

DACTYLORHIZA FUCHSII (ORCHIDACEAE), A NEW SPECIES IN THE FLORA OF SERBIA

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Abstract – *Dactylorhiza fuchsii* (Orchidaceae) has been found on Mt. Javor (SW Serbia) as a new species in the flora of Serbia. This is the single known locality of this species in the Central Balkans and the southernmost limit of the species' distribution on the Balkan Peninsula. Data concerning its morphology, distribution, habitat preferences, flowering period, population size and conservation status in Serbia are provided.

Key words: *Dactylorhiza fuchsii*; Orchidaceae; distribution; Balkan Peninsula; Serbia

INTRODUCTION

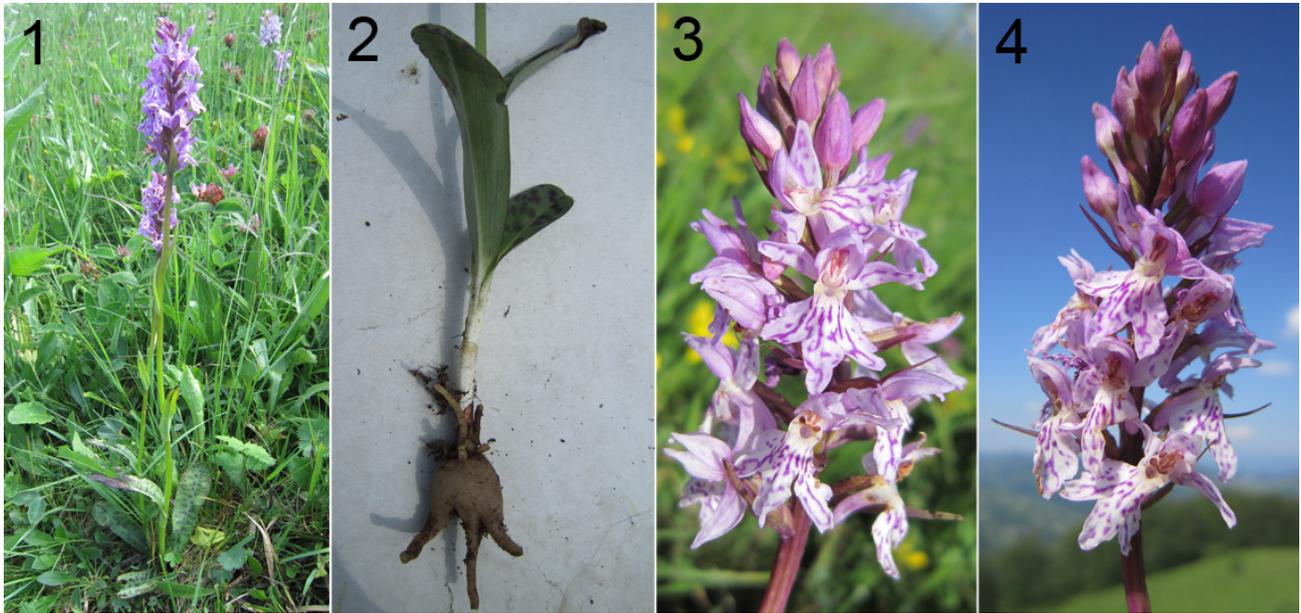
Species of the genus *Dactylorhiza* Necker ex Nevski (Orchidaceae) are distributed primarily in the temperate and boreal zones, mostly in Europe, as well as in western and northern Asia, the Himalayas, northern Africa and Alaska (Delforge, 2006; Ståhlberg and Hedrén, 2008; Vakhrameeva et al., 2008). There are three centers of diversity of this genus: Western Europe (including the British Isles, Germany and southern Scandinavia), the Carpathians and the Balkans, and Asia Minor (Averyanov, 1990). Molecular studies have showed that the greatest phylogenetic and genetic diversity as well as a high level of endemism in the genus *Dactylorhiza* are in the Caucasus and Mediterranean Basin (Pillon et al., 2006). The number of accepted species varies from 12 to 75 (Ståhlberg and Hedrén, 2008). There are 58 species of this genus in Europe, North Africa and the Near East (Averyanov, 1990), and 14 species and 10 subspecies on the Balkan Peninsula (WCSP, 2013). According to Diklić (1976), the genus *Dactylorhiza* is represented by 7 species and 4 subspecies in Serbia to date: *D. cordigera* (Fries) Soó subsp. *bosniaca* (Beck) Soó, *D.*

cordigera (Fries) Soó subsp. *cordigera*, *D. incarnata* (L.) Soó, *D. maculata* (L.) Soó subsp. *maculata*, *D. maculata* (L.) Soó subsp. *saccifera* (Brongn.) Diklić, *D. maculata* subsp. *transsilvanica* (Schur) Soó, *D. majalis* (Rchb.) Hunt & Summerh. subsp. *impudica* (Cr.) Soó, *D. majalis* (Rchb.) Hunt & Summerh. subsp. *majalis*, *D. romana* (Seb.) Soó, *D. sambucina* (L.) Soó, and *D. viridis* (L.) R.M. Bateman, Pridgeon & M.W. Chase (sub nom. *Coeloglossum viride* (L.) Hartman).

The present paper reports the first finding of *Dactylorhiza fuchsii* (Druce) Soó in Serbia. The main goals of this study were: a) to provide the current distribution of the species; b) to determine its habitat preferences, and c) to estimate its population size and IUCN threatened status in Serbia.

MATERIALS AND METHODS

During floristic and chorological investigation of the orchids of western Serbia in June 2013 on the territory of Mt. Javor, data concerning the distribution, habitat characteristics and population size of the spe-



Figs. 1-4. *Dactylorhiza fuchsii* (all from Mt. Javor, SW Serbia, 15.06.2013; photo V. Djordjević): 1 – habitus; 2 – tubers and the first leaves; 3 and 4 – inflorescence.

cies *D. fuchsii* were recorded. The identification was checked by comparing the plants to the descriptions and keys provided by Delforge (2006), Soó (1980), Ståhlberg and Hedrén (2008) and Vakhrameeva et al. (2008), while the nomenclature followed Flora Europaea (Soó, 1980) and the World Checklist of Kew Gardens (WCSP, 2013). The voucher specimens of *D. fuchsii* were deposited in the Herbarium of the Institute of Botany and Botanical Garden “Jevremovac”, University of Belgrade (BEOU). Our description of the morphological features of the species is based on herbarium specimens, with some qualitative and quantitative characters added according to Delforge (2006), Vakhrameeva et al. (2008), Ståhlberg and Hedrén (2008) and Flora Europaea (Soó, 1980). The distribution of *D. fuchsii* in Serbia is presented on a grid map with squares of ca. 10 km × 10 km, based on the Universal Transverse Mercator (UTM) projection (Lampinen 2001), grid zone 34T. Geo-coordinates (longitude, latitude and altitude) were recorded using a Garmin eTrex 30 handheld GPS device in the World Geodetic System 84 (WGS 84) format. Plant communities of sites with *D. fuchsii* were determined according to Braun-Blanquet (1964) methodology, while the names of syntaxa

followed Kojić et al. (1998). The population size of *D. fuchsii* at the studied localities was determined on the basis of counting the total number of plant specimens. For the estimation of the threatened status of *D. fuchsii* in Serbia, IUCN (2001) Red List Categories and Criteria were applied.

RESULTS AND DISCUSSION

Dactylorhiza fuchsii (Druce) Soó, *Nom. Nov. Gen.*

Dactylorhiza: 8 (1962)

Homotypic synonyms: *Orchis fuchsii* Druce, Bot. Soc. Exch. Club Brit. Isles 4: 105 (1914 publ. 1915); *Dactylorchis fuchsii* (Druce) Verm., Stud. Dactylorch.: 69 (1947); *Dactylorhiza maculata* subsp. *fuchsii* (Druce) Hyl., Nord. Kärleväxtfl. 2: 238 (1966).

Morphological features – A perennial plant, (15-) 30-50 (-70) cm high, with two palmate tubers. Leaves (4-) 6-11 (-15), usually spotted on upper side, rarely unspotted. The lowermost leaf usually short, obovate or wide-lanceolate; median leaves lanceolate and broadest in the upper half, 8-21 cm long and (1.5-) 2-3.8 (-5) cm wide; uppermost leaves bract-like. In-

florescence 4-10 (-20) cm long, initially conical, becoming near cylindrical, with (10-) 15-50 (-65) light pink, whitish, deep lilac or crimson flowers. Bracts 0.6-1.2 cm long, usually shorter than the flowers. Outer perianth-segments 6-9 mm. Labellum 6-11 mm long and 8-16 mm wide, deeply 3-lobed, with the markings mostly around the median axis, with often dark, purplish dots and streaks. Lateral lobes 4-7 mm long, widely spread, rounded, obliquely truncated or falcate. Middle lobe prominent (5-) 6-9 (-11) mm long, triangular, almost as wide as, and longer than the lateral lobes. Spur 6-9 mm long and 1.2-2.5 mm wide, cylindrical, horizontal to pointing downwards, shorter than the ovary.

Dactylorhiza fuchsii is closely related to *D. maculata* (L.) Soó and *D. saccifera* (Brongn.) Soó. *Dactylorhiza fuchsii* differs from *D. maculata* by the obtuse tip of the lowest leaf and broader leaves in the upper half of the stem. In *D. maculata*, the lowest leaf is usually narrower, broader in the basal half, with an acute tip. Furthermore, *D. maculata* is distinguished by having the middle lobe of the labellum much narrower than the lateral lobes. Its middle lobe is shorter than to as long as (rarely longer than) the lateral lobes. *Dactylorhiza saccifera* differs from *D. fuchsii* by the larger (7-15 mm) and thicker spur (2-4.5 mm), which is near cylindrical to conical, straight, sometimes curved upwards at tip, and lower bracts that are usually longer than the flowers (Soó, 1980; Delforge, 2006).

General distribution – *Dactylorhiza fuchsii* is a Euro-Siberian species more typical for northern Europe and is absent from most of the south (Soó, 1980; Delforge, 2006). It is distributed in Scandinavia, in western, middle and eastern Europe, as well as in Asia (eastern and western Siberia and Mongolia) (Vakhrameeva et al., 2008). According to recent literature sources (Delforge, 2006; WCSP, 2013; Stefaniak et al., 2013), this species has been recorded in: Great Britain, Austria, Belgium, France, Germany, the Netherlands, Switzerland, Denmark, Norway, Sweden, Finland, Iceland, Ireland, Poland, (former) Czechoslovakia, Hungary, the Ukraine, Belarus, Latvia, Lithuania, Estonia, Russia, Spain,

Italy, (former) Yugoslavia, Romania, and China. On the Balkan Peninsula, *D. fuchsii* has been recorded in Slovenia (Ravnik, 2002), Croatia (Kranjčev, 2005) and Romania (WCSP, 2013).

According to the World Checklist of Kew Gardens (WCSP, 2013), there are six subspecies of the species *D. fuchsii*: subsp. *fuchsii* (Druce) Soó (throughout most of the range of the species: Europe to Siberia and Mongolia), subsp. *carpatica* (Batoušek & Kreutz) Kreutz (Slovakia), subsp. *hebridensis* (Wilmott) Soó (Great Britain, Ireland), subsp. *okellyi* (Druce) Soó (Great Britain, Ireland), subsp. *psychrophila* (Schltr.) Holub (Europe to Siberia: Finland, Norway, Sweden, Austria, former Czechoslovakia, France, Russia) and subsp. *sooana* (Borsos) Borsos (Slovakia, Hungary). The populations of *D. fuchsii* from Serbia are identified as *D. fuchsii* subsp. *fuchsii* (Druce) Soó.

Distribution in Serbia – *Dactylorhiza fuchsii* has been found in SW Serbia: Mt. Javor, Poljanska gora, 43.49531 N, 20.04835 E, UTM DP21, alt. 1243 m, the meadow community of the alliance *Pancicion*, limestone, exp. NE, incl. 25°, 15.06.2013, coll./det. V. Djordjević (BEOU 16829); Mt. Javor, Poljanska gora, 43.49477 N, 20.04926 E, UTM DP21, alt. 1250 m, ass. *Arrhenatheretum elatioris*, limestone, exp. NE, incl. 20°, 15.06.2013, coll./det. V. Djordjević (BEOU 16830) (**Fig. 5**).

The finding of *D. fuchsii* on Mt. Javor (SW Serbia) is the first record of this species not only on the territory of Serbia, but also in the Central Balkans. This locality represents the southernmost limit of its distribution in the Balkans, and lies ca. 250 km southwest of the nearest known locality in Romania (the Cerna valley; S. Milanović pers. comm., 2013) and ca. 395 km southeast of the nearest known locality in Croatia (Velebit, V. Paklenica; Kranjčev, 2005).

Habitat and ecology – *Dactylorhiza fuchsii* has been found to grow on limestone bedrock, on moderately moist soil, under a full light regime on Mt. Javor. The species has been recorded at an altitude between 1 243 m and 1 250 m, on northeast-exposed slopes,

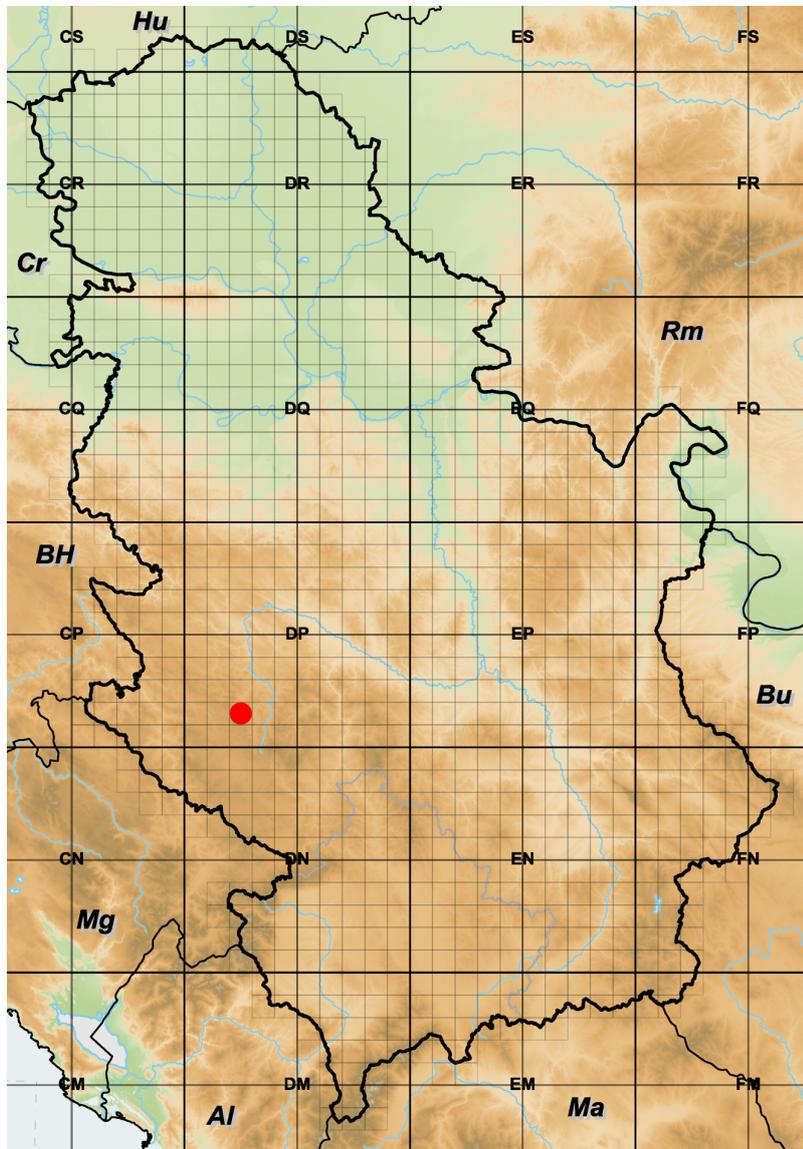


Fig. 5. Distribution of *Dactylorhiza fuchsii* in Serbia.

with 20-25° inclination. *Dactylorhiza fuchsii* inhabits two mesophilous meadow communities in the zone of mountain beech forests: the community of the alliance *Pancicion* Lakušić 1966 (the first subpopulation) and *Arrhenatheretum elatioris* s.l. (the second subpopulation), both of the order *Arrhenatheretalia elatioris* Pawl. 1928, and class *Molinio-Arrhenatheretea* Tx. 1937. According to EUNIS classification, these habitats belong to alpine and subalpine enriched grassland (E4.5 code) (Lakušić et al., 2005).

Otherwise, it is known that *D. fuchsii* grows usually in grassland and open woodlands, woodland edges and areas with scattered tree stands and not dense grass cover, up to 2 300 m a.s.l. (Soó, 1980; Lang, 2004; Delforge, 2006). Furthermore, it inhabits different types of deciduous forests (oak, beech, birch, alder and aspen) and coniferous forests (spruce and pine), and occurs in steppes and forest-steppes (Vakhrameeva et al., 2008). In Croatia, *D. fuchsii* has been recorded to grow in beech forests,

mixed beech-fir forests, oak-hornbeam forests, forest edges, especially on limestone bedrock, at an altitude between 500 m and 1 500 m (Kranjčev, 2005). In Britain, it occurs in grasslands, open woodlands, but also on railway banks and road verges, in wastelands and abandoned industrial sites (Lang, 2004).

The occurrence of *D. fuchsii* in Serbia on limestone substrate on moderately moist soil under a full light regime is in accordance with its ecological preferences reported from other countries. Namely, this species usually occurs in calcareous habitats, on alkaline and weakly acid soils moderately enriched with nutrients, especially nitrogen, more often on soils with thin structure, rarely clayish or peat (Soó, 1980; Lang, 2004; Delforge, 2006; Vakhrameeva et al., 2008). It is a species with a wide ecological range, growing under a full light or in a slight shade, on moderately dry or fairly wet soils, and it gradually disappears with excessive humidity (Vakhrameeva et al., 2008).

Flowering period – On 15 June all specimens of *D. fuchsii* on Mt. Javor were in full bloom. This is in accordance to the flowering period provided by Delforge (2006), who reported that this species flowers from May to July, as well as in August as an extremely late period.

Population size and conservation status – The first subpopulation of Mt. Javor has consisted of nine specimens within an area of 4 m², while the second subpopulation has been numbered as fourteen specimens within an area of 30 m². Bearing in mind that potentially suitable habitats of this species may also occur nearby, its total population size is estimated to be ca. 100 mature individuals. Furthermore, its area of occupancy is estimated to be less than 1 km². Therefore, applying the IUCN (2001) Red List Categories and Criteria on the territory of Serbia, the current threatened status of *D. fuchsii* is estimated as Critically Endangered – CR B2a; C2a(i). *Dactylorhiza fuchsii* is protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Hágsater and Dumont, 1996). Consequently, *D. fuchsii* must be included in the Red

Data Book of Flora of Serbia and the official list of strictly protected species in Serbia (Sl, RS 5/2010).

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