

Three rarely occurring plant communities of *Glycerio-Sparganion* alliance (*Phragmito-Magnocaricetea* class) from Slovakia

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Abstract: Three plant communities of *Glycerio-Sparganion* alliance were studied in recent years in Slovakia. *Rorippo ancipitis-Catabrosetum aquaticae* was previously mentioned only from the Drienčanský kras Mts, while the occurrence of the other two associations, *Glycerio notatae-Veronicetum beccabungae* and *Polygono hydropiperis-Veronicetum anagallidis-aquaticae*, was only generally mentioned from Slovakia. Based on a field study and published sources, all three associations were documented by 12 phytosociological relevés. Comparison of *Rorippo ancipitis-Catabrosetum aquaticae* with *Catabroso-Polygonetum hydropiperis* (*Bidentetea* class) was discussed. List of communities of the *Glycerio-Sparganion* alliance was added; altogether 8 associations are recently mentioned from Slovakia.

Keywords: *Glycerio notatae-Veronicetum beccabungae*, marsh vegetation, *Polygono hydropiperis-Veronicetum anagallidis-aquaticae*, *Rorippo ancipitis-Catabrosetum aquaticae*.

Introduction

Wetland vegetation of the *Glycerio-Sparganion* alliance covers one- or two-layered, species-poor, monodominant and relatively small stands with the presence of hygrophytic plant species. Vegetation occurs within or along at least seasonally running waters, such as brooks, small rivers or drainage ditches, and additionally in

littoral zones of fishponds with fluctuating water level. Substrate is composed of fine-grained or coarser sediment (sandy to gravel), occasionally with a variously deep layer of the organic matter (Valachovič 2001; Šumberová et al. 2011; Landucci et al. 2013). The communities are relatively common in Slovakia, mainly those with the dominance of *Glyceria* species, *Berula erecta* and *Leersia oryzoides* (Valachovič 2001). On the contrary, *Rorippo ancipitis-Catabrosetum aquaticae* (mentioned by Valachovič 2001 as *Catabrosetum aquaticae* Kaiser 1926), with the dominance of Red-listed plant species *Catabrosa aquatica* (category Near-threatened; Eliáš et al. 2015), was represented only by one phytosociological relevé (Kliment et al. 2000; Valachovič 2001). Altogether, 6 plant communities were mentioned from the territory of Slovakia in the last vegetation survey and documented by phytosociological material (Valachovič 2001), including *Leersietum oryzoidis*, which was recently arranged into the *Eleocharito palustris-Sagittarion sagittifoliae* alliance (Landucci et al. 2020). Later, *Veronico beccabungae-Mimuletum guttati* was published from uplands to mountains of Central Slovakia (Hrivnák et al. 2018). The next two associations, *Glycerio notatae-Veronicetum beccabungae* and *Polygono hydropiperis-Veronicetum anagallidis-aquaticae*, were mentioned from Slovakia, but without any records (Šuvada 2023). These two associations belong probably to overlooked plant communities in Slovakia; dominant and also diagnostic species of the communities are relatively frequent in the territory (see <https://pladias.sk/>).

Therefore, we focused on the documentation and a short characteristic of rarely occurring plant communities of *Glycerio-Sparganion* based on relevés from both the field research and previously published material.

Material and Methods

Stands dominated by *Catabrosa aquatica*, *Veronica anagallis-aquatica* and *V. beccabunga* were studied during the research of wetlands in Slovakia in the last years using the traditional Zürich-Montpellier approach (Westhoff & van der Maarel 1973). This material was completed by published relevés from the papers stored in the Slovak Vegetation Database (code EU-SK-001 in the Global Index of Vegetation Plot Databases; Šibík 2012). Relevés dominated by at least one of the three mentioned species (cover $\geq 15\%$) and with the prevalence of diagnostic species of the *Glycerio-Sparganion* alliance (see Valachovič 2001; Šumberová et al. 2011; Landucci et al. 2013) were selected from the mentioned source. On the contrary, relevés with the dominance of the species, but without the *Glycerio-Sparganion* species and with a significant portion of diagnostic species from the other alliances of the *Phragmito-Magnocaricetea* class, or the *Isoëto-Nanojuncetea* and *Bidentetea* classes were omitted. Altogether, 12 relevés were selected, 10 from published sources and 2 from author's own material. All were stored in the TURBOVEG database (Hennekens & Schaminée 2001), exported and processed in the Juice programme (Tichý 2002).

Names of plants and plant communities are presented according to POWO (2024) and Landucci et al. (2020), respectively.

Results and Discussion

We completed the information about the distribution of *Rorippo ancipitis-Catabrosetum aquaticae*. In addition, we present *Glycerio notatae-Veronicetum beccabungae* and *Polygono hydropiperis-Veronicetum anagallidis-aquaticae* first time from Slovakia based on the phytosociological material. The most frequent community was *Rorippo ancipitis-Catabrosetum aquaticae*, while other two associations were documented rarely (Tab. 1 and Fig. 1).

Rorippo ancipitis-Catabrosetum aquaticae created small, closed, species-poor (3–16 taxa, 8 in average) stands along or within small streams as well as in the alluvia near the watercourses. Except for one relevé, *Catabrosa aquatica* was the dominant plant, *Glyceria fluitans*, *G. notata* occurred frequently (>50%), while the other species of the *Glycerio-Sparganion* alliance such as *Berula erecta* and *Veronica beccabunga* were rare (both with 25% frequency). Other three wetland species (*Myosotis scorpioides* agg., *Persicaria hydropiper* and *Ranunculus sceleratus*) were frequently present (>50%), but with low cover values. Species composition of the stands in Slovakia is similar to those mentioned from the other European countries (Landucci et al. 2020). In addition to *Rorippo ancipitis-Catabrosetum aquaticae*, *Catabroso-Polygonetum hydropiperis* Poli et J. Tx. 1960 (*Bidentetea* class) was mentioned from Slovakia (Zaliberová & Jarolímek 1995; Medvecká et al. 2009). A high presence of the *Bidentetea* class and lower syntaxa diagnostic species was typical for the community, while the species of *Glycerio-Sparganion* were relatively less frequently present (Jarolímek et al. 2007). However, this community has a transitional position between *Glycerio-Sparganion* and *Bidention tripartitae* (Jarolímek et al. 2007), which was documented by several relevés (e.g. Špániková & Zaliberová 1982; Zaliberová & Jarolímek 1995, table 13, rel. 2).

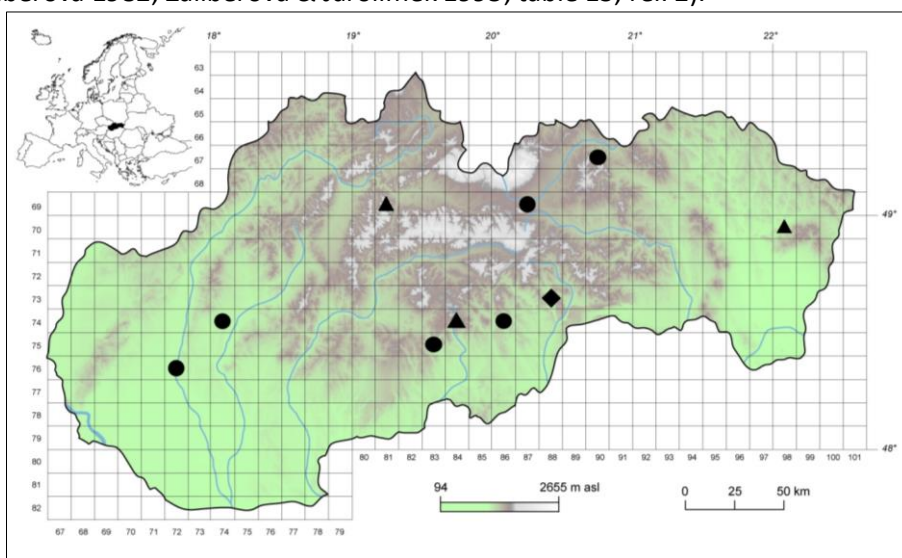


Fig. 1 Distribution map of *Rorippo ancipitis-Catabrosetum aquaticae* (circles), *Glycerio notatae-Veronicetum beccabungae* (triangles) and *Polygono hydropiperis-Veronicetum anagallidis-aquaticae* (diamond) in Slovakia via squares of Central European mapping network.

The name *Glycerio notatae-Veronicetum beccabungae* was recently created by Landucci et al. (2020) based on the material from central Italy (Corbetta & Pirone 1989). *Veronica beccabunga* strongly dominated in the community stands in the whole Europe (Landucci et al. 2020 and Tab. 1), while only a few other species had higher frequency (*Agrostis stolonifera*, species of the genus *Glyceria* and *Mentha longifolia*) in presented relevés from Slovakia. Stands were species-poor (7–9, 8), closed and small with the occurrence on the margins of small streams in (sub)mountain area. Published relevés presented in the Tab. 1 were classified by the authors into various syntaxa, *Glycerietum notatae* (Hrivnák & Kochjarová 2008), *Veronico beccabungae-Mimuletum guttati* (Hrivnák et al. 2018) or only as a community within *Glycerio-Sparganion* alliance (Zaliberová et al. 2000).

Polygono hydropiperis-Veronicetum anagallidis-aquaticae was found on the margin of alluvium in seasonally flooded arable land and documented only by a single relevé. The stand was relatively large, species-poor, dominated by *Veronica anagallis-aquatica* with higher cover of *Alisma plantago-aquatica*. Species composition reflected a shallow spring flood and a later infiltration of water under the soil surface, and the species typical for these ecological conditions were present (see Tab. 1). Therefore, its composition makes it closely related to the *Eleocharito palustris-Sagittarion sagittifoliae* alliance, with the occurrence of *Bidentetea* and *Isoëto-Nanojuncetea* species. Except for the dominant *Veronica anagallis-aquatica*, only three other species (*Alisma plantago-aquatica*, *Lythrum salicaria* and *Persicaria hydropiper*) were present with a higher frequency than 10%, as mentioned by Landucci et al. (2020; see Supplement 7). On the contrary, the other diagnostic species of the *Glycerio-Sparganion* alliance, more frequently present within the association from other part of Europe (*Glyceria fluitans* and *Nasturtium officinale* with a cover of 13% and 28%, respectively), were absent. Therefore, the presence of the association in Slovakia needs both more phytosociological material and further study.

In conclusion, the recent list of associations of *Glycerio-Sparganion* alliance mentioned from Slovakia is as follows:

Phragmito-Magnocaricetea Klika in Klika et Novák 1941

Nasturtio-Glycerietalia Pignatti 1953

Glycerio-Sparganion Br.-Bl. et Sissingh in Boer 1942

Glycerio notatae-Veronicetum beccabungae Landucci et al. 2020

Glycerietum notatae Kulczyński 1928

Beruletum erecti Roll 1938

Polygono hydropiperis-Veronicetum anagallidis-aquaticae Schaminée et Weeda in Schaminée et al. 1995

Rorippo ancipitis-Catabrosetum aquaticae (Oberdorfer 1957) Müller et Görs 1961

Glycerietum nemoralis-plicatae Kopecký 1972

Glycerietum fluitantis Nowiński 1930

Veronico beccabungae-Mimuletum guttati Niemann 1965

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Tab. 1 Rarely occurring plant communities of *Glycerio-Sparganion* in Slovakia.

Taxon/Relevé number	1	2	3	4	5	6	7	8	9	10	11	12
<i>Rorippo ancipitis-Catabrosetum aquaticae</i>												
<i>Catabrosa aquatica</i>	5	5	b	5	4	3	5	a	.	.	.	.
<i>Glycerio notatae-Veronicetum beccabungae</i>												
<i>Veronica beccabunga</i>	.	.	.	.	.	+	+	1	5	4	4	.
<i>Polygono hydropiperis-Veronicetum anagallidis-aquaticae</i>												
<i>Veronica anagallis-aquatica</i>	.	.	.	.	.	.	.	.	.	.	.	5
<i>Glycerio-Sparganion</i>												
<i>Glyceria notata</i>	+	+	+	.	a	.	1	1	.	b	+	.
<i>Glyceria fluitans</i>	.	.	4	1	.	+	.	+	+	.	.	.
Other species												
<i>Persicaria hydropiper</i>	.	.	a	r	.	+	.	+	+	.	.	+
<i>Agrostis stolonifera</i>	.	.	.	1	.	.	.	1	+	+	.	r
<i>Ranunculus sceleratus</i>	+	+	+	.	.	.	+	.	.	.	.	.
<i>Myosotis scorpioides</i> agg.	.	+	.	1	.	+	.	1	.	.	1	.
<i>Poa trivialis</i>	.	.	.	+	+	+	.	1	.	.	.	.
<i>Alopecurus aequalis</i>	.	1	.	.	.	+	.	+	.	.	.	.
<i>Epilobium roseum</i>	.	.	.	.	.	1	.	1	.	.	.	.
<i>Ranunculus repens</i>	.	.	.	.	.	+	.	+	.	.	.	.
<i>Bidens tripartitus</i>	.	.	.	.	.	+	.	.	.	.	.	+
<i>Cardaria draba</i>	.	.	.	.	.	r	.	+	.	.	.	.
<i>Equisetum arvense</i>	.	.	.	.	.	r	.	.	.	.	r	.
<i>Rorippa palustris</i>	.	.	.	.	.	.	+	r	.	.	.	.
<i>Juncus articulatus</i>	.	.	.	.	.	.	+	.	.	.	.	1
<i>Alisma plantago-aquatica</i>	.	.	.	.	.	.	.	.	+	.	.	a
<i>Mentha longifolia</i>	.	.	.	.	.	.	.	.	.	+	1	.

Taxa with the occurrence only in a single relevé: *Berula erecta* relevé number 5: cover 2a, *Caltha palustris* 10: +, *Cerastium holosteoides* 6: r, *Epilobium hirsutum* 4: 1, *E. tetragonum* 11: 1, *Equisetum palustre* 5: +, *Eupatorium cannabinum* 10: +, *Juncus inflexus* 10: 1, *Leersia oryzoides* 9: 1, *Lythrum hyssopifolia* 12: r, *L. salicaria* 12: +, *Medicago lupulina* 8: r, *Mimulus guttatus* 11: 1, *Myosoton aquaticum* 4: r, *Phalaris arundinacea* 5: +, *Phragmites australis* 11: +, *Poa palustris* 12: +, *Potamogeton crispus* 5: 1, *Rumex conglomeratus* 6: r, *Rumex maritimus* 2:1, *R. palustris* 7: +, *Salix purpurea* 4: r, *Scirpus sylvaticus* 11: +, *Sparganium erectum* 9: 2a, *Trifolium repens* 8: r, *Tripleurospermum inodorum* 8: +.

Localities and sources of the relevés presented in the Table 1: 1, 2 – Nitrianska pahorkatina Mts, Horné Štitáre (Ripka 1998); 3 – Revúcka vrchovina, Slizké (Kliment et al. 2000 & Valachovič 2001); 4 – Spišsko-šarišské medzihorie Mts, Nová Ľubovňa (Zaliberová & Jarolímek 1995); 5 – Podunajská nížina lowland, Pusté Sady (south margin of the village, Jarčie stream, 17°49'37.5"E, 48°18'26.9", altitude 143 m, relevé area 25 m², cover E₁ 80%. R. Hrivnák, 4. 6.

2018); 6 – Popradská kotlina basin, Veľká pri Poprade (Špániková & Zaliberová 1982); 7 – Revúcka vrchovina Mts, Ružiná (Hrivnák et al. 2021); 8 – Popradská kotlina basin, Batizovce (Špániková & Zaliberová 1982); 9 – Beskydské predhorie Mts, Dlhé nad Cirochou (Zaliberová et al. 2000); 10 – Veľká Fatra Mts, Ružomberok (Hrivnák & Kochjarová 2008); 11 – Veporské vrchy Mts, Ipeľský Potok, Vlčovo (Hrivnák et al. 2018); 12 – Slovenský kras Mts, Brzotín (south-western from the village, alluvium of the nameless stream, exposed bottom, 20°28'45.869"E, 48°36'37.084"N, altitude 248 m, relevé area 16 m², cover E₁ 95%, E₀ 1% (not identified). R. Hrivnák, 31. 5. 2024).