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A SYNOPSIS OF THE GENUS *STIPA* (POACEAE) IN MIDDLE ASIA, INCLUDING A KEY TO SPECIES IDENTIFICATION, AN ANNOTATED CHECKLIST, AND PHYTOGEOGRAPHIC ANALYSES[1]

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Abstract

The genus *Stipa* L. comprises over 150 species, all native to the Old World, where they grow in warm temperate regions throughout Europe, Asia, and North Africa. It is one of the largest genera in the family Poaceae in Middle Asia, where one of its diversity hotspots is located. However, identification of Middle Asian *Stipa* species is difficult because of the lack of new, comprehensive taxonomic studies including all of the species recorded in the region. We present a critical review of the Mid-Asian representatives of *Stipa*, together with an identification key and taxonomic listing. We relied on both published and unpublished information for the taxa involved, many of which are poorly known. For each taxon, we present a taxonomic and nomenclatural overview, habitat preferences, distribution, altitudinal range, and additional notes as deemed appropriate. We describe four new nothospecies: *S.* ×*balkanabatica* M. Nobis & P. D. Gudkova, *S.* ×*dzungarica* M. Nobis, *S.* ×*pseudomacroglossa* M. Nobis, *S.* ×*subdrobovii* M. Nobis & A. Nowak, one subspecies *S. caucasica* Schmalh. subsp. *nikolai* M. Nobis, A. Nobis & A. Nowak, and eight varieties: *S. araxensis* Grossh. var. *mikojanovica* M. Nobis, *S. caucasica* var. *fanica* M. Nobis, P. D. Gudkova & A. Nowak, *S. drobovii* (Tzvelev) Czerep. var. *jarmica* M. Nobis, *S. drobovii* var. *persicorum* M. Nobis, *S. glareosa* P. A. Smirn. var. *nemegetica* M. Nobis, *S. kirghisorum* P. A. Smirn. var. *balkhashensis* M. Nobis & P. D. Gudkova, *S. richteriana*

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Kar. & Kir. var. *hirtifolia* M. Nobis & A. Nowak, and *S.* ×*subdrobovii* var. *pubescens* M. Nobis & A. Nowak. Additionally, 12 new combinations, *Achnatherum haussknechtii* (Boiss.) M. Nobis, *A. mandavillei* (Freitag) M. Nobis, *A. parviflorum* (Desf.) M. Nobis, *Neotrinia chitralensis* (Bor) M. Nobis, *S. badachschanica* Roshev. var. *pamirica* (Roshev.) M. Nobis, *S. borysthenica* Klokov ex Prokudin var. *anomala* (P. A. Smirn.) M. Nobis, *S. holosericea* Trin. var. *transcaucasica* (Grossh.) M. Nobis, *S. kirghisorum* P. A. Smirn. var. *ikonnikovii* (Tzvelev) M. Nobis, *S. macroglossa* P. A. Smirn. var. *kazachstanica* (Kotuchov) M. Nobis, *S. macroglossa* var. *kungeica* (Golosk.) M. Nobis, *S. richteriana* var. *jagnobica* (Ovcz. & Czukav.) M. Nobis & A. Nowak, and *S. zalesskii* Wilensky var. *turcomanica* (P. A. Smirn.) M. Nobis are proposed, and the lectotypes for 14 taxa (*S. arabica* Trin. & Rupr., *S. bungeana* Trin. ex Bunge, *S. caspia* K. Koch, *S.* ×*consanguinea* Trin. & Rupr., *S. effusa* Mez, *S.* ×*heptapotamica* Golosk., *S. jacquemontii* Jaub. & Spach., *S. kungeica* Golosk., *S. margelanica* P. A. Smirn., *S. richteriana*, *S. rubentiformis* P. A. Smirn., *S. sareptana* A. K. Becker, *S. tibetica* Mez, and *Timouria saposhnikovii* Roshev.) are designated. In Middle Asia the genus *Stipa* comprises 98 taxa, including 72 species, four subspecies, and 22 varieties. Of the 72 species of feather grasses, 23 are of hybrid origin (nothospecies). In Middle Asia, feather grasses can be found at elevations from (0 to)300 to 4500(to 5000) m, but most are montane species. The greatest species richness is observed at altitudes between 1000 and 2500 m. Nineteen species grow above 3000 m, but only nine above 4000 m. The number of taxa (species and subspecies) growing in each country also varies considerably, with the highest noted in Kazakhstan (42), Tajikistan (40), and Kyrgyzstan (35). Of the 76 taxa of *Stipa* (species and subspecies) recorded in Middle Asia, 41 are confined to the region, with some being known only from a single country or mountain range. Distribution maps of selected species are provided.

Key words: Checklist, distribution, feather grasses, identification key, mountains of central Asia, Old World, *Stipa*, taxonomy, typification.

The vascular plant flora of Middle Asia comprises more than 8000 species, and over 20% of them are considered endemic (Kamelin, 2002). The mountains of central Asia have been identified as one of the world's biodiversity hotspots (Brooks et al., 2006; Mittermeier et al., 2011; Critical Ecosystem Partnership Fund, 2018) and one of the 11 most important focal points of scientific studies and conservation efforts (Giam et al., 2010). Middle Asia is also characterized by a high degree of grass diversity, of which one of the highly represented genera is *Stipa* L. After the splitting of the genus and division of the Eurasian species into multiple genera (e.g., *Achnatherum* P. Beauv., *Aristella* Bertol., *Celtica* F. M. Vázquez & Barkworth, *Macrochloa* Kunth, *Neotrinia* (Tzvelev) M. Nobis, P. D. Gudkova & A. Nowak, *Oloptum* Röser & Hamasha, *Orthoraphium* Nees, *Ptilagrostis* Griseb., *Patis* Ohwi, *Piptatherum* P. Beauv., *Psammochloa* Hitchc., *Stipellula* Röser & Hamasha, and *Trikeraia* Bor), *Stipa* s. str. still comprises more than 150 species that are distributed in warm temperate regions throughout Europe, Asia, and North Africa (Roshevitz, 1934; Bor, 1960, 1970; Tzvelev, 1968, 1976; Martinovský, 1980; Freitag, 1985; Jacobs & Everett, 1996; Kotukhov, 2002; Wu & Phillips, 2006; Barkworth, 2007; Barkworth et al., 2008; Romaschenko et al., 2008, 2012; Nobis, 2013, 2014; Hamasha et al., 2012). Its representatives grow in open grasslands, alpine meadows (in neutral to alkaline soils), lowlands, mountains, and stony and sandy deserts, as well as on steppes, rocks, and screes. Sometimes particular *Stipa* species create communities, commonly known as feather grass steppes or feather grass grasslands, in which they constitute diagnostic, constant, and/or dominant species (e.g., *Koelerio macranthae–Stipetum pennatae* Kolbek, *Stipetum tirsae* Meusel, *Festuco valesiacae–Stipetum capillatae* Sillinger, *Asperulo albiflorae–Stipetum zeravshanicae* M. Nobis, A. Nowak & A. Nobis, or *Stipetum lipskyi* A. Nowak, S. Nowak, A. Nobis & M. Nobis; Korovin, 1962; Stanyukovich, 1982, Lavrenko et al., 1991; Gadghiev et al., 2002; Agakhanjanz & Breckle, 2003; Eberhardt, 2004; Peer et al., 2008; Chytrý, 2010; Ermakov, 2012; Rachkovskaya & Bragina, 2012; Kabaš et al., 2013; Nobis et al., 2013; Nowak et al., 2016, 2018).

Stipa comprises perennial and usually densely tufted plants whose most distinctive character is a terminal awn on the lemma. The awn can be unigeniculate or bigeniculate, scabrous/glabrous to variously pilose, and can reach from 2 to 50 cm in length. *Stipa* clearly differs from the other Old World genera of Stipeae in the pattern of the lemma micromorphology, which has great phylogenetic value within the tribe. *Stipa* species have lemmas characterized by the presence of rectangular to square fundamental (long) cells, with numerous hooks and sparse, reniform to oblong silica bodies sometimes associated with cork cells. Hooks are distributed on short cells along the entire upper surface of the lemma (Barkworth & Everett, 1987; Romaschenko et al., 2012; Nobis, 2013; Nobis et al., 2016a, 2019a, 2019b; Olonova et al., 2016). This pattern of lemma epidermis has been called saw-like, in contrast to maize-like, which is characterized by short fundamental cells and extremely numerous silica bodies on the upper surface of the lemma, typical for achnatheroid grasses represented by e.g., *Achnatherum*, *Aristella*, or *Stipellula* (Romaschenko et al., 2012). The third type of lemma epidermis pattern encountered in Stipeae and observed in *Neotrinia*, *Orthoraphium*, *Piptatherum*, *Psammochloa*, *Ptilagrostis*, and *Trikeraia* is characterized by elongate fundamental (long) cells that vary in shape, from rectangular to elongated with straight or sinuous edges, more or less numerous silica bodies associated with cork cells, and sparse or absent hooks (Romaschenko et al., 2012, 2014; Nobis & Nobis, 2013; Nobis et al., 2019a, 2019b). Some authors have proved that although the

general pattern of the lemma epidermis in species of *Stipa* is relatively uniform, it may be useful in the identification of particular species within and/or between different generic sections (Nobis, 2013, 2014; Nobis et al., 2014b, 2015b, 2016a; Olonova et al., 2016). Despite several phylogenetic studies on Stipeae carried out so far (Romaschenko et al., 2008, 2010, 2012; Cialdella et al., 2010; Hamasha et al., 2012; Sclovich et al., 2015), no final phylogenetic relationships have been identified within the genus *Stipa*. In previous studies, based on analysis of ITS and various regions of chloroplast DNA, phylogenetic resolution between species was obscure; when clades were resolved, support was often weak (Hamasha et al., 2012; Romaschenko et al., 2012). Recently, Krawczyk et al. (2017) showed that the nuclear ribosomal RNA intergenic spacer (IGS) region, especially the part adjacent to the 26S nuclear ribosomal DNA, can serve as an effective molecular marker enabling reconstruction of the phylogeny of *Stipa*. Using this region, the authors conducted a molecular phylogenetic study for 36 species of *Stipa*, obtaining the first phylogenetic tree, with well-resolved clades, linked in most cases to infrageneric sections, which are distinguished by morphological characters. Nevertheless, as of yet no comprehensive explanation of phylogenetic relationships within the genus *Stipa* has been put forward.

Because of their ornamental value, feather grasses have drawn the attention of nature lovers as well as botanists for many years. The first taxonomic studies including *Stipa* from Middle Asia (the region including southern Kazakhstan, western China, Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan, northern Afghanistan, northwestern Iran, and northern Pakistan) were published in the 19th century (Trinius, 1820, 1829; Link, 1827; Trinius & Ruprecht, 1842; Grisebach, 1852, 1868; Steudel, 1855; Hackel, 1887; Hooker, 1896). At the beginning of the 20th century, research on *Stipa* was conducted by Junge (1910), Roshevitz (1916, 1920, 1929, 1934), Smirnov (1924, 1925, 1928, 1929a, 1929b, 1930, 1934), and Drobov (1941). After World War II, data on the taxonomy of the genus *Stipa* were supplemented by Gamayunova (1956), Ovchinnikov and Chukavina (1957), Bor (1960, 1970), Pazij (1968), Tzvelev (1968, 1974, 1976), Martinovský (1980), Cope (1982), Freitag (1985), and Kuo and Sun (1987). The number of *Stipa* species recognized for the region varied between 40 and 70. However, these numbers also included several taxa (based on morphological and molecular studies) currently belonging to other genera, e.g., *Ptilagrostis*, *Achnatherum*, or *Stipellula*. On the other hand, during the last 30 years, some new species of *Stipa* also have been described from central Asia by Lomonosova (1990), Kotukhov (1987, 1991, 1994, 1998a, 1998b), Tzvelev (2012), Nobis (2013, 2014), Nobis et al. (2013, 2014b, 2017a), and Zhao and Guo (2011, 2017). Further exploration of the region is expected to reveal additional species. Approximately half of the Middle Asian feather grasses are endemics (restricted either to a single country or mountain range, or to the region in general) and are considered threatened (Pazij, 1968; Tzvelev, 1976; Nobis, 2009). It is worth mentioning that the systematic position of several taxa representing the genus is still unclear and requires further study.

Based on morphological comparison, some researchers have hypothesized that many *Stipa* taxa have arisen through hybridization (Smirnov, 1970; Tzvelev, 1976; Kotukhov, 2002; Nobis, 2013). Nevertheless, before now, all information and hypotheses on the hybrid origin of these taxa, as well as on hybridization events in feather grasses, were based on morphology only. Recently Nobis et al. (2019c) provided the first molecular evidence for this phenomenon in *Stipa*. Hybridization within this genus is particularly interesting because hybrids are perennial and reproduce vegetatively and, less frequently, sexually (Nobis, 2013; Nobis et al., 2017a). Most produce fertile pollen grains and therefore are, or may be, able to backcross with parental species, resulting in introgression (Nobis et al., 2019c). We presume that currently more than 30% of *Stipa* species have a hybrid origin.

An additional impediment to the identification of *Stipa* in the region is the lack of current comprehensive treatment of taxa in the region. Thus, the main goals of this paper are to provide, for members of *Stipa* currently known from the region: (1) an identification key; (2) a taxonomic and nomenclatural summary that also includes notes on each taxon's habitat preferences and distribution; (3) descriptions of new taxa found by our research team during field studies or revision of herbarium materials; and (4) an analysis of the diversity and distribution patterns of *Stipa* in Middle Asia.

Materials and Methods

This study is based on the authors' fieldwork in the region (from 2007 to the present) and examination of specimens deposited in the following herbaria: AA, B, BM, BRNU, COLO, E, FR, FRU, G, GAT, GFW, GOET, IFP, K, KAS, KFTA, KHOR, KRA, KRAM, KUN, KUZ, L, LE, LECB, M, MHA, MO, MSB, MW, NY, P, PE, PR, PRC, TAD, TASH, TK, UPS, W, WA, WU, and Z as well as critical review of available literature regarding the taxonomy and distribution of feather grasses. Herbarium codes mentioned above follow Thiers (2018). In total, more than 5000 sheets with specimens representing the genus *Stipa* were revised. The specimens were collected from Middle Asia (Kamelin, 1973) as well as the mountains of central Asia. This area is located in the western part of central Asia and comprises the following countries: southern Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan, northern

Figure 1. The area of study.

Afghanistan, northwestern Iran, and northern Pakistan (Fig. 1). The most important morphological characters used in the taxonomy of *Stipa* are presented in Figure 2. Illustrations and descriptions of other morphological characters can be found, e.g., in the work of Roshevitz (1934), Martinovský (1967, 1970, 1972, 1976, 1977), Freitag (1985), Moraldo (1986), Gonzalo et al. (2012, 2013), Nobis (2013, 2014), Gudkova et al. (2013b), and Nobis et al. (2013, 2016a, 2017a).

MORPHOLOGICAL ANALYSES

The numerical analyses are based on 76 taxa (species and subspecies) representing the genus *Stipa* in Middle Asia. We selected 16 variable morphological characters (Table 1) and scored all taxa of *Stipa* examined, as well as 22 additional taxa selected from six genera of the tribe Stipeae. Each taxon was treated as an operational taxonomic unit (OTU) in accordance with the methods used in numerical taxonomy (Sokal & Sneath, 1963). Cluster analysis was performed on all OTUs to estimate morphological similarities among the species. The similarities among OTUs were calculated using Gower's general similarity coefficient. A cluster analysis (unweighted pair group method with arithmetic mean) was carried out using PAST software (Hammer et al., 2001).

Taxonomic Treatment

Within the the key and list of taxa presented below, four new nothospecies (*Stipa* ×*balkanabatica* M. Nobis & P. Gudkova, *S.* ×*dzungarica* M. Nobis, *S.* ×*pseudomacroglossa* M. Nobis, and *S.* ×*subdrobovii* M. Nobis & A. Nowak), one subspecies (*S. caucasica* Schmalh. subsp. *nikolai* M. Nobis, A. Nobis & A. Nowak), and eight varieties (*S. araxensis* Grossh. var. *mikojanovica* M. Nobis, *S. caucasica* var. *fanica* M. Nobis, P. D. Gudkova & A. Nowak, *S. drobovii* (Tzvelev) Czerep. var. *jarmica* M. Nobis, *S. drobovii* var. *persicorum* M. Nobis, *S. glareosa* P. A. Smirn. var. *nemegetica* M. Nobis, *S. kirghisorum* P. A. Smirn. var. *balkhashensis* M. Nobis & P. D. Gudkova, *S. richteriana* Kar. & Kir. var. *hirtifolia* M. Nobis & A. Nowak, *S.* ×*subdrobovii* M. Nobis & A. Nowak var. *pubescens* M. Nobis & A. Nowak) are described. Additionally, 12 new combinations, *Achnatherum haussknechtii* (Boiss.) M. Nobis, *A. mandavillei* (Freitag) M. Nobis, *A. parviflorum* (Desf.) M. Nobis, *Neotrinia chitralensis* (Bor) M. Nobis, *S. badachschanica* Roshev. var. *pamirica* (Roshev.) M. Nobis, *S. borysthenica* Klokov ex Prokudin var. *anomala* (P. A. Smirn.) M. Nobis, *S. holosericea* Trin. var. *transcaucasica* (Grossh.) M. Nobis, *S. kirghisorum* P. A. Smirn. var. *ikonnikovii* (Tzvelev) M. Nobis, *S. macroglossa* P. A. Smirn. var. *kazachstanica* (Kotuchov) M. Nobis, *S. macroglossa* var. *kungeica* (Golosk.) M. Nobis, *S. richteriana* var. *jagnobica* (Ovcz. & Czukav.) M. Nobis & A. Nowak, *S. zalesskii* Wilensky var. *turcomanica* (P. A. Smirn.) M. Nobis, are proposed, and the lectotypes for 14 taxa, namely *S. arabica* Trin. & Rupr., *S. bungeana* Trin. ex Bunge, *S. caspia* K. Koch, *S.* ×*consanguinea* Trin. & Rupr., *S. effusa* Mez, *S.* ×*heptapotamica* Golosk., *S. jacquemontii* Jaub. & Spach., *S. kungeica* Golosk.,

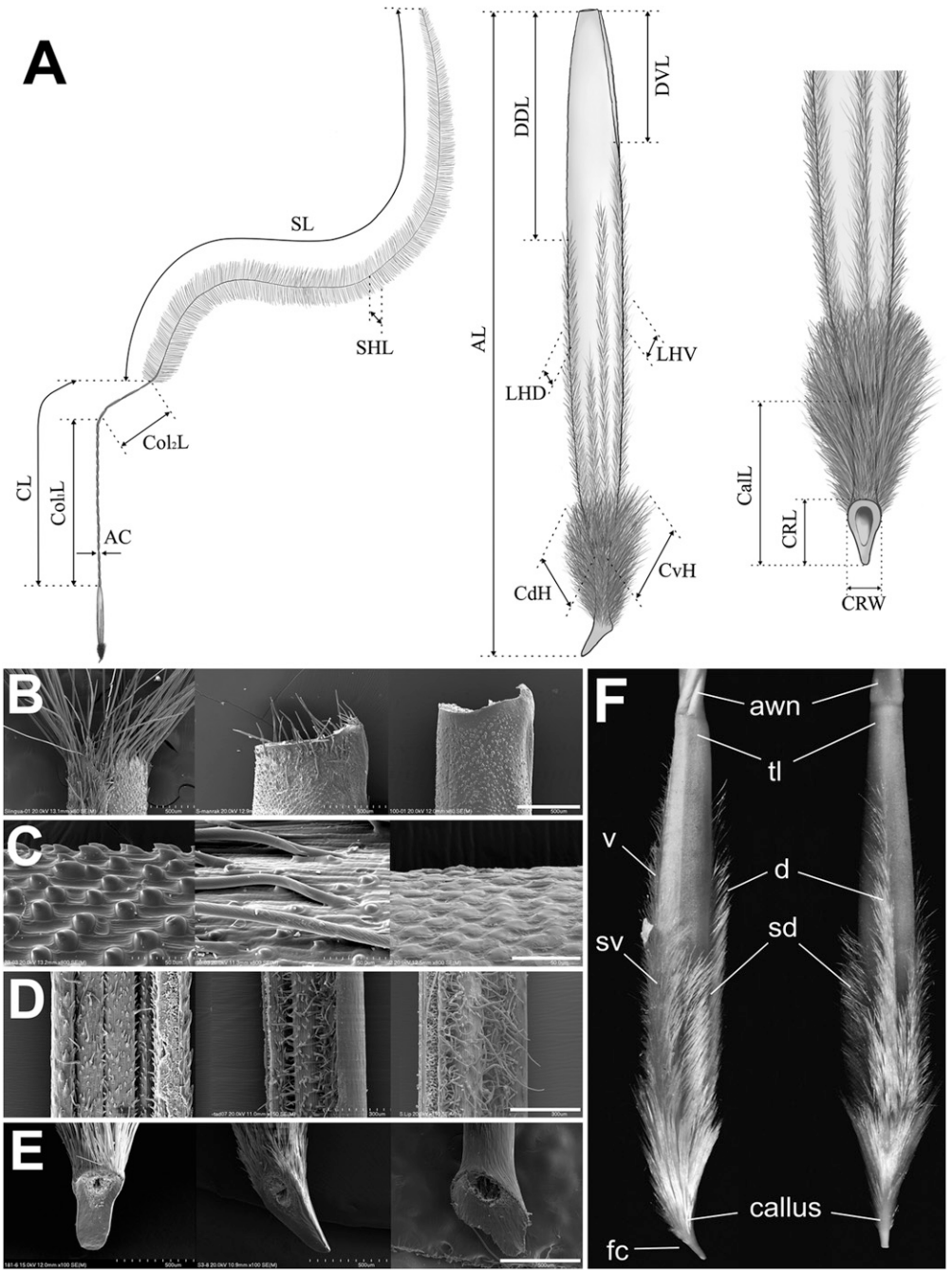

Figure 2. Selected morphological characters of feather grasses. —A. Awn and anthecium: width of awn column (AC), length of anthecium (AL), length of callus (CalL), length of hairs on the ventral part of the callus (CvH), length of hairs on the dorsal part of the callus (CdH), length of the lower segment of column (Col_1L), length of the upper segment of column (Col_2L), length of the peripheral ring of the callus base (CRL), width of the peripheral ring of the callus base (CRW), distance from the end of the dorsal line of hairs to the top of the lemma (DDL), distance from the end of the ventral line of hairs to the top of the lemma (DVL), length of hairs in the dorsal line on the lemma (LHD), length of hairs in the ventral line on the lemma (LHV), length of hairs on the seta (SHL), length of the longest hairs on the seta (SL). —B. Top of the lemma (from left): with well-developed ring of hairs, with poorly developed ring of hairs, and without ring of hairs. —C. Micromorphological patterns of the lemma epidermis. —D. Adaxial (upper) surface of leaves (from left): with mixed short and long hairs, with hairs up to 2 mm long, and with dense hairs up to 6 mm long. —E. Ring (foot) of the callus (from left): pyriform, cuneate, goblet-like concave and ovate in shape. —F. Anthecium. tl, top of lemma; d, dorsal line of hairs; sd, subdorsal line of hairs; sv, subventral line of hairs; v, ventral line of hairs; fc, foot of the callus.

S. margelanica P. A. Smirn., *S. richteriana*, *S. rubentiformis* P. A. Smirn., *S. sareptana* A. K. Becker, *S. tibetica* Mez, and *Timouria saposhnikovii* Roshev., are designated. For seven species (*S.* ×*adamii* M. Nobis, *S.* ×*albasiensis* L. Q. Zhao & K. Guo, *S.* ×*assyriaca* Hand.-Mazz., *S.* ×*consanguinea*, *S.* ×*gnezdilloi* Pazij, *S.* ×*heptapotamica*, and *S.* ×*pseudocapillata*), we indicate a status of nothospecies (pro species). In addition, for all taxa with a hybrid origin presented in the list below, we provide information on their putative parental species.

For each examined taxon, we provide the following information: type specimen (holotype or lectotype) and place of its preservation, habitat requirements, geographic distribution, altitudinal range, and other chorological, taxonomic, or nomenclatural information. Taxonomic synonyms for species given below are based on the revision of original herbarium material of the species conducted by the two first authors of the paper as well as the works of Tzvelev (1976), Freitag (1985), Wu and Phillips (2006), Nobis (2010, 2013, 2014), Nobis and Gudkova (2011, 2016), Nobis et al. (2015b, 2016b), Nobis and Klichowska (2016), and working lists of plant species available online through Plant List (<http://www.theplantlist.org/>) and Tropicos® (<www.tropicos.org>).

CHECKLIST OF *STIPA*

Stipa L., Sp. Pl. 1: 78. 1753. TYPE: *Stipa pennata* L.

KEY TO TAXA OF *STIPA* IN MIDDLE ASIA

1. Awn scabrous throughout, covered with hairs up to 0.3 mm long (shorter than diameter of the awn) 2
1′. Awn entirely or only partially covered with hairs over 0.3 mm long (longer than diameter of the awn) 8
2. Glumes 9–15 mm long, callus 0.5–1.3 mm long, anthecium 5–7 mm long 3
2′. Glumes 20–35 mm long, callus 1.5–4 mm long, anthecium 7–14 mm long 4
3. Callus 1–1.3 mm long, awn with hairs up to 0.1 mm long, ligules of vegetative shoots 0.2–0.5 mm long, lemma with 7 lines of hairs, of which the dorsal one terminates below the half of the lemma length . . . . . *S. bungeana* Trin. ex Bunge
3′. Callus (0.5–)0.6–0.8(–1) mm long, awn with hairs 0.2–0.3 mm long, ligules of vegetative shoots up to 0.2 mm long, densely hairy on margins, lemma with indistinct lines of hairs or pilose all around, hairs terminate in the upper half of the lemma length . . . . . *S. richteriana* Kar. & Kir. subsp. *jagnobica* (Ovcz. & Czukav.) Tzvelev
4. Abaxial surface of blades of vegetative leaves usually glabrous, rarely slightly scabrous, adaxial surface densely covered with hairs up to 0.1 mm long, anthecium with well-developed ring of hairs at the apex 5
4′. Abaxial surface of blades of vegetative leaves usually scabrous, rarely almost glabrous, adaxial surface densely covered with hairs 0.2–0.5 mm long, or a mixture of short and long hairs, anthecium without or with poorly developed ring of hairs at the apex 6
5. Ligules of vegetative leaves up to 0.2 mm long, callus 2.1–4.1 mm long . . . . . *S. krylovii* Roshev.
5′. Ligules of vegetative leaves 0.3–2 mm long, callus 1.5–2 mm long . . . . . *S. margelanica* P. A. Smirn.
6. Lemma with poorly developed ring of hairs at the apex (rarely well developed), abaxial surface of leaves of vegetative shoots scabrous due to prickles and spinules and adaxially covered with short or mix of short and long hairs (long hairs present only on marginal ribs) . . . . . *S. sareptana* A. K. Becker
6′. Lemma glabrous at the apex or rarely with scattered hairs and/or prickles near the lemma margins, abaxial surface of leaves of vegetative shoots scabrous to almost glabrous, and densely covered adaxially with 0.2–0.5 mm long hairs (rarely, long hairs are present only on marginal ribs) 7
7. Anthecium 7–11 mm long, awn 7–11 cm long, internodes usually longer than culm sheaths . . . *S. karakabinica* Kotukhov
7′. Anthecium (10–)11–13(–14) mm long, awn (10–)12–22 cm long, internodes usually shorter than culm sheaths . . . . . *S. capillata* L.
8(1). Column (lower segment of awn) plumose with hairs distinctly longer than those on seta (upper segment of awn) 9
8′. Column glabrous, scabrous or plumose with hairs equal to or shorter than those on seta 14
9. Awn with hairs on seta 0.1–0.3 mm long, 5 or more times shorter than those on column 10
9′. Awn with hairs on seta (0.3–)0.5–1.1(–1.4) mm long, 1.5–4 times shorter than those on the column . . . *S. roborowskyi* Roshev.
10. Awn 1.5–3.5 cm long, anthecium 5–8 mm long 11
10′. Awn 12–23 cm long, anthecium over 11 mm long . . . . . *S. holosericea* Trin.
11. Column with hairs up to 1.5 mm long . . . . . *S. regeliana* Hack.
11′. Column with hairs 2–4 mm long 12
12. Panicle lax, branches more than 3 cm long, anthecium 5–8 mm long . . . . . *S. penicillata* Hand.-Mazz.
12′. Panicle contracted, branches up to 3 cm long, anthecium 4–6 mm long 13
13. Glumes 6–8(–8.5) mm long, almost equal, abruptly contracted into more or less acute tip, awn usually more than 21 mm long . . . . . *S. subsessiliflora* Roshev.
13′. Glumes (9–)9.5–13.5 mm long, distinctly unequal, gradually narrowed into acute tip, awn usually up to 19 mm long . . . . . *S. basiplumosa* Munro ex Hook. f.
14(8). Awn unigeniculate or indistinctly bigeniculate 15
14′. Awn distinctly bigeniculate 45
15. Column glabrous, smooth or scabrous, seta with hairs 3–11.5 mm long 16
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17′. Glumes (37–)39–45 mm long, anthecium (9.6–)10–11.5 mm long, callus (1.3–)1.4–1.7 mm long, densely pilose, callus base not expanded with peripheral ring 0.32–0.37 mm in diam. ..... *S.* ×*adamii* M. Nobis
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87′. Seta 6.5–13.5 cm long, 2–4 times longer than column, glumes 25–50 mm long . . . . . *S. turkestanica* Hack.
88. Hairs on the adaxial surface of the vegetative leaves 0.15–0.25 mm long, anthecium (12.2–)13–14.5(–16) mm long, dorsal line of hairs extending to 1/2 lemma length and terminating at (4.3–)5.5–6.8(–9.1) mm below the top . . . . . *S. macroglossa* subsp. *macroglossa*
88′. Hairs on the adaxial surface of the vegetative leaves up to 0.1 mm long, anthecium (11.3–)12–13.5(–13.9) mm long, dorsal line of hairs extending to 2/3 lemma length and terminating at (3.1–)3.5–4.5(–6.4) mm below the top . . . . . *S. macroglossa* subsp. *kazachstanica*

Stipa ×adamii M. Nobis, Nordic J. Bot. 28(6): 734. 2010, pro sp. (*S. caucasica* Schmalh. × *S. karataviensis* Roshev.). TYPE: Kazakhstan. Western Tian-Shan, Karatau Mtns., upper part of the Karasai Valley, Kara-sai plateau (NE of Algabas village near Chayan), 1105 m, 12 June 1936, *A. Pyataeva s.n.* (holotype, LE!; isotypes, LE!, KRA 382216!).

Habitat. *Stipa* ×*adamii* is found in mountain steppes at 800–1200 m.

Distribution. *Stipa* ×*adamii* is found in Middle Asia (Nobis, 2010, 2013) in Kazakhstan (Karatau Mountains; Fig. 3).

Notes. This species was previously known only from the type specimens; however, during revision of herbarium materials in MW and TK, we found additional specimens representing this nothospecies. They were collected in the northwestern part of the Karatau Mountains, near Ran settlement, on 13 May 1935 (*G. Tekutev 85*, MW), and the Karatau Mountains, in May 2014 (*A. Ebel s.n.*, TK).

Stipa akseirica Kotukhov, Turczaninowia 1(2): 11. 1998. TYPE: Saur-Tarbagataj, praemontia boreali-occidentalia jugi Saikan, locus Akseir, denudationes argillarum tertiarum, partitiones glareoso-argillosae, 20 July 1993, *Ju. Kotuchov s.n.* (lectotype, designated by Nobis & Gudkova [2016: 32], LE!; isolectotypes, KRA

Table 1. Morphological characters and character states used in cluster analysis.

Morphological characters	States
Macromorphological characters	
Mean length of anthecium (lemma + callus) (mm)	3–8.5 (1), 9–14.5 (2), 15–24 (3)
Lemma lobes	absent (1), always present and rounded, triangular to elongated (2), present and elongated with apical awnlike vein (3)
Lemma apex	with hard, deflexed (retrorse) prickles (1), without hard, deflexed prickles (2)
Mean length of callus (mm)	0.3–0.9 (1); 1–2.6 (2), 2.7–5 (3)
No. of awn geniculations	without geniculation or indistinctly unigeniculate (1), unigeniculate (2), bigeniculate (3)
Mean length of awn (mm)	4–9 (0), 10–40 (1), 41–140 (2), 141–380 (3)
Mean length of seta (mm)	3–8 (0), 9–40 (1), 41–130 (2), 131–300 (3)
Mean length of hairs on column (mm)	glabrous (0), scabrous 0–0.3 (1), pubescent 0.4–2 (3), pilose 2–4 (4)
Mean length of hairs on seta (mm)	0.1–0.3 (1), 0.4–0.9 (2), 1–3 (3), 3–9 (4)
Mean length of glumes (mm)	6–17 (1), 18–38 (2), 39–85 (3)
Ratio lower glume/upper glume	subequal (1), lower distinctly longer than upper (2), lower distinctly shorter than upper (3)
Mean length of ligules of the vegetative leaves (mm)	0–0.2 (1), 0.2–1.2 (2), 1.3–3 (3), 3–8 (4)
No. of ovary styles	3 to 4 (1), 2 (2)
Micromorphological characters of the lemma epidermis	
Length of long cells	1–3(–5) times as long as width (1), (4–)5–7(–9) times as long as width (2), wider than longer (3)
Side walls of long cells	not thickened (1), thickened (2)
Hooks distribution	frequent (more than 12 on area of 0.015 mm^2) (1), sparse (less than 12 on area of 0.015 mm^2) (2), absent (3)
Silica cells	with constrictions (1), without constrictions (2)
Silica cell shape	elongated to ovate (1), ovate to elliptic or reniform (2)
Silica cell distribution	frequent (more than 20 per area of 0.015 mm^2) (1), sparse (less than 20 per area of 0.015 mm^2) (2)

432648!, KRA 436049!, KUZ!, LE!). = **Stipa sareptana** A. K. Becker.

Stipa aktauensis Roshev., Bull. Jard. Bot. Acad. Sc. URSS 1931, 30: 302. 1932. TYPE: Turkestan. Petro-Alexandrovsk, the Kyzyl Kum desert, Aktau, 6 May 1916, *S. Filatov 219* (holotype, LE!).

Synonyms. = *Stipa lingua* A. Junge var. *minor* Roshev., in B. Fedtsch. Fl. Aziat. Ross. 12: 146. 1916. TYPE: betw. Karak Ata & Adam Kirulgan, 1873, *Korolkov & Krause s.n.* (holotype, LE!).

Habitat. *Stipa aktauensis* is found in rocky grasslands at 300–600 m.

Distribution. *Stipa aktauensis* is found in Middle Asia (Gonzalo et al., 2012; Nobis, 2012), specifically in Uzbekistan (Aktau Mountains). Figure 4.

Stipa ×alaica Pazij, Opred. Rast. Sred. Azii 1: 200. 1968 (*S. caucasica* Schmalh. × *S. trichoides* P. A. Smirn.; Nobis, 2010). TYPE: Pamiro-Alai, Alaiskii khrebet, yugo-zap. sklon pravogo berega r. Kyzyl-su v 50 km k zap. ot Sary-tash, na melkozemisto-shchebenchatykh uchastkakh sredi krasnopeschanikovykh porod, 1 Aug. 1962, *E. Puchkova 152* (holotype, TASH!).

Synonyms. = *Stipa kopetdaghensis* Czopanov.

Habitat. *Stipa ×alaica* is found in mountain steppes at 1500–3000 m.

Distribution. *Stipa ×alaica* is found in Middle Asia (Pazij, 1968; Gonzalo et al., 2012; Nobis, 2013; Nobis et al., 2015a), specifically in Afghanistan, Kyrgyzstan, Tajikistan, and Turkmenistan.

Stipa ×albasiensis L. Q. Zhao & K. Guo, Ann. Bot. Fenn. 48(6): 522. 2011, pro sp. (*S. glareosa* P. A. Smirn. × *S. orientalis* Trin.). TYPE: China, Inner Mongolia, Ordos, Mt. Albasi, 39°38′12.1″N / 106°58′53.8″E, on stony mtn. slopes, alt. 1500 m, 12 June 2009, *L. Q. Zhao 09-001* (holotype, HIMC not seen).

Habitat. *Stipa ×albasiensis* is found in sandy steppes, rocky grasslands, and high mountain deserts at 2500–4000 m.

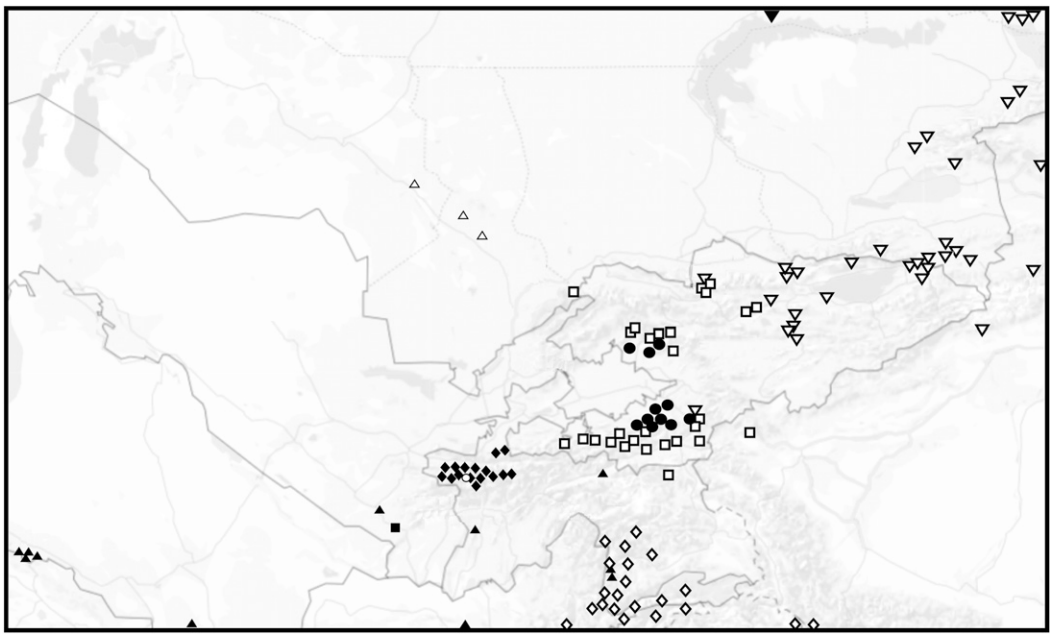

Figure 3. Distribution maps. *Stipa* ×*adamii* M. Nobis (△); *S.* ×*fallax* M. Nobis & A. Nowak (○); *S.* ×*gnezdilloi* Pazij (■); *S. gracilis* Roshev. (□); *S. kirghisorum* P. A. Smirn. var. *balkhashensis* M. Nobis & P. D. Gudkova (▼); *S. lingua* A. Junge (▲); *S. macroglossa* P. A. Smirn. subsp. *kazachstanica* (Kotukhov) M. Nobis (▽); *S. magnifica* A. Junge (●); *S. turkestanica* Hack. (◊); *S. zeravshanica* M. Nobis (♦).

Distribution. *Stipa* ×*albasiensis* is found within the range of the parental species, *S. orientalis* and *S. glareosa* (Mongolia, Kazakhstan, northern and western China; Zhao & Guo, 2011; Nobis, pers. obs.). In Middle Asia, it specifically occurs in China, Kazakhstan, Kyrgyzstan (Tian-Shan Mountains), and Tajikistan (Pamir).

Notes. This taxon was described from China (Zhao & Guo, 2011). Due to intermediate characters (ligules of vegetative shoots 0.5–1 mm, glumes 18–26 mm long, unigeniculate or indistinctly bigeniculate awns) and the fact that both *Stipa orientalis* and *S. glareosa* commonly occur together in northern China, we consider *S.* ×*albasiensis* to be a result of their hybridization. Until this study, *S.* ×*albasiensis* was known only from the type; however, during field studies and review of the herbarium materials at LE, FRU, TAD, KUZ, and KRA, we found additional specimens from Mongolia, Kazakhstan, Kyrgyzstan, and Tajikistan.

New records of Stipa ×albasiensis. KAZAKHSTAN. East Kazakhstan Distr., Markakolskii region, Karaniryuk Mtns., SE slope, 11 June 1998, *O. M. Maslova et al. s.n.* (KUZ!). MONGOLIA. Gobi, Argalant Mtns., ca. 4 km of Ubchu settlement, alt. 1700 m, 2 Aug. 1973, *N. S. Golubkova & U. Tsogt 152* (LE!). TAJIKISTAN. Pamir Mtns., stony steppes, 10 km SW of Murgab (hills near the rd.), alt. 3655 m, slope 25°, inclination SE, 24 July 2016, *M. Nobis & A. Nobis s.n.* (KRA!).

Stipa aliciae Kanitz, Növényt. Gyujtesek Eredm. Grof Szechenyi Bela Keletazsiai Utjabol 61. 1891. TYPE: [China.] Prov. Kan-su, Ku-lang-shien, 24 June 1879, *Lóczy 62* (holotype, PB not seen). = **Stipa breviflora** Griseb. (syn. after Freitag, 1985).

Stipa anomala P. A. Smirn., Del. Sem. Hort. Bot. Univ. Mosquensis 15. 1930. TYPE: Uralskii okrug, Teplovskii raion, mezhdu khutorami Faduleevym i Novenkim, v zapadine sredi kovyl'noi stepi, 16 June 1929, *N. Rubtsov s.n.* (holotype, LE!; isotype, MW!). ≡ **Stipa borysthenica** Klokov ex Prokudin var. **anomala** (P. A. Smirn.) M. Nobis.

Stipa arabica Trin. & Rupr., Sp. Gram. Stipac. 77. 1842. TYPE [original label]: 107. *Stipa barbata* Desf., Unio itiner., inter lapides ad radices montis Sinai, 15 May 1835, *Schimper s.n.* (lectotype, designated here, LE TRIN, N. 1378.1!; isolectotypes, BM!, E!, G not seen, L not seen, LE! [2 sheets], NY not seen, W!).

Notes. *Stipa arabica* was described by Trinius and Ruprecht (1842) from Sinai (Egypt). The original description stated: "Inter lapides ad radices montis Sinai; 15 Majo. (Schimper! Un. itin. n. 107.)." The syntypes of this taxon, examined by us, are preserved at LE, BM, E, and W. The first typification of this species was

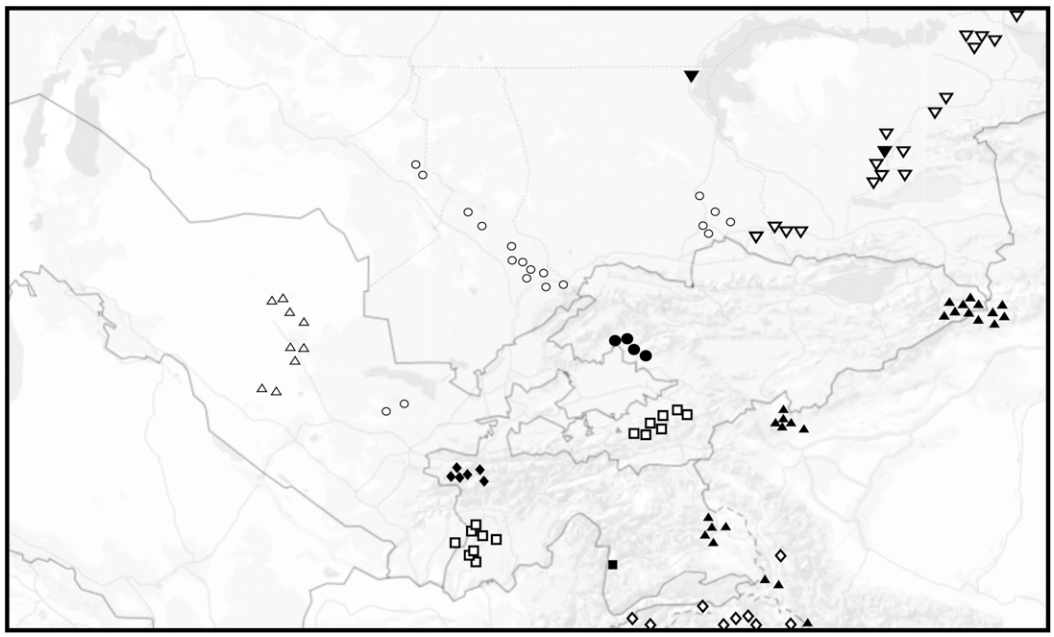

Figure 4. Distribution maps. *Stipa aktauensis* Roshev. (△); *S.* ×*czerepanovii* Kotukhov (▼); *S.* ×*heptapotamica* Golosk. (▽); *S. himalaica* Roshev. (◊); *S. karataviensis* Roshev. (○); *S. longiplumosa* Roshev. (□); *S. narynica* M. Nobis (●); *S. okmirii* Dengub. (■); *S. richteriana* Kar. & Kir. subsp. *jagnobica* (Ovcz. & Czukav.) Tzvelev (♦); and *S. tianschanica* Roshev. (▲).

provided by Tzvelev (1976: 583), who stated that the holotype and two isotypes are preserved at LE, but he did not point out which of the specimens/sheets is the holotype nor did he designate a lectotype. Consequently, we designated the specimen with label "Herbarium Trinii, N. 1378.1" as the lectotype in accordance with the *International Code of Nomenclature* (McNeill et al., 2012; Turland et al., 2018).

Within the species two varieties are recognized.

1. Leaves of vegetative shoots scabrous, rarely almost glabrous . . . . . *Stipa arabica* Trin. & Rupr. var. *arabica*
1′. Leaves of vegetative shoots pubescent . . . . . *Stipa arabica* var. *turgaica* (Roshev.) Tzvelev

Stipa arabica var. **arabica.**

Synonyms. ≡ *Stipa barbata* Desf. var. *arabica* (Trin. & Rupr.) Boiss. ex Kuntze, Acta Horti Petrop. 10: 255. 1887; ≡ *S. barbata* var. *arabica* (Trin. & Rupr.) Bornm., Bull. Herb. Boissier, sér. 2, 8: 737. 1908; = *S. caspia* K. Koch ≡ *S. arabica* subsp. *caspia* (K. Koch) Tzvelev, Novosti Sist. Vissh. Rast. 11: 16. 1974; = *S. szovitsiana* Trin.; ≡ *S. arabica* var. *szovitsiana* Trin. & Rupr., Sp. Gram. Stipac. 77. 1842; ≡ *S. arabica* var. *szovitsiana* Trin., Mem. Acad. Petersb. ser 6, 7: 2. 1843; ≡ *S. szovitsiana* (Trin. & Rupr.) Griseb., Fl. Ross. 4: 450. 1852; = *S. orientalis* Trin. var. *persica* Trin., Mém. Acad. Imp. Sci. St. Pétersbourg Hist. Acad. 1: 79. 1830 (TYPE: LE? not seen).

Habitat. *Stipa arabica* var. *arabica* is found in stony and sandy steppes, fallows, and roadsides at 400–2800 m.

Distribution. *Stipa arabica* var. *arabica* is widely distributed from Asia Minor to central Asia (Tzvelev, 1976, 2006; Freitag, 1985; Wu & Phillips, 2006; Nobis et al., 2016b). In Middle Asia, it is found in Afghanistan, China, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan.

Stipa arabica var. **turgaica** (Roshev.) Tzvelev, Zlaki SSSR 584. 1976. Basionym: *Stipa turgaica* Roshev., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 11: 21. 1949.

Synonyms. = *Stipa damascena* Boiss.; = *S. koenigii* Woronow; ≡ *S. arabica* Trin. & Rupr. subsp. *koenigii* (Woronow) Tzvelev, Bot. Zhurn. (Moscow & Leningrad) 78(10): 93. 1993.

Habitat and distribution. The range and habitats for *Stipa arabica* var. *turgaica* are similar to those of *S. arabica* var. *arabica*.

Notes. *Stipa arabica* s.l. is highly variable in morphology, and a taxonomic revision of its specimens from the entire distribution range is needed.

Stipa ×**assyriaca** Hand.-Mazz., Ann. Nat. Hofmus. Wien 28: 26. 1914, pro sp. (*S. arabica* Trin. & Rupr. × *S. hohenackeriana* Trin. & Rupr.). TYPE: [Iraq.] Gipssteppe auf dem Rücken des Kalaat Schergat

(Assur) am Tigris, 200–300 m, 10 May 1910, *Handel-Mazzetii 1062* (holotype, WU 0072644!).

Synonyms. ≡ *Stipa hohenackeriana* Trin. & Rupr. var. *assyriaca* (Hand.-Mazz.) H. Scholz, Fl. Turkey 9: 548. 1985; ≡ *S. hohenackeriana* subsp. *assyriaca* (Hand.-Mazz.) F. M. Vázquez, Telopea 13: 168. 2011; = *S. stapfii* Roshev.; = *S. iraqensis* Martinovský; = *S.* ×*kolakovskyi* Tzvelev.

Habitat. *Stipa* ×*assyriaca* is found in sandy steppe, rocky grasslands, and roadsides at 400–1500 m.

Distribution. *Stipa* ×*assyriaca* is found within the range of both parental species, *S. arabica* and *S. hohenackeriana*. In Middle Asia, it occurs in Afghanistan, northern Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

Stipa atriseta Stapf ex Bor, Fl. Iranica [Rechinger], 70: 389. 1970. TYPE: [Iran, Fars Prov.] In summo monte Kuh Bul, 4600 m, 6 Sep. 1885, *Stapf 1536* (holotype, W!). = **Stipa hohenackeriana** Trin. & Rupr. var. **hohenackeriana**.

Stipa avenoides Honda, Rep. Exped. Manchoukuo Sect. IV, Pt. 4, Index Fl. Jeholensis 103. 1936. TYPE: not seen. = **Achnatherum sibiricum** (L.) Keng ex Tzvelev, Probl., Ekol. Geobot., Bot. Geogr. Florist. 140. 1977 (syn. after Wu & Phillips, 2006).

Stipa azutavica Kotukhov,Turczaninowia 1(2): 9. 1998. TYPE: Altaj australis, praemontia australi-orientalia jugi Azutau, mons Bulgartabaty, desertum lapidosum, 22 May 1991, *Ju. Kotuchov s.n.* (lectotype, designated by Nobis & Gudkova [2016: 36], LE!; isolectotypes, KRA 436050!, KUZ!, LE!). ≡ **Stipa orientalis** Trin. var. **azutavica** (Kotukhov) M. Nobis & P. D. Gudkova.

Stipa badachschanica Roshev., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 11: 19. 1949. TYPE: [USSR, Pamir] Schugnan, dolina Darshaz ot mosta Pul-i-furs do ust'ya, 9 June 1914, *N. Tuturin & P. Bessedin 183* (lectotype, designated by Tzvelev [1976: 584], LE!; isolectotypes, LE!).

Within the species two varieties are recognized.

1. Lemma covered with scattered hairs . . . . . *Stipa badachschanica* Roshev. var. *badachschanica*
1′. Lemma glabrous, rarely with single hairs in the lower part . . . . . *Stipa badachschanica* var. *pamirica* (Roshev.) M. Nobis

Stipa badachschanica var. **badachschanica.**

Habitat. *Stipa badachschanica* var. *badachschanica* is found in sandy, rocky, and steppe grasslands at 1800–4000 m.

Distribution. *Stipa badachschanica* var. *badachschanica* is found in southwestern Asia (Ovchinnikov & Chukavina, 1957; Tzvelev, 1976; Ikonnikov, 1979; Freitag, 1985). In Middle Asia, it occurs in Afghanistan, northern Iran, and Tajikistan (Pamir).

Notes. *Stipa badachschanica* var. *badachschanica* is morphologically similar to *S. arabica* var. *turgaica*, but can be distinguished by having a glabrous (versus pilose) callus.

Stipa badachschanica var. **pamirica** (Roshev.) M. Nobis, comb. & stat. nov. Basionym: *Stipa pamirica* Roshev., Bot. Mater. Ger. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 11: 20. 1949. TYPE: [USSR, Tajikistan.] Vakhan-Inkashimskii raion, kovyl'no-solyankovo-polynnaya polupustynya po vost. shchebnistym sklonam v raione kishlaka Vrang, 3120 m, 9 Aug. 1935, *P. Ovchinnikov & K. Afanasev 1735* (lectotype, designated by Tzvelev [1976: 584], LE!).

Synonyms. ≡ *Stipa badachschanica* Roshev. subsp. *pamirica* (Roshev.) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 16. 1974; ≡ *S. arabica* Trin. & Rupr. subsp. *pamirica* (Roshev.) F. M. Vázquez, Telopea 13(1–2): 168. 2011; ≡ *S. arabica* var. *pamirica* (Roshev.) Freitag, Notes Roy. Bot. Gard. Edinburgh 42(3): 461. 1985.

Habitat. *Stipa badachschanica* var. *pamirica* is found in rocky and steppe grasslands and screes at 2500–4500 m.

Distribution. *Stipa badachschanica* var. *pamirica* is found in Middle Asia (Ovchinnikov & Chukavina, 1957; Tzvelev, 1976; Ikonnikov, 1979; Freitag, 1985), specifically in Afghanistan and Tajikistan (Pamir).

Notes. *Stipa badachschanica* var. *pamirica* differs from *S. badachschanica* var. *badachschanica* only in the character of the lemma, which is glabrous or almost so versus covered with scattered hairs, respectively. Plants belonging to *S. badachschanica* var. *pamirica* were collected from the same area as those belonging to variety *badachschanica*. A similar phenomenon has been seen in other species that normally have pubescent lemmas, e.g., *S. subsessiliflora* or *S. klemenzii* Roshev. (M. Nobis, pers. obs.).

Stipa baktashevae Tzvelev, Novosti Sist. Vyssh. Rast. 45: 7. 2014. TYPE: Republic of Kalmykia. Tselinnyi Distr., outskirts of the Solnechnyi settlement, sandy slope among psammophytes, 21 May 2011, *E. Egorova & N. Baktasheva s.n.* (holotype,

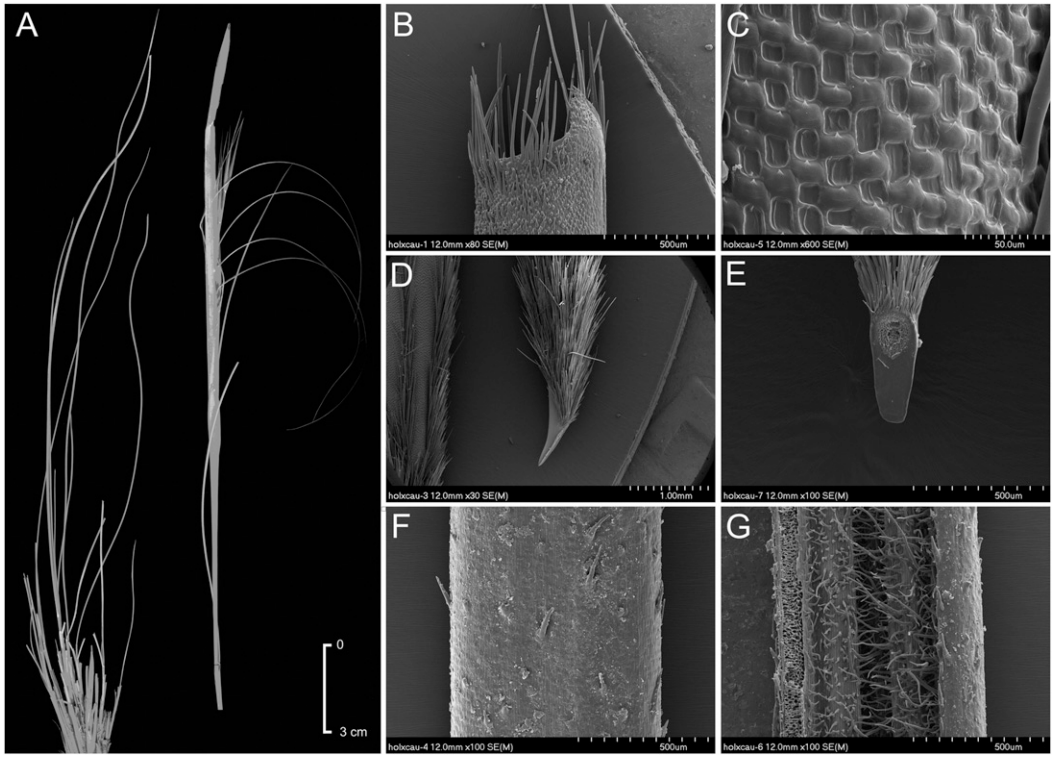

Figure 5. *Stipa* ×*balkanabatica* M. Nobis & P. D. Gudkova. —A. Vegetative shoots and panicle. —B. Top of the lemma. —C. Lemma epidermal pattern. —D. Callus. —E. Ring (foot) of the callus. —F. Abaxial surface of leaves. —G. Adaxial surface of leaves.

LE 01009340!). = **Stipa borysthenica** Klokov ex Prokudin var. **borysthenica**.

Stipa ×balkanabatica M. Nobis & P. D. Gudkova, nothosp. nov. (*S. caucasica* Schmalh. × *S. sareptana* A. K. Becker). TYPE: Turkmenskaya SSSR [Turkmenistan]. khr. Bol'shoi Balkhan, tropa ot rodn, Arlan k rodn, Kabak-Bulak, pologii sklon melkozem., v bol'shom kolichestve [Great Balkhan Mtns., rte. from Arlan to Kabak-Bulak, on slope, abundant] 1600 m, 25 June 1958, *Praskuryanova s.n.* (holotype, MW!; isotype, KRA476853!). Figure 5.

Diagnosis. *Stipa* ×*balkanabatica* M. Nobis & P. D. Gudkova is similar to *S.* ×*consanguinea* Trin. & Rupr., a hybrid between *S. glareosa* P. A. Smirn. and *S. krylovii* Roshev., in its unigeniculate awns that are minutely pubescent throughout, but it differs in having more robust, longer (11–15 cm vs. 7–11 cm) awns and glumes (32–40 vs. 24–30 mm) as well as vegetative leaves that are distinctly scabrous due to densely distributed spinules and prickles versus vegetative leaves glabrous or slightly scabrous due to scattered spinules.

Plants perennial, densely tufted, with a few culms and numerous vegetative shoots; culms 40–60 cm tall, 3-noded, glabrous at nodes and very densely and shortly pubescent below them. Leaves of vegetative shoots: sheaths glabrous, ciliate at margins and with white edge; ligules rounded or truncate, up to 0.2 mm and ciliate at margins; blades convolute, up to 20 cm, 0.5–0.7 mm in diam., upper surface densely pubescent with hairs 0.15–0.2 mm, and on marginal ribs with mixture of longer hairs 0.2–0.3 mm, lower surface scabrous due to short prickles and bristles. Cauline leaves: sheaths glabrous and with white edge, shorter than internodes, upper sheath up to 20 cm, glabrous, slightly inflated; ligules 2–3.3 mm, obtuse or acute; blades scabrous, up to 10 cm. Panicle 17–24 cm contracted, at base enclosed by sheath of uppermost leaf, branches erect, setulose, single or paired. Glumes subequal, 32–40 mm, narrowly lanceolate, tapering into long hyaline apex, midvein sometimes setulose with cilia up to 1 mm. Anthecium 10–12 × 0.7–0.8 mm. Callus 1.9–2.2 mm, densely long-pilose on ventral and dorsal surfaces, callus base not enlarged, peripheral ring 0.2 mm in diam., acute, cuneate, scar elliptic to circular. Lemma pale green, on dorsal surface with abundant hooks and with 7 lines of ascending hairs, hairs up to 0.5–0.6 mm, ventral and dorsal line of hairs terminating at 1–2 mm below top of lemma; top of lemma scabrous due to prickles and short hairs, surpassed by a ring of unequal

hairs 0.3–1 mm long at apex. Palea equal to lemma in length. Awn 130–160 mm, unigeniculate or slightly bigeniculate; column 32–46 mm, twisted, 0.4–0.5 mm wide at base, covered with hairs 0.2–0.5 mm, gradually increasing in length toward geniculation; seta arcuate or flexuous, 100–120 mm, hairs in lower part of seta 0.4–0.8(–0.9) mm, gradually decreasing in length toward apex. Anthers yellow, ca. 7 mm, glabrous.

Phenology. *Stipa ×balkanabatica* flowers from May to June.

Habitat. *Stipa ×balkanabatica* is found in mountain steppes, slopes, and screes at 1500–1700 m.

Distribution. *Stipa ×balkanabatica* is found in Turkmenistan (northwestern Kopet-Dagh).

Etymology. The name of the species originates from Balkanabat, a city located in the vicinity of the Great Balkhan Mountains.

Stipa basiplumosa Munro ex Hook. f., Fl. Brit. India [J. D. Hooker] 7(22): 229. 1896. TYPE: Western Tibet (India, Kashmir, Ladakh), ascent to Lank pass, 13 Sep. 1847, *Thomson s.n.* (syntype, K); ravine below Lank pass, 5000 m, 14 Sep. 1847, *Thomson s.n.* (syntypes, E!, K!).

Synonyms. ≡ *Stipa subsessiliflora* (Rupr.) Roshev. subsp. *basiplumosa* (Munro ex Hook. f.) D. F. Cui, Fl. Xinjiangensis 6: 309. 1996; ≡ *S. subsessiliflora* var. *basiplumosa* (Munro ex Hook. f.) P. C. Kuo & Y. H. Sun, Fl. Reipubl. Popularis Sin. 9(3): 284. 1987.

Habitat. *Stipa basiplumosa* is found in high mountain deserts and semideserts, steppes, and stony slopes at 3000–4600 m.

Distribution. *Stipa basiplumosa* is found in the mountains of central Asia (Tzvelev, 1968; Kuo & Sun, 1987; Nobis et al., 2015b, 2016b). In Middle Asia, it occurs in southwestern China and Pakistan.

Notes. In the Himalayas, Kunlun, and Karakorum, the taxon can be confused with *Stipa subsessiliflora*, but the two species clearly differ in length and shape of glumes as well as in awn length (see key).

Stipa bella Drobow, Repert. Spec. Nov. Regni Veg. 21: 37. 1925, hom. illeg. non Phil., Anales de la Universidad de Chile 26: 203. 1870. ≡ **Stipa drobovii** (Tzvelev) Czerep. var. **drobovii**.

Stipa bhutanica Noltie, Edinburgh J. Bot. 56(2): 289. 1999. TYPE: Bhutan. Ha Distr., W side of Chelai La, 27°22′N, 89°20′E, 3600 m, 29 Sep. 1998, *Noltie, Pradham, Sherub & Wangdi 349* (holotype, E!; isotype, THIM not seen). ≡ **Ptilagrostis bhutanica** (Noltie) M. Nobis, PhytoKeys 128: 109. 2019.

Stipa boczantzevii Tzvelev, Novosti Sist. Vyssh. Rast. 43: 24. 2011 [2012]. TYPE: Asia Media, jugum Alaicum, secus fl. Aksu inter pag. Jordan et trajectum Shivali, in calcareis, 17 Aug. 1962, *V. P. Boczantzev 208* (holotype, LE!). = **Stipa caucasica** Schmalh. var. **caucasica**.

Stipa borysthenica Klokov ex Prokudin, Fl. Kryma [Wulff] 1(4): 25. 1951. TYPE: Ukraine. Lugov forest country house, Tyasmin, Aleks, u., 18 May 1911, *I. Paczoski s.n.* (lectotype, designated by Tzvelev [1976: 591], LE!).

Within the species two varieties are recognized.

1. Awn glabrous on column and plumose on seta . . . *Stipa borysthenica* Klokov ex Prokudin var. *borysthenica*
1′. Awn pilose throughout . . . . . *Stipa borysthenica* var. *anomala* (P. A. Smirn.) M. Nobis

Stipa borysthenica var. **borysthenica.**

Synonyms. ≡ *Stipa pennata* L. fo. *sabulosa* Pacz., Kherson. Fl. 1: 112. 1914; ≡ *S. sabulosa* (Pacz.) Sljuss.; ≡ *S. pennata* subsp. *sabulosa* (Pacz.) Tzvelev, Novosti Sist. Vyssh. Rast. 10: 80. 1973; ≡ *S. joannis* Čelak. subsp. *sabulosa* (Pacz.) Lavrenko, Flora SSSR 2: 123. 1940; = *S. baktashevae* Tzvelev; = *S. joannis* var. *marchica* Endtm., Wiss. Z. Ernst-Moritz-Arndt-Univ. Greifswald, Math.-Naturwiss. Reihe 11: 148. 1976. TYPE: Germany. Naturschutzgebiet "Geesower Hügel" zwischen Gartz/Oder und Geeson/Kr. Angermünde, 18 June 1960, *Endtmann* (holotype, GFW; isotype, JE!); ≡ *S. borysthenica* Klokov ex Prokudin var. *marchica* (Endtm.) Rauschert, Mitt. Arbeitsgen. Florist. Kart. Bayerns 4: 11. 1978.

Habitat. *Stipa borysthenica* var. *borysthenica* is found in sandy grasslands at 0–900 m.

Distribution. *Stipa borysthenica* var. *borysthenica* is widely distributed from central Europe to central Asia (Pazij, 1968; Tzvelev, 1968, 1976, 2006; Martinovský, 1980; Freitag, 1985; Gonzalo et al., 2013; Nobis et al., 2016b). In Middle Asia, it is found in northwestern China and Kazakhstan.

Stipa borysthenica var. **anomala** (P. A. Smirn.) M. Nobis, comb. & stat. nov. Basionym: *Stipa anomala* P. A. Smirn., Del. Sem. Horti. Univ. Mosquensis 15. 1930.

Synonyms. ≡ *Stipa anomala* P. A. Smirn. ex Roshev., Fl. URSS 2: 740. 1934; ≡ *Stipa pennata* L. var. *anomala* (P. A. Smirn) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 18. 1974; ≡ *Stipa pennata* subsp. *anomala*

(P. A. Smirn.) F. M. Vázquez & M. Gut., Telopea 13(1–2): 159. 2011.

Habitat. *Stipa borysthenica* var. *anomala* is found in sandy grasslands at 0–900 m.

Distribution. *Stipa borysthenica* var. *anomala* is found within the range of the nominal variety (Roshevitz, 1934; Tzvelev, 1976). In Middle Asia, it occurs in Kazakhstan.

Notes. Although this taxon belongs to *Stipa* sect. *Stipa*, which comprises plants having awns with glabrous columns, sometimes within populations of this species a few individuals with shortly pubescent columns can be recorded. According to Tzvelev (1976) and Scholz (1985), such individuals with pubescent awn columns could be the result of spontaneous mutation. Nevertheless, such individuals have been observed in subsequent years or confirmed at particular localities several years after their first finding (e.g., *S. zalesskii* var. *iljinii*; *S. pulcherrima* var. *paradoxa* A. Junge ex Roshev.) [synonyms: *Stipa grafiana* Steven var. *paradoxa* A. Junge, Izv. Imp. S.-Peterburgsk. Bot. Sada 10: 1, 1910; *S. paradoxa* (A. Junge) P. A. Smirn., Tabl. dla opred. kovyl. 7. 1927, nom. illeg. hom. non *S. paradoxa* (L.) Raspail, Ann. Sci. Nat. (Paris) 5: 449. 1825; *S. syreistschikowii* P. A. Smirn., Del. Sem. Hort. Bot. Univ. Mosquensis 1948: 36. 1948; *S. schisensis* Roshev. ex Grossh., Fl. Kavkaza 1: 65. 1928]. Here we treat such specimens in the rank of variety, with the most similar species having glabrous lower parts of the awn (column).

It is worth mentioning that while examining herbarium materials from Armenia, we found another specimen from section *Stipa* with entirely pilose awns. Having lemmas with seven lines of ascending hairs 0.8–1.2 mm long, of which one ventral lemma terminates 0.5–1.5(–2) mm below the top of the lemma, whereas the dorsal terminates at 4/5–3/4 of the lemma length, about (1.5–)2–5(–6) mm below the top and being twice as long as the subdorsal lines, these specimens are most similar to *S. araxensis*; however, their entirely pilose awns are also similar to those of *S. pulcherrima* var. *paradoxa*. We consider that these specimens may be the result of spontaneous mutation. They represent a new variety of *S. araxsensis*, which is described below:

Stipa araxensis Grossh. var. *mikojanovica* M. Nobis, var. nov. TYPE: *Stipa araxensis* Gross. × *S. mayeriana* Trin & Rupr. [det. N. Tzvelev], Armenian SSR, Mikoyanovski Distr., rocky slope (almost scree), western exposition of not high mtn. betw. Agi-Sofi Mtns. & Arpi-Gai River, 2.5–3 km to the SSW from the Mikoyan city [now Ehegnadzor], 7 July 1957, *N. N. Tzvelev & S. K. Cherepanov 745* (holotype, LE!).

Diagnosis. *Stipa araxensis* Grossh. var. *mikojanovica* M. Nobis differs from *S. araxensis* var. *araxensis* in having the awn column shortly pubescent (covered with 0.3–1 mm long hairs) versus awn column glabrous and smooth, respectively. Due to having entirely pilose awns it resembles *S. pulcherrima* K. Koch var. *paradoxa* A. Junge ex Roshev.; however, it differs in general pattern of lemma pilosity. In *S. araxensis* var. *mikojanovica* ventral lines terminate 0.5–1.5(–2) mm below the top of the lemma and the dorsal line terminates in 4/5–3/4 of the lemma length, whereas in *S. pulcherrima* var. *paradoxa* the dorsal line of hairs is fused with subdorsals with the ventral lines reaching the top of the anthecium.

Stipa brandisii Mez, Repert. Spec. Nov. Regni Veg. 17: 207. 1921. TYPE: [India] N. W. Himalaya, Kulla, Oct. 1876, *Dr. Brandis 1005* (lectotype, selected and labeled by H. Freitag on 15 Mar. 1984 and designated by Nobis et al. 2019b: 110, K 32092!) = **Achnatherum brandisii** (Mez) Z. L. Wu, Acta Phytotax. Sin. 34: 154. 1996.

Stipa brauneri (Pacz.) Klokov, Novosti Sist. Vyssh. Nizsh. Rast. 1975: 21. 1976. Basionym: *Stipa lessingiana* Trin. & Rupr. subsp. *brauneri* Pacz., Zap. Krymsk. Obsch. Estesvoisp. 5: 4. 1916. TYPE: Tauria, penins, Tarchankut, prope Ak-Meczet, 30 Apr. 1914, *A. Brauner s.n.* (holotype, LE!). ≡ **Stipa lessingiana** Trin. & Rupr. var. **brauneri** (Pacz.) Roshev.

Stipa ×brevicallosa M. Nobis, Pl. Syst. Evol. 299(7): 1340. 2013 (*S. lipskyi* Roshev. × *S. drobovii* (Tzvelev) Czerep.; Nobis, 2013). TYPE: Dolina Fan (Fan River valley), Góry Zerawszańskie (Pamiro-Ałaj), "Rejon Zerawszański C," Dolina rzeki Fan, prawy stok gór Gushty, ok. 500 m na E od centrum przysiółka Zerawszan, wysokogórski step ostnicowy [Zeravshan Mtns., Fan River Valley, right slope of Gushty Mtns., ca. 500 m E of Zeravshan settlement center, high mtns. feather grass steppe], 39°13′14″N / 68°32′51″E, alt. 2150 m, exp. W, slope 25°, loc. 1, 21 June 2009, *M. Nobis & A. Nowak s.n.* (holotype, Herb. Stip. M. Nobis!, KRA 383192!; isotypes, KRA 423399!, KRA 383490!, KRA 383084!).

Within the species two varieties are recognized.

1. Leaves of vegetative shoots glabrous . . . . . *Stipa ×brevicallosa* M. Nobis var. *brevicallosa*
1′. Leaves of vegetative shoots densely pubescent . . . *Stipa ×brevicallosa* var. *hissarensis* M. Nobis & A. Nowak

Stipa ×brevicallosa var. **brevicallosa.**

Habitat. *Stipa ×brevicallosa* var. *brevicallosa* is found in mountain steppes at 1300–2350 m.

Distribution. *Stipa ×brevicallosa* var. *brevicallosa* is found in Middle Asia (Nobis, 2013), specifically in Tajikistan (Hissar and Zeravshan Mountains).

Stipa ×brevicallosa var. **hissarensis** M. Nobis & A. Nowak, Acta Mus. Siles. Sci. Nat. 65: 278. 2016.

TYPE: Tajikistan. Hissar Mtns. (Pamir Alai), "Zeravshan B region," steppe grassland on the right slope of Gabierud River valley, near Pormin settlement near Zeravshan village, ca. 2 km S of Jagnob River, alt. 1896 m, 39°10′12.46″N / 68°34′42.86″E, 25 May 2015, *M. Nobis & A. Nowak s.n.* (holotype, KRA 464720!; isotypes, KRA 464721!, KRA 464722!, KRA 464723!, KRA 464708!).

Habitat. *Stipa* ×*brevicallosa* var. *hissarensis* is found in mountain steppes at 1850–2350 m.

Distribution. *Stipa* ×*brevicallosa* var. *hissarensis* is found in Middle Asia (Nobis & Nowak, 2016), specifically in Tajikistan (Hissar Mountains).

Stipa breviflora Griseb., Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 82. 1868. TYPE: Tibet. Gnari Khorsum Prov.: Peti via Lomórti to Poling, 5–15 Sep. 1855, *Schlagintweit 7105* (holotype, GOET!; isotype, LE!).

Synonyms. = *Stipa aliciae* Kanitz.

Habitat. *Stipa breviflora* is found in sandy steppes, grasslands, and screes at 1000–4000 m.

Distribution. *Stipa breviflora* is a widely distributed central Asian species (Tzvelev, 1968, 1976; Pazij, 1968; Freitag, 1985; Dickoré, 1995; Lu & Wu, 1996; Wu & Phillips, 2006). In Middle Asia, it is found in China, Kyrgyzstan, and Pakistan.

Stipa bromoides (L.) Dörfl., Herb. Norm. Sched. Cent. [Dörfler] 34: 129, no. 3386. 1897. Basionym: *Agrostis bromoides* L., Mant. Pl. 30. 1767. TYPE: Montpellier, *Gouan 3* (lectotype, designated by Freitag [1985: 401], LINN 94.6!). ≡ **Achnatherum bromoides** (L.) P. Beauv., Ess. Agrostogr. 20: [146], 147. 1812 [≡ *Aristella bromoides* (L.) Bertol., Fl. Ital. [Bertoloni] 1: 690. 1833].

Stipa ×brozhiana M. Nobis, Nordic J. Bot. 29(4): 459. 2011 (*S. lipskyi* Roshev. × *S. arabica* Trin. & Rupr.; Nobis, 2011). TYPE: Góry Zerawszańskie (Pamiro-Alaj), "Rejon Zerawszański B" Zeravszan Mtns., "Zeravshanski range B" Vashan River Valley (near Urmetan), murawa stepowa w części podszczytowej lewego zbocza doliny rzeki Vashan (w pobliżu ujścia do rzeki Zerawszan), przy N części wsi Vashan koło Urmetan (pomiędzy rzeką Vashan a przełęczą Chukalik) [Tajikistan, Zeravshan Mtns. (Pamir Alai Mtns.), steppe grassland near the top of the left slope of the Vashan River valley, N of Vashan settlement near Urmetan village (betw. the Vashan River & Chukalik pass)], N 39°24′47″/ E 68°16′23″, 1680 m, exp. NE, slope 30°, 21 June 2010, *M. Nobis* (holotype, KRA 378169!; isotypes, Herb. Stip. M. Nobis!, KRA 378170!, KRA 378171!, KRAM!).

Habitat. *Stipa* ×*brozhiana* is found in steppe grasslands at 1600–1800 m.

Distribution. *Stipa* ×*brozhiana* is found in Middle Asia (Nobis, 2011, 2013), specifically in Tajikistan (Zeravshan Mountains).

Stipa bungeana Trin. ex Bunge, Enum. Pl. China Bor. [A. A. von Bunge] 70. 1833. TYPE: Ad radices montium Zui-wey-schan et ad vias prope Ssi-jui-ssi (lectotype, designated here, LE Herbarium Trinii 1383.1!; isolectotype, LE Herbarium Trinii 1382.2!; syntypes, LE! [3 sheets]).

Habitat. *Stipa bungeana* is found in sandy steppes, grasslands, and semideserts at 500–4000 m.

Distribution. *Stipa bungeana* is a widely distributed central Asian species (Pazij, 1968; Tzvelev, 1968, 1976; Lu & Wu, 1996; Wu & Phillips, 2006). In Middle Asia it is found in central Afghanistan, China, Kyrgyzstan (around Issyk-Kul Lake), and Pakistan.

Notes. In LE there are five sheets with specimens of *Stipa bungeana* originating from the collection of Bunge. However, only on two of them (preserved in the Trinius collection) is the label "*Ad radices montium Zui-wey-schan et ad vias prope Ssi-jui-ssi*" as stated in the protologue (Bunge, 1833). The first typification of this species was provided by Tzvelev (1976: 578), who stated that the holotype and three isotypes are preserved at LE, but he did not point out which of the specimens/sheets is the holotype nor did he designate a lectotype. Consequently, we designated the specimen with label "Herbarium Trinii, N. 1383.1" as the lectotype in accordance with the *International Code of Nomenclature* (McNeill et al., 2012; Turland et al., 2018).

Stipa canescens P. A. Smirn. ex Roshev., Fl. URSS 2: 741. 1934. TYPE: Armenia. Distr. Nor-Bajazet: in viciniis pag. Elenovka, 2 July 1929, *O. Zedelmejer & T. Gejdeman s.n.* (holotype, LE!). = **Stipa zalesskii** Wilensky subsp. **zalesskii**.

Stipa capensis Thunb., Prodr. Pl. Cap. 1: 19. 1794. TYPE: Promontorium Bonae Spei Africae, *Thunberg 2560* (holotype, UPS not seen). ≡ **Stipellula capensis** (Thunb.) Röser & Hamasha, Schlechtendalia 24: 92. 2012 [≡ *Stipella capensis* (Thunb.) Röser & Hamasha, Pl. Syst. Evol. 298: 365. 2012, hom. illeg. ≡ *Stipella capensis* (Thunb.) Tzvelev, Novosti Sist. Vyssh. Rast. 43: 23. 2011 [2012], hom. illeg.].

Stipa capillata L., Sp. Pl., ed. 2, 1: 116. 1762. TYPE: Bohemia, Busser I: 127(1) (lectotype, designated by Freitag [1985: 453], UPS not seen).

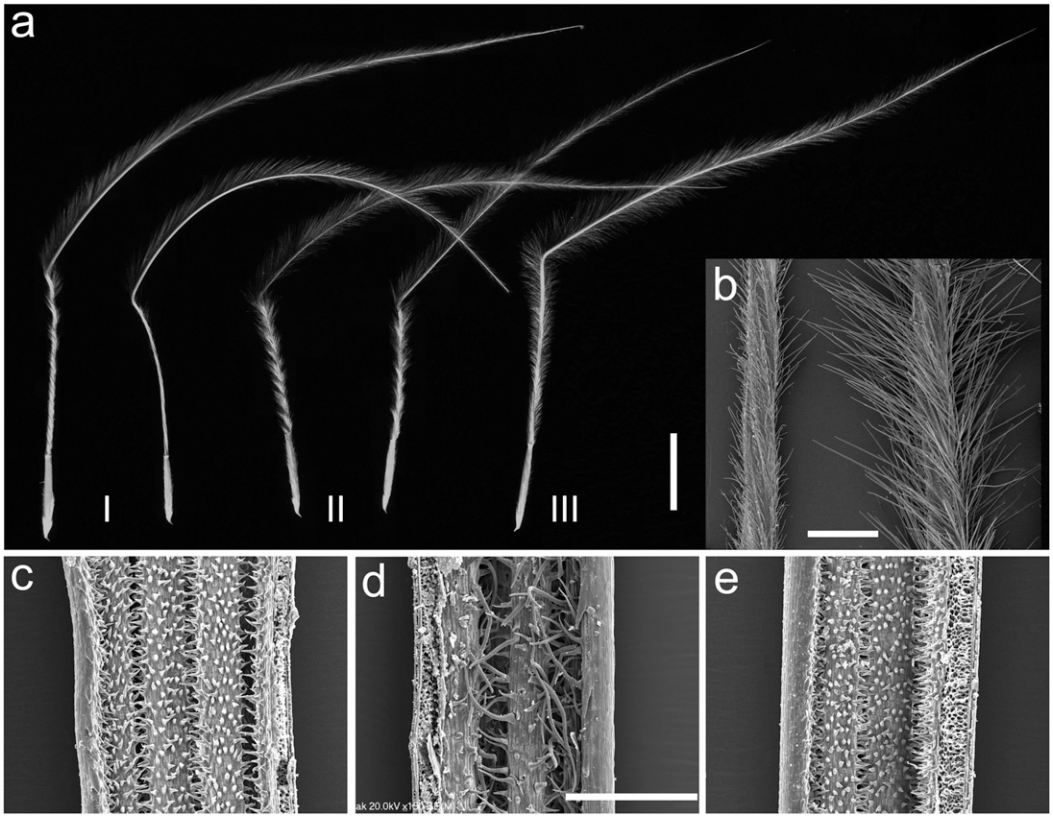

Figure 6. A comparison of selected morphological characters in *Stipa caucasica* Schmalh. agg. —A. Awns with anthecia. I, *S. caucasica* subsp. *nikolai* M. Nobis, A. Nobis & A. Nowak; II, *S. caucasica* var. *fanica* M. Nobis, P. D. Gudkova & A. Nowak; III, *S. caucasica* var. *caucasica*. —B. Awn column: *S. caucasica* subsp. *nikolai* (left) and *S. caucasica* var. *caucasica*. —C–E. Adaxial surface of the vegetetive leaves in *S. caucasica* subsp. *nikolai*, *S. caucasica* var. *fanica*, and *S. caucasica* var. *caucasica*, respectively. Scale bars: A = 1 cm, B = 0.1 mm, C–E = 0.3 mm.

Synonyms. = *Stipa ukranensis* Lam.

Habitat. *Stipa capillata* is found in sandy steppes and grasslands at 500–2500 m.

Distribution. *Stipa capillata* is widely distributed from western Europe to central-eastern Asia (Pazij, 1968; Tzvelev, 1968, 1976; Martinovský, 1980; Freitag, 1985; Wu & Phillips, 2006). In Middle Asia it is found in Afghanistan, China, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan.

Notes. Kotukhov (1987) described *Stipa austroaltaica* Kotukhov from the southern Altai Mountains, which is morphologically very similar to *S. capillata*. He distinguished it from *S. capillata* by its shorter anthecia (7.5–8.2 vs. 10–13 mm long), shorter awns (8.1–9.6 vs. 11–20 cm long), and sheaths of culm leaves that are shorter (vs. longer) than the internodes. After reviewing all specimens of *S. austroaltaica* from the type collections at LE, we found the variability in the length of these characters to be greater than that described in the protologue. For example, anthecia are 7.8–11 mm long and awns are 8.5–10.3 cm long (Nobis & Gudkova, 2016). In *S. capillata*, sheaths are generally longer than or equal to the internodes; however, during our review of specimens, we also saw sheaths that were somewhat shorter than internodes. It is likely that *S. austroaltaica* is conspecific with *S. capillata* and represents only marginal variability of the latter taxon. Taxonomic revision of this group of species is required.

Stipa caragana Trin., Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 1: 74. 1830. TYPE: Littora orientalia maris Caspium ad prom. Tjuk-Caragan, *Eichwald s.n.* (lectotype, designated by Tzvelev [1976: 564], LE!). ≡ **Achnatherum caragana** (Trin.) Nevski, Trudy Bot. Inst. Akad. Nauk S.S.S.R., Ser. 1, Fl. i Sist. Vyssh. Rast. 4: 336–337. 1937.

Stipa caspia K. Koch, Linnaea 21(4): 440. 1848. TYPE: Am Ufer des Caspischen Meeres, zwischen Baku und Derbend, auf Meersand, *K. Koch s.n.* (lectotype, designated here, GOET!; holotype, preserved at B

was destroyed during World War II). = **Stipa arabica** Trin. & Rupr. var. **arabica**.

Stipa caucasica Schmalh., Ber. Deutsch. Bot. Ges. 10: 293. 1892. TYPE: Dagestan, Temir-Khan-Shura, 6 May 1891, *V. Lipskii s.n.* (lectotype, designated by Tzvelev [1976: 593], LE!; isolectotypes, LE!; ERE 418! electr. image).

Stipa caucasica subsp. **caucasica.**

Within the taxon, two varieties are recognized.

1. Abaxial surface of leaves densely covered with ca. 0.1 mm long prickles, callus at the dorsal surface densely and long pilose, with hairs 1–1.5 mm long . . . . . *Stipa caucasica* Schmalh. var. *caucasica*

1′. Abaxial surface of leaves densely covered with 0.25–0.5 mm long hairs, callus at the dorsal surface sparsely pilose, with short (0.4–0.8 mm long) hairs . . . . . *Stipa caucasica* var. *fanica* M. Nobis, P. D. Gudkova & A. Nowak

Stipa caucasica var. **caucasica** (Fig. 6).

Synonyms. = *Stipa orientalis* Trin. var. *grandiflora* Rupr., Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 7, 14(4): 35. 1869. TYPE: Kyrgyzstan. In regione sylvatica jugi Tian-Shan, 20 July 1867, *Osten-Sacken s.n.* (lectotype, designated by Gonzalo et al. [2011: 401], LE!); = *S. caucasica* fo. *autumnalis* Roshev., Fl. Aziat. Ross. 12: 142. 1916. TYPE: Kazakhstan. Prov. Semirichinsk, Distr. Djarkinsk, Kapkak River, 13 July 1912, *Saposhnikow & Schischkin s.n.* (lectotype, designated by Gonzalo et al. [2011: 401], LE!); = *S. caucasica* fo. *crassifolia* Roshev., Fl. Aziat. Ross. 12: 142. 1916. TYPE: Kazakhstan. Prov. Semirechinsk, Distr. Djarkinsk, Ketmen village, 5 July 1912, *Saposhnikow & Schischkin s.n.* (lectotype, designated by Gonzalo et al. [2011: 401], LE!); = *S. caucasica* fo. *brevifolia* Roshev., Fl. Aziat. Ross. 12: 142. 1916. TYPE: Uzbekistan. Prov. Fergana, Distr. Margelan. Kitchik-Alay River valley, at 1–2 km of Kindik mouth, 13 May 1914, *Desiatoff 2186* (lectotype, designated by Gonzalo et al. [2011: 401], LE!); = *S. caucasica* fo. *robusta* Roshev., Fl. Aziat. Ross. 12: 143. 1916. TYPE: Kazakhstan. Prov. Syr-Darya, Distr. Auliye-Ata, around Aleksandrovskaia village, 16 May 1909, *Minkwitz 142* (lectotype, designated by Gonzalo et al. [2011: 401], LE!); *S. caucasica* var. *typica* Drobow, Repert. Spec. Nov. Regni Veg. 21: 37. 1925. nom. inval.; = *S. caucasica* var. *major* Drobow, Repert. Spec. Nov. Regni Veg. 21: 37. 1925. TYPE: not seen; = *S. boczantzevii* Tzvelev.

Habitat. *Stipa caucasica* var. *caucasica* is found in steppes and rocky grasslands at 350–3000 m.

Distribution. *Stipa caucasica* var. *caucasica* is widely distributed from Egypt through the Caucasus up to central Asia (Pazij, 1968; Tzvelev, 1968, 1976; Freitag, 1985; Wu & Phillips, 2006; Nobis, 2011; Gonzalo et al., 2012, Nobis et al., 2019d). In Middle Asia, it is found in Afghanistan, China, Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

Stipa caucasica var. **fanica** M. Nobis, P. D. Gudkova & A. Nowak, var. nov. TYPE: Kazakhstan. Steppe grassland on hills & slopes, 6 km E of Targap settlement, (80 km W of Almaty), 43°19′22″N / 75°55′55″E, alt. 775 m, exp. S, slope 5°, wp. 227, 18 May 2014, *M. Nobis & P. Gudkova s.n.* (holotype, KRA 486509!; isotypes, KRA 456384!, KRA 486503! KRA 486504!, KRA 486505!, KRA 486506!, KRA 486507!, KRA 486508!). Figure 6.

Diagnosis. *Stipa caucasica* Schmalh. var. *fanica* M. Nobis, P. D. Gudkova & A. Nowak is similar to *S. caucasica* var. *caucasica* in having a pilose lower segment of the awn (column) with hairs 0.9–2(–2.5) mm long, but differs in having the abaxial surface of vegetative leaves densely covered with 0.25–0.5 mm long hairs versus covered with ca. 0.1 mm long prickles as well as in having the callus entirely pilose with 0.4–0.8 mm long hairs at the dorsal surface (ca. 2 times shorter than those on the ventral surface) versus the callus entirely pilose with hairs at the dorsal surface 1–1.5 mm long (comparable in length to those on the ventral surface), respectively. *Stipa caucasica* var. *fanica* is also similar to *S. drobovii* var. *drobovii* in having long hairs on the adaxial surface of the leaves, but differs in having longer calluses (1.9–2.5 vs. 0.8–1.5 mm) with shorter hairs dorsally (0.4–0.8 vs. 1.5–3 mm).

Habitat. *Stipa caucasica* var. *fanica* is found in steppes, stony slopes, and rocky grasslands at 350–2600 m.

Distribution. *Stipa caucasica* var. *fanica* is found in the mountains of Middle Asia in Tajikistan (Turkestan, Zeravshan, western Pamir Mountains), Kyrgyzstan (Fergana, Kirgiz, Tallas Mountains), Kazakhstan (Tian-Shan Mountains), and Turkmenistan (Kopet-Dagh Mountains).

Paratypes. KAZAKHSTAN. In N part of Balkhash Lake near Gulshat settlement, 50 km SWW of Balkhash city, steppe grassland, 46°41′39″N / 74°26′6″E, 360 m, 22 May 2014, *M. Nobis & P. Gudkova s.n.* (KRA). KYRGYZSTAN. In the eastern part of Tashkumyr town, 41°19′47″N / 72°12′51″E, 650 m, exp. S, slope 40°, no. 1, 11 May 2011, *M. Nobis & A. Nowak s.n.* (KRA 479106); steppe grassland, ca. 3 km SE of Kyzyl-Korgon village, 70 km SE of Osh, 40°9′38″N / 73°30′41″E, 6 June 2013, *M. Nobis & A. Nowak 3/119* (KRA 479027); Karakabin region, 19 May 1952, *Kirsanov & Proskurnikov s.n.* (KRA 455706); steppe grasslands in the Talas River valley, WNW of Ivanovo-Alekseevka village near Talas, alt. 1200 m, 42°33′25″N / 72°09′32″E, 10 May 2011, *M. Nobis s.n.* (KRA 479055, KRA 479961); Adaevskii u. Mangyshlak, Ak-tau, ur. Akmysh, 5 June 1926, *M. D. Spiridonov 693/2* (LE); Adaevskii u. Mangyshlak, okrestnostii rodnika Dokarmysh, 4 June 1926, *F. N. Rusanov 188/1* (LE); Turgai Distr., lower Sary-su River valley, Muyunkumov, near Kara-turgai, 31 May 1914, *N. Krascheninnikov*

5/97 (LE); western Betpak-dala, Kol. Cholak-ecpe, 5 May 1936, *B. Mironov & V. Pazij 712* (LE); Fergana Distr., Margelanskii u., dol. r. Isfairat, Lyangar, 13 May 1913, *N. Dessiatoff 1014* (LE); Karavanskii Distr., Dzhida-sai, 7 May 1952, *Nabiev 71* (TASH). TAJIKISTAN. High mtn. steppes on the N slope of Kuimond Mtns., in the Zeravshan River valley, to the S of Langar settlement (ca. 80 km E of Aini), 39°24′57″N / 69°33′16″E, alt. 2000 m, exp. NNW, slope 30°, no. 3, 19 June 2009, *M. Nobis s.n.* (KRA 479052, KRA 479959, KRA 456385, KRA 479032, KRA 479035); Turkestan Mtns., Tashrabad, 1941, *Pryakhin s.n.* (TAD 1809); western Pamir, S slope of Vakhan Mtns., alt. 2860 m, 3 June 1962, *Nurbanbenov 134* (KRA 479960). TURKMENISTAN. Kopet-Dagh Mtns., S of Prokhladnoe settlement, alt. 1450 m, 20 June 1934, *A. G. Borisova 256* (TAD 1810).

Stipa caucasica subsp. **nikolai** M. Nobis, A. Nobis & A. Nowak, subsp. nov. TYPE: Tajikistan. Fan Mtns., high mtn. steppe grassland with share of *Juniperus*, *Rosa* & other shrubs, ca. 1 km SE of Sarytag settlement, on the right slope of Sarytag stream valley [Góry Fańskie, wysokogórska murawa stepowa z udziałem Juniperus, Rosa i innych krzewów, ok. 1 km na SE od wsi Sarytag, na prawym zboczu doliny potoku Sarytag], 39°05′38″N / 68°16′38″E, alt. 2415 m., incl. NE, 15 June 2007, no. 4, *M. Nobis, M. Kozak & A. Nowak s.n.* (holotype, KRA 454902!; isotypes, KRA 454912!, KRA 454906!). Figure 6.

Diagnosis. *Stipa caucasica* Schmalh. subsp. *nikolai* M. Nobis, A. Nobis & A. Nowak differs from *S. caucasica* subsp. *caucasica* in having clearly shorter hairs in the lower and middle part of the column (0.2–0.7[–0.9] vs. [0.9–]1–2[–2.5] mm long). Additionally, the two subspecies differ in their habitat preferences, with *S. caucasica* subsp. *nikolai* growing mainly in upper mountain elevations and harsher habitats of rocky and stony grasslands and steppes in Middle Asian mountains, whereas *S. caucasica* subsp. *caucasica* prefers more arid habitats in lowlands or lower mountain elevations in Middle Asia but also extends further into the south and southwestern Asia.

Plants perennial, densely tufted, with a few culms and numerous vegetative shoots; culms (20–)30–60 cm tall, 3-noded, glabrous at nodes and very shortly pubescent, or scabrous to glabrous below them. Leaves of vegetative shoots: sheaths shortly pubescent, scabrous to glabrous, at margins white and ciliate, cilia 0.5–1 mm; ligules rounded or truncate, 0–0.2 mm and ciliate (0.4–1.5 mm) at margins; blades convolute, 5–35 cm long, 0.5–0.8(–1) mm in diam., upper surface densely short-pilose with hairs 0.09–0.12 mm, glabrous and smooth beneath. Cauline leaves: sheaths glabrous to slightly scabrous, rarely shortly pubescent in the upper part, margins glabrous or ciliate, usually shorter than internodes, upper sheath up to 20 cm, glabrous or scabrous, uninflated or slightly inflated; ligules 0.3–2.5 mm, truncate to acute, ciliate at apex with hairs 0.3–1.5 mm and setulose on the back; blades scabrous, up to 12 cm. Panicle 8–25 cm, contracted, with 5 to 14 spikelets, at the base enclosed by sheath of uppermost leaf, branches erect, setulose, single or paired. Glumes subequal, lower glume (33–)36–48(–60) mm, upper glume (32–)35–46(–58) mm, narrowly lanceolate, tapering into long hyaline apex, midvein sometimes setulose with cilia up to 1 mm. Anthecium (9–)10–12(–13.5) × 0.8–1.1 mm. Callus (1.7–)2–2.3(–2.6) mm, densely and long pilose ventrally, with the longest hairs 1–1.9 mm, dorsally with straight hairs, 0.7–1.5 mm, base of callus not enlarged, peripheral ring 0.15–0.25 mm in diam., acute, cuneate, scar elliptic. Lemma pale green, on dorsal surface with abundant hooks and 7 lines of ascending hairs, 1–1.7 mm, ventral lines terminating 0–3 mm below top of lemma, dorsal line terminating (0–)0.5–4 mm below top of lemma; top of lemma scabrous due to prickles and short hairs, surpassed by a well-developed ring of unequal hairs (0.3–)5–8(–1.2) mm at apex. Palea equal to lemma in length, glabrous or with a dorsal line of ascending hairs (hairs up to 0.6 mm), reaching up to 1/2–2/3 of palea length. Awn (58–)85–110(–140) mm, unigeniculate or slightly bigeniculate; column (14–)21–27(–36) mm, twisted, 0.4–0.6 mm wide at base, shortly pilose, with hairs (0.2–)0.3–0.7(–0.9) mm, in the upper part gradually increasing in length toward second geniculation; seta (40–)60–80(–110) mm long, falcate, (1.8–)2.5–3.3(–4.3) times longer than column, hairs in lower part of seta (4–)5–6(–7.3) mm, gradually decreasing in length toward apex. Anthers purplish, 6–9 mm, glabrous.

Phenology. *Stipa caucasica* subsp. *nikolai* flowers from May to June.

Habitat. *Stipa caucasica* subsp. *nikolai* is found in stony and rocky grasslands and high mountain steppes at 1000–3600 m.

Distribution. *Stipa caucasica* subsp. *nikolai* is a widely distributed mountain taxon, occurring in Tian-Shan, Pamir, Alai, and Karakorum Mountains. In Middle Asia, it occurs in Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan.

Paratypes. KYRGYZSTAN. Western Tian-Shan, rocks near the Sary-Chelek lake, 41°52′N / 71°58′E, alt. 1585 m, 9 June 2013, *M. Nobis & A. Nowak s.n.* (KRA 457808, KRA 457985, KRA 457986); Karasu River valley, Chatkalskii regon, western Kyrgyzstan, western Tian-Shan, steppe grasslands in the Chat River valley (the left tributary of the Karasu River), betw. Czat & Alcza settlement, 41°30′32″N / 72°14′33″E, alt. 1170 m, incl. SE, slope 30°, 10 May 2011, *M. Nobis s.n.* (KRA 455307); ca. 5 km of Toktogul town, 41°51′37″N / 73°00′53″E, alt. 1020 m, 9 May 2011, *M. Nobis s.n.* (KRA 455907); calcareous rocks, ca. 10 km N of Tash-Kumyr town, 41°30′32″N / 72°14′31″E, alt. 1190 m, 9 June 2013, *M. Nobis & A. Nowak s.n.* (KRA 457548, KRA 457547). TAJIKISTAN. Zeravshan Mtns., Romit, on rocks, 5 June 2014, *A. Nowak s.n.* (KRA 455305, KRA 454417); Zeravshan Mtns. high mtn. steppe ca 2.5 km E of Sarytag settlement, 39°02′38″N / 68°19′20″E, alt. 2415 m, incl. S, slope 5°, 15 June 2007, *M. Nobis et al. s.n.* (KRA 458310, KRA 458311); Zeravshan Mtns. (Pamiro-Alai), high mtn.

steppe on the left slope of Fan River valley, near Zeravshan II settlement, 39°12′10″N / 68°32′08″E, alt. 1610 m, incl. SWW, slope 50°, 9 June 2009, *M. Nobis s.n.* (KRA 456371); Zeravshan Mtns., steppe on the left slope of Fan River valley, Zeravshan settlement (S of Aini), 39°13′08″N / 68°31′40″E, alt. 1650 m, incl. NW, slope 25°, 10 June 2009, *M. Nobis s.n.* (KRA 458510, KRA 458511); Jagnob River valley, Zeravshan Mtns., rocks, left slope of the river valley, ca. 1.5 km NW of Margeb settlement near Anzob, 39°12′26″N / 68°54′41″E, alt. 2220 m, incl. W, slope 80°, 9 June 2011, *M. Nobis s.n.* (KRA 456372); Zeravshan Mtns., Kante River valley, 29 June 2014, *A. Nowak s.n.* (KRA 458320!); Zeravshan Mtns., Remon settlement, alt. 2600 m, 18 June 2012, *A. Nowak s.n.* (KRA 458323); Zeravshan Mtns. (Pamiro-Alai), steppe, 200 m S of tourists base Artucz, ca. 1 km S of Czukurak lake (ca. 8 km SE of Madowra settlement), 39°16′14″N / 68°08′12″E, alt. 2225 m, incl. NWW, slope 35°, 25 June 2008, *M. Nobis & M. Kozak s.n.* (KRA 454401, KRA 455288, KRA 454403, KRA 454404, KRA 455290); Zeravshan Mtns. steppe grassland near the Artuch tourist camp, Artucz, ok. 2.5 km S of Czukurak lake (ca. 8 km SE of Madowra settlement), 39°16′40″N / 68°08′21″E, alt. 2320 m, incl. S, slope 35°, 23 June 2008, *M. Nobis s.n.* (KRA 454891, KRA 454426); Fan Mtns., stony steppe on the left slope of Iskanderkul Lake, ca. 1.5–2 km SW of Varzob tourists camp, 39°04′07″N / 68°21′05″E, alt. 2220 m, incl. SE, 12 June 2007, *M. Nobis et al. s.n.* (KRA 454409, KRA 454410, KRA 455294); Mogiendaria River valley, steppe grassland, E of Khurmi settlement near Mogien, 39°16′28″N / 67°41′12″E, alt. 1500 m, exp. S, inc. 20° E, 12 June 2010, *M. Nobis s.n.* (KRA 455934); Zeravshan Mtns., steppe grassland on the left slope of Mogiendaria River valley, ca. 5 km NEE of Khurmi settlement near Mogien, 39°16′29″N / 67°36′10″E, alt. 1520 m, exp. W-E, incl. 10–30° E, 27 May 2015, *M. Nobis & A. Nowak s.n.* (KRA 455906, KRA 455929); Zeravshan Mtns., Jagnob River valley, steppe grassland, ca. 3–4 km E of Marzich settlement (W of Anzob), 39°11′21″N / 68°44′09″E, alt. 2050 m, exp. S, incl. 30–70°, 22 June 2009, *M. Nobis s.n.* (KRA 455930), Pamir, high mtn. steppe, in the Toguzbulok River valley (Szugnan Mtns.), ca. 8 km NW of Drzelondi settlement, 37°37′52″N / 72°32′33″E, alt. 3520 m, 4 July 2008, *M. Nobis s.n.* (KRA 455933); Zeravshan Mtns., Imat River valley, 8 km SW of Marguzor, 39°13′05″N / 68°21′32″E, 2650 m, incl. E, slope 35°, 22 June 2008, *M. Nobis s.n.* (KRA 455931, KRA 457974, KRA 457975, KRA 457976, KRA 457977, KRA 457978, KRA 457979); Zeravshan Mtns., Imat River valley, 9 km SW of Marguzor, 39°12′52″N / 68°21′20″E, alt. 2700 m, incl. SE, slope 35°, 22 June 2008, *M. Nobis s.n.* (KRA 451239, KRA 451241, KRA 451240, KRA 454896, KRA 451238, KRA 454895, KRA 451250, KRA 454908); Zeravshan Mtns. (Pamiro-Alai), high mtn. steppe (in the Pasruddaria River valley) ca. 3 km W of Marguzor settlement 39°15′13″N / 68°24′04″E, alt. 2190 m, incl. S, slope 10°, 19 June 2008, *M. Nobis & A. Nowak s.n.* (KRA 454415, KRA 454416, KRA 455293, KRA 454408); steppe grasslands on the left slope of Iskanderkul Lake, ca. 500–1500 m SW of tourist camp Varzob, 39°05′05″N / 68°22′05″E, 2220 m, 12 June 2007, *M. Nobis et al. s.n.* (KRA 457984, KRA 458313, KRA 457982); Gabierud River valley, Pamiro-Alai, ca. 0.5 km S of Shurpast settlement (S of Jagnob River), 39°07′53″N / 68°34′52″E, alt. 2300 m, incl. NE, slope 10° to 30°, 24 June 2009, *M. Nobis et al. s.n.* (KRA 456370); Kazakhstan Chuilijskie Mtns., near the Kurday pass, alt. 1100 m, 20 June 1978, *L. Ivaninia et al. s.n.* (KRA 455308); Zeravshan Mtns., steppe, left slope of the Czapdaria River valley, ca. 1 km NE of Allowodii tourists camp (ca. 12 km NWW of Marguzor), 39°15′46″N / 68°16′56″E, alt. 2650 m, exp. SE, incl. 70°, 20 June 2008, *M. Nobis s.n.* (KRA 455287, KRA 454400); Zeravshan Mtns., high mtn. steppe on the left slope of Pasruddaria River valley, ca. 10 km NE of Allowodii tourists camp, 39°15′08″N / 68°19′43″E, alt. 2460 m, exp. E, incl. 5°, 20 June 2008, *M. Nobis s.n.* (KRA 455291, KRA 454406, KRA 454405); Zeravshan Mtns., high mtn. steppe on the left slope of Czapdaria River valley, ca. 1 km NE of Allowodii tourists camp, 12 km NWW of Marguzor, 39°15′46″N / 68°16′56″E, alt. 2650 m, exp. SE, incl. 70°, 20 June 2008, *M. Nobis s.n.* (KRA 455283, KRA 454398, KRA 455282, KRA 455281); Zeravshan Mtns., high mtn. steppe in the eastern part of Marguzor settlement (near the rd.), 39°13′53″N / 68°26′02″E, alt. 2246 m, exp. NW, slope 50°, 19 June 2008, *M. Nobis s.n.* (KRA 455292, KRA 454407); high mtn. steppe, on the left slope of Uriecz settlement, ca. 1 km NW of Kulikalon Lake (Gowkhona Mtns.) (ca. 8 km SE of Madowra settlement), 39°15′56″N / 68°10′14″E, alt. 2750 m, exp. NE, slope 25°, 25 June 2008, *M. Nobis & M. Kozak s.n.* (KRA 455289, KRA 454402); steppe grassland on the left slope of Uriecz River valley, ca. 4 km S of Jakahona settlement (2 km N Artucz tourists camp), 39°17′04″N / 68°07′36″E, alt. 2240 m, exp. SW, slope 30°, 26 June 2008, *M. Nobis s.n.* (KRA 454884, KRA 454423); Zerawszan Mtns., high mtn. steppe on the left slope of Pasruddaria River valley, ca. 3 km NE of Allowodii tourists camp, 39°15′24″N / 68°18′53″E, alt. 2550 m, exp. S, slope 30°, 20 June 2008, *M. Nobis s.n.* (KRA 455285, KRA 454399); Zeravshan Mtns., high mtn. steppe, betw. stones, on the left slope of Iskanderdarya River valley, ca. 0.5 km E of Serimadarun Lake (near Iskanderkul Lake), 39°05′08″N / 68°22′46″E, alt. 2326 m, incl. W, slope 5° to 10°, 14 June 2011, *M. Nobis s.n.* (KRA 455905); Fann Mtns., high mtn. steppe on the left slope of Sarytag stream valley, 39°03′08″N / 68°19′01″E, alt. 2400 m, incl. S, 16 June 2008, *M. Nobis s.n.* (KRA 454897, KRA 451242); Fann Mtns., high mtn. steppe on the left slope of Arch stream valley, NW of Sarytag settlement, 39°03′07″N / 68°19′17″E, alt. 2410 m, incl. SW, 16 June 2008, *M. Nobis s.n.* (KRA 451243, KRA 451244, KRA 451245, KRA 451246, KRA 451247, KRA 454899); Fan Mtns., steppe grasslands on the right slope of Karakul River valley, 3–4 km SW of Sarytag settlement, 39°02′09″N / 68°16′45″E, alt. 2460 m, incl. NW, 17 June 2008, *M. Nobis s.n.* (KRA 454412, KRA 455300, KRA 454411); Zeravshan Mtns., stony steppe on the right slope of Pasruddaria River valley, ca. 6 km NE of Marguzor settlement 39°14′57″N / 68°22′15″E, alt. 2350 m, exp. N, slope 15° to 25°, 22 June 2008, *M. Nobis s.n.* (KRA 454904, KRA 451249, KRA 454903, KRA 451248); Fan River valley, Gushty Mtns., ca. 500 m E of Zeravshan settlement, steppe, 39°13′14″N / 68°32′51″E, alt. 2150 m, exp. W, slope 25°, 21 June 2009, *M. Nobis & A. Nowak s.n.* (KRA 457922, KRA 458324, KRA 458325, KRA 458327).

Stipa chitralensis Bor, Kew Bull. 9: 500. 1954. TYPE: Pakistan. Chitral, Guger, 18 May 1895, *Harris 16800* (holotype, K!; isotypes, BM!, E!, WU not seen). ≡ **Neotrinia chitralensis** (Bor) M. Nobis, comb. nov.

Notes. Contrasting with other species of *Stipa*, specimens representing *Neotrinia chitralensis* have 2–2.5 mm long hyaline lobes on the apical part of the lemma. Representatives of *Stipa* have lemmas without elongated lobes or lobes (if present) are flat and less than 1 mm long (Freitag, 1985). In *N. chitralensis*, the pattern of its lemma micromorphology is dominated by elongated basal cells and frequent silica bodies and cork cells (M. Nobis, pers. obs.), which makes it more similar to *N. splendens* (Trin.) M. Nobis, P. D. Gudkova & A. Nowak rather than other

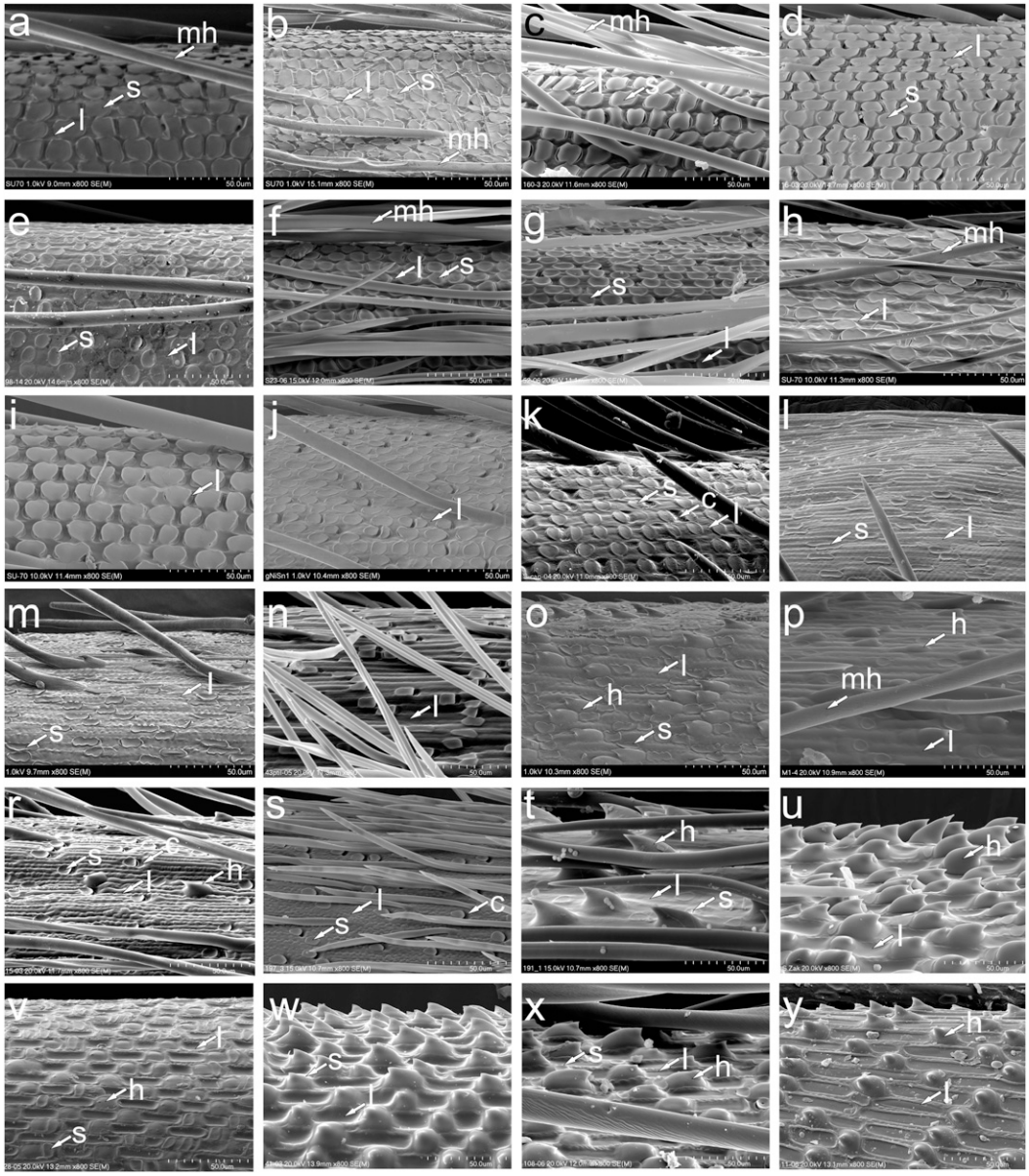

Figure 7. Patterns of the lemma micromorphology in selected species of the tribe Stipeae: (a) *Achnatherum haussknechtii* (Boiss.) M. Nobis (Iran, *J. Bornmüller 4834* [PRC]), (b) *A. staintonii* (Bor) M. Nobis & P. D. Gudkova (Nepal, *M. A. Farille 81-340* [E]), (c) *A. mandavillei* (Freitag) M. Nobis (Oman, *Mandaville 6525* [KAS]), (d) *A. turkomanicum* (Roshev.) Tzvelev (Tajikistan, *M. Nobis s.n.* [KRA]), (e) *A. calamagrostis* (L.) Beauv. (Hungary, *H. Petry s.n.* [KRA]), (f) *A. caragana* (Trin.) Nevski (Tajikistan, *M. Nobis s.n.* [KRA]), (g) *A. pubicalyx* (Ohwi) Keng (China, *Kozlov 124* [LE]), (h) *A. inebrians* (Hance) Keng ex Tzvelev (China, *M. Olonova s.n.* [KRA]), (i) *A. bromoides* (L.) P. Beauv. (Iran, *T. Alexeenko 316* [LE]), (j) *A. brandisii* (Mez) Z. L. Wu (India, Kashmir, *R. R. Stewart 18120* [NY]), (k) *Stipellula capensis* (Thunb.) Röser & Hamasha (Spain, *R. Piwowarczyk s.n.* [KRA]), (l) *Ptilagrostis malyschevii* Tzvel. (Kyrgyzstan, *M. Nobis s.n.* [KRA]), (m) *P. alpina* (Fr. Schmidt) Sipl. (Russia, *S. Kharkevich, T. Bush s.n.* [NY]), (n) *P. mongholica* (Turcz. ex Trin.) Griseb. (Mongolia, *A. Pacyna s.n.* [KRA]), (o) *Orthoraphium roylei* (Nepal, *M. A. Farille s.n.* [E]), (p) *Macrochloa tanacissima* (L.) Kunth (Spain, *R. Piwowarczyk s.n.* [KRA]), (r) *Neotrinia splendens* (Trin.) M. Nobis, P. D. Gudkova & A. Nowak (Tajikistan, *Yu. Gusev s.n.* [LE]), (s) *Piptatherum munroi* (Stapf ex Hook. f.) Mez (Nepal, *M. F. Watson et al. DNEP3 AX33* [E]), (t) *Patis coreana* (Honda) Ohwi (China [KUN 387221]), (u) *Stipa* ×*brevicallosa* M. Nobis (Tajikistan, *M. Nobis s.n.* [KRA]), (v) *S. grandis* P.A. Smirn. (Mongolia, *Safronova et al. s.n.* [KRA]), (w) *S. bungeana* Trin. (Kyrgyzstan, *M. Nobis & A. Nowak s.n.* [KRA]), (x) *S. drobovii* (Tzvelev) Czerep. (Tajikistan, *M. Nobis s.n.* [KRA]), (y) *S. zeravshanica* M. Nobis (Tajikistan, *M. Nobis s.n.* [KRA]). Abbreviations: l, long cell (fundamental cell); s, silica cell (silica body); c, cork cell; h, hook; mh, macrohair.

members of *Stipa* or *Achnatherum* in which the lemma epidermal pattern is different (Fig. 7; see also Romaschenko et al., 2012; Nobis et al., 2019a, 2019b). Thus, the transfer of *S. chitralensis* to the genus *Neotrinia* is proposed.

Stipa confusa Litv., Izv. Akad. Nauk SSSR, Ser. 6, 1928: 53, pl. 3, f. 2. 1928. TYPE: Altai, ad fluvium Tscharysch in montosis herbidis, July 1826, *Ledebour 172* (lectotype, designated by Tzvelev [1976: 576], LE TRIN 1441.2!; isolectotype, LE TRIN 1441.4!). ≡ **Achnatherum confusum** (Litv.) Tzvelev, Probl. Ekol. Geobot. Bot. Geogr. Florist. 140. 1977.

Stipa ×consanguinea Trin. & Rupr., Sp. Gram. Stipac. 78. 1842, pro sp. (*S. krylovii* Rochev. × *S. glareosa* P. A. Smirn.). TYPE: Altai, desert Tschuj. edit., 1833, *Dr. Bunge s.n.* (lectotype, designated here, LE Herbarium Trinii 1393.1!; isolectotypes, LE! [2 sheets]).

Habitat. *Stipa ×consanguinea* is found in steppe grasslands and high mountain deserts at 1800–3000 m.

Distribution. *Stipa ×consanguinea* is found in mountains of north-central Asia (Tian-Shan: China, Altai: Russia, Mongolia, Kazakhstan; Tzvelev, 1968, 1976). In Middle Asia, it occurs in Kazakhstan and western China (Tian-Shan Mountains).

Notes. *Stipa ×consanguinea* was described by Trinius and Ruprecht (1842) from Altai. The original description states: "*Fl. Altalca: in desertis Tschujae editioribus; Julio (Bunge!).*" The collection of four syntypes of this taxon is preserved at LE. The first typification of this species was provided by Tzvelev (1976: 580), who instead of choosing a lectotype indicated that a [holo-] type and two isotypes were preserved at LE. Later, Byalt (in Sokolova, 2012: 300), citing Tzvelev (1976), designated the lectotype, isolectotype, and two syntypes and attached appropriate labels to the sheets in 2010. Unfortunately, this lectotypification of *S. ×consanguinea* is not effective because he did not use the phrase "designated here" (see Art. 7.11 of the *International Code of Nomenclature*, McNeill et al., 2006, 2012; Turland et al., 2018). Because Byalt in Sokolova (2012) did not use the required phrase, we provide the correct designation of the lectotype. We designated specimens on the herbarium sheet preserved in the Trinius herbarium and deposited them at LE as the lectotype; these were previously designated as the holotype by P. Peterson (Soreng et al., 1995) because information on the herbarium label is most similar to that in the original description. The other two sheets with labels "*Herb. Fisch., in lapidosis apricis ad Tschuja, [18]32, Bunge* (LE)" and "*Stipa juncea ?, Bge fl alt suppl., in lapidosis apricis ad fluv. Tschuja, 1832, Dr. Bunge, Acc. ab inventore 1833, S. consanguinea Rupr. Hb. Meyer* (LE 01011394)" are isolectotypes. The fourth sheet, which has one specimen and a label reading "Herb. Fisch. *Stipa consanguinea* Trin., *Stipa juncea* L. ?, suppl. fl. alt., Bge.," is a syntype.

Stipa crassiculmis P. A. Smirn., Repert. Spec. Nov. Regni Veg. 22: 375. 1926. TYPE: Kopet-Dagh, pereval Arvaz, 2300 m, *Kultiasov s.n.* (holotype, TASH not seen). ≡ **Stipa pulcherrima** K. Koch subsp. **crassiculmis** (P. A. Smirn.) Tzvelev.

Stipa ×czerepanovii Kotukhov, Turczaninowia 1(2): 13. 1998 (*S. orientalis* Trin. × *S. richteriana* Kar. & Kir.; Nobis & Gudkova, 2016). TYPE: [Kazakhstan.] Depressio Zaissanica denudatinies argillarum tertiariarum Akseir (maryo orientalis) jugi parve declivitas australi-occidentalis glareoso-argillosa, 17 July 1993, *Ju. Kotuchov s.n.* (lectotype, designated by Nobis & Gudkova [2011: 199], LE!; isolectotypes, KRA 436047!, KRA 436048!, KUZ! [9 sheets], LE!).

Habitat. *Stipa ×czerepanovii* is found in steppe grasslands at 600–1500 m.

Distribution. *Stipa ×czerepanovii* is found in eastern Kazakhstan (Kotukhov, 2002; Nobis & Gudkova, 2016) (Fig. 4).

Stipa damascena Boiss., Diagn. Pl. Orient. ser. 1, 13: 45–46. 1854. TYPE: [Syria.] In collibus aridissimis pone urbem Damascum, May 1846, *Boissier* (holotype, G not seen; isotype, W!). = **Stipa arabica** Trin. & Rupr. var. **turgaica** (Roshev.) Tzvelev.

Stipa dasyphylla (Lindem.) Trautv., Trudy Imp. S.-Peterburgsk. Bot. Sada 9: 350. 1884. TYPE: Kharkov, na kholmakh i kosogorakh Rogani, 13 June 1853, *V. Chernyaev s.n.* (lectotype, designated by Tzvelev [1976: 589], LE!; isolectotype, LE!).

Habitat. *Stipa dasyphylla* is found in steppe grasslands at 1500–1600 m.

Distribution. *Stipa dasyphylla* is found from eastern Europe to northern and central Asia (Tzvelev, 1968, 1976; Kotukhov, 2002). In Middle Asia, it occurs in Kazakhstan (Manrak Mountain).

Stipa decipiens P. A. Smirn., Ucen. Zap. Moskovsk. Gosud. Univ. 2: 338. 1934. TYPE: Altai merid., in declivibus stepposis, locis lapidosis prope pag. Katon-Karagaj, ca. 1100 m, 24 June 1930, *P. Smirnov 3a* (holotype, MW!; isotype, MW!). = **Stipa krylovii** Roshev.

Stipa densa P. A. Smirn., Del. Sem. Hort. Bot. Univ. Mosq. 15, 1930 (replaced synonym *S. densiflora* P. A. Smirn., nom. illeg.). TYPE: [Russia.] Khakasia, okr. sel. Askyz, slabo solontsevataya khryaschevataya step' v doline Abakana, July 1927, *V. V. Reverdatto s.n.* (holotype, TK!). = **Stipa krylovii** Roshev.

Stipa densiflora P. A. Smirn., Repert. Spec. Nov. Regni Veg. 26: 265. 1929, nom. illeg. non Hughes 1921. TYPE: [Russia.] Khakasia, okr. sel. Askyz, slabo solontsevataya khryaschevataya step' v doline Abakana, July 1927, *V. V. Reverdatto s.n.* (holotype, TK!). = **Stipa krylovii** Roshev.

Stipa desertorum (Roshev.) Ikonn., Opred. Vyssh. Rast. Badakhshana 83. 1979. Basionym: *Stipa caucasica* Schmalh. fo. *desertorum* Roshev., Fl. Aziat. Ross. 12: 143. 1916. TYPE: Tsentr. Tian-Shan, Przhevalskii u., u Tamchi bliz oz. Issyk-Kul', na peskakh, 19 June 1908, *R. Rozhevich 574* (lectotype, designated by Tzvelev [1976: 593], LE!). = **Stipa glareosa** P. A. Smirn. var. **glareosa**.

Stipa drobovii (Tzvelev) Czerep., Sosud. Rast. SSSR 387. 1981 [replaced synonym: *S. bella* Drobow, hom. illeg.]. TYPE: Uvaly Karatau severnoe oz. Biilikol', slantsevye sklony k oz. Akkul', 1 June 1922, *V. Drobov 285* (lectotype, designated by Tzvelev [1976: 592], LE!; isolectotype, TASH 831!).

Notes. Having a short callus with very distinct, long, and falcate hairs dorsally, *Stipa drobovii* is an easily distinguishable taxon, but varies considerably in the pubescence of its leaves (blades and sheaths). Based on the revised plant material, four varieties are recognized in Middle Asia.

1. Abaxial surface of leaves of vegetative shoots densely pubescent . . . . . *Stipa drobovii* (Tzvelev) Czerep. var. *iskanderkulica* (Tzvelev) M. Nobis & A. Nowak
1′. Abaxial surface of leaves of vegetative shoots glabrous and smooth 2
2. Adaxial surface of vegetative leaves covered with hairs up to 0.1 mm long . . . . . *Stipa drobovii* var. *persicorum* M. Nobis
2′. Adaxial surface of vegetative leaves covered with hairs 0.3–0.6 mm long 3
3. Sheaths of cauline leaves shortly and densely pubescent . . . . . *Stipa drobovii* var. *jarmica* M. Nobis
3′. Sheaths of cauline leaves glabrous . . . . . *Stipa drobovii* var. *drobovii*

Stipa drobovii var. **drobovii**.

Habitat. *Stipa drobovii* var. *drobovii* is found in steppe grasslands at 800–2500 m.

Distribution. *Stipa drobovii* var. *drobovii* is widely distributed from the Caucasus to Middle Asia (Pazij, 1968; Tzvelev, 1968, 1976; Freitag, 1985; Wu & Phillips, 2006; Gonzalo et al., 2012). In Middle Asia, it occurs in Afghanistan, Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

Stipa drobovii var. **iskanderkulica** (Tzvelev) M. Nobis & A. Nowak, Phytotaxa 303(2): 151. 2017. Basionym: *Stipa caucasica* Schmalh. subsp. *iskanderkulica* Tzvelev, Novosti Sist. Vyssh. Rast. 11: 20. 1974. TYPE: Samarkand Distr., Iskanderkul, 21 May 1914, *V. Dubyanskii s.n.* (holotype, LE!).

Synonyms. ≡ *Stipa iskanderkulica* (Tzvelev) Czerep.; = *S. caucasica* Schmalh. f. *dasyphylla* Roshev., Fl. Aziat. Ross. 12: 142. 1916. TYPE: LE not seen; = *S. bella* Drobow var. *incana* Korol. ex Ovcz. & Czukavina, Fl. Tadzhik. 1: 421. 1957, nom. nud.

Habitat. *Stipa drobovii* var. *iskanderkulica* is found in steppe grasslands at 1500–2500 m.

Distribution. *Stipa drobovii* var. *iskanderkulica* is found in Middle Asia (Ovchinnikov & Chukavina, 1957; Nobis et al., 2017a), specifically in Tajikistan (Zeravshan and Hissar Mountains).

Stipa drobovii var. **jarmica** M. Nobis, var. nov. TYPE: Dolina rzeki Zeravshan (Zeravshan River valley), Rejon Zerawszański C (Zeravshan Region C), Góry Zeravshańskie (Pamiro-Alai); Murawy stepowe na przydrożnych skarpach, na prawej terasie rzeki Zerawszan, w pobliżu wsi Diemnora, w pobliżu potoku Liangarshif (około 100 km na E od Aini) [near Demnora settlement, near Langarshif stream (ca. 100 km E of Aini), steppe grasslands on the roadside escarpment, on the right terrace of Zeravshan River], 39°27′00″N / 69°52′36″E, alt. 2450 m, exp. S, slope 30°, loc. 7, 19 June 2009, *M. Nobis s.n.* (holotype, KRA 457708!; isotypes, KRA 454144!, KRA 456642!, KRA 456646!, KRA 457709!).

Diagnosis. *Stipa drobovii* (Tzvelev) Czerep. var. *jarmica* M. Nobis resembles *S. drobovii* var. *drobovii* in having vegetative leaves that are glabrous on the abaxial surface but differs from the latter taxon in having cauline leaves with densely pubescent (vs. glabrous) sheaths.

Plants perennial, densely tufted, with a few culms and numerous vegetative shoots; culms (35–)40–60 cm tall, 3-noded, glabrous at nodes and densely pubescent below them. Culm leaves: lower, middle, and upper sheaths densely shortly pubescent, blades glabrous and smooth on abaxial surface and densely pubescent on adaxial surface. Leaves of the vegetative shoots: ligules up to 0.2 mm, densely ciliate, cilia up to 1.5 mm; abaxial surface of blades glabrous and smooth, whereas adaxial surface densely covered with hairs 0.25–0.6 mm. Glumes 32–46 mm. Anthecium 8–11 × 0.8–1.1 mm. Callus acute, 0.8–1.4 mm, its base 0.6–0.9 × 0.25–0.45 mm, densely bearded, dorsal hairs falcate and longer than ventral hairs. Lemma with 5 to 7 lines of hairs, marginal and dorsal lines reaching base of awn or terminating at 0.2–1 mm below top; lemma apex with ring of hairs. Awn unigeniculate, column 12–20 mm; with hairs 13–20 mm; seta arcuate, 40–65 mm, hairs in lower part of seta (35–)40–50 mm.

Phenology. *Stipa drobovii* var. *jarmica* flowers from May to June.

Habitat. *Stipa drobovii* var. *jarmica* is found in steppe grasslands at 1900–2500 m.

Distribution. *Stipa drobovii* var. *jarmica* is found in Tajikistan (Turkestan and Zeravshan Mountains).

Etymology. The name of the taxon originates from the name of the Jarm (Yarm) settlement located in the eastern part of the Zeravshan River valley.

Paratypes. TAJIKISTAN. Northern slope of Turkestan Mtns., on the left bank of Argly River valley, foreland of the Kurganak Mtn., 24 July 1967, *A. N. Konnov 2542* (KRA); high mtn. steppes on the left slope of Kuimont Mtns., in the Zeravshan River valley, to the S of Langar settlement (ca. 80 km E of Aini), 39°24′57″N / 69°33′16″E, alt. 2000 m, exp. NNW, slope 30°, loc. 3, 19 June 2009, *M. Nobis s.n.* (KRA 455387, KRA 455808, KRA 455811, KRA 455812, KRA 455850, KRA 456212, KRA 456636, KRA 457706, KRA 457443, KRA 456650); high mtn. steppes on the left slope of Kuimont Mtns., at the mouth of the river Tabaspin to the Zeravshan, ca. 2 km S of Langar settlement (ca. 80 km E of Aini), alt. 2340 m, exp. W, slope 50°, loc. 2, 19 June 2009, *M. Nobis s.n.* (KRA 457428, KRA 457444, KRA 457159, KRA 455343); steppe grassland on the right terrace of Zeravshan River near the Sabakh settlement, near the mouth of Dzhikhdon River (ca. 100 km E of Aini), alt. 2350 m, 39°28′35″N / 69°47′29″E, exp. S, slope 10° to 30°, loc. 2, 19 June 2009, *M. Nobis s.n.* (KRA 456637, KRA 456638, KRA 456639, KRA 456640, KRA 456641, KRA 455809, KRA 455810, KRA 456644, KRA 456645, KRA 457707); steppe grassland on the left slope of Zeravshan River valley (near the rd.), ca. 4 km E of Tabusht settlement, W of Yarm (ca. 115 km E of Aini), alt. 2360 m, 39°27′47″N / 69°47′52″E, exp. SE, slope 10° to 30°, loc. 5, 20 June 2009, *M. Nobis s.n.* (KRA 457429); steppe grassland on the right terrace of Zeravshan River valley, ca. 3–4 km W of Yarm settlement (ca. 125 km E of Aini), alt. 2455 m, 39°26′10″N / 69°56′04″E, exp. S, slope 10° to 60°, loc. 4, 20 June 2009, *M. Nobis s.n.* (KRA 457431, KRA 457433, KRA 453742, KRA 453743).

Stipa drobovii var. **persicorum** M. Nobis, var. nov. TYPE: Persia [Iran]. Ad pedem merid, montium Kúh-e Shan Jahan, ca. 20 km austro-orient. ab oppido Esfarain, 36°57′ – 57°40′, 16 June 1977, *J. Soják s.n.* (holotype, PR!).

Diagnosis. *Stipa drobovii* (Tzvelev) Czerep. var. *persicorum* M. Nobis is similar to *S. drobovii* var. *drobovii* in its lower segment of the awn (column) long pilose, with hairs 0.9–2(–2.5) mm, but differs in having the abaxial surface of the vegetative leaves densely covered with hairs 0.10–0.15 mm, whereas *S. drobovii* var. *drobovii* has leaves covered with hairs 0.25–0.5 mm.

Plants perennial, densely tufted, with a few culms and numerous vegetative shoots; culms (15–)20–30 cm tall, 3-noded, glabrous at nodes and densely pubescent below them. Culm leaves: sheaths glabrous, blades glabrous and smooth on abaxial surface and pubescent on adaxial surface. Leaves of vegetative shoots: ligules up to 0.2 mm, densely ciliate, cilia up to 1.5 mm; abaxial surface of blades glabrous and smooth, whereas densely covered with hairs 0.1–0.15 mm adaxially. Glumes 34–45 mm. Anthecium 8–10 × 0.8–1.0 mm. Callus acute, 0.8–1.2 mm, its base 0.6–0.9 × 0.25–0.45 mm, densely bearded, dorsal hairs falcate and longer than ventral hairs. Lemma with 5 to 7 lines of hairs, marginal and dorsal lines reaching base of awn or terminating at 0.2–1 mm below top; lemma apex with ring of hairs. Awn unigeniculate, column 12–20 mm; with hairs 13–20 mm; seta arcuate, 40–65 mm, hairs in lower part of seta (35–)40–50 mm.

Phenology. *Stipa drobovii* var. *persicorum* flowers from April to June.

Habitat. *Stipa drobovii* var. *persicorum* is found in steppes, stony slopes, and rocky grasslands at 1500–2000 m.

Distribution. *Stipa drobovii* var. *persicorum* is found in Middle Asia, specifically in northeastern Iran and Turkmenistan (Kopet-Dagh Mountains).

Stipa duthiei Hook. f., Fl. Brit. India 7: 232. 1896. TYPE: [India.] Tehri Garwhal, Lekhus, below Srikanta, 12,000–13,000 ft., 11 Aug. 1853, *Duthie 273* (holotype, K 32097!). ≡ **Ptilagrostis duthiei** (Hook. f.) M. Nobis & P. D. Gudkova, PhytoKeys 128: 107. 2019 [≡ *Achnatherum duthiei* (Hook. f.) P. C. Kuo & S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 322, pl. 80, f. 9–14. 1987].

Stipa ×dzungarica M. Nobis, nothosp. nov. (*S. kirghisorum* P. A. Smirn. × *S. richteriana* Kar. & Kir. subsp. *richteriana*). TYPE: Kazakhstan. Western part of Dzhungarskii Alatau, N Tian-Shan, ca. 3 km NW of Sary-Ozek, ca. 140 km NNE of Almaty, steppe, 44°22′58″N / 77°56′16″E, 1007 m, wp. 1250, 27 May 2019, *M. Nobis* (holotype, KRA 479043!; isotype, KRA!).

Diagnosis. *Stipa ×dzungarica* M. Nobis is similar to *S. ×heptapotamica* Golosk., but it differs from the latter taxon in having longer anthecia, 9.5–11.5 mm (vs. 7–9.2 mm), with hairs arranged in 7 lines and without a ring of hairs at the apex (vs. anthecia pilose all over with a well-developed ring of hairs at the apex), longer calluses, 1.5–2.2 mm (vs. 1.3–1.6 mm), and longer glumes, 18–28 mm (vs. 15–20 mm).

Plants perennial, densely tufted, with a few culms and numerous vegetative shoots; culms 50–58 cm tall, 3-noded, glabrous at nodes and very shortly pubescent below them. Leaves of vegetative shoots: sheaths shortly pubescent; ligules rounded or truncate, up to 0.2 mm and ciliate at margins; blades convolute, up to 35 cm, 0.4–0.6(–0.7) mm in diam., adaxial surface densely pubescent with hairs 0.1–0.15 mm, abaxial surface scabrous due to hooks and short prickles. Cauline leaves: sheaths glabrous and with white edges, shorter than internodes, glabrous; ligules 0.2–0.5 mm, obtuse

and ciliate at margins; blades scabrous, up to 8 cm. Panicle 18–25 cm, contracted, at base enclosed by sheath of uppermost leaf, branches erect, setulose, single or paired. Glumes subequal, 18–28 mm, narrowly lanceolate, tapering into long hyaline apex, midvein sometimes setulose. Anthecium 9.5–11.5 × 0.7–1 mm. Callus 1.5–2.2 mm, densely long-pilose on ventral and dorsal surfaces, callus base not enlarged, peripheral ring 0.2 mm in diam., acute, cuneate, scar elliptic to circular. Lemma pale green, on dorsal surface with abundant hooks and with 7 lines of ascending hairs, hairs up to 0.6 mm, ventral line of hairs terminating at 0.4–1 mm below top of lemma and dorsal line terminating at 2–3 mm below top of lemma; top of lemma scabrous due to hooks and prickles but without ring of hairs at apex. Palea equal to lemma in length. Awn 125–155 mm, bigeniculate; lower segment of column 34–47 mm, twisted, ca. 0.5 mm wide near base, distinctly scabrous due to hard prickles, gradually increasing in length toward geniculation; upper segment of column 12–15 mm, twisted, scabrous due to prickles and short hairs 0.1–0.3 mm, gradually increasing in length toward geniculation; seta straight or flexuous 90–120 mm, hairs in lower part of seta 1.2–1.5(–1.7) mm, gradually decreasing in length toward apex. Anthers yellow, 4–5 mm, glabrous.

Phenology. *Stipa ×dzungarica* flowers from May to June.

Habitat. *Stipa ×dzungarica* is found in steppes at 800–1100 m.

Distribution. *Stipa ×dzungarica* is found in Middle Asia, specifically Kazakhstan (in the western part of Dzhungarskii Alatau).

Notes. The plot of vegetation that includes *Stipa × dzungarica* is documented here: feather grass steppe, on the loess substrate, area of relevé 16 m², cover of herbs layer 70%: *S. ×dzungarica* +, *S. kirghisorum* 3, *S. richteriana* subsp. *richteriana* 1, *S. sareptana* 2, *Bromus tectorum* 1, *Artemisia* sp. 3, *Ziziphora tenuior* +, *Poa bulbosa* 1, *Salvia* sp. +, *Holosteum glutinosum* +, *Orobanche amoena* +, *Iris* cf. *glaucescens* +, *Descurainia sophia* +, *Festuca valesiaca* 1. Steppes in the southwest part of Dzungarskii Alatau are rich in species of feather grasses. At the locality near Sary-Ozek, together with *S. ×dzungarica*, the following taxa were recorded: *S. ×heptapotamica*, *S. kirghisorum*, *S. sareptana*, *S. orientalis*, *S. ×czerepanovii*, *S. richteriana* subsp. *richteriana*, *S. arabica*, and *S. caucasica*. It is possible that further localities of *S. ×dzungarica* can be found in the region.

Stipa effusa Mez, Repert. Spec. Nov. Regni Veg. 17: 210. 1921. TYPE: Persia austro-orient., Prov. Kerman, Kuh-e-Dschupar, in reg. alp. et subalp., 2900–3200 m, 9 June 1892, *Bornmuller 4837* (lectotype, designated here, JE!; holotype, preserved at B, was destroyed during World War II). = **Achnatherum haussknechtii** (Boiss.) M. Nobis [≡ *Stipa haussknechtii* Boiss.].

Stipa ×fallax M. Nobis & A. Nowak, Phytotaxa 303(2): 145. 2017 (*S. drobovii* (Tzvelev) Czerep. × *S. macroglossa* P. A. Smirn. subsp. *macroglossa*; Nobis et al., 2017a). TYPE: Western Tajikistan, western Pamir Alai. Zeravshan Mtns., high mtn. steppe, on the southern slope of mtns. (left slope of the Iskanderdarya River valley), ca. 0.6 km E of Serimadarun Lake (near Iskanderkul Lake), 39°05′N / 68°23′E, alt. 2340 m, incl. S, slope 5°, 15 June 2012, *M. Nobis s.n.* (holotype, KRA 407904!; isotypes, KRA 407898!, KRA 407899!, KRA 407900!, KRA 407901!, KRA 407902!, Herb. Stip. M. Nobis!).

Habitat. *Stipa ×fallax* is found in mountain steppe grasslands at 2200–2400 m.

Distribution. *Stipa ×fallax* is found in Middle Asia (Nobis et al., 2017a), specifically in Tajikistan (Zeravshan Mountains). Figure 3.

Stipa glareosa P. A. Smirn., Repert. Spec. Nov. Regni Veg. 26: 266. 1929. TYPE: Gobi. Steppum glareosum in depressione lac. Orok-nor, 7 Sep. 1924, *N. Pavlov 169* (holotype, MW!; isotype, LE!).

Synonyms. ≡ *Stipa caucasica* Schmalh. subsp. *glareosa* (P. A. Smirn.) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 20. 1974; = *Stipa orientalis* Trin. var. *trichoglossa* Hack., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 55: 164. 1903. TYPE: Ad Sufi Kurgan in montibus Alai, 18 July 1898, *Paulsen 404* (lectotype, designated by Gonzalo et al. [2011: 405], C; isolectotype, W!); = *S. glareosa* var. *langshanica* Y. Z. Zhao, Acta Sci. Nat. Univ. Nei Menggu 23(4): 546. 1992. TYPE: China. Langshan, 4 July 1988, *Zhao Yizhi et al. 4077* (holotype, HIMC not seen); ≡ *S. langshanica* (Y. Z. Zhao) Y. Z. Zhao; = *S. caucasica* Schmalh. fo. *desertorum* Roshev., Fl. Aziat. Ross. 12: 143. 1916. TYPE: Tsentralnyi Tyan-Shan, Semirechinskaya oblast, Przhevalskii uezd, u reki Tamachi, bliz oz. Issyk-kul, na peskakh, 19 June 1908, *Roshevitz 574* (lectotype, designated by Tzvelev [1974: 20], LE!); ≡ *S. caucasica* var. *desertorum* (Roshev.) Tzvelev in V. I. Grubov, Pl. Central Asia 4: 53. 1968; ≡ *S. caucasica* subsp. *desertorum* (Roshev.) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 20. 1974; ≡ *S. desertorum* (Roshev.) Ikonn.

Habitat. *Stipa glareosa* is found in gravelly or sandy deserts, steppes, high mountain rocky grasslands, and screes at 350–5000 m.

Distribution. *Stipa glareosa* is a widely distributed central Asian species (Pazij, 1968; Tzvelev, 1968, 1976; Freitag, 1985; Dickoré, 1995; Wu & Phillips, 2006; Gonzalo et al., 2012; Gudkova et al., 2013a, 2015; Nobis, 2014). It also occurs in Middle Asia in Afghanistan, China, Kazakhstan, Kyrgyzstan, and Tajikistan.

Notes. *Stipa caucasica* fo. *desertorum* differs from *S. glareosa* in having glabrous and smooth versus scabrous vegetative leaves (Roshevitz, 1916; Gudkova et al., 2013b). However, during field studies, specimens with both glabrous and/or slightly scabrous leaves were observed and collected by us from localities where *S. glareosa* was recorded. Moreover, even the type of *S. caucasica* fo. *desertorum* (LE!) has slightly scabrous leaves. Thus, we consider *S. desertorum* conspecific with *S. glareosa*.

During the revision of the specimens representing *Stipa glareosa* we found interesting specimens collected in southern Mongolia that represent this new variety, which may also be found in the area of Middle Asia.

Stipa glareosa var. *nemegetica* M. Nobis, var. nov. TYPE: southern Mongolia, southern Gobi Aimak, Nemeget Mtns., alt. 2000–2700 m, 17 July 1964, *K. Kowalski s.n.* (holotype, KRA 100264!).

Diagnosis. *Stipa glareosa* P. A. Smirn. var. *nemegetica* M. Nobis differs from both varieties within *S. glareosa* (variety *glareosa* and variety *pubescens* (P. A. Smirn. ex Roshev.) Gubanov) in having scabrous vegetative and culm leaves and very densely and long pubescent culm sheaths.

Stipa glareosa P. A. Smirn. var. *pubescens* (P. A. Smirn. ex Roshev.) Gubanov, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 87(1): 124. 1982. Basionym: *Stipa glareosa* fo. *pubescens* P. A. Smirn. ex Roshev., Fl. URSS 2: 89. 1934. TYPE: Mongolia. Gobi Altai, Bain-Tsagan, 4 Aug. 1931, *N. P. Ikonnikov-Galitzky & V. A. Ikonnikova-Galitzkaya 3824* (lectotype, designated by Grubov [1982], LE!).

Stipa glareosa var. *pubescens*, which is known only from Mongolia, may also occur in Middle Asia. The taxon differs from the nominal variety (*S. glareosa* var. *glareosa*) in having leaves and sheaths densely and long pubescent versus vegetative and culm leaves more or less scabrous and sheaths of culm leaves that may be glabrous or scabrous, respectively.

Stipa ×gnezdilloi Pazij, Opred. Rast. Sred. Azii 1: 201. 1968, pro sp. (*S. caucasica* Schmalh. × *S. hohenackeriana* Trin. & Rupr.). TYPE: Pamir-Alai, Kh. Kugitang, zapadnyi sklon, okr. z. Maidan, shchebnistye sklony, 20 July 1935, *A. Gnezdillo 134* (holotype, TASH 151761!; isotype, TASH 151760!).

Habitat. *Stipa ×gnezdilloi* is found in steppe grasslands at 900–1400 m.

Distribution. *Stipa ×gnezdilloi* is found in Middle Asia (Pazij, 1968), specifically in Uzbekistan (Kuhitang Mountains). Figure 3.

Notes. The taxon is known only from the type collection. In the original description, Pazij (1968) stated that *Stipa gnezdilloi* has bigeniculate awns; however, the holotype and isotype have unigeniculate or indistinctly bigeniculate awns. The combination of morphological characters (hairs on seta 3–4.2 mm, hairs on column 0.1–0.3 mm and gradually increasing toward geniculation, as well as ligules of vegetative leaves that are ca. 0.4 mm long) suggests that the species originated from hybridization between *S. caucasica* and *S. hohenackeriana*.

Stipa gracilis Roshev., Fl. Aziat. Ross. 1(12): 151, pl. 10, f. 4, 4a. 1916. TYPE: Semirechinskaya obl. Pishpekckii uezd, dolina r. Chemaldynki, kamenistye sklony doliny, 23 July 1915, *M. D. Spiridonow 17* (lectotype, designated by Nobis et al. [2013: 670], MW!).

Habitat. *Stipa gracilis* is found in rock ledges and fissures at 700–3000 m.

Distribution. *Stipa gracilis* is found in the mountains of Middle Asia (Nobis & Nowak, 2011; Nobis et al., 2013, 2014c). It occurs in southern Kazakhstan (Tian-Shan Mountains), Kyrgyzstan (Alai Mountains, Tian-Shan Mountains), northern Tajikistan (Pamir), and western China (Tian-Shan Mountains). Figure 3.

Stipa grafiana Steven, Bull. Soc. Imp. Naturalistes Moscou 30(2): 116. 1857. TYPE: [Ukraine.] Ekaterinosevash Prov., 1851, *Graff s.n.* (holotype, LE!). = **Stipa pulcherrima** K. Koch subsp. **pulcherrima**.

Stipa haussknechtii Boiss., Fl. Orient. [Boissier] 5(2): 501. 1884. TYPE: In rupibus calcareis montis Sawers Persiae occid. supra Gulbar, 9000 ft., July 1868, *Haussknecht s.n.* (holotype, G not seen; isotypes, JE!, W!, WU!). ≡ **Achnatherum haussknechtii** (Boiss.) M. Nobis, comb. nov.

Notes. Because of the lemma epidermis having a maize-like pattern, dominated by silica bodies and short fundamental cells (Fig. 7) typical for representatives of *Achnatherum* rather than *Stipa*, the transfer of *S. haussknechtii* to genus *Achnatherum* is needed. A similar pattern in the lemma epidermis is observed in *A. mandavillei* (Freitag) M. Nobis, comb. nov. (Fig. 7) [Basionym: *Stipa mandavillei* Freitag, Davis & Hedge Festschrift 118. 1989], which is known from Oman.

Stipa ×heptapotamica Golosk., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 19: 46. 1959, pro sp. (*S. lessingiana* Trin. & Rupr.

× *S. richteriana* Kar. & Kir.; Nobis et al., 2019c). TYPE: Yugo-zapadnye otrogi Dzhungarskogo Alatau, gory Chulak, Monga-sai, po severnym ostepennym sklonam [SW spurs of Dzhungarian Alatau, Chulak Mtns., Monga-sai, along southern slopes], 29 May 1955, *V. P. Goloskokov s.n.* [Typus!, I 1957, determ. V. P. Goloskokov] (lectotype, designated here, LE!; isolectotypes, LE! [3 sheets]).

Habitat. *Stipa* ×*heptapotamica* is found in steppe grasslands at 800–1500 m.

Distribution. *Stipa* ×*heptapotamica* is found in southeastern Kazakhstan (Dzhungarski Alatau, northern forelands of Tian-Shan Mountains; Goloskokov, 1959; Pazij, 1968; Tzvelev, 1976; Kotukhov, 2002; Gudkova et al., 2015; Nobis et al., 2019c). Figure 4.

Notes. *Stipa* ×*heptapotamica* was described by Goloskokov (1959) on the basis of one collection (southwestern spurs of Dzhungarskii Alatau, Chulak Mtns., Monga-sai, along southern slopes, 29 May 1955, *V. P. Goloskokov s.n.*) composed of four herbarium sheets and preserved at LE. In the description of the species, Goloskokov (1959) included information that the type is in LE; however, he did not select the holotype, but to the specimens he attached additional labels: Typus I, Typus II, and Typus III. The fourth specimen, which has the same label as the three mentioned above, was identified by Goloskokov as *S. richteriana* and redetermined by Tzvelev in 1972 as another isotype of *S. heptapotamica*. Tzvelev (1976) stated that the holotype and three isotypes of this species are preserved in LE, but he did not point out which one of these three specimens is the holotype. Because a holotype of *S.* ×*heptapotamica* was not formally chosen by the author of the species, according to the *International Code of Nomenclature* (McNeill et al., 2012; Turland et al., 2018), a lectotype needs to be designated. Thus the specimen with the above cited label and additional labels "Typus! I, 1957, determ. V.P. Goloskokov" is designated here as the lectotype.

Stipa himalaica Roshev., Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 5: 11. 1924. TYPE: [Pakistan.] Gilgit Exped., S of Hindukush, *Giles s.n.* (lectotype, designated by Tzvelev [1968: 55], LE 9269!; isolectotypes, E!, K!, WU!).

Habitat. *Stipa himalaica* is found in rocky ledges, grasslands, and screes at 2000–4000 m.

Distribution. *Stipa himalaica* is found in the mountains of central Asia (Pamir, Kunlun, Karakorum, Hindukush, Himalayas; Freitag, 1985; Dickoré, 1995; Nobis et al., 2013). In Middle Asia, it occurs in Afghanistan, western China, and Pakistan (Fig. 4).

Stipa ×hissarica M. Nobis, Pl. Syst. Evol. 299(7): 1345. 2013 (*S. lipskyi* Roshev. × *S. orientalis* Trin.; Nobis, 2013). TYPE: Dolina rzeki Iskanderdaria (Iskanderdaya River valley), Rejon Zerawszański B (Zeravshan Range B), Zachodni Tadżykistan (western Tajikistan), Pamir Alai Mtns., Zeravshan Mtns., high mtn. steppe, among stones, on the left slope of the Iskanderdarya River valley, ca. 0.8 km ESE of Serimadarun Lake (near Iskanderkul Lake), 39°05′04″N / 68°22′52″E, elev. 2320 m, inclination SW, slope 5° to 10°, 14 June 2011, *M. Nobis s.n.* (holotype, KRA!; isotypes, Herb. Stip. M. Nobis!, KRA).

Habitat. *Stipa* ×*hissarica* is found in high mountain steppes at 2250–2350 m.

Distribution. *Stipa* ×*hissarica* is found in Middle Asia (Nobis et al., 2013), specifically in Tajikistan (Zeravshan Mountains).

Stipa hohenackeriana Trin. & Rupr., Sp. Gram. Stipac. 80. 1842. TYPE: [Azerbaijan.] Transcaucasia, circa Shusha et Helenendorf (Kirovabad), *Hohenacker 1253* (holotype, LE!).

Notes. *Stipa hohenackeriana* is a species highly variable in morphology, and its taxonomic revision is needed. Here, we recognize two varieties within the species.

1. Leaves of vegetative shoots scabrous, rarely almost glabrous . . . . . *Stipa hohenackeriana* Trin. & Rupr. var. *hohenackeriana*

1′. Leaves of vegetative shoots pubescent . . . . . *Stipa hohenackeriana* var. *grossheimii* (Tzvelev) Tzvelev

Stipa hohenackeriana var. **hohenackeriana.**

Synonyms. = *Stipa pennata* L. var. *minor* Boiss., Fl. Orient. 5: 502. 1884, nom. illeg.; = *S. barbata* Desf. var. *seminudata* Hack., Denkschr. Kaiserl. Akad. Wiss., Wien. Math.-Naturwiss. Kl. 50: 8. 1885. TYPE: In collibus ad viam versus Dauletabad (Malayer), Polak 882 (holotype, W!); = *S. atriseta* Stapf ex Bor; = *S. subbarbata* B. Keller.

Habitat. *Stipa hohenackeriana* var. *hohenackeriana* is found in sandy and stony steppes, grasslands, fallows, and roadsides at 100–3000 m.

Distribution. *Stipa hohenackeriana* var. *hohenackeriana* is widely distributed from Asia Minor to central Asia (Tzvelev, 1976, 2006; Freitag, 1985; Wu & Phillips, 2006; Nobis et al., 2016b). In Middle Asia it specifically occurs in Afghanistan, China, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan.

Stipa hohenackeriana var. **grossheimii** (Tzvelev) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 16. 1974.

Basionym: *Stipa hohenackeriana* subsp. *grossheimii* Tzvelev, Novosti Sist. Vyssh. Rast. 3: 21. 1966. TYPE: Azerbaijan. Nakhichevanskaya ASSR, Norashenskii raion, otrogi g. Myunkh-Bala-Ogly, bliz sel. Ulya-Norashen [Nakhichevan, Norashen Distr., Myunkh-Bala-Ogly Mtns.], ca. 900 m, 15 May 1947, *A. A. Grossgeim, I. A. Ilinskaya & M. E. Kirpichnikov s.n.* (holotype, LE!; isotype, LE!).

Synonyms. = *Stipa hohenackeriana* Trin. & Rupr. subsp. *ordubadica* Tzvelev, Novosti Sist. Vyssh. Rast. 3: 22. 1966. TYPE: Ordubad region, kamenistyi sklon v nizhn. gornom poyase Zangezyrskogo khr. k vost. ot Ordubada, 6 June 1956, *T. Egorova, N. Tzvelev & S. Cherepanov s.n.* (holotype, LE!); ≡ *S. hohenackeriana* var. *ordubadica* (Tzvelev) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 16. 1974.

Habitat. *Stipa hohenackeriana* var. *grossheimii* is found in sandy and stony steppes at 400–2800 m.

Distribution. *Stipa hohenackeriana* var. *grossheimii* is distributed within the range of *S. hohenackeriana* var. *hohenackeriana*. In Middle Asia, it occurs in Afghanistan and Tajikistan (Pamir).

Stipa holosericea Trin., Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 1: 81. 1830. TYPE: [Iran, Azerbaijan.] In siccis montosis circa Badalan, 8 June 1829, *Szovits 410* (holotype, LE!).

Within the species, two varieties are recognized.

1. Adaxial surface of vegetative leaves covered with mixture of short and long hairs, lower sheaths of cauline leaves shortly pilose . . . . . *Stipa holosericea* Trin. var. *holosericea*

1′. Adaxial surface of vegetative leaves shortly pilose with mixture of longer hairs on marginal ribs, sheaths of lower cauline leaves glabrous . . . . . *Stipa holosericea* var. *transcaucasica* (Grossh.) M. Nobis

Stipa holosericea var. **holosericea**.

Habitat. *Stipa holosericea* var. *holosericea* is found in steppe grasslands at 1000–1500 m.

Distribution. *Stipa holosericea* var. *holosericea* is found in southwestern Asia (Freitag, 1985). In Middle Asia it occurs in northern Iran (Kopet-Dagh Mountains).

Stipa holosericea var. **transcaucasica** (Grossh.) M. Nobis, comb. & stat. nov. Basionym: *Stipa transcaucasica* Grossh., Trudy Bot. Inst. (Baku) 2: 245. 1936.

Synonyms. ≡ *Stipa holosericea* subsp. *transcaucasica* (Grossh.) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 14. 1974.

Habitat. *Stipa holosericea* var. *transcaucasica* is found in steppe grasslands at 800–1500 m.

Distribution. *Stipa holosericea* var. *transcaucasica* is found in southwestern Asia (Tzvelev, 1976; Freitag, 1985; Nikitin & Geldikhanov, 1988). In Middle Asia, it occurs in Turkmenistan (Kopet-Dagh Mountains).

Stipa ikonnikovii Tzvelev, Spisok Rast. Gerb. Fl. SSSR 21: 49. 1977. TYPE: Badachshan, ad ripam dextram fl. Gunt, Czartym, in lapidosis, 5 Aug. 1957, *S. Ikonnikov s.n.* [G. Ladygina, L. Sidorov] (holotype, LE!; isotypes, B!, JE!, KRAM!, MW!, TK!). ≡ **Stipa kirghisorum** P. A. Smirn. var. **ikonnikovii** (Tzvelev) M. Nobis.

Stipa iljinii Roshev., Izv. Bot. Sada Akad. Nauk SSSR 30: 294. 1932. TYPE: Semipalatinskii u., okr. pos. Znamenskogo, peschanaya kovylevaya step [Inter Semipalatense, in steppis arenosis stipaceis non procul a pago Snamenskoje], 6 July 1928, *M. Ijlin & O. Heinrichson 3867* (holotype, LE!; isotype, LE!). ≡ **Stipa zalesskii** Wilensky var. **iljinii** (Roshev.) Tzvelev.

Stipa inebrians Hance, J. Bot. 14: 212. 1876. TYPE: Hab. in montis Alashan, Mongoliae interioris, 1875, Herb. propr., *H. F. Hance 19204* (holotype, BM!; isotype, LE!). ≡ **Achnatherum inebrians** (Hance) Keng ex Tzvelev, Rast. Tsentr. Azii 4: 40. 1968.

Stipa iraquensis Martinovský, Preslia 42: 375. 1970. TYPE: [Iraq.] 40 km ad orientem a Rutba positus, 27 Apr. 1961, *Hadač 4375* (holotype, PR!). = **Stipa ×assyriaca** Hand.-Mazz.

Stipa iskanderkulica (Tzvelev) Czerep., Sosud. Rast. SSSR 387. 1981. Basionym: *Stipa caucasica* Schmalh. subsp. *iskanderkulica* Tzvelev, Novosti Sist. Vyssh. Rast. 11: 20. 1974. TYPE: Samarkand Distr., Iskanderkul, 21 May 1914, *V. Dubyanskii s.n.* (holotype, LE!). ≡ **Stipa drobovii** (Tzvelev) Czerep. var. **iskanderkulica** (Tzvelev) M. Nobis & A. Nowak.

Stipa jacquemontii Jaub. & Spach., Ill. Pl. Orient. 4: 60, pl. 339. 1851. TYPE: [India.] Ad rupes in excelsis Emodi Cashemyriani, 3000 m, Aug. 1831, *V. Jacquemont 994* (lectotype, designated here, P00753746!; isolectotypes, P00753747!, P00753745!, K000032095!). ≡ **Achnatherum jacquemontii** (Jaub. & Spach.) P. C. Kuo & S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 323. 1987; = *Achnatherum botschantzevii* Tzvelev, Novosti Sist. Vyssh. Rast. 11: 4. 1974. TYPE: Asia Media, jugum Alaicum, inter fl. Isfara et Soch, angustium Kara-kulj austro-occidentaliter versus a pag. Karabulak in rupibus calcareis, 15 July 1962, *V. Botschantzev s.n.* (holotype, LE!).

Notes. Because a holotype of *Stipa jacquemontii* was not chosen formally by the authors of the species,

according to the *International Code of Nomenclature* (McNeill et al., 2012; Turland et al., 2018), a lectotype needs to be designated. Thus, the herbarium sheet with specimens of *S. jacquemontii*, and the label mentioned above including number P00753746, is designated here as the lectotype.

Based on revised herbarium material of *Achnatherum botschantzevii* collected from Kyrgyzstan and Uzbekistan (northern part of the Alai Mountains) and preserved at JE, KRA, and LE, we find this taxon conspecific with previously described *A. jacquemontii* (Nobis et al., unpubl.). The locality of this species in the Alai Mountains is the northernmost within the range of *A. jacquemontii*.

Stipa jagnobica Ovcz. & Czukav., Izvest. Otdel. Estestven. Nauk Akad. Nauk Tadzhik. SSR 17: 51. 1956 [1957]. TYPE: [Tajikistan.] Northern slope of the Hissar Mtns., 5 km S of Takfon, 2600 m, 4 June 1949, *Grigorev s.n.* (holotype, LE!; isotype, TAD!). ≡ **Stipa richteriana** Kar. & Kir. subsp. **jagnobica** (Ovcz. & Czukav.) Tzvelev.

Stipa ×kamelinii Kotukhov, Turczaninowia 1(1): 10. 1998 (*S. orientalis* Trin. × *S. lessingiana* Trin. & Rupr.; Nobis & Gudkova, 2016). TYPE: Saur-Tarbagataj, praemontium boreali-occidentale juge Sajkan, in denudationibus tertiariis Akseir, jugi parvi declivitas aqua erosa australi-occidentalis, in glareoso-argillosis, 9 June 1992, *Ju. Kotuchov s.n.* (holotype, LE!; isotypes, KRA 436045!, KRA 436046!, KUZ! [9 sheets]).

Habitat. *Stipa ×kamelinii* is found in steppe grasslands at 1200–1500 m.

Distribution. *Stipa ×kamelinii* is found in eastern Kazakhstan (Tarbagatai Mountains; Kotukhov, 2002; Nobis & Gudkova, 2016).

Notes. Morphologically, *Stipa ×kamelinii* is similar to *S. ×zaissanica* Kotukhov, which grows in the southern Altai Mountains; however, they differ in the length of the ligules of the vegetative shoots, which are 0.3–1(–1.3) mm versus (0.5–)3–6.5(–7.5) mm long, and the length of hairs on the seta, which are 3.3–4 mm versus 2.3–3.6 mm, respectively (Nobis & Gudkova, 2016). Kotukhov (1991, 1998a) supposed that *S. kamelinii* arised as the result of the hybridization of *S. orientalis* and *S. ×zaissanica*, whereas *S. zaissanica* is a hybrid of *S. orientalis* and *S. hohenackeriana*. In our opinion it seems unlikely that *S. ×kamelinii* originated from a backcrossing of *S. ×zaissanica* and *S. orientalis*, since the ligules on the vegetative shoots of *S. ×kamelinii* are much shorter than those in both putative parental species (Nobis & Gudkova, 2016).

Stipa karakabinica Kotukhov, Bot. Zhurn. (Moscow & Leningrad) 79(7): 105. 1994. TYPE: Altaj Australis, jugum Tarbagatai, depressio Karakabinica, elev. 1800 m, moraenae clausae, declivitas substepposa cum Sibiraea altaiensis, 18 Aug. 1986, *Ju. Kotuchov s.n.* (holotype, LE!; isotypes, KRA 451780! [earlier designated by Nobis & Gudkova, 2016: 34, as the lectotype], KRA 436020!, KRA 436022!, KRA 436024!, KRA 436027!, KUZ! [4 sheets], LE! [2 sheets]).

Habitat. *Stipa karakabinica* is found in steppe grasslands at 1700–1800 m.

Distribution. In Middle Asia *Stipa karakabinica* is found in eastern Kazakhstan (Tarbagatai Mountains; (Kotukhov, 2002; Nobis & Gudkova, 2016).

Notes. Although Kotukhov (1994) indicated the LE herbarium as the place of the holotype, we were not able to find it there during our research in 2008–2015 (Nobis & Gudkova, 2016), thus the lectotype of the species was designated from Kotukhov's original collection, which is preserved at KRA and KUZ. However, in December 2016 we found in LE three sheets with specimens of *S. karakabinica*, with one of them being the holotype. *Stipa karakabinica* is similar to *S. capillata* and *S. austroaltaica* known from Altai Mountains (Nobis & Gudkova, 2016), and probably both taxa mentioned above are conspecific with *S. capillata*. Taxonomic revision of this group of taxa is required.

Stipa karataviensis Roshev., Trudy Pochv.-Bot. Eksped. Izsl. Kolon. Raionov Aziatsk. Rossii, Chast'II, Bot. Izsl. 6: 186. 1912. TYPE: Kazakhstan. Syr-Darin. obl.: Aulie-atinskii uezd 23 mai, uschele Berk-kara (Karatau), no. 310, Iter ad distr. Aulie-ata, 1909, *Z. von Minkwitz s.n.* (lectotype, designated by Nobis [2013: 1329], LE!; isolectotypes, LE!, W 35652!).

Habitat. *Stipa karataviensis* is found in steppe grasslands at 700–1300 m.

Distribution. *Stipa karataviensis* is found in Middle Asia (Pazij, 1968; Tzvelev, 1976; Nobis, 2010, 2013; Gonzalo et al., 2012), specifically in southern Kazakhstan (Tian-Shan Mountains: Karatau, Dzhambyl, and Chu-Illinskie Mountains) and Uzbekistan (Nuratau and Aktau Mountains). Figure 4.

Stipa kazachstanica Kotukhov, Bot. Zhurn. (Moscow & Leningrad) 79: 104. 1994. TYPE: Saur-Tarbagatai, praemontia australi-occidentalia jugi Manrak, locus Sarybulak, clivulus schistosus australi-orientalis, 12 June 1992, *Ju. Kotuchov s.n.* (holotype, LE!; isotypes, LE!, KRA 436018!, KUZ! [2 sheets]). ≡

Stipa macroglossa P. A. Smirn. subsp. **kazachstanica** (Kotukhov) M. Nobis.

Stipa kempirica Kotukhov, Bot. Zhurn. (Moscow & Leningrad) 79(7): 101. 1994. TYPE: Saur-Tarbagatai, brachia australi-occidentalia jugi Manrak, elev. 600 m, locus Kempirbulak, clivulus lapidosus orientalis, 11 July 1992, *Ju. Kotuchov s.n.* (lectotype, designated by Nobis & Gudkova [2016: 34], LE!; isolectotypes, KRA 436044!, KUZ!, LE!).

Habitat. *Stipa kempirica* is found in steppe grasslands at ca. 500–600 m.

Distribution. *Stipa kempirica* is found in eastern Kazakhstan (Tarbagatai Mountains; Kotukhov, 2002; Nobis & Gudkova, 2016).

Notes. This taxon is probably of hybrid origin; further studies are required to identify its parental species.

Stipa kirghisorum P. A. Smirn., Repert. Spec. Nov. Regni Veg. 21: 232–233. 1925. TYPE: Semipalatinskaya obl., Bokai, *Kossinskii s.n.* (holotype, MW!). EPITYPE: Semipalatinskaya obl., Semipalatinskii uezd, Chingiz, zapadnaya chast' gory Karagian-koi-tas, krutoi kamenistyi sklon gory, 1 July 1914, *C. Kossinsky 607* (epitype, designated by Nobis et al. [2016a: 151], LE!).

Within the species three varieties are recognized.

1. Awn glabrous or scabrous on column and plumose on seta 2
1′. Awn pilose throughout . . . . . *Stipa kirghisorum* P. A. Smirn. var. *balkhashensis*
2. Ventral line of hairs on the anthecium terminating 0.3–1.0 mm below the top, adaxial surface of vegetative leaves with hairs 0.15–0.35 mm long . . . . . *Stipa kirghisorum* var. *ikonnikovii* (Tzvelev) M. Nobis
2′. Ventral line of hairs on the anthecium terminating 1–3(–4.6) mm below the top, adaxial surface of vegetative leaves covered with prickles up to 0.1 mm long, sometimes with mixture of longer hairs . . . . . *Stipa kirghisorum* var. *kirghisorum*

Stipa kirghisorum var. **kirghisorum.**

Synonyms. ≡ *Stipa pennata* L. subsp. *kirghisorum* (P. A. Smirn.) Freitag, Notes Roy. Bot. Gard. Edinburgh 42: 438. 1985; = *S. violacea* Nikitina, hom. illeg.; ≡ *S. nikitinae* Tzvelev; ≡ *S. kirghisorum* P. A. Smirn. var. *violacea* Tzvelev, Novosti Sist. Vyssh. Rast. 11: 18. 1974.

Habitat. *Stipa kirghisorum* var. *kirghisorum* is found in high mountain steppes, grasslands, screes, and low scrubs at 350–3200 m.

Distribution. *Stipa kirghisorum* var. *kirghisorum* is widely distributed in central Asia (Gonzalo et al., 2013; Nobis et al., 2016a). In Middle Asia, it occurs in Afghanistan, China, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, and Uzbekistan.

Stipa kirghisorum var. **ikonnikovii** (Tzvelev) M. Nobis, comb. & stat. nov. Basionym: *Stipa ikonnikovii* Tzvelev., Spis. Rast. Gerb. Fl. SSSR 21(111–114): 49. 1977.

Habitat. *Stipa kirghisorum* var. *ikonnikovii* is found in high mountain steppes and grasslands at 2000–2400 m.

Distribution. *Stipa kirghisorum* var. *ikonnikovii* is found in Middle Asia, specifically in eastern Tajikistan (Pamir Mountains; Tzvelev, 1977; Ikonnikov, 1979).

Stipa kirghisorum var. **balkhashensis** M. Nobis & P. D. Gudkova, var. nov. TYPE: steppe grassland, near the rd., near NW part of Balkhash Lake, 25 km W of Balkhash City, 46°48′04″N / 74°41′30″E, alt. 360 m, wp. 251, 22 May 2014, *M. Nobis & P. Gudkova s.n.* (holotype, KRA 432672!; isotype, KRA 426156!). Figure 3.

Diagnosis. *Stipa kirghisorum* P. A. Smirn. var. *balkhashensis* M. Nobis & P. D. Gudkova differs from *S. kirghisorum* var. *kirghisorum* only in having awns with shortly pubescent (covered with 0.3–1 mm long hairs) versus glabrous and smooth columns.

Habitat. *Stipa kirghisorum* var. *balkhashensis* is found in steppe grasslands at ca. 350–400 m.

Distribution. *Stipa kirghisorum* var. *balkhashensis* is found in Middle Asia, specifically in Kazakhstan (near northwest part of Balkhash Lake).

Notes. See comments under *Stipa borysthenica* var. *anomala*.

Stipa koenigii Woronow, Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 5: 61. 1924. TYPE: Culta in sectione caucasica Horti Tiflisiensis e seminbus a cl. E. Koenig e distr. Olty prov. Kars a. 1906 allatis, *Yu. Woronow s.n.* (holotype, LE!). = **Stipa arabica** Trin. & Rupr. var. **turgaica** (Roshev.) Tzvelev.

Stipa ×kolakovskyi Tzvelev, Bot. Zhurn. (Moscow & Leningrad) 78(10): 93. 1993. TYPE: Norashenskii r-n, na kholmakh okolo sel. Diza, na sev. sklone, 4 June 1947, *A. Grossheim, I. Ilinskaya, M. Kirpichnikov & Gerb. Fl. SSSR 3666* (holotype, LE!). = **Stipa ×assyriaca** Hand.-Mazz.

Stipa kopetdaghensis Czopanov, Novosti Sist. Vyssh. Rast. 6: 22. 1970. TYPE: Central Kopetdag Mtns., western slope, near the top of Dushak Mtn., 30 July 1967, *P. Czopanov s.n.* (holotype, ASH not seen; isotype, LE!). = **Stipa ×alaica** Pazij.

Stipa korshinskyi Roshev., Fl. Aziat. Ross. 1(12): 163, t. 11. 5, 5a. 1916. TYPE: Kazakhstan. Akmolinskaya obl., Atbasarskii u., tipchakovo-kovyl'naya step v okr. st. Atbasarskoi, 30 May 1908, no. 2, *V. Kapelkin s.n.* (lectotype, designated by Tzvelev [1976: 578], LE!).

Habitat. *Stipa korshinskyi* is found in steppes and grasslands at 300–1000 m.

Distribution. *Stipa korshinskyi* is found in Kazakhstan (Aral-Caspian and Balkhash regions) and southern Russia (southern Ural, Transvolga, western Siberia; Tzvelev, 1976; Punina & Gudkova, 2016). In Middle Asia, it occurs in central Kazakhstan (around Balkhash Lake).

Notes. Because of its shortly pilose awns, with hairs on the seta 0.3–0.5 mm long, *Stipa korshinskyi* is similar to *S. richteriana* s.l. However, the latter taxon differs from *S. korshinskyi* by having straight setae, up to 5 cm long versus setae more or less flexuous and longer than 5 cm; callus (0.5–)0.6–1.1 mm long and bent versus callus 1.3–1.8 mm long and straight. The possibility should not be excluded that *S. korshinskyi* originated from hybridization between *S. sareptana* and *S. richteriana* subsp. *richteriana*. Further studies are needed to evidence this; however, during field studies in Kazakhstan in 2019, we found two small populations of *S. korshinskyi* growing within populations of the two species mentioned above.

New records. KAZAKHSTAN. Northern part of Dzhungarskii Alatau, N Tian-Shan, ca. 10 km NEE of Saryozek, NE of Almaty, steppe, 44°23′06″N / 78°05′52″E, 936 m, wp. 1254, 27 May 2019, *M. Nobis s.n.* (KRA); 63 km NW of Usharal, E of Balkhash Lake, steppe, 46°31′32″N / 80°17′29″E, 404 m, wp. 1226, 23 May 2019, *M. Nobis s.n.* (KRA).

Stipa kotuchovii M. Nobis, Ann. Bot. Fenn. 48: 494. 2011 [replaced synonym: *Stipa monticola* Kotukhov, hom. illeg.]. TYPE: Saur-Tarbagataj, brachia austro-occidentalia jugi Saur, in viciniis hibernaculi Kyzylkija, elev. 1700 m, declivitas australi-orientalis, 18 Aug. 1992, *Ju. Kotuchov s.n.* (holotype, LE!; isotypes, KRA 436032!, KRA 435918!, KRA 436039!, KRA 436040!, KUZ! [2 sheets]).

Habitat. *Stipa kotuchovii* is found in steppe grasslands at 1600–1700 m.

Distribution. *Stipa kotuchovii* is found in Middle Asia (Kotukhov, 2002; Nobis & Gudkova, 2016), specifically in eastern Kazakhstan (Tarbagatai Mountains).

Notes. *Stipa kotuchovii* is very similar to *S. sczerbakovii* Kotukhov, and most probably it should be treated as conspecific with the latter taxon. Kotukhov (1998a) distinguished it from *S. sczerbakovii* by its longer anthecium (9.5–11.5 vs. 8.5–9 mm long), shorter awn (7–9 vs. 9–10 mm long), and vegetative leaves (adaxial surface covered by mixture of short and long hairs vs. adaxial surface covered only by short hairs). However, in accordance with the results of our revision, variability of particular characters of *S. sczerbakovii* is much greater than was detailed in the protologue (see comment under *S. sczerbakovii*). Because both of these taxa probably have a hybrid origin, taxonomical revision using molecular methods is needed.

Stipa krascheninnikowii Roshev., Mat. Komiss. Eksped. Issl. Akad. Nauk, Ser. Kazakst. 5: 253. 1928. TYPE: Aktyubinskaya obl., bass. Khobdy, sklon k Tamde, kovylno-raznotravnaya step, 7 July 1926, *I. Ilin & I. Avramchik 297* (lectotype, designated by Tzvelev [1976: 588], LE!). = **Stipa ucrainica** P. A. Smirn.

Stipa krylovii Roshev., Izv. Glavn. Bot. Sada S.S.S.R. 28: 379. 1929. TYPE: Selenginskaya Dauriya, gory mezhdu Temnikom i Dzhidoi, yugo-zapadnaya chast khr. Borgoiskogo, na sklonakh so stepnoi rastitelnostyu, 28 July 1912, *V. Smirnov 524* (lectotype, designated by Tzvelev [1976: 581], LE!).

Synonyms. ≡ *Stipa sareptana* A. K. Becker subsp. *krylovii* (Roshev.) D. F. Cui, Fl. Xinjiangensis 6: 299. 1996; ≡ *S. sareptana* var. *krylovii* (Roshev.) P. C. Kuo & Y. H. Sun, Fl. Reipubl. Popularis Sin. 9(3): 275. 1987; = *S. capillata* L. var. *coronata* Roshev., Fl. Aziat. Ross. 12: 168. 1916. TYPE: LE!; = *S. densiflora* P. A. Smirn.; = *S. densa* P. A. Smirn.; = *S. decipiens* P. A. Smirn.

Habitat. *Stipa krylovii* is found in steppes, screes, and sandy and rocky grasslands at 500–3500 m.

Distribution. *Stipa krylovii* is widely distributed in central Asia. Its occurrence is known in Russia, Mongolia, China, Kazakhstan, Kyrgyzstan, Tajikistan, India, and Nepal (Pazij, 1968; Tzvelev, 1968, 1976; Freitag, 1985; Wu & Phillips, 2006; Nobis et al., 2016c; Gudkova et al., 2017a, 2017b). In Middle Asia it occurs in China, eastern Kazakhstan (Tarbagatai Mountains, Tian-Shan Mountains), Kyrgyzstan (central Tian-Shan Mountains), and Tajikistan (Pamir). Figure 8.

Stipa kuhitangi Drobow, Fl. Uzbekist. 1: 537. 1941. TYPE: Greben Kugitanga protiv s. Kyzyl-alma, 27 June 1927, *M. G. Popov 157* (holotype, TASH 47030!). = **Stipa richteriana** Kar. & Kir. var. **richteriana**.

Stipa kungeica Golosk., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 16: 39. 1954. ≡ **Stipa macroglossa** P. A. Smirn. var. **kungeica** (Golosk.) M. Nobis.

Stipa kyzylkiensis Kotukhov, Turczaninowia 1(2): 12–13. 1998. TYPE: Saur-Tarbagataj, jugum Saur, in regione hibernacula Kyzylkija, declivitas australi-

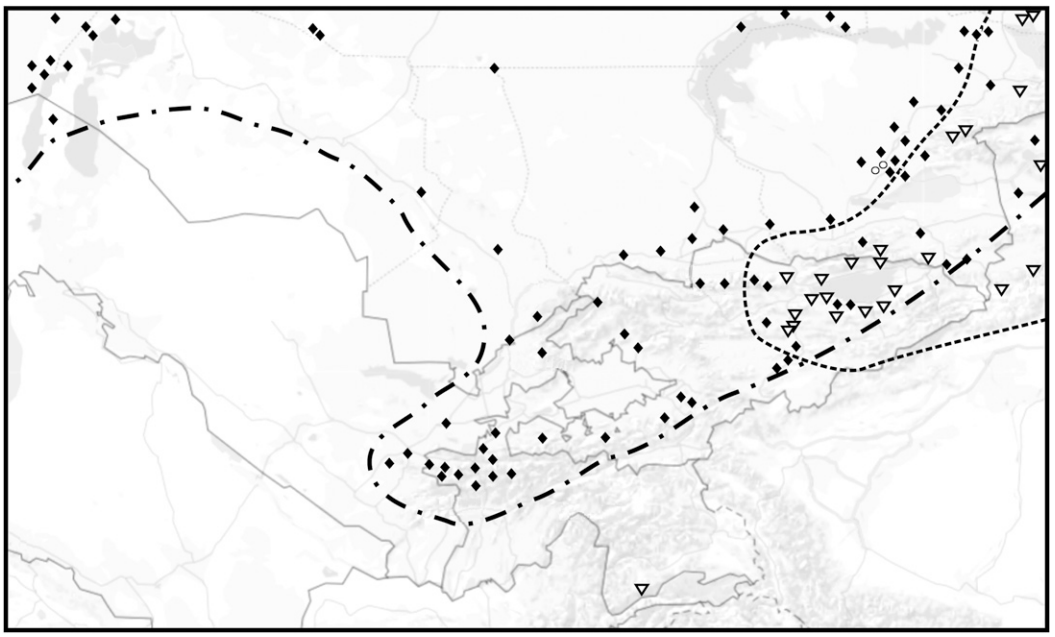

Figure 8. Distribution maps. *Stipa krylovii* Roshev. (∇) and *S. sareptana* A. K. Becker (♦).

orientalis lapidosa, 17 July 1993, *Ju. Kotuchov s.n.* (lectotype, designated by Nobis & Gudkova [2016: 35], LE!; isolectotypes, KRA 436041!, KRA 436042!, KUZ! [6 sheets], LE! [2 sheets]). = **Stipa sczerbakovii** Kotukhov.

Stipa langshanica (Y. Z. Zhao) Y. Z. Zhao, Acta Sci. Nat. Univ. Neimenggu. 27(2): 211. 1996. TYPE: China. Nei Monggol, Bayannaoermen, Langshan, in clivis, 4 July 1988, *Zhao et al. 4077* (holotype, HIMC not seen). = **Stipa glareosa** P. A. Smirn.

Stipa laxiflora Keng, Sunyatsenia 6(1): 73. 1941. TYPE: [China.] Kansu [Gansu] Prov., 17 Oct. 1934, *C. W. Yao 562* (Herbarium of the Biological Laboratory, the Science Society of China no. 49597, not seen). = **Stipa penicillata** Hand.-Mazz. [syn. after Tzvelev, 1968].

Stipa lessingiana Trin. & Rupr., Sp. Gram. Stipac. 79. 1842. TYPE: "*Stipa pennata* L.," Orenburg Gubern., 1834, *Lessing 413* (holotype, LE Herbarium Trinii 1413.1!).

1. Sheaths of cauline leaves glabrous . . . . *Stipa lessingiana* Trin. & Rupr. var. *lessingiana*
1′. Sheaths of cauline leaves pubescent . . . . *Stipa lessingiana* var. *brauneri* (Pacz.) Roshev.

Stipa lessingiana var. **lessingiana.**

Synonyms. = *Stipa saikanica* Kotukhov.

Habitat. *Stipa lessingiana* var. *lessingiana* is found in mountain steppes, grasslands, rocks, and gravelly slopes at 300–1500 m.

Distribution. *Stipa lessingiana* var. *lessingiana* is a widely distributed species. Its range extends from eastern Europe (Greece, Bulgaria, Romania, Ukraine) through Turkey, Georgia, Armenia, Azerbaijan, Iran, Kazakhstan, and southern Russia up to western China (Pazij, 1968; Tzvelev, 1968, 1976; Klokov & Osychnyuk, 1976; Martinovský, 1980; Freitag, 1985; Nobis et al., 2019a). In Middle Asia, it occurs in China, Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. Figure 9.

Stipa lessingiana var. **brauneri** (Pacz.) Roshev., Fl. URSS 2: 93. 1934. Basionym: *Stipa lessingiana* Trin. & Rupr. subsp. *brauneri* Pacz., Zap. Krymsk. Obsch. Estestvoips. 5: 4. 1916. TYPE: Tauria, penins, Tarchankut, prope Ak-Meczet, 30 Apr. 1914, *A. Brauner s.n.* (holotype, LE!).

Synonyms. ≡ *Stipa brauneri* (Pacz.) Klokov.

Habitat. *Stipa lessingiana* var. *brauneri* is found in steppes and grasslands at 300–1000 m.

Distribution. *Stipa lessingiana* var. *brauneri* was noted within the range of the nominal variety (Ukraine, Kazakhstan, southwestern Russia, Georgia; Tzvelev, 1976, 2006; Klokov & Osychnyuk, 1976). In Middle Asia it occurs in Kazakhstan.

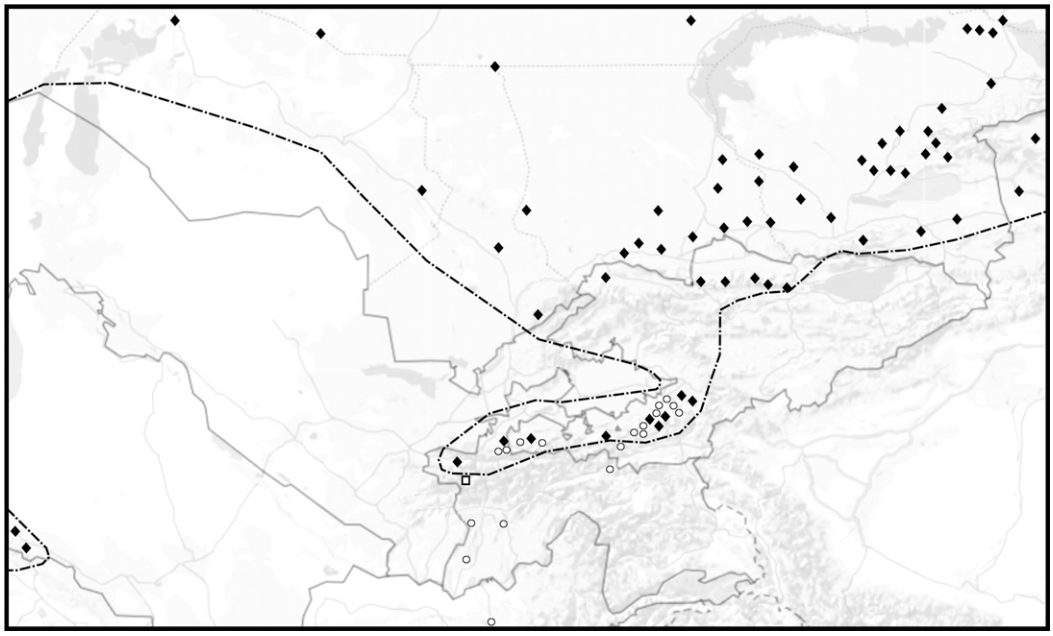

Figure 9. Distribution maps. *Stipa lessingiana* Trin. & Rupr. (♦), *S. margelanica* P. A. Smirn. (○), and *S.* ×*pseudomacroglossa* M. Nobis (□).

Stipa lingua A. Junge, Bull. Jard. Bot. Petersb. 10: 129. 1910. TYPE: [Turkmenistan.] Flora turkomanica, prope Germab, 30 May 1889, *A. Antonov* (holotype, LE!; isotype, LE!, MW!).

Synonyms. = *Stipa lingua* A. Junge fo. *brevifolia* Roshev., Fl. Aziat. Ross., 12: 146. 1916. TYPE: Tajikistan. Schugnan, Šachdary Valley, betw. Drum Dar River & Chay-Kil River, 26 July 1914, *Tuturin & Bessedin 371* (lectotype, designated by Gonzalo et al. [2011: 415], LE!); = *S. platypoda* Bor.

Habitat. *Stipa lingua* is found in mountain steppes, grasslands, deserts, screes, and gravelly slopes at 1000–2600 m.

Distribution. *Stipa lingua* is found in the southern part of Middle Asia (Freitag, 1985; Gonzalo et al., 2012). It also occurs in Afghanistan, Iran, Tajikistan, Turkmenistan, and Uzbekistan. Figure 3.

Stipa lipskyi Roshev., Fl. Aziat. Ross. 12: 153, pl. 10, f. 5, 5a. 1916. TYPE: [Middle Asia.] Srednyaya Aziya, Samarkand obl., Samarkand, 27 May 1897, *V. I. Lipskii 4530* (lectotype, designated by Tzvelev [1976: 594], LE!; isolectotypes, K!, MW!).

Within the species two varieties are recognized.

1. Upper cauline sheaths glabrous to slightly scabrous . . . . . *Stipa lipskyi* Roshev. var. *lipskyi*
1′. Upper cauline sheaths pilose along the veins . . . . . *Stipa lipskyi* var. *pilosivaginata* M. Nobis

Stipa lipskyi var. **lipskyi.**

Synonyms. ≡ *Stipa lingua* A. Junge subsp. *lipskyi* (Roshev.) R. Gonzalo, Ann. Bot. Fenn. 48(2): 159. 2011.

Habitat. *Stipa lipskyi* var. *lipskyi* occurs in mountain steppes, grasslands, deserts, and gravelly slopes at 300–2400 m.

Distribution. *Stipa lipskyi* var. *lipskyi* is found in Middle Asia (Nobis, 2013) in Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan.

Stipa lipskyi var. **pilosivaginata** M. Nobis, Pl. Syst. Evol. 299(7): 1338. 2013. TYPE: Tajikistan. Zeravshan Mtns., high mtn. steppe, on the left slope of Fan River valley, near the N part of Zeravshan II settlement, 39°11′46″N / 68°32′04″E, alt. 1750 m, exp. NE, slope 30° to 50°, no. 5, 16 June 2012, *M. Nobis s.n.* (holotype, KRA 383077!; isotypes, Herb. Stip. M. Nobis!, KRA!, KRAM!).

Habitat. *Stipa lipskyi* var. *pilosivaginata* is found in arid, high mountain steppes at 1700–1800 m.

Distribution. *Stipa lipskyi* var. *pilosivaginata* is found in Tajikistan (Zeravshan Mountains; Nobis, 2013).

Stipa litwinowiana P. A. Smirn. ex Pavlov & Lipsch., Sovietsk. Bot. 19. 1934. Replaced synonym: *Oryzopsis turcomanica* Roshev., Fl. Aziat. Ross. 12: 184. 1916. TYPE: Turcomania, in montibus supra Firuza prope Chan-Jaila, 1200 m, 18 July 1897, *D. Litwinov 184a* (holotype,

LE!). ≡ **Achnatherum turcomanicum** (Roshev.) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 6. 1974.

Stipa longiplumosa Roshev. ex Kom., Fl. URSS 2: 87–88. 1934. TYPE: Khrebet Sarsaryak,vostochnyi sklon okrestnosti kishl. Margak, kholmy nizhe Margaka, v 2–3 km ot nego na Yu-V, no. 227, 7 June 1932, *N. Gontscharow, G. Grigorjev & V. Nikitin s.n.* (lectotype, designated by Nobis [2013: 1332], LE!; isolectotypes, LE!).

Habitat. *Stipa longiplumosa* is found in mountain steppes, grasslands, deserts, and gravelly slopes at 900–1500 m.

Distribution. *Stipa longiplumosa* is found in Middle Asia (Nobis, 2013), specifically in Kyrgyzstan, Tajikistan, and Uzbekistan (Fig. 4).

Notes. *Stipa longiplumosa*, with its description in Russian, was published by Roshevitz (1934) who referenced its Latin description to another publication (Acta Inst. Bot. Acad. Sci. URSS 2[2]. 1934). However, the Latin description of the species was not actually published until two years later in 1936 (Roshevitz, 1936; Nobis, 2013).

Stipa macroglossa P. A. Smirn., Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 5: 47. 1924. TYPE: I. M. Krasheninnikov [sic]: Ekspeditsiya v Turgaiskii uezd 1914 g., no. 5203, Turgaiskaya obl. i u. Kizildzhingilskaya volost, r. Sary-su v svoikh nizovyakh, Okrestnosti Muyun-kumov, Obnazhenie tretichnykh peschanikov, 1 June 1914, *H. Krascheninnikov s.n.* [sic] (lectotype, designated by M. Nobis in Nobis et al. [2014a: 84], LE!; isolectotypes, LE! [3 sheets]).

Stipa macroglossa subsp. **macroglossa.**

Synonyms. ≡ *Stipa turkestanica* Hack. subsp. *macroglossa* (P. A. Smirn.) R. Gonzalo, Syst. Bot. 38: 370. 2013.

Within the taxon two varieties are recognized.

1. Sheaths of cauline leaves glabrous . . . . *Stipa macroglossa* P. A. Smirn. var. *macroglossa*
1′. Sheaths of cauline leaves pubescent . . . . . *Stipa macroglossa* var. *pubescens* (P. A. Smirn.) M. Nobis

Stipa macroglossa P. A. Smirn. var. **macroglossa.**

Habitat. *Stipa macroglossa* var. *macroglossa* is found in mountain steppes, grasslands, and screes at 1100–2400 m.

Distribution. *Stipa macroglossa* var. *macroglossa* is found in Middle Asia (Gonzalo et al., 2013; Nobis et al., 2016a), specifically southern Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan.

Stipa macroglossa var. **pubescens** (P. A. Smirn.) M. Nobis, Pl. Syst. Evol. 302: 151. 2016a. Basionym: *Stipa macroglossa* fo. *pubescens* P. A. Smirn., Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 5: 48. 1924. TYPE: Semirech. obl., Przhev. u. Ur. Toguztorau, terrasy prav. stor. r. Kugart, 9 June 1913, *V. Sapozhnikov 35* (lectotype, designated by Nobis et al. [2016a: 151], LE!; isolectotype, LE!).

Habitat. *Stipa macroglossa* var. *pubescens* is found in mountain steppes at 1500–2000 m.

Distribution. *Stipa macroglossa* var. *pubescens* is found in Middle Asia (Nobis et al., 2016a) in southern Kazakhstan and Tajikistan.

Stipa macroglossa subsp. **kazachstanica** (Kotukhov) M. Nobis, Pl. Syst. Evol. 299: 1352. 2013. Basionym: *Stipa kazachstanica* Kotukhov, Bot. Zhurn. (Moscow & Leningrad) 79: 104. 1994.

Within the taxon two varieties are recognized.

1. Awn glabrous or scabrous on column and plumose on seta . . . . . *Stipa macroglossa* P. A. Smirn. var. *kazachstanica* (Kotukhov) M. Nobis
1′. Awn pilose throughout . . . . *Stipa macroglossa* var. *kungeica* (Golosk.) M. Nobis

Stipa macroglossa var. **kazachstanica** (Kotukhov) M. Nobis, comb. & stat. nov. Basionym: *Stipa kazachstanica* Kotukhov, Bot. Zhurn. (Moscow & Leningrad) 79: 104. 1994.

Habitat. *Stipa macroglossa* var. *kazachstanica* is found in mountain steppes, grasslands, and screes at 1000–2800 m.

Distribution. *Stipa macroglossa* var. *kazachstanica* is found in the mountains of central Asia (Kotukhov, 2002; Nobis et al., 2016a, 2016b). In Middle Asia, it occurs in western China, eastern Kazakhstan, and Kyrgyzstan. Figure 3.

Stipa macroglossa var. **kungeica** (Golosk.) M. Nobis, comb. & stat. nov. Basionym: *Stipa kungeica* Golosk., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk. S.S.S.R. 16: 39. 1954. TYPE: [Kazakhstan.] Severnye otrogi Kungei-Alatau, Tau-Chilik, v 1 km nizhe vpadeniya r. Kaindy, po yuzhnomu kamenistomu sklonu pestrotsvetnykh tolysch [northern spurs of Kungei Alatau, Tau-Chilik, 1 km below the fall of Kainda, along southern stony slopes], 9 June 1953, *V. P. Goloskokov s.n.* ["TYPUS I, *V. Goloskokov*" and "*Stipa kingeica* m. Typus!, II [Feb.] 1954, determ. V. P. Goloskokov"] (lectotype, designated here, LE!; isolectotypes, AA!, LE! [2 sheets]).

Habitat. *Stipa macroglossa* var. *kungeica* is found in steppes and grasslands at 1000–1500 m.

Distribution. *Stipa macroglossa* var. *kungeica* is found in Middle Asia (Goloskokov, 1954; Pazij, 1968; Tzvelev, 1976), specifically in Kazakhstan (Dzhungarski Alatau).

Notes. *Stipa macroglossa* var. *kungeica* is known only from the type collection. Morphologically it is close to *S. macroglossa* var. *kazachstanica*, but differs in having pubescent (vs. glabrous) awn columns. *Stipa kungeica* was described by Goloskokov (1954) on the basis of one collection (1 km below the fall of Kainda, along southern stony slopes, 9 June 1953, *V. P. Goloskokov s.n.*) that is preserved on four sheets, three at LE and one at AA. In the description of the species, Goloskokov (1954) included information that the type is preserved at LE. However, he did not indicate the holotype, but to the specimens he attached additional labels: Typus I, Typus II, and Typus III. Tzvelev (1976) stated that the holotype and two isotypes of this species are preserved at LE, but he did not point out which one of these three specimens was the holotype. Because the holotype of *S. kungeica* was not formally chosen by the author of the species, according to the *International Code of Nomenclature* (McNeill et al., 2012; Turland et al., 2018), the lectotype needs to be designated. Thus the specimen with the above cited label and two additional labels, "TYPUS I, *V. Goloskokov*." and "*Stipa kingeica* m. Typus!, II 1954, determ. *V. P. Goloskokov*," is designated here as the lectotype.

Stipa maeotica Klokov & V. V. Osychnyuk, Novosti Sist. Vyssh. Nizsh. Rast. 1975: 60–61. 1976. TYPE: [Ukraine.] Donetskaya obl., Novoazovskii r-n, Khomutovskaya step, 11 June 1955, *F. Grin s.n.* (holotype, KW; isotype, LE!). = **Stipa zalesskii** Wilensky var. **zalesskii**.

Stipa magnifica A. Junge, Bull. Jard. Bot. Petersb. 10: 128. 1910. TYPE: Turkestania, Prov. Fergana, Distr. Osch, prope Gulcza, 7 June 1900, *W. Transchel s.n.* (holotype, LE!; isotypes, LE!, MW!).

Synonyms. ≡ *Stipa lingua* A. Junge subsp. *magnifica* (A. Junge) R. Gonzalo, Ann. Bot. Fenn. 48(2): 160. 2011; ≡ *S. caucasica* Schmalh. var. *tranzschelii* Drobow, Repert. Spec. Nov. Regni Veg. 21: 37. 1925. TYPE: probably the same as for *Stipa magnifica*; = *S. barbata* Desf. var. *platyphylla* Hack., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 55: 163. 1903. TYPE: Kyrgyzstan. Alai Mtns., Sufi Kurgan, 18 July 1898, *Paulsen 407* (holotype, C not seen, syn. after Gonzalo et al. 2011).

Habitat. *Stipa magnifica* is found in mountain steppes, grasslands, and screes at 600–1900 m.

Distribution. *Stipa magnifica* occurs in Middle Asia (Tzvelev, 1976; Gonzalo et al., 2012; Nobis, 2012; Lazkov & Sultanova, 2014), specifically in southwestern Kyrgyzstan (Fig. 3).

Stipa ×manrakica Kotukhov, Bot. Zhurn. (Moscow & Leningrad) 74(3): 414. 1989 (*Stipa caucasica* Schmalh. × *Stipa macroglossa* P. A. Smirn. subsp. *kazachstanica* (Kotukhov) M. Nobis; Nobis, 2010). TYPE: Kazachstania Orientalis, jugi Manrak pars centralis, locus Sagyndyk Major, in regione montana media, 1100 m supra mare, jugi parvi declivitas occidentalis schistosa, 27 June 1998, *J. Kotuchov s.n.* (lectotype, designated by Nobis [2010: 737], LE!; isolectotypes, KUZ! [2 sheets], LE! [2 sheets]).

Synonyms. = *Stipa saurica* Kotukhov.

Habitat. *Stipa ×manrakica* is found in steppe grasslands at 1500–2600 m.

Distribution. *Stipa × manrakica* occurs in Middle Asia (Kotukhov, 2002; Nobis, 2010, 2012; Nobis et al., 2015a), specifically in Kazakhstan (Tarbagatai Mountains, Tian Shan Mountains) and Kyrgyzstan (Tian-Shan Mountains).

Stipa margelanica P. A. Smirn., Repert. Spec. Nov. Regni Veg. 26: 264. 1929. TYPE: [Kyrgyzstan.] Ferg. obl. Margel. u., mezhdu dol. r. Isfairam i ur. Khodzha-aryk, sukhoi kamenistyi zap. sklon, u perevala [Fergana, Distr. Margelan, inter val. fl. Isfairam et pread. Chodsha-aryk, ad trajectum in declivitate sicca petrosa], 31 May 1913, *N. Dessiatoff 892* (lectotype, designated here, LE!; isolectotypes, LE!, MW!).

Habitat. *Stipa margelanica* is found in steppe grasslands at 1000–2000 m.

Distribution. *Stipa margelanica* occurs in Middle Asia (Ovchinnikov & Chukavina, 1957; Pazij, 1968; Tzvelev, 1976; Freitag, 1985), specifically in southern Kyrgyzstan, Tajikistan, and Afghanistan.

Notes. The original material representing *Stipa margelanica* (type) was prepared on the basis of one collection, no. 892, leg. *N. Dessiatoff*, which is preserved on two herbarium sheets at LE and one at MW. On each of the herbarium sheets deposited at LE, Smirnov attached his revision label "*Stipa macroglossa P. Smirn., 1927.VI, Det. P.A. Smirnow*." In addition, on both sheets white labels with the inscription *Typus* have been attached by herbarium employees, but only one of them has an additional label in the left corner: "*Kew*

negative, no. 6921, 4 Mar 1965." It is likely that based on this, Tzvelev (1976) treated that sheet as the type (= holotype), regarding the second one as an isotype. Because the holotype was not chosen by the author of the species description, the lectotype, according to the *International Code of Nomenclature* (McNeill et al., 2012; Turland et al., 2018), still needs to be designated. Thus, the specimen on the sheet with the label "*Kew negative...*" is designated here as a lectotype of the species. The other specimens cited from LE and MW are isolectotypes.

Stipa minuscula F. M. Vázquez, Telopea 13(1–2): 166, f. 1k, m. 2011. TYPE: Tibet. Plants of the NE part of the Qinghai-Xizang (Tsinghai-Tibet) Plateau, C.G. 81-0362 8, s. coll. (holotype, BM001191177! [single specimen in the upper left corner of the sheet]). = **Stipa glareosa** P. A. Smirn. var. **glareosa**.

Stipa mongholica Turcz. ex Trin., Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 4: 42. 1836. TYPE: *Stipa mongholica* Turcz, Transbaical (coll. of 12 syntypes at LE!, cf. Sokolova, 2012). ≡ **Ptilagrostis mongholica** (Turcz. ex Trin.) Griseb., Fl. Ross. 4(13): 447. 1852 [≡ *Achnatherum mongholicum* (Turcz. ex Trin.) Ohwi, J. Jap. Bot. 17: 403. 1941].

Notes. The data on the distribution of *Ptilagrostis mongholica* in Kyrgyzstan and Tajikistan (given, e.g., by Chukavina & Ovchinnikov, 1957; Lazkov & Sultanova, 2014) should be referred to *P. malyschevii* Tzvelev (Novosti Sist. Vyssh. Rast. 11: 7–8. 1974. TYPE: Tjanj-Schanj centralis, in declivitatibus borealibus ad fl. Buzulgan, 18 July 1908, *R. Rozhevitz 1244* [holotype, LE!; isotype, LE!]), whose occurrence in this region was confirmed by us during both field studies and revision of the herbarium materials.

Stipa monticola Kotukhov, Turczaninowia 1(1): 11. 1998, hom. illeg. non *Stipa monticola* H. Scholz, Willdenowia 23(1–2): 117. 1993. TYPE: Saur-Tarbagataj, brachia austro-occidentalia jugi Saur, in viciniis hibernaculi Kyzylkija, elev. 1700 m, declivitas australi-orientalis, 18 Aug. 1992, *Ju. Kotuchov s.n.* (holotype, LE!; isotypes, KRA 436032!, KRA 435918!, KRA 436039!, KRA 436040!, KUZ! [2 sheets]). ≡ **Stipa kotuchovii** M. Nobis.

Stipa nakaii Honda, Rep. First Sci. Exped. Manchoukuo 4(4): 104. 1936. TYPE: Manshuria, Prov. Chin-chou, Prope Chao-yang, 8 Aug. 1933, *Nakai, Honda & Kitagawa s.n.* (holotype, KYO not seen). ≡ **Achnatherum nakaii** (Honda) Tateoka ex Imzab, Fl. Intramong. 7: 196. 1983.

Stipa narynica M. Nobis, Nordic J. Bot. 30(1): 70–72, f. 1, 3 1a–d, 4a. 2012. TYPE: Western Kyrgyzstan, western Tian-Shan Mtns., Naryn River valley, steppe grasslands on the right calcareous slope of stream valley, a left tributary of the Naryn River, in the eastern part of Tash Kumyr town, 41°19′N / 72°12′E, alt. 650 m, exposition S, slope 40°, no. 1, 11 May 2011, *M. Nobis & A. Nowak s.n.* (holotype, KRA 382227!; isotypes, FRU!, Herb. Stip. M. Nobis!, KRA!, KRAM!).

Habitat. *Stipa narynica* is found in steppe grasslands at 500–1200 m.

Distribution. *Stipa narynica* occurs in Middle Asia (Nobis, 2012), specifically in western Kyrgyzstan (Chatkal and Fergana Mountains). Figure 4.

Stipa nikitinae Tzvelev, Novosti Sist. Vyssh. Rast. 43: 27. 2012. TYPE: Tsentralnyi Tian-shan, severnyi sklon khr. Kavak-tau, pereval mezhdu Beiryuk i Kash-bel, 28 July 1937, *E. Mikhailova & L. Popova 66* (holotype, LE!). = **Stipa kirghisorum** P. A. Smirn.

Stipa okmirii Dengub., Bot. Zhurn. (Moscow & Leningrad) 65(3): 431. 1980. TYPE: Jugum Schugnanicum, in viciniis horti botanici Pamirensis, declivia lapidosa ad austro-occidentem exposita [Tadzhikistan, GBAO, Shugnanskii khr., okrestnosti botanicheskogo sada, sklon], elev. 2350 m, 14 June 1977, *A. V. Dengubenko 2731* (holotype, LE!).

Habitat. *Stipa okmirii* is found in steppe grasslands at 2250–2500 m.

Distribution. *Stipa okmirii* occurs exclusively in Tajikistan (western Pamir; Dengubenko, 1980; Nobis, 2011, 2013; Gonzalo et al., 2012). Figure 4.

Notes. *Stipa okmirii* is likely a taxon of hybrid origin. Because of its unigeniculate or indistinctly bigeniculate awns, it could arise through hybridization from *S. lingua* and either *S. turkestanica* or *S. kirghisorum* (Nobis, 2013).

Stipa orientalis Trin. ex Ledeb., Fl. Altaic. [Ledebour] 1: 83. 1829. TYPE: [Kazakhstan.] In rupium fissuris montis Arkaul, 17 May 1826, *C. A. Meyer* (lectotype, designated by Tzvelev [1976: 583], LE!).

Within the species, two varieties are recognized.

1. Leaves of the vegetative shoots distinctly scabrous, ligules with hairs up to 1 mm long . . . *Stipa orientalis* Trin. ex Ledeb. var. *orientalis*
1′. Leaves of the vegetative shoots glabrous to slightly scabrous, ligules with hairs 0.7–1.5(–2) mm long . . . . . *Stipa orientalis* var. *azutavica* (Kotukhov) M. Nobis & P. D. Gudkova

Stipa orientalis var. **orientalis.**

Habitat. *Stipa orientalis* var. *orientalis* is found in steppes, screes, rock crevices and ledges, and high mountain deserts at 300–4500 m.

Distribution. The range of the taxon extends from Iran (Alborz Mountains) up to southern Russia, Mongolia, China, and northwest India (Tzvelev, 1968, 1976; Freitag, 1985; Wu & Phillips, 2006; Nobis et al., 2013). In Middle Asia, it occurs in Afghanistan, China, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, and Uzbekistan.

Stipa orientalis var. **azutavica** (Kotukhov) M. Nobis & P. D. Gudkova, Phytotaxa 245(1): 36. 2016. Basionym: *Stipa azutavica* Kotukhov, Turczaninowia 1(2): 9–10. 1998. TYPE: Altaj australis, praemontia australi-orientalia jugi Azutau, mons Bulgartabaty, desertum lapidosum, 22 May 1991, *Ju. Kotuchov s.n.* (lectotype, designated by Nobis & Gudkova [2016: 36], LE!; isolectotypes, KRA 436050!, KUZ!, LE!).

Habitat. *Stipa orientalis* var. *azutavica* is found in rock crevices, ledges, and screes at 1000–1500 m.

Distribution. *Stipa orientalis* var. *azutavica* occurs in the mountains of central Asia in Kazakhstan, Mongolia, Russia, and Pakistan (Kotukhov, 2002; Nobis & Gudkova, 2016). In Middle Asia it is found in eastern Kazakhstan (Sauro-Manrak Mountains) and Pakistan.

Notes. A third variety, *Stipa orientalis* var. *ladakhorum* M. Nobis, is currently known only from northwestern India (Ladakh) but seems likely to extend into Middle Asia. It differs from variety *orientalis* by its vegetative shoots, which are densely pubescent versus glabrous, respectively (Nobis & Nowak, 2016).

Stipa ovczinnikovii Roshev., Fl. URSS 2: 87. 1934. TYPE: [Tajikistan.] Zeravshanskii khr, polynnokovyl'naya step po zap. sklonu gor, obrashchennykh k doline Zeravshana, bliz kishlaka Syuzhena, 3 June 1932, *P. Ovczinnikov 144* (holotype, LE!; isotype, TAD 2342!).

Habitat. *Stipa ovczinnikovii* is found in steppe grasslands at 1500–2200 m.

Distribution. *Stipa ovczinnikovii* is found in Tajikistan (Hissar, Zeravshan, and Turkestan Mountains).

Notes. *Stipa ovczinnikovii*, with a Russian description, was published by Roshevitz (1934) with reference to its Latin description in another publication. However, a Latin description of the species was published only two years later in 1936 [Trudy Bot. Inst. Acad. Nauk SSSR, Fl. i Sist. Vyssh. Rast 1(2): 92. 1936].

Stipa pamirica Roshev., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 11: 20. 1949. TYPE: [USSR, Tajikistan.] Vakhan-Inkashimskii raion, kovyl'no-solyankovo-polynnaya polupustynya po vost. shchebnistym sklonam v raione kishlaka Vrang, 3120 m, 9 Aug. 1935, *P. Ovchinnikov & K. Afanasev 1735* (lectotype, designated by Tzvelev [1976: 584], LE!). ≡ **Stipa badachschanica** Roshev. var. **pamirica** (Roshev.) M. Nobis.

Stipa parviflora Desf., Fl. Atlant. 1: 98–99, t. 29. 1798. TYPE: In collibus aridis prope Mascar et in regno Tunetano, *Desfontaines* (syntype, P not seen, after Freitag, 1985). ≡ **Achnatherum parviflorum** (Desf.) M. Nobis, comb. nov. [≡ *Stipellula parviflora* (Desf.) Röser & Hamasha, Schlechtendalia 24: 92. 2012].

Notes. *Stipa parviflora* is characterized by its maize-like lemma epidermal pattern, which clearly distinguishes it from other species of *Stipa* and confirms that this species belongs to the achnatheroid group of grasses within the Stipeae. Röser (2012) transferred this taxon to the new paraphyletic genus *Stipellula* based on molecular analysis (Hamasha et al., 2012). However, similar to Peterson et al. (2019), we recognize annual *Stipellula capensis* as the only species in this genus originally described by Tzvelev (1974, 2012), and prefer to treat *S. parviflora* as a member of *Achnatherum*. However, it also has not been excluded that this annual species mentioned above should be treated as a member of *Achnatherum* (as *A. capensis*). Further studies using modern molecular methods are needed to estabish a phylogenetic relation within achnatheriod members of the tribe Stipeae.

Stipa pavlovii Kotukhov, Turczaninowia 1(1): 7. 1998. TYPE: Saur-Tarbagataj, jugi Saurici brachia australi-occidentalia, 1800 m, in regione hibernaculi Kyzylkija, declivitas austro-orientalis saxosa, 4 July 1991, *Ju. Kotukhov s.n.* (holotype, LE not found, Nobis & Gudkova, 2016). = **Stipa sczerbakovii** Kotukhov.

Stipa pelliotii Danguy, Bull. Mus. Natl. Hist. Nat. 17: 451. 1911. TYPE: Asie Centrale, Zamutch-tagh, 1700 m, 28 July 1907, *Pelliot & Vaillant 375* (holotype, P02241094!; isotype, LE!). ≡ **Achnatherum pelliotii** (Danguy) Röser & Hamasha, Pl. Syst. Evol. 298: 365. 2012 [≡ *Ptilagrostis pelliotii* (Danguy) Grubov, Consp. Fl. Outer Mongolia (Vasc. Pl.) 62. 1955].

Stipa penicillata Hand.-Mazz., Oesterr. Bot. Z. 85: 226–227. 1936. TYPE: Kuku-nor, gegen Lombutong,

21 Sep. 1918, *Licent 4869* (holotype, W1926-0016157!; isotype, K00433026!).

Synonyms. = *Stipa laxiflora* Keng.

Habitat. *Stipa penicillata* is found in steppes, high mountain deserts, as well as rock crevices and ledges at 1500–4500 m.

Distribution. *Stipa penicillata* is found in China (Tzvelev, 1968; Wu & Phillips, 2006). In Middle Asia, it occurs in Tian-Shan, Kunlun, and Himalayas.

Notes. Leaf indumentum in this species is variable (Wu & Phillips, 2006). Specimens with an abaxial surface of scabrous vegetative leaves represent *Stipa penicillata* var. *penicillata*, whereas specimens with vegetative leaves and sheaths of culm leaves densely pubescent belong to *S. penicillata* var. *hirsuta* P. C. Kuo & Y. H. Sun.

Stipa pennata L., Sp. Pl. 1: 78. 1753. TYPE: s. loc., *A. van Royen 900.320-437* (lectotype, designated by Freitag [1985: 437], L!) (= *Stipa joannis* Čelak.).

Notes. The occurrence of the species in eastern Kazakhstan reported by Kotukhov (2002) requires confirmation, whereas data given for Tajikistan from Gonzalo et al. (2013) refer, in fact, to *Stipa kirghisorum* not *S. pennata*. Although we have seen no specimens of *S. pennata* from Middle Asia, its presence in northern Kazakhstan is probable.

Stipa pilgeriana K. S. Hao, Bot. Jahrb. Syst. 68(5): 583. 1938. TYPE: [China.] Kokonor, im Tsi-gi-gen-ben Gebiete, 3900 m, 25 Aug. 1930, *K. S. Hao 1009* (holotype, PEK not seen). = **Stipa purpurea** Griseb. (syn. after Freitag, 1985).

Stipa platypoda Bor, Biol. Skr. 14(4): 81. 1965. TYPE: Afghanistan. Herat, profuse over the whole plain, *Aitchison 1137* (holotype, K!; isotype, BM!). = **Stipa lingua** A. Junge.

Stipa praecapillata Alechin, Krat. Predv. Otchet O Rabotakh Nizhegorod Geobot. Eksped. 1925. 171. 1926. TYPE: Nizhegorodskaya gub., Lukyanovskii u., bliz sel. Divii Usad, yuzhn. sklon Kosovoi gory, 14 June 1925, *V. Alekhin, K. Dobrokhotova & I. Belov s.n.* (lectotype, designated by Tzvelev [1976: 581], LE!). = **Stipa sareptana** A. K. Becker.

Notes. Although we treat *Stipa praecapillata* as conspecific with *S. sareptana*, it should not be excluded that *S. praecapillata* (having a well-developed ring of hairs at the lemma apex) is more closely related to *S. krylovii*, from which it differs by having spinulose versus glabrous vegetative leaves. Thus, taxonomic revision of this group of taxa using modern molecular methods is required.

Stipa ×pseudocapillata Roshev., Fl. Aziat. Ross. 12: 172, pl. 11, 6, 6a. 1916, pro sp. (*S. sareptana* A. K. Becker × *S. lessingiana* Trin. & Rupr.). TYPE: *Stipa consanguinea* Trin.?, Songoria, *Alex. Schrenk s.n.* (Herbarium Trautvetter) (holotype, LE!; isotype, LE!).

Synonyms. = *Stipa spiridonovii* Roshev.

Habitat. *Stipa ×pseudocapillata* is found in sandy and clayey semideserts and steppes at 300–700 m.

Distribution. *Stipa ×pseudocapillata* is found in Middle Asia (Tzvelev, 1976), specifically in Kazakhstan (Transcaspian and Balkhash regions).

Notes. *Stipa ×pseudocapillata* is regarded as a very rare endemic species in the flora of Kazakhstan. In 2014 a new locality of this taxon was found in northern Kazakhstan, Akmolinskii region, near Ereimentau town, N part of Ereimentau Mountains, steppe, 27 June 2014, *A. L. Ebel s.n.* (det. M. Nobis, KRA). A specimen of this taxon was collected from the locality where the population of *S. sareptana* and *S. lessingiana* grow together. Tzvelev (1976) suggested that *S. pseudocapillata* is a species of hybrid origin and indicated *S. capillata* and *S. lessingiana* as the parental species. In our opinion, hybridization between *S. sareptana* and *S. lessingiana* is more probable than between *S. capillata* and *S. lessingiana* because these two first species flower in the same period (usually in May), while *S. capillata* flowers much later (usually June and July).

Stipa ×pseudocapillata was described by Roshevitz (1916) based on one gathering and two herbarium sheets preserved at LE. Tzvelev (1976) stated that the holotype of this species is preserved at LE, but at the same time he did not mention the second sheet of this species that was also preserved at LE. Because only one of them has the stamp "Herbarium Trautvetter," as was mentioned by Roshevitz (1916) in the protologue of the taxon, it should be treated as the holotype. Taking into account that the herbarium sheet with the holotype of *S. ×pseudocapillata* has no number, for identification purposes the following information is useful: on the sheet, the two additional illegible labels written in German were attached to Roshevitz's determination label: "*Stipa pseudocapillata Roshev., I 1916, determ. R. Roshevitz*" and two labels (white and blue) with the word *Typus*.

Stipa ×pseudomacroglossa M. Nobis, nothosp. nov. (*S. lipskyi* Roshev. × *S. macroglossa* P. A. Smirn. subsp. *macroglossa*). TYPE: Dolina rzeki Iskanderdarya (Iskanderdarya River valley) Rejon Zerawszański B (Zeravshan Region B), Zachodni

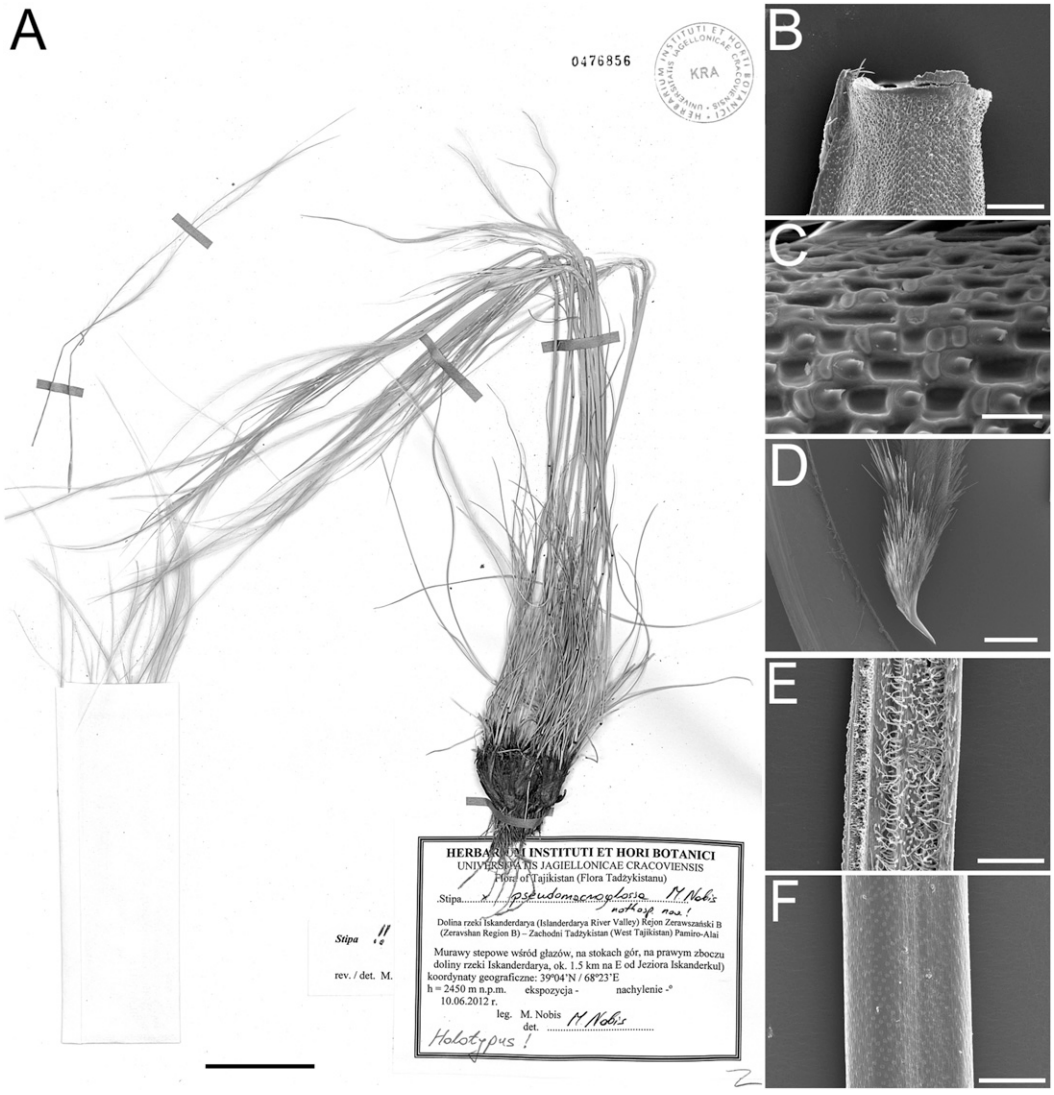

Figure 10. *Stipa* ×*pseudomacroglossa* M. Nobis. —A. Holotype. —B. Top of lemma. —C. Lemma micromorphological pattern. —D. Callus. —E. Adaxial surface of the vegetative leaf. —F. Abaxial surface of the vegetative leaf. Scale bars: A = 5 cm, B, E, F = 0.3 mm, C = 30 μm, D = 1 mm.

Tadżykistan (West Tajikistan) Pamiro-Alai; Murawy stepowe wśród głazów, na stokach gór, na prawym zboczu doliny rzeki Iskanderdarya, ok. 1.5 km na E od Jeziora Iskanderkul (steppe grasslands, among stones, on mtn. slopes, on the right slope of Iskanderdarya River valley, ca. 1.5 km of Iskanderkul Lake), 39°04′N / 68°23′E, 2450 m, 10 June 2012, *M. Nobis s.n.* (holotype, KRA 476856!; isotypes, KRA 479081!, KRA 479082!). Figure 10.

Plants perennial, densely tufted, with a few culms and numerous vegetative shoots; culms 35–45 cm tall, 3-noded, glabrous at nodes and shortly pubescent below them. Leaves of vegetative shoots: sheaths glabrous, with white edge at margins ciliate; ligules rounded or acute, (0.2–)0.3–1.4(–2) mm and ciliate at margins with cilae (0.4–)0.8–1.4 mm; blades of vegetative shoots convolute, 11–14 cm, 0.4–0.6 mm in diam., upper surface densely short-pilose with hairs 0.2–0.3 mm, glabrous and smooth beneath, sporadically somewhat scabrous due to short, single prickles, young leaves with tuft of hairs at apex. Cauline leaves: sheaths glabrous, with white and glabrous margins, shorter than internodes, upper sheath up to 15 cm, glabrous, in upper part

scabrous, slightly inflated; ligules up to 2.3 mm, truncate or acute, ciliate at apex; blades glabrous to slightly scabrous, 4–7 cm. Panicle 14–20 cm contracted, at base enclosed by sheath of uppermost leaf, branches erect, setulose, single or paired. Glumes subequal, 44–52 mm, narrowly lanceolate, tapering into long hyaline apex, midvein sometimes setulose with cilia up to 1 mm. Anthecium 13–14.5 × 0.8–1 mm. Callus 1.9–2.4 mm, densely long-pilose, base of callus not enlarged, peripheral ring ca. 0.3 mm in diam., acute, cuneate, scar broadly elliptic. Lemma pale green, on dorsal surface with abundant hooks and 7 lines of ascending hairs, up to 0.7 mm, ventral lines terminating at 1–1.5 mm below top of lemma, dorsal line terminating at 2.5–3.5 mm below top of lemma; top of lemma glabrous (without a ring of hairs) and scabrous due to short prickles below apex. Palea equal to lemma in length. Awn 158–220 mm, unigeniculate or indistinctly bigeniculate; column 38–45 mm, twisted, 0.4–0.5 mm wide at base, glabrous and smooth; seta slightly flexuous 120–176 mm and 2.5–3.5 times longer than column, hairs in lower part of seta 5.2–6.2 mm, gradually decreasing in length toward apex. Anthers yellow, 8–9 mm, glabrous.

Phenology. *Stipa* ×*pseudomacroglossa* flowers from May to June.

Habitat. *Stipa* ×*pseudomacroglossa* is found in mountain steppes at 2350–2500 m.

Distribution. *Stipa* ×*pseudomacroglossa* occurs in Tajikistan (Zeravshan Mountains). Figure 9.

Stipa pulcherrima K. Koch, Linnaea 21: 440. 1848. TYPE: Central Poland, Nida Basin, western part of gypsum hills, located betw. Bronina & Owczary villages near Busko-Zdrój, 50°27′N / 20°44′E, 23 May 2010, *A. Nobis & M. Nobis s.n.* (holotype, KRA 465416!; isotypes, BM!, E!, GOET!, KRA 465417!, PR!, WA!), typ. cons. prop. by Nobis et al. (2017b: 518).

Stipa pulcherrima subsp. **pulcherrima.**

Synonyms. ≡ *Stipa pennata* L. subsp. *pulcherrima* (K. Koch) Á. Löve & D. Löve, Folia Geobot. Phytotax. 10(3): 273. 1975; ≡ *S. pennata* subsp. *pulcherrima* (K. Koch) Freitag, Notes Roy. Bot. Gard. Edinburgh 42(3): 440. 1985; ≡ *S. pennata* var. *pulcherrima* (K. Koch) Halácsy, Consp. Fl. Graec. 3: 352. 1904; ≡ *S. pennata* var. *pulcherrima* (K. Koch) Beck, Wiss. Mitt. Bosnien & Herzegovina 9: 426. 1904; ≡ *S. pennata* fo. *pulcherrima* (K. Koch) Brand, Syn. Deut. Schweiz. Fl. 3: 2718. 1907; = *S. grafiana* Steven; ≡ *S. pulcherrima* K. Koch subsp. *grafiana* (Steven) Pacz., Khersonsk. Fl. 1: 115. 1914; ≡ *S. pennata* L. var. *grafiana* (Steven) Lindem., Fl. Chers. 2: 283. 1882.

Habitat. *Stipa pulcherrima* subsp. *pulcherrima* is found in mountain steppes, clay slopes, and grasslands at ca. 400–2400 m.

Distribution. *Stipa pulcherrima* subsp. *pulcherrima* is widely distributed; its range extends from central Europe and the Mediterranean area, through the Caucasus, Black Sea region, southern Ural to Siberia (Altai Mountains), and central Tian-Shan Mountains in Middle Asia (Tzvelev, 1976, 2006; Martinovský, 1980; Freitag, 1985; Durka et al., 2013; Gudkova et al., 2014b). In Middle Asia, it occurs in Kazakhstan and Kyrgyzstan (central Tian-Shan Mountains).

Notes. This species was confirmed in the studied area in Kyrgyzstan (central Tian-Shan, ca. 36.5 km NNE of Naryn, ca. 63 km NE of At-Bashy, steppe on slope/shrubs, 41°29′41″N / 76°25′33″E, elev. 2283 m, exp. N, incl. 25°, 6 July 2018, *M. Nobis, E. Klichowska, A. Wróbel & A. Nowak s.n.* [KRA 0502537, KRA 0502538, KRA 0502540, KRA 0502541, KRA 0502542, KRA 0502544]) and Kazakhstan (63 km NW of Usharal, E of Balkhash Lake, steppe, 46°31′38″N / 80°17′23″E, elev. 404 m, 23 May 2019, *M. Nobis s.n.* [KRA]); up to now, its occurrence in Middle Asia was questionable (Pazij, 1968; Tzvelev, 1976).

Because the lectotype of *Stipa pulcherrima* designated by Freitag (1985: 440) (Tatarisch Grusien, 1844, *K. Koch s.n.* [GOET No. 013762]) creates serious nomenclatural conflict (Nobis et al., 2017b), as it can be referable to *S. endotricha* Martinovský, *S. majalis* Klokov, or *S. pulcherrima* var. *alagezica* Tzvelev, Nobis et al. (2017b) proposed a gathering from central Europe as the conserved type. This gathering demonstrates characters that are fully within the range of variability of *S. pulcherrima* s. str. as well as occurring in specimens from Georgia or Armenia (Transcaucasia, Tiflis, in fruticetis, [19]20–V–20, *A. Grossheim s.n.* [LE]), from where the species was described.

Stipa pulcherrima subsp. **crassiculmis** (P. A. Smirn.) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 18. 1974. Basionym: *Stipa crassiculmis* P. A. Smirn., Repert. Spec. Nov. Regni Veg. Beih. 22: 375. 1926.

Habitat. *Stipa pulcherrima* subsp. *crassiculmis* is found in steppe grasslands at 800–1500 m.

Distribution. *Stipa pulcherrima* subsp. *crassiculmis* is found in eastern Europe and southwestern Asia (Tzvelev, 1976; Martinovský, 1980; Nikitin & Geldikhanov, 1988). In Middle Asia, it occurs in northern Iran and Turkmenistan (Kopet-Dagh Mountains).

Stipa purpurascens Hitchc., Proc. Biol. Soc. Washington 43: 95. 1930. TYPE: [China.] Gansu, S of Sining, in the La Che Tze Mtns., 3350–3900 m, Aug.

1923, *R. C. Ching 686* (holotype, US-1245701 not seen). ≡ **Stipa regeliana** Hack.

Stipa purpurea Griseb., Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 82. 1868. TYPE: [China.] Tibet, Gnari (Nari) Khorsum, 5000 m, 5–15 Sep. 1855, *Schlagnitweit 7116* (holotype, GOET!; isotypes, BM!, LE!).

Synonyms. ≡ *Ptilagrostis purpurea* (Griseb.) Roshev., Fl. URSS 2: 76. 1934; = *Lasiagrostis tremula* Rupr., Ost.-Sack. & Rupr., Mém. Acad. Imp., St. Pétersb., Sér. 7, 14(4): 35. 1869. TYPE: Fl. Sarymeki, sudlicher Abhang des Tian-Schan, 28 July 1867, *F. Osten-Sacken s.n.* (holotype, LE!); = *Ptilagrostis semenovi* Krasn., Spisok rastenii sobrannykh v vostochnom Tyan-Shane, letom 1886 goda, 125, 1887. TYPE: Ad fl. Sary-Jassy, 1 Aug. 1886, *Krassnov s.n.* (holotype, LE); ≡ *Stipa semenovi* Krasn.

Habitat. *Stipa purpurea* is found in alpine meadows at 2500–4700 m.

Distribution. *Stipa purpurea* is found in the mountains of central Asia (from Tian-Shan up to the Himalayas; Tzvelev, 1968, 1976; Freitag, 1985; Wu & Phillips, 2006). In Middle Asia, it occurs in eastern Afghanistan, western and southwestern China, eastern Kyrgyzstan, eastern Tajikistan, and eastern Pakistan.

Notes. This taxon is highly variable in morphology, and its taxonomic revision is required.

Stipa regeliana Hack., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 89: 130. 1884. TYPE: [Kyrgyzstan.] Issyk-Kul, Musart, 7–5000′, Aug. 1877, *A. Regel s.n.* (holotype, W 1916-0026455!).

Synonyms. ≡ *Achnatherum regelianum* (Hack.) Tzvelev, Novosti Sist. Vyssh. Rast. 43: 22. 2012; = *Stipa purpurascens* Hitchc.

Habitat. *Stipa regeliana* is found in alpine meadows at 2200–4500 m.

Distribution. *Stipa regeliana* is a widely distributed central Asian species (Pazij, 1968; Tzvelev, 1968, 1976; Freitag, 1985; Wu & Phillips, 2006; Nobis et al., 2015b). In Middle Asia, it occurs in eastern Afghanistan, western and southwestern China, eastern Kazakhstan, eastern Kyrgyzstan, eastern Tajikistan, and northeastern Pakistan.

Stipa retorta Cav., Observ. Hist. Nat. 1: 119. 1795. TYPE: MA not seen. = **Stipellula capensis** (Thunb.) Röser & Hamasha, Schlechtendalia 24: 92. 2012. [≡ *Stipa capensis* Thunb., syn. after Freitag, 1985].

Stipa richteriana Kar. & Kir., Bull. Soc. Imp. Naturalistes Moscou 14(4): 862. 1841. TYPE: [Eastern Kazakhstan.] In lapidosis mont. Arganty, 1840, *Karelin 907* (lectotype, designated here, LE!; isolectotype, LE!).

Notes. There are six sheets in LE with plants representing syntypes of *Stipa richteriana*. One of these sheets, labeled "Stipa richteriana Kar. et Kir. enum. 1840, no. 907, in lepidosis mont. Arganatty, 1842 Jul, Kraelin," has an additional label attached by N. Tzvelev: "Stipa richteriana Kar. et Kir., Lectotype, 1972." However, in his work Tzvelev (1976) indicated it as a type (holotype) and stated that there are three additional isotypes preserved at LE. In accordance with the *International Code of Nomenclature*, Tzvelev's typification does not meet the requirements of effective lectotypification (McNeill et al., 2012; Turland et al., 2018). Since the collection of typical specimens of *S. richteriana* represents a collection of syntypes, the lectotype should be designated. Of the two sheets with specimens of *S. richteriana* and the original label, dated 1840 and signed/collected by Karelin, we designate the one, previously selected by Tzvelev in 1972, as the lectotype and the second as isolectotype. The other four specimens are syntypes.

Stipa richteriana subsp. **richteriana.**

Within the taxon two varieties are recognized.

1. Leaves of vegetative shoots glabrous to slightly scabrous . . . *Stipa richteriana* Kar. & Kir. var. *richteriana*
1′. Leaves of vegetative shoots densely pubescent . . . . . *Stipa richteriana* var. *dasyphylla* (Roshev.) Tzvelev

Stipa richteriana var. **richteriana.**

Synonyms. = *Stipa kuhitangi* Drobow; = *S. voronini* Krasn.; ≡ *S. woroninii* Krasn.

Habitat. *Stipa richteriana* var. *richteriana* is found in steppes, stony and clay slopes, and sandy grasslands at 200–1200 m.

Distribution. *Stipa richteriana* var. *richteriana* is found in Middle Asia and southwestern Siberia (Lavrenko & Nikolskaya, 1965; Tzvelev, 1976; Nobis et al., 2016b). In Middle Asia it occurs in western China, Kazakhstan, and Uzbekistan.

Stipa richteriana var. **dasyphylla** (Roshev.) Tzvelev, Zlaki SSSR 578. 1976. Basionym: *Stipa richteriana* f. *dasyphylla* Roshev., Fl. Aziat. Ross. 12: 135. 1916. TYPE: Fl. Iliensis, prope Andrakai, May 1886, *Krassnov s.n.* (lectotype, designated by Tzvelev [1976: 578], LE!).

Habitat. *Stipa richteriana* var. *dasyphylla* is found in steppes, stony and clay slopes, and sandy grasslands at 200–1200 m.

Distribution. In Middle Asia, *Stipa richteriana* var. *dasyphylla* is found in central Kazakhstan, within the range of the nominal variety (Tzvelev, 1976).

Stipa richteriana subsp. **jagnobica** (Ovcz. & Czukav.) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 14. 1974. Basionym: *Stipa jagnobica* Ovcz. & Czukav., Izvest. Otdel. Estestven. Nauk Akad. Nauk Tadzhik SSR 17: 51. 1957.

Within the taxon two varieties are recognized.

1. Leaves of vegetative shoots glabrous . . . . . .
. . . . *Stipa richteriana* Kar. & Kir. var. *jagnobica* (Ovcz. & Czukav.) M. Nobis & A. Nowak
1′. Leaves of vegetative shoots densely pubescent . . .
Stipa richteriana var. *hirtifolia* M. Nobis & A. Nowak

Stipa richteriana var. **hirtifolia** M. Nobis & A. Nowak, var. nov. TYPE: Tajikistan. Dolina rzeki Archamaidon (Archamaydon River valley) Rejon Zerawszański B (Zeravshan Region B), Zachodni Tadżykistan (western Tajikistan) Pamir Alai Mtns.; wysokogórska mrawa stepowa (step bylicowo-ostnicowy), na zachodnich stokach gór, na prawym zboczu doliny rzeki Archamaidon, na S od wsi Gazza koło Zimtut [high mtn. steppe grassland, on western mtn. slopes, on the right slope of the Archamaydon River valley, S of Gazza settlement near Zimtut], 39°14′44″N / 68°01′55″E, 1740 m, exp. W, slope 45°, pH = 8.2, 16 June 2010, *M. Nobis s.n.* (holotype, KRA 468742!; isotypes, KRA 468760!, KRA 468750!, KRA 465273!).

Diagnosis. *Stipa richteriana* Kar. & Kir. var. *hirtifolia* M. Nobis & A. Nowak differs from *S. richteriana* var. *jagnobica* (Ovcz. & Czukav.) M. Nobis & A. Nowak in having the abaxial surface of the vegetative leaves densely pubescent versus the abaxial surface of the vegetative leaves glabrous or slightly scabrous.

Habitat. *Stipa richteriana* var. *hirtifolia* is found in high mountain steppes at 1700–2400 m.

Distribution. In Middle Asia, *Stipa richteriana* var. *hirtifolia* is found in Tajikistan, within the range of the nominal variety (Zeravshan Mountains).

Paratypes. TAJIKISTAN. Fan River valley, Zeravshan Region C, western Tajikistan, Pamir Alai Mtns.; high mtn. steppe grassland, on western mtn. slopes, Gushty Mtns., E of Zeravshan I settlement S of Aini, 39°13′N / 68°33″E, 2400 m, exp. W, slope 35°, 19 June 2010, *M. Nobis s.n.* (KRA 468744, KRA 468743).

Stipa richteriana var. **jagnobica** (Ovcz. & Czukav.) M. Nobis & A. Nowak, comb. & stat. nov. Basionym: *Stipa jagnobica* Ovcz. & Czukav., Izvest. Otdel. Estestven. Nauk Akad. Nauk Tadzhik. SSR 17: 51. 1957.

Habitat. *Stipa richteriana* var. *jagnobica* is found in steppes, stony and clay slopes, and rocky grasslands at 1700–3000 m.

Distribution. *Stipa richteriana* var. *jagnobica* is found in Tajikistan (Hissar and Zeravshan Mountains; Ovchinnikov & Chukavina, 1957) and in central-eastern Afghanistan (Freitag, 1985). Figure 4.

Stipa roborowskyi Roshev., Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 1(6): 1. 1920. TYPE: Kuen-Lun, severn. sklon khrebta Russkogo, 10–12.5 tys. fut. abs. vysoty, ur. Kara-sai, Lyundzhilin-Khakum, verkhovya reki Aksu, po lessovym sklonam gor, luga, 3 July 1890, *W. J. Roborowski s.n.* (holotype, LE!; isotype, W 1916-0034934!).

Habitat. *Stipa roborowskyi* is found in high mountain deserts, alpine meadows, and stony slopes at 3000–4500 m.

Distribution. *Stipa roborowskyi* is found in the mountains of central Asia: Pamir, Karakorum, Kunlun, and Himalayas (Wu & Wang, 1999; Nobis et al., 2014b). In Middle Asia it occurs in western China and northwestern Pakistan.

Notes. *Stipa roborowskyi* is morphologically similar to *S. klimesii* M. Nobis [syn. ≡ *Stipa basiplumosa* Munro ex Hook. f. var. *longearistata* Munro ex Hook. f.], which occurs in China (Tibet), Bhutan, Nepal, India (Ladakh), and Pakistan; however, *S. roborowskyi* differs from *S. klimesii* by having shorter ligules of the vegetative shoots (0.5–1.5[–2] vs. [2–]3.5–7.5[–9] mm), shorter anthecium ([6–]6.5–7.5[–7.7] vs. [7–]8.3–9.5[–10] mm), and shorter hairs on the seta ([0.3–]0.5–1.1[–1.4] vs. [1–]1.3–2 [–2.3] mm).

New record of Stipa roborowskyi to the flora of Pakistan. Karakorum, Upper Braldu tributary, above Chikor, 36°22–24′N / 75°22–24′E, alpine steppe, alt. 4100–4200 m, 17 Aug. 1991, *G. & S. Miehe 6221* (MSB).

Stipa roerichii Keng, J. Wash. Acad. Sci. 28: 307. 1938. TYPE: Mongolia. In crevice of exposed rocks, Temur Khada, Peiling Miao, Suiyan Prov., 1500 m, 26 July 1935, *Y. L. Keng 3181 (Roerich Exp. no. 518)* (holotype, Herb. of the Nat. Research Inst. of Biol., Acad. Sinica, Nanking, China not seen). = **Achnatherum nakai** (Honda) Tateoka ex Imzab, Fl. Intramongol 7: 196. 1983 [≡ *Stipa nakaii* Honda] (syn. after Wu & Phillips, 2006).

Stipa rubens P. A. Smirn., Repert. Spec. Nov. Regni Veg. 21: 231. 1925. TYPE: Akmolinskaya obl. i u., na stepennoi polyane v berezovom lesu v 11

verstakh k vost. ot Akmolinska, 27 May 1914, *S. Ganeshin 351* (holotype, LE!; isotypes, LE!, MW!). = **Stipa zalesskii** Wilensky var. **zalesskii**.

Stipa rubentiformis P. A. Smirn., Trudy Imp. S.-Peterburgsk. Bot. Sada 40: 115. 1928. TYPE: Saratov, okr. Polivanovka, stepnoi uchastok, 1 June 1927, *B. A. Fedchenko & E. G. Bobrov 30* (lectotype, selected by Tzvelev in 1970 and designated here, LE!). = **Stipa zalesskii** Wilensky var. **zalesskii**.

Stipa sabulosa (Pacz.) Sljuss., Trudy Nauchno-Issl. Inst. Bot. 37: 26. 1963. Basionym: *Stipa pennata* L. subsp. *joannis* Čelak. f. *sabulosa* Pacz., Khersonsk. Fl. 1: 112. 1914. TYPE: Ukraine. Lugov forest country house, Tyasmin, Aleks, u., 18 May 1911, *I. Paczoski* (lectotype, designated by Tzvelev [1976: 591], LE!). ≡ **Stipa borysthenica** Klokov ex Prokudin var. **borysthenica**.

Stipa saikanica Kotukhov, Turczaninowia 1(2): 10. 1998. TYPE: Saur-Tarbagataj, praemontia boreali-occidentalia jugi Saikan, locus Akseir, denudationes argillarum tertiariarum (in gypsaceis), partitiones glareoso-argillosae, 9 June 1992, *Ju. Kotuchov s.n.* (lectotype, designated by Nobis & Gudkova [2016: 37], LE!; isolectotypes, KRA 436036!, KUZ! [2 sheets], LE! [2 sheets]). = **Stipa lessingiana** Trin. & Rupr.

Stipa saposhnikowii (Roshev.) Kitag., Rep. Inst. Sci. Res. Manchoukuo 6(4): 118. 1942. ≡ **Achnatherum saposhnikowii** (Roshev.) Nevski, Trudy Bot. Inst. Akad. Nauk S.S.S.R., Ser. 1, Fl. Sist. Vyssh. Rast. 4: 224. 1937. Basionym: *Timouria saposhnikowii* Roshev., Fl. Aziat. Ross. 12: 174. 1916. TYPE: Semirech. obl., Przhev. u., u. R. Sary-Dzhas pri uste Kaindy, kamenistye sklony k reke i priberezhnaya galka, 8 Aug. 1912, *V. Sapozhnikov & B. Shishkin s.n.* (lectotype, designated here, LE! [sheet with a single specimen]; isolectotype, LE!).

Stipa sareptana A. K. Becker, Bull. Soc. Imp. Naturalistes Moscou 57(1): 52. 1882. TYPE: Sarepta, 1881, *A. Becker 3887* (lectotype, designated here, LE!).

Synonyms. ≡ *Stipa capillata* L. var. *sareptana* (A. K. Becker) Schmalh., Fl. Sr. i Yuzh. Ross. 2: 595. 1897; = *S. akseirica* Kotukhov; = *S. sareptana* A. K. Becker var. *kasakorum* Roshev., Fl. URSS 2: 111. 1934. TYPE: LE not seen; (?) = *S. praecapillata* Alechin; ≡ *S. sareptana* fo. *praecapillata* (Alechin) Krylov ex Roshev., Fl. URSS 2: 111. 1934.

Habitat. *Stipa sareptana* is found in steppes, stony slopes, roadsides, escarpments, and fallows at 300–2500 m.

Distribution. *Stipa sareptana* is a widely distributed, eastern European–central Asian species, its range extending from southwestern Russia and Middle Asia, up to Mongolia and western China (Tzvelev, 1976; Wu & Phillips, 2006; Gudkova et al., 2017a). In Middle Asia, it occurs in western China, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. Figure 8.

Notes. *Stipa sareptana* was described by Becker (1882) based on plant material collected from Sarepta (currently part of Volgograd [southwestern Russia]) with a short diagnosis in German and without a date of collection, collection number, or name of the herbarium where the type was deposited. During revision of the material representing *S. sareptana* that was preserved at LE, W, and WU, we found 12 potential syntypes. All had been collected by A. Becker from Sarepta. However, a part of them have either no collection date or different collection numbers and descriptions on the labels. Tzvelev (1976) mentioned that the type and four isotypes of *S. sareptana* are preserved at LE. However, we found another five specimens (without year of collection) labeled by L. Pignotti in 2011 as a type of the species (Süd Russland, Sarepta, A. Becker [W-Hackel 1916-0022319]) in the herbarium of W as well as one specimen labeled by M. Sonnleitner in 2013 as a type of the species (Sarepta, 1881, A. Becker [WU 0072643!]) in WU. In accordance with the *International Code of Nomenclature* (McNeill et al., 2012; Turland et al., 2018), all of the specimens from Sarepta collected by Becker and deposited at LE, W, and WU should be treated as syntypes, and a lectotype needs to be designated. As a lectotype we designated the specimen preserved at LE with the labels: "*Stipa capillata L., Stipa sareptana Becker, Sarepta, 1881, A. Becker* and collection no. *3887*," with the additional label below having a pencil-written description of morphological characters as well as Smirnov's revision label "*Stipa sareptana Becker, 1928.I, Det. P.A. Smirnow*." The other specimens, attached to the five sheets preserved at LE, five preserved at W, and one at WU, are the syntypes.

Stipa saurica Kotukhov, Bot. Zhurn. (Moscow & Leningrad) 79: 103. 1994. TYPE: Saur-Tarbagatai, brachia boreali-occidentalia jugi Saur, in viciniis hibernaculi Kesek, clivulus saxosus australi-occidentalis, in schistosis, 14 July 1992, *Ju. Kotuchov s.n.* (lectotype, designated by Gonzalo et al. [2011: 433], LE!; isolectotype, KUZ!). = **Stipa ×manrakica** Kotukhov.

Stipa sczerbakovii Kotukhov, Bot. Zhurn. (Moscow & Leningrad) 76(6): 872. 1991. TYPE: Altai Australis, brachia austro-orientalia jugi Azutau, montes Bulgartabaty, elev. 600 m, locus Sargalym,

steppa fruticeto-graminosa lapidosa, 16 June 1988, *J. Kotuchov s.n.* (holotype, LE!; isotypes, KRA 136031!, KUZ! [13 sheets]).

Synonyms. = *Stipa kyzylkiensis* Kotukhov; = *S. pavlovii* Kotukhov.

Habitat. *Stipa sczerbakovii* is found in steppe grasslands at 600–1700 m.

Distribution. *Stipa sczerbakovii* is found in Kazakhstan, western China, Mongolia, and Russia (Kotukhov, 2002; Nobis & Gudkova, 2016; Zhao et al., 2019). In Middle Asia, it occurs in eastern Kazakhstan (Tarbagatai Mountains).

Notes. *Stipa sczerbakovii* likely has a hybrid origin (*S. krylovii* × *S. orientalis*). The variability of morphological characters of this taxon is greater than that presented by Kotukhov (1991) in the protologue: e.g., ligules of vegetative shoots (0.1–)0.3–2.7 mm (not 0.3–2 mm as in the protologue), anthecium 8–10.5(–11) mm (not 8.5–9 mm), awns 8.5–11.7 cm (not 9–10 cm), hairs on seta 0.4–1.3 mm (not 0.5–0.8 mm), anthers 3.2–4.3 mm (not 3.5–4 mm). Taking into account that Kotukhov described *S. monticola* (nom. nov. *S. kotuchovii*) as very similar to *S. sczerbakovii*, taxonomic revision of the species using modern molecular methods is required.

Stipa semenowi Krasn., Scripta Bot. Horti Univ. Imper. Petropolitanae, Botanicheskiia Zapiski 2(1): 22. 1887. TYPE: *Ptilagrostis semenovii*, Ad fl. Sary-Jassy, 1 Aug. 1886, *Krassnov s.n.* (holotype, LE). = **Stipa purpurea** Griseb.

Notes. This taxon was also described by Krassnov as *Stipa semenovi* Krasn. (Zap. Imperat. Russ. Geograf. Obsch., Opyt istor. rasv. fl. yuzhn. ch. vost. Tyan-Shanya 19: 341–342. 1888).

Stipa sibirica (L.) Lam., Tabl. Encycl. 1: 158. 1791. Basionym: *Avena sibirica* L., Sp. Pl. 1: 79. 1753. TYPE: Siberia, Amman 27 (lectotype, designated by Scholz in Cafferty et al. [2000: 248], LINN-95.1). = **Achnatherum sibiricum** (L.) Keng ex Tzvelev, Probl. Ekol. Geobot. Bot. Geogr. Florist. 140. 1977.

Stipa smirnovii Martinovský, Preslia 47(3): 260. 1975. TYPE: Bohemia, bor.–occ. Montges České středohoří: in stepposis ad declivem austro occ. Collies Raná, June 1974, *Martinovský s.n.* (holotype, PRC!). = **Stipa zalesskii** Wilensky var. **zalesskii**.

Stipa spiridonovii Roshev., Bull. Jard. Bot. Acad. Sci. URSS 1931, 30: 302. 1932. TYPE: Mangyshlak, v 1 km ot kotlov. Khangababa po doroge v fort Aleksandrovsk, pologii yuzhn. sklon ravniny sarmata, suglinok, 8 June 1926, *M. Spiridonov 755/9* (holotype, LE!). = **Stipa ×pseudocapillata** Roshev.

Stipa splendens Trin., Neue Entdeck. Pflanzenk. 2: 54. 1821. TYPE: [USSR, Transbaikalia] Agrostis longiaristata, *herb. Fischer* (holotype, LE TRIN!). ≡ **Neotrinia splendens** (Trin.) M. Nobis, P. D. Gudkova & A. Nowak, Turczaninowia 22(1): 40. 2019 (≡ *Achnatherum splendens* (Trin.) Nevski, Trudy Bot. Inst. Akad. Nauk S.S.S.R., Ser. 1, Fl. Sist. Vyssh. Rast. 4: 224. 1937).

Stipa staintonii Bor, Bull. Bot. Surv. India 7: 133. 1965. TYPE: Nepal. Near Seng Khola, 12,500 ft. [3810 m], exposed cliffs, 4 Oct. 1954, *Stainton, Sykes & Williams 4677* (holotype, K!; isotype, BM!). ≡ **Achnatherum staintonii** (Bor) M. Nobis & P. D. Gudkova, PhytoKeys 128: 112. 2019 (≡ *Stipella staintonii* (Bor) Röser & Hamasha, Pl. Syst. Evol. 298: 365. 2012, nom. illeg. ≡ *Stipellula staintonii* (Bor) Röser & Hamasha, Schlechtendalia 24: 92. 2012).

Stipa stapfii Roshev., Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 5: 11. 1924. TYPE: Persia. [Fars Prov., near Shiraz], 1885, *Stapf [1530]* (holotype, LE!; isotypes, WU072646!, WU072647!). = **Stipa ×assyriaca** Hand.-Mazz.

Stipa subbarbata B. Keller, Bot.-Geogr. Issledov. Zaisansk. uj. Semipalatinsk. Obl. 2: 53. 1912. TYPE: Kaldzhirskaya dolina, po levuyu stronu reki Kaldzhira, Chiganchii protoki v podgornom stepii, 4 July 1908, *B. A. Keller s.n.* (holotype, LE!; isotype, LE!). = **Stipa hohenackeriana** Trin. & Rupr.

Stipa ×subdrobovii M. Nobis & A. Nowak, nothosp. nov. (*S. drobovii* (Tzvelev) Czerep.× *S. caucasica* Schmalh.). TYPE: Dolina rzeki Iskanderdarya (Iskanderdarya River valley) Rejon Zerawszański B (Zeravshan Region B), Zachodni Tadżykistan (western Tajikistan) Pamir Alai Mtns.; Zeravshan Mtns., high mtn. steppe, betw. stones, on the left slope of the Iskanderdarya River valley, ca. 0.5 km E of Serimadarun Lake (near Iskanderkul Lake), 39°05′N / 68°23′E, 2340 m, inclination W, slope 5°, 15 June 2012, no. 3, *M. Nobis & A. Nowak s.n.* (holotype, KRA 456386!). Figure 11.

Diagnosis. *Stipa ×subdrobovii* M. Nobis & A. Nowak is most similar to *S. drobovii* (Tzvelev) Czerep., but differs in its longer callus, (1.5–)1.6–2.1(–2.3) mm versus 0.8–1.3(–1.4) mm, flexuous to straight versus strongly falcate hairs at the dorsal part of the callus as well as shorter hairs at the adaxial surface of leaves (0.15–0.25 vs. 0.35–0.6 mm). *Stipa ×subdrobovii* is also somewhat similar to *S. caucasica* var. *fanica*, but differs in its somewhat shorter anthecium with lines of hairs on the lemma reaching the top of the lemma or terminating

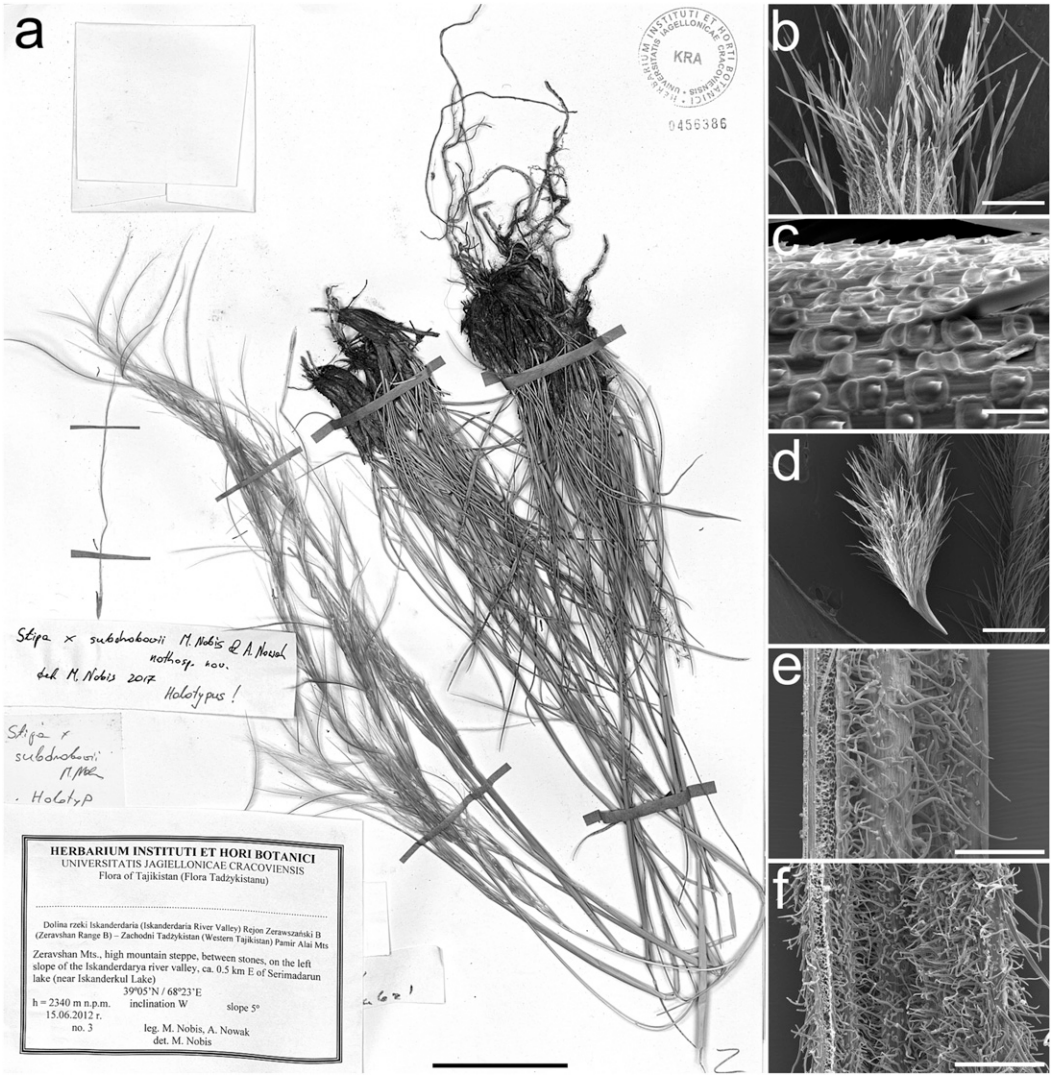

Figure 11. *Stipa* ×*subdrobovii* M. Nobis & A. Nowak. —A. Holotype. —B. Top of lemma with lower part of awn. —C. Lemma micromorphological pattern. —D. Callus. —E. Adaxial surface of vegetative leaf in *S.* ×*subdrobovii* var. *subdrobovii*. —F. Adaxial surface of vegetative leaf in *S.* ×*subdrobovii* var. *pubescens* M. Nobis & A. Nowak. Scale bars: A = 5 cm, B, E, F = 0.3 mm, C = 30 μm, D = 1 mm.

0.5–1 mm below the top of the lemma versus lines of hairs on the lemma terminating 2–5 mm below the top of lemma, hairs in the dorsal part of the callus slightly flexuous and as long as those in the ventral part versus hairs in the dorsal part of the callus straight and 3 to 4 times shorter than those in the ventral part.

Plants perennial, densely tufted, with a few culms and numerous vegetative shoots; culms (25–)30–60 cm tall, 3-noded, pubescent or glabrous at nodes and densely pubescent below them. Culm leaves: sheaths glabrous or the lower shortly pubescent, blades glabrous at abaxial surface and pubescent at adaxial surface. Leaves of vegetative shoots: ligules up to 0.2 mm long, densely up to 1.5 mm long, ciliate; abaxial surface of blades glabrous and smooth or pubescent, adaxial surface densely covered with hairs 0.15–0.25(–0.4) mm. Glumes 35–46 mm. Anthecium 9–11 × 0.8–1.1 mm. Callus acute, (1.5–)1.6–2.1(–2.3) mm, its base 0.7–0.9 × 0.25–0.3 mm, densely bearded, dorsal hairs flexuous or straight. Lemma with 7 lines of hairs, marginal and dorsal lines reaching base of awn or terminating at 0.2–1 mm below top; lemma apex with ring of hairs. Awn unigeniculate, column 20–35 mm; with hairs 9–16 mm; seta arcuate, 45–75 mm, hairs in lower part of seta 45–55 mm.

Phenology. *Stipa* ×*subdrobovii* flowers from May to June.

Habitat. *Stipa* ×*subdrobovii* is found in mountain steppes at 1500–2450 m.

Based on the characteristics of the abaxial surface of the vegetative leaves (glabrous or pubescent), two varieties of *Stipa* ×*subdodrobovii* are recognized.

1. Leaves of vegetative shoots glabrous . . . . . *Stipa* ×*subdrobovii* M. Nobis & A. Nowak var. *subdrobovii*
1′. Leaves of vegetative shoots densely pubescent . . . *Stipa* ×*subdrobovii* var. *pubescens* M. Nobis & A. Nowak

Stipa ×subdrobovii var. **subdrobovii.**

Culm leaves: sheaths glabrous or the lower shortly pubescent, blades glabrous abaxially and pubescent adaxially. Leaves of vegetative shoots: ligules up to 0.2 mm, densely up to 1.5 mm ciliate; abaxial surface of blades glabrous and smooth or pubescent, whereas adaxial surface densely covered with hairs 0.15–0.25 mm.

Habitat. *Stipa* ×*subdrobovii* var. *subdrobovii* is found in high mountain steppes and stony and clay slopes at 1500–2450 m.

Distribution. *Stipa* ×*subdrobovii* var. *subdrobovii* is found in Tajikistan (Zeravshan Mountains), western Kyrgyzstan, and southern Kazakhstan (western Tian-Shan Mountains).

Additional specimens studied. KAZAKHSTAN. Almatiiskai region, 7 km S of Boguto, 5 June 1985, *V. Grubov et al. 76* (KRA 455878!, KRA 479063!, KRA 479064!); sandy grassland, 15 km N of Kapshagai (40 km N of Almaty), 44°13′13″N / 77°42′17″E, 940 m, wp. 266, 22 May 2014, *M. Nobis & P. Gudkova s.n.* (KRA!). TAJIKISTAN. Islanderdarya River valley, Zeravshan Region B, western Tajikistan, high mtn. steppe, among stones on the left slope of the Iskanderdarya River valley, ca. 0.5 km E of Serimadarun Lake (near Iskanderkul Lake), 39°05′N / 68°23′E, 2320 m, incl. SW, slope 5°, 30 May 2015, no. 8, *M. Nobis s.n.* (KRA 456383!); Iskanderdarya River valley, Zeravshan Region B, western Tajikistan, Pamir-Alai Mtns., high mtn. steppe, betw. stones, on the left slope of the Iskanderdarya River valley, ca. 0.5 km E of Serimadarun Lake (near Iskanderkul Lake), 39°05′08″N / 68°22′46″E, 2326 m, incl. W, slope 5° to 10°, 14 June 2011, no. 3, *M. Nobis s.n.* (KRA 455908!); Zeravshan Mtns., Jagnob River valley, high mtn. steppe on the right slope of the no name tributary of the Fagnob River, E of Marzich settlement (W of Anzob), 39°10′54″N / 68°43′49″E, 2200–2300 m, exp. W, slope 40°, 22 June 2009, *M. Nobis s.n.* (KRA!); Fan Mtns., Pamir Alai Mtns., high mtn. stony steppe, on the mtn. slopes, near N part of Iskanderkul Lake, 39°05′06″N / 68°22′23″E, 2200 m, inclination S–SSE, 4 June 2009, *M. Nobis s.n.* (KRA 479069!, KRA 479062!); Zeravshan River valley, Zeravshan Region C, Zeravshan Mtns. (Pamiro-Alai); steppe grasslands on the right terrace of the Zeravshan River, ca. 3–4 km W of Yarm, betw. Yarm & Langarshif streams (ca. 125 km E of Aini), 39°26′10″N / 69°56′04″E, 2455 m, exp. S, slope 10° to 60°, no. 4, 20 June 2009, *M. Nobis s.n.* (KRA 479061!).

Stipa ×subdrobovii var. **pubescens** M. Nobis & A. Nowak, var. nov. TYPE: Western Tajikistan, western Pamir Alai, Zeravshan Mtns., high mtn. steppe, on the southern slope of mtns. (left slope of the Iskanderdarya River valley), ca. 0.6 km E of Serimadarun Lake (near Iskanderkul Lake), 39°05′N / 68°23′E, 2340 m, 10 June 2012, no. 4/1, *M. Nobis & A. Nowak s.n.* (holotype, KRA 479068!; isotypes, KRA 407896!, KRA 479065!, KRA 479066!, KRA 479067!).

Diagnosis. *Stipa* ×*subdrobovii* M. Nobis & A. Nowak var. *pubescens* M. Nobis & A. Nowak differs from *S.* ×*subdrobovii* var. *subdrobovii* in having pubescent not glabrous leaves of the vegetative shoots.

Culm leaves: sheaths glabrous or lower shortly pubescent, blades glabrous abaxially and pubescent adaxially. Leaves of vegetative shoots: ligules up to 0.2 mm, densely ciliate, cilia up to 1.5 mm; abaxial and adaxial surfaces of blades pubescent and covered with hairs 0.25–0.4 mm.

Habitat. *Stipa* ×*subdrobovii* var. *pubescens* is found in steppes and stony and clay slopes at 2200–2450 m.

Distribution. In Middle Asia, *Stipa* ×*subdrobovii* var. *pubescens* is found Tajikistan, within the range of the nominal variety (Zeravshan Mountains).

Paratypes. TAJIKISTAN. Islanderdarya River valley, Zeravshan Region B, western Tajikistan, Pamir-Alai Mtns., high mtn. steppe, among stones on the left slope of the Iskanderdarya River valley, ca. 0.5 km E of Serimadarun Lake (near Iskanderkul Lake), 39°05′N / 68°23′E, 2320 m, inclination SW, slope 5°, 30 May 2015, no. 8, *M. Nobis s.n.* (KRA [10 sheets]); western Tajikistan, western Pamir Alai, Zeravshan Mtns., high mtn. steppe, on the southern slope of mtns. (left slope of the Iskanderdarya River valley), ca. 0.6 km E of Serimadarun Lake (near Iskanderkul Lake), 39°05′N / 68°23′E, 2300 m, inclination SW, slope 5°, 15 June 2012, no. 35/1, *M. Nobis s.n.* (KRA 479068, KRA 407893); Islanderdarya River valley, Zeravshan Region B, western Tajikistan, Pamir-Alai Mtns., steppe, among stones on the left slope of the Iskanderdarya River valley, ca. 0.5 km E of Serimadarun Lake (near Iskanderkul Lake), 39°05′04″N / 68°22′47″E, 2350 m, 17 June 2010, no. 5, *M. Nobis s.n.* (KRA 479060); steppe grasslands on the left slope of Iskanderkul Lake, ca. 500 m NNE of tourist camp Varzob, 39°05′56″N / 68°20′54″E, 2250 m, 14 June 2007, no. 2/32, *M. Nobis s.n.* (KRA 479058, KRA 479059); steppe grasslands on the left slope of Iskanderkul Lake, ca. 500–1500 m SW of tourist camp Varzob, 39°05′05″N / 68°22′05″E, 2220 m, 12 June 2007, no. 2/32, *M. Nobis, M. Kozak & A. Nowak s.n.* (KRA 479057).

Notes. Because this variety has densely pubescent leaves, *Stipa drobovii* var. *iskanderkulica* is thought to be one of its putative parental taxa. *Stipa drobovii* var. *iskanderkulica* also has densely pubescent leaves and frequently co-occurs with *S. subdrobovi* var. *pubescens* at the same localities. Further examination using molecular methods is needed to evidence the origin of this taxon.

Stipa subeffusa Ohwi, Acta Phytotax. Geobot. 17: 15. 1957. TYPE: Pakistan. (Hunza) Inter Minapin et Chalt, 22 Aug. 1955, *Nakao s.n.* (holotype, KYO

not seen; isotype, KYO not seen). = **Achnatherum brandisii** (Mez) Z. L. Wu, Acta Phytotax. Sin. 34: 154. 1996 [syn. after Freitag, 1985].

Stipa subsessiliflora (Rupr.) Roshev., Izv. Imp. Bot. Sada Petra Velikago 14(Suppl. 2): 50. 1915. Basionym: *Lasiagrostis subsessiliflora* Rupr., Sert. Tianschan. publ. in Mém. Acad. Imp., St. Pétersb., Sér. 7, 14(4): 35. 1869. TYPE: [China. Xinjiang:] Mittlerer Tianshan, Toyandy-Tal (ca. 70 km NNW of Kashgar), 30 July 1886, *Osten-Sacken s.n.* (holotype, LE!).

Synonyms. ≡ *Ptilagrostis subsessiliflora* (Rupr.) Roshev., Fl. URSS 2: 74. 1934.

Habitat. *Stipa subsessiliflora* is found in high mountain steppes and stony slopes at 3000–4200 m.

Distribution. *Stipa subsessiliflora* is found in the mountains of central Asia (Tzvelev, 1968, 1976; Wu & Phillips, 2006). In Middle Asia, it occurs in northeastern Afghanistan, western China, Kyrgyzstan, eastern Tajikistan, and eastern Pakistan.

Stipa szovitsiana Trin. in Hohenacker, Bull. Soc. Imp. Naturalistes Moscou 11(3): 243. 1838. TYPE: Tatuni, July 1853, "mis. cl.," *Hohenacker 1253* (lectotype, designated by Tzvelev, [1976: 584], LE!). = **Stipa arabica** Trin. & Rupr. var. **arabica**.

Stipa ×tadzhikistanica M. Nobis, Pl. Syst. Evol. 299(7): 1338. 2013 (*S. caucasica* Schmalh. × *S. lipskyi* Roshev.; Nobis, 2013). TYPE: Dolina rzeki Iskanderdaria (Iskanderdarya River valley), Rejon Zerawszański B (Zeravshan Region B), Zachodni Tadżykistan (West Tajikistan) Pamiro-Alai, murawy stepowe wśród głazów, na stokach gór, na lewym zboczu doliny rzeki Iskanderdarya, ok. 0.5 km na E od jeziora Serimadarun (koło Jeziora Iskanderkul [Tajikistan, Zeravshan Mtns. (Pamir Alai Mtns.), steppe grasslands on the mtn. slopes, among stones, on the left slope of the Iskanderdarya River valley, ca. 0.5 km E of the Serimadarun Lake (near Iskanderkul Lake)], 39°05′04″N / 68°22′47″E, 2350 m, exp. SE, slope 10°, no. 5, 17 June 2010, *M. Nobis s.n.* (holotype, KRA 383654!; isotypes, Herb. Stip. M. Nobis!, KRA!, KRAM!).

Habitat. *Stipa ×tadzhikistanica* is found in steppe grasslands at 1400–2400 m.

Distribution. *Stipa ×tadzhikistanica* is found in Middle Asia (Nobis, 2013) in Tajikistan (Hissar and Zeravshan Mountains).

Stipa ×talassica Pazij, Bot. Mater. Gerb. Inst. Bot. Zool. Akad. Nauk Uzbeksk. S.S.R. [Not. Syst. Herb. Inst. Bot. & Zool. Acad. Sci. Uzbek.] 10: 21. 1948 (*S. caucasica* Schmalh. × *S. macroglossa* P. A. Smirn. subsp. *macroglossa*; Nobis, 2013). TYPE: Tsentralnyi Tyan-Shan, Verkhne-Talasskii raion, Talasskii Alatau, Dol. r. Besh-tash, Poyas khvoinogo lesa, skaly, 30 June 1927, No. 339, *M. M. Sovetkina & M. V. Uspenskaya s.n.* (holotype, TASH 163462!; isotype, LE!).

Habitat. *Stipa ×talassica* is found in steppe grasslands at 1100–1800 m.

Distribution. *Stipa ×talassica* is found in Middle Asia (Pazij, 1968; Nobis, 2013) in Kyrgyzstan (Talass, Kyrgyz, and Fergana Mountains).

Stipa tianschanica Roshev., Fl. Aziat. Ross. 12: 149, pl. 10, f. 3, 3a. 1916. TYPE: Semirech. obl. Przhev. u. r. Ak"-Shiiryak" nizove, kamenistye sklony, 31 July 1913, *B. Shishkin s.n.* (lectotype, designated by Nobis [2014: 302], MW!).

Habitat. *Stipa tianschanica* is found in high mountain steppes, semideserts, and rocky ledges and crevices at 2500–4000 m.

Distribution. *Stipa tianschanica* is found in the mountains of central Asia (Nobis, 2011, 2014). In Middle Asia, it occurs in western China (Tian-Shan, Pamir, Karakorum Mountains), Kyrgyzstan (Tian-Shan Mountains), and Tajikistan (Pamir Mountains). Figure 4.

Notes. Within the species, the two subspecies can be distinguished: *Stipa tianschanica* subsp. *tianschanica* (which occurs in the studied area) and *S. tianschanica* subsp. *gobica* (Roshev.) D. F. Cui (synonyms: ≡ *S. gobica* Roshev., ≡ *S. tianschanica* var. *gobica* (Roshev.) P. C. Kuo & Y. H. Sun). Since the latter taxon grows in northeastern Kazakhstan (Altay Mountains) and western China (Nobis, 2014) near the borders of the studied area, it is also possible to find it in Middle Asia. *Stipa tianschanica* subsp. *tianschanica* differs from *S. tianschanica* subsp. *gobica* in having glumes 24–34 mm long (vs. 14–27 mm long), the top of the lemma with a well-developed ring of hairs (vs. the top of the lemma without a ring of hairs or, rarely, with a few scattered, short hairs), awn (63–)75–90(−103) mm long (vs. awn [42–]55–80 mm long) and the seta (51–)60–80(−86) mm long (vs. seta [31–]40–60[−70] mm long).

Stipa tibetica Mez, Repert. Spec. Nov. Regni Veg. 17: 207. 1921. TYPE: Lasiag. Mongholica Trin., Tibet Occ., alt. 14,000 ft., *T. T. (Herb. Ind. Or. Hook. fil. & Thomson)* (lectotype, designated here, LE00009272!; holotype, B†). ≡ **Ptilagrostis**

tibetica (Mez) Tzvelev, Rast. Tsentr. Azii 4: 45. 1968.

Stipa tirsa Steven, Bull. Soc. Imp. Naturalistes Moscou 30(2): 115. 1857. TYPE: Ukraine. Kaltschik, camp. Maeotic, *Graff s.n.* (lectotype, designated by Martinovský & Skalický [1969: 339], H not seen).

Synonyms. ≡ *Stipa pennata* L. var. *tirsa* (Steven) Čelak., Sitzungsber. Königl. Böhm. Ges. Wiss. Prag, Math.-Naturwiss. Cl. 1884: 58. 1884.

Notes. Although we did not find any specimens of *Stipa tirsa* during this study, it is known from northern Kazakhstan (Tzvelev, 1976), so it is also very likely to be found in the area of study. Narrow-leaved specimens of *S. zalesskii* sometimes may be confused with *S. tirsa*. However, *S. tirsa* has vegetative leaves with a bristle-like apex and very short (0.1–0.2 mm long) ligules, whereas in *S. zalesskii* vegetative leaves are obtuse at the apex and ligules are always longer.

Stipa tortilis Desf., Fl. Atlant. 1: 99–100, pl. 31, f. 1. 1798. TYPE: in arvis (holotype, P not seen, syn. after Freitag, 1985). = **Stipellula capensis** (Thunb.) Röser & Hamasha, Schlechtendalia 24: 92. 2012.

Stipa transcaucasica Grossh., Trudy Bot. Inst. (Baku) 2: 245–246. 1936. TYPE: [Azerbaijan.] Zuvant, Kis-Jurdy Mtns. near Gevedara, 17 July 1930, *Prilipko s.n.* (holotype, BAK not seen). ≡ **Stipa holosericea** Trin. var. **transcaucasica** (Grossh.) M. Nobis.

Stipa trichoides P. A. Smirn., Repert. Spec. Nov. Regni Veg. 21: 233. 1925. TYPE: Turkomania. Pr. Ashabad. In m. Ludsha, 6500, 9 July 1898, *D. Litwinow 2222* (lectotype, designated by Nobis et al. [2016a: 150], LE!; isolectotypes, LE! [3 sheets], MW!).

Synonyms. ≡ *Stipa turkestanica* Hack. subsp. *trichoides* (P. A. Smirn.) Tzvelev, Novosti Syst. Vyssh. Rast. 11: 17. 1974.

Habitat. *Stipa trichoides* is found in steppes, stony slopes, and screes at 1800–2900 m.

Distribution. *Stipa trichoides* is found in Middle and southwestern Asia (Gonzalo et al., 2013; Nobis et al., 2016a). In Middle Asia, it occurs in Afghanistan, northern Iran, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

Stipa turcomanica P. A. Smirn., Repert. Spec. Nov. Regni Veg. 21: 234. 1925. TYPE: Pl. Turkomaniae, in montibus prope Ashabad, 1000 m, 9 May 1897, *D. Litvinov 177* (lectotype, designated by Tzvelev [1976: 588], LE!; isolectotypes, LE!). ≡ **Stipa zalesskii** Wilensky var. **turcomanica** (P. A. Smirn.) M. Nobis.

Stipa turgaica Roshev., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 11: 21–22. 1949. TYPE: Turgai Distr. & post, Kizyl-Jingilskaya Volost, series of small lakes in the lower reaches of Sarysu, Lake Tailyak-Kul, wormwood-biyurgun steppe, 21 May 1914, *I. Krasheninnikov 5104* (lectotype, designated by Tzvelev [1976: 584], LE!). ≡ **Stipa arabica** Trin. & Rupr. var. **turgaica** (Roshev.) Tzvelev.

Stipa turkestanica Hack., Trudy Imp. S.-Peterburgsk. Bot. Sada. 26: 59. 1906. TYPE: Iter Turkestanicum 1904; *Stipa turkestanica* Hack., Shugnan: stoyanka Dzhidaka, 27 July 1904, *B. A. Fedtschenko s.n.* (holotype, W-Hackel No. 19184!; isotypes, MW! [2 sheets]).

Habitat. *Stipa turkestanica* is found in steppes, stony slopes, and screes at 1800–4000 m.

Distribution. *Stipa turkestanica* is found in the mountains of central and southwestern Asia (Nobis et al., 2016a). In Middle Asia, it occurs in Afghanistan, western China, northern Iran, eastern Pakistan, and Tajikistan. Figure 3.

Notes. *Stipa turkestanica* var. *diyaensis* L. Q. Zhao & K. Guo has recently been described from western China (Himalayas). It differs from the nominal variety only in the character of its awn column, which is shortly pubescent versus glabrous. During our herbarium visits, we found another specimen of this taxon, collected from southeastern Afghanistan (Prov. Paktia, 3 km S of Zirok, rd. from Khost to Urgun, 29 May 1971, *O. H. Volk 71/188* [M-0257951], rev. M. Nobis). Despite *S. turkestanica* var. *diyaensis* being unknown from the research area up to this point, its occurrence in Middle Asia is very likely.

Stipa ×tzveleviana Kotukhov, Bot. Zhurn. (Moscow & Leningrad) 79(7): 102. 1994 (*S. orientalis* Trin. × *S. macroglossa* P. A. Smirn. subsp. *kazachstanica* (Kotukhov) M. Nobis; Nobis & Gudkova, 2016). TYPE: Saur-Tarbagatai, brachia australi-occidentalia jugi Manrak, 600 m, locus Kempirbulak, clivulus saxosus boreali-occidentalis, 11 July 1992, *Ju. Kotuchov s.n.* (holotype, LE!; isotypes, LE! [3 sheets]).

Habitat. *Stipa ×tzveleviana* is found in steppe grasslands at 600–1400 m.

Distribution. *Stipa ×tzveleviana* is found in the mountains of northeastern Middle Asia (Kotukhov,

2002; Nobis & Gudkova, 2016). It occurs specifically in eastern Kazakhstan (Sauro-Manrak Mountains).

Stipa ×tzvelevii Ikonn., Opred. Vyssh. Rast. Badakhshana 84. 1979 (*S. caucasica* Schmalh. × *S. orientalis* Trin.; Nobis, 2011). TYPE: Tajikistan. Badakhshan, Kishty Dzharob Valley, near Lyangar settlement, NE exposure, 3700 m, 10 July 1956, *G. Ladygina 3219* (holotype, LE!).

Habitat. *Stipa ×tzvelevii* is found in steppe grasslands, screes, rocks, and stony slopes at 1500–2800 m.

Distribution. *Stipa ×tzvelevii* is found in Middle Asia (Nobis, 2011) in Kazakhstan, Kyrgyzstan, and Tajikistan.

Stipa ucrainica P. A. Smirn., Repert. Spec. Nov. Regni Veg. 22: 374. 1926. TYPE: Ekaterinoslavskaya gub., Aleksandrovskii u., bliz khut. Mirgorodovka, stepnoi sklon Ternovoi balki, *V. Alekhin 209* (holotype, MW!; isotypes, MW! [4 sheets]).

Synonyms. ≡ *Stipa zalesskii* Wilensky subsp. *ucrainica* (P. A. Smirn.) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 17. 1974; = *S. krascheninnikowii* Roshev.

Habitat. *Stipa ucrainica* is found in steppes and stony slopes at 300–1000 m.

Distribution. *Stipa ucrainica* is a widespread species. Its range extends from eastern Europe to the northern part of Middle Asia (Tzvelev, 1976; Slyusarenko, 1977). In Middle Asia it occurs in western and central Kazakhstan.

Stipa ukranensis Lam., Tabl. Encycl. 1: 157. 1791. TYPE: Ex Ukrania, Tirsa, Guettard mem. v. 1. t. 1.2 (not seen; syn. after Tzvelev, 1976). = **Stipa capillata** L.

Stipa violacea Nikitina, Trudy Biol. Inst. Kirg. Fil. An SSSR 2: 68. 1947, hom. illeg. non Hitchcock, Contr. U.S. Natl. Herb. 24(7): 282. 1925. TYPE: Tsentralnyi Tian-shan, severnyi sklon khr. Kavaktau, pereval mezhdu Beiryuk i Kash-bel, 28 July 1937, *E. Mikhailova & L. Popova 66* (holotype, LE!). = **Stipa kirghisorum** P. A. Smirn.

Stipa voronini Krasn., Spisok. Rast. Sobr. Vost. Tyan-Shane, letom 1886 goda 125, 1887. TYPE: Fl. Iliensis, prope Andraki, May 1886, *Krassnov s.n.* (lectotype, designated by Tzvelev [1976: 578], LE!). = **Stipa richteriana** Kar. & Kir. subsp. **richteriana**.

Stipa woroninii Krasn., Script. Hort. Univ. Petrop. II, 1: 22. 1887–1888. TYPE: Fl. Iliensis, prope Andraki, May 1886, *Krassnov s.n.* (lectotype, designated by Tzvelev [1976: 578], LE!). = **Stipa richteriana** Kar. & Kir. subsp. **richteriana**.

Stipa zalesskii Wilensky, Dnevn. Vserossisk. S"ezda Russk. Bot. 41. 1921. TYPE: Kazakhstan. In the vic. of Saratovka, southern slopes in the regions of Kalyubanov's country house, 5 June 1918, *D. Zalesskii s.n.* (lectotype, designated by Tzvelev [1976: 587], LE!).

Within the species three varieties are recognized.

1. Awn glabrous or scabrous on column and plumose on seta 2
1′. Awn pilose throughout . . . . . *Stipa zalesskii* Wilensky var. *iljinii* (Roshev) Tzvelev
2. External sheaths of vegetative shoots shortly pubescent . . . . . *Stipa zalesskii* var. *zalesskii*
2′. External sheaths of vegetative shoots glabrous . . . *Stipa zalesskii* var. *turcomanica* (P. A. Smirn.) M. Nobis

Stipa zalesskii var. **zalesskii.**

Synonyms. ≡ *Stipa pennata* L. subsp. *zalesskii* (Wilensky) Freitag, Notes Roy. Bot. Gard. Edinburgh 42: 443. 1985; = *S. rubens* P. A. Smirn.; ≡ *S. zalesskii* Wilensky var. *rubens* (P. A. Smirn.) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 19. 1974; = *S. rubentiformis* P. A. Smirn.; ≡ *S. rubens* P. A. Smirn. subsp. *rubentiformis* (P. A. Smirn.) F. M. Vázquez & M. Gut., Telopea 13(1–2): 164. 2011; = *S. rubens* subsp. *sublevis* Martinovský, Preslia 44(1): 21. 1972. TYPE: Krymskaja oblast, Simferopolskyj ra-n, s. Partizanske, l July l955, *A. Barbaricz, D. Dobroczyaeva & M. Kukalo s.n.* (holotype, KWHA not seen); = *S. maeotica* Klokov & Osychnyuk; ≡ *S. zalesskii* var. *maeotica* (Klokov) Tzvelev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. n.s. 91(1): 121. 1986; = *S. smirnovii* Martinovský; = *S. canescens* P. A. Smirn. ex Roshev.

Habitat. *Stipa zalesskii* var. *zalesskii* is found in steppe grasslands at 1300–3200 m.

Distribution. *Stipa zalesskii* var. *zalesskii* is a widely distributed species. Its range extends from central Europe up to central Asia (Tzvelev, 1976; Conert, 1998; Nobis et al., 2016b, 2016c). In Middle Asia, it occurs in western China, Kazakhstan, and Kyrgyzstan.

Stipa zalesskii var. **iljinii** (Roshev.) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 18. 1974. Basionym: *Stipa iljinii* Roshev., Bull. Jard. Bot. Acad. Sc. URSS 1931, 30: 294. 1932.

Habitat. *Stipa zalesskii* var. *iljinii* is found in steppe grasslands, within the altitudinal range of the nominal variety.

Distribution. *Stipa zalesskii* var. *iljinii* is found within the range of the nominal variety (Roshevitz,

1916; Tzvelev, 1976). In Middle Asia it occurs in Kazakhstan.

Notes. See comments for *Stipa borysthenica* var. *anomala*.

Stipa zalesskii var. **turcomanica** (P. A. Smirn.) M. Nobis, comb. & stat. nov. Basionym: *Stipa turcomanica* P. A. Smirn., Repert. Spec. Nov. Regni Veg. 21: 234. 1925.

Synonyms. ≡ *Stipa zalesskii* subsp. *turcomanica* (P. A. Smirn.) Tzvelev, Nov. Syst. Vyssh. Rast. 11: 18. 1974.

Habitat. *Stipa zalesskii* var. *turcomanica* is found in steppe grasslands at 1200–2000 m.

Distribution. *Stipa zalesskii* var. *turcomanica* is found in the southern part of Middle Asia (Tzvelev, 1976) in northern Iran and Turkmenistan (Kopet-Dagh Mountains).

Notes. The only difference between *Stipa zalesskii* var. *turcomanica* and *S. zalesskii* var. *zalesskii* is the character of the sheaths of the vegetative shoots, which are glabrous versus shortly pubescent, respectively. This character (pubescence or lack of indumentum) is often considered natural variation, and both glabrous as well as pubescent sheaths can be observed within one population, e.g., in *S. caucasica*. However, we did not notice such variation in specimens identified as *S. zalesskii* var. *zalesskii* or *S. zalesskii* var. *turcomanica*, whereas the length of the awn and anthecium, considered a diagnostic character by Tzvelev (1976), varies considerably across the range of these taxa (Nobis at al., 2016b, 2016c; M. Nobis, pers. obs.).

Stipa zeravshanica M. Nobis, Nordic J. Bot. 31(6): 667. 2013. TYPE: Western Tajikistan, western Pamir Alai Mtns.: Góry Zerawszańskie, w szczelinach i na półkach skalnych, na prawym, skalistym stoku doliny rzeki Jagnob (przy drodze), ok. 5 km na W od wsi Anzob (pomiędzy osadami Anzob i Marzicz) [Zeravshan Mtns., in rocky crevices and ledges, on the right slope of the Jagnob River valley (near the rd.), ca. 5 km W of Anzob (betw. Anzob & Marzich settlements)]; 39°10′49″N / 68°46′49″E; 2100 m, incl. S, slope 80°, 10 June 2009, *M. Nobis 3a* (holotype, KRA 407887!; isotypes, Herb. Stip. M. Nobis! [2 sheets], KRA 407870!, KRA 407871!, KRA 407884!, KRA 407885!, KRA 407886!, KRA 407858!, KRAM!, WA!).

Habitat. *Stipa zeravshanica* is found in ledges and fissures of calcareous rocks at 1500–2600 m.

Distribution. *Stipa zeravshanica* is found in Middle Asia (Nobis et al., 2013), specifically in Tajikistan (Zeravshan Mountains, northern part of Hissar Mountains, and northern Turkestan Mountains). Figure 3.

Taxonomic-phytogeographic Analysis of the Middle Asian Feather Grasses

In Middle Asia the genus *Stipa* comprises 98 taxa, including 72 species, four subspecies, and 22 varieties. Of the 72 species of feather grasses, 23 are of hybrid origin (nothospecies). For all nothospecies we indicated putative parental species. Several other taxa (e.g., *S. kempirica*, *S. korshinskyi*, *S. kotuchovii*, *S. okmirii*, *S. sczerbakovii*) are probably of hybrid origin as well, but further studies using molecular methods are needed to establish this. The number of feather grasses occurring in different countries varies considerably. The countries richest in *Stipa* taxa (species and subspecies) include Kazakhstan (42 taxa), Tajikistan (40 taxa), and Kyrgyzstan (35 taxa; Table 2, Fig. 12).

Among the 76 taxa (species and subspecies) of *Stipa* recorded in Middle Asia, 41 are endemic, with distribution restricted either to a particular country or mountain range or to the region in general. Eight species (*S. himalaica*, *S. kirghisorum*, *S. korshinskyi*, *S. lingua*, *S. roborowskyi*, *S. tianschanica*, *S. trichoides*, and *S. turkestanica*) distributed in Middle Asia, with several stations exceeding the borders of the studied region, can be considered subendemics. Among endemics recorded in the research area, 20 taxa are of hybrid origin (Table 2). The highest number of endemic taxa of *Stipa* has been recorded in southern Kazakhstan (21 taxa: 12 species, nine nothospecies), Tajikistan (20 taxa: 11 species, nine nothospecies), Kyrgyzstan (14 taxa: 10 species, four nothospecies), and Uzbekistan (seven taxa: six species, one nothospecies).

Based on sectional divisions of the genus *Stipa* proposed by Tzvelev (1974), Middle Asian feather grasses can be divided into six sections (Fig. 13): *Smirnovia* Tzvelev (13 species, one subspecies, 12 nothospecies), *Barbatae* A. Junge (11 species, four nothospecies), *Stipa* (11 species, two subspecies, two nothospecies), *Leiostipa* Dumort. (10 species, one subspecies, five nothospecies), *Pseudoptilagrostis* Tzvelev (three species), and *Regelia* Tzvelev (one species). However, in accordance with the results of our numerical analyses, sectional affiliations of some taxa, especially those representing section *Barbatae* (e.g., *S. purpurea*, *S. orientalis*, *S. gracilis*, *S. himalaica*, *S. zeravshanica*, *S.* ×*gnezdilloi*, *S. breviflora*, *S. roborowski*) as well as those from section *Leiostipa* (*S.* ×*dzungarica*, *S.* ×*heptapotamica*, *S. breviflora*, *S. richteriana*; Fig. 13) are puzzling. Some of the species mentioned previously in this article create subclades that are clearly separated from the other ones (Freitag, 1985). Because of the hybrid origin of some taxa studied, their sectional affiliations are problematic, and sometimes

Table 2. List of *Stipa* L. taxa (species and subspecies) occurring in Middle Asian countries. The presence of a taxon in a particular country is marked using a plus sign (+), endemics are listed in bold, and subendemics are marked with an asterisk (*).

	N Afghanistan	W China	N Iran	Kazakhstan	Kyrgyzstan	N Pakistan	Tajikistan	Turkmenistan	Uzbekistan
S. ×adamii	.	.	.	+	.	.	.	.	.
S. aktauensis	.	.	.	.	.	.	.	.	+
S. ×alaica	+	.	.	.	+	.	+	+	.
S. ×albasiensis	.	+	.	+	+	.	+	.	.
S. arabica	+	+	+	+	+	+	+	+	+
S. ×assyriaca	+	.	+	+	+	.	+	+	+
S. badachschanica	+	.	+	.	.	.	+	.	.
S. ×balkanabatica	.	.	.	.	.	.	.	+	.
S. basiplumosa	.	+	.	.	.	+	.	.	.
S. borysthenica	.	+	.	+	.	.	.	.	.
S. ×brevicallosa	.	.	.	.	.	.	+	.	.
S. breviflora	.	+	.	.	+	+	.	.	.
S. ×brozhiana	.	.	.	.	.	.	+	.	.
S. bungeana	+	+	.	.	+	+	.	.	.
S. capillata	+	+	+	+	+	+	+	+	+
S. caucasica subsp. *caucasica*	+	+	+	+	+	.	+	+	+
S. caucasica* subsp. *nikolai	+	.	.	+	+	.	+	.	+
S. ×consanguinea	.	+	.	+	.	.	.	.	.
S. ×czerepanovii	.	.	.	+	.	.	.	.	.
S. dasyphylla	.	.	.	+	.	.	.	.	.
S. drobovii	+	.	+	+	+	.	+	+	+
S. ×dzungarica	.	.	.	+	.	.	.	.	.
S. ×fallax	.	.	.	.	.	.	+	.	.
S. glareosa	+	+	.	+	+	+	+	.	.
S. ×gnezdilloi	.	.	.	.	.	.	.	.	+
S. gracilis	.	+	.	+	+	.	+	.	.
S. ×heptapotamica	.	.	.	+	.	.	.	.	.
*S. himalaica**	+	+	.	.	.	+	.	.	.
S. ×hissarica	.	.	.	.	.	.	+	.	.
S. hohenackeriana	+	+	+	+	+	+	+	+	+
S. holosericea	.	.	+	.	.	.	.	+	.
S. ×kamelinii	.	.	.	+	.	.	.	.	.
S. karakabinica	.	.	.	+	.	.	.	.	.
S. karataviensis	.	.	.	+	.	.	.	.	+
S. kempirica	.	.	.	+	.	.	.	.	.
*S. kirghisorum**	+	+	.	+	+	+	+	.	+
*S. korshinskyi**	.	.	.	+	.	.	.	.	.
S. kotuchovii	.	.	.	+	.	.	.	.	.
S. krylovii	.	+	.	+	+	.	+	.	.
S. lessingiana	.	+	+	+	+	.	+	+	+
*S. lingua**	+	.	+	.	.	.	+	+	+
S. lipskyi	.	.	.	+	+	.	+	.	+
S. longiplumosa	.	.	.	.	+	.	+	.	+

Table 2. Continued.

	N Afghanistan	W China	N Iran	Kazakhstan	Kyrgyzstan	N Pakistan	Tajikistan	Turkmenistan	Uzbekistan
S. macroglossa* subsp. *kazachstanica	.	+	.	+	+	.	.	.	.
S. macroglossa* subsp. *macroglossa	.	.	.	+	+	.	+	.	+
S. magnifica	.	.	.	.	+	.	.	.	.
S. ×manrakica	.	.	.	+	+	.	.	.	.
S. margelanica	+	.	.	.	+	.	+	.	.
S. narynica	.	.	.	.	+	.	.	.	.
S. okmirii	.	.	.	.	.	.	+	.	.
S. orientalis	+	+	+	+	+	+	+	.	+
S. ovczinnikovii	.	.	.	.	.	.	+	.	.
S. penicillata	.	+	.	.	.	.	.	.	.
S. ×pseudo-capillata	.	.	.	+	.	.	.	.	.
S. ×pseudo-macroglossa	.	.	.	.	.	.	+	.	.
S. pulcherrima subsp. *crassiculmis*	.	.	+	.	.	.	.	+	.
S. pulcherrima subsp. *pulcherrima*	.	.	.	+	+	.	.	.	.
S. purpurea	+	+	.	.	+	+	+	.	.
S. regeliana	+	+	.	+	+	+	+	.	.
S. richteriana* subsp. *jagnobica	+	.	.	.	.	.	+	.	.
S. richteriana* subsp. *richteriana	.	+	.	+	.	.	.	.	+
*S. roborowskyi**	.	+	.	.	.	+	.	.	.
S. sareptana	.	+	.	+	+	.	+	+	+
S. sczerbakovii	.	.	.	+	.	.	.	.	.
S. ×subdrobovii	.	.	.	+	.	.	+	.	.
S. subsessiliflora	+	+	.	.	+	+	+	.	.
S. ×tadzhikistanica	.	.	.	.	.	.	+	.	.
S. ×talassica	.	.	.	.	+	.	.	.	.
*S. tianschanica**	.	+	.	.	+	.	+	.	.
*S. trichoides**	+	.	+	.	+	.	+	+	+
*S. turkestanica**	+	+	+	.	.	+	+	.	.
S. ×tzveleviana	.	.	.	+	.	.	.	.	.
S. ×tzvelevii	.	.	.	+	+	.	+	.	.
S. ucrainica	.	.	.	+	.	.	.	.	.
S. zalesskii	.	+	+	+	+	.	.	+	.
S. zeravshanica	.	.	.	.	.	.	+	.	.
Total no. of taxa	22	28	15	42	35	15	40	15	20
Endemics	5	3	1	21	13	0	20	2	7

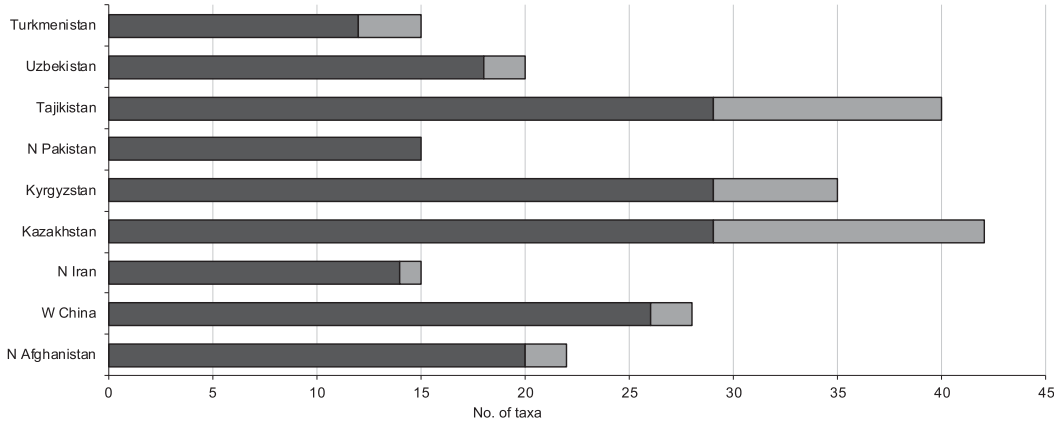

Figure 12. Number of *Stipa* L. taxa in particular countries of Middle Asia; black columns refer to species and subspecies, gray refers to nothospecies.

these taxa have been incorporated into one or another section. For instance, most taxa originating from the hybridization of species representing sections *Stipa* and *Smirnovia* (e.g., *S.* ×*manrakica*, *S.* ×*alaica*, *S.* ×*talassica* or *S.* ×*pseudomacroglossa*), as well as sections *Leiostipa* and *Smirnovia* (*S.* ×*consanguinea* and

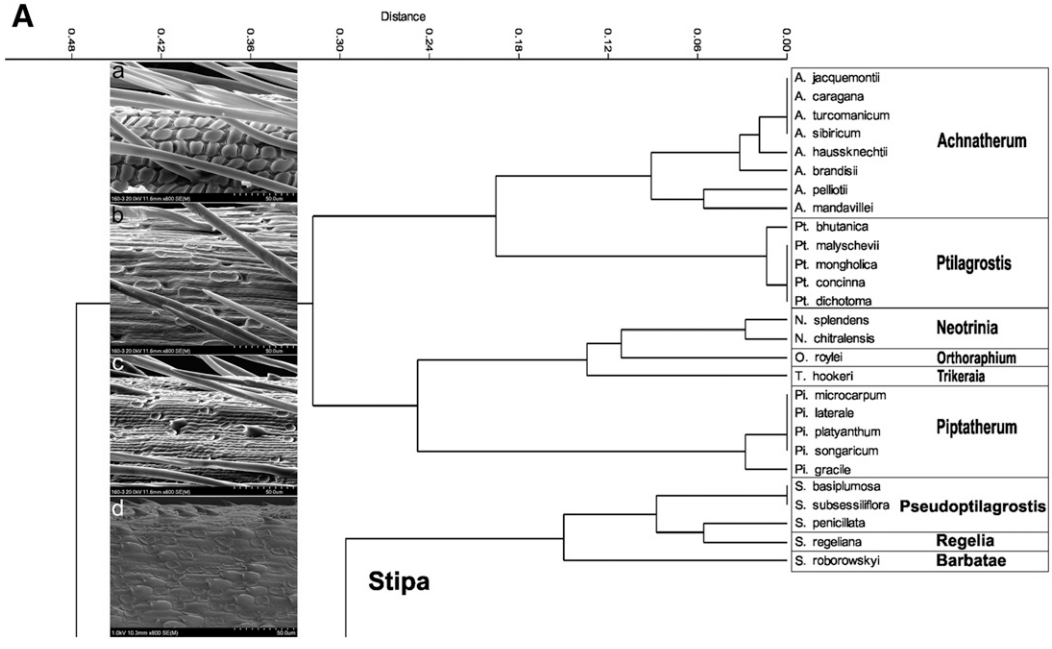

Figure 13. —A, B. Cluster analysis (UPGMA method of classification and Gower's general similarity coefficient) performed on 16 qualitative characters. As an outgroup to *Stipa* L., selected members from the genera *Achnatherum* P. Beauv., *Ptilagrostis* Griseb., *Neotrinia* (Tzvelev) M. Nobis, P. D. Gudkova & A. Nowak, *Orthoraphium* Nees, *Trikeraia* Bor, and *Piptatherum* P. Beauv. were used. Lemma epidermal patterns are presented for the following species: (a) *Achnatherum mandaivillei* (Freitag) M. Nobis (Oman, *Mandaville 6525* [KAS]), (b) *Ptilagrostis concinna* (Hook. f.) Roshev. (India, Ladakh, *L. Klimeš s.n.* [KRA]), (c) *Neotrinia splendens* (Trin.) M. Nobis, P. D. Gudkova & A. Nowak (Tajikistan, *Yu. Gusev s.n.* [LE]), (d) *Orthoraphium roylei* Nees (Nepal, *M. A. Farille s.n.* [E]), (e) *Trikeraia hookeri* (Stapf) Bor (China, Tibet [PE 718306]), (f) *Piptatherum microcarpum* (Pilg.) Tzvelev (Tajikistan, *M. Nobis* [KRA]), (g) *Stipa ucrainica* P. A. Smirn. (Kazakhstan, *R. Roshevitz et al. s.n.* [LE]), (h) *S. lessingiana* Trin. & Rupr. (Kazakhstan, *M. Nobis s.n.* [KRA]), (i) *S. karataviensis* Roshev. (Kazakhstan, *R. Kamelin et al. s.n.* [LE]), (j) *S. richteriana* Kar. & Kir. (Kazakhstan, *M. Nobis s.n.* [KRA]), (k) *S. korshinskyi* Roshev. (Kazakhstan, *V. Goloskokov s.n.* [LE]), (l) *S. badachschanica* Roshev. var. *pamirica* (Roshev.) M. Nobis (Tajikistan, *M. Krivonogova 256* [TAD]), (m) *S. regeliana* Hack. (China, *A. A. Yunatov & Yuan U-fen 623* [LE]).

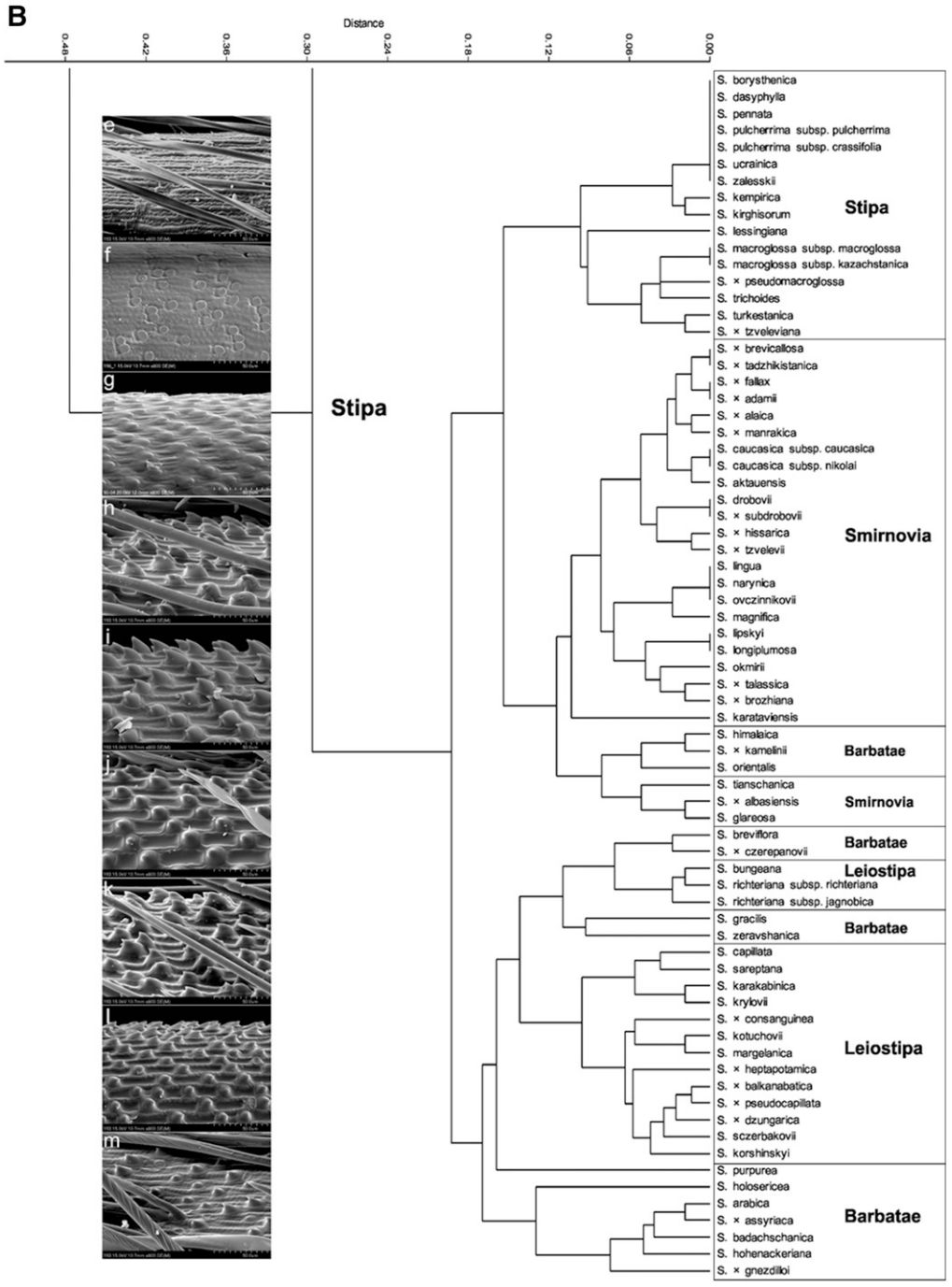

Figure 13. (Continued)

S. ×*balkanabatica*), due to the presence of unigeniculate or indistinctly bigeniculate awns, have been included by different authors into one or another sections. This problem also applies to taxa originating from hybridization between species belonging to sections *Leiostipa* and *Stipa* (e.g., *S.* ×*pseudocapillata* or *S.* ×*heptapotamica*) that were usually included in section *Barbatae*. Several years ago, Tzvelev (2012, 2014) distinguished additional sections, *Hemibarbatae* Tzvelev, *Subbarbatae* Tzvelev, and *Hybridogenae* Tzvelev. Section

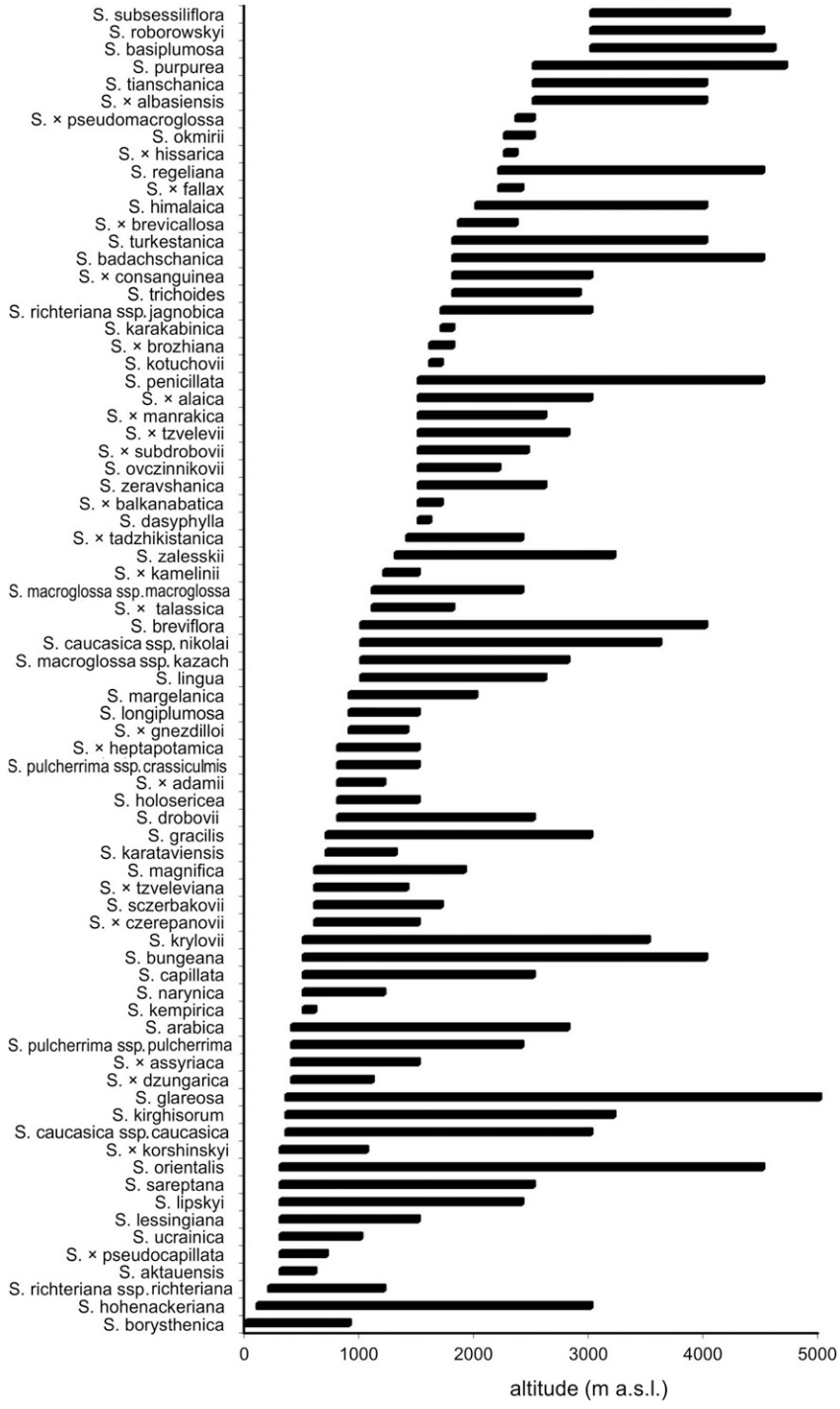

Figure 14. Altitudinal distribution of *Stipa* L. species in Middle Asia.

Subbarbatae is monotypic and comprises only *S. lessingiana*, whereas section *Hybridogenae* comprises taxa originating from hybridization between species from sections *Stipa* and *Subbarbatae*. Keeping in mind that intersectional hybrids in *Stipa* are common and occur between species from almost all sections distinguished to date, following Tzvelev's practice, five or six additional new sections dedicated only for that nothospecies could be distinguished

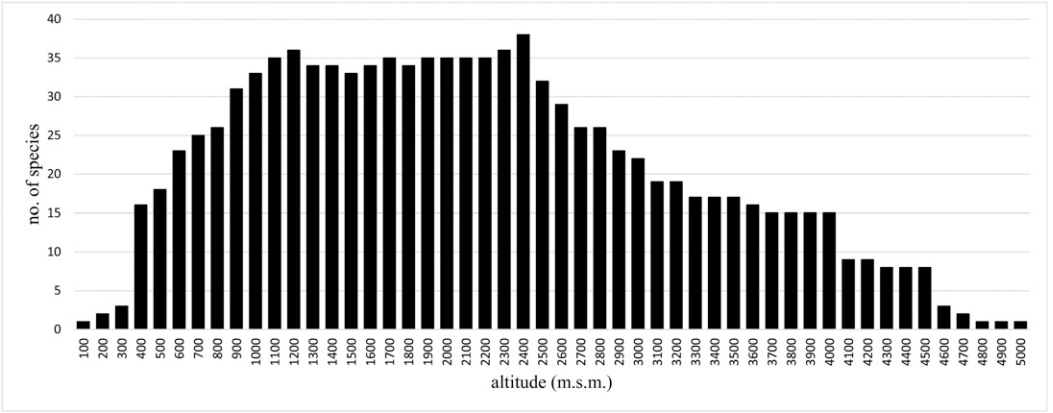

Figure 15. Altitudinal distribution of feather grasses in Middle Asia (number of species occurring in 100-m altitudinal belts).

within the genus *Stipa*. Even in the case of some "good" (pure) species, those for which a hybrid origin has not been suggested, the sectional affiliation might also be confusing. For example, *S. himalaica*, *S. zeravshanica*, and *S. orientalis*, due to their morphological characters, i.e., the presence of an ovary with two styles and pilose awns throughout, might be included either in section *Barbatae* or section *Stipa* (cf. Tzvelev, 1974; Freitag, 1985). A similar problem involves several species from section *Hemibarbatae* (Tzvelev, 2012) that have been included previously either in sections *Leiostipa* or *Barbatae* (Tzvelev, 1974; Freitag, 1985).

Today, molecular techniques are widely used for identifying phylogenetic relations between and within different genera of Stipeae (e.g., Romaschenko et al., 2008, 2010, 2012; Hamasha et al., 2012; Sclovich et al., 2015; Krawczyk et al., 2017, 2018). In accordance with the preliminary results of phylogenetic studies on the genus *Stipa* conducted by Krawczyk et al. (2017, 2018), *S. orientalis* is more closely related to *S. glareosa* and *S. tianschanica*, the species belonging to section *Smirnovia*, rather than to representatives from sections *Barbateae* or *Stipa*, with which the taxon was traditionally classified (Tzvelev, 1976). Another example is *S. richteriana* s.l., which creates a clade with *S. lessingiana* rather than with other representatives of *Stipa*, *Leiostipa*, or *Barbatae* (Krawczyk et al., 2017), whereas based on the results of Hamasha et al. (2012) and Krawczyk et al. (2017), *S. pururea* and *S. roborowskyi* are closely related to species representing section *Pseudoptilagrostis*, not section *Barbatae*, which partially corresponds with the results of our analysis presented in this paper (Fig. 13). To resolve the problem of the phylogenetic relationships between and within particular sections in the entire genus *Stipa*, further studies involving the use of molecular methods are needed, and this is the topic of our next paper (Nobis et al., in prep.).

In Middle Asia, members of the genus *Stipa* can be found at elevations from (0 to)300 to 4500(to 5000) m (Fig. 14), but most of the studied feather grasses are mountain species. Greatest species richness is observed at altitudes between 900 and 2500 m, with 31 to 38 species (34 species on average) per every 100 m (Figs. 14, 15). Areas situated above 3000 m are occupied by 19 species, but in the highest elevations, above 4000 m, only nine species of feather grasses have been found. Some species have a very narrow altitudinal range, but others such as *S. bungeana*, *S. glareosa*, *S. gracilis*, *S. hohenackeriana*, *S. kirghisorum*, *S. krylovii*, and *S. orientalis* have a very wide one (Fig. 14). All of these taxa can be found in numerous localities in the mountains as well as in some of the lowlands, e.g., in central Kazakhstan (*S. glareosa*, *S. orientalis*, *S. kirghisorum*). Like other mountain taxa, their current range may be a result of glaciations and previous climate changes. In the lowest elevations, up to 900 m, four species occur, i.e., *S. aktauensis*, *S. kempirica*, *S.* ×*pseudocapillata*, and *S. borysthenica* (Fig. 14). These species grow in lowlands and in lower mountain ranges within steppes or deserts in central Uzbekistan and/or central Kazakhstan (Pazij, 1968; Tzvelev, 1976; Kotukhov, 2002; Nobis, 2012). The majority of feather grasses are typical steppe taxa, occurring in different lowland and mountain grasslands on sand, loess, gravel, and rock. Some of the analyzed taxa can occupy a few different habitats, e.g., steppes, semideserts, dry grasslands, rocky grasslands, and screes (e.g., *S. caucasica*, *S. drobovii*, *S. kirghisorum*, or *S. orientalis*). However, there is also a group of species restricted to one or two habitat types, e.g., in high mountain deserts (e.g., *S. orientalis*, *S. glareosa*, *S. basiplumosa*, *S. subsessiliflora*), sands (e.g., *S. arabica*, *S. borysthenica*), screes (e.g., *S. macroglossa*), or alpine meadows (e.g., *S. regeliana*, *S. penicillata*, *S. purpurea*). Some have a very narrow ecological range, growing only

on rocky habitats (ledges and fissures) on calcareous substrates (e.g., *S. himalaica*, *S. gracilis*, *S. zeravshanica*). Two of the last mentioned species, namely *S. gracilis* and *S. zeravshanica*, represent typical geographical vicariants, occurring in isolated mountain ranges.

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