Centaurea lovricii, a new species of C. sect. Centaurea (Asteraceae) from Croatia

Sandro Bogdanović¹,², Igor Boršić³, Ivica Ljubičić¹, Salvatore Brullo⁴, Gianpietro Giusso del Galdo⁴

¹ University of Zagreb, Faculty of Agriculture, Department of Agricultural Botany, Svetošimunska 25, 10000 Zagreb, Croatia ² Centre of Excellence for Biodiversity and Molecular Plant Breeding, Svetošimunska 25, 10000 Zagreb, Croatia ³ Institute for Environment and Nature, Ministry of Economy and Sustainable Development, Radnička cesta 80/7, 10000 Zagreb, Croatia ⁴ Department of Biological, Geological and Environmental Sciences, University of Catania, Via A. Longo 19, 95125 Catania, Italy

Corresponding author: Sandro Bogdanović (sbogdanovic@agr.hr)

Academic editor: Pieter Pelser | Received 22 June 2022 | Accepted 2 November 2022 | Published 30 November 2022

Citation: Bogdanović S, Boršić I, Ljubičić I, Brullo S, Giusso del Galdo G (2022) Centaurea lovricii, a new species of C. sect. Centaurea (Asteraceae) from Croatia. PhytoKeys 214: 97–114. https://doi.org/10.3897/phytokeys.214.89404

Abstract
A new species, Centaurea lovricii, is described and illustrated from the island of Vis (Dalmatia, Croatia). It occurs on northwest-facing calcareous cliffs near the sea, where it grows with several other rare endemic species. Centaurea lovricii is morphologically similar to C. glaberrima and C. divergens of C. sect. Centaurea, from which it differs in having more succulent leaves with larger and less incised leaflets, bigger capitula, larger phyllaries with more developed appendages and denser undulate fimbriae, larger florets, bigger achenes, and longer pappus. Its morphological features, distribution, ecology, conservation status and taxonomic affinities are examined. In addition, a new iconography and lectotypification for C. glaberrima and C. divergens is provided.

Keywords
Adriatic region, Balkan flora, Centaurea, Croatia, morphology, new species, taxonomy

Introduction

The genus Centaurea L. is one of the largest genera in the family Asteraceae. In its current circumscription as a natural group, it includes about 250 species (Susanna and Garcia-Jacas 2007, 2009). It is mainly distributed in the Euro-Mediterranean and
south-western Asian territories (Susanna et al. 1995, 2006;Susanna and Garcia-Jacas 2007, 2009;Font et al. 2009; López et al. 2011; Hilpold et al. 2014a, b). As emphasised by Hilpold et al. (2014b), three subgenera can be recognised, namely C. subgen. Centaurea, C. subgen. Lopholoma (Cass.) Dobrocz., and C. subgen. Cyanus (Mill.) Cass. ex Hayek, each represented by numerous sections and subsections.

According to the literature (Hilpold 2012; Boršić 2013; Hilpold et al. 2014a, b), within sect. Centaurea of subgen. Centaurea three subsections are recognised, i.e. subsect. Centaurea, subsect. Phalolepis (Cass.) Garcia-Jacas, Hilpold, Susanna & Vilatersana, and subsect. Willkommia (Blanca) Garcia-Jacas, Hilpold, Susanna & Vilatersana. In particular, subsect. Centaurea [formerly sect. Acrolophus (Cass.) DC.] is characterised by having triangular phyllary appendages that are regularly ciliate at the margin and often provided with a mucro at the apex. This subsection is widespread in the Mediterranean area (Hilpold 2012). Several of its species are distributed in Croatia, Montenegro, Serbia, Bosnia and Herzegovina, while some of them are exclusively known from Croatia and its islands (Lovrić 1976, 1990, 1995; Nikolić et al. 2015; Nikolić 2020, 2022). Within this subsection several endemic species are known from the western Balkan peninsula: C. biokovensis Teyber s.l., C. crithmifolia Vis., C. cuspidata Vis. s.l., C. dalmatica A.Kern., C. derventana Vis. & Pančić, C. divergens Vis., C. fridericii Vis., C. glaberrima Tausch, C. gloriosa Radić, C. incompta Vis., C. kartschiana Scop., C. radichii Plazibat, C. spinosociliata Seenus s.l. and C. visianiana Plazibat.

During field investigations focused on the flora of the Dalmatian islands (Croatia) a peculiar chasmophilous population of Centaurea growing on the cliffs of the island of Vis was found. Previously, it was examined by Lovrić (1982, 1983, 1990, 1995) and named C. issaea or C. glaberrima var. issaea. However, these names must be considered nomina nuda, because a description was not provided for them and no type material was indicated. According to Art. 38.1 and 40 of the ICN (Turland et al. 2018), the names were therefore not validly published. Later, these names were used by several authors (Van der Maarel and Van der Maarel-Versluys 1996; Bogdanović and Ruščić 2011; Boršić 2013; Terzi et al. 2019; Nikolić 2020, 2022), all confirming the occurrence of this taxon on the island of Vis. According to the results of molecular genetic investigations (nuclear and plastid DNA sequences, as well as Amplified Fragment Length Polymorphism data - AFLP) carried out by Boršić (2013) on the amphip-Adriatic species of Centaurea, the population from Vis island is closely related to C. glaberrima, a species occurring in southern Croatia, Montenegro, Albania, Bosnia and Herzegovina. To examine the affinities of these two taxa, morphological studies of populations from the island of Vis and the type locality of C. glaberrima in Dalmatia were carried out, as well as of its type specimen kept in PRC. These analyses show that the population from the island of Vis is highly distinct from C. glaberrima, as well as from the allied C. divergens and the other species belonging to subsect. Centaurea. Therefore, based on morphological and ecological differences with other species in this subsection, the plants in question are treated here as a new species for science and named C. lovricii.
**Materials and methods**

For this morphological study, we examined 90 herbarium specimens and scanned images of specimens from several, also virtual, herbaria (BEO, BEOU, BP, BUNS, CAT, CNHM, K, MW, P, PAD, PI, PRC, SARA, U, W, WU, ZA, ZAGR and ZAHO). The herbarium acronyms follow Thiers (2022). In addition, we collected 20 plants of *C. lovricii* from the island of Vis (one population), and 50 plants of *C. glaberrima* (seven populations) and 40 plants of *C. divergens* (seven populations) from several other localities in Croatia, including *loci classici*. The investigations were carried out on material preserved in alcohol and glycerine solution, as well as on herbarium exsiccate deposited at CAT and ZAGR. Information about distribution, habitat, ecology and phenology were obtained from field data and herbarium specimens.

**Taxonomic treatment**

1. *Centaurea lovricii* Bogdanović, Boršić, Ljubičić, Brullo & Giusso, sp. nov.
   urn:lsid:ipni.org:names:77309067-1

   Figs 1–3B, C, D

   *Centaurea glaberrima* var. *issaea* Lovrić, Taxon 31(4): 763, 1982 (nom. nud.).

   *Centaurea issaea* Lovrić, Pos. izd. Muz. grada Šibenika 10: 191, 1983 (nom. nud.).

**Type.** Croatia. Island of Vis, Blišćevac bay, calcareous rocky slopes, 16 May 2021, 43°4’23.30”N, 16°5’51.59”E, *S. Bogdanović & M. Temunović s.n.* (holotype: ZAGR–68512; isotypes: CAT, CNHM, ZA, ZAGR).

**Description.** Perennial herb, with several stems, sterile leaf-rosettes and woody rootstock. Stems erect, glabrous, striate, shiny green, 25–50 cm long, not winged, laxly branched. Basal leaves fleshy, shiny green, glabrous, 1–2 pinnatisect, 7–20 cm × 5–40 mm; leaflets 5–15 per side, lanceolate, linear-lanceolate to linear, or oblong lanceolate, 5–30 × 0.8–5(–10) mm, often the terminal ones lanceolate and up to 10 mm wide; young leaves oblong lanceolate with entire margin or with few lateral teeth; petioles 5–55 mm long. Median and upper cauline leaves similar to basal ones, sessile or sub sessile, 1(–2) pinnatisect, 1.5–12 × 0.5–3 cm; leaflets 1–12 per side, linear-lanceolate to linear, margins entire. Synflorescence laxly paniculate, with 7–30 solitary capitula. Peduncles 1–20 cm long, apex clavate, bracts 1–8, entire. Involucre ovoid, 13–15 × 8–12 mm. Phyllaries straw-coloured, glabrous, coriaceous, dorsally with 3–7 nerves; the outer ones ovate, 6.5–8 × 2.5–3.5 mm; the median ones ovate-oblong, 10–15 × 3.5–4.5 mm; the innermost linear, 12.5–15 × 2–2.8 mm; phyllary appendages well-developed, triangular to orbicular, dark brown, appressed, densely fimbriate with 7–10 pairs of undulate fimbriae, 0.3–1.7 mm long, ending with a terminal acute tooth. Florets pink-purplish. Outermost florets sterile; corolla tube glabrous, 7.5–9 mm long; corolla lobes linear, irregular, 7.5–11.5 mm long. Disc
florets fertile; corolla tube 10–11.5 mm long; corolla lobes linear, equal, 5 mm long. Stamens 12.5–13.5 mm long; filaments 4.5–5 mm long; anthers 8–8.5 mm long, dark violet. Style 16–16.5 mm long, ciliate at apex; stigmas 1.5 mm long. Achenes oblong,
2.6–3 × 1.4–1.5 mm, glabrous, dark brown up to the apex, with several irregular straw-coloured longitudinal ridges. Pappus obscurly biseriate, whitish, with bristles 0.6–2.3 mm long.

**Etymology.** This species is dedicated to the Croatian botanist Andrija–Željko Lovrić (1943–2018), who was the first to collect it and consider it as a new species.

**Phenology.** *Centaurea lovricii* flowers from May to late June, and fruits from late June to July.

**Distribution and ecology.** This new species grows along the northern coast between Dragodid Bay and Oključina Bay of the island of Vis in Dalmatia, Croatia (Fig. 4). It grows on sea facing cliffs constituted of Triassic dolomites (Lozić et al. 2012) at 10–100 m a.s.l., in rocky crevices together with many other rare or endemic species (Fig. 3A). The most frequent chasmophytes occurring in this habitat are *Aurinia leucadea* subsp. *scopulorum* (Ginzb.) Plazibat, *Campanula teutana* Bogdanović & Brullo, *Centaurea ragusina* L., *Helichrysum italicum* subsp. *pseudolitoreum* (Fiori) Bacch., Brullo & Mossa, *Brassica incana* Ten., *Limonium issaeum* Bogdanović & Brullo, *Pimpinella tragium* subsp. *lithophila* (Schischk.) Tutin and *Sesleria interrupta* Vis. (Bacchetta et al. 2003; Bogdanović and Ruščić 2011; Bogdanović et al. 2014; Bogdanović and Brullo 2015; Terzi et al. 2019).

**Conservation status.** The single population of *C. lovricii* is composed of fewer than 1000 scattered mature individuals, so it can be considered Vulnerable (VU D1) according to the IUCN Red List Categories and Criteria (IUCN 2022). It is currently distributed in a very narrow coastal belt of ca. 0.5 km², so it has a restricted area of occupancy and only one location, but as its growing site is very steep and quite inaccessible, which makes the population unthreatened by any human disturbance, it does not qualify for subcriterion D2.

**Chromosome number.** According to Lovrić (1982, 1983) and Van Loon (1987) the ploidy level of *C. lovricii*, previously attributed to “*C. glaberrima* var. *issaea*”, is tetraploid with 2n = 4x = 36 chromosomes, similarly to that of the allied species *C. glaberrima* and *C. divergens* (Siljak-Yakovlev et al. 2005). According to Boršić (2013) the estimated ploidy level for “*C. issaea*” is also tetraploid.

**Discussion.** Within *Centaurea* subsect. *Centaurea*, *C. lovricii* is most similar to *C. glaberrima*, particularly in the morphology of its capitula and phyllaries. *Centaurea glaberrima* is a species occurring in several localities in the north-western Balkans (Nikolić et al. 2015). However, these two species show some significant differences in habit and the morphology of their leaves, capitula and achenes (Table 1). In particular, *C. glaberrima* (Figs 5, 6) has a more robust and rigid habit, stems with up to 80 capitula, rigid basal leaves with leaflets linear-filiform (0.5–2 mm wide), involucre 6–10 mm long, with phyllaries up to 8 mm long, appendages straw-coloured, often tinged with pale-brown, with sparse fimbriae, outermost sterile florets with corolla tube 6–6.5 mm long and pappus bristles 0.2–0.8 mm long. In addition, the two species have different ecological requirements. *Centaurea glaberrima* usually behaves as a ruderal plant growing along roadsides, in dry rocky grasslands and occasionally also in rupestrian stands, whereas *C. lovricii* is a true chasmophyte in coastal stands. A population genetic study of some endemic Adriatic species of *Centaurea* using AFLPs was
Figure 2. *Centaurea lovricii* sp. nov. A capitulum B phyllaries C outermost sterile florets D disc florets E stigma F achenes G stamens upper part. Drawn by Salvatore Brullo.
Centaurea lovricii a new species from Croatia

Figure 3. Centaurea lovricii sp. nov. A habitat B plant growing in natural habitat C capitulum D basal leaves; C. glaberrima E plant growing in natural habitat F capitula G basal leaves; C. divergens H plant growing in natural habitat I capitulum. Photographed by Sandro Bogdanović.

carried out by Boršić (2013), who showed the distinctness of the population from the island of Vis (sub C. issaea) from C. glaberrima, but also concluded that this population shows evidence of introgression with C. glaberrima and C. spinosociliata. A phylogeny
based on nrDNA internal transcribed spacer sequences revealed that *C. lovricii* still has an unclear phylogenetic position among the species of *C. sect. Centaurea* included in this study (Boršić 2013).

Another morphologically similar species is *C. divergens* (Fig. 6), which is often treated as a subspecies or variety of *C. glaberrima* (Malý 1928; Hayek 1931; Lovrić 1967–1968; Dostál 1976; Gavrilović and Janačković 2022), but its treatment as a distinct species, as proposed by Visiani (1847) and Hayek (1901), seems to be more appropriate (see Table 1). It differs from *C. lovricii* in having a hispid stem, rigid and dull green basal leaves with linear-filiform leaflets (0.5–2 mm wide), a 6–10 mm long involucre, phyllaries that are up to 8 mm long, with up to 2 mm long fimbriae, outermost sterile florets with a 5.5–6 mm long corolla tube, and up to 1.1 mm long pappus bristles. They are also ecologically well differentiated, because *C. divergens* is usually a typical ruderal species, while *C. lovricii* is a chasmophyte.

A nomenclatural overview and lectotype designation for *C. glaberrima* and *C. divergens*, species closely related to *C. lovricii*, are here provided:

### Table 1. Main diagnostic features of *Centaurea lovricii*, *C. glaberrima* and *C. divergens*.

|                | *C. lovricii*                                                                 | *C. glaberrima*                                           | *C. divergens*                                           |
|----------------|------------------------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------|
| **Stem**       | glabrous, shiny, 25–50 cm long,                                             | glabrous, dull, 25–80 cm long,                            | hispid, dull, 25–100 cm long,                            |
| **Basal leaves**| fleshy, robust, glabrous, 1–2 pinnatisect, 7–20 cm long, with leaflets lanceolate to linear, 5–30 × 0.8–5 mm, the terminal one up to 10 mm wide | thin, rigid, glabrous, 1–3 pinnatisect, 8–15 cm long, with leaflets linear-filiform, 2–15 × 0.5–0.8(–2) mm | thin, rigid, hispid, 1–3 pinnatisect, 8–20 cm long, with leaflets linear-filiform, 2–15 × 0.5–0.8(–2) mm |
| **Cauline leaves** | 1.5–12 cm long, 1–12 leaflets per side, linear lanceolate to linear          | 0.5–5 cm long, 1–15 leaflets per side, linear-filiform     | 0.5–7 cm long, 1–10 leaflets per side, linear-filiform   |
| **Synflorescence** | laxly branched, with 7–30 capitula                                            | lady paniculate, very branched, with (15)50–80 capitula  | densely paniculate, very branched, with 15–80 capitula   |
| **Capitula**   | solitary, involucre 13–15 × 8–12 mm, with peduncle 1–20 cm long             | solitary to grouped, involucre 6–8.5(–10) × 4.5–5.5 mm, with peduncle 0.3–6 cm long | solitary to grouped, involucre 6–10 × 4–6.5 mm, with peduncle 0.2–7 cm long |
| **Phyllaries** | 6.5–15 × 2–4.5 mm, with appendages triangular to orbicular, dark-brown, densely fimbriate with 7–10 pairs of undulate fimbriae 0.3–1.7 mm long | 2.5–8 × 1.2–2.6 mm, with appendages triangular to orbicular, straw-coloured often tinged with pale-brown, 4–8 pairs of lax and more or less straight fimbriae, which are 0.3–1(–1.5) mm long | 3–8 × 1.4–2.2 mm, with appendages triangular, straw-coloured, tinged with pale-brown, 3–6 pairs of lax and more or less straight fimbriae, which are 0.2–2 mm long |
| **Corolla of outermost sterile florets** | tube 7.5–9 mm long, lobes 7.5–11.5 mm long                                  | tube 6–6.5 mm long, lobes 2–4.1 mm long                   | tube 5.5–6 mm long, lobes 3–6 mm long                     |
| **Corolla of disc florets** | tube 10–11.5 mm long, lobes 5 mm long                                        | tube 5–6 mm long, lobes 2–2.5 mm long                     | tube 6.5–7.5 mm long, lobes 3–3.3 mm long                |
| **Stamens**    | 12.5–13.5 mm long, with filament 4.5–5 mm long and anthers 8–8.5 mm long    | 7.5–9.8 mm long, with filaments 5.3–5.8 mm long and anthers 2.2–4 mm long | 10–10.5 mm long, with filaments 5–5.5 mm long and anthers 5 mm long |
| **Style**      | 16–16.5 mm long                                                             | 7.5–8.3 mm long                                           | 10 mm long                                               |
| **Stigma**     | 1.5 mm long                                                                  | 1.25 mm long                                              | 1.2 mm long                                              |
| **Achenes**    | 2.6–3 × 1.4–1.5 mm, glabrous, dark-brown up to the apex                      | 2.5–2.7 × 1–1.2 mm, glabrous, dark-brown with straw-coloured strip above | 2.3–2.5 × 0.9–1.1 mm, sparsely hairy, dark-brown with straw-coloured strip above |
| **Pappus**     | obscurely 2-seriate, with bristles 0.6–2.3 mm long                           | 2-seriate, with bristles 0.2–0.8 mm long                  | 2-seriate, with bristles 0.2–1.1 mm long                 |
2. *Centaurea glaberrima* Tausch, Syll. Pl. Nov. 2: 249, 1828.

Figs 5, 6

*Centaurea punctata* Vis., Flora 12: 23, 1829. Type: Croatia. In agris sterilibus Dalm. [Dalmatia] montanae (prope Duare), *Visiani s.n.* (lectotype, designated here: PAD – HD02644).

**Type.** Croatia. e Dalmat. [Dalmatia], s.d., *Sieber s.n.* (lectotype, central specimen designated here: PRC).

**Nomenclatural note.** Tausch (1828) described *C. glaberrima* from Dalmatia without indicating any precise locality. The herbarium sheet, with three specimens, that we found in PRC has an original herbarium label with Tausch’s handwriting: “*Centaurea – ?,*
Figure 5. Habit of *Centaurea glaberrima*. Drawn by Salvatore Brullo.
Centaurea lovricii a new species from Croatia

Tausch usually shortened geographical names: “e Dalmat.” refers to specimens collected in eastern Dalmatia, while “Sber.” refers to the collector (i.e. Sieber). In addition, he provided a short morphological description. Later, to the same herbarium label, the identification [= C. punctata Vis.] was added. This was probably done by V. Kosteleczky (pers. observ. by curator P. Mraz). The fourth specimen on the sheet belongs to C. spinosociliata and it is correctly identified on a separate herbarium label by A. Hayek. Here we select the central specimen, which fits Tausch’s description, as lectotype for the name C. glaberrima. One year later, Visiani (1829) described C. punctata from Duare [Zadvarje] in Dalmatia. We consulted the type specimen in PAD (PAD – HD02644), which fits Visiani’s description given in the protologue. In fact, the morphology of the specimen perfectly corresponds to Tausch’s description of C. glaberrima. Therefore, we here designate this specimen as a lectotype and include the name C. punctata as a synonym of C. glaberrima.

Iconography. Figs 5, 6; Tav. 11, Visiani, Fl. Dalmat. 2: 39, 1847, sub C. punctata; Tav. 47 (II, III, 4–14), Reichenbach, Icon. Fl. Germ. Helv. 15: 30, 1852, sub C. punctata; Tav. 155 (II, 10–11), Reichenbach, Icon. Fl. Germ. Helv. 15: 31, 1853, sub C. punctata.

Distribution. According to Greuter (2006), Barina et al. (2015) and Nikolić et al. (2015), C. glaberrima is distributed in Albania, Bosnia and Herzegovina, Croatia and Montenegro (Fig. 4).

3. Centaurea divergens Vis., Fl. Dalmat. 2: 37, 1847.

Acosta divergens (Vis.) Soják, Čas. Nár. Muz. Odd. Přír. Prague 140: 134, 1972. Type. Based on Centaurea divergens Vis.

Centaurea glaberrima subsp. divergens (Vis.) Hayek, Repert. Spec. Nov. Regni Veg. Beih. 30(2): 260, 1931. Type. Based on Centaurea divergens Vis.

Centaurea glaberrima var. divergens (Vis.) Malý, Glasn. Zemaljsk. Muz. Bosne Hercgovine Sarajevu. Prir. Nauke 40(1): 122, 1928 Type. Based on Centaurea divergens Vis.

Centaurea petteri Rchb.f., Icon. Fl. Germ. Helv. 15: 36, 1852. Type. Croatia. Auf dem Monte Mossor Dalm., June, Reichenbach fil. s.n. (W1889-0292916).

Type. Croatia. In apricis montium Lesina, s.d., Stalio 448 (lectotype, designated here: PAD – HD02637).

Nomenclatural note. Centaurea divergens was described from the island of Hvar in central Dalmatia by Visiani (1847). In the protologue, Visiani clearly indicated “in saxosis collium, et montium circa Lessina, unde misit prof. Stalio” and we found original type material in the PAD herbarium that corresponds to description given in the protologue. Here we select a specimen that fits Visiani’s description as lectotype for the name C. divergens.

Iconography. Fig. 6; Tav. 12(b)(41), Visiani, Fl. Dalmat. 2: 37, 1847; Tav. 51 (772) I, 1–7, Reichenbach, Icon. Fl. Germ. Helv. 15: 35, 1852; Tav. 52 (783) II, 9–16, Reichenbach, Icon. Fl. Germ. Helv. 15: 36, 1852, sub Centaurea petteri.
Figure 6. *Centaurea glaberrima* (1) and *C. divergens* (2) A capitula B phyllaries C outermost sterile florets D disc florets E stamens upper part F style.
Distribution. According to Greuter (2006), *C. divergens* is distributed in Bosnia and Herzegovina, Croatia, Montenegro (Fig. 4) and as an adventive plant in France.

Additional specimens examined. *Centaurea lovricii* (paratypes): CROATIA. Split-Dalmatia County, island of Vis, Kraljićina špilja, vertical rocks, 26 April 2010, S. Bogdanović & Z. Liber s.n. (ZAGR); Dalmazia, Isola di Vis, Oklučina, pereti rocciosi sopra il mare, 25 May 2011, S. Bogdanović, S. Brullo & G. Giusso s.n. (CAT, ZAGR); Island of Vis, Oklučina, vertical cliffs, 12 June 2010, S. Bogdanović & I. Boršić s.n. (ZAGR); Island of Vis, Oklučina, vertical cliffs, 23 May 2010, S. Bogdanović s.n. (ZAGR). *Centaurea glaberrima*: ALBANIA. District of Shkodër, in mountain Maja e Zezë above village Baks-Rjoll, on the slope of Mts Mali e Rencit, on limestone rocks, 41.83324°N, 19.53921°E, 76 m a.s.l., 5 August 2011, Z. Barina & G. Somogyi 19743 (BP761381); District of Shkodër, in dry grassland, on limestone, 41.85733°N, 19.50846°E, 248 m a.s.l.; 4 May 2014, Z. Barina, D. Pifkó & G. Puskás 23227 (BP767834). CROATIA. Flora Dalmatica, In rupibus promontorii Punta Spezerea pr. Ragusam, 5 June 1906, A. Degen s.n. (PI012666); E Dalmat, s.d., Tausch s.n. (PRC); Dalmatia, 1832, R. Visiani s.n. (K000772946); Južna Hrvatska, Velji Do, obronci planini inzad Cavtata, 22 July 2013, S. Bogdanović & I. Boršić s.n. (ZAGR44365); Ragusa in Dalmatia, R. Visiani s.n., sub *C. punctata* Vis. (P02815194); Ragusa, 15 June 1867, R. Huter s.n., sub *C. punctata* Vis. (P02815195, P02815196, P02815197); Raguse, 14 June 1861, R. Huter s.n. (P04215180); Pelješac, Ston, uz cestu, 30 July 2021, S. Bogdanović s.n. (CAT, ZAGR); Pelješac, Ston, Majkovi, 11 July 2021, S. Bogdanović s.n. (CAT, ZAGR); Južna Dalmacija, otok Lipud, stijene uz obalu mora, 12 May 2018, S. Bogdanović & I. Rešetnik s.n. (ZAGR50465, ZAGR50466, ZAGR50462, ZAGR50463); Dalmacija, otok Lopud, stijene uz obalu mora, 12 May 2018, I. Rešetnik & S. Bogdanović s.n. (ZAGR53125); Dubrovnik, kod hotela Belvedere, stijene uz obalu mora, 12 May 2018, I. Rešetnik & S. Bogdanović s.n. (ZAGR53144); Ortočki šipan: Kaludrica, u garigu, 25 August 1979, M. Hećimović s.n. (ZA13511); Na morskoj litiči, Vrtac kod selo Popovići, ca 50 m, 19 July 1926, V. Loschnigg s.n. (ZA13510); In colle Gorizae et ad margines agrarum olivar. Lapad, 1868, M. Vodopič s.n. (ZA13508), sub *C. punctata* Vis.; Otok Lokrum: travnjak u masliniku kraj zgrade, 2 May 1959, S. Horvatić s.n. (ZA13007), sub *C. punctata* Vis.; In saxosis fruticetis sempervirentis ad Lapad (Gruž), 28 July 1928, Th. Soška s.n. (MW0794564); Slano, February 1972, M. Obradović s.n. (BUNS18767), Gradac, 9 May 1967, M. Obradović s.n. (BUNS18956); In rupibus calc., pr. Dubrovnik, 15 August 1946, O. Grebenščikov s.n. (BEO26342); Lokrum, s.d., S. Jovanović s.n. (BEOU719); Padine brda Srd, Dubrovnik, kamenjarski travnjaci, October 1993, S. Maslo s.n. (ZAGR); Konavoske stijene, Dubrovnik, pukotine kremenjačkih stijena uz morsku obalu, 16 July.
2003, S. Maslo s.n. (ZAGR); Konavoske stijene (najzapadniji dio, kod Popovića), kamenjare, 1 August 1978, I. Trinajstić s.n. (CNHM4058:BOT); Dubrovnik, Lapad, 9 October 1977, I. Trinajstić s.n. (CNHM4050:BOT); Srd iznad Dubrovnika, 29 November 1978, I. Trinajstić s.n. (CNHM4051:BOT). **Bosnia and Herzegovina.** Weideplätze – V. Trebinje, n. Lastva, 7 August 1895, Matulić s.n. (SARA44076); In rupestribus montis Gliva prope Trebinje, 7 August 1895, K. Vandus s.n. (SARA44075); Trebinje, 19 July 1892, E. Brandis s.n. (SARA44070); Am Wege von Meka gruda nach Djeć, 20 July 1925, V. Hawelka s.n. (SARA44054); In saxosis apricis prope Zavala, 18 October 1909, K. Malý s.n. (SARA44052).

**Montenegro.** Katunska nahija, 2 August 1991, V. Stevanović s.n. (BEOU1578.91); Ad Viluša, ca. 1.100 m, July 1904, J. Rohlena s.n. (PI012665); Vidiokvac iznad jezera Slano, 31 July 2021, S. Bogdanović s.n. (CAT, ZAGR); Gruda, Majden, 13 July 1928, D. Petrović s.n. (BEOU37275); Orjen, Poštirovnik, s. Prčanj cca 890 m.s.m., s. dol., 2 August 1980, Č. Šilić s.n. (SARA44071, 44072, 44073, 44074).

**Centaurrea divergens:** **Croatia.** Island of Hvar, St. Nikola, rocky grassland, 28 July 2021, S. Bogdanović s.n. (CAT, ZAGR); Zadvarje, along the road, 28 July 2021, S. Bogdanović s.n. (CAT, ZAGR); In apricus saxos. ins. Lessina, Visiani s.n. (P02815388); Dalmatia, in lapidos., pr. Macarsca, July 1880, Th. illeg. s.n. (P02815392, P02815393, MW0794555, BEOU37200); Dalmatia, s.d., M. Botteri s.n. (BEOU37200); Mala Duba, Živogošće, kamenite padine uz Jadransku magistralu, 12 July 2003, S. Maslo s.n. (ZAGR); Brač, Vidova gora, October 1976, I. Trinajstić s.n. (CNHM4054:BOT); Otok Brač, kod Bola, 28 March 1969, I. Trinajstić s.n. (CNHM4054:BOT); Otok Brač, uz cestu Supetar – Nerežišće, 20 July 2013, M. Vukojević s.n. (ZAGR40083); op keinestrand b. Makarska, 26 July 1965, T. Baretta (U1112735); Dalmatia. In agris sterilibus ad Macarscam, s.d., Piebler s.n. (P02815392, P02815393, MW0794555, BEOU37201); Dalmatia, Lessina, s.d., M. Botteri s.n. (BEOU37200); Mala Duba, Živogošće, kamenite padine uz Jadranšku magistralu, 12 July 2003, S. Maslo s.n. (ZAGR); Brač, Vidova gora, October 1976, I. Trinajstić s.n. (CNHM4054:BOT); Otok Brač, kod Bola, 28 March 1969, I. Trinajstić s.n. (CNHM4054:BOT); Otok Brač, uz cestu Supetar – Nerežišće, May 1968, I. Trinajstić s.n. (CNHM4052:BOT). **Bosnia and Herzegovina.** Bosna, između Rilje i Kifinog sela, July 1969, I. Trinajstić s.n. (CNHM4055:BOT); Mostar, am Humberg, 100 m, July 1903, E. Sagorski s.n. (P04453688, P04453689); Mostar, in incultis, July 1907, E. Sagorski s.n. (P04132171); Mostar, in incultis ad m. Humberg, July 1905, E. Sagorski s.n. (SARA44056); Ad via, July 1908, E. Sagorski s.n. (PI12696); Flora Hercegovine, Prenj, Porim, na izloženom grebenu, 29 July 1962, I. Horvat s.n. (ZAHO); Žitomislići, Mostar, kamenite padine i škare brda Osojnica, July 2001, S. Maslo s.n. (ZAGR); Herbegoa, Prenj pl., Prevoj, kamenite padine uz put za Rupište, July 2011, S. Maslo s.n. (ZAGR); Stolac, Križevac, 260 m alt., 43.06159N, 17.9839E, kamenjari, kreknjak, 1 July 2015, M. Niketić, G. Tomović, K. Jakovljević & S. Đurović s.n. (BEOU43550); In locis siccis agris Livansko polje, prope Prolog, 22 June 1970, H. Ritter s.n. (SARA48730); In locis siccis agris Livansko polje, prope Kablić, 30 July 1970, H. Ritter s.n. (SARA48729); In valle Drežanka
prope Drežnica, 4 August 1900, K. Malý s.n. (SARA 44058); In paucibus, Narontis, prope g. Grabovica, ca. 150 m, 5 October 1930, K. Malý s.n. (SARA44057); In paucibus, Narontis, prope g. Grabovica, 140 m, 7 September 1907, K. Malý s.n. (SARA44050); Konjic, in monte Vitaljica et Zlatar, 27 June 1955, H. Ritter s.n. (SARA44055); In valle Narontis prope Glavatičev, solo dolomitico, 380 m, 17 July 1923, K. Malý s.n. (SARA44053); Inter Podgorjani-Lišani, 260 m, 18 August 1918, K. Malý s.n. (SARA44051); In saxosis apricus prope Bišina, ca. 1000 m, 7 August 1907, K. Malý s.n.(SARA44049); U dolini Rakitnice ispred Blaca, 10 August 1957, H. Ritter s.n. (SARA48725). Montenegro. Boka Kotorska, Luštica iznad Rosa, kamenjari sa Salvia officinalis, krečnjak, 100 m, 3 August 1996, D. Lakušić & B. Lakušić s.n. (BEOU2150/96); Boka Kotorska, Luštica, prevoj izmedju Rosa i Kraćića, kamenjari, krečnjak, 350 m, 24 August 2002, D. Lakušić & B. Lakušić s.n. (BEOU15337); Kotor, put Prčanj-Rose, 29 June 2003, P. Janačković s.n. (BEOU38399); Iznad Vrbanja, kamenjari sa Globularia cordifolia, 16 June 1990, V. Stevanović s.n. (BEOU1198.90); Klinci, Sv. Tripun, Luštica, kamenje pored šoderskog put, 24 June 1995, V. Karaman 501 (BEOU37273).

Key to Centaurea lovricii and allied species

1 Stem with 7–30 capitula; basal leaves fleshy, shiny, leaflets lanceolate to linear (0.8–10 mm wide); involucre 13–15 mm long, 8–12 mm wide; phyllaries up to 15 mm long, appendages dark-brown, fimbriae dense; outermost florets with lobes 7.5–11.5 mm long; pappus bristles up to 2.3 mm long............C. lovricii
   – Stems with up to 80 capitula; basal leaves rigid, dull, leaflets linear-filiform (0.5–2 mm wide); involucre 6–10 mm long, 4–6.5 mm wide; phyllaries up to 8 mm long, appendages straw-coloured tinged with pale brown, fimbriae sparse; outermost florets with lobes 2–6 mm long; pappus up to 1.1 mm long........2

2 Leaves glabrous; fimbriae on phyllaries up to 1(–1.5) mm long; disc floret tube 5–6 mm long and lobes 2–2.5 mm long; pappus bristles up to 0.8 mm long....
   ..................................................................................................................C. glaberrima
   – Leaves hispid; fimbriae on phyllaries up to 2 mm long; disc floret tube 6.5–7.5 mm long and lobes 3–3.3 mm long; pappus bristles up to 1.1 mm long.....
   ..................................................................................................................C. divergens

Acknowledgements

We thank the curators of BEO, BEOU, BP, BUNS, CAT, CNHM, K, MW, P, PAD, PI, PRC, SARA, U, W, WU, ZA, ZAGR and ZAHO for enabling the examination of their herbarium specimens. We especially would like to thank Patrik Mráz (PRC) and Rossella Marcucci (PAD) for searching type specimens in their collections. Prof. Sandro Bogdanović would like to thank the University of Zagreb, Programme of Academic Mobility for partial funding of this research and the Erasmus+ programme for facilitating the collaboration with Prof. Gianpietro Giusso del Galdo from the University of Catania, Department of Biological, Geological and Environmental Sciences.
References

Bacchetta G, Brullo S, Mossa L (2003) Note tassonomiche sul genere Helichrysum Miller (Asteraceae) in Sardegna. Informatore Botanico Italiano 35(1): 217–225.

Barina Z, Piško D, Rakaj M (2015) Contributions to the flora of Albania, 5. Studia Botanica Hungarica 46(2): 119–140. https://doi.org/10.17110/StudBot.2015.46.2.119

Bogdanović S, Brullo S (2015) Taxonomic revision of Limonium cancellatum group (Plumbaginaceae) in Croatia. Phytotaxa 215(1): 1–87. https://doi.org/10.11646/phytotaxa.215.1.1

Bogdanović S, Ruščić M (2011) Pimpinella tragium Vill. subsp. lithophila (Schischk.) Tutin (Apiaceae), a new taxon in Croatian flora. Acta Botanica Croatia 70(1): 115–120. https://doi.org/10.2478/v10184-010-0007-4

Bogdanović S, Brullo S, Rešetnik I, Šatović Z, Liber Z (2014) Campanula teutana, a new isophyllous Campanula (Campanulaceae) from the Adriatic region. Phytotaxa 162(1): 1–17. https://doi.org/10.11646/phytotaxa.162.1.1

Boršić I (2013) Phylogeography of Centaurea (Compositae) in the circum-Adriatic region. PhD. Thesis. University of Zagreb, Faculty of Science. Zagreb.

Dostál J (1976) Centaurea L. In: Tutin TG, Heywood VH, Moore DM, Valentine DH, Walters SM, Webb DA (Eds) Flora Europaea, vol. 4. Cambridge University Press, Cambridge, 254–301.

Font M, Garcia-Jacas N, Vilatersana R, Roquet C, Susanna A (2009) Evolution and biogeography of Centaurea section Acrocentron inferred from nuclear and plastid DNA sequence analyses. Annals of Botany 103(6): 985–997. https://doi.org/10.1093/aob/mcp022

Gavrilović M, Janačković P (2022) Micromorphology of endemic Centaurea glaberrima subsp. divergens (Asteraceae). Acta Botanica Croatica 81(1): 23–31. https://doi.org/10.37427/botcro-2021-028

Greuter W (2006) Compositae (pro parte majore). In: Greuter W, Raab-Straube E von (Eds) Compositae. Euro+Med Plantbase. http://ww2.bgbm.org/EuroPlusMed/

Hayek A (1901) Die Centaurea - Arten Österreichs – Ungarns. Denkschriften der Kaiserlichen Akademie der Wissenschaften / Mathematisch-Naturwissenschaftliche Classe 70: 587–773.

Hayek A (1931) Prodromus floriae peninsulae Balcanicae. Vol. 2: Dicotyledoneae Symptalae. Repertorium Specierum Novarum Regni Vegetabilis. Beihefte 30(2): 97–336.

Hilpold A (2012) Evolution of the Centaurea Acrolophus subgroup. PhD Dissertation. Universitat de Barcelona, Facultat de Farmacia.

Hilpold A, Vilatersana R, Susanna A, Meseguer AS, Boršić I, Constantinidis T, Filipheedu R, Romaschenko K, Suárez-Santiago VN, Tugay O, Üysal T, Pfeil BE, García-Jacas N (2014a) Phylogeny of the Centaurea group (Centaurea, Compositae)—Geography is a better predictor than morphology. Molecular Phylogenetics and Evolution 77: 195–215. https://doi.org/10.1016/j.ympev.2014.04.022

Hilpold A, García-Jacas N, Vilatersana R, Susanna A (2014b) Taxonomical and nomenclatural notes on Centaurea: A proposal of classification, a description of new sections and subsections, and a species list of the redefined section Centaurea. Collectanea Botanica 33(e001): 1–29. https://doi.org/10.3989/collectbot.2013.v33.001
Centaurea lovričii a new species from Croatia

IUCN (2022) Standards and Petitions Committee. Guidelines for Using the IUCN Red List Categories and Criteria. Version 15. Prepared by the Standards and Petitions Committee. https://www.iucnredlist.org/documents/RedListGuidelines.pdf [accessed: 24 February 2022]

López E, Devesa JA, Arnelas I (2011) Taxonomic study in the Centaurea langei complex (Asteraceae). Annales Botanici Fennici 48(1): 1–12. https://doi.org/10.5735/085.048.0101

Lovrić AŽ (1967–1968) Prilog poznavanju ilirskih Centaureja s posebnim obzirom na sekciju Pterolophus (Cass.) DC. Acta Botanica Croatica 26–27: 263–278.

Lovrić AŽ (1976) Evolution et écologie des Centaurea de l’Archipel Adriatique. Rapport de la Commission Intéionale de la Mer Méditerranéenne 23: 37–38.

Lovrić AŽ (1982) Reports In: Löve Á (Ed.) IOPB chromosome number reports LXXVII. Taxon 31(4): 762–763. https://doi.org/10.1002/j.1996-8175.1982.tb03587.x

Lovrić AŽ (1983) Visianijevi endemi na Dinarskom kršu i revalorizacija njegovih Centaureja. In: Pavletić Zi, Matković P, Grubišić S (Eds) Zbornik Roberta Visianija Šibenčanina, Muzej grada Šibenika, Šibenik, 185–194.

Lovrić AŽ (1990) Biosistematika, endemizam i sinekologija roda Centaurea (L.) em. Schmal. (Asteraceae) na primorskom kršu. Bilten Društva ekologa Bosne i Hercegovine, ser. B, 5: 101–106.

Lovrić AŽ (1995) Eolski kserobiomi od Jadrana do Irana (Taksonomske i biocenološke osobitosti olujnih obala i vrhova duž Taurodinarskog velekrasa). PhD Dissertation. Institut Ruder Bošković, Zagreb.

Lozić S, Krklec K, Perica D (2012) Typology of Vis island based on influence of geological, geomorphological and pedological characteristics on natural and cultural landscape. Naše More [Dubrovnik] 59(1–2): 82–91.

Malý K (1928) Prilozi za floru Bosne i Hercegovine 10. Glasnik Zemaljskog Muzeja Bosne i Hercegovine 40(1): 107–172.

Nikolić T (2015) Endemi u hrvatskoj flori. Alfa d.d., Zagreb.

Siljak-Yakovlev S, Solic M-E, Catrice O, Brown SC, Papeš D (2005) Nuclear DNA content and chromosome number in some diploid and tetraploid Centaurea (Asteraceae: Cardueae) from the Dalmatia region. Plant Biology 7(4): 1–8. https://doi.org/10.1055/s-2005-865693

Susanna A, Garcia-Jacas N (2007) Tribe Cardueae. In: Kadereit JW, Jeffrey C (Eds) The families and genera of vascular plants, vol. 8. Springer Verlag, Berlin, Heidelberg & New York, 123–147.

Susanna A, Garcia-Jacas N (2009) The tribe Cardueae. In: Funk VA, Susanna A, Stuessy TF, Bayer RJ (Eds) Systematics, evolution, and biogeography of Compositae. IAPT, Vienna, 293–313.

Susanna A, Garcia-Jacas N, Soltis DE, Soltis PS (1995) Phylogenetic relationships in tribe Cardueae (Asteraceae) based on ITS sequences. American Journal of Botany 82(8): 1056–1068. https://doi.org/10.1002/j.1537-2197.1995.tb11571.x

Susanna A, Garcia-Jacas N, Hidalgo O, Vilatersana R, Garnatje T (2006) The Cardueae (Compositae) revisited: Insights from ITS, trnL-trnF, and matK nuclear and chloroplast
DNA analysis. Annals of the Missouri Botanical Garden 93(1): 150–171. https://doi.org/10.3417/0026-6493(2006)93[150:TCCRIF]2.0.CO;2

Tausch IF (1828) Diagnoses plantarum novarum aut minus cognitarum. In: Hornschuch CF (Ed.) Sylloge plantarum novarum itemque minus cognitarum, vol. 2. Typis Viduae C. E. Brenck, Ratisbonae, 240–256.

Terzi M, Bogdanović S, D’Amico FS, Jasprica N (2019) Rare plant communities of the Vis Archipelago (Croatia). Botany Letters 167(2): 241–254. https://doi.org/10.1080/23818107.2019.1684359

Thiers B (2022) Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden’s Virtual Herbarium. http://sweetgum.nybg.org/ih/ [accessed 4 March 2022]

Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber WH, Li DZ, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ, Smith GF (2018) International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159. Koeltz Botanical Books, Glashütten. https://doi.org/10.12705/Code.2018

Van der Maarel E, Van der Maarel-Versluys M (1996) Distribution and conservation status of littoral vascular plant species along the European coasts. Journal of Coastal Conservation 2(1): 73–92. https://doi.org/10.1007/BF02743039

Van Loon JC (1987) A cytotaxonomical atlas of the Balkan flora. J. Cramer, Berlin-Stuttgart, 416 pp.

Visiani R (1847) Flora Dalmatica sive enumeratio stirpium vascularum quas hactenus in Dalmatia lectas et sibi observantas descriptis digessit rariorumque iconibus illustravit, Vol. 2. Friedericum Hofmibister, Lipsiae.

Visiani R (1829) Plantae rariores in Dalmatia recens detectae a Roberto de Visiani, M. D. et plurium Academiarum Sodali. Flora oder Allgemeine Botanische Zeitung 12(1): 1–24.