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NEW DATA ON THE DISTRIBUTION OF RARE PLANT SPECIES IN THE FLORA OF THE REPUBLIC OF N MACEDONIA

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This article presents new data on the distribution of 15 taxa within the Flora of North Macedonia: *Anthemis auriculata* Boiss., *Astragalus hypoglottis* L. subsp. *gremlii* (Bur.) Greut. & Burdet, *Aubrieta* gracilis subsp. *scardica* (Wettst.) Phitos, *Bellardia trixago* (L.) All., *Coronilla coronata* L., *Fumana arabica* (L.) Spach, *Hippuris vulgaris* L., *Ilex aquifolium* L., *Lagoecia cuminoides* L., *Linum aroanum* Boiss. & Heldr., *Kitaibela vitifolia* Willd., *Odontites glutinosa* (M. Bieb.) Bentham, *Parietaria lusitanica* L., *Calamagrostis pseudo-phragmites* (Haller f.) Koeler, and *Romulea bulbocodium* (L.) Sebast. & Mauri. The article provides a list of new localities, contributing to the gradual completion of their distribution area within North Macedonia.

Kew words: flora; vascular plants; distribution; North Macedonia

INTRODUCTION

The results of floristic research conducted on the territory of Macedonia have been extensively documented in numerous scientific papers, spanning from the mid-19th century [1] until the present day. These findings have been comprehensively compiled in eight books of the Flora of the Republic of Macedonia (Flora of SR Macedonia, Flora of N Macedonia) [2–9]. Through continuous and ongoing floristic field research, new and previously unknown species have been discovered within the territory of North Macedonia, along with new localities for rare plant species that have been found to have a limited distribution within its borders.

The authors of this paper have conducted the latest field research in various regions of North Macedonia, leading to the identification of previously unknown localities for 15 vascular plant species. These species include *Anthemis auriculata* Boiss., *Astragalus hypoglottis* L. subsp. *gremlii* (Bur.) Greut. & Burdet, *Aubrieta gracilis* subsp. *scardica* (Wettst.) Phitos, *Bellardia trixago* (L.) All., *Coronilla coronata* L., *Fumana arabica* (L.) Spach, *Hippuris vulgaris* L., *Ilex aquifolium* L., *Lagoecia cuminoides* L., *Linum aroanum* Boiss. & Heldr., *Kitaibela vitifolia* Willd., *Odontites glutinosa* (M. Bieb.) Bentham, *Parietaria lusitanica* L., *Calamagrostis pseudophragmites* (Haller f.) Koeler, and *Romulea bulbocodium* (L.) Sebast. & Mauri.

MATERIAL AND METHODS

The new data presented in this study are derived from plant specimens collected during field research conducted by the authors in various regions of Macedonia. These herbarium specimens have been carefully processed and are currently stored at the Herbarium of the Institute of Biology, Faculty of Natural Sciences and Mathematics in Skopje

(MKNH). Detailed information regarding the geographical distribution, precise location, habitat, GPS coordinates, and collection dates are provided for each taxon. The comments section for each species includes references to relevant floristic literature. The authors have also supplemented the data with their personal observations on species habitats.

During the determination of the herbarium material, the authors consulted relevant literature, including "Prodromus Florae peninsulae Balcanicae, I-III" [10–12], "Flora Europaea, I-V" [13], "Flora of the Republic of Macedonia, 1(1-6)" [2–7], and other regional floras. They also referred to specific papers and databases focused on taxonomy, nomenclature, and chorology of the studied taxa. The nomenclature and taxonomy of the plants adhere to the Euro + Med (2006-) database [14]. Voucher specimens for all taxa have been carefully preserved within the Herbarium (MKNH).

RESULTS AND DISCUSION

Apiaceae

***Lagoecia cuminoides* L.** (Fig. 1 a, b)

Mk - Literature data: Demir Kapija, Bošava [15, 16], Veles-Ulanci; Dojran-Djopčeli, Star and Nov Dojran [7].

Mk - New locality: Negotino: Between Negotino and Krivolak, on clay, 200 m s.m., 2.06.2013 (coll. V. Matevski) (MKNH).

The Mediterranean plant species mentioned in the previous text is known to have a wide distribution within the narrow Mediterranean belt, stretching from Bulgaria to Portugal. Until now, it has been documented in only a few specific locations along the Vardar River, which is recognized as a phytogeographic corridor within the territory of North Macedonia. This corridor has facilitated the expansion of numerous Mediterranean plant species in a south-north direction. However, a new locality has recently been identified in the central part of North Macedonia, specifically in a steppe-like region around Negotino.

a) b)

Figure 1. a, b. *Lagoecia cuminoides* - Negotino-Krivolak

Aquifoliaceae

***Ilex aquifolium* L.** (Fig. 2).

Mk - Literature data: Nidže [17], Skopska Crna Gora [18], Javorlica, Garvan Klisura [16], Karadžica-Pepeljak; Nidže-Bela Reka [19], Demir Kapija-Došnica, Kožuf-Konjska Reka, Smrdliva Voda, Visoka Čuka, Keči Kaja, Belasica-v. Bansko [7].

Mk - New Locality: Jablanica-v. Vevčani, between v. Vevčani and Jankov Kamen, in the chesnut forest, 41.238288°N; 20.577483°E; 1168 m s.m., 10.07.2015 (coll. V. Matevski & O. Matevska) (MKNH)

To date, all recorded occurrences of this Mediterranean-Atlantic species within North Macedonia have been limited to the Vardar River and its tributaries, making them part of the Aegean catchment area. The vicinity of Vevčani (Jablanica Mountain) represents the sole known locality of this species in the western and southwestern regions of Macedonia, which falls within the Adriatic catchment area.

Figure 2. *Ilex aquifolium* - Jablanica Mt.: Vevčani

Asteraceae

***Anthemis auriculata* Boiss.** (Fig. 3)

Mk - Literature data: Dojran [20], Mariovo: Rasim Bej Most; Selečka Mt.- v. Kalen [21].

Mk - New locality: Kavadarci: v. Mrzen, dry grasslands, 10.06.2005 (coll. V. Matevski) (MKNH).

According to the Euro+Med Plant Base, Anthemis auriculata is known to have a restricted distribution in the Eastern Mediterranean and the southern regions of the Balkan Peninsula [AE (G) Bu Gr Mk Tu (A E)]. It is an intriguing and uncommon plant species with a limited range within the territory of North Macedonia. A new locality of this species has been identified in the central part of North Macedonia, specifically in Kavadarci - v. Mrzen. Recently, it has been the subject of diverse phytochemical research [22, 23].

Figure 3. *Anthemis auriculata* - Kavadarci: Mrzen

Cistaceae

***Fumana arabica* (L.) Spach** (Fig. 4)

Mk - Literature data: Dojran-Nikolič [24, 4].

Mk - New locality: Valandovo - Valandovsko Brdo, between Valandovo and v. Kosturino, in the belt of *Quercus coccifera*, 41.324581°N, 22.597107°E; 271 m s.m., 27.05.2005 (coll. V. Matevski) (MKNH)

Fumana arabica is naturally found in the southern part of Europe, ranging from Sardinia to Crimea. Previously, its presence in Macedonia was only documented in the vicinity of Dojran-v. Nikolic, as reported by Bornmuller [24] and Micevski [4]. However, the recent discovery of a locality near Valandovo confirms the continued existence of this taxon approximately 90 years later.

Figure 4. *Fumana arabica* - Valandovo - Valandovsko Brdo

Brassicaceae

***Aubrieta gracilis* subsp. *scardica* (Wettst.) Phitos** (Fig. 5)

Mk - Literature data: Šar Planina, Bistra, Korab, Dešat [4].

Mk - New locality: Galičica: Golem Kazan, screes, 40.936744°N, 20.825795°E, 2074 m s.m., 16.07.2010 (coll. R. Ćušterevska) (MKNH).

New locality for Galičica Mt.

Figure 5. *Aubrieta gracilis* subsp. *scardica* (Wettst.) Phitos - Galičica: Kazan

Fabaceae

***Astragalus hypoglottis* L. subsp. *gremlii* (Burnat) Greuter & Burdet** (Fig. 6)

Mk - Literature data: Krčin, Galičica [25, 6], Stogovo [26].

Mk - New localities: Jablanica Mt: Podgorečko lake, in mountain pastures and rocky, 1700–1900 m s.m., 7.9.2007 (coll. V. Matevski); Jablanica Mt - Vevčansko lake, Golina, mountain pastures and rocky, 41.244444°N, 20.536389°E; 1895 m s.m., 11.7.2015 (coll. V. Matevski & O. Matevska) (MKNH).

New locality is registered on Jablanica mountain (near Podgorečko and Vevčansko lake).

Figure 6. *Astragalus hypoglottis* subsp. *gremlii* - Jablanica: Vevčansko lake, Golina

***Coronilla coronata* L.**

Mk - Literature data: Skopje: Nova Breznica; Debar-Kosovrasti [6], Jakupica [27], Treska Gorge - Kapina, Poreče [28].

Mk - New locality: Galičica Mt: Krvov Kamen, pH 6,4; 1300 m s.m., SW, 34°, 17.6.2010 (coll. V. Matevski, A. Čarni & M. Kostadinovski) (MKNH)

New plant species for the Galičica mountain. It develops within the ass. *Querco pubescenis - Ostryetum carpinifoliae* Horv. 1938.

Linaceae

***Linum aroanium* Boiss. & Heldr.** (Fig. 7)

Mk - Locality from literature: Dešat-Krčin [7].

Mk - New locality: Galičica: 40,992891°N, 20,87048°E; 1488 m s.m., 08.07.2009 (coll. R. Ćušterevska) (MKNH)

Linum aroanum is a plant species native to the southern Balkans and Asia Minor, and it has a highly restricted distribution within North Macedonia. Previously, it was known to exist solely in subalpine pastures on Dešat Mountain-Krčin [7]. However, a newly discovered locality on Galičica Mountain has been found to thrive in similar habitats, at an elevation of approximately 1500 meters.

Figure 7. *Linum aroanium* Boiss. & Heldr. - Galičica: Tomoros

Malvaceae

***Kitaibela vitifolia* Willd.** (Fig. 8)

Mk - Literature data: Skopje: Vodno, Kitka, Skopska Crna Gora, Gorge of Treska, Pčinja; Demir Kapija; Crn Drmi-Lukovo; Gorna Belica [5].

Mk - New localities: Jablanica: Vevčani, between settlement Vevčani and Sveti Spas, in beech forest, 41.248997°N; 20.581352°E; 1289 m s.m., 8.09.2015 (coll. V. Matevski & O. Matevska) (MKNH)

Kitaibela vitifolia is tertiary plant species with Central Balkan and Asia Minor (Turkey) distribution. The primary occurrences of *Kitaibela vitifolia* are found in valleys and gorges, which are recognized as significant refuges for Tertiary plant species in the Balkan Peninsula. However, according to Stevanovic et al. [29], the habitats of this species are primarily anthropogenic in nature. These habitats include roadsides, vineyards, low scrublands, and the edges of degraded forests. This suggests that the occurrence of *K. vitifolia* is largely influenced by human activity. Consequently, *K. vitifolia* can be considered an element of the Tertiary flora that has successfully adapted to anthropogenic environments. Recently, similar habitats supporting this species have been discovered in Jablanica Mountain, near v. Vevčani, along forest roads within degraded beech and chestnut forests.

Figure 8. *Kitaibela vitifolia* - Jablanica: Vevčani

Scrophulariaceae

***Bellardia trixago* (L.) All.** (Fig. 9)

Mk - Literature data: Bitola-Crnovrška River (sub f. flaviflora Boiss.) [20].

Mk - New localities: Prilep: Debrešte-Debreška Krasta, dry grasslands, 41.484403°N, 21.339753°E; 760 m s.m., 23.06.2004 (coll. V. Matevski & M. Kostadinovski); Prilep: Mariovo-Sliva, wet places, 9.07.2013 (coll. V. Matevski, M. Kostadinovski & R. Ćuštere-vska); Prilep, v. Krivogaštani - Krajni Rid, hilly pastures, 41.345111°N; 21.317653°E, 674 m s.m., 17.06.2017 (coll. S. Cvetanovska) (MKNH); Bitola: Mariovo, between v. Rapeš and Staravina, 41.098092 ° N, 21.665271 ° E, 604 m, s.m., 18.06.2022 (coll. V. Matevski); Bitola: Rotino 41.0705955 °N; 21.197233 °E, 4.07.2023 (coll. M. Kostadinovski)

This plant species is exceptionally rare within the territory of North Macedonia and was previously known only in the vicinity of the city of Bitola [20]. However, recent discoveries have revealed its presence in three additional localities near Prilep, specifically in v. Debrešte, v. Krivogaštani, and Selečka Mountain.

***Odontites glutinosa* (M. Bieb.) Bentham** (Fig. 10)

Mk - Literature data: Baba, Luben [30]; Kozjak-Trojaci [31], Kapina-Oča [28], Vodno [32].

Mk - New locality: Prilep: v. Debrešte-Debreška Krasta, limestone, 780-850 m s.m., 17.06.2004 (coll. V. Matevski & M. Kostadinovski) (MKNH).

According to Bolliger [33], *Odontites glutinosa* (sub *Macrosyringion glutinosum*) is a plant species with a widespread but scattered distribution in the higher mountains of the Balkans, Anatolia, and the Caucasus. It can be found in the southern and southwestern parts of the Balkan Peninsula, including Serbia, Montenegro, Macedonia, Albania, Western and Southern Bulgaria, and Greece.

Within the territory of North Macedonia, *Odontites glutinosa* is considered a rare plant species. So far, it has only been documented in a few medium-high mountains, such as Luben, Kozjak-Pletvar, and Vodno. Typically, it is found in the belt of hilly pastures, similar to the newly discovered locality of the species on Debreška Krasta, near Prilep.

Figure 9. *Bellardia trixago* - Prilep: Debrešte-Debreška Krasta

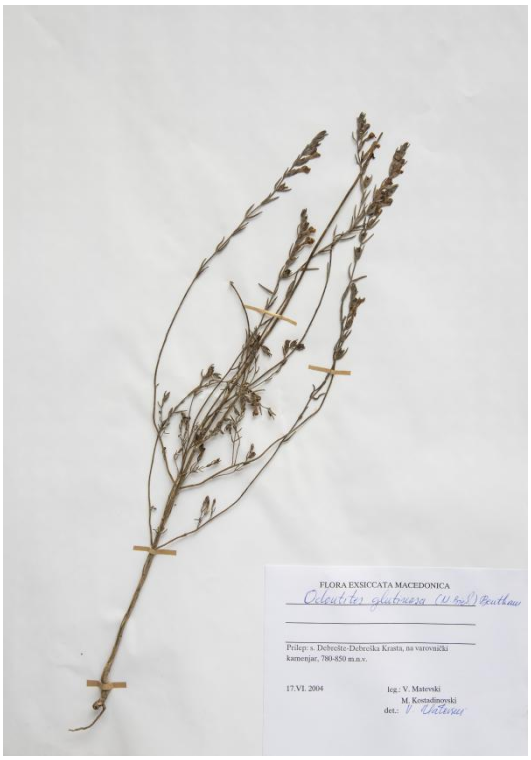

Figure 10. *Odontites glutinosa* - Prilep: Debrešte-Debreška Krasta

Hippuridaceae

***Hippuris vulgaris* L.**

Mk - Literature data: Ohrid and Struga Marsh [34, 6], Strumica [35].

Mk - New localities: Kratovo: v. Stracin-Suvo Ezero, peat bog, 42.185000°N; 22.002778°E; 918 m s.m., 19.06.2004 (coll. V. Matevski); Ohrid-Potpeš, 41.110636°N; 20.792288°E; 708 m s.m., 14.12.2020 (coll. V. Matevski & O. Matevska) (MKNH).

This amphibious plant species, widely distributed in the northern hemisphere, has a highly restricted range within the territory of North Macedonia. Previous data indicated that *Hippuris vulgaris* was solely known to exist in wetlands along Ohrid Lake and in the vicinity of Strumica [6]. However, recent investigations have confirmed its presence in Lake Ohrid and revealed another newly discovered locality near the village of Stracin, in the vicinity of Kratovo.

Urticaceae Juss.

***Parietaria lusitanica* L.** (Fig. 11)

Mk - Literature data: Dojran, Demir Kapija, Prilep:Kozjak, Kavadarci-Konopište [3].

Mk - New locality: Bitola - Mariovo: v. Grunište, under large granite rocks, 750 m s.m., 9.6.1996 (coll. V. Matevski & M. Kostadinovski) (MKNH)

In the Flora of Macedonia, the genus *Parietaria* is represented by three species: *Parietaria officinalis*, *P. diffusa*, and *P. lusitanica* [3]. The first two species are widespread throughout the territory, while *P. lusitanica* is an extremely rare plant, previously known from only a few localities. However, the distribution range of *P. lusitanica* in North Macedonia has expanded with the discovery of a new locality in the Mariovo area, near the village of Grunište. This species thrives beneath large granite rocks within the Crna Reka gorge, under the influence of a sub-Mediterranean climate.

Figure 11. *Parietaria lusitanica* - Bitola - Mariovo: v. Grunište

Figure 12. *Romulea bulbocodium* - Dojran: Debrešte-Nikolič

Iridaceae

***Romulea bulbocodium* (L.) Sebast. & Mauri (**Fig. 12)

Mk - Literature data: Dojran - Dojran Lake, Hasanli, Nikolič [36, 37, 38, 39, 40, 41], Valandovo - Anska Reka [36, 37, 39], Strumica - Bansko, Belasica, Novo Selo [36, 31, 35, 39], Bogdanci [36, 37], Gevgelija - Negorci [37], Radoviš, Plačkovica [42, 41].

Mk - New locality: Prilep: v. Krivogaštani - Krajni Rid, hilly pastures, 41.348892°N; 21.316575°E, 694 m s.m., 25.03.2017 (coll. S. Cvetanoska) (MKNH).

Romulea bulbocodium is a widely distributed plant species within the Mediterranean basin. It can be found along the Adriatic coast of the Balkan Peninsula and extends to the territories of Macedonia, Greece, Bulgaria, and Turkey [43, 44, 45, 46, 41]. In North Macedonia, it occurs primarily in the southern and southeastern parts, including the areas of Gevgelija, Bogdanci, Dojran, Valandovo, Strumica, and Radovis. It is typically found as a component of early spring therophytic non-nitrophilous vegetation, which develops under the influence of a sub-Mediterranean climate [41]. The populations of this species in all known Macedonian localities are predominantly located within the belt of *Quercus coccifera*. However, a newly discovered locality has been identified outside the *Quercus coccifera* area, specifically in hilly pastures in the central parts of North Macedonia, near Prilep.

Poaceae

***Calamagrostis pseudophragmites* (Haller f.) Koeler** (Fig. 13)

Mk - Literature data: Golešnica - Kadina Reka, 870 m s.m. (f. *persica* Boiss.); Skopska Crna Gora - Sv. Ilija, 1000 m s.m. (subvar. *exserta* Bornm.), Veles-Vardar [37, 38], Raduša [28].

Mk - New locality: Prilep: Mariovo-v. Bešište, gorge on the r. Satoka-Monastery of St. Petka, near the river, 800 m s.m., 20.07.1993 (coll. V. Matevski & M. Kostadinovski) (MKNH).

This plant species is typically found along water bodies, canals, and rivers throughout Europe. According to the online database "Plants of the World," its distribution range extends across various regions: Europe (central, southwestern, southeastern, and eastern), Asia-temperate (including Siberia, the Soviet Far East, Soviet Middle Asia, the Caucasus, western Asia, China, Mongolia, and eastern Asia), and Asia-tropical (India).

Within the territory of North Macedonia, this plant is considered very rare and has only been documented in the northern and central parts, specifically in the Skopje valley and the surroundings of Veles. However, a newly discovered locality has been identified in the Mariovo region, specifically in the Satoka River gorge.

Figure 13. *Calamagrostis pseudophragmites* - Prilep: Mariovo-v. Bešište

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НОВИ ПОДАТОЦИ ЗА РАСПРОСТРАНУВАЊЕТО НА РЕТКИ РАСТИТЕЛНИ ВИДОВИ ВО ФЛОРАТА НА РС МАКЕДОНИЈА

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Во овој труд се наведуваат нови податоци за распространувањето на 15 таксони од флората на РС Македонија: *Anthemis auriculata* Boiss., *Astragalus hypoglottis* L. subsp. *gremlii* (Bur.) Greut. & Burdet, *Aubrieta gracilis* subsp. *scardica* (Wettst.) Phitos, *Bellardia trixago* (L.) All., *Coronilla coronata* L., *Fumana arabica* (L.) Spach, *Hippuris vulgaris* L., *Ilex aquifolium* L., *Lagoecia cuminoides* L., *Linum aroanium* Boiss. & Heldr., *Kitaibela vitifolia* Willd., *Odontites glutinosa* (M. Bieb.) Bentham, *Parietaria lusitanica* L., *Calamagrostis pseudophragmites* (Haller f.) Koeler и *Romulea bulbocodium* (L.) Sebast. & Mauri. Со новите локалитети, постепено се заокружува нивниот ареал на територијата на РС Македонија.

Клучни зборови: флора; васкуларни растенија; дистрибуција; РС Македонија