

Two species of genus *Carex* sect. *Spirostachyae* (Cyperaceae) new to Bosnia and Herzegovina

Dvije vrste roda *Carex* sect. *Spirostachyae* (Cyperaceae) nove za floru Bosne i Hercegovine

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ABSTRACT

During systematic field research of genus *Carex* in Bosnia and Herzegovina in the period of 2014-2018, two species from sect. *Spirostachyae* Drejer ex L. H. Bailey have been recorded for the first time in the flora of the country: *Carex extensa* Gooden. and *Carex punctata* Gaudin. While *C. punctata* is a quite common species growing in damp and wet habitat types over serpentine substrates in Central Bosnia, *C. extensa* is recorded as very rare along the Adriatic Sea coast on Klek Peninsula (southern Bosnia and Herzegovina), and recognized as critically endangered (CR) in the country.

Key words: Bosnia and Herzegovina, *Carex extensa*, *Carex punctata*, conservation status, new floristic records.

INTRODUCTION - Uvod

The genus *Carex* L. (Cyperaceae) is one of the most diverse and widely distributed angiosperm, especially in the temperate regions of the Northern Hemisphere (Reznicek, 1990). It consists of more than 2000 species, which are colonizing a great range of habitats (Frodin, 2004). Five subgenera (*Carex*, *Kreczetoviczia*, *Psillophora*, *Vignea* and *Vigneastra*) are recognized based on a comprehensive taxonomic account (Egorova, 1999). Section *Spirostachyae* Drejer ex L.H. Bailey belongs to the subge-

nus *Carex* and mostly occurs in mesic places across Eurasia and N. Africa (Egorova, 1999). There are about 26 species of the section *Spirostachyae* occurring across Eurasia and N Africa, with 13 representatives distributed in Europe (Escudero et al., 2008). Of these species only three are distributed in the Balkan Peninsula: *Carex distans* L., *Carex extensa* Gooden. and *Carex punctata* Gaudin.

In the flora of Bosnia and Herzegovina (B&H) the presence of 75 taxa of genus *Carex* at subspecies level have

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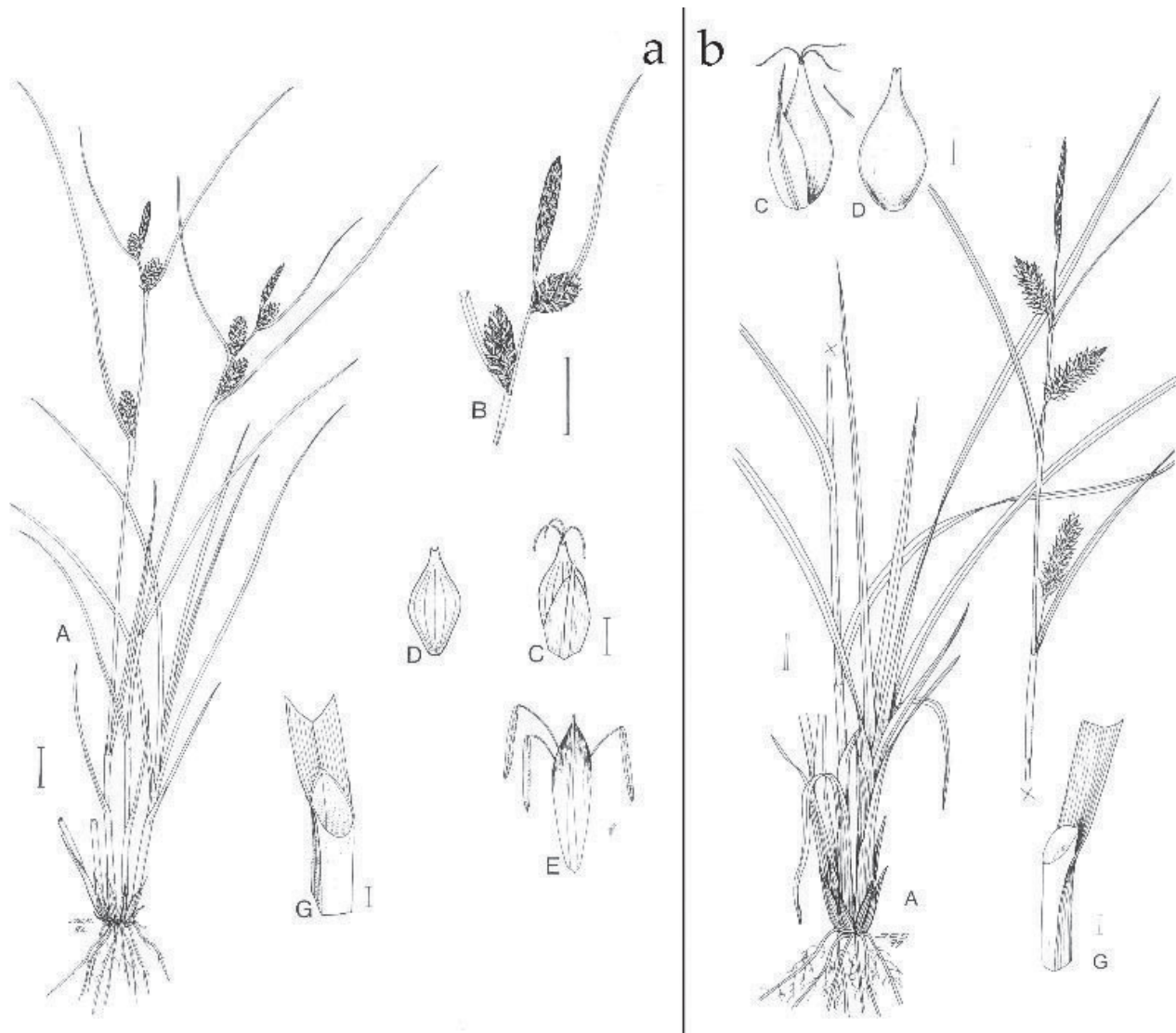


Figure 1. (a) *Carex extensa* Gooden. and (b) *Carex punctata* Gaudin
A. habitus B. inflorescence C. female glume D. utricle E. male glume G. ligule
(Drawing from the book Danmarks halvgræsser, by Jens Christian Schou with permission of author)

Slika 1. (a) *Carex extensa* Gooden. and (b) *Carex punctata* Gaudin
A. habitus B. cvast C. ženska pljeva D. mješak E. muška pljeva G. ligula
(Crtež iz knjige Danmarks halvgræsser, od Jens Christian Schou sa odobrenjem autora)

undoubtedly been recorded so far (Milanović, 2014a, 2014b, 2017). Only *Carex distans* L. was previously known from the section *Spirostachyae* (Beck-Mannagetta, 1903).

MATERIAL AND METHODS – Materijal i metode

The research area occupies the salt-sprayed coastal zone of Klek Peninsula in the extreme south of BiH, and serpentine habitats of wider area of Central Bosnia as well. The specimens were collected and stored into the

Herbarium of the National Museum of Bosnia and Herzegovina (SARA) (voucher numbers: 51866, 51867) and Herbarium of the Faculty of Forestry University of Banja Luka (voucher numbers: 22/01-205, 22/01-206, 22/01-254). Identification was performed using the identification keys and descriptions provided by Chater (1980), Jermy et al. (2007) and Schou (2006). The nomenclature follows Jiménez-Mejías & Luceño (2011). The distribution of target species is shown on the map using standard UTM grid 10x10 km.

RESULTS AND DISCUSSION – *Rezultati i diskusija*

Carex extensa Gooden. and *Carex punctata* Gaudin belongs to Subgenus *Carex*, section *Spirostachyae* Drejer ex L. H. Bailey (Figure 1). Generally, the main morphological characteristics of the section *Spirostachyae* are: primary rhizomes with short internodes, presence of leaf anteligule, lowest bract of the inflorescence leaf-like, sheathing, three stigmas, glabrous and smooth utricles, epidermal cells of utricles with red crystalloid bodies, bifid or bidentate utricle beak and ellipsoid achenes (Chater, 1980; Escudero & Luceño, 2009).

In order to clarify the diagnostic characteristics of the target species within the section *Spirostachyae*, and its relation with morphologically similar section *Ceratocystis* Dumort. as well, the identification key is provided here, following Chater (1980) and Jermy et al. (2007):

1. The pistillate spikes generally ovoid or globose and approximate, on relatively short peduncles; achenes distinctly obovate.....section *Ceratocystis*
1. The pistillate spikes short-cylindric, distant, the lower are often conspicuously pedunculate; achenes elliptic in outline.....section *Spirostachyae*
2. Utricles indistinctly nerved..... *C. punctata*
2. Utricles distinctly nerved3
3. The pistillate spikes far separated. Leaves of flowering stems flat, pure green..... *C. distans*
3. The pistillate spikes usually clustered near stem apex. Leaves of flowering stems channelled or involute, glaucous to grayish green..... *C. extensa*

***Carex punctata* Gaudin 1811, *Agrost. Helv.* 2: 152.**

C. punctata (synonym: *Carex laevicaulis* Seub., Fl. Azor.: 21. 1840) (Figure 1b) is a caespitose perennial with shortly creeping rhizomes. Culms are erect, 15-100 cm tall, trigonous. Leaves are 10-50 cm x 2-5 mm, usually as long as the stem, flat or shallowly keeled, pale or yellow-green. Ligule is 3 mm long, obtuse and tubular. Inflorescence is about ½ length of stem. Bracts are leaf like, at least one usually but not invariably exceeding the inflorescence. Male spike 1, 10-30 mm. Male glumes 3-4 mm, oblong-obovate, orange-brown; apex mucronate, often fimbriate. Female spikes 2-4, upper contiguous, lower distant, 5-25 mm, ovoid-cylindric. Female glumes 2.5-3.5 mm, obovate, yellowish or pale brown with green midrib, margin hyaline; apex acuminate or obtuse and mucronate. Utricles 3-4 mm, obovoid-ellipsoid, inflated, indistinctly nerved, shiny, pale green, often reddish-spotted, inserted at an angle of 75-80° to the stem axis and therefore strongly patent, narrowing abruptly into a beak, widely bifid; stigmas 3

(Jermy et al., 2007). Chromosome numbers, $2n=68$ (Escudero et al., 2008).

Recent floristic researches in the region of Balkan Peninsula show that this species has been overlooked in most of the neighbouring countries, probably due to morphological similarity to *C. distans*. Just in the last ten years it was first recorded in Montenegro (Stešević & Drescher, 2010), Croatia (Koopman & Topić, 2011) and Albania (Barina et al., 2013). Within the region *C. punctata* is registered also in Macedonia, Slovenia, Bulgaria and Greece (Maly, 1931-32; Chater, 1980; Martinčić, 2007).

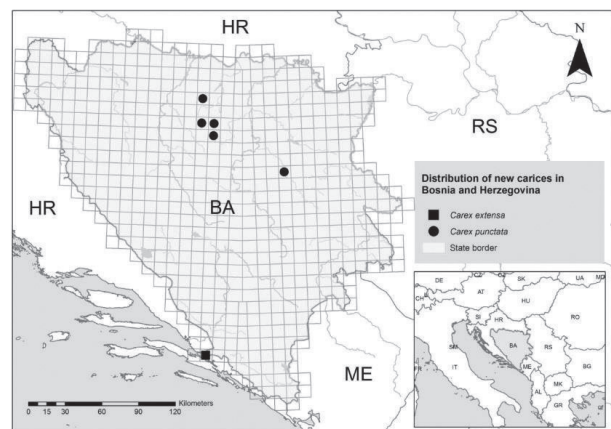


Figure 2. Distribution of *Carex extensa* and *Carex punctata* in Bosnia and Herzegovina

Slika 2. Rasprostranjenje vrsta *Carex extensa* i *Carex punctata* u Bosni i Hercegovini

The species is quite common in damp, grassy or rocky places near the sea in W. & S. Europe, extending locally north-eastwards to S.W. Sweden, N. Poland and S.E. Austria (Chater, 1980). It is also known from sandy patches of marine marshes, sheltered rock ledges on sea-cliffs, and wetlands of siliceous substrates (Preston et al., 2002). Opposite to that, excluding only the record from Velika Ulcinjska beach (Stešević & Drescher, 2010), in the Western Balkans it occurs only in inland habitats, colonizing wet meadows, alkaline fens, degraded swamps, and wet road verges and ditches (Koopman & Topić, 2011; Kocjan, 2014). In Bosnia and Herzegovina it has been recorded only over serpentine substrates in Central Bosnia (Figure 2). Here it grows in wet habitats alongside small serpentine watercourses and around water sources, in damp places on the edge of forests, and in ditches, wet verges and swards along macadam roads and skidding trails, where it occurs as quite common species in numerous populations. According to that, *C. punctata* probably occurs in the area more widely than the new records indicate.

The researches of flora and vegetation of maritime marshes indicates that *C. punctata* and *C. extensa* often grow together. In addition to that, at all here stated finding places *C. punctata* grows together with similar *C. distans*. So, it can be overlooked with both similar species. But, the mature plants of *C. punctata* can be easily distinguished from both due to its light female glumes with green midrib and hyaline margin, as well as a bit smaller, shiny utricles, with indistinct nerves (Figure 3), particularly in fresh specimens. Contrary to *C. distans*, *C. punctata* has the lowest bract exceeding the inflorescence, which is flat, while in *C. extensa* this bract is involute (Figure 4 a-b).

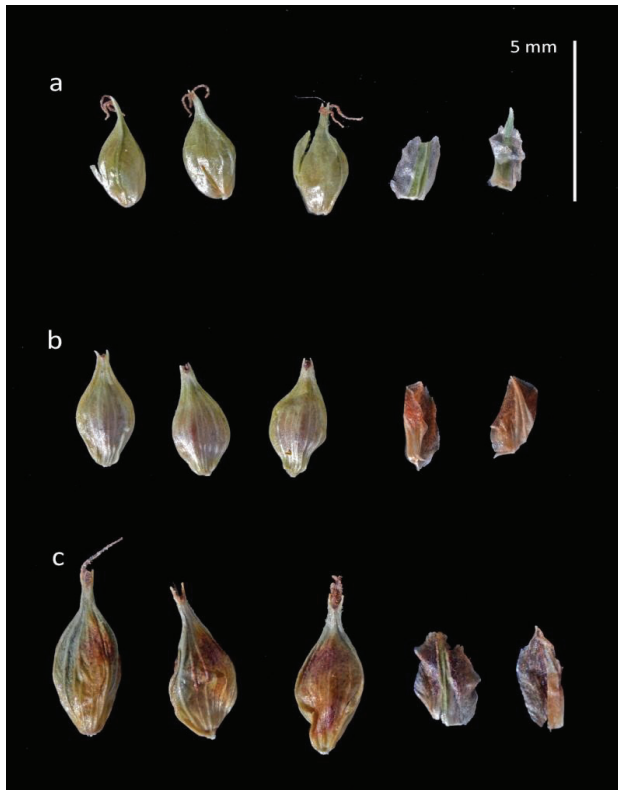


Figure 3. Utricles and female glumes of three similar species of the section *Spirostachyae* from Bosnia and Herzegovina: (a) *C. punctata*, (b) *C. extensa*, (c) *C. distans* (© Đ. Milanović)

Slika 3. Urtikule i ženske ljuške tri slične vrste sekcije *Spirostachyae* iz Bosne i Hercegovine: (a) *C. punctata*, (b) *C. extensa*, (c) *C. distans* (© Đ. Milanović)

***Carex extensa* Gooden. 1794, in *Trans. Linn. Soc. London* 2: 175.**

C. extensa (Figure 1a, 4 c-d) is a densely tufted perennial with short rhizomes. Culms are erect, 5-45 cm tall, rigid and bluntly trigonous. Leaves are 5-35 cm x 2-3 mm, rigid, thick, keeled, often inrolled, grey-green or glaucous. Ligule 2 mm, rounded. Inflorescence is about 1/3 or 1/2 length of stem. Bracts are leaf like, usually reflexed, far exceeding the inflorescence. Male spike usually 1, rarely

2-3, 5-25 mm. Male glumes 3-4 mm, obovate-elliptic, red-brown, with paler midrib; apex obtuse. Female spikes 2-4, contiguous or lower sometimes distant, 5-20 mm, subglobose to cylindrical. Female glumes 1.5-2 mm, broadly ovate, red-brown with pale midrib, margin hyaline; apex mucronate. Utricles 3-4 mm, ovoid or ellipsoid, weakly ribbed, grey-green or brownish with purplish blotches, beak smooth, notched; stigmas 3 (Jermy et al., 2007). Chromosome numbers, $2n=60$ (Escudero et al., 2008).

As opposed to *C. punctata*, *C. extensa* is a typical coastal sedge, occurs inland only along salt marshes (Preston et al., 2002). It grows along the European coast from the Baltic Sea via the Atlantic coast and the Mediterranean Basin to the Black Sea. It has been recorded in all Balkan countries which generally have coastal habitats: Montenegro, Albania, Bulgaria, Greece, Slovenia and Croatia (Rohlén, 1942; Chater, 1980; Martinčić, 2007; Nikolić, 2000).

As Bosnia and Herzegovina have only 24 km of the Adriatic sea shore and doesn't have salt marshes at all, the Klek Peninsula and the surrounding of the town of Neum are only potential finding places for the typical flora of maritime habitats. Although the flora and vegetation of Klek Peninsula were systematically investigated in the past (Kutleša & Lakušić, 1964), *C. extensa* hasn't been recorded so far. During research of the flora of Klek Peninsula carried out in the period of October 2017-July 2018, the species was found as very rare, with less than 30 characteristic tufts, in a small bay under the locality of Izbroće in the southern part of the Peninsula, near an abandoned mussels farm. Considering that this species has a very restricted area of occupancy, and count very small numbers of adult plants (criteria D), it has to be included into the Red List of endangered plant species for Bosnia and Herzegovina, as critically endangered (CR) (IUCN, 2001).

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- "Study of endemic and threatened flora in NW Bosnia", financed by RUFFORD Foundation, and implemented by authors.

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Figure 4. *Carex punctata* (a) habitus (b) female spike, and *Carex extensa* (c) habitus (d) female and male spike (© Đ. Milanović and Š. Šarić)

Slika 4. *Carex punctata* (a) habitus (b) ženski klas, i *Carex extensa* (c) habitus (d) ženski i muški klas (© Đ. Milanović and Š. Šarić)

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SAŽETAK

Tokom sistematskog terenskog istraživanja roda *Carex* u Bosni i Hercegovini u periodu 2014-2018. dvije vrste iz sekcije *Spirostachyae* Drejer ex L. H. Bailey prvi put su zabilježene u flori ove države: *Carex extensa* Gooden. i *Carex punctata* Gaudin. Rezultati ukazuju da je *C. punctata* prilično česta vrsta na vlažnim staništima na serpentinitima centralne Bosne, dok je *C. extensa* zabilježena kao vrlo rijetka duž jadranske obale na poluotoku Kleku (južna Bosna i Hercegovina) i prepoznata kao kritično ugrožena vrsta (CR) u BiH.