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Vegetation of the depressions with *Eleocharis quinqueflora* in spring fens in Slovenia

Vegetacija uleknin z vrsto *Eleocharis quinqueflora* na povirnih barjih v Sloveniji

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Abstract: During the investigations of wetlands in Slovenia over the last decade specific plant communities in spring fens were found. Stands with species *Eleocharis quinqueflora* occurring in depressions inundated with standing and/or running water were found in the Alpine, pre-Alpine and Dinaric phytogeographic regions of Slovenia. Standard Central European method for vegetation research was used and multivariate analyses were performed using Syn-Tax program. Stands were classified in two different species-poor, small-scale plant communities, most of them into association *Eleocharitetum pauciflorae* Lüdi 1921. This rare plant community occurs in the Alpine and Carpathian regions and in northern Europe and has not been recorded in Slovenia before. The association *Eleocharitetum pauciflorae* is a two-layered plant community of calcium-rich fens. It thrives in shallow temporary paddies and on the sandy or stony slopes with seeping water. Smaller group of relevés was classified into association *Scorpidio-Utricularietum minoris* Ilschner ex T.Müller et Görs 1960. This association thrives in permanent paddies, where the water is deeper as in a case of the first association. Since the dominating species *Eleocharis quinqueflora* and *Utricularia minor*, respectively, have the status of a vulnerable species according to Red List of Slovenia, the stands of the studied communities, which represent vital populations, should be preserved as well as the corresponding habitat types.

Key words: wetland, fen, plant community, *Eleocharis quinqueflora, Utricularia minor*, vulnerable species.

Izvleček: V sklopu preučevanja mokrišč v Sloveniji v zadnjem desetletju, smo v povirnih barjih našli specifične rastlinske združbe. V Alpskem, Predalpskem in Dinarskem fitogeografskem območju smo našli sestoje z vrsto *Eleocharis quinqueflora*, ki se pojavljajo v ulekninah poplavljenih s stoječo ali tekočo vodo. Pri preučevanju vegetacije smo uporabili standardno srednjeevropsko metodo, multivariatne analize pa so bi le opravljene s programom Syn-Tax. Popise smo uvrstili v dve različni vrstnorevni miniaturni rastlinski združbi – večino v asociacijo *Eleocharitetum pauciflorae* Lüdi 1921. Ta redka rastlinska združba se pojavlja v Alpski in Karpatski regiji ter v severni Evropi in v Sloveniji še ni bila popisana. Asociacija *Eleocharitetum pauciflorae je dvoslojna* rastlinska združba s kalcijem bogatih nizkih barij, uspeva v plitvih občasnih lužah in na peščenih ali kamnitih brežinah z mezečo vodo. Manjšo skupino popisov smo uvrstili v asosciacijo *Scorpidio-Utricularietum minoris* Ilschner ex T.Müller et Görs 1960. Ta asociacija uspeva v stalnih lužah, kjer je voda globlja kot pri prvi asociaciji. Ker imata dominantni vrsti *Eleocharis quinqueflora* in *Utricularia minor* status ranljivih vrst v skladu z Rdečim seznamom Republike Slovenije, bi morali sestoje preučevanih združb, ki predstavljajo njihove vitalne populacije zavarovati, kakor tudi odgovarjajoč habitatni tip.

Ključne besede: mokrišče, nizko barje, rastlinska združba, *Eleocharis quinqueflora*, *Utricularia minor,* ranljive vrste.

Introduction

Almost 100 years ago Rübel (1911) recorded the stands of the characteristic species *Eleocharis quinqueflora* on the sandy and wet bank of a dike on the altitude of 1715 m above the sea in Switzerland. Ten years later the association with the name *Eleocharitetum pauciflorae* Lüdi 1921 was described. The syntaxonomic classification of the analysed type of vegetation is questionable (Martinčič and coworkers 1994, Pott 1995) and it depends on the authors.

Koch (1926) and Tüxen (1937) treated community *Eleocharitetum pauciflorae* as subassociation of the association *Schoenetum nigricantis*. Both authors classified this community into class *Scheuchzerio-Caricetea fuscae* which unifies plant communities of the fens. Passarge (1964) classified this community named *Triglochin-Eleocharis pauciflora* into the mentioned class and order *Caricetalia davallianae,* but into special alliance *Eleocharition pauciflorae*. Braun (1968) classified this type of vegetation into class *Utricularietea intermedio-minoris,* order *Utricularietalia intermedio-minoris* and alliance S*phagno-Utricularion.* Similarly Oberdorfer (1977) classified such stands into *Scorpidio-Utricularietum minoris scorpidietosum* var. *Eleocharis quinqueflora.* Dierssen and Dierssen (1985), Steiner (1993), Pott (1995), Hájek and Háberová (2001) classified this plant community into class *Scheuchzerio-Caricetea fuscae*, order *Caricetalia davallianae*, alliance *Caricion davallianae* and association *Eleocharitetum pauciflorae* Lüdi 1921.

The classification of vegetation with *Utricularia minor* is studied and explained in detail in Dite and coworkers (2006). The association *Scorpidio-Utricularietum minoris* Ilschner ex T.Müller et Görs 1960 is classified into class *Isoëto-Nanojuncetea (*Hájek and Háberová 2001, Dite et al. 2006).

Wetlands, especially fens are supposed to be highly endangered ecosystems and so are the fen plant-communities and specific plant taxa as well. Ecology and vegetation of fens were studied in Slovenia by different authors: Leskovar 1990, 1996, Leskovar-Štamcar 1996, 1991, 1996, 2001, Martinčič and coworkers 1994, Zelnik. This type of plant communities, which thrives in inunda-ted depressions and shallow small lakes within different fen-vegetation types have not been studied before.

Thus the aim of the paper is to present original data on floristic composition, the distribution and ecology of this type of vegetation in Slovenia, to point out vulnerable species thriving in these stands and to emphasize the need to protect the fens.

Materials and methods

The standard Central European phytosociological method (Braun-Blanquet 1964) was used for vegetation sampling. Cover-abundance estimation values were used, which were transformed in accordance with van der Maarel (1979). Relevés were made in summer months, when the majority of plant species are in optimal phase and determinable. The size of the plots ranges from 1 to 15 m^2 and depends on the microrelief. Multivariate statistical analyses of vegetation relevés were performed using SYNTAX 2000 (Podani 2001) programme. We used ordination method - Principal Coordinates Analysis (PCoA) and complement of Similarity ratio.

The nomenclature of vascular plants follows Martinčič et al. (2007); the nomenclature of mosses follows Martinčič (2003). The nomenclature of syntaxa is in accordance with Steiner (1993) and Valachovič and Ot'ahel'ová (2001).

Results and discussion

During the survey of fens in Slovenia the stands of these small-scale plant communities were also found and 16 stands were recorded. Analytical table (Tab. 1) shows the floristic composition of these species-poor stands.

Table 1. Analytical table of associations: *Eleocharitetum pauciflorae* Lüdi 1921 and *Scorpidio-Utricularietum minoris* Ilschner ex. T.Müller et Görs 1960. V – vulnerable species, on the Red List of Ferns and Flowering plants in Republic Slovenia.

Tabela 1. Analitična tabela asociacij *Eleocharitetum pauciflorae* Lüdi 1921 in *Scorpidio-Utricularietum minoris* Ilschner ex. T.Müller et Görs 1960. V – ranljiva vrsta, na Rdečem seznamu praprotnic in semenk republike Slovenije.

RL of RS	column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	relevé number	**2**	**3**	**4**	**5**	**7**	**8**	**13**	**6**	**9**	**10**	**1**	**14**	**15**	**11**	**12**	**16**
	No. of vascular taxa	16	13	15	18	16	14	7	10	9	13	7	6	7	4	6	5
	No. of plant taxa	18	15	17	20	19	17	9	13	13	16	8	9	11	8	9	6
ass. *Scorpidio-Utricularietum minoris*, alliance *Scorpidio-Utricularion minoris*																	
and **class Utricularietea intermedio-minoris char. taxa**																	
V	*Utricularia minor*	.	.	.	.	.	.	.	.	.	.	.	+	1	**3**	**2**	**1**
.	*Scorpidium scorpioides*	.	.	.	.	.	.	.	.	.	.	.	.	.	**.**	**2**	**3**
V	*Triglochin palustre*	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.
ass. *Eleocharitetum pauciflorae* char. taxon																	
V	*Eleocharis quinqueflora*	**5**	**5**	**4**	**5**	**5**	**4**	**3**	**4**	**4**	**4**	**4**	**3**	**2**	1	2	1
subass. *drepanocladetosum* diff. taxon																	
.	*Drepanocladus cossonii*	4	4	+	+	+	+	+	1	+	+	.	+	+	2	1	.
subass. *charetosum* diff. taxon																	
.	*Chara sp.*	.	.	.	.	.	.	.	**2**	**2**	**3**	**1**	**+**	**+**	.	.	.
Caricion davallianae																	
.	*Carex lepidocarpa*	+	1	+	1	1	+	.	1	+	1	.	.	+	.	+	.
V	*Eriophorum latifolium*	r	.	.	+	+	+	.	.	+	+	.	.	.	1	+	+
V	*Carex davalliana*	1	+	+	1	.	.	.	1	1	+	+	+	.	.	.	.
V	*Carex hostiana*	.	.	+	+	+	+	.	+	.	.	.	.	.	.	.	.
.	*Valeriana saxatilis*	.	.	.	+	+	+	.	.	+	+	.	.	.	.	.	.
V	*Epipactis palustris*	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.
V	*Schoenus nigricans*	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.
.	*Equisetum telmateia*	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Caricetalia davallianae																	
.	*Pinguicula alpina*	2	2	+	+	.	+	+	+	.	+	.	+	+	.	.	.
.	*Tofieldia calyculata*	1	+	+	+	+	.	.	.	.	+	.	.	+	.	.	.
.	*Parnassia palustris*	.	+	+	+	+	+	+	.	+	.	.	.	.	.	.	.
V	*Equisetum variegatum*	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
.	*Juncus alpinoarticulatus*	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
.	*Campylium stellatum*	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.
.	*Carex flava*	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Scheuchzerio-Caricetea fuscae																	
.	*Carex panicea*	2	+	2	2	+	2	+	1	3	3	+	.	.	.	.	.
.	*Juncus articulatus*	.	.	.	+	+	1	.	1	+	.	.	.	.	.	.	+
.	*Calliergon trifarium*	.	.	.	.	.	.	+	.	.	.	.	+	+	2	+	.
V	*Equisetum fluviatile*	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.
V	*Drosera anglica*	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Molinio-Arrhenatheretea																	
.	*Equisetum palustre*	+	1	+	+	+	1	+	+	.	+	.	.	.	.	+	+
.	*Molinia caerulea*	1	1	+	+	2	1	+	+	.	+	.	.	.	.	.	.
.	*Cirsium oleraceum*	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
.	*Juncus acutiflorus*	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
other phanerophytes																	
.	*Pinus sylvestris (juv.)*	+	+	+	+	+	.	.	r	.	.	.	.	.	.	.	.
.	*Fraxinus ornus (juv.)*	+	+	+	+	.	.	.	.	.	+	.	.	.	.	.	.
.	*Equisetum arvense*	r	.	.	+	+	+	.	.	.	.	+	.	.	.	.	.
.	*Acer pseudoplatanus (juv.)*	+	1	.	+	+	.	.	.	.	.	.	.	.	.	.	.
.	*Picea abies (juv.)*	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.
.	*Potentilla erecta*	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.
.	*Eupatorium cannabinum*	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
other mosses																	
.	*Bryum pseudotriquetrum*	1	1	4	4	1	+	.	+	+	+	.	.	.	+	.	.
.	*Aneura pinguis*	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.

On the base of the results of multivariate analysis of the relevés and their aggregation in two distinct groups (Fig. 1) these two relevé groups can be undoubtedly classified in two mentioned plant communities. According to the presence and abundance of characteristic species bigger group was classified into association *Eleocharitetum pauciflorae* Lüdi 1921, while the second group was classified into association *Scorpidio-Utricularietum minoris* Ilschner ex T.Müller et Görs 1960.

Floristic composition

Beside the dominant species *Eleocharis quinqueflora* ten other species have the status of vulnerable species according to Red list of republic of Slovenia (Wraber et al 2002) (Table 1). That means that over one third of present species of vascular plants (11 out of 32) are considered as vulnerable.

The community *Eleocharitetum pauciflorae* (syn.: *Scirpus pauciflorus* ass. Osvald 1923, *Eleocharitetum quinqueflorae* (Zobrist 1935) Braun 1968 is a two-layered, species-poor, association of calcium-rich fens. Recorded relevés contain 6-18 species of vascular plants (Table 1).

The association is defined by the absence of character species of other associations of the alliance *Caricion davallianae,* but most of all, by dominance of *Eleocharis quinqueflora* (Hájek and Háberová 2001). Steiner (1992, 1993) has defined the following diagnostic species combination:

Character and dominant species: *Eleocharis quinqueflora*

Dominant and/or most common species: *Drepanocladus revolvens agg.* (dom.)*, Carex flava* (subdom.)*, C. panicea, Eriophorum latifolium, E. angustifolium, Molinia caerulea, Parnassia palustris, Pinguicula vulgaris, Tofieldia calyculata.*

On the base of the presence and abundance of the cryptogams, we can divide the association *Eleocharitetum pauciflorae* Lüdi 1921 in two subassociations (Hájek and Háberová 2001). Steiner (1993) defined two subassociations - one with taxon *Chara* thriving on flooded sites and the other with *Drepanocladus revolvens* thriving on the calcium-rich stony or sandy sites with thin-layered peat. Since the species *Drepanocladus revolvens* thrives on acidic peat bogs, this subassociation could not be defined with the mentioned moss species but with species *Drepanocladus cossonii,* which was actually found in our fens. Both of the subassociations were found in the researched area (Tab. 1). Subassociation with *Chara* on average contains nine species of vascular plants, while the subassociation with *Drepanocladus* characteristic for less wet conditions contains 14 species on average. The reason is in anoxic conditions in inundated substrate, which often occur in the sites of the first subassociation, while the sites of the second subassociations can dry up during the periods of summer droughts.

On some of the sites of the same habitat type, but with slightly deeper and permanent water the community *Scorpidio-Utricularietum minoris* Ilschner ex T.Müller et Görs 1960 was found. This plant community is characterized, above all, by the dominance of free floating macrophyte *Utricularia minor*. Three character species occur in research area: *Utricularia minor, Scorpidium scorpidioides* and *Triglochin palustre*. Diferential species *Eleocharis quinqueflora,* which is subdominant in stands of this association (Valachovič and Ot'ahel'ová 2001) is present in all relevés (Tab. 1).

Community *Scorpidio-Utricularietum* consists of 3-7 species on average only (Valachovič and Ot'ahel'ová 2001). Recorded relevés contain 4-6 species of vascular plants (Tab. 1), but 6-9 species in total, what is slightly higher than stands recorded in Slovakia. Possible reasons are warmer climate and a greater species pool of Dinaric floral province.

Syntaxonomic position and distribution

The distribution of the species *Eleocharis quinqueflora* and the distribution of the association *Eleocharitetum pauciflorae* in Slovenia are shown on the map (Fig. 2). This rare association reaches here the southeast border of its distribution. It was found in the Alpine, pre-Alpine and Dinaric phytogeographic regions of Slovenia in fens on dolomite limestone substrate in mountain belt. The altitude of those fens ranges between 500 and 755 m above the sea level.

Association *Scorpidio-Utricularietum minoris* has even narrower distribution in Slovenia due to narrow distribution of its dominant species *Utricularia minor*. It was found on three localities only, namely on the Bloke plateau in Dinaric and near Hotedršica in pre-Alpine phytogeographic region. In all three localities *Eleocharitetum pauciflorae* was also found. These stands were found within fens, the altitude ranged from 570 to 775 m.

According to the floristic composition, presence of the characteristic species and location within the communities from the mentioned fen vegetation types the association *Eleocharitetum pauciflorae* Lüdi 1921 was classified into alliance *Caricion davallianae*, order *Caricetalia davallianae* and class *Scheuchzerio-Caricetea fuscae*. The mentioned order and a class unify the vegetation of fens.

Association *Eleocharitetum pauciflorae* Lüdi 1921 occurs from SW France across the Alpine and Carpathian regions to the Northern Europe and Baltic region, respectively (Balátová-Tuláčková and Venanzoni 1990, Steiner 1992). Pott (1995) reports its occurring in pre-Alpine region, in fens and sites with seeping water in the mountains of the middle belt of Central Germany and on the shores of the islands in the North Sea. This community was also found in the alpine region in Austria, the closest in South Carinthia and Styria (Steiner 1992). Community is very rare in Slovakia and southern Poland (Hájek and Háberová 2001).

We have classified association *Scorpidio-Utricularietum minoris* Ilschner ex T.Müller et Görs 1960 into alliance *Scorpidio-Utricularion minoris* Pietsch 1964, order *Utricularietalia intermedio-minoris* Pietsch 1965 and class *Isoëto-Nanojuncetea* Br.-Bl. et R.Tx. ex Westhoff et al. 1946, according to the floristic composition and presence of the characteristic species. The order *Utricularietalia intermedio-minoris* contains floating plant communities of the fen and peat lakes.

Stands of the association *Scorpidio-Utric-*

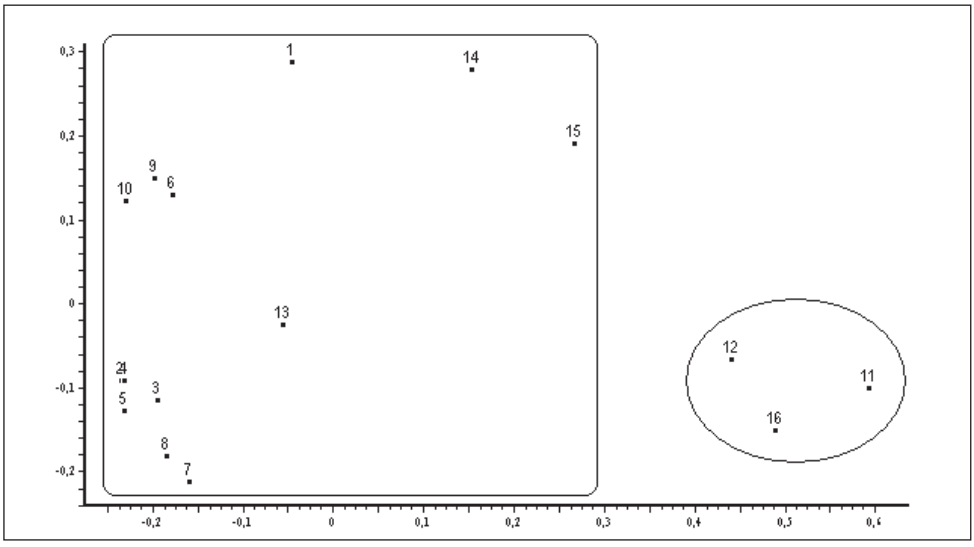

Figure 1. Ordination diagram of the relevés obtained as a result of Principal Coordinate analysis. Relevés on the right-hand side (11, 12, 16 – in ellipse) were classified into association *Scorpidio-Utricularietum minoris*. All other relevés belong to the association *Eleocharitetum pauciflorae* (in rectangle). Relevés 14 and 15 represent a transition since they contain species characteristic for both associations.

Slika 1. Ordinacijski diagram popisov kot rezultat analize glavnih koordinat (PCoA). Popisi na desni strani (11, 12, 16 – v elipsi) so bili uvrščeni v asociacijo *Scorpidio-Utricularietum minoris*. Vsi ostali popisi spadajo v asociacijo *Eleocharitetum pauciflorae* (v pravokotniku). Popisa 14 in 15 predstavljata prehod, saj vsebujeta značilne vrste obeh asociacij.

ularietum minoris have the centre of distribution in boreal-suboceanic region in Alpine region stands are species-poorer (Valachovič and Ot'ahel'ová 2001). Association is common in Germany (Pott 1995) and in Austria (Wallnöfer 1993), but rarely found in Slovakia, Czech Republic and southern Poland (Valachovič and Ot'ahel'ová 2001).

The subassociation *Scorpidio-Utricularietum minoris charetosum* is very similar to *Eleocharitetum pauciflorae charetosum*. Oberdorfer (1977) even treats both associations as *Scorpidio-Utricularietum minoris*. Some other authors also consider both associations as one.

Ecology

Both associations are pioneer plant communities, which are sometimes only fragmentally developed (Valachovič and Ot'ahel'ová 2001) and we found them on disturbed sites within different fen communities, mostly of the alliance *Caricion davallianae*.

Eleocharitetum pauciflorae is a community of calcium-rich fens. It is always occurring in small patches on sites where the substrate is saturated with basic ions (Pott 1995). The permeable sandy soil is wet due to seepage or high groundwater rich in carbonate (Steiner 1993). This community also thrives in coastal area in wet depressions of halophile grasslands (Pott 1995).

In Slovenia this rare fen community can be found on limestone-rich sites. Dominant species *Eleocharis quinqueflora* forms low and loose stands. These stands thrive on open and mostly wet sandy or silty substrate. This community thrives in spring areas in shallow paddies and on the sandy or stony slopes with seeping water. Water is alkaline and rich in Ca^{2+} (>20 mg/l), electric conductivity is always higher than 300

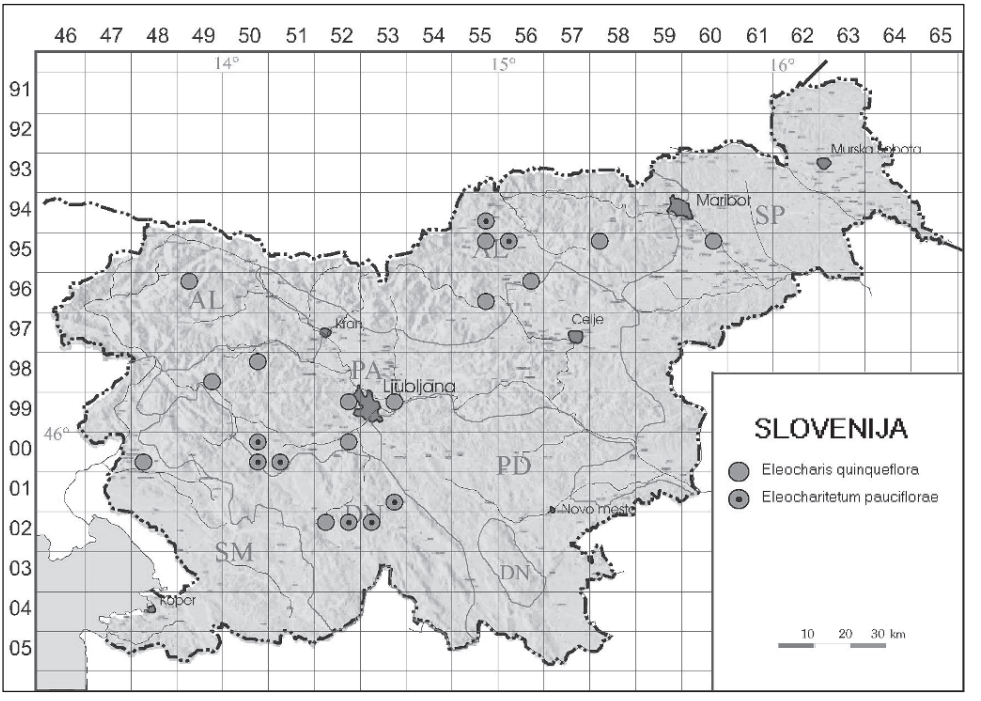

Figure 2. Distribution of the species *Eleocharis quinqueflora* in Slovenia and of the association *Eleocharitetum pauciflorae*. Localities are presented in the grid of central European mapping.

Slika 2. Razširjenost vrste *Eleocharis quinqueflora* in asociacije *Eleocharitetum pauciflorae* v Sloveniji. Lokalitete so predstavljene v mreži srednjeevropskega kartiranja.

μS/cm (Martinčič 1994).

In similar sites with slightly deeper water the community *Scorpidio-Utricularietum minoris* was also found. This community thrives mostly in paddies with 5-20 cm deep water. Water is mesotrophic to oligotrophic, pH being neutral to alkaline.

Alkaline fens are classified onto the List of a Decree on Habitat Types which are being preferentially maintained in good condition and are rare in Republic of Slovenia, vulnerable or they have small natural distribution area.

Conclusions

Both studied plant communities have been alternatively classified as a subunit of the other one, by different authors. On the other hand they belong to different types of vegetation, even into different classes – *Eleocharitetum pauciflorae* belongs into the class of fens and *Scorpidio-Utricularietum minoris* belongs into the class of fen and/or peat lakes, that indicates the evident differences in ecological conditions and species composition. The most probable reason for such ambiguity is a low number of characteristic species in both associations, what could make classification difficult especially in the presence of species that both have in common. However the main difference in ecological conditions, which forms two vegetation types, is the duration of water phase. Water phase is more or less permanent in case of the association with *Utricularia* (*Scorpidio-Utricularietum minoris),* while in the sites of other association (*Eleocharitetum pauciflorae*) the water dries up regularly.

The common fact in both plant communities is the high share of vulnerable Red List species and their rarity in Slovenia and in Central Europe. The presence of the studied plant communities would give additional reasons for protection of the fens, which have already been recognized as endangered habitat types. Stands with *Eleocharis quinqueflora* are also vulnerable due to their dependence on hydrological regime in the landscape, which is changing nowadays. The studied stands are on the southeast margin of their distribution. Marginal areas are most sensitive to the changes, so these data represent important material for the estimation of consequences of the local as well as global changes.

Povzetek

Sestoji z vrsto *Eleocharis quinqueflora* so bili popisani že pred skoraj 100 leti, vendar so še več desetletij po tem različni avtorji tovrstne sestoje uvrščali v različne vegetacijske tipe. Nekateri avtorji so sestoje s prevladujočima vrstama *Eleocharis quinqueflora* in *Utricularia minor* uvrstili v isto rastlinsko združbo. Vrstna sestava, ekologija in razširjenost preučevane vegetacije je v nekaterih evropskih državah dobro preučena, v Sloveniji pa o tem še ni bilo objavljenih del. V Sloveniji smo v povirnih barjih našli specifične rastlinske združbe. V Alpskem, Predalpskem in Dinarskem fitogeografskem območju smo našli sestoje z vrsto *Eleocharis quinqueflora,* ki se pojavljajo v stalno ali občasno poplavljenih ulekninah.

Pri preučevanju vegetacije smo uporabili standardno srednjeevropsko metodo, multivariatne analize pa so bile opravljene s programom Syn-Tax. Pri tem smo uporabili analizo glavnih koordinat (PCoA). Popise smo uvrstili v dve različni vrstnorevni miniaturni rastlinski združbi – večino v asociacijo *Eleocharitetum pauciflorae* Lüdi 1921. Manjšo skupino popisov smo uvrstili v asosciacijo *Scorpidio-Utricularietum minoris* Ilschner ex T.Müller et Görs 1960.

Asociacija *Eleocharitetum pauciflorae* je dvoslojna rastlinska združba s kalcijem bogatih nizkih barij, uspeva v plitvih občasnih lužah in na peščenih ali kamnitih brežinah z mezečo vodo. Je redka rastlinska združba, ki se pojavlja v Alpski in Karpatski regiji ter v severni Evropi. Asociacija je definirana predvsem z dominanco vrste *Eleocharis quinqueflora.*

Asociacija *Scorpidio-Utricularietum minoris* uspeva v stalnih lužah, kjer je voda globlja kot pri prvi asociaciji. V vodi na teh rastiščih je visoka koncentracija kalcija in ima bazično reakcijo. Asociacija je definirana predvsem z dominanco prosto plavajoče vrste *Utricularia minor.*

Ker imata dominantni vrsti *Eleocharis quinqueflora* in *Utricularia minor* status ranljivih vrst v skladu z Rdečim seznamom Republike Slovenije, bi morali sestoje preučevanih združb,

ki predstavljajo njihove vitalne populacije zavarovati, kakor tudi odgovarjajoč habitatni tip.

Poleg omenjenih dominantnih vrst ima še devet drugih vrst status ranljive vrste in so uvrščene na Rdeči seznam RS, kar predstavlja več kot tretjino vseh popisanih vrst cvetnic.

Na podlagi prisotnosti in pogostosti mahov in alg, lahko asociacijo *Eleocharitetum pauciflorae* razdelimo na dve subasociaciji, ki smo jih tudi našli na preučevanem območju. Subasociacija s taksonom *Chara* uspeva na poplavljenih rastiščih, druga s taksonom *Drepanocladus revolvens,* pa na kamnitih ali peščenih rastiščih. Ker vrsta *Drepanocladus revolvens* iz istoimenskega agregata uspeva le na kislih visokih barjih, gre tukaj za vrsto *Drepanocladus cossonii,* ki smo jo v naših sestojih tudi določili in je značilna za bazična rastišča.

Izpostavljene so majhne okoljske razlike, ki pogojujejo razlike v vegetaciji. Sestoji z vrsto *Eleocharis quinqueflora* so še posebno ranljivi, saj so odvisni od hidrološkega režima v krajini, ki pa se danes spreminja. Sestoji v Sloveniji se nahajajo na južni meji razširjenosti. Robni predeli arealov so najbolj občutljivi na spremembe, zato tovrstni zapisi predstavljajo pomemben dokument, za ugotavljanje posledic, ne samo lokalnih, temveč tudi globalnih sprememb.

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Appendix:

List of the relevé localities (from Table 1):

1: 9556/1 Raduše, Smrčun; **2:** 9556/1 Raduše, Smrčun; **3:** 9556/1 Sele, Blatnik; **4:** 9556/1 Sele, Blatnik; **5:** 9556/1 Sele, Blatnik; **6:** 9455/4 Kot pri Prevaljah; **7:** 9455/4 Kot pri Prevaljah; **8:** 9455/4 Kot pri Prevaljah; **9:** 9455/4 Kot pri Prevaljah; **10:** 9556/14 Raduše, Smrčun; **11:** 0050/4 Hotedršica, Žejna dolina; **12:** 0050/4 Hotedršica, Žejna dolina; **13:** 0253/1 Volčje (Bloke); **14:** 0050/2 Žibrše, Žejna dolina; **15:** 0050/2 Žibrše, Žejna dolina; **16:** 0252/2 Ulaka (Bloke);