Occurrence of the *Orchidaceae* Plant Species in the Territory of Železné Hory

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Abstract: The aim of this study is the comparison of current and historical occurrence of species of the *Orchidaceae* family in the territory of Železné hory. The thesis makes an assessment of 66 habitats within the territory of protected landscape area Železné hory and 20 other habitats in close vicinity of the protected landscape area, with total area of 7.35 km^2. The researched territory consist mostly of mezo-xerophyte meadow up to hygrophyte wetland phytocoenoses, forest eco systems from the vegetation degree of wild flower oak woods up to vertical degree of fir beech wood. The study is based on botanical field research on 86 habitats during vegetation seasons in the years 2004, 2011 and 2014. The occurrence of the *Orchidaceae* in the habitats was recorded by GPS in the environment of the program ArcPad 8.0 sp2. Based on recorded data and using the program Arc Gis Desktop 10 sp2 the grid maps and cartograms with occurrence of individual species of the *Orchidaceae* were set up. Moreover, vitality and sociability of individual identified species was assessed. The occurrence of the *Orchidaceae* was confirmed in 42 habitats. Most frequently, on 23 habitats occurred *Dactylorhiza majalis*. On the other hand, *Dactylorhiza sambucina* and *Epipactis purpurata* species were growing in one place only. Also the number of individuals was monitored. The highest number of individuals - 3233 pieces – reached the species *Dactylorhiza majalis.* On the other hand, the lowest number of individuals was recorded for the species *Dactylorhiza sambucina* with 3 pieces and *Epipactis albensis* with 2 pieces.

Key-Words: Protected landscape area Železné hory, orchidaceous family, nature protection and care management, endangered species, occurrence of the Orchidaceous.

Introduction

The plants from the *Orchidaceae* family are growing from tropical to temperate zones of both hemispheres. Several genera of the family grow even in the tundra behind the Arctic circle, respectively in the heights of around 4 000 m above the sea level.

Most species of the *Orchidaceae* family grow in tropical areas of South America, Africa and Asia, where some 30 000 species occur, but there are also hundreds inhabiting the temperate zones. There are about 70 known *Orchidaceae* species in the Czech Republic. Two of them are local endemites – *Dactylorhiza bohemica* and *Dactylorhiza carpatica* – and five species are considered to be extinct in the territory [15].

Most of the species of the *Orchidaceae* family growing in the nature of the Czech Republic are protected by Act No. 114/1992 Coll. on nature and landscape protection [16] and related regulations. For the efficiency of protection of the *Orchidaceae*, not only the plants themselves must be protected but also their whole natural eco systems.

This study deals with the occurrence of the *Orchidaceae* family in the territory of Železné hory. It maps the occurrence of the *Orchidaceae* family as well as it compares the results of botanical researches with historical literary data and it assesses the vitality and sociability of the exemplars found using the scale Braun and Blanquet [2].

It shows in a complex way the trend in occurrence of the *Orchidaceae* in Železné hory, which may support setting of the correct management of given territory for preservation of the *Orchidaceae* as well as other protected species in monitored locations for future generations.

Material and Methods

General information about the territory of Železné hory and extensive territorial relations were taken mainly from the Plan of care for the Protected

Landscape Area of Železné hory for the period 2011 – 2020 [12] .Main information on the historical incidence of the *Orchidaceae* family plants in the selected territory is based on botanical researches held in 1994 [6] and in 1995 [8]. Based on literature86 habitats with probable incidence of the *Orchidaceae* were chosen.

All habitats with strongly and critically endangered species of the *Orchidaceae,* than habitats with higher numbers of species and finally with probable incidence of plants from the *Orchidaceae* family were included.

Having defined 86 habitats with the total area of 7.35 km^2 in the territory of Železné hory, a detailed botanical field research aimed at vascular plants with emphasis on the *Orchidaceae* in the course of vegetation seasons in the years 2004, 2011, 2014 was performed.

An exact position of individual detected plants of the *Orchidaceae* family was recorded using the GPS Trimble Juno Sc with the program Arc Pad 8.0 sp2 in the co-ordinate system S-JTSK East North. After processing the digital data of the *Orchidaceae* incidence the topical cartograms of the *Orchidaceae* incidence in Železné hory in the environment of Arc Gis Desktop 10 sp2 software was set up.

The nomenclature of vascular plants including the *Orchidaceae* is taken from the Key to the Flora of the Czech Republic [9].

Two quantitative features were investigated. The first is the sociability, expressing the distribution of the species individuals in the phytocoenosis according to the scale Braun and Blanquet [2]. The other established qualitative feature was vitality, expressing the ability of plant development and successful reproduction. It is set using the four-level scale Braun and Blanquet [2].

In the course of field researched of the habitats data on the *Orchidaceae* species, other vascular plants were recorded and photo documentation of the habitat and the orchid species were taken

Mapping of the *Orchidaceae* species

Botanical research was performed in the vegetation season on 86 habitats of Železné hory in 2004, 2011, 2014.

The incidence was confirmed 2004 on 42 out of historically proved 86 habitats with occurrence of the *Orchidaceae* in Železné hory. In the course of the revision in 2014, the incidence of the *Orchidaceae* was confirmed in 36 habitats only.

The most frequent species *Dactylorhiza majalis* was observed on 23 (41 historical) and *Epipactis helleborine* on 8 habitats (17 historical) in 2004 and 2014. On the other hand, the species *Dactylorhiza sambucina*, *Dactylorhiza x braunii*, *Epipactis albensis*, *Epipactis purpurata* were growing in only one place in all monitored years.

Table 1 Comparison of Historical Habitats of the *Orchidaceae* with Habitats Confirmed in the Course of Botanical Researche in 2004, 2011 and 2014 and Numbers of Identified Individuals.

Latin name	Number of historical habitats	Number of confirmed habitats in 2004	Number of confirmed habitats in 2011	Number of confirmed habitats in 2014	Number of individuals in 2004	Number of individuals in 2011	Number of individuals in 2014
Cephalanthera damasonium	5	2	2	2	183	64	249
Cephalanthera longifolia	0	0	0	1	0	0	5
Coeloglossum viride	2	0	0	0	0	0	0
Corallorhiza trifida	2	0	0	0	0	0	0
Dactylorhiza fuchsii	16	3	1	0	20	4	0
Dactylorhiza majalis	41	23	20	23	1634	2560	3233
Dactylorhiza sambucina	4	1	1	1	7	4	3
Dactylorhiza x braunii	1	1	1	1	3	6	11
Epipactis albensis	0	1	1	1	2	2	4
Epipactis helleborine	17	8	9	8	202	63	137
Epipactis palustris	7	3	3	3	1036	1958	2619
Epipactis purpurata	2	1	1	1	29	28	33
Gymnadenia conopsea	8	0	0	0	0	0	0
Listera ovata	9	4	0	0	22	0	0
Neottia nidus - avis	10	1	0	1	3	0	2
Orchis morio	7	0	0	0	0	0	0
Orchis ustulata	1	0	0	0	0	0	0
Platanthera bifolia	17	3	1	1	18	11	11
Platanthera chlorantha	9	6	5	3	194	95	105
Spiranthes spiralis	1	0	0	0	0	0	0

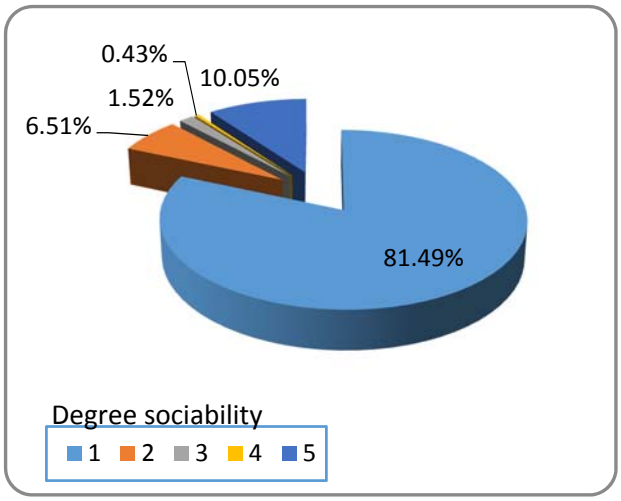
In the course of botanical researches also the numbers of individuals of orchids was monitored, the highest number was identified in the species *Dactylorhiza majalis* with 1634 pcs in 2004 and with 3 233 pcs in 2014.

An increasing trend was proven even in the case of *Epipactis palustris* with 1 036 pcs in 2004 and 2 619 in 2014. Just to the contrary, a low number of individuals and decreasing tendency of incidence was proven for *Platanthera bifolia* with 18 pcs in 2004 and 11 in 2014, *Dactylorhiza sambucina* with 7 pcs in 2004 and 3 in 2014, *Neottia nidus avis* with 3 pcs in 2004 and 2 in 2014.

Two quantitative features - sociability (distribution of individuals in the phytocoenosis) and vitality of plants according to the scale Braun and Blanquet [2] were assessed.

The sociability of the individuals found usually reached level 1, which means that the individuals most frequently grow individually or – less frequently – level 5, which means that the individuals grow in continuous stands.

Fig. 1 Sociability of all the detected orchids at all habitats in 2011.



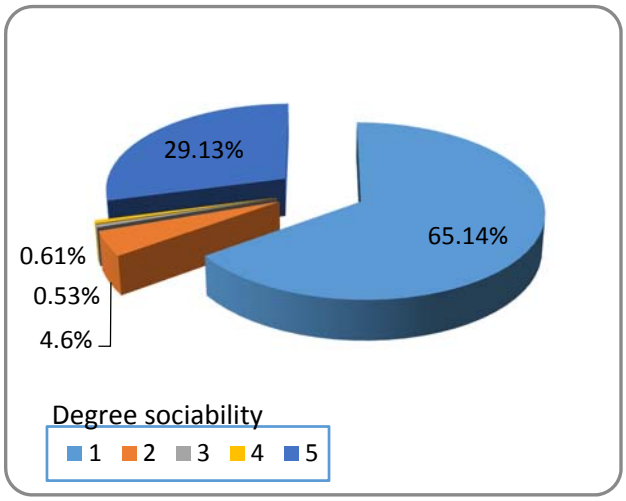
The second assessed quantitative feature was the vitality of orchid individuals found. The average vitality of all orchid species was 1.28 in 2004, 1.06 in 2011 and 1.07 in 2014. That means that most of the *Orchidaceae* were well developed according to the scale, with regular life cycle. In the course of the botanical field research in 2004, there were detected in total 299 species of vascular plants in monitored habitats. 17 species of them are protected according to Act No. 114/1992 Coll., on nature and landscape protection [16]. In 2011 and 2014 we succeeded to identify 346 and 387 vascular plants, 18 species of them being protected according to Act No. 114/1992 Coll. [16].

Discussion

In the territory of Železné hory 12 of the historically described 20 species of the *Orchidaceae* family were found. The incidence of the family on 42 out of original 86 historical habitats was confirmed in 2004 and only on 36 in 2014.

The highest number of plants of the *Orchidaceae* family were found in 2014, when 6 434 plants were successfully recorded in all habitats. Two aspects play the key role in the high number of observed plants. In three habitats of the small-area specially protected territory in Železné hory the endangered species *Epipactis palustris* occurs, which due to favourable conditions reached a total population of 2 619 pcs in 2014. Another reason for the high number of exemplars of the family is quite frequent incidence of the species *Dactylorhiza majalis*, which appeared in 23 habitats in Železné hory with the total number of 3 233 plants in 2014. Only slightly lower numbers of individuals of these both species were proven also in 2004 and 2011.

Fig. 2 Sociability of all the detected orchids at all habitats in 2014.



But originally, *Dactylorhiza majalis* appeared in 41 historical habitats and *Epipactis palustris* inhabited 7 places. Thus the populations must have been much more numerous in earlier times.

But other species of the family turned out much more badly. For example the *Platanthera bifolia* originally inhabited 17, while in 2014 only one place with a total number of 11 exemplars.

Even other detected species of the *Orchidaceae* family in the territory of Železné hory survive in just a small number of original habitats with lower numbers of exemplars. Moreover, the species *Coeloglossum viride*, *Corallorhiza trifida*, *Gymnadenia conopsea*, *Orchis morio*, *Orchis*

ustulata and *Spiranthes spiralis* were not found in the nature of Železné hory during botanical researches in 2004, 2011 and 2014 and the chances for recovery in that region are minimal for most of the species.

Two quantitative features of the found orchids were assessed - sociability (distribution of individuals in the phytocoenose) and vitality of plants according to the scale Braun and Blanquet [2]. The sociability of the individuals found usually reached level 1, which means that the individuals were growing most frequently individually or – less frequently – level 5, mainly *Epipactis palustris* and *Dactylorhiza majalis,* which means that the individuals were in continuous stands.

The second assessed quantitative feature was the vitality of orchid individuals. The average vitality of all species of the *Orchidaceae* was 1,28 in 2004, 1,06 in 2011 and 1,07 in 2014. That means that most of the orchid plants were well developed according to the scale, with regular life cycle.

The sociability and vitality set the momentary space and health parameters of the current researched population, but they do not assess any increase or decrease of populations or their extinction [5].

Pasture was stopped, respectively annual harvest of grass biomass by mowing was cancelled in many meadow location in the course of the recent twenty years. Succession change of species composition occurs in these habitats and it is not suitable any more for the species of the *Orchidaceae* family – the species quickly disappeared from those places.

Fortunately, at least some kind of well-preserved areas in Železné hory have recently been transferred by the Železné hory PLA Administration to the small-area specially protected area with fixed management of care respectively financial means from the Program of care for countryside were successfully used for arrangement of mowing of several other meadow habitats that will preserve current species variability including incidence of plants from the *Orchidaceae* family.

Conclusion

The study deepens the knowledge of the flora of Železné hory. It involves 86 habitats dispersed in the whole territory of Železné hory, with the total area of 7.35 km^2. The researched areas include mainly mezohygrophyte meadow phytocoenoses, wetland, fenny and peat meadows or forest communities from wildflower beech woods, oak woods up to fir and beech wood.

The main aim of the work was the performance of botanical field research of habitats, with focus on the *Orchidaceae* family. The botanical field researches were held in 2004, 2011 and 2014.

In the course of the study12 species of plants from the *Orchidaceae* family out of the 20 historically proven were confirmed. In the territory of Železné hory most frequently *Dactylorhiza majalis* was found, that currently inhabits 23 out of the original 41 historically proven places. Also for *Epipactis palustris*, growing in 3 natural reserves were recorded high number of exemplars.

Unfortunately, the situation with the other orchids is much worse. Their incidence persists in just a few original habitats and the numbers of exemplars are usually low.

The most valuable members of the *Orchidaceae* family in the territory of Železné hory include the seriously endangered *Dactylorhiza sambucina* with incidence in one place with 3 exemplars only and the seriously endangered *Epipactis albensis*, also growing in one habitat only, reaching the number of 4 exemplars found in 2014.

This work will make easier any future research in this field and it will serve to extend knowledge of the given territory.

Acknowledgement

Herewith, I would like to thank mainly Ing. Petr Jelínek, Ph.D. from the Faculty of Forestry, Mendel University, for many valuable advices and information and the employees of the Administration of Protected Landscape Area of Železné hory for provision of literature and facilitation of research of the *Orchidaceae* family in protected areas.

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