

Addition of *Poa calliopsis* (Poaceae: Pooideae: Poeae) to the flora of Eastern Himalaya, India

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Abstract: In India, *Poa calliopsis* Litv. ex Ovcz. was known only from two Western Himalayan states, Jammu & Kashmir and Himachal Pradesh. However, the present record of this species in Sikkim reveals its occurrence in the Indian Eastern Himalayan region. A detailed description, photo plate and illustration of the species along with notes on its habitat, phenology and distribution are presented here. Notes on the affinities of this species with allied taxa are also incorporated. An identification key to the species of *Poa* of Indian Eastern Himalaya is provided.

Keywords: Himachal Pradesh, Himalaya, Jammu & Kashmir, New record, Sikkim.

Introduction

Poa L. (Poaceae, subfamily Pooideae, tribe Poeae) includes more than 500 species worldwide, mostly distributed in the temperate and alpine regions (Rajbhandari, 1991; Zhu *et al.*, 2006; Mabblerley, 2017; Kellogg *et al.*, 2020). *Poa* is taxonomically complex and considered as one of the largest genera of the grass family (Rajbhandari, *l.c.*; Gillespie & Soreng, 2005; Kavousi *et al.*, 2015; Nautiyal & Gaur, 2017).

Stapf (1896) recorded 17 species of *Poa* for the British India. However, currently 62 species are recorded within the present political boundary of the country (Sinha *et al.*, 2019; Kellogg *et al.*, 2020; Mao & Dash, 2020), including three endemics

(Singh *et al.*, 2015; Mao & Dash, 2020). Notably, all members are growing in the laps of the Himalayas, except *Poa gamblei* Bor which is strictly confined to Tamil Nadu (Mao & Dash, 2020). Among the recorded species, 20 have distribution in both the Western to Eastern Himalayan regions (Sinha *et al.*, 2019; Mao & Dash, 2020). Sikkim shelters about 32 species (Singh, 1996; Noltie, 2000; Sinha *et al.*, 2019; Mao & Dash, 2020; Kellogg *et al.*, 2020; Gogoi *et al.*, 2021).

While surveying the flora of North Sikkim, a few specimens of *Poa* have been collected from high alpine meadows towards the Kareng valley. Comprehensive literature searches (Bor, 1960; Cope, 1982; Noltie, 2000; Zhu *et al.*, 2006) and critical analysis of the specimens confirmed their identity as *Poa calliopsis* Litv. ex Ovcz. Since the digital images of type specimens are not available online, the identity of the specimen was established by consulting digital images of authentic specimens at K and the protologue.

Erstwhile, in India *P. calliopsis* was recorded only from two Western Himalayan states, Jammu & Kashmir and Himachal Pradesh (Cope, 1982; Sinha *et al.*, 2019; Mao & Dash, 2020). The present finding in Sikkim is thus an extension of its distribution to the Indian Eastern Himalaya. Besides, this discovery also reveals its continuous distribution range, from Kashmir to Bhutan through Nepal and Sikkim.

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In the present communication, a detailed description, photo plate and illustration of the species along with notes on its habitat, phenology and distribution are provided. Affinities with allied taxa and an identification key to *Poa* species found in the Indian Eastern Himalaya including Sikkim are also given.

Materials & Methods

Plant specimens were collected from high alpine meadows of the Kareng valley of North Sikkim at an elevation of about 5059 m. Morphological characters were studied under a EZ4 stereomicroscope (Leica, Germany) and illustrations were made after taking the measurements carefully. The identity of the species was confirmed by consulting the protologue and authentic specimens (e.g. K [K000633898, K000633899, K000789514 digital images!]; MW [MW0733562 digital image!]). Voucher specimens are kept at CUH (acronym follows Thiers, 2024).

Taxonomic Treatment

Poa calliopsis Litv. ex Ovcz., Izv. Tadzhikestansk. Bazy Akad. Nauk S.S.S.R. 1(1): 11, 18. 1933; Bor, Grasses Burma Ceyl. Ind. Pak. 556.1960; Cope in Nasir & Ali, Fl. Pakistan 143: 411. 1982; Noltie, Fl. Bhutan 3(2): 558. 2000; Zhu *et al.* in Wu *et al.*, Fl. China 22: 273. 2006. *Type*: TAJIKISTAN, Pamir, Khorgosh gorge, 13500 ft (4115 m), 26.07.1901, Alexeenko (LE).

Poa phariana Bor, Kew Bull. 3(1): 141. 1948. *Type*: TIBET, Phari (Chumbi Valley), 14,700 ft. (c. 4454 m), 21.05.1945, Bor, N. L. & Kirat, R. 19398 (holo K [K000789515 digital image!]).

Poa calliopsis Litv., Fl. USSR 2: 414, 755. 1934, *isonym, nom. illeg.*

Figs. 1 & 2

Dwarf rhizomatous perennials. Rhizomes long, slender, creeping. Young shoots extravaginal. Culms erect, unbranched, 1.4–15 cm tall, 0.05–0.1 cm across, terete, covered with fibrous remains of old leaf sheaths at base, glabrous; node 1, glabrous.

Leaves mostly basal; leaf sheaths 1–8 × 0.1–0.2 cm, margin smooth, glabrous, surface smooth, glabrous, ribs inconspicuous; ligule membranous, 0.5–3 mm, apex truncate to obtuse, smooth, glabrous; collars glabrous, light brownish; leaf blades 0.3–4.5 × 0.1–0.3 cm, usually conduplicate, sometimes flat, margin smooth, apex prow-tipped, glabrous, surface smooth, glabrous. Spikelets arranged in panicle; panicle open, ovoid, oblong or pyramidal in outline, 1–5 × 1–3 cm, internodes 0.3–1.3 cm long; branches 1–2 per node, 0.4–2.5 cm long, capillary, spreading to reflexed, flexuous, smooth or scaberulous distally (especially the upper branches), with 2–12 spikelets clustered towards tips; pedicels smooth or scaberulous. Spikelets broadly to narrowly elliptic or ovate, 3–4.5 × 0.7–2 mm, variegated with green, purple and gold. Florets 2, bisexual; rachilla internodes 0.2–0.6 mm, smooth, glabrous; callus woolly. Lower glume elliptic, ovate or sub-flabellate, 2–3.4 × 1–1.5 mm, margin smooth, hyaline, apex acute, papery with membranous hyaline apex, smooth, glabrous, 1-veined, 1-keeled, flushed purple with green around the midvein near base; keel smooth, glabrous. Upper glume elliptic, ovate, orbicular or sub-flabellate, 2.3–3.8 × 1.3–1.8 mm, margin smooth, glabrous, apex acute to obtuse, papery with membranous hyaline apex, smooth, glabrous, 3-veined, 1-keeled, flushed purple with green around the veins; keel scabrid near apex, otherwise smooth, glabrous. Floret 1: Lemma broadly oblong to oblong-lanceolate or ovate, 2.8–4.2 × 1.5–1.6 mm, margin smooth, hyaline, glabrous, apex sub-acute obtuse to rounded, 5-veined, 1-keeled, outer lateral veins long-ciliate for ¼–½ of their length, intermediate veins faint to prominent, glabrous, surface between veins smooth, glabrous, flushed gold with sub-apical purple band and apical hyaline part; keel smooth, long-ciliate for ½ of its length. Palea oblong-elliptic to lanceolate-oblong, 2.3–3.8 × 0.5–0.6 mm, margin smooth, apex bluntly acute or notched to 2-toothed, membranous, glabrous or pilulose between keels proximally, 2-veined, 2-keeled, hyaline to golden; keel smooth or with

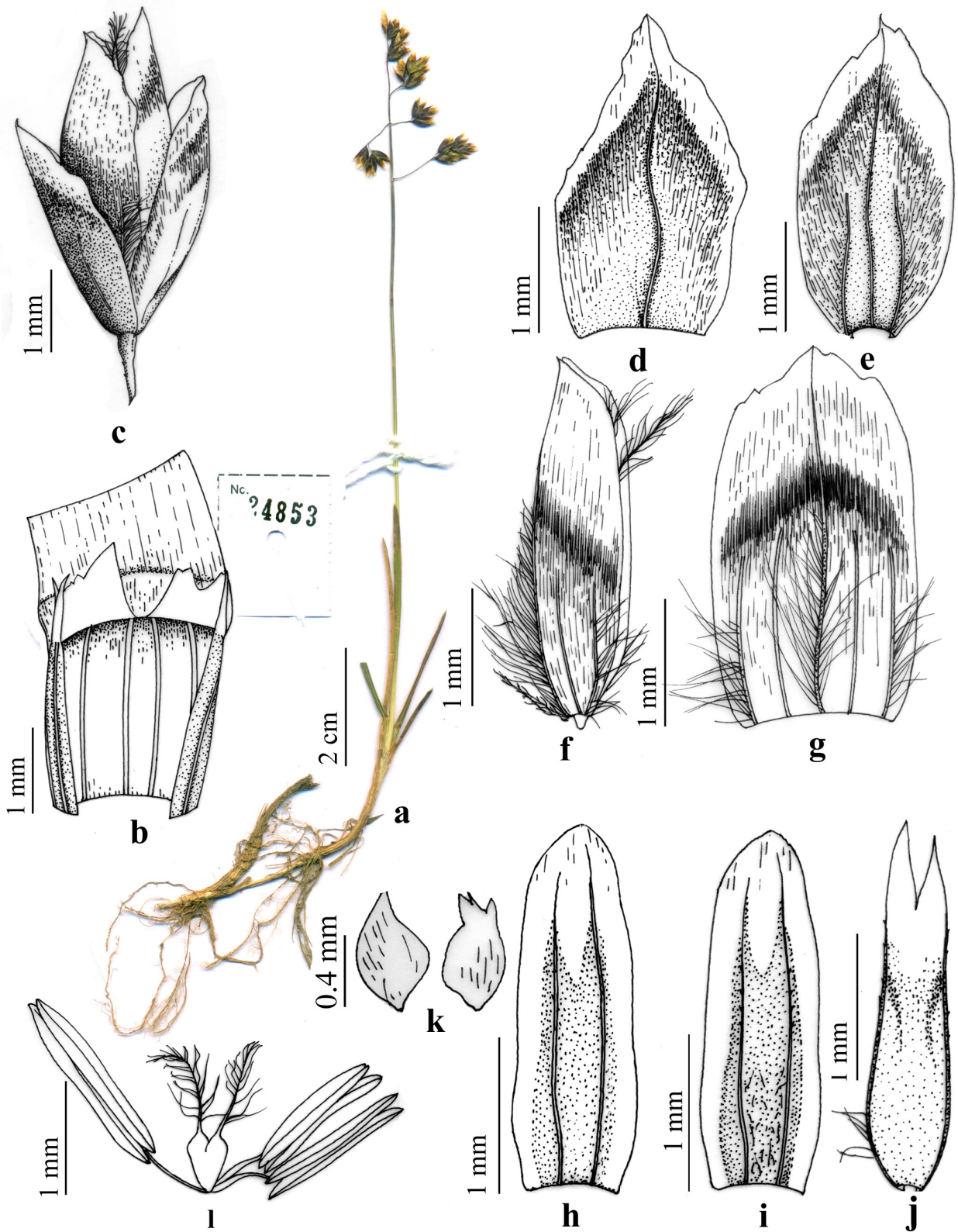


Fig. 1. *Poa calliopsis* Litv. ex Ovcz.: **a**. Habit; **b**. Ligule; **c**. Spikelet; **d**. Lower glume–abaxial view; **e**. Upper glume–abaxial view; **f**. Floret 1–lateral view; **g**. Lemma–abaxial view; **h**. Palea with bluntly acute apex–abaxial view; **i**. Palea with pilulose surface between keels proximally–abaxial view; **j**. Palea with bifid apex–abaxial view; **k**. Lodicules–abaxial view; **l**. Stamens and pistil (from Maity *et al.* 24853-CUH; drawn and photographed by Suparna Saha).

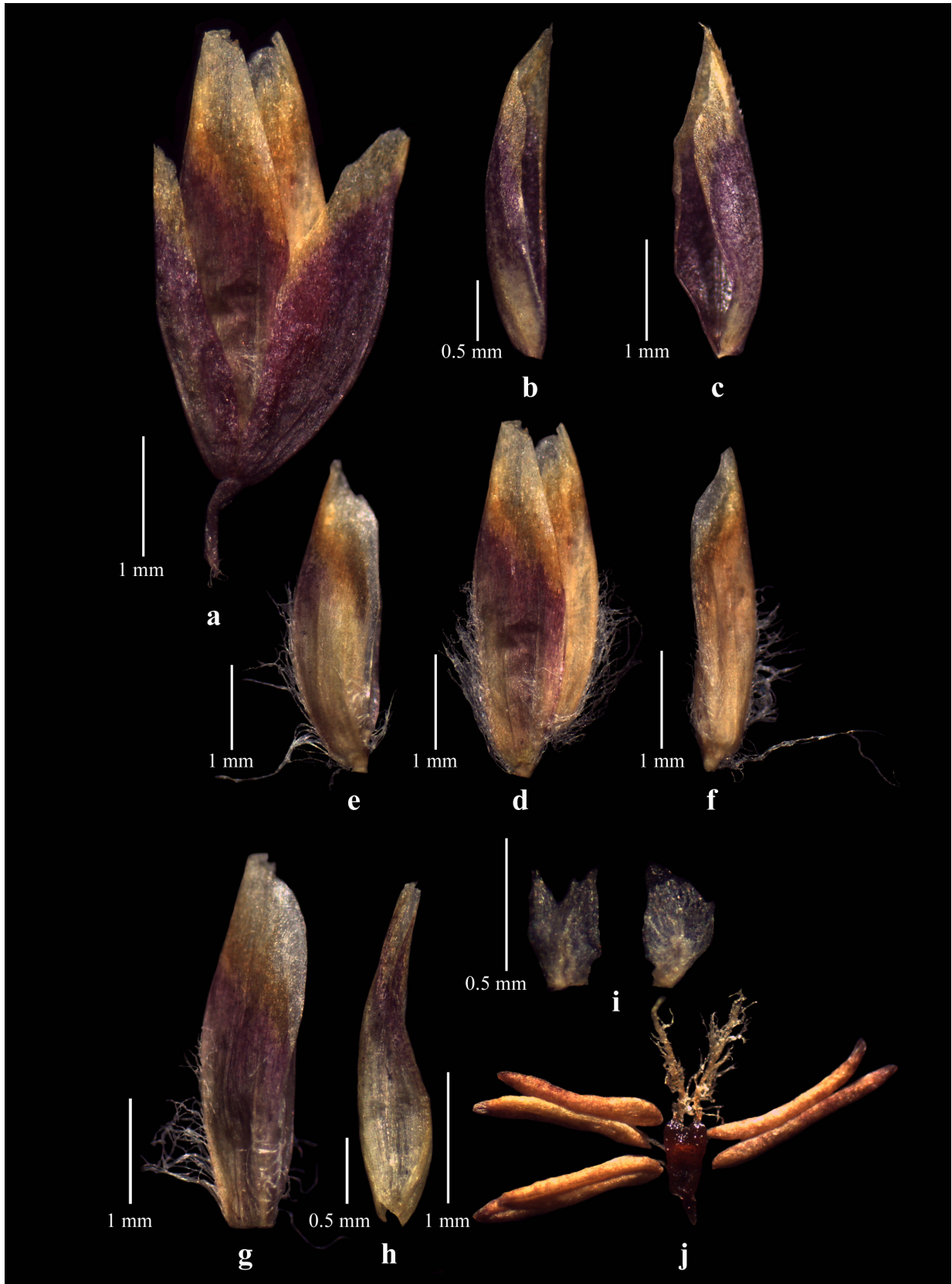


Fig. 2. *Poa calliopsis* Litv. ex Ovcz.: **a.** Spikelet; **b.** Lower glume–lateral view; **c.** Upper glume–lateral view; **d.** Florets together–lateral view; **e.** Floret 1–lateral view; **f.** Floret 2–lateral view; **g.** Lemma–lateral view; **h.** Palea–abaxial view; **i.** Lodicules–abaxial view; **j.** Stamens and pistil (from Maity *et al.* 24853-CUH; photos by D. Maity).

few blunt teeth distally, glabrous or rarely with few cilia near base. Lodicules 2, ovate, c. 0.7 × 0.4 mm, entire or emarginated (-lobed), apex acute, often few denticulate, membranous, glabrous, hyaline. Stamens 3; filaments 0.3–0.6 mm long; anthers 0.9–2.5 × 0.2–0.3 mm, yellow. Ovary obovoid, 0.5–0.8 × 0.2–0.3 mm, apex notched, smooth, glabrous, wine red at maturity; styles 2, free, up to 0.3 mm long; stigmas 2, 0.8–1.5 × 0.6–1.2 mm, white. Florets 2: similar to floret 1 but with shorter lemma (2.5–3 × c. 1 mm), palea (2–2.5 × 0.3–0.5 mm) and lodicules (c. 0.6 × 0.2 mm).

Flowering & fruiting: May to August.

Habitat: Grows in alpine meadows, along streams and water bodies, on grassy slopes, in damp areas, and on dry hillocks mostly in association with *Carex deasyi* (C.B. Clarke) O.Yano & S.R.Zhang (Cyperaceae), *Dracocephalum heterophyllum* Benth. (Lamiaceae), *Primula* sp. (Primulaceae), *Scrophularia wattii* (Hook.f.) P.Li (Scrophulariaceae).

Distribution: India [Himachal Pradesh, Jammu & Kashmir, Sikkim (present report)], Kyrgyzstan, Tajikistan, Pakistan, China, Nepal, Bhutan.

Specimen examined: INDIA, **North Sikkim**, towards Kerang, 5059.68 m, 13.06.2022, Maity, Mandal, Ghosh, Midday, Saha & Halder 24853, 24884 (CUH).

Notes: *Poa calliopsis* can be distinguished by the broadly blunt lemmas variegated with gold and purple. Besides, its rhizomatous habit, presence of callus hairs at the base of the florets, long cilia on the basal half of the keel (mid-vein) and lateral veins of the lemma, 2–3 teeth on the upper part of the palea keels (middle and lower parts smooth), and 0.9–2.5 mm long anthers make this species unique among all other members of the genus. Notably, in the present study few spikelets were found to have a palea with few cilia on the lower part of its keels, which is similar to *P. nepalensis* (Wall. ex Griseb.) Duthie. This observation corroborates Noltie (2000). However, *P. nepalensis* can be easily distinguished from *P. calliopsis* by the presence of scabrid leaf blades and 3–6 florets

in a spikelet.

The new record of *P. calliopsis* in Sikkim Himalaya brings the number of species recognized in the genus to 33 in the state Sikkim.

Key to the species of *Poa* found in the Indian Eastern Himalaya

1. Keels of palea with slender hooks 2
1. Keels of palea without slender hooks..... 5
2. Callus woolly.....3
2. Callus glabrous.....4
3. Aerial shoot always solitary; panicle branches usually smooth..... *P. alpigena*
3. Aerial shoots several; panicle branches usually spinulose..... *P. pratensis*
4. Ligule mostly 3–8 mm high..... *P. asperifolia*
4. Ligule up to 1.5 (–2) mm high... *P. polyneura*
5. Rhizomatous perennial; lemmas 1.5–1.6 mm broad, long ciliate on basal half of keel (midvein) and lateral veins, surface between veins smooth, flushed gold with sub-apical purple band and apical hyaline part; palea keels 2–3 dentate on upper part of keels *P. calliopsis*
5. Plants never with above character combinations 6
6. Palea keels smooth 7
6. Palea keels scabrid or ciliate to pillulose..... 10
7. Panicle oblong in outline *P. albertii*
7. Panicle pyramidal to ovoid in outline 8
8. Spikelets wedge-shaped..... *P. lachenensis*
8. Spikelets ovate to oblong 9
9. Plants annual; anthers 0.2–1.1 mm long *P. annua*
9. Plants perennial; anthers 1.2–3.5 mm long *P. supina*
10. Lemma keel never ciliate *P. dzongicola*

10. Lemma keel ciliate, at least at lower half (sometimes scabrid in *P. szechuensis*) 11
11. Plant glaucous throughout.. *P. nitidespiculata*
11. Plants never glaucous throughout (sometimes only spikelets glaucous in *P. gammieana*).....12
12. Ligule whitish 13
12. Ligule otherwise, never whitish 14
13. Spikelets obovate *P. hirtiglumis*
13. Spikelets elliptic-oblong *P. falconeri*
14. Anthers > 1 mm long 15
14. Anthers up to 1 mm long 23
15. Number of culm nodes > 5 *P. gammieana*
15. Number of culm nodes < 5 16
16. Ligule usually 0.2–1 mm high 17
16. Ligule usually 1.5–10 mm high..... 18
17. Leaf sheaths as long as leaf blades; panicle open, broadly triangular; spikelets elliptic to oblong *P. mairei*
17. Leaf sheaths shorter than leaf blades; panicle slender; spikelets lanceolate *P. nemoralis*
18. Culm nodes distinctly constricted and translucent *P. pagophila*
18. Culm nodes otherwise, not as above 19
19. Leaf blades folded or inrolled to needle-shape, firm *P. attenuata*
19. Leaf blades flat or if folded never needle-shaped, not firm 20
20. Ligules smooth abaxially *P. alpina*
20. Ligules scabrous or scaberulous abaxially... 21
21. Annual; upper glumes > 4 mm long; florets 3–7 *P. hylobates*
21. Perennial; upper glumes < 3.5 mm long; florets 2–3 22
22. Ligule 2.3–3 mm high *P. mustangensis*
22. Ligule 3.5–10 mm high *P. trivialis*
23. Palea keels eciliate, rather scabrid 24
23. Palea keels ciliate at least below to medially 29
24. Lowest lemma 4.2–6.5 mm long *P. eleanorae*
24. Lowest lemma 1.5–3.8 mm long 25
25. Spikelets narrowly wedge-shaped..... 26
25. Spikelets oblong, lanceolate, ovate to narrowly elliptic 27
26. Leaves arranged throughout culm length *P. cooperi*
26. Leaves arranged $\frac{2}{3}$ length of culm.... *P. longii*
27. Collar ciliate *P. rajbhandarii*
27. Collar glabrous..... 28
28. Spikelets ovate, < 4 mm long; lemmas elliptic, 1.5–2.6 mm long *P. szechuensis*
28. Spikelets oblong to lanceolate, > 4.5 mm long; lemmas oblong, 2.7–3.3 mm long *P. wardiana*
29. Keels of palea a few-hooked distally...*P. nepalensis*
29. Keels of palea never hooked 30
30. Callus glabrous..... *P. sikkimensis*
30. Callus woolly..... 31
31. Panicle branches 2–4 per node *P. khasiana*
31. Panicle branches always 2 per node..... 32
32. Collar glabrous; ligule 2.5–5 mm long ... *P. stapfiana*
32. Collar strigulose or ciliate; ligule 0.8–2.5 mm long 33
33. Lemma glabrous between veins*P. himalayana*
33. Lemma hairy between veins.....*P. burmanica*

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