

Research Article

***Cotoneaster bullatus* Bois. (Rosaceae), a new non-native species to the flora of the Balkan Peninsula**Vera Stanković¹, Vladan Djordjević², Predrag Lazarević², Filip Verloove³ and Eva Kabaš²¹Institute of Criminological and Sociological Research, Gračanička 18, 11000 Belgrade, Serbia²University of Belgrade, Faculty of Biology, Institute of Botany and Botanical Garden “Jevremovac”, Takovska 43, 11000 Belgrade, Serbia³Meise Botanic Garden, Nieuwelaan 38, B-1860 Meise, BelgiumCorresponding author: Vera Stanković (vera.batanjski@gmail.com)

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Abstract

At the beginning of their establishment, alien species appear as a peculiar subject of the new habitat. Their further encroachment can lead to noxious effects on overall ecosystem services and native biodiversity. The moment they become invasive, a multi-level intervention is required to remove them. Therefore, after prevention, the identification of a new non-native species is the most important step in monitoring. Higher altitude areas are not resistant to negative anthropogenic influences, which are also reflected in the flora. The distribution patterns and abundance of non-native species have not been sufficiently studied in the mountain areas of Serbia and the Balkan Peninsula. The floristic survey of the Zlatibor Mountain and Nature Park (western Serbia) took place in the period 2020–2024. The species *Cotoneaster bullatus* Bois, from SW China, was recorded with 16 individuals in a semi-natural forest of *Pinus nigra* and *P. sylvestris*, right next to the motorway in the wider surroundings of the locality Partizanske vode. In 2024, an expansion of the population was observed up to 50 individuals with the appearance of shoots. Hollyberry cotoneaster is a new allochthonous taxon for the flora of Serbia and the Balkan Peninsula. The newly recorded *Cotoneaster* taxon is presented on the basis of its morphology, distribution, habitat preferences, ecology and population size. The only known population is most likely of subsontaneous origin and was established by ornithochory. The species does not yet represent an aggravating factor for native plant communities. However, there is a risk that the population of *C. bullatus* will spread to the surrounding natural forest habitats.

Key words: Hollyberry, naturalized shrub, allochthonous mountain species, Serbia**Introduction**

The centers of diversity of the genus *Cotoneaster* Medik. (Rosaceae) are the mountains of central and southwestern China and the eastern Himalayas (Fryer and Hylmö 2009; Dickoré and Kasperek 2010). The genus consists of unarmed shrubs with entire leaves, flowers less than 1 cm in diameter and red or black fruits as characteristic features (Tutin et al. 2001; Dickoré and Kasperek 2010). The species are variable, there are many interspecific hybrids and all are divided into two sections: (1) *Cotoneaster* (with erect,

reddish, pinkish or white petals and red markings) and (2) *Chaenopetalus* (with patent, white (rarely pink) petals) (Browicz 2001). The genus is taxonomically difficult and it is still not entirely clear how many species it comprises (Dickoré and Kasperek 2010; Meng et al. 2021; Li et al. 2023). Namely, Dickoré and Kasperek (2010), who adopted a very wide species concept, estimated that there were 50 to 70 species of this genus worldwide, whereas Flinck and Hylmö (1966) identified 176 *Cotoneaster* species. The online platform POWO (2024b) counts 268 accepted *Cotoneaster* species, while Pyšek et al. (2017) estimated that there were 294 species of this genus. According to some authors, including the monographic study of Fryer and Hylmö (2009), there are even more than 400 species. The latter authors adopt a narrow species concept and emphasize on the genus in cultivation. Numerous taxa they treat are unknown in the wild.

A total of 11 species are known in the Flora of Europe, but not *Cotoneaster bullatus* Bois. (Browicz 2001). The same authors stated that seven native species of the genus *Cotoneaster* occur in Europe: six species belong to the section *Cotoneaster* and one to the section *Chaenopetalus*. Numerous species of the genus *Cotoneaster* are cultivated in Europe for ornamental purposes. With 75 species, it is the most species-rich alien genus in Europe (Lambdon et al. 2008), although this number evidently depends on species delimitation. For example, Sennikov (2009) accepted only 21 alien species of this genus in Europe, Western Asia and North Africa. Sixteen taxa (including two hybrids) are naturalized or escaped in Belgium (Verloove 2013). In allochthonous areas of this genus, *Cotoneaster* species are mostly ornamental plants (Vukićević 1987). About 20 species have escaped from cultivation in Central Europe, and 10 have become completely naturalized. Some of these species are locally invasive (Dickoré and Kasperek 2010). There are many cultivated strains, critical and intermediate taxa that differ from the wild species (Dickoré and Kasperek 2010). An additional problem is that apomixis is very common within the genus. As a result, morphological differences between genetically similar species can be very small (Fryer and Hylmö 2009). Cultivation and naturalization of the allochthonous *Cotoneaster* species are common in temperate and subtropical regions worldwide (Dickoré and Kasperek 2010).

There are seven *Cotoneaster* species and one hybrid on the Balkan Peninsula (Jovanović 1972; Zlatković and Randelović 1997; Zlatković et al. 2004; POWO 2024b) (Table 1).

Thus, in Serbia, there are three native species and one hybrid of this genus: *C. tomentosus*, *C. integerrimus*, *C. laxiflorus* and *C. × parnassicus*. Only the ornamental *Cotoneaster horizontalis* has so far been cultivated in parks and gardens and has not been recorded in the wild in Serbia (Jovanović 1972; POWO 2024b).

Table 1. Overview and distribution of species and hybrids of the genus *Cotoneaster* Medik. recorded on the Balkan Peninsula so far.

Taxon	Occurrence in the Balkan countries	Origin
<i>Cotoneaster horizontalis</i> Decne.	Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, North Macedonia, Serbia, Slovenia	introduced
<i>Cotoneaster integerrimus</i> Medik.	Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Montenegro, North Macedonia, Serbia, Slovenia	native
<i>Cotoneaster laxiflorus</i> J.Jacq. ex Lindl.	Bosnia and Herzegovina, Bulgaria Croatia, Montenegro, North Macedonia, Serbia, Slovenia	native
<i>Cotoneaster multiflorus</i> Bunge	Bulgaria	introduced
<i>Cotoneaster niger</i> (Ehrh.) Fr.	Bulgaria	introduced
<i>Cotoneaster nummularius</i> Fisch. & C.A.Mey.	Greece	native
<i>Cotoneaster</i> × <i>parnassicus</i> Boiss. & Heldr. (<i>C. integerrimus</i> × <i>C. tomentosus</i>)	Albania, Bosnia and Herzegovina, Croatia, Greece Montenegro, North Macedonia, Serbia, Slovenia	native
<i>Cotoneaster tomentosus</i> (Aiton) Lindl.	Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Montenegro, North Macedonia, Serbia, Slovenia	native

On the Balkan Peninsula and in Serbia, the occurrence of *C. bullatus* in natural or semi-natural areas has not been documented so far. The present study aims to fill this gap by presenting: (a) morphology, (b) occurrence and distribution, (c) habitat and ecological preferences, (d) ecological impact and dispersal potential, (e) population size and (f) invasive status of *C. bullatus* on Mt. Zlatibor and Serbia.

Materials and methods

The floristic study was carried out between 2020 and 2024 in the Zlatibor Nature Park (western Serbia). The study area included both the protected area and its immediate surroundings. Data collection included the recording of GPS coordinates and altitude (Garmin eTrex 32 device), habitat characteristics, plant community details and population size of *C. bullatus*. The distribution of *C. bullatus* in Serbia was presented on a grid map with squares of 10 × 10 km based on the Universal Transverse Mercator (UTM) projection (Lampinen 2001), grid zone 34T.

The taxon was identified according to Dickoré and Kasperek (2010) and Verloove (2013), while the nomenclature followed POWO (2024a). Specimens of *C. bullatus* were deposited in the Herbarium of the Institute of Botany and Botanical Garden “Jevremovac” of the University of Belgrade (BEOU). The morphological description of the species is based on ten herbarium specimens and observations made directly in the field, where differential qualitative and quantitative characters were added according to Dickoré and Kasperek (2010). The values of the measured characteristics of the specimens from Serbia are shown in bold (Table 2).

The vegetation sampling of the stand with *C. bullatus* was carried out according to the methodology of Braun-Blanquet (1964), whereas the habitat type was determined according to the EUNIS habitat classification (<http://eunis.eea.europa.eu/>). The bedrock type was determined based on the 1:100,000 scale geological map of the study area (Mojsilović et al. 1977). The invasive status of *C. bullatus* in Zlatibor and Serbia was estimated according to the criteria established for Serbia by Lazarević et al. (2012).

Table 2. Morphological features of *Cotoneaster* species similar to *C. bullatus*. The information was retrieved from Verloove (2013). Dimensions of the species traits measured on specimens from Serbia are given in the last column.

Species/character	<i>C. bullatus</i>	<i>C. rehderi</i>	<i>C. franchetii</i>	<i>C. bullatus</i> from Serbia
Leaves	55–90 × 26–46 mm, with veins moderately impressed (slightly bullate)	70–210 × 45–90 mm, with veins very deeply impressed (strongly bullate)	ca. 25–37 mm long, with veins not impressed	40–50 × 21–27 mm
Fruit	7–8 mm, red, usually with 5 pyrenes (rarely 4)	8–11 mm, red, with 4 or 5 pyrenes	orange-red, usually with 3 pyrenes (rarely 2 or 4)	7–9 mm, red, with 4–5 pyrenes



Figure 1. *Cotoneaster bullatus* (Serbia, Mt. Zlatibor, Partizanske vode, 11 October 2022, photo V. Djordjević).

Results and discussion

Cotoneaster bullatus Bois, Bull. Soc. Bot. France 51(Sess. Jub. 2): 153 (1904) belongs to Sect. *Cotoneaster*, series *Bullati* (Figure 1).

Synonyms

According to POWO (2024a), *Cotoneaster bullatus* Bois has one homotypic synonym: *Pyrus bullatus* (Bois) M.F.Fay & Christenh. in Global Fl. 4: 99 (2018), and nine heterotypic synonyms: *Cotoneaster boisianus* G. Klotz in Wiss. Z. Friedrich-Schiller-Univ. Jena, Math.-Naturwiss. Reihe 21: 987 (1972 publ. 1973), *Cotoneaster bullatus* var. *floribundus* (Stapf) L.T.Lu & Brach in Novon 12: 496 (2002), *Cotoneaster bullatus* f. *floribundus* (Stapf) Rehder & E.H.Wilson in C.S.Sargent, Pl. Wilson. 1: 165 (1912), *Cotoneaster glomerulatus* W.W.Sm. in Notes Roy. Bot. Gard. Edinburgh 10: 21 (1917), *Cotoneaster moupinensis* Stapf in Bot. Mag. 135: t. 8284 (1909), *Cotoneaster moupinensis* f. *floribundus* Stapf in Bot. Mag. 135: t. 8284 (1909), *Cotoneaster reticulatus* Rehder & E.H.Wilson in C.S.Sargent, Pl. Wilson. 1: 160 (1912), *Pyrus boisiana* (G.Klotz) M.F.Fay & Christenh. in Global Fl. 4: 98 (2018) and *Pyrus reticulata*

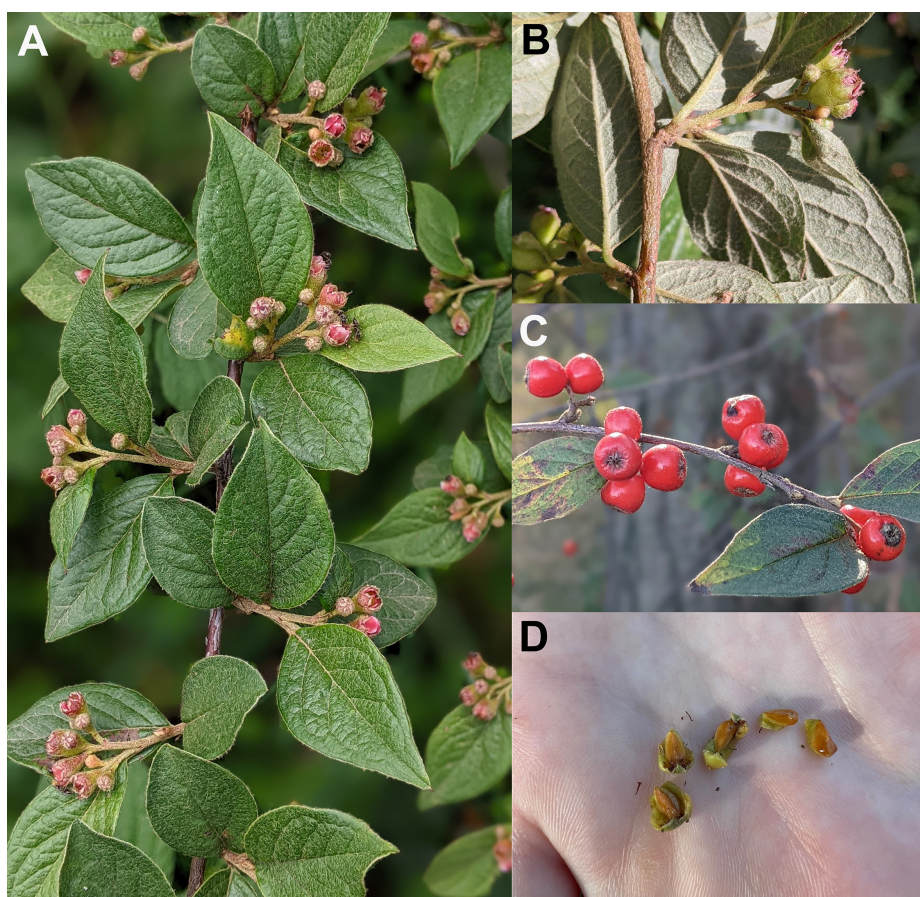


Figure 2. *Cotoneaster bullatus*: (A) flowers and leaves (upper side), (B) leaves (under side), (C) fruits and (D) pyrenes (Zlatibor Mt., Partizanske vode, 2 Jul 2024, photos: P. Lazarević (A, B, C), V. Stanković (D)).

(Rehder & E.H.Wilson) M.F.Fay & Christenh. In Global Fl. 4: 118 (2018). It should be noted, however, that some of these taxa are accepted as distinct species by other contemporary authors (e.g. Fryer and Hylmö 2009).

Morphology

According to Fryer and Hylmö (2009), the series *Bullati* encompasses 19 species, some of which are difficult to distinguish. The species *C. bullatus* is a deciduous, spreading shrub that grows up to 2 metres (Figures 1 and 2). Branchlets slightly inflexed, grayish black, terete, stout, initially strigose, gradually glabrescent. Petiole (1.5–)3–6 mm long, pilose; stipules caducous, brown, lanceolate, 3–5 mm, pilose; leaf blade oblong-ovate to elliptic or lanceolate-oblong, 3.5–7(–15) × 2–4(–8) cm, veins prominently raised abaxially, abaxially pilose, more densely so along veins, sometimes subglabrous, adaxially glabrous or pilose, conspicuously rugose and bullate, base cuneate or rounded, apex acuminate, rarely acute. Corymbs 2.5–5 cm in diam., 5–13(–31)-flowered; rachis and pedicels pilose; bracts lanceolate, 2–3 mm, pilose. Pedicel 1–3 mm. Flowers 7–8 mm in diam. Hypanthium campanulate, abaxially initially pilose, glabrate. Sepals triangular, 1–1.5 × 1.5–2.5 mm, apex acute. Petals erect, pinkish, obovate, 4–4.5 mm and nearly as broad,

Table 3. Morphological features of *Cotoneaster* species similar to *C. bullatus*. The information was retrieved from Lingdi and Brach (2003). Dimensions of the species traits measured on specimens from Serbia are given in the last column.

Species/character	<i>C. bullatus</i>	<i>C. rehderi</i>	<i>C. franchetii</i>	<i>C. bullatus</i> from Serbia
Leaves	blade oblong–ovate to elliptic or lanceolate–oblong, 3.5–7(–15) × 2–4(–8) cm, veins prominently raised abaxially, abaxially pilose, more densely so along veins, sometimes subglabrous, adaxially glabrous or pilose, conspicuously rugose and bullate, base cuneate or rounded, apex acuminate, rarely acute	blade obovate–elliptic or elliptic, rarely elliptic–oblong or lanceolate–oblong, 5–15 × 2.5–8 cm	blade elliptic to ovate, 23 × 11.5 cm, thick, lateral veins 4 or 5 pairs, raised abaxially and deeply impressed adaxially, abaxially densely yellow or white tomentose, adaxially initially appressed pubescent, glabrescent, base cuneate, apex acute or acuminate	blade oblong–ovate, 3–5 × 2.1–2.7 cm, veins prominently raised abaxially, abaxially pilose, rugose and bullate, apex acuminate, to acute
Inflorescences	2.5–5 cm in diam., (3–)5–13(–31)–flowered	5–8 cm in diam., 11–31–flowered	1.5–2.5 cm, 5–11–flowered	2.5–4.5 cm in diam., 4–6 flowered
Fruit	red, globose or obovoid, 6–8 × 6–8 mm; pyrenes 4 or 5	globose, 7–9 mm, with 5 pyrenes	orangish red or red, ovoid–globose, 6–7 mm in diam., initially pubescent, finally glabrous; pyrenes usually 3, rarely to 5	red, globose or obovoid, 7–9 × 7–9 mm; pyrenes 4 or 5

base shortly clawed, apex obtuse. Stamens 20–22, shorter than petals. Ovary pubescent apically; styles 4 or 5, free, very short. Fruit red, globose or obovoid, 6–8 × 6–8 mm, pyrenes 4 or 5 (Lingdi and Brach 2003).

Flowering period

In its area of origin, the species flowers from May to June, and fruiting is from August to September (Lingdi and Brach 2003). According to Fryer and Hylmö (2009), the flowering period of *C. bullatus* in the northern hemisphere is from May to July and the fruits ripen in August. The same flowering and fruiting periods were observed at the only known locality on the Balkan Peninsula, in Serbia.

Taxonomic notes and differentiation from other species

The species most similar to *Cotoneaster bullatus* in terms of morphological features is *C. rehderi* Pojark. The most striking differences are the appearance of the leaves, the number of flowers and the size of the fruits. Comparing the species *C. bullatus* and *C. rehderi*, it can be seen that the leaves are larger in the species *C. rehderi*, the inflorescences of the species *C. bullatus* are smaller and generally have fewer flowers, and the fruits of *C. bullatus* are also smaller (Lingdi and Brach 2003; Verloove 2013). Specimens of *C. bullatus* from Serbia have slightly smaller leaves and slightly larger fruits compared to the dimensions of *C. bullatus* given by Verloove (2013) (Table 2). Also according to the morphological characteristics of *C. bullatus* as described in the Flora of China (Lingdi and Brach 2003), the leaves are slightly smaller and the fruits slightly larger in specimens found in Serbia (Table 3). Yet, we believe that the plants that were found in Serbia belong to the species *C. bullatus* s.str. (Figure 3).

The species *C. bullatus* is also superficially similar to *C. franchetii* Bois, but the first species is a deciduous shrub, while the second is a semi-evergreen shrub. The leaves of *C. franchetii* are smaller and white tomentose



Figure 3. A specimen of *Cotoneaster bullatus* from the site Partizanke vode, Mt. Zlatibor (western Serbia), deposited in the BEOU herbarium.

beneath, inflorescences are smaller and fruits have fewer pyrenes, usually 3 (Tables 2 and 3). The authors consider that a recently detected population of *Cotoneaster* from Serbia falls within the variability of *C. bullatus* (see Lingdi and Brach 2003; Verloove 2013), although the specimens could be confused for *C. franchetii* if only seen during the later vegetation period without flowers or clearly overwintering leaves. However, during winter, it can be seen that the leaves are dry and the species is deciduous.

General distribution

The shrub *C. bullatus* originates in SW China (Hubei, Guizhou, Sichuan, [SE] Xizang, Yunnan) (Dickoré and Kasperek 2010). In Europe, it is distributed in Austria, Belgium, the Czech Republic, Denmark, Finland,

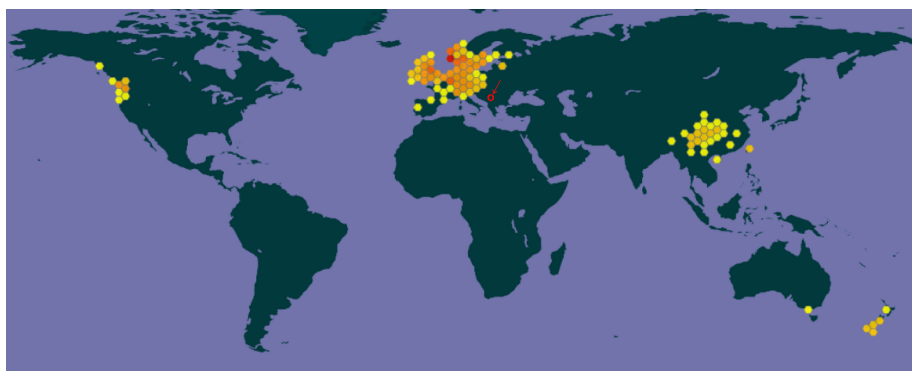


Figure 4. Distribution of *Cotoneaster bullatus* (Map from GBIF – Global Biodiversity Information Facility: <https://www.gbif.org/species/3026294>). The newly reported occurrence in Serbia is marked with a circle and an arrow.

France, Germany, Ireland, Latvia, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland and the United Kingdom (Dickoré and Kasperek 2010; GBIF 2024; POWO 2024a) (Figure 4). It should be noted that it is not clear for every country whether the species is considered in a broad or narrow sense. Some claims may relate to *C. rehderi* which is much more often cultivated and found as an escape than *C. bullatus* s. str. (Verloove 2013).

Distribution in Serbia

Hollyberry cotoneaster was recorded in western Serbia, in the wider vicinity of the locality Partizanske vode, GPS coordinates: 43°43'04.4"N, 19°42'19.8"E, MGRS 34T CP94, 1,002 m a.s.l., serpentinite, exp. SE, incl. 5°, 11 October 2022, coll./det. E. Kabaš and V. Djordjević (BEOU 68538) (Figure 5). The site is located in the tourist centre of Zlatibor Mountain and near the protected area of the Zlatibor Nature Park, which is surrounded by its borders to the north-west, west, south and south-east.

For Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Albania, Serbia, North Macedonia, Bulgaria and Greece, no data are available for the species analyzed in GloNAF (2019), GBIF (2024), POWO (2024a), ESENIAS (2025) databases and scientific papers by Teofilovski (2011), Petrova et al. (2013), Barina et al. (2014), Nikolić (2015+), Maslo (2016), Rat et al. (2016), Stojanović and Jovanović (2018), Haziri (2024) and Ministry of Environmental protection and Green Transition (2024). No occurrence of this species has been reported from the neighboring countries of Hungary and Romania either. According to the above-mentioned databases for alien species, this discovery of *C. bullatus* is the first for Serbia and the entire Balkan Peninsula. The closest finding of hollyberry cotoneaster is much further north, in Austria (Dickoré and Kasperek 2010).

Habitat and ecology

The habitat in which the species was found is an open, planted forest of *Pinus nigra* J.F. Arnold and *P. sylvestris* L., which is about 50 years old. It is a Coniferous plantation of site-native trees (T3N) EUNIS habitat type (European

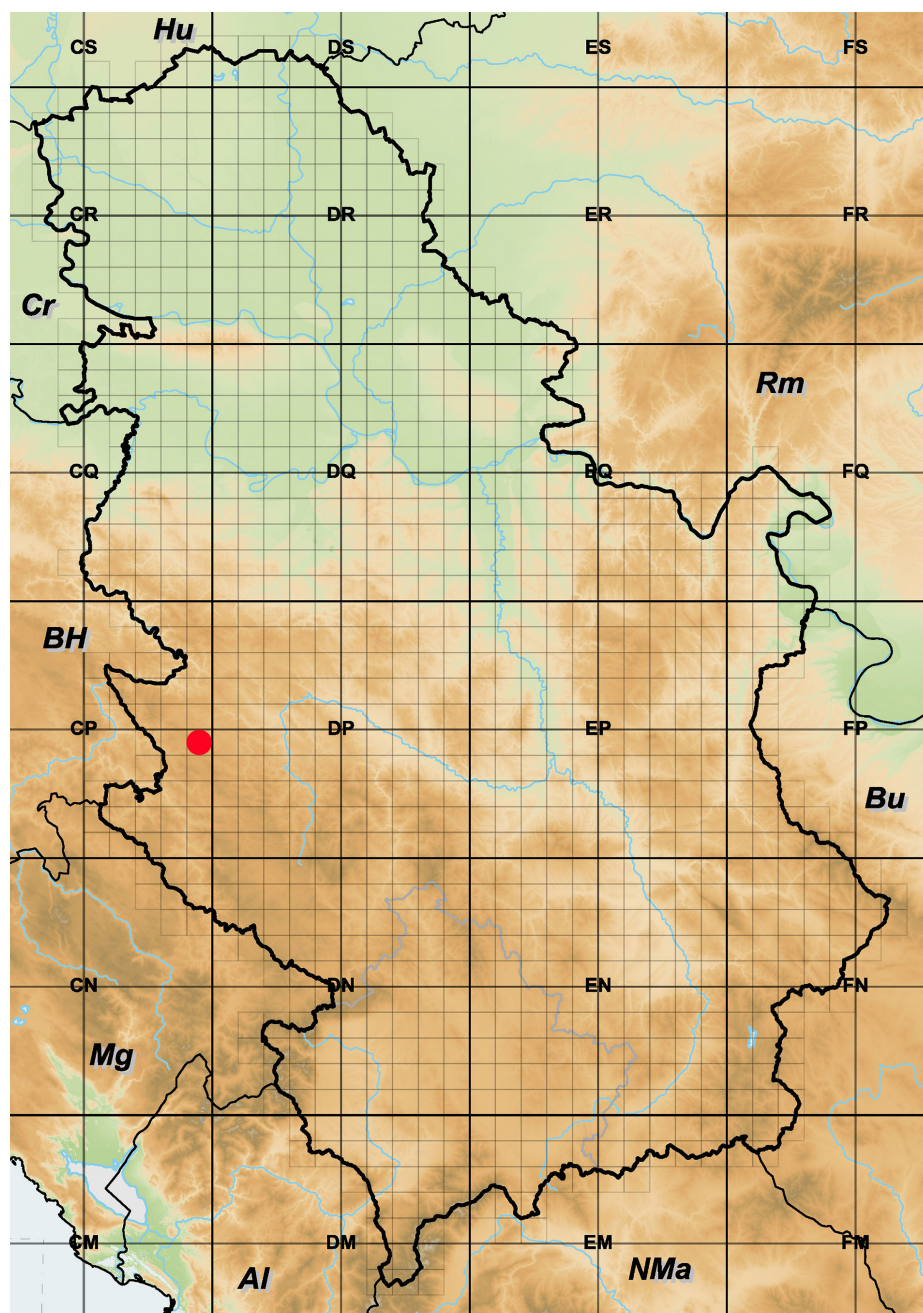


Figure 5. Distribution of *Cotoneaster bullatus* in Serbia and on the Balkan Peninsula (red dot).

Environmental Agency 2021) (Figure 6). The investigated site is located on serpentinite rocky mountain slopes (Mojsilović et al. 1977). Potential association of the site is the alliance *Pinetum nigrae-silvestris* Z. Pavlović, 1951. Other dominant species are *Sorbus aucuparia* L. and *Erica carnea* L. A phytocenological relevé was made in September 2023 on 25 m². The habitat is exposed to the north and has a slope of 20°. Represented species: general cover – 90%, tree layer cover (40%): *Pinus nigra* J.F.Arnold 3.4, *Pinus sylvestris* L. 3.4, *Acer pseudoplatanus* L. 1.1, *Fraxinus ornus* L. 1.1; shrub layer cover (60%): *Cotoneaster bullatus* Bois 2.3, *Sorbus aucuparia* L. 2.2, *Rubus idaeus* L. 1.2, *Crataegus monogyna* Jacq. 1.1, *Prunus avium* (L.) L. 1.1, *Prunus spinosa* L. 1.1, *Rosa arvensis* Huds. 1.1, *Rubus caesius* L. 1.1, *Corylus avellana* L. +,

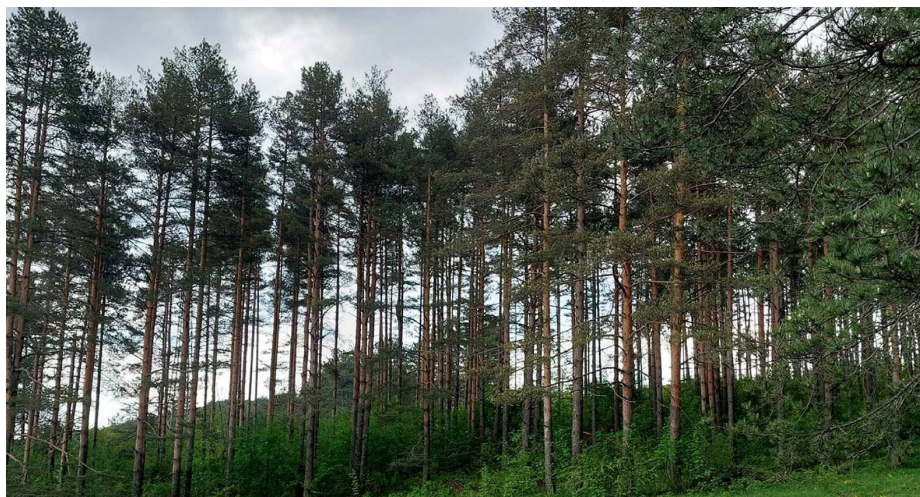


Figure 6. Habitat of *Cotoneaster bullatus* in Serbia (Zlatibor Mt., Partizanske vode, 2 Jul 2024, photo: P. Lazarević).

Sambucus nigra L. +; herb layer cover (80%): *Erica carnea* L. 4.4, *Brachypodium sylvaticum* (Huds.) P. Beauv. 1.1, *Stachys scardica* (Griseb.) Hayek 1.1, *Agrostis capillaris* L. +, *Briza media* L. +, *Cytisus procumbens* (Waldst. & Kit. ex Willd.) Spreng. +, *Dactylis glomerata* L. +, *Deschampsia caespitosa* (L.) P. Beauv. +, *Euphorbia cyparissias* L. +, *Fragaria vesca* L. +, *Molinia caerulea* (L.) Moench. +, *Mycelis muralis* (L.) Gaertn. +, *Polygonatum multiflorum* L. (All.) +, *Pontechium maculatum* (L.) Böhle & Hilger +, *Prunella laciniata* (L.) L. +, *Quercus cerris* L. +, *Quercus petraea* (Matt.) Liebl. +, *Scabiosa columbaria* L. +.

The only known population of *C. bullatus* in Serbia and on the entire Balkan Peninsula colonizes habitats similar to those in its area of origin – i.e. rocky mountain slopes. The altitude of the only known locality in the Balkans (1,002 m) is within the limits of the area of origin (900–3,200 m a.s.l.) (Lingdi and Brach 2003). In much of the introduced range, however, the species occurs at much lower altitudes. The study area of this research is similar to the introduced areas of Central Europe. It is a mountain forest comparable to that in Bavaria, where coniferous forests of *Pinus nigra* and *P. sylvestris* were planted in the past (Dickoré and Kasperek 2010). The area of the Zlatibor plateau is characterized by natural mixed forests of these two pine species and the plant community in which *C. bullatus* was found is part of this ecosystem. At the only known location of this species in the Balkans, the natural forest was cut down and replanted with the same pine species approximately 40 years ago.

Due to the fact that *Betula pendula* Roth forests are native to the Balkan Peninsula, there is a possibility that *C. bullatus* will spread, as in Germany (Munich-Feldmoching), where the so-called “Cotoneaster forest” was established together with other *Cotoneaster* species. In addition, there are other anthropogenic and disturbed unsaturated potential niches for the

hollyberry cotoneaster (Dickoré and Kasperek 2010). Contrary, in Serbia, it appears in a population of currently 50 individuals, which is however expanding.

Population size

In 2022, a total of 16 individuals up to 3 m tall were found on an area of 100 m² at an altitude of 1,002 m. However, in 2024, there were about 50 individuals per 100 m² in the population, with new shoots appearing on the slope southeast of the original population.

Invasive status

The species *C. bullatus* has been recorded as an introduced in various regions, although its exact distribution and taxonomy remain complex and unresolved (Dickoré and Kasperek 2010). According to the European Alien Species Information Network (European Commission 2024), *C. bullatus* is an alien species in Europe. According to all known information on this species at the only known location on the Balkan Peninsula and considering the criteria for invasiveness established by Lazarević et al. (2012), the status of alien for hollyberry cotoneaster can be confirmed in Serbia also. According to Lazarević et al. (2012), the plants that are considered allochthonous are predominantly cultivated, with no records of their established populations in the wild, and without invasive potential in Serbia or in neighbouring countries. However, this is not the case with newly recorded *C. bullatus* in Serbia, as its population expansion was noted in the last year of monitoring, with many new shoots spreading vegetatively.

It is not known how *C. bullatus* has become established in Serbia. No individuals of this species were found planted in the immediate vicinity or further afield, nor has the species been recorded in neighboring countries. The nearest known occurrences (in Austria) are so far away that it can be assumed that the individuals have reached the only known locality in the Balkans through seed dispersal by birds. Although *C. bullatus* is not an invasive species in Serbia yet, special attention should be paid to it, as an expansion of its population has been observed with the appearance of numerous shoots and the presence of many potentially suitable natural habitats for its establishment and increase. This is an opportunity to monitor and manage this alien species appropriately, as it is currently present in a single, easily accessible location.

Authors' contribution

VS, EK, VDJ, PL research conceptualization; VS, EK, PL, VDJ sample design and methodology; VS, EK, PL, VDJ investigation and data collection; VS, EK, VDJ, FV data analysis and interpretation; VS, EK, PL, VDJ, FV ethics approval; EK, PL, VDJ funding provision; VS, EK, VDJ roles/writing – original draft; VS, EK, VDJ, PL, FV writing – review and editing. All authors contributed to the text and approved the final version of the manuscript.

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