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## ***Epipactis helleborine* subsp. *moratoria* Riech. & Zirnsack, a new subspecies for the flora of Greece**

### **Keywords**

*Orchidaceae*; *Epipactis helleborine* subsp. *moratoria*, Flora of Greece, Macedonia.

### **Summary**

Antonopoulos, Z., Bergfeld, D. & S. Tsiftsis (2011): *Epipactis helleborine* subsp. *moratoria* Riech. & Zirnsack, a new subspecies for the flora of Greece.- J. Eur. Orch. 43 (1): 85-98.

*Epipactis helleborine* subsp. *moratoria* Riech. & Zirnsack, a newly described taxon from Germany, has also been found for the first time on some mountains of northern Greece. Its geographical distribution, its habitats as well as its taxonomy are shortly discussed. In addition, the main traits that differentiated it from *E. helleborine* subsp. *helleborine* are well documented. In a large scale, the scattered distribution of *E. helleborine* subsp. *moratoria* may indicate a wider distribution of it in whole Europe.

### **Zusammenfassung**

Antonopoulos, Z., Bergfeld, D. & S. Tsiftsis (2011): *Epipactis helleborine* subsp. *moratoria* Riech. & Zirnsack, eine neue Unterart für die Flora von Griechenland.- J. Eur. Orch. 43 (1): 85-98.

Es wird über die Erstfunde von *Epipactis helleborine* subsp. *moratoria* in Griechenland in den Jahren 2008 – 2010 berichtet. Diese Funde stammen aus dem Falakron-Gebirge im Bezirk Drama, dem Olymp im Bezirk Pieria sowie dem Paiko und Vorras. Die bislang in Griechenland bekannte Verbreitung ergibt sich aus Fig. 12. Diese Unterart wurde vor wenigen Jahren von RIECHELMANN & ZIRNSACK (2008) aus der Fränkischen Alb beschrieben mit einer Ergänzung in 2010. In Baden-Württemberg wurde diese Unterart ebenso gefunden (BERGFELD 2009).

Die Populationen in Griechenland entsprechen weitgehend den Pflanzen in

Süddeutschland. Eine Population von etwa 80 Pflanzen am Falakron wurde in einer Stichprobe ausgemessen (Tab. 1). Wo die Pflanzen etwas lichter stehen, können die Blätter kürzer sein als in Deutschland, auch der Stängel gerader. Die Blütenabmessungen entsprechen den für die deutschen Populationen mitgeteilten Größen (RIEHELMANN & ZIRNSACK 2008; BERGFELD 2009).

Diese Unterart ist generell allogam. Bei einzelnen Pflanzen wurde der Übergang zur Autogamie festgestellt. Die Pollinien können nach dem völligen Aufblühen bröselig werden. Auch wurde beobachtet, dass sie im Paket aus den Pollenfächern herausgeschoben werden. Durch Biegung der Stielchen gelangen die Pollinien auf die Klebdrüse und die Narbe (Abb. 7). Wie in Deutschland dringt diese Unterart auch in Griechenland in lichtarme Buchenhochwälder vor, wo sie u. a. mit *Cephalanthera damasonium* und *Neottia nidus-avis* vergesellschaftet ist.

Vorkommen in Süditalien, die unter *E. schubertiorum* publiziert wurden (BARTOLO & al. 1996), scheinen nach der Blütenmorphologie mit *E. helleborine* subsp. *moratoria* nah verwandt zu sein. Allerdings finden sich in den Erstbeschreibungen beider Taxa Unterschiede hinsichtlich Habitus und besiedelten Biotopen. BERNARDO (2009: 245) zeigt eine Pflanze, die von dem bei BARTOLO & al. gezeigten typischen Exemplar deutlich abweicht. Nur BAUMANN & al. (2006) geben einen zierlichen und mit *E. helleborine* subsp. *moratoria* vergleichbaren Wuchs an. Der Status beider Taxa erfordert deswegen weitere vergleichende Untersuchungen.

### Περίληψη

Αντωνόπουλος, Ζ., Bergfeld, D. & Σ. Τσιφτσής (2011): *Epipactis helleborine* subsp. *moratoria* Riech. & Zirnsack, ένα νέο υποείδος για την ελληνική χλωρίδα. - J. Eur. Orch. 43 (1): 85-98.

Το *Epipactis helleborine* subsp. *moratoria* Riech. & Zirnsack, ένα taxon το οποίο πρόσφατα περιγράφηκε από τη Γερμανία, καταγράφηκε για πρώτη φορά σε ορισμένα ορεινά συγκροτήματα της βόρειας Ελλάδας. Στα πλαίσια της παρούσας εργασίας, δίδονται πληροφορίες που αφορούν τη γεωγραφική του εξάπλωση, τα ενδιαιτήματα στα οποία απαντάται, καθώς επίσης και ταξινομικά σχόλια. Επιπρόσθετα, αναφέρονται τα κύρια χαρακτηριστικά τα οποία το διαφοροποιούν από το *E. helleborine* subsp. *helleborine*. Όσον αφορά τη γεωγραφική του εξάπλωση, οι διάσπαρτες θέσεις οι οποίες είναι γνωστές, ενδεχομένως να καταδεικνύουν μια ευρύτερη εξάπλωση του εν λόγω taxon σε ολόκληρη την Ευρώπη.

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## 1. Introduction

Among the species of the genus *Epipactis* Zinn, *E. helleborine* was characterized in the past, as well as nowadays, as one of the most variable ones (DAVIES & al. 1984). As a result, individuals, covering an extensive part of variability regarding the size, the shape and the disposition of the leaves, as well as those of the bracts and the flowers, recognized as *E. helleborine* specimens. In recent times, many taxa have been split out from *E. helleborine* s.l. increasing the number of taxa belonging to the *E. helleborine* group, according to DELFORGE (2006) to 13 (11 species and 2 varieties). Additionally, in 2008, *E. helleborine* subsp. *moratoria* has been described as new for the science (RIEHELMANN & ZIRNSACK 2008). It can be clearly distinguished from *E. helleborine* subsp. *helleborine* as it is differentiated in the stem morphology, the leaves, the inflorescence, the flowers, as well as the ovary.

On a trip to the Falakron mountain on 05<sup>th</sup> and 06<sup>th</sup> of July of 2008 a population of a small-sized *Epipactis* has been found, which was not able to be classified to the until that time known taxa of the mountain. Despite the fact that the most individuals were not in flower yet, these were elegant with a slightly flexuous stem, four or five cauline leaves with a small basal one and a fairly lax inflorescence. Because only few flowers were half opened and a final determination was not possible, the authors visited Mt. Falakron again, while they made several additional excursions in other mountains of central and north Greece. Except from Mt. Falakron where the unknown *Epipactis* was first located, in 26<sup>th</sup> July of 2008 similar individuals have been found by the authors on Mt. Olympus. Since *Epipactis helleborine* subsp. *moratoria* was not yet described, they concluded that these plants from Mt. Olympus might be *E. helleborine* subsp. *schubertiorum* or *Epipactis helleborine* var. *minor*.

## 2. Materials and methods

This study was based on personal observations and collections from different mountains of north Greece in the period 2008-2010. Field data about the distribution, population size and habitats were collected. In addition, morphometric characters were measured from the individuals of Mt. Falakron which are given in Table 1. The known localities of *E. helleborine* subsp. *moratoria* are presented and a distribution map was created using DMAP software ver. 7.3.

### 3. Results and discussion

#### 3.1 Characteristics of *E. helleborine* subsp. *moratoria*

Because of the different morphological traits, it is clear to make a distinction between *E. helleborine* subsp. *moratoria* and *E. helleborine* subsp. *helleborine*. This includes specific features of the stem, the leaves, the inflorescence, the flowers, as well as the ovary. A detailed description is given by RIECHELMANN & ZIRNSACK (2008: 57-84) and supplementary by RIECHELMANN (2010: 222-235). In addition, BERGFELD (2009: 519-528) points out the morphological traits of *E. helleborine* subsp. *moratoria* found at Baden-Wuerttemberg.

*Epipactis helleborine* subsp. *moratoria* could be characterized by the elegant habitus and the flexuous, hairy stem, the long lanceolate crooked leaves and a loose, one-sided inflorescence which bears few flowers (mostly between 10 and 20 flowers). The basal leaf is ovate and is strongly reduced in the populations of south Germany (RIECHELMANN 2010: 223), while in northern Greek populations it is also ovate but slightly bigger. The length of the cauline leaves varies in the Greek populations; in some locations these are shorter than in Germany. Their leaves, generally, tend to be shorter in the lighter micro-sites compared to the shady beech forests where the leaves are larger. In addition, the stem in the lighter micro-sites is almost straight without being as flexuous as in the shadier ones. However, the species of the genus *Epipactis* are characterized by a great variability in the leaf size and shape. This makes the absolute use of these traits in the classification process insecure.

On Mt. Falakron, near Volakas (municipality of Kato Nevrokopi), we have found a population with at least 80 individuals. The data of a representative sample, constituted of six individuals, are presented in Table 1.

The flowers look almost square because the petals are only slightly shorter in proportion to the sepals (Table 1). In comparison to *E. helleborine* subsp. *helleborine* the flowers are clearly smaller with a length of the labellum between 7.5 and 9.5 mm. Although the sepals are always coloured green, the petals show a chromatic circle from greenish to white and also pink (seldom magenta-coloured).

The epichil is coloured in most populations almost purely white, more or less, can show also light rose's tones or green ones. The colouring of the flowers becomes more intense during the anthesis. The broadly cordate epichil, 0.4 cm long and 0.4 cm wide, is  $\pm$  serrated, without or with two small sized swellings. In fresh flowers, tip is just stretched, whereas later it is curved backwards. The hypochil is coloured between tan or almost brown.

Table 1: Biometrical data of *E. helleborine* subsp. *moratoria*, population near Volakas, to July 11, 2010 [measurements in mm]. Mean values, as well as the standard deviation (SD) are also presented.

Details of the plants\ Sample nr.	1	2	3	4	5	6	Mean	SD
Height	200	270	240	230	270	270	246.7	28.8
Leaves [n]	5	5	5	5	6	6	5.33	0.52
Length of the basal leave	25	23	24	28	21	20	23.50	2.88
Width of the basal leave	24	28	19	21	15	15	20.33	5.13
Length second cauline leave	50	52	53	57	65	50	54.50	5.75
Width second cauline leave	35	36	27	31	48	28	34.17	7.68
Flowers [n]	13	11	5	12	8	7	9.33	3.14
Length of the sepals	11	12	10	9	10	9	10.17	1.17
Width of the sepals	5	6	6	5.5	6	5	5.58	0.49
Length of the petals	9	10	8	8	9	8	8.67	0.82
Width of the petals	6	5.5	5	5	5.5	5	5.33	0.41
Length of the labellum	8	9.5	9	7.5	8	8.5	8.42	0.74

The plants are general cross-pollinating with a functional rostellum (RIEHELMMANN & ZIRNSACK 2008: 70 and 72). This fact has been also attested in Baden-Württemberg (BERGFELD 2009: 528, Abb.4) as well as in Greece for the purposes of the present study. It has been observed that, sometimes, the anther moves upwards and the pollinia, in the form of compact masses, get out of the pollen shelves onto the rostellum (Fig. 7). This change takes place after the complete opening of the flower. However, few plants have been observed to be self-pollinated, as the powdery pollinia of their flowers fell onto the active zone of the stigma.

Another difference between the two subspecies is the position of the ovary. Although in *E. helleborine* subsp. *moratoria* is horizontal during maturity, in *E. helleborine* subsp. *helleborine* is  $\pm$  hanging downwards. In addition, in the former subspecies the ovary is relatively shorter compared to latter one.

### 3.2 Occurrence and locations of *Epipactis helleborine* subsp. *moratoria* in Greece

Northern Greece is especially rich in taxa of the genus *Epipactis* with *E. helleborine* s.l. being one of the commonest and most abundant as regards its distribution range and population size, respectively (TSIFTSIS 2009). After the description of *E. helleborine* subsp. *moratoria* by RIECHELMANN & ZIRNSACK (2008) it has been found in several mountains of north Greece (Fig. 12). In more detail, it has been found on Mts. Falakron, Olympus, Paiko, Vorras and Menikion. In all cases, the habitat type was shady beech forests (*Fagus sylvatica*) above limestones, while on Mt. Menikion it inhabited mixed forests of beech (*Fagus sylvatica*) and fir (*Abies borisii-regis*). As in Germany, other orchids that are associated with it in north Greece are *Cephalanthera damasonium* and *Neottia nidus-avis*. More specifically, the subspecies was observed on Mt. Olympus also together with *E. microphylla* and *E. subclausa*, on Mt. Paiko together with *Epipogium aphyllum*, *Epipactis microphylla*, *E. persica* subsp. *gracilis* and *Neottia nidus-avis*, while on Mt. Menikion together with *Epipactis nauosaensis*, *E. helleborine* subsp. *helleborine*, *E. microphylla*, *Cephalanthera damasonium*, *C. rubra* and *Neottia ovata*. In most cases, *Epipactis helleborine* subsp. *moratoria* was growing sympatrically with *E. helleborine* subsp. *helleborine*. Their difference was that the former was occupying shadier micro-sites while the later one preferred lighter micro-sites or forest edges.

In more detail, *E. helleborine* subsp. *moratoria* in northern Greece has been found in the following places (UTM WGS 84):

#### **Mt. Falakron**

35 T 0249933; 4576610; altitude 1095 m, Volakas, Entrance to the stone quarry above Volakas in the area of the fork of the street to the ski centre in Prof. Ilias, beech timber forest, at least 80 Ex. bud – early flower, July 06, 2008 (Dietrich Bergfeld & Gisela Neff) and July 09, 2010, (Dietrich Bergfeld & Heribert Heil).

34 T 0744742; 4575821; altitude 846 m, Granitis, from the street to Kato Nevrokopi branching off way northwesterly of the place, mixed forest , 5 Ex. early – full flower, July 11, 2010, (Dietrich Bergfeld & Heribert Heil).

35 T 0252812; 4572255; altitude 1073 m, Pyrgi, unpaved way to the east of the place, beech forest, 3 Ex. early - full flower, July 10, 2010, (Dietrich Bergfeld & Heribert Heil).

### **Mt. Olympus**

34 T 0624471; 4440770; 1030 m, Litchoro, from the street to Prionia branching off unpaved road, mixed forest, 10 Ex. bud - full flower, July 02, 2010, (Dietrich Bergfeld & Heribert Heil).

34 T 0623190; 4441888; 1120 m, Litchoro, from the street to Prionia branching off unpaved road, mixed forest, at least 10 Ex. bud – early flower, July 11, 2008 and July 16, 2010, (Dietrich Bergfeld & Heribert Heil).

34 T 0621508; 4440918; 1507m, footpath to Apostolides refugee, ≈10 plants, pure population, July 27, 2008 (Zissis Antonopoulos & Spyros Tsiftsis).

### **Mt. Paiko**

34 T 0608895; 4536177; 1410m, beech forest, unpaved road south-east of Livadia, ≈20 plants, starting flowering, together with *Epipogium aphyllum*, *Epipactis helleborine* subsp. *helleborine*, *Epipactis persica* subsp. *gracilis*, *Epipactis microphylla* and *Neottia nidus-avis*. July 23, 2010, (Zissis Antonopoulos).

### **Mt. Vorras**

34 T 0572694; 4529354; 1300m, mixed forest, 4,5 km east of ski resort, unpaved road to Orma village, ≈20 plants, pure population. Typical *Epipactis helleborine* subsp. *helleborine* observed only 500 m more to North-West, in more clear locations. July 24, 2010, (Zissis Antonopoulos).

### **Mt. Menikion**

34T 0731485; 4566204; 1300m, mixed forest, 50 plants, together with *Epipactis nauosaensis*, *Epipactis helleborine* subsp. *helleborine*, *Epipactis microphylla*, *Cephalanthera damasonium*, *Cephalanthera rubra*, *Neottia ovata*, August 1, 2010, (Spyros Tsiftsis).

## **3.3 European distribution of *Epipactis helleborine* subsp. *moratoria***

*Epipactis helleborine* subsp. *moratoria* has been found in numerous localities in Germany (RIEHELMANN & ZIRNSACK 2008; BERGFELD 2009), while additionally, it has also been found in Trentino, northern Italy (PERAZZA 2010; RIEHELMANN 2010). On the other hand, the occurrences that have been reported for Greece and analyzed in the present study largely extend the distribution area of it in Europe. As a result, and taking into account that *E. helleborine* subsp. *moratoria* is a taxon occurring mainly in beech forests in central Europe, as well as in those of northern Greece, it should be expected that it would be also distributed in other countries of the Balkan Peninsula and the Alps.

The occurrence in southern Italy of a closely related to *E. helleborine* subsp. *moratoria* taxon under the name *E. schubertiorum* (BARTOLO & al. 1996) should be checked. Despite the fact that *E. schubertiorum* differs from *E. helleborine* subsp. *moratoria* in leaf arrangement, plant height as well as the habitat types in which they occur, they are closely related regarding the flower morphology.

Furthermore, BERNARDO (2009) describes *E. helleborine* subsp. *schubertiorum* as a taxon clearly different from the taxon that BARTOLO & al. (1996) have described as *E. schubertiorum*, whereas BAUMANN & al. (2006: 84) describe *E. helleborine* subsp. *schubertiorum* as an elegant taxon up to 40 cm height which may correspond well to *E. helleborine* subsp. *moratoria*.

The until that time known distribution of *E. helleborine* subsp. *moratoria* together with the relatively unclear status between the two both above mentioned taxa indicate that supplementary studies should be carried out.

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- Fig. 2: *E. helleborine* subsp. *moratoria*, Habit, Paiko, 23.07.2010 (phot. ZA).  
Fig. 3: *E. helleborine* subsp. *moratoria*, Habit, Germany, Radolfzell, 10.07.2009 (phot. DB).  
Fig. 4: *E. helleborine* subsp. *moratoria*, Infructescence, Germany, Radolfzell, 10.07.2009 (phot. DB).  
Fig. 5: *E. helleborine* subsp. *moratoria*, Part of inflorescence, Falakron, Granitis, 11.07.2010 (phot. DB).

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- Fig. 6: *E. helleborine* subsp. *moratoria*, Part of inflorescence, Falakron, Volakas, 09.07.2010 (phot. DB).  
Fig. 7: *E. helleborine* subsp. *moratoria*, Autogamous flowers, Olympus, Karies, 02.07.2010 (phot. DB).  
Fig. 8: *E. helleborine* subsp. *moratoria*, Flower, Germany, Kraichtal, 01.07.2009 (phot. DB).  
Fig. 9: *E. helleborine* subsp. *moratoria*, Flower, Paiko, 23.07.2010 (phot. ZA).  
Fig. 10: *E. helleborine* subsp. *moratoria*, Flower, Menikion, 01.08.2010 (phot. ST).



Fig. 1: *Epipactis helleborine* subsp. *moratoria*. Habit, Falakron, Volakas, 09.07.2010 (phot. DB).







Fig. 11: *E. helleborine* subsp. *moratoria*; Flower, Vorras, July 24, 2010 (phot. ZA).

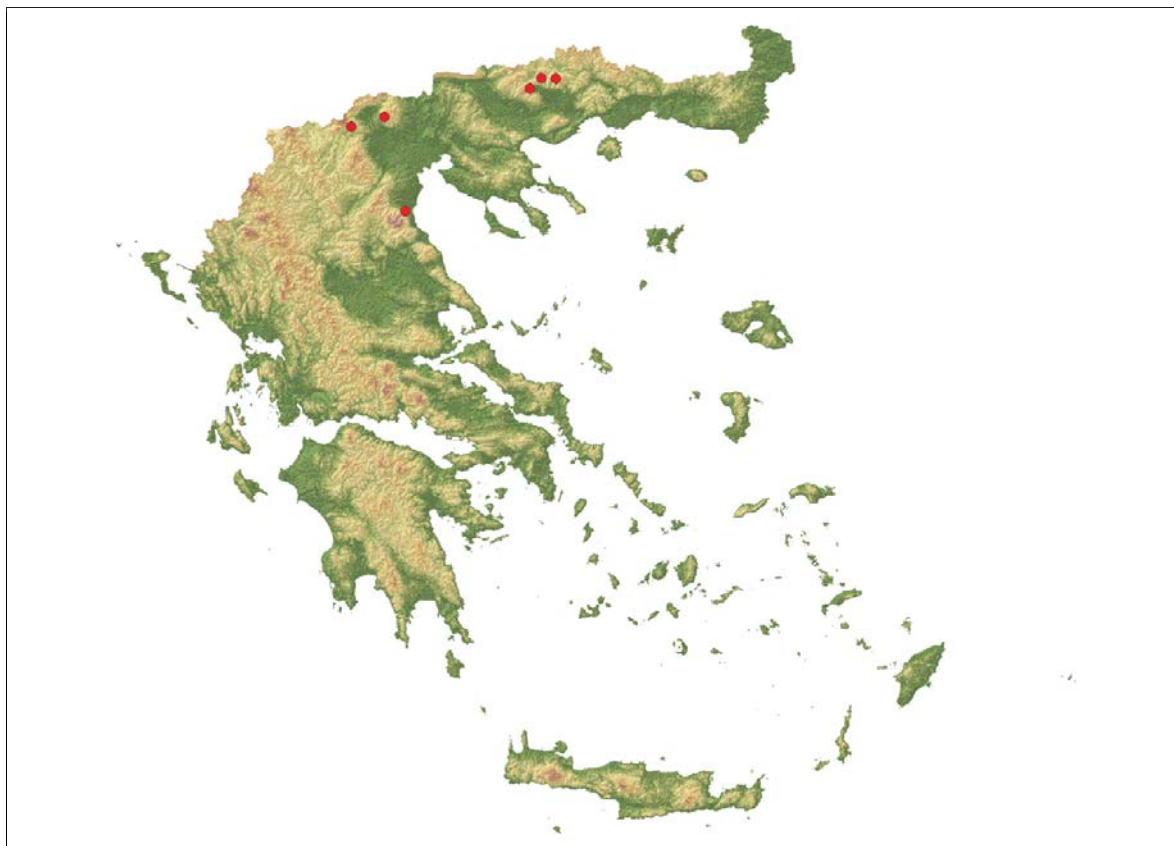


Fig.12: Distribution map of *Epipactis helleborine* subsp. *moratoria* in Greece.