



Notes on *Salvia baldshuanica* (Lamiaceae), an endemic species from Middle Asia

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ABSTRACT

We present a critical revision of information about rare and endangered endemic species *Salvia baldshuanica* (Lamiaceae), included in the Red Books of the USSR and Tajikistan. As the nomenclatural type had been missing, we assembled information on the original herbarium material performed a proper typification of the species name. A chorological analysis of the species distribution in Middle Asia was carried out. To assess the state of the current natural populations, a topographic mapping of localities (Sanglok mountains, two isolated local populations; Sarsaryak ridge, one local population) was made. A narrow edaphic confinement of plants of this species to gypsum-bearing mountain soils has been established. A taxonomic assessment of the key morphological traits of *S. baldshuanica* confirmed at least the sectional level of its position within the subgenus *Leonia*. The species was found in nature only three times – in 1883, 1937 and 1979, which confirms its exceptional rarity and high scientific interest.

Keywords: chorology, endangered species, morphology, nomenclature, typification

РЕЗЮМЕ

Турдибоев О.А., Байкова Е.В., Акбаров Ф., Байков К.С. Заметки о *Salvia baldshuanica* (Lamiaceae), эндемичном виде из Средней Азии. Проведена критическая ревизия сведений о редком и исчезающем эндемичном виде *Salvia baldshuanica* (Lamiaceae), внесенном в Красные книги СССР и Таджикистана. В связи с отсутствием номенклатурного типа определен состав оригинального гербарного материала и выполнена типификация названия вида. Выполнен хорологический анализ распространения вида в Средней Азии. Для контроля за состоянием природных популяций проведена топографическая привязка локалитетов (горы Санглок, две изолированные локальные популяции; хребет Сарсаряк, одна локальная популяция). Установлена узкая эдафическая приуроченность растений данного вида к гипсоносным горным породам. Таксономическая оценка ключевых морфологических признаков *S. baldshuanica* подвела как минимум секционный уровень его обособленности в пределах подрода *Leonia*. Вид был найден в природе всего трижды – в 1883, 1937 и 1979 годах, что подтверждает его исключительную редкость и высокий научный интерес.

Ключевые слова: хорология, исчезающие виды, морфология, номенклатура, типификация

Endemic species have a high conservation priority, as they are exclusive to a geographically restricted and limited territory. Being often rare and ecologically infrequent, any unfavorable change can cause their rapid extinction (Callmander et al. 2008). The study of endemic species of Middle Asia is carried out within the framework of long-term international cooperation of the Central Siberian Botanical Garden SB RAS with research institutes of Uzbekistan and Tajikistan. Significant results have been obtained on morphology, distribution and nomenclature (Davlatov & Baikova 2011, Ovchinnikova et al. 2020), especially of representatives of the Lamiaceae family (Bobokalonov et al. 2020, Cheryomushkina et al. 2020, Talovskaya 2020).

Genus *Salvia* L., the largest in the Lamiaceae family, is represented in Middle Asia by 35 species (Khassanov et al. 2015); 20 of them are endemic to this region (Makhmedov 1984). An extremely rare Middle Asiatic local endemic species is *Salvia baldshuanica* Lipsky. According to Makhmedov

(1984), its range is extremely limited. Data on *S. baldshuanica* in GBIF (2021), POWO (2021), COL (2021) databases are scarce, its specimens are absent in JSTOR (2021) and Virtual Herbaria (2021). The species is included in the Red Data Books of the USSR (Borodin et al. 1984) and Tajikistan (Rahimi et al. 2017) in a critical status because it is completely inactive; urgent special protection of the species is required. It is therefore necessary to identify the modern range of the species. The results will target future conservation action for this endangered species and improve our understanding of plant extinctions. The latter ones are a significant part of the global problem of the world's biodiversity extinction (Humphreys et al. 2019).

Salvia baldshuanica is characterized by a unique set of features of the flower, which are diagnostic traits of a high taxonomic rank. Pobedimova (1954) in the revision of *Salvia* in the “Flora of the USSR” described the new monotypic subgenus *Sanglakia* Pobed. including *S. baldshuanica*, and

showing its separate position in the genus. Makhmedov (1980) assigned this species to the monotypic section *Sanglakia* (Pobed.) Makhmedov, which he considered as part of the subgenus *Leonia* (Llav. et Lex.) Benth. The morphological diagnosis of the species was given in Latin and Russian when describing the species by Lipsky (1900). It was subsequently expanded and detailed by Pobedimova (l. c.). Now it is necessary to modify the description of *S. baldshuanica* on the basis of modern morphological approaches and terminology, taking into account the type of synflorescence and the division of shoots into structural and functional zones.

Salvia baldshuanica was first described by V. Lipsky (1900) based on herbarium specimens collected by A. Regel in 1883 from the eastern slope of the Sanglok Mountain range. There is no information on type specimens in the protologue of the species, so typification is necessary in such a case.

The targets of this work are to identify the current range and clarify the morphological features of *S. baldshuanica*, a rare and endangered endemic species of Middle Asia, as well as typification of the species name.

MATERIAL AND METHODS

In order to prepare a full description for *S. baldshuanica*, we collected plant material from the geographical distribution range of the species in Tajikistan during 1979. Three authentic specimens tested by Lipsky as a new species *S. baldshuanica* (original materials), which are deposited in LE (herbarium acronyms hereafter in accordance to B. Thiers, 2016) as well as all other specimens of the species stored in LE, Middle Asia Sector and General Sector were studied in detail. In addition, we examined specimens stored in TAD, TASH, US. Herbarium samples from P and US were studied from images freely available on the Internet. Lectotype and isolectotype are designated below in accordance with Article 9 of the Shenzhen Code (Turland et al. 2018). Label texts for all specimens are provided in full, with barcodes where these have been assigned. The protologue, herbarium specimens of *S. baldshuanica* and information from international nomenclatural and taxonomic electronic plant databases (IPNI 2021, WCVF 2021, POWO 2021, WCSP 2021, COL 2021) were analyzed during this research.

RESULTS

Salvia baldshuanica Lipsky 1900, Trudy Imp. S.-Peterburgsk. Bot. Sada 18:89.

Locus classicus: “Бальджуанъ: вост. склонъ горы Сенгулакъ на р. Вахшъ 5.000', 13 мая 1883 (А. Регель !) [Baldshuan: eastern slope of Sengulak Mt. in the Vakhsh River Basin 5.000', 13 May 1883 (A. Regel !)]” (Lipsky 1900: 91).

Typification of the species name. Original material and type specimens were chosen and designated here. We consider as type specimens only three authentic ones tested by V.I. Lipsky as *Salvia baldshuanica*.

Lectotype, designated here: A. Regel, Iter Turkestanicum. Distr. Baldschuan: in duliv. orient. montis Sangulak, ad fl. Wachs. 5000' 13–25/VII 1883 (LE, barcode LE00052480!) (Fig. 1). The lectotype for the species name was chosen among the original material as the most informative specimen in the best condition of storage. We believe

that the date specified in the protologue is incorrect. According to Lipsky (1905), Regel collected plants at the Sanglok (Sangulak) Mountains on July 13, and on May 13 he did not work there. The dates in Lipsky's work are indicated according to the Julian calendar, and on the labels of the Regel herbarium they are given according to the Julian and Gregorian calendars, which is noted by Lipsky (l. c.).

Isolectotype, designated here: A. Regel, Iter Turkestanicum. Distr. Baldschuan: in duliv. orient. montis Sangulak ad fl. Wachs. 5000' 13–25/VII 1883 (LE, barcode LE00052815!).

Syntype, designated here: A. Regel, Iter Turkestanicum. In duliv. orient. montis Sangulak 5000' 13–25/VII 1883 Distr. Baldschuan (LE, barcode LE00052816!).

Other specimens examined: A. Regel, Iter Turkestanicum. In duliv. orient. montis Sangulak 5000' 13–25/VII 1883 (LE, barcode LE00052817!); A. Regel, Iter Turkestanicum. Baldshuan 1883 (LE!, two specimens without barcodes); A. Regel, Iter Turkestanicum. In duliv. orient. mont. Sangulak. 5000'. 13–25/VII 83 (TAD!); P, barcode P02871887! image of the specimen is available at <http://coldb.mnhn.fr/catalognumber/mnhn/p/p02871887>; US barcode US02805923! image of the specimen is available at <http://n2t.net/ark:/65665/m3f2f42d61-c7b4-454c-b886-ee33a906073e>; Таджикистан. Юго-запад. склон хребта Сар-Саряк. 10 км. вверх от к-ка Санг-Туда по лев. берег р. Вахш. На гипсах. 29.V.1979, № 463, Камелин Р.В., Махмедов А.М. [Tajikistan. Southwest. The slope of the Sarsaryak ridge. 10 km upstream from the village of Sang-Tuda, on the left bank of the Vakhsh River. On gypsum rocks. 29.V.1979, No. 463, Kamelin R.V., Makhmedov A.M.] (TAD!, LE!, TASH!); Южный Таджикистан. Хребет Санлок. На гипсах близ к-ка Мансев. 9/VI.1937. М. Пряхин [Southern Tajikistan. Sanglok Ridge. On gypsum rocks near the village of Mantsev. 9/VI.1937. M. Pryakhin] (TAD!, №№ 53548, 53549).

Morphological description. Dwarf semishrub, 8–30 cm high, with a thick woody dark-brown contractile root and dark-brown thin woody perennial bases of shoots (branches of caudex). Stems ascending, annual flowering branches grayish-green, densely covered with short protrudent hairs. Leaves ovate or elliptical, obtuse or subacute, cuneate at base, decurrent, flexuous-hairy at margin, curly, doubly dentate, strongly rugose on both sides, gray, with numerous short protrudent hairs (Fig. 2). Leaf blade 8–12 mm long, 5–7 mm broad, petiole as long as or shorter than blade; upper leaves sessile. Leaves on the main axis of inflorescence (floral leaves) ovate, acute, 4–5 mm long, 2 mm broad, sessile, with dense long hairs. Inflorescence is simple racemiform thyrus, as long as or longer than subfloral part of the stem, with distant pairs of cymes reduced to single flowers. Pedicels long-hairy, 3–6.5 mm long, with 2 narrowly oblong long-haired bracts. As we showed earlier (Baikova 2006), such pedicels are composite axes formed as a result of the dichazium reduction. Calyx campanulate, 9–10 mm long, long-haired outside, with short appressed hairs inside; upper lip rounded, with 3 small approximate teeth at apex, the middle tooth somewhat shorter than the lateral; lower lip bilabiate, with longer teeth; all teeth subulately short-pointed. Calyx not expanded after flowering, it easily falls off when nutlets ripen. Corolla twice as long as calyx, the tube slightly exerted, the hairy ring forming a regular circle; upper lip short, deeply bi-lobed, with obtuse elliptical lobes; lower lip three-lobed, with the lateral lobes almost equal to the



Figure 1 Lectotype of *Salvia baldshuanica* Lipsky (designated here). A scanned copy was kindly provided by Mariya Sheludyakova (Herbarium of the Komarov Botanical Institute, LE, Saint-Petersburg, Russia)

middle one, slightly deflected. Only lower stamens fertile; upper stamens staminodial. Staminal filaments as long as or longer than connectives which exerted outside the corolla. Connective joins the filament without visible articulation

and seems to be its continuation; lower thecae absent; lower connective arm short, sterile, directed downwards along the filament (Fig. 2.6). Nutlets ellipsoid, 1.5 mm long, black, smooth, with oblong areola.

The **taxonomic rank** of the key morphological features of *S. baldshuanica* (a significant reduction of the lower connective arm, joint of the connective with the filament without visible articulation, etc.) corresponds, at least to the sectional level within the subgenus *Leonia*. The extreme degree of lower connective arm reduction is characteristic for several independent groups of *Salvia* (sect. *Hemisphaea* Benth., sect. *Sanglakia*, sect. *Vernalia* Kudo, subgen. *Allagospadonopsis* Briq., subgen. *Audibertia* J.B. Walker, B.T. Drew & Sytsma), which are considered by taxonomists either as sections within the subgenus *Leonia*, or as independent subgenera or even genera. We believe that the rank of the section for such taxa is more correct (Baikova 2006), and in this case our opinion of the taxonomic status of *S. baldshuanica* corresponds to the viewpoint of Makhmedov (1980, 1984).

Distribution. There are three records for *S. baldshuanica* in GBIF (<https://www.gbif.org/species/3884131>). Two of them are based on herbarium specimens collected by Regel in 1883 (from P & US) (MNHN & Chagnoux 2021, Orrell & Informatics Office 2021). These records are published

without coordinates, only including information on the region of location: Tajikistan (first record in the list), and Uzbekistan (second record). The third record is based on herbarium specimen stored in MW (Seregin 2021) and labelled without coordinates, location, locality and date. Uzbekistan as location of *S. baldshuanica* was indicated in GBIF after the specimen from US. This is based on the label record “Turkestan. Baldschuan”, the specified territory was mistakenly attributed to Uzbekistan instead of Tajikistan. Incorrect location information is reproduced in COL, WCSP and POWO databases. In the latter one, the map is generated (<http://powo.science.kew.org/taxon/455735-1>) based on the above-mentioned incorrect location information. In addition, the distribution is marked by filling the entire territory of the regions, so the range of the species has been unnecessarily expanded. Thus, we have excluded the territory of Uzbekistan from the range of the species and estimate such records in GBIF and other world databases as incorrect. It can be concluded that *S. baldshuanica* is a local endemic species only of Tajikistan.

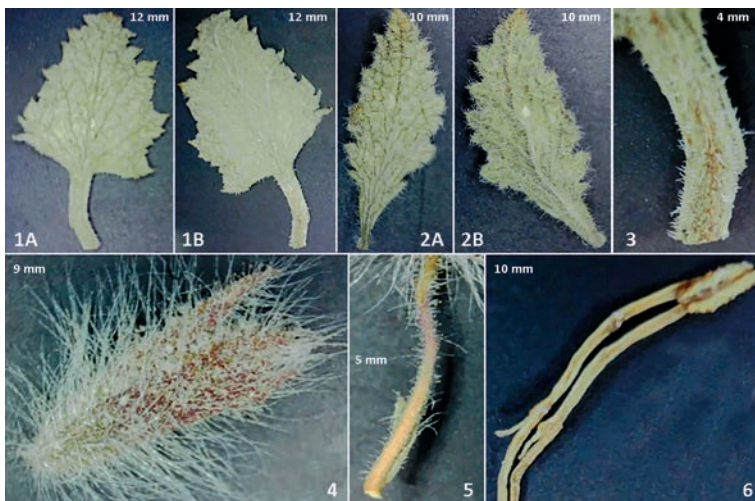


Figure 2 Morphology of *Salvia baldshuanica* Lipsky. Leaves: adaxial (1A, 2A) and abaxial (1B, 2B) sides; petiole (3); calyx (4); pedicel with the bracts (5); pair of stamens (6). The length of the structures in millimeters is presented

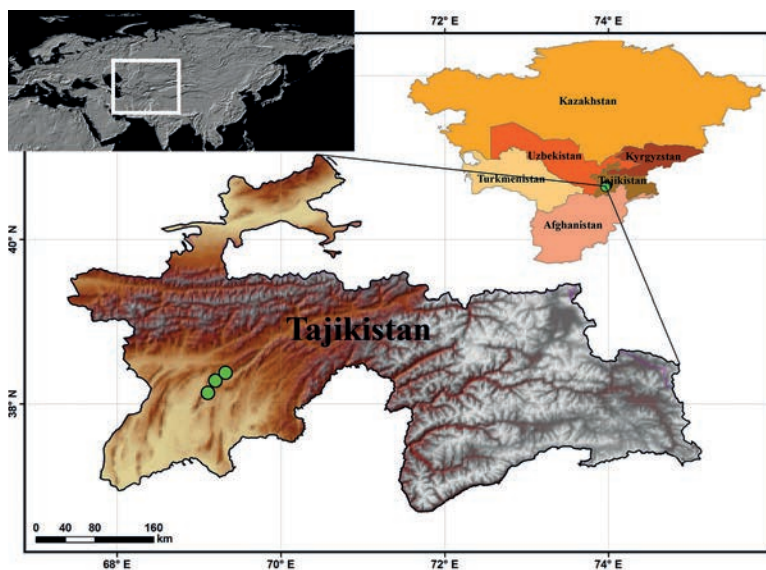


Figure 3 Distribution of *Salvia baldshuanica* Lipsky according to the revision of the TAD, LE, TASH herbaria

The most recent herbarium specimens of *S. baldshuanica* available in the GBIF and reflected in other world plant databases were collected more than 130 years ago; later collections are not taken into account. This was the reason to consider this species extinct with a high degree of probability (Humphreys et al. 2019). However, the species was found again almost 55 years after Regel's collection at the Sanglok Ridge near the Mansev village by M. Pryakhin. The last known collection of *S. baldshuanica* was made in 1979 by R. Kamelin and A. Makhmedov at the Sarsaryak ridge. Since no new finds of the species have been reported over the past 40 years, its possible extinction is eminent. However, this can only be confirmed or refuted by special efforts to find this species. This is a difficult task, taking into account the limited accessibility of this area and the rarity of the species.

According to the results of chorological analysis of *S. baldshuanica* distribution in Middle Asia it is a local endemic of the Western Pamir within Tajikistan. All known localities of the species are confined to the Sarsaryak ridge and Sanglok mountains (Fig. 3), which stretch along the left bank in the middle course of the Vakhsh River. The distance between the extreme locations based on topographic mapping of localities does not exceed 35 km.

Habitats and phenology. *Salvia baldshuanica* inhabits gypsum rocks in the middle mountain belt (Makhmedov 1987). According to Kudryashev (1937), *S. baldshuanica* usually grows with *Allium gypsaceum* Popov & Vved., *Thesium gontscharovii* Bobrov and *Onobrychis gypsacea* nomen invalidum. Kamelin and Makhmedov found a small isolated population of about 20 plants growing on gypsum rocks at an altitude of

1400 m above sea level (Makhmedov 1979), whereas Zhogoleva & Kochkareva (1986) mentioned that this species can be found at altitudes of 1500–1800 m above sea level, and Rahimi et al. (2017) indicated a different altitude of 750–900 m above sea level.

The plants of *S. baldshuanica* flower from May to June and fruits set from June to July.

Etymology: The many herbarium specimens were collected as a result of research carried out by Albert Regel in the region of Baldschuan (Boldzhuan) in 1882–1883. The name of this region later became the basis for the designation of many species. The name of this *Salvia* species is given after the Baldschuan region by Lipsky (1900).

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