

THE DISTRIBUTION OF *SCABIOSA DELMINIANA* (CAPRIFOLIACEAE) IN CROATIA

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Milović, M., Karadole, J. & Pandža, M.: The distribution of *Scabiosa delminiana* (Caprifoliaceae) in Croatia. Nat. Croat., Vol. 34, No. 1, 103-112, 2025, Zagreb.

Scabiosa delminiana Abadžić is an endemic of the central Dinarides that occurs in the border area of Bosnia and Herzegovina and Croatia. In Croatia, it has previously been recorded only at a few localities along the border between the two countries: along the Butižnica River, Mount Svilaja (Orlove stine), Mount Dinara (Suhopolje), Mount Kamešnica (Donja Korita) and the surroundings of Sinj (Glavica hill). This study, conducted over five vegetation seasons from 2019 to 2023, identifies new sites with *S. delminiana* in Croatia, spanning the regions of Lika and the hinterland of Dalmatia. As a result, the western border of the species' distribution range in Croatia is now extended to include Udbina and Gračac in the north, and Promina Mountain and the vicinity of Sinj in the south. *Scabiosa delminiana* occurs in dry grasslands that are threatened by the cessation of grazing, which leads to natural succession to deciduous thickets and forests. Additionally, the species is at risk from the intensive planting of black pine.

Key words: Dinaric karst, endemic species, habitats, new sites, range size

Milović, M., Karadole, J. & Pandža, M.: Rasprostranjenost vrste *Scabiosa delminiana* (Caprifoliaceae) u Hrvatskoj. Nat. Croat., Vol. 34, No. 1, 103-112, 2025, Zagreb.

Scabiosa delminiana Abadžić je endem središnjih Dinarida koji raste u pograničnom području Bosne i Hercegovine i Hrvatske. U Hrvatskoj je svojta bila zabilježena samo na nekoliko lokaliteta: uz rijeku Butižnicu, Suhopolje (Dinara), Donja Korita (Kamešnica), Orlove stine (Svilaja) i okolica Sinja (brdo Glavica). Ova studija, provedena tijekom pet vegetacijskih sezona od 2019. do 2023., donosi nova nalazišta *S. delminiana* u Hrvatskoj, koja obuhvaćaju područja Like i unutrašnjosti Dalmacije. Time je zapadna granica rasprostranjenosti vrste u Hrvatskoj sada proširena na Udbinu i Gračac na sjeveru te planinu Prominu i okolicu Sinja na jugu. *Scabiosa delminiana* javlja se na suhim travnjacima koji su ugroženi nedostatkom ispaše, što dovodi do prirodne sukcesije u listopadne šikare i šume. Osim toga, ugrožena je intenzivnom sadnjom crnog bora.

Ključne riječi: Dinarski krš, endemična vrsta, nova nalazišta, staništa, veličina areala

INTRODUCTION

The genus *Scabiosa* L. is represented in the flora of Croatia by a total of 10 taxa (Nikolić, 2024), including *Scabiosa canescens* Waldst. et Kit. and *S. delminiana* Abadžić. *Scabiosa canescens* was first described in 1801 (WALDSTEIN & KITAIBEL, 1799–1802: 53). According to Euro+Med (2006–2024), the center of its distribution range lies in Central Europe. To the north, its range extends to southern Sweden, and to the southeast, it reaches southwestern Anatolia in Turkey (ABADŽIĆ, 2007; DAVIS, 1972). In the Balkans, HAYEK (1930:

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520) mentions the species only for Croatia and Bosnia and Herzegovina. It has not been recorded in Slovenia (MARTINČIČ *et al.*, 1999), Serbia (DIKLIĆ, 1973), Montenegro (Rochlena, 1942), or Albania (Vangjeli, 2015). Reports of its occurrence in Italy are considered doubtful (PIGNATTI, 2018: 686) or erroneous (BARTOLUCCI *et al.*, 2024). In Croatia, the species is known from a small number of localities: KLINGGRÄFF (1861–1862) recorded it for Zagrebačka gora (Medvednica), while SCHLOSSER & VUKOTINOVIĆ (1869: 727) reported it for Jelenje, Grobnik, and Svilno under the name *Astrocephalus suaevolens* Wallr. These same localities were later cited by ROSSI (1930: 297) as *S. suaevolens* Desf. Rossi (op. cit.) notes that the plant was not observed in those localities in subsequent studies and considers these records doubtful. More recently, it has been recorded in Međimurje, near Goričani and Donji Kraljevac, in Učka Nature Park, and in the vicinity of Tršće in Gorski kotar (NIKOLIĆ, 2024). In the border area between Croatia and western Bosnia and Herzegovina, LOVRIĆ & BEDALOV (1987: 179–180) report *S. canescens* along the Butišnica River and the upper reaches of the Una River. However, Visiani's records for the Dinara and Gnjat mountains are attributed to *S. silenifolia* Waldst. et Kit. (VISIANI, 1847: 14, as *Astrocephalus suaevolens* Wallr. β *silenifolia*).

Research over several years into the morphological and chorological characteristics as well as the ecological conditions of populations previously identified as *S. canescens* in western Bosnia and Herzegovina revealed significant differences from the features of *S. canescens*, leading to their attribution to a new species—*Scabiosa delminiana* (ABADŽIĆ, 2007) (Fig. 1). *Scabiosa delminiana* (Figs. 2–4) is distinguished by a glabrous stem, smaller flower capitula (7–11 mm in diameter), and shorter calyx setae (0.5–1.2 mm), in contrast to the grey pubescent stem, larger flower capitula (15–25 mm in diameter), and longer calyx setae (1.4–1.6 mm) of *S. canescens* Waldst. et Kit. (ABADŽIĆ, 2007: tab. 1). The locus classicus is situated on Mount Lip (Lib) at the edge of Duvańsko polje in western Bosnia and Herzegovina.

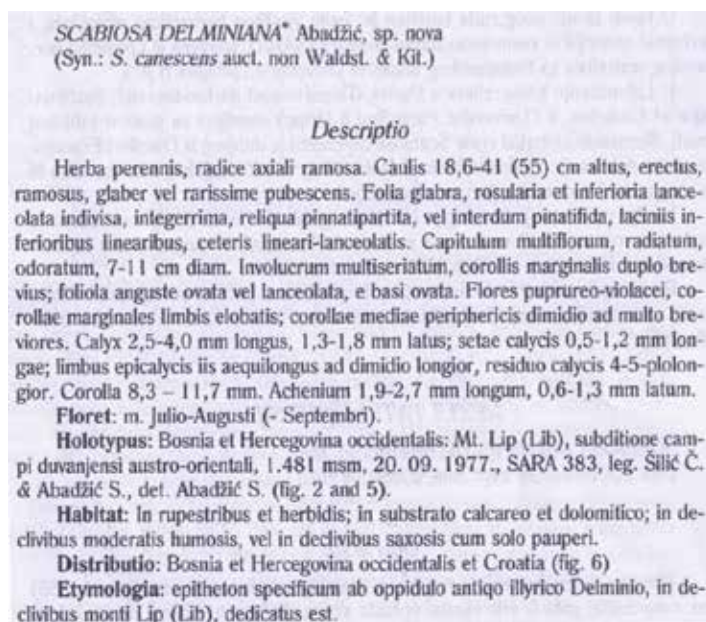


Fig. 1. Original description of the species *Scabiosa delminiana* (ABADŽIĆ, 2007: p. 41).



Fig. 2. *Scabiosa delminiana* – habitus.



Fig. 3. *Scabiosa delminiana* – basal and stem leaves.

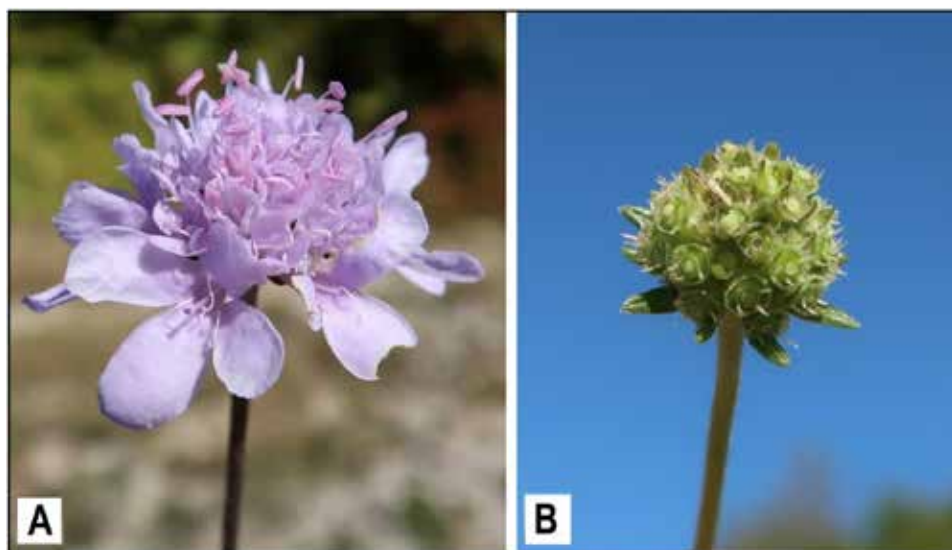


Fig. 4. *Scabiosa delminiana* – flowering (A), and fruiting (B) capitula.

Scabiosa delminiana is endemic to the central Dinarides, with its range including the area of western Bosnia and Herzegovina (the vicinity of Bosansko Grahovo and Drvar, Livanjsko polje, Glamočko polje, Kupreško polje, the vicinity of Posušje, Dugo polje). According to ABADŽIĆ (2007: Fig. 5), occurrences in Croatia in the border area with Bosnia and Herzegovina, along Butižnica (a tributary of the Krka River) and the upper reaches of the Una river (LOVRIĆ & BEDALOV 1987: 179-180, as *S. canescens*) also belong to the newly described taxon of *S. delminiana*. Based on these findings, *S. delminiana* was included in the list of Croatian flora (NIKOLIĆ *et al.*, 2014), as well as in the list of endemic taxa (NIKOLIĆ, 2024). It occurs within the vegetation of the amphi-Adriatic dry steppic sub-Mediterranean grasslands of the order *Scorzonneretalia villosae* Kovačević 1959 (PANDŽA *et al.*, 2025).

In recent years, *S. delminiana* has been recorded on Mount Svilaja, in the vicinity of the village of Tešije (Gornje Ogorje), as well as near the peak of Orlove Stine (MILOVIĆ *et al.*, 2021). Specimens collected on Mount Dinara (in the Suhopolje area and near the mountain shelter called Bili cvitak), near the village of Donja Korita on Mount Kamešnica and on Glavica hill in the vicinity of Sinj (PAURIĆ *et al.*, 2022, NIKOLIĆ, 2024) are stored in the Herbarium of the Faculty of Agriculture in Zagreb (ZAGR).

The aim of this paper was to investigate the distribution of *S. delminiana* in the Lika and Dalmatia regions, along the border with Bosnia and Herzegovina, in order to enhance the understanding of the western and southwestern boundaries of its range in Croatia.

MATERIALS AND METHODS

Field research was carried out from July to October over five vegetation seasons (2019–2023). To identify *S. delminiana*, we relied on the original description by ABADŽIĆ (2007: 40–41) and the identification key provided by NIKOLIĆ (2019). The locus classicus of *S. delminiana* on Mount Lip (Lib) in Bosnia and Herzegovina was visited, which



Fig. 5. Distribution of *Scabiosa delminiana* in Bosnia and Herzegovina and Croatia according to Abadžić (2007: fig. 6).

helped confirm the identification of populations in Croatia. The Gauss-Krüger (GK) coordinates (5th and 6th zone, respectively) and altitudes of new sites were recorded using a GPS (Garmin MAP64s). All collected data, including photographic material, are deposited in the Flora Croatica Database (FCD, NIKOLIĆ, 2024). Herbarium specimens are preserved in the Herbarium of the Botanical Institute at the Faculty of Natural Sciences in Zagreb (ZA). The plant taxonomic nomenclature follows the FCD (NIKOLIĆ, 2024).

RESULTS AND DISCUSSION

Until this study, *S. delminiana* was known in Croatia from only a few localities (ABADŽIĆ, 2007; NIKOLIĆ *et al.*, 2014; MILOVIĆ *et al.*, 2021; PAURIĆ *et al.*, 2022; NIKOLIĆ, 2024). The results of this study confirmed our assumption that the range of *S. delminiana* in Croatia is significantly much wider than previously known. The species was recorded at numerous new sites in the Lika region and in the Dalmatian hinterland.

New sites of *Scabiosa delminiana* in Croatia are as follows:

Lika, between Udbina and Donji Lapac

- Visuć: y=5567645; x=4931975; 815 m a.s.l.; September 19, 2020
- Visuć, Podkuk: y=5568205, x=4931272; 810 m a.s.l.; September 19, 2020 (Fig. 6)
- Visuć, Trnava poljana: y=5569986, x=4931178; 940 m a.s.l.; September 19, 2020
- Međugorje: y=5570854, x=4929761; 972 m a.s.l.; July 9, 2019



Fig. 6. Grassland with *S. delminiana* in the village of Visuć (Podkuk), near Udbina in Lika region.

Lika, between Mazin and Bruvno and surroundings of Bruvno

- between Mazin and Bruvno: y=5574461, x=4921392; 819 m a.s.l.; September 19, 2020
- between Mazin and Bruvno: y=5574126, x=4921157; 772 m a.s.l.; September 19, 2020
- Mandića Draga: y=5577495, x=4919570; 1010 m a.s.l.; July 9, 2019
- surroundings of Bruvno: y=5572072; x=4918756; 755 m a.s.l.; July 9, 2019

Lika, area of Velikopopinsko polje

- Debelo brdo, Srbski klanac: y=5587185, x=4906626; 796 m a.s.l.; July 9, 2019
- Velikopopinsko polje: y=5586259, x=4905407; 693 m a.s.l.; August 20, 2020
- Velikopopinsko polje: y=5585342, x=4903454; 654 m a.s.l.; August 20, 2020

Lika, between Gračac and Otrić

- Vučipolje: y=5575367, x=4903139; 724 m a.s.l.; August 20, 2020
- Malovan: y=5577098, x=4902964; 792 m a.s.l.; August 20, 2020 (Fig. 7)
- Vagan Popinski, Grubišići: y=5581343, x=4902437; 731 m a.s.l.; August 20, 2020

Mt Dinara, hiking trail from Ježević to the peak of Velika Duvjakuša

- y=6383631, x=4866723; 1398 m a.s.l.; July 21, 2021
- y=6383151, x=4866438; 1192 m a.s.l.; July 21, 2021
- y=6383023, x=4866051; 1042 m a.s.l.; July 21, 2021
- y=6382525, x=4865951; 844 m a.s.l.; July 21, 2021
- y=6382106, x=4865889; 748 m a.s.l.; July 21, 2021
- y=6381797, x=4865742; 697 m a.s.l.; July 21, 2021



Fig. 7. Dry rocky grassland with *S. delminiana* in the area of Malovan in the Lika region.

- y=6381318, x=4865501; 605 m a.s.l.; July 21, 2021 **Mt Promina**
- surroundings of Promina mountain lodge: y=5594170, x=4863477; 814 m a.s.l.; October 8, 2023
- surroundings of the village of Trbounje (Vukušići): y=5593378, x=4862456; 578 m a.s.l.; October 8, 2023

Mt Svilaja

- Gornje Ogorje, Ječamnjaci: y=6381350, x=4847280; 1008 m a.s.l.; August 14, 2019 (Fig. 8)

Dinara - Mt Kamešnica

- between the village of Gljev and the peak of Glavaš: y=6403191, x=4844011; 973 m a.s.l.; October 18, 2021
- between the village of Gljev and the peak of Glavaš: y=6404554, x=4843416; 1166 m a.s.l.; June 27, 2021
- between the village of Gljev and the peak of Glavaš: y=6403391, x=4843375; 922 m a.s.l.; June 27, 2021
- Voštane, Akračica: y=6412744, x=4835823; 1020 m a.s.l.; October 2, 2021

Surroundings of Sinj

- Jasensko, Petrada hill: y=6391714, x=4843887; 339 m a.s.l.; October 18, 2020
- Jasensko, Petrada hill: y=6391803, x=4843644; 362 m a.s.l.; October 18, 2020
- Jasensko, Petrada hill: y=6391779, x=4843442; 368 m a.s.l.; June 27, 2021
- Jasensko, Petrada hill: y=6391707, x=4843244; 372 m a.s.l.; June 27, 2021
- Jasensko, near Šušnjarići: y=6391965, x=4843188, 354 m a.s.l.; June 27, 2021



Fig. 8. *Scabiosa delminiana* occurring within the rocky grassland on Mt Svilaja.

- Jasensko, near Šušnjarići: y=6391848, x=4843120; 372 m a.s.l.; June 27, 2021
- between Petrada hill and Šušnjevača hill: y=6391672, x=4842975; 352 m a.s.l.; August 6, 2020
- between Petrada hill and Šušnjevača hill: y=6391657, x=4842864; 345 m a.s.l.; August 6, 2020
- Šušnjevača hill: y=6392318, x=4842629; 402 m a.s.l.; August 6, 2020
- Šušnjevača hill: y=6392716, x=4842611; 384 m a.s.l.; August 6, 2020
- between Šušnjevača hill and Greda hill: y=6392966, x=4842656; 341 m a.s.l.; August 6, 2020
- Greda hill: y=6393344, x=4842820; 352 m a.s.l.; June 27, 2021
- Greda hill: y=6394047, x=4843137; 343 m a.s.l.; June 27, 2021
- Bakračica hill: y=6394442, x=4843544; 345 m a.s.l.; October 2, 2021
- Bakračica hill: y=6394679, x=4843549; 341 m a.s.l.; October 2, 2021
- Bakračica hill: y=6394955, x=4843540; 328 m a.s.l.; October 2, 2021
- Medinjak hill (Čugurna glavica hill): y=6391550, x=4841143; 346 m a.s.l.; August 6, 2020

Surroundings of Trilj

- Bila glavica hill: y=6396767, x=4831857; 346 m a.s.l.; October 2, 2021
- Bila glavica hill: y=6396827, x=4831955; 355 m a.s.l.; October 2, 2021
- Bila glavica hill: y=6396917, x=4831953; 362 m a.s.l.; October 2, 2021

Our study indicates that *S. delminiana* is distributed across the Croatia and Bosnia and Herzegovina border region (Fig. 9), extending from Udbina in the north (Lika region) to the areas around Sinj and Trilj in the south (Dalmatian hinterland). In Croatia, the species' range follows the slopes of Mount Dinara and Kamešnica, with its

western border reaching nearly to the settlements of Udbina and Gračac in the northern part. In the south, the distribution reaches Promina Mountain and the southern slopes of Mount Svilaja, including the surrounding areas of Sinj and Trilj.

Throughout most of its range in Croatia, *S. delminiana* occurs at altitudes between 600 and 1142 m a.s.l., with the highest elevations around the peak of Velika Duvjakuša (1192 and 1398 m a.s.l.) on Dinara Mountain and around the peak of Glavaš (1166 m a.s.l.) on Kamešnica Mountain. In the southern part of its Croatian distribution, particularly on the hills surrounding the edges of Sinjsko polje (such as Čugurna glavica, Petrada, Greda, and Bakračica near Sinj, as well as Bila glavica near Trilj), *S. delminiana* grows at significantly lower altitudes (328–402 m a.s.l.) than at other sites. This altitudinal difference is attributed to the specific microclimate of Sinjsko polje, where, despite its low altitude, temperature inversion causes considerable temperature fluctuations, coupled with severe winter frosts (on average, 63 days of frost per year) and a recorded absolute minimum temperature as low as -24.2°C (KIRIGIN *et al.*, 1971). Sinjsko polje is also characterized for its frequent and intense stormy winds, with an annual average of 79 days featuring wind speeds exceeding force 8 on the Beaufort Scale (Lovrić *et al.*, 1987).

The plant grows within the grasslands, primarily on shallow, skeletal soils developed over dolomite substrates. On the hills along the northwestern edge of Sinjsko polje (such as Petrada, Greda, and Bakračica hills), *S. delminiana* is often found in plant communities alongside species like *Globularia meridionalis* (Podp.) O. Schwarz, *Jurinea mollis* (L.) Rchb., *Satureja subspicata* Bartl. ex Vis., *Edraianthus tenuifolius* (Waldst. et Kit.) A. DC., *Teucrium montanum* L., *Koeleria splendens* C. Presl, *Eryngium amethystinum* L., *Plantago holosteum* Scop., *Asperula purpurea* (L.) Ehrend., *Fumana procumbens* (Dunal) Gren. et Godr., *Asperula aristata* L., and the stenoendemic *Dalmatocytisus dalmaticus* (Vis.) Trinajstić. In many locations, the habitats of *S. delminiana* are threatened by the lack of grazing, leading to natural succession into deciduous thickets and forests. Additionally, in areas near Sinj (e.g., Čugurna glavica and Petrada hills), the planting of black pine (*Pinus nigra* J.F. Arnold) further threatens these habitats.

The localities in Croatia are comparable to those in Bosnia and Herzegovina, as they are situated on the edges of karst fields and in montane areas more or less along the border between the two countries. This geographic continuity suggests the potential for discovering additional sites within the delineated area in Croatia.



Fig. 9. The distribution of *Scabiosa delminiana* in Croatia (taken from NIKOLIĆ, 2024, <https://hirc.botanic.hr/fcd/beta/Map/Distribution/34677>, and rearranged).

ACKNOWLEDGMENTS

We wish to thank Nenad Jasprica who provided helpful comments on earlier versions of this manuscript.

Received December 26, 2024

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