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**CONTRIBUTIONS TO THE KNOWLEDGE OF ORCHIDS
FROM ROMANIA**

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ABSTRACT

Herbariums are collections that reunite plants from different places and periods. Amongst the national herbariums, a special place is obtained by "Alexandru Beldie" Herbarium that contains a collection of approximately 60000 taxa. The Orchidaceae Family and its genera occupy a special place in this collection. Our method consisted in inventorying the vouchers with Orchis species and then creating a database with the information present on the vouchers' labels. At the same time, their conservation state was evaluated and graded. In total, a number of 139 vouchers were inventoried, containing 30 species, subspecies, varieties and hybrids. Amongst them, an important number is present on the redlists consulted and mentioned in the bibliography. Furthermore, a significant part of the studied species are no longer in the Orchis Genus, but were reassigned to other genera such as Anacamptis, Dactylorhiza, Neotinea or Gymnadenia. Due to their vulnerability, it is essential to be attentive to the places and conditions in which they vegetate.

INTRODUCTION

Herbariums are plant collections (wood/non-wood) where they are systematized based on different classification criteria. Later on, they are used as study material in the botanic domain. It is estimated that 2,5 milliard plants exist worldwide in this type of collections (Delgado et al. 2005). „Alexandru Beldie” Herbarium was created in 1929 (Plesca et al., 2019, Cantar et al., 2019; Dinca et al., 2019; Vasile et al., 2019) and contains approximately 60000 taxa (Dinca et al., 2018; Plesca et al., 2020; Ciontu et al., 2019; Crisan et al., 2020), collection by Romanian specialists (Dinca et al., 2020; Crisan et al., 2020; Scarlatescu et al., 2017) or foreign ones (Kachova et al., 2020; Vechiu et al., 2019; Dinca et al., 2020). Wild orchids have a special place in this herbarium as they offer valuable data regarding their distribution in areas from where they were collected (Irimia 2018; Jovanović 2011; Khmil et al. 2007; Barina 2017; Molnar et al. 2012;). *Orchidaceae* Family has over 28000 species and 763 genera (Khapugin, 2020), being widespread worldwide, with the exception of Antarctica (Chase 2005). Our country has 24 genera with 45 species (Buia et al. 1965). *Orchis* Genus contains approximately 80 species in Europe and Asia, while Flora R.S.R. describes 16 species and 6 hybrids (Nyarady et al. 1972). Even from the start of the century, the species were considered endangered and interesting based on their systematic, morphology and areal (Panțu 1915).

MATERIAL AND METHOD

The first step was to inventory the maps that contain *Orchis* vouchers from “Alexandru Beldie” Herbarium. The data was centralized around the information offered by their labels, namely: collection name; species name; harvesting date; harvesting place; the persons that have participated in gathering them; data regarding the inventory number and other observations. Together with their inventory, we have also appreciate their conservation degree, using the following scale: 1 = very well preserved plant, kept in its entirety and correctly attached to the voucher, 2 = plant detached from the voucher, with detached parts but still present, 3 = plant detached from the voucher, with missing parts and 4 = detached and fragmented plant, with over 50% of its parts missing (Pleșca et al, 2019). The species' names were verified in international databases in order to see if they are of actuality, if they have become synonyms or migrated towards other existent or new genera. Another aspect regarding the importance of species from this collection is the number of taxa included on national and international “Red Lists”. As such, the following sources were consulted: *Endangered, vulnerable and rare vascular plants from Romania's forests* (Danciu et al. 2007), *Flora R.S.R. volume XII* (Nyarady et al. 1972), *The red list of superior plants from Romania* (Oltean et al. 1994), *The red book of vascular plants from Romania* (Dihoru & Negrean 2009), *Orhidacee from Romania* (Panțu 1915), as well as online databases: *theplantlist.org*, *http://wcsp.science.kew.org/* and *https://www.iucnredlist.org/*.

RESULTS

The inventory resulted in 139 vouchers that contain 27 species, 2 varieties and 1 hybrid. After they were checked in existent databases, we have seen that an important number of names are no longer part of current taxonomy. Table number 1 presents the species, the new names as well as the number of vouchers and their inclusion on “Red lists”.

Table 1

Species identified in “Alexandru Beldie” Herbarium

No. crt.	Species herbarium	theplantlist.org/ wcsp.science.kew.org	No of vouc.	1*/2*/3*
1	<i>O. champagneuxii</i> Barn.	<i>A. morio</i> subsp. <i>champagneuxii</i> (Barn.) H. Kretz., Ecc.& H. Dietr./ idem	1	-/-/-
2	<i>O. conopsea</i> L.	<i>G. coposea</i> (L.) R. Br./ idem	1	R/-/-
3	<i>O. cordigera</i> Fr.	<i>D. cordigera</i> (Fr.) Soó / <i>D.majalis</i> subsp. <i>cordigera</i> (Fr.) H.Sund.	12	-/-LC
4	<i>O. cordiger</i> Fr. var. <i>rochelii</i>	-/-	2	-/-/-
5	<i>O. coriophora</i> L.	<i>A. coriophora</i> (L.) R.M.Bat., Pridg. & M.W.Ch. / idem	9	R/-LC
6	<i>O. cruenta</i> . Mull.	<i>D. incarnata</i> subsp. <i>cruenta</i> (O.F.Müll.) P.D.Sell i / idem	1	-/-/-
7	<i>O. elegans</i> Heuff.	<i>A. palustris</i> subsp. <i>elegans</i> (Heuff.) R.M.Ba., Pridg. & M.W.Ch. / idem	3	-/-/-
8	<i>O. fusca</i>	<i>O. purpurea</i> Huds./ <i>O. purpurea</i> subs. <i>purpurea</i>	1	R/-/-
9	<i>O. gruenii</i> H W.	-/-	1	-/-/-
10	<i>O. incarnata</i> L.	<i>D. incarnata</i> (L.) Soó / idem	7	R/-LC

No. crt.	Species herbarium	theplantlist.org/ wcsp.science.kew.org	No of vouc.	1*/2*/3*
11	<i>O. latifolia</i> L.	<i>D. incarnata</i> (L.) Soó / <i>D. incarnata</i> subsp. <i>incarnata</i> .	1	R/-/LC
12	<i>O. maculata</i> L.	<i>D. maculata</i> (L.) Soó / idem	21	R/-/LC
13	<i>O. mascula</i> (signifer)	<i>O. mascula</i> subsp. <i>speciosa</i> (Mutel) Hegi / idem	1	-/-/-
14	<i>O. militaris</i> L.	<i>O. militaris</i> L./ idem	4	R/-/LC
15	<i>O. militaris</i> x <i>finfrireus</i>	-/-	1	-/-/-
16	<i>O. morio</i> L.	<i>A. morio</i> (L.) R.M. Bat., Pridg. & M.W. Ch. / idem	16	R/-/NT
17	<i>O. palustris</i> Jacq.	<i>A. palustris</i> (Jacq.) R.M.Bat., Pridg. & M.W.Ch. / idem	5	-/-/LC
18	<i>O. panuciflora</i> Cem.	-/-	1	-/-/-
19	<i>O. provincialis</i> Balb.	<i>O. provincialis</i> Balb. Ex Lam. & DC. / idem	2	-/-/LC
20	<i>O. purpurea</i> Huds	<i>O. purpurea</i> Huds. / idem	7	R/R/LC
21	<i>O. saccifera</i> Brog (Brongn)	<i>O. basilica</i> subsp. <i>saccifera</i> (Brongn.) Klinge / idem	1	-/-/-
22	<i>O. sambucina</i> L.	<i>D. sambucina</i> (L.) Soo / idem	12	R/R/LC
23	<i>O. signifer</i> Vest	<i>O. mascula</i> subsp. <i>speciosa</i> (Mutel) Hegi / idem	5	-/-/-
24	<i>O. sambucinus</i> L. var. <i>purpureus</i> Koch.	-/-	2	-/-/-
25	<i>O. speciosa</i>	<i>O. mascula</i> subsp. <i>speciosa</i> (Mutel) Hegi / idem	2	-/-/-
26	<i>O. speciosus</i> Host	-/-	2	-/-/-
27	<i>O. Spitzelii</i> Saut.	<i>O. Spitzelii</i> Saut. Ex. W.D.J. Koch. / idem	1	-/-/NT
28	<i>O. traunsteineri</i> Sauter.	<i>D. traunsteineri</i> (Saut. Ex. Rchb) Soo / <i>D. majalis</i> suns. <i>Lapponica</i> (Laest ex Hartm.)	1	-/-/-
29	<i>O. ustulata</i> L.	<i>N. ustulata</i> (L.) R.M. Bat., Pridg. & M.W. Ch. / idem	15	R/-/LC
30	<i>O. variegata</i> All.	<i>N. tridentata</i> (Scop.) R.M. Bat., Pridg. & M.W. Ch. / idem	1	-/-/LC

*1 The red list of superior plants from Romania (Oltean et al. 1994);

2 Endangered, vulnerable and rare vascular plants from Romania's forests (Danciu et al. 2007);

3 IUCN RED LIST (<https://www.iucnredlist.org>); R-rare; LC- Least concern; NT- Near Threatened A-Anacamptis, G.- Gymnadenia, D.- Dactylorhiza, N.- Neotinea, O.- Orchis.

The two identified varieties, *Orchis cordigera* Fr. var. *rochelii* and *Orchis sambucinus* L. var. *purpureus* Koch. are described in Flora R.S.R. (Nyarady et al. 1972). However, they are not present in international databases. A large number of taxa require a high degree of conservation. The majority of plants were collected from Romania and only a small part from Germany, France, Moldavia, Bulgaria, Austria, Sweden and Italy. They originate from collections that were donated, bought or obtained through exchanges.

The plants were collected during 1851-1970 by botanists such as Beldie Al., Haret M., Georgescu C.C., Nyarady E.I., Borza Al., Păuca A., Morariu I., Cretzoiu P., Pașcovschi S., Coman A., Păun M., and Țopa E. The oldest vouchers belong to dr. Iulius Wolff, a botanist-pharmacist who has gathered an important plant collection

from Turda-Cluj. The herbarium reunites a series of collections, among which the most important one is the one inherited from Bucharest Polytechnic School that reunites 83 *Orchis* vouchers. Besides it, a botanic laboratory existed within the Silviculture Faculty. Other important collections that must be mentioned are the ones created around Cluj University, Craiova University, I.C.E.F – the Institute of Forestry Research and Experimentation (the future I.C.A.S.), as well as the personal collections of Beldie Al., Iacobescu Al., Georgescu C., and Werner. As it can be seen, a large part of *Orchis* taxa were reframed in other genera such as *Anacamptis*, *Dactylorhiza*, *Neotinea* or *Gymnadenia*. Discussions concerning the reframing in other genera were older and have noted detail aspects regarding the species (Pedersen 2000). In regard to the conservation degree, the vouchers are in a very good conservation state (1-95%, 2-4%, 3-1%). *Orchis* species are perennial plants with erect stems and radicular twin tubercula. The leaves are immaculately or maculate green, with a plain and wide labia that is often lobate or phidate in the anterior part (Buia et al. 1965). *Salep tuber* is obtained from the tuberose roots of *Orchis* species. This is a product with glucose and mannose content (mucilage 50%) with different pharmaceutical usages (Grigorescu et al. 1986), having a demulcent, analgesic and hipogliceminate action (Luchian et al. 2017).

O. cordigera Fr. (*Dactylorhiza cordigera* (Fr.) Soó) (*Dactylorhiza majalis* subsp. *cordigera*) stands out through its inferior leaves, 4-6 in number, that have a maximum length above the middle (Nyarady et al. 1972). The tubercula are deeply divided, while the leaves have petals arranged regularly (Păucă & Roman 1959). The herbarium contains 12 vouchers harvested mainly from Bucegi Mountains, as well as from Rodnei Mountains and Retezat Mountains.

O. cordigera Fr. var. ***rochelii*** (Gris. et Sch.) is recognisable through its trilobed label (Nyarady et al. 1972). It was signalled in Bârgăului Mountains, Rodnei Mountains (Preluci, Crăciunel), Apuseni Mountains (Arieşului valley, Draganului valley, Retezat mountains, Parâng mountains, Bihor mountains, Mic Mountain (Țarcu), Godeanu Mountains and Bucegi Mountains (Nyarady et al. 1972). The sample from Alexandru Beldie Herbarium was collected from Bucegi Mountains, Orzea forest, by M. Haret in 1921 (17 July).

O. sambucina L. (*Dactylorhiza sambucina* (L.) Soo) is frequently found in mountain meadows with yellow flowers (Păuca & Roman 1959). It is mesophite, crescent, and in stations with acid-neutral soils that are poor in nutritive substances (Danciu et al. 2007). It is mentioned as a rare species and presents a decrease in population according to <https://www.iucnredlist.org>. Within the herbarium, 12 vouchers were inventories and harvested from Buceti Mountains and the Curvature Sub Carpathians.

O. purpurea Hudson is mezoxeripherous with a semi-shadow temperament, moderately thermophile from stations with an alternate humidity. It vegetates on weakly acid-(basic)-neutral soils with a reduced content of nutritive substances (Danciu et al. 2007). It is important to mention that the species is found in both works mentioned in Table number one as being rare. Seven vouchers were identified in the herbarium, harvested from Sighișoara and south Dobrogea.

O. morio L. (*Anacamptis morio* (L.) Soó) has a number of 16 vouchers collected from Bucegi Mountains, Maramureşului Carpathians (Dragomireşti), and the Curvature Sub Carpathians (Istriței Hill). Table number 1 classifies it as a rare species. It is present on meadows and pastures from the hill and mountain areas.

O. maculata L. (*Dactylorhiza maculata* (L.) Soó) reunites a number of 21 vouchers, being the most well represented species from the collection. The species were harvested

from both the mountain area (Bucegi Mountains, Baiului Mountains) as well as from the hill area (Curvature Sub Carpathians, Transylvania's hill depression). The stem is compact with tainted leaves, while the flowers are light violet with purple spots (Tarnavschi & Andrei 1971). It is present in humid meadows and peats.

O. ustulata L. (*Neotinea ustulata* (L.) is a rare species (Table 1) and contains 15 vouchers harvested from a rather large areal: Bucegi Mountains, Haşmaşul Mare Mountains, Domogled Mountains, Piatra Craiului Mountains; Şomeşan Plateau, Parâng Mountains. The species is characterised by a cylindrical-oblong inflorescence with weakly bifidate labels on the middle lobe (Tarnavschi & Andrei 1971). It is present on meadows and subalpine pastures.

CONCLUSIONS

Knowing the *Orchis* species present in the herbarium's collection is important because they offer important information about the species present in our country's flora as well as about the places where they were signalled. In addition, *Orchis* Genus stands out through a rather large number of species included on the list of rare, vulnerable and endangered species. Furthermore, the new taxonomy does not include many of these species, while some of them are described only in Flora R.S.R., without having a correspondent in international databases. It is necessary to offer a special attention to defining a precise areal for *Orchis* species by discovering new places in which they are present as well as by emphasizing the populations, including the herbarium's collection.

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