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EPIPACTIS PURPURATA SM. (ORCHIDACEAE) – A NEW SPECIES IN THE FLORA OF SERBIA

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Abstract – *Epipactis purpurata* Sm. (Orchidaceae) is recorded as a new species in the flora of Serbia. It was found on Mt. Maljen (Western Serbia) at 740 m altitude, and it inhabits mixed beech-fir forest. Data about the morphology, distribution, habitat, ecology, flowering period, pollination and population size of the newly-recorded species are given. The distribution map of this species in Serbia is created on a 10 x 10 km UTM grid system. In the evaluation of the species according to IUCN categories and criteria applied in Serbia, *E. purpurata* is classified as Critically Endangered.

Key words: Epipactis purpurata, Orchidaceae, new record, Serbia, ecology, threatened status

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INTRODUCTION

Sspecies of the genus *Epipactis* Zinn. (Orchidaceae) are distributed in the temperate zone of Europe and Asia, in North Africa and North America (Vakhrameeva et al., 2008). The main diversity centers of this genus are Western and Central Europe, and Western Asia (Efimov, 2008). The number of species varies, due to difficulties in the taxonomy, from 19 (Buttler, 2001), 25-30 (Vakhrameeva et al., 2008) to 40-65 (Delforge, 2006; Efimov, 2008). Research in the last decades has provided recordings of numerous new species from the Iberian Peninsula (Bernardos et al., 2004) and the Balkan Peninsula (Petrova and Venkova, 2006; 2008). According to Diklić (1976), the genus *Epipactis* is represented by four species in Serbia: *E. atrorubens* (Hoffm.) Besser., *E. latifolia* (L.) All., *E. microphylla* (Ehrh.) Sw. and *E. palustris* (L.) Cr.

This paper is a report of the first finding of *Epipactis purpurata* Sm. in Serbia. Considering the fact that knowledge of orchid ecology (geology, climate, altitudinal preferences, soil type, humus content, etc.) is necessary for orchid conservation (Stewart, 1992; Hágsater and Dumont, 1996), the aims of this study were to determine the ecological preferences of the newly-recorded orchid (light regime, soil moisture, geological and pedological substrate, terrain exposition and inclination, altitude) and to determine the ***plant community type which is inhabited by the given species***, its flowering period, population size and threatened status in Serbia.

MATERIALS AND METHODS

During the floristic investigations carried out in the territory of Mt. Maljen (Western Serbia) in the period between 2004 and 2009, the species *Epipactis purpurata* was found. The collected specimens of this species were herbarized and deposited in the Herbarium of the Institute of Botany and Botanical Garden "Jevremovac", University of Belgrade (BEOU). The species was determined according to Moore (1980), Buttler (1991), Ravnik (2002), Lang (2004), Delforge (2006), Efimov (2008) and Vakhrameeva et al. (2008). The distribution of the newly-recorded orchid species in Serbia is mapped on a 10 x 10 sq. km at UTM grid system (UTM Zone 34T) (Lampinen, 2001). A phytocoenological investigation was performed following the standard Central-European method (Braun-Blanquet, 1964).

The light regime and moisture of the soil were examined during field observation. Population size was determined by counting the total number of plant specimens. For the estimation of the threatened status of the species on the territory of

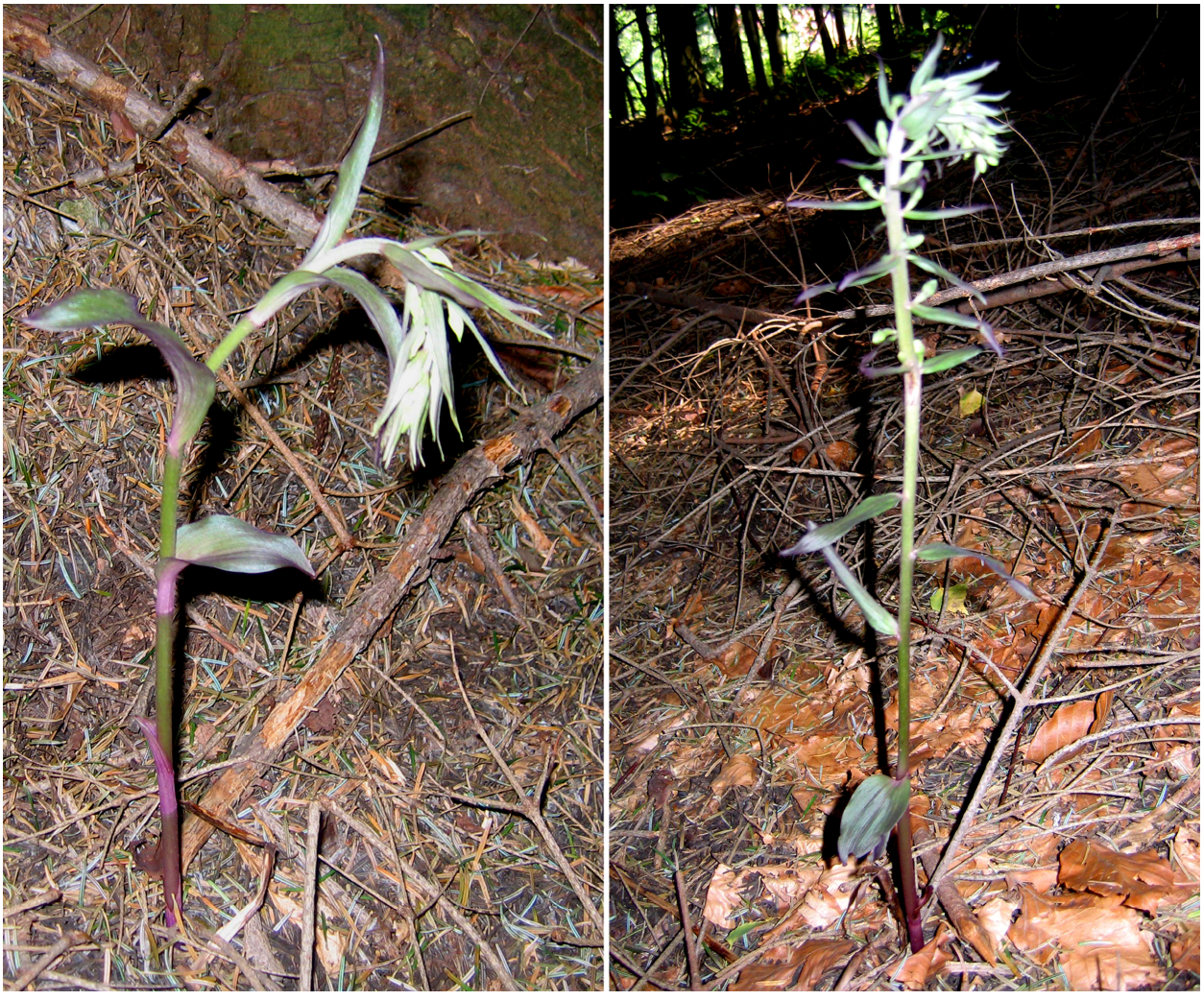

Fig. 1. *Epipactis purpurata* Sm. – Mt. Maljen (Western Serbia), 18th July 2009 (photo V. Djordjević).

Serbia, IUCN Red List Categories and Criteria (2001) were applied. The description of the plant is based on the morphological features of the herbarium specimens and on recent literature sources (Moore 1980; Buttler, 1991; Lang, 2004; Delforge, 2006; Efimov, 2008; Vakhrameeva et al., 2008).

RESULTS AND DISCUSSION

Epipactis purpurata Sm., Engl. Fl. 4: 41 (1828), nom. cons. (Fig. 1).

Homotypic Synonyms: *Epipactis latifolia* var. *purpurata* (Sm.) Nyman, Consp. Fl. Eur.: 688 (1882); *Epipactis latifolia* subsp. *purpurata* (Sm.) K. Richt., Pl. Eur. 1: 284 (1890); *Helleborine purpurata* (Sm.) Druce, J. Bot. 47: 28 (1909). Heterotypic Synonyms: *Epipactis viridiflora* (Hoffm.) Krock., Fl. Siles. 3: 41 (1814); *Epipactis sessilifolia* Peterm., Flora 27: 370 (1844); *Epipactis violacea* (Dur.-Doq.) Boreau, Fl. Centre France, ed. 3: 651 (1857); *Epipactis varians* (Crantz) H.Fleischm. & Rech., Oesterr. Bot. Z. 55: 267 (1905).

Fig. 2. Distribution of *Epipactis purpurata* Sm. in Serbia

Morphology: *E. purpurata* is a perennial plant, 20-75 cm high, with a vertical, long-branched, descending rhizome, and a tendency to form colonies of up to 20 plants. The stem has a violet tinge and is covered with short grey hairs, with 2-3 sheathing scale leaves and 3-6 (-12) leaves spirally arranged up the stem. The leaves are narrow, grey-green-violet. The largest leaves are 5-10 cm long, narrow-ovate to narrow-lanceolate. The inflorescence is curved down in the beginning of flowering period. It is up to 10-25 (-30) cm long, has a pale green and violet stalk which is covered with short hairs, and consisting of 25-50 flowers. The bracts are linear, acuminate, the lower usually exceeding the flowers. The perianth segments are (whitish) green, sometimes merging into pale violet with a silken sheen. The sepals are 8-12 mm long and 4-5 mm wide, ovate, hairy beneath; lateral petals are somewhat narrower. The labellum is 8-10 mm long, whitish to pale pink, shorter than the outer perianth segments. The lip has pale brown lines of hypochile. The epichile is heart-shaped and about as broad as it is long, with two smooth, bright pink bosses at the base. The hypochile is deeply concave, widened, without side lobes, reddish on the outside and light violet on the inside. A wide tie separates the epichile from the hypochile. The ovary is deep-green, narrowly ovate and slightly curved during fruiting time, (6-) 12 mm long. Pedicels are 0.2-0.5 cm long, pubescent, violet-tinted at the base.

E. purpurata is similar to *E. leptochilla* (Godfery) Godfery and *E. helleborine* (L.) Cr. (Lang, 2004). The full flowering period is some two weeks later than for these two species. The best distinguishing features are the narrow, dark, greyish or purplish leaves and the bosses on the base of the epichile (Lang, 2004). Also, a form lacking chlorophyll is frequent. The epichile of *E. purpurata* is as long as or longer than wide, while the epichile of *E. helleborine* is not longer than wide (Moore, 1980). Also, *E. purpurata* is very similar to *E. rechingeri* Renz. *E. purpurata* differs from it by its usually more numerous, slightly longer leaves, and longer, narrowly ovate, slightly curved fruits (Efimov, 2008).

Chromosomes: 2n = 40 (Moore, 1980).

General distribution: *E. purpurata* is concentrated in the temperate zone of western and central Europe, radiating towards the south and south-east; rarely in the Atlantic region; eastwards as far as Lithuania, Poland and the Republic of Moldova; southwards to northern Italy, (former) Yugoslavia and southern Romania (Buttler, 1991). According to recent literature sources and the Internet, it grows in Great Britain, Denmark, Spain, France, Belgium, Germany, Switzerland, Hungary, Austria, Czechoslovakia, Poland, Romania, Italy, Luxembourg, Estonia, Latvia, Lithuania, Kaliningrad, Russia (Delforge, 2006); Slovenia (Ravnik, 2002); Croatia (Nikolić, 2010); Bulgaria (Petrova and Venkova, 2008); Greece (Baumann et al., 2006); the Ukraine (Vakhrameeva et al., 2008) and Crimea (Efimov, 2008).

Distribution in Serbia: Western Serbia: Mt. Maljen, Bukovi (Kaona) – DP18, ass. *Abieti-Fage-*

tum sensu lato, diabase and split, brown forest soil, 740 m a.s.l., NE exp., 06-Sep-2004, coll./det. V. Djordjević (BEOU 16402); 18-Jul-2009 (BEOU 16401) (Fig. 2).

Habitat and ecology: *E. purpurata* inhabits the forest community *Abieti-Fagetum sensu lato* on Mt. Maljen (Western Serbia). It is an old beech-fir forest, with planted trees of *Picea abies* (L.) Karst, situated at 740 m a.s.l., on NE exposure and inclination of 20°. All the specimens of *E. purpurata* were recorded in the shade. The geological substrate is diabase and split, the pedological substrate is a brown forest soil. The moisture of the soil is moderate.

Analysis of floristic composition in community *Abieti-Fagetum* of the stand where *E. purpurata* was found is represented in the phytocoenological recording:

Locality: Mt. Maljen, Bukovi (Kaona); Date: 18th July 2009; Altitude: 740 m; Exposition: NE; Inclination: 20°; Conopy: 0.9; Size of sample area: 50 m²; Height of tree layer I: 16-18 m; Height of the tree layer II: 5-7 m;

Tree layer I: *Abies alba* Mill. 4.2, *Fagus sylvatica* L. 1.1;

Tree layer II: *Fagus sylvatica* L. 2.1, *Abies alba* Mill. 1.1, *Picea abies* (L.) Karst. 1.1, *Carpinus betulus* L. 1.1, *Betula pendula* Roth. 1.1;

Shrub layer: *Fagus sylvatica* L. 2.2, *Abies alba* Mill. 1.1, *Carpinus betulius* L. 1.1, *Acer pseudoplatanus* L. +.1, *Crataegus monogyna* Jacq. +.1;

Herb layer: *Rubus hirtus* W. et K. 2.2, *Lamium galeobdolon* (L.) Nath. 2.2, *Abies alba* Mill. 1.2, *Galium rotundifolium* L. 1.2, *Athyrium filix-foemina* (L.) Roth. 1.2, *Sanicula europaea* L. 1.2, *Asarum europaeum* L. 1.1, *Pteridium aquilinum* (L.) Kuhn. +.1, *Hedera helix* L. +.1, *Dentaria bulbifera* L. +.1, *Asperula odorata* L. +.1, *Mycelis muralis* (L.) Rchb. +.1, *Fagus sylvatica* L. +.1, *Helleborus odorus* W. et K. +.1, *Viola sylvestris* Lam. +.1, *Crataegus monogyna* Jacq. +.1, *Aremonia agrimonioides* (L.) DC. +.1, *Carex sylvatica* Huds. +.1, *Epipactis helleborine* (L.) Cr. +.1, *Quercus petraea* (Matt.) Lieb. +, *Campanula patula* L. +, *Pyrus piraster* Burg. +, *Neottia nidus-avis* (L.) Rich. +, *Platanthera bifolia* (L.) Rich. +, *Brachypodium sylvaticum* (Huds.) P.B. +.2, *Salvia glutinosa* L. +.1, *Prenanthes purpurea* L. +, *Hieracium racemosum* W. et K. +, *Tamus communis* L. +, *Ajuga reptans* L. +, *Epilobium montanum* L. +, *Circea lutetiana* L. +, *Campanula trachelium* L. +, *Epipactis purpurata* Sm. +.

The occurrence of *E. purpurata* in a mixed beech-fir forest (ass. *Abieti-Fagetum*) on Mt. Maljen is not surprising, bearing in mind that it was also recorded in similar forest communities in Europe. Rivas-Martínez et al. (2002) noted that this species is characteristic for the vegetation order *Fagetalia sylvaticae* Pawłowski in Pawłowski, Sokołowski & Wallisch 1928. According to literature data (Summerhayes, 1951; Buttler, 1991; Lang, 2004; Delforge, 2006), *E. purpurata* inhabits deciduous woodland (beech, more rarely oak), mixed woodland, rarely coniferous forests or plantations, and can be found up to 1,500 m a.s.l. In Denmark it is restricted to deciduous forest (mainly beech woods) and situated in areas where plastic clay from the Eocene reaches the surface (Ehlers and Pedersen, 2000). It usually grows in groups of 2-15 (up to 200) specimens (Füller, 1986).

E. purpurata is a shade-tolerant species, growing in moderate moisture, more often on fresh soils, rich in lime, argillaceous or sandy soils (Vakhrameeva et al., 2008). According to Lang (2004), this species grows on chalk soils and "clay-with-flints". Procházka and Velísek (1983) found *E. purpurata* on soils with pH 4.6 - 6.0.

Flowering period: The flowering of *E. purpurata* lasts from the last week of July until the last week of August on Mt. Maljen. The optimal (full) flowering period includes the first and the second weeks of August. According to Vakhrameeva et al. (2008), *E. purpurata* flowers

from the end of July to the middle of September. Summerhayes (1951) noted that specimens with broader leaves flower earlier.

Pollination: *E. purpurata* is a cross-pollinated plant, and the pollinators are wasps (*Vespula germanica* Fab., *V. sylvestris* Scop., *V. vulgaris* L.), female Cuckoo Bees, Buff-tailed Bumblebees and *Dascillus cervinus* L. (Füller, 1986; Lang, 2004; Brodmann et al., 2008).

Mycorrhiza: The roots of *E. purpurata* countain almost no mycorrhizal fungi (Fuchs and Ziegenspeck, 1925). When specimens grow in deep shade, they significantly depend on the mycorrhiza (Summerhayes, 1951). Rarely, specimens are apparently saprophytic; they may completely lack chlorophyll, and are entirely pink or pale violet (Delforge, 2006).

Population size: Three specimens were recorded in 2004 (6th September) and 2005 (1st July) and seven specimens were recorded in 2009 (18th July) within an area of 120 m^2. The low abundance of *E. purpurata* may be explained by the specific pollination ecology of this species and the specific characteristics of the soil.

IUCN threatened status in Serbia: According to the IUCN (2001) categories and criteria applied in Serbia, *E. purpurata* is classified as Critically Endangered (**CR D**). The threatened status is based on the number of specimens, which is under 50. The species is on the CITES list and in the list of Internationally Important Species (UNEP-WCMC, 2010).

CONCLUSIONS

The finding of *E. purpurata* on Mt. Maljen (Western Serbia) represents the first recording of this species on the territory of Serbia. The newly-recorded orchid species inhabits a forest community *Abieti-Fagetum sensu lato* ***developed on*** diabase and split. All the specimens were recorded at 740 m altitude, in the shade, on soil which is moderately moist.

Bearing in mind that *E. purpurata* is concentrated in the temperate zone of western and central Europe, the discovery of this plant in Serbia significantly contributes to a better understanding of the species' distribution. Considering the fact that orchids are poorly studied in Serbia, and the fact that this species belongs to late flowering geophytes, new findings in adequate habitats in Serbia are possible.

According to the IUCN (2001) categories and criteria applied in Serbia, *E. purpurata* is classified as Critically Endangered.

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