First confirmed record of Carex limosa L. (Cyperaceae) and community Caricetum limosae Br.–Bl. for Nevesinjsko polje (Bosnia & Herzegovina)

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Abstract
During the field investigation of wetland flora and vegetation conducted on carstic terrains of Nevesinjsko polje (Bosnia & Herzegovina) we discovered numerous individuals of Carex limosa L. This Arctic–boreal relic species is remarkably rare in Southeastern Europe with only several known records across Balkans and few recent records for Bosnia & Herzegovina. Its habitat in Nevesinjsko polje can be described as an transitional mire with pronounced Sphagnum turfs on top of which C. limosa forms almost homogenous, species–poor stands of community Caricetum limosae Br.–Bl. In this article is presented the short account of this first confirmed record of C. limosa for Nevesinjsko polje (Bosnia & Herzegovina).

Key words: vascular flora, relic species, Balkans, carstic fields, mires.

Introduction

With more than 2000 known species occurring on various habitats worldwide (especially in the Northern Hemisphere) the genus Carex L. is one of the most diverse groups of vascular plants with intricate taxonomical and phytogeographical background (Egorova 1999; Ball & Reznicek 2003). This perceived complexity with consequential identification errors is, beyond reasonable doubt, great impediment to the better knowledge concerning the distribution of many species of Carex and at the same time powerful driving force resulting in a number of recently described new species, even in Europe (e.g. Štěpánková 2008; Molina et al. 2008; Jiménez–Mejías & Luceño 2009).

The abovementioned discrepancy is even larger in the case of Bosnia & Herzegovina: although flora studies here have been pursued by the some of the most eminent botanist for more than 150 years, the vascular flora and especially diversity of Carex, remain still insufficiently explored (Milanović 2014, 2017).
During the investigations of wetland flora and vegetation fragments preserved on carstic field Nevesinjsko polje we had discovered numerous individuals of Carex limosa L., a rare Arctic–boreal relic species with only a few known records across Balkans (see the text below). After a carefull examination of specimens and literature review we concluded that this is the first certain record confirming the existence of this rare species for Nevesinjsko polje (Bosnia & Herzegovina). Here we provide a brief description of this record with basic information about the species relating to its morphological traits, biology, regional distribution, habitat preferences and conservation status in Bosnia & Herzegovina.

Material and Methods

Voucher herbarium specimens are deposited in PZZP collection (Thiers 2018). Nomenclature status and synonyms are given according to the Euro+Med Plantbase (2006+) and The Plant List database (http://www.theplantlist.org/), respectively. Distribution data for Croatia, Bosnia & Herzegovina, Montenegro, Serbia, Bulgaria and Greece are derived from literature sources as well as from field observations and mapped on the 10 x 10 km MGRS UTM map (Lampinen 2001). Taxon description follows Boott (1860), Krechetovich (1935), Chater (1980), Ball & Reznicek (2003) and Dai et al. (2010) with supplementary data resulting from our observation of the collected specimens.

Results and Discussion

Carex limosa L., Sp. Pl. 977 (1753).

Syn. Carex elegans Willld., Fl. Berol. prodr. 34 (1787); Trasus limosus (L.) S. F. Gray, Nat. Arr. Brit. Pl. 2: 67 (1821); C. laxa Dewey, Amer. J. Sci. Arts. 26: 376 (1834), nom. illeg.; Facolos limosa (L.) Raf., Good Book. 26 (1840); C. glaucocarpa St.–Lag. in A. Cariot, Étude Fl., ed. 8(2): 856 (1889); C. fusco–cuprea (Kiük.) V. Krecz., Flora URSS 3: 599 (1935).

Description. Laxly cespitose, rhizomatous, glaucous–green perennial. Rhizomes ± angulate, far–creeping with tufts of fibrous, brown–yellowish, lanate roots produced at the nodes. Stems distinctly triquetrous, slender, erect, in upper part ± nodding and usually minutely antorsely scabrid at the angles. Basal sheaths persistent, yellowish– to reddish–brown, entire or sometimes disintegrating into fibres. Leaves stiff, shorter than stem, sheathed, leaf blades 1–2(2.5) mm wide, canaliculate–folded, scabrid and long–attenuate. Bracts shorter than inflorescence, very shortly sheathed (barely 2 mm), lowest leaf–like 2–2.5 cm long [in our specimens up to 15 mm long], upper setaceous. Spikes 2–3(4), pedunculate, subdistant. Male spike 1, terminal, (7)10–30(35) × (1)1.5–3 mm, usually linear, erect. Male glumes ovate–lanceolate to obovate, 3–5 × (0.8)1–1.7 mm, brownish with a lighter, viridescent or concolorous middle nerve ending with an acute or obtuse point or short mucro. Anthers 3, 2–3 mm long. Female spikes 1–2(3), lateral, ± approximate, ovate to oblong–ovate, (5)10–20 × 4–8(10) mm, dense, with 8–30 flowers, sometimes with few male flowers at the apex [as is the case with some of our plants], often pendent, peduncles slender, 1–4 cm long. Female glumes ovate to ovate–lanceolate, 3–5(6) × 2–3(4) mm, brown or reddish–brown, usually exceeding utricles, with 3 nerves (middle sometimes lightly coloured), at the apex acute or with hard, somewhat curved mucro c. 1 mm long. Utricles glaucous–green, suberect, 3.5–4(4.5) × (1.2)1.8–2.6 mm, ellipsoid to ovate, compressed–trigonus (sometimes wrinkled to a certain degree), prominently 7–9 veined, very finely papillose, at the base shortly stipitate and rounded, apex abruptly narrowed into short–cylindric beak c. 0.1–0.5 mm long. Mouth brownish, entire, truncate or scarcely emarginate. Stigmas 3, c. 2 mm. Nutlets elliptic, compressed–trigonus, apiculate at the apex, c. 2(4) mm long. 2n=52, 56, 58, 61–64 (Chater 1980; Randjelović 1999; Luceño 2007; Rotreklová et al. 2011). Reproduction time: V–VII. Pollination: anemophilly (Randjelović 1999). Seed dispersal: hydro– and endozoochoria (endoornithochoria) (Soó 1980; Randjelović 1999). Type in London: LINN, no. 1100.56 (designated by Egorova 1999: 359) (Fig. 1).

Distribution. A circumpolar species native to lowland Arctic and boreal areas of Eurasia and North America with isolated southern stations through a mountain ranges in Europe and Transcaucasia as well as in the Korean peninsula and Japan (Krechetovich 1935; Randjelović 1999; Dai et al. 2010). It was described from boreal parts of Europe [„Habitat in Europe frigidae paludibus sylvaticis“] (Linnaeus 1753: 977). In Europe it
has been known from Iceland, Denmark, Sweden, Norway, Finland, Ireland, Britain, Netherlands, Belgium, Luxembourg, Spain, France, Germany, Switzerland, Italy, Czech, Slovakia, Poland, Estonia, Latvia, Lithuania, Belarus, Russia, Austria, †Hungary, Slovenia, Croatia, Montenegro, Serbia, Greece, Romania, Bulgaria and Ukraine (Chater 1980; Jiménez–Mejías & Luceño 2011).

Figure 1. Carex limosa in the study area. – Bosnia and Herzegovina, Nevesinjsko polje, Srednja Voda, 16–July–2017, Photo by Jelena Knežević.

Across Balkans it is principally confined to the secluded boreal refugia on high mountains: Bosnia and Herzegovina: Sutjeska National Park, Gornje bare [34T CN09]; ? mt. Zelengora, Kotlaničko jezero [34T BP90] (Milanović 2017: 80); Montenegro: Durmitor mt. [34T CN47] (Košanin ap. Malý 1931–32: 64; Rohlena 1942: 452); Serbia: Vlasina plateau [34T FN02 FN12 FN13] (data summarized by Randjelović 1999: 248), Ostrozub mt. [34T FN04] (Adamović 1904: 161) and Rogozna mt. [34T DN66, rough position] (Ratknić & al. 2011: 439); Bulgaria: Vitosha mt. [34T FN82] and Central Rhodopes mt. [35T LG00]
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(Fordanov 1964: 102–103; Stoeva 2015) and Greece: Voras mt. [34T EL74] (Strid & Franzén 1982: 26; Voliotis 1982).

According to Topić & Stančić (2006: 3374) it seems that *C. limosa* has disappeared from its historical finding places in Croatia [33T WL47 WL56 XL29 YL11] (Schlosser & Farkaš–Vukotinović 1869: 1187; Pavić ap. Horvat 1939: 74) while its supposed records from very atypical habitats near lowland mediterranean small lakes viz. Kuti [33T YH15], Modro oko [33T YH07] and Baćinska lake [33T XH97] (Topić 1995 according to Glasnović et al. 2015: 170) are likely to be erroneous (Fig. 2).

![Map of the Balkans showing distribution of Carex limosa](image)

**Figure 2.** Distribution of *Carex limosa* in the Balkans.

**Distribution in Bosnia & Herzegovina.** Despite the fact that this species has been recorded in neighbouring countries for decades ago and that favourable habitats are present in Bosnia and Herzegovina, this species has been reported for Bosnia & Herzegovina recently (Dug 2011: 106; Anonymous 2011: 455; Dug 2015: 96). In above mentioned publications *C. limosa* is listed as one of numerous species characteristic for habitat type „7140 Transitional mires“. Whether this data are originating from original field work or they are merely...
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included under the abovementioned habitat description in a manner per analogiam to other, similar manuals in neighbouring countries (Topić & Vukelić 2009; Anonymous 2013), the fact is that there are no cited particular localities nor voucher herbarium specimens in accessible herbarium collection supporting this claim, which is unfortunately not contributing to the scientific value of it. First published record of this species for Bosnia & Herzegovina with cited precise location emerged just recently (Milanović 2017), but without supporting voucher specimens in some publicly accessible herbarium collection. Author of this paper also indicates one more locality for Bosnia & Herzegovina (mt. Zelengora), but without any further details needed for its verification.

In this regard, according to our knowledge, the second confirmed habitat of *C. limosa* in Bosnia & Herzegovina is limited to the southern edge of transitional mire called Srednja Voda close to Nevesinje. The next records of *C. limosa* is ca. 40 km and 80 km east on Maglić and Durmitor mt. (Montenegro) respectively (Malý 1931–32; Rohlena 1942, Milanović 2017).

**Voucher specimens:** Bosnia and Herzegovina: Nevesinje: Srednja Voda, 43. 29998° N, 018. 11333° E, [34T BN69], 851 m (Perić, R., Škondrić, S., Knežević, J. 03–May–2017; 16–Jul–2017, PZZP).

**Habitat.** *Sphagnum* bogs and mires, margin of peat–lakes, swamp meadows, shores and watersides (Chater 1980; Ball & Reznicek 2003; Dai et al. 2011). Its habitat near Nevesinje can be described as acidic transitional *Sphagnum*–mire developed on Lower Triassic (Werfen) strata fractions (Riter–Studnička 1954). There individuals of *C. limosa* densely occupy no more than a few dozen square meters at the southern edge of mire forming numerous, small, scattered tufts of community *Caricetum limosae* Br.–Bl. which develop at the very top of *Sphagnum* hummocks. Accompanying species are *Drosera rotundifolia* L. and *Sphagnum* spp.

**Conservation status.** As is the case with many other Arctic–boreal (glacial) relic species at warmer temperate latitudes of Northern Hemisphere, their rather rambling and rare occurrence in those areas appears to be profoundly influenced not only by the long–time changes in glaciation cycles and climate changes but also by various anthropogenic impacts and accompanying vegetation succession, which additionally contribute to the further decreasing and loss of boreal species stands across the warmer parts of Europe (Hegi 1923; Riter–Studnička 1956; Topić & Stančić 2006; Topić & Vukelić 2009). Threat status for this species published by Milanović (2017) as „endangered“ (EN) (B2a, B2biii) is based on obsolete 2001 IUCN criteria. According to the most recent IUCN criteria (http://www.iucnredlist.org) threat status of *C. limosa* in Bosnia & Herzegovina can be estimated as critically endangered (CR B1a+ 2a).

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