

New records and updated distribution for 44 data deficient, rare, or threatened vascular plants from Croatia

SEBASTIAN ĆATO

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Abstract

Floristic research conducted in different regions of Croatia over the past four years has yielded valuable data on 44 rare and threatened taxa within the Croatian flora. In all, eleven taxa are classified within threatened categories: one near threatened, one vulnerable, three endangered, and six critically endangered. Additionally, three taxa are data deficient. These records expand the known distribution range of 21 taxa, fill existing gaps for 23 taxa, and, in some cases, confirm the presence of taxa not recorded in Croatia for extended periods.

Keywords: allochthonous, flora, Southeastern Europe, Vodice

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Sažetak

Floristička istraživanja provedena u različitim područjima Hrvatske tijekom posljednje četiri godine rezultirala su vrijednim podacima o 44 rijetke i ugrožene svoje hrvatske flore. Ukupno 11 svojti je klasificirano u nekoj kategoriji ugroženosti: jedna gotovo ugrožena, jedna osjetljiva, tri ugrožene i šest kritično ugroženih. Dodatne tri vrste su nedovoljno poznate. Ovi nalazi proširuju poznato područje rasprostranjenosti za 21 svojtu, popunjuju postojeće praznine u području rasprostranjenosti za 23 svojte, a u nekim slučajevima služe i kao potvrda prisutnosti svojti koje duže razdoblje nisu bilježene u Hrvatskoj.

Ključne riječi: alohtono, flora, Jugoistočna Europa, Vodice

Introduction

For a better understanding of the distribution and population state of various organisms occurring in a specific area, the possession of recent and confirmed records is crucial for planning and executing further actions, such as conservation. Croatia is a country very rich in vascular plants, having almost 5000 taxa occurring on an area of 56,594 km², ranking third in richness of plant diversity in Europe (Nikolić et al. 2014). Croatia is still not explored completely, with new plant species being described almost annually from the country (e.g., Conti & Stinca 2023, Bogdanović et al. 2022). Floristic investigations of specific areas can lead to unexpected and rare discoveries. Although some may view checklist creation as less complex than or not as essential as other research, it is crucial for a better understanding of both local and national biodiversity (e.g., Trinajstić et al. 1995, Pandža 1998). A good recent example of this is the floristic investigation of the town of Vodice (Dalmatia) and its surroundings, where, in the past years, many important records were created during field work. Multiple data deficient, threatened, and invasive species were discovered in the area, while in some instances, taxa were found after decades or even centuries of not being recorded in the Croatian flora. What began as a small personal project yielded valuable data and even helped solve several longstanding botanical mysteries in Croatia. All these important

discoveries from Vodice and from other areas of the country are presented here and further discussed.

Materials and methods

Field work was performed over a period of four years, from May 2021 to March 2025. It was performed in areas of central Croatia, Istria, Gorski Kotar, Lika region, and Dalmatia, with a focus on northern Dalmatia, especially the city of Vodice and its surroundings. Valuable discoveries were investigated in more detail using available literature (e.g., Host 1802, Visiani 1847, Schlosser & Vukotinović 1869, Hirc 1909, Rossi 1930, Hruševar et al. 2022) and herbaria paired with Flora Croatica Database – FCD (Nikolić et al. 2025). Identifications were completed using the most recent key for the Croatian flora (Nikolić 2020a, 2020b) and relevant papers containing new and additional data (e.g., Maslo 2019, Borovečki Voska 2023). Nomenclature follows Plants of the World Online (POWO 2025) apart from *Ophrys archipelagi*, whose nomenclature is according to FCD (Nikolić et al. 2025). IUCN vulnerability categories are according to the Croatian Red Book of vascular flora (Nikolić & Topić 2005). Collected plant materials are stored in the ZA herbarium. Specific details of the newly reported localities are presented in Tab. 1, while the updated distribution of the mentioned taxa is shown in Fig. 1, 2, 3 and 4.

Table 1. Details of all newly discovered localities of the 44 discussed taxa (IUCN status: CR – critically endangered, EN – endangered, VU – vulnerable, NT – near threatened, DD – data deficient).

Tablica 1. Podaci o novo otkrivenim nalazištima 44 svojte (IUCN status: CR – kritično ugrožena, EN – ugrožena, VU – osjetljiva, NT – gotovo ugrožena, DD – nedovoljno poznata).

Taxon	Location	Date	Coordinates	IUCN
<i>Acalypha rhomboidea</i> Raf.	Central Croatia, Karlovac	4 June 2024	45.526878°N, 15.568442°E	-
<i>Adonis microcarpa</i> DC.	Northern Dalmatia, Vodice	18 Apr 2022	43.816500°N, 15.763353°E	-
<i>Adonis microcarpa</i> DC.	Northern Dalmatia, Vodice	6 May 2023	43.824349°N, 15.770767°E	-
<i>Alyssum turkestanicum</i> Regel & Schmalh	Northern Dalmatia, Vodice	11 May 2023	43.767607°N, 15.764533°E	-
<i>Alyssum turkestanicum</i> Regel & Schmalh	Northern Dalmatia, Vodice	12 May 2023	43.807441°N, 15.776689°E	-
<i>Alyssum turkestanicum</i> Regel & Schmalh	Northern Dalmatia, Vodice	25 May 2023	43.771491°N, 15.783344°E	-
<i>Alyssum turkestanicum</i> Regel & Schmalh	Northern Dalmatia, Vodice	2 July 2023	43.903207°N, 15.854623°E	-
<i>Alyssum turkestanicum</i> Regel & Schmalh	Northern Dalmatia, Gornji Karin	28 April 2024	44.141782°N, 15.665640°E	-
<i>Baldellia ranunculoides</i> (L.) Parl.	Northern Dalmatia, Vodice	1 July 2023	43.820614°N, 15.776858°E	CR
<i>Biarum tenuifolium</i> (L.) Schott	Northern Dalmatia, Vodice	25 September 2021	43.773929°N, 15.790867°E	-
<i>Biarum tenuifolium</i> (L.) Schott	Northern Dalmatia, Vodice	13 September 2022	43.790750°N, 15.764112°E	-
<i>Biarum tenuifolium</i> (L.) Schott	Northern Dalmatia, Vodice	12 April 2023	43.809003°N, 15.775723°E	-
<i>Biarum tenuifolium</i> (L.) Schott	Northern Dalmatia, Vodice	25 September 2024	43.772845°N, 15.772569°E	-

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Taxon	Location	Date	Coordinates	IUCN
<i>Bromus catharticus</i> Vahl.	Souther Dalmatia, Buk Vlaka	15 July 2024	43.013846°N, 17.513350°E	-
<i>Cardamine occulta</i> Hornem.	Northern Dalmatia, Dubrava kod Šibenika (Garden center Dubrava)	1 August 2022	43.735720°N, 15.946886°E	-
<i>Cardamine occulta</i> Hornem.	Northern Dalmatia, Vodice	24 February 2024	43.755310°N, 15.783974°E	-
<i>Cardamine occulta</i> Hornem.	Central Croatia, Zagreb	10 January 2025	45.814274°N, 15.998062°E	-
<i>Centaurea benedicta</i> (L.) L.	Northern Dalmatia, Vodice	16 May 2022	43.773984°N, 15.771984°E	-
<i>Centaurea benedicta</i> (L.) L.	Northern Dalmatia, Vodice	31 May 2024	43.779015°N, 15.774463°E	-
<i>Colchicum doerfleri</i> Halácsy	Northern Dalmatia, Vodice	2 April 2023	43.773526°N, 15.763514°E	-
<i>Colchicum doerfleri</i> Halácsy	Northern Dalmatia, Vodice	6 April 2023	43.769045°N, 15.791605°E	-
<i>Colchicum doerfleri</i> Halácsy	Northern Dalmatia, Vodice	6 April 2023	43.764706°N, 15.793126°E	-
<i>Colchicum doerfleri</i> Halácsy	Northern Dalmatia, Vodice	8 April 2023	43.772787°N, 15.789708°E	-
<i>Colchicum doerfleri</i> Halácsy	Northern Dalmatia, Vodice	11 April 2023	43.778748°N, 15.754834°E	-
<i>Colchicum doerfleri</i> Halácsy	Central Dalmatia, Hvar Island	5 March 2025	43.129593°N, 16.829875°E	-
<i>Crataegus pentagyna</i> Waldst. & Kit. ex Willd	Northern Dalmatia, Vodice	2 October 2021	43.788833°N, 15.767419°E	-
<i>Crataegus pentagyna</i> Waldst. & Kit. ex Willd	Northern Dalmatia, Vodice	21 November 2021	43.773023°N, 15.763380°E	-

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Taxon	Location	Date	Coordinates	IUCN
<i>Crepis bursifolia</i> L.	Northern Dalmatia, Vodice	8 May 2023	43.768994°N, 15.773379°E	-
<i>Crepis bursifolia</i> L.	Northern Dalmatia, Vodice	11 May 2023	43.763826°N, 15.767848°E	-
<i>Crepis bursifolia</i> L.	Northern Dalmatia, Vodice	10 July 2024	43.758050°N, 15.765207°E	-
<i>Damasonium polyspermum</i> Coss.	Northern Dalmatia, Vodice	19 August 2021	43.820614°N, 15.776858°E	CR
<i>Falcaria vulgaris</i> Fabr.	Northern Dalmatia, Vodice	12 April 2023	43.809900°N, 15.773723°E	-
<i>Falcaria vulgaris</i> Fabr.	Northern Dalmatia, Vodice	1 May 2023	43.754202°N, 15.761551°E	-
<i>Heliotropium supinum</i> L.	Central Dalmatia, Knezovići	4 June 2022	43.460232°N, 17.110755°E	CR
<i>Heliotropium supinum</i> L.	Northern Dalmatia, Vodice	14 August 2022	43.814303°N, 15.766320°E	CR
<i>Isolepis setacea</i> (L.) R. Br.	Northern Dalmatia, Vodice	30 May 2024	43.754187°N, 15.761969°E	CR
<i>Juncus hybridus</i> Brot.	Northern Dalmatia, Vodice	1 May 2023	43.752629°N, 15.759866°E	-
<i>Juncus ranarius</i> Songeon & E. P. Perrier	Northern Dalmatia, Vodice	14 May 2021	43.824937°N, 15.770713°E	-
<i>Lythrum thymifolium</i> L.	Northern Dalmatia, Zablacé (Šibenik)	20 May 2023	43.718194°N, 15.870266°E	-
<i>Lythrum thymifolium</i> L.	Northern Dalmatia, Vodice	1 July 2023	43.752699°N, 15.759931°E	-
<i>Lythrum thymifolium</i> L.	Northern Dalmatia, Vodice	30 May 2024	43.754497°N, 15.762216°E	-
<i>Lythrum tribracteatum</i> Spreng	Northern Dalmatia, Vodice	1 July 2023	43.820614°N, 15.776858°E	CR

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Taxon	Location	Date	Coordinates	IUCN
<i>Melampyrum barbatum</i> ssp. <i>carstiense</i> Ronniger	Northern Dalmatia, Vodice	13 May 2022	43.800937°N, 15.751208°E	-
<i>Muscari tenuiflorum</i> Tausch	Northern Dalmatia, Gornji Karin	1 May 2023	44.134867°N, 15.654691°E	-
<i>Muscari tenuiflorum</i> Tausch	Northern Dalmatia, Gornji Karin	3 May 2023	44.137377°N, 15.655110°E	-
<i>Nicotiana alata</i> Link & Otto	Easterna Croatia, Vinkovci	29 September 2022	45.290683°N, 18.794539°E	-
<i>Nicotiana tabacum</i> L.	Southern Croatia, Bijeli Vir	16 July 2024	43.015399°N, 17.656880°E	-
<i>Oenothera glazoviana</i> Micheli	Northern Dalmatia, Vodice	29 March 2024	43.770497°N, 15.788502°E	-
<i>Oenothera speciosa</i> Nutt.	Northern Dalmatia, Vodice	20 September 2023	43.769986°N, 15.773073°E	-
<i>Ophrys archipelagi</i> Gölz & H. R. Reinhard	Northern Dalmatia, Vodice	29 March 2022	43.800310°N, 15.788174°E	DD
<i>Ophrys archipelagi</i> Gölz & H. R. Reinhard	Northern Dalmatia, Vodice	29 March 2024	43.771094°N, 15.795400°E	DD
<i>Ophrys bombyliflora</i> Link	Northern Dalmatia, Vodice	1 May 2023	43.753578°N, 15.760413°E	VU
<i>Orobanche cernua</i> Loefl.	Northern Dalmatia, Jadrija (Šibenik)	15 June 2022	43.726154°N, 15.840531°E	-
<i>Orobanche pubescens</i> d'Urv	Northern Dalmatia, Vodice	8 May 2023	43.766798°N, 15.774334°E	-
<i>Oxalis pes-caprae</i> L.	Northern Dalmatia, Solaris (Šibenik)	26 March 2023	43.695193°N, 15.885655°E	-
<i>Periploca graeca</i> L.	Northern Dalmatia, Lake Vrana (Pakoštane)	18 June 2022	43.934224°N, 15.513618°E	EN

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Taxon	Location	Date	Coordinates	IUCN
<i>Plantago crassifolia</i> Forssk.	Northern Dalmatia, Seline	11 May 2024	44.268686°N, 15.480836°E	-
<i>Plantago major</i> ssp. <i>winteri</i> (Wirtg.) W. Ludw.	Northern Dalmatia, Vodice	31 August 2023	43.753636°N, 15.762082°E	-
<i>Plantago major</i> ssp. <i>winteri</i> (Wirtg.) W. Ludw.	Northern Dalmatia, NP Paklenica	25 July 2024	44.330909°N, 15.560170°E	-
<i>Sabulina attica</i> (Boiss. & Spruner) Dillenb. & Kadereit ssp. <i>attica</i>	Northern Dalmatia, Vodice	18 April 2021	43.769552°N, 15.754952°E	-
<i>Schoenoplectiella supina</i> (L.) Lye	Northern Dalmatia, Vodice	1 July 2023	43.820614°N, 15.776858°E	-
<i>Setaria adhaerens</i> (Forssk.) Chiov.	Northern Dalmatia, Vodice	27 September 2024	43.753737°N, 15.767049°E	-
<i>Setaria adhaerens</i> (Forssk.) Chiov.	Northern Dalmatia, Vodice	27 September 2024	43.755791°N, 15.769200°E	-
<i>Setaria faberi</i> R. A. W. Herrm.	Northern Dalmatia, Dubrava kod Šibenika	1 August 2022	43.736705°N, 15.947122°E	-
<i>Sporobolus aculeatus</i> (L.) P. M. Peterson	Northern Dalmatia, Vodice	31 August 2023	43.752207°N, 15.758203°E	NT
<i>Stellaria ruderalis</i> M. Lepší, P. Lepší, Z. Kaplan & P. Koutecký	Northern Dalmatia, Lozovac (Šibenik)	9 April 2023	43.804112°N, 15.963542°E	-
<i>Stellaria ruderalis</i> M. Lepší, P. Lepší, Z. Kaplan & P. Koutecký	Northern Istria, Monterol (Umag)	3 May 2023	45.455946°N, 13.519986°E	-
<i>Stellaria ruderalis</i> M. Lepší, P. Lepší, Z. Kaplan & P. Koutecký	Gorski Kotar, Gornje Dubrave	26 April 2023	45.308410°N, 15.278614°E	-
<i>Stellaria ruderalis</i> M. Lepší, P. Lepší, Z. Kaplan & P. Koutecký	Central Dalmatia, Hvar Island	2 March 2025	43.180541°N, 16.426283°E	-

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<i>Stellaria ruderalis</i> M. Lepší, P. Lepší, Z. Kaplan & P. Koutecký	Central Dalmatia, Hvar Island	7 March 2025	43.143192°N, 16.757498°E	-
<i>Stellaria ruderalis</i> M. Lepší, P. Lepší, Z. Kaplan & P. Koutecký	Central Croatia, Zagreb	18 March 2025	45.818145°N, 15.994956°E	-
<i>Sternbergia colchiflora</i> Waldst. et Kit.	Northern Dalmatia, Vodice	20 March 2022	43.772632°N, 15.772988°E	EN
<i>Sternbergia colchiflora</i> Waldst. et Kit.	Northern Dalmatia, Vodice	20 September 2022	43.778581°N, 15.774028°E	EN
<i>Trifolium lucanicum</i> Guss.	Northern Dalmatia, Vodice	8 May 2023	43.776265°N, 15.779413°E	-
<i>Trifolium lucanicum</i> Guss.	Northern Dalmatia, Vodice	12 May 2023	43.807472°N, 15.776759°E	-
<i>Trifolium lucanicum</i> Guss.	Northern Dalmatia, Vodice	23 May 2023	43.776920°N, 15.773664°E	-
<i>Trifolium lucanicum</i> Guss.	Northern Dalmatia, Gornji Karin	28 April 2024	44.141651°N, 15.666558°E	-
<i>T. spumosum</i> L.	Northern Dalmatia, Vodice	19 April 2023	43.790316°N, 15.767210°E	DD
<i>Veronica dalmatica</i> Padilla-García, Rojas-Andrés, López-González & M. M. Mart. Ort.	Northern Dalmatia, Vodice	30 March 2024	43.792999°N, 15.754609°E	-
<i>Xeranthemum cylindraceum</i> Sm.	Northern Dalmatia, Vodice	30 May 2022	43.819128°N, 15.776662°E	-
<i>Xeranthemum cylindraceum</i> Sm.	Northern Dalmatia, Koljane	7 August 2022	43.885707°N, 16.459064°E	-

Results and Discussion

Records of 44 data deficient, rare, and endangered taxa made over the past four years are presented here in alphabetical order and discussed in some detail. These records expand the distribution area for 22 taxa, fill in the existing range with new records for 23 taxa, and for four taxa even serve as a confirmation of their presence in Croatia (Fig. 1, 2, 3 and 4).

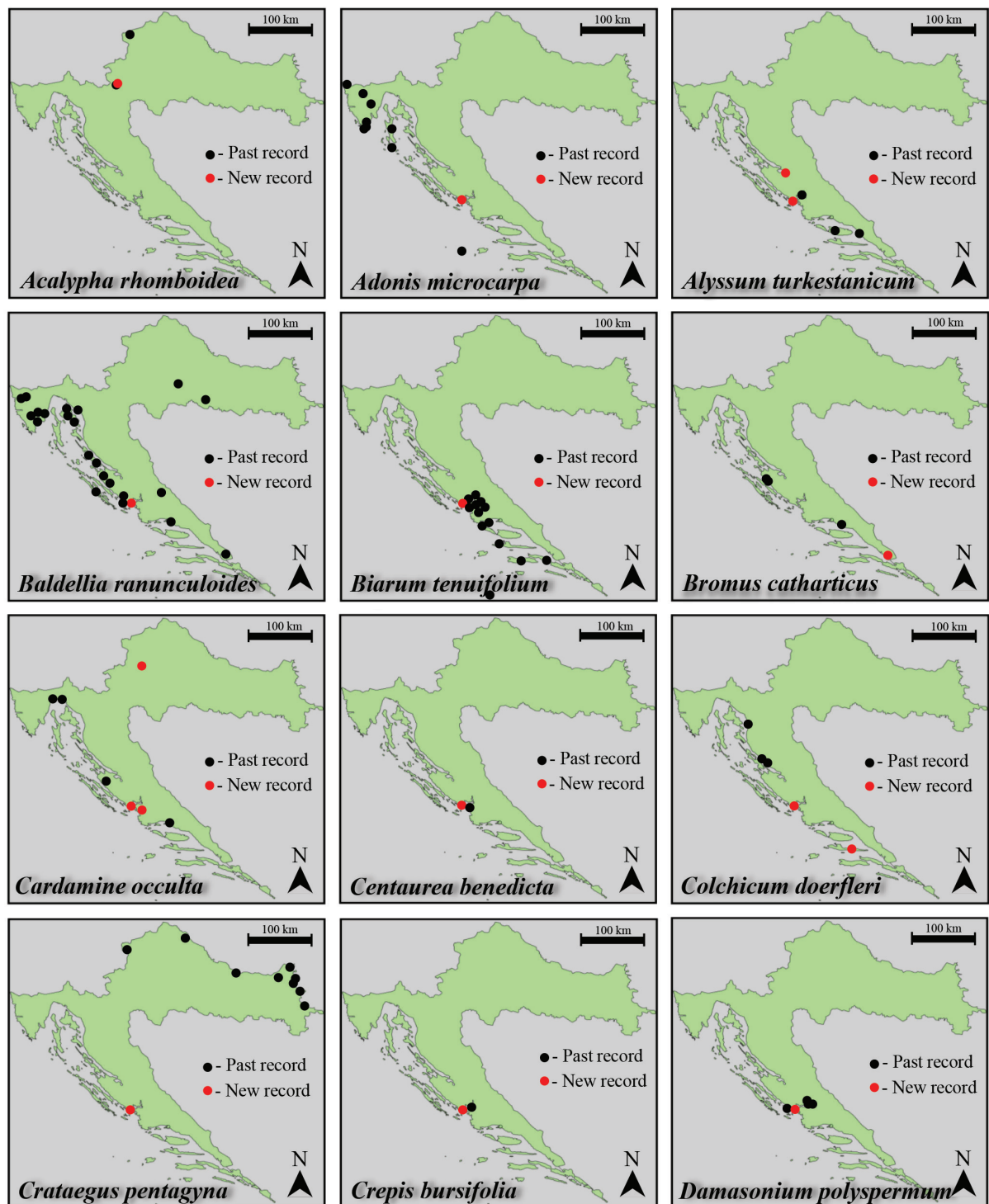


Figure 1. Updated distribution of selected species in alphabetical order (Ac-Da). Black dots show past records, while red dots represent new records reported here.

Slika 1. Ažurirana rasprostranjenost odabranih vrsta po abecednom redu (Ac-Da). Crne točke označavaju stara nalazišta, dok crvene točke predstavljaju nova nalazišta iz ovog rada.

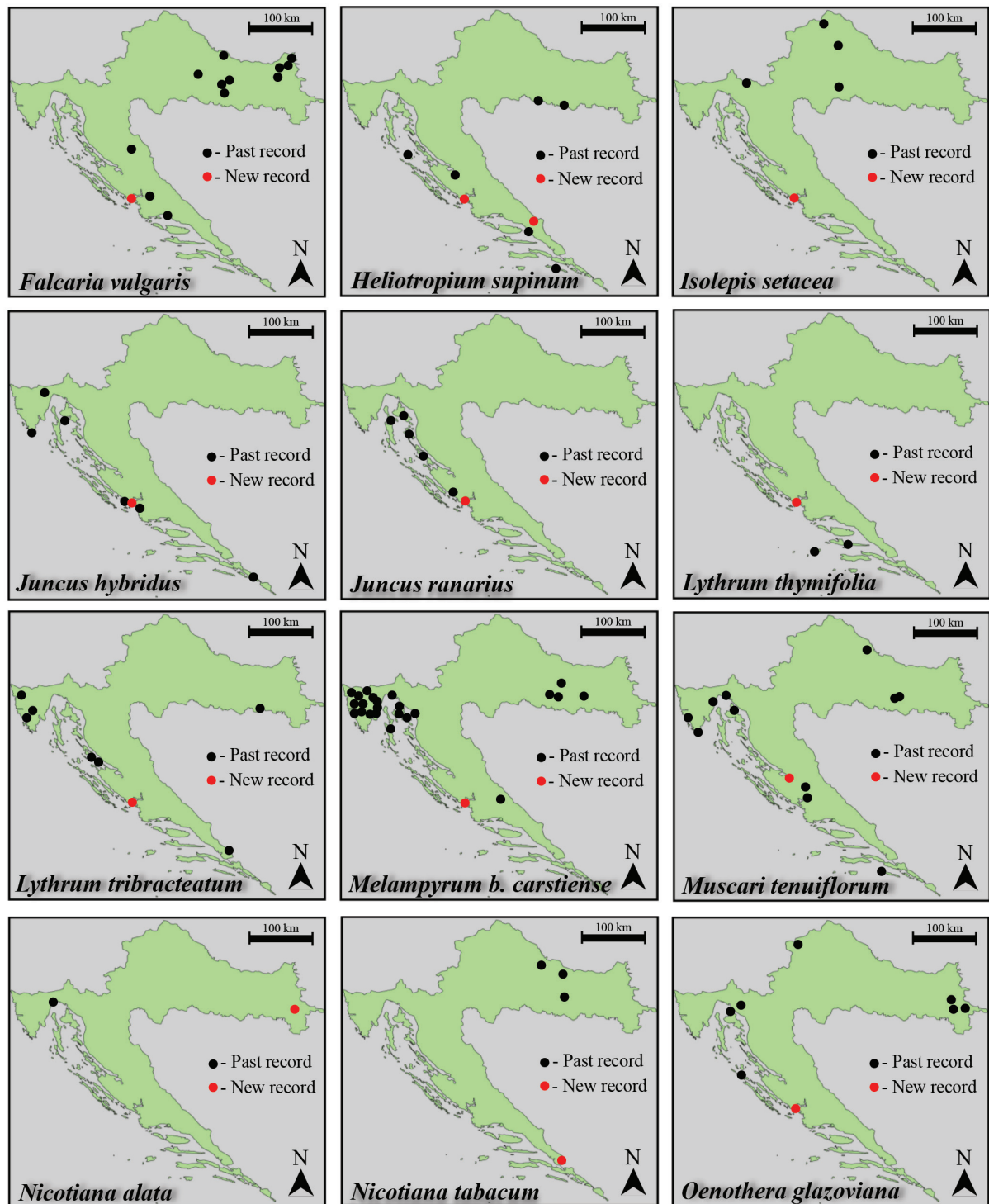


Figure 2. Updated distribution of selected species in alphabetical order (Fa-Oe). Black dots show past records, while red dots represent new records reported here.

Slika 2. Ažurirana rasprostranjenost odabranih vrsta po abecednom redu (Fa-Oe). Crne točke označavaju stara nalazišta, dok crvene točke predstavljaju nova nalazišta iz ovog rada.

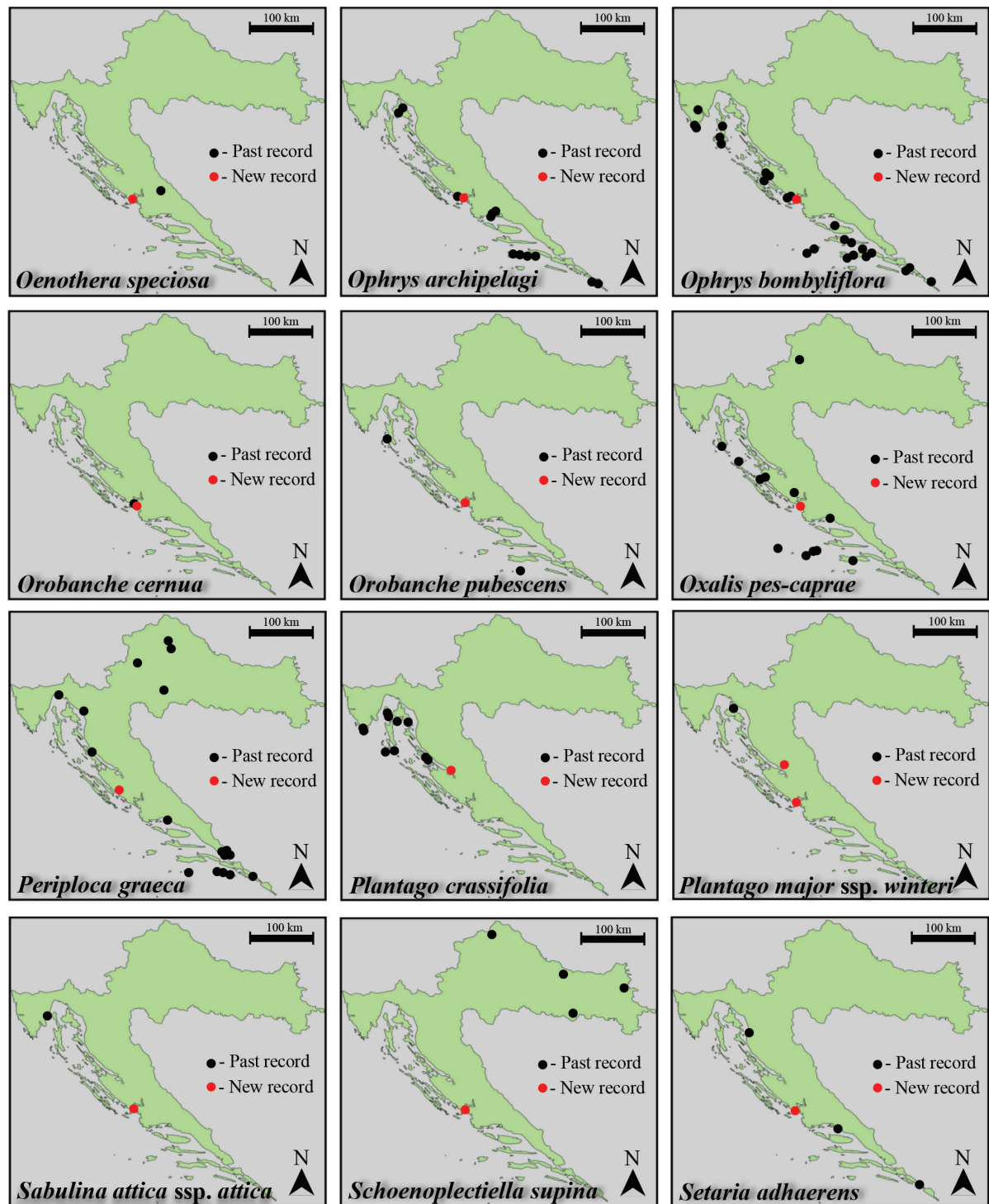


Figure 3. Updated distribution of selected species in alphabetical order (Oe-Se). Black dots show past records, while red dots represent new records reported here.

Slika 3. Ažurirana rasprostranjenost odabranih vrsta po abecednom redu (Oe-Se). Crne točke označavaju stara nalazišta, dok crvene točke predstavljaju nova nalazišta iz ovog rada.

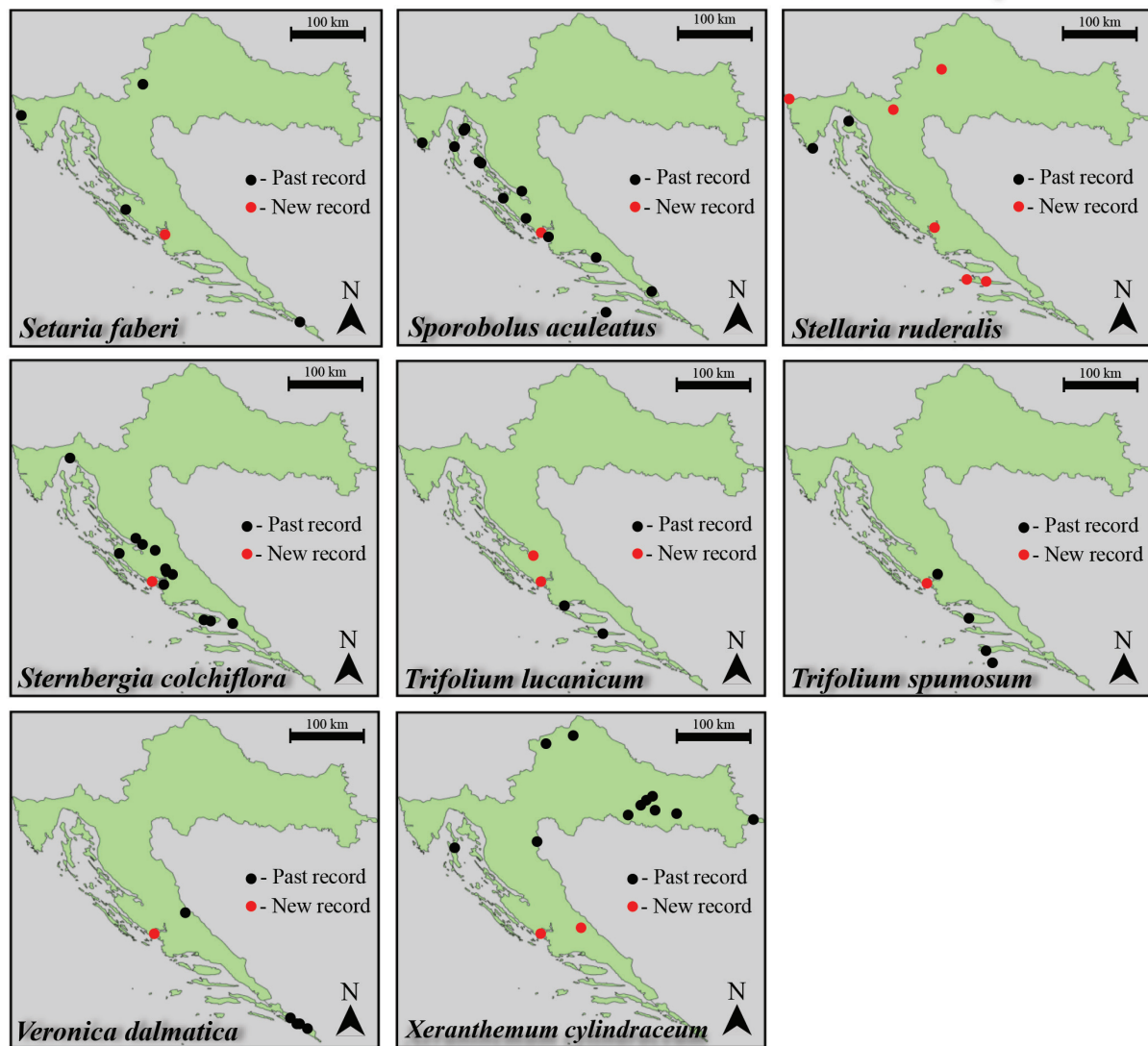


Figure 4. Updated distribution of selected species in alphabetical order (Se-Xe). Black dots show past records, while red dots represent new records reported here.

Slika 4. Ažurirana rasprostranjenost odabranih vrsta po abecednom redu (Se-Xe). Crne točke označavaju stara nalazišta, dok crvene točke predstavljaju nova nalazišta iz ovog rada.

***Acalypha rhomboidea* Raf.**

Acalypha rhomboidea (Euphorbiaceae) is an annual plant native to North America, which was documented in Europe for the first time from Portugal in 2006 (Almeida & Matos 2006). After the initial finding, it was also later recorded from multiple other European countries, including Croatia (Borovečki-Voska et al. 2023). This is the second species of *Acalypha* confirmed for the country, right after *A. virginica* L., which was discovered in the urban flora of Split

in 2003 (Ruščić 2003). As mentioned, *A. rhomboidea* was only recently found in Croatia at two localities, Karlovac and the castle of Kostel (Hrvatsko Zagorje). In June of 2024, a new population of this species was discovered three kilometres from the reported site in Karlovac. It consisted of numerous young plants growing on both sides of a gravelled road, a habitat quite like those reported by Borovečki-Voska et al. (2023). The site was visited again in October when mature plants were also found at the edge of a nearby

forest. Mature specimens were collected and are deposited in ZA (80599). This additional record shows that the species could very well already be present in a much wider area than previously thought (Fig. 1).

***Adonis microcarpa* DC. (Fig. 5A)**

Adonis microcarpa (Ranunculaceae) has only a few sparse records in Croatia, found in Istria (Griebel 2009), on Cres and Lošinj island (Wallnöfer 2008), and on the very remote island of Svetac (Pavletić 1978). There were no past records of the species from the Dalmatian mainland until now (Fig. 1). It was discovered in Vodice (northern Dalmatia) at two locations, both in the town's hinterland. The plants were found next to macadam roads and olive groves, appearing in small groups. Additional data on the occurrence of this species in Dalmatia is needed to determine whether it is genuinely rare or simply under-recorded.

***Alyssum turkestanicum* Regel & Schmalh**

Genus *Alyssum* (Brassicaceae) is represented by eight species in the Croatian flora (Rešetnik & Španiel, 2018). Four taxa present are annuals: *A. alysoides* (L.) L., *A. simplex* Rudolphi, and *A. strigosum* Banks & Sol., and *A. turkestanicum*, the latter being quite rare and even considered doubtful for Croatia (Rešetnik & Španiel 2018). It differs from all the other annual *Alyssum* species present by its glabrous or almost fully glabrous ovaries (Rešetnik & Španiel 2018). The initial finding of the taxon in Croatia is from the early 1800s, when the species was found in Makarska under the synonym *A. minimum* Willd. (Host 1802). Other observations are from Brač Island (Ruščić 2009) and Krka National Park (Hršak et al. 2022). Plazibat (2006) also mentions three herbarium specimens in ZA. New records of this species are from three localities in northern Dalmatia: Vodice, Vaćani, and Gornji Karin (Fig. 1). In Vodice it was observed on three sites growing in meadows and co-occurring with other *Alyssum* species, most commonly *A. simplex*. Records from Vaćani and Gornji Karin are both from a single site,

appearing in habitats identical to those in Vodice with other *Alyssum* species. All these new observations are based typically on the finding of a single individual rather than a group, as this species tends to be solitary and has low population density.

***Baldellia ranunculoides* (L.) Parl. (Fig. 5B)**

From the genus *Baldellia* (Alismataceae), only *B. ranunculoides* occurs in Croatia and is usually found in the Mediterranean region. So far, it has been recorded in Istria (Rossi 1930), Kvarner area (e.g., Visiani 1842, Schlosser & Vukotinović 1869, Trinajstić 1965), Dalmatia (e.g., Visiani 1842, Schlosser & Vukotinović 1869, Pandža 1998, Ljubičić & Britvec 2006, Stančić 2008) and the Neretva valley (e.g., Schlosser & Vukotinović 1869). Two old herbarium specimens from continental Croatia were sourced from the area of Lonjsko polje (ZA 12389, ZA 12391). On the European scale, it has a near-threatened status (Lansdown 2014), and in Croatia, it was assessed as critically endangered (CR) (Nikolić & Topić 2005). Many plant species found in Mediterranean temporary ponds are threatened, as these habitats are at risk of disappearing due to factors such as increased solar radiation, habitat fragmentation or complete habitat destruction (Blaustein & Schwartz 2000). The newest record of *B. ranunculoides* is from Vodice (northern Dalmatia), where a population was discovered in the hinterland of the town, at the largest water body in the area - the Kovča Marsh. A population of 20 to 30 individuals was discovered growing with other rare and threatened taxa, mentioned below. The nearest known localities include Murter (Pandža 1998) and Vransko Lake near Pakoštane (Staničić 2008) (Fig. 1). Should there be no or little precipitation during winter and spring, the species tends to stay dormant for the season in the seed bank of the marsh. Herbarium voucher is deposited in ZA (80636).

***Biarum tenuifolium* (L.) Schott (Fig. 5C)**

Biarum tenuifolium (Araceae) is distributed in the northern Mediterranean, including Croatia. The first literature record is found in Flora Dalmatica (Visiani

1842), where the species is mentioned for the island of Korčula and the rocky hills surrounding Šibenik. It was later found in the wider area of Šibenik (e.g., Bedalov 1967–1968, Milović 2002), as well as in Krka National Park (Hršak et al. 2022) and on several islands, including Veli Drvenik (Bedalov 1967–1968), Čiovo (Ževrnja 2010), Hvar (Trinajstić 1993), Mljet (Regula-Bevilacqua & Ilijanić 1984) and the Pelješac Peninsula (Bedalov 1967–1968). Among these, the most records are from the Šibenik area (Fig. 1). The recent findings come from the Vodice area, where four new localities were discovered. These individuals were commonly observed along roadsides and represent the species' currently westernmost known occurrences in Croatia. Flowering takes place in September and October, with leaves emerging near the end of the flowering period and disappearing during the summer months. As moisture and cooler temperatures return in late summer, the plant's cycle begins anew. The late flowering period makes it challenging to record this species, as not many people are in the field during this period. The foliage can be easily missed with the presence of dense vegetation, as the small, lanceolate-linear green leaves easily blend in with the environment.

***Bromus catharticus* Vahl.**

According to the Flora Croatica Database (Nikolić et al. 2025), there are 27 taxa of the genus *Bromus* (Poaceae) documented for the country, with a single recorded alien species, *B. catharticus*. It is a species grown for fodder, which usually gets naturalized where it is grown (Smith 1980). The native range of this species is South America, but there are numerous records from North America, Europe, Africa, Asia, and even Australia, meaning it can be found on all continents except Antarctica (POWO 2025). There are just a few records of the species in Croatia, mainly from the Zadar area (Maly 1928, Milović et al. 2010, Milović & Mitić 2012). There are two additional observations from Split (Maslo 2015) and Bibinje, Zadar area (Pandža 2017). The species was recently found in the agricultural lands of the

Neretva River delta, where a dense population was observed growing alongside a canal. Although only a small portion of the area was surveyed, the species is likely to be more widely distributed throughout the delta. This new record is geographically isolated from the others and is currently the southernmost known occurrence in Croatia (Fig. 1).

***Cardamine occulta* Hornem.**

Over 20 taxa of *Cardamine* (Brassicaceae) can be found in Croatia, out of which seven species are endemic (Nikolić et al. 2015). The only introduced and potentially invasive species in Croatia is the East Asian native *C. occulta*, which was discovered in 2017 in two plant nurseries in Dalmatia (Zemunik Donji and Split) and was also found in flowerpots in the continental part of Croatia (Hruševac et al. 2021). Most recent records are outside plant nurseries, from Opatija (Király et al. 2021) and from Rijeka (Randić 2022, 2023). As well as in Croatia, it occurs in a big part of Europe, with the initial findings from Belgium and Italy being made in the 20th century (POWO 2025). New records of the species come from the Šibenik area, Vodice (northern Dalmatia), and Zagreb (Fig. 1). An observation from Šibenska Dubrava revealed another occurrence of the species in a plant nursery. During August of 2022, numerous individuals were found growing in different areas of the Dubrava Garden Centre, some of which were collected (ZA 80637). Some time later, during 2024, individuals were found in Vodice growing as a weed in a plant pot and among seasonal decorative plants in the lawn (the plant material from both locations probably came from the same garden centre in which it had been discovered two years before). This is not the first time for introduced and potentially invasive species to be found in this garden centre, with multiple occurrences in the past (Ćato & Zagorac 2021, Martinović et al. 2022). It even served as the introduction pathway for the recently introduced *Euphorbia hypericifolia* L. (Ćato et al. 2023). After all, horticulture is the leading introduction gateway for alien insects,

pathogens, and, of course, plants (Liebhold et al. 2012). In early 2025, the species was also discovered in Zagreb, growing in sidewalk cracks of the city together with the similar *Cardamine hirsuta* L. As the species has been present in Croatia for some years now, it will without a doubt be found in other areas of the country, especially plant nurseries.

***Centaurea benedicta* (L.) L. (Fig. 5D)**

Centaurea (Asteraceae) is a large genus with a native range in the temperate and subtropical Old World (POWO 2025), there being close to a hundred taxa in Croatia alone (Nikolić et al 2025). One of the countries' rarest species from this genus is undoubtedly *C. benedicta* with a single historical record from Šibenik (Fig.1), reported as *Cnicus benedictus* L. in Visiani (1847), but the species has not been recorded in the area again during any of the recent floristic surveys (Milović 2002). This fact leads to questioning and even doubting the species' current presence in the country, as it has not been documented for over 150 years. During May of 2022, three mature specimens of *C. benedicta* were discovered on a ruderal site, and two years later, a larger and healthier population of over 10 individuals was discovered on a soil dump nearby. It prefers ruderal and anthropogenic habitats, thriving on disturbed soils that are perfect for seed germination and the successful development of young plants without much competition. Flowering and seed production take place before the summer heat and drought, after which dead specimens can still be observed. Herbarium voucher is stored in ZA (80635). These two records would be the first findings of this taxon in Croatia since 1847, with the species' presence now re-confirmed for Croatia. Observations in similar habitats are expected in the surrounding areas, with the old record from Šibenik needing confirmation.

***Colchicum doerfleri* Halácsy (Fig. 5E)**

In Croatia, this genus *Colchicum* (Colchicaceae) is represented by six species (Milović 2017), among which there is *C. doerfleri*, occurring in Albania,

North Macedonia, Bulgaria, Greece, and Croatia. It was described by E. de Halácsy in 1897 based on plants collected from Albania as a spring-flowering species with synanthic leaves which are glabrous on the upper side, but densely pubescent on the under side, flowering with up to eight lilac-pink flowers (Degen & Döerfler 1897). A similar and commonly occurring species in Croatia is *C. hungaricum* Janka, which has both sides of the leaf glabrous with hairs present only on the margins. Just a couple of literature records of *C. doerfleri* exist in Croatia, from the Velebit area. In the publication by Rossi (1930), an observation by J. Kúmerle from the surroundings of Senj (Medarje) is mentioned together with an observation by S. Kocsis, lacking specific details but referring to Velebit Mountain. In Flora Velebitica (Degen 1936), observations by S. Kocsis are again referred to, this time with data - Karlobag and Lukovo Šugarje. In that work, Degen refers to this taxon as a variety of the related *C. hungaricum* – *C. hungaricum* var. *doerfleri* (Halácsy) Degen. It was referred to as a variety for some time, until it was restored to the status of species without any additional research or specific details (Persson et al. 2007). As it had the status of a variety for some time and no other Croatian records refer to *C. doerfleri* or specifically *C. hungaricum* var. *doerfleri*, and the confirmed range of the species is quite distant from the alleged Croatian localities, they needed to be checked and confirmed. After 87 years of the last record, the species was found once again and confirmed for Croatia, this time 100 kilometers further south in Vodice on five different localities and 200 kilometers south at a single locality on Hvar Island (Fig. 1). It is quite common in Vodice, and it is surprising that the species was not found in the surrounding areas in the past. As the observations were made in May and April, the plants had developing fruits and had yet to be seen flowering. In early 2025, the discovered localities of *C. doerfleri* in Vodice were visited in the hope of encountering the species in flower, but all the located flowering individuals had young leaves glabrous with only hairy edges, corresponding to *C. hungaricum*. Most of the localities in Vodice and

the single locality on Hvar Island contain both *C. doerfleri* and *C. hungaricum* growing together, and individuals with only half of the abaxial part of the leaves pubescent were also observed. Further investigation about the exact relationship of these two taxa is needed.

***Crataegus pentagyna* Waldst. & Kit. ex Willd**

Crataegus pentagyna (Rosaceae) is found in continental Croatia (Panjković 1989, Vukelić et al. 1999, Rožac & Ozimec 2018). New records originate from Vodice, where two individuals were found during 2021, next to macadam roads. These findings would be one of the few documented occurrences of the species on the country's coast, or potentially the first (Fig.1).

***Crepis bursifolia* L. (Fig. 5F)**

In Croatia, there are many common *Crepis* (Cichoriaceae) species, but this does not include *Crepis bursifolia*. This species is native to Italy and Croatia, but it is naturalised in multiple European countries and even the United States (California), from as early as 1943 (Calflora 2024). While widespread in Italy (Pignatti 2018), there is just a single literature record for Croatia dating back to 1802 where Host mentions a finding from Skradin (Šibenik area) (Fig. 1), but it was not mentioned again in any of the recent publications from the area (Milović 2002, Hršak et al. 2022). Individuals of the species were recently discovered in Vodice, confirming the presence of *Crepis bursifolia* in Croatia after more than 220 years without any recorded observations. The species was found in Vodice at three different locations in 2023 and 2024. Around ten individuals per locality were found, having healthy populations, preferring disturbed and anthropogenic habitats, growing predominantly on roadsides and in sidewalk cracks. Flowering time starts around April with the warmer temperatures and ends with the summer drought. There is a possibility that the species is more widely distributed on the Croatian coast, but it could be just rare or even misidentified, given the lack of any recent records.

***Damasonium polyspermum* Coss. (Fig. 5G)**

Damasonium polyspermum (Alismataceae) is an annual, heliophilous species which grows in the Mediterranean temporary ponds which are partially or fully seasonally dry, depending on water level for completion of its life cycle (Michaund, 2004). Its presence in the country was not known until 1995 when it was discovered on the island of Murter (northern Dalmatia), the first record not only for Croatia, but also the Balkan peninsula as a whole (Trinajstić et al 1995, Pandža 1998). The second finding occurred in 2012 near the Krka National Park (Boršić & Posavec Vukelić 2012). Soon it was found at the Lake Vrana Nature Park (Vuković & Jelaska 2015), and again in Krka NP (Šegota et al. 2019, Hršak et al. 2022). All localities of the species in Croatia are concentrated in a small area in northern Dalmatia (Fig.1). The newest locality is from the same general area, found in Vodice in the same marsh, Kovča, as the earlier mentioned *Baldellia ranunculoides*. Dried specimens were noticed during August of 2021, but the first live specimens appeared two years later, after an unusually wet spring. The Red List of Vascular Flora of Croatia (2005) listed the species as data deficient (DD), but it was soon after assessed as vulnerable (VU) in Global and Mediterranean Red-Lists (de Bélair et al. 2010). In the following years it was assessed as critically endangered (CR) in Croatia (Boršić & Posavec Vukelić 2012), and it became a statutorily strictly protected species (Anonymous 2013). New localities could be discovered if research were to be conducted on the various botanically unexplored water bodies found in northern Dalmatia, as the species seems to be present mostly (if not only) in that specific area.

***Falcaria vulgaris* Fabr.**

In Croatia, records of *Falcaria vulgaris* (Apiaceae) are mostly from the continental part of the country (e.g., Hirc 1908, Panjković 1998, Topić 1998, Hulina 2005, Pandža 2010) while records from coastal Croatia are rare. In Dalmatia, the species was found in Drniš (Visiani 1852, Hirc 1908) and Split (Rušić 2003), and an observation was made in the Lika region by Topić (2010).



Figure 5. Some of the species mentioned: A) *Adonis microcarpa*, B) *Baldellia ranunculoides*, C) *Biarum tenuifolium*, D) *Centaurea benedicta*, E) *Colchicum doerfleri*, F) *Crepis bursifolia*, G) *Damasonium polyspermum*, H) *Heliotropium supinum*.

Slika 5. Neke od spomenutih vrsta: A) *Adonis microcarpa*, B) *Baldellia ranunculoides*, C) *Biarum tenuifolium*, D) *Centaurea benedicta*, E) *Colchicum doerfleri*, F) *Crepis bursifolia*, G) *Damasonium polyspermum*, H) *Heliotropium supinum*.

New records of this species are from the coastal region of the country (Vodice) (Fig. 2), where it was found to be rather rare. In 2023, a population was found in the hinterland of Vodice, close to olive groves and vineyards. The following year, in May, two mature flowering individuals were found growing on disturbed soil in the coastal part of the city. As the species is largely represented by old and sparse records, especially on the Croatian coast, these new records will help in a better understanding of the current distribution and state of the species in Croatia.

***Heliotropium supinum* L. (Fig. 5H)**

Heliotropium (Boraginaceae) is a widely distributed genus with over 250 species, two of which are found in Croatia: *H. europaeum* L. and *H. supinum*. Both are annual herbs and occur predominantly in the Mediterranean part of Croatia, with *H. europaeum* being quite common, while *H. supinum* is much rarer and was even assessed as critically endangered (CR) given the lack of suitable habitat (Nikolić & Topić 2005). The earliest records of the species are from Karin and Makarska (Visiani 1847, Schlosser & Vukotinović 1869, Hirc 1906), additional records deriving from Slavonski Kobaš (Marković-Gospodarić 1965), Mljet Island (Regula-Bevilacqua & Ilijanić 1984), Stara Gradiška (Nikolić et al 2025), and the most recent record comes from Morovnik Island where a single specimen was found growing on the coast (Šegota et al. 2024). New localities of the species come from the significant landscape Prološko blato and Vodice (Fig. 2). The observation from Prološko blato is from June of 2022, when around ten young individuals were observed growing on the pebbled bank of the swamp. The following month, another population was discovered in Vodice. There were three individuals discovered at the bottom of a dried-up pond, where seeds stay dormant, submerged on the bottom of the pond, germinating after the pond dries out in the summer. If additional localities of this elusive species are discovered soon, its status could potentially even be changed to endangered (EN) rather than critically endangered (CR).

***Isolepis setacea* (L.) R. Br. (Fig. 6A)**

Isolepis (Cyperaceae) is a cosmopolitan genus of plants, counting 70 species, two of which can be found in Croatia, *I. cernua* (Vahl) Roem. & Schult. and *I. setacea*. Both *Isolepis* species are on the Croatian Red list of vascular plants, with *I. cernua* assessed as near threatened (NT) and *I. setacea* as critically endangered (CR) (Nikolić & Topić 2005). It is not without reason that *I. setacea* was assessed as CR, after all, it has only four known localities, with most of them from old literature and herbaria records, without any recent confirmations. The literature mentions the species as occurring only in Lonjsko polje and the surroundings of Križevci, found by Schlosser & Vukotinović (1869), while two herbarium vouchers exist, one from the surroundings of Varaždin near the River Drava (ZA 75447) and a more recent one from Golik collected in 2019 from a roadside ditch (ZA 75447). A new locality of this rare taxon was recently discovered in Vodice (Fig. 2). In May of 2024, a healthy population containing tens of individuals was found in an inundation zone near the coast dominated by *Phragmites australis* (Cav.) Trin. ex Steud. This newly discovered population represents the second currently confirmed site in Croatia, and it is already threatened and will possibly be gone soon due to urbanization. Part of the habitat is already gone due to prior and current destruction caused by land clearing. Herbaria material was collected and is stored in ZA (80634). The species was not recorded from the coastal part of the country previously, meaning undiscovered localities could still be present somewhere on the Adriatic coast.

***Juncus hybridus* Brot**

Some Mediterranean *Juncus* (Juncaceae) species found in Croatia are dependent on the Mediterranean temporary ponds. This is the case with two rare species of Croatia, *J. hybridus* and *J. ranarius* which have a similar area of distribution, occurring in the Kvarner area and northern Dalmatia (Fig. 2). *Juncus hybridus* was recorded in Istria (Bernhardt 2005,

Starmühler 2005), Plavnik island (Starmühler 2011), Murter island (Pandža 1998) and the Šibenik area, where Visiani (1842) recorded it at Morinje Bay. An old herbarium record from the Dubrovnik area (ZA 19547) also exists. The new record of this species is from Vodice, where it was found in a seasonally flooded coastal area.

***Juncus ranarius* Songeon & E. P. Perrier**

Records of *J. ranarius* come from the Islands of Krk (Starmühler 2011), Cres (Starmühler 2012), Rab, and Pag (Horvatić 1939). Observations of the species exist from Vrana Nature Park, uploaded by Z. Stančić in FCD (Nikolić et al. 2025), and an old herbarium specimen was collected in the Gospić area from the Lika region (ZA 19602) (Fig. 2). The new population of *J. ranarius* was found in the Vodice hinterland growing next to a pond in heavy clay soil. Both *J. hybridus* and *J. ranarius* are currently known from only a single locality in Vodice and are tied to different water bodies.

***Lythrum thymifolia* L. (Fig. 6B)**

Distributed in various parts of Croatia, six *Lythrum* (Lythraceae) species are found. The most common are *L. salicaria* L., while species such as *L. thymifolia* and *L. tribracteatum* Spreng. are rare and are represented by only a handful of records. Currently only known from Dalmatia (Fig. 2), *L. thymifolia* has been recorded on the Islands of Hvar (Trinajstić 1993) and Vis (Nikolić et al. 2025). After more than 20 years, a new locality has been found in northern Dalmatia, with the species now also known from Vodice. Only multiple specimens were encountered, growing in two inundation zones near the coast. A herbarium voucher is stored in ZA (80633).

***Lythrum tribracteatum* Spreng**

Lythrum tribracteatum (Lythraceae) is a critically endangered (CR) species in the Croatian flora (Nikolić & Topić 2005) with records from Istria (Vitasović Kosić et al. 2009, Nikolić et al. 2025),

Pag Island (Horvatić 1933, Ljubičić & Britvec 2006), Neretva (herbarium specimen ZA 10345), and Gajna near Slavonski Brod (Barišić 1999) (Fig. 2). A small population of the species was also found in Vodice in 2023, growing in the Kovča Marsh with other rare and threatened taxa discussed here. A herbarium voucher is stored in ZA (80632).

***Melampyrum barbatum* Waldst & Kit. ssp. *carstiense* Ronniger**

In Croatia, nine *Melampyrum* (Scrophulariaceae) species can be found, with *M. barbatum* ssp. *carstiense* as one of the rarer taxa endemic to the northeastern Mediterranean (Nikolić et al. 2025, POWO 2025). In Croatia, most of the records are concentrated in Istria (e.g., Čarni 2003, Rottensteiner 2022), the Kvarner area mainland (Borovečki-Voska 2019), and islands of Krk (Rottensteiner 2022) and Cres (Wallnöfer 2008, Rottensteiner 2016) (Fig. 2). Some records and observations also exist in eastern Croatia around Mt. Papuk (Tomašević 1969-2010, Pandža 2010). It was recently found on Mt. Svilaja (Milović et al. 2021), a rare record of the species in Dalmatia. A new record from Dalmatia is from Vodice, where a population was discovered in the town's hinterland. It seems to form small populations, being locally abundant rather than widespread. This may be the reason for the lack of records, especially from Dalmatia.

***Muscari tenuiflorum* Tausch (Fig. 6C)**

Among the seven present *Muscari* (Asparagaceae) taxa in Croatia, two of them belong to the subgenus *Leopoldia*, *M. comosum* (L.) Mill. and *M. tenuiflorum*, the latter being much rarer. Records of *M. tenuiflorum* come from Istria and Kvarner area (Griebel 2009, Rottensteiner 2014), northern Croatia (Soklić 1943), and Dalmatia (Hršak et al. 2022) (Fig. 2). Three herbarium sheets exist from Požega (ZA 18832), Mljet Island (ZA 52388), and Ervenik (CNHM 26530). This rare species was found in May of 2024 in the Karin Gornji area,



Figure 6. Some of the species mentioned: A) *Isolepis setacea*, B) *Lythrum thymifolium*, C) *Muscari tenuiflorum*, D) *Oenothera speciosa*, E) *Ophrys archipelagi*, F) *O. bombyliflora*, G) *Orobanche pubescens*, H) *Oxalis pes-caprae*.

Slika 6. Neke od spomenutih vrsta: A) *Isolepis setacea*, B) *Lythrum thymifolium*, C) *Muscari tenuiflorum*, D) *Oenothera speciosa*, E) *Ophrys archipelagi*, F) *O. bombyliflora*, G) *Orobanche pubescens*, H) *Oxalis pes-caprae*.

growing in and around the canyon of the River Bijela, occurring together with *M. comosum*. The species is listed as dubious in the Flora Croatica Database (Nikolić et al. 2025) but should not be listed as such anymore, given that multiple recent records exist in different parts of the country.

***Nicotiana alata* Link & Otto**

Nicotiana (Solanaceae) is a genus consisting of over 100 species native predominantly to the Americas, with four of them introduced to Croatia (Nikolić et al. 2025, POWO 2025). They occasionally appear in Croatia as escaped from cultivation or as weeds in various anthropogenic habitats. *Nicotiana alata* was first recorded for Croatia in 1995 from Rijeka Bay (Starmühler 2005). The new observation of this species is from Vinkovci (eastern Croatia) (Fig. 2), where a single specimen was found growing spontaneously in a barren valley. The seeds most likely came from cultivated plants in the area.

***Nicotiana tabacum* L.**

The situation with the species *N. tabacum* (Solanaceae), commonly grown for tobacco, is similar to that with *N. alata*. The first mention of the species is from 1904 (Hirc 1904), but newer records of naturalized plants are rare, with a single record from the surroundings of Slatina (ZA 79861, ZA 79862). The most recent record of this species is from southern Croatia, where in July of 2024, three young individuals were found on cleared land in the vicinity of Bijeli Vir near Metković (Fig. 2).

***Oenothera glazoviana* Micheli**

Oenothera glazoviana (Onagraceae) is a newer addition to the Croatian flora, recorded from Krk Island (Rottensteiner 2023) and observed from the wider area of Vinkovci, Mt Strahišnjica, and Fužine (Nikolić et al. 2025) (Fig. 2). The species is nowhere as common as *O. biennis*, with only a few scattered records. The most recent record of this species is from Vodice. The species is probably widely distributed in the country but lacks records.

***Oenothera speciosa* Nutt (Fig. 6D)**

Oenothera speciosa (Onagraceae) is another species that has naturalized in various parts of Europe, and was only recently found in Croatia, recorded outside cultivation in 2021 (Milović et al. 2021). No additional records of this species have been reported. During September of 2023, a single individual was found in a ruderal area in Vodice, making it the second record of the species for Croatia (Fig. 3). It was not found again the following year. This is the only instance of it being found growing spontaneously in Vodice, but future records are expected if the species becomes commonly cultivated.

***Ophrys archipelagi* Gözl & H. R. Reinhard (Fig. 6E)**

According to FCD (Nikolić et al. 2025), there are over 60 *Ophrys* (Orchidaceae) taxa in Croatia, supporting the microspecies taxonomic concept. *Ophrys archipelagi*, a species endemic to Croatia and Italy, was described in 1986 from Korčula Island in Dalmatia, where it is quite a frequent species (Jeričević & Jeričević 2024), inhabiting sunny to semi-shaded habitats on calcareous substrates up to 680 m altitude (Nikolić et al. 2015). It can also be found on Čiovo (Ževrnja 2010) and Krk (Borovečki-Voska 2019). On the mainland the species is found in the area of Tisno (Pandža 2014), Kaštela (Kranjčev 2001, 2002) and Konavle municipality (Kranjčev 2002) (Fig. 3). It was assessed as data deficient (DD) in the Croatian Red Book of Vascular Flora (Nikolić & Topić 2005), but Kranjčev (2005) considers it vulnerable (VU) given its habitat loss caused by natural succession. Two new sites of this species are from Vodice, which were discovered in March 2022 and 2023. The first locality contained a single specimen, which was not found the following year, while the other locality had numerous individuals growing in a karstic habitat co-occurring with *O. × flavicans* Vis. In view of its data deficient status, any new localities will help us to better understand and assess the regional state of the species.

***Ophrys bombyliflora* Link (Fig. 6F)**

A new locality of this vulnerable orchid species is in Vodice (Fig. 3), where a healthy population was found in May 2023, after the possibility of its presence in Vodice was raised (Ćato, 2023). There, *O. bombyliflora* inhabits a small area near the sea, forming multiple smaller patches in garrigue dominated by *Myrtus communis* L., *Juniperus deltoidea* R. P. Adams, *Pistacia lentiscus* L., and *Viburnum tinus* L. This recently discovered population, together with a dozen other orchid taxa, is already threatened by the development of new tourist facilities – once again showing that destruction of habitat is the main reason for orchid endangerment (Nikolić & Topić 2005).

***Orobanche cernua* Loefl.**

Over 30 *Orobanche* (Orobanchaceae) species can be found in Croatia, with some being rare and having sparse or localised records. A good example of such species is *O. cernua*; this holoparasite of *Artemisia* L. has a single national record from the Solaris complex in the Šibenik area (Milović 2002). A new record of this rare taxon is once again from Šibenik, but from a new area, Jadrija. Around five specimens were found growing on the beach, parasitising on the roots of a single plant of *A. caerulea* L. With only two records (Fig. 3) and the ongoing littoralisation, this species may be at risk of regional extinction.

***Orobanche pubescens* d'Urv (Fig. 6G)**

Another rare species in the Croatian flora is *O. pubescens* (Orobanchaceae), known from the islands of Lastovo (Forenbacher 1911, Trinajstić 1979) and Cres (Rottensteiner, 2017). A new record of the species is from the mainland: a single individual was found in Vodice (Fig. 3) growing by a road, while most likely parasitising on *Erodium ciconium* (L.) L'Hér.

***Oxalis pes-caprae* L. (Fig. 6H)**

The first record of *Oxalis pes-caprae* (Oxalidaceae) for Croatia is from 2000, when it was discovered

on the islands Vis and Biševo (Bogdanović et al. 2003, 2004). It was later found in Split (Rušić, 2003), on Jabuka Island (Boršić et al. 2008), Silba Island (Bogdanović et al. 2011), Zadar (Milović 2012), Korčula Island (Jeričević et al. 2014), and Lošinj Island (Bauer 2018). The new locality of the species is in Šibenik, the Solaris area (Fig. 3), where in March of 2023, a single individual was found under a newly planted olive tree, most probably brought together with it.

***Periploca graeca* L.**

The only species of *Periploca* (Asclepiadaceae) occurring in Croatia is *P. graeca*, which occurs along the coast according to FCD (Nikolić et al. 2025) (Fig. 3). While there are some older records from continental Croatia, these are considered improbable and have not been recently confirmed (Nikolić & Topić 2005). A new record of the species is from Lake Vrana Nature Park, where it is abundant in the ornithological reserve area in the northern part of the lake. This is a valuable observation, as there are no previous records from this broader region, marking the first confirmed occurrence for northern Dalmatia.

***Plantago crassifolia* Forssk.**

Croatia has 27 *Plantago* taxa, two of which are critically endangered (Nikolić & Topić 2005). Although not currently threatened, the halophytic species *P. crassifolia* (Plantaginaceae) is rarely recorded in Croatia, with confirmed occurrences in Istria and the Kvarner region (e.g. Hruševar 2008, Starmühler 2011). While commonly reported from islands, records from the mainland are overall scarce (Fig. 3). A newly discovered mainland locality of this species was recorded in May 2024, in Seline (near Starigrad Paklenica). A healthy population was found on the flooded meadows of Cape Pisak, growing with other halophytes such as *Limonium narbonense* Mill., *Camphorosma monspeliaca* L., and *Parapholis incurva* (L.) C. E. Hubb. As with other halophytes, littoralisation is

a major issue in connection with the survival of this species.

***Plantago major* L. ssp. *winteri* (Wirtg.) W. Ludw.**

One *Plantago* taxon only recently added to the Croatian flora is *Plantago major* ssp. *winteri* (Plantaginaceae). So far, it is only known from Soline on the island of Krk, where it grows in brackish coastal waters (Rottensteiner 2023) (Fig. 3). New records of this taxon are from Vodice and Paklenica National Park. In Vodice, a population was found on the shore of a canalized stream. Other halophytes such as *Juncus maritimus* Lam., *Scirpoides holoschoenus* (L.) Soják, and *Samolus valerandi* L. were found nearby. In Paklenica National Park, around ten individuals were found growing on the path leading to Sveto Brdo. These mountain plants are somewhat different from the coastal specimens in the sense that the mountain individuals have smaller, ovate-elliptical leaves with slightly acute apices, shorter petioles, and entire, smooth leaf edges in comparison to the coastal plants with larger, elliptical, and narrow leaves with sinuate edges and noticeable petioles. Plants from both localities have coriaceous leaves covered in small hairs and short, prostrate flowering stems with around 15 to 20 flowers accumulated at the top.

***Sabulina attica* (Boiss. & Spruner) Dillenb. & Kadereit ssp. *attica* (Fig. 7A)**

Among the *Sabulina* (Caryophyllaceae) taxa present in Croatia there is the challenging *S. verna* group, which has been a subject of detailed research in recent years (e.g., Nunvářová Kabátová, 2019, Lipánova, 2023). One of the species from the complex is *S. attica*, differing from all the other Croatian taxa in the group by having pointed petals which are widest beneath the middle. This key is provided by Nikolić (2019), where the taxon is treated as *Minuartia verna* ssp. *attica* (Boiss. & Spruner) Hayek. However, the status of this

species in Croatia remains unclear. The most recent publication on the topic (Lipánova, 2023) lists two taxa for Croatia: *S. attica* ssp. *attica* and the morphotype “*S. attica* 2”. Diploid plants from low elevations from Plomin area were classified as typical subspecies, while two other studied populations are tetraploid plants growing on higher elevations of Mt Velebit. These Velebit populations are still under evaluation, temporarily classified as the preliminarily recognized morphotype „*S. attica* 2“, which has minute (but stable) differences from *S. attica*, requiring a more detailed analysis (Nunvářová Kabátová 2019, Lipánova 2023). In 2021, a population of *Sabulina* sp. was discovered on a hill at an altitude of around 180 m in Vodice (Fig. 3). Following the key (Nikolić 2019), these plants appear to be *M. verna* ssp. *attica*, which combined with data from Lipánova (2023), in which a low-altitude population from Istria was recognized as the typical subspecies, would mean this population is most likely also *S. attica* ssp. *attica*. At the mentioned locality, the taxon commonly occurs on the hills' calcareous substrate, growing between rocks and forming smaller clumps which tend to flower during April.

***Schoenoplectiella supina* (L.) Lye (Fig. 7B)**

Two members of this genus are found in Croatia, both critically endangered (CR) (Nikolić & Topić 2005). The annual *S. supina* (Cyperaceae) has only a few known localities, all situated in the continental part of Croatia. The earliest records are represented by old herbarium specimens from the Herbarium Croaticum (ZA). Two of these vouchers are from the Varaždin area in northern Croatia, collected in 1943 (ZA 11404) and in 1959 (CNHM 78979), both sourced from banks of the Drava. The third voucher is from Jelas-polje near Slavonski Brod, where the species was growing as a field weed, collected in 1949 (ZA 11405). An old literature record places the species in eastern Croatia, in the area between the forest of Haljevo and the Drava-Danube confluence (Jovanović 1965). The next record was created 50 years later in Gornji

Miholjac, where the species was found on two localities, both threatened due to enclosing vegetation and agriculture (Prlić 2017). The following year, a new site was reported by Rožac et al. (2018) when the species was confirmed for Kopački rit Nature Park. The newest record is from Vodice, which represents the first observation of this rare species from coastal Croatia. A small population was discovered in 2023, growing together with the earlier mentioned *B. ranunculoides* and *D. polyspermum* at the Kovča Marsh. This is the fifth known site of *Schoenoplectiella supina* in Croatia, situated 260 km from the nearest known other locality (Fig. 3). This record indicates that the species is not restricted to northern and eastern Croatia, where it was previously known. A herbarium voucher is stored in ZA (80631).

***Setaria adhaerens* (Forssk.) Chiov. (Fig. 7C)**

Seven *Setaria* (Poaceae) taxa occur in Croatia (Nikolić et al. 2025, Maslo 2019). To clarify, FCD lists eight taxa, including *S. gussonei* Kerguélen, which according to POWO (2024) is a synonym of the very variable *S. verticillata* (L.) P. Beauv., making the final number of taxa seven. *Setaria adhaerens* has only recently been added to the Croatian flora, recorded from the areas of Dubrovnik, Split, and Senj (Fig. 3), appearing in different ruderal habitats and flowerbeds (Maslo 2019). Additional records of the species are from Vodice, where it was discovered in two locations during the autumn of 2024, growing on barren soil and in cracks in concrete. Vouchers are stored in ZA (80626, 80627). This taxon is almost certainly widely distributed but overlooked, because of the similarity to *S. verticillata*.

***Setaria faberi* R. A. W. Herm.**

Setaria faberi (Poaceae) is another introduced species occurring in Croatia, with records from the Jastrebarsko area in northwestern Croatia (Dujmović Purgar & Hulina 2004), Poreč in Istria

(Rottensteiner 2016), and Sukošan (Milović & Pandža 2023) (Fig. 4). A new record of this species is presented by an individual discovered in Dubrava near Šibenik, growing among weed vegetation in the grounds of the Dubrava Garden Centre.

***Sporobolus aculeatus* (L.) P. M. Peterson (Fig. 7D)**

Sporobolus aculeatus (Poaceae) is an annual grass species with a near-threatened (NT) status in the Croatian flora (Nikolić & Topić 2005). It is most common on the coast, growing in water-retaining ground that forms puddles during late summer and autumn (often with brackish water). It is quite evenly documented along the whole coast, e.g., Krk Island (Trinajstić 1965), Cres Island (Wallnöfer 2008), Pag Island, Zadar area, Lake Vrana (Nikolić et al. 2025), Šibenik (Milović & Marković 2003), and Lastovo Island (Trinajstić 1979) (Fig. 4). Herbarium specimens exist from Seline (ZA 15425), Omiš (ZA 5658), and the Neretva Valley (ZA 15423). The newest record of this species is from Vodice, where a small population was discovered in a coastal area liable to flooding. This habitat was much larger in the past, but due to recent beach development projects – such as gravel infill and the construction of a walking trail – it now covers only 70 square meters. If additional development occurs, the species may soon disappear from this location. This is another species being threatened with extinction in Vodice due to the excessive urban development caused by mass tourism. Seed collection and distribution to other suitable habitats is not possible, as such habitats do not exist anymore in the vicinity of Vodice or the surrounding area because of excessive urbanization.

***Stellaria ruderalis* M. Lepšić, P. Lepšić, Z. Kaplan & P. Koutecký (Fig. 7E)**

Stellaria ruderalis (Caryophyllaceae) is a recently described allotetraploid annual species from the *Stellaria media* group natively occurring in central and southern Europe (Lepšić et al. 2019).

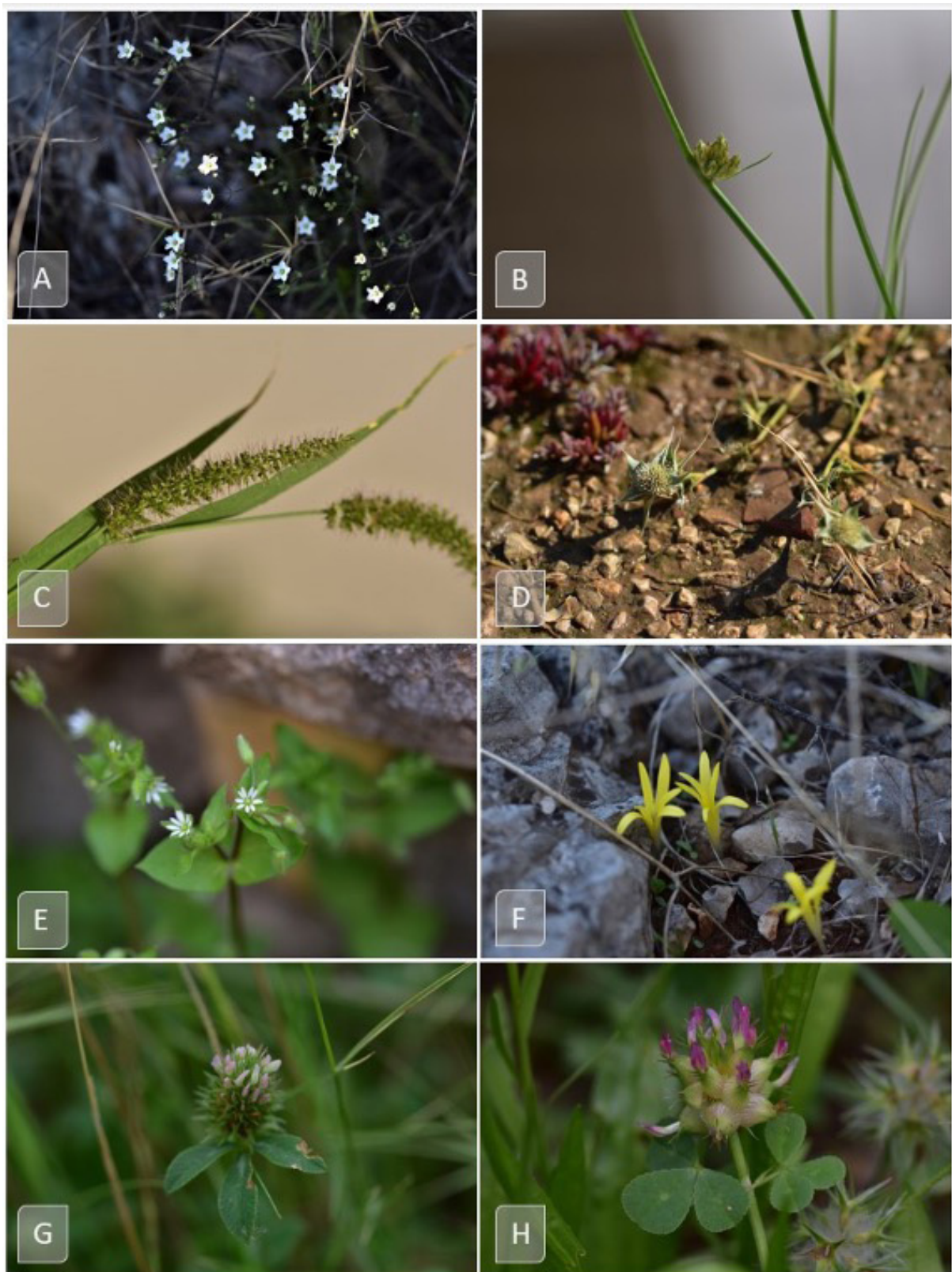


Figure 7. Some of the species mentioned: A) *Sabulina attica* ssp. *attica*, B) *Schoenoplectiella supina*, C) *Setaria adhaerens*, D) *Sporobolus aculeatus*, E) *Stellaria ruderalis*, F) *Sternbergia colchiflora*, G) *Trifolium lucanicum*, H) *T. spumosum*.

Slika 7. Neke od spomenutih vrsta: A) *Sabulina attica* ssp. *attica*, B) *Schoenoplectiella supina*, C) *Setaria adhaerens*, D) *Sporobolus aculeatus*, E) *Stellaria ruderalis*, F) *Sternbergia colchiflora*, G) *Trifolium lucanicum*, H) *T. spumosum*

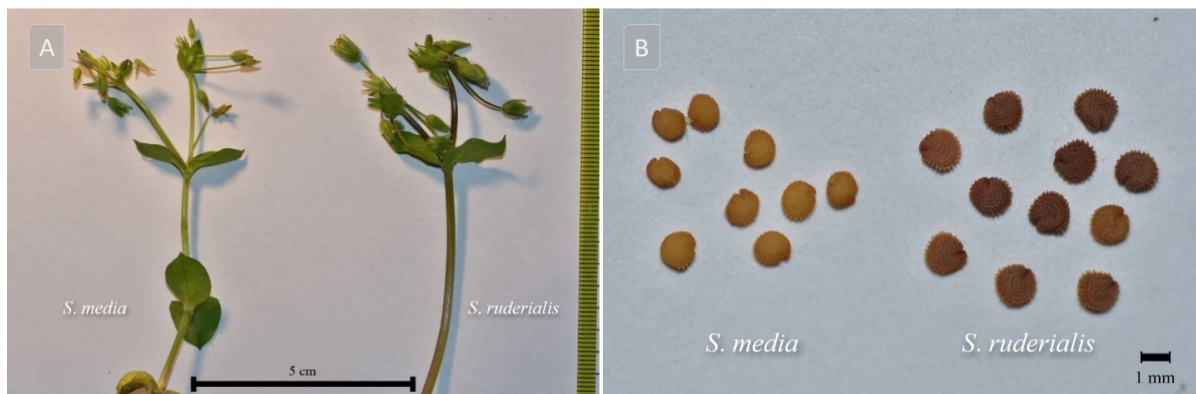


Figure 8. Comparison of species *Stellaria media* and *S. ruderalis*: A) Comparison of inflorescences, B) Comparison of seeds, showing different size, morphology, and colouring.

Slika 8. Usporedba vrsta *Stellaria media* i *S. ruderalis*: A) usporedba cvata, B) usporedba sjemenki, s razlikom u veličini, morfologiji i obojenosti.

Aside from *S. ruderalis*, other species from the group, such as *S. media* (L.) Vill., *S. neglecta* Weihe and *S. pallida* (Dumort.) Crép also occur in Croatia (Bogdanović & Nikolić 2023, Nikolić et al. 2025) but differ from the former by their ecology (most similar to *S. media*), larger size, and seed morphology (Fig. 8) (Lepšić et al. 2019). In Croatia, it was recorded from only two sites: Ližnjan (Lepšić et al. 2019) and the island of Krk (Rottensteiner 2022). The species was found on six additional localities from the regions of Istria, Gorski Kotar, and Dalmatia (Fig. 4). In Dalmatia, the species was discovered within the limits of Krka National Park, growing from pathway cracks near Skradinski buk waterfall (ZA, 80630) and on Hvar Island among ruderal flora ZA, 80629). In the Gorski Kotar region, it was found at the Dobra-west rest stop growing among grassland vegetation. In Istria, it was found in Monterol, where multiple individuals were found by a path in ruderal vegetation. A similar situation is to be found in Zagreb, where the species was found in cracks in a sidewalk. It is by no means a rare species, occurring much more widely than the current data shows.

***Sternbergia colchiflora* Waldst. et Kit. (Fig. 7F)**

The genus *Sternbergia* (Amaryllidaceae) is represented by two species in Croatia, *S. colchiflora* and

S. lutea (L.) Ker. Gawl. ex Spring. *S. colchiflora* is much less common, and is considered a very rare taxon, given the sparse and irregular observations of the species, especially in recent decades. The first records are from the early 19th century when plants found near Zadar by Reichenbach were even described as a distinct variety (*S. colchiflora* var. *dalmatica*) based on morphological differences such as bright yellow flowers, floral segments nearly as long as the floral tube, and a style longer than the stamens, all differing from the previously known Hungarian populations of the species (Reichenbach 1830). Some of the later records include localities such as Drniš (Visiani 1842), Rijeka (ZA 17143), Brač Island (Pavletić 1964), Mt Biokovo (Šilić & Šolić 1999), and Krka National Park (Vuković et al. 2017) (Fig. 4). New localities of *S. colchiflora* are from two locations in Vodice (northern Dalmatia). The first observation occurred on March 20, 2022, when two plants were encountered while bearing seedpods, growing in a carpet of lichen *Cladonia foliacea* (Huds.) Willd. Half a year later, on September 20, a new population was discovered nearby. In this instance, the numerous plants were found in flower, growing on open ground with sparse vegetation. While it was assessed as data deficient (DD) in 2005 (Nikolić & Topić 2005), newer data enabled the process of reassessment of its endangerment status in 2017 when it was estimated as

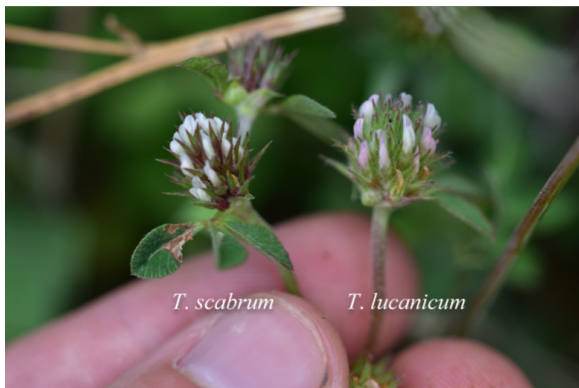


Figure 9. Comparison of *Trifolium scabrum* and *T. lucanicum*, showing different corolla, flower head, and calyx.

Slika 9. Usporedba vrsta *Trifolium scabrum* i *T. lucanicum*, s različitim vjenčićima, cvjetnim glavicama i čaškama.

an endangered (EN) species in the Croatian flora (Vuković et al. 2017). The low number of records is the result of the species' short flowering period, lasting for barely two weeks, when hardly any botanist is doing fieldwork. Literature and herbaria data show that most observations of *S. colchiflora* in Croatia occur between the 15th and the 25th of September. Although the species is not as rare as previously assumed, it is threatened by succession, as also noted by Vuković et al. (2017), and many of its current habitats could be lost soon unless land use practices change.

***Trifolium lucanicum* Guss. (Fig. 7G)**

Trifolium (Fabaceae) is one of the larger genera in Croatia, with over 60 taxa (Nikolić et al. 2025). One of the poorly known species is *T. lucanicum*, which has only a few older records, one from Hvar Island (Trinajstić 1993) and one from Vela Kluda island (Vladović et al. 2001) (Fig. 4). Two new locations were found: Vodice and the Gornji Karin area, both in northern Dalmatia. In Vodice it was found in a meadow among downy oaks (*Quercus pubescens* Willd.), on roadsides, and in grasslands. The following year, it was found in a meadow in the Gornji Karin area, which is currently the

northernmost record. It is quite similar to the closely related *T. scabrum* L. with the main differences being corolla colour (white in *T. scabrum*, pinkish in *T. lucanicum*) and length (shorter than or the same length as the calyx in *T. scabrum*, barely exceeding the calyx in *T. lucanicum*) and the overall flowerhead shape (globular or egg-shaped in *T. scabrum*, cylindrical in *T. lucanicum*) (Nikolić 2019). Other differences are that *T. lucanicum* has calyx lobes with noticeably erect trichomes, while in *T. scabrum*, the trichomes are appressed. Also, *T. lucanicum* seems to have the whole calyx light green, while in *T. scabrum*, only the lobes are green, while the calyx is dark red. These somewhat subtle but noticeable differences (Fig. 9) can be overlooked in the field with the presence of the widespread and well-known *T. scabrum*, making records of *T. lucanicum* much rarer than they should be. While probably not as common as *T. scabrum*, *T. lucanicum* should occur in the same overall area but in somewhat moister habitats (unlike *T. scabrum*, which tolerates both dry and moist habitats), such as meadows and grasslands. On some occasions, the species can be found growing together.

***Trifolium spumosum* L. (Fig. 7H)**

Trifolium spumosum (Fabaceae) is one of the many clover species listed as data deficient (DD) in Croatia (Nikolić & Topić 2005). This interesting taxon has only a few known records in Croatia (Fig. 4), with the first observation made on the island of Lastovo (Trinajstić, 1979). It was soon discovered on the island of Brač and its potential presence was suggested for nearby islands such as Veli Drvenik, Šolta, Hvar, Vis, Korčula, and Mljet (Marković & Štamol 1983). This hypothesis was later confirmed by a record from Korčula (Trinajstić 1985). After being reported from three different islands in less than a decade, only a single additional record has been published since, originating from Krka National Park (Hršak et al. 2022), representing the species' first record from the mainland. The newest record of this species is

from Vodice, where a single individual was found in vegetation in April of 2023 and was flowering when visited again in May. This low number of present individuals was also mentioned by Marković & Štamol (1983), which, in combination with the overall rarity, is most likely the reason for the sparse and rare records of this species.

***Veronica dalmatica* Padilla-García, Rojas-Andrés, López-González & M. M. Mart. Ort.**

Veronica (Plantaginaceae) is a large cosmopolitan genus that includes over 450 species worldwide, 36 of which can be found in Croatia (POWO 2025, Nikolić et al. 2025). A recently described species from the genus endemic to Croatia is the diploid *Veronica dalmatica*, belonging to the *V. austriaca* complex, being most similar to *V. austriaca* ssp. *jacquinii* (Baumg.) Watzl. (Padilla-García 2018). Distribution is restricted to the western Balkan Peninsula: Albania, Bosnia and Herzegovina, Croatia, and Montenegro. In Croatia, it occurs most commonly in the southern part of the country (ZAGR 44366, Maslo 2015, Padilla-García 2018, Bogdanović & Šegota 2021), but can also be found further north, reaching Mt Dinara (ZAGR 58923, (Bogdanović & Šegota 2021) (Fig. 4). A new record of the species is from Vodice. In March of 2024, multiple individuals in flower were encountered on a hill at the elevation of 165 meters, growing together with other karstic species such as *Aethionema saxatile* (L.) W. T. Aiton, *Euphorbia fragifera* Jan, *Genista sylvestris* ssp. *dalmatica* (Bartl.) H. Lindb., *Helichrysum italicum* (Roth) G. Don, and *Teucrium capitatum* L. Vodice and Mt Dinara are the northernmost currently known localities, and to establish whether the species occurs even further north, additional research is needed.

***Xeranthemum cylindraceum* Sm.**

Xeranthemum (Asteraceae) is a genus with sparse records across Croatia, where it is represented by three annual species, including one species listed as endangered (EN) (Nikolić & Topić 2005).

Xeranthemum cylindraceum has been recorded, mainly in continental Croatia, e.g., Varaždin (ZA 3331), Mt Papuk (Pandža 2010), Bapska (Topić 2010) and Baraćeve špilje (CNHM 54455). In contrast, records from the Adriatic coast are much more limited, with previous confirmations restricted to Cres Island (Wallnöfer 2008) (Fig. 4). Two new records of this under-reported species from Dalmatia are presented here. In 2022, multiple individuals in bud were found in Vodice, growing from discarded rocks at the edge of an olive plantation. They were in full flower when visited again almost two months later, at the end of June. The species was also discovered on the shore of Peruća Lake, within therophyte-rich dwarf-herb and low-grass communities. These additional records confirm the species' presence in Dalmatia as it is easily missed during botanical inventory, being quite localised rather than widespread.

Conclusion

These new records provide a better understanding of the distribution and presence of 44 vascular plant taxa in Croatia. In all, eleven taxa fall into one of the threatened species categories: one is near threatened, one is vulnerable, three are endangered, and six are critically endangered. Additionally, three taxa are listed as data deficient. The records have expanded the distribution range of 22 taxa and filled existing gaps for 23 taxa. Furthermore, the occurrence of three taxa in Croatia has been confirmed through these records: *Centaurea benedicta*, *Crepis bursifolia* and *Colchicum doerfleri*.

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