

Four rare taxa of the genus *Verbascum* (*Scrophulariaceae*) for the vascular flora of Bosnia and Herzegovina

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Abstract. This article contributes new data on the distribution of the native vascular flora in Bosnia and Herzegovina. It includes new records and confirmations for some rare taxa of the genus *Verbascum*. *Verbascum sinuatum* is a new species for Bosnia and Herzegovina and the presence of three other taxa (*V. baldaccii*, *V. niveum* subsp. *visianianum* and *V. orientale*) is confirmed. Special attention is paid to the conservation categories of the taxa. Three taxa are assessed as threatened, and one taxon has a Data Deficient status.

Key words: Bosnia and Herzegovina, distribution, rare taxa, *Verbascum*.

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Introduction

Verbascum L. (*Scrophulariaceae* Juss.) is a genus with about 360 species across the world (Fischer 2004), with centres of diversity in Anatolia, Caucasus, NW Iran, Levant, and southern Balkans (Murbeck 1939). It is represented by about 20 species in the flora of Bosnia and Herzegovina, of which four taxa are very rare and occurring only in Herzegovina: *V. baldaccii*, *V. niveum* subsp. *visianianum*, *V. orientale* and *V. sinuatum* (Slavnić 1967).

Material and methods

The study is based on recent field research, examination of herbarium material deposited at SARA (herbarium acronyms according to Holmgren & al. 1990), and literature data. Photographs have been taken in the field. The nomenclature follows Marhold (2011+). The available literature and herbarium records on the investigated four species are summarized in Table 1.

Distribution of the species in Bosnia and Herzegovina is mapped under a standard UTM grid 10×10 km.

Table 1. First literature and herbarium records of *V. baldaccii*, *V. niveum* subsp. *visianianum*, *V. orientale*, and *V. sinuatum* in Bosnia and Herzegovina

Taxon	Literature records	Herbarium records
<i>V. baldaccii</i>	Smrčanj, Velež Mt. Murbeck 1933	Smrčanj, Velež Mt. Vandas 1893 (W)
<i>V. niveum</i> subsp. <i>visianianum</i>	Mostar & Žitomislići, Murbeck 1933	Žitomislići, Malý 1925 (SARA, 35529)
<i>V. orientale</i>	Mostar, Murbeck 1891	Ljubuški, Fiala 1894 (SARA, 35534)
<i>V. sinuatum</i>	Blagaj, Struschka 1880 ??	No herbarium material in SARA

Localities from literature and herbaria are indicated in black on the map, while the new localities are indicated in red. A list of all localities representing the distribution of *V. baldaccii*, *V. niveum* subsp. *visianianum*, *V. orientale*, and *V. sinuatum* in Bosnia and

Herzegovina is also provided in a table. WGS1984 coordinates are given for literature records, herbarium records and new records. IUCN criteria have been used for assessment of the relevant Red List categories (IUCN 2012).

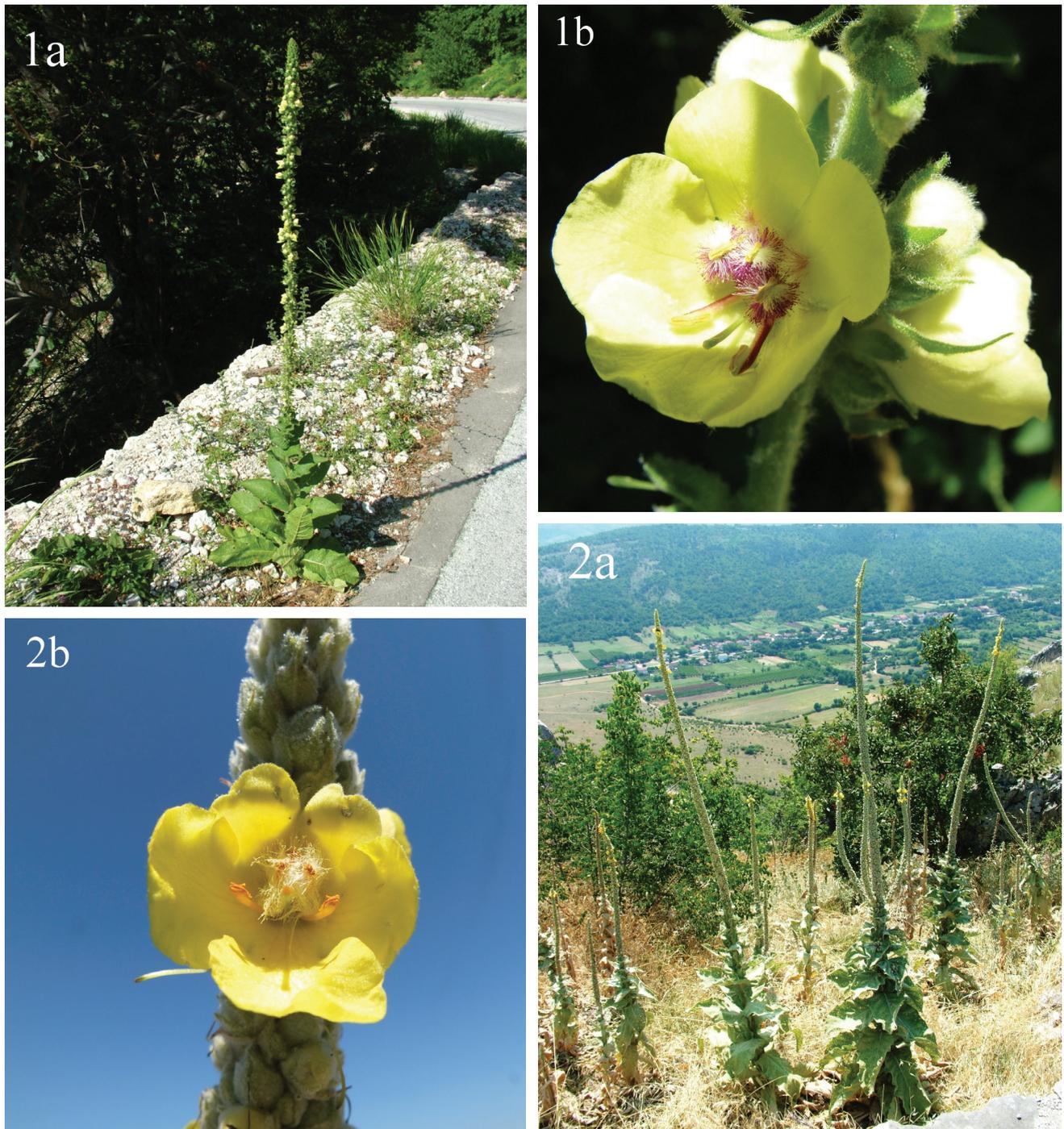


Fig. 1. 1. *Verbascum baldaccii* on the slopes of Veliko Rujšće: a. habitat; b. flowers. 2. *Verbascum niveum* subsp. *visianianum* in Ošanići: a. habitat; b. flowers (photos S. Maslo).

Results and discussion

During the field research in South Herzegovina conducted between 2014 and 2019, some new localities of four rare taxa of the genus *Verbascum* have been recorded for the flora of Bosnia and Herzegovina. Details are provided below.

Verbascum baldaccii Degen, Oesterr. Bot. Z. 46: 416. 1896 (Fig. 1).

Biennial plant, 100–250 cm tall, green and sticky glandular all over, overgrown with felt, loose and soft fluffy hairs. All leaves are bright green, thin, densely overgrown with glands and loosely felted dirty white fluffy hairs on all surfaces. Basal leaves form a wide rosette, broadly obovate or oblong-elliptic, crenate. Inflorescence is dense during flowering, subsequently loose. Bracts are slightly longer than flowers. Corolla pale yellow, 30–50 mm, with fluffy felt hairs and glands on the outer side. Stamen filaments of the two longer stamens 5–6 mm, purple; of the other stamens, reaching up to the anther, are covered with long dark purple hairs. Anthers of the two longer stamens descend far down the filaments. Detailed description of the species can be found in Murbeck (1933) and Nikolić (1974).

Verbascum baldaccii is an endemic species to the Balkan Peninsula, distributed only in Albania (Hayek 1930; Barina et al. 2018), Bosnia and Herzegovina (Murbeck 1933), Greece (Degen 1897; Dimopoulos & al. 2013), Montenegro (Rohlena 1904/1905; Hayek 1930), North Macedonia (Murbeck 1933), and Serbia (Nikolić 1974). It has been known from only one locality in Bosnia and Herzegovina: Velež Mt., Smrčanj near Mostar. These data is ca 130 years old and the species has not been confirmed during this long period.

The only known record so far was that of Vandas (1893) for Smrčanj, near Donje Zijemlje village, on the E slopes of the Velež Mt. (43°22'26.8"N, 17°59'31.6"E, 1024 m). The species was determined by Vandas, but there were no voucher specimens of it deposited in the herbarium collection of SARA. According to Murbeck (1933), a specimen from the actual locality was stored in the Vienna herbarium. After more than a century, Vandas' record has only historical value. In

July 2014, the species was recorded at three separate localities on the W slopes of Veliko Rujište (Velež Mt.), approximately 9 km northwest from Vandas' location of the species (Table 2).

Recently recorded localities: **Locality 1:** Velež Mt., Gola Glavica, Veliko Rujište, 43°27'37.9"N, 17°57'34.8"E, 02.07.2014, leg. S. Maslo; twenty flowering individuals and several rosettes observed. The population was found in an opening of *Pinus heldreichii* and *P. nigra* forest, as well as under sparse *P. heldreichii* trees at an altitudinal range of 1100–1200 m a.s.l.; **Locality 2:** Velež Mt., slopes of Veliko Rujište, 43°27'27.9"N, 17°57'31.7"E, 02.07.2014, leg. S. Maslo; about one hundred individuals observed. The population was found on road cuttings on the right side of the road R 435a, between Potoci and Rujište, at an altitudinal range of 1000–1050 m a.s.l.; **Locality 3:** Mostar, Humilišani, 43°27'07.2"N, 17°56'31.4"E, 02.07.2014, leg. S. Maslo; only two individuals have been recorded at the edge of an Oriental Hornbeam forest, along the right side of the road R 435a, between Potoci and Rujište, at an altitude of 643 m a.s.l.

The most abundant populations were recorded on the edges of the endemorelict Bosnian Pine (*Pinus heldreichii*) and Black Pine (*Pinus nigra*) forests, on the slopes of Veliko Rujište (Velež Mt.), at an altitudinal range of 1000–1200 m a.s.l.. Several solitary specimens were recorded at the foot of the mountain, along the edges of the Oriental Hornbeam forest, at an altitude of about 600 m a.s.l. (Table 2).

The localities from Velež Mt., as well as those from Mostar (Humilišani), mark the western limits of distribution range of this taxon in Europe.

V. baldaccii is known only from four restricted populations in Bosnia and Herzegovina. A preliminary assessment of its conservation status on national scale showed that this species meets the criteria for the category Endangered (EN) (IUCN 2012), because of its area of occupancy smaller than 500 km² and its severely fragmented populations or populations known to exist at no more than five locations (criterion B2a). Moreover, the population size of the species has been estimated at less than 250 mature individuals (criterion D). Furthermore, due to its restricted range in the country (the localities are situated at the

Table 2. Georeferenced data on the distribution of four rare taxa of the genus *Verbascum* in Bosnia and Herzegovina

Taxon	Number and name of the locality, observers (collectors) and dates of the observations (Herbarium/collection number)	WGS coordinates	Altitude	UTM quadrant
<i>V. baldaccii</i>	1 Smrčanj, Donje Zijemlje, Velež Mt., leg Vandas Aug. 1893 (Hb. W.) Murbeck 1933; Slavnić 1967.	43°22'26.8"N, 17°59'31.6"E	1024 m	YJ30
<i>V. baldaccii</i>	2 Velež Mt., Gola Glavica, Veliko Rujište, leg Maslo 02.07.2014	43°27'37.9"N 17°57'34.8"E	1154 m	YJ31
<i>V. baldaccii</i>	3 Velež Mt., slopes of Veliko Rujište, leg Maslo 02.07.2014	43°27'27.9"N 17°57'31.7"E	1086 m	YJ31
<i>V. baldaccii</i>	4 Mostar, Humilišani, leg Maslo 02.07.2014	43°27'07.2"N 17°56'31.4"E	643 m	YJ31
<i>V.niveum</i> subsp. <i>visianianum</i>	1 Vrani Kuk near Žitomislčići, leg. Malý 31.05.1925, rev. Murbeck 1929 (SARA 35529), Malý 1933, Murbeck 1933 (as <i>V. montanum</i> Schrad.)	43°12'04.5"N 17°47'52.2"E	111 m	YH28
<i>V.niveum</i> subsp. <i>visianianum</i>	2 Podvelež near Mostar, leg Bornmüller 06.06.1886, (Hb.Bornm.) Murbeck 1933, Slavnić 1967	43°20'48.9"N 17°49'34.7"E	300 m	YJ20
<i>V.niveum</i> subsp. <i>visianianum</i>	2 Mostar, Fortica Hill, Mali Kuk, leg Maslo 04.07.2017	43°21'07.1"N 17°49'17.0"E	240 m	YJ20
<i>V.niveum</i> subsp. <i>visianianum</i>	3 Mostar, Stolac Hill, leg Maslo 04.07.2017	43°20'53.0"N 17°50'19.0"E	571 m	YJ30
<i>V.niveum</i> subsp. <i>visianianum</i>	4 Stolac, Ošanići, Daorson, leg Maslo 13.07.2018	43°06'14.5"N 17°55'37.3"E	266 m	YH37
<i>V. orientale</i>	1 The old town of Ljubuški, leg. Fiala 13.05.1894 (SARA 35534), Fiala 1896	43°12'02.7"N 17°33'30.0"E	314 m	YH08
<i>V. orientale</i>	2 Mostar, left bank of river Neretva, leg Baenitz. 01.06.1897 (SARA 35532, SARA 35537), Murbeck 1891, Pichler 1898/9.	43°22'21.8"N 17°50'36.4"E	70 m	YJ20
<i>V. orientale</i>	3 Stolac, Ošanića Glavica, Beck-Mannagetta 1901.	43°06'08.6"N 17°55'39.5"E	264 m	YH37
<i>V. orientale</i>	4 Mostar, Brdo Stolac, leg Halacsy 15.05.1895 (SARA 35533).	43°20'35.6"N 17°49'25.9"E	200 m	YJ20
<i>V. orientale</i>	4 Mostar, Stolac Hill, leg Malý 06.06.1912 (SARA 35535), Malý 1912.	43°20'35.6"N 17°49'25.9"E	150 m	YJ20
<i>V. orientale</i>	5 Dretelj on river Neretva, leg Malý 26.05.1912 (SARA 35536), Malý 1912.	43°07'32.3"N 17°43'12.7"E	15 m	YH27
<i>V. orientale</i>	6 Mostar, Bijelo Polje, leg Malý, 24.05.1908 (SARA 35531), Maslo 2014	43°21'06.8"N 17°48'56.6"E	116 m	YJ20
<i>V. orientale</i>	7 Blagaj, Vrelo Bune, leg Maslo 21.04.2014, Maslo & Abadžić 2015	43°15'24.1"N 17°54'07.1"E	61 m	YH39
<i>V. orientale</i>	8 Počitelj, Old Town, leg Maslo 28.04.2015, Maslo & Boškailo 2017	43°08'01.1"N 17°43'52.2"E	27 m	YH27

Taxon	Number and name of the locality, observers (collectors) and dates of the observations (Herbarium/collection number)	WGS coordinates	Altitude	UTM quadrant
<i>V. orientale</i>	9 Mostar, Hum Hill, leg Maslo, 11.04.2017	43°20'10.1"N 17°48'39.4"E	77 m	YJ20
<i>V. orientale</i>	10 Mostar, Sjeverni Logor, left bank of river Neretva, leg Maslo 15.07.2017	43°21'40.7"N 17°48'21.6"E	58 m	YJ20
<i>V. orientale</i>	11 Ljubuški, Buturovica Hill, leg. Maslo 28.04.2019	43°12'02.7"N 17°33'30.0"E	314 m	YH08
<i>V. orientale</i>	12 Stolac, Križevac Hill, leg. Maslo 28.04.2019	43°04'53.7"N 17°57'24.1"E	96 m	YH47
<i>V.sinuatum</i>	1 Čapljina, Mogorjelo, leg. Maslo 12.04.2019	43°05'51.2"N 17°42'11.4"E	4 m	YH17
<i>V.sinuatum</i>	2 Neum, Jazine, leg. Maslo 13.04.2019	42°54'40.7"N 17°37'42.7"E	39 m	YH15
<i>V.sinuatum</i>	3 Neum, Center, Neum parking lot, leg. Maslo 13.04.2019	42°55'26.7"N 17°36'42.3"E	2 m	YH15

westernmost limits of the species in the Balkans), the habitat of this species might be affected by such anthropogenic factors as road construction or forest fires in the near future.

Verbascum niveum subsp. *visianianum* (Rchb.) Murb., Acta Univ. Lund. 29: (2) 101. 1933 (syn.: *Verbascum visianianum* Rchb. f., *Verbascum macrurum* Hayek (Fig. 1).

Biennial plant, 50–150 cm tall, sparsely to densely white-tomentose. Basal leaves 10–20×6–10 cm, entire to finely crenate-dentate, rather densely grey tomentose. Inflorescence is usually branched. Bracts are 12–18 mm, exceeding the unopened flowers. Calyx 8–10 mm. Corolla yellow, 30–40 mm, tomentose on the outer side. Stamens five, the lower with decurrent anthers, filament hairs white. Detailed description of the taxon can be found in Murbeck (1933).

Verbascum niveum subsp. *visianianum* is an endemic taxon to the Balkan Peninsula, distributed only in Albania (Barina & al. 2018), Bosnia and Herzegovina (Murbeck 1933), Croatia (Nikolić 2000), and Montenegro (Rohlena 1942).

V. niveum subsp. *visianianum* was first recorded for Bosnia and Herzegovina by Bornmüller on the

western slopes of the Velež Mt., Podvelež near Mostar in 1886 (Murbeck 1933). There are no voucher specimens of the taxon in the herbarium collection of SARA. According to Murbeck (1933), a specimen from the actual locality was stored in the Bornmüller herbarium. On May 31, 1925, that taxon was collected by Malý in the Neretva River Valley, in the locality of Vrani Kuk near Žitomislići as *V. montanum* Schrad., and was subsequently revised by Murbeck in 1929 as *V. niveum* subsp. *visianianum* (SARA 35529). The latter record was also reported by Murbeck (1933) and Slavnić (1967), but it was never confirmed afterwards (Table 1). In July 2017 and July 2018, that taxon was recorded in three separate localities in Herzegovina (Table 2).

Recently recorded localities: **Locality 1:** Ošanići near Stolac, 43°06'14.5"N, 17°55'37.3"E, 13.07.2017, leg. S. Maslo; several hundred individuals observed. The population was found in rocky places and dry grasslands, right next to the Megalithic site of Daorson, at an altitude of 266 m a.s.l.; **Locality 2:** Mostar, Fortica Hill, Mali Kuk, 43°21'07.1"N, 17°49'17.0"E, 04.07.2018, leg. S. Maslo; twenty flowering individuals and several rosettes. The population was found on road cuttings on both sides of the road between

Mostar and Podvelež, at an altitudinal range of 240 m a.s.l.; **Locality 3:** Mostar, Stolac Hill, 43°20'53.0"N, 17°50'19.0"E, 04.07.2018, ten flowering individuals and several rosettes observed. The population was found on the W slopes of Stolac Hill, probably not far from Bornmüller's location of the taxon, at an altitude of 571 m a.s.l.

The Mostar finds most likely confirm Bornmüller's first record of the taxon. The largest population is recorded on the plateau of the Ošanići Hill in the vicinity of Stolac. A few hundred individuals were recorded in dry grasslands, together with *Echinops ritro* and *Goniolimon tataricum*. On the other hand, populations from the hills of Mostar, Fortica and Stolac, were also recorded along the sides of the road to Podveležje, where a total of thirty individuals were identified.

V. niveum subsp. *visianianum* is known only from three restricted population in Bosnia and Herzegovina. A preliminary assessment of its conservation status on national scale showed that this species meets the criteria for the category Endangered (EN) (IUCN 2012), because of its area of occupancy smaller than 500 km² and the severely fragmented populations known to exist in no more than five locations (criterion B2a). Moreover, the population size of the species has been estimated at less than 250 mature individuals (criterion D). Furthermore, the habitat of the species might be affected by such anthropogenic factors as road construction or forest fires in the near future.

Verbascum orientale (L.) All. Fl. Pedem. 1: 106. 1785 (syn.: *Celsia orientalis* L., *Verbascum elegans* Salisb.) (Fig. 2).

Annual plant, 15–80 cm tall, glandular-hairy above. Basal leaves obovate, obtuse, coarsely crenate to pinnatifid, often withered by flowering time. Inflorescence a lax, simple raceme. Bracts 6–17 mm, entire. Flowers solitary, not in small clusters along the spike, yellow, often with a few brownish spots. Stamens four, the filaments with yellow hairs. Detailed description of the taxon can be found in Huber-Morath (1978).

Verbascum orientale belongs to the East Mediterranean floristic element and its native distribution range is from SE Europe to Iran. So far, *V. orientale* has been reported in the Balkans from Albania (Ba-

rina & al. 2018), Bosnia and Herzegovina (Murbeck 1891), Bulgaria (Stefanova-Gateva 1995), Croatia (Nikolić 2020), Greece (Dimopoulos & al. 2013), and Turkey (Huber-Morath 1978).

The species has limited distribution in Bosnia and Herzegovina; its habitats are located only in the Mediterranean part of the country, in fragmented populations. The oldest record from Bosnia and Herzegovina is that of Murbeck (1891), in rocky, bushy places at river Neretva, northwards of Mostar, ca. 70 m., as *Celsia orientalis* L. (Table 1). Subsequently, the species has been recorded in other six grid-cell quadrants, all in South Herzegovina: Ljubuški (Fiala 1896), Mostar (Pichler 1898/9; Malý 1912; Maslo 2014), Stolac (Beck-Mannagetta 1901), Dretelj (Malý 1912), Blagaj (Maslo & Abadžić 2015) and Počitelj (Maslo & Boškaić 2017) (Table 2). In the Herbarium of the National Museum of Bosnia and Herzegovina (SARA), only seven specimens of *V. orientale* are stored. During the field research conducted between 2017 and 2019, the presence of the species has been confirmed in all old localities, as well as in four new localities in South Herzegovina (Table 2).

Recently recorded localities: **Locality 1:** Mostar, Hum Hill, 43°20'10.1"N, 17°48'39.4"E, 11.04.2017, leg. S. Maslo; only two individuals recorded. The population was found in rock fissures on the northern slopes of Hum Hill, at an altitude of 77 m a.s.l.; **Locality 2:** Mostar, Sjeverni Logor, the left-side bank of river Neretva, 43°21'40.7"N, 17°48'21.6"E, 15.07.2017, leg. S. Maslo; only three individuals recorded. The population was found in rocky places, at an altitude of 58 m a.s.l.; **Locality 3:** Ljubuški, Buturovica Hill, 43°12'02.7"N, 17°33'30.0"E, 28.04.2019, leg. S. Maslo; only two individuals recorded. The population was found on the walls of the Fortress of Herceg Stjepan, at an altitude of 314 m a.s.l.; **Locality 4:** Stolac, Križevac Hill, 43°04'53.7"N, 17°57'24.1"E, 28.04.2019, leg. S. Maslo; only one individual recorded. The population was found in rock fissures, at an altitude of 96 m a.s.l.

It is important to note that all confirmed populations are poor and consist only of a few individuals. The largest population was identified in Blagaj, in the crevices of limestone rocks at the source of river Buna; about a dozen individuals were recorded on April 21,

2017. The population size of the species in the country is estimated at less than 50 mature individuals.

Verbascum orientale is currently known only from seven grid-cell quadrants in Bosnia and Herzegovina. A preliminary assessment of its conservation status on national scale has shown that this species meets the criteria for category Endangered (EN) (IUCN 2012),

because of its area of occupancy smaller than 500 km² and its severely fragmented populations known to exist at no more than five locations (criterion B2a). Moreover, the population size of the species is estimated at less than 250 mature individuals (criterion D). Furthermore, the habitat of the species might be affected by various anthropogenic factors in the near future.



Fig. 2. 3. *Verbascum orientale* in Blagaj: a. habitat, b. flowers; 4. *Verbascum sinuatum* in Neum: a. habitat, b. flowers (photos S. Maslo).

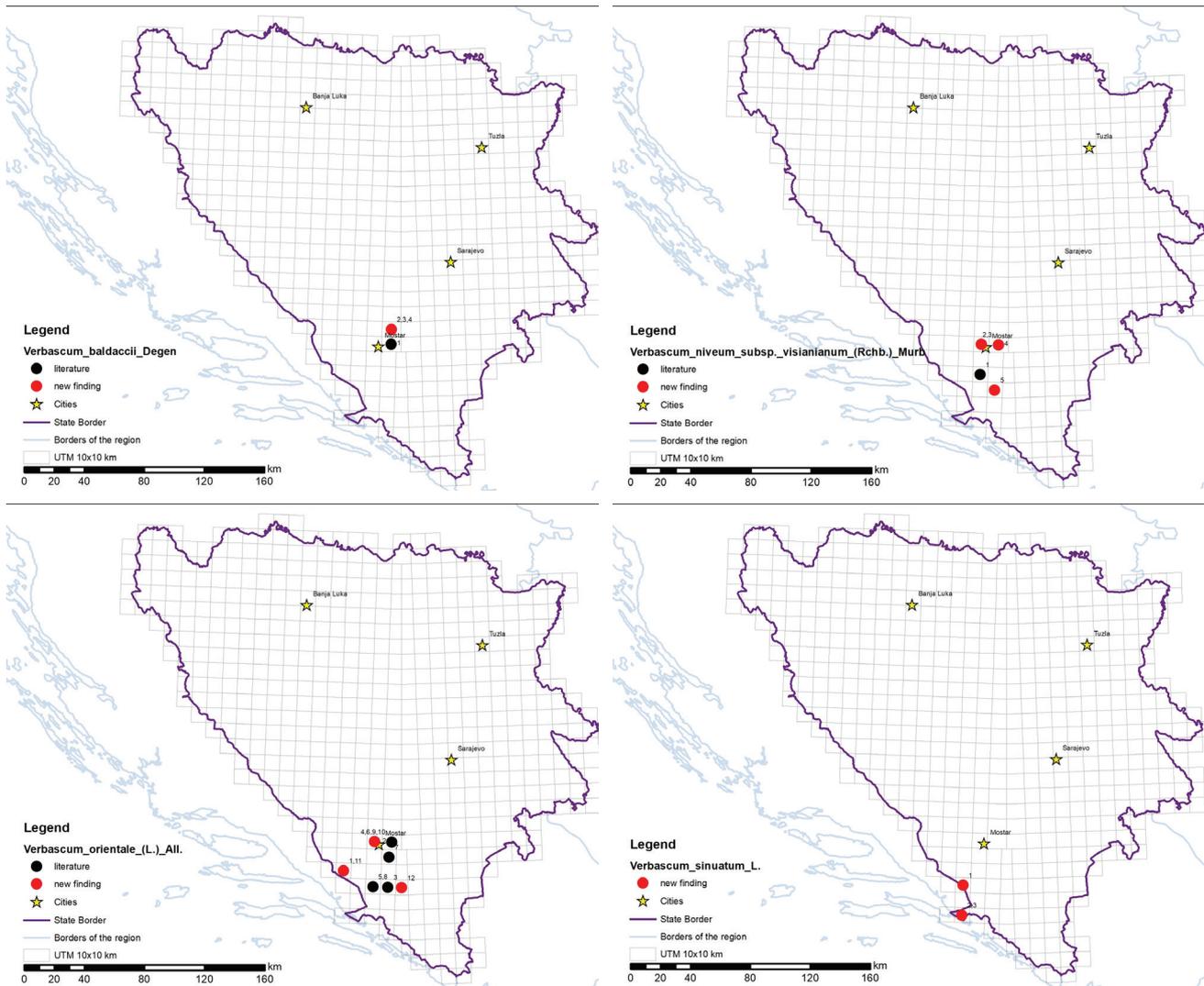


Fig. 3. Distribution of *V. baldaccii*, *V. niveum* subsp. *visianianum*, *V. orientale*, and *V. sinuatum* in Bosnia and Herzegovina. Old records are indicated by black circles and new records – by red circles.

***Verbascum sinuatum* L., Sp. Pl.: 178. 1753 (Fig. 2).**

Biennial plant, 50–100 cm tall, densely grey- or yellow-wooly, glandular-hairy in the inflorescence. Basal leaves in large distinctive rosettes, oblong, pinnately-lobed and undulate. Inflorescence is twiggy, widely branched. Bracts are 3–8 mm long, triangular-heart-shaped. Corolla yellow, 15–30 mm. Stamens five, filament hairs violet. Detailed description of the taxon can be found in Ferguson (1972) and Huber-Morath (1978).

Verbascum sinuatum is a Mediterranean plant species. It grows in rocky places, sandy coastal hab-

itats and at roadsides in the countries around the Mediterranean Sea (Marhold 2011).

The oldest record in Bosnia and Herzegovina is that of Struchka (1880) from Blagaj near Mostar, but it was not accepted by Murbeck (1933) about half a century later, because of lack of other records and especially lack of herbarium specimens in SARA. That locality has never been confirmed afterwards. After a century and a half, Struchka's record has only historical value. More recently, *V. sinuatum* has been listed as a dubious taxon in Bosnia and Herzegovina (Slavnić 1967). Literature data do not indicate the presence of this species in Bosnia and Herzegovina

(Slavnić 1967) without confirmation by herbarium specimens or field observations. In April 2019, the species has been recorded in three localities in South Herzegovina, in the vicinity of Čapljina and Neum (Table 2).

Recently recorded localities: Locality 1: Jazine-Neum, 42°54'40.7"N, 17°37'42.7"E, 13.04.2019, leg. S. Maslo; five flowering individuals and several rosettes observed. The population was found in semi-ruderal places, below the road E 65, at an altitude of 39 m a.s.l.; **Locality 2:** Neum, 42°55'26.7"N, 17°36'42.3"E, 13.04.2019, leg. S. Maslo; two flowering individuals and several rosettes observed. The population was found on ruderal surfaces, next to the parking lot in the center of Neum, at an altitude of 2 m a.s.l.; **Locality 3:** Čapljina, Mogorjelo, 43°05'51.2"N, 17°42'11.4"E, 12.04.2019, leg. S. Maslo; three flowering individuals and several rosettes observed. The population was found in dry grasslands, along the right-side bank of river Neretva, at an altitude of 4 m a.s.l.

These new records in the Mediterranean region of Herzegovina provide the first firm evidence of the presence of *V. sinuatum* in Bosnia and Herzegovina. Although only a few individuals have been recorded, this insufficiently known taxon is expected to have a wider distribution in coastal Herzegovina, considering the suitable habitats.

This species is known from numerous localities in other countries along the Adriatic coast. Therefore, a much wider occurrence of the species in this region of Bosnia and Herzegovina is expected. It is determined as Data Deficient (DD) according to IUCN Red List categories and criteria.

The currently known distribution of the studied species in Bosnia and Herzegovina is presented in Fig. 3.

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