

## New locality of *Scirpus radicans* in the Borská nížina Lowland (Western Slovakia) in the context of the species occurrence in Slovakia

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Dítě D. & Eliáš P. jun. (2013): New locality of *Scirpus radicans* in the Borská nížina Lowland (Western Slovakia) in the context of the species occurrence in Slovakia. – Thaiszia – J. Bot. 23 (2): 131-136. – ISSN 1210-0420.

Abstract: *Scirpus radicans* is a very rare species in Slovakia. It was found only on ten localities especially in the Podunajská nížina and the Východoslovenská nížina lowlands. Whereas the number of recent locations is low and occurrence of *S. radicans* is often only temporary, we evaluate the species in category "endangered" [EN B2a(ii)b(iii)c(iii,iv)] in Slovakia. As a pioneer species of disturbed habitats affected by fluctuating groundwater and surface water, it takes part in the succession of stagnant water banks of blind branches and water reservoirs. Here, the community of *Scirpetum radicans* is developed under appropriate conditions. This species-poor community comprises of a few wetland and aquatic species except the dominant *Scirpus radicans*. In this paper we publish a new site of the species in the Borská nížina Lowland, where the occurrence of the species was not recorded so far. We have found initial stage of *Scirpetum radicans* association developed secondarily on the bank of a sand pit lake.

Keywords: aquatic and swamp vegetation, Cyperaceae, rare species, *Scirpus radicans*.

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### Introduction

*Scirpus radicans* Schuhr. is an Eurasian species with extensive, in large part disjunctive distribution range. In Europe, the main area of occurrence is in the

central part of the continent (southern Germany, Czech Republic, Austria, Slovakia, Poland), where it continues east through the north of Ukraine, Belarus and the Baltic states into the European part of Russia. In addition, isolated occurrences are in southern Norway and Sweden, Croatia, Italy, and Transylvania (northwestern Romania). Another part of the distribution range is in Asia from the Urals to the western and eastern Siberia, the Korean peninsula and Japan. The occurrence in Asia is scattered with large distances between small areas where species grows (CASPER & KRAUSCH 1980; SCHULZE-MOTEL 1980). In Slovakia, the occurrence of *Scirpus radicans* is not well known. DOSTÁL (1992) indicates the distribution of the species as "scattered throughout the lowlands to the foothills". FERÁKOVÁ et al. (2001) rated it in the category NT (near threatened) in the latest Red List.

*Scirpus radicans* is regarded as a pioneer species occupying habitats with open vegetation. Under favourable conditions, pure stands of the association of *Scirpetum radicans* Nowiński 1930 from the alliance of *Eleocharito palustris-Sagittarion sagittifoliae* Passarge 1964 are developed. This association is only known from Central Europe, Ukraine, European Russia and southern Scandinavia (cf. ŠUMBEROVÁ et al. 2011).

The community occupies disturbed habitats with strongly fluctuating water level. It develops after decrease of water table and when bottom is exposed and seeds stored in the soil seed bank germinate. Seeds store germination probably several decades (cf. ŠUMBEROVÁ et al. l. c.).

In Slovakia it has been found in stagnant and periodic flow-through wetlands on clay unconsolidated sediments. It tolerates fluctuations in water levels, but during dry seasons requires a sufficiently waterlogged soil. *Scirpetum radicans* is a pioneer community of helophytes causing deposition of sediments in oxbows (OŤAHEĽOVÁ et al. 2001). Its presence is often transient, ephemeral and if disturbance or continuous strip of bottom absent, competitively stronger stands of common reed, high sedges or willows quickly developed (ŠUMBEROVÁ et al. 2011). DOSTÁL (1992) pointed out the colonization of secondary wetland habitats.

As in the case of *Scirpus radicans*, also *Scirpetum radicans* community is found only very rarely in Slovakia. It was recorded in years with dry summers when the water level fell significantly in oxbows (cf. OŤAHEĽOVÁ et al. 2001). In the literature, incidence of community was published (also with phytosociological relevés) from the Podunajská nížina Lowland, from the Klúčovské rameno oxbow of the Danube River (SUCHÁ 1992). In the Východoslovenská nížina Lowland, OŤAHEĽOVÁ (1995) published the species in relevés sampled near the Latorica River not far from the Veľké Kapušany settlement and a single relevé published ZALIBEROVÁ et al. (2000) from the surrounding of Kráľovský Chlmec. OŤAHEĽOVÁ et al. (2001) considered community as very rare and endangered.

This paper provides information on new finding of *Scirpus radicans* at Záhorská nížina Lowland (Western Slovakia). At the same time we publish first time comprehensive data on the occurrence of the species in Slovakia.

## Material and Methods

The data concerning the distribution of the species was achieved from herbaria BRA, BRNU, BRNM, MMI, MZ, NI, KO, OLM, PR, PRC, SAV, SLO and

ZV. Herbarium abbreviations are according to VOZÁROVÁ & SUTORÝ (2001). The results of the study are presented on the point map. The map was designed by program ArcGis, version 9.2. Coordinates of historical localities were taken from Google Earth. Coordinates of recent localities were obtained during field research using GPS equipment Garmin CS 60; the numbers of grid squares follow one that was described by NIKLFELD (1971). A list of localities was compiled according to the directives of the Flóra Slovenska VI/1 (cf. GOLIAŠOVÁ & ŠÍPOŠOVÁ 2008). Phytogeographical divisions of FUTÁK (1984) are also used in the list of locations.

The phytosociological relevés were sampled according to the Zürich-Montpellier approach using the adapted nine-grade Braun-Blanquet's scale (BARKMAN et al. 1964). Nomenclature of flowering plants follows MARHOLD & HINDÁK (1998) and the names of syntaxa follow ŠUMBEROVÁ et al. (2011), communities not included in above mentioned reference are published with author abbreviations.

## Results and Discussion

*Scirpus radicans* belongs to a very rare plant species of Slovakia; there is a little knowledge about the historical and actual occurrence, as well. Occurrence of *S. radicans* in Slovakia published only DOSTÁL (1950, 1989 and 1992) in the past. The author mentioned the presence as scattered throughout the lowlands to the foothills, but he did not mention any particular location. As our study showed, only 10 locations of the species are known in total, but only three sites are supported by herbarium vouchers. We believe that some of these data are questionable, especially the northernmost location the Babia hora massif on the border with Poland. MIGRA (1985) did not find the species in this area so that he considered that it was confusion with *Scirpus sylvatica*. Similarly, the locations in the surroundings of Bratislava and Muráň settlements have not been confirmed for a long time (KOCHJAROVÁ et al. 2004; OŤAHEL'OVÁ 2013 in verb.). Based on this data we can conclude that *S. radicans* is recently occurred only in lowland areas of Slovakia (Fig. 1). Because the number of recent locations is 5, its occurrence is fragmented and it occurred often only temporary, the species is evaluated according to IUCN categories and criteria (IUCN 2012) as "endangered" [EN B2a(ii)b(iii)c(iii,iv)].

The newly discovered site is located in the northern part of the Borská nížina lowland (phytogeographical district Záhoriská nížina lowland), in large sand pit lake system southeast of the village Šajdíkove Humence. The stand of the species covers an area of about 150 m<sup>2</sup> in the western shore of lake accrued after extraction of sand. On the shallow shore which is flooded with water only when the lake surface is elevated, *Scirpus radicans* formed tumble, species-poor stand. Vegetation conditions in the location are characterized by the following phytosociological relevé:

Šajdíkove Humence, littoral of the sand pit lake, E17°16'56.0", N48°39'04.9", altitude 189 m, relevé area 16 m<sup>2</sup>, E1: 40 %, E0: 0 %, open water 100%, water depth 5 – 10 cm, 28. 7. 2011, D. Dítě & P. Eliáš jun.

E1: *Scirpus radicans* 2b, *Carex gracilis* 2a, *Phragmites australis* 1, *Calamagrostis epigejos* +, *Juncus articulatus* +, *J. conglomeratus* +, *Lythrum salicaria* +, *Potamogeton* sp. r.

As showed above mentioned relevé, the stand of *Scirpus radicans* can be classified as untypical developed, species-poor vegetation of the *Scirpetum radicans* association. The stand is isolated from larger complex of related littoral or wetland vegetation. It bordered very sharply with vegetation of disturbed areas with sparse vegetation cover with dominance of *Calluna vulgaris*. *Calamagrostis epigejos* is also abundant in small sandy ridges which are not flooded at the time of maximum water level. It rarely penetrates to the stand of *Scirpus radicans*. In the years 2012 and 2013, which were characterised by extreme drought during the summer, the water level of the lake dropped significantly and *Scirpus radicans* has survived in sparse and low stand of poorly developed sterile individuals.

OŤAHEĽOVÁ (1995) recorded in two species-poor relevés of the association *Scirpetum radicans* from east of Slovakia. She found there species of open water surface as *Nuphar lutea* and *Sagittaria sagittifolia*, further *Bidens frondosa*, *Eleocharis palustris* and *Leersia oryzoides* and also *Carex gracilis* and *Lythrum salicaria* which we also found in stand at the Borská nížina lowland. ZALIBEROVÁ et al. (2000) published one relevé with presence of *Leersia oryzoides* from eastern Slovakia. Besides of it, species *Bidens frondosa*, *Carex riparia* and *Equisetum fluviatile* occurring with very little coverage in the stand. In each case, the dominant species *Scirpus radicans* reached abundance more than 75% in relevés.

In addition, SUCHÁ (1992) mentioned association of *Scirpetum radicans* in the Klúčovské rameno oxbow (the Danube River). *Scirpus radicans* predominated again in stands, only *Persicaria amphibia* and *Persicaria hydropiper* had higher abundance (5–25%) in relevés and species *Lemna minor* and *Spirodela polyrhiza* were very rare with minimal coverage. The published relevés showed that the stands of the association were very species-poor, most other species are only accessorial, but the species composition of community is different comparing individual sites. For example, the occurrence of aquatic species depends on the height of water surface and the phase of flooding of stands. Except *Scirpetum radicans*, the author found *Scirpus radicans* rarely also in association of *Oenanthe aquatica*-*Rorippetum amphibiae* and in stands dominated by *Schoenoplectus triquetrum*.

In the Czech Republic, other wetland species as *Alisma plantago-aquatica*, *Phellandrium aquaticum* or *Bidens radiata* are present in typically developed stands of *Scirpetum radicans* association. In addition to *S. radicans*, *Carex rostrata*, *Juncus effusus* and *Eleocharis ovata* may sub-dominate in stands of the association (ŠUMBEROVÁ et al. 2011). None of these species were found in the stand of newly found location in the Borská nížina Lowland.

## Acknowledgements

We thank to H. OŤAHEĽOVÁ (Institute of Botany, Bratislava) for consultations and to Z. MELEČKOVÁ (Institute of Botany, Bratislava) for correction of English language. The research was supported by project VEGA No. 2/0008/13.

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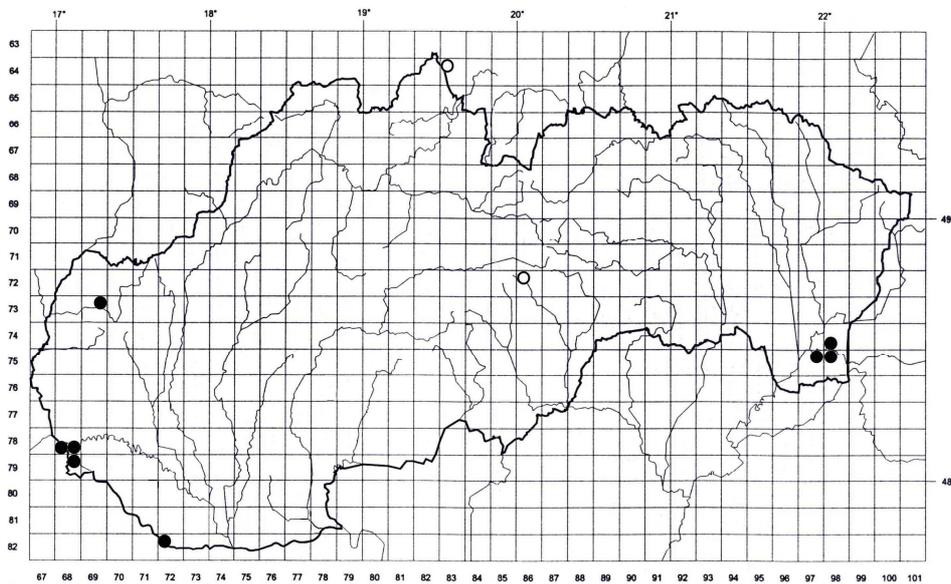
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## Appendix

### List of locations of *Scirpus radicans* in Slovakia:

**4. Borská nížina Lowland.** Šajdíkové Humence, flooded sand pit (ELIÁŠ jun. et DITĚ 2011 NI). **6. Podunajská nížina Lowland.** Bratislava (HOLUBY 1854 BRA; SCHNELLER sine data SLO). – Bratislava, Pečenský ostrov (VOTAVOVÁ 1975 BRA). – Bratislava, part Petržalka (NÁBĚLEK 1935 SAV). – Klúčovec, Klúčovské rameno oxbow (SUCHÁ 1992). **8. Východoslovenská nížina Lowland.** Between Kráľovský Chlmec and Veľké Kapušany, relict meander of the river Latorica in left-bank inundation – Between Kráľovský Chlmec and Veľké Kapušany, oxbow in the river right bank inundation of the Latorica river east of the bridge near traditional pub (both data OŤAHEĽOVÁ 1995). – Inundation of the Latorica River between Kráľovský Chlmec and Veľké Kapušany (ZALIBEROVÁ et al. 2000).

Doubtful locations: **16. Muránska planina Hills.** Surrounding of the Muráň settlement (MÜLLER 1843 sec. KOCHJAROVÁ et al. 2004). **28. Západné Beskydy Mts.** Babia hora massif, around streams in mountains (ZELENÝ 1966 sec. MIGRA 1985).



**Fig. 1. Distribution of *Scirpus radicans* Schuhr. in Slovakia: ○ – doubtful locations, ● – reliable confirmed locations.**

Received: August 27<sup>th</sup> 2013  
Revised: October 7<sup>th</sup> 2013  
Accepted: October 8<sup>th</sup> 2013