

# New insight into the distribution of *Eranthis hyemalis* (L.) Salisb. in Bosnia and Herzegovina

Novi uvid u distribuciju vrste *Eranthis hyemalis* (L.) Salisb. u Bosni i Hercegovini

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## ABSTRACT

The paper presents the updated distribution map for winter aconite in Bosnia and Herzegovina (B&H) and a description of two new localities. The distribution map is produced in QGIS ver. 3.4. and it includes 19 localities that have been recorded over time. The new localities are described in terms of plant ecology.

**Key words:** winter aconite, new localities, Bosnia and Herzegovina

## INTRODUCTION - Uvod

Winter aconite, *Eranthis hyemalis* (L.) Salisb. (*Ranunculaceae*), is an early spring ephemeral occurring in the mountain ecosystems of the Northern Hemisphere (Ziman et Keener, 1989). It occurs in the humid environments of deciduous forests in temperate Europe (Xiang et al., 2021). Winter aconite is native in France (Delahaye et al., 2008), Italy (Conti et al., 2005), Slovenia (Martinčič et al., 1999), Croatia (Topić et Šegulja, 1983; Franjić, 1992, 1997; Nikolić, 2020), Bosnia and Herzegovina (Beck, 1909; Šilić, 1990, 1992-1995; Brujić et al., 2006), Serbia (Petrović et Lakušić, 2017; Bogosavljević et Zlatković, 2018), Bulgaria (Andreev et al., 1992) and Türkiye (Davis, 1965).

Since it is easily reproduced by tubers (Marcinkowski, 2002), winter aconite has been widely naturalized (Parfitt, 1997; Boens, 2014) and cultivated as an ornamental plant since 1570 (Rysiak et Żuraw, 2011). Due to poor seed dispersal abilities (Xiang et al., 2021), its natural populations are highly isolated and susceptible to human-induced changes in habitats. Thus, winter aconite is considered rare in Slovenia and Croatia (Budak, 1999), and critically endangered (CR) in B&H, Serbia and Bulgaria (Budak, 1999; Brujić et al., 2006; Đug et al., 2013; Bogosavljević et Zlatković, 2018; Petrova et Vladimirov, 2009). In Italy, it is a regionally endangered taxon (EN) (Budak, 1999).

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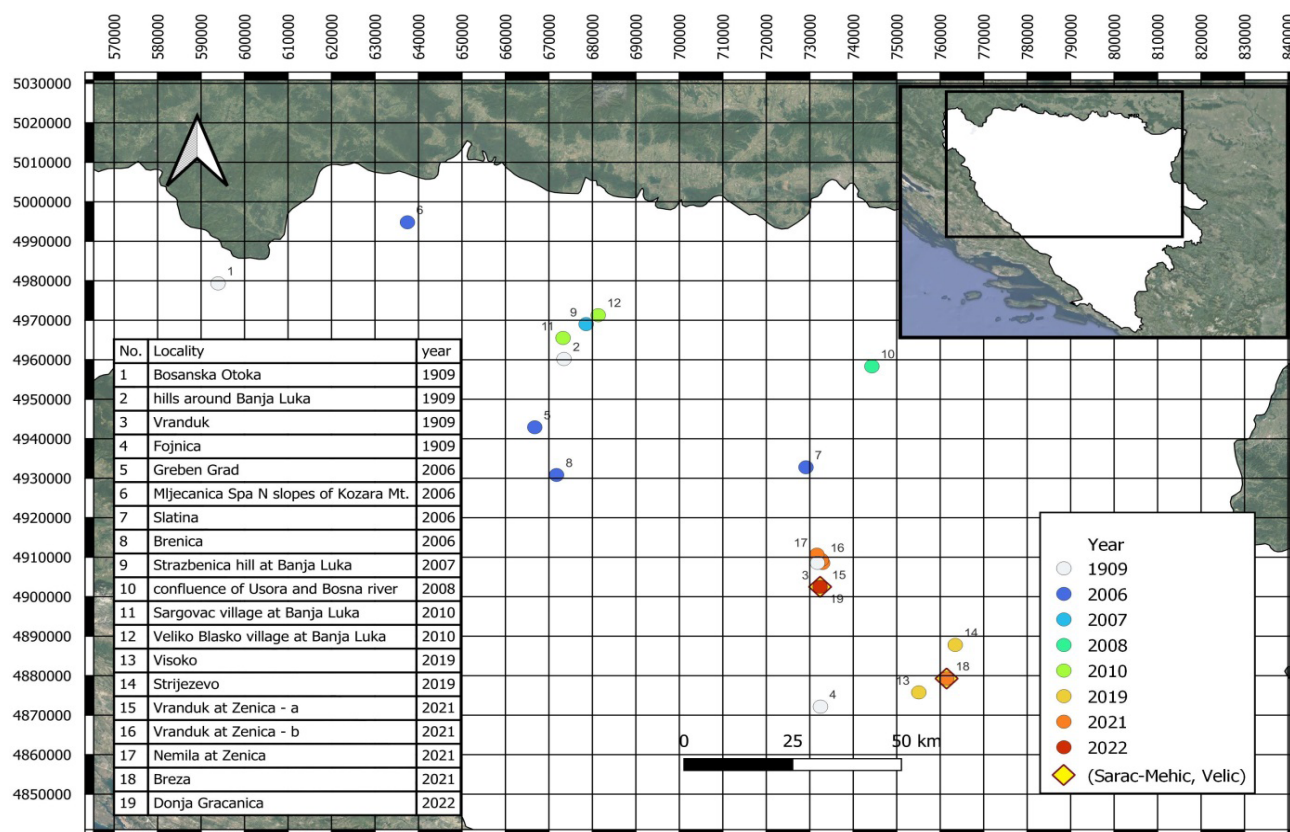


Figure 1. Localities of winter aconite in B&H (new localities marked as rhombs)

Karta 1. Lokaliteti ozimice u BiH (nova nalazišta označena rombom)

It has ecological optimum along the edges of (sub-) montane deciduous forests: *Quercus-Carpinetum betuli*, *Carpino betuli-Quercetum roboris* and *Quercus-Carpinetum illyricum* (Topić et Šegulja, 1983; Šilić, 1990; Franjić, 1992, 1997; Nikolić, 2020). However, the highest abundance was denoted within the stands of *Robinia pseudoacacia* (Franjić, 1992; Petrović et Lakušić, 2017). *R. pseudoacacia* has got a high N<sub>2</sub> fixation capacity (Wang et al., 2021) which plays a crucial role for winter aconite, because it occurs in richly fertile and moist places, according to Ellenberg's indicator values (Hill et al., 1999). Moreover, it requires adequate soil humidity in order to propagate through seeds (Rysiak et Żuraw, 2011). It is a shade plant, but this could be related to humidity as well, for illumination and humidity are ecological variables which are mutually conditioned. The aim of the paper is: i) to present an updated distribution map of winter aconite in B&H; ii) to describe newly discovered localities.

## MATERIAL AND METHODS – Materijal i metode

Previously published records of winter aconite's distribution were summarized (Beck, 1909; Šilić, 1990; Brujić et al., 2006; Vladimirov, 2011; Anonymous, 2019), along

with the ones that were recently discovered by Velić et al. (2021) and Sarač-Mehić (2022), and confirmed in personal communication by Šarić (2021). In total, 19 georeferenced localities in B&H were imported in QGIS ver. 3.4. and projected in UTM zone 33N within 10x10 km grid cells. The distribution map was arranged in a way to present the temporal dynamics of records. The herbarium specimens from two new localities (Gornja Gračanica and Breza) were collected and deposited in the Herbarium of the National Museum of Bosnia and Herzegovina (SARA). New localities were described according to the Zürich-Montpellier's School (Braun-Blanquet, 1964). In total, four relevés were done.

## RESULTS AND DISCUSSION – Rezultati i diskusija

According to the distribution map, winter aconite occurs in the watersheds of Vrbas and Bosna rivers (Fig. 1). However, two localities are recorded in the floodplain of Sava river, in the northernmost section of B&H.

The most recently discovered localities are situated in central B&H.





Figure 2. Meadow population of winter aconite in Donja Gračanica (Photo: E. Sarač-Mehić)

Slika 2. Livadska populacija ozimice u Donjoj Gračanici (Foto: E. Sarač-Mehić)

Locality: Donja Gračanica, N 44.23646207, E 17.90902879, 415 m, 19th February 2022, coll. E. Sarač-Mehić (SARA 53492).

Locality: Breza, N 44.0181, E 18.2613, 566 m, 30th January 2021, coll. S. Velić, S. Trakić & V. Bakić (SARA 53493).

Three sub-populations are recorded at Donja Gračanica, two of which are in an orchard and adjacent meadow (Fig. 2). The total area covered by winter aconite amounts to about 400 m<sup>2</sup>.

However, the largest and most abundant one is the third sub-population which grows along the edge of the forest. Indicators of nitrification, such as *Urtica dioica* L., *Lamium purpureum* L., *Stellaria media* (L.) Cirillo, *Geum urbanum* L., *Veronica hederifolia* L., *Apium graveolens* L., *Glechoma hederacea* L. occur abundantly. Moreover, the occurrence of *Helleborus odoratus* Willd., *Hedera helix* L. and *Primula vulgaris* Huds. in floristic composition indicates forest phytoclimate. According to the relevés, the vegetation corresponds with the class *Stellarietea mediae* Tüxen et al. ex von Rochow 1951.

The new locality at Breza is situated in the suburban area which is close to the local disposal site for ashes. The population here grows abundantly, covering ca. 30 m<sup>2</sup> (Fig. 3). Within the monodominant stand of winter aconite sporadically occur: *H. odoratus*, *Ficaria verna* Huds., *L. purpureum*, *Brachypodium silvaticum* (Huds.) P. Beauv.. The locality is adjacent to a clearing in an oak-hornbeam forest (*Quercus-Carpinetum betuli*) and represents ecotone toward anthropogenic ecosystem. However, some characteristic indicators of nitrification and ecosystem degradation are missing, which makes it difficult to determine the vegetation unit.

Due to specific phenology, winter aconite was often neglected by botanists for its occurrence does not correlate positively with vegetation season in temperate Europe. Lack of field work in early spring has led to poor knowledge on its current distribution in B&H. In the 90s, it was even considered extinct in the wild (Šilić, 1992-1995). Only much later, four new localities in N B&H were discovered (Brujić et al., 2006), whereas Šilić confirmed locality at the confluence of Usora river in





Figure 3. Locality and population of winter aconite in Breza (Photo: S.Velić)

Slika 3. Lokalitet i populacija ozirnice u Brezi (Foto: S.Velić)

2008 (Vladimirov et al., 2011), previously reported by Beck (1909). In 2011, available data for B&H was summarized by Vladimirov et al. whereby it was stated that winter aconite became extinct from the following localities: Vranduk, along the valleys of Lašva and Fojnica river and around Sarajevo. However, our findings (pers. comm. Š. Šarić, 2021) show that it did not go extinct from the Vranduk area. Furthermore, the study of forest ecosystems in the Forestry management plan “Gornjebosansko” (Anonymous, 2019) confirmed its occurrence at Visoko and Striježevo. Moreover, its occurrence in central B&H is questionable, for the new locality in Breza is close to the Fojnica river and Visoko. Our results imply that a systematic study in the watersheds of Bosna and Vrbas rivers would be required in order to outline the exact distribution map of winter aconite in B&H.

## CONCLUSION – Zaključak

The distribution map of winter aconite in B&H is updated in terms that the most recent list of localities was supplemented with new (Donja Gračanica, Breza) and confirmed ones (Vranduk, Visoko, Vareš). The area of winter aconite in B&H relates to the Black Sea Basin and it is continuous along the valleys of Bosna and Vrbas river. In the future, we expect that even more localities will be found in suitable habitats. Considering the fact that winter aconite is a critically endangered species in B&H, our results represent a significant contribution to the assessment of its conservation status in B&H.

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## SAŽETAK

Ozimica, *Eranthis hyemalis* (L.) Salisb. (*Ranunculaceae*), je rana proljetnica koja naseljava vlažna staništa umjerno kontinentalne Evrope. Smatra se rijetkom u Sloveniji i Hrvatskoj, dok u drugim zemljama regiona ima status kritično ugrožene vrste. Ciljevi rada su: 1. revidiranje distribucijske mape za ozimicu u Bosni i Hercegovini (BiH), 2. opis novih nalazišta vrste. Revidirana mapa je urađena u QGIS ver. 3.4. na osnovu 19 georeferenciranih podataka iz literature te podataka o novim i potvrđenim nalazištima u BiH. Primjerci sa novih nalazišta su herbarizirani i deponovani u Herbarijumu Zemaljskog muzeja u Sarajevu (SARA). Staništa na novim lokalitetima su analizirana metodom Ciriško-monpelješke škole. Distribucijska mapa ozimice implicira zastupljenost vrste isključivo u crnomorskom slivu, u dolinama Bosne i Vrbasa sa novim lokalitetima u Brezi i Donjoj Gračanici. Na novim nalazištima su konstatovane vrste koje indiciraju nitrifikaciju i/ili šumski fitoklimat. Zbog specifične fenologije, ozimica je dug period bila zanemarena od strane botaničara u BiH te je početkom 90-ih čak proglašena nestalom u divljini. Novi lokaliteti i potvrda za ranija nalazišta impliciraju potrebu za sistematskim istraživanjima u slivovima Vrbasa i Bosne, kako bi se utvrdilo tačno područje distribucije ozimice u BiH te na taj način dao doprinos u procjeni njenog konzervacijskog statusa na nacionalnom nivou.



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