



Stipa dickorei sp. nov. (Poaceae), three new records and a checklist of feather grasses of China

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Abstract

Stipa dickorei sp. nov. from the Western Tibetan Plateau (China) is described. The new species is morphologically similar to *S. regeliana*, but they differ from each other in the length of ligules of vegetative shoots. *Stipa dickorei* is also similar to *S. aliena*, however they differ in the shape of panicle, which is contracted with straight branches in *S. dickorei*, and lax with flexuous branches in *S. aliena*. Images of macromorphological and micromorphological structures of the new taxon are provided. Additionally, new records of *S. borysthena*, *S. richteriana*, and *S. zaleskii*, species not listed in the recent Flora of China, as well as a checklist of Chinese feather grasses are also presented.

Key words: distribution, feather grasses, lemma micromorphology, macromorphology, *Stipa*, taxonomy

Introduction

The genus *Stipa* Linnaeus (1753: 78) is one of the most species rich grass genera in China but the number of taxa and taxonomic level at which they were treated, differs among taxonomic publications and editions of the Chinese Floras. For instance, Kuo & Sun (1982) listed 27 species and 4 taxa at variety level while the same authors, a few years later (Kuo & Sun 1987), listed 23 species and 6 varieties. In the Nineties, Lu & Wu (1996) listed 32 species and 5 taxa at variety level, and in the last edition of the Flora of China, Wu & Phillips (2006) gave 23 species, 1 subspecies and 5 taxa at variety level. The differences in the number of species, in particular publications regard mainly such species like: *S. basiplumosa* Munro ex Hooker (1896: 229), *S. himalaica* Roshevitz (1924: 11), *S. hohenackeriana* Trinius & Ruprecht (1842: 80), *S. pennata* Linnaeus (1753: 78), *S. richteriana* Karelin & Kirilov (1841: 862), *S. stapfii* Roshevitz (1924: 11), *S. szovitsiana* Trinius & Ruprecht (1842: 77) Grisebach (1852: 450) and *S. turgaica* Roshevitz (1949: 22), as well as those which are either regarded as varieties or raised to the level of subspecies or species. All of the taxa mentioned above were listed by Lu & Wu (1996), but omitted or regarded as conspecific with other taxa by Wu & Phillips (2006). However, some of these taxa mentioned above were reported from China also by other authors, e.g., occurrence of *S. himalaica* in China was confirmed by Tzvelev (1968), Dickoré (1995) and Nobis *et al.* (2013); *S. hohenackeriana* was reported by Tzvelev (1968), whereas *S. pennata* by Tzvelev (1968) and Gonzalo *et al.* (2013). Herbarium specimens of this species (revised by us) are preserved at LE. From the remaining taxa, *S. basiplumosa* [= *S. subsessiliflora* (Ruprecht 1869: 35) Roshevitz (1915: 50) subsp. *basiplumosa* (Munro ex Hook.f.) Cui (1996: 309), ≡ *S. subsessiliflora* var. *basiplumosa* (Munro ex Hook.f.) Kuo & Sun (1987: 282)] should be treated as a legitimate species as it clearly differs from *S. subsessiliflora* in longer (9.5–13.5 vs. 6–8.5 mm) glumes, which are the widest in the lower 1/3 of their length vs. in the middle part of their length, respectively (Nobis *et al.* 2015a). *Stipa szovitsiana* is a synonym of *S. arabica* Trinius & Ruprecht (1842: 77) whereas *S. turgaica* is currently sunk within *S. arabica* as the variety, *S. arabica* var. *turgaica* (Roshev.) Tzvelev (1976: 584) as it differs by having pubescent leaves and sheaths.

This is similar to the case of *S. penicillata* Handel-Mazzetti (1936: 226), where specimens having pubescent culms and leaves are treated as *S. penicillata* var. *hirsuta* Kuo & Sun (1984: 89). Although *S. hohenackeriana* is absent in Wu & Phillips (2006), it was mentioned by them under *S. lessingiana* Trinius & Ruprecht (1842: 79) with the statement that *S. hohenackeriana* was reported from Xinjiang. *Stipa stapfii* is currently regarded as a synonym of *S. hohenackeriana* (Freitag 1985). *Stipa richteriana*, on the other hand, is a native and permanent element of the Chinese flora collected from few localities in western China (see chapter New records, below). Some other taxa, treated in the Flora of China (Wu & Phillips 2006) at the level of variety, such as *S. klemenzii* Roshevitz (1924: 12) and *S. krylovii* Roshevitz (1929: 379) are currently regarded as distinct species (Tzvelev 1976, Lomonosova 1990, Nobis 2014, Nobis *et al.* 2016b). In a result of previous field investigation in poorly explored regions of China and revision of herbarium material collected from the country, species unlisted so far in the Flora of China were recorded and new taxa were described. Only recently, *Stipa gracilis* Roshevitz (1916: 151), *S. klimesii* Nobis (in Nobis *et al.* 2014: 174 [166]) and *S. macroglossa* Smirnov (1924: 47) subsp. *kazachstanica* (Kotukhov 1994: 104) Nobis (2013: 1055) were recorded as components of the Chinese flora (Nobis 2013, Nobis *et al.* 2013, 2015b) and *S. albasiensis* Zhao & Guo (2011: 522) was described from China.

During revision of herbarium material belonging to *Stipa* we came across specimens belonging to *Stipa borysthenica* Klokov ex Prokudin (1951: 25), *S. richteriana* and *S. zaleskii* Wilenskii (1921: 41), the species not mentioned in the recent Flora of China (Wu & Phillips 2006), as well as specimens belonging to *Stipa* section *Regelia* Tzvelev (1974: 13), collected from southern China that were clearly distinguishable from the other members of this section and representing the new species, *Stipa dickorei*, described herein.

Material and Methods

This study is based on plant material deposited in the herbaria of B, E, FRU, GAT, GFW, GOET, IFP, KAS, KHOR, KRA, KRAM, KUN, LE, M, MOIS, MSB, MW, PE, TAD, TK, UPS, W, WA, WU. For scanning electron microscope (SEM) observation, samples were coated with gold using a JFC-1100E Ion sputter manufactured by JEOL. Micromorphological structure of the lemmas was observed and photographs taken by means of the scanning electron microscope Hitachi S-4700, at various magnifications. Lemmas (removed from mature spikelets in the middle part of the panicle) were studied from the base to the distal portions. Quantitative and qualitative characters were studied for the abaxial lemma surface. We analysed: length of long cells, length and distribution of macrohairs, shape of silica bodies, presence and shape of hooks and prickles. The pattern of hairiness of the leaves (adaxial and abaxial surface of blades from the middle part of leaves) was also studied in examined taxa and photographs were taken by means of SEM.

Taxonomy

Stipa dickorei M.Nobis, *sp. nov.* (Figs. 1–2)

Type:—CHINA. Xizang: E Tibet, upper Salween basin, Riwoqe—Dengqen, Da Qu, 31°10'N/96°10'E, elev. ca. 4120 m, lower alp. *Kobresia* turf, limestone rocks, 8 July 1994, B. Dickoré 9083 (holotype MSB-152840!, isotypes KAS!—2 sheets, KRA!).

Perennial plant, densely tufted, with a few culms and numerous vegetative shoots; culms (12–)19–40 cm tall, with 1(–2) node in the lower part of the culm. Leaves of vegetative shoots: sheaths glabrous or/and shortly pilose but only in the upper part near the margin and ligule; ligules membranous (0.3–)0.5–1.6 mm long, obtuse, the apex shortly ciliate and setulose on the back; blades flat or convolute, green to pale green, 12–18 cm long, 0.5–1.0 mm in diameter or up to 2.2 mm wide when they are flat, adaxial surface densely covered with prickles up to 0.09 mm long, abaxial surface glabrous, at the apex glabrous or somewhat scabrous due to short prickles and spinules. Cauline leaves: sheaths glabrous, upper sheath of culms not inflated; ligules (1.5–)2.0–3.5(–4.5) mm long, acute or obtuse, with very short cilia at the apex, and shortly setulose on the back; blades convolute, green or pale green, up to 10 cm long, adaxial surface shortly pilose, abaxial surface glabrous, slightly scabrous at the apex due to short prickles and spinules. Panicle contracted, (5–)10–16 cm long and 1–2 cm wide, with (8–)12–17 spikelets, exerted, branches erect, glabrous or somewhat setulose below spikelets. Glumes subequal, pale green to somewhat purple, lower glume 10.5–13.0 mm long, upper glume

10.0–12.5 mm long, lanceolate, tapering into a delicate hyaline apex, glabrous on dorsal line. Anthercium 8.0–9.2 mm long, 0.7–0.9 mm wide. Callus 1.0–1.3 mm long, sharply pointed, densely long-pilose, hairs 0.5–0.9 mm long; base of callus dorsally flattened and long protruding, peripheral ring 0.25–0.30 mm in diameter, scar broadly elliptic. Lemma pale green, on dorsal surface covered by numerous hooks and scattered ascending hairs 0.4–0.7 mm long, top of lemma with coronula of hairs 0.4–1.0 mm long. Awn 20–26(–32) mm long, bigeniculate; column 5–7 mm long, twisted, 0.2(–0.3) mm wide, green or straw-coloured, pilose, hairs (0.2–)0.5–1.0(–1.3) mm long, gradually decreasing in length towards the geniculation; the middle segment of the awn 3–5 mm long, pilose, hairs (0.1–)0.2–0.3 mm long; seta straight, green or purple, 11–15 mm long, hairs on seta 0.1–0.2 mm long. Palea equal to lemma in length, with scattered hairs on dorsal surface. Anthers yellow or purple, glabrous, 3–4 mm long.



FIGURE 1. Holotype of *Stipa dickorei*.

Distribution and ecology:—*Stipa dickorei* is known from the eastern part of the Qinghai-Tibetan Plateau in southwestern China. It is probable that the species occupies neighbouring areas, where similar habitat occurs. The species grows in high mountain alpine swards, between elevation range of 3700 to 4300 m.

Etymology:—The species epithet honors the collector Dr. Wolf Bernhard Dickoré, the eminent German botanist, researcher of the flora and vegetation of Central Asian mountains.

Additional specimens studied (paratype):—CHINA. Qinghai: Nangqên Xian, Bêca Xiang, just W of Bêca Forest Station, on road to the Bas Qu, SE of Bêcaka, 31°53'N/96°32'E, 3750 m, on large rocks, slope below limestone

cliffs with remnant *Juniperus* woodland, rock outcrops frequent, 9 September 1996, T.N. Ho, B. Bartholomew, M. Watson, M. Gilbert 3024 (PE-202793!).

Similar species:—Because of its contracted panicle, *Stipa dickorei* is morphologically very similar to *S. regeliana* Hackel (1884: 130). However, the two species differ from each other in the character of ligules of vegetative shoots, which in *S. dickorei* are always shorter (0.3–1.6 vs. 4–6 mm) as well as by glabrous vs. slightly scabrous leaves, respectively.

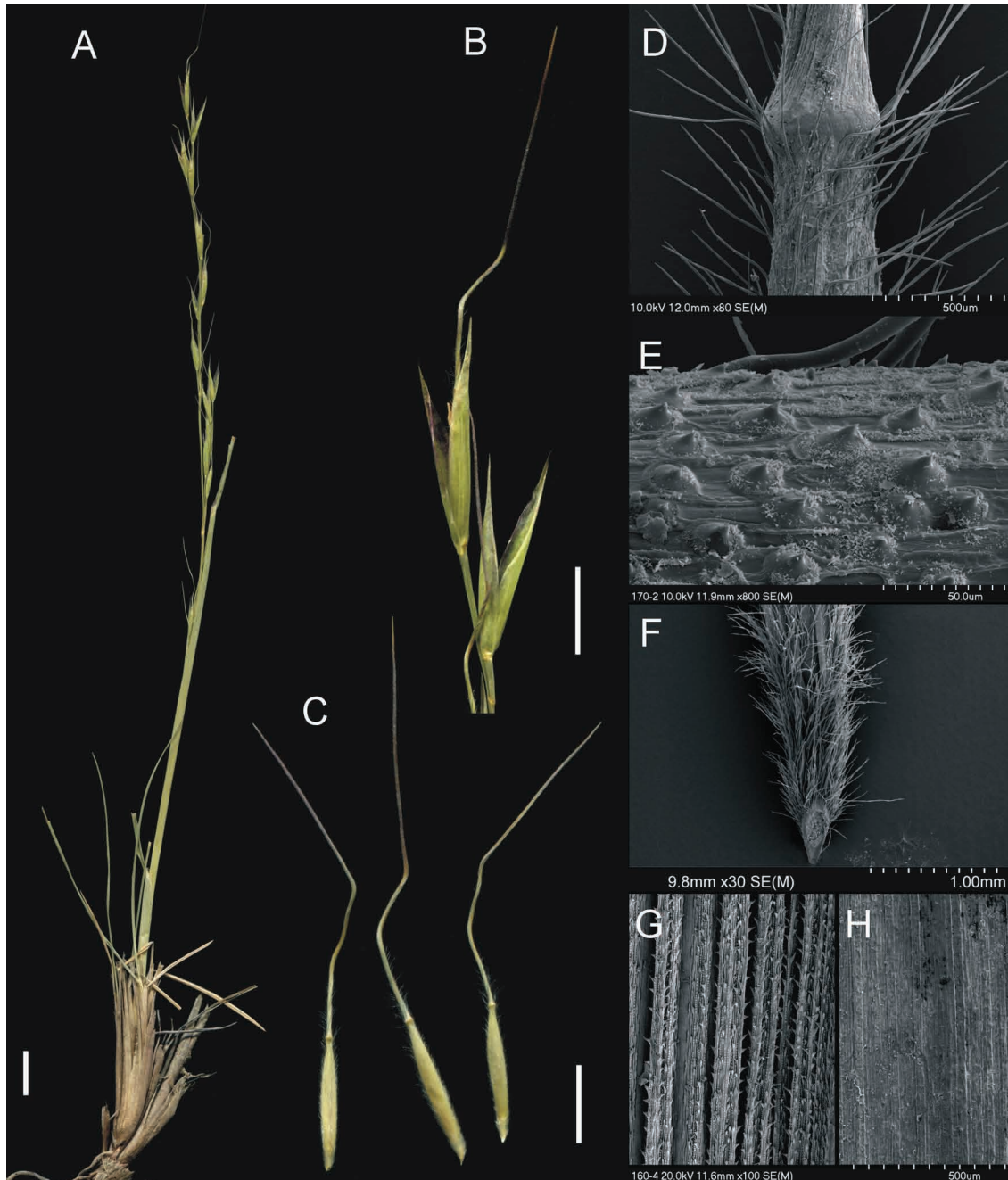


FIGURE 2. Selected morphological characters of *Stipa dickorei*. A. General habit. B. Spikelets. C. Anthercia with awns. D. Lemma apex with basal part of the awn. E. Micromorphological structure of the lemma epidermis (lateral view). F. Callus. G. Adaxial surface of leaves. H. Abaxial surface of leaves. Scale bars: A: 1 cm, B–C: 5 mm.

Stipa dickorei is also similar to *S. aliena* Keng (1941a: 74). These two species differ in the shape of their panicle which, in *S. dickorei* is contracted with straight, glabrous or somewhat setulose branches, whereas in *S. aliena* the panicle is lax with flexuous branches that are more or less densely setulose (hairs 0.3–0.6 mm long, sometimes present only below the glume). Additionally, *S. dickorei* has somewhat longer ligules of the vegetative leaves [(0.3–)0.5–1.6 vs. 0.1–0.5(–0.9) mm, respectively].

Stipa aliena is a polymorphic and variable taxon, particularly in the length of its culms, glumes, anthercia, calluses,

awns, as well as in the number of spikelets per panicle (Nobis *et al.* 2015a). Within the taxon, the variety *S. aliena* var. *macrocarpa* (Martinovský 1970: 163) Nobis (in Nobis *et al.* 2015a: 238) has been distinguished, which differs from *S. aliena* var. *aliena* by having longer anthercia (9–12 vs. 6.5–8.5 mm) and slightly longer awns (23–30 vs. 15–26 mm). At the end of the last century, *S. rohmooiana* Noltie (1999: 287) was described from Sikkim. This taxon is morphologically very close to *S. aliena*, what was stressed also by Noltie (1999). Based on the description, *S. rohmooiana* differs from *S. aliena* generally by lower culms (3.5–12 cm) and smaller number of spikelets (5–7 non ca. 20) per panicle (Noltie 1999). However, during our revision of Chinese specimens of *S. aliena*, specimens with culms 5–60(–84) cm tall and panicles with (2–)5–14(–20) spikelets were frequently observed. Probably, growth of plants from Sikkim could be limited by harsh conditions at the mountainous locality (elevation ca. 5000 m.), where these specimens were collected by Rohmoo in September 1912. Similar modifications in the habit of plants is observed for other high-mountains feather grasses, like *S. glareosa* Smirnov (1929a: 12), *S. tianschanica* Roshevitz (1916: 149), *S. lipskyi* Roshevitz (1916: 153), *S. zeravshanica* Nobis (in Nobis *et al.* 2013: 667) or *Ptilagrostis concinna* (Hooker 1896: 230) Roshevitz (1934: 75), which at higher elevations, have smaller culms and sometimes reduced number of spikelets. Thus, we treat *S. rohmooiana* as conspecific with *S. aliena*.

Taxonomic synopsis of *Stipa* sect. *Regelia*:—Having awn setas with hairs up to 0.3 mm long as well as plumose columns with hairs up to 1.5 mm long, the new species described here is a typical member of the section *Regelia*, which currently comprises three species, namely:

1. *Stipa regeliana* Hack.

Type:—[KYRGYZSTAN]. Issyk-kul, Musart, 2300–2650 m, August 1877, *Regel* (holotype W!).

≡ *Achnatherum regelianum* (Hack.) Tzvelev (2012: 22).

= *Stipa purpurascens* Hitchcock (1930a: 95). Type:—CHINA. Gansu: south of Sining, in the La Che Tze Mountains, elev. 3350 to 3900, *R.C. Ching 686* (US-1245701).

2. *Stipa aliena* Keng

2.1 *Stipa aliena* var. *aliena*

Type:—CHINA. Gansu: Labrang, grassy swampy places, elev. 3000 m, 17 October 1934, *C.W. Yao 502* [Herbarium Biological Laboratory, the Science Society of China, N 57946] (isotype PE-639926!)

= *Stipa smithii* Martinovský (1970: 162) *nom. hom. illeg.*, non *S. smithii* Hitchcock (1930b: 382). Type:—CHINA. Sichuan [Sina, prov. Sze-ch'uan]: reg. bor.-occid., Sankar-von-mâ, c. 45 km bor.-orient. versus in prato, c. 4100 m, 2 September 1922, *leg. Harry Smith, Plantae sinenses 4287* (holotype UPS!, isotypes UPS!, PE!, LD)

= *Stipa rohmooiana* Noltie, *syn. nov.* Type:—Sikkim: Chugya, elev. c. 4900 m, 12 September 1912, *Rohmoo 277* (holotype E!, isotype K!).

2.2 *Stipa aliena* var. *macrocarpa* (Martinovský) M.Nobis

Basionym:—*Stipa smithii* Martinovský var. *macrocarpa* Martinovský (1970: 163). Type:—CHINA. Sichuan: reg. bor.-occid., Tsipula, in prato alpino graminoso, alt. c. 4000 m, 2 August 1922, *leg. Harry Smith, Plantae sinenses 4148* (holotype UPS!, isotypes PE-2029699!, LD, MOIS!).

3. *Stipa dickorei* M.Nobis

Micromorphological variation:—The general pattern of the lemma micromorphology in *Stipa dickorei* is typical for the genus *Stipa* (cf. Barkworth & Everett 1987, Nobis 2013, 2014, Nobis & Nobis 2013, Nobis *et al.* 2013, 2014, 2015a, 2016a) (Fig. 2E). Fundamental long cells are elongated, rectangular to more or less square in shape. The side walls of the long cells are raised and undulate. Silica bodies are frequent, reniform to oblong or ovate, whereas cork cells are sparse or absent. Hooks are frequent, oriented towards the lemma apex, whereas prickles are sparse and present mostly near the apex of the lemma (Fig. 2D–E). Macrohairs are frequent on the whole surface of the lemma. They are straight, (0.1–)0.4–0.7 mm long or geniculately bent near the base, cylindrical and/or string-like twisted, with bulbous base and needle-like apex. The adaxial surface of leaves of the vegetative shoots (Fig. 2G) is ribbed and covered by frequent prickles and papillae as well as less frequent stomata and rectangular to slightly 8-like constricted silica bodies. Abaxial surface of leaves is glabrous (Fig. 2H), with frequent elongated long cells and rounded to rectangular silica bodies.

New records of *Stipa* for the Flora of China

During revision of Chinese material of *Stipa*, we came across on three species which are absent in the recent Flora of China (Wu & Phillips 2006). Data regarding these species are presented below.

Stipa boryshtenica Klokov ex Prokudin

Type:—UKRAINE. Lugov forest country house, Tyasmin, Aleks, u., 18 May 1911, *I. Paczoski* (lectotype selected by Tzvelev, LE!)

Stipa boryshtenica is a widely distributed taxon ranging from central Europe to central Asia (Tzvelev 1976, Martinovský 1980, Conert 1998, Gonzalo *et al.* 2013) and is here reported for the first time from China. Having the ventral line of hairs at the anthercium at the distance of (1.6–)4.2–6.1(–7.7) mm not reaching the base of awn and almost glabrous to slightly scabrous vegetative leaves, *S. boryshtenica* is close to *S. pennata*, however they differ by having callus base narrowly cuneate vs. pyriform, callus (3.4–)3.7–4.2(–4.6) vs. (2.4–)2.8–3.25(–3.75) mm long, upper cauline leaves (22–)36–62(–125) vs. (4–)10–22(–40) mm long respectively (Klichowska & Nobis 2016). These two taxa also differ in the type of habitat in which they grow. *Stipa boryshtenica* grows generally on sandy grasslands and *S. pennata* grows on steppe grasslands.

Specimens studied:—CHINA. Xinjiang: Fuyun county, Tuergen, elev. 1470 m., 6 June 1959, *Xinjiang Exped. 10381* (PE-707071!, PE-707072!).

Stipa richteriana Kar. & Kir.

Type:—Eastern KAZAKHSTAN. In lapidosis mont. Arganty, 1840, *Karelin 907* (lectotype selected by Tzvelev 1976, LE!)

The species is widely distributed in central Asia, mainly in Kazakhstan, western China, Uzbekistan and Afghanistan (Pazij 1968, Tzvelev 1968, 1976, Freitag 1985). The main morphological characters of this taxon include: abaxial surface of vegetative leaves glabrous and adaxial surface shortly pilose with hairs up to 0.1 mm long, spikelets 10–14 mm long, anthercium 5.5–7.5 mm long, callus 0.5–1.0 mm long, awn 4–8 cm long, seta straight with hairs 0.3–0.8 mm long. The species can be confused with *Stipa bungeana* Trinius (1835: 144) and *S. breviflora* Grisebach (1868: 82). However, it clearly differs from *S. bungeana* by its pilose vs. scabrous awn, shorter callus (0.5–1.0 vs. 1–1.5 mm long) as well as different lemma indumentum. *Stipa richteriana* differs from *S. breviflora* by shorter awns (up to 8 vs. over 9 cm long) and shorter hairs on seta (0.3–0.8 vs. 1–2 mm long).

Specimens studied:—CHINA. Xinjiang: northern slope of Eastern Tian-Shan Mts, Manas River valley, 15–20 km higher from Manas city, semidesert, 6 June 1957, *Bot-expedition 644* (LE!); northern slope of Eastern Tian-Shan Mts, foreland, by the road from Tsitai (Guchen), 20 km from Urumchi, steppe-desert, 24 September 1957, *Bot-expedition 2293* (LE!); Mongolian Altai, Koktogai settl., 7 June 1959, *Bot-expedition 10409* (LE!).

Stipa zalesskii Wilenskii

Type:—KAZAKHSTAN. In the vicinity of Saratovka, southern slopes in the regions of Kalyubanov's country house, 5 June 1918, *D. Wilenskii* (lectotype selected by Tzvelev (1976: 587), LE!)

Stipa zalesskii is a widely distributed taxon extending from central Europe to the central Asia (Kyrgyzstan, Kazakhstan, Russia) (Tzvelev 1976, 2012, Martinovský 1980, Freitag 1985, Conert 1998, Nobis *et al.* 2016b). *Stipa zalesskii* was reported from China by Tzvelev (1968) and Cui (1996), but it was omitted by Wu & Phillips (2006). During revision of *Stipa* material at LE, we came across a specimen of the species collected from Xinjiang. This is the easternmost locality of this taxon. *Stipa zalesskii* belongs to the section *Stipa* and is easily distinguishable from other Chinese feather grasses of the section *Stipa* by having anthercia 17–23 mm long, ventral line of hairs on lemma reaching the base of the awn, vegetative shoots with sheaths shortly pubescent and leaves with a mixture of short and long hairs on the adaxial surface and the abaxial surface scabrous due to hard prickles with a more or less dense admixture of spinules and/or short hairs (Nobis *et al.* 2016b).

Specimens studied:—CHINA. Xinjiang: Dzhungaria border zone, Dzhair Mts., Dzhair pass, by the road from Toli to Otu, high mountain feather grass steppe, 9 September 1957, *A.A. Yunatov, S.I. Li, I.F. Yuan 1300* (LE!).

Checklist of feather grasses (*Stipa*) of China

The genus *Stipa* in China comprises currently 37 species, 1 subspecies and 5 varieties distributed in the vast area of open grasslands and steppes (Tzvelev 1968, Freitag 1985, Kuo & Sun 1987, Lu & Wu 1996, Wu & Wang 1999, Wu & Phillips 2006, Zhao & Guo 2011, Nobis 2011, 2013, 2014, Gonzalo *et al.* 2013, Nobis *et al.* 2013, 2015a, 2015b, 2016a). Because of recently new species of feather grasses were described from China and new records were encountered, we presented below in alphabetic order a checklist of *Stipa* occurring in China, as a supplement to the Flora of the country (Wu & Phillips 2006).

1. *Stipa albasiensis* L.Q.Zhao & K.Guo
2. *Stipa aliena* Keng
- 2a. *S. aliena* var. *aliena* [=*S. smithii* Martinovský; =*S. rohmooiana* Noltie]
- 2b. *S. aliena* var. *macrocarpa* (Martinovský) M.Nobis [=*S. smithii* Martinovský var. *macrocarpa* Martinovský]
3. *Stipa arabica* Trin. & Rupr.
- 3a. *S. arabica* var. *arabica* [=*S. arabica* var. *szovitsiana* Trinius & Ruprecht (1842: 77); =*S. szovitsiana* (Trin. & Rupr.) Griseb.; =*S. caspia* Koch (1848: 440); =*S. arabica* subsp. *caspia* (K.Koch) Tzvelev (1974: 16)]
- 3b. *S. arabica* var. *turgaica* (Roshev.) Tzvelev [=*S. turgaica* Roshev.]
4. *Stipa baicalensis* Roshevitz (1929: 380) [=*S. attenuata* Smirnov (1934: 338)]
5. *Stipa basiplumosa* Munro ex Hook.f. [=*S. subsessiliflora* (Rupr.) Roshev. subsp. *basiplumosa* (Munro ex Hook.f.) D.F.Cui; =*S. subsessiliflora* var. *basiplumosa* (Munro ex Hook.f.) P.C.Kuo & Y.H.Sun]
6. *Stipa borysthena* Klokov ex Prokudin [=*S. pennata* L. f. *sabulosa* Paczoski (1914: 112); =*S. pennata* subsp. *sabulosa* (Paczoski) Tzvelev (1973: 80); =*S. sabulosa* Sljussarenko (1963: 26); =*S. joannis* Čelakovský (1884: 318) subsp. *sabulosa* (Paczoski) Lavrenko (1940: 123)]
7. *Stipa breviflora* Griseb. [=*S. aliciae* Kanitz (1891: 61)]
8. *Stipa bungeana* Trin.
9. *Stipa capillacea* Keng (1941b: 100)
- 9a. *S. capillacea* var. *capillacea* [=*S. koelzii* Stewart (1945: 441)]
- 9b. *S. capillacea* var. *parviflora* Zhao & Li (1994: 229)
10. *Stipa capillata* Linnaeus (1762: 116)
11. *Stipa caucasica* Schmalhaus (1892: 293)
12. *Stipa consanguinea* Trinius & Ruprecht (1842: 78)
13. *Stipa dickorei* M.Nobis
14. *Stipa glareosa* P.A.Smirt. [=*S. caucasica* Schmalh. subsp. *glareosa* (P.A.Smirt.) Tzvelev (1974: 20); =*S. orientalis* Trinius (1829: 83) var. *trichoglossa* Hackel (1903: 164); =*S. glareosa* var. *langshanica* Zhao (1992: 546); =*S. langshanica* (Y.Z.Zhao) Zhao (in Zhao & Cao 1996: 211)]
15. *Stipa gracilis* Roshev.
16. *Stipa grandis* Smirnov (1929a: 267)
17. *Stipa himalaica* Roshev.
18. *Stipa hohenackeriana* Trin. & Rupr. [=*S. stapfii* Roshev.]
19. *Stipa kirghisorum* Smirnov (1925: 223) [=*S. pennata* L. subsp. *kirghisorum* (P.A.Smirt.) Freitag (1985: 438)]
20. *Stipa klemenzi* Roshev. [=*S. gobica* Roshev. var. *klemenzi* (Roshev.) Norlindh (1949: 66); =*S. tianschanica* Roshev. var. *klemenzi* (Roshev.) Kuo & Sun (1987: 277)]
21. *Stipa klimesii* M.Nobis
- 21a. *S. klimesii* var. *klimesii* [=*S. basiplumosa* Munro ex Hook.f. var. *longearistata* Munro ex Hooker (1896: 229)]
- 21b. *S. klimesii* var. *pubescens* Nobis (in Nobis *et al.* 2014: 176 [168])
22. *Stipa krylovii* Roshev. [=*S. sareptana* Becker (1882: 52) subsp. *krylovii* (Roshev.) Cui (1996: 299); =*S. sareptana* var. *krylovii* (Roshev.) Kuo & Sun (1987: 275); =*S. capillata* L. var. *coronata* Roshevitz (1916: 186); =*S. densiflora* Smirnov (1929b: 265); =*S. densa* Smirnov (1930: 15), =*S. decipiens* Smirnov (1934: 338)]
23. *Stipa lessingiana* Trin. & Rupr.
24. *Stipa macroglossa* P.A.Smirt. subsp. *kazachstanica* (Kotukhov) M.Nobis [=*S. kazachstanica* Kotukhov]
25. *Stipa mongolorum* Tzvelev (1968: 57)
26. *Stipa orientalis* Trin.
27. *Stipa penicillata* Handel-Mazzetti
- 27a. *S. penicillata* var. *penicillata* [=*S. laxiflora* Keng (1941a: 73)]
- 27b. *S. penicillata* var. *hirsuta* P.C.Kuo & Y.H.Sun
28. *Stipa pennata* L.
29. *Stipa przewalskyi* Roshevitz (1920: 3)
30. *Stipa purpurea* Grisebach (1868: 82)
- 30a. *S. purpurea* var. *purpurea* [=*Ptilagrostis purpurea* (Griseb.) Roshevitz (1934: 76); =*Lasiagrostis tremula* Ruprecht (1869: 35); =*Stipa pilgeriana* Hao (1938: 538)]
- 30b. *S. purpurea* var. *arenosa* Tzvelev (1968: 60) [=*S. purpurea* subsp. *arenosa* (Tzvelev) Cui (1996: 307)]
31. *Stipa regeliana* Hack. [=*Achnatherum regelianum* (Hack.) Tzvelev; =*Stipa purpurascens* Hitchc.; =*Achnatherum purpurascens* (Hitchc.) Keng]
32. *Stipa richteriana* Kar. & Kir. [=*S. voronini* Krassnov (1887: 125); *S. kuhitangi* Drobov (1941: 537)]

33. *Stipa roborowskyi* Roshevitz (1920: 1)
 34. *Stipa sareptana* A.K.Becker
 35. *Stipa subsessiliflora* (Rupr.) Roshev. [=*Lasiagrostis subsessiliflora* Ruprecht (1869 : 35); =*Ptilagrostis subsessiliflora* (Rupr.) Roshevitz (1934: 74)]
 36. *Stipa tianschanica* Roshev.
 36a. *S. tianschanica* subsp. *tianschanica*
 36b. *S. tianschanica* subsp. *gobica* (Roshevitz 1924: 13) Cui (1996: 299) [=*S. gobica* Roshev.; =*S. tianschanica* var. *gobica* (Roshev.) Kuo & Sun (1987: 277); =*S. sinomongholica* Ohwi (1943: 168); =*S. potaninii* Roshevitz (1924: 13); =*S. gobica* var. *wulateica* Zhao (1992: 546); =*S. wulateica* (Y.Z.Zhao) Zhao (in Zhao & Cao 1996: 211)]
 37. *Stipa zalesskii* Wilenskii [=*S. rubens* Smirnov (1925: 231); =*S. rubentiformis* Smirnov (1928: 115); =*S. maeotica* Klokov & Osychnyuk (1976: 60); =*S. smirnovii* Martinovský (1975: 260)]

Notes: During revision of the herbarium material preserved at MSB, PE and KUN, we found numerous specimens of *Stipa bhutanica* Noltie (1999: 289), collected from Yunnan, Sichuan and Xizang provinces [selected specimens studied: Yunnan, the mountain behind Laotanfang, Hongtudi town, Gongchuan District, Kunming, 26°05'931"N/102°54'579"E, 3400 m a.s.l., alpine meadow, 1 August 2008, Peng Hua, Liu Ende, Xiang Jianyuing et al. 9240 (KUN!, KUN-918490!); Xizang, E Tibet, Niingjing Shan, Mekong (Lancang) tributary, W of Markham (Gartong), above Camp 2, 29°41'N/98°30'E, 4300 m a.s.l., subalpine+lower alp. turf, Rhododendron dwarf-scrub, *Picea* forest at tree line, 1 July 1994, B. Dickoré 8628 (MSB-152870!)]. Occurrence of this species in China was recently also reported from numerous localities by Zhang et al. (2016, unpubl). The species was described and up to date known only from Bhutan (Noltie 1999). In China, it was misidentified mainly as *S. subsessiliflora*, *S. basiplumosa* and *S. regeliana*, however, *S. bhutanica* differs from all of these mentioned above taxa by having a short blind callus, unigeniculate awns and clearly unequal lemma and palea. Because the lemma epidermal pattern of this species is typical rather for *Ptilagrostis* not for *Stipa* (Nobis & Nobis 2013, Nobis 2013, Nobis et al. 2016a), we decided to not included this species into the given above checklist. The taxon should be transferred to the genus *Ptilagrostis* as *P. bhutanica* (M. Nobis unpubl.), further researches are needed in this case.

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