
NOTES RELATING TO THE FLORA OF BHUTAN: XXXVIII. GRAMINEAE I, TRIBE STIPEAE

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Three new species and one new subspecies of *Stipa* are described from the E Himalaya: *S. jacquemontii* subsp. *chuzomica* and *S. bhutanica* which appear to be endemic to Bhutan; *S. milleri* from Nepal, India (Sikkim) and Bhutan and *S. rohmooiana* from India (Sikkim).

Keywords. E Himalaya, new taxa, *Stipa*.

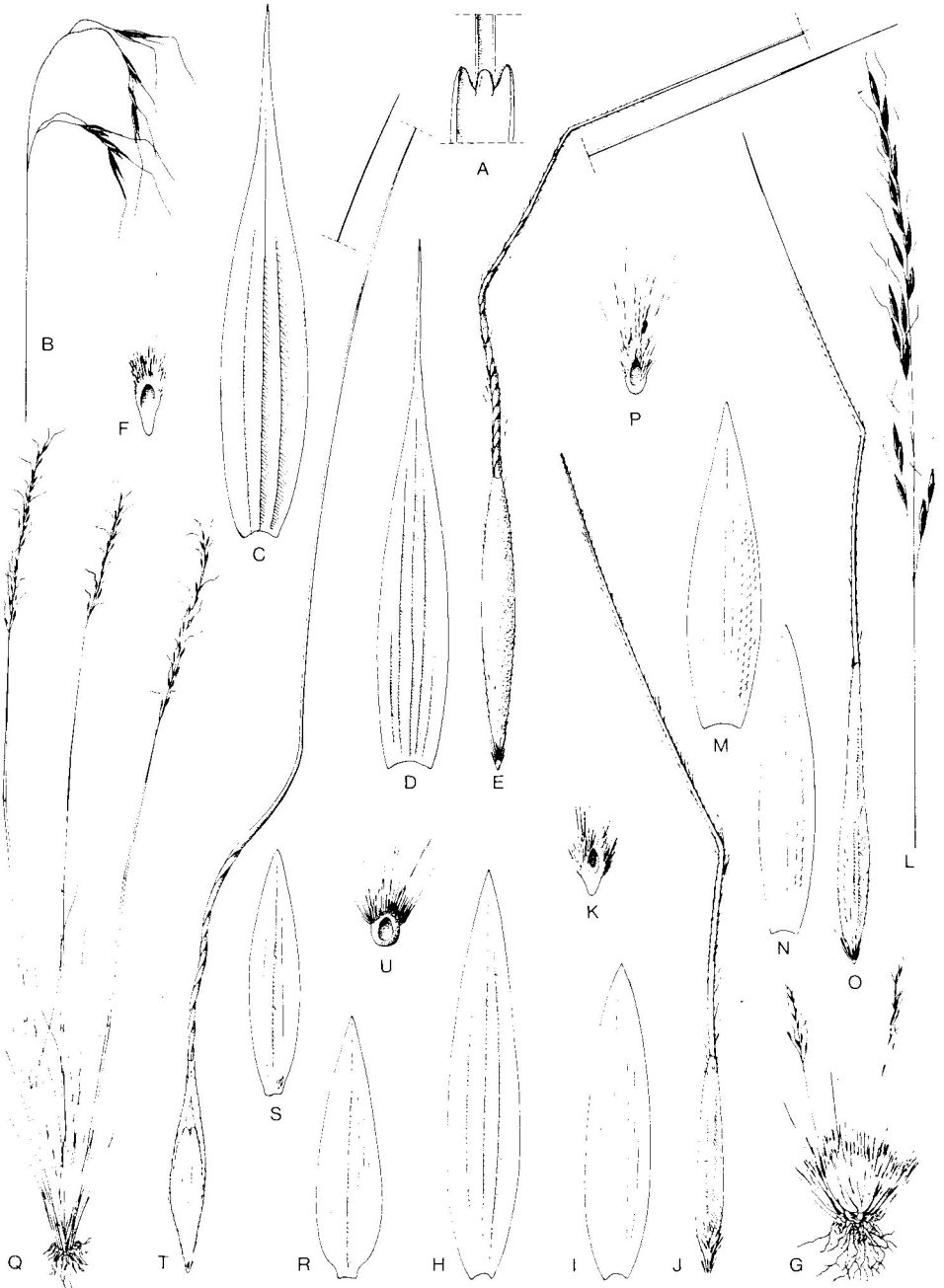
INTRODUCTION

The family *Gramineae* has been rather poorly collected in the *Flora of Bhutan* area, but even given this general neglect, the genus *Stipa* L. is represented by notably few specimens in British herbaria. It is not possible to be certain whether or not this is due to genuine rarity. As the majority of the species are high alpiners (occurring over 3300m), it seems likely that at least those species are genuinely rare and rather isolated geographically. However it should be noted that the previously rarely collected *S. roylei* (Nees) Mez, which occurs at intermediate altitudes (above 2300m) was found, on a recent field trip, to be common throughout the country in suitable habitats.

Revision of the genus for the *Flora* has found it to be represented by 11 taxa, of which no fewer than four appear to be undescribed. The genus is thus relatively small in our area, compared with other parts of Asia: for example Freitag (1985) treats 42 species in the area between the Mediterranean and the Himalaya as far east as Nepal; if one adopts Freitag's generic concepts, then Tzvelev (1984) treats 71 species for the former USSR, Wu (1987) 28 for Tibet and Kuo (1987) 44 for China. The genus is controversial in terms of delimitation, and Russian and Chinese authors have tended to use segregate genera. It is also problematic at the species level, not least as so many of the species are known from very few specimens. A comprehensive revision of all Asian species, including China, is badly needed.

Having studied the specimens in the herbaria of BM, K and E and available literature, the following taxa appear to be undescribed. Nevertheless it is with some trepidation that I describe them, given our poor knowledge of the Chinese species. Accounts of *Stipeae* are published for Tibet (Wu, 1987) and for the whole of China (Kuo, 1987) in Chinese, but unfortunately the numerous illustrations in the latter are too small and poorly reproduced to be of much help. The broad generic concept of Freitag (1985) is followed, though I find it hard to place some of these species into his sections.

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***S. rohmooiana* Noltie, sp. nov. Fig. 1A–F**

Affinis *S. alienae* Keng, sed characteribus sequentibus differt: tota planta (culmi, folia, inflorescentiaque) minor, foliorum culmi vaginarum margines sursum in aurículas prominentes triangulares utroque latere ligulae productae; inflorescentia spiculis paucioribus (6–7 non c.20), glumae atropurpureae (non stramineae vel flavo-brunneae), ea inferior veinis paucioribus (3–4, nec 7–9), pili in dorso lemmatis breviora (c.0.5mm nec 1.5mm). Affinis *S. purpureae* Griseb. in inflorescentiae forma et colore sed characteribus sequentibus differt: antheceium brevius (c.7.5mm, non plus quam 8mm); callus brevior (c.1.2mm, non plus quam 1.5mm); arista brevior (usque ad 24mm, non plus quam 50mm), infra articulationem inferiorem solum pilosa, pilis brevioribus, 0.8–1.2mm longis, seta minute scabrida. Similis etiam *S. regelianae* Hack. a qua differt statura humiliore, inflorescentia laxiore, glumis longioribus, arista lemmatis longiore, seta aristae minute scabrida.

Type: India, Sikkim, Chugya, 15,000ft, 12 ix 1912, *Rohmoo* 277 (holo. E, iso. K).

Densely tufted, branching intravaginal. *Culms* 3.5–12cm, pubescent below inflorescence, nodes concealed. *Culm leaves* 2; sheaths glabrous, that of upper leaf more than half-length to almost equalling culm, margins extended upwards into auricles, auricles c.1.2mm, triangular, rounded, hairy; ligule c.0.8mm, triangular, ciliate; blades 1–2cm, filiform, inrolled, minutely rough on veins on upper surface, lower surface smooth. *Basal leaves* similar, blades 3–6cm, glabrous. *Inflorescence* 4–8cm, of 5–7 spikelets, lax, branches borne singly, flexuous, pubescent, the lower two to 1.8cm, bearing 2 spikelets, upper spikelets borne singly, pedicels to 1.5cm, filiform, flexuous, pubescent. *Spikelets* c.13.5mm. *Glumes* papery, dark purple, subequal, margins and apex widely hyaline; the lower 13–13.5 × c.2mm, oblong-lanceolate, finely acuminate, 3–4-veined; the upper similar, 12.8–13.2 × c.1.7mm, 4–6-veined. *Antheceium* c.7.5mm; callus c.1.2mm, acute, curved in lateral profile, scar lanceolate, hairs to 1mm. *Lemma* c.6.3 × 0.8mm, cream, linear, back hairy all over, hairs c.0.5mm, margins tightly enclosing palea; awn 22.2–24mm, bigeniculate at 5.5–6 and at 8.5–9.5mm, column twisted, hairy, hairs 0.8–1.2mm, decreasing to 0.2–0.5mm below second articulation, seta very minutely scabrid. *Palea* c.6 × 0.5mm, very slightly shorter than lemma, with a few, sparse hairs on back. *Lodicules* 3, similar, linear-lanceolate, acute, c.1mm. *Anthers* 3–3.2mm, cells not bearded.

Other specimen seen. Sikkim, Chaerlung, 16,000ft, 12 ix 1912, *Rohmoo* 385 (E).

FIG. 1. *Stipa rohmooiana* Noltie (*Rohmoo* 277): A, sheath apex of culm leaf (×6); B, inflorescence (×½); C, lower glume (×6); D, upper glume (×6); E, antheceium (×6); F, callus scar (×16). *S. milleri* Noltie (*EENS* 349): G, habit (×⅓); H, lower glume (×6); I, upper glume (×6); J, antheceium (×6); K, callus scar (×16). *S. bhutanica* (*NPSW* 349): L, inflorescence (×⅔); M, lower glume (×6); N, upper glume (×6); O, antheceium (×6); P, callus scar (×16). *S. jacquemontii* subsp. *chuzomica* Noltie (*NPSW* 333): Q, habit (×¼); R, lower glume (×6); S, upper glume (×6); T, antheceium from front showing short palea (×6); U, callus scar (×16).

These sheets were studied by Bor, who initially identified them as *S. purpurea*, then later as *S. regeliana*. From the callus shape this species is probably best placed in sect. *Pseudoptilagrostis* Tzvelev. However, it is also similar in some ways to *S. regeliana* which Freitag (1985) placed in sect. *Achnatheropsis* Tzvelev. From the protologue (Keng, 1941) and the illustrations in Wu (1987) and Kuo (1987) it is clearly very close to *S. aliena* Keng, described from Kansu, of which no authenticated specimens have been seen.

The name commemorates the Lepcha collector Rohmoo. Lepcha collectors based at the Government Quinine Factory at Mungpoo near Darjeeling were first used by Sir George King as a means of obtaining seeds and specimens for the Calcutta herbarium. Along with Ribu, Rohmoo was one of the collectors employed by William Wright Smith and G.H. Cave to explore the mountains of Sikkim around 1910. Lepchas are the indigenous people of Sikkim, who made excellent and observant plant collectors and were also used by Ludlow and Sherriff.

***S. milleri* Noltie, sp. nov. Fig. 1G–K.**

Affinis statibus parvis *S. mongholicae* Turcz. ex Trin. (= *S. concinnae* Hook.f.) in characteribus vegetativis et aristas lemmatis usque ad apicem plumosis, sed in characteribus sequentibus differt: panicula linearis; glumae inequalis, longiores (inferior c.10mm, non minus quam 6mm); callus acutus. In forma calli et aspectu generali spicularum similis etiam *S. roborowskyi* Roshev., sed ab illa differt glumis brevioribus (inferior non plus quam 14mm longa) et arista brevior, unigeniculata (haud bigeniculata et plus quam 30mm).

Type: India, Sikkim, Goichang, Lasha Chhu valley, 27°55'52"N, 88°36'17"E, 4555m. 19 vii 1996, *EENS* 349 (holo. E, iso. BSHC).

Densely tufted, branches intravaginal. Culms short (3–7cm), nodes basal, concealed. Culm leaves 1–2, sheaths glabrous, margins widely hyaline, not auriculate at apex, ligule 2.5–2.7mm, broadly triangular, apex rounded; leaf blades to 3.5cm, filiform, inrolled, shortly hairy on veins above, minutely scabrid on veins beneath. Basal leaves similar, blades 3–7cm. Inflorescence 3.7–6cm, not or only slightly exerted from upper leaf sheath, linear, ± simple, spikelets borne singly or in pairs on infl. axis, pedicels 0.7–1.2cm, erect. Spikelets 9.4–10.2mm, purplish. Glumes unequal, green flushed purple, margins and apex hyaline, 4-veined; the lower 9.5–10.2 × 1.5–1.6mm, narrowly lanceolate, acuminate; the upper 7.5–7.6 × 1–1.2mm, oblong-lanceolate, apex minutely toothed. Antheridium 4.7–5mm; callus 0.5–0.7mm, acute, curved in lateral profile, scar lanceolate, hairs c.0.5mm. Lemma 4.4–4.6 × 0.8mm, greenish, oblong, back appressed-hairy in lower third, hairs to 0.3mm, apical lobes 0.2mm, margins completely enclosing palea; awn c.1.3mm, weakly uni-geniculate at c.5mm, plumose throughout, hairs 1–1.1mm at base, 0.7–0.8mm at apex. Palea c.4 × 0.5mm, linear-lanceolate, glabrous. Lodicules: anterior pair lanceolate, c.1.2mm; the posterior linear, c.1.4mm. Anthers c.0.9mm, not bearded.

Other specimens seen. NEPAL. Above Bibre, 16,000ft, 29 x 1984, *D.J. Miller* 215 (K).

BHUTAN. Upper Mo Chu district, above Jangothang, c.14,000ft, 11 x 1987, *D.J. Miller* 303 (K).

The sectional placement of this very distinct species is problematic, but from the shape of the callus it is perhaps best placed in sect. *Pseudoptilagrostis* Tzvelev.

A species of high altitude turf, grazed by yak (*Bos gruniens*). Named after Daniel J. Miller, a rangeland and livestock specialist who was the first to make a detailed study of the alpine grasses of Bhutan and made important collections there.

***S. bhutanica* Noltie, sp. nov. Fig. 1L–P.**

S. regeliana Hack. similis sed a speciminibus emodis illius speciei caracteribus sequentibus differt: glumae minorer (non plus quam 8mm); antheceium longius (non minus quam 5.5mm); callus brevior, rotundus (haud acutus, plus quam 0.7mm); antherae breviores (non plus quam 3mm). *S. subsessilifloram* (Rupr.) Roshev. etiam simulans a qua differt pilis in columna aristae brevioribus.

Type: Bhutan, Ha district, W side of Chelai La, 27°22'N, 89°20'E, 3600m, 29 ix 1998, *Noltie, Pradhan, Sherub and Wangdi* 349 (holo. E., iso. THIM).

Densely tufted, branches intravaginal. *Culms* 8 32.5cm, nodes concealed. *Culm leaves* 2–3, distant; sheaths 6.8–11cm, glabrous, margins hyaline, not produced into auricles above, ligule 2.8–3.3mm, triangular, acute or blunt; leaf blades 3–8.3cm, filiform (0.3–0.5mm wide), inrolled, minutely scabrid on veins beneath. *Basal leaves* similar, blades 5–15cm. *Inflorescence* 5–11cm, usually shortly exerted from upper leaf sheath, linear, spikelets 7–18, branches short, erect, the lowest unequally paired, the longer to 1.8cm bearing 2–3 spikelets, pedicels 0.4–0.9cm, filiform, erect, scabrid. *Spikelets* 7.1–8.1mm, purplish. *Glumes* flushed dark purple, papery, subequal, 3-veined, margins narrowly hyaline; the lower 7.1–8.1 × 1.6–1.9mm, lanceolate, apex hyaline, very acute; the upper 6.9–8 × 1.3–1.4mm, more oblong, less acute than lower. *Antheceium* 6.5–7.5mm; callus c.0.5mm, rounded, scar circular, hairs 0.7–1mm. *Lemma* 6–7 × 0.7–0.8mm, herbaceous, green streaked purple, linear, back shortly hairy at extreme base, hairs 0.4–0.6mm, with longer (c.0.6mm) hairs near and overtopping apex, apical lobes not developed, margins completely concealing palea; awn 13–16.3mm, unigeniculate at 6–7mm, column hairy, hairs 0.7–0.9mm, seta minutely scabrid. *Palea* conspicuously shorter than lemma, 4.2–5 × 0.5–0.6mm, linear, subacute, sparsely hairy. *Lodicules*: anterior pair oblong, blunt, c.1.4mm, the posterior linear, acute, c.1.4mm. *Anthers* 1.6–1.7mm, cells not bearded.

Other specimens seen. BHUTAN. Ha/Thimphu district, Chelela, 13,000ft, 4 ix 1986, *Miller* 185 (K); summit of Chelai-la, 12,800ft, vii 1983, *Keith* 173 (E, K). Thimphu district, mountain E of Thimphu, 3500m, 24 vii 1988, *Wood* 6504 (E). Bumthang district, Kidifuh, *Anon.*, s.n. (K). Unlocalized specimens collected by Griffith in Bhutan in 1838, from which all the florets have been shed, almost certainly belong to this species: *Kew Distrib. No.* 2694, *HEIC No.* 6586 (K).

Grows in alpine turf among dwarf rhododendron scrub, 3500–3960m.

The sectional placement of this species is problematic, but from the callus shape it is probably best placed in sect. *Lasiagrostis* (Link) Hack.

S. jacquemontii Jaub. & Spach subsp. ***chuzomica*** Noltie, **subsp. nov.** Fig. 1Q–U.

A subsp. jacquemontii ligula foliorum culmi caespites laterales pilorum carenti, lem-matibus coriaceis atrobrunneis (haud membranaceis pallidis), antheris brevioribus (non plus quam 3mm) haud barbatis differt.

Type: Bhutan, Thimphu district, Paro valley just above Confluence, 27°19'N, 89°32'E, 2160m, 28 ix 1998, *Noltie, Pradhan, Sherub & Wangdi* 333 (holo. E. iso. THIM).

Densely tufted, branches extravaginal. *Culms* to 40cm, wiry, slightly angled at the prominent nodes. *Culm leaves* 3, widely spaced; sheaths glabrous, apical auricles minute, ligule c.0.2mm, truncate, lacking lateral hair tufts; blades 7.5–13cm, filiform, inrolled, c.0.7mm wide, minutely hispid above. *Basal leaves* similar, blades to 14cm. *Inflorescence* 8–13cm, long exserted from upper leaf, very stiff and narrow, spikelets numerous, branches slender, very short, erect, whorled, again branched, longest branch of lowest whorl 1.3–1.5cm, bearing 3–7 spikelets. *Spikelets* c.6mm; pedicels 0.4–1cm. *Glumes* subequal, whitish-hyaline, 3-veined; the lower c.5.8 × 1.7mm, oblong-lanceolate, apex apiculate; the upper c.5.6 × 1.2mm. *Anthecium* c.4.6mm; callus 0.3mm, rounded, scar lanceolate, hairs c.0.7mm. *Lemma* c.4.1 × 0.7mm, dark brown, coriaceous, linear-lanceolate, with short (0.6mm), hyaline apical lobes, back covered in white, bristly hairs, hairs to 0.5mm, overtopping apex, margins not concealing palea; awn to 27.7mm, bigeniculate at 4.2 and 7.7mm, minutely scabrid throughout, seta c.20mm. *Palea* c.2.6mm, conspicuously shorter than lemma, oblong, truncate, back bristly. *Lodicules* dissimilar, anterior pair oblong, c.0.7mm, the posterior linear, c.0.4mm. *Anthers* c.2.5mm, not bearded.

Known only from the type, this subspecies belongs to sect. *Lasiogrostis* (Link) Hackel in Freitag's scheme. Although differing from subsp. *jacquemontii* in only small characters, it seems worth describing in view of the large disjunction in distribution. Subsp. *jacquemontii* is a plant of the NW Himalaya (from E Afghanistan to W Nepal).

The epithet refers to the area where the plant was found growing on dry slopes among *Ceratostigma/Cotoneaster* scrub. Chuzom is the Dzongkha word for a river confluence, in this case the junction of the Paro and Thimphu rivers. This is an interesting rain-shadow area, but differs in its vegetation from the dry valleys of central and eastern Bhutan (those of the Sankosh, Kuru Chu and Manas Rivers) which are all much deeper and hotter. It is interesting that it was growing with *S. brandisii* Mez, the only other member of the genus to grow at low altitudes in Bhutan. *S. brandisii* is unknown elsewhere in Bhutan, though it has a wide distribution from the NW Himalaya to SW China. Another associated plant was the attractive shrub *Ceratostigma griffithii* C.B. Clarke, which has its centre of distribution in the same area.

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