II. BLADDERWORT COLONIES – LEMNO-UTRICULARIETALIA

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General description

The order *Lemno-Utricularietalia* consists of thermophile communities which are distributed mainly in Middle and Southern Europe. This vegetation type has one or two layers which consist of free-floating species on the surface and insect-trapping species underneath. The determining ecological factor is the organic material and detritus richness of the dystrophic water. Crustacean fauna of the habitat is usually rich in species. Stands frequently appear in shaded waters surrounded by reed vegetation (Borhidi 2003).

II.1. *Lemno-Utricularietum vulgaris* (Soó 1928)

The community was described by Soó in 1928 (Soó 1928). In the first half of the last century it was treated together with *Lemnetum minoris* and was considered as the subassociation of it (Soó 1964).

Habitat conditions

Bladderwort community forms separate zones in the shaded glades of reeds in the secondary lines of rivers, lakes and backwaters. This community occurs mainly in oligo- and distrophic waters of 40-100 cm depth and is sensitive to eutrophication (Borhidi 2003). The composition of the accessory species of the community strongly depends on the fluctuation of water level as was reported from lake Bence (Nagy 1996).

Characterization of stands along River Tisza and its tributaries

Bladderwot community is characterized on the basis of 35 relevés from the Tisza river basin, most of which were recorded on percentage scale (for further details see Appendix page 156).

It is a two layered community which consists mainly of the submerged *Utricularia vulgaris* which can associate with *Lemna minor* in the surface layer and with *Lemna trisulca* in the more shaded places. *Salvinia natans, Lemna trisulca, Hydrocharis morus-ranae* are frequent, they occur in 50-70 % of the stands. In the submerged layer *Ceratophyllum demersum* occurs locally.

The protected *Salvinia natans* occurred in Lake Bence, Török-rivulet and Kengyel-oxbow, and with a minimum cover (+) value in the oxbow of Kistisza-sziget. In the submerged layer of the whole community *Utricularia vulgaris* was dominant and *Ceratophyllum demersum* associated to it in three relevés (11, 13 and 14).

In the Bereg sample, *Salvinia natans, Lemna minor* and *Hydrocharis morus-ranae* were dominant in the free-floating layer. *Hydrocharis morus-ranae* was dominant in the relevé of oxbow lake of Tisza at Boroszlókert. In the oxbow-lake of Kengyel at Bodrogköz, *Lemna trisulca* and *Salvinia natans* dominated the surface layer (except for the relevé 14). The first species was dominant in the half of the relevés while the second one in the other half. In the sample of Török-rivulet, *Lemna trisulca* was present with only a small cover, and *Salvinia natans* was dominant in the surface layer. *Sparganium erectum* and *Sium latifolium* were accessory species in the oxbow lake of Kis Tisza island.

We evaluated only one relevé from Lajos Timár recorded on AD scale because *Utricularia vulgaris* occurred only in this sample (Timár 1954). According to the recent literature, the dominant species of the community is always *Utricularia vulgaris* (Borhidi 2003).

Multivariate statistical analysis

We carried out a centred principal components analysis (PCA) ordination on the relevés (Podani 1993). On the basis of the eigenvalues, 5 components accounted for 90,55 % of the total variance of data. The objects were divided into three large and one smaller groups, and two objects separated from the others. Dominance of *Salvinia natans* and *Lemna trisulca* are the determining factors in the separation of groups. Considering the correlations of the variables with the first two axes, the cover values of *Salvinia natans* grow along *x* axis from the left to the right. There is no large difference in the cover values of *Utricularia vulgaris* (70-100 %) among the relevés.

In the relevés of group A (Fig. 1) the cover value of *Salvinia natans* is low (0-25 %), *Lemna minor* is present in 90 % of the samples, and occassionally it is dominant. In addition, *Hydrocharis morus-ranae* is the most frequent accompanying species and sometimes subdominant in the free-floating layer. *Lemna trisulca* is completely missing from this group.

In the group B, *Salvinia natans* is dominant in the surface layer (its cover value of is 60-95 %), *Lemna trisulca* is sub- or codominant. In relevé 32, *Lemna trisulca* is dominant and *Salvinia natans* is subdominant in the surface layer.

In the relevés of group C, *Hydrocharis morus-ranae* is dominant in the surface layer, creating a consociation, and *Salvinia natans* is missing. In the group D, *Lemna trisulca* is dominant with cover values of 32 to 95 % and *Salvinia natans* becomes a subordinate species.

Relevé 14 is very different from the others; three species are co-dominant (*Utricularia vulgaris*, *Lemna trisulca* and *Ceratophyllum demersum*), they occur in similar proportion, and *Lemna minor* is the only accompanying species.

The sample recorded on AD scale shows a species-poor stand; the surface layer consists of *Lemna minor* and *Salvinia natans*, and the submerged layer is dominated by *Utricularia vulgaris*.

On the ordination plot (Fig. 1) only the relevés of one site (Tisza-oxbow of Boroszlókert, Gulács) form a separate group as a consequence of the dominance of *Hydrocharis morus-ranae* in the surface layer; the samples from the other sites are more or less mixed, geographic differentiation can not be revealed. The groups of relevés were formed by one or several dominant species as was explained above. The ratio of the associated species is influenced by several abiotic and biotic factors, for example by the species composition of the neighbouring communities, the density of water-birds, the rate of eutrophization, the depth of water body, the disturbance of the area etc.

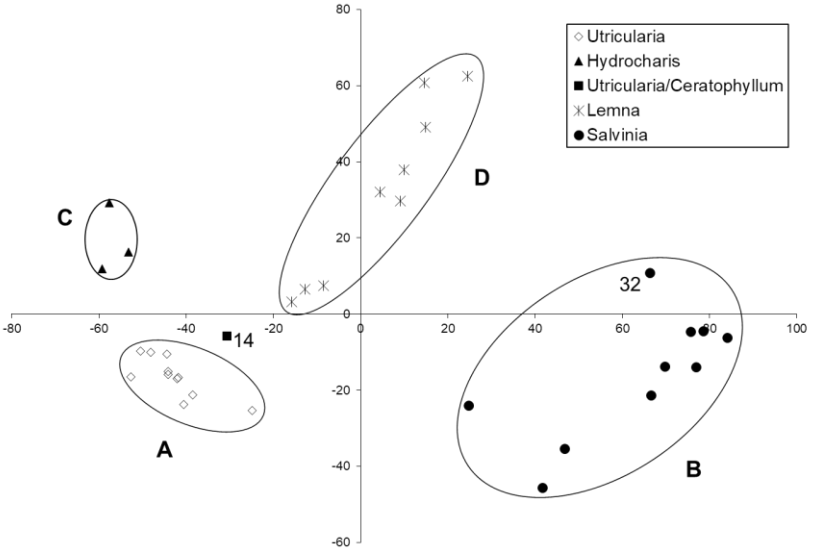

Fig. 1. PCA ordination of the samples of *Lemno-Utricularietum community* (n=34) recorded on percentage scale (centered PCA was applied). Relevés of group A are dominated by *Utricularia vulgaris*, and *Lemna trisulca* is missing; group B is dominated by *Salvinia natans* and group C by *Hydrocharis morsus-ranae*; group D is characterized by the dominance of *Lemna trisulca* and the low cover values of *Salvinia natans*. Int he relevé marked with solide square (No. 14), proportion of *Utricularia vulgais* is much less than the average and *Ceratophyllum demersum* becomes co-dominant.

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