

# New findings of rare and under-recorded vascular plants, bryophytes, lichens, fungi and algae in Croatia and neighbouring countries – 2

VEDRAN ŠEGOTA<sup>1\*</sup>, MARIJA GLIGORA UDOVIČ<sup>2</sup>, ZLATKO LEVKOV<sup>3</sup>, SANDRO BOGDANOVIĆ<sup>4</sup>, ANJA RIMAC<sup>1</sup>, ANTUN ALEGRO<sup>1</sup>, MIRELA ŠUŠNJARA<sup>2</sup>, MARKO DOBOŠ<sup>5</sup>, MARTINA TEMUNOVIĆ<sup>6</sup>, PETAR ŽUTINIĆ<sup>2</sup>, IVAN BUDINSKI<sup>7</sup>, FABIO CONTI<sup>8</sup>, VALENTINA DORIĆ<sup>9</sup>, ANTONIJA KULAŠ<sup>2</sup>, MARIJA BUČAR<sup>1</sup>, MONIKA CINDRIĆ<sup>10</sup>, DRIES ENGELEN<sup>7</sup>, BARIŠA ILIĆ<sup>11</sup>, MIRJANA JERIČEVIĆ<sup>12</sup>, MAJA MASLAČ MIKULEC<sup>13</sup>, ELVEDIN ŠABANOVIĆ<sup>14</sup>, NINA VUKOVIĆ<sup>1</sup>, LJILJANA BOROVEČKI-VOSKA<sup>15</sup>, SEBASTIAN ČATO<sup>16</sup>, ILINKA ČETKOVIĆ<sup>17</sup>, TOMISLAV HUDINA<sup>7</sup>, DAVID HUŠKA<sup>18</sup>, NELA JANTOL<sup>19</sup>, NEBOJŠA JERIČEVIĆ<sup>12</sup>, IVAN LIMIĆ<sup>20</sup>, URSULA LOOS<sup>21</sup>, MAGDALENA KLARIĆ<sup>16</sup>, MARIJA KOVAČEVIĆ<sup>18</sup>, MARTA ROGOŠIĆ<sup>19</sup>, LUKA ŠKUNCA<sup>7</sup>, ZDENKO TKALČEC<sup>22</sup>, DUNJA JURINA<sup>2</sup>, CSILLA STENGER-KOVÁCS<sup>23</sup>

<sup>1</sup> University of Zagreb, Faculty of Science, Department of Biology, Division of Botany, Marulićev trg 20, 1000 Zagreb, Croatia

<sup>2</sup> University of Zagreb, Faculty of Science, Department of Biology, Division of Botany, Rooseveltov trg 6, 10000 Zagreb, Croatia

<sup>3</sup> Ss. Cyril and Methodius University, Faculty of Natural Sciences, Institute of Biology, Arhimedova 3, Skopje, North Macedonia

<sup>4</sup> University of Zagreb, Faculty of Agriculture, Department of Agricultural Botany, Svetošimunska cesta 25, 10000 Zagreb, Croatia

<sup>5</sup> Public institution Papuk Nature Park, Stjepana Radića 46, 34300 Velika, Croatia

<sup>6</sup> University of Zagreb, Faculty of Forestry and Wood Technology, Department of Forest Genetics, Dendrology and Botany, Svetošimunska cesta 23, 10000 Zagreb, Croatia

<sup>7</sup> BIOM, Čazmanska ulica 2, 10000 Zagreb, Croatia

<sup>8</sup> Università di Camerino – Parco Nazionale del Gran Sasso e Monti della Laga, Centro Ricerche Floristiche dell'Appennino, Via Prov.le km 4,2 - San Colombo, 67021 Barisciano, Italy

<sup>9</sup> University of Zagreb, Faculty of Science, Department of Biology, Division of Zoology, Rooseveltov trg 6, 10000 Zagreb, Croatia

<sup>10</sup> Međimurska priroda – Public Institution for Nature Protection, Trg međimurske prirode 1, Križovec, 40315 Mursko Središće, Croatia

<sup>11</sup> Ornithological society Brkata sjenica, Mlinska 50, 20350 Metković, Hrvatska

<sup>12</sup> Žrnovo 558, 20275 Žrnovo, Croatia

<sup>13</sup> Geonatura Ltd., Borongajska cesta 81c, 22, 10000 Zagreb, Croatia

<sup>14</sup> University "Privredna akademija" Brčko District B&H, Faculty of Technical Sciences, Petra Kočića 6, 76100 Brčko, Bosna & Hercegovina

<sup>15</sup> Tuhelj 53, 49215 Tuhelj, Croatia

<sup>16</sup> Biology Students Association – BIUS, Rooseveltov trg 6, 10000 Zagreb, Croatia

<sup>17</sup> Natural History Museum of Montenegro, Trg Vojvode Bećir bega Osmanagića 16, 81000 Podgorica, Montenegro

<sup>18</sup> Public institution for the management of the protected area of Požega-Slavonia County, Ulica Republike Hrvatske 1B, 34000 Požega, Croatia

<sup>19</sup> Oikon Ltd.-Institute of Applied Ecology, Trg Senjskih uskoka 1-2, 10020 Zagreb, Croatia

<sup>20</sup> Institute for Adriatic Crops and Karst Reclamation, Put Duilova 11, 21000 Split, Croatia

<sup>21</sup> Žrnovo 342, 20275 Žrnovo, Croatia

<sup>22</sup> Ruđer Bošković Institute, Bijenička cesta 54, 10000 Zagreb, Croatia

<sup>23</sup> University of Pannonia, Center for Natural Sciences, Limnology Research Group; HUN-REN-PE Limnology Research Group; National Laboratory for Water Science and Water Security, Center for Natural Science, Egyetem Str. 10., 8200 Veszprém, Hungary

**\*Autor za dopisivanje / corresponding author:** [vedran.segota@biol.pmf.hr](mailto:vedran.segota@biol.pmf.hr)

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## Abstract

This paper supplies new data on the occurrence of 22 vascular plants (*Anthyllis dalmatica*, *Carduus chrysacanthus*, *Centaurea alpina*, *Centaurea ceratophylla* ssp. *danielae*, *Ceratophyllum submersum*, *Cyclospermum leptophyllum*, *Dactylorhiza sambucina*, *Drimia maritima*, *Euphorbia hercegovina*, *Linaria microsepala*, *Neotinea lactea*, *Ophrys archipelagi*, *Op. lutea* subsp. *galilaea*, *Ophioglossum lusitanicum*, *Polygonum salicifolium*, *Pseudostellaria europaea*, *Quercus coccifera*, *Senecio viscosus*, *Silene vallesia* subsp. *graminea*, *Stratiotes aloides*, *Torilis nodosa* and *Utricularia minor*), four bryophytes (*Blasia pusilla*, *Philonotis marchica*, *Rhodobryum ontariense* and *Ricciocarpos natans*), one fungus (*Rhodophana nitellina*), and 11 algal (diatom) species (*Achnanthidium druartii*, *Amphora aequalis*, *Brachysira chiaruccii*, *B. paraexilis*, *B. styriaca*, *Gomphonema angusticephalum*, *G. supertergestinum*, *Halamphora bullatoides*, *Mayamaea ingenua*, *Planothidium fonticolanceolatum*, *Simonsenia maolaniana*) in Croatia and the neighbouring countries (Bosnia and Herzegovina and Montenegro).

**Keywords:** biodiversity, distribution, new records

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Novi nalazi rijetkih i nebilježenih vaskularnih biljaka, mahovina, lišaja, gljiva i algi u Hrvatskoj  
i susjednim zemljama – 2. Glas. Hrvat. bot. druš. 13(1): 72-109.

## Sažetak

U članku se predstavljaju novi podaci za 22 vaskularne biljke (*Anthyllis dalmatica*, *Carduus chrysacanthus*, *Centaurea alpina*, *Centaurea ceratophylla* ssp. *daniellae*, *Ceratophyllum submersum*, *Cyclosporum leptophyllum*, *Dactylorhiza sambucina*, *Drimia maritima*, *Euphorbia hercegovina*, *Linaria microsepala*, *Neotinea lactea*, *Ophrys archipelagi*, *Op. lutea* subsp. *galilaea*, *Ophioglossum lusitanicum*, *Polygonum salicifolium*, *Pseudostellaria europaea*, *Quercus coccifera*, *Senecio viscosus*, *Silene vallesia* subsp. *graminea*, *Stratiotes aloides*, *Torilis nodosa* i *Utricularia minor*), četiri mahovine (*Blasia pusilla*, *Philonotis marchica*, *Rhodobryum ontariense* i *Ricciocarpos natans*), jednu gljivu (*Rhodophana nitellina*) i 11 vrsta algi (kremenjašica) (*Achnanthidium druartii*, *Amphora aequalis*, *Brachysira chiaruccii*, *B. paraexilis*, *B. styriaca*, *Gomphonema angusticephalum*, *G. supertergestinum*, *Halamphora bullatoides*, *Mayamaea ingenua*, *Planothidium fonticolanceolatum*, *Simonsenia maolaniana*) u Hrvatskoj i susjednim zemljama (Bosna i Hercegovina i Crna Gora).

**Ključne riječi:** bioraznolikost, rasprostranjenost, novi podaci

## Introduction

Detailed knowledge of the flora of any area is crucial for recognising patterns of biodiversity, understanding the processes affecting it and recommending conservation strategies. This paper is dedicated to new findings on the distribution of vascular plants, bryophytes, lichens, fungi and algae in Croatia. Here, we present noteworthy data on 38 species in Croatia.

## Vascular plants

### *Anthyllis dalmatica* F. Conti et Stinca

**Contributors:** Sandro Bogdanović (SB), Martina Temunović (MT), Fabio Conti (FC)

Croatia, Dinara Nature Park, SE of Ježević, alpine grassland above Kozja jama, ca. 1350 m a.s.l., 43.935184°N, 16.544018°E, 20 June 2024, SB & MT



**Figure 1.** *Anthyllis dalmatica* from the Dinara Nature Park (photos by S. Bogdanović).

**Slika 1.** *Anthyllis dalmatica* iz Parka prirode Dinara (fotografije S. Bogdanović).

This species (Fig. 1) belongs to *Anthyllis vulneraria* complex and it has recently been described from Mt Mosor in Dalmatia where it was thought to be endemic (Conti & Stinca 2023). This new finding is the second known locality and is the northernmost point of the distribution in Croatia. Morphologically it is closely related to the Italian endemic *A. apennina* F. Conti et Bartolucci, occurring in the central Apennines, from which it differs by a less-wide calyx, a lower ratio between standard limb length and width, a wider standard, and by the colour of corolla and calyx at flowering time, which are dark yellow.

### ***Carduus chrysacanthus* Ten.**

**Contributors:** Fabio Conti (FC), Sandro Bogdanović (SB)

In Croatia this species is known only from the literature: from Trogir, Šibenik, the island of Hvar (Visiani 1847), Učka (Hirc 1915), and the island of Lošinj (Wallnofer 2008). Recently it has been recorded from a specimen collected on the island of Krk by Bernhardt as *Carduus acanthoides* L. and revised by Starmühler as *C. chrysacanthus* (Rottensteiner 2014).



**Figure 2.** *Carduus chrysacanthus* from Gran Sasso, Vallone delle Cornacchie in Italy (photo by F. Conti).  
**Slika 2.** *Carduus chrysacanthus* iz Gran Sasso, Vallone delle Cornacchie u Italiji (fotografija by F. Conti).

After a comparison with many specimens of *C. chrysacanthus* from the central Apennines (Fig. 2), from which the plant has been described, we think that the Croatian specimens belong to the *C. nutans* group. *Carduus chrysacanthus* must therefore be considered endemic to the Apennines, and *C. chrysacanthus* has to be excluded from the flora of Croatia.

### ***Centaurea alpina* L.**

**Contributors:** Sandro Bogdanović (SB), Martina Temunović (MT)

Croatia, Dinara Nature Park, SE of Ježević, above Sutina, Velika draga, rocky grassland, ca. 670 m a.s.l., 43.926762°N, 16.522165°E, 16 June 2024 (SB, MT)

*Centaurea alpina* (Fig. 3) is one of the rarest species in the Croatian flora. Till now it has been known only from the Risnjak National Park in Gorski Kotar (Šegulja et al. 1994), and from Kuk on Platak (Nikolić 2002). This new finding within Dinaric mountains in Dalmatia represents the southernmost point of the species' distribution in Croatia.



**Figure 3.** Capitula and leaf of *Centaurea alpina* from the Dinara Nature Park (photos by S. Bogdanović).  
**Slika 3.** Glavica i list vrste *Centaurea alpina* iz Parka prirode Dinara (fotografije S. Bogdanović).



**Figure 4.** Habit and capitulum of *Centaurea ceratophylla* subsp. *danielae* from the island of Brač (photo by S. Bogdanović).

**Slika 4.** Habitus i glavica vrste *Centaurea ceratophylla* subsp. *danielae* s otoka Brača (fotografije S. Bogdanović)

***Centaurea ceratophylla* Ten. ssp. *danielae*  
F. Conti, Moraldo et Ricceri**

**Contributors:** Fabio Conti (FC), Sandro Bogdanović (SB)

Croatia, Island of Brač, E of Nerežišća, rocky grassland along the road, 43.313569°N, 16.606678°E, 16 April 2024 (SB)

Croatia, Island of Brač, W of Pražnica, rocky grassland along the road, 43.318729°N, 16.690095°E, 16 April 2024, (SB)

Croatia, Island of Brač, S of Pražnica, rocky grassland along the road, 43.314866°N, 16.703892°E, 16 April 2024, (SB)

Croatia, island of Brač, 556 m a.s.l., dry grasslands, 43.313569°N, 16.606678°E, 18 June 2024 (FC, L. Bracchetti)

Croatia, island of Brač, close to Pražnica, 403 m a.s.l., dry grasslands, 43.318731°N, 16.690094°E, 18 June 2024, (FC, L. Bracchetti)

Croatia, island of Brač, 376 m a.s.l., dry grasslands, 43.314867°N, 16.703892°E, 18 June 2024 (FC, L. Bracchetti)

This taxon (Fig. 4) was described by Conti et al. (2011) from Biokovo (the only report for Croatia) and was also recorded for SW Bosnia and Herzegovina (Buško jezero, Posušje, Zavelim and hills towards Mostar). In the new population, on the island of Brač from central Dalmatia, although the capitula are very small, probably due to the higher temperatures. The observed variability makes us believe that it also belongs to *C. ceratophylla* ssp. *danielae*.

***Ceratophyllum submersum* L.**

**Contributors:** Nina Vuković (NV), Marija Bučar (MB)

Croatia, Podravina, village of Ždala, rivulet Ždalica, 46.170556°N; 17.145556°E, 7 July 2024 (NV, MB), herbarium ID: ZA 79672

The genus *Ceratophyllum* is represented in Croatia by two species: *Ceratophyllum demersum* L. and *C. submersum* L. (Nikolić et al. 2025). *C. demersum* is a cosmopolite, whereas the distribution of *C. submersum* is narrower and its native range stretches from Europe to Central Asia, from Tropical Africa to the South Arabian Peninsula and through the Indian Subcontinent (POWO 2025).



**Figure 5.** Scanned herbarium sheet stored in ZA (left) collected in the Ždalica rivulet (right) (photo by M. Bučar).

**Slika 5.** Skenirani herbarijski primjerak pohranjen u ZA (lijevo) sakupljen u rječici Ždalici (desno) (fotografija M. Bučar).

According to the publicly available data, the localities of both taxa are spread across Croatia, with *C. demersum* being more widely distributed while there: about 15 national records of *C. submersum* (Nikolić et al. 2025). However, according to our experience, macrophyte taxa are generally under-recorded in Croatia and publicly available data do not describe their true distribution well. During our annual monitoring of surface waters in Croatia which took in several hundreds of localities over the last decade, we determined that the occurrence of these two taxa does not correspond to the picture given by the available records. *C. demersum* is one of the most frequently recorded species in slow-flowing to stagnant water bodies in our surveys, while this is the first finding of *C. submersum* in almost 10 years of detailed fieldwork. We recorded the species in the Podravina region in an open and sunny site on a shallow (0-30 cm), clear, slow-running rivulet, the Ždalica, with a muddy and regulated riverbed (Fig. 5). The site was rich in macrophyte vegetation with an estimated 60% cover. Accompanying submersed macrophytes were *Potamogeton crispus* L. and *Utricularia vulgaris* L., while free-floating *Lemna minor* L., *L. trisulca* L., *Hydrocharis morsus-ranae* L. and *Spirodela polyrrhiza* (L.) Schleid. were also present and much more abundant. The free-floating bryophytes *Riccia fluitans* L. and *Ricciocarpos natans* (L.) Corda and the helophytes *Berula erecta* (Huds.) Coville and *Sparganium erectum* L. were also recorded. The species was previously recorded in the Podravina region only twice and only in historical times, in Ješkovo (herbarium specimen ZA 46325, Gjurašin 1894) and Slatina (Hirc 1909).

### ***Cyclosporum leptophyllum* (Pers.)**

**Sprague ex Britton et P. Wilson**

**Contributor:** Sandro Bogdanović (SB)

Croatia, Istria, Poreč, old town, Trg Jurja Dobrile, ruderal habitat in town park, 45.228522°N, 13.592243°E, 24 June 2024 (SB)



**Figure 6.** *Cyclosporum leptophyllum* from Poreč in Istria (photo by S. Bogdanović).

**Slika 6.** *Cyclosporum leptophyllum* iz Poreča u Istri (fotografija S. Bogdanović).

Croatia, Opatija, Opatijska rivijera, ruderal habitat along the road, 45.341233°N, 14.312866°E, 26 June 2024 (SB)

The first occurrence of this species in Croatia was published by Jogan (2014) from Opatija in Istria. At this locality, the species was confirmed recently, and according to the Flora Croatica Database (Nikolić et al. 2025) it was also recorded in Lovran (Istria). Two recent findings could be found in Poreč (Istria) (Fig. 6) and in Split (Dalmatia) according to iNaturalist (2025).

### ***Dactylorhiza sambucina* (L.) Soó**

**Contributors:** David Huška (DH), Marija Kovačević (MK), Marko Doboš (MD)

Eastern Croatia, Mt Psunj, Velika Poljana, meadow, 45.398407°N, 17.285287°E, 23 April 2025 (DH, MK, MD)



**Figure 7.** *Dactylorhiza sambucina* from Mt Psunj (photos by M. Doboš).

**Slika 7.** *Dactylorhiza sambucina* sa Psunja (fotografije M. Doboš).

*Dactylorhiza sambucina* (Orchidaceae) is not uncommon in the Dinaric mountains of Croatia, as well as on Mt Žumberak, Mt Medvednica and the hills of the Zagorje region, but as we move eastward, this species becomes very rare and elusive. In the Slavonia region it is known from the Slavonian highlands (Požeško gorje) and near Belišće (Nikolić et al. 2025). In Požega Valley and the surrounding Slavonian highlands it was first mentioned from around Požega, Pleternica and Bektež by Schlosser and Vukotinović (1869). Only a few years later, high school teacher and botanical enthusiast from Požega Ivan Komlanec made a list of flora of the surroundings of Požega in which he mentioned this species (Komlanec 1873). Numerous later authors, who were dealing with the flora of that region, included *D. sambucina* in their species lists. Sometimes they explicitly refer to historical records (Neilreich 1870, Hudina 2015, Tomašević 2016) and sometimes it is not clear if they are presenting

their own original records (Ilijanić 1977, Pandža et al. 2002, Kranjčev 2005, Pandža 2010, Samardić and Galić 2018), but in our opinion, they all most likely used only the old historical data. Prof. Mirko Tomašević who botanized intensively in the area for 50 years, noted in his monograph (Tomašević 2016) that he had never found this species. The only recent record for the Slavonia region is from Bistrinaci near Belišće (Zahirović 2000). Here we report probably the first record of *D. sambucina* (Fig. 7) in the Slavonian highlands after it was published by Komlanec in 1873. It was found on a meadow surrounded by forest at 690 m a. s. l. Population was quite rich, numbering more than 150 individuals in multiple colors (yellow, purple and pink). The meadow is mowed annually by the local hunters and the grass is formed into haystacks used for the winter diet of the game. This practice has enabled conservation of the species' habitat, which would otherwise have become overgrown.

### ***Drimia maritima* (L.) Stearn**

**Contributors:** Dries Engelen (DE), Maja Maslač Mikulec (MMM), Luka Škunca (LŠ), Tomislav Hudina (TH)

*Southern Croatia, Lastovo Archipelago, Island of Veli Rutvenjak, 42.771389°N, 16.796111°E, May 2019 (DE, MMM, LS, TH)*

*Drimia maritima* (previously *Urginea maritima* (L.) Baker) is a bulbous plant of rocky Mediterranean habitats. While blooming, it can grow up to two meters in height and the inflorescence consists of many small white flowers arranged around the main stem. It has dark green leathery leaves and it flowers during autumn, both of which are adaptations to the Mediterranean climate. In Croatia, the species has mostly been recorded on the southern Dalmatian islands of Korčula, Mljet, Vis and Palagruža (Nikolić et al. 2025). In 2019, over 100 individuals were observed on the island of Veli Rutvenjak in the Lastovo archipelago during ornithological fieldwork for the LIFE Artina project



**Figure 8.** *Drimia maritima* from the island Veli Rutvenjak: bulbs (left) (photo by M. Maslač Mikulec), inflorescence (in the middle), rosettes (right) (photos by D. Engelen).

**Slika 8.** *Drimia maritima* s otoka Veli Rutvenjak: lukovice (lijevo) (fotografija M. Maslač Mikulec), cvat (u sredini), rozete (desno) (fotografije D. Engelen).

(Fig. 8). Botanical surveys carried out on several other islands around Lastovo during the same year, as well as in 2023, did not record the species anywhere else in the archipelago (Hudina 2019, Škunca & Hudina 2023). Veli Rutvenjak is a small island (<1.3 ha) situated between the islands of Prežba and Mrčara and its vegetation consists mostly of well-developed, open macchia with *Olea europaea* L., *Pistacia lentiscus* L. and *Juniperus phoenicia* L. There, *D. maritima* was among the most common species of the understory, alongside *Ruta graveolens* L. and *Brachypodium retusum* (Pers.) P. Beauv., although it is also present in smaller numbers along the island's shore (Hudina 2019). As the species is currently not included in the management plan of the Lastovo Archipelago Nature Park, it is recommended that it be included when the plan is revised in 2026. Finally, it is important to note that some recent studies argue that *D. maritima* is restricted to the Iberian Peninsula and North-western Africa, and that plants growing in the Central Mediterranean should instead be classified as *D. pancration* (Pfosser & Speta 2004), in which case this would also apply to those individuals growing in Croatia.

### ***Euphorbia hercegovina* Beck**

**Contributors:** Sandro Bogdanović (SB), Martina Temunović (MT)

Croatia, Dinara Nature Park, SE of Ježević, above Sutina, Velika draga, rocky grassland, ca. 650 m a.s.l., 43.926313°N, 16.521578°E, 16 June 2024 (SB, MT)

Croatia, Dalmatia, Mt Dinara, in the immediate vicinity of Bili cvitak shelter, on rocky grassland, ca. 800 m a.s.l., 44.030278°N, 16.373981°E, 23 June 2021 (SB, Ivan Budinski), herbarium ID: ZAGR 75308

Croatia, Dalmatia, surroundings of Sinj, Otok, 43.688422°N, 16.740008°E, 22 July 2020 (SB, Ivan Budinski), herbarium ID: ZAGR 79172

Croatia, Dalmatia, Dalmatian Hinterland, Donja Tigarica, rocky grassland along the road, 43.607003°N, 16.867589°E, 7 September 2021 (SB, Ivica Ljubičić), herbarium ID: ZAGR 75161

*Euphorbia hercegovina* (Fig. 9) belongs to the *E. barrelieri* group and is considered a rare Balkan endemic species (Frajman & Schönswetter 2017). In Croatia, it has been known till now from the *locus classicus* in Pijavično on Pelješac Peninsula (Nikolić et al. 2014) and from Dubrovnik and the



**Figure 9.** Habit of *Euphorbia hercegovina* from Velji Do above Cavtat in southern Croatia (photo by S. Bogdanović).

**Slika 9.** Habitus vrste *Euphorbia hercegovina* s lokaliteta Velji Do iznad Cavtata u južnoj Hrvatskoj (fotografija S. Bogdanović).



**Figure 10.** *Linaria microsepala* on Mt Mosor (Sitno Gornje) (left) and from Klis Fortress (right) (photos by I. Limić).

**Slika 10.** *Linaria microsepala* s Mosora (Sitno Gornje) (lijevo) i sa Tvrđave Klis (desno) (fotografije I. Limić).

Konavle region (Terzi et al. 2023). These new sites have significantly contributed to the expansion of the species' range northward.

### ***Linaria microsepala* A. Kern.**

**Contributors:** Ivan Limić (IL), Vedran Šegota (VS)

Croatia, Dalmatia, Klis, Klis fortress, 43.56008°N, 16.52469°E; 43.55992°N, 16.52347°E; 43.55967°N, 16.52275°E, 25 May 2021 (IL, VS)

Croatia, Dalmatia, Klis, 43.55873°N, 16.52124°E; 43.55912°N, 16.52390°E, 25 May 2021 (IL, VS)

Croatia, Dalmatia, Gornja Brela, 43.38842°N, 16.92842°E, 2 July 2022 (IL)

Croatia, Dalmatia, Mosor, Sitno Gornje, 43.52017°N, 16.60817°E; 43.52017°N, 16.60817°E, 20 June 2023 (IL)

Croatia, Dalmatia, Mosor, near mountain shelter Kontejner, 43.51200°N, 16.65942°E, 24 September 2024 (IL)

Croatia, Dalmatia, Mosor, hiking route from the mountain shelter Kontejner towards the peak of Kozik

(Sveti Jure), 43.49394°N, 16.68733°E; 43.49197°N, 16.68872°E; 43.49172°N, 16.68906°E; 43.49072°N, 16.69053°E, 24 September 2024 (IL)

Croatia, Dalmatia, Mosor, hiking route from the peak of Kozik (Sveti Jure) towards Dubrava (Studenac), 43.48933°N, 16.68700°E, 24 September 2024 (IL)

*Linaria microsepala* (Fig. 10) is a rare and endemic plant species from the *Plantaginaceae* family found exclusively in southern and central Dalmatia, from Split to the island of Mljet (Nikolić et al. 2025). The species was first described in 1881 by the Austrian botanist Anton Kerner based on specimens collected near the town of Klis. This perennial plant has white flowers marked with pale purple veins. It typically grows on dry grassland and rocky terrain, favouring calcareous substrates with well-drained soil. In these open, sunlit areas, *Linaria microsepala* thrives with minimal competition from other plant species. Its adaptation to extreme conditions makes it a valuable example of the evolutionary resilience of Mediterranean flora. This species occurs in fragmented populations, often in remote locations with minimal human disturbance. It is classified as data deficient and is still poorly studied

in Croatia. The incomplete distribution data of this species are due to its inconspicuousness and the inaccessibility of some of its habitats. Here we report seven new localities.

***Neotinea lactea* (Poir.) R. M. Bateman,  
Pridgeon & M. W. Chase**

(syn. *Orchis lactea* Poir.)

**Contributors:** Mirjana Jeričević (MJ), Ursula Loos (UL)

Croatia, Dalmatia, island of Korčula, Vela luka, area of Prihonja, 42.9522°N, 42.9522°E, 10 March 2025 (MJ, UL), herbarium ID: ZA 80663

The species was recorded during a field survey in the orchid season of 2025 on the island of Korčula, in the Prihonja area of Vela Luka. The previous data on this species in Croatia date back to the beginning of the 20th century. It was first recorded in 1914 by Dragutin Hirc in the area around Volosko, near Opatija (Kvarner Bay) (Hirc 1914). Ten years later, Ljudevit Rossi (Rossi 1924) reported a finding for Jablanička draga (the village of Jablanac, south of Senj), and this finding is accompanied by a herbarium specimen deposited in the Herbarium Croaticum (ZA) collection under number 40210. Thus, our finding confirms the existence of this species in the Croatian flora after a full 101 years. The species is a herbaceous perennial that grows on dry calcareous soils. In the Red Book of Vascular Flora of Croatia, it is listed as an endangered species (EN) (Nikolić & Topić 2005). We found only one plant with seven inflorescences (Fig. 11) in an olive grove, on dry Mediterranean grassland accompanied by *Anemone hortensis* L., *Asparagus acutifolius* L., *Brachypodium pinnatum* (L.) P. Beauv., *Daucus carota* L., *Foeniculum vulgare* Mill., *Gladiolus* sp., *Lathyrus ochrus* (L.) DC, *Leontodon tuberosus* L., *Muscari commutatum* Guss., *Olea europaea* L., *Rhagadiolus stellatus* (L.) Gaertn., *Sanguisorba minor* Scop., *Sonchus oleraceus* L., *Tordylium apulum* L. and *Urospermum picroides* (L.) F. W. Schmidt. We noticed that the species has an extremely pleasant scent. We also measured the height of the tallest inflorescence,



**Figure 11.** *Neotinea lactea* from island of Korčula (photos by Nebojša Jeričević).

**Slika 11.** *Neotinea lactea* s otoka Korčule (fotografije Nebojša Jeričević).

which was 30 cm. Given that the plant was in full bloom at the time of discovery (March 10, 2025), it can be assumed that flowering began as early as February. Such early flowering is a possible reason for this rare species being overlooked in Croatia.

***Ophrys archipelagi* Gözl et H.R.Reinhard**

**Contributors:** Elvedin Šabanović (EŠ), Bariša Ilić (BI)

Bosnia and Herzegovina, Municipality Mostar, Blagaj, an old road for Nevesinje, 43.260969°N, 017.909203°E, 250 m a.s.l., 22 April 2025, total count: 5 individuals/500 m<sup>2</sup> (EŠ, BI)

*Ophrys archipelagi* was described in 1986 by Reinhard and Golz from the island of Korčula in Croatia. The species belongs to the *O. exaltata* group and is also known under many synonyms. According to POWO (2025), it is recognised as *Ophrys* × *arachnitiformis* Gren. & M. Philippe, while Euro+Med (2006-onwards) lists it as *Ophrys archipelagi* subsp. *adriatica* Kranjčev. It is a rare orchid with a disjunct distribution area on both sides of the Adriatic Sea. On eastern Adriatic coast it is known from the island of Korčula, Dalmatian coast between Zadar and Šibenik, and south of Dubrovnik as well as



**Figure 12.** *Ophrys archipelagi* from Blagaj in Bosnia & Herzegovina (photo by E. Šabanović).

**Slika 12.** *Ophrys archipelagi* iz Blagaja u Bosni i Hercegovini (fotografija E. Šabanović).

on the islands of Cres, Lošinj and Krk, additionally stretching down to Montenegro and Albania (Dilena 2019, Kreutz 2024). On the western Adriatic coast it grows in the southeast of Italy in Foggia, Matera and Bari (Delforge 2006) and Apulia on Mt Gargano (Kreutz 2024). This is the first record of *O. archipelagi* (Fig. 12) in Bosnia and Herzegovina. It was identified in the locality of Blagaj, where it grows on dry calcareous soils in full sun with open maquis on which plant communities of the class *Thero-Brachypodietea*

alternate. This rare taxon belongs to a group of similar 'species' in the Mediterranean region, which are thought to have originated from hybrids between different members of the *Ophrys fuciflora* and *Ophrys sphegodes* complex. The species was not assessed for the IUCN Red List of Threatened Species. There are still insufficient data to accurately determine the degree of endangerment for *O. archipelagi* in Bosnia and Herzegovina.

### ***Ophioglossum lusitanicum* L.**

**Contributors:** Nina Vuković (NV), Mirjana Jeričević (MJ), Nebojša Jeričević (NJ), Ivan Budinski (IB), Vedran Šegota (VŠ), Anja Rimac (AR), Ljiljana Borovečki-Voska (LJBV), Marko Doboš (MD), Maja Maslač Mikulec (MMM)

Croatia, Southern Dalmatia, island Korčula, Vela Luka, Sitnica, 42.93147°N, 16.72941°E, 20 November 2015 (IB); Smokvica, Ugrinovica, 42.91495°N, 16.88177°E, 27 November 2016 (IB); Smokvica, Ugrinovica, 42.916417°N, 16.8835°E, 23 December 2018 (MJ, NJ); Smokvica, Višnja, 42.916028°N, 16.898556°E, 1 April 2018 (MNJ); Smokvica, Pržinice, 42.902667°N, 16.889278°E, 25 February 2021 (MJ, NJ); Smokvica, Vela Stiniva, 42.906917°N, 16.911667°E, 26 February



**Figure 14.** *Ophioglossum lusitanicum* at Sitnica near Vela Luka, island of Korčula (left), typical habitat in different stages of succession (right). (photo by I. Budinski)

**Slika 14.** *Ophioglossum lusitanicum* na lokalitetu Sitnica blizu Vele Luke na otoku Korčuli (lijevo), tipično stanište u različitim stadijima sukcesije (desno). (fotografije: I. Budinski)

2024 (MJ, NJ); Lumbarda, Lazina 42.920833°N, 17.140278°E, 13 February 2024 (MJ, NJ); Kneža, Plišivac, 42.970833°N, 17.061472°E, 12 January 2021 (MJ, NJ); between Pupnat and Žrnovo, Pri Veli vrh, 42.947611°N, 17.080194°E, 2023 (MJ, NJ); Čara, Ropa, 42.920056°N, 16.928778°E, 2023 (MJ, NJ)

Croatia, Southern Istria, Upper Kamenjak, the Monte Kope – Crvene stijene road, 44.811833°N, 13.879183°E, 1 January 2016, (NV), herbarium ID: ZA 40429; Volme, 44.817559°N, 13.882659°E, 25 December 2016 (NV), Safari bar, 44.773016°N, 13.909177°E, 28 December 2016 (NV); Prestanišin rt, 44.78603°N, 13.91849°N, 28 December 2018 (NV)

Croatia, Southern Dalmatia, island of Lastovo, Dovid, 42.74275°N, 16.91238°E, 14 February 2019 (IB); Vrsej dolac, 42.7499090438°N, 16.8870330602°E, 16 March 2023 (MD, MMM)

Croatia, Southern Dalmatia, island of Mljet, Mljet National Park, southern of village Pomena, 42.78393°N, 17.33606°E, 12 February 2019 (VŠ, AR); Islet of Kobra, 42.789139°N, 17.408667°E, 03 December 2024 (IB)

Croatia, Quarnero Bay, island of Krk, Sulinj, 45.17062°N, 14.62275°E, 9 February 2019 (LJBV)

Croatia, Quarnero Bay, Island of Rab, Fruga, 44.80324°N, 14.74486°E, 12 April 2023 (LJBV)

Due to a long gap in the records, *Ophioglossum lusitanicum* (Fig. 14) was considered regionally extinct in Croatia for decades (Marković 1994). Several historical findings from the Eastern Adriatic coast dating from the 19<sup>th</sup> century were followed by almost a hundred years without any findings. In modern times, detailed field surveys revealed the occurrence of over 20 populations in southern Istria (Brana et al. 2014) and contributed to the inclusion of the species into the Croatian Red book as a Critically Endangered taxon (Marković 2005, Nikolić & Topić 2006-onwards). Nevertheless, historical findings from southern Dalmatian



**Figure 13.** *Ophrys lutea* subsp. *galilaea* from village Duži in Bosnia & Herzegovina (photo by E. Šabanović).

**Slika 13.** *Ophrys lutea* subsp. *galilaea* iz sela Duži u Bosni i Hercegovini (fotografija E. Šabanović).

Hvar archipelago (Visiani 1852) were never confirmed after the mid-19<sup>th</sup> century. Since the last published data, in the period between 2015-2024, we have discovered more populations of *O. lusitanicum* in southern Istria and also registered the first records on the Quarnero Bay islands of Krk and Rab. However more interestingly, the species was found again in Southern Dalmatia, for the first time on Korčula, Mljet and Lastovo islands, with as many as 10 populations recorded on the island of Korčula. All recently found populations were recorded in a dynamic environment, i.e. early successional stages of disturbed habitats. It is typically found along patches of grassland in garrigues and low macchia, often on the edges of paths or in otherwise trampled areas, which may be connected to the spore germination requirements (Whittier 1981). The species most likely occurs elsewhere in coastal parts of Croatia, but was generally overlooked for long periods of time due to its indistinctive appearance and early time of emergence. Since its rediscovery in Croatia, more attention is being given to finding new populations, new findings thus constantly emerging.

***Ophrys lutea* Cav. subsp. *galilaea* (H. Fleischm. et Bornm.) Soó**

(syn. *Ophrys lutea* Cav. ssp. *minor* (Tod.) O. Danesch et E. Danesch)

**Contributors:** Elvedin Šabanović (EŠ), Bariša Ilić (BI)

Bosnia and Herzegovina, municipality of Neum, village of Duži, near the Catholic church, 42.914667°N, 17.666250°E, 22 April 2025, 115 m a.s.l., total count: 78 individuals/100 m<sup>2</sup> (EŠ, BI)

*Ophrys lutea* subsp. *galilaea* (syn. *Ophrys sicula* Tineo) was first described in 1846 by Tineo from Palermo, Sicily. A Mediterranean floral element, the plant usually grows on dry grasslands, in scrub and maquis. It was initially recognized as a variety of *Ophrys lutea*, but over the years it enjoyed several synonyms and was long listed as *O. lutea* subsp. *minor*. Around the turn of the century, however, there was considerable reclassification within the group and the species most affected was *O. sicula*. Henneke and Munzinger (2014) concluded that the eastern Mediterranean populations of *O. sicula* are distinct from those in the west and that it is a distinct species, very similar to *O. galilaea* described from Israel by Fleischmann (1923). This is the first record for this species (Fig. 13) in the territory of Bosnia and Herzegovina – in village Duži, near the Catholic church, where it grows in dry grassland together with *Anacamptys pyramidalis* (L.) Rich., *Spiranthes spiralis* (L.) Chevall. and *Ophrys rhodostephan* Devillers et Devillers-Tersch. There is still not enough information to accurately determine the degree of endangerment for this species in Bosnia and Herzegovina.

***Polygonum salicifolium* Brouss. ex Willd.**

**Contributors:** Vedran Šegota (VŠ), Anja Rimac (AR), Monika Cindrić (MC), Marta Rogošić (MR), Nela Jantol (NJ)

Croatia, Drava River oxbow near Cenkovičan, 46.124167°N, 17.104444°E, 13 September 2022 (MR, NJ)



**Figure 15.** Scanned herbarium sheet of *Polygonum salicifolium* stored in ZA.

**Slika 15.** Skenirani herbarijski primjerak vrste *Polygonum salicifolium* pohranjen u zbirci ZA.

Croatia, Međimurje, Bara Žučička pond near Kotoriba, 46.366222°N, 16.796389°E, 3 September 2024 (VS, AR, MC), herbarium ID: ZA 9765, ZA 79766, ZA 79767, ZA 79768, ZA 79769

*Polygonum salicifolium* is an annual, erect or semi-decumbent herb, up to 1 m high, with linear-lanceolate leaves about 15 cm long and 1.5 cm wide and with whitish-pink flowers. It grows in marshy places, along the banks of streams, rivers and lakes. It is widespread in southern Europe, Macaronesia, tropical and South Africa, tropical Asia, Australia and America and naturalized in Madagascar. In Croatia, it has the status of data deficient (DD) species, since there is only one national record, from the Krka River (Marković et al. 1993). Two populations were found recently in Northern Croatia (Fig. 15), in an oxbow of the

Drava River and an oxbow lake of the Mura River. The first one, near the Drava River, is situated in the vicinity of the settlement of Cenkovičan, where it was growing along with *Cyperus fuscus* L., *C. glomeratus* L., *Polygonum hydropiper* L., *Rumex crispus* L., and the aquatic *Ranunculus aquatilis* L. The second population was found along the bank of the Bara Žužička pond, an oxbow lake, which used to be connected to the Mura River. Here, the species was accompanied by *Berula erecta* (Huds.) Coville, *Iris pseudacorus* L., *Lysimachia nummularia* L., *Lythrum salicaria* L., *Phragmites australis* (Cav.) Steud., *Rumex hydrolapathum* Huds. and *Scutellaria galericulata* L. along the pond bank, while the aquatic *Nuphar lutea* (L.) Sm., *Salvinia natans* (L.) All. and *Utricularia australis* R. Br. inhabited the shallow water of the pond.

### ***Pseudostellaria europaea* Schaeftl.**

**Contributors:** Antun Alegro (AA), Vedran Šegota (VŠ)

NW Croatia, Dubravica, forest, 45.963794°N, 15.744917°E, 27 April 2023 (AA, VŠ)

*Pseudostellaria europaea* belongs to the so called Illyricoid floral element, a group of species of mesophilous forest vegetation with distribution limited to the NW part of the Illyrian phytogeographical

province (Trinajstić 1992, 1995). There are only a few known localities of this species in Croatia, limited to the NW part of the country (Samoborsko gorje, Vukomeričke gorice, and lately Gorski kotar) (Rossi 1924, Trinajstić 1995, Mitić et al. 2007, ZAHO herbarium specimen No. 80970, CNHM 600:ZAG;6580:BO, Borovečki-Voska, 2013). We found the species within a forest of sessile oak and common hornbeam (*As. Epimedio-Carpinetum betuli* (Horvart 1938) Borhidi 1963) in the vicinity of the Dubravica peatbog.

### ***Quercus coccifera* L.**

**Contributors:** Dries Engelen (DE), Ivan Budinski (IB)

Southern Croatia, Lastovo Islands, Island of Bratin, 42.747189°N, 16.799439°E, March 2021 (DE, IB)

The kermes oak (*Quercus coccifera* L.) is an evergreen shrub or tree of dry, rocky soils which is widespread across the Mediterranean Basin. Its range overlaps that of the holm oak (*Q. ilex* L.), but it is better able to withstand harsher (e.g. windier) and drier weather conditions than the latter. In Croatia, *Q. coccifera* has mostly been recorded in Konavle and on the Kvarner and South Dalmatian Islands (Trinajstić 2010, Nikolić et al. 2025). There are, however, no records of the species from the



**Figure 16.** *Pseudostellaria europaea* near Dubravica peatbog (photos by A. Alegro).

**Slika 16.** *Pseudostellaria europaea* u blizini creta Dubravica (fotografije A. Alegro).



**Figure 17.** *Quercus coccifera* from the island of Bratin in Lastovo Archipelago – stand of high trees (left) and leaves (right) (photos by D. Engelen).

**Slika 17.** *Quercus coccifera* s otoka Bratin u Lastovskom arhipelagu – sastojina visokih stabala (lijevo) i listovi (desno) (fotografije D. Engelen).

Lastovo archipelago. In March 2021, while preparing trails for carrying out rat removal work on the island of Bratin, a stand of kermes oaks was found on the north-eastern side of the island. The stand covered a few square meters and consisted of 16 stems, reaching up to ~10 m in height, and below them were several seedlings present (Fig. 17). The island of Bratin (17.5 ha) is situated directly to the west of Lastovo and is one of the more botanically diverse islands in the archipelago (Hudina 2019). The northern part is largely covered by well-developed Aleppo pine (*Pinus halepensis* Mill.) forest with an understory of the evergreen shrubs lentisk (*Pistacia lentiscus* L.) and Phoenician Juniper (*Juniperus phoenicia* L.). The island also hosts a population of free-roaming domestic goats which prevents successful regeneration and consequently, no middle-aged Kermes oak individuals are present on the island.

### ***Senecio viscosus* L.**

**Contributor:** Sebastian Ćato (SC)

Croatia, Lika region, Ramljani - highway stop Janjče, 44.751743°N, 15.375152°E, 1 August 2024 (SC)

*Senecio viscosus* (Asteraceae) (Fig. 18) is an annual therophyte forming an herbaceous bush. It can be recognized by numerous small and yellow composite flowers, many branched inflorescence, lobed leaves and abundant glandular hairs of various sizes covering the plant entirely, making it considerably sticky. This species is native to most of Europe and was introduced to North America and Asia, being considered invasive (POWO 2025). It can be found growing in different disturbed and abandoned habitats such as railway tracks, roadsides and various waste grounds. It is infrequently found in Croatia with scattered, occasional observations with sometimes decades between observations. The first report for Croatia dates back a century, from two localities on Mt Psunj in southwestern Slavonia (Bošnjak 1925). Subsequent records are mostly from the continental region (Kolonić 1971 – 1972; Tomašević 1999, Pandža 2010) with more recent findings from the Alpine region – Sveti Rok (Topić 2020) and the Mediterranean region – Knin (Jasprica et al. 2017). The newest record of *S. viscosus* is represented by a population from Lika (Alpine region) which was discovered in August 2024. Numerous plants were found on the grounds of the Janjče – Istok highway



**Figure 18.** *Senecio viscosus* from the Janjče highway stop in Lika (photos by S. Čato).

**Slika 18.** *Senecio viscosus* s odmorišta Janjče u Lici (fotografije S. Čato).

rest area, growing in an area of barren soil and rocks. It was not previously known from this wider area, which currently represents the westernmost known population in the country.

***Silene vallesia* L. ssp. *graminea* (Vis. ex Rchb.) Nyman**

**Contributors:** Sandro Bogdanović (SB), Martina Temunović (MT)

Croatia, Dinara Nature Park, SE of Ježević, alpine grassland above Kozja jama, ca. 1350 m a.s.l., 43.935184°N, 16.544018°E, 20 June 2024 (SB, MT)



**Figure 19.** *Silene vallesia* subsp. *graminea* from the Dinara Nature Park (photo by S. Bogdanović).

**Slika 19.** *Silene vallesia* subsp. *graminea* iz Parka prirode Dinara (fotografija S. Bogdanović).

Croatia, Dinara, main ridge Ošljak, grassland, 44.040669°N, 16.389578°E, 30 June 2018 (SB, Ivan Ljubičić), herbarium ID: ZAGR 47133

Although it was initially described as *Silene graminea* Vis. ex Rchb. from Mt Dinara (Visiani 1852) and Kamešnica (Reichenbach 1844), this taxon (Fig. 19) has not been found for many years on the mountains of Dinara. All localities recorded in Croatia are from Mt Velebit and Mt Plješivica in Lika (Nikolić et al. 2025).

***Stratiotes aloides* L.**

**Contributors:** Anja Rimac (AR), Vedran Šegota (VŠ), Monika Cindrić (MC)

Eastern Croatia, Slavonia, Dubočac, near Slavonski Brod, the confluence of the Dubočac and Mirošava canals before their discharge into the Sava River, 45.053235°N, 17.879264°E, 9 August 2019 (AR, VŠ)

Central Croatia, Moslavina, south of Garešnica, on the road between Međurić and Veliko Vukovje, in stagnant water of a channel connected to the Ilova River, 45.4560855°N, 16.910689°E, 5 September 2023 (AR, VŠ)

NW Croatia, Međimurje, Husićova Graba Mali Gomba Kut oxbow lake, near Goričan, 46.418248°N, 16.682582°E, 16 September 2024 (MC)



**Figure 20.** *Stratiotes aloides* – drone (left) (photo by V. Bašek) and ground (right) footage of the population in Husića Graba oxbow lake (photo by M. Cindrić).

**Slika 20.** *Stratiotes aloides* – snimka dronom (lijevo) (fotografija V. Bašek) i s tla (desno) populacije u starom rukavcu Husića Graba (fotografija M. Cindrić).

*Stratiotes aloides* L. is a perennial aquatic species of stagnant and slow-flowing waters with a mostly submerged spiral rosette of leaves. At the time of flowering (from May to July), the leaves rise above the water, and after that, they sink again. The species is distributed in Central Europe, the Caucasus and Western Siberia. In Croatia, it has been rarely found in stagnant waters along the Sava, Drava and Danube rivers (Nikolić et al. 2025) and has the status of vulnerable species. We found the species in August 2019, in stagnant and eutrophic water after the confluence of the Dubočac and Mirošava canals before their discharge into the Sava River. The species was considerably abundant. It was accompanied by *Ceratophyllum demersum* L., *Hydrocharis morsus-ranae* L., *Myriophyllum spicatum* L., *Potamogeton crispus* L., *P. trichoides* Cham. et Schldtl., *Spirodela polyrhiza* (L.) Schleid, *Lemna minor* L., *L. trisulca* L. and *Trapa natans* L. Interestingly, this was the one of rare localities of invasive alien macrophyte species *Elodea nuttallii* (Planch.) H. St. John in Croatia (Bučar et al. 2024). A small population of *S. aloides* was also found in September 2023 in the channel connected to the Ilova River, on the road between Međurić and Veliko Vukovje, south of Garešnica. Here, the species was accompanied by the invasive alien plant

*Ludwigia peploides* (Kunth) P. H. Raven. Finally, the species was found for the first time in Međimurje (NW Croatia) in September 2024 in an oxbow of the Mura River called Husićeva Graba, west of the Goričan border crossing, together with *Hydrocharis morsus-ranae*, *Salvinia natans* (L.) All. and *Lemna minor*. Drone footage was taken to further monitor the size of the population, which is at present in good condition covering an area of approximately 5,000 m<sup>2</sup> (Fig. 20).

### ***Torilis nodosa* (L.) Gaertn.**

**Contributors:** Anja Rimac (AR), Magdalena Klarić (MK)

Central Croatia, Zagreb, Trnjanska Savica, along Slavonska Avenija, 45.794423°N, 15.978316°E, 7 May 2025 (AR, MK)

Eastern Croatia, Slavonia, Vinkovci, adjacent to Hotel Slavonia, 45.28769°N, 18.80311°E, 16 May 2025 (AR)

Central Croatia, Zagreb, Maksimir, Svetice, near Faculty of Economics and Business, 45.817011°N, 16.013022°E, 31 May 2025 (AR)

Central Croatia, Zagreb, Makismir, Svetice, along Ulica Kralja Zvonimira, 45.81428°N, 16.00675°E, 3 June 2025 (AR)



**Figure 21.** *Torilis nodosa* from Zagreb, Trnjanska Savica (up left) and Vinkovci (up right). Habitat from Zagreb-Maksimir (down left) and Vinkovci (down right).

**Slika 21.** *Torilis nodosa* iz Zagreba, iz Trnjanske Savice (gore lijevo) i Vinkovaca (gore desno). Stanište u Zagrebu, u Makimiru (dolje lijevo) i Vinkovcima (dolje desno).

Central Croatia, Zagreb, Makimir, along Ulica Vjekoslava Heinzela, 45.81037°N, 16.00225°E, 14 June 2025 (AR)

*Torilis nodosa* (L.) Gaertn. (*Apiaceae*) is a small annual therophyte that typically inhabits dry, disturbed environments such as grasslands, roadsides, and waste grounds and is diagnostic of the class *Chenopodietea* Br.-Bl. in Br.-Bl. et al. 1952 (Aladías 2014-onward, Chytrý et al. 2024). The species is native to Europe and is most common in the Mediterranean (Hand 2011). However, it extends beyond that region, especially in areas where human activities and microclimate conditions mimic Mediterranean habitats. In Croatia, it was so far known only from the Mediterranean part (Nikolić et al. 2025), except for one record from Udbina

(Marković-Gospodarić 1965). Here we present new findings from Central (Zagreb) and Eastern Croatia (Vinkovci) to document its spread to the continental part of the country (Fig. 21), most likely facilitated by milder winters in recent years and the effect of urban heat. In Zagreb, the species was found in four localities, within the roadside vegetation along the major and medium-sized roads in Trnjanska Savica and Maksimir, flowering and fruiting in May and June. Here, it was accompanied by species characteristic of ruderal habitats, with *Hordeum murinum* L. ssp. *murinum*, *Bromus sterilis* L. and *Lolium perenne* L. being predominant in Savica and *Hordeum murinum* L. ssp. *murinum*, *Lolium perenne* L., *Polygonum aviculare* L. and *Amaranthus deflexus* L. in Maksimir. A small population of *Torilis nodosa*

was also found in the center of Vinkovci in Slavonia, in May 2025. It was accompanied by species commonly found in anthropogenic habitats and urban green areas such as *Hordeum murinum* L., *Oxalis corniculata* L., *Poa annua* L., *Plantago lanceolata* L., *P. major*, *Stellaria media* (L.) Vill., *Bellis perennis* L., *Taraxacum officinale* F. H. Wigg., *Trifolium repens* L. and invasive *Erigeron annuus* (L.) Desf. and *Veronica persica* Poir.

### ***Utricularia minor* L.**

**Contributors:** Antun Alegro (AA), Vedran Šegota (VŠ)

Croatia, Plitvice Lakes National Park, Ljeskovačke Bare peatbog, 44.849411°N, 15.600881°E, 15 September 2020 (AA, VŠ)

Croatia, alkaline fen in the spring area of the Dretulja River, near the town of Plaški, 45.3515°N, 45.0756°E, 8 July 2024 (VŠ)

*Utricularia minor* is extremely rare insectivorous macrophyte species in Croatia with the old records from Plitvice Lakes National Park (herbarium ID: CNHM 600:ZAG;3995:BOT, Domac 1967-1968, Krga 1992) and Dretulja River near Plaški (Gaži-Baskova 1973). The old records from Šestine (Zagreb), Mt

Ivanščica (herbarium ID: ZA 47589) and the island of Pag (Horvatić 1933) are dubious. We confirmed the two old localities – Ljeskovačke Bare mire (within Plitvice Lakes NP) where a significant population was found growing in shallow oligotrophic ponds and an alkaline fen near Dretulja River in the vicinity of the town of Plaški with only a few specimens in the microdepressions along the river valley slopes. In both populations flowering plants were registered (Fig. 22).

### **Bryophytes**

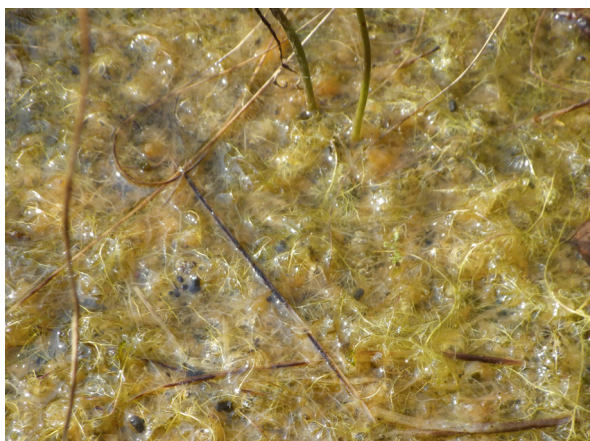
#### ***Blasia pusilla* L.**

**Contributors:** Antun Alegro (AA), Marko Doboš (MD), Vedran Šegota (VŠ), Anja Rimac (AR)

Croatia, Papuk Nature Park, Stražbenica, 45.55626°N, 17.79118°E, 17 September 2010 (AA, VŠ, AR)

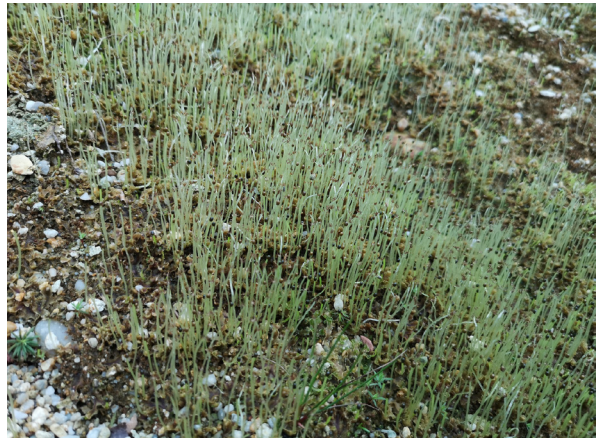
Croatia, Papuk Nature Park, Stražbenica, 45.55626°N, 17.79118°E, 7 March 2024 (MD)

Croatia, Bilogora hills, ca 3.7 km NNE of village Dijakovac, ca 10 km SSW from Virovitica town, E of Babinac (area on TK25 map), 45.74389°N, 17.36056°E, 5 July 2025 (MD, VŠ)



**Figure 22.** *Utricularia minor* – submersed stems at Ljeskovačke bare mire (left) (photo A. Alegro) and flower at Dretulja alkaline fen (right) (photo K. Husnjak Malovec).

**Slika 22.** *Utricularia minor* – podvodne stabljike na cretu Ljeskovačke bare (lijevo) (fotografija A. Alegro) i cvijet na bazofilnom cretu Dretulja (desno) (fotografija K. Husnjak Malovec).



**Figure 23.** *Blasia pusilla* from the locality Babinac in 2024 (left) and Stražbenica in Papuk Nature Park in 2024 (Photos by M. Doboš).

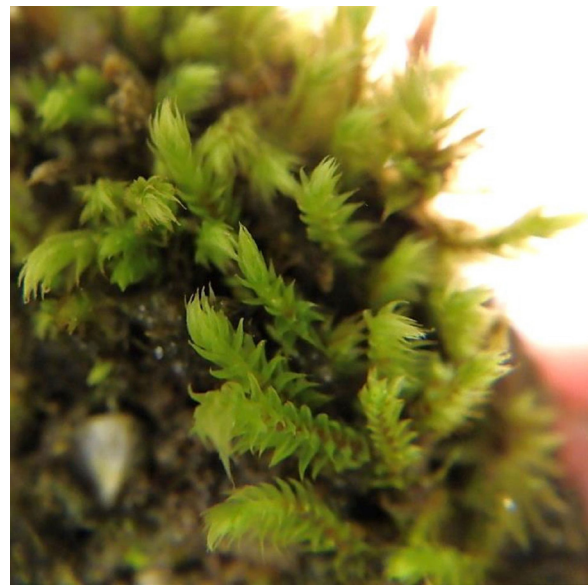
**Slika 23.** *Blasia pusilla* s lokaliteta Babinac iz 2024. (lijevo) i Stražbenice u Parku prirode Papuk u 2024. (fotografije M. Doboš).

Croatia, Mt Papuk, W part of Papuk Nature Park, Đedovica/Djedovica, close to the road Kamenska-Voćin (D38), 438 (on TK25 map), 45.57688°N, 17.49518°E (MD)

There are only three historical records of this rare liverwort in Croatia – Zagreb (Jelenovac and Prekrižje) (Heinz 1888), Mt Klek (Mágyosy-Dietz 1908) and Dubravica in Hrvatsko Zagorje (Horvat 1932). We confirmed this species for Croatian bryoflora in 2010 by finding a population near Stražbenica within Papuk Nature Park, accompanied by *Dicranella rufescens* (Dicks.) Schimp., *Pogonatum urnigerum* (Hedw.) P. Beauv. and *Pohlia annotina* (Hedw.) Lindb. The species was growing on exposed slopes built of silicate sands, along the margin of the sessile oak forest. The same population was again registered in 2024, when a large number of specimens had developed sporophytes (Fig. 23). The second locality was found in 2025, south of Virovitica, growing on the soil, in a moist drainage ditch between the macadam road and a forest edge. The population was quite dense, but very localized on the edge of the north facing side of a ditch. The third locality was found in 2025 at Đedovica on the moist soil above siliceous bedrock, close to the creek, on a disturbed habitat after the passage of heavy forestry machinery and logging.

### ***Philonotis marchica* (Hedw.) Brid.**

**Contributors:** Vedran Šegota (VŠ), Anja Rimac (AR), Antun Alegro (AA)



**Figure 24.** *Philonotis marchica* from the Velika Belica River in Plitvice Lakes National park (photo by A. Rimac).

**Slika 24.** *Philonotis marchica* iz rijeke Velike Belice u Nacionalnom parku Plitvička jezera (fotografija A. Rimac).

Croatia, Plitvice Lakes National Park, Korana River, upstream from the 2<sup>nd</sup> Korana Waterfall, 44.909000°N, 15.608000°E, 12 August 2022 (AR, VŠ, AA)

The species has been recently found for the first time in Croatia, in the Gorski Kotar region (Velika Belica River) (Rimac et al. 2021, 2022). In 2022, we found another population, on the Korana River within Plitvice Lakes National Park (Fig. 24). The species was growing on the limestone rocks within the river, together with other bryophytes (*Hymenostylium recurvirostrum* (Hedw.) Dixon, *Pellia endiviifolia* (Dicks.) Dumort., *Ptychostomum pseudotriquetrum* (Hedw.) J. R. Spence et H. P. Ramsay, *Palustriella commutata* (Hedw.) Ochyra, *Gymnostomum calcareum* Nees et Hornsch., *Cratoneuron filicinum* (Hedw.) Spruce, *Pohlia melanodon* (Brid.) A. J. Shaw), the charophyte *Chara globularis* Thuiller and the macrophyte *Mentha aquatica* L. Although known from most European countries, the species is rarely recorded anywhere else.



**Figure 25.** *Rhodobryum ontariense* from Sirač (Mt Papuk) (photo by M. Doboš).

**Slika 25.** *Rhodobryum ontariense* iz Sirača (Papuk) (fotografija M. Doboš).

### ***Rhodobryum ontariense* (Kindb.) Kindb.**

**Contributors:** Marija Bučar (MB), Marko Doboš (MD)

Eastern Croatia, Slavonia, Mt Papuk, Sirač, Papukkale, 45.55909°N, 17.33842°E, 26 December 2022 (MD) photodocumented – available on iNaturalist (ID 145125107)

Eastern Croatia, Slavonia, Mt Papuk, Gornji Vrhovci, 45.47318°N, 17.56028°E, 7 May 2023 (MB) photodocumented – available on iNaturalist (ID 172650385)

Central Croatia, Mt Hrastovička gora, Hrastovica, 45.40074°N, 16.27711°E, 2 November 2024 (MB), herbarium ID: ZA 80345

*Rhodobryum ontariense* (Fig. 25) is a dendroid acrocarpous moss known mostly from the east of North America, but also sporadically found in Europe and Asia. It prefers calcareous substrates with high pH in areas of high continentality (van Zuijlen et al. 2023). Historically, there is only one record of this species in Croatia from the island of Lošinj (Düll 1999). More recently, two new records were published in Bučar et al. (2022). These specimens were however bought from market vendors in the course of the Christmas market survey; therefore, no precise locality was given. Both were said to have been collected from rocks near Ogulin and Sinj, but exact localities are missing. Most recently, three new localities were given between 2022 and 2024. Interestingly, the three localities provide slightly different ecological conditions (Fig. 26). In Hrastovica, *R. ontariense* was found above the road, on a dry, sunny slope characterized by crumbly soil. On Mt Papuk, near Gornji Vrhovci, it was recorded in an open calcareous grassland on the soil. On another location on Mt Papuk, near Sirač, however, it was located in a shaded forest on a calcareous boulder next to the stream. This species is known to grow in both forests and grasslands due to its indifference to light availability or moisture. It also does not indicate any extremes in habitat values of nutrient load or temperature.



**Figure 26.** *Rhodobryum ontariense* localities: A – Hrastovica, Hrastovička gora, B – Sirač, Papuk, C – Gornji Vrhovci, Papuk (photos by M. Bučar and M. Doboš)

**Slika 26.** Nalazišta vrste *Rhodobryum ontariense*: A – Hrastovica, Hrastovička gora, B – Sirač, Papuk, C – Gornji Vrhovci, Papuk (fotografije M. Bučar i M. Doboš).

### ***Ricciocarpos natans* (L.) Corda**

**Contributors:** Nina Vuković (NV), Marija Bučar (MB), Vedran Šegota (VŠ), Dragan Prlić (DP)

Croatia, Bistra River (Krajnica), 46.056184°N, 17.159304°E, 10 October 2018 (DP)

Croatia, Bistra River (Krajnica), 46.056184°N, 17.159304°E, 7 July 2024 (NV, MB), herbarium ID: ZA 80132

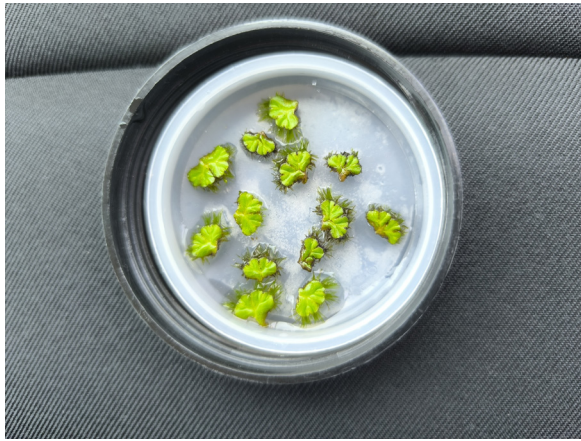
Croatia, Rog-Strug River (Podravske Sesvete), 45.999064°N, 17.244790°E, 7 July 2024 (NV, MB), herbarium ID: ZA 80135

Croatia, Ždralica River (Ždrala), 46.170620°N, 17.145725°E, 7 July 2024 (VŠ, NV), herbarium ID: ZA 80133

Croatia, Bistrec River, Rakovnica II, 46.338421°N, 16.808697°E, 24 July 2024 (VŠ, NV)

*Ricciocarpos natans* is an aquatic bryophyte

(Fig. 27), usually free floating although it can be stranded on mud as the water level drops. It is distributed worldwide though more abundant in temperate regions, while in Croatia it is very rare and distributed along the northern border. The first literature records of *Ricciocarpos natans* in Croatia were published relatively recently, showing that the species was sporadically found by various authors in the period 2006-2016 in altogether six localities in northern and eastern Croatia, mostly related to backwaters or inundation areas of large rivers, the Danube, Drava and Mura (Ellis et al. 2017). *Ricciocarpos natans* was found in five new sites since the last published records, all situated in the Podravina region, near the locations where *S. natans* was previously noted. These sites were generally located on small watercourses with slow running water, rich in macrophyte and helophytic vegetation, indicating eutrophic waters. Vegetation cover ranged from (estimated) 60-95% and total species numbers



**Figure 27.** Habitus of *Ricciocarpos natans* from Rog-Strug, near Sesevete Posavske (photo by N. Vuković).

**Slika 27.** Habitus vrste *Ricciocarpos natans* iz rijeke Ros-Strug kraj Seseveta Posavskih (fotografija N. Vuković).

were generally high (13-32 species). The lowest species number was detected in Rog-Strug (eight species) however the total cover was 95%.

## Fungi

### *Rhodophana nitellina* (Fr.) Papetti

**Contributors:** Ilinka Četković (IČ), Zdenko Tkalčec (ZT)

Montenegro, Nikšić Municipality, Trebjesa forest park, 42.769900°N, 18.959050°E, 14 November 2023 (IČ, ZT), herbarium ID: NHMM 1326/19382

*Rhodophana nitellina* (Fig. 28) is a fungal species (Agaricales, Basidiomycota) that lives as a litter and soil saprotroph in deciduous and coniferous forests. It is widespread in Europe, but occasional to rare (Noordeloos 1998, 2012). In Montenegro, it has only been recorded once, by Hadžić (2018), as *Rhodocybe nitellina*, accompanied by a photograph of basidiomata. However, since his identifications were largely made without observations of microscopic characters and since it is not possible to confirm his identification based on that photograph (most likely it shows a completely different species),



**Figure 28.** *Rhodophana nitellina* from the Trebjesa forest park in Montenegro (Photo by I. Četković)

**Slika 28.** *Rhodophana nitellina* iz Park šume Trebjesa u Crnoj Gori (fotografija I. Četković)

his record of *R. nitellina* should be disregarded. Therefore, the finding presented here is the first reliable record of this species in Montenegro. The collected material (basidiomata) is deposited in the mycological collection of the Natural History Museum of Montenegro in Podgorica.

## Algae

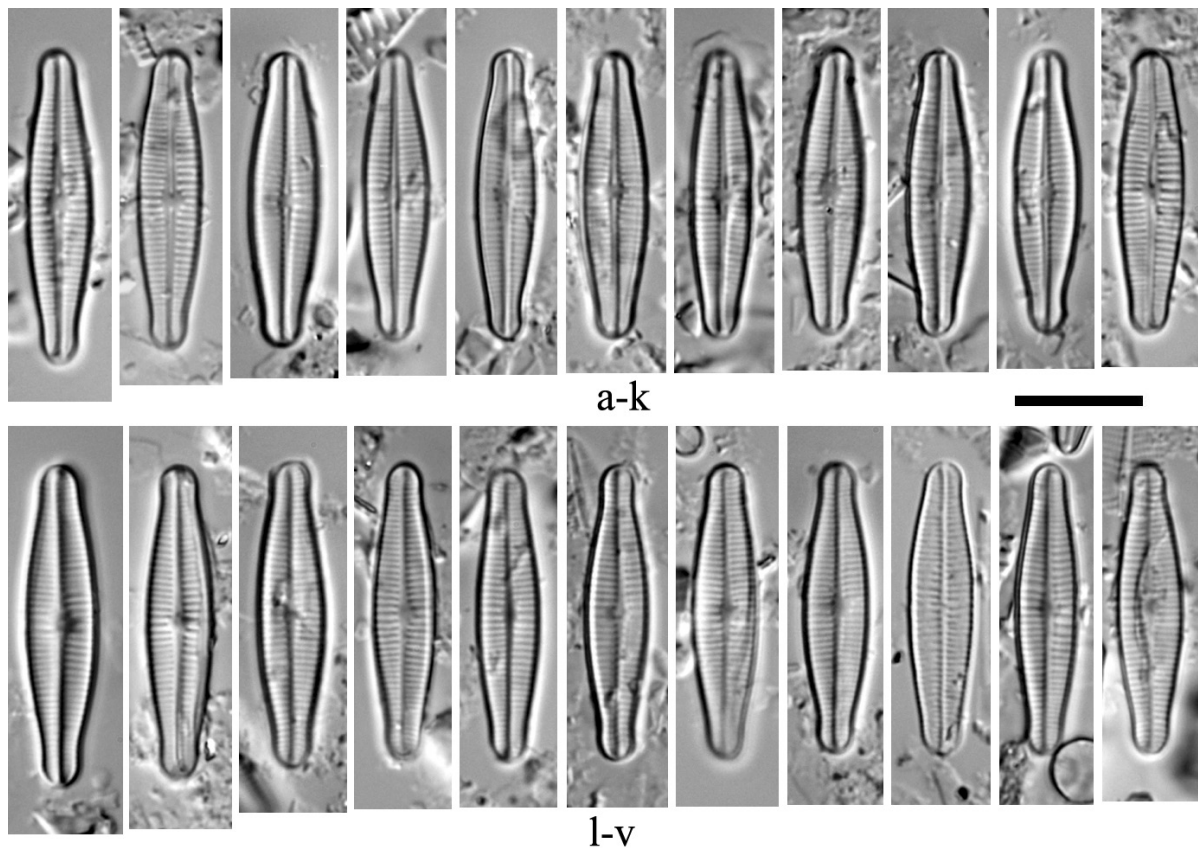
### *Achnanthidium druartii* Rimet et Couté

**Contributors:** Marija Gligora Udovič (MGU), Antonija Kulaš (AK), Petar Žutinić (PŽ), Valentina Dorić (VD), Dunja Jurina (DJ), Csilla Stenger-Kovács (CSK), Zlatko Levkov (ZL)

Croatia, Drava River, Belišće, 45.690494°N, 18.41682°E, 19 July 2019, herbarium ID: HRNDC 001833

Croatia, Reservoir HE Čakovec, 46.312428°N, 16.376679°E, 2 September 2024, herbarium ID: MKNDC 014909

Croatia, old riverbed of the Drava River after the dam of HE Dubrava, 46.318038°N, 16.744044°E, 3 September 2024, herbarium ID: MKNDC 014905



**Figure 29.** *Achnanthidium druartii*. Figures a-k: Raphe valve views showing the range of morphological variation. Figures l-v: Rapheless valve views showing the range of the morphological variation. Scale bar is 10  $\mu\text{m}$  (photos by Z. Levkov).

**Slika 29.** *Achnanthidium druartii*. Slike a-k: Prikaz smanjenja veličine i morfološke varijacije rafidne valve. Slike l-v: Prikaz smanjenja veličine i morfološke varijacije arafidne valve. Mjerna skala je 10  $\mu\text{m}$  (fotografije Z. Levkov).

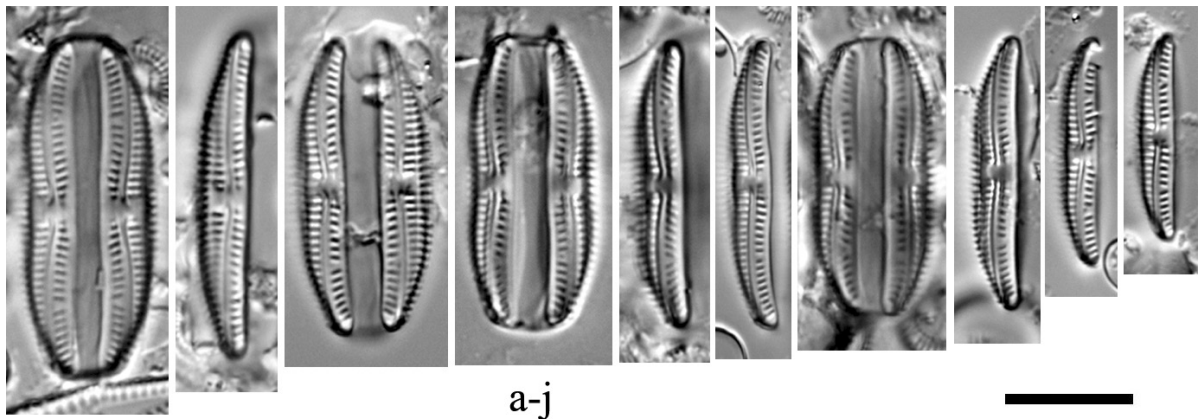
Croatia, reservoir HE Dubrava, 46.323809°N, 16.606581°E, 2 September 2024, herbarium ID: MKNDC 014901

Croatia, stream Rumin (tributary of the Cetina River), 43.776176°N, 16.648138°E, 9 April 2024, herbarium ID: MKNDC 014601

Croatia, Cetina River, Radmanove mlinice, 43.436788°N, 16.758348°E, 9 April 2024, herbarium ID: MKNDC 014602

Croatia, Butišnica River, Bulin most, 44.040930°N, 16.186935°E, 6 March 2024, herbarium ID: MKNDC 014614

Frustules are heterovalval, one valve with raphe (RV), the other without raphe (RL). Valves are lanceolate with slightly subrostrate and broadly rounded ends. Valve length is 16-25  $\mu\text{m}$ ; valve breadth is 4.5-5.5  $\mu\text{m}$ . Axial area on the both valves is linear, central area is almost absent to narrow, bordered with slightly shortened 1-2 central stria. Raphe on RV valve is filiform with slightly expanded proximal raphe ends. Distal raphe ends are unilaterally curved. Striae on both valves are coarse, parallel to slightly radiate in the middle, 15-22 in 10  $\mu\text{m}$ , composed of 6 to 7 areolae. This species is considered an invasive species (Rimet et al. 2010) and its distribution should be monitored, especially in the watershed of the River



**Figure 30.** Light microscope views of size diminution and morphological variation of the valves and frustules of *Amphora aequalis*. Scale bar is 10  $\mu\text{m}$  (photos by Z. Levkov).

**Slika 30.** Mikroskopski (SM) prikaz smanjenja veličine i morfološke varijacije valvi i frustula vrste *Amphora aequalis*. Mjerna skala je 10  $\mu\text{m}$  (fotografije Z. Levkov).

Drava. *Achnantheidium druartii* (Fig. 29) has been recorded in the Drava River, Beliše and River Drava watershed (reservoir HE Dubrava, the old riverbed of the Drava River after the dam of HE Dubrava and reservoir of HE Čakovec) with a relative abundance of 8.5-15.25%. Small populations have been observed in Rumin stream (a tributary of the Cetina River), Cetina River - Radmanove mlinice and Butižnica - Bulin most, with a relative abundance of lower than 1%.

### *Amphora aequalis* Krammer

**Contributors:** Marija Gligora Udovič (MGU), Antonija Kulaš (AK), Petar Žutinić (PŽ), Zlatko Levkov (ZL)

Croatia, Krka River, Lozovac, Velika Luka, 43.845563°N, 15.985488°E, 21 September 2017, herbarium ID: HRNDC 000091

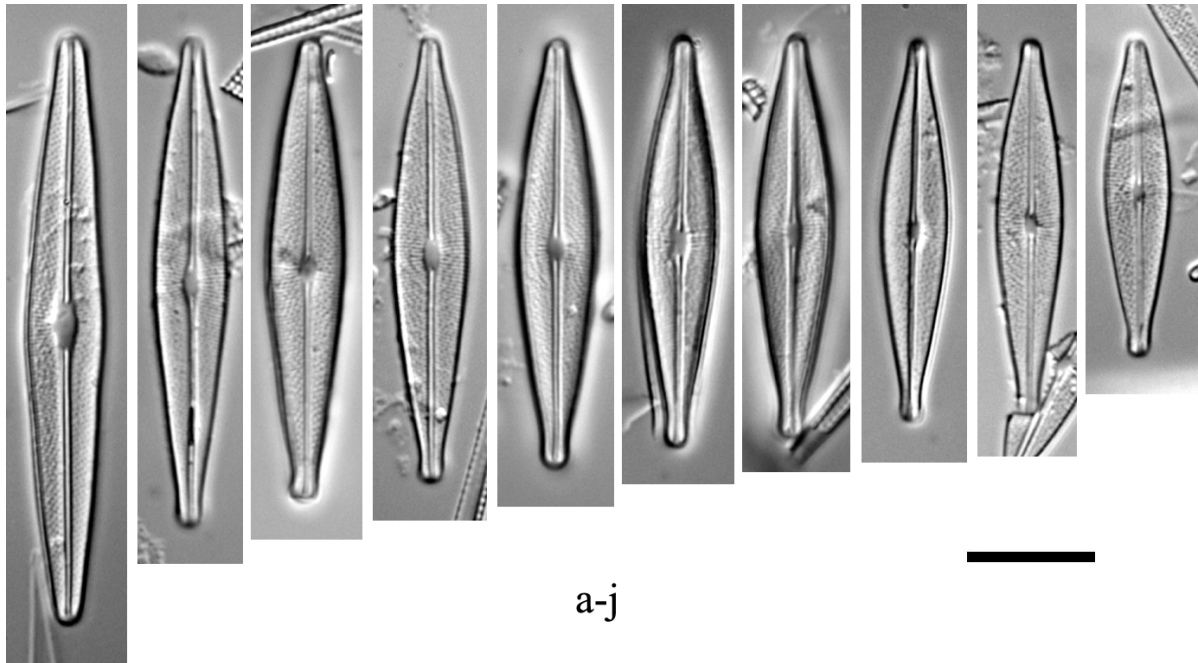
Frustules are elliptical to oblong with slightly constricted margins in the middle and truncate ends (Fig. 30). Valves are moderately dorsi-ventral with a dorsal margin smoothly arched to slightly constricted in the middle and a ventral margin straight to slightly convex in the middle. The dorsal margin appears with short "spines" due to strongly thickened interstria. Valve ends broadly rounded and slightly ventrally bent.

Valve length is 15-34  $\mu\text{m}$ , valve breadth is 4.5-5.5  $\mu\text{m}$ , frustule width 7-14  $\mu\text{m}$ . Axial area is very narrow; central area forms a bilateral fascia, extending to the valve margin, and is broader on the ventral side. Raphe branches are biarcuate, with dorsally bent proximal raphe endings. Dorsal striae are parallel in the middle of the valve, becoming radiate at the ends, 15-18 in 10  $\mu\text{m}$ . Punctuation of the striae is not visible under LM. Ventral striae are radiate in the middle, becoming convergent at the valve ends. According to Levkov (2009) distribution data of *A. aequalis* are uncertain and need to be revised. According to Hofmann et al. (2018), this species is considered as endangered in the flora of Germany. Based on the available data this can be considered the first record of the species in Croatia.

### *Brachysira chiaruccii* Cantonati, Lange-Bertalot, E. Arnaud, M. Galbiati et É. Soróczki-Pintér

**Contributors:** Marija Gligora Udovič (MGU), Valentina Dorić (VD), Dunja Jurina (DJ), Zlatko Levkov (ZL)

Croatia, Lake Kutl, 42.94896°N, 17.60808°E, 26 May 2022, herbarium ID: MKNDC 014373



**Figure 31.** Light microscope views of size diminution and morphological variation of the valves of *Brachysira chiaruccii*. Scale bar is 10  $\mu\text{m}$  (photos by Z. Levkov).

**Slika 31.** Mikroskopski (SM) prikaz smanjenja veličine i morfološke varijacije valvi vrste *Brachysira chiaruccii*. Mjerna skala je 10  $\mu\text{m}$  (fotografije Z. Levkov).

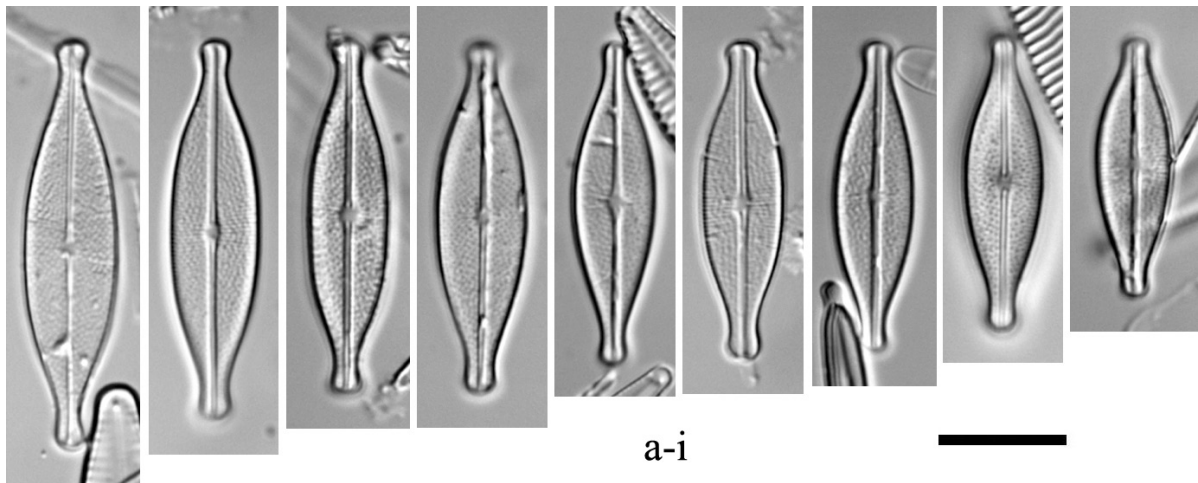
Cells are solitary. Frustules are rectangular in girdle view, with two to a few girdle bands. Valves are slightly heteropolar, narrowly rhombic to lanceolate. Valve ends are weakly or slightly protracted and acutely rounded apices, in some specimens the “foot pole” is sometimes slightly subcapitate. Valve length is 14.0–40.0  $\mu\text{m}$  and valve width is 4.0–6.5  $\mu\text{m}$ . Axial area is narrow, linear, slightly widened near the central area. Central area is narrowly elliptic to elliptic. Raphe is straight, filiform with simple and straight proximal raphe end. Striae are fine, slightly radiate to almost parallel at mid-valve, becoming radiate near the ends, 32–35 in 10  $\mu\text{m}$ . This species (Fig. 31) was described from the mountain lake in northern Italy and recorded in one additional lake on Corsica (Cantonati et al. 2021). The type locality is an oligotrophic, shallow lake, with moderate conductivity. Probably this species is rare in central and south Europe. According to the available data this is the first record of this species.

### ***Brachysira paraexilis* Van de Vijver et B. Kennedy**

**Contributors:** Marija Gligora Udovič (MGU), Mirela Šušnjara (MŠ), Zlatko Levkov (ZL)

Croatia, Plitvica River, near the bridge near Kućan Gornji, 45.268250°N, 16.380980°E, 19 September 2023, herbarium ID: HRNDC 002706

Valves are mostly isopolar to rarely weakly heteropolar, the latter valves have “head poles” that are less expanded than the “foot poles” (Fig. 32). Valves are distinctly lanceolate with convex margins and clearly protracted, capitate to subcapitate valve ends. Valve length is 25–35  $\mu\text{m}$ , width 5.0–6.0  $\mu\text{m}$ . Axial area is very narrow, linear, opening into very small, elliptical to rounded central area. Raphe is straight and filiform with simple proximal ends. Distal raphe ends are not visible in LM. Striae are very densely positioned, radiate and equidistant throughout the entire valve, 30–33 in 10  $\mu\text{m}$ . Areolae hardly discernible



**Figure 32.** Light microscope views of size diminution and morphological variation of the valves of *Brachysira paraexilis*. Scale bar is 10  $\mu$ m (photos by Z. Levkov).

**Slika 32.** Mikroskopski (SM) prikaz smanjenja veličine i morfološke varijacije valvi vrste *Brachysira paraexilis*. Mjerna skala je 10  $\mu$ m (fotografije Z. Levkov).

in LM, with four areolae per stria. According to Van de Vijver et al. (2023) this species was observed only from the type locality, Lough Bunny, a shallow hard-water freshwater lake in the karstic limestone region of the Burren (Co. Clare, Ireland) with conductivity of ca. 300  $\mu$ S/cm. According to the available data this is the first record of this species in Croatia.

### ***Brachysira styriaca* (Grunow) R. Ross**

**Contributors:** Marija Gligora Udovič (MGU), Valentina Dorić (VD), Zlatko Levkov (ZL)

Croatia, Lake Kuti, 42.94896°N, 17.60808°E, 26 May 2022, herbarium ID: MKNDC 014373

Valves are lanceolate to rhombic-lanceolate, gradually narrowing from mid-valve towards valve ends (Fig. 33). Valve ends are slightly elongated, protracted and broadly rounded. Valve length is 20–35  $\mu$ m and valve width is 5–7  $\mu$ m. Axial area is very narrow and linear, almost indiscernible in LM. Central area narrow, apically elliptical to linearly elongated, and in larger specimens slightly constricted. Raphe is straight and filiform with indistinct central raphe ends. Terminal raphe ends are not

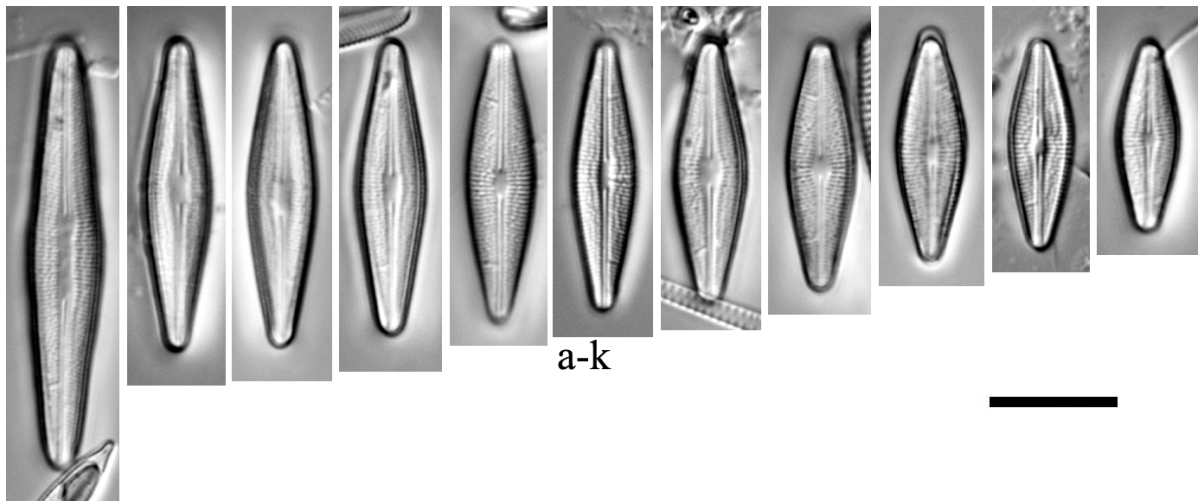
discernible in LM. Striae are distinctly radiate throughout the entire valve, approximately 30 in 10  $\mu$ m. Areolae hardly discernible in LM, but with at least three areolae per stria. The type material of *B. styriaca* (Grunow sample 20 from Lake Erlauf, Austria) was recently analysed by Van de Vijver et al. (2021). Lake Erlauf is an oligotrophic, oligosaprobic, calcium-bicarbonate rich, alkaline lake habitat. Lange-Bertalot & Moser (1994) stated that this species is an indicator of high water quality. According to the available data, this is the first record of this species in Croatia.

### ***Gomphonema angusticephalum* E. Reichardt et Lange-Bertalot**

**Contributors:** Marija Gligora Udovič (MGU), Zlatko Levkov (ZL)

Croatia, Čarna canal, Zlatna Greda, 45.722689°N, 18.841117°E, 11 April 2024, herbarium ID: MKNDC 014648

Valves are moderately clavate with slightly undulate valve margin. Valve in the middle is slightly tumid, maximal width is near the head pole. Head pole is broadly cuneate and foot pole is narrowly rounded.

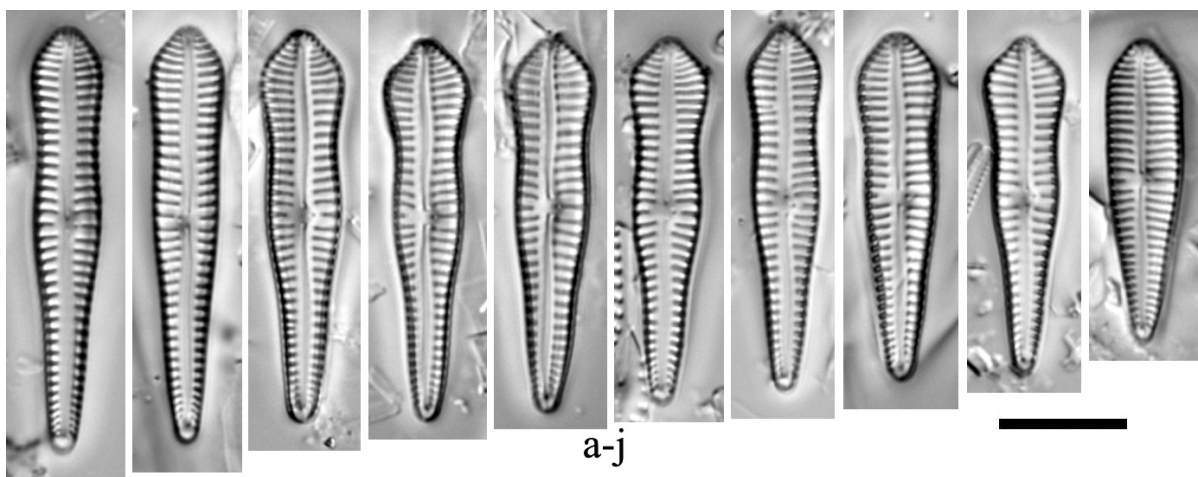


**Figure 33.** Light microscope views of size diminution and morphological variation of the valves of *Brachysira styriaca*. Scale bar is 10  $\mu\text{m}$  (photos by Z. Levkov).

**Slika 33.** Mikroskopski (SM) prikaz smanjenja veličine i morfološke varijacije valvi vrste *Brachysira styriaca*. Mjerna skala je 10  $\mu\text{m}$  (fotografije Z. Levkov).

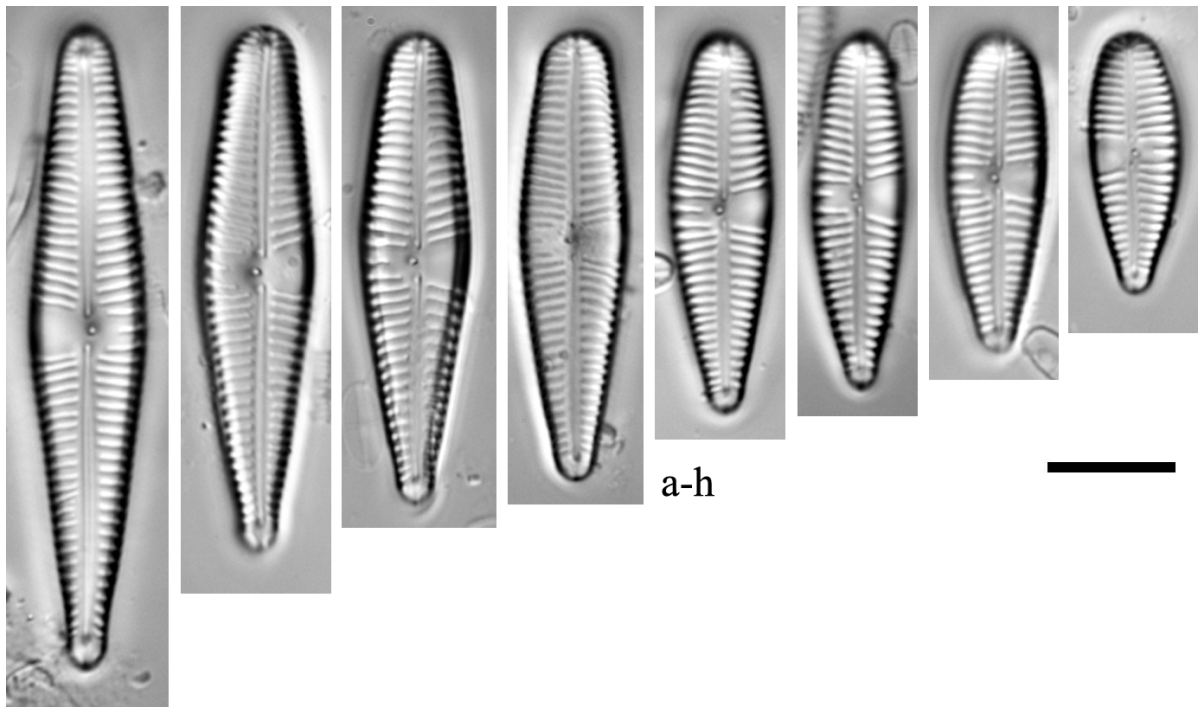
Valve length is 22-35  $\mu\text{m}$  and valve width is 4.0-5.5  $\mu\text{m}$ . Axial area is narrow, linear, central area is small, slightly transversally elongated, bordered on both sides with a single slightly shortened central stria. One isolated pore is present in the central area located close to proximal raphe endings and close to the shortened central stria. Raphe is slightly lateral and undulated terminating with

expanded proximal raphe endings. At the head pole, distal raphe end is deflected first towards the pore-bearing side and then deflected on the opposite side. At the foot pole, the distal raphe bisects a well-developed apical pore field. Striae in LM coarse, parallel in the mid-valve, becoming radiate to strongly radiate near the poles, 11-14 in 10  $\mu\text{m}$ . *Gomphonema angusticephalum* (Fig. 34) occurs in



**Figure 34.** Light microscope views of size diminution and morphological variation of the valves of *Gomphonema angusticephalum*. Scale bar is 10  $\mu\text{m}$  (photos by Z. Levkov).

**Slika 34.** Mikroskopski SM prikaz smanjenja veličine i morfološke varijacije valvi vrste *Gomphonema angusticephalum*. Mjerna skala je 10  $\mu\text{m}$  (fotografije Z. Levkov).



**Figure 35.** Light microscope views of size diminution and morphological variation of the valves of *Gomphonema supertergestinum*. Scale bar is 10  $\mu\text{m}$  (photos by Z. Levkov).

**Slika 35.** Mikroskopski (SM) prikaz smanjenja veličine i morfološke varijacije valvi vrste *Gomphonema supertergestinum*. Mjerna skala je 10  $\mu\text{m}$  (fotografije Z. Levkov).

freshwater, oligotrophic waters (Reichardt 1999). According to Hofmann et al. (2018) this species is considered as an extremely rare species in Germany. According to the available data this is the first record of the species in Croatia.

### ***Gomphonema supertergestinum* E. Reichardt**

**Contributors:** Marija Gligora Udovič (MGU), Mirela Šušnjara (MŠ), Zlatko Levkov (ZL)

Croatia, Una River, near the border of Bosanski Novi, 45.049786°N, 16.372592°E, 30 August 2023, herbarium ID: HRNDC 002737

Valves are heteropolar, clavate with the largest valve width near the mid-valve (Fig. 35). Head pole is broadly rounded, foot pole is narrowly rounded. Valve length is 20-50  $\mu\text{m}$ , width at mid-valve 5.5-9.0  $\mu\text{m}$ . Axial area is very narrow, linear. Central area is large, a semi fascia on the side opposite to the

isolated pore, bordered by one to two strongly shortened central striae on the isolated pore-bearing side. Central stria on the secondary side (isolate pore-bearing side) are distantly spaced from other striae. One isolated pore is present in the central area located close to proximal raphe endings and distantly from the shortened central stria. Raphe is slightly lateral and undulated terminating with expanded proximal raphe endings. At the head pole, distal raphe ends are deflected first towards the pore-bearing side and then deflected to the opposite side. At the foot pole, the distal raphe bisects a well-developed apical pore field. Striae in LM are fine, strongly radiate on primary valve side, parallel to slightly radiate on secondary valve side, becoming strongly radiate towards poles, 12-14 in 10  $\mu\text{m}$ . Distribution in Europe of *G. supertergestinum* is not precisely known due to its possible confusion with *G. tergestinum* (Grunow) M. Schmidt (Reichardt 2009).

Population illustrated in Levkov et al. (2016) very likely represents a different species, similar to *G. supergestinum*. According to the available data this is the first record of the species in Croatia.

***Halamphora bullatoides* (M. H. Hohn and Hellerman) Levkov**

**Contributors:** Marija Gligora Udovič (MGU), Mirela Šušnjara (MŠ), Zlatko Levkov (ZL)

Croatia, Korana River, Veljun, 45.252514°N, 15.545736°E, 29 August 2023, herbarium ID: HRNDC 002727

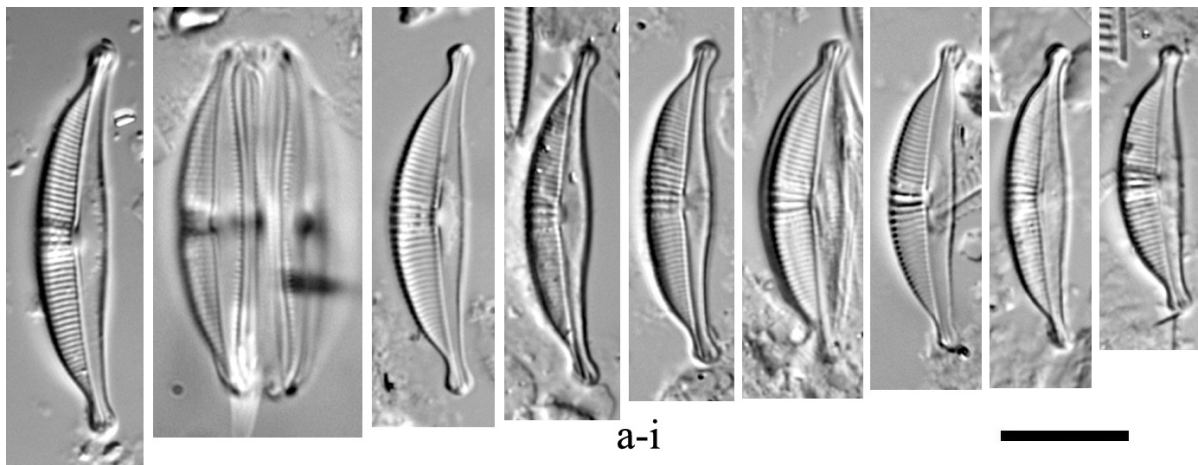
Frustules are elliptical with truncate apices (Fig. 36). Valves are semi-lanceolate to semi-elliptical, dorsi-ventral, with arched dorsal margin and slightly convex to weakly tumid ventral margin. Valve ends are distinctly capitate and slightly ventrally bent. Valve length 19–31 µm, valve width 4.5–6.5 µm. Axial area is wide on the ventral valve side and very narrow on the dorsal side. Central area absent on dorsal valve side and broad, semi-elliptical on the ventral valve side. Raphe

branches are arched with slightly dorsally bent proximal raphe ends. Dorsal striae are finely punctate, thickened and more widely spread at the valve centre, radiate throughout, 16–18 in 10 µm. Ventral striae indistinct, hard to resolve with LM. This species was described from the Potomac River, Maryland, USA (Hohn & Hellerman 1963) and type material was observed by Levkov (2009). This species is distributed in the Middle Atlantic States and the Laurentian Great Lakes, USA (Patrick & Reimer 1975, Reavie 2023). Very likely this species has broader distribution in Croatia, but is always rare and might be overlooked and/or confused with other *Halamphora* species.

***Mayamaea ingenua* (Hustedt) Lange-Bertalot et G. Hofmann**

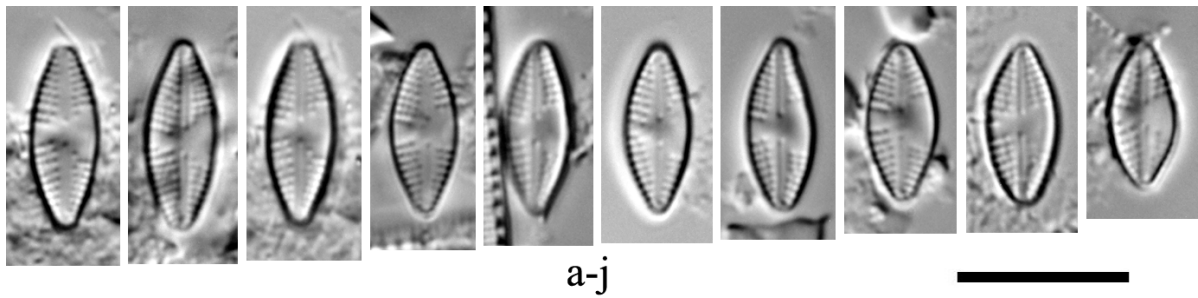
**Contributors:** Marija Gligora Udovič (MGU), Mirela Šušnjara (MŠ), Zlatko Levkov (ZL)

Croatia, flood-relief canal Lonja - Strug (Trebež), Trebež sluice, 45.365809°N, 16.751839°E, 13 September 2023, herbarium ID: HRNDC002739



**Figure 36.** Light microscope views of size diminution and morphological variation of the valves and frustules of *Halamphora bullatoides*. Scale bar is 10 µm (photos by Z. Levkov).

**Slika 36.** Mikroskopski (SM) prikaz smanjenja veličine i morfološke varijacije valvi *Halamphora bullatoides*. Mjerna skala je 10 µm (fotografije Z. Levkov).



**Figure 37.** Light microscope views of size diminution and morphological variation of the valves of *Mayamaea ingenua*. Scale bar is 10  $\mu\text{m}$  (photos by Z. Levkov).

**Slika 37.** Mikroskopski (SM) prikaz smanjenja veličine i morfološke varijacije valvi vrste *Mayamaea ingenua*. Mjerna skala je 10  $\mu\text{m}$  (fotografije Z. Levkov).

Valves are small, rhombi-elliptic to elliptic with slightly protracted and narrowly rounded apices (Fig. 37). Valve length is 7.0–11.0  $\mu\text{m}$ , valve width 3.0–4.0  $\mu\text{m}$ . Axial area is narrow, linear. Central area is broad, asymmetric and much wider on one valve side. Raphe is straight and filiform with slightly expanded central pores. Striae are coarse, strongly radiate throughout the valve, 20–22 in 10  $\mu\text{m}$ . Areolae are clearly visible in LM, ca. 20 in 10  $\mu\text{m}$ . According to Hoffman et al. (2013) this species is rare and occurs in small streams and small rivers as well as in marshes. According to the available data this is the first record of the species in Croatia.

#### ***Planothidium fonticolanceolatum* (Lange-Bertalot et Schimanski) Lange-Bertalot**

**Contributors:** Marija Gligora Udovič (MGU), Petar Žutinić (PŽ), Antonija Kulaš (AK), Zlatko Levkov (ZL)

Croatia, Krka River, Roški Waterfall, above the waterfall; enlarged river bed, 43.905801°N, 15.975945°E, 27 May 2017, herbarium ID: HRNDC000045

Frustules are heterovalval, one valve with raphe (RL) and the second valve without raphe (RL). Valves are elliptic-lanceolate to elliptic with non-protracted, and narrowly rounded apices. Valve length 21–35  $\mu\text{m}$ , valve width is 8.0–9.5  $\mu\text{m}$ . Axial area on RL valve is narrow, almost linear to weakly lanceolate. Central area small, elliptic

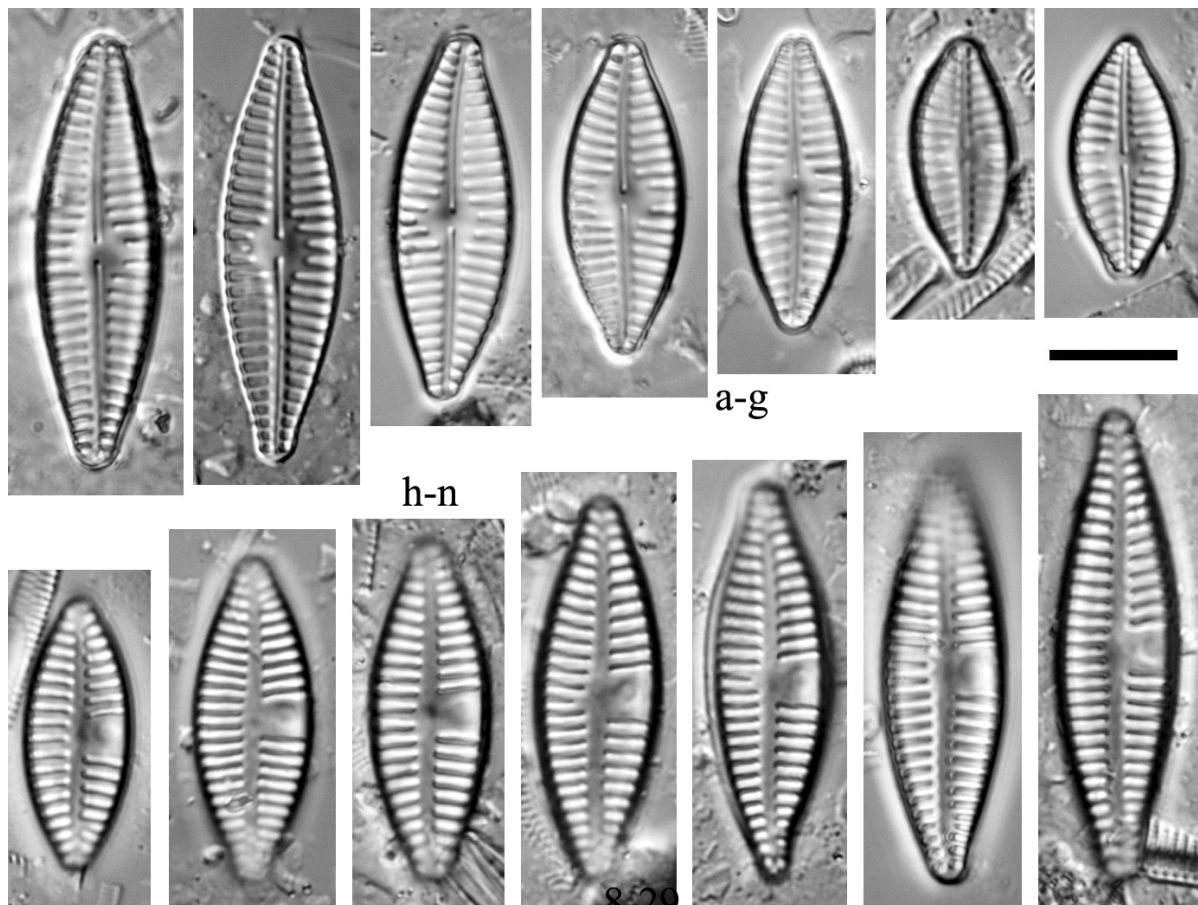
to round. Axial area on RL is narrow, opening into broad central area, unilateral fascia. Raphe branches are slightly biarcuate, filiform. Proximal raphe endings weakly expanded, terminal raphe fissures not discernible in LM. Striae are coarse, equidistant and slightly radiate throughout almost the entire valve, 9–10 in 10  $\mu\text{m}$  on both valves. Areolae not discernible in LM. *Planothidium fonticolanceolatum* (Fig. 38) was described from the River Trebišnica in Bosnia and Hercegovina (Hustedt 1945, Lange-Bertalot & Krammer 1989) but there are no further records of this species. This species is probably endemic to karstic streams and rivers in the NW Balkans.

#### ***Simonsenia maolaniana* You et Kociolek**

**Contributors:** Marija Gligora Udovič, Mirela Šušnjara, Zlatko Levkov

Croatia, Korana River, Velemerić, 45.391685°N, 15.595184°E, 19 August 2023, herbarium ID: HRNDC 002746

Frustules are small, rectangular (Fig. 39). Raphe on one valve positioned diagonally to the raphe on the other. Valves are lanceolate in larger specimens to elliptical-lanceolate in smaller specimens with the widest part in the centre of the valve. Valve ends are narrowly rounded and not protracted. Valve length is 9.0–25.0  $\mu\text{m}$ , width: 2.0–3.5  $\mu\text{m}$ . The raphe is almost marginal with simple raphe



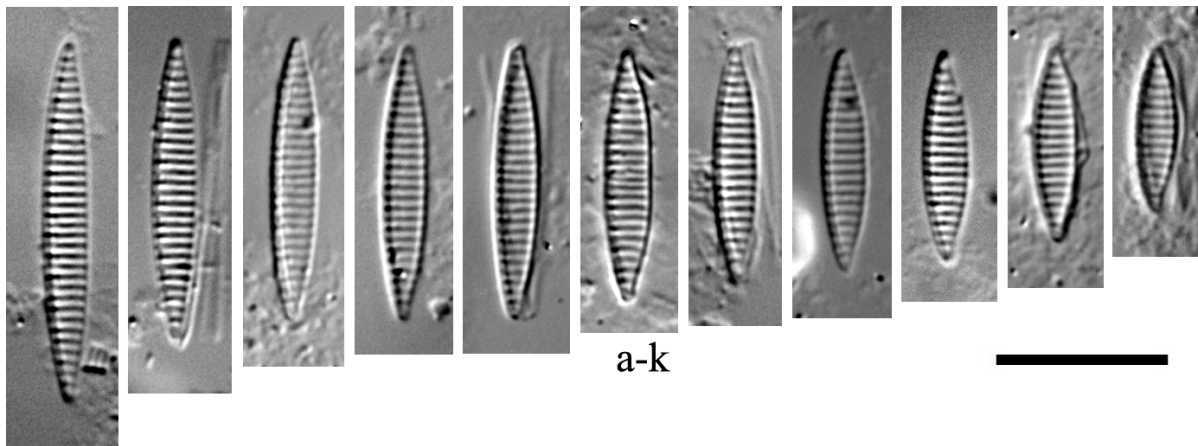
**Figure 38.** *Planothidium fonticolanceolatum*. Figures a-g. Raphe valve views showing the range of morphological variation. Figures h-n. Rapheless valve views showing the range of the morphological variation. Scale bar is 10  $\mu$ m (photos by Z. Levkov).

**Slika 38.** *Planothidium fonticolanceolatum*. Slika a-g. Prikaz smanjenja veličine i morfološke varijacije rafidne valve. Slika h-n. Prikaz smanjenja veličine i morfološke varijacije arafidne valve. Mjerna skala je 10  $\mu$ m (fotografije Z. Levkov).

slit. Transapical ribs are coarse and thickened, 13-17 in 10  $\mu$ m. Striae are biseriate to multiseriate, hardly visible with LM. This species was described from a karstic stream in the Maolan Nature Reserve, Libo County, Guizhou (China) (You et al. 2016). Very likely this species is widely distributed in the karstic streams and rivers, but overlooked or misidentified as *Simonsenia delognei* (Grunow) Lange-Bertalot. According to the available data this is the first record of the species in Croatia.

### Acknowledgment

The findings of *Ceratophyllum submersum*, *Philonotis marchica*, *Ricciocarpos natans*, *Stratiotes aloides* and several algae species were made within the project of the annual monitoring of Croatian surface waters (Croatian Institute for Water Management). The finding of *Polygonum salicifolium* came in the course of the project LIFE RESTORE for MDD - Preserving and restoring floodplain forest habitats along the Mura-Drava-Danube (WWF-Austria).



**Figure 39.** Light microscope views of size diminution and morphological variation of the valves of *Simonsenia maolaniana*. Scale bar is 10 µm (photos by Z. Levkov).

**Slika 39.** Mikroskopski (SM) prikaz smanjenja veličine i morfološke varijacije valvi vrste *Simonsenia maolaniana*. Mjerna skala je 10 µm (fotografije Z. Levkov).

Observations of algae have been further made within the projects Biological assessment of surface waters (Croatian Electric Power Company - HEP proizvodnja d.o.o.), Development of methods for assessing the ecological status of Lake Kuti based on biological elements-phytoplankton, phytobenthos, macrophytes, macrozoobenthos and fish (Croatian Institute for Water Management), Diatoms of River Krka (Krka National Park Public Institution), Complex study of diatom diversity with special emphasis on rarity and invasion (Hungarian National Research, Development and Innovation Office (NKFIH) K 137950). Survey of *Drimia maritima* was undertaken within ornithological fieldwork for the LIFE Artina project. *Pseudostellaria europea* was recorded within the project Botanical research of the mire habitat and flora of the NATURA 2000 site Cret Dubravica (Public institution for the management of protected areas and other protected parts of nature of Zagreb County "Zeleni prsten"), and *Philonotis marchica* within the project Research of NATURA 2000 habitat type Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in the Plitvice Lakes National Park (Plitvice Lakes National Park Public Institution).

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