



## Synopsis of the Central Asian *Salvia* species with identification key

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### Abstract

The genus *Salvia* is comprised of about 1000 species and has diversity hotspots in the Americas, East Asia, southwest Asia and the Mediterranean region. Central Asia also possesses considerable *Salvia* species diversity but is understudied relative to the aforementioned diversity hotspots. To help remedy this deficiency, we present a synopsis of Central Asian *Salvia* species based on extensive fieldwork, herbarium consultation, and literature surveys focusing on Uzbekistan, Kyrgyzstan, Tajikistan, Kazakhstan, and Turkmenistan (*i.e.*, Central Asia). According to our final taxonomic revision, there are 41 species of native *Salvia* in the flora of Central Asia, 24 of which are endemic. *Salvia ariana* from Tajikistan and *S. spinosa* from Kazakhstan are documented from the respective countries for the first time, and the presence of *S. tianschanica* from Tajikistan and *S. verticillata* from Kazakhstan has been confirmed. In addition, the neotypification of *S. deserta* and three lectotypifications (*Perovskia abrotanoides*, *S. bucharica* and *S. trautvetterii*) are provided. Furthermore, we synonymized six species of *Salvia* that were previously reported from Central Asia, including *S. intercedens*, *S. kopetdaghensis*, *S. linczevskii*, *S. lipskyi*, *S. semilanata* and *S. stepposa*. Finally, a new species identification key for Central Asian *Salvia* is presented based on the new nomenclature changes and our taxonomic revision.

### Introduction

Floristically, Central Asia is defined by five countries, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, according to the monograph *Conspectus Florae Asiae Mediae* (Adylov & Zukervanik 1993). This region can be characterized by different types of vegetation and habitats ranging from the Kyzylkum Desert to the high mountains of Tian Shan and the Pamir-Alay range (Zhang *et al.* 2013, Li *et al.* 2020). According to the latest floristic checklists (Khassanov 2015, Li *et al.* 2020), there are 9341 vascular plant taxa belonging to 161 families and 1288 genera in the flora of Central Asia.

*Salvia* Linnaeus (1753: 23) (sages) is a species rich and economically important genus within Lamiaceae (mint family) and contains about 1000 currently accepted species. *Salvia* has major centers of diversity in Mexico and Central/South America, Southwest Asia and the Mediterranean region, East Asia and Central Asia (Walker *et al.* 2007, Drew *et al.* 2017, Will & Claßen-Bockhoff 2017, Kriebel *et al.* 2019, 2020, Celep *et al.* 2020a, b, González-Gallegos *et al.* 2020, Zhao *et al.* 2021).

Recently, myriad new taxonomic, micro-morphological, molecular phylogenetic, karyological, anatomical and pollination ecology studies of the genus have been published that have largely focused on the aforementioned centers of *Salvia* diversity (*e.g.*, Celep *et al.* 2009a, b, Celep & Doğan 2010, Celep *et al.* 2011a, b, 2014, 2015, 2016, 2022,

Kahraman *et al.* 2010, Martin *et al.* 2011, Walker *et al.* 2015, Eiji & Salmaki 2016, Xiang *et al.* 2016, Claßen-Bockhoff 2017, Hu *et al.* 2017, 2020, González-Gallegos *et al.* 2018, 2019, 2020, Cairampoma *et al.* 2020, Drew 2020, Rose *et al.* 2021). Although Central Asia possesses considerable *Salvia* diversity, our knowledge of Central Asian *Salvia* species is wanting relative to the major diversity hotspots of *Salvia*, possibly due to the lack of salient publications written in English and because most specimens are stored in local or regional herbaria within Central Asia. We have only limited, and often conflicting, taxonomic, morphological, and floristic information about the Central Asian species of *Salvia*, mostly from regional floras (Vvedensky 1961, Zhogoleva & Kochkareva 1986, Bajtenov 2001, Lazkov 2016, Makhmedov 1984, 1987, Nowak *et al.* 2020, Baikov *et al.* 2021, Turdiboev & Turginov 2021, Turdiboev *et al.* 2021). In different *Salvia* treatments from the region, Kudrjashev (1937) reported 19 species, Makhmedov (1987) reported 34 species, and Khassanov (2015) reported 35 species. In the *Flora of USSR* prepared by Pobedimova (1954), 79 species were reported (including the segregate genus *Schraderia* Medic.), 35 of which were reported from Central Asia.

Several broad-scale phylogenetic studies on *Salvia* have been conducted (Walker & Sytsma 2007, Drew *et al.* 2017, Will & Claßen-Bockhoff 2017, Kriebel *et al.* 2019, 2020, Rose *et al.* 2021). Drew *et al.* (2017) subsumed five small genera (*Dorystaechas* Boiss. & Heldr. ex Benth (1848: 261) (1 spp.), *Meriandra* Benth (1829: sub pl. 1282) (2 spp.), *Perovskia* Karelin (1841: 15) (8 spp.), *Rosmarinus* Linnaeus (1753: 23) (3 spp.), and *Zhumeria* Rechinger & Wendelbo (1967: 39) (1 spp.)) within *Salvia* and treated the five former genera as subgenera within *Salvia*. According to Drew *et al.* (2017) and Kriebel *et al.* (2019, 2020), Central Asian species of *Salvia* are placed in the subgenera *Perovskia*, *Salvia*, *Sclarea*, *Zhumeria*, and the “*S. verticillata*” clade (the informal subgenus ‘*Heterosphace*’ was used by Kriebel *et al.* (2019) and includes New World ‘*Salviastrum*’ and Old World ‘*S. verticillata*’ and their close relatives). However, only some widely distributed species and a few Central Asian endemic species were included in these studies.

During our taxonomic revision of *Salvia* in Central Asia, extensive fieldwork, herbarium studies, and literature surveys have been performed. The aim of this study is to prepare an updated synopsis of Central Asian species of *Salvia* from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, to elucidate the distributions of the native species, and to prepare a new identification key based on the latest molecular and taxonomic treatments.

## Materials and methods

We examined specimens in the field, material collected during field expeditions, and more than 2000 herbarium specimens of *Perovskia* and *Salvia* (the first recently included in *Salvia* by Drew *et al.* 2017) from the Royal Botanic Garden Edinburgh Herbarium (E), *Komarov Botanical Institute* Leningrad (LE), Moscow State University (MW), Muséum National d’Histoire Naturelle (P), National Herbarium of Uzbekistan (TASH), Estonian University of Life Sciences, Institute of Agricultural and Environmental Sciences, and Vascular Plant Herbarium (TAA). The identification of herbarium specimens was done by consulting relevant literature sources (Pobedimova 1954, Hedge 1966, 1982a, b, Makhmedov 1984, 1987, Nowak *et al.* 2020).

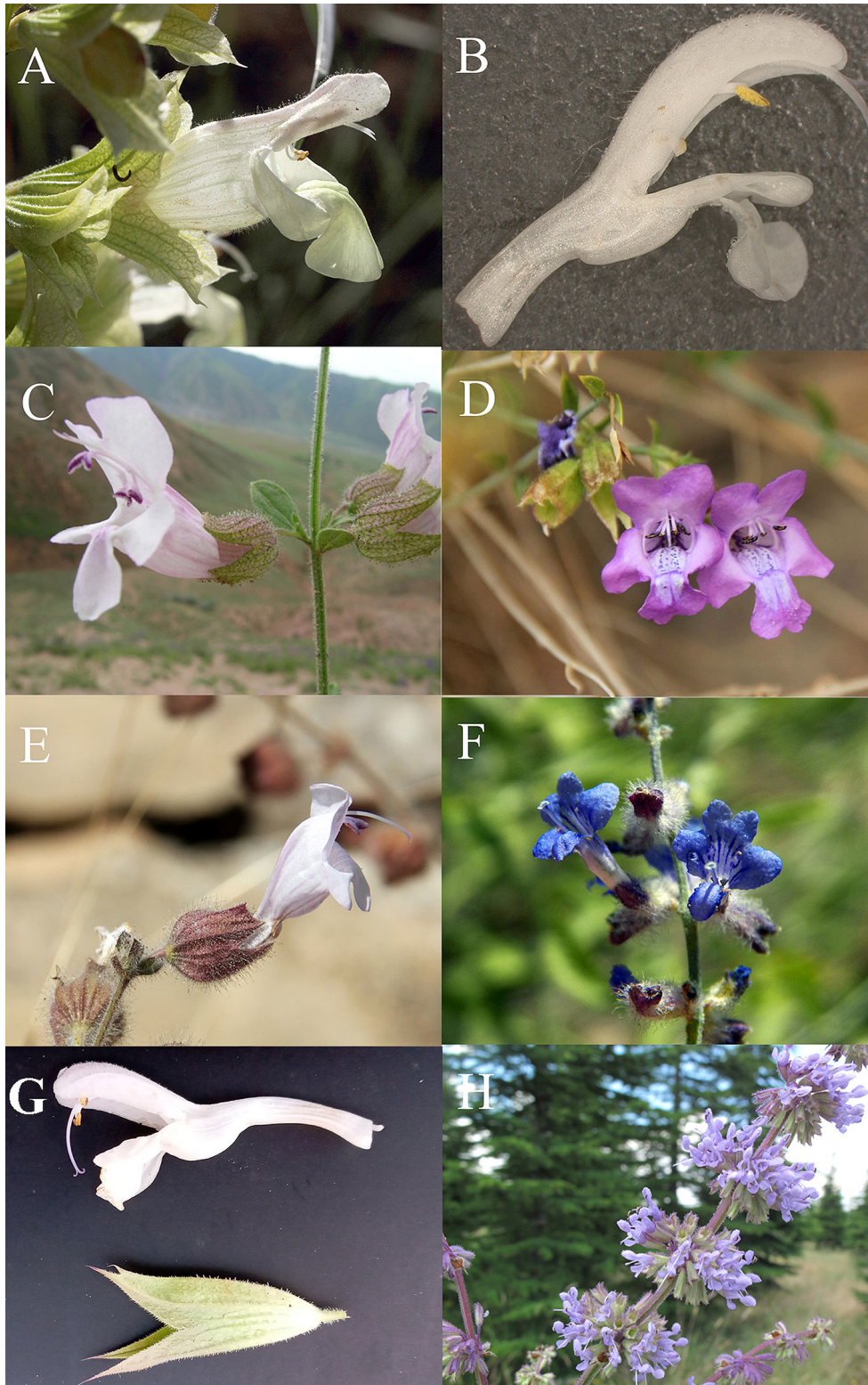
## Results

Based on our literature surveys as well as field and herbarium studies, we synonymized several “species” of *Salvia* which were previously reported from Central Asia, including *S. intercedens* Pobedimova (1954: 213), *S. kopetdaghensis* Kudrjashev (1937: 26), *S. linczevskii* Kudrjashev (1937: 22), *S. lipskyi* Pobedimova (1954: 198), *S. semilanata* Czerniakovska (1930: 27), and *S. stepposa* Desjatiyova-Shostenko (1932: 670). In the *Flora of the USSR* (Pobedimova 1954), two Central Asian species were treated under the genus *Schraderia*. However, based on morphological and phylogenetic studies (Hedge 1982a, b, Drew *et al.* 2017, Kriebel *et al.* 2019), all members of the genus *Schraderia* were moved into *Salvia*. Similarly, seven *Perovskia* species known from Central Asia were treated within *Salvia* by Drew *et al.* (2017).

**Two new records and two species confirmations (Figs. 1–4):**—*Salvia ariana* Hedge (1966: 417) was described from the province of Maymana in Afghanistan (Hedge 1966). Later, in the *Flora Iranica*, Hedge (1982b) reported that the species is endemic to Afghanistan and Turkmenistan (Kopet Dagh). According to Makhmedov (1984, 1987), this



species is widespread in the Pamir-Alay ranges (Kugitang, low mountains of Southern Tajikistan, Tuyuntau, Aktau) and the Kopet Dagh regions. In addition to these records, during studies in the TASH and LE herbaria, we found several specimens of *S. ariana* from the Darvaz region in Tajikistan. Therefore, *S. ariana* is reported here for the first time from Tajikistan.



**FIGURE 1.** Central Asian species of *Salvia*: A. *S. korolkovii* (photo by A. Gaziev, <https://www.plantarium.ru/page/view/item/33503.html>); B. *S. aethiopsis* (photo by F. Celep) C. *S. vvedenskyi* (photo by Georgy Lazkov, <https://www.plantarium.ru/page/view/item/33562.html>). D. *S. drobovii* (photo by N. Beshko, <https://www.plantarium.ru/page/view/item/33477.html>); E. *S. lilacinocoerulea* (photo by N. Beshko, <https://www.plantarium.ru/page/view/item/33505.html>). F. *S. karelinii* (photo by D. Polevoy, <https://www.plantarium.ru/page/view/item/27351.html>) G. *S. insignis* (photo by O. Turdiboev), H. *S. verticillata* subsp. *amasiaca* (photo by F. Celep).

*Salvia spinosa* Linnaeus (1771: 511) is known from Afghanistan, Iraq, Iran, Israel, Palestine, Syria, Turkey, Turkmenistan and Transcaucasian countries (Hedge 1982a, b). Bajtenov (2001) and Aralbaev *et al.* (2002) did not mention *S. spinosa* for the flora of Kazakhstan. During our studies we found several specimens of *S. spinosa* from Kazakhstan for the first time (Fig. 2). It is easily recognized in the fruiting stage by the spine-tipped broad tubular calyces. Also, during anthesis, it usually has some sterile lateral or terminal flowering shoots (Hedge 1982a).

*Salvia tianschanica* Makhmedov (1980: 215) is a poorly known species. The species was described from the Chatkal reserve within the Bashkizylsai river basin from Uzbekistan by Makhmedov (1984). The paratype of *S. tianschanica* was given from the Kurama ridge within the Pangaz river basin in Tajikistan. However, Kochkareva (1986) did not include *S. tianschanica* in the flora of Tajikistan, nor did Nowak *et al.* (2020). Turginov *et al.* (2019) listed *S. tianschanica* as an endemic species for the flora of Uzbekistan. Thus, there is some contradictory information whether *S. tianschanica* is present within Tajikistan. During our herbarium studies at LE, we found some *S. tianschanica* specimens from the Kurama region in Tajikistan (Fig. 3). Therefore, we reconfirmed its presence in Tajikistan after Makhmedov (1984).

*Salvia verticillata* Linnaeus (1753: 26) is a widespread species in Europe, SW Asia (*i.e.* Turkey, Iran, N Iraq) and Caucasia (Hedge 1982b). However, there are some controversial data about the distribution of *S. verticillata* in Central Asia. According to Bajtenov (2001) and Khasanov (2015), *S. verticillata* is distributed in Central Asia, but they did not indicate any herbarium specimen or specify a locality where the species grows. On the other hand, Kudrjashev (1937) and Makhmedov (1984, 1987) reported that *S. verticillata* does not occur in Central Asia. During our herbarium studies at TASH, we found a single specimen of *S. verticillata* from the Talas Alatau region in Kazakhstan. Thus, we reconfirmed its occurrence in Central Asia.

**Neotypification for *Salvia deserta*:**—There are no syntypes of *Salvia deserta* Shagin ex Ledebour (1824: 6) as no specimens are cited in the protologue within *Indicis Seminum Horti Academici Dorpatensis* (Ledebour 1824). In the protologue, its locality was only given as “Hab. in Sibiria altaica”. Therefore, the species needs a neotypification (Art. 9.8 and 9.13 of the *Shenzhen Code*; Turland *et al.* 2018). Furthermore, the name is usually ascribed to Shagin alone. However, as the name was published in 1824, and Shagin died in 1816, he cannot have been the author of the descriptive material. According to IPNI, Ledebour, who was a professor of botany at Dorpat from 1821 to 1836, was the author of *Index Seminum Horti Academici Dorpatensis*, and so the authorship should really be *S. deserta* Shagin ex Ledeb. Moreover, if there is any original material it would most likely be a specimen collected from the Hortus Academicus Dorpatensis, currently known as the University of Tartu in Estonia. Therefore, we asked TU herbarium to find whether any possible original material was stored there. Unfortunately, we learned that they do not have any *S. deserta* specimens in the TU herbarium.

On the other hand, we have seen an herbarium sheet which is stored in the TAA herbarium (Estonian University of Life Sciences herbarium). The herbarium sheet was labelled as “TAA0128175-*Salvia desertorum* Schagin: *Salvia deserta* Schrang., Sibirea”. In our correspondence with the TAA herbarium, we learned that the specimen belonged to the Herbarium of Karl Ernst von Baer who lived between 1792 and 1876. We thought that it could be one of the original collections, however we could not find clear evidence whether this specimen is some of the original material seen by Ledebour. In addition, Krestovskaya (2012) reported three specimens from LE herbarium that could be syntypes of *S. deserta* as 1. “*Salvia deserta* Schagin, 1824, in Ledeb., Index Sem. Horti Dorpat.: 6. ?Syntypus: Зап. Сиб., Омск., «Desert. Barabense [fl.] [?Schagin]”, 2. “?Syntypus: Зап. Сиб., Алт., «Inter Barnaulium et Zmeinogorsk [fl.] [?Schagin]”, 3. “?Syntypus: Зап. Сиб., Алт., «Sibir. Alt. [fl.]. Sievers. По протологу: «Hab. in Sibiria altaica”.

Absent any original material or any other suitable specimens at TU, we selected a specimen as neotype that best demonstrates the characters by which Ledebour distinguished the species, though he treated it as a synonym of *S. sylvestris* Linnaeus (1753: 24) in both 1829 (*Flora Altaica*) and 1849 (*Flora Rossica*). Neotype:—RUSSIA: Зап. Сиб., Омск., «Desert. Barabense [fl.] [?Schagin] (LE 01081338!) (Fig. 5).

**Synopsis, distribution and endemism:**—According to our studies there are 41 naturally occurring species of *Salvia* in Central Asia, of which 24 are endemic to the region. There are 25 (2 endemic) species in Uzbekistan, 18 (1 endemic) species in Kyrgyzstan, 27 (5 endemic) species in Tajikistan, 13 (1 endemic) species in Kazakhstan, and 17 species in Turkmenistan.

In the Floras of Pobedimova (1954), Makhmedov (1984), and Lazkov (2016), Central Asian *Salvia* species were placed within subgenera and sections based on morphological characters. However, recent molecular phylogenetic studies have indicated that many of the previous infrageneric designations within *Salvia* are not correct, and the genus needs a new infrageneric classification (Drew *et al.* 2017, Will & Claßen-Bockhoff 2017, Kriebel *et al.* 2019, Rose *et al.* 2021). In addition, only a few endemic Central Asian species, which have clear and distinct differences in floral morphology (*i.e.*, corolla and calyx) relative to other species of *Salvia*, have been included in molecular phylogenetic



studies. Therefore, we did not attempt to apply infrageneric classifications in this study. To better understand *Salvia* evolution and to make correct infrageneric classifications, we should include as many species, especially endemics, as possible from Central Asia in future molecular phylogenetic studies.



FIGURE 2. *Salvia spinosa* L. (P04387482) <http://coldb.mnhn.fr/catalognumber/mnhn/p/p04387482>





FIGURE 3. *Salvia tianschanica* Makhm. Paratype (LE0052465).



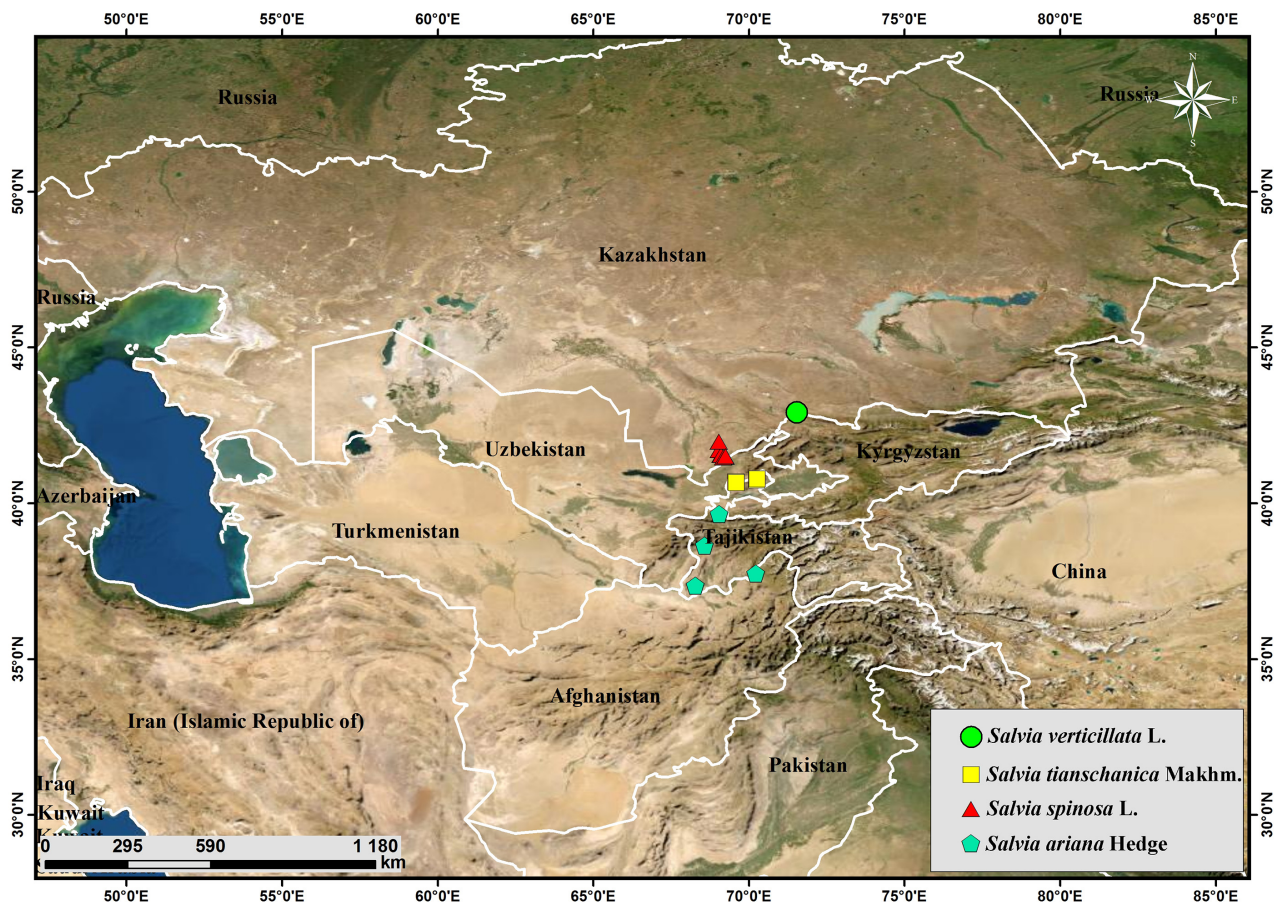


FIGURE 4. New records of *Salvia* species for the flora of Kazakhstan and Tajikistan.

### Synopsis of Central Asian *Salvia* species (\* endemic to Central Asia)

1. *Salvia abrotanoides* (Kar.) Sytsma, *Taxon* 66: 140. (2017)

≡ *Perovskia abrotanoides* Karelin (1841: 15).

Lectotype (designated here):—"Habitat in montibus Balcanensibus Turcomaniae media" in Karelin (1841: 15) (LE00050301!) (Fig. 6).

Note:—In the protologue of *Perovskia abrotanoides*, Karelin (1841) only indicated "Habitat in montibus Balcanensibus Turcomaniae media". During our literature and herbarium studies, we have found at least 15 specimens (syntypes) of the type referred to by Karelin for *P. abrotanoides*. Therefore, the lectotypification of *P. abrotanoides* is proposed here, in conformance with Art. 9.3 of International Code of Nomenclature for algae, fungi, and plants (Turland *et al.* 2018).

= *Perovskia artemisioides* Boissier (1859: 15).

Type:—PAKISTAN. Beloochistan, 1851, *J.E. Stocks 1112* (lectotype K000929629 [photo!], isolecotypes K000929630 [photo!] & G-BOISS [not seen]).

Distribution in Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan.

2. \**Salvia aequidens* Botsch., *Byull. Sredne-Aziatsk. Gosud. Univ.* 22: 326. (1937)

Type:—KYRGYZSTAN. At the exit from Aksu to Zambarych, 1 June 1919, *G. A. Balabaev 1484* (holotype TASH002914!, isotype TASH002915!).

Distribution in Central Asia: Kyrgyzstan, Uzbekistan.

3. *Salvia aethiopsis* L., *Sp. Pl.*: 1: 27. (1753)

≡ *Sclarea aethiopsis* (L.) Miller (1768: 2).

Type:—Herb. Linnaeus 42.48. Designated by Hedge in Rechinger (ed.), *Fl. Iranica* 150: 451 (1982).

Distribution in Central Asia: Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan.





FIGURE 5. Neotype of *Salvia deserti* (LE01081338).





**FIGURE 6.** Lectotype of *Perovskia abrotanoides* Kar. (LE00050301!).

4. *Salvia ariana* Hedge, *Notes Roy. Bot. Gard. Edinburgh* 26: 417. (1966)

Type:—IRAN. West of Panjao, Godar, steep slatey crees, 2 July 1962, *Hedge & Wendelbo W-4966* (holotype E00319555 [photo!], isotype G00435278 [photo!]).

Distribution in Central Asia: Tajikistan, Turkmenistan, Uzbekistan.

5. *Salvia atropatana* Bunge, *Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 7* 21(1): 47. (1873)  
 Type:—IRAN. Inter Teheran et Tabriz prope Tikmedesch, *A.A. Bunge s.n.* (lectotype G00330254 [photo!], fragment P02871909 [photo!]).  
 Designated by Hedge in Rechinger (ed.), *Fl. Iranica* 150: 456 (1982).  
 = *Salvia linczevskii* Kudrjashev (1937: 22).  
 Type:—TURKMENISTAN. Inter Czandyr et Sumbar, prope fontem Machtum-sai, ca. 1000 m, 9 June 1931, *I.A. Linczevsky 163* (holotype LE00053582! fragment LE00053581!).  
 = *Salvia kopetdaghensis* Kudrjashev (1937: 26).  
 Type:—TURKMENISTAN. Kopet Dagh. Montes Bosikyamow in vicinis urb. Ashgabat, 7 June 1898, *D. Litwinow s.n.* (holotype LE00053520!).  
 Distribution in Central Asia: Turkmenistan.
6. \**Salvia baldshuanica* Lipsky, *Trudy Imp. St. Peterburgsk. Bot. Sada* 18: 89. (1900)  
 Type:—TAJIKISTAN. A. Regel, Iter Turkestanicum. Distr. Baldschuan: in duliv. orient. montis Sangulak, ad fl. Wachs. 5000' 13–25 July 1883, *A. Regel s.n.* (lectotype LE00052480!). Designated by Turdiboev *et al.* in *Botanica Pacifica* 10: 88 (2021).  
 Distribution in Central Asia: endemic to Tajikistan.
7. *Salvia bucharica* Popov, *Trudy Turkestan. Nauch. Obsc.* 1: 40. (1923)  
 Type:—UZBEKISTAN. Shaarshauz region, near Samakh, 26 May 1916, *M.G. Popov 975* (lectotype LE00051702!, isolectotype: TASH002917!; designated here).  
 Note:—When describing this species, Popov (1923) indicated "Hab. in provinciis bucharicus mediis in montanis siccis nec non in provincia Samarkand Turkestanica (M.G. Popov et ali); f. *albiflora*. interdum occurrunt specimina calycibus decoloratis corollaque alba gaudentia. Buchara, prov. Jakkabag ad pagum Samak ipse legi.". According to Kudrjashev (1936: 11), *Salvia bucharica* was described by Popov in 1923 from his collections from the Yakkabag region, in the vicinity of Samakh. Pobedimova (1954) wrote "Described from the vicinity of Samakh (Jakkabag), Type in LE". During our literature and herbarium studies, we have found six specimens (syntypes) of the type referred to by Popov as *S. bucharica*, stored in LE and TASH. Therefore, the lectotypification of *S. bucharica* is proposed here, in conformance with Art. 9.3 of International Code of Nomenclature for algae, fungi, and plants (Turland *et al.* 2018).  
 = *Schraderia bucharica* (Popov) Nevski (1937: 327).  
 = *Arischrada bucharica* (Popov) Pobedimova (1972: 247).  
 = *Stiefia bucharica* (Popov) Soják (1983: 22).  
 = *Salvia honigbergeri* Rech.f. (1941: 418).  
 Type:—Kabul, *J.M. Honigberger s.n.* (holotype W0052196 [photo!]).  
 Distribution in Central Asia: Tajikistan, Turkmenistan, Uzbekistan.
8. \**Salvia bungei* J.G.González, *Taxon* 66: 140. (2017)  
 = *Perovskia virgata* Kudrjashev (1936: 28).  
 Type:—TAJIKISTAN. Darvoz, Kalai-Khum, September 1881, *A. Regel s.n.* (holotype LE01009698!).  
 Distribution in Central Asia: Kyrgyzstan, Tajikistan, Turkmenistan.
9. \**Salvia campylodonta* Botsch., *Byull. Sredne-Aziatsk. Gosud. Univ.* 22: 327. (1937)  
 Type:—TAJIKISTAN. Southern Tajikistan. Mount Sebistan, Southern rubble heavily gypsum slopes, 8 June 1933, *V.P. Botschanzev 34* (holotype TASH002921!).  
 Distribution in Central Asia: endemic to Tajikistan.
10. *Salvia ceratophylla* L., *Sp. Pl.* 1: 27. (1753)  
 Type:—Herb. Linnaeus 42.47. Designated by Hedge in Rechinger (ed.), *Fl. Iranica* 150: 452 (1982).  
 = *Salvia semilanata* Czerniakowska (1930: 27).  
 Type:—IRAN. Persia borealis, Kaswin, in vinetis, 17 May 1902, *J. Bornmuller & A. Bornmuller 7986* (lectotype B100264871 [photo!]).  
 Distribution in Central Asia: Turkmenistan.
11. *Salvia chloroleuca* Rech.f. & Aellen, *Oesterr. Bot. Z.* 99: 59. (1952)  
 Type:—IRAN. Khorasan. Montes Kopet Dagh, inter Kucan et jugum Alamli, 3 June 1948, *Rechinger f. & Aellen 4771* (holotype W19580006969 [photo!], isotypes SG5419 [photo!], G00000066 [photo!], G00000067 [photo!]).  
 Distribution in Central Asia: Turkmenistan.



12. *Salvia deserta* Schangin ex Ledeb., *Index Seminum (TU, Dorpatensis)* 1824: 6. (1824)  
 Type:—RUSSIA: Siberia Occid., Omsk «Desert. Barabense [fl.] [?Schangin]». In protologue: «Hab. in Sibiria altaica» (neotype LE01081338!; here designated).  
 Distribution in Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan.
13. \**Salvia drobovii* Botsch., *Byull. Sredne-Aziatsk. Gosud. Univ.* 22: 326. (1937)  
 Type:—UZBEKISTAN. In montibus Zeravschanicus haud procul a pago Urgut, in rupibus in angustiis Taglyk, 9 June 1936. *Gnezdillo s. n.* (holotype TASH002946!).  
 Distribution in Central Asia: endemic to Uzbekistan.
14. *Salvia dumetorum* Andr. ex Besser, *Bess. Enum. Pl. Volh.* 3: 40. (1821)  
 Type:—Sine loco, “in pratis sylvaticis frequens”, undated, s. coll., ut “*Salvia dumetorum* nob.” (lectotype LECB0001080, the original label on the specimen was handwritten by A. Andrzejowski). Designated by Nachychko *et al.* in *Phytotaxa* 332: 81–87. (2017).  
 = *Salvia stepposa* Desjatova-Shostenko (1932: 670).  
 Type:—“*Salvia pratensis* L. β. *sibthorpii* (Sm.) near Karpovki, Konstantinograd county, Poltav region, 8 May 1905, Y. Bordzilovskiy s. n.” (lectotype LE01039435!). Designated by Krytska in *Ukr. Botan. Zhurn.* 70: 735. (2013).  
 Distribution in Central Asia: Kazakhstan.
15. \**Salvia glabricaulis* Pobed., *Fl. URSS* 21: 656. (1954)  
 Type:—TAJIKISTAN. Pamiro-Alaj. Kansay, in jugo Okurtau prope Kisilkan, 18 May 1938, N. Azbukin 237 (holotype LE00051701!).  
 Distribution in Central Asia: Tajikistan, Uzbekistan.
16. \**Salvia gontscharovii* Kudr., *Bot. Journ. S.S.S.R.* 23: 409. (1938)  
 Type:—TAJIKISTAN. River valley Vakhsh, red sandstones below the Puli-Sangin bridge, 25 May 1932, N. Gontscharov, Y. Grigoriev & V. Nikitin 39 (holotype LE00051711!, isotype LE00051712!).  
 Note:—According to Art. 60.9 of the ICN, the spelling of the specific epithet originally published as “gontscharowii” is to be corrected as “gontscharovii”.  
 Distribution in Central Asia: endemic to Tajikistan.
17. \**Salvia insignis* Kudr., *Trudy Sektora Rast. Res. Komit. Nauk Uzbeksk. SSR* 3: 19. (1937)  
 Type:—TAJIKISTAN. Kabadan region, in decliviis lapidosis montium Babatagh, 12 May 1887, S. Korschinsky 4167 (holotype LE00051705!).  
 Distribution in Central Asia: Tajikistan, Uzbekistan.
18. \**Salvia kamelinii* Makhm., *Novosti Sist. Vyssh. Rast.* 21: 141. (1984)  
 Type:—TAJIKISTAN. Eastern slope of the Vakhsh ridge, an ascent from Garmak, 9 July 1932, N. Gontscharov, Y. Grigoriev & V. Nikitin 614 (holotype LE00052482!).  
 Distribution in Central Asia: endemic to Tajikistan.
19. \**Salvia karelinii* J.B.Walker, *Taxon* 66: 140 (2017)  
 ≡ *Perovskia angustifolia* Kudrjashev (1936: 23).  
 Type:—UZBEKISTAN. Tian-schan occidentalis, Gandiga-sai 5 km septentrionem versus a Namangan, in decliviis lapidosis, in promontoris, 23 May 1912, O.E. Knorring 13 (holotype LE01009685!, isotypes LE01009686!, LE01009687!).  
 Distribution in Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan.
20. \**Salvia klokovii* J.B.Walker, *Taxon* 66: 140. (2017)  
 ≡ *Perovskia linczevskii* Kudrjashev (1936: 30).  
 Type:—TAJIKISTAN. Dashti-Dzumsky, Montes Pamiro-Alaj, systema fl. Pjandsh. Fl. Sarbus in angustiis Vaschpuscht in lapidosis, 4 October 1935, J.A. Linczevski, T.J. Maslennikova 1545 (holotype LE01009693!).  
 Distribution in Central Asia: endemic to Tajikistan.
21. \**Salvia komarovii* Pobed., *Fl. URSS* 21: 655 (1954)  
 Type:—TAJIKISTAN. Asia media, Seravschan, prope pagum Schink, 28 May 1892, V.L. Komarov s. n. (holotype LE00051699!).  
 Distribution in Central Asia: Tajikistan, Uzbekistan.

22. *\*Salvia korolkovii* Regel & Schmalh., *Trudy Imp. S.-Peterburgsk. Bot. Sada, prepr.* 6: 356. (1879)  
 ≡ *Schraderia korolkovii* (Regel & Schmalh.) Pobedimova (1954: 373).  
 ≡ *Arischrada korolkovii* (Regel & Schmalh.) Pobedimova (1972: 247).  
 ≡ *Stieftia korolkovii* (Regel & Schmalh.) Soják (1983: 22).  
 Type:—UZBEKISTAN. Between Aktagh-tau and Ak-sakata, June 1872, *Korolkov s. n.* (lectotype LE0051698!).  
 Distribution in Central Asia: Kazakhstan, Kyrgyzstan, Uzbekistan.
23. *\*Salvia kudrjashevii* (Gorschk. & Pjataeva) Sytsma, *Taxon* 66: 140. (2017)  
 ≡ *Perovskia kudrjashevii* Gorschk. & Pjataeva (1954: 290).  
 Type:—UZBEKISTAN. Tjan-Schan occidentalis, districtus Bostandyk, in vicinitate pagi Britsh-Mulla, ad viam Chudaj-Dod, in glareosis ad ripam fluminis Tschatkal, 31 June 1950, *A. Pjataeva 98* (holotype LE01009690!, isotype TASH002976!).  
 Distribution in Central Asia: Kyrgyzstan, Tajikistan, Uzbekistan.
24. *\*Salvia lilacinocoerulea* Nevski, *Trudy Bot. Inst. Akad. Nauk S.S.S.R., Ser. 1, Fl. Sist. Vyssh. Rast.* 4: 327. (1937).  
 Type:—TURKMENISTAN. In montibus Kuhitang supra pagum Chodsha-i-fil, 27 June 1931, *S. Nevski 415* (holotype LE00051695!, isotype LE00051696!).  
 Distribution in Central Asia: Turkmenistan, Uzbekistan.
25. *Salvia macrosiphon* Boiss., *Diagn. Pl. Or. Nov., 1 ser.* 5: 11. (1844)  
 Type:—IRAN. Persia Australi inter Fasa et Schiraz, *Aucher-Eloy 5197* (holotype G00330256 [photo!], isotypes G00380067 [photo!], K000929741 [photo!], P00714712 [photo!] & P00714711 [photo!]).  
 = *Salvia kotschy* Boissier (1846: 46).  
 Type:—IRAN. Inter segetes pr. urbem Schiras, 29 April 1842, *C. Kotschy, 291* (holotype E00319552 [photo!], isotypes WAG0004448 [photo!], BM000950402 [photo!], MO694951 [photo!], BM000950403 [photo!], M0099272 [photo!], L2870316 [photo!], FI011123 [photo!], GOET004463 [photo!], P00714713 [photo!] & P00714714 [photo!]).  
 = *Salvia nachiczewanica* Pobedimova (1954: 657).  
 Type:—AZERBAIJAN. Transcaucasia, republic Nachiczewan, ad fl. Diza-tshaj, in. ripa glareosa, 7 June 1934, *L. Prilipko s.n.* (holotype LE, not seen).  
 Distribution in Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.
26. *\*Salvia margaritae* Botsch., *Byull. Sredne-Aziatsk. Gosud. Univ.* 22: 324. (1937)  
 Type:—UZBEKISTAN. Alai Range. River basin Kara-kazyk, near Shakhimardan, Kuruk-Aksai, 9 July 1935, *M.M. Sovetkina 19* (holotype TASH002966!, isotypes TASH002965!, TASH002970!).  
 Distribution in Central Asia: Kyrgyzstan, Tajikistan, Uzbekistan.
27. *Salvia nemorosa* L., *Sp. Pl., ed. 2.* 1: 35 (1762)  
 Type:—*Gerber*, Herb. Linnaeus 42.14. Designated by Hedge in *Notes Roy. Bot. Gard. Edinburgh* 23: 565. (1961).  
 ≡ *Sclarea nemorosa* Miller (1768: 6).  
 ≡ *Sclarea punctata* Moench (1794: 374).  
 Distribution in Central Asia: Kazakhstan, Tajikistan, Uzbekistan.
28. *\*Salvia pobedimovae* J.G.González, *Taxon* 66: 141. (2017)  
 ≡ *Perovskia botschantzevii* Kovalevskaja & Kochkareva (1986: 483).  
 Type:—UZBEKISTAN. Montes Aktau, ad orientem a urb. Nurata, vallis sicca Ingiczkze, ad declivia lapidosa, 12 July 1970, *V.P. Botzchanzev 123* (holotype LE01009688!).  
 Distribution in Central Asia: Kyrgyzstan, Tajikistan, Uzbekistan.
29. *\*Salvia seravschanica* Regel & Schmalh., *Izv. Imp. Obshch. Lyubit. Estestv. Moskovsk. Univ.* 34: 62. (1882)  
 Type:—UZBEKISTAN. In valle fluvii Saravschan, Sangy-djuman, 4000–7000', 25 May 1869, *O. Fedtschenko s. n.* (holotype LE00051693!).  
 = *Salvia capusii* Franchet (1884: 232).  
 Type:—UZBEKISTAN. Pass TachtaKaratcha, 9 May 1881, *G. Capus 1058* (holotype P00714676 [photo!]).  
 Distribution in Central Asia: Tajikistan, Turkmenistan, Uzbekistan.

30. \**Salvia schmalhauseni* Regel, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 6: 356. (1879)  
 Type:—KYRGYZSTAN. Namangan county, Maylin forest (near Namangan), June 1870, *Krause s.n.* (lectotype LE00051707!).  
 Distribution in Central Asia: Kyrgyzstan, Tajikistan.
31. *Salvia sclarea* L., *Sp. Pl.* 1: 27 (1753)  
 ≡ *Aethiopis sclarea* (L.) Opiz (1852: 11).  
 Type:—ITALY. “In hortis passim, Florentia sponte” Herb. Burser XIII: 108 (UPS). Designated by Rosua & Blanca in *Taxon* 35: 719. (1986).  
 = *Salvia turkestanica* Noter (1905: 77).  
 Type:—not indicated.  
 = *Salvia pamirica* Gandoger (1913: 26).  
 Type:—TAJIKISTAN? Asia Centralis, Pamir, 1878, *Kuschakewicz s.n.* (holotype LE, not seen).  
 Distribution in Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.
- 32a. \**Salvia scrophulariifolia* (Bunge) B.T.Drew, *Taxon* 66: 141 (2017)  
 ≡ *Perovskia scrophulariifolia* Bunge (1851: 433).  
 Type:—TAJIKISTAN. Hab. An allen sonnigen Felsgehängen des obern Sarafschan und vond Penschakent bis Warsani-nor. *A. Lehmann s. n.* (holotype P02864780 [photo!], isotypes LE01009696!, LE01009696!).  
 Note:—Though the holotype previously was given from the LE herbarium, having studied all available specimens we concluded that the holotype is actually stored in the Paris (P) herbarium (P02864780 [photo!]).  
 Distribution in Central Asia: Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.
33. *Salvia spinosa* L., *Mant. Pl. Alt.* 2: 511. (1771)  
 Type:—Herb. Linnaeus 42.44. Designated by Hedge in *Notes Roy. Bot. Gard. Edinburgh* 33: 89. (1974).  
 ≡ *Sclarea spinosa* (L.) Rafinesque (1837: 94).  
 Distribution in Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.
34. \**Salvia submutica* Botsch. & Vved., *Bot. Mater. Gerb. Inst. Bot. Akad. Nauk Uzbeesk. S.S.R.* 14: 11. (1954)  
 Type:—UZBEKISTAN. Mountain Koytash, on the way from Kok-Bulak to Omandara, 5 August 1934, *V.P. Botschanzev s.n.* (holotype TASH002972!).  
 Distribution in Central Asia: endemic to Uzbekistan.
35. \**Salvia tianschanica* Makhm., *Novosti Sist. Vyssh. Rast.* 17: 215 (1980)  
 Type:—UZBEKISTAN. Western Tien Shan, Tashkent Alatau, Chatkal reserve, southern slopes in the basin river Bashkyzylsay, 8 July 1976, *R.V. Kamelin & L. Levichev* 3 (holotype LE00051706!).  
 Distribution in Central Asia: Tajikistan, Uzbekistan.
36. \**Salvia trautvetterii* Regel, *Trudy Imp. S.-Peterburgsk. Bot. Sada, prepr.* 6: 355 (1879)  
 Type:—KAZAKHSTAN. Montes Karatau, Balikschi-ata, 29 May 1876, *A. Regel* 100 (lectotype LE00052485!; second-step lectotype designated here).  
 Note:—The name *Salvia trautvetterii* was first used by Regel (1879) with an indication of the type locality in Latin: “In Turkestan montibus karatavicis prope Balikschiata (A. Regel)”. Pobedimova (1954) designated the type specimen for this name with a collection kept at LE. However, this collection consists of four duplicates, and a second-step lectotypification is thus designated here (Turland *et al.* 2018, Art. 9.3 ICN).  
 We designated LE00052485! as the lectotype (Turland *et al.* 2018, Art. 9.3 ICN) and the other specimens as the isolectotypes (LE00052484!, LE00052486!, LE00052487!) (Turland *et al.* 2018, Art. 9.4 ICN).  
 = *Salvia lipskyi* Pobedimova (1954: 654).  
 Type:—KAZAKHSTAN. Karatau Syr-Dariensis, Czimkent, pag. Kornilovka, 17 May 1909, *V. Lipsky s.n.* (holotype LE00052608!).  
 Distribution in Central Asia: endemic to Kazakhstan.
37. *Salvia turcomanica* Pobed., *Fl. URSS* 21: 661. (1954)  
 Type:—TURKMENISTAN. Transcaspian region, Krasnovod county, Yoldere, 25 May 1912, *N.I. Samokysh* 3162 (holotype LE00051692!).  
 Distribution in Central Asia: Tajikistan, Turkmenistan, Uzbekistan.



38. *Salvia verticillata* L., *Sp. Pl.* 1: 26 (1753)

Type:—Herb. Linnaeus 42.30. Designated by Hedge in Rechinger (ed.), *Fl. Iranica* 150: 473 (1982).

Distribution in Central Asia: Kazakhstan, Kyrgyzstan.

39. *Salvia virgata* Jacq., *Hort. Bot. Vindob.* 1: 14 (1770)

Type:—Herb. Linnaeus 42.32. Designated by Carratore *et al.* in *Allionia* 36: 41–46. 1998.

≡ *Sclarea virgata* (Jacq.) Soják (1983: 22).

Distribution in Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.

40. *Salvia viridis* L., *Sp. Pl.* 1: 24 (1753)

Type:—Herb. Linnaeus 42.11. Designated by Hedge in *Notes Roy. Bot. Gard. Edinburgh* 33: 94. (1974).

= *Salvia intercedens* Pobed. (1954: 657).

Type:—TURKMENISTAN. Kopet Dag, Karakala, in lapidosis ad pedes montium Sjun, 7 July 1931, *I.A. Linczevski s.n.* (holotype LE00053519!).

Distribution in Central Asia: Turkmenistan.

41. \**Salvia vvedenskii* Nikitina, *Fl. Kirgiz SSR* 10: 377 (1962)

Type:—KYRGYZSTAN. Jalal-Abad region Toktagul district, between Terek and Sogot, 1 June 1960, *M. Botbaeva s.n.* (holotype FRU [photo!], isotype TASH002975!).

Distribution in Central Asia: endemic to Kyrgyzstan.

## An identification key for *Salvia* species in Central Asia

(Modified from Pobedimova 1954 and Makhmedov 1987)

1. Flowers resupinate, connective tissue between thecae of the anthers very short or weakly swelled, no staminal lever mechanism ..  
..... **Group A**
- Flowers not resupinate, the connective tissue between thecae of the anthers clearly elongated, articulated around filament tip and moveable (staminal lever mechanism) except for *S. verticillata* and *S. baldshuanica* ..... **2**
2. Staminal connectives equal, longer or slightly shorter than filaments, both upper and lower lever arms of staminal lever mechanism bear fertile thecae bearing pollen grains, staminal lever mechanism active; upper corolla lip straight or backward-looking .....  
..... **Group B**
- Staminal connective tissue clearly longer than the filament, only upper lever arm with fertile thecae, lower lever arm reduced to a dolabriform or subulate sterile tissue and not bearing thecae and pollen grains; upper lip of corolla usually falcate or semifalcate, rarely straight (in *S. verticillata* and *S. baldshuanica*) ..... **Group C**

### Group A

1. Leaves bipinnatisect ..... *S. abrotanoides*
- Leaves not bipinnatisect ..... **2**
2. Flowers sessile or pedicels 0.5–1 mm long; verticillasters 2–6(–8) flowered; calyx covered with simple or branched hairs ..... **3**
- Pedicels ca. 2 mm long or longer; verticillasters 2–4 flowered; calyx pubescent with branched, subsessile and stalked hairs or only subsessile (stellate) hairs ..... **6**
3. Leaves 1.5–3(–4) cm long, 0.5–0.8 cm wide, rhombic-lanceolate, sparsely covered with short simple and branched hairs; pedicels 0.5–0.7 mm long; inflorescence virgate; calyx ca. 5 mm long ..... *S. bungei*
- Leaves 3–7 cm long, 0.7–3.5 cm wide, oblong, lanceolate or ovate, glabrous; pedicels 1 mm long; inflorescence pyramidal; calyx ca. 6–8 mm long ..... **4**
4. Leaves oblong; inflorescence 11–18 cm long, short-branched, dense; calyx green, covered with simple and branched hairs .....  
..... *S. kudrjashevii*
- Leaves broadly lanceolate or ovate; inflorescence (17–) 22–30 cm long, branched, lax; calyx +/- colored, +/- violet, rarely green, covered with simple hairs ..... **5**
5. Leaves ovate or oblong-ovate, obtuse, crenate, rounded or cordate at base, petiole 0.5–1 cm long; inflorescence leafless .....  
..... *S. scrophulariifolia*
- Leaves oblong-lanceolate or broadly lanceolate, subacute, serrate, cuneate at base, petiole 0.4–0.6 cm long; inflorescence leafy ...  
..... *S. karelinii*
6. Leaves lanceolate or oblong-lanceolate; calyx 4–5 mm long, pubescent with branched, almost sessile (stellate) hairs; corolla 8–9 mm long ..... *S. klokovii*
- Leaves oblong or oblong-lanceolate; calyx 5–6 mm long, pubescent with branched hairs on stalks, only in the upper third with almost sessile (stellate) branched hairs; corolla 10–12 mm long ..... *S. pobedimovae*

## Group B

1. Calyx tubular campanulate, slightly accrescent; stems strongly branched; flowers solitary in axils of floral leaves; caulinar leaves simple and usually entire margin (lower ones large-toothed), 1–2.5 cm long and 0.5–1.2 cm wide .....2
- Calyx slightly inflated (upper lip 3-toothed with very small or subulate-pointed middle tooth, or 2-toothed) or calyx expanded in fruit; stems not strongly branched; flowers 2–3(–10) flowers in axils of floral leaves; caulinar leaves simple (only *S. korolkovii*) or pinnatisect, dissected or deeply lobed, 4–9 cm long, 1.5–4 cm wide .....7
2. Calyx pubescent with eglandular hairs, its teeth 5–7 mm long in fruit .....3
- Calyx pubescent with glandular hairs, its teeth 1–4 mm long in fruit .....4
3. Lower calyx lip longer than the upper; pedicels 15–20 mm long ..... *S. schmalhauseni*
- Lower calyx lip shorter than the upper; pedicels 8–13 mm long ..... *S. kamelinii*
4. Corolla tube included in the calyx or very slightly exerted ..... *S. aequidens*
- Corolla tube exerted from calyx half of its length or the length of calyx 25–30 mm long .....5
5. Floral axis glandular-pubescent; pedicels 6–9 mm long ..... *S. drobovii*
- Floral axis glabrous; pedicels 7–12 mm long .....6
6. Stem always repeatedly branched; calyx subequal, the teeth of upper lip subequal ..... *S. campyloclontia*
- Stem mostly simply branched; lower calyx lip longer than the upper one, lateral teeth of upper lip longer than the middle teeth ...  
..... *S. margaritae*
7. Fruiting calyces infundibular with widely spreading rounded lobes .....8
- Fruiting calyces usually urceolate, upper lip 3-toothed with very small or subulate-pointed middle tooth or 2-toothed .....9
8. Leaves simple; calyx greenish-yellow and corolla cream-yellowish ..... *S. korolkovii*
- Leaves pinnatisect; calyx and corolla light to dark pink ..... *S. bucharica*
9. Plants 15–20 cm tall; calyx 22–25 mm long, upper lip 2-toothed, all teeth of the calyx blunt, without awl-shaped sharpening .....  
..... *S. submutica*
- Plants 25–65 cm tall; calyx 10–22 mm long, upper lip 3-toothed, sometimes with a very small reduced middle teeth, all teeth of the calyx subulate pointed .....10
10. Stem with few (3–4) basal leaves; pedicels reddish-purple, with different pairs of bracts; one bract oblong-ovate, large, up to 15 mm long, the other lanceolate, small, up to 4 mm long; calyx with a sharp network of green and reddish-purple anastomosing veins ..... *S. vvedenskii*
- Stem leafless or with reduced stem leaves, leaves mostly basal; pedicels green, with the same pairs of bracts; calyx without a noticeable network of veins .....11
11. Middle stem internodes bare; basal leaves elliptical, deeply incised into ovoid or triangular blunt lobes; calyx 10–16 mm length ..  
..... *S. glabricaulis*
- Middle stem internodes densely covered with long, thin, multicellular, trampled hairs with an admixture of long and short-necked glands; basal leaves oblong-lanceolate, deeply pinnate-dissected into elliptical, triangular-oblong sharp-toothed; calyx 16–22 mm long .....12
12. Corolla naked outside; plants of Pamiro-Alay .....13
- Corolla finely tortuous hairy outside, sometimes with an admixture of sessile glands; plants of Western Tien Shan .....14
13. Pedicels 5–7 mm long; flowers pale-white ..... *S. komarovii*
- Pedicels 8–12 mm long; flowers pale lilac-blue ..... *S. lilacinocoerulea*
14. Basal leaves large, 7–9 cm long, 3–4 cm wide, deeply pinnately dissected into triangular-oblong sharp-toothed lobes; calyx glabrous inside, its upper lip with a well-defined middle tooth ..... *S. tianschanica*
- Basal leaves relatively small, 4–5 cm long, 1.5–2 cm wide; deeply pinnatisect, the segments flexuous-linear; calyx hairy inside, its upper lip with a very reduced middle tooth ..... *S. trautvetteri*

## Group C

1. Lower staminal arm subulate, lever mechanism not active; upper corolla lip straight .....2
- Lower staminal arm expanded (dolabriform tissue), lever mechanism active; upper corolla lip falcate or semifalcate .....3
2. Low subshrubs with densely pubescent white leaves; upper corolla lip deeply emarginated, not narrowed at base and not movable; verticillasters 2-flowered; filaments long and exerted from corolla tube ..... *S. baldshuanica*
- Perennial herb with short hairs; upper corolla lip slightly emarginated, narrowed at base and movable up; verticillasters 20–40-flowered; filaments short and included in corolla tube ..... *S. verticillata*
3. Annual; stems often topped by a colored coma of sterile bracts ..... *S. viridis*
- Perennial or biennial plants; stems without a colored coma at the top .....4
4. Leaves pinnatifid with spreading linear segments ..... *S. ceratophylla*
- Leaves not pinnatifid .....5
5. Calyx markedly accrescent in fruit, 22–30 mm long; upper corolla lip slightly curved .....6
- Calyx not or poorly accrescent in fruit, up to 22 mm long; upper corolla lip falcate or slightly concave .....7
6. Leaves green above, almost glabrous, pubescent below; inflorescences compact, verticillasters 1–1.5 cm apart from each other; bracts longer than calyx; corolla tube hidden in the calyx; flowers white (pink) ..... *S. insignis*
- Leaves green on both sides, glabrous or covered with sparsely short glandular hairs along the veins beneath; inflorescences lax, verticillasters 2–3 cm apart from each other; bracts almost as long as or slightly shorter than calyx; corolla tube strongly exposed from the calyx; flowers white or pale violet ..... *S. gontscharovii*
7. Inflorescence candelabriform, widely spreading and branching; stems eglandular lanate; calyx densely white lanate hairy .....  
..... *S. aethiopsis*
- Inflorescence not candelabriform; stems pilose to villous; calyx short pilose to pubescent, never white lanate hairy .....8

8. Corolla usually less than 20 mm long, usually violet-blue; calyx 5–10 mm in anthesis, upper calyx lip strongly reflexed in fruit, with two deep sulcate grooves.....9  
 - Corolla usually more than 20 mm long, usually white, pinkish, or pale lilac; calyx 10–20 mm in anthesis, upper calyx lip not strongly reflexed in fruit, without two deep sulcate grooves .....13
9. Floral leaves as long as or shorter than the calyx, green, non-imbricate in bud; inflorescence usually branched, widely-paniculate (in *S. virgata* and *S. turcomanica*) or simple (in *S. dumetorum*), with 12–40 verticillasters .....10  
 - Floral leaves exceeding the calyx, violet, imbricate in bud; inflorescence simple or slightly branched, with 5–30 verticillasters.12
10. Basal leaves oblong or cordate-oblong; flowers bisexual, pistillate, or a mix of bisexual and pistillate..... *S. dumetorum*  
 - Basal leaves elliptic-oblong to ovate-oblong, or oblong-lanceolate; all flowers bisexual ..... 11
11. Corolla 14–16 mm long, upper lip falcate, almost equal to the lower lip, corolla tube short, hidden in calyx; stem and calyx with long glandular hairs .....*S. virgata*  
 - Corolla 16–20 mm long, upper lip straight or slightly concave, but not falcate, upper lip slightly longer than the lower one, corolla tube significantly exposed from the calyx; stem and calyx eglandular hairy.....*S. turcomanica*
12. Leaves green on both sides, glabrous above, villous along the veins beneath; bracts longer than or as long as the calyx; calyx nerves covered with very short appressed hairs; corolla blue-violet ..... *S. nemorosa*  
 - Leaves dull green above, clearly pubescent, gray by a dense pubescence beneath; bracts usually shorter than calyx; calyx nerves covered with long hairs; corolla bright purple or pink (albino white) .....*S. deserta*
13. Corolla tube squamulate, ventricose (corolla tube abruptly widening towards throat).....14  
 - Corolla tube not squamulate, ventricose or not (corolla tube gradually widening towards throat) .....16
14. Upper corolla lip lilac; bracts clearly longer than the calyx (1.5–2 times), bracts white, greenish, pink to mauve .....*S. sclarea*  
 - Upper corolla lip white; bracts as long as or slightly longer than the calyx, bracts yellowish green .....15
15. Leaves ovate to ovate-oblong, glabrous or with few scattered hairs above, densely patent hairy beneath; calyx 12–15 mm long, recurved in fruit .....*S. chloroleuca*  
 - Leaves linear-oblong, rarely ovate-elliptic, arachnoid-tomentose with sessile glands on both side; calyx 8–14 mm long, not recurved in fruit ..... *S. atropatana*
16. Inflorescence paniculate, pyramidal-spreading; flowers white .....17  
 - Inflorescence simple or branched, with two pairs of short lateral branches; flowers pale purple-violet or pink.....18
17. Leaves ovate; calyx broadly tubular, 6–7 mm wide.....*S. spinosa*  
 - Leaves oblong-ovate; calyx narrowly tubular, 4–5 mm wide .....*S. macrosiphon*
18. Leaves green above, slightly pubescent and densely whitish hairy below; calyx tubular, 16–20 mm long .....*S. sarawschanica*  
 - Leaves on both sides whitish, later glabrescent above; calyx long-tubular, 20–22 mm long .....*S. ariana*

## Examined specimens for new records and reconfirmations

### *Salvia ariana* Hedge

TAJIKISTAN: Aktau mountains, In the cracks of gypsum rocks Akbulak, 25 May 1959, *V.P. Botschantsev & S.Y. Yunusov* 127 (LE!); mountains Hajj-Kazian, to in from the Shaartz mountains, rocky slopes, 23 May 1960, *V.P. Botschantsev, T.V. Egorova, 324, 324a* (LE!); Southwestern spurs of the Darvaz ridge, Upper Buzdykham, near the ridge, 5 km S from the village of Parkhar, scattered red sandstones, 2100 m, 12 June 1960, *Y.D. Soskov & S.Y. Yunusov* 1148 (LE!); Sarymsakly, On the slopes in the gorges of the western Zastava, near the border, 22 May 1961, *D. Kurbanov s. n.* (LE!).

### *Salvia spinosa* L.

KAZAKHSTAN: On deposits in the village Kaplanbek, 21 May 1928, *I. Granitov & A. Vvedensky* 6790 (TASH!, MW0873446 [photo!], P04387482 [photo!] (Fig. 2), E00031017 [photo!]); Kaplanbek hills, in the vicinity of Tashkent, 24 May 1928, *Radkewicz s. n.* (TASH!); Kaplanbek, on the Bogar, 20 June 1928, *N. Bartnikov s.n.* (TASH!); South Kazakhstan, surroundings Kaplanbek, 5 May 1938, *Zeldina & Juchtenishaher* 78 (TASH!); Darwaza, near the Mesa, high loess hills, 11 June 1950, *Students specimen 1* (TASH!); Array river Keles, in the vicinity of station Darwaza, 10 May 1966, *G. Khamidov s.n.* (TASH!); Tashkent chuli, 10–12 km north of the railway station Djilga, dry hills, 13 May 1975, *A. Lee, M. Pakhomova, U. Pratov, G. Shermatov & T. Tsukervanik* 4 (TASH!);

### *Salvia tianschanica* Makhm.

TAJIKISTAN: Kurama ridge, Altyn-Topkan Mountains, in the region of Kara-Kiya-say (Pangaz-say), southwestern rubble slope, 18 June 1953, *R. Vernik, M. Nabiev & T. Tsukervanik* 361 (TASH!); 5 km from Altyn-Topkan towards Almalyk, 23 June 1961, *Z.N. Filimonova s. n.* (TASH!); Pangaz river valley, Siyo-Kukh mountains, dry slopes, 23 June 1970, *R.V. Kamelin* 335 (LE0052465! paratype (Fig. 3)); The road from Almalyk to Leninabad stony slope, 24 May 1976, *U. Pratov, T. Tsukervanik & A. Makhmedov* 669 (TASH!).



## *Salvia verticillata* L.

KAZAKHSTAN: Talas Alatau ridge. Poplar forest, the vicinity of the village of Talas, 18 June 1938, P.Z. Krasovskiy s. n. (TASH!).

## Acknowledgements

The authors are grateful to the curators of E, LE, MW, P, TAA, TASH, TU for providing access to the herbarium material. This study was supported by the “Taxonomic revision of polymorphic plant families of the flora of Uzbekistan (FZ-20200929321)”. The study was carried out within the framework of the project “Implementation by the State Botanical Gardens of the priority scientific and practical tasks of the Global Strategy for Plant Conservation as a Sustainable System for Maintaining Biodiversity” (BR05236546) and the Komarov Botanical Institute RAS “Herbarium collections of BIN RAS (history, conservation, investigation and replenishment)” (no. AAAA-A18-118022090078-2). The authors thanks to Marina Vitalievna Legchenko and Ivan Tatanov, from the Komarov Botanical Institute (LE), Veronique Andro and Germinal Rouhan from Herbarium of the Muséum National d’Histoire Naturelle (MNHN - Paris), Toomas Kukk and Thea Kull from TAA herbarium (Estonian University of Life Sciences herbarium) and Kai Vellak from TU herbarium (University of Tartu in Estonia) for providing images of *Salvia deserta* from their collections. Bryan Drew acknowledges support from the U.S. National Science Foundation (DEB-1655611). The authors also thanks to J. McNeill (Scotland) and F. Khasnov (Uzbekistan) for comments regarding the application of ICN and providing further literature and suggestions.

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