# WILD ORCHID DIVERSITY WITHIN THE NERA GORGES-BEUŞNIŢA NATIONAL PARK HABITATS

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***Abstract:*** *The diversity and distribution of wild orchids within the Nera Gorges-Beuşniţa National Park (Caraş-Severin, Romania) was studied between 2009 and 2015. The last documented orchid inventory in the Nera Gorges region was published more than forty years ago. The presence of twenty six out of thirty-three orchid taxa known for this region was confirmed during our investigations. These represent almost half of the orchid species that occur in Romania, many of them being listed in the Annexes of Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora and in various national and European Red Lists. We discuss here the distribution of orchid taxa in relation to the Natura 2000 habitats identified within the borders of the protected area with remarks on the evolution of chorology of several species.*

***Key words:*** *Orchidaceae, distribution, habitats, Nera Gorges-Beuşniţa National Park*

## INTRODUCTION

The Nera Gorges-Beuşniţa National Park is located in the south-west part of Romania in Caraş-Severin county, in the southern side of Anina Mountains. The minimum altitude is 152 m and the maximum of 1162 m. The total area of this park is 37.100 ha. It is a protected area since 1943. Since 2000, it received the status of a national park comprising several nature reserves: Nera Gorges - Beuşniţa Gorge Susara, Ciclova - Ilidia, Ducin, Lisovacea and Bigăr Spring.

The study aim is a comparison of the current and historical occurrences of species of the Orchidaceae within the national park habitats, both because the members of this plant family often exhibit conservation issues and the presence of these plants could be an indicator of habitat stability. Until now, the most comprehensive investigation of Orchidaceae family in this area has been done by SCHRÖTT and FAUR (1972). These authors mentioned 33 species of orchids for this region. Various occurrence records of orchids from the South area of Banat are included in references that both list original distribution or records from literature reviews (RÖSLER & GOGA, 2002; RÖSLER, 2003). A more recent article that covers important conservation issues mentions 12 orchid species for the Nera Gorges-Beuşniţa National Park (BÂTEA *et al*., 2014). None of the authors deal with the types of habitats associated with the orchids in the Nera Gorges-Beuşniţa National Park. With the present study we reconfirm the presence of 25 species of orchids and add another species that was not previously recorded in the park. For each species we indicate the type of habitats in which it occurs together with some notes on occurrence status. In spite of its species diversity, no monitoring data for orchid species exist to date from the protected area. We suggest that the orchid species regardless their red-list status should be included in a monitoring program because even common species of this family may register fluctuations in relation to various anthropic and climate impacts and only long term monitoring data could give us a deep insight into the population dynamics (KULL & HUTCHINGS, 2006; JACQUEMYN *et al*., 2007; HORNEMANN *et al*., 2012; JACQUEMYN *et al*., 2015).

## MATERIAL AND METHODS

The study is based on botanical field research during the vegetation seasons starting with the

year of 2009 until the spring of 2015. The occurrence of the orchids in the field was recorded using a GPS and data was managed using the biodiversity toolkit from the mybiOSis project at http://mybiosis.info. The occurrence records were documented in detail including *in situ* voucher images of the observed specimens and habitat notes.

The nomenclature of Orchidaceae follows the World Checklist of Selected Plant Families from http://apps.kew.org/wcsp/. Habitat designation was according to the Interpretation Manual of European Union Habitats (EUR 27) and the Manual of habitat interpretation for Natura 2000 habitats in Romania (GAFTA & MOUNTFORD, 2008).

## RESULTS AND DISCUSSIONS

### Orchid species that depend on forest habitats

In order to thrive in an environment, orchids require particular ecological conditions being associated with specific habitats. They are mostly distributed in small clusters of individuals, usually occupying the gaps between the dominant plants.

More than half (about 61%) of the Nera Gorges-Beuşniţa National Park surface is covered by forest which includes a wide range of habitats. Half of the forested surface (about 30% of the park area) is represented by the *Asperulo-Fagetum* beech forests (H 9130). Other representative forest habitats are the Illyrian *Fagus sylvatica* forests (*Aremonio-Fagion*, H 91K0) with 15 % and the Medio-European limestone beech forest of the *Cephalanthero-Fagion* (H 9150) with 12% of the park surface. The rest of forested surface (less than 5%) is represented by a mixture of other types of forest habitats like Illyrian oak-hornbeam forests (*Erytrinio-Carpinion*, H 91L0), *Galio-Carpinetum* oak-hornbeam forests (H 9170), alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*, H 91E0*), Dacian oak-hornbeam forests (H 91Y0), *Tilio-Acerion* forests of slopes, screes and ravines (H 9180*), and Pannonian-Balkanic turkey-oak and sessile-oak forests (H 91M0).

The most common orchids species that depend on forest habitats are *Cephalanthera damasonium* (Mill.) Druce, *Cephalanthera longifolia* (L.) Fritsch, *Neottia nidus-avis* (L.) Rich., *Neottia ovata* (L.) Bluff & Fingerh., *Orchis mascula* subsp. *speciosa* (Mutel) Hegi. The preferred habitat of these species is the beech forests of the Medio-European *Cephalanthero-Fagion* on limestone (H 9150), which in the researched area can be found on Beiu Valley, Ducin Valley and the Nera Gorges.

*Cephalanthera longifolia*, *C. damasonium*, *Neottia ovata*, *Orchis mascula* subsp. *speciosa* are species with large scattered populations among the *Cephalathero-Fagion* (H9150) habitat (Figure 1). *Neottia ovata* and *Orchis mascula* subsp. *speciosa* occur predominantly in forest habitats, but sometimes to a lesser extent also in meadows that are more or less in closer vicinity of forest border.

*Platanthera bifolia* (L.) Rich. is more frequent in the beech forests of *Luzulo-Fagetum* (H 9110), but also occurs in other types of forest habitat like oak forests. *Platanthera chlorantha* (Custer) Rchb is found in Pannonian-Balkanic turkey-oak and sessile-oak forests (H 91M0).

*Dactylorhiza saccifera* (Brongn.) Soó is another common forest orchid in some areas within the Nera Gorges-Beuşniţa National Park (Figure 2). It is mainly found in *Asperulo-Fagetum* beech forests habitat (H 9130) (Figure 3). *D. saccifera* prefers mostly the humid edge of the forest and often can be seen along the main roadsides especially in natural drainage channels. From what we learn from other localities, the natural drainage channels along roads may be a vulnerable location when it comes to upgrading roads; when the road from Resiţa city to Semenic Mountain (a nearby area to Nera Gorges-Beuşniţa National Park) was improved the *D. saccifera* population along the road almost disappeared.

Less common orchid species that depend on forest habitats are *Epipactis purpurata* Sm. and *E. helleborine* (L.) Crantz.

*Epipactis purpurata* was recorded from a new location within the Nera Gorges-Beuşniţa

National Park. *E. purpurata* is a shade-tolerant species (Figure 4) that grows in moderate moisture more often on fresh, rich in lime, argillaceous, or sandy soils. Within the investigated area, this species was found in *Asperulo-Fagetum* beech forests (H 9130) with a localized population made of several clusters of exemplars.

*Epipactis helleborine* is generally known as a more tolerant orchid species that prefers a diverse spectrum of forest habitats. However, within the Nera Gorges-Beuşniţa National Park we observed it to be more representative for old forests and it was always found as small groups of very localized plants. Therefore, we consider this species as a less common orchid for this park. In the investigated area, this species prefers the beech forests of *Luzulo-Fagetum* (H 9110) and the *Cephalathero-Fagion* (H 9150) habitat.

Other rare orchid species that depend on forest habitats are *Orchis pallens* L., *Orchis militaris* Hornem., *Limodorum abortivum* (L.) Sw., *Cephalanthera rubra* (L.) Rich., and *Epipactis microphylla* (Ehrh.) Sw. *Orchis pallens* L. (Figure 5) and *Epipactis microphylla* were found in the Illyrian *Fagus sylvatica* forests (*Aremonio-Fagion*, H 91K0) and *Asperulo-Fagetum* beech forests (H 9130). In the Sasca Montană area, at the edge of the illyrian *Fagus sylvatica* forests (*Aremonio-Fagion*, H 91K0) can be found a few specimens of *Orchis militaris* Horn. *Cephalanthera rubra* (L.) Rich. was found as a single specimen in C*ephalathero-Fagion* (H9150) habitat in Beiu Valley (Figure 4).

*Limodorum abortivum* (L.) Sw. is a rare orchid species within the Nera Gorges-Beuşniţa National Park borders. It has an interesting biology having an atypical blooming during the years. An assessment of rare plants composition within the natural habitats of Romania (OPREA *et al*., 2010) mentions *L. abortivum* in Pannonian woods with *Quercus pubescens*, (H 91H0*) and eastern white oak woods (H 91AA*). These habitat types are not identified within the Nera Gorges-Beuşniţa National Park territory. We have identified *L. abortivum* in a clearence of the *Asperulo-Fagetum* beech forests (H 9130) and Medio-European limestone beech forests of the *Cephalanthero-Fagion* (H 9150).

**Orchid species that depend on grassland habitats**

In the Nera Gorges-Beuşniţa National Park territory about 10 % are grassland areas. These include a variety of specific habitats on calcareous substrate like semi-natural dry grasslands (H 6210*), subcontinental peri-pannonic scrub (H 40A0*), rupicolous basophile (H 6110*) and pannonic grasslands (H 6190). In some grassland areas the traditional management methods are abandoned and usually these places are massively invaded by woody plants signaling a transition toward a forested habitat type.

The most common orchids found on grassland habitats are *Anacamptis morio* (L.) R.M.Bateman, Pridgeon & M.W.Chase, *Anacamptis coriophora* (L.) R.M.Bateman and *Gymnadenia conopsea* (L.) R.Br. The preferred habitat for these orchid species is a semi-natural dry grassland and scrubland (*Festuco-Brometalia*, H 6210 *) which is a type of grassland considered important for orchid sites. *Anacamptis morio* can be found also in the rupiculous Pannonic grasslands (H 6190) in the close vicinity of Sasca Română village and on the Terezia Hill. Although these orchids are regarded as common in various locations within the Nera Gorges-Beuşniţa National Park, due to changing nature of the grassland habitats toward forest type habitats, we infer that their population density is much lower than in the past.

The orchid species that are specific to grassland habitats and are less common in the area are *Anacamptis pyramidalis* (L.) Rich., *Neotinea tridentata* (Scop.) R. M. Bateman, Pridgeon & M. W. Chase, and *Neotinea ustulata* (L.) R. M. Bateman, Pridgeon & M. W. Chase. All these species can be found in a semi-natural dry grassland and scrubland (*Festuco-Brometalia*, H 6210*).

A rare meadow specific orchid species for the Nera Gorges-Beuşniţa National Park is *Spiranthes spiralis* (Lour.) Makino (Figure 6). This is a light-loving species and prefers a wide range of substrates, but it has a typical preference for short grasslands (JACQUEMYN, 2010). Previously, this species was mentioned in Pleşivei Plateau in a high altitude mountain meadow within an area of

limestone sinkholes (SCHRÖTT & FAUR, 1972). We found *S. spiralis* in a new location near Cărbunari village in an area of well-grazed grasslands along the forest edge.

**Orchid species that are found in the meadows invaded by shrubs**

This type of habitat in the Nera Gorges-Beuşniţa National Park territory has its limits in continuous change. Among species for this type of habitat we list *Himantoglossum jankae* Somlyay, Kreutz & Óvári [erroneously named in the area as *Himantoglossum caprinum* (Marschall von Bieberstein) Sprengel] and *Ophrys scolopax* subsp. *cornuta* (Steven) E.G.Camus.

Within the Nera Gorges-Beuşniţa National Park, *Himantoglossum jankae* was found in meadows invaded by the scrubs and also in the clearings of the Pannonian-Balkanic turkey-oak and sessile-oak forests habitat (H 91M0) (Figure 7). These areas have an evolution toward forest habitat types with a great impact on *H. jankae* population. Another negative impact on this species that is relevant for this area are the severe droughts which can be prolonged even during the winter months when plants at all stages of their life-cycle could be very affected. In the past, this species was mentioned as one of the most frequent orchid species from this region (SCHRÖTT & FAUR, 1972). We found *H. jankae* only in two isolated localities within the Nera Gorges-Beuşniţa National Park from which only one includes a well sized population. Therefore, we may regard *H. jankae* as a rare orchid species.

*Ophrys scolopax* subsp. *cornuta* is a rare species (Figure 7) within the studied area that prefers xero-mesophilic grasslands invaded by scrubs. DIHORU and NEGREAN (2009) cite this species as being extinct from the Oraviţa area. However, from our observations we can reconfirm the presence of this species in the very close vicinity of Oraviţa town. This species is represented there by a small population with about 40-50 specimens. During the latent vegetation period in the late fall season, the number of visible plant rosettes should be higher. The anthropic impacts on this species in Oraviţa area are major and include overgrazing and the loss of habitat due to conversion of pasture to the arable land or building constructions. *Ophrys scolopax* subsp. *cornuta* is also present along the Nera Gorges in the limestone grasslands area near Sasca Română. The number of plants here is even smaller than within the Oraviţa area.

**Orchid species that depend on mezohygrophile habitats**

Hygrophyte to mesophyte phytocoenoses favourable for these orchids can be found just in a few sporadic locations within the Nera Gorges-Beuşniţa National Park area. Therefore, the presence of species like *Anacamptis palustris* subsp. elegans (Heuff.) R.M.Bateman, Pridgeon & M.W.Chase and *Dactylorhiza incarnata* (L.) Soó. is limited to some isolated spots. *Dactylorhiza incarnata* was localized at the entrance in the protected area from Potoc village. *Anacamptis palustris* subsp. *elegans* has en endangered habitat location near Potoc village (Figure 8).

It is very well known that orchid species confined to wet grassland suffer greater losses than species that are found in calcareous grasslands or forests (JACQUEMYN *et al*., 2005). These habitats, which in most cases are represented by small areas need a special attention and effort to save them from extinction.

**Orchid species that have not been reconfirmed for the area**:

*Ophrys fuciflora* (F.W.Schmidt) Moench was mentioned in the literature just for Beuşnita Basin on a xero-mezophilic grassland (SCHRÖTT & FAUR, 1972).

*Epipactis palustris* (L.) Crantz was found occurring sporadically on mesohygrophilic grasslands on Nera Valley (SCHRÖTT & FAUR, 1972).

*Epipactis atrorubens* (Hoffm.) Besser was mentioned in the past near Marila, Beiu Sec Valley, Nera Gorges and within the Beuşniţa Basin. Its presence was recorded as sporadic within the xero-thermophilous scrubs and in meadows (SCHRÖTT & FAUR, 1972; RÖSLER & GOGA, 2002).

*Anacamptis papilionacea* (L.) R.M.Bateman, Pridgeon & M.W.Chase was mentioned as rare for the region. Schrott and Faur recorded this species just from a few localities on xero-mezophilic

grasslands from Nera Gorges and Ciclova Valley (SCHRÖTT & FAUR, 1972).

*Dactylorhiza sambucina* (L.) Soó was signaled just for the mountain areas from the surroundings of Anina and Poiana Roşchii (SCHRÖTT & FAUR, 1972).

*Dactylorhiza maculata* (L.) Soó is known from the areas of Pleşivei Plateau and Beiu Sec Valley (SCHRÖTT & FAUR, 1972).

*Epipogium aphyllum* Sw. was found in the past just in a small number of specimens on rich humus soils in forests from Ciclova and Rea Valleys (SCHRÖTT & FAUR, 1972).

*Orchis simia* Lam. was recorded as sporadic in xero-termophilous schrubs from the Nera Valley Beuşniţa Basin (SCHRÖTT & FAUR, 1972).

**CONCLUSIONS AND CONSERVATION ISSUES**

The Nera Gorges-Beuşniţa National Park still includes a high variety of spontaneous orchids. We have identified 25 out of the 33 orchid species that were historically documented for this area. *Platanthera chlorantha* is a new orchid species for the protected area that was not previously recorded. If *P. chlorantha* is a relatively common species in the Banat mountains, the new location for *Epipactis purpurata* is an important find because excepting the record from SCHRÖTT & FAUR (1972) there are no other records of this species documented from the Anina Mountains and only very few records are known in the whole South Banat area (mybiosis database accessed December 2015, https://kladia.info/klados/klados.php?identifier=ta16052).

We reconfirm *Ophrys scolopax* subsp. *cornuta* (Steven) E.G.Camus for Oraviţa area with a better status than the population present in the Nera Gorges area.

*Himantoglossum jankae* (name revised by MOLNÁR et al., 2012; SRAMKÓ *et al* 2012) an endangered species mentioned in the Annex II of the Habitats Directive has a much lower distribution than in the past and requires close monitoring and conservation measures (BÂTEA *et al*., 2014).

We have found a new location for *Spiranthes spiralis* within the Nera Gorges-Beuşniţa National Park. This species is mentioned in a literature review as common for Romania (RÖSLER, 2003), but its status may be different today given the fact that most of the pasture areas in Romania are currently overgrazed. Overgrazing during the flowering and seed set period is particularly damaging the population levels of this species (JACQUEMYN *et al*., 2007). The other major cause of population decline is the pasture conversion to arable land.

The distribution of orchid species is much restrained than in the past. Most species are represented by relatively small populations. The last published paper for this region has a similar conclusion (BÂTEA *et al*., 2014). Most frequent orchids were found in forest habitats, *Cephalanthero-Fagion* (H 9150) being one of the most representative type of habitat for orchids in the Nera Gorges-Beuşniţa National Park.

Unfortunately, the situation with the other types of habitats is different. The orchid populations persist in just a few grasslands habitats and the numbers of specimens are usually low. With the exception of *Epipogium aphyllum* and *Dactylorhiza maculata* which are dependent on forest type habitats, the rest of species that were not reconfirmed for the area during the present study are all related to various types of grassland habitats.

In the Nera Gorges-Beuşniţa National Park the grasslands orchids seems to suffer the greatest loss due to habitat deterioration and the lack of adequate management in time. The effective way to protect orchids is to conserve the habitats were their species occur. Habitat conservation is important because orchids depend on many other organisms such as insect pollinators, specific fungi from the soil and other plant species that are capable of supporting pollinators. Relatively simple interventions such as cutting the woody plants may produce a rapid change to the habitat and this action can reinvigorate orchid populations in some areas (JACQUEMYN *et al*. 2009).

All species of orchids should be included in future monitoring programs. Orchids are among the first species to be affected when the habitat changes, and the presence of orchids signifies the state of conservation of the habitat (VOGT-SCHILB *et al*., 2015). Even most common species of orchids are sensible to habitat changes. The long term studies of common orchid species could give insights into orchid population dynamics (KULL & HUTCHINGS, 2006; JACQUEMYN *et al*., 2007; HORNEMANN *et al*., 2012).

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Figure 1. Distribution of *Cephalanthera damasonium*, *C. longifolia*, *Neottia nidus-avis*, *N. ovata*, *Orchis mascula* subsp. *speciosa* within the *Cephalathero-Fagion* (H 9150) habitat in the Beiu Valley.

Figure 2. Left: *Cephalanthera damasonium* from Beiu Valley. Right: *Dactylorhiza saccifera* from Marila area (Foto. CORINA ARDELEAN).

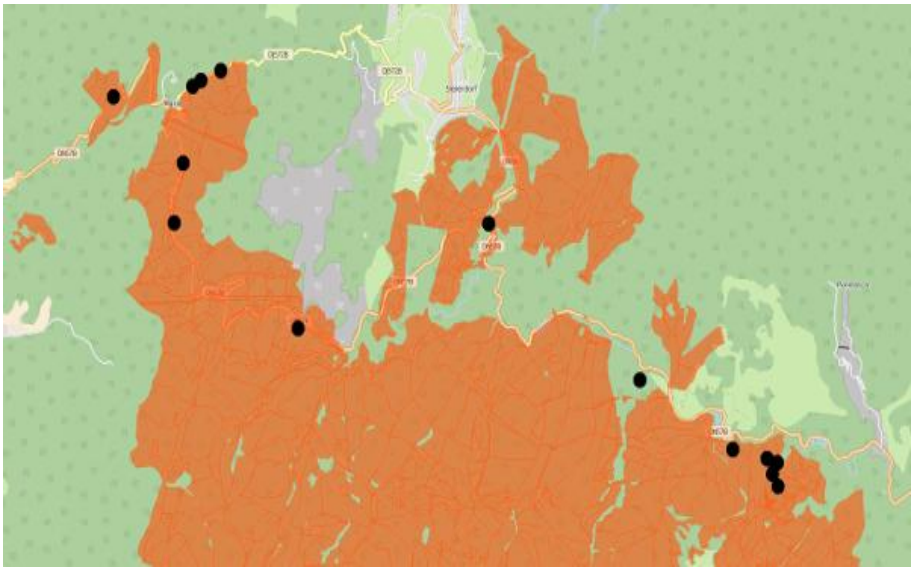

Figure 3. Distribution of *Dactylorhiza saccifera* in *Asperulo-Fagetum* beech forests habitat (H 9130).

Figure 4. Left: *Cephalanthera rubra* from Beiu Valley. Right: *Epipactis purpurata* in situ near Brădişoru (Foto. ADORIAN ARDELEAN).

Figure 5. *Orchis pallens, in situ* near Ciclova Montană (Foto. ADORIAN ARDELEAN).

Figure 6. *Spiranthes spiralis.* Left: inflorescence detail. Right: *in situ* near Cărbunari (Foto. CORINA ARDELEAN).

Figure 7. Left: *Himantoglossum jankae.* Right: *Ophrys scolopax* subsp. *cornuta* (Foto. CORINA ARDELEAN).

Figure 8. Left: *Anacamptis palustris* subsp. e*legans.* Right: *Dactylorhiza incarnata* near entrance from Potoc village (Foto. CORINA ARDELEAN).