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Carex magellanica subsp. *irrigua* – a new taxon in the Western Carpathians

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Carex magellanica subsp. *irrigua* (Cyperaceae) is a plant taxon growing mainly in Northern Europe, while in Central Europe occurs rarely. Till now, it has been reported either from Slovakia or from the whole Western Carpathians. In 2001, we found this species in Oravská kotlina Basin (northern Slovakia) in the mire Surdíky eastwards of Oravská priehrada Dam. At the site, small and isolated population of *C. magellanica* subsp. *irrigua* grows in slightly elevated and less waterlogged habitats of floating fen.

Key words: *Carex magellanica* subsp. *irrigua*, Cyperaceae, Western Carpathians, Slovakia, ecology.

Introduction

In the flora of Central Europe, only few species of the genus *Carex* can be considered glacial relic (RYBNÍČEK, 1989). Most of them are rare, with distribution restricted to few sites. During the postglacial period they found shelter in high-altitude grasslands (e.g., *Carex atrofusca, C. parviflora*) or in wetlands (*C. chordorrhiza, C. lasiocarpa, C. limosa*). *C. magellanica* subsp. *irrigua* also belongs to the group of wetland sedges. While mapping wetlands, we discovered a new site of this sedge, so far not known in the Western Carpathians, and here we briefly characterize this finding also in terms of phytosociology and ecology.

Material and methods

The Braun-Blanquet approach (sec. MORAVEC et al., 1994) was used in the field and during the synthetic phase of the work. Nomenclature of non-vascular and vascular plants follows MARHOLD & HINDÁK (1998), except for *C. magellanica* subsp. *irrigua* (see below). Names of syntaxa are according to VALACHOVIČ (2001) and STEINER (1992).

Besides the conventional habitat variables, pH and conductivity were measured directly in groundwater using CyperScan PC 300. The conductivity values were related to the temperature of 20 °C, subtracting the hydrogen ion conductivity (SJÖRS, 1950). pH values were corrected according to du Rietz (sec. SJÖRS, 1950).

The specimens are deposited in the Museum of Tatra National Park in Tatranská Lomnica (TNP) and in the Slovak Agricultural University, Department of Botany in Nitra (NI).

Results and discussion

Carex magellanica subsp. *irrigua* (WAHLENB.) HIITONEN

Syn.: (SCHULTZE-MOTEL in HEGI, 1966; TUTIN et al., 1980): *C. limosa* var. *irrigua* WAHLENB., *C. irrigua* (WAHLENB.) SM. ex HOPPE, *C. pauper-*

cula subsp. *irrigua* (WAHLENB.) LÖVE et LÖVE, *C. paupercula* var. *irrigua* FERN, *C. planifolia* KOHTS, *C. limosa* var. *subalpina* BRÜGGER, *C. magellanica* subsp. *planitiei* (ASCH. et GRAEBN.) W. SCHULTZE-MOTEL.

Description (SCHULTZE-MOTEL, 1966) (Fig. 1): Perennial plant with short, horizontal rhizome. Stem erect, thin, 10–30 (40) cm high, up to 1 mm wide, sharply trihedral, smooth, or slightly coarse above, with leaves only in lower part. Leaf-blade flat, shorter or as long as the stem, 2–4 mm wide, and margin slightly coarse, grassy green. Sheath brown or purple. Bract (of lowest spikelets) erect, leaf-like, usually as long as the inflorescence or longer, with very short sheath. Inflorescence 3–5 cm long, consisting of one male and 2–3 female spikelets. Female spikelets with long peduncles (peduncle smooth, up to 2 cm long), later usually pendulous, ovate or oblong-ovate, 6–10 mm long, approximately 5 mm wide, sometimes bearing terminal male spikelet. Male spikelets slimly cylindrical, erect, sometimes bearing terminal female spikelet. Female bristles early deciduous, lanceolate, elongate, pointed, approximately twice as long as nutlets, dark maroon with green keel. Male bristles lighter. Nutlets elliptical, lenticularly oblate (outside firmly arched, in cross-section looking like slightly trihedral), 2.5–3 mm long, 1.5–2 mm wide, below constringed to long stalk, opposite with very short rostellum, veinless, or subtle parallel-veined, densely papillose, grassy green, later brownish. Seeds 3, fruit obovate, trihedral.

Flowering time: May – August.

Taxonomical note: The European plants belong to *C. magellanica* subsp. *irrigua*. SCHULTZE-MOTEL (1966) mentioned also *C. magellanica* subsp. *planitiei* from Europe. Despite the fact that this taxon is not generally accepted in literature, its description is included for completeness: whole plant high (40–60 cm), most stems above distinctly coarse, bristles wide, pointed, light brown; nutlets 3.5–4 mm long, 2–2.5 mm wide, jade green, later brown, distinctly parallel-veined. Time of flowering: June – July. According to the above-mentioned author the subspecies is distributed in South Scandinavia, northwest Russia and former East Prussia. The species is also known from North America. Nominal subspecies *C. magellanica* LAM. subsp. *magellanica* is known only from South America (cf. MOORE & CHATER, 1971, EGOROVA, 1999, see Nomenclatural note).

The related species *C. limosa* L., in Slovakia growing rarely in Západné Beskydy Mts., Vysoké Tatry Mts and in Vihorlat Mts, differs from *C. magellanica* subsp. *irrigua* by the traits given in the Table 1.

Fig. 1. 1 – *Carex magellanica* subsp. *irrigua* – Slovakia, the Oravská kotlina Basin, in the mire Surdíky eastwards of Oravská priehrada Dam (DÍTĚ & PUKAJOVÁ, 2001, SAV); 2 – *Carex limosa* – "Slepé Štrbské Pleso (V. NÁBĚLEK, 1935, SAV).

Nomenclatural note: Unfortunately, there is no agreement in nomenclature of this species in European literature, and the use of the name *C. magellanica* (OSVALD, 1923; POLUNIN, 1959; HULTÉN, 1962; HESS et al., 1967; BÖCHER et al., 1968; SCHULTZE-MOTEL, 1966; MOORE, & CHATER, 1971; TUTIN et al., 1980; MOORE, 1982; LÖVE, 1983; LID, 1985; MIREK et al., 1995; SELL & MURRELL, 1996; KROK & ALMQUIST, 1997; KARLSSON, 1998; HÄMET-AHTI et al., 1998; EGOROVA, 1999) or *C. paupercula* (MEUSEL, 1965; GRINTESCU et al., 1966; DOSTÁL, 1989; STEINER, 1992; ADLER et al., 1994; LID & LID, 1994; SPICHIGER, 1994; AICHELE & SCHWEGLER, 1996;

Table 1. The morphological differences between *Carex magellanica* subsp. *irrigua* and *C. limosa*.

	Carex magellanica subsp. *irrigua*	*Carex limosa*
Plant, color	Pale green	Glaucous
Leaves, wide	2–4 mm	1–1.5 (2) mm
Female spikelets	2–3	1–2
Female spikelets, long	6–10 mm	4–4.5 mm
Female spikelets, wide	5 mm	2 mm
Nutlets, long	2.5–3 mm	4 mm
Nutlets, wide	1.5–2 mm	2 mm
Bract (of lowest spikelets)	usually as long as the inflorescence or longer	usually shorter than inflorescence

Gerdol & Tomaselli, 1997; Coldea, 1997; Wisskirchen & Haeupler, 1998; Rothmaler, 2000) varies with the authors. In Global Plant Checklist (1960–2000), the name *C. paupercula* Michx. is accepted as well as the name *C. magellanica* subsp. *irrigua* (Wahlenb.) Hiitonen, admitting two different taxa. *C. paupercula* subsp. *irrigua* (Wahlenb.) Löve et Löve is considered a synonym of *C. paupercula* Michx. and *C. magellanica* subsp. *planitiei* (Asch. et Graebn.) W. Schultze-Motel is a synonym of *C. magellanica* subsp. *irrigua* (Wahlenb.) Hiitonen. Flora Europaea (Tutin et al., 1980) does not use the name *C. paupercula* at all, even not as synonym, and the only accepted name is *C. magellanica* subsp. *irrigua* (Wahlenb.) Hiitonen (syn.: *C. irrigua* (Wahlenb.) Sm. ex Hoppe, *C. magellanica* subsp. *planitiei* (Asch. et Graebn.) W. Schultze-Motel. According to Tutin et al. (1980), Sell & Murrell (1996), and Aichele & Schwegler (1996), the European plants belong to the subspecies *C. magellanica* subsp. *irrigua* (Wahlenb.) Hiitonen. Nominal subspecies *C. magellanica* Lam. subsp. *magellanica* is known only from South America, where this sedge was described (cf. Moore & Chater, 1971; Egorova, 1999). According to Aichele & Schwegler (1996), *C. magellanica* was considered as an Alpine form of *C. limosa* L. the authors doubt whether the species coming from different hemispheres might be identical (cf. Aichele & Schwegler, 1996). According to Hess et al. (1967), *C. magellanica* is only provisional name because there is not enough data available for conclusive analysis. According to Moore & Chater (1971), the European plants are different from South American and belong to the subspecies *C. magellanica* subsp. *irrigua*, supporting the opinion of Hultén (1962).

General distribution: *C. magellanica* is a species of bipolar disjunct distribution. In Europe, *C. magellanica* subsp. *irrigua* occurs mainly in Scandinavia, but also in British Isles, Baltic area and Russia. The plant is known from the Alps [more often in the northern part (mainly in Austria), while in the Southern Alps (Italia) it occurs rarely], from Germany (Schultze-Motel, 1966) and Bohemian boundary mountains (Šumava Mts, Krkonoše Mts; data from the Krušné hory Mts are not reliable – Dostál, 1989), from Poland (Krokonoše Mts, 2 localities, Wolejko, in litt.), from Southern Carpathians (Grintescu et al., 1966; Coldea, 1997) and Bulgaria (Vitoša Mts – Schultze-Motel, 1966). It spreads eastwards to Asia Minor, Caucasus, through Siberia to Kamchatka, Sakhalin and Japan. It grows also in North America and Greenland. (Schultze-Motel, 1966). *C. magellanica* subsp. *magellanica* – occurs only on the Southern hemisphere – from Tierra del Fuego (Chile) and the Falklands Islands north along the Andes to about 40° S lat. (cf. Moore & Chater, 1971).

Distribution in the Western Carpathians: *C. magellanica* subsp. *irrigua* is confirmed only from one locality: Slovakia, the Oravská kotlina Basin, in the mire Surdíky eastwards of Oravská priehrada Dam (49°25′55″; 19°38′06″).

Ecology and phytosociology: From the information published in the literature it is obvious that C. *magellanica* subsp. *irrigua* is a taxon with wide trophic amplitude (Schultze-Motel, 1966). According to Schultze-Motel (1966) *C. magellanica* subsp. *irrigua* occurs rarely in Central Europe, mainly in fens or fen springs. It grows mainly in mountains (from 840 m to 2350 m a.s.l.), in slightly wet to wet habitats, rich in nutrients, acid, poor in Ca and Mg. Aichele & Schwegler (1996) reported this species from calcium-free, acid peat soils of high-altitude peatlands in Central Europe, almost exclusively between 1000–2000 m a.s.l. According to these authors, apart from the Alps, *C. magellanica* subsp. *irrigua* also

grows in Bavarian Forest (Germany) and, in Bohemia, in areas around springs and flat marshlands, entering the communities of the alliance *Caricion fuscae* (cf. HESS et al., 1967).

OSVALD described the association *Caricetum magellanicae* from lowland Hulbäck in (Sweden) 1923. Despite the fact that *C. magellanica* subsp. *irrigua* rarely grows in uniform stands and in the southern part of its geographic range is generally rare, the association *Caricetum pauperculae* (syn. *Caricetum magellanicae* OSVALD 1923) is known from the Alps (STEINER, 1992; GERDOL & TOMASELLI, 1997). According to STEINER (l. c.), this is a community of the subalpine and alpine bog pools in the central Alps, having the optimum in boreal zone. It usually covers small areas on bare peat soils in mesotrophic or acid peatlands, often accompanied by the species of the association *Caricetum goodenowii*. Apart from typical subassociation, for which the moss *Warnstorfia exannulata* is characteristic, there are four associations described: with *Calliergon sarmentosum* (MELIN 1917) DIERSSEN 1982, requiring wet habitats with slowly running water. Rich pools are inhabited by subass. with *Sphagnum contortum*, subass. with *Sphagnum subsecundum* is restricted to sloping mires, and in subalpine bog pools is subass. with *Sphagnum majus* present. The last three associations were reported by STEINER (1992).

Having mapped peatlands in Slovakia, in August 2001 we discovered a new site of *C. magellanica* subsp. *irrigua* in Oravská kotlina Basin, in the mire eastwards of Oravská priehrada Dam. This rare species has not been recorded in the Western Carpathians yet.

At this site, *C. magellanica* subsp. *irrigua* colonizes slightly elevated and less waterlogged habitats of floating-fen. Small hummocks arose due to accumulation of organic matter around saplings of *Picea abies*. *C. magellanica* subsp. *irrigua* occurs irregularly, scattered over the area of about 10 × 25 m. The following relevés (1, 2) can describe the plant communities inhabited by *C. magellanica* subsp. *irrigua*.

1) August 8, 2001, the mire eastwards of Oravská priehrada Dam (49°25′55″; 19°38′06″), floating-fen edge, sampled area 16 m^2, 620 m a.s.l., aspect NNW, slope less than 2°, pH 4.9, conductivity 71 μS/cm, E_0: 100%, E_1: 17% (sampled by Dítě & Pukajová):
E_1: *Calla palustris* 2, *Comarum palustre* 2, *Agrostis canina* 1, *Calamagrostis canescens* 1, *Carex echinata* 1, ***C. magellanica* 1**, *C. rostrata* 1, *Equisetum fluviatile* 1, *Naumburgia thyrsiflora* 1, *Carex canescens* +, *Galium uliginosum* +, *Juncus effusus* +, *Viola palustris* +, *Betula pubescens* r, *Picea abies* r. E_0: *Sphagnum flexuosum* 5.

2) Next to previous, floating-fen edge, sampled area 4 m^2, flat surface, pH 5.6, conductivity 102 μS/cm, E_0: 100%, E_1: 20%, E_2: 2% (sampled by DÍTĚ & PUKAJOVÁ):
E_2: *Picea abies* r. E_1: *Carex rostrata* 2, *Calla palustris* 1, *Calamagrostis canescens* 1, *Carex canescens* 1, *C. echinata* 1, ***C. magellanica* 1**, *C. nigra* 1, *Comarum palustre* 1, *Naumburgia thyrsiflora* 1, *Viola palustris* +, *Salix aurita* r, *S. silesiaca* r. E_0: *Sphagnum flexuosum* 5.

Based on relevés, the community should be placed into alliance *Sphagno recurvi-Caricion canescentis* PASSARGE 1964, association *Carici rostratae-Sphagnetum apiculati* OSVALD 1923.

The known localities of *C. magellanica* subsp. *irrigua* most close to the locality found in Slovakia are in the Czech Republic. However, we were not able to find any other relevé in the literature from the Czech Republic. Therefore, we bring detailed information about the locality in Šumava Mts. for which we made relevé (3). In Šumava Mts, *C. magellanica* subsp. *irrigua* is restricted to open peatlands, colonizing less waterlogged habitats than the related *C. limosa*, and is growing on hummocks of peat mosses of the alliances *Sphagnion medii* KÄSTNER et FLÖßNER 1933 and *Oxycocco-Empetrion hermaphroditi* NORDH. ex HADAČ et VÁŇA 1967 (GRULICH, in litt.). Rarely, e.g. in the fen "Na Roklanském potoku", also mesotrophic pool edges, as documented in the relevé (sampled by DÍTĚ & PUKAJOVÁ):
(1) July 9, 2001, the fen "Na Roklanském potoku", infilling water area, sampled area 7.5 m^2, 1160 m a.s.l., flat surface. pH 6.0, conductivity 19.45 μS/cm, Cover E_0: 30%, E_1: 10%, open water cover 95%.
E_1: ***Carex magellanica* 1**, *C. rostrata* 1, *Eriophorum angustifolium* 1, *Trichophorum caespitosum* 1, *Drosera anglica* +, *Drosera rotundifolia* +, *Oxycoccus palustris* r. E_0: *Sphagnum fallax* 2, *Sphagnum cuspidatum* 2.

The discovery of *C. magellanica* subsp. *irrigua* in Slovakia was unexpected. The plant grows in small isolated population with a reduced viability and probability of recolonization. *C. magellanica* subsp. *irrigua* should be preserved in Slovakia for the future, a special conservation programme has to be proposed and implemented. In the Red list of ferns and flowering plants of Slovakia (FERÁKOVÁ et al., 2001) *C. magellanica* subsp. *irrigua* is included into the category data deficient (DD). Despite of our intensive search in all potential sites of occurrence of the species both in close

and larger surroundings, and in the mires of the northern part of Slovakia (mainly in Vysoké Tatry Mts.) in 2001 and 2002, we did not find any other locality of *C. magellanica* subsp. *irrigua*. Therefore, we propose for this subspecies the category critically endangered (CR).

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