

Short communication

## Bouché's star of Bethlehem, *Ornithogalum boucheanum* (Kunth) Asch. (Hyacinthaceae), a new species in flora of Croatia

Dragica Purger<sup>1\*</sup>, Sanja Kovačić<sup>2</sup>, János Csiky<sup>1</sup>

<sup>1</sup> Department of Ecology, Institute of Biology, Faculty of Sciences, University of Pécs, Ifjúság útja 6, H-7624 Pécs, Hungary.

<sup>2</sup> Botanical Garden, Department of Biology, Faculty of Science, University of Zagreb, Trg Marka Marulića 9A, 10000, Zagreb, Croatia.

**Abstract** – Populations of Bouché's star of Bethlehem (*Ornithogalum boucheanum* (Kunth) Asch., fam. Hyacinthaceae) were recorded on Bansko Hill (Baranja, Croatia) in 2007. Since this species has not been previously confirmed in Croatia, it should be treated as a new taxon in the country and included in the Flora Croatica Database. In this paper we present a short morphological description of *O. boucheanum* and diagnostic morphological characters for differentiation from the related *O. nutans* L. We suggested *O. boucheanum* be evaluated as a critically endangered (CR) species of the Croatian flora, considering the small number of individuals and the small extension of its population. The recording of its populations on the edge of the loess cliff in Bansko Hill a part of which belongs to the Important Plant Area and Natura 2000, confirms the significance of this unique habitat in preserving rare and endangered plants.

**Key words:** Bansko Hill, Baranja, loess, *Myogalum boucheanum*, *Ornithogalum nutans*, threatened plants

### Introduction

Bouché's star of Bethlehem (*Ornithogalum boucheanum* (Kunth) Asch.; Österr. Bot. Zeitschr. (1866) 16: 192), (Syn.: *Myogalum boucheanum* Kunth, *Honorius boucheanus* (Kunth) Holub, *Ornithogalum nutans* L. subsp. *boucheanum* (Asch.) Hayek; Liliales, Hyacinthaceae), is a lowland-colline plant, an Eastern-sub-Mediterranean-Pannonic (Pontic) floristic element (Soó 1973). The species is distributed in Central and Southeastern Europe, where it is considered native, while in North and Western Europe it is treated as adventive (Zahariadi 1980). The species is distributed in the Caucasus, around the Black Sea, through Anatolia and the Balkans to the eastern part of the Danube valley and the Carpathian Basin (Soó 1973). According to Jávorka (1925) it does not occur in Croatia. During a survey of the loess flora and vegetation on Bansko Hill in Baranja (NE Croatia) we found two small populations of *Ornithogalum boucheanum*. This species is not included in the recent Croatian botanical literature (cf. Domac 2002; Nikolić 2000; Nikolić and Topić 2005) or in the national database of the Croatian flora (Nikolić 2016a,b). There are no data about this species in the papers dealing with the flora of Bansko Hill (Sturc 1988) and Baranja (Panjković 1990, Zahirović 2000). The

occurrence of a related species, the Nodding star of Bethlehem (*Ornithogalum nutans* L.) is reported from the northern part of Croatia (Rauš and Šegulja 1983) and several Adriatic islands (Nikolić 2016a). The native range of this species is smaller than that of the related *O. boucheanum* and it comprises Anatolian and Balkan peninsulas. In most of Europe it is considered to be an alien species, or else it is of unknown status (Euro+Med 2006–).

*Ornithogalum boucheanum* and *O. nutans* are two species of the subgenus *Myogalum* (Link) Baker in Europe specimens of which are difficult to separate on the basis of morphological characters, especially after they have bloomed (Zahariadi 1980). Since some authors of the last century (e.g. Hayek 1933) considered *O. boucheanum* a subspecies of *O. nutans* (*O. nutans* L. subsp. *boucheanum* (Asch.) Hayek), there is a possibility, that these two taxa were not properly distinguished when collected in the last century. Therefore our aim was to check the specimens in Herbarium Croaticum (ZA) and Herbarium in Budapest (BP) and to clarify the status of these two related taxa in Croatia.

In this paper we present a short morphological description of *O. boucheanum* and diagnostic morphological characters for differentiation from the related *O. nutans*.

\* Corresponding author, e-mail: dragica@gamma.ttk.pte.hu

## Material and methods

For determination of plant species we used the recent Croatian (Domac 2002) and Hungarian (Király 2009) handbooks. The description of the species is given based on characteristics of the collected specimens and according to related literature (e.g. Speta 2008, Meriç et al. 2011). The distribution map of *O. boucheanum* in Croatia (Fig. 1) was compiled according to the Central European Flora Mapping System (Nikolić et al. 1998). Geocoding of site was made by a GPS device. For classification of *O. boucheanum* into IUCN red list categories we used criteria after Nikolić (2005) and IUCN (2012) amended for Croatia in 2014. Examples of plants have been collected (on April 16, 2008) and a voucher specimen was deposited in Herbarium Croaticum (ZA).

## Study area

Bansko Hill (Fig. 1.) is a 21 km long elevation (243 m a.s.l.) extending in a NE–SW direction, and consists of loess sediments. Its southeastern part is a sheer, 25–58 m high loess cliff, facing the floodplain of the River Danube (Purger and Csiky 2008).

## Results and discussion

During a survey of loess flora and vegetation on Bansko Hill (NE Croatia) from Zmajevac to Batina (0178/4 Central European Flora Mapping quadrangle) two small populations of *O. boucheanum* were recorded (Fig. 1.), at the very border of the Natura 2000 site HR2001309 “Dunav North of Kopački rit” (Anonymous 2013a).

WGS 84 coordinates, altitude, population size and brief habitat descriptions:

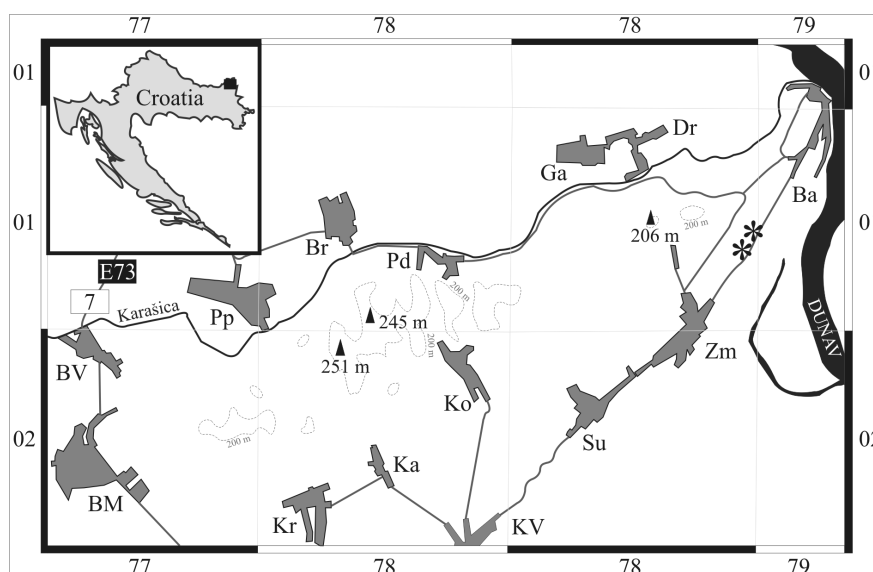
1. N 45°49'11.10", E 18°49'40.14", 100 m a.s.l., small population of fewer than 10 individuals, on the edge of the pla-

teau, in a secondary xerophilous forest with *Fraxinus ornus*, *Acer campestre*, *Robinia pseudacacia* in the tree layer, *Crataegus monogyna*, *Prunus spinosa*, *Viburnum lantana* in the shrub layer and *Anthriscus cerefolium*, *Ballota nigra*, *Bromus sterilis*, *Chelidonium majus*, *Erodium ciconium*, *Galium aparine*, *Geranium rotundifolium*, *Stellaria media* and *Veronica hederifolia* in the herb layer (leg./det.: J. Csiky, D. Purger, 26.04.2007, Zmajevac);

2. N 45°49'13.99", E 18°49'42.39", 100 m a.s.l., small population of fewer than 100 individuals, in a secondary xerophilous forest with *Robinia pseudacacia*, *Fraxinus ornus* in the tree layer, *Crataegus monogyna*, *Prunus spinosa*, *Eunonymus europaeus*, *Ulmus minor* in the shrub layer, *Anthriscus cerefolium*, *Artemisia campestris*, *Arum orientale*, *Ballota nigra*, *Bromus sterilis*, *Carduus acanthoides*, *Chelidonium majus*, *Securigera varia*, *Erodium ciconium*, *Euphorbia cyparissias*, *E. helioscopia*, *Fumaria schleicheri*, *Galium aparine*, *G. mollugo*, *Geranium pusillum*, *Geum urbanum*, *Lamium purpureum*, *Melandrium album*, *Muscari neglectum*, *Onopordon acanthium*, *Sisymbrium orientale*, *Stellaria media*, *Veronica hederifolia*, *Vicia narbonensis* subsp. *serratifolia*, *V. pannonica*, *Viola cf. odorata* in the herb layer (leg./det.: J. Csiky, D. Purger, 16.04.2008., Zmajevac [ZA]).

The populations on Bansko Hill occurred in the shrubs and transitional zone of grassland and forest in the very border of the loess plateau. These are the only known and proved localities of *O. boucheanum* in Croatia. Since this species has not been previously identified in the country, it should be treated as a new taxon of the vascular flora of Croatia and included in the Flora Croatica Database (Nikolić 2016a).

We also checked data of similar, related species *O. nutans* to clarify its status in the country. In the old botanical literature occurrence of this species (“between Vukovar and Sotin”) is mentioned (Strein ap. Schlosser and Vukotinović



**Fig. 1.** Distribution of *Ornithogalum boucheanum* (\*) on Bansko Hill (Croatia).

A grid square measures approximately 6500 (latitudinal) × 5500 (longitudinal) metres. Abbreviations: Ba – Batina; BM – Beli Manastir; Br – Branjina; BV – Branjin Vrh; Dr – Draž; Ga – Gajić; Ka – Kamenac; Kr – Karanac; Ko – Kotlina; KV – Kneževi Vinogradi; Pd – Po dolje; Pp – Popovac; Su – Suza; Zm – Zmajevac (drawn by J. Csiky and T. Nikolić).

**Tab. 1.** Diagnostic characters of *Ornithogalum boucheanum* and *O. nutans*.

Characters	<i>O. boucheanum</i>	<i>O. nutans</i>
Raceme	(5)10–15(20) flowered	(3)6–10(12) flowered
Perianth segments (length)	20–35 mm	15–20 mm
Perianth segments (colour)	green and white inner side, dark green stripe on outer side	white inner side, greenish stripe on outer side
Ovary (length)	4–7 mm	3–5 mm
Style (length)	5–7 mm	<5 mm
Toothed filaments	6	3
Seed	2–2.5 mm, broadly ovoid-orbicular	1.5–2 mm, ovoid-orbicular
Leaf anatomy	mesophyll equifacial (1000 $\mu$ m)	mesophyll unifacial (700 $\mu$ m)
Pollen grains (P – polar axis,	P = 70.84 $\pm$ 0.35 $\mu$ m	P = 64.02 $\pm$ 0.15 $\mu$ m
E – equatorial axis)	E = 50.27 $\pm$ 1.22 $\mu$ m	E = 42.01 $\pm$ 0.20 $\mu$ m

1869). The specimen of Star of Bethlehem collected by Pavich in the 19<sup>th</sup> century near Sava River (Slavonia), identified as *O. nutans* is deposited in the Herbarium Croaticum (ZA). It was the only record of this species reported from the continental part of Croatia (Nikolić 2016a). After checking this specimen in ZA, we found that it was *Ornithogalum umbellatum* s.l. misidentified as *O. nutans*. Probably upon these old data the Nodding star of Bethlehem (*O. nutans*) is listed in the Flora of Slavonia and Baranja (Rauš and Šegulja 1983), though without any localities or recent findings. Accordingly, we can conclude, that the distribution of *O. nutans* in Croatia is restricted to the Mediterranean part of the country (Nikolić 2016a). There are three specimens in the Herbarium in Budapest which are supposed to be *O. boucheanum* and are said to originate from Croatia. On these sheets data about locality, habitat and date of collecting are missing or ambiguous, therefore upon that material we could not confirm the occurrence of *O. boucheanum* in the Mediterranean part of Croatia. According to the data of its distribution in Hungary, it seems that this species becomes rare towards the south-west (towards Croatia) and it is already rare in Baranya County (Bartha and Király 2015).

As the handbook for the identification of plants in Croatia (Domac 2002) does not contain *O. boucheanum*, here we provide a description of this species and additional information for its determination. According to our own knowledge and literature data (Zahariadi 1980, Hrouda 2002, Mesterházy and Király 2009, Meriç et al. 2011), we summarised the morphological and anatomical features of *O. boucheanum* and the closely related *O. nutans*, which are very similar, but differ in several characters (Tab. 1).

*Ornithogalum boucheanum* is a 20–60 cm high plant. Bulb ovoid-globose, 30 $\times$ 40 mm, tunica light brown. Scape erect, cylindrical, light green. Leaves (3–6) bright green, as long as the scape or shorter, 1.0–1.5 cm wide, 20–40 cm long, margin entire, edges are parallel and gradually tapering to acute apex, at flowering time withered. The adaxial face of the leaf has white median line. Raceme corymbose, dense, 10–20 flowered. Flowers scentless. Bract 22–25 mm long, lanceolate-acuminate, light brown and membrane-like structured. Pedicel 5–10 mm, 10–13 mm in fruit. Perianth segments 18–25 (–30) mm long, 2–3.5 mm wide, lanceo-

late, milky-white with green fascia inside and outside (Fig. 2a). Anthers 2–3 (–3.5) mm, white, light yellow, filament 4–5 (–6) mm, lanceolate, wide and winged, ending with two lateral teeth. Stigma spatulate. Ovary ovoid-elliptic (green), as long as style (white). Capsule ovoid (Fig. 2b) 18 $\times$ 12 mm, erect. Seeds numerous, black, subglobose to globose, black and reticulate with wrinkled, undulate walls.

According to the results of Bednorz and Czarna (2008) seeds of *O. boucheanum* and *O. nutans*, two closely related and morphologically very similar species, are practically undistinguishable. Although the species are similar in regard to the scape anatomy, their leaf anatomy is different: mesophyll in *O. boucheanum* is thicker, differentiates as palisade parenchyma which is present on both the adaxial and abaxial side and spongy parenchyma, which contains large lacuna (Meriç et al. 2011). *Ornithogalum* is a taxonomically difficult genus; its morphology is poorly correlated with the variation in chromosome number and karyotype. The chromosome numbers of *O. boucheanum* have been determined as 2n=56 (basic chromosome number x=8), while the chromosome numbers of *O. nutans* are determined as 2n=14 and 2n=35 (basic chromosome number x=7) (Dalgic and Ozhatay 1997, Dalgic et al. 2009).

*O. boucheanum* rarely occurs in Southern Transdanubia (Hungary), in grasslands (Purger 2008) and spring weed vegetation in vineyards (Pál 2007); in this part of the coun-


**Fig. 2.** *Ornithogalum boucheanum* near Zmajevac on Bansko Hill: a) flowers and b) fruits (Photo: J. Csiky and D. Purger).

try it is considered to be a strongly endangered plant (Pál 2005). In Hungary it grows in clay (loamy) soils on loess and in humic sandy soils and can be found in different habitats, mostly in forest clearings, sparse oak forests, on open slopes, in valleys along streams, in lowland-colline areas with altitudinal range up to 500 m (Soó 1973). According to Borhidi (1995) it is a natural weed, a plant of disturbed habitats which belongs to the vegetation of class *Artemisietea*. In Serbia it occurs only in the Pannonian part (Vojvodina province): the Deliblato sandy area, the vicinity of Kikinda (Diklić 1975), Ridica, Sombor, Bački Monoštor (Obradović et al. 1981); Fruška gora mountains: Irig (Butorac 1992).

Focus on the Carpathian Basin: *O. boucheanum* is a sparse but not endangered species in Hungary (Király 2007), rare and critically endangered in Austria (Speta 2008). In Slovakia this species is endangered (EN) according to Feráková et al. (2001), however recently Eliáš et al. (2015) considered it as least concern (LC). In Serbia it is a statutorily protected but not threatened species (Stevanović 1999).

So far, *Ornithogalum boucheanum* is known in Croatia from only the two (very close) localities presented here, its estimated 'area of occupancy' being less than 10 km<sup>2</sup> (criterion B1a and B2a) and population number of the species is estimated to fewer than 1000 mature individuals (criterion

C), therefore it could be evaluated as a critically endangered (CR) species of the Croatian flora (Nikolić 2005; IUCN 2012). Accordingly, we also propose that this species should be included among the statutorily strictly protected species of Croatian flora (acc. to Anonymous 2013b).

Since loess cliff habitats are very rare and sporadically distributed in NE Croatia, a part of this area is considered an IPA (Important Plant Area) site and belongs to the Natura 2000 network. This habitat is endangered by the invasion of the Black-locust tree (*Robinia pseudacacia*) and Tree of heaven (*Ailanthus altissima*) (Purger and Csiky 2008). The recording of *O. boucheanum* on the edge of a loess cliff in BANSKO HILL confirms the extreme importance of this habitat for preserving this rare and endangered plant species.

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