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Orchis provincialis (Orchidaceae), a new species in the flora of Serbia

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Summary: The occurrence of *Orchis provincialis* (Orchidaceae) in the flora of Serbia is documented here for the first time. This Mediterranean-Submediterranean species was found in May 2021 in the northern part of Mts Šar-Planina at Štrpce (Vrbeštica). Its morphological characteristics, currently known distribution and habitat preferences are presented. On the basis of the IUCN Red List Categories and Criteria, *O. provincialis* is estimated as Critically Endangered in Serbia.

Keywords: *Orchis provincialis*, Orchidaceae, distribution, Balkan Peninsula, Serbia

Orchis Tourn. ex L. (Orchidaceae, Orchidoideae, Orchideae) is a genus of terrestrial orchids distributed throughout Europe, temperate Asia and North Africa, north to Scandinavia, west to the Azores, Madeira and the Canary Islands, and east to the Caucasus, with the center of diversity in the Mediterranean region (Kretzschmar et al. 2007). The genus *Orchis* s.l. formerly included genera that are now widely accepted, such as *Anacamptis* Rich., *Dactylorhiza* Neck. ex Nevski and *Gymnadenia* R.Br. in W.T. Aiton (Tyteca et al. 2012). Recent molecular analyses have confirmed the polyphyletic status of the genus *Orchis* s.l. and many taxa have been placed in the expanded genera *Anacamptis* Rich. and *Neotinea* Rchb.f. (Pridgeon et al. 1997; Bateman et al. 1997, 2003). The taxa of the genus *Orchis* are divided into the subgenera *Orchis* s.str. and *Masculae* (Tyteca et al. 2012). In addition, Tyteca & Klein (2008, 2009) proposed a division into two genera: *Orchis*, comprising all species and subspecies with a so-called 'anthropomorphic' lip (*O. militaris* group), and *Androrchis* Tyteca & Klein, comprising all remaining 'non-anthropomorphic' species and subspecies (*O. mascula* group).

According to the World Checklist of Kew Gardens (WCSP 2021), the genus *Orchis* consists of 23 species and 10 subspecies. The orchid flora of the Balkan Peninsula is represented by a total of 14 species and subspecies of this genus (WCSP 2021). In Serbia, seven *Orchis* taxa have been known until now: *Orchis mascula* (L.) L. subsp. *mascula*, *Orchis mascula* (L.) L. subsp. *speciosa* (Mutel) Hegi, *Orchis militaris* L. subsp. *militaris*, *Orchis pallens* L., *Orchis purpurea* Huds. subsp. *purpurea*, *Orchis simia* Lam. subsp. *simia* and *Orchis spitzelii* Saut. ex W.D.J. Koch subsp. *spitzelii* (Djordjević et al. 2018). Moreover, *Orchis italica* L. has the status of a doubtful species, while *Orchis anthropophora* (L.) All. is disputed on the checklist of orchid taxa in Serbia (Djordjević et al. 2018).

The present study reports the first finding of *Orchis provincialis* Balb. ex Lam. & DC. in Serbia. The objectives of this study were:

a) to provide its morphological description,
b) to present the currently known distribution of the species,
c) to determine its habitat preferences and
d) to determine the population size and estimate the IUCN threatened status of this species in Serbia.

Materials and methods

During the floristic survey conducted in May 2021 in the area of Mts Šar-Planina, data on the morphology, distribution, habitat preferences and population size of *Orchis provincialis* were collected. The identification of the taxon was checked by comparing the plant material with the descriptions and keys provided by Buttler (1991), Baumann et al. (2006) and Delforge (2006), whereas the nomenclature followed the World Checklist of Kew Gardens (WCSP 2021). One specimen of *O. provincialis* (without underground organs – tubers and roots) was collected for documentation purposes and deposited in the Herbarium of the Institute of Botany and Botanical Garden 'Jevremovac', University of Belgrade [BEOU] (Thiers 2021). The present morphological description of the species is provided here based on own observations and according to Buttler (1991), Baumann et al. (2006), Delforge (2006) and Kretzschmar et al. (2007). The values of the measured traits of the specimen from Serbia are shown in **bold**.

The distribution of *O. provincialis* in Serbia was mapped on a grid map with squares of 10 × 10 km, using the Universal Transverse Mercator (UTM) projection, grid zone 34T. Geographic coordinates (longitude, latitude) and altitude were georeferenced using OziExplorer 3.95.4s software in the World Geodetic System 84 (WGS 84) format.

The plant community of the site with *O. provincialis* was determined by phytosociological sampling according to Braun-Blanquet (1964), whereas habitat type was determined according to the EUNIS habitat classification (http://eunis.eea.europa.eu/). The geological substrate was determined in the field. In addition, a geological map of the study area on a scale of 1 : 100,000 was also used.

The abundance of *O. provincialis* was determined on the basis of counting the total number of flowering individuals. For the estimation of the threatened status of *O. provincialis* in Serbia, IUCN (2012) Red List Categories and Criteria were applied.

Results and discussion

Orchis provincialis Balb. ex Lam. & DC., Syn. Pl. Fl. Gall.: 169 (1806) (Fig. 1)

Synonyms. *Orchis morio* var. *provincialis* (Balb. ex Lam. & DC.) Pollini, Fl. Veron. 3: 9 (1824); *Androrchis provincialis* (Balb. ex Lam. & DC.) D.Tyteca & E.Klein, J. Eur. Orch. 40: 544 (2008); *Orchis cyrilli* Ten., Fl. Napol. 1(Prodr.): LII (1812); *Orchis leucostachya* Griseb., Spic. Fl. Rumel. 2: 359 (1846).

Morphological characteristics. Perennial plant, 15–**28.6**–35 cm high, with two ovate-ellipsoid tubers. There are 2–3 scale leaves at the base, 3–**5**–8 leaves forming a rosette, and 2–3 sheathing leaves up the stem. Basal leaves in a rosette are spreading to nearly erect, usually heavily spotted with numerous reddish-brown to purplish spots, linear-lanceolate to oblong-lanceolate, (5–)**6–10.5**(–15) cm long and **1.2–1.7**–2.5 cm wide. The bracts are membranous, yellowish-green, (8–)**10–16**–20 mm long and **2–3.3**–5.5 mm wide, as long as or longer than the ovaries. The inflorescence is lax, **8.2** cm long, with 5–**14**–20 pale yellow flowers. The lateral sepals are oval, **7–10**–14 mm long and **3–4**–6 mm wide, asymmetrical, vertically upstanding, with margins sometimes wavy. The dorsal sepal is **5–6**–7.5(–11) mm long, almost erect or forming a hood with the petals, which are about the same length. The lip is 3-lobed, broadly wedge-shaped, **8–11**–13 mm long and **8–12**–18.5 mm wide, convex to sharply longitudinally folded.

Figure 1. *Orchis provincialis* (all from Štrpce, Vrbeštica, 02.05.2021; photo M. Veljković): a – habitus; b – rosette leaves; c and d – flowers.

Its central part is somewhat more intensely coloured than the other parts of the flower, with numerous reddish or reddish-brown spots. The lateral lobes are almost rhomboid, often curved downwards. The middle lobe is curved downward at an angle of about 60°, longer than the lateral lobes, distinctly bent at the base, with two secondary lobes that are slightly divergent. The spur is cylindrical, horizontal to slightly curved upwards with a thickened apex, **12–14**–19 mm long and **2–3**–4 mm wide, about as long as the ovary.

Differentiation from other species. *Orchis provincialis* is similar to *Orchis pauciflora* Ten., *O. pallens* L., *Dactylorhiza romana* (Sebast.) Soó and *D. sambucina* (L.) Soó. In general, *O. provincialis* differs from the above species in having strongly spotted basal leaves, which are absent in the others. In addition, *O. pauciflora* differs from *O. provincialis* in the darker yellowish lip; in the margins of lateral lobes, which are usually scalloped; in the middle lobe, which is toothed; and in the spurs, which are often longer (15–25 mm) (Delforge 2006). *Orchis pallens* differs from *O. provincialis* in the unspotted lip and the unspotted and usually broader leaves (1.5–4 cm), which are oblong to oval (Delforge 2006). *Dactylorhiza romana* differs from *O. provincialis* in possessing tubers that are forked over no more than ⅓ of their length, unspotted leaves, a middle lip lobe that is not spotted, bracts that are slightly longer than the flowers, and flowers that can be light to dark magenta (Buttler 1991; Delforge 2006). *Dactylorhiza sambucina* is distinguished from *O. provincialis* by tubers that are at most half forked, leaves that are not spotted, bracts that

are of the same length or longer than the flowers, spurs that are bent downward and flowers that can be reddish or purple (Buttler 1991; Delforge 2006).

Pollination. *Orchis provincialis* is a cross-pollinating and deceptive orchid, and the pollinator is *Andrena lathyri* Alfken, 1899 (Svolynskiy et al. 2014). This orchid species uses Batesian floral mimicry, a mechanism whereby its flowers mimic the flowers of the rewarding plants: *Lathyrus aureus* (Steven) D. Brândză and *Corydalis cava* subsp. *marschalliana* (Willd.) Hayek (Svolynskiy et al. 2014).

General distribution. *Orchis provincialis* was discovered and described in 1804 by Giovanni Battista Balbis from the region of Provence in southeastern France, where its name was also coined (Kretzschmar et al. 2007). However, it is distributed mainly in the central Mediterranean area of Europe, to Portugal and Spain in the west, through southern France and the Apennine Peninsula, Corsica, Sicily, then along the Mediterranean and Submediterranean zones of the Dinarides along the Adriatic coast, through Albania, western Greece, the Aegean part of Greece and Crete, then across south and southeastern Bulgaria and Anatolia, and eastward to the Caucasus and Crimea (Kretzschmar et al. 2007). In a broader sense, it belongs to the Mediterranean-Submediterranean chorological group. On the Balkan Peninsula, this species has so far been recorded in Slovenia (Dolinar 2015), Croatia (Nikolić 2019), Bosnia and Herzegovina (Šabanović et al. 2019), Montenegro (Stevanović et al. 1995), North Macedonia (Teofilovski 2011), Albania (Barina 2017), Greece (Tsiftsis & Antonopoulos 2017), Bulgaria (Assyov & Petrova 2012) and Turkey (Kretzschmar et al. 2007).

Distribution in Serbia. *Orchis provincialis* has been found in Kosovo: Mts Šar-Planina, Štrpce (Vrbeštica), N42.237363°, E20.984553°, MGRS 34T DM97, 1105 m a.s.l., *Festucetum valesiaceae* s.l., limestone, exp. SW, incl. 10°, 16 May 2021; coll. M. Veljković, det. M. Veljković, V. Djordjević [BEOU 17759] (Fig. 2).

The finding of *O. provincialis* on the northern part of Mts Šar-Planina is the first record of this species on the territory of the Kosovo region and in Serbia in general. The finding of this species in this part of the Central Balkans is not surprising, considering that its locality is about 130 km northeast of Adriatic Sea, due to the influence of the Mediterranean climate and the obviously favourable bioclimatic characteristics of the area for the development and survival of this species. The locality Štrpce (Vrbeštica) represents one of the northeasternmost distribution points of the species in the Central Balkans. The nearest known populations occur further south in North Macedonia: Suva Gora (Miletino – Gaber) (Teofilovski 2011) and southwest in Albania (Barina 2017).

Habitat and ecology. *Orchis provincialis* was found on the locality of Štrpce (Vrbeštica) in the grassland community *Festucetum valesiaceae* s.l. In addition to *Festuca valesiaca* Gaudin, the following accompanying taxa have been recorded in the stand with *O. provincialis*: *Danthonia alpina* Vest, *Teucrium chamaedrys* L., *Sideritis montana* L., *Astragalus onobrychis* L., *Melica ciliata* L., *Anthyllis vulneraria* L., *Neotinea tridentata* (Scop.) R.M. Bateman, Pridgeon & M.W. Chase, *Anacamptis morio* (L.) R.M. Bateman, Pridgeon & M.W. Chase, *Hypericum barbatum* Jacq., *Trifolium incarnatum* L. and *Arabis planisiliqua* (Pers.) Rchb. According to the EUNIS classification, this habitat type belongs to the arid subcontinental steppic grassland (*Festucion valesiacae*) (E1.22 code; https://eunis.eea.europa.eu/habitats/1846). The population was recorded at an altitude of 1105 m, on limestone, under full light regime, on southwest exposed slopes, with

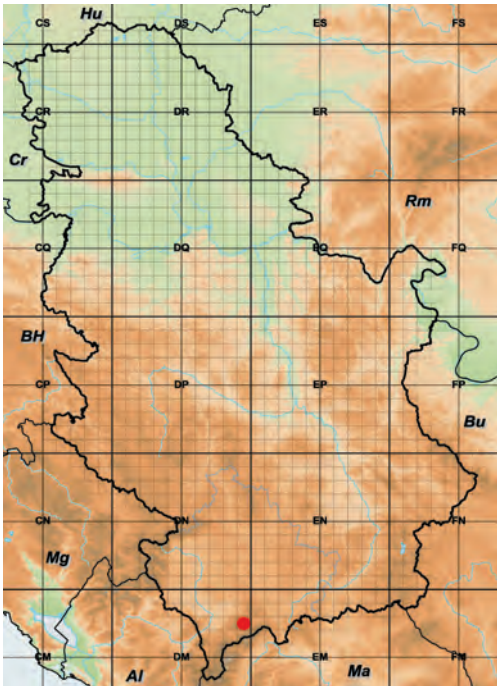

Figure 2. Distribution of *Orchis provincialis* in Serbia.

10° inclination. Although this species has been reported elsewhere to occur in grassland habitats, it most commonly inhabits shrub habitats such as maquis or phrygana and well-lit deciduous and coniferous forests (Delforge 2006; Kretzschmar et al. 2007; Tsiftsis & Antonopoulos 2017). This species has been found on soils with pH ranging from 4.59 to 8.0 (Djordjević & Tsiftsis 2020 and references therein), but generally prefers acidic soils. The finding of this species in Serbia on limestone is not surprising, as it also occurs in other parts of its range on calcareous and thus alkaline soils, but usually when an acidic subsoil is also present (Kretzschmar et al. 2007). The species has also been found on serpentine substrate on Crete and on dolomite on Rhodes (Kretzschmar et al. 2007). The recorded altitudinal range of this species from other countries is between 0 m and 1700 m (Baumann et al. 2006; Delforge 2016), in Italy up to 1750 m (G.I.R.O.S. 2009), in Albania even up to 2200 m (Barina 2017).

Population size. Only one individual of *O. provincialis* was recorded in an area of about 100 m^2. The total population size falls within the IUCN category of fewer than 50 mature individuals.

Conservation status. *Orchis provincialis* is protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as all members of the family Orchidaceae. The current status of *O. provincialis* in Serbia is estimated as Critically Endangered – **CR C2a(i); D**. The species should be included in the Red Data Book of Flora of Serbia and the official list of strictly protected species in Serbia.

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