VIOLA CHELMEA AND VIOLA JOOI (VIOLACEAE), NEW SPECIES FOR THE FLORA OF SERBIA AND THEIR DISTRIBUTION IN THE BALKAN PENINSULA AND THE CARPATHIANS

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During several botanical expeditions in the Republic of Serbia (Mts Šar-Planina and Mts Homoljske Planine), two species of the genus Viola (V. sect. Viola) were found as new for the flora of Serbia: Viola chelmea Boiss. & Heldr. in Mt. Ošljak and V. jooi Janka in Mt. Vukan. The last taxon represents a new species also for the flora of the Balkan Peninsula. The taxonomic positions, phytogeographic importance and conservation statuses of the two new plants is discussed within the scope of their newly established distribution patterns both in the Carpathians and the Balkan Peninsula.

Key words: vascular flora, Viola chelmea, Viola jooi, distribution, Serbia, Balkan Peninsula, Carpathians
INTRODUCTION


Still, the number of *Viola* species is not final, since the intensive and long-standing field work and inspection of the herbarium collections resulted in discovering of two new species from the *V.* sect. *Viola* either for the whole Balkan Peninsula or for the territory of Serbia. The first one is *V. chelmea* Boiss. & Heldr. collected on Mts Šar-Planina in Metohija province and second is *V. jooi* Janka that was discovered in Mts Homoljske Planine in northeastern Serbia. New findings and complete distribution range of *V. chelmea* in the Balkan countries (Croatia, Bosnia and Herzegovina, Montenegro, Albania, Republic of Macedonia and Greece) and *V. jooi* in the Carpathians (Romania and Ukraine) are also provided.

MATERIAL AND METHODS

Field survey, checking and revision of herbarium material and numerous literature sources were used for compilation of the distribution records. Distribution of the species in the Balkan Peninsula and South-eastern Europe is presented according to the grid map with squares of 10 × 10 km, based on the Military Grid Reference System (MGRS) projection (Lampinen 2001). Collected plant material is stored in the Herbarium of the Institute of Botany and Botanical Garden “Jevremovac”, University of Belgrade (BEOU), the Herbarium of the Natural History Museum in Belgrade (BEO), Hungarian Natural History Museum, Budapest (BP) and Herbarium Melovskiorum, Skopje, Republic of Macedonia (MKMEL), (THIERS 2013, http://sciweb.nybg.org/Science2/Index-Herbariorum.asp). Nomenclature is given according to The Plant List database (http://www.theplantlist.org). Taxon description is given according to several botanical sources (Grințescu *et al.* 1955, Valentine *et al.* 1968, Raus 1986, Micevski 1995, Nikolić *et al.* 2015, https://de.wikipedia.org/wiki/Viola_chelmea), with some modifications and changes which were the results of the field observations. Plant material for morphological
analysis included 40 individuals collected from 11 localities in Bosnia and
Hercegovina, Montenegro, Serbia, Republic of Macedonia and Greece).
Descriptive statistics and analysis of variance were performed.

RESULTS AND DISCUSSION


DESCRIPTION

Perennial, 2.5 to 8 cm, acaulescent, herbaceous plant, with short,
lignifying and thick erect rhizome, without stolons, often covered by
withered leaf bases. Leaf petiole 4–5 cm long, (0.8–)1.4–1.9(2.4) times
longer than lamina; leaf blade triangular to ovate-oblong, obtuse, cuneate,
truncate or at most very shallowly cordate at the base (1.2–)1.4–4.6(–5.2)
cm long, (1.0–)1.1–2.4(–3.0) cm wide, hairy when young, later becoming
glabrous. Stipules broadly lanceolate, shortly glandular-fimbriate.
Peduncles 3–8 cm long. Flowers small (1 cm in diameter), not fragrant.
Sepals ovate, obtuse or subacute, glabrous. Petals pale violet, violet or
whitish-violet; lower petal including spur 1–1.4 cm long. Spur rather stout,
shorter than sepals. Fruiting peduncles mostly remaining upright, or those
of cleistogamous flowers lying on the ground when ripe. Capsule glabrous.
Flowering period: (April–) May–July.

TAXONOMIC MEMBERSHIP

Deutschl., ed. 2: 934 (1844), nom. inval.
– _Viola_ subsect. _Eflagellatae_ (Kitt. ex Juz.) Espeut, Monde Pl. 464: 37
(1999), comb. inval.

_Viola chelmea_ was originally described from Mt. Chelmos
(Peloponnisos, Greece). As a leading authority on the genus in early 20th
century W. Becker (1910) separated endemic Balkan (_V. chelmea_) and
Lebanese (_V. libanotica_ Boiss.) species (into unranked “_Lignosae_”) from
typical acaulescent representatives of the genus (_V._ subsect. _Viola_, named
as unranked “_Curvato-pedunculatae_” or “_Uncinatae_” – incl. _V. odorata_ L.,
_V. alba_ Besser, _V. hirta_ L., _V. pyrenaica_ Ramond ex DC., etc.). The same
author later joined two Balkan (_V. prenja_ Beck, _V. vilaensis_ Hayek) and
one Afghan (_V. griffithiana_ Boiss.) violets to “_Lignosae_” (Becker 1925).
Thereafter five species were described from Turkish mountains (_V._
sandrasea Melch., V. isaurica Contandrid. & Quézel, V. bocquetiana Yıld., V. kizildaghensis Dinç & Yıld., V. yildirimii Dinç & Bağcı) which also apparently belong to this group (Dinç 2009), although Nikitin (2012) treat V. sandrasea conspecific with V. pyrenaica. The main diagnostic features of “Lignosae” (compared to V. subsect. Viola) are branched, thickened and woody rhizome covered by withered leaf bases at the top, cuneate to slightly cordate leaf blades, uncinate stigmas with horizontal to more upwardly directed beaks as well as erect fruiting peduncles (Becker 1925). In florogenetic respects, representatives of “Lignosae” are exclusively oromediterranean or subalpine-zone heliophytic relict species with disjunct distribution, restricted to separate centres of speciations in the East Mediterranean (s.l.) and Orient. Melchior (1939) and Schmidt (1964) also pointed out that it is a primitive group compared to the V. subsect. Viola [“Acaules”]. On the contrary, Marcussen et al. (2003) noted the presence of some derived characters shared with typical taxa of V. subsect. Viola (uncinate style, unexplosive capsule).

Melchior (1939), Rössler (1943) and Schmidt (1964) partially rejected Beckers’s classification of “Lignosae” proposing reinclusion in V. subsect. Viola, i.e., V. ser. Eflagellatae, and anatomical (absence of excretory cells), morphological (style, seeds) and karyological evidences supported this attitude. Some of these authors believed that representatives of “Lignosae” should be classified in a separate series, closely related to V. ser. Eflagellatae, but they did not apply a formal designation. This concept follows the vast majority of modern authors, not mentioning (Valentine et al. 1968, Marcussen & Borgen 2000, Dinç & Yildirimli 2002, Dinç et al. 2003, Bağcı et al. 2008) or mentioning “Lignosae” (Okamoto et al. 1993, Marcussen et al. 2003, Dinç 2009). Marcussen et al. (2003) even expressed doubts on monophyly of “Lignosae”, considering it as an ecological group adapted to drought and exposure. In support of this conclusion, these authors pointed to the occurrence of spontaneous fertile hybrids of V. chelmea with V. alba and V. odorata (from V. ser. Viola), and allozyme studies also showed connection of V. chelmea with V. hirta and V. ambigua Waldst. & Kit. (from V. ser. Eflagellatae) (Marcussen et al. 2003). We have also noticed a great similarity between Dinaric-Scardic representatives of V. chelmea and Pontic V. ambigua, which are allopatric and possibly vicariant in the Balkan Peninsula (see also Raus 1986). On the other hand, morphological singularity of the group “Lignosae” (Becker 1925) can not be ignored, and in the case of the recognition of this group V. chelmea (incl. V. vilaensis) would have been the only European species. However, instead of a formal designation of its rank it is better to wait for the results of phylogenetic studies at this point. Eurasian V. collina Besser, V. thomasiana Sonegon & E.P. Perrier (from the Alps and Caucasus) and V. hondoensis W. Becker & H. Boissieu (from Japan) are also included in V. ser. Eflagellatae (Becker 1925).
GENERAL DISTRIBUTION

*V. chelmea* is Balkan endemic plant, distributed in Croatia, Bosnia and Herzegovina, Montenegro, Albania, Republic of Macedonia and Greece (Fig. 1). Within the species, two subspecies were recognized (Valentine et al. 1968, https://de.wikipedia.org/wiki/Viola_chelmea):

Fig. 1. – Distribution of the species *Viola chelmea* Boiss. & Heldr. in the Balkan Peninsula. *V. chelmea* subsp. vratnikensis Gáyer & Degen (red marks), *V. chelmea* subsp. chelmea (black marks); indication of locations: full circle - according to literature and herbarium data; circle with white spot - according to herbarium new chorological data only; circle with gray/black spot - according to literature data only; ? - doubtful records (*V. prenja* Beck).
subsp. *chelmea*

Leaf blade 1.4–2.2 × 1.1–1.5 cm; broadly triangular to reniform, 1.1–1.4 as long as wide; truncate to shallowly cordate, less frequently cuneate at base; margins distinctly crenate, with 8–10 teeth on each side (Fig. 2). Stipules ± scarious, subglabrous on the upper surface. Bracts of the peduncle narrow, glabrous or sparsely ciliate. Petals pale violet.

Fig. 2. – *Viola chelmea* Boiss. subsp. *chelmea* – herbarium specimens from Mt. Chelmos (Peloponnisos, Greece) (BEO).

**DISTRIBUTION**

Present only in Greece (Fig. 1) in the following regions and localities: South Pindhos (Mt. Athamanon, Mt. Liakoura, Mt. Pteri, Mt. Tsoumerka, Mt. Voutsikáki), Sterea Ellas (Mt. Chelidon, Mt. Dhirfis, Mt. Giona, Mt. Kalliaíouda, Mt. Xirovouni) and Peloponnisos (Mt. Chelmos, Mt. Erymanthos, Mt. Killini, Mt. Menalon, Mt. Taygetos) (Raus 1986, Tan & Iatrou 2001).

**NEW CHOROLOGICAL RECORDS**

**Greece: Thessaly:** Mt. Tringia, above village Palaiochóri, 39.58711 N, 21.39467 E, [MGRS 34T EJ38], on limestone rocks, 1945 m, 23.06.2015, coll./det. Z. Barina (BP 27873).


≡ *V. vilaensis* Hayek, Denkschr. Akad. Wiss. Math.-Nat. Kl. (Wien) 94: 154, Plate 3 (Fig. 1), Plate 5 (Fig. 8) (1918); ≡ *V. dinarica* subsp. *vilaensis* (Hayek) Trinajstić, Suppl. Fl. Anal. Jugosl. 3: 6 (1975), nom. illeg.
Leaf blade 3.8–4.6 × 2–2.4 cm; narrowly triangular, 1.7–1.9 as long as wide; cuneate to truncate, rarely shallowly cordate at base; margins finely serrate-crenate, with 13–15 teeth on each side (Figs 3–4). Stipules not scarious, greenish, purplish or brownish, often pubescent on the upper surface. Bracts of the peduncle wide at the base, ciliate. Petals violet (Fig. 3 a-b) to whitish-violet (Fig. 3 c-d).

Fig. 3. – *Viola chelmea* subsp. *vratnikensis* Gáyer & Degen in flower: a) plant from Mt. Orjen, Zubački Kabao (SW Montenegro); b-d) plants from Mt. Bijela Gora (SW Montenegro) (photo P. Cikovac).
Variability and morphological differentiation

Subspecies was originally described from Mt. Velebit (in Croatia) and Mt. Orjen (Montenegro) (Degen 1914), wherein the elder G. Beck’s exsiccate from Mt. Velež (Bosnia and Hercegovina) was incorrectly treated as a type subspecies. Longer ciliate margins of stipules with finely fringed cilia (compared to the type subspecies) is used as the main diagnostic character in the protologue and this judgment is also currently accepted (Valentine et al. 1968, Trinajstić 1975, The Plant List 2013). However, it is excluded from our identification key as too variable. Four years after Degen’s discovery, Hayek (1918) described *V. vilaensis* from the border of

Fig. 4. – *Viola chelmea* subsp. *vratnikensis* Gáyer & Degen in fruit: a) Mt. Ošljak, Popovo Prase (S Serbia, Metohija) – species habitat; b-c) plants from Mt. Jablanica, Malo Sedlo (SW Macedonia); d-e) herbarium specimens from Mt. Jablanica, Malo Sedlo (SW Macedonia) (BEO) (photo M. Niketić).
Montenegro and Albania (Mt. Kučke Prokletije). He distinguished it from *V. chelmea* (incl. *V. c. subsp. vratnikensis*) by leaf blade base more cuneate to truncate (rarely shallowly cordate), hairy young leaves, pubescent stipules and paler petals. With the exception of leaf indumentum, we accept these diagnostic features, but they do not apply to the analysed populations from Mt. Orjen (*V. c. subsp. vratnikensis*) and Hayek’s and Degen’s plants obviously belong to the same taxon. The results of our morphometric analysis additionally support the proposed subspecific delimitation and the most significant and easily recognizable features refer to the leaf blade size, shape and serration. The type subspecies has conspicuously smaller and relatively broader blades with more prominent and fewer teeth on the margin (Fig. 5), as well as ± scarious stipules. These differences are not mentioned in the existing literature. Analysis of variance showed that petiole/blade ratio has no role in the subspecific

Fig. 5. – Variation in selected morphological characters and indices (leaf blade height, leaf blade width, leaf blade length/width, numbers of teeth on one side of leaf blade margin) for *Viola chelmea* Boiss. *chelmea* and *V. chelmea subsp. vratnikensis* Gáyer & Degen.
differentiation. Observed differences may point to the specific status of non-Greek taxon (Trinajstić 1975, Raus 1986) – in that case the legitimate name would be *V. vilaensis*, not *V. dinarica*. However, transitory forms are also observed in some populations of *V. chelmea* (e.g. Mt. Voutsikáki in S Pindhos, BEO).

**TAXONOMIC RELATIONSHIPS**

Currently, *V. vilaensis* is included in the *V. chelmea* subsp. *vratnikensis* (Valentine et al. 1968, Marcussen et al. 2003, The Plant List 2013). On the other hand, the position of closely related *V. prenja* is still unresolved. Beck (1887) described *V. prenja* from Mt. Prenj in Herzegovina province (Bosnia and Herzegovina) and presented detailed description and drawing of this taxon, as well as habitat type [“in rupium fissuris”] in which this taxon was found. According to Beck (1918) there is only a single gathering from this locality. Later on, Beck (1901) added new locality for this taxon in Mt. Treskavica but Bjelčić & Šilić (1971), Šilić & Abadžić (1991) and Đug et al. (2013) cited Mt. Prenj as unique locality for this plant.

Identity of this plant has been challenged on several occasions. After the comparison of *V. chelmea* subsp. *vratnikensis* and *V. prenja*, Degen (1914) concluded that they are “extremely close” and “appear to be local hybrids of the same species”. According to this author, the plants from Mt. Orjen are very similar to *V. prenja* and Beck’s plant only differs by elongated rhizome, narrower not deeply fimbriate stipules, fragrant flowers and thicker, slightly upwardly curved spur. Moreover, Degen’s material from Mt. Orjen was previously identified as *V. prenja*.

In contrary, Hayek (1918, 1924) claimed that the whole habitus of *V. prenja* (particularly rhizome) does not indicate belonging to the same taxonomic group as the *V. chelmea*. According to him this plant is actually closely related to *V. pyrenaica* and insignificant differences between the two taxa (*V. prenja* has smaller flowers and thicker spur) refer to their conspecific status. Malý (1923) considered it as a variety of *V. pyrenaica*. This opinion is accepted also currently (Valentine et al. 1968, Trinajstić 1975, The Plant List 2013), although Becker (1925) included it in the “Lignosae”.

It is not easy to choose which of these two classification is correct due to lack of type material originated from single gathering. Furthermore, the original illustration may correspond to both aforementioned species (*V. chelmea* and *V. pyrenaica*). Nevertheless, in the protologue *V. suavis* [sub *V. austriaca* A. Kern.
& Jos. Kern.) and *V. odorata* were suggested as closest relatives of *V. prenja* (Beck 1887). Although *V. pyrenaica* has traditionally been classified in *V.* ser. *Eflagellatae*, recent allozyme studies showed that *V. pyrenaica* is possibly ancestor of *V. suavis* from *V.* ser. *Viola* (Marcussen & Borgen 2000). Taking into account other characteristics (rhizome, stipules, fragrant flowers) *V. prenja* appears to be linked with *V. pyrenaica*. However, Beck (1887) also mentioned the lower stature of the plant, small leaves, truncate to shallowly cordate at base and small flowers. For these reasons, and taking into account phytogeographic characteristics of the area, a possible relationship with *V. chelmea* should not be excluded. Therefore, on the distribution map of *V. chelmea* (Fig. 1) two records for *V. prenja* are treated as doubtful.

**DISTRIBUTION**


**NEW CHOROLOGICAL RECORDS**

**Serbia (first record):** Metohija: Mts Šar-Planina, Mt. Ošljak, Popovo Prase peak, [MGRS 34T DM97], stene i kamenjari, krečnjak, c. 1900 m, 30.07.2008, coll. M. Niketić, Š. Duraki, det. M. Niketić (BEO s.n.).

**Bosnia and Herzegovina:** Mt. Velež, Veliki Velež, Čaba peak, [MGRS 34T BN69], visokoplaninski pašnjaci i kamenjari, krečnjak, 1200–1750 m, 08.08.2011, coll./det. M. Niketić (BEOU 337705; BEO s.n.); Mt. Velež, Veliki Velež, between Čaba peak and Botun peak, [MGRS 34T BN69, BP50], visokoplaninski pašnjaci i stene, krečnjak, 1750–1900 m, 08.08.2011, coll./det. M. Niketić (BEO s.n.); Mt. Maglić, Prijevor peak, [MGRS 34T CN19], visokoplaninski pašnjaci i kamenjari, krečnjak, 1800–2000 m, 12.08.2008, coll./det. M. Niketić (BEO s.n.).

**Montenegro:** Mt. Orjen, Krivošije, [MGRS 34T CN01], 19.06.1906, coll./det. J. Schneider, sub. *V. vratnikensis* (W 9473); Mt. Orjen: Krivošije, [MGRS 34T CN01], kalk, c. 1850 m, 09.06.1911, coll. J. Baumgartner (WU 5274); Mt. Orjen, Orjenske lokve - Kabao, [MGRS 34T BN91], *Pinus heldreichii* zona, krečnjak,
1500–1893 m, 20.08.2010, coll./det. M. Niketić, G. Tomović (BEOU 31415, BEO s.n.); Mt. Orjen, Pavlović do, [MGRS 34T BN91], šuma Pinus heldreichii, krečnjak, 1750 m, 13.06.2009, coll./det. P. Cikovec (BEOU 29605); Mt. Žijovo, towards to peak, [MGRS 34T CN71], Pinus heldreichii zona, krečnjak, c. 1800 m, 25.08.2011, coll./det. M. Niketić (BEO s.n.).

Note: Although V. chelmea subsp. vratnikensis was already known from Mt. Orjen (Degen 1914), the precise locality was not presented, therefore the new records are given in this paper.


Note: Although V. chelmea subsp. vratnikensis was cited for Mt. Jablanica ([https://de.wikipedia.org/wiki/Viola_chelmea](https://de.wikipedia.org/wiki/Viola_chelmea)) and Mt. Galičica (Micevski 1995), the precise localities were not presented, therefore the new records are also given in this paper.

Albania: Mali i Polisit, Lugu i Thellë, Maja Faqja e Madhe, [MGRS 34T DL44], crevices in limestone rocks, 1900–1970 m, 04.07.2008, coll./det. Lj. Melovski (MKMEL 08332, 08333); Albanian Alps (Prokletije), Popllukes, from Kukaj towards Maja e Jezerces, [MGRS 34T DM09], limestone scree and stony site with sparse and stunted Bosnian pines and other shrub, 1500–1600 m, 05.07.2015, coll. Lj. Melovski, N. Melovska, det. Lj. Melovski (MKMEL 08323);
District of Berat: on the eastern slope of Mali i Tomorit, above village Bargullas, 40.65082 N, 20.15758 E, [MGRS 34T DL20], on limestone rocks, 2232 m, 20.06.2012, coll./det. Z. Barina, D. Pifkó, G. Lunk (BP 21413); District of Bulqizë: Mali i Kreshës, c. 1.0 km west of village Vajkal Bulqizë, 41.50809 N, 20.20141 E, [MGRS 34T DL39], on limestone rocks, 2177 m, 30.05.2008, coll./det. Z. Barina, D. Pifkó, B. Pintér (BP 13673); Mali i Kreshës, on southern slope of Maja e Kreshtes (2100.9 m), c. 1.2 km northwest of village Vajkal Bulqizë, 41.51949 N, 20.20548 E, [MGRS 34T DL39], in open grassland, on serpentine, 1057 m, 01.06.2008, coll./det. Z. Barina, D. Pifkó, B. Pintér (BP s.n.); District of Burrel: Mali i Dejës, above village Macukull, near pass “Shkol-Den”, 41.68929 N, 20.16825 E, [MGRS 34T DM31], in rocky grassland, on limestone, 1996 m, 09.08.2009, coll./det. Z. Barina, D. Pifkó (BP 15984); District of Devoll: near the summit of Mt. Gremnja, above village Vernik, 40.6464 N, 21.0541 E, [MGRS 34T DL00], in dolina, on limestone, 1467 m, 25.06.2015, coll./det. Z. Barina, D. Pifkó (BP 27976); District of Dibër: Mali i Lopës, c. 900 m east of town Bulqizë, towards lake “Liqeni i Zi”, 41.49134 N, 20.23671 E, [MGRS 34T DL39], in pine forest, on serpentine, 1057 m, 24.05.2008, coll./det. Z. Barina, D. Pifkó (BP 13406); District of Kolonjë: western slope of Mt. Kameniku (2043.1 m), 900 m west of the peak, 40.2135 N, 20.70494 E, [MGRS 34T DK75], in limestone rocky grassland, 1890 m, 21.07.2006, coll./det. Z. Barina, D. Pifkó, G. Király, Cs. Németh (BP 22954); District of Lezhë: on the slope of Mt. Guri e Kuq, above village Fregën, 41.86162 N, 19.73641 E, [MGRS 34T CM93], in opened grassland, on serpentine, 586 m, 30.03.2015, coll./det. Z. Barina, D. Pifkó, H. Mező (BP 17175); District of Lushaj, above village Lushaj, 42.21055 N, 20.46392 E, [MGRS 34T DM57], in dry grassland, on serpentine, 1120 m, 30.06.2015, coll./det. Z. Barina, K. Baráth, G. Puskás (BP 28115); near the peak of Mt. Pashtrik (1998 m), above village Pogaj, 42.20426 N, 20.52693 E, [MGRS 34T DM67], in mountain grassland, on limestone, 1741 m, 22.05.2010, coll./det. Z. Barina, D. Pifkó (BP 17175); District of Librazhd: on the slope of Mt. Maja e Marjathit, above village Kalimash, 42.05445 N, 20.29232 E, [MGRS 34T DM45], in opened grassland, on serpentine, 1016 m, 01.08.2013, coll./det. Z. Barina, D. Pifkó, H. Mező (BP 22954); District of Stërmit, above village Qafë-Murrë and c. 7 km S of village Çidhnë, 41.69699 N, 20.21471 E, [MGRS 34T DM31], in rocky grassland, on limestone, 1790 m, 19.05.2010, coll./det. Z. Barina, D. Pifkó (BP 17004); District of Has: Maja e Gajrepit, above village Fushë-Lurë, 41.78203 N, 20.24341 E, [MGRS 34T DM32], on limestone rocks, 1781 m, 19.05.2010, coll./det. Z. Barina, D. Pifkó (BP 17004); District of Dibër: Mali i Lopës, c. 900 m east of town Bulqizë, towards lake “Liqeni i Zi”, 41.49134 N, 20.23671 E, [MGRS 34T DL39], in pine forest, on serpentine, 1057 m, 24.05.2008, coll./det. Z. Barina, D. Pifkó (BP 13406); District of Kolonjë: western slope of Mt. Kameniku (2043.1 m), 900 m west of the peak, 40.2135 N, 20.70494 E, [MGRS 34T DK75], in limestone rocky grassland, 1890 m, 21.07.2006, coll./det. Z. Barina, D. Pifkó, G. Király, Cs. Németh (BP 10250); District of Kukës: on the slope of Mt. Guri e Kuq, above village Fregën, 41.86162 N, 19.73641 E, [MGRS 34T CM93], in opened grassland, on serpentine, 573 m, 30.03.2015, coll./det. Z. Barina, D. Pifkó, L. Lőkös (BP s.n.); on the slope of Mt. Guri e Kuq, above village Fregën, 41.86252 N, 19.73652 E, [MGRS 34T CM93], in opened grassland, on serpentine, 586 m, 30.03.2015, coll./det. Z. Barina, D. Pifkó, L. Lőkös (BP 24373); District of Librazhd: Mali i Jablanices, between Mt. Maja e Strapit (1974 m) and pass Tamizit, c. 5.6 km south of village Steblevë, 41.28594 N, 20.48201 E, [MGRS 34T DL57], on gravel-conglomerate rock, 2121 m, 03.07.2008, coll./det. Z. Barina, D. Pifkó, A. Vojtkó (BP 13896); Mali i Jablanices, on Mt. “Lapë” (2038 m), c. 5.1 km east of village Qarrishët, 41.24944 N, 20.50152 E, [MGRS 34T DL56], in rocky grassland, on limestone, 1840 m, 04.07.2008, coll./det. Z. Barina, D. Pifkó, A. Vojtkó (BP s.n.); Mali i Jablanices, on Mt. “Lapë” (2038 m), c. 5.2 km east of village Qarrishët, 41.25083 N, 20.50372 E, [MGRS 34T DL56], in rocky grassland, on limestone, 1998 m, 04.07.2008, coll./det. Z. Barina, D. Pifkó, A. Vojtkó (BP s.n.); Mali i Jablanices, on Mt. “Lapë” (2038 m), c. 5.6 km east of village Qarrishët, 41.24845 N, 20.50545 E, [MGRS 34T DL56], in rocky grassland, on limestone, 1993 m, 04.07.2008, coll./det. Z. Barina, D. Pifkó, A. Vojtkó (BP 13951); Mali i
Jablanices, on the 1957 m high mount between Mt. “Lapë” (2038 m) and Mt. “Zrinos” (1998 m), c. 4.6 km east of village Qarrishtë, 41.25273 N, 20.49773 E, [MGRS 34T DL56], in rocky grassland, on limestone, 1925 m, 04.07.2008, coll./det. Z. Barina, D. Piškó, A. Vojtkó (BP s.n.);

District of Malësì e Madhe: above village Lëpushë, cliffs Shkëmbjejet e Jamës, 42.50204 N, 19.74179 E, [MGRS 34T CN90], on limestone rocks, 1861 m, 02.08.2011, coll./det. Z. Barina, G. Somogyi (BP s.n.); District of Malësì e Madhe: above village Lëpushë, cliffs Shkëmbjejet e Jamës, 42.50204 N, 19.74179 E, [MGRS 34T CN90], on limestone rocks, 1976 m, 02.08.2011, coll./det. Z. Barina, G. Somogyi (BP 19659);

District of Malësì e Madhe: above village Lëpushë, cliffs Shkëmbjejet e Jamës, 42.50204 N, 19.74179 E, [MGRS 34T CN90], on limestone rocks, 1861 m, 02.08.2011, coll./det. Z. Barina, G. Somogyi (BP 19680);

District of Malësì e Madhe: above village Lëpushë, cliffs Shkëmbjejet e Jamës, 42.50204 N, 19.74179 E, [MGRS 34T CN90], on limestone rocks, 1861 m, 02.08.2011, coll./det. Z. Barina, G. Somogyi (BP 19680);
HABITAT AND ECOLOGY

*V. chelmea* subsp. *chelmea* inhabits limestone rocks and rocks crevices, in scattered *Abies cephalonica* and *Pinus nigra* forests or above timberline, at altitudes from (1300–)1400 to 2200 m (Raus 1986, Tan & Iatrou 2001).
The other subsp. *vratnikensis* in the Republic of Macedonia also grows on limestone rocky ground from 1700–2000 m (Micevski 1995), but can be found on much lower altitudes (c. 500 m) on ultramafic rocky grounds in Albania (see new records). In the western parts of its distribution range, subsp. *vratnikensis* inhabits lower to moderate altitudes (500–1900 m), exclusively on limestone, within open grassy habitats, rocky grounds and rocks. It can rarely be found in shrub communities of *Pinus mugo* or dry *Pinus heldreichii* or *Pinus nigra* forests (Lubarda 2013, Nikolić et al. 2015).

Serbian population on Mts Šar-planina (Mt. Ošljak, Popovo Prase peak) was found at the altitude between 1800 to 1900 m in the zone of Bosnian Pine forest (*Seslerio autumnalis-Pinetum heldreichii* Janković et Bogojević 1962). The prime habitat for the species is xerophytic rocky subalpine pastures (*Sesleria wettsteinii-Onobrychis montana* Rajevski 1990) of the alliance *Seslerion rigidae*, order *Seslerietalia juncifolia* and vegetation class *Elyno-Seslerietea*. Plants grow at S exposure and inclination between 0 to 60°. Geological substrate is limestone. Detailed floristic characteristics of two stands are represented in the following layer:


**CHROMOSOME NUMBER**

2n=20 was reported from Mt. Giona, Mt. Chelidon, and Mt. Kalliakouda in Greece (Franzén & Gustavsson 1983: 105).

**POPULATION SIZE AND AREA OF OCCUPANCY IN SERBIA**

Population area occupies ca. 5 ha, between 1880 and 1920 m. Population size is estimated to be less than 200 mature individuals.

**ESTIMATED THREATENED STATUS IN SERBIA**

According to the IUCN (2012) the main level of threat should be regarded as critically endangered: CR B1 i, ii, iv; C2b / EN C2a; D / VU E.
**Viola jooi** Janka, Österr. Bot. Wochenbl. 7: 198 (1857)

**DESCRIPTION**

Perennial plant with creeping rhizome, without stolons, 5–8 cm high during the flowering and elongating in fruit. Stems absent. Basal leaves of flowering plants are up to 5 cm long and 3 cm wide, extending from the roots, triangular-ovate, cordate-dentate, with a blunt or short pointed tip, with short or fairly deep sinus, on the edge crenate, naked, with long petioles (Figs 6–7). Stipules for almost its entire length adnate to petiole, apex free, linear-lanceolate or lanceolate, acute. Peduncles up to 15 cm long, with bracts 4–6 mm long about middle. Flowers moderate to fairly large, 1.5–2.5 cm long and 1.5–2.5 wide, violet or purplish-violet with dark violet or dark purple stripes (in Serbia white with pale yellow stripes), often yellowish at base, fragrant. Sepals 5–6 mm long, 2–2.5 mm wide, elongate-elliptical or ovate-lanceolate, obtuse or rounded at apex, appendages short, obtuse or rounded, glabrous. Petals 10–12 mm long, subrotundate to ovate, ± crenate, lateral bearded. Spur rather slender, scarcely curved upward or almost straight, pale violet or whitish (in Serbia white), 4–6 mm long. Ovary glabrous; style nail-shaped, thickened toward summit. Capsule 7–9 mm long, up to 4 mm wide, ellipsoid, obtuse, glabrous. Seeds large, brown or reddish-brown. Flowering period: April–June.

**TAXONOMIC MEMBERSHIP**


*V. jooi* belongs to *V.* subsect. *Adnatae* (W. Becker) W. Becker, which includes acaulescent perennials plants, without stolons; rhizome branched underground and under the original location of the leaves forming a smooth roots; stipules, especially outer, up to the middle connate (semi-adnate) to petiole, pale green to brown; leaves narrow to wide, at base cuneate to deeply cordate, sometimes like an arrow; style flattened at the top and usually bordered, with short stigma’s beak (Becker 1925). In the Flora
Fig. 6. – *Viola jooi* Janka: a) Mt. Veliki Vukan (NW Serbia) – species habitat; b-c) habitus; d-f) flowers; g) petioles and stipules (photo M. Niketić).

Europaea, besides *V. jooi*, *V.* subsect. *Adnatae* encompasses *V. selkirkii* Pursh ex Goldie (distributed in Fennoscandia, N. & C. Russia) and *V.*
pinnata L. (present in the Alps) (Valentine et al. 1968). According to Becker (1925), the closest relative of *V. jooi* is *V. macroceras* Bunge and sometimes it was regarded as a subspecies of the latter. *V. macroceras* is distributed in Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Russia (W Siberia), Tajikistan and Uzbekistan, where it inhabits alpine meadows, rocks, stony slopes, scrub and banks of streams (Yuzepchuk et al. 1949, Chen et al. 2007).

**Fig. 7.** – *Viola jooi* Janka – herbarium specimens from Mt. Vukan.

**GENERAL DISTRIBUTION**

*V. jooi* is Carpathian endemic plant distributed only in Romania and Ukraine (Fig. 8). In Romania it is present in the following counties and localities: Bacău County (Bicaz pe Piatra Corbului, Bicazu Ardelean, Cheile Bicazului, Mt. Măgura din. V. Bistricioarei, Măii Oituzului pe V. Uzului, Piatra Neamț pe Dl. Cozla, Tulghes), Brașov County (Brașov, Codlea pe Măgura Codlei, Csik Basin, Mt. Piatra Craiului, Mt. Postăvaru, Munții Ciucului, Racoșul de Jos pe Dl. Tipeiului, V. Prăpăstiiilor), Cluj County (Cheile Turzii, Cluj la cariera Mănăștur și pe Dl. Gîbrău, Cluj-Napoca, Colleşti, Gîrda, Poiana Aiudului, Poșaga pe Mt. Scărița, Rimetea, Vălișoara), Harghita County (Borsec and Frumoasa), Hunedoara County (Hațeg, Hunedoara, Mții Trăscăului pa Piatra Ceții, Orăștie), Suceava County (Mții Bistriței pe V. Barnarului, Pojorîta pe Mt. Adam și Eva) and Mehedini County (Domogled - Băile Herculane) (Grințescu et al. 1955). In Ukraine it is distributed in Ivano-Frankivsk region - Tlumach districts (Harasymiv village) and Gorodenky districts (Nazarenkovo village) (Sheliag-Sosonko et al. 1980, Didukh 2009). However, according to Novikoff & Hurdu (2015) *V. jooi* in Ukraine belongs to the group of
doubtful taxa, with its taxonomy and/or chorology under question and in need of further clarifications.

Fig. 8. – Distribution of the species *Viola jooi* Janka in the Balkan Peninsula and the Carpathians; circle with white spot - according to herbarium new chorological data only; circle with black spot - according to literature data only.

**Note:** *V. jooi* is on the list of Delivering Alien Invasive Species In Europe (DAISIE), with a status Alien/Not established for Hungary (http://www.europe-aliens.org/) or casual alien (Balogh & al. 2004, http://www.hear.org/gcw/species/viola_jooi/).

**FIRST RECORD IN SERBIA AND THE BALKAN PENINSULA**

**Northeast Serbia:** Mts Homoljske Planine, Mt. Vukan, Veliki Vukan peak, [MGRS 34T EQ40], stene i kamenjari, krečnjak, c. 810 m, 29.04.2003, coll. *M. Niketić*, G. *Tomović*, det. *M. Niketić* (BEOU 16448; BEO s.n.); stene i kamenjari, krečnjak, c. 820 m, 01.05.2015, coll. *M. Niketić*, G. *Tomović*, det. *M. Niketić* (BEOU 43185; BEO s.n.).

**HABITAT AND ECOLOGY**

*V. jooi* grows on limestone rocks and in fissures in mountain regions of the Carpathians (Grințescu *et al.* 1955). In Romania, it belongs to the group
of Dacian phytoelements that inhabit rocky grounds of the alliance *Seslerion rigidae* Zólyómi 1939, order *Seslerietalia* Br.-Bl. 1926 and vegetation class *Elyno-Seslerietea* Br.-Bl. 1948 (Boșcai & Täuber 1985). In Serbia (at newly established locality in Mt. Vukan) this plant inhabits rocky grounds community *Cephalario-Seslerietum rigidae* Tatić et Atanacković 1973 of the alliance *Seslerion rigidae* Zólyómi 1939, order *Seslerietalia juncifoliae* Ht. 1930 and vegetation class *Elyno-Seslerietea* Br.-Bl. 1948. Habitat is surrounded by Moesian types of deciduous thickets and scrubs of *Syringo-Carpinetum orientalis* (Grebenščikov 1950) Mišić 1967 and *Eryngio-Syringetum vulgaris* Diklić 1965. This plant grows at the altitude between 780 to 820 m, at S exposure and inclination between 0 to 10°. Geological substrate is limestone. Detailed floristic characteristics of two stands are represented in the following layer:


**CHROMOSOME NUMBER**

2n=24 was reported from Romania (Gershoy 1932, 1934, Valentine *et al.* 1968)

**POPULATION SIZE AND AREA OF OCCUPANCY IN SERBIA**

This plant occurs on restricted area of ca 3 ha (300 × 100 m) near the main peak of Mt. Vukan, between 780 to 820 m. Population size is estimated to be less than 500 mature individuals. Continued fouling of rocky pastures could be a major problem for the population survival in the future.

**ESTIMATED THREATENED STATUS IN SERBIA**

According to the IUCN (2012) the main level of threat should be regarded as critically endangered: CR B1 i, ii, iv; B2b,c,e / EN C2b / VU C2a; D1; D2; E.
CONCLUSIONS

*Viola chelmea* is a new species from *V.* subsect. *Viola* for the flora of Serbia. In this paper, 78 new records for the flora of Bosnia and Herzegovina, Montenegro, Albania, Republic of Macedonia and Greece were listed. In addition, the complete distributions of the *V. c.* subsp. *vratnikensis* and *V. c.* subsp. *chelmea* in the Balkan Peninsula were presented. Some morphological characters important to subspecific delimitation were also presented for the first time.

*Viola jooi* represents a new recorded species from *V.* subsect. *Adnatae* not only for the flora of Serbia, but for the whole Balkan Peninsula. Isolated and very restricted locality of *V. jooi* in Mt. Vukan in northeast Serbia is c. 95 km distant from the nearest known locality in Romania (Mehedini County, Domogled, Bâile Herculane) and marks the southernmost limit of the species distribution range in Europe. It is assumed that the species also occurs in other mountains of northeastern Serbia. It’s closest relative, *V. macroceras*, inhabits similar habitats in central Asia. There are not many other examples of remote vicarious species distributed on Balkan Peninsula and C Asia (i.e. *Gymnospermium scipetarum* Paparisto & Qosja ex E. Mayer & Pulević and *G. altaicum* (Pall.) Spach.) or remote populations of one species with similar distributions (i.e. *Sibiraea laevigata* (L.) Maxim.). It is interesting to note that Serbian populations are different from all others (incl. *V. macroceras*) in coloration of petals (white) which can indicate a genetic bottleneck in an isolated population at the far southwest. Further research will show whether a description of a new infraspecific taxon is appropriate.

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NIKETIĆ, M. et al.: VIOLA CHELMEA AND V. JOOI IN SERBIA AND BALKAN


VIOLA CHELMEA И VIOLA JOOI (VIOLACEAE), НОВЕ ВРСТЕ ЗА ФЛОРУ СРБИЈЕ И ЊИХОВО РАСПРОСТРАЊЕЊЕ НА БАЛКАНСКОМ ПОЛУОСТРВУ И НА КАРПАТИМА

МАРЈАН НИКЕТИЋ, ПАВЛЕ ЦИКОВАЦ, ЗОЛТАН БАРИНА, ДАНИЕЛ ПИФКО, ЉУПЧО МЕЛОВСКИ, ШЕМИЈА ДУРАКИ, ГОРДАНА ТОМОВИЋ

РЕЗИМЕ

Током неколико ботаничких експедиција на подручју Србије (Шар-планина и Хомољске планине), откривене су две нове врсте из рода Viola (V. sect. Viola) за флору Србије: Viola chelmea Boiss. & Heldr. сакупљена је на планини Ошљак, а Viola jooi Janka на планини Вукан. V. jooi истовремено представља и нову врсту за флору Балканског полуострва. Таксономски положај, фитогеографски значај и конзервациони статуси ове две нове врсте за подручје Србије дискутовани су у светлу новоусстављених образаца дистрибуције на Карпатима и на простору Балканског полуострва.