

# Orchidaceae Family in the Belianske Tatry Mountains

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**Abstract.** The aim of the paper was to get together and analyse the literature data on the occurrence of *Orchidaceae* members on the territory of Belianske Tatry Mts. The historical data were compared with recent literature sources as well as with the results of current investigation carried out in 2004 - 2010. The investigation is mainly focused to the taxa recorded in the past. The threat to sensitive members of *Orchidaceae* is recorded.

**Key words:** *Orchidaceae*, Belianske Tatry Mts., TANAP, occurrence, conservation

## Introduction

The *Orchidaceae* family belongs to the most interesting and to the most threatened taxa in the world scale. This is why nearly all the species of the family are included in the Convention on International Trade in Endangered Species (CITES) in order to prevent illegal business.

Belianske Tatry Mts are component of the Tatra National Park (TANAP). This is a limestone area, Faticum of Krizna Nappe, built up of limestones, quartzites and sandstones. The main geochemical rock types are limestones and dolomites (Biely *et al.* 2002). With respect to the geological bedrock, the following soil types are developed in the Belianske Tatry Mts: litosols, kambisols, podzols, rankers and rendzinas.

As for vegetation, forest communities, montane and submontane meadows, dwarf pine stands, high altitude grasslands, rock and scree communities are developed here.

The intention of investigation was to sum up the knowledge on occurrence of *Orchidaceae* members throughout the Belianske Tatry Mts and, consecutively, the historical data compare with actual state.

The majority of recorded members of *Orchidaceae* family are redlisted (Čeřovský *et al.* 1999, Feráková *et al.* 2001) and protected by law under directive 24/2003, designated by the Ministry of Environment.

## Material and Methods

The field investigation have been carried out in 2004 - 2010, both in North and South slopes, and in the ridge area Tatranská Kotlina - Kopské Saddle, Široké Saddle, Ždiarska Vidla peak, Havran peak, Nový peak, Muráň peak, Kôň Hill and Rogová Hill. Isolated parts like Belanská kopa, Stežky and Pálenica were excluded from investigation.

The geographical coordinates are recorded in the system WGS 84, device Garmin eTrex Vista, the GPS data were plotted into software application ArcView. Nomenclature of the taxa follows the Checklist by Marhold (1998). Threat evaluation follows categories accepted in Gland (IUCN 1994).

## Results

On the territory of Belianske Tatry Mts, field investigation revealed 25 species of 17 genera (*Orchidaceae*), the localities are depicted on Fig. 1.

### *CYPRIPEDIUM* L.

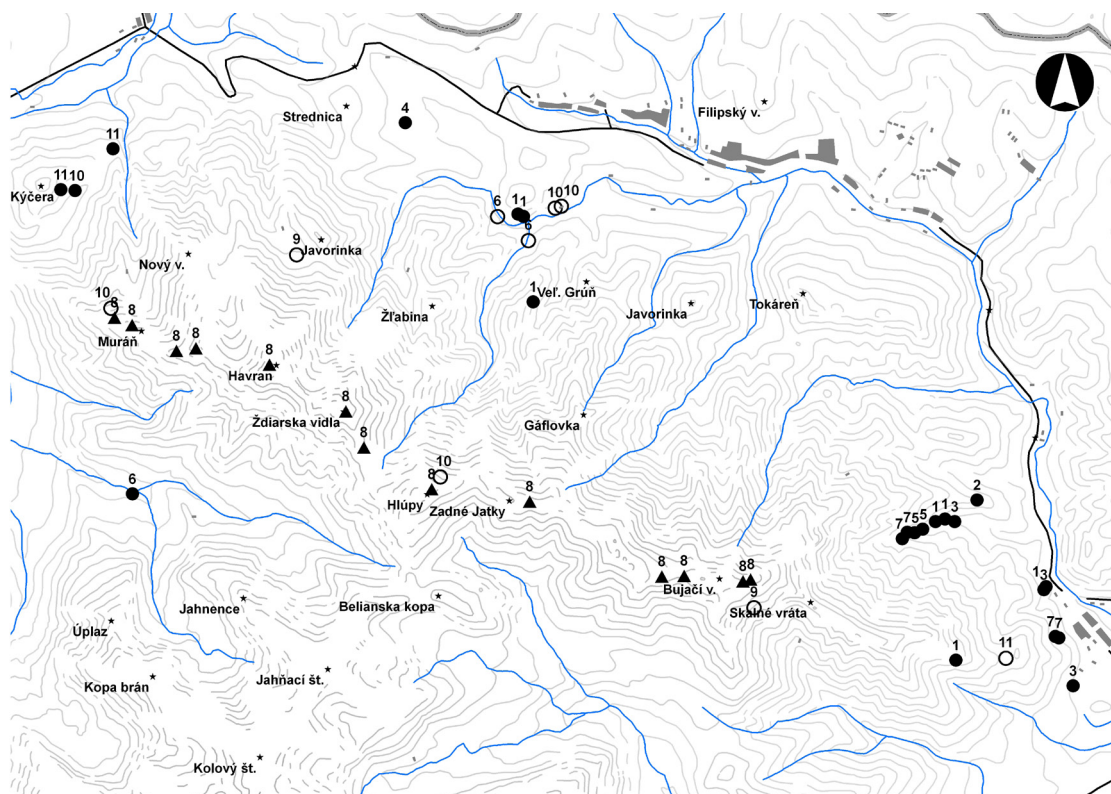
Lady's-slipper, *Cypripedium calceolus* L.

Occurrence of the species *Cypripedium calceolus* is reported in the literature sources only in general. The mapping have brought seven localities in the North part of territory - two localities in Vtáčie Turne, Veľký Rígeľ, in abandoned quarry in Tatranská Kotlina, two localities in Dolina Suchého potoka Valley and below Kobylí hill, this is the highest point of occurrence at the altitude of 1,237m a. s. l. **Threat category:** VU (Vulnerable).

### *CEPHALANTHERA* L. C. Rich.

White Helleborine, *Cephalanthera damasonium* (Mill.) Druce

The occurrence in the territory was reported by Procházka and Velisek (1983) and by Kanka (2008). Two plants in blossom were recorded in 2008 in the spruce zone of Dlhý hill at the altitude of 890m a. s. l. Due to the bark beetle disaster, the forest stands were cut down in 2009, the plants of *Cephalanthera damasonium* have never been re-found in the locality. **Threat category:** VU (Vulnerable).



**Fig. 1.** Distribution of *Orchidaceae* in the Belianske Tatry Mts. Legend: Full circle - record of the author; Empty circle - unconfirmed literature source; Full triangle - confirmed literature source. 1. Lady's-slipper, *Cypripedium calceolus*; 2. White Helleborine, *Cephalanthera damasonium*; 3. Red Helleborine, *Cephalanthera rubra*; 4. Marsh Helleborine, *Epipactis palustris*; 5. Ghost Orchid, *Epipogium aphyllum*; 6. Lesser Twayblade, *Listera cordata*; 7. Northern Rattlesnake-plantain, *Goodyera repens*; 8. Alpine Tunturiorhot, *Chamorchis alpina*; 9. Musk Orchid, *Herminium monorchis*; 10. Early-purple Orchid, *Orchis mascula* subsp. *signifera*; 11. Adder's Mouth, *Malaxis monophyllos*.

Red Helleborine, *Cephalanthera rubra* (L.) L. C. Rich

In 2008, only the single locality was recorded in Dolina Suchého potoka Valley at the altitude of 810m a.s.l. Recently, in 2010 several flowering plants have been found in abandoned quarry in Tatranská Kotlina and near tourist path to the Dolina Siedmich prameňov Valley above waterworks.

*Threat category:* VU (Vulnerable).

*EPIPACTIS* Zinn

Marsh Helleborine, *Epipactis palustris* (L.) Crantz

There are no information on the occurrence of *Epipactis palustris* in accessible literature sources in Belianske Tatry Mts. During field investigation in 2008 have been recorded locality in spring community under Príslop at the altitude of 971m a.s.l.

*Threat category:* VU (Vulnerable).

Dark-red Helleborine, *Epipactis atrorubens* (Hoffm. Ex Bernh.) Schult. subsp. *atorubens*

The species is found from montane to alpine level, grows along tourist paths (e. g. along tourist path to Zadné Medodoly), along margins of mowed meadows in Strednica (Ždiar) and along service path to Faixova poľana. Some populations were destroyed due to forest harvest technology.

*Threat category:* NT (Near threatened).

Broad-leaved Helleborine, *Epipactis helleborine* (L.) Crantz subsp. *helleborine*

The plant occurs scattered all over the territory from Tatranská Kotlina to Tatranská Javorina. The highest point of occurrence has been recorded below Rogová near service path at the altitude of 1,056m a.s.l., in Medzisteny. Thriving populations have been recorded in Dolina Suchého potoka Valley and in Babia dolina Valley.

*Threat category:* VU (Vulnerable).

*EPIPOGIUM* R. Br.

Ghost Orchid, *Epipogium aphyllum* (F.W. Schmidt) Swartz

Occurrence of *Epipogium aphyllum* is reported in 1983 by Velisek in the vicinity of Tatranská Kotlina (Potůček 1990). Potůček (1990) published locality in Monkova dolina Valley and more localities in Belianske Tatry were confirmed by Procházka and Velisek (1983) and Vlčko *et al.* (2003).

At present (August 2010), two localities in the Dolina Suchého potoka Valley have been recorded.

*Threat category:* EN (Endangered).

*NEOTTIA* Guett

Bird's-nest Orchid, *Neottia nidus-avis* (L.) L.C. Rich

On investigated territory the plant occurs abun-

dantly, particularly in spruce zone - under the North wall of Muráň Mt, in Vtáčie turne and on Príslop.

The species doesn't satisfy any criteria of the threatened categories of IUCN.

*LISTERA* R. Br.

Common Twayblade, *Listera ovata* (L.) R.Br.

Rich population has been found in spring meadows below Strednica in Ždiar at the altitude of 910m a.s.l. (43 plants in 1 m<sup>2</sup>), along path to Zadné Meďodoly, to Kopské sedlo and in Monkova dolina Valley.

*Threat category:* VU (Vulnerable).

Lesser Twayblade, *Listera cordata* (L.) R.Br.

Businský (1981) reported occurrence of the species on the right streamside of Rigliansky potok in the entrance to Monkova dolina Valley as abundant. Another occurrence in Monkova dolina approximately 300m above valley mouth near forest road at the altitude of 1,080m a.s.l., was reported by Vlčko (1994) and by Šibík *et al.* (2006). Šibík *et al.* (2006) also published locality of *Listera cordata* in Monkova dolina between green marked path and Rigliansky potok at the altitude of 940m a.s.l. 22 flowering and 16 sterile plants have been recorded in Zadné Meďodoly Valley near tourist path in 2009 at the altitude of 1,200m a.s.l.

*Threat category:* EN (Endangered).

*GOODYERA* R. Br.

Northern Rattlesnake-plantain, *Goodyera repens* (L.)R.Br.

The occurrence of the species in the Belianske Tatry Mts published Procházka and Velíšek (1983). While mapping in 2008, the locality in spruce zone of the Dolina Suchého potoka Valley was discovered. Recently, in 2010, more localities in the upper part of the valley in spruce forest have been found, another locality has been recorded close to the path to the Belianska jaskyňa Cave.

*Threat category:* VU (Vulnerable).

*PLATANTHERA* L. C. Rich.

Lesser Butterfly-orchid, *Platanthera bifolia* subsp. latiflora (Drejer) Lejtnant, 1978

The species occurs scattered all over the territory, the finds have been recorded in Zadné Meďodoly, in Medzisteny, in Strednica, in Monkova dolina Valley, below Tokáreň, in Babia dolina Valley, in Dolina Suchého potoka Valley and below Kozie skalky.

*Threat category:* VU (Vulnerable).

*GYMNADENIA* R.Br.

Conopsea Orchid, *Gymnadenia conopsea* (L.) R.Br.

The occurrence of the species in the area of Havran and Kopa were reported by Procházka and Velíšek (1983), the another location in the Belianske Tatry confirmed Potůček (1990). The occurrence of *Gymnadenia conopsea* in Belianske Tatry is rather common in meadows

(Medzisteny, Zadné Meďodoly, Monkova dolina), along tourist paths (Kopské sedlo Saddle) up to subalpine level (saddle between Muráň and Nový, Havranie sedlo Saddle, Predné Jatky Mts, Faixova poľana).

*Threat category:* VU (Vulnerable).

Densiflora Orchid, *Gymnadenia densiflora* (Wahlenb.) A. Dietr.

Sporadic occurrence near Ždiar recorded Procházka and Velíšek (1983). At present, the occurrence in the locality hasn't been confirmed.

*Threat category:* EN (Endangered).

Fragrant Orchid, *Gymnadenia odoratissima* (L.) L. C. Rich.

Procházka and Velíšek (1983) reported occurrence on more sites in Belianske Tatry Mts, scattered occurrence of the species was reported by Potůček (1990). Field investigation has revealed locality in Monkova dolina Valley on the left streamside of Biela.

*Threat category:* VU (Vulnerable).

*PSEUDORCHIS* E. Mey.

Small-white Orchid, *Pseudorchis albida* (L.) Á. Löve et D. Löve

The occurrence near Tatranská Kotlina (Faixova Hill) and on Bujačí vrch published Businský (1981), the occurrence in Belianske Tatry Mts confirmed Potůček (1990). Nowadays, in 2007 *Pseudorchis albida* has been recorded in South slopes of submontane meadows in Strednica, in 2008 in West slopes of Havran dolina Valley and in 2009 in Medzisteny, below the North slope of Muráň Mt. Rich population of the species below Široké sedlo and on the North slope of Zadné Jatky has been recorded in 2010.

*Threat category:* EN (Endangered).

*CHAMORCHIS* L. C. Rich.

Alpine Tunturiorhot, *Chamorchis alpina* (L.) L.C.Rich.

The species is confined to communities with *Carex firma*, occupying ridge zones in subalpine level. In Slovakia, the distribution is restricted to the West Tatra Mts - Tomanova dolina - Stoly, Temniak and to the Belianske Tatry Mts - Muráň, Ždiarska Vidla, Malý Havran, Tristárska dolina, Vyšné Kopské sedlo, Zadné Meďodoly, Hlúpy, Predné Jatky and Zadné Jatky, Košiare, Rakúsky chrbát, Bujačí vrch, Dolina Siedmych prameňov, Kozí chrbát, Belianska kopa (Potůček 1990). The occurrence of the species has been confirmed throughout the subalpine and alpine level.

*Threat category:* VU (Vulnerable).

*HERMINIUM* Guett.

Musk Orchid, *Herminium monorchis* (L.) R.Br.

Hendrych in 1975 found location in the area of Skalné vráta at the altitude of 1,700m a.s.l. (Hendrych 1991). At the present, we couldn't confirm the occurrence of the species in the current localities.

*Threat category:* CR (Critically endangered).

*TRAUSTEINERA* Reichenb.  
Globosa Orchid, *Trausteinera globosa* (L.) Reichenb.

Distribution of the species in the Belianske Tatry Mts was reported by Businský (1981). The author recorded occurrence species on slopy calcareous grassland below Muráň at the altitude of 1,810m a.s.l. in 1977 and on slope heaths of Havran at the altitude of 1,850-1,900m a.s.l. More localities have been recorded in the montane meadows in Medzisteny, in the ridge of Rogová, in Zadné Meďodoly and on the foot of Havran Mt.  
*Threat category:* VU (Vulnerable).

*ORCHIS* L.  
Early-purple Orchid, *Orchis mascula* subsp. *signifera* (Vest.) Soó

Records on occurrence of the species refer to the slopy calcareous grassland below Muráň at the altitude of 1,780m a.s.l., more over the species was recorded on wet slopy calcareous grassland below Hlúpy at the altitude of 1,600m a.s.l., the lowest point of occurrence is the mouth of Monkova dolina Valley at the altitude of 900 - 950m a.s.l. (Businský 1981). The present-day occurrence has been recorded in Medzisteny, on wet spots of slope meadow in 2005.  
*Threat category:* VU (Vulnerable).

*DACTYLORHIZA* Necker ex. Nevski  
Irish Marsh-orchid, *Dactylorhiza majalis* (Rchb.) P. F. Hunt et Summerh. subsp. *majalis*

In the past, it was one of the most widespread species, at present is declining due to drainage or fertilizers applications (Potůček 1990). Businský (1981) reported occurrence in Monkova dolina in wet places in neighbourhood of the Hotel Magura at the altitude of 900 - 930 m a.s.l. Rich population is thriving in Strednica under ski lifts.  
*Threat category:* VU (Vulnerable).

Common Spotted Orchid, *Dactylorhiza fuchsii* (Druce) Soó, subsp. *fuchsii*

In the Belianske Tatry Mts the species was discovered in 1977 in Dolina Nového potoka Valley between Nový Mt and Muráň Mt at the altitude of 1,150m a.s.l., more records refer to the SE slope of Kobylí vrch Hill at the altitude of 800m a.s.l. (Businský 1981). The occurrence in Monkova dolina Valley near tourist path has been recorded.  
*Threat category:* VU (Vulnerable).

Frog Orchid, *Dactylorhiza viridis* (L.) R. M. Bateman, A. M. Pridgeon & M. W. Chase

Businský (1981) recorded more localities at the altitude of 1,200-2,100m a.s.l. (Bujačí vrch, South slopes of Hlúpy, West ridge of Ždiarska Vidla, Štefanka Valley). Record in 1977 refers to the slopy calcareous grassland below Muráň at the altitude of 1,820 m a.s.l. *Dactylorhiza viridis* occurs scattered all over the territory of Belianske Tatry Mts (the saddle between Muráň Mt and Nový Mt, summit of Muráň Mt and Havran Mt). Presently, rich populations have

been recorded on the North slopes of Predné Jatky and Zadné Jatky and in Široké sedlo Saddle.  
*Threat category:* VU (Vulnerable).

*MALAXIS* Sol. Ex Swartz  
Adder's Mouth, *Malaxis monophyllos* (L.) Swartz

Occurrence of the species on SE slope of Kobylí vrch at the altitude of 900m a.s.l. was recorded in 1974 (Businský 1981). In 2008, near the path to Medzisteny were counted five plants of *Malaxis monophyllos*, the number was confirmed in 2009. In 2010 we could record only two plants, the road was repaired by the State Forests of the Tatra National Park. Nowadays, new found of *Malaxis monophyllos* has been recorded near the path below Muráň on the North slope at the altitude of 1,280m a.s.l.  
*Threat category:* EN (Endangered).

*CORALLORHIZA* Chat.  
Coralroot Orchid, *Corallorhiza trifida* Chat.

The plant was recorded in the spruce forest of Kýčera at the altitude of 1,500m a.s.l. (Businský 1981). Rich occurrence of the species has been found below Muráň, in Dolina Suchého potoka Valley and in Rogová.  
*Threat category:* VU (Vulnerable).

## Discussion

The occurrence of the members of *Orchidaceae* have been recorded in all vegetation levels of Belianske Tatry Mts. Within the submontane level were recorded four species of *Orchidaceae*. The majority of *Orchidaceae* species have been recorded within the montane level, from 800 up to 1,500m a.s.l. Within the subalpine level, nine *Orchidaceae* species have been counted. In the alpine level, dominated by calcareous rocky slopes, alpine grasslands or debris, five *Orchidaceae* species were identified, four out of them have a wide ecological requirements, they occur from montane to alpine level and one species, *Chamorchis alpina*, is restricted to the alpine level. Unfortunately, we couldn't confirm occurrence of *Herminium monorchis* and *Gymnadenia densiflora*.

Approximately in the fifties last century grazing in the Belianske Tatry Mts was stopped. The natural development in the ecosystems set up. In the present days, the bark beetle disaster treatment is carried out in the forest stands. Across the territory of Belianske Tatry Mts, a bidirectionally (originally unidirectionally) tourist path leads from Monkova dolina Valley to Široké sedlo Saddle and Kopské sedlo Saddle.

Forest harvest technology brings about the disturbance of soil structure, the favourable conditions for *Orchidaceae* are broken. The consequence is decreased diversity, extinction of some species is possible.

The localities of two species of *Epipactis* genera were destroyed in Tatranská Javorina due to forest practices, narrow path has changed into wide, scuzzy road.

The spruce forest sheltering *Epipogium aphyllum* in understory in Monkova dolina Valley near Ždiar was cut down, habitat of the species was destroyed. Similar event happened near Tatranská Kotlina, where shaded spruce forest harboured *Cephalanthera damasonium*, nowadays there is a clearfelled area.

The montane meadows became timber stockpiles ploughed up by heavy machines. Endangered are mainly species restricted to humid, shaded forests or to montane meadows.

Some species doesn't require mykorrhiza when adult (e.g. *Cypripedium calceolus*). To mykorrhiza are dependent green leaved orchids of the *Epipactis* and *Cephalanthera* genera. It is supposed that orchid decrease is caused both directly by deterioration of habitat conditions and indirectly, owing to mykorrhizic mushrooms or pollinators decrease due to insecticide exploitation.

From botanical point of view, Belianske Tatry Mts are well explored phytogeographical unit. Botanical attractiveness is stressed by the presence of Orchidaceae members. Recently, during field investigation in 2004 – 2010 we have recorded 17 genera and 25 species. Unfortunately, we couldn't confirm species *Herminium monorchis* and *Gymnadenia densiflora*, recorded in the past. Nevertheless, majority of published species have been confirmed, although not just in original location.

It is crucial to identify the reasons for decline or extinction of Orchidaceae in some sites. Recently, the Tatra forests are hitten by large scale bark beetle outbreak. Large forest stands are being cleared away and solitaire infected trees are being removed, not taking note of legislation - the area is reservation under strong protection.

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