

Systematic revision of *Orobanche pycnostachya* and first record of *O. filicicola* (Orobanchaceae) in Russia

Систематическая ревизия *Orobanche pycnostachya* и первая находка *O. filicicola* (Orobanchaceae) в России

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Abstract. Plants whose morphological characteristics correspond to those of *Orobanche filicicola* Nakai ex Hyun, Lim et Shin as described by Nakai (1952) and validated by Huyn et al. (2003), were in 2012 found for the first time in Russia (Far East, Primorye Territory) growing on the banks of the Ussuri River in the Chuguyevsky District and in a mixed population with *O. amurensis* (Beck) Kom. on the SE flank of the Sikhote-Alin Mountains (Lazovsky District). The status of the taxon has been revised. As a result, it is reclassified as a new variety of *O. pycnostachya* Hance, namely as *O. pycnostachya* var. *filicicola* (Nakai ex Hyun, Lim et Shin) Rätzel et Uhlich. In this context, *O. pycnostachya* and *O. amurensis* are discussed, including the relationship of *O. amurensis* with *O. pycnostachya*. In addition, *O. coerulescens* Stephan, *O. coerulescens* f. *cristata* Beck, *O. coerulescens* f. *lehmannii* Beck, *O. coerulescens* f. *pekinensis* Beck, *O. coerulescens* var. *arenaria* Serg., *O. macrolepis* Turcz., *O. pycnostachya*, *O. pycnostachya* f. *amurensis* Beck, *O. pycnostachya* f. *albo-lutea* Beck, *O. quadrivalvis* Regel and *O. ussuriensis* Novopokr. are lectotypified. Three necessary new combinations of infraspecific taxa from *O. coerulescens* — *O. coerulescens* var. *nipponica* (Makino) Uhlich et Rätzel, *O. coerulescens* var. *occidentalis* f. *multidentata* (Beck) Uhlich et Rätzel and *O. coerulescens* f. *arenaria* (Serg.) Uhlich et Rätzel — are made. The name *O. quadrivalvis* is to be used as a synonym of *O. kotschyi* Reut.

Keywords: Orobanchaceae, *Orobanche*, *O. amurensis*, *O. coerulescens*, *O. filicicola*, *O. kotschyi*, *O. pycnostachya*, Russia, Far East, Primorye Territory, new combinations, lectotypification, synonymization.

Аннотация. Растения, морфологические характеристики которых соответствуют *Orobanche filicicola* Nakai ex Hyun, Lim et Shin, описанному Nakai (1952) и валидизированному Нуун et al. (2003), были обнаружены впервые в России в Приморском крае на берегах Уссури в Чугуевском районе и в смешанной популяции с *O. amurensis* (Beck) Ком. на юго-восточном макросклоне Сихотэ-Алиня в Лазовском районе в 2012 году. В результате таксон принят в ранге разновидности — *O. pycnostachya* Hance var. *filicicola* (Nakai ex Hyun, Lim et Shin) Rätzel et Uhlich. Даны соответствующие комментарии к *O. pycnostachya* и *O. amurensis*, а также к систематической структуре родства *O. pycnostachya*. Названия *O. coerulescens* Stephan, *O. coerulescens* f. *cristata* Beck, *O. coerulescens* f. *lehmannii* Beck, *O. coerulescens* f. *pekinensis* Beck, *O. coerulescens* var. *arenaria* Serg., *O. macrolepis* Turcz., *O. pycnostachya*, *O. pycnostachya* f. *amurensis* Beck, *O. pycnostachya* f. *albo-lutea* Beck, *O. quadrivalvis* Regel и *O. ussuriensis* Новопокр. лектотипифицированы. Обнародованы три новые комбинации внутривидовых таксонов *O. coerulescens*: *O. coerulescens* var. *nipponica* (Макино) Улих и Рэтцель, *O. coerulescens* var. *occidentalis* f. *multidentata* (Бек) Улих и Рэтцель и *O. coerulescens* f. *arenaria* (Серг.) Улих и Рэтцель. Название *O. quadrivalvis* синонимизировано с *O. kotschyi* Реут.

Ключевые слова: Orobanchaceae, *Orobanche*, *O. amurensis*, *O. coerulescens*, *O. filicicola*, *O. kotschyi*, *O. pycnostachya*, Россия, Дальний Восток, Приморский край, новые комбинации, лектотипификация, синонимизация.

Within the genus *Orobanche* L., the subsection *Coerulescentes* (Beck) Novopokr., which has only a few members¹, occupies a phylogenetically relatively

exceptional position (cf. Schneeweiss et al., 2004; Li et al., 2017; Piwowarczyk et al., 2021). In contrast to

¹ According to more recent phylogenetic studies (Li et al., 2017; Piwowarczyk et al., 2021), *Orobanche boninsimae* (Maxim.) Tuyama (= *Platypholis boninsimae* Maxim.) also belongs to the

genus *Orobanche*, in particular to subsect. *Coerulescentes*. However, that taxon differs very significantly from the other representatives of that subsection, both morphologically and ecologically (e. g. completely different habitats and hosts).

other sections and subsections of the genus *Orobanche*, it has its main area of distribution in East Asia; only *O. coerulescens* Stephan emend. Willd., which has an extremely large total distribution area, also reaches Central Europe. From an ecological point of view it should be noted that numerous species of this subsection (but also the sect. *Inflatae* (Beck) Rouy) parasitize exclusively on members of the genus *Artemisia* L.; but then in a broad spectrum, that sometimes goes beyond the respective section.

Materials and methods

During a several-week botanical excursion to various regions of the Russian Far East in 2012, the first author of this article collected material from *O. coerulescens* and taxa from the relatives of *O. pycnostachya* Hance.

List of herbarium specimens of *O. coerulescens*, *O. pycnostachya* var. *filicicola* (Nakai ex Hyun, Lim et

Shin) Rätzel et Uhlich and var. *pycnostachya* f. *amurensis* Beck, collected by S. Rätzel in the Russian Far East: [Appendix 1](#).

In addition, on several visits to the Komarov Botanical Institute of the Russian Academy of Sciences in Saint Petersburg (LE) since 2015, the second author studied the types and other herbarium material of the members of the subsection *Coerulescentes*. Besides the relevant herbarium material of the members of the subsection has been researched in various Herbaria (B, DR, FR, GFW, GLM, H, HAL, JE, LD, LZ, Teryokhin's *Orobanche* herbarium in the Botanical Museum of the Komarov Botanical Institute, a. o.) of the world and other sources (e. g. Chinese Virtual Herbarium, 2021; GBIF, 2022; Herbarium Berolinense – Virtual Herbarium, 2022; Naturalis Biodiversity Center, 2022; Vascular Plants Herbarium of the Komarov Botanical Institute RAS – Herbarium LE, 2022; Virtual Herbaria JACQ, 2022) for a number of years.

Results

Until now, *O. filicicola* Nakai ex Hyun, Lim et Shin was considered endemic to South Korea (Hyun et al., 2003: 64). This is surprising because habitats with clearly ruderal characteristics are named for this taxon (e. g. Hyun et al., 2003: 66; Lee et al., 2011: 273). During the above-mentioned excursion in 2012, material attributable to *O. filicicola* was found on a bank terrace of the Ussuri River not far from the settlement of Sokolovka (Fig. 1: A; 2: A, B). The specific dimensions and characteristics agree with the description of *O. filicicola* given in the protologue (Hyun et al., 2003) and the information in the table (Hyun et al., 2003: 66). The location on the bank of Ussuri River corresponds to the original locations of the host and parasite (cf. Hyun et al., 2003: 66 – “gravelly place between the river and the forest margin along a roadside”. In our view, the plants of *O. pycnostachya* s. l. are spreading because human activities and increasing urban sprawl are constantly creating suitable habitats for their hosts and the parasites.

Furthermore, *O. amurensis* (Beck) Kom. was found growing in mixed stands with plants of the *O. filicicola*-habit on the southeast flank of the Sikhote-Alin Mountains (Fig. 1: B; 2: C, D).

During the excursion it was confirmed that, in contrast to *O. pycnostachya* s. l., *O. coerulescens*, which also occurs in the Far East, populates natural or near-natural habitats such as rocks (especially coastal rocks along the Sea of Japan), dunes etc., which, as far as we know,



Fig. 1. Habitats of *Orobanche pycnostachya* var. *filicicola* (A, B) and *O. pycnostachya* var. *pycnostachya* f. *amurensis* (B).

A – terraces of the Ussuri River near Sokolovka, dominated by *Artemisia* cf. *argyi* (host of *O. pycnostachya* var. *filicicola*), 15 VI 2012; B – southeast flank of the Sikhote-Alin, Lazovsky District, ruderal vegetation, dominated by *Artemisia* cf. *umbrosa* (host of both taxa), 20 VI 2012. Photos by S. Rätzel.

are places that are in fact never ruderal covered or disturbed.

Discussion

The morphological differences between the above three taxa (*O. amurensis*, *O. filicicola* and *O. pycnostachya*) were described and summarized in Hyun et al. (2003).

In our opinion, the inflorescence of *O. pycnostachya*, which was described as “always dense” in Hyun et al. (2003), cannot be maintained as a characterising feature. In addition, we do not agree, that as described by Hyun et al. (2003: 66, tab. 1), different ratio of the length of the inflorescence to the length of the flowerless part of the stem is a consistent distinguishing feature of *O. filicicola* from *O. amurensis* and *O. pycnostachya*. This ratio is variable in the course of the phenological development of the plant. The specimens of *O. pycnostachya* available in Chinese Herbaria (Chinese Virtual Herbarium, 2021) show plants with inflorescences which are often shorter, but also sometimes longer than the flowerless part (e. g. [PE 01476129](#), [PE 01476083](#), [PE 01476084](#)). Photographs by *O. filicicola* on the Internet (e. g. Naejangsan National Park Service, 2018) similarly show plants with inflorescences which are often longer and looser, but also sometimes shorter. The first author of this article also found plants which are attributable to *O. amurensis* but which have a significantly longer inflorescence (Fig. 2: C, D) than that described by Hyun et al. (2003). The flower colour also varies, e. g. in *O. filicicola*, from a bright dark to pale blue, exceptionally white. In our opinion, this eliminates the differences, which, among other things, were the basis for the differentiation at the rank of species in Hyun et al. (2003) between *O. filicicola* on the one hand, and *O. pycnostachya* and *O. amurensis* on the other.

The other differences in characteristics between the above three taxa discussed by Hyun et al. (2003) are exclusively of a quantitative nature. They are essentially limited to insignificant differences in size. Other, non-quantitative characteristics that would justify a demarcation between these taxa at species rank are absent. There is also a clear overlap of the spectrum of host plants (Table). Thus all three taxa parasitize *Artemisia* host species, several of which are the same for all three.



Fig. 2. Habits (A, C) and inflorescences (B, D) of *Orobanche pycnostachya* subtaxa.

A, B — *O. pycnostachya* var. *filicicola*, Ussuri terraces near Sokolovka, on *Artemisia* cf. *argyi* (host), 15 VI 2012; C, D — *O. pycnostachya* f. *amurensis*, Sikhote-Alin, Lazovsky District, 20 VI 2012. Photos by S. Rätzel.

In terms of vegetation ecology, too, no significant difference can be found between the taxa under discussion. With their hosts, all three taxa colonize locations with high habitat dynamics (habitat turnover due to

Table. Overview of the hosts used by *Orobanche pycnostachya* s. l. according to the current state of knowledge

Host (<i>Artemisia</i> L. ¹)			“ <i>O. amurensis</i> ”	“ <i>O. filicicola</i> ”	<i>O. pycnostachya</i> s. str.
Section	Series	Species			
Subgenus <i>Artemisia</i>					
<i>Abrotanum</i> (Duchamel) Besser	<i>Laciniatae</i> Kitam.	<i>A. laciniata</i> Willd.	Novopokrovsky, Tzvelev, 1958: 74; Kurbatsky, 1996: 94		
	<i>Paniculigerae</i> Poljakov, nom. inval.	<i>A. keiskeana</i> Miq.	Schischkin, 1930: 151		
	<i>Ponticae</i> [Rydb. unranked]	<i>A. sacrorum</i> Ledeb. (= <i>A. gmelinii</i> Web. ex Stechm.)	Novopokrovsky, Tzvelev, 1958: 74		Beck, 1930: 117; Hsu, Wang, 1996: 99; Korsun, 2014
<i>Artemisia</i>	<i>Angustilobae</i> Poljakov, nom. inval.	<i>A. argyi</i> H. Lévl. et Vaniot	PE 01476152, IFP 13202004x0021, IFP 13202004x0022	Rätzel, published here (cf.)	
		<i>A. selengensis</i> Turcz. ex Besser	IFP 13202004x0016		
	<i>Simplicifoliae</i> Poljakov, nom. inval.	<i>A. stolonifera</i> (Maxim.) Kom.	Schischkin, 1930: 151; IFP 13202004x0016		
	<i>Artemisia</i>	<i>A. umbrosa</i> (Turcz. ex Besser) Pamp.	Rätzel, published here (cf.)	Rätzel, published here (cf.)	
		<i>A. vulgaris</i> L.	Schischkin, 1930: 151		
Subgenus <i>Dracunculus</i> (Besser) Peterm.					
	<i>Commutatae</i> Poljakov, nom. inval.	<i>A. campestris</i> L.	Maximowicz, 1859: 211		
		<i>A. commutata</i> Besser	Novopokrovsky, Tzvelev, 1958: 74; Kurbatsky, 1996: 94		Novopokrovsky, Tzvelev, 1958: 73
	<i>Japonicae</i> Krasch. ex Poljakov, nom. inval.	<i>A. capillaris</i> Thunb.	PE 01476155		
		<i>A. desertorum</i> Spreng.	Maximowicz, 1859: 211		Beck, 1930: 117
	<i>?Psammophilae</i> Poljakov, nom. inval.	<i>A. ordosica</i> Krasch.			Hsu, Wang, 1996: 99

natural perturbations or human activity), e. g. river valleys, and especially those with anthropogenic influence (i. e. $\pm$ ruderalized locations). Differences in altitude of the populated locations are just as difficult to recognize as their own distribution area. The result of our researches shows that *O. filicicola* tends to be a small-statured and small-flowered variety of *O. pycnostachya*. Like *O. amurensis*, it has $\pm$ intensely (purple) blue flowers and usually white stigmas. *O. pycnostachya* s. str. in contrast, has $\pm$ completely yellowish-white flowers and yellow stigmas.

Orobanche filicicola is therefore comparable with taxa such as *O. coerulescens* var. *occidentalis* (Beck) O. Fedtsch. et B. Fedtsch. (cf. for the classification of the var. *occidentalis* also Uhlich, in prep.) from the same subsection, *O. owerinii* Beck var. *woronowii* Beck and *O. crenata* Forssk. var. *sylvestris* Beck. These taxa are

also small-flowered varieties of what are usually clearly larger-flowered species.

There are no consistent characterising features which justify the present classification of *O. filicicola* at the rank of species. Instead, it is more appropriate to reclassify it as a variety of *O. pycnostachya*.

Of the three taxa dealt with herein, the name *Orobanche pycnostachya* Hance (Hance, 1872) has priority at the rank of species. Since *O. filicicola* has not been previously named at the rank of variety, we now classify it at that rank.

We consider *O. amurensis* a colour form of *O. pycnostachya*. In the subsection *Coerulescentes* the occurrence of pale-yellowish and $\pm$ whitish corollas is also known in other taxa (e. g. *O. coerulescens* f. *albiflora* (O. Kuntze) H. Hara = *O. korshinskyi* Novopokr.). All features of *O. amurensis*, except for the colours of the corolla and stigma, are identical to, or overlap with those of *O. pycnostachya* s. str. Characteristics presented as differences in the literature (such as the

¹ The system of the genus *Artemisia* follows the treatment in the “Flora URSS” (Poljakov, 1961), including invalidly published names of series.

representation of style hairiness as “sparsely glandular” for *O. pycnostachya* versus “subglabrous” for *O. amurensis* in Hyun et al., 2003; cf. previously Beck, 1890, 1930) fall within the usual variability of these taxa and do not represent consistent or taxonomically usable differences.

We therefore propose an overall breakdown of the three taxa discussed as follows:

Systematic arrangement of *Orobanche pycnostachya* s. l. and reclassification of *O. filicicola* as a variety of *O. pycnostachya*

Orobanche pycnostachya Hance, 1872, J. Linn. Soc., Bot. 13, 66: 84. — **Lectotype** (designated here): “17048. *Orobanche* L. *pycnostachya* Hance. Herb. H. F. Hance. Rec[eive]d. 1887. In m[onti] bus ad occasum Peking sitis, m[ens]. Junio 1870, Dr. E. Bretschneider” (BM: [BM000997919](#) (scan!)), the first plant from the right of the specimen sheet; isolecotypes: BM000997919, all other plants on the specimen sheet). — Fig. 1 in [Appendix 2](#).

***O. pycnostachya* var. *pycnostachya*.**

O. pycnostachya var. *pycnostachya* f. *pycnostachya*.

≡ *O. pycnostachya* f. *typica* Beck, 1890, Biblioth. Bot. 19: 141, tab. 2, fig. 32, nom. inval. ≡ *O. pycnostachya* var. *genuina* Beck f. *typica* (Beck) Beck, 1930, in Engl., Pflanzenr. 4 (261): 118, nom. inval.

= *O. macrolepis* Turcz. 1851, Bull. Soc. Imp. Naturalistes Moscou, 24 (4): 356, nom. illeg., non Coss. 1848. — **Lectotype** (designated here): “*Orobanche macrolepis* m[ihi]. Ad radices rupium fl. Schilka cingentium, 1839, Turcz.” (LE: [LE 01057582](#) (scan!)) — Fig. 2 in [Appendix 2](#); syntype: “*Orobanche macrolepis* m[ihi]. Ad radices rupium fl. Schilka, cingentium, 1833, Turcz.” (LE [01205156!](#)); original specimen: [LE 01205154!](#)

= *O. pycnostachya* var. *genuina* Beck f. *albo-lutea* Beck, 1890, Biblioth. Bot. 19: 141, tab. 2, fig. 32. — **Lectotype** (designated here): “560. Herbarium horti Petropolitani. *Orobanche*. Weiße, wohlriechende Blüten, mit gelben Pistillen. Gelber Schaft. Braune Blattschuppen. Beinahe 1 Fuß hoch. Tang-shan im Parke. 23. Mai. Flora Pekinensis. Dr. Bretschneider 1877”, “*O. pycnostachya* Hance f. *albo-lutea* Beck” (LE: [LE 01205320!](#) (both plants)) — Fig. 3 in [Appendix 2](#); syntype: “561. Blüten wie die der vorigen, ...Bis 2 Fuß hoch. Yiu shan. 25. Mai. Flora Pekinensis. Dr. Bretschneider 1877” (LE [01205157!](#)).

— *O. pycnostachya* var. *zaianica* Teryokhin, 1993, in Teryokhin et al., Opred. Zaraz. Fl. SSSR: 37, nom. inval., sine typo.

— *O. pycnostachya* var. *pycnostachya* auct. non Hance: Park, 2007, Gen. Vasc. Pl. Korea: 895.

O. pycnostachya* var. *pycnostachya* f. *amurensis
Beck, 1890, Biblioth. Bot. 19: 141.

≡ *O. pycnostachya* var. *amurensis* (Beck) Beck, 1930, in Engl., Pflanzenr. 4 (261): 118. ≡ *O. amurensis* (Beck) Kom. 1907, Trudy Imp. S.-Peterburgsk. Bot. Sada, 25: 469; id. 1907, Fl. Manshur. 3, 2: 469. — **Lectotype** (designated here): “*Orobanche ammophila* C. A. Mey. 2 VII 1860. Bai Possjet, auf Wiesenland nicht selten, fl. azurei. Bai Victoria, Mandshuria, Maximowicz [hand of Maximowicz]”; “Залив Посъета, на лугах, не редко, 2 VII 1860, Максимович [hand of Komarov]” (LE: [LE 01015418!](#), the complete specimen). — Fig. 4 in [Appendix 2](#).

Note. Beck (1890) cites the collections by Maximowicz: “Mandshuria et territ. fl. Amur: ad Bureiae ostium, prope Possjet, Poriph, Poddale, Dsikiri prope Blagowestschensk (f. 3 [i. e. f. *amurensis*] leg. Maximowicz)”, as well as refers to the specimens that Maximowicz (1859) mentioned in his “Primitiae florae amurensis” for the most part under the name *O. ammophila*. Thus, the collection LE 01015418 labelled by Tzelev as “authentic specimen” is therefore, from our point of view, entirely suitable as a type material.

We select the entire specimen as a unit, as individual fragments cannot be reliably assigned.

= *O. ussuriensis* Novopokr. 1950, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR, 12: 274. — **Lectotype** (designated here): “Переселенческое Управление; экспедиция В. Л. Комарова в Южно-Уссурийский край. V. Komarov, Iter Austro-Ussuriense. № 431. *Orobanche amurensis* G. Beck. Бассейн р. Сучана. Селение Владимирская падь во Влад.-Александровске. Формация Кустарников[ая] заросль с высокой трав[янистой] рас[тительност]ью. Почва Перегной. 25 VI 1913, А. Булавкина”; “*Orobanche ussuriensis* Novopokr. Determ. I. Novopokrovsky 12 XII 1948”; “= *O. amurensis* (G. Beck) Kom. (Typus *O. ussuriensis* Novopokr.). Teste: Цвелёв 19 II 1955” (LE: [LE 01015423!](#), the complete specimen). — Fig. 5 in [Appendix 2](#).

***Orobanche pycnostachya* Hance var. *filicicola* (Nakai ex Hyun, Lim et Shin) Rätzel et Uhlich, comb. et stat. nov.**

≡ *O. filicicola* Nakai ex Hyun, Lim et Shin, 2003, Novon, 13, 1: 64; Nakai, 1952, Bull. Natl. Sci. Mus. 31: 104, nom. nud. — **Holotype**: “Korea. Chunnam: ca. 1 km N of the Office of National Parks Authority at Mt. Bailyang, along roadside, running parallel with the Hwangryong River, Changsung-Gun. 1 VI 1999, Jin O. Hyun 1999” (SNU; isotypes: KB (from AJOU), [MO5694578](#), scan!, SNU; paratype: TI).



Fig. 3. Lectotype (right plant) and isoelectotype of *Orobanche coerulescens* (HAL0090414; <https://hal.jacq.org/HAL0090414>). Courtesy of the Herbarium of the University Halle/Saale (CC-BY 4.0).

Further reclassifications and lectotypifications

Orobanche coerulescens Stephan emend. Willd. 1800, in Willd., Sp. Pl. 3: 349. — **Lectotype** (designated here): “*Orobanche coerulescens* e Siberia versus mare Caspium (Stephan), W[ilddenow] det. [hand of D. F. L. v. Schlechtendal, pat.]” (HAL: [HAL0090414](#)!, right plant; isoelectotype: HAL0090414, left plant). — Fig. 3.

Note 1. In view of the author citation “Stephan emend. Willd.”, it follows from the protologue (Willdenow, 1800: 349) that Stephan provided both the name *O. coerulescens* and brief diagnosis (“Steph. in litt.”; see the second paragraph of the protologue), while Willdenow completed this diagnosis in the first and last paragraphs of the protologue (each with his abbreviation “W.”).

In Berlin (B-WILLD: [B-W 11594-01 0!](#), [B-W 11594-02 0!](#)), there are probably isoelectotypes.

Note 2. According to Novopokrovsky and Tzvelev (1958), and Tzvelev (2006), the *locus classicus* is assumed to be in western Kazakhstan in the vicinity of Lake Inder (“Описан из района Индерского озера”). This assumption is based on a mixed collection, the left hand plant of which was collected by Stephan: “*Orobanche coerulescens* mihi, selten, [на] Индерской горе [Inderskoi gore. Hand of Stephan]”, “Herb. Stephan. *Orobanche caerul[escens]*. Clas. XIV, Montes Inderienses [hand?]”, “Orig. Stephan. *Orobanche (Trionychon) coerulescens* Stephan, *typica*, det. Dr. G. Beck [hand of Beck?]”, “Typus! 14 V 1949, I. Novopokrovsky. Not. crit. [hand of Novopokrovsky]” ([LE 00050163](#)! — Fig. 4). However, the specimen does not reveal that it was available to Willdenow for the protologue (compare to: Turland et al., 2018: Art. 9.4); the location is also not mentioned in the protologue. Beck’s assignment of the species to the “*Trionychon*” section is apparently an oversight. The reference to a type located in St. Petersburg (LE) in Novopokrovsky and Tzvelev (1958) obviously goes back to this specimen.

Compared to the herbarium specimen LE 00050163, we consider the herbarium specimen HAL0090414 to be more suitable as a lectotype: the specimen contains the phrase from the protologue almost verbatim. There is no evidence that Willdenow saw the St. Petersburg specimen. Had he seen it, he would probably have chosen the relatively precise locality “Lake Inder” or “Inderskoi gore” as the classic locality and not the broad formulation “in Siberia versus Mare Caspium”. The writer of the label of the herbarium from Halle, D. F. L. von Schlechtendal (1767–1842), was a contemporary of Willdenow and was in close contact with him. The herbarium specimen probably reached Halle from Willdenow. The abbreviation “W.” on the label implied that Willdenow, who abbreviates himself that way, saw the receipt himself.

Orobanche coerulescens* var. *coerulescens* f. *arenaria (Serg.) Uhlich et Rätzel, stat. nov.

≡ *O. coerulescens* var. *arenaria* Serg. 1939, in Krylov et al., Fl. Zapadnoi Sibiri, 10: 2540. — **Lectotype**

(designated here): “Гербарий Томского университета. *Orobanche coerulescens* С. А. Мей. var. *arenaria* m[ihi] (?)”. Семипалат[инская] губ., Зайсанск[ий] у. Между д. д. Николаевкой и Александровкой — 48½° с. ш. и 55¾° в. д., на песках Бланды-кум. 22 VII 1929, П. Крылов и Л. Сергиевская” (ТК: [TK-002057](#) (the second plant from the right; scan!) — Fig. 5; isoelectotypes: [LE 00053850](#)! (“I. Novopokrovsky. Notae criticae. *Orobanche coerulescens* Steph. f. *antheris pilosiusculis*. 15 VII 1948”), TK-002057 (all other plants)).

This plant differs from typical *O. coerulescens* only in its relatively tall habit (35–50 cm high), a longer, above rounded spike (16–20 cm) and hairy anthers (cf. Krylov et al., 1939). The height of the plant and the length of the inflorescence are within the variability of the species. Only the hairy anthers are a systematically and taxonomically relevant feature. The taxon is only known from the type locality. These circumstances justify the classification in the rank of a form.

O. coerulescens* var. *coerulescens* f. *cristata Beck, 1890, Biblioth. Bot. 19: 138.

Lectotype (designated here): “*Orobanche radibus Artemisiae campestris* innascens in insul. arenos. Wolgae. Bunge. Herb. Fischer”, “a) *O. coerulescens* Steph. b) f. *cristata* Beck [hand of Beck]”, “Lectotypus *Orobanche coerulescens* f. *cristata* Beck, Mon. Orob.: 138. 1890. Holger Uhlich, Welterod, Germany (2020)” (LE: [LE 01060143](#)! — Fig. 6 in [Appendix 2](#)).

O. coerulescens* var. *coerulescens* f. *lehmannii Beck, 1890, Biblioth. Bot. 19: 139 (“*lehmanni*”).

Lectotype (designated here): “Alexandri Lehmann Reliquiae botanicae. *Orobanche coerulescens*. Al. Bunge”, “*O. coerulescens* Steph. f. *O. Lehmanni* Beck [hand of Beck]”, “Holotypus *O. coerulescens* f. *lehmannii* Beck. Holger Uhlich, Welterod, Germany (2019)” (LE: [LE 00053849](#) — Fig. 7 in [Appendix 2](#)).

O. coerulescens* var. *coerulescens* f. *pekinensis Beck, 1890, Biblioth. Bot. 19: 138.

Lectotype (designated here): “556. Herbarium horti Petropolitani. *Orobanche*. Blau, geruchlos. — Pan shan. Mai. Flora Pekinensis. Dr. Bretschneider 1877”, “*O. coerulescens* Steph. f. *O. pekinensis* mihi. Beck [hand of Beck]”, “*Orobanche coerulescens* Steph. (non *O. ombrochares* Hance!). Teste N. Tzvelev (LE) XII 1995”, “№ 556. *Orobanche coerulescens* f. *pekinensis* Beck, Monogr. Orob.: 138. 1890. Lectotypus! (the middle larger plant) Hic designatus: H. Uhlich 2 IV 2021” (LE: [LE 01072663](#)!, the middle larger plant; isoelectotypes: LE 01072663, the other two plants from the collection). — Fig. 8 in [Appendix 2](#).



Fig. 4. Original specimen of *Orobancha coerulea* (LE 00050163, left plant; <http://rr.herbariumle.ru/00050163>). Courtesy of the Komarov Botanical Institute of the Russian Academy of Sciences.



Fig. 5. Lectotype (second plant from the right) and isolectotypes of *Orobanche coerulescens* var. *arenaria* (TK-002057; <https://tk.botdb.ru/r/002057>). Courtesy of the P. N. Krylov Herbarium, Biological Institute, Tomsk State University.

Note. There are two gatherings on the sheet, the second one is: “558. Herbarium horti Petropolitani. *Orobanche*. Blau, geruchlos. — Miao feng shan. 15. Juni. Flora Pekinensis. Dr. Bretschneider 1877”, “*O. coerulescens* Steph. f. *O. ombrochares* Hance. Beck [hand of Beck]” (LE 01072664!).

***Orobanche coerulescens* var. *nipponica* (Makino)**

Uhlich et Rätzel, stat. nov.

≡ *O. nipponica* Makino, 1928, J. Jap. Bot. 5, 10: 40.

≡ *O. coerulescens* f. *nipponica* (Makino) Kitam. 1957, Acta Phytotax. Geobot. 17, 1: 8.

Type specimen unknown, possible in Makino Herbarium (Tokyo Metropolitan University), not seen.

The classification as a variety is justified because of its own East Asian distribution area and because of significant differences between the taxon (the entire plant is glabrous) and typical *O. coerulescens*. In this context, reference must be made to *O. coerulescens* var. *glaberrima* Sakata (1935, Bull. Agric. Forest. Coll. Suigen (Suwon), 91: 32). The latter name might have priority as the oldest combination in the rank of variety. A clarification was not possible, however, since the literature was not accessible to the authors.

***Orobanche coerulescens* var. *occidentalis* (Beck)**

O. Fedtsch. et B. Fedtsch. f. ***multidentata*** (Beck) Uhlich et Rätzel, stat. nov.

≡ *O. coerulescens* f. *occidentalis* subf. *multidentata* Beck, 1930, in Engl., Pflanzenr. 4 (261): 121.

Protologue citation: “Rußland: Permer Gouvernement (Kryloff!)”. Type specimen possibly in LE, not seen.

The recombination was necessary because Fedtschenko and Fedtschenko (1913) upgraded the f. *occidentalis* to a variety — rightly in our opinion.

Note on *Orobanche coerulescens* var. *coerulescens* f. *ombrochares* (Hance) Beck (1930, in Engl., Pflanzenr. 4 (261): 121. ≡ *O. ombrochares* Hance, 1872, J. Linn. Soc., Bot. 13: 84).

Beck (1930: 121) has the plants, collected under № 15872 by S. W. Williams and Bretschneider (BM000997917 (scan!), BM000997918 (scan!), K000061378 (scan!), K000061379 (scan!); Hance refers only to S. W. Williams!) seen and considers them to be typical specimens of *O. coerulescens*. In the original description, the plant has all the characteristics of the typical *O. coerulescens*, except for the purple-violet colour of the flowers. Although Hance (1873: 84) states glabrous anthers, it is coded with very hairy anthers as a distinguishing feature in more modern “Floras” (e. g. Zhang, Tzvelev, 1998), which often place them in the rank of the species. Further investigations are required for a critical assessment of the taxon.

Note on *Orobanche quadrivalvis* Regel (1880, Trudy Imp. S.-Peterburgsk. Bot. Sada, 6: 354).

Beck (1890: 138, 1930: 120) and Sánchez Pedraja et al. (2022) place this name in the synonymy of *O. coerulescens*. As part of the research at the Herbarium LE, the type specimen of *O. quadrivalvis* was found and is selected here as the lectotype of this name.

Lectotype (designated here): “A. Regel. Iter Turkestanicum 1878 VIII”, “*Orobanche quadrivalvis* Rgl., Obere Borotala, 8500', 18 VIII [1878], A. Regel”, “*Orobanche kotschy* Reuter? 13 VIII 1947. Determin. I. Novopokrovsky”, “*Orobanche solmsii* Clarke. 1995. Teste N. Tzvelev (LE)”, “*Orobanche quadrivalvis* A. Regel, ... Lectotypus! Hic designatus: H. Uhlich 04. April 2021” (LE: LE 01072662! — Fig. 9 in Appendix 2). Based on the type, it can be determined that the collected plant clearly belongs to *O. kotschy* Reut. The name *O. quadrivalvis* is therefore to be used as a synonym of *O. kotschy*.

Identification key for the differentiation of the taxa of the *Orobanche* subsection *Coerulescentes* in the Russian Far East (excl. *O. boninsimae* (Maxim.) Tuyama)

1. Inflorescences (incl. bracts, calyces and corollas) glandular pubescent, rarely sparsely villous. Lobes of the corolla at margin ± long glandular ciliate. Stigma yellow or white, often projecting. Anthers at suture dense woolly to (almost) glabrous (check several flowers or plants) *O. pycnostachya* ... 2.
- + Inflorescences (incl. bracts, calyces and corollas) whitish arachnoid-villous, rarely glabrous. Lobes of the corolla glabrous at margin. Stigma white, usually enclosed in the corolla. Anthers glabrous or slightly hairy at suture, rarely hirsute or densely white tomentose-villous along suture (check several flowers or plants) *O. coerulescens* ... 4.
2. Corolla yellow or white. Stigma yellow. Inflorescence tends to ± dense *O. pycnostachya* var. *pycnostachya* f. *pycnostachya*.
- + Corolla ± intensive bluish or azure (rarely also plants with a white corollas in otherwise typically coloured populations). Stigma white. Inflorescence tends to ± lax (especially in the lower part) 3.
3. Plant 10–45 cm tall. Bracts 15–20 mm long, broadly lanceolate. Calyx 8–18 mm long. Corolla 18–25 mm long. Style almost glabrous *O. pycnostachya* var. *pycnostachya* f. *amurensis*.
- + Plant 13–30 cm tall. Bracts 10–16 mm long, linear-lanceolate. Calyx 8–11 mm long. Corolla 13–22 mm long. Style sparse glandular hairy *O. pycnostachya* var. *filicicola*.
4. Inflorescences (like the whole plant) glabrous *O. coerulescens* var. *nipponica*.¹
- + Inflorescences (incl. bracts, calyces and corollas) whitish arachnoid-villous 5.
5. Anthers almost glabrous, very rarely hairy 6.

¹ See above “Further reclassifications”.

- + Anthers hirsute or densely white tomentose-villous along suture 12.
- 6. Corolla large, 20–23 mm long 7.
- + Corolla small, 10–18(21) mm long 8.
- 7. Corolla 20–22 mm long, conspicuous prominent. Lobes of the lower lip mostly distinctly denticulate. Calyx segments scarcely divided to the middle. Bracts a little shorter than or as long as the corolla
..... *O. coerulescens* var. *coerulescens* f. *coerulescens*.
- + Corolla large 22–23 mm long. Lobes of the lower lip broadly elliptical. Calyx segments deep (often down below the middle) 2-toothed. Bracts as long as the corolla
..... *O. coerulescens* var. *coerulescens* f. *lehmannii*.
- 8. Corolla very small, 10–15 mm long, dark blue
..... *O. coerulescens* var. *coerulescens* f. *pekinensis*.
- + Corolla 16–21 mm long, intense blue-violet or blue to almost whitish 9.
- 9. Calyx and bracts dense white lanate. Corolla often intensive coloured
..... *O. coerulescens* var. *coerulescens* f. *ombrochares*.
- + Calyx and bracts not dense white lanate 10.
- 10. Bracts longer than the corolla and therefore inflorescences at apex comose. Calyx teeth as long as the corolla tube
..... *O. coerulescens* var. *coerulescens* f. *cristata*.
- + Bracts as long as the corolla or shorter. Flowers small, barely 20 mm long, scarcely exceeding the bracts, often hid by bracts and calyx segments
..... *O. coerulescens* var. *occidentalis* ... 11.
- 11. Calyx segments 2-toothed
..... *O. coerulescens* var. *occidentalis* f. *occidentalis*.
- + Each calyx segment 3-toothed, dorsally slightly connate. Plant robust. Inflorescences multi-flowered
..... *O. coerulescens* var. *occidentalis* f. *multidentata*.
- 12. Anthers hirsute. Stem 35–50 cm tall. Inflorescences 16–20 cm long, obtuse at apex
..... *O. coerulescens* var. *coerulescens* f. *arenaria*.
- + Anthers densely white tomentose-villous along suture. Stem 15–30 cm tall, densely white arachnoid-tomentose throughout. Inflorescences 5.08–6.35 cm (sec. Hance, 1873: “2–2.5 pollicaris”) or 8–15 cm (sec. Zhang et Tzvelev, 1998) long, rounded at apex
..... *O. coerulescens* var. *coerulescens* f. *ombrochares*.

The other species of the subsection *Coerulescentes* — *O. megalantha* Harry Sm., *O. mupinensis* Hu, *O. sinensis* Harry Sm., incl. var. *cyanescens* (Harry Sm.) Zhi Y. Zhang — are not to be found in the Russian Far East, but in southwestern China (SE Tibet, S Qinghai, N, NW and W Sichuan). *O. ombrochares* is included in *O. coerulescens* (see above). *O. pycnostachya* var. *yuennanensis* Beck (“*yünnanensis*”) according to Harry Smith (1933) is also attributable to *O. coerulescens* s. str.

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Supplementary materials

Appendix 1. Herbarium specimens of *Orobanche coerulescens*, *O. pycnostachya* var. *filiicola* and *O. pycnostachya* var. *pycnostachya* f. *amurensis*, collected by S. Rätzel in the Russian Far East. https://www.binran.ru/files/journals/Novitates/2022_53/NSPV-53_11-Ratzel_Uhlich-Appendix_1.pdf

Appendix 2. Images of lectotypes of the names of some *Orobanche* taxa, designated in the article. https://www.binran.ru/files/journals/Novitates/2022_53/NSPV-53_11-Ratzel_Uhlich-Appendix_2.pdf

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