NEW DISTRIBUTION DATA FOR THE ENDEMIC SPECIES *EPIPACTIS GUEGELII* ROBATSCH (*ORCHIDACEAE*) IN THE WESTERN SIDE OF ROMANIA

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Abstract: *The endemic species Epipactis guegelii Robatsch is considered a very local and rare one among the Epipactis genus. Epipactis guegelii was described in 1996 by Karl Robatsch from the Danube Delta, the Letea Forest. Just after some years, in 2008 this species had another publication record by Wolfgang Wucherphennig who revisited Letea Forest. He traveled in this isolated area with the purpose to study this very little known Epipactis species among other rare orchid species like E. danubialis Robatsch § Rydlo which grows together with E. guegelii in this remote area. As a result of his investigations he reconfirmed the presence of this two species in this area and clarified their status, proved that E. danubialis Robatsch § Rydlo is identical to E. persica (Soó) Hausskn. ex Nannf. and E. guegelii Robatsch to be considered a distinct species from E. helleborine. It is known that the taxonomy of the genus Epipactis as being difficult because of the particularity of morphological aspects needed for identification. These morphological characters of Epipactis genus are observed in most cases just in fresh blooming plants. When studying herbarium specimens of this genus the most important diagnostic characters that differentiate similar species cannot be observed anymore. After more than 20 years since the first description of E. guegelii, we found E. guegelii in the western side of the country, in three locations, in the riparian/alluvial forests of the Banat region. With this new observation data on the E. guegelii the chorology of this species is extended much further from its original eastern habitat. This new location data from the Banat region, so further away from its eastern limits, might indicates that the view of the endemic status of E. guegelii for Romania is having by now could change in the future. This new find might help to fill in the gaps in geographical distribution of Epipactis species at European level by extending further the eastern limits of this species. Discussions and morphological diagnosis characters are documented by pictures of plants taken in these new sites we discovered. From all these new locations another orchid species are mentioned, associated plant species are documented, habitat notes, population size and conservational concerns are presented besides.*

Keywords*: Epipactis guegelii, endemic species, chorology, Romania, new occurrence records.*

INTRODUCTION

This paper presents new distribution data on the endemic species *Epipactis guegelii* Robatsch in Romania. *E. guegelii* was described by K. Robatsch in 1996 from Danube Delta (ROBATSCH, K., 1996), Letea Forest and is considered a very local and extremely rare among other European *Epipactis* species. Previously in 1989 another *Epipactis* species was described from Danube Delta as *E. danubialis* Robatsch § Rydlo (ROBATSCH, K., 1989). This species was found together with another *Epipactis* species which was not in a blooming state at that moment and was initially presumed to be *E. helleborine* (ROBATSCH, K. 1996). Just later in July 1995 when K. Robatch visited again Danube Delta he found this *Epipactis* in a proper full blooming state and described as *E. guegelii* (ROBATSCH, K., 1996). During the 2006 and 2007 W. Wucherpfennig visited couple times the Danube Delta - Letea Grind, exactly the site were this species were previously described with the purpose to study this rare *Epipactis* species. As a result of his investigations he reconfirmed the presence of this two species in this area and clarified their status, proved that *E. danubialis* Robatsch § Rydlo is identical to *E. persica* (Soó) Hausskn. ex Nannf. and *E. guegelii* Robatsch to be considered a distinct species from *E. helleborine* (WUCHERPFENNIG, W., 2008).

The main international scientific databases mention *E. guegelii* and accept this name and its geographical distribution in Romania. In the recent checklists of Romanian (SÂRBU, I., ET ALL, 2013; CIOCÂRLAN, V., 2009) *E. guegelii* is not presented. It is mentioned by G. Negrean in addenda to "Flora Romaniae"

(NEGREAN, G., 2011) and in another recent publications related to *Epipactis* (ARDELEAN, C., 2011, ARDELEAN, C., 2018).

MATERIAL AND METHODS

This new distribution data of *E. guegelii* was found while searching different forests for *Epipactis* species in Banat region. During the summer of 2016 we find the first locations of *E. guegelii* in a close proximity of Ghiroda area, in Bistra Forest (Timis county). In the summer of 2017-2018 we investigated again Bistra Forest and gather more data, extended the research to the Green Forest along the Behala water channel (near Timisoara, Timis county) and the forested areas along the Mures river, in Arad (Arad county) where we considered that we could find proper habitat and phytosociological characteristics. For each investigated taxa we gathered data about associated plant species, habitat type and data about population size. High resolution images of each morphological detail were taken and voucher images were stored online in the database Nature Digital Object Repository (NDOR) and can be found within the species pages at http://kladia.info. The collected specimens will be deposited in a public herbarium.

RESULTS AND DISCUSSIONS

Description and diagnostic characters of *Epipactis guegelii* Robatsch.

E. guegelii is a medium size *Epipactis,* about 30-45 cm tall, the stem is thin which often hangs on the surrounding vegetation, the stem is sometimes slightly brown and glabrous in the lower part and dense pubescent at the tip; it has 1-2 basal leaves, 4-5 upper leaves, the leaves are lanceolate and longer than the internodes, spreading-arched with a bluish-green colour; lower leaves around 5m long, 2 cm wide, middle leaves are around 7 cm long, 3,5 cm wide, upper leaves around 8 cm long, 2,5 cm wide and 6 cm, 1,8 cm wide. The inflorescence is rather lax, one-sided with 10-20 small flowers mostly greenish in colour, pinkish petals; lateral sepals are 7,5 mm long, 4,5 mm wide. Hypochile is greenish-brown inside. The junction hypochile-epichile is broad, epichile is heart shaped with toothed margins with two slightly wrinkled bosses at base, the tip of the epichile is usually straight. Ovary is elongated and slightly pubescent. Anthere are broad and short with a short pedicel. Viscidium is highly developed and efficient, pollinia is compacted and cohesive. It is a allogame species. Flowering season is starting before middle of June. (ROBATSCH, K., 1996, DELFORGE, P., 2006)

Differences from related species.

Until today because of its rarity, with a very local distribution and not so easily accessible location, *E. guegelii* has just a very few published papers from the time of its original description. This might indicates that some aspects of its morphologic variability might not be understood yet. However the flowers of *E. guegelii* can shows a slight morphological variability mostly in the intensity of the color (Table II).

A similar species is considered *E. helleborine* (L.) Crantz. Both of those taxa are allogamous species. In the investigated areas *E. guegelii* grows together with *E. helleborine* and blooms a bit earlier than *E. helleborine* but at some point the blooming time overlap. At a first look we acknowledged some differences in the habitus, the thinner stem of *E. guegelii* which often hangs on a side, also the color of the leaves are different with a bluish-green tint, the pendant aspect of the leaves, the lax dispersal of the leaves on the stem and the smaller bracts. *E. helleborine* has a much thicker stem, the leaves are much darker in color and have a longer bracts (Table I). Another differences from *E. helleborine* are the aspect of the inflorescence which is almost one-sided in *E. guegelii* and the elongated shape of the ovary. In *E. helleborine* the inflorescence is dense with many flowers. The margins of the epichile have clearly toothed edges in *E. guegelii* which is different than *E. helleborine*. The fruits of *E. guegelii* are elongated and are not rounded like in *E. helleborine* (Table II).

We have observed that some plants of *E. guegelii* were not standing straight up, actually some of them were lying on the grown while in full bloom. This aspect in the habitus of the plants is mentioned also from the area of the locus classicus of *E. guegelii* (ROBATSCH, K., 1996; WUCHERPFENNIG, W., 2008). From our observations from the past three years now the position of the stem are strongly influenced by the edaphic

condition and how much humidity is retained in the ground when the plant is blooming. The alluvial and riparian forest anyway tend to be more humid then others even during the summer months.

From our investigated areas we observed that the differences are even in the habitat preferences which are similar with the observations made previously in the locus classicus of *E. guegelii* from Danube Delta (WUCHERPFENNIG, W., 2008). In Bistra Forest (Ghiroda area, Timis county) *E. guegelii* can grow side by side with *E. helleborine* in the dryer spots but in the channeled areas of the forest were the water is stagnant during the winter through early spring season the preferences of the two species changes. *E. guegelii* prefers the humid areas which is subject to periodic floods and it grows on some areas on this channels when the water recedes later in spring. In this area just *E. guegelii* is growing in numerous exemplars, *E. helleborine* preferring a much dryer and brighter location than *E. guegelii*. The same observations were made previously from the locus classicus of *E. guegelii* (ROBATSCH, K., 1996, WUCHERPFENNIG, W., 2008) (Table IV).

Another similar species is *E. helleborine* subsp. *minor* (R. Engel) Engel but this subspecies prefers a different habitat, growing on acid substrate, the habitus of the thin stem looks similar like in *E. guegelii* but are differences in the morphology of the epichile which is not dentate at the edges, also the blooming time is later.

Habitat and population data of E. guegelii Robatsch.

We found *E. guegelii* in in the western side of Romania in three locations. One is located near Ghiroda (Timis county), in Bistra Forest at an elevation of 80 m; collection date is: 10 June 2016 plants in full bloom, 22 June 2017 plants in full bloom, 27 may 2018 plants with well-developed inflorescence and buds, 12 June 2018 plants in full bloom, 18 June 2018 few plants in full bloom. The Bistra Forest is crossed by water channels that are mostly full of water in the cold season. Later in the spring when the water recedes, *E. guegelii* begins to grow in these dry channels. In this location the individuals are numerous and grows through the dense vegetation in those channels and also grows in other areas through the forest. The second location is in Green Forest, near Timisoara (Timis county) where we find *E. guegelii* along the Behela water channels, at an elevation of 90 m; collection date: 7 June 2018 just very few plants, at the beginning of flowering period (Table IV).

In these two locations *E. guegelii* is growing in two types of habitats. According to the European habitat classification is a 91E0* habitat - Alluvial forests with *Alnus glutinosa* and *Fraxinus excel*sior and a 91F0 habitat - Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (*Ulmenion minoris*) (GAFTA D. § MOUNTFORD O. J., 2008).

A list of species present in these locations are: *Alnus glutinosa* (L.) Gaertn., *Quercus robur* subsp. *pedunculiflora* (K.Koch) Menitsky, *Fraxinus excelsior L., Acer campestre* L., *Ulmus laevis* Pall., *Prunus serotina* Ehrh., *Cornus sanguinea* L., *Rubus caesius* L., *Galium aparine* L., *Erigeron annuus* (L.) Pers., *Lycopus europaeus* L., *Anthriscus cerefolium* (L.) Hoffm., *Anthriscus sylvestris* (L.) Hoffm., *Pulmonaria officinalis* L., *Lapsana communis* L., *Symphytum officinale* L., *Geranium robertianum* L., *Urtica dioica* L., *Calystegia sepium* (L.) R. Br., *Alliaria petiolata* (M.Bieb.) Cavara & Grande, *Glechoma hederacea* L., *Circaea lutetiana* L., *Dioscorea communis* (L.) Caddick & Wilkin, *Stachys sylvatica* L., *Rumex sanguineus* L., *Scrophularia nodosa* L., *Corydalis cava* (L.) Schweigg. & Körte, *Stellaria neglecta* Weihe, etc. Besides *Epipactis helleborine* (*L.*) Crantz, we found another orchids in these forests: *Platanthera bifolia* (L.) Rich., *Epipactis purpurata* Sm.

The third location is in Arad, along forested area of the Mures river, at an elevation of 98 m; collection date: 24 June 2017. The habitat is 92A0 - *Salix alba* and *Populus alba* galleries (GAFTA D. § MOUNTFORD O. J., 2008). This area had a strong antropic impact and we found just very few scattered exemplars on this location. Associated plant species from this location are: *Populus nigra* L., *Salix alba* L., *Fraxinus excelsior L., Ulmus laevis* Pall., *Epipactis helleborine* (*L.*) Crantz, *Humulus lupulus* L., *Moehringia trinervia* (L.) Clairv., *Rubus scaber* Weihe, *Parthenocissus inserta* (A. Kern.) Fritsch, *Urtica dioica* L., *Vitis vulpina* L., *Hedera helix* L., *Phalaris arundinacea* L., *E. helleborine* (L.) Crantz. etc.

The habitats from our investigated areas are very similar with the habitat and phytosociological characteristics described in the original description for *E. guegelii* from the Danube Delta which is a riparian forest with *Quercus*, *Fraxinus*, *Populus*, *Salix*. The very particular edaphic condition that occurs related to the

fluctuant humidity associated with a certain type of the surrounding vegetation is also the same as in the locus classicus (ROBATSCH, K. 1996) (Table IV).

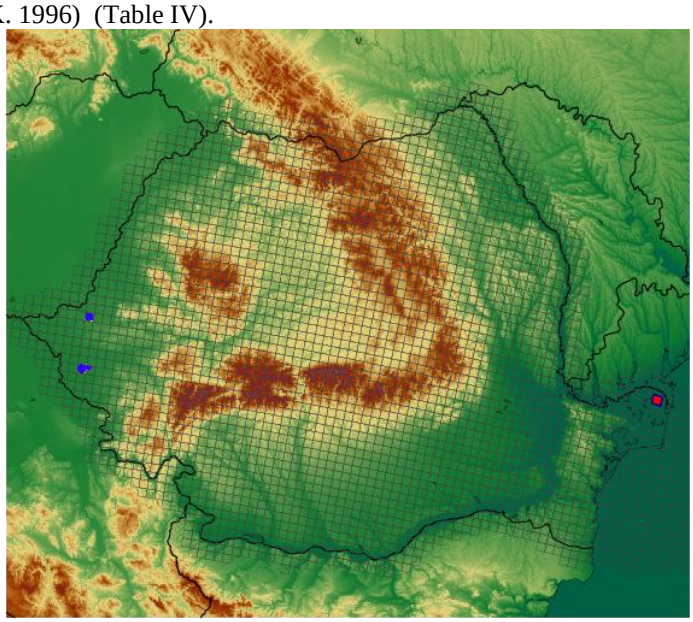

Fig.1. Map distribution of *Epipactis* ***guegelii*** shows the new locations in the western side of Romania and the old data from Letea Forest (Danube Delta) (map from https://kladia.info).

CONCLUSIONS

We found *E. guegelii* Robatsch in the western side of the country, in three locations, in Bistra Forest near Ghiroda (Timis county), in Green Forest near Timisoara, along the Behela water channel (Timis county) and in Arad along the forested area of Mures river (Arad county). The habitat is a riparian/alluvial forests in the Banat region and very similar with the habitat preference of *E. guegelii*. With these new observations data on the *E. guegelii* the chorology of this species is extended much further from its original eastern habitat. This new location data from the Banat region, so further away from its eastern limits might indicates that the view of the endemic status of *E. guegelii* for Romania is having by now could change in the future. This new find might help to fill in the gaps in the geographical distribution of *Epipactis* species at European level by extending further the eastern limits of this species.

Because the orchids are threatened by loss of habitat in many regions all orchids are included under Annex B of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In woodland the loss of habitat is caused by clearing of old trees or trees with economic importance, construction of roads, etc.

In many European countries some of the rare and vulnerable *Epipactis* species are included in the Red Lists with their threatened status (https://www.iucnredlist.org/search?query=Epipactis&searchType=species) . The fact that these *Epipactis* species are classified as threatened indicate the importance of taking specific measures to conserve the habitats were this species are present. In the last couple of hundreds of years in the Banat region the riparian and alluvial forests were drastically reduced and changed in many ways and today most of these remnant forests have a strong antropic impact or are under the pressure of constant selective clearings.

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Table 1

1-5 ***Epipactis guegelii,*** **Habitus,** 1-4 exemplars from Bistra Forest (Ghiroda area), 1-2 from 10 June 2016, 3 from 12 June 2018, 4 from 22 June 2018, 5 exemplar from Green Forest (Timisoara area) from 1 June 2018 (© C. Steiu)

Table 2

1-3 ***Epipactis guegelii,*** **flowers detail,** exemplars from Bistra Forest (Ghiroda area), 1 from 22 June 2018, 2 from 10 June 2016, 3 from 10 June 2017 (© C. Steiu)

Table 3

1-5 *Epipactis guegelii*, exemplars from Bistra Forest (Ghiroda area),
1-2 flowers detail, 3- 5 column detail, from 12 June 2018 (© C. Steiu)

Table 4

***Epipactis guegelii* h**abitat in Green Forest (Timisoara area), we found just few exemplars of *E. guegelii* growing along the Behela water channels, 10 June 2018 (© C. Steiu)

***Epipactis guegelii* h**abitat – Bistra Forest (Ghiroda area) - aspect of Bistra water channels in spring time; most of the water begins to recedes later in the spring and *E. guegelii* begins to grow in these dry channels, 22 April 2018 (© C. Steiu)