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Novelties for the vascular flora of Serbia

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ABSTRACT: The flora of Eastern, South-Eastern and Southern parts of Serbia is one of the richest and the best studied in the country. A large number of newly recorded taxa has been reported from those areas in the last few decades. The currently updated species list indicates that Mediterranean plants *s.l.* is the most numerous group. This time, *Petrorhagia velutina, Umbilicus rupestris, Carthamus dentatus, Carduus pycnocephalus, Hypochaeris cretensis, Scorzonera mollis, Asparagus verticillatus* and *Valerianella costata* recorded in SE & S parts are reported as new species to the flora of Serbia. The phytogeographic importance of the new records is discussed within the scope of their northern distribution limits forming anew in Balkan Peninsula. The estimated threatened status for some of the taxa should present useful information for plant protection management in the region.

Key words: Serbia, floristic novelties, Mediterranean and Pontic species, distribution, threatened status

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INTRODUCTION

The flora of the Balkan Peninsula is one of the most diverse floras in Europe (Turrill 1929; Stevanović *et al.* 1999). The long-term florogenetic and plant migration processes, from the Tertiary through the Ice Ages, have been the most influential factors in the process of its creation (Turrill 1929). However, during historical times human-created impacts also became very prominent. The distribution of plants, which is constantly changing through a combination of climatic and anthropogenic influences, is of special interest today (Pignatti 1978).

Within the framework of Balkans flora, Serbia is recognized as the territory having a prominent richness and diversity of plant species (Stevanović *et al.* 1999). While the present recorded number of species and subspecies is 3662, this is a more or less precise number that is still fluctuating due to recent floristic investigations. Part of S and SE Serbia seem less floristically explored and these regions are most opened southwards to floristic influences from the Mediterranean region (Aegean Sea) along the lowlands and valleys of large rivers. These corridors are the most important for the spreading of thermophilous plants of Mediterranean and Mediterranen-Pontic types of distribution further into the Peninsula. That way, numerous new data on occurrence and distribution of the plant taxa have been published recently, presenting this area as a region of particular floristic interest (Zlatković *et al.* 2009; Tomović *et al.* 2009).

The aim of this paper is to present data on eight species as novelties to the flora of Serbia. New records will fill in the gaps present in knowledge on the distribution and ecological data in the published edition of "The Flora of Serbia".

Some of the taxa listed above are recognized as regionally threatened and should be added to the Preliminary Red List of Threatened Plant Species of Serbia (Stevanović *et al.* 1996) or future volumes of the Red Data Book of the flora of Serbia.

MATERIAL AND METHODS

During this study information was collected on all proven new plants for the flora of Serbia recorded from the SE &

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S territory, including the 8 recently discovered taxa. The field survey, checking and revision of herbarium material as well as literature data were used for supplementation of the distribution data. Distribution of taxa was mapped on 10 x 10 km² at the UTM grid system (UTM Zone 34T). Literature used to compare recent with previously published distribution maps included recent volumes of Atlas Florae Europae (Jalas & Suominen 1986; Jalas *et al*. 1999), Comparative Chorology of the Central European Flora (Meusel *et al*. 1965, 1978; Meusel & Jäger 1992), Assyov *et al*. (2006) as well as the latest literature data for selected taxa. Classification of floristic elements is given according to Meusel *et al*. (1965, 1978), Meusel & Jäger (1992) and Stevanović (1992a). For the attribution of life forms the criteria proposed by Mueller-Dombois & Ellenberg (1974) and Stevanović (1992b) were followed.

Collected plant material is deposited in the Herbarium of the Institute of Botany and Botanical Garden "Jevremovac", University of Belgrade (BEOU), Herbarium of the Natural History Museum in Belgrade (BEO) (Holmgren *et al*. 1990), Herbarium Moesiacum, University of Niš (HMN), as well as in the private collection of N. Ranđelović (HMD). Nomenclature is given according to the databases Euro+Med Plantbase (http://ww2.bgbm.org/EuroPlusMed/) or IOPI (http://plantnet.rbgsyd.nsw.gov.au/iopi/iopihome.htm). The threatened status of the selected taxa was estimated according to the IUCN (2001) Red List Categories and Criteria.

RESULTS AND DISCUSSION

Review of the recently recorded taxa:

***Petrorhagia velutina* (Guss.) P. W. Ball & Heywood**

General distribution: Albania, Bulgaria, Croatia, Cyprus, Greece, Macedonia, Montenegro, Italy, France, Portugal, Spain, Turkey; Floristic element: Mediterranean-submediterranean; Life form: T scap

Records in Serbia: Pčinja river gorge (St. Prohor Pčinjski), subnom. *Petrorhagia velutina*?, 15-05-1975, EM-78, coll./det. V. Nikolić *et N. Diklić* (BEO, 38206); Kosovska Kamenica (Domorovce, Crveni Breg, Lokva), subnom. *P. prolifera*, 500 m, 15-05-2008, EN-50, coll. *J. Stanković*, det. *B. Zlatković,* rev. *B. Zlatković* (HMN, 3500); Mt Starac (Gornji Starac), *Koelerio-Silenetum frivaldszkyanae*, 600 m, 12-06-2004, EM-78, coll./det. *B. Zlatković* (BEOU, 16380); Pčinja river gorge (Vogance), *Trifolion cherleri*, 450 m, 15-05-2004, EM-78, coll./det. *B. Zlatković* (BEOU, 16379); Pčinja river gorge (Šajince), 560 m, 25-04-2000, EM-89, coll./det. *B. Zlatković* (BEOU, 16382); Rujan Mt (Slavujevac), 550 m, 06-06-2009, EM-68, coll./det. *B. Zlatković* et *N. Smiljković* (BEOU, 16381); Bujanovac (Srpska Kuća), *Ornithopodi-Tuberarietum guttatae*, 420 m, 06-06-2009, EN-60, coll./det. *B. Zlatković* et *N. Smiljković* (BEOU, 16378); (Fig. 1);

Fig. 1. Distribution of *Petrorhagia velutina* in Serbia (• - new chorological data).

Occurrence of *Petrorhagia velutina* in Serbia represents the northernmost inland points of its distribution in the Balkans. The former northern limit was close to Skoplje (Micevski 1993). The closest points in Bulgaria are in Struma valley but it is also distributed in S and SE parts of the country (Assyov *et al*. 2006). In Serbia it is common along the valley of the river Pčinja and represented by a relatively large population in that area. It mainly occurs in warm, rocky slopes and along the roadsides on the bare silicate ground, inhabited by pastures of *Thero-Brachypodietalia*.

***Umbilicus rupestris* (Salisb.) Dandy**

General distribution: Albania, Algeria, Croatia, Cyprus, Egypt (Sinai), France Greece, Ireland, Italy, Lebanon, Libya, Macedonia, Montenegro, Morocco, Portugal, Spain, Tunisia, Turkey, United Kingdom; Floristic element: Atlantic-Mediterranean-submediterranean; Life form: H ros succ

Records in Serbia: Pčinja river gorge (Vogance), *Drabo-Cardaminion hirsutae*, 450 m, 23-04-2003, EM-78, coll./det. *B. Zlatković* (BEOU, 16358); Kozjak Mt (Delinovica), *Geranio lucidi-Cardaminetum hirsutae*, 400 m, 07-1999, EM-78, coll./det. *B. Zlatković* (BEOU, 16360); Pčinja river gorge (Novo Selo), 500 m, 07-1999, EM-89, coll./det. *B. Zlatković* (BEOU, 16361); Pčinja river gorge (Barbace), 530 m, 07-1999, EM-79, coll./det. *B. Zlatković* (BEOU, 16366); (Fig. 2).

New localities of *U. rupestris* in Serbia fit the northernmost limits of species distribution in the Balkans.

Fig. 2. Distribution of *Umbilicus rupestris* in Serbia (indication as in Fig. 1.).

Fig. 3. Distribution of *Valerianella costata* in Serbia (indication as in Fig. 1.).

The previous northernmost locality was situated in N Macedonia (Jalas *et al.* 1999) but still not confirmed by herbarium evidence (Micevski 1993). The plant is associated with mainly nemoral or ruderal elements forming the dense vegetation of shaded silicate rocks that probably belongs to *Geranio lucidi-Cardaminetum hirsutae* (*Drabo-Cardaminion hirsutae*, *Stellarietea mediae*) community. The association is recently recognized in S Macedonia (Čarni *et al.* 2003). ***Conservation status:*** *U. rupestris* is represented in Serbia by only a few small populations restricted exclusively to the gorge of Pčinja. The species is regionally threatened and according to IUCN its conservation status should be estimated as Critically Endangered [CR B2ab (ii,iii,iv)]. All habitats in Serbia are included in the Natural Asset "Dolina reke Pčinje", protected at the national level as The Landscape of Outstanding Features.

***Valerianella costata* (Steven) Betcke**

General distribution: Algeria, Bulgaria, Greece, Moldova, Romania, Italy, Macedonia, Malta, Russian Federation (Ciscaucasia), Spain, Turkey, Ukraine (Crimea); Floristic element: Mediterranean-submediterranean-S. Pontic; Life form: T scap

Records in Serbia: Kozjak Mt (village Jablanica), *Astragalo-Calaminthetum hungaricae*, 430 m, 16.05.2004, EM-78, coll./det. *B. Zlatković* (BEOU, 16372); Kozjak Mt**,** (Delinovica), *Orno-Quercetum pubescentis,* 450 m, 15.05.2004, EM-78, coll./det. *B. Zlatković* (BEOU, 16374); Starac Mt (Gornji Starac), *Trifolion cherleri*, 650 m, 02-05-2005, EM-78, coll./det. *B. Zlatković* (BEOU, 16375); Pčinja river gorge (Trgovište, Vražji Kamen), *Carpinetum orientalis,* 620 m, 06-05-2002, EM-79, coll./det. *B. Zlatković* (BEOU, 16377); Kozjak Mt (St. Prohor Pčinjski, Krst), 410 m, 01.05.2002, EM-78, coll. *B. Zlatković, & S. Puzović*, det. *B. Zlatković* (BEOU, 16376); Pčinja river gorge (St. Prohor Pčinjski), *Orno-Quercetum pubescentis,* 24.04.1983, EM-78, coll. *N. Ranđelović,* det. *B. Zlatković* (HMD, 2278); Rujan Mt (Slavujevac), 550 m, 06-06-2009, EM-69, coll. *B. Zlatković & N. Smiljković* det. *B. Zlatković* (BEOU, 16371); Bujanovac (Srpska Kuća), *Ornithopodi-Tuberarietum guttatae*, 400 m, 06-06-2009, EN-60, coll. *B. Zlatković & N. Smiljković* det. *B. Zlatković* (BEOU, 16373); (Fig. 3).

It is mainly distributed across the E Mediterranean and Pontic region, occasionally reaching W Mediterranean (Devesa & Lopes 2007). The occurrence of *V. costata* in Serbia was completely doubtful, with no data in the referent floristic literature (Kojić 1973; Ranđelović, 1975). After the neglected and imprecise data of Parlatore (1887), occurrence of this species was confirmed in Serbia more than a century later. It is closely related to *V. locusta*, but distinguished by strongly marked carpological traits.

Carthamus dentatus* (Forssk.) Vahl** subsp. ***dentatus

General distribution: Bulgaria, Cyprus, Greece, Italy, Iran (N & E), Macedonia, Syria, Turkey; Floristic element: C-E Mediterranean-submediterranean-Oriental-Turanian; Life form: T scap

Records in Serbia: Pčinja river gorge (Šaprance), *Onopordion acanthi*, 550 m, 15-07-2004, EM-89, coll./det. *B. Zlatković* (BEOU, 16356); Pčinja river gorge**,** (Brnjare), 470 m, 15-07-2004, EM-79, coll./det. *B. Zlatković* (BEOU, 16357; BEO, 40758); (Fig. 4). It usually colonizes dry, open, limestone screes in the lower part of Pčinja valley.

Fig. 4. Distribution of *Carthamus dentatus* in Serbia (indication as in Fig. 1.).

Fig. 5. Distribution of Carduus pycnocephalus subsp. albidus in Serbia (indication as in Fig. 1.).

C. dentatus is spreading beyond the E Mediterranean region into new localities in Serbia. It has been colonizing arid habitats under human impact, along the roadsides in Bulgaria (Bancheva & Delcheva, 2006). As a frequent weed it is constituent of the ruderal vegetation of the *Onopordion illyrici* alliance in southern parts of the Balkan Peninsula (Oberdorfer 1954a). It is also a member of weed vegetation of the *Caucaidion lappulae* Tx. alliance in crop fields in Macedonia (Kratovalieva 2003).

***Carduus pycnocephalus* L. subsp. *albidus* (M. Bieb.) Kazmi**

General distribution: Albania, Armenia, Azerbaijan, Bulgaria (SW, NE, SE), Cyprus, Egypt (N), Georgia, Greece, Lebanon, Libya (E), Macedonia, Russian Federation (S European and Ciscaucasia), Syria, Turkey, Ukraine (incl. Crimea); Floristic element: E. Mediterranean-Oriental-Pontic; Life form: T scap

Records in Serbia: Pčinja river gorge (Novo Selo), *Onopordion acanthii*, 500 m, 19.06.2005, EM-89, coll./det. *B. Zlatković* (BEO, 40758); Pčinja river gorge (Vogance), *Onopordion acanthii*, 450 m, 19.06.2005, EM-78, coll./det. *B. Zlatković* (BEOU, 16353); (Fig. 5).

Showing an almost invasive character, this plant is a frequent weed along the roadsides and settlements throughout the Mediterranean. *C. pycnocephalus* subsp. *albidus* has a more eastern distribution than subsp. *pycnocephalus*, additionally being one of the commonest taxa within a complex comprised of some five subspecies. It is occasionally recorded at field edges or along the roadsides in Serbia. Closest populations of this plant to the new findings are situated between Staro Nagoričane and Kumanovo in N Macedonia. The species seems to be much more frequent along the Vardar river valley (Micev 1952) and further to the south (Adamović 1904; Bornmüller 1926; Soška 1939a).

***Hypochoeris cretensis* (L.) Bory & Chaub.**

General distribution: Albania, Bulgaria (N&C), Croatia, France (Corsica), Greece (incl. Crete), Macedonia, Italy (S incl. Sardinia, Sicily), Malta, Montenegro; Floristic element: C.-E.Mediterranean-submediterranean; Life form: H ros

New distribution data in Serbia: Starac Mt (Gornji Starac), *Trifolion cherleri*, 650 m, 20-05-2000, EM-78, coll./det. *B. Zlatković* (BEOU, 16352); (Fig. 6).

From the southern, warmer parts the species spread over C and E Macedonia (Bornmüller 1926; Micev 1952; Matevski & Kostadinovski 1995) up to the new northern limit in Serbia. As it occurs in various warmth-loving communities, it was labeled as a characteristic species of the *Trifolion chreleri* alliance (Micevski 1972), climbing into the hilly region of N Greece and Macedonia and extending northwards to S and SE Serbia.

***Scorzonera mollis* M. Bieb.**

General distribution: Albania, Armenia, Azerbaijan, Bulgaria, Greece (incl. Crete), Georgia, Iran, Iraq, Israel, Lebanon, Macedonia, Moldova, Romania, Russian Federation (Ciscaucasia), Syria, Turkey, Turkmenistan, Ukraine (incl. Krym); Floristic element: Pontic-Oriental-E. Mediterranean-submediterranean; Life form: H caesp-scap.

Records in Serbia: Kozjak Mt (Kitka and Uši peaks), *Chrysopogoni-Danthonion calycinae,* 730 m, 15.05.2004, EM-78, coll./det. *B. Zlatković* (BEOU, 16355); Mt Kozjak

(Delinovački Rid), *Chrysopogoni-Danthonion calycinae*, 550 m, 16.05.2005, EM-78, coll./det. *B. Zlatković* (BEOU, 16354; BEO, 40759); Pčinja river gorge (Jablanica, Kostin Čukar), *Festuco-Chrysopogonetum grylli*, 700 m, 15-05-2004, EM-79, coll./det. *B. Zlatković* (BEOU, 40760); (Fig. 7).

Scorzonera mollis differs from other representatives in Serbian flora by having a thickened or rounded rootstock. Although primarily of Pontian origin, its distribution also shows wide Mediterranean affinities. It inhabits dry slopes covered by steppe-like grasslands of medium altitudes. The closest findings are those from Macedonia (Bornmüller 1926; Soška 1939b; Micev 1952). It is reported for communities of the *Xeranthemion* alliance in Greece (Oberdorfer 1954b). ***Conservation status*:** The species is restricted to a few small populations under the protected asset "Dolina reke Pčinje". According to the IUCN, its conservation status should be regarded as Endangered [EN B2ab (ii,iii)] in Serbia.

Fig. 6. Distribution of *Hypochoeris cretensis* in Serbia (indication as in Fig. 1.).

Fig. 7. Distribution of *Scorzonera mollis* in Serbia (indication as in Fig. 1.).

***Asparagus verticillatus* L.**

General distribution: Armenia, Azerbaijan, Bulgaria, Greece, Georgia, Iran, Iraq (N), Libya, Macedonia, Romania, Russian Federation (Ciscaucasia), Turkey (N and C), Turkmenistan, Ukraine; Floristic element: Pontic-Oriental-Turanian-E. Mediterraean-submediterranean; Life form: G rhiz.

Records in Serbia: Rujan Mt (Preševska Povija, Mamince), *Orno-Quercetum pubescentis*, 460 m, 22.07.1998, EM-57, coll. *B. Zlatković, V. Ranđelović, and N. Ranđelović*, det. *B. Zlatković* (BEOU, 16370); Monastery St. Prohor Pčinjski (Starac Mt, Golet), *Carpinetum orientalis,* 650 m, 30-05-2000, EM-78, coll. *B. Zlatković and S. Puzović,* det. *B. Zlatković* (BEOU, 16369); Kozjak Mt, slopes above the Monastery St. Prohor Pčinjski (Krst), *Orno-Quercetum pubescentis*, 410 m, 08.07.1997, EM-78, coll. *B. Zlatković, V. Ranđelović, G. Tomović, Lj. Tomović, and D. Jović*, det. *B. Zlatković* (BEOU, 16367); Pčinja river gorge (Vogance, Jablanica), *Quercetum frainetto-cerris*, 450 m, 19.05.2005, EM-79, coll./det. *B. Zlatković* (BEOU, 16368); (Fig. 8).

Fig. 8. Distribution of *Asparagus verticillatus* in Serbia (• - new chorological data; • - literature data reconstruction)

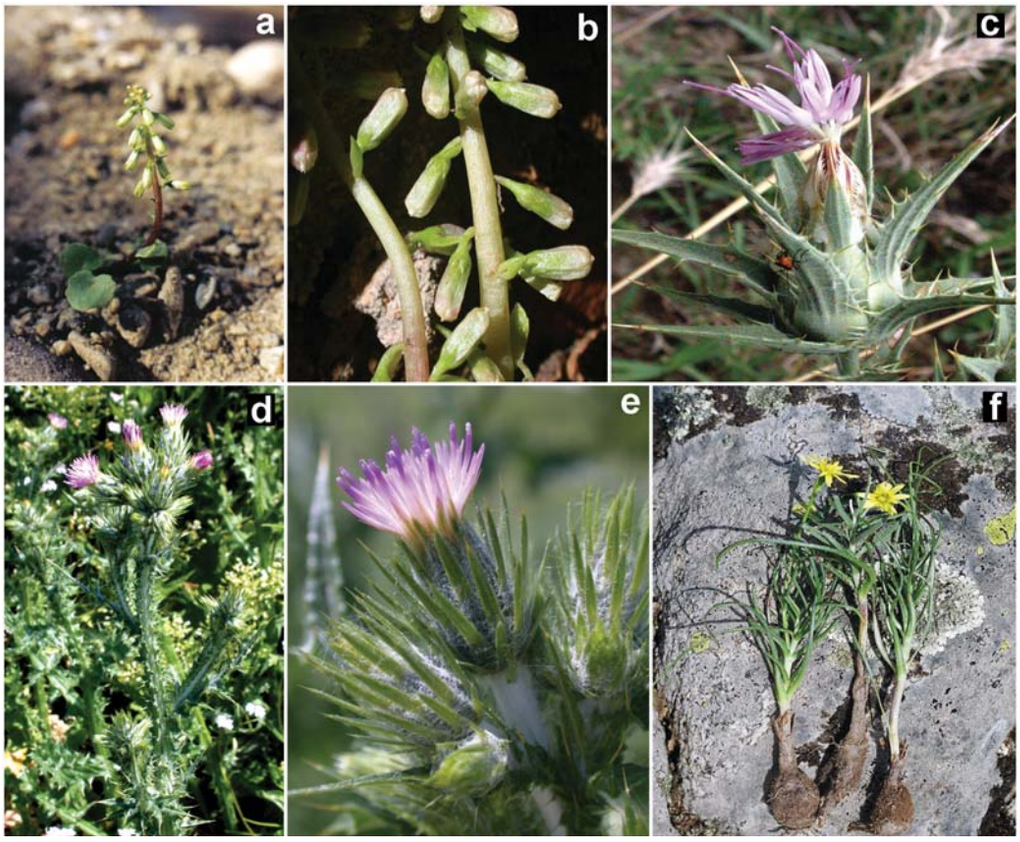

Fig. 9. Umbilicus rupestris (a & b); Carthamus dentatus (c); Carduus pycnocephalus. subsp. albidus (d & e); Scorzonera mollis (f).

Localities of *A. verticillatus* in Serbia represent the northern limit of its distribution which extends from the S Balkans. This was considered to be reaching N Macedonia with former final findings around Skopje (Soška 1939b; Grupče 1958). The other direction of its spread was towards C Balkans streams up to the final inland localities in SW Bulgaria (Assyov *et al*. 2006).

After the recent recording of this species in Serbia, checking of herbarium data in BEOU, BEO and HMD has shown no evidence of *A. verticillatus* from Serbia. On the other hand, there were a few literature records of similar *A. scaber* (Vukićević & Diklić, 1975; Nikolić *et al*. 1986). Some of them are resolved to be *A. pseudoscaber* (Jovanović 1999) in the Peripannonian part. However it was still unclear if *A. scaber* occurs in S Serbia. According to our study, *A. scaber* is not distributed in Serbia at all as was considered previously (Nikolić *et al*. 1986; Stamenković & Ranđelović 1986). In that sense all literature records for *A. scaber* from S Serbia should be regarded as *A. verticillatus*. ***Conservation status*:** This species is a member of thermophilous oak forests that have been extensively destroyed and evidently threatened. According to the IUCN, the conservation status of this species should be assessed as Vulnerable [VU 2ab (iii)] in Serbia. Excluding the habitats in the vicinity of Preševo, almost half of the given localities of *A. verticillatus* gravitate to the protected area "Dolina reke Pčinje".

CONCLUSIONS

The following taxa were reported from Serbia for the first time: *Petrorhagia velutina, Umbilicus rupestris, Carthamus dentatus, Carduus pycnocephalus, Hypochaeris cretensis, Scorzonera mollis* and *Asparagus verticillatus*. The first precise records of the neglected *Valerianella costata*, previously known only from unreliable literature data, are presented for the same territory more than a century later.

Occurrence of most of the enumerated species is of considerable interest, as they extend in a northerly direction from their previously known distribution points. According to their origin, all the listed species belong to Mediterranean or Mediterranean-S Pontian elements reaching their northern range limits in the C Balkan Peninsula, including the E, SE & S parts of Serbia. In addition to being enabled by mild climatic influences, their spread from the Mediterranean region also depends on various human activities. The dispersion of many of them, *e.g. Petrorhagia velutina, Carthamus dentatus* and *Hypochoeris cretensis,* is supported by destruction of primary habitats and forming places disturbed by human activities.

On the basis of the estimated conservation status according to the IUCN Red List Categories and Criteria we proposed the inclusion of *Umbilicus rupestris* (CR B2ab (ii,iii,iv)), *Scorzonera mollis* (EN B2ab (ii,iii)) and

Asparagus verticillatus (VU 2ab (iii)) in the next volume of the Red Data Book of Flora of Serbia.

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REZIME

Noviteti za vaskularnu floru Srbije

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Teritorija Srbije, sa položajem u centralnom delu Balkanskog poluostrva, odlikuje se značajnim florističkim bogatstvom i diverzitetom biljnog sveta. Pored činjenice da je flora Srbije istraživana više od 150 godina još uvek postoje delovi teritorije koji su ostali izvan interesovanja i detaljnih istraživanja botaničara. To se posebno odnosi na pogranične oblasti. U ovom radu prikazano je 8 novih vrsta vaskularne flore koje nisu zabeležene na teritoriji Srbije i to: *Petrorhagia velutina, Umbilicus rupestris, Carthamus dentatus, Carduus pycnocephalus, Hypochaeris cretensis, Scorzonera mollis*, *Valerianella costata* i *Asparagus verticillatus*. Navedene vrste pronađene su u južnoj i jugoistočnoj Srbiji u blizini granice sa Makedonijom. One pripadaju mediteranskim i mediteransko-južnopontskim elementima flore, koji svoju severnu granicu rasprostranjenja na Balkanskom poluostrvu dostižu u južnoj i jugoistočnoj Srbiji. Za svaku novootkrivenu vrstu date su karte rasprostranjenja u Srbiji prikazane na UTM grid mreži 10x10 km, dok su nalazišta detaljno prikazana sa podacima o staništu (zajednica, nadmorska visina, geološka podloga).
Pojedini novozabeleženi taksoni predstavljaju regionalno ugrožene predstavnike flore Srbije. Na osnovu IUCN kategorija i kriterijumima za zaštitu su predložene sledeće vrste: *Umbilicus rupestris* - krajnje ugrožena (CR B2ab(ii,iii,iv)), *Scorzonera mollis* - ugrožena (EN B2ab(ii,iii)) i *Asparagus verticillatus* - ranjiva (VU 2ab(iii)).

Ključne reči: Srbija, floristički noviteti, Mediteranske i Pontske vrste, rasprostranjenje, status ugroženosti