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CONTRIBUTIONS TO AQUATIC VEGETATION OF ISAC-UZLINA COMPLEX KNOWLEDGE

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Abstract: Aquatic vegetation represents an important natural filter for the impurities charge of the Danube river water, constituting a barrier which hinds the polluants entrance in the Black Sea. It is important to mention that the conventional industrial installations, to obtain the treatment objectives of waste waters, use the same physical , chemical and biological principles as that which acts in a natural wet zone. The Isac – Uzlina aquatic complex (Danube Delta Biosphere Reserve) was studied and a number of 13 aquatic associations was identified. For every of these, the floristic structure, composition and specific features are also given out. 40 relevès of aquatic vegetation from 40 points were used to characterize this aquatic complex.

Key words: Danube Delta , Isac-Uzlina , aquatic vegetation

Introduction

The Isac-Uzlina (DDBR) aquatic complex is situated inside of the subunity delimitated by Sulina and Sf. Gheorghe branches, in the fluvial zone of Danube Delta, in the Gorgova-Isac depression. It is represented by Isac, Uzlina, Isacel and Pojarnia lakes and it is separated from Gorgova aquatic complex by Litcov channel. As area, the Isac lake is noticed with 1083 ha followed by Uzlina-470 ha, Pojarnia with 235 ha and Isacel with 173 ha. From the depth viewpoint it was observed that the lowest values, below 0 m Black Sea level, were registered in the lake depressions: -1,9 m in Isac lake and –1,8 m in Uzlina lake. These values are unsteady because of mineral and organic colmatage. The Isac-Uzlina aquatic complex genesis is directly related to Danube Delta genesis. Generally, it is accepted that on the actual Delta place could been existed a Black Sea gulf before. In time it was isolated by a sand band and transformed into a liman who was slimed by the enormous sediments quantity brought by Danube river. The result was the liman fragmentation and then the formation of main and secondary sand banks and also the formation of many lake depressions, the lakes of this complex being individualized by plaur bands generally.

From the viewpoint of evolution this complex is different to other lake systems because the colmatation process is less intense. On the other way, the limitation of Danube swamps water overflowing process and the limitation of water penetrate process from the existent environing streams and channels is reduced in a very important proportion and it is estimated that it can not influence in a very important measure the lakes evolution process, so the organic colmatation process plays the main role. Thus, the great area of these lakes (with Gorgova complex – 2,03% of Delta's area) and their clear waters (exception is Uzlina having turbid waters because Uzlina channel which connects the lake to the river) can be explained. To characterize the evolution process, the shape coefficient representing the short and long axes ratio can also be used. Analyzing the special literature, the Isac lake

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had in 1883 a 0,74 value of this coefficient and a 0,53 value in 1983, so in 100 years period the lake presented a increasing of it's long axis and a decreasing of the short axis. The cause of this elongation process is the alluviation phenomenon from W to E direction and the result is the more and more narrow depressions formation and, in time, the lake shape change.

From hydrology viewpoint, the lake complex water supply is provided to Isac lake from Litcov channel by an intermediate channel and from Sf. Gheorghe branch via Uzlina channel to Uzlina lake. The complex drainage role, in all hydrologic conditions, is ensured by channel between Isac lake and Perivolovca channel to Sf. Gheorghe branch. As a consequence of the precarious water supply and of the insufficient drainage to Sf. Gheorghe branch, the aquatic complex (especially Isac lake) is supporting for a long and intense period the water flowering phenomenon with effects on biological productivity. Some factors as the river branches proximity, the hydrographic system, the amplitude and time of flood period are constituting in important elements which helps us understand the following three aspects: water input, sediments input and nutrients input. Sf. Gheorghe branch and numerous connecting channels are assuring the water input. Sediments input is half diminished especially because Portile de Fier I and II power plant construction. The sediments accumulation is more accentuated in Uzlina lake having a 1cm/year value and it is considersted that it could be completely colmatated in the next 100-200 years only by this cause. The nutrients input has considerably increased, the industrial activity, natural processes and the water complex input increasing representing the main reasons of this phenomenon.

From lithology point of view it is observed a similitude between this and other aquatic complexes. The superficial strata belong to the fine sands clays and organic rests of aleuritic complex. Below that, there are the sand and gravels of the psamitic-aleuritic, psamo-pelitic, medium psamitic, old psamitic complexes and the terra-rosa clays representing the Delta foundation.

From the pedogenesis point of view, Danube Delta represents the youngest region of Romanian territory, the pedogenesis processes being entirely characteristic. The soils formation process begins with the marsh soils stage evolving to steppe soils gradually. In the study sector, marsh soils with the following subdivisions have been met: black alluvial soils rich in humus, $CaCO_3$ and vegetable rests; peaty soils; soils formed by organic silts with no structure and permanently covered by water; “plaur”- characteristic Delta element.

The Isac-Uzlina aquatic complex climate is continental-temperate with pontic influences and can be characterized by high thermic amplitude, active eolian regime and little rainfalls. The annual average temperature has a 10,8°C value. The rainfalls regime has a 350mm/year average value and the humidity is about 87%. Winds direction is from NW to SE in winter and from W to E in summer

Material and method

The Isac–Uzlina aquatic complex (Danube Delta Biosphere Reserve) was studied and a number of 13 aquatic associations was identified. For every of these, the floristic structure, composition and specific features are also given out. 40 relevès of aquatic vegetation from 40 points were used to characterize this aquatic complex. The relevès had a variable size and were made from canoe. Submerged macrophytes were collected using a rake and the abundance-dominance of each species was visually estimated using a six points scale (Braun-Blanquet scale).

Results and disscutions

Cenotaxonomic summary:

LEMNETEA O. de Bolós et Masclans 1955
LEMNETALIA O. de Bolós et Masclans 1955
Lemnion minoris O. de Bolós et Masclans 1955
1. Lemnetum minoris (Oberd. 1957) Müller et Görs 1960
2. Lemno- Spirodeletum polyrhizae W. Koch 1954
3. Salvinio – Spirodeletum polyrhizae Slavić 1956

Utricularion vulgaris Pass. 1964
4. Lemno- Utricularietum vulgaris Soó 1928

HYDROCHARIETALIA Rübel 1933
Hydrocharition Rübel 1933
5. Hydrocharietum morsus- ranae Langendonck 1935
6. Ceratophyllo – Hydrocharietum I. Pop 1962
7. Salvinio- Hydrocharietum (Oberd. 1957) Boşcaiu 1966

POTAMOGETONETEA PECTINATI R. Tx. et Prsg. 1942
POTAMOGETONETALIA PECTINATI W. Koch 1926
Nymphaeion Oberd. 1957 em. Neuhäusl 1959
8. Myriophyllo verticilati – Nupharetum lutei W. Koch 1926
9. Nymphaeetum albae Vollmar 1947
10. Nymphoidetum peltatae (Allorge 1922) Oberd. et Müller 1960
11. Trapetum natantis Müller et Görs 1960
Potamogetion lucentis Rivas Martinez 1973
12. Elodeetum canadensis Egller 1933
13. Potamogetonetum pectinati Carstensen 1955

1. **Lemnetum minoris** (Oberd 1957) Műller et Gőrs 1960. It is a pretty extended association in the studied aquatic complex, which vegetates better in the reed thickets clearings. It is especially localized between the reed band and shore. The dominant species is *Lemna minor*, but well represented are also *Spirodela polyrhiza* and *Salvinia natans*, two floating and unfixed species. The submerged stratum is represented by the following species: *Ceratophyllum demersum*, *Potamogeton pectinatus*, *Potamogeton crispus*, *Potamogeton fluitans*, etc. In shallow waters *Utricularia vulgaris* and *Stratiotes aloides* also appears. This aquatic association is characterized by a significant cover degree (80-100%) and is typical for mesotrophic waters (table 1, rel. 1-6).

2. **Lemno-Spirodeletum polyrhizae** W. Koch 1954. This association vegetates in stagnant and (especially) slowly waters, with a maximum growth in July-August month. It is also better developed at the Scirpo-Phragmitetum association edge. In this phytocenosys *Lemna minor* and *Spirodela polyrhiza* are sharing domination, forming sometimes a 4-5 cm thickness floating stratum at the water surface and realizing a 90-95% cover. The submerged stratum is less represented and is formed by *Ceratophyllum demersum*, *Myriophyllum spicatum* and *Potamogeton pectinatus*. Sporadically, in the floating stratum can be found *Trapa natans*, *Nymphoides peltata* or *Salvinia natans*. The presence of

Utricularia vulgaris species in shallow waters can give us about water quality, this species being characteristic to the meso-eutrophic waters (table 1, rel. 7-10).

3. **Salvinio-Spirodeletum polyrhizae** Slavnic 1956. This association is frequently met in the stagnant waters of Isac-Uzlina aquatic complex. The floating stratum is dominated by *Salvinia natans* and *Spirodela polyrhiza*; pretty abundant is *Lemna minor* too. In this association also appears *Trapa natans* and sporadically *Nymphaea alba* at the water surface. Submerged vegetation is represented by *Ceratophyllum demersum*, *Myriophyllum spicatum* and *Potamogeton pectinatus*. It is thought that the decaying organic matters sedimentation process is accelerated by this association, producing thus the colmatation pool phenomenon. The cover degree varies from 80% to 95% (table 1, rel. 11-14).

4. **Lemno-Utricularietum vulgaris** Soó 1928. The association appears in shallow waters of the complex, strongly colmatated and rich in decaying organic matters. Both strata, floating and submerged stratum are well individualized. On the water surface there are the dominant species, *Lemna minor* and *Utricularia vulgaris*. *Salvinia natans* and *Wolffia arhiza* are well representated too. In the submerged stratum *Ceratophyllum demersum*, *Potamogeton trichoides* and *Potamogeton pectinatus* vegetates. The vegetation cover degree varies from 70% to 80%. The association is characteristic to eutrophic waters (table 2, rel. 1-4).

5. **Hydrocharietum morsus-ranae** Langendonk 1935. Unlike the previous presented associations which are unstable to the wind action because the most species are not fixed to the bottom, Hydrocharietum morsus-ranae association is a lot more stable. However, it prefers the sheltered places of the reed thickets clearings, through the big, peripheral individuals. Beside *Hydrocharis morsus-ranae*, in the floating stratum vegetates *Lemna minor*, *Spirodela polyrhiza*, *Salvinia natans*, etc. Submerged vegetation is represented by *Myriophyllum spicatum*, *Ceratophyllum demersum* and various *Potamogeton* species. The vegetation cover degree has values between 70-80%. The illustrating species for this association is characteristic to phosphates rich waters (table 2, rel. 5-7).

6. **Ceratophyllo-Hydrocharietum** I. Pop 1962. It is a floating-submerged association, populating the shallow waters of the complex, with the maximum vegetating and fructifying period in July-August months. The characteristic species are *Hydrocharis morsus-ranae* and *Ceratophyllum demersum*. There is two strata: in the emerged stratum the first species is dominating, forming a cover containing also *Lemna minor*, *Salvinia natans* and *Spirodela polyrhiza*. The submerged stratum is abundant populated by *Ceratophyllum demersum* and sporadically *Myriophyllum spicatum* and *Potamogeton pectinatus*. Both strata are here and there penetrated by emerged hydrophytes like *Schoenoplectus lacustris*, *Butomus umbellatus*, *Typha angustifolia* or *Phragmites australis*. The cover degree average oscillates around 75% value. This association is developed on silt, organic substratum and eutrophic waters (table 2, rel. 8-9).

7. **Salvinio-Hydrocharietum** (Oberd. 1957) Boşcaiu 1966. This association represents an transition stage between the floating groups of Lemnetea class and the fixed groups of Potametea class and prefers the100-125 cm depth waters. Characteristic species like *Salvinia natans* and *Hydrocharis morsus-ranae* vegetates side by side with *Lemna minor*, *Spirodela polyrhiza*, *Utricularia vulgaris* and *Stratiotes aloides*. The vegetation cover degree is high, about 85-90%. The association was described as populating the strong eutrophic waters (table 2, rel. 10-12).

8. **Myriophyllo verticillati-Nupharetum lutei** W. Koch 1936. Is a large area extended association in slow waters places around lakes connection channels. It's structure is realized by emerged and submerged aquatic plants, the last of them being most numerous. The most representative species are: *Nuphar luteum*-dominant species, *Myriophyllum verticillatum*, *Myriophyllum spicatum*, *Potamogeton trichoides*, *Potamogeton natans*, *Lemna minor*, *Salvinia natans*, *Nymphoides peltata* and *Elodea nuttalii*. The association has an 85-90% cover degree and a better development on organic substratum (table 3, rel. 1-2).

9. **Nymphaeetum albae** Vollmar 1947. This association is developing in reed shelters or thickets clearings tolerating a certain shadow degree, in 180-200 cm depth slow waters. The floating stratum is better represented by *Nymphaea alba*, *Nymphaea candida*, *Trapa natans*, *Nymphoides peltata* and the submerged stratum by *Elodea canadensis*, *Elodea nuttalii*, *Potamogeton pectinatus*, *Potamogeton trichoides* and *Potamogeton lucens*. The association prefers clear and clean waters and is characterized by an 85-90% cover degree (table 3, rel. 3-5)

10. **Nymphoidetum peltatae** (Allorge 1922) Oberd et Műller 1960. The association is developing in 60-70 cm depth shallow waters, on clay substratum. *Nymphoides peltata* is the characteristic species. *Polygonum amphibium*, *Nymphaea alba*, *Nuphar luteum* and *Trapa natans* also are forming the emerged stratum. The submerged stratum is formed by *Ceratophyllum submersum*, *Elodea nuttalii*, *Potamogeton pectinatus* and *Myriophyllum verticillatum*. In the shore shallow waters also appears *Sagittaria sagittifolia*, *Alisma plantago-aquatica*, *Sparganium erectum* and *Phragmites australis*. The vegetation cover degree varies from 75% to 80%. In this association was identified also *Ranunculus trichophyllum*, species about the speciality literature tells it is developing on turbification tendency substrata situated under shallow mezotrophic waters (table 3, rel. 6-7).

11. **Trapetum natantis** Műller et Gőrs 1960. This association is installed in 150-300 cm depth waters, on clay substratum, resisting to their large level oscillations and having the survive possibility on swampy ground. The maximum development was found in sediments rich waters or in pools in colmatation course. Beside the characteristic species- *Trapa natans*, *Nymphoides peltata*, *Nuphar luteum*, *Elodea nuttalii*, *Salvinia natans*, *Lemna minor* and *Potamogeton natans* had been met too. The vegetation cover degree is high, around 95% (table 3, rel. 8-9).

12. **Elodeetum canadensis** Egller 1933. The association is installated on limited areas, close by the shore, in 70-85 cm depth shallow waters. This is a less rich plant community, *Elodea canadensis* being accompanied by *Elodea nuttalii*, *Potamogeton pectinatus*, *Potamogeton trichoides*, *Potamogeton crispus*, and *Vallisneria spiralis*. *Salvinia natans*, *Lemna minor* or *Trapa natans* are constituting an unpermanent stratum. The vegetation cover degree varies from 80 to 90% (table 3, rel. 10-11).

13. **Potamogetonetum pectinati** Carstensen 1955. This association vegetates in 120-150 cm depth stagnant waters on clay substratum and is characteristic to insufficiently oxygenated waters. The characteristic species – *Potamogeton pectinatus* – is accompanied by *Potamogeton trichoides, Potamogeton perfoliatus*, *Potamogeton crispus* and *Lemna minor*, *Salvinia natans* at the water surface and sometimes *Trapa natans*, *Nuphar luteum*, *Nymphoides peltata* or *Oenanthe aquatica* are present. The vegetation cover degree has an 85% value (table 3, rel. 12-14).

Table 1
Lemnion minoris O. de Bolós et Masclans 1955

Asociația	**Lemnetum minoris**						**Lemno-Spirodeletum polyrhizae**				**Spirodelo-Salvinietum natantis**			
Nr. releveu	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Adâncimea apei (dm)	8	12	12	10	15	12	7	12	11	80	12	10	15	12
Acop. vegetației (%)	85	90	85	95	100	90	95	90	95	95	95	90	80	80
Suprafața de probă (m^2)	10	5	20	6	4	10	10	8	6	8	20	10	16	12
Lemnion et Lemnetalia														
Lemna minor	4	5	4	5	5	4	3	4	3	2	+	+	1	+
Spirodela polyrhiza	1	+	-	+	-	-	3	1	2	3	2	3	1	1
Salvinia natans	-	+	+	1	+	1	-	+	+	1	3	2	3	3
Hydrocharis morsus-ranae	+	-	-	-	-	-	-	+	1	+	+	-	-	-
Ceratophyllum demersum	-	-	+	-	-	+	+	-	-	-	-	-	1	1
Utricularia vulgaris	-	+	-	-	-	-	-	+	-	-	-	-	-	-
Stratiotes aloides	+	-	+	-	-	-	-	+	+	-	-	+	-	-
Potamogetonetea pectinati														
Myriophyllum spicatum	-	+	-	-	-	-	-	-	+	-	-	+	+	-
Potamogeton crispus	+	-	+	-	-	-	-	+	-	-	-	+	-	-
Potamogeton lucens	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Trapa natans	+	-	-	-	-	-	-	-	+	-	1	+	-	-
Nymphaea alba	-	-	+	-	-	-	-	-	-	-	-	-	+	1
Nymphaea candida	-	-	+	-	-	-	-	-	-	-	-	-	+	1
Nymphoides peltata	+	-	-	-	-	+	+	-	-	-	-	-	-	-
Nuphar luteum	-	+	-	-	-	-	-	-	-	-	+	1	-	-
Potamogeton pectinatus	-	+	-	+	-	+	-	+	+	-	+	+	1	-
Potamogeton fluitans	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Phragmitetea														
Phragmites australis	+	-	-	-	-	+	+	-	-	-	+	-	-	1
Typha angustifolia	+	-	-	-	-	-	-	-	-	+	-	-	-	-
Oenanthe aquatica	-	+	-	-	-	-	-	-	-	-	-	+	-	-
Alisma plantago-aquatica	-	-	-	-	-	+	+	-	-	+	-	-	-	-
Glyceria maxima	+	-	-	-	-	-	+	-	-	-	-	-	-	-
Stachys palustris	-	+	-	-	-	-	-	-	-	-	+	-	-	-
Lysimachia vulgaris	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Mentha aquatica	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Carex riparia	-	-	-	-	-	-	-	-	-	+	-	-	-	-

Table 2
Utricularion vulgaris Pass. 1964 **et Hydrocharition** Rubel 1933

Asociatia	**Lemno-Utricularietum vulgaris**				**Hydrocharietum morsus-ranae**			**Ceratophyllo-Hydrocharietum**		**Salvinio-Hydrocharietum**		
Nr. releveu	1	2	3	4	5	6	7	8	9	10	11	12
Adâncimea apei (dm)	12	13	10	11	12	12	9,5	15	12	11	12,5	10
Acoperirea vegetației (%)	75	80	70	70	80	85	70	75	70	90	85	90
Suprafața de probă (m^2)	8	4	6	10	4	5	8	10	12	10	20	16
Utricularion vulgaris												
Utricularia vulgaris	2	2	3	3	-	-	+	-	-	-	-	+
Lemna minor	3	3	2	2	+	+	+	1	+	+	1	+
Spirodela polyrhiza	-	-	+	-	-	+	-	-	+	-	-	1
Stratiotes aloides	-	-	-	-	+	-	-	-	+	-	-	+
Wolffia arrhiza	+	-	+	-	-	-	-	-	-	-	-	-
Salvinia natans	+	1	-	+	-	+	-	+	+	3	2	2
Hydrocharition et Hydrocharietalia												
Hydrocharis morsus-ranae	-	-	-	-	4	5	3	2	2	3	4	3
Ceratophyllum demersum	-	+	-	-	+	-	+	3	3	-	-	+
Ceratophyllum submersum	-	-	-	-	-	+	-	-	-	+	-	-
Potamogetonetea pectinati												
Myriophyllum spicatum	-	-	-	-	+	-	1	+	-	-	-	-
Nymphoides peltata	-	-	-	-	-	-	-	-	-	+	-	+
Potamogeton trichoides	-	+	-	-	-	-	1	+	-	-	+	-
Potamogeton pectinatus	-	-	-	+	-	+	+	+	+	-	-	+
Polygonum amphibium	-	-	-	-	+	-	-	-	-	-	-	-
Trapa natans	-	-	-	-	-	-	-	+	+	-	+	-
Nymphaea alba	-	-	-	-	-	+	-	-	-	+	-	-
Nuphar luteum	-	-	-	-	-	-	-	-	-	-	+	-
Ranunculus trichophyllus	-	-	-	-	+	-	-	-	-	-	-	-
Sagittaria sagittifolia	-	-	-	-	-	-	-	-	-	+	+	-
Phragmition												
Phragmites australis	-	-	-	-	-	-	+	-	+	-	-	-
Schoenoplectus lacustris	-	-	+	-	-	-	+	+	-	-	-	-
Butomus umbellatus	-	-	-	-	-	-	-	+	-	-	-	-
Alisma plantago-aquatica	+	-	-	-	-	-	-	-	-	-	-	-
Lysimachia vulgaris	-	-	-	-	-	-	-	-	+	-	-	-
Mentha aquatica	-	-	+	-	-	-	+	-	-	-	-	-

Table 3
Potamogetonetea pectinati R. Tx. et Prsg. 1942

Asociația	**Myriophyllo verticilati-Nupharetum lutei**		**Nymphaeetum albae**			**Nymphoidetum peltatae**		**Trapetum natantis**		**Elodeetum canadensis**		**Potamogetonetum pectinati**		
Nr. releveu	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Adâncimea apei (dm)	23	20	18	11	21	6	7	18	22	7	13	18	15	15
Acoperirea vegetației (%)	85	90	85	90	90	75	80	95	95	90	80	80	85	80
Suprafața de probă (m^2)	20	25	50	100	100	10	8	64	100	25	30	10	20	12
Nymphaeion														
Nuphar luteum	4	3	-	-	-	+	-	-	+	-	-	-	-	+
Nymphaea alba	-	-	4	5	5	-	+	+	-	-	-	+	-	-
Nymphoides peltata	-	+	+	-	-	4	4	-	+	-	-	-	-	+
Trapa natans	-	+	+	+	+	-	+	5	5	1	+	-	-	-
Polygonum amphibium	+	-	-	-	-	+	+	-	-	-	+	+	-	-
Nymphaea candida	-	-	1	+	+	+	-	-	-	-	+	-	+	-
Potamogetion														
Elodea canadensis	-	-	+	-	-	-	-	-	-	5	4	+	-	-
Elodea nuttalii	+	+	-	+	-	+	+	+	-	-	1	-	+	-
Potamogeton pectinatus	-	-	+	-	-	-	+	+	+	-	+	4	5	4
Potamogeton trichoides	+	1	-	+	-	-	-	-	-	+	+	-	-	+
Myriophyllum spicatum	+	1	-	-	-	-	-	-	-	-	-	-	-	-
Potamogeton perfoliatus	-	-	+	-	-	+	-	-	-	-	-	+	-	-
Potamogeton lucens	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Potamogetonetalia														
Potamogeton crispus	-	-	-	-	-	-	-	-	-	+	-	-	+	-
Ceratophyllum submersum	-	+	-	-	+	-	-	-	+	-	-	-	-	-
Ranunculus trichophyllus	-	-	-	-	-	-	+	-	-	+	-	-	-	-
Potamogeton natans	-	+	-	+	-	-	-	+	-	-	-	-	-	-

Potamogetonetea														
Vallisneria spiralis	-	-	-	-	-	-	-	-	-	+	-	-	+	-
Myriophyllumvertici-llatum	+	2	-	-	-	-	+	-	-	-	-	-	-	-
Ceratophyllum demersum	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Sagittaria sagittifolia	-	-	-	+	-	+	-	-	-	-	-	-	-	-
Lemnetea														
Lemna minor	+	+	1	+	+	-	+	-	+	-	+	+	+	1
Salvinia natans	-	+	+	-	-	+	-	1	+	+	+	1	+	+
Utricularia vulgaris	-	+	-	+	+	+	-	-	-	-	-	-	-	-
Stratiotes aloides	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Phragmitetea														
Phragmites australis	-	-	-	-	+	-	-	-	-	+	-	-	-	-
Sparganium erectum	-	+	-	-	-	+	-	-	-	-	-	-	-	-
Alisma plantago-aquatica	-	-	-	-	-	+	-	-	+	-	-	-	-	-
Rumex hydrolapathum	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Oenanthe aquatica	-	-	-	+	-	-	-	-	-	-	-	-	+	-
Glyceria maxima	-	-	-	+	-	-	-	-	-	-	-	+	-	-

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