1	.	+	+	+	+
<i>Lepidium ruderae</i>	.	.	.	.	.	.	.	+	.	.

Place of relevé: 1-3: Ostrov Cernovca (Delta of Danube); 4-5: Larga Jijiei (Iasi county); 6-7: Slobozia Oancei (Galați county); 8-10: Vadu (Constanța county)

Table 6
As. Agrostio-Beckmannietum (Rpcs. 16) So6 33

Surface, m ²	50	25	35	25	100	100	50	50
Cover, %	90	95	95	90	80	80	80	95
Nr. of relevé	1	2	3	4	5	6	7	8
<i>Beckmannia eruciformis</i>	3	4	4	3	2	3	3	+
<i>Agrostis stolonifera</i>	2	1	+	1	2	1	1	4
Beckmannion eruciformis								
<i>Rorippa kernerii</i>	+	+	.	+	.	.	.	.
<i>Rumex stenophyllus</i>	.	.	.	.	+	+	+	+
Puccinellietalia								
<i>Eleocharis palustris</i>	+	+	1	1	.	.	.	.
<i>Atriplex hastata</i>	+	.	.	.	.	.	.	.
<i>Aster tripolium</i>	.	+	.	.	.	.	.	.
<i>Suaeda maritima</i>	.	+	.	.	.	.	.	.
<i>Cyperus pannonicus</i>	.	.	.	+	.	.	.	.
Puccinellio-Salicornietea								
<i>Matricaria chamomilla</i>	+	.	.	+	.	.	.	.
<i>Trifolium repens</i>	+	.	.	.	.	.	.	.
<i>Alopecurus geniculatus</i>	.	+	+	.	.	.	.	.
<i>Spergularia marginata</i>	.	+	.	.	.	.	.	.
<i>Cichorium intybus</i>	.	.	+	.	.	.	.	.
Agrostion								
<i>Alopecurus pratensis</i>	+	.	.	1	.	.	.	.
<i>Lythrum virgatum</i>	.	.	.	1	+	+	+	+
<i>Trifolium fragiferum</i>	+	+	+	.	+	+	.	.
Agropyro-Rumicion crispi								
<i>Mentha longifolia</i>	+	.	.	.	.	.	.	.
<i>Rumex crispus</i>	+	.	.	.	+	+	+	+
<i>Juncus inflexus</i>	.	+	.	.	+	+	.	.
<i>Potentilla reptans</i>	.	.	+	+	.	.	.	.
<i>Verbena officinalis</i>	.	.	+	.	.	.	.	.

<i>Rorippa austriaca</i>	.	.	.	.	+	+	.	.
<i>Inula britannica</i>	.	.	.	.	+	+	+	+
Aliae								
<i>Agropyron repens</i>	1	+	+	+	.	.	.	.
<i>Glyceria plicata</i>	+	+	.	1	.	.	.	.
<i>Carex distans</i>	1	+	+	+	.	.	.	.
<i>Lepidium ruderae</i>	+	.	.	+	.	.	.	.
<i>Lysimachia nummularis</i>	+	.	.	+	+	+	+	+
<i>Ranunculus sceleratus</i>	+	+	+	+	.	.	.	.
<i>Veronica beccabunga</i>	+	+	.	+	.	.	.	.
<i>Catabrosa aquatica</i>	+	.	+	.	.	.	.	.
<i>Taraxacum officinale</i>	+	.	.	.	.	.	.	.
<i>Ranunculus repens</i>	.	.	+	+	.	.	.	.
<i>Plantago major</i>	.	.	+	.	.	.	.	+
<i>Polygonum aviculare</i>	.	.	+	.	+	+	.	.
<i>Polygonum lapathifolium</i>	.	.	+	.	.	.	.	.
<i>Echinochloa crus-galli</i>	.	.	.	+	.	.	.	.
<i>Pulicaria vulgaris</i>	.	.	.	+	+	+	.	+
<i>Polygonum hydropiper</i>	.	.	.	+	.	.	.	.
<i>Xanthium italicum</i>	.	.	.	.	+	+	+	.
<i>Mentha pulegium</i>	.	.	.	.	+	.	+	.
<i>Gypsophila muralis</i>	.	.	.	.	+	+	.	+

Place of relevé: 1-2: Olteneşti (Vaslui county); 3: Ostrov Cernovca (Delta of Danube); 4: Spineni (Iaşi county); 5-8: Jorâşti (Galaţi county).