

Morphological variation and a new variety of *Gymnadenia conopsea* (Orchidaceae) in Finland

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Populations of *Gymnadenia conopsea* (L.) R. Br. have been studied and monitored for many years in the Savonlinna area, in the Province of South Savo, South Finland. Two kinds of populations were recognized, one with red flowers and another with white flowers, the latter being taller, with longer and denser inflorescences and broader leaves. There is also a difference in the flowering time: the white-flowering populations flower ca. seven to ten days later than the red-flowering ones. Genetically, the white-flowering populations belong to *G. conopsea*, even though morphologically resembling *G. densiflora* (Wahlenb.) A. Dietr., which has not been recorded from Finland. The white-flowered, tall plants are described here as a new variety *G. conopsea* var. *scitula* T. Kettunen. In addition to the Savonlinna area, similar plants have been collected or recorded from a few places in the provinces Satakunta, South Häme, North Häme, North Savo and North Karelia.

In Finland *Gymnadenia conopsea* has often been divided into two geographical races, mostly treated as varieties. The northern race is here recognized as a subspecies, *G. conopsea* subsp. *alpina* (Turcz. ex Rchb. f.) Janchen ex Sóo, and its taxonomy, synonymy and nomenclature are discussed. If treated as a variety, the accepted name is *G. conopsea* var. *lapponica* (Zetterst.) Hartm. Its basionym, *Orchis conopsea* var. *lapponica* Zetterst., is lectotypified and its identity confirmed.

Introduction

Gymnadenia conopsea (L.) R. Br. s. lat. is a morphologically variable and challenging orchid, the phylogeny and taxonomy of which have been clarified since development of molecular research, but opinions are still controversial. Two taxa, earlier mostly accepted as varieties, have been recently recognized as separate species mainly based on molecular studies, i.e. *G. borealis* (Druce) R. M. Bateman, Pridgeon & M. W. Chase from the northern part of the British Isles and *G. densiflora* (Wahlenb.) A. Dietr., which is quite widespread in Central Europe. Recently, they have often been treated as species (Marhold et al. 2005, Bateman et al. 2003, Stark et al. 2011,

Trávníček et al. 2012, Efimov 2012, 2013). However, because of partial overlapping of morphological characters with *G. conopsea* s. str. the latter has still commonly been regarded as only a variety (e.g., Anderberg & Anderberg 2015, Mossberg & Stenberg 2018, Hedrén et al. 2018 and Zimmermann 2018), or subspecies (e.g., Karlsson & Agestam 2019). Furthermore, a mountain race *Gymnadenia conopsea* var. *alpina* Turcz. ex Rchb. f., is often recognized in the Alps and the Carpathians. Similar plants occur in the northern part of North Europe, e.g. in North Finland, and recently they have been mostly named as *G. conopsea* var. *lapponica* (Zetterst.) Hartm. (e.g. Vuokko 1998, Salmia 2013).

Gymnadenia conopsea has been widespread and locally even rather common in Finland excluding the western parts, but since the 1960s it has declined markedly (Lampinen & Lahti 2018). The decline concerns in particular the southern half of the country, represented by var. *conopsea*, which was considered an archaeophyte by Suominen & Hämet-Ahti 1993. The decrease is mainly due to overgrowth and other reasons for the disappearance of its habitats, such as meadows and other sites of traditional agriculture (Kypärä 2012). Accordingly, var. *conopsea* has been assessed as vulnerable in the present Red Data Book of Finland (Hyvärinen et al. 2019). Correspondingly, it is clearly decreasing also in North West Russia (Efimov 2012). In the north, the native *G. conopsea* var. *lapponica* has retained its habitats much better and has not been regarded as threatened.

Living in Savonlinna (South Savo), the author Kettunen has observed the variation of *Gymnadenia conopsea* in the area over two decades. The species is not so rare in South Savo, but even here the number and size of populations are gradually decreasing: altogether the species has been recorded from 52 one-km² squares (100 populations), but records in or after 1985 exist only from 24 squares (46 populations) (Kettunen 2009). Already in the late 1990s, observations were being made on two kinds of *Gymnadenia* populations in Savonlinna town and its surroundings – one flowering later, with tall plants and white flowers, the other flowering earlier and with smaller plants and red flowers. The different kinds of plants did not occur together but as separate colonies, usually distant from each other, and there were several red- and white-flowering colonies in the area.

In 2010–2014 several populations were studied in more detail. Kettunen (2015) published the main results of this research, but it was not possible to solve finally the identity of the populations with white-flowering plants. The aim of the present paper is to draw taxonomic conclusions concerning this variation on the basis of additional information from molecular analysis of some plants and herbarium studies. In addition, the taxonomy and nomenclature of the northern race will be discussed.

Material and methods

Population study. For morphological and phenological analysis eight populations of *Gymnadenia conopsea* from South Savo (ES/Sa), Savonlinna town and the surroundings, were chosen for a detailed study. They were divided into two groups on the basis of flower colour. The number of flowering plants varies considerably between years and it is given after the population size for the years 2010, 2012 and 2014.

Red-flowering populations:

- 1) Savonlinna, Pirhiänniemi, Grid 27°E: 686:359; open, fairly dry grassland; population size ca. 50 m²; 93 (2010), 84 (2012), 36 plants (2014).
- 2) Savonlinna, Aholahdi, Grid 27°E: 686:359; open dry grassland; population size several hundreds of m²; 40, 61, 19 plants.
- 3) Rantasalmi, Saariselmäki, Grid 27°E: 687:358; fairly open, steep cliff slope; population size several m²; 5, 4, 0 plants.
- 4) Savonlinna, Viuhonmäki, Grid 27°E: 686:360; mesic, partly bushy forest under electricity power-line; population size a couple of hundreds of m²; 61, 45, 14 plants.

White-flowering populations:

- 5) Savonlinna, Marjomäki, Grid 27°E: 686:358; open, moist grassland; population size several m²; 20, 29, 11 plants.
- 6) Savonlinna, Luhtinen, Grid 27°E: 686:358; open moist grassland; population size a couple of m²; 4, 6, 6 plants.
- 7) Rantasalmi, Lahnasenvuori, Grid 27°E: 687:358; partly open, dry mesic forest on a steep slope; population size a couple of hundreds m²; 19, 13, 7 plants.
- 8) Savonlinna, Kallislahti, Grid 27°E: 687:358; fairly open mesic forest in hilly area, partly shrubby, under electricity power-line; the population size a bit more than one hectare; 86, 116, 62 plants.

In each population, the number of plants was counted and the height of every individual was measured in 2010 and 2012. Flowering was studied in 2010–2012. However, due to the unfavorably dry summer and withering of plants early in

2010 and 2011, only the beginning of flowering was recognized in these years and then the monitoring was discontinued. In 2012 the same individuals which were measured for height were monitored during the whole flowering period and the number of buds, open flowers and withering flowers were regularly counted. On the basis of the figures in 2012 the date of maximum flowering (maximum number of open flowers) was counted for each population.

In 2014 the following parameters were measured from all plants of the populations (except for the population no. 3, where flowering stems were absent): height, width of the second lowest leaf, length of the inflorescence, and number of flowers. The density of each inflorescence was calculated as well as the means for the two population groups.

Molecular study. In 2015, a small piece of fresh leaf for molecular analysis was collected from one individual of each population listed above. The samples were studied by M. Hedrén (Lund). DNA sequences obtained for nuclear ITS regions were analyzed from each specimen by the method described in Hedrén & al. (2018), which allowed determination the individuals as belonging to *Gymnadenia conopsea* or *G. densiflora*.

Herbarium study and interviews. To elucidate the possible occurrence of similar white-flower-

ing plants in the whole country, the herbarium specimens of *Gymnadenia* in the Finnish Museum of Natural History (H) and the Botanical Society of Tampere (TMP) were studied. On the one hand, an effort was made to divide the specimens between the northern and southern races and, on the other hand, to study the white-flowered specimens. White-flowered plants were often indicated on the label as f. *alba*, var. *albiflora*, f. *ornithis* or fl. *albo*. The flower colour is not always given on the labels and the flowers may turn brownish in herbarium specimens, and recognizing white flowers can be difficult in such cases. However, there are usually at least some red patches and red nerves still visible on the petals in the herbarium specimens of red-flowering plants; in white flowers there is hardly any tinge of pink and the nerves are brownish to yellowish.

Several active amateur botanists were asked about their observations of similar white-flowering *Gymnadenia* in different parts of Finland.

The southern variability: results and taxonomic conclusion

Detailed results from the morphological observations of the populations studied are presented in Table 1 (Kettunen 2015) and are summarized in Table 2.

Table 1. The mean values and standard deviations of five morphological characters in the eleven populations of *Gymnadenia conopsea* studied in 2014 and the mean values for the red-flowering and white-flowering populations. Density of the inflorescence = number of flowers/cm.

Population	Number of plants	Height (cm)		Max. width of second lowest leaf (cm)		Length of inflorescence (cm)		Number of flowers		Density of inflorescence	
		mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Pirhiänniemi	36	46.64	7.52	0.88	0.19	10.81	2.87	35.94	12.57	3.33	0.64
Aholhti	19	44.63	9.06	1.26	0.25	12.21	3.28	39.11	8.84	3.20	0.57
Viuhonmäki	14	51.57	9.01	1.11	0.22	12.79	3.91	42.71	17.40	3.34	0.62
Red-flowering populations	69	47.09		1.03		11.59		38.19		3.29	
Marjomäki	11	85.10	8.76	2.28	0.42	22.64	4.06	89.91	25.20	3.97	0.62
Luhtinen	6	65.00	4.65	1.32	0.28	14.00	3.16	50.83	15.65	3.63	0.47
Lahnasenvuori	7	65.29	8.86	1.34	0.20	16.43	3.21	46.14	8.25	2.81	0.72
Kallisolahti	62	67.58	10.41	1.38	0.36	16.27	4.38	54.79	16.94	3.37	0.75
White-flowering populations	86	69.45		1.49		16.94		58.30		3.44	

Table 2. Morphological characters of red-flowering and white-flowering populations of *Gymnadenia conopsea* in Savonlinna and Rantasalmi (Kettunen 2015), and comparison with *G. conopsea* and *G. densiflora* from the Czech Republic (Marhold et al. 2005) and Germany (Stark et al. 2011). Only population averages are given.

	Finland, Savonlinna & Rantasalmi		Czech Republic		Germany	
	red-flowering	white-flowering	<i>G. conopsea</i>	<i>G. densiflora</i>	<i>G. conopsea</i>	<i>G. densiflora</i>
Height (cm)	47.09	69.45	40.74	67.29	47.84	58.16
Width of second lowest leaf (cm)	1.03	1.49	1.13	2.34	1.23	2.00
Length of inflorescence	11.59	16.94			12.37	14.11
Number of flowers	38.19	58.30	39.7	77.5	41.19	69.10
Density of inflorescence	3.29	3.44			3.40	4.83

In the populations studied in Savonlinna and Rantasalmi white-flowered plants were distinctly taller than the red-flowered ones and their leaves were broader and inflorescences longer. The measurements of the red-flowered populations are largely similar to those of *G. conopsea* s.str. reported from the Czech Republic (Marhold et al. 2005) and Germany (Stark et al. 2011), and the height, length of inflorescence and number of flowers for the white-flowered populations match quite well those of *G. densiflora*; however the leaf width and inflorescence density are greater in *G. densiflora* (Table 2). Furthermore, in all three years 2010–2012 the monitored white-flowered plants started flowering later than the red-flowering ones. In 2012, the peaks of flowering in red-flowered populations were in July 7, 8, 10 and 12, while it was on July 16, 17, 19 and 19 in white-flowered populations.

However, molecular analyses indicate that all eight samples from Savonlinna are genetically similar and belong to *G. conopsea* s. str. (M. Hedrén, personal communication). Yet, the robust, white-flowering plants differ in several characters from the usual *G. conopsea* (Table 3) and deserve taxonomic recognition. They are here described as a new variety of *G. conopsea*.

Gymnadenia conopsea* var. *scitula T. Kettunen, var. nov.

Holotype: Finland, South Savo (ES/Sa). Savonlinna. Kalislahti, eteläisemmän Leppälammen N-päästä n. 280 metriä n. W. Hyvin loiva rinne sähkölinjalla. Kukkat olivat tuoreena valkoisia. Keruulupa ESAELY/864/2014. Finnish uniform grid (YKJ): 68715:35851, 15.VII.2014 *Tapani Kettunen* 374 (H 830244; Fig. 1).

Etymology: The epithet refers to the long, elegant inflorescence of the variety.

Description. As *Gymnadenia conopsea* var. *conopsea*, but plants robust and tall, height 50–90 cm; the second lowest leaf 1–2(–3) cm wide; inflorescence 12–25 cm; flowers 40–70, white, sometimes slightly pinkish when young. Flowers in July, ca. seven to ten days later than var. *conopsea*. Table 3; Figs 1 and 2.

Habitats. Open rich and mesic forests, mesic felled areas, power-line clearings, dry to fairly moist meadows and banks. Habitats are more or less similar to those of var. *conopsea*.

Distribution. In the 2010s *Gymnadenia conopsea* var. *scitula* has been observed from at least ten localities in the province of South Savo, from Savonlinna Town and Rantasalmi Parish (T. Kettunen). In this area, it is almost as common as var. *conopsea*. In addition, a few herbarium specimens of *G. conopsea* from the central parts of South Finland belong to var. *scitula* on the grounds of flower colour and other characters given in Table 3. According to responses to the inquiries, observations of similar plants come from the same area. These specimens and records (obs.) are listed below.

Satakunta: Eurajoki, two white-flowered plants in 2015 and one in 2016, in the same locality (J. Wessberg, obs.); Ylöjärvi, Viljakkala, 1931 *O. Vuorinen* (TMP). South Häme: Ylöjärvi, Yli-Huuhkaja, 1964 *I. Mäkisalo* (TMP) and Lempiänniemi, 1936 *R. Marjanen* (TMP); Ruovesi, Penkkilä, white-flowering plants in a quite wide area in 1988, not seen later (M. Kääntönen, obs.); Hollola, 1926 *T. Levander* (H); Heinola, Maitiaislahti, 1951 *S.-S.* (H); Sysmä, 5 plants in 2013 and 12 plants in 2015 in one locality (M. Könkkölä, obs.). North

Fig. 1. Holotype of
Gymnadenia conopsea
var. *scitula* T. Kettunen
(Photo Ari Taponen; H).



holo TYPE
of *Gymnadenia conopsea*
var. *scitula* T. Kettunen
=
det. T. Kettunen 8.0.18
(publ. in _____)
University of Helsinki, Finland

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Gymnadenia conopsea (L.) R.Br.
var. *scitula* T. Kettunen
det./rev. Tapani Kettunen 2018

MUSEUM BOTANICUM UNIVERSITATIS, HELSINKI (H)
PLANTAE FENNICAE

Gymnadenia conopsea var. *densiflora*
ETELÄ-SAVO (ES/Sa), Savonlinna, Kallisahti, eteläisemmän
Leppälammen N-päästä n. 280 metriä n. W.
Hyvin loiva rinne sähkölinjalla. Kukat olivat tuoreina valkoisia.

Keruulupa ESAELY/864/2014.
Finnish uniform grid (YKJ): 68715:35851
15.VII.2014 Tapani Kettunen 374
(H830244)

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830244
QUADR. CATAL. 2015

Table 3. Comparison of morphological characters and flowering time of the Finnish *Gymnadenia conopsea* taxa. The numbers are from the population observations and from the measures of East Fennoscandian herbarium specimens in H.

	var. <i>conopsea</i>	var. <i>scitula</i>	subsp. <i>alpina</i>
Height (cm)	30–60(–70)	50–80(–90)	(10–)15–30(–35)
Width of second lowest leaf (mm)	5–15(–17)	10–20(–30)	2–8
Length of inflorescence (cm)	8–15	12–20(–25)	3–8(–13)
Number of flowers	30–50	40–70	15–20(–30)
Flower colour	pink – red, sometimes white or yellowish	white, sometimes pinkish especially when young	purple – red, sometimes white
Flowering time	June – July	July	(mid-)July – August

Savo: Varkaus, Kangaslampi, Pisamaniemi, 1963, *M. Tikkanen* (H); Kuopio, Enonlahti, 1909 *K. Linkola* (H). North Karelia: Liperi, Salonnenä, 1962, *A. Aro* 1442 (H); Kontiolahti, Lehmo, tall white-flowering plants abundant in 1980 *M. & K. Koskinen* (H), H. Saari (obs.), later they were less abundant and no recent observation exist (H. Saari); Lieksa, Koli, 1904 *J. Pekkarinen* (H).

Notes on taxonomy. The new variety shares several morphological features with *Gymnadenia densiflora* (Marhold et al. 2005; Stark et al. 2011), such as the height, wide leaves, dense inflorescence and somewhat later flowering time. Originally (Kettunen 2015) it was supposed that the tall white-flowering plants of Savonlinna might belong to that taxon, despite several differences. There was no difference in the odour between red- and white-flowered *Gymnadenia* populations; stronger scent has been noted in *G. densiflora*. In addition, *G. densiflora* occurs in calcareous areas, which is not the case for the Savonlinna populations of *Gymnadenia*. *G. densiflora* is not known from so far north; the northernmost finds are from Leningrad and Pskov Regions in Russia (Efimov 2012), Estonia and southern Sweden (e.g., Trávníček et al. 2012). Furthermore, early- and late-flowering populations were reported also for *G. conopsea* s. str. from Sweden (Gustafsson & Lönn 2003). Finally, molecular analysis completely excluded the possibility of *G. densiflora* in the Savonlinna populations.

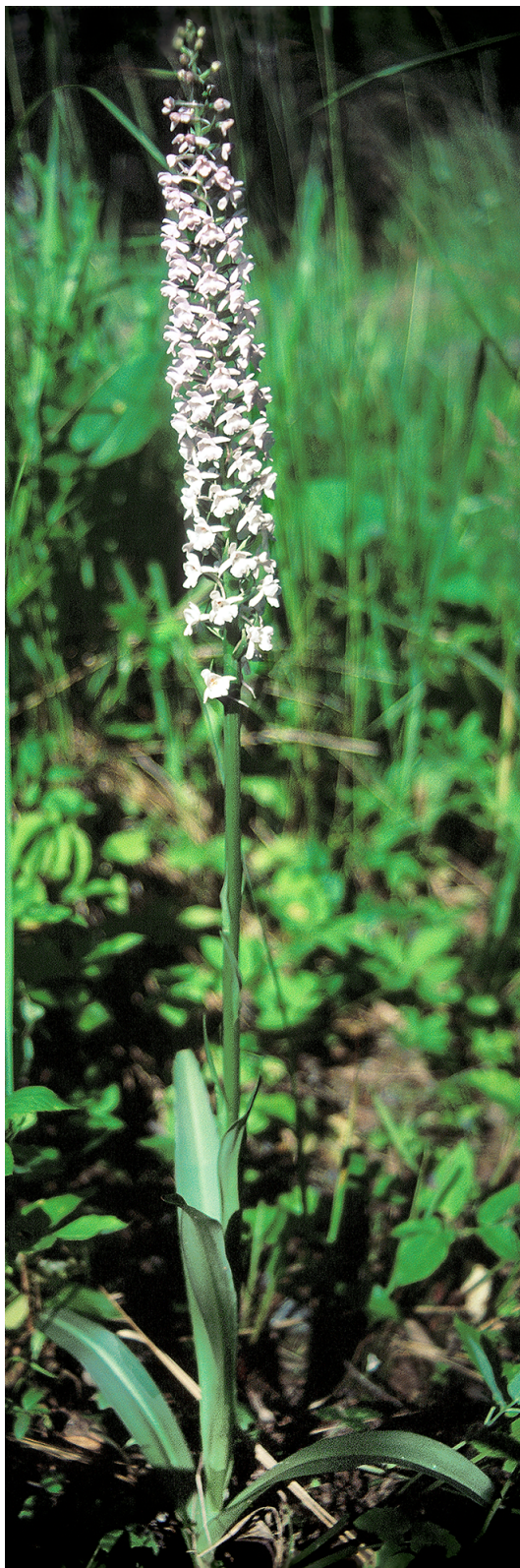
G. conopsea var. or f. *densiflora* were accepted for Finland in several old Finnish floras and checklists (Lönnrot 1860, Brenner 1886, Cajander 1906, Hagfors 1924, Hiitonen 1933, 1934), probably just following Swedish Floras.

Several specimens in H, collected from Finland and adjacent Russian Karelia, have been named by the collectors as var. or f. *densiflora*. None of them represents *G. densiflora*, but all belong to *G. conopsea*, most of them to var. *conopsea* and only a few to var. *scitula*. One specimen from Russian Karelia, determined by the collector as var. *densiflora*, was also discussed by Kravchenko (2007).

White-flowered plants of *Gymnadenia conopsea* s. lat. are not uncommon in Europe. They have been provided with a few names mainly at form and variety levels. Jacquin (1773) described the white-flowering *Orchis ornithis* (*Gymnadenia ornithis* (Jacq.) Rich.) from the Austrian Alps. Schur (1866) named from the Carpathians *G. conopsea* var. *leucantha* with white to yellowish flowers; in addition, the small plants have a lax inflorescence. Zapałowicz (1906) described *G. conopsea* var. *albiflora* (f. *albiflora*) from the Carpathian Mountains, Czarna Hora, as a variant with white flowers; he gives *Orchis ornithis* and *G. conopsea* var. *leucantha* Schur *pro parte*, as synonyms.

None of these descriptions mention about the considerable height and the size of inflorescence and leaves; rather they describe quite small plants from the mountains. They do not refer to var. *scitula* but most probably represent white-flowering forms of var. *conopsea* or the mountain race of *G. conopsea*.

Most of the white-flowered *Gymnadenia conopsea* specimens from Finland have been named by the collectors as a white-flowering form or variety (f. *albiflora*, var. *albiflora*, f. *ornithis*) or provided by a note of white flowers. Almost all



◀ Fig. 2. *Gymnadenia conopsea* var. *scitula*. South Savo, Savonlinna, Kallistahti, side of forest road. Photo T. Kettunen 2 July 2013.

specimens with white flowers represent single plants without indication of population characters. Some of the specimens are tall and with a long, dense inflorescence and broad second leaf, and they closely resemble var. *scitula*. However, populations of var. *scitula* may also contain smaller plants, and therefore single smaller, white-flowered specimens cannot be excluded from var. *scitula* with certainty. White-flowered specimens have been collected quite randomly in the whole country, and they include plants of both the southern and the northern races.

The northern race

The northern race of *Gymnadenia conopsea* differs from the southern one in the smaller size, lower number of leaves and shorter inflorescence with fewer flowers (Table 3). The flower colour is usually more purplish and the spur often remains shorter than in the southern race. However, the characters are quantitative, changing from north to south and in part overlapping in a wide area in Southern Lapland – Koillismaa – Kainuu regions. Hjelt (1892) pointed that out there is no clear distinction between the races but because of the geographical pattern they are worthy of being recognized. The distribution pattern is similar in several other species, for example *Spinum annotinum* (L.) A. Haines, *Equisetum arvense* L., *Juniperus communis* L., *Pyrola rotundifolia* L., *Prunus padus* L., *Salix caprea* L., *Rhinanthus minor* L., *Achillea millefolium* L. and *Solidago virgaurea* L., among others, where a northern race is distinguished even though the overlapping zone is broad. In Finland, the subspecies level is generally used for this kind of variation, and the same is now applied to *G. conopsea*. There are two other reasons supporting the recognition of two subspecies: the differences in ecology and history of the northern and southern races, and the recognition of the more randomly occurring new variety *scitula* from *G. conopsea*.

Gymnadenia conopsea* subsp. *alpina (Turcz.

ex Rchb. f.) Janchen ex Sóo in Ann. Univ. Budapest (Biol.) 11: 60. 1969.

- ≡ *G. conopsea* var. *alpina* Turcz. ex Rchb. f. in Reichenbach, Icon. Fl. Germ. Helv. 13–14: t. 73. 1851. ≡ *G. alpina* (Turcz. ex Rchb. f.) Czerep., Sosud. Rast. SSSR: 310. 1981, *nom. illeg.*, non Rouy (1812).
- = *Gymnadenia conopsea* var. *lapponica* (J. W. Zetterst.) Hartm., Handb. Scand. Fl. 3: 205. 1838. ≡ *Orchis conopsea* L. var. *lapponica* J. W. Zetterst., Resa Umeå Lappm.: 119, 138. 1833. ≡ *Habenaria conopsea* (L.) Benth. f. *lapponica* (J. W. Zetterst.) Almq. & Krok in Hartm., Handb. Skand. Fl. 12: 96. 1889. ≡ *Gymnadenia conopsea* f. *lapponica* (J. W. Zetterst.) Neuman in Neuman & Ahlfv., Sveriges Fl.: 632. 1901. – Type: *Orchis conopsea* Linn. var. [Sweden] In alpe Brattisfjell Lapp. Umensis 8 Jul. 1832. Zett. Iter Lapp. p. 119. [manu J. W. Zetterstedt]. (lectotype LD 2025794, designated here by Uotila).
- = *Gymnadenia conopsea* var. *lapponica* Saelan, Herb. mus. fenn.: 19. 1859, *nom. illeg.* ≡ *Gymnadenia conopsea* f. *lapponica* (Saelan) Saelan, Herb. mus. fenn. Ed. 2: 31. 1889, *nom. illeg.*
- ? *G. conopsea* var. *leucantha* Shur, Enum Pl. Transilv.: 644. 1866; replaced synonym *Orchis ornithis* Jacq.
- ? *G. conopsea* var. *ornithis* (Jacq.) Nyman, Consp. Fl. Eur.: 695. 1882. ≡ *G. conopsea* f. *ornithis* (Jacq.) Neuman in Neuman & Ahlfv., Sveriges fl.: 632. 1901. ≡ *Orchis ornithis* Jacq., Fl. Austriac. 2: 23. 1774; replaced synonym for *G. conopsea* var. *leucantha* Schur
- ? *G. conopsea* var. *albiflora* Zapal., Consp. Fl. Gallic. Crit. 1: 217. 1906.

Distribution. In Finland subsp. *alpina* is the only race of *Gymnadenia conopsea* in the Lapland provinces (Kittilä Lapland, Sompio Lapland, Enontekiö Lapland and Inari Lapland). In Outer Ostrobothnia, Koillismaa and Kainuu, some of the specimens studied clearly belong to subsp. *alpina*, but there are also many plants that are too tall and many-flowered for a typical subsp. *alpina*. Even typical var. *conopsea* has been found from these provinces; in the map of var. *conopsea*, provided by Kypärä (2012), the area was quite artificially delimited in the north. The range of subsp. *alpina* stretches at least to the northern fells of Sweden and Norway and to Kola Peninsula.

Notes on taxonomy. J. W. Zetterstedt travelled in Swedish Lapland in 1832 and recorded flora from several places. He reported '*Orchis conopsea* var. *lapponica*, med blomsporrn kortare än fruktämnet' [the spur shorter than the ovary] from

two different places in Åsele Lappmark, Brattisfjell and Tresunda (Zetterstedt 1933: 191, 138). Perhaps he paid attention to such plants because Wahlenberg (1820) remarked that fell plants of *Orchis conopsea* have smaller flowers and sparse inflorescence, and somewhat shorter spurs than the species in general. Zetterstedt collected a herbarium specimen from both localities, on July 8 from Brattisfjell and July 12 from Tresunda. Both specimens include only one small, 12–15 cm tall plant, which is in the bud stage. This early phase of the flowers explains the observation of the short spur – the spurs of the *Gymnadenia* flowers were still not developed to their full length.

C. J. Hartman saw Zetterstedt's specimens (Zetterstedt's note on the labels), and, following Zetterstedt's wording, accepted var. *lapponica* under *Gymnadenia conopsea* in *Handbok i Skandinaviens flora* (C. J. Hartman 1838). In subsequent editions of the flora up to ed. 10 (C. Hartman 1870) there is a similar reference to Zetterstedt, but in Ed. 11 (C. Hartman 1879), the variability is mentioned without any name. Again, in Ed. 12 (Krok 1889), a reference to Zetterstedt is included but the taxon was named as f. *lapponica*. Even Neuman & Ahlfengren (1901) and Lindman (1918) treated it as a form. Later, almost no attention was paid to the race in Sweden and Norway; however, it was mentioned by Nilsson (1986) as var. '*lapponicum*'.

Saelan in *Herbarium Musei Fennici* (Nylander & Saelan 1859) also noted the small size of the northern *Gymnadenia*, but according to him the spurs were quite long, which is a key character of *Gymnadenia*, and he concluded that this was not the same as Zetterstedt's var. *lapponica*. He supposed that Zetterstedt's 'var. *lapponica*' is '*Orchis lapponica* Laest.' [*Dactylorhiza lapponica* (Hartm.) Soó], which has a short spur. Unfortunately, he named his northern variety by using the same epithet, and as a later homonym *G. conopsea* var. *lapponica* Saelan is illegitimate. In the second edition of *Herbarium Musei Fennici* (Saelan et al. 1889) Saelan treated the taxon as a form. Most of the Finnish floras of the 1800s (e.g. Lönnrot 1860; Hjelt 1892; Mela 1895) included Saelan's var. or f. *lapponica*. Lindberg (1901) in his enumeration did not accept the northern race, but Cajander (1906) included it as *G. conopsea* f. *lapponica* (Zetterst.) Hartm.

In Finland, Hiitonen (1933, 1934) was the first who used 'var. *alpina* Rchb.' as the name of the northern *Gymnadenia conopsea*, giving 'f. *lapponica* Zett.' as a synonym. After Hiitonen's solution var. *alpina* also appeared on many herbarium specimens. Judging from the excellent colour drawing in Reichenbach (1851), var. *alpina* matches well with the most typical fell plants of Lapland. As in many other plants, a Central European mountain race can occur also in Lapland. Keller & So (1933) recognized f. *lapponica* as

a northern form of *G. conopsea* var. *alpina*. It is hardly possible to find morphological differences between the northern and alpine races of *G. conopsea*, and they are here regarded as the same taxon. If the race is treated as a variety, the correct epithet at that level is *lapponica*, which is almost 20 years earlier than *alpina*. However, the status of the northern *G. conopsea* is still pending further research. Plants of Lapland and alpine areas have not been compared properly, and Lapland plants have not been included in molecular

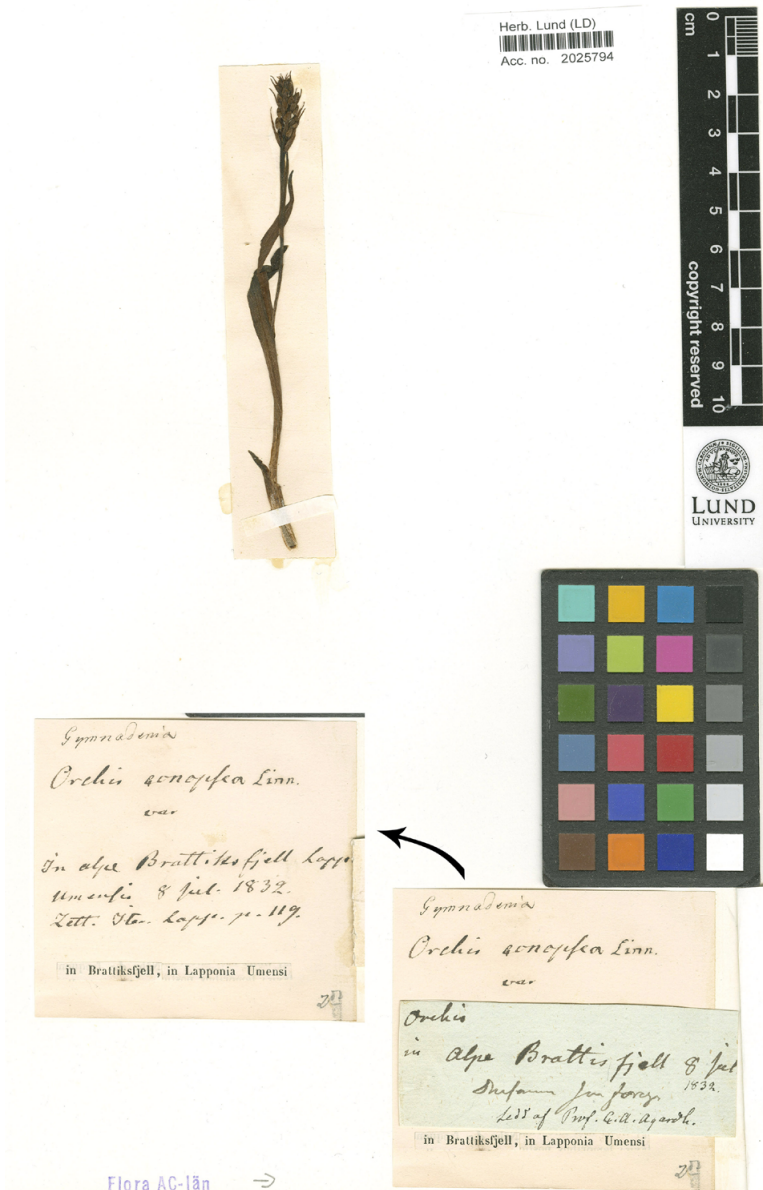


Fig. 3. Lectotype of *Orchis conopsea* var. *lapponica* Zetterst. (Photo: Patrik Frodn; LD).

studies, except for in M. Hedrén, who has studied some samples but did not discuss them in Hedrén et al. (2018).

In Russia very little attention has been paid to the northern race of *Gymnadenia conopsea*. There is no reference to it in either Orlova (1957), Smol'yaninova (1976) or Ramenskaya & Andreeva (1982). However, the illustration included in Orlova (1957) clearly refers to var. *lapponica*. Kravchenko (2007) cited var. *lapponica* from Kuusamo on the basis of a Finnish specimen (Hjelt 1892), but doubted the identity of his own collections from the islands and coast of the White Sea. Czerepanov (1981) accepted the species rank (*G. alpina* (Turcz. ex Rchb.) Czerep., *comb. illeg.*) for this race from European Russia. On the other hand, Averyanov (1995) discusses similar plants in the Caucasus Mountains, but considers them only as phenotypic variation and not worthy of taxonomic recognition.

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