

CALAMAGROSTIS GAMBLEI SP. NOV. (POACEAE) FROM THE WESTERN HIMALAYAS, NW INDIA

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Abstract. A new grass species of *Calamagrostis* Adans. from NW India, *Calamagrostis gamblei* B. Paszko, is described and illustrated. The new species is distributed mainly in the Garhwal Himalayas, and spikelet morphology shows that it is similar to *C. stolizkai* Hook. f. and *C. moupinensis* Franch. A key to *C. gamblei* and closely related species in NW India is presented.

Key words: new species, *Calamagrostis emodensis*, *C. garhwalensis*, *C. moupinensis*, *C. pseudophragmites*, *C. stolizkai*, Uttarakhand, Himachal Pradesh

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INTRODUCTION

Calamagrostis Adans. and *Deyeuxia* Clarion ex P. Beauv. (Poaceae: Agrostidinae) are two closely related genera, mainly of the Northern Hemisphere, which include closely related species complexes and numerous hybrids (Howard *et al.* 2009; Paszko & Nobis 2010; Paszko 2011; Paszko & Ma 2011; Paszko 2012). The present work is part of a general revision of the widespread Eurasian complex of *Calamagrostis pseudophragmites* (Haller f.) Koeler. This study revealed several herbarium collections of an enigmatic *Calamagrostis* species housed in different herbaria (CAL, BSD, DD, E, K, US). These specimens cannot be referred to any previously described species of *Calamagrostis* or *Deyeuxia*. They are between 50 and 120 cm tall and have a weak habit, (3)–5-veined lemmas, callus hairs usually sub-equal or occasionally equal to the lemma, a straight awn inserted dorsally above the midpoint of the lemma back, and a 2–4-toothed lemma apex. No other Central Asian species presents this combination of characters (Hooker 1897; Bor 1960, 1970; Moulik 1997). These specimens represent a previously undescribed species named *C. gamblei* B. Paszko here. Spikelet morphology indicates that the new species is similar to the Western Himalayan *C. stolizkai* Hook. f. and the Chinese *C. moupinensis* Franch.

Calamagrostis gamblei is described here as a new species from NW India, its records are scored, morphological variation among *C. gamblei* and its allies is discussed, and a brief taxonomic synopsis of the new species is given, as well as an identification key for *C. gamblei* and closely related species in NW India, such as *C. emodensis* Griseb., *C. garhwalensis* C. E. Hubb. & Bor, *C. stolizkai* Hook. f. and the *C. pseudophragmites* complex.

***Calamagrostis gamblei* B. Paszko, sp. nov.**

Figs 1, 2, 3A & 4A

HOLOTYPE: NW INDIA, Uttarakhand prov., [Dehradun distr.], Jaunsar, Mundali, alt. 7000 ft., Oct. 1894, leg. J. S. Gamble 25249 (K!); **ISOTYPES:** CAL!, DD!

Culms 50–120 cm high; nodes 3–6. Sheaths slightly scabrous, leaf collars glabrous. Ligules 3–14 mm long, obtuse, sometimes lacerate. Culm leaf blades flat or weakly inrolled, 11–40 cm, 4–9 mm wide, slightly ribbed, adaxial surfaces glabrous or slightly scabrous, green or grey-green. Panicles 10–30 cm long, slightly nodding, lowest node with 5–7 branches, 5–8 cm long,

branches slightly scabrous. Spikelets 1-flowered, 5.3–6.9 mm long, laterally compressed; glumes subequal, slightly scabrous over the midvein, apices narrowly acuminate, lower 5.3–6.9 mm long, 0.80–1.13 mm wide, 1-veined, upper 4.8–6.3 mm long, 0.84–1.00 the length of lower glume, 0.88–1.20 mm wide, 3-veined; callus hairs 2.75–4.10 mm long, 0.6–1.0 the length of lemma, surrounding the floret; lemmas 3.8–4.7 mm long, usually 5-veined, sporadically 3-veined, 0.60–0.76 the length of lower glume, apex shortly 2–4-toothed, awn straight, 3.5–5.3 mm long, inserted dorsally between 0.50 and 0.84 of the lemma back, exerted from the glumes; palea shorter than lemma, 1.85–2.60 mm long, 0.46–0.64 the length of lemma; rachilla prolongation always present, 0.4–1.5 mm long, penicillate, 3–5 mm long including silky hairs; lodicules 2, *ca* 1 mm long, hyaline. Anthers 3, 1.5–1.9 mm long. Ovary *ca* 0.5 mm long, glabrous; styles 2, separate; stigmas 2, feathery, whitish.

ETYMOLOGY: The new species is named in honor of James Sykes Gamble (1846–1925), English-born Indian forester and botanist who specialized in the flora of the Indian Subcontinent and collected the type in 1894.

DISTRIBUTION AND HABITAT: *Calamagrostis gamblei* occurs in two northwestern provinces of India: Uttarakhand (distr.: Dehradun, Tehri Garhwal, Chamoli) and Himachal Pradesh (distr.: Kulu). It grows in colline and montane belts in the Garhwal Himalayas (Uttarakhand, India) and in the Pin Panjal Range (Himachal Pradesh, India) at altitudes between 1800 and 3000 m a.s.l. There is little information on the herbarium labels about the habitats occupied by the new species, but it can be inferred that it grows in montane meadows, on open slopes, and in pine forests.

SIMILAR SPECIES. The new species can be distinguished from other species of *Calamagrostis* in NW India by the following combination of char-

acters: plant height 50–120 cm, 5-veined lemma, the presence of a rachilla extension with numerous 3–5 mm long silky hairs, callus covered with silky hairs which are 0.6–1.0 the length of the lemma, the lemma dorsally awned above the midpoint, the lemma tip 2–4-toothed, and the adaxial leaf surface slightly ribbed, glabrous or slightly scabrous (Fig. 3A).

Calamagrostis gamblei is similar to *C. stolizkai* in spikelet morphology but differs from it by having (i) a weak habit; (ii) shorter palea (1.85–2.60 versus 2.2–4.2 mm in *C. stolizkai*); (iii) a lower ratio of palea to lemma length (0.46–0.64 versus 0.60–0.96); (iv) shorter anthers (1.5–1.9 versus 1.5–3.7 mm); (v) shorter callus hairs (2.75–4.10 versus 3.4–6.3 mm); (vi) shorter callus hairs in relation to lemma length (usually shorter than lemma versus usually longer than lemma); (vii) the lemma usually 5-veined, rarely 3-veined (in *C. stolizkai* the lemma most frequently is 3-veined, sometimes 5-veined); (viii) a shortly 2–4-toothed lemma apex (2–4 short awnlike teeth at the lemma tip in *C. stolizkai*); (ix) the adaxial leaf surface slightly ribbed, glabrous or slightly scabrous (Fig. 3A), whereas the upper leaf surface of *C. stolizkai* is conspicuously scabrous and has high ribs and deep furrows (Fig. 3B); and (x) a different distribution pattern and elevation preferences. *C. gamblei* grows at lower elevations between 1800 and 2900 m a.s.l. in Uttarakhand and Himachal Pradesh of NW India, whereas *C. stolizkai* occurs at higher elevations between 2750 and 5200 m a.s.l. in Jammu and Kashmir of NW India and Gilgit-Baltistan of Pakistan.

Calamagrostis gamblei differs from members of the *C. pseudophragmites* complex by having longer awns (3.5–5.3 mm versus 0.8–4.0 mm), higher ratios of lemma to lower glume length (0.60–0.76 versus 0.37–0.63), lower ratios of callus hairs to lemma length (0.6–1.0 versus 1.3–2.6), the lemma awned above the midpoint (0.50–0.84 versus 0.75–1.00), the lemma usually 5-veined,

Fig. 1. *Calamagrostis gamblei* B. Paszko, *sp. nov.* (drawn by Jolanta Urbanik). A – habit, B – inflorescence, C – sheath, ligule and blade, D – lower glumes, E – floret, F – rachilla, G – palea, H – stamens, I – pistil, J – lodicules. B–G & J from *W. Koelz 21785* (US); A & H from *J. F. Duthie 5128* (US); I from *W. Koelz 21708a* (US).

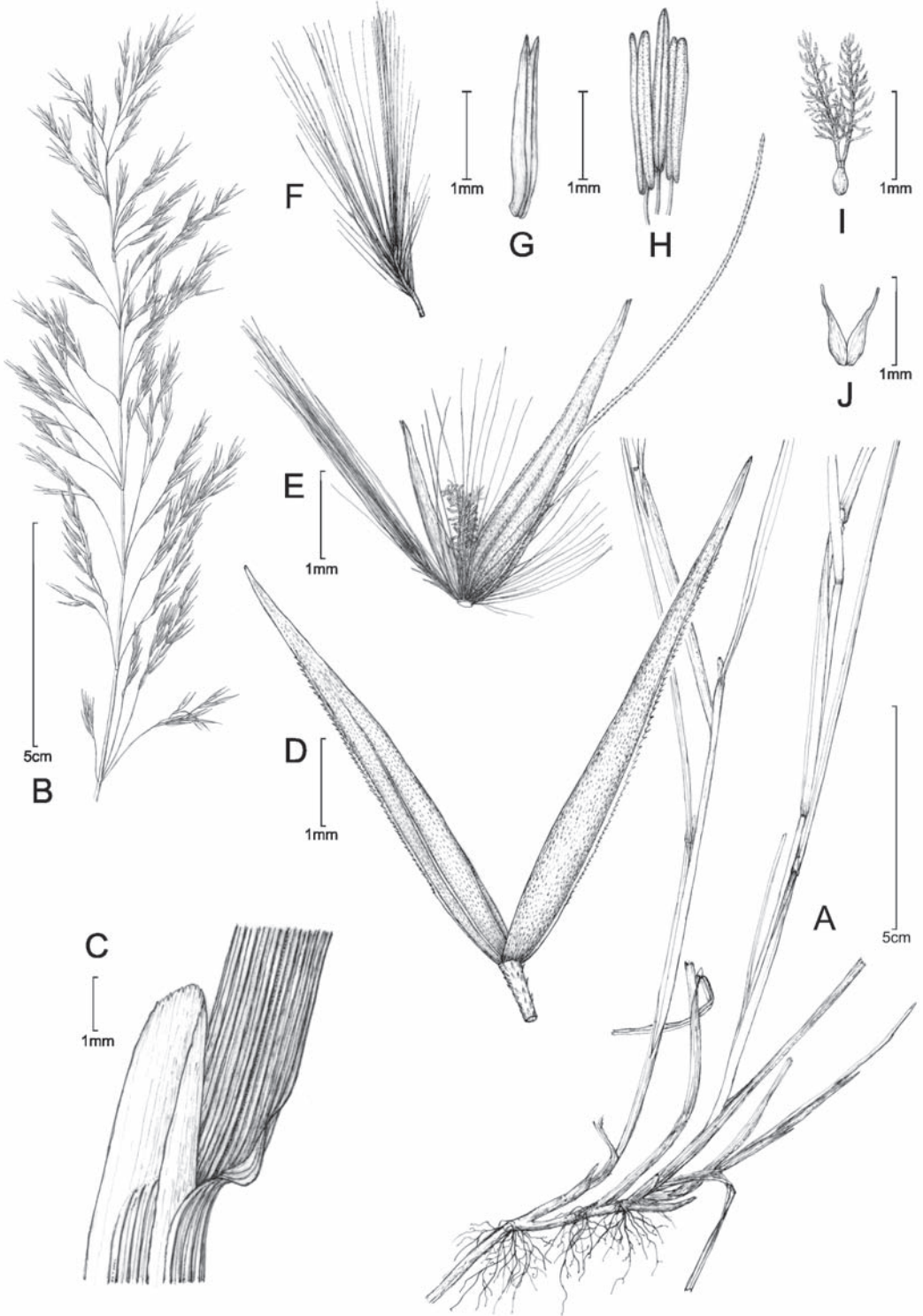


Table 1. Comparison of the salient characters distinguishing *Calamagrostis gamblei* B. Paszko, *sp. nov.*, *C. emodensis* Griseb., *C. garhwalensis* C. E. Hubb. & Bor, the *C. pseudophragmites* complex and *C. stoliczkae* Hook. f. n/a – not applicable.

Character (scale)	<i>C. gamblei</i>	<i>C. emodensis</i>	<i>C. garhwalensis</i>	<i>C. pseudophragmites</i> complex	<i>C. stoliczkae</i>
Anther length (mm)	1.5–1.9	0.6–1.1	1.1–1.7	0.9–2.3	1.5–3.7
Awn insertion (mm; measured as the length from the base of the lemma to the point of awn insertion) (mm)	2.0–3.5	0.95–2.25	1.70–2.15	2.0–3.8	1.5–4.5
Ratio: awn insertion to lemma length	0.50–0.84	0.40–0.75	0.60–0.74	0.75–1.00	0.40–0.97
Lemma awn length (mm)	3.5–5.3	4.85–8.45	4.5–6.0	0.85–4.00	2.5–6.7
Callus hair length (mm; measured as the length of the longest callus hairs) (mm)	2.75–4.10	3.3–5.5	4.8–6.3	3.0–6.5	3.4–6.3
Ratio: callus hairs to lemma length	0.6–1.0	1.4–2.3	1.67–2.19	1.25–2.60	0.88–1.44
Lower glume length (mm)	5.30–6.85	4.2–7.7	6.4–7.6	3.8–8.3	4.9–9.0
Lower glume width (mm)	0.80–1.13	0.45–0.85	0.75–0.90	0.45–1.15	0.85–1.90
Ratio: lower glume width to lower glume length	0.14–0.20	0.07–0.13	0.10–0.14	0.08–0.20	0.14–0.26
Ligule length (mm)	3.25–14.00	0.4–5.2	3.0–12.5	1.7–26.0	0.4–12.0
Lemma length (mm)	3.85–4.65	2.0–3.4	2.4–3.4	2.0–4.2	3.3–6.0
Ratio: lemma to lower glume length	0.60–0.76	0.34–0.50	0.35–0.47	0.37–0.63	0.54–0.77
Number of culm nodes	3–6	3–6	5	3–6	2–5
Panicle length (cm)	10.5–27.0	16–33	23–37	8.7–35.0	5.5–25.0
Palea length (mm)	1.85–2.60	1.3–2.5	1.4–2.3	1.0–2.6	2.2–4.2
Ratio: palea to lemma length	0.46–0.64	0.6–0.9	0.56–0.75	0.44–0.75	0.60–0.96
Length of rachilla prolongation with hairs (mm)	3–5	n/a	n/a	n/a	1.25–4.25
Rachilla prolongation length (mm)	always present; 0.35–1.50	almost always absent; if present: 0.15–0.57	always present; 0.2–0.6	almost always absent; if present: 0.25–0.35	0.3–1.3*
Upper glume length (mm)	4.80–6.25	4.0–7.1	4.5–6.0	2.7–6.7	4.4–8.5
Ratio: upper glume to lower glume length	0.84–0.98	0.78–1.00	0.68–0.83	0.63–0.90	0.8–1.0
Upper glume width (mm)	0.88–1.20	0.50–0.86	0.7–1.0	0.45–1.40	0.9–1.6

* About 53% of the spikelets of *C. stoliczkae* have a reduced rachilla prolongation covered with a few hairs, but ca 26% of the spikelets have no rachilla prolongation, and in 21% of the spikelets it is present only in the form of a short naked rachis.

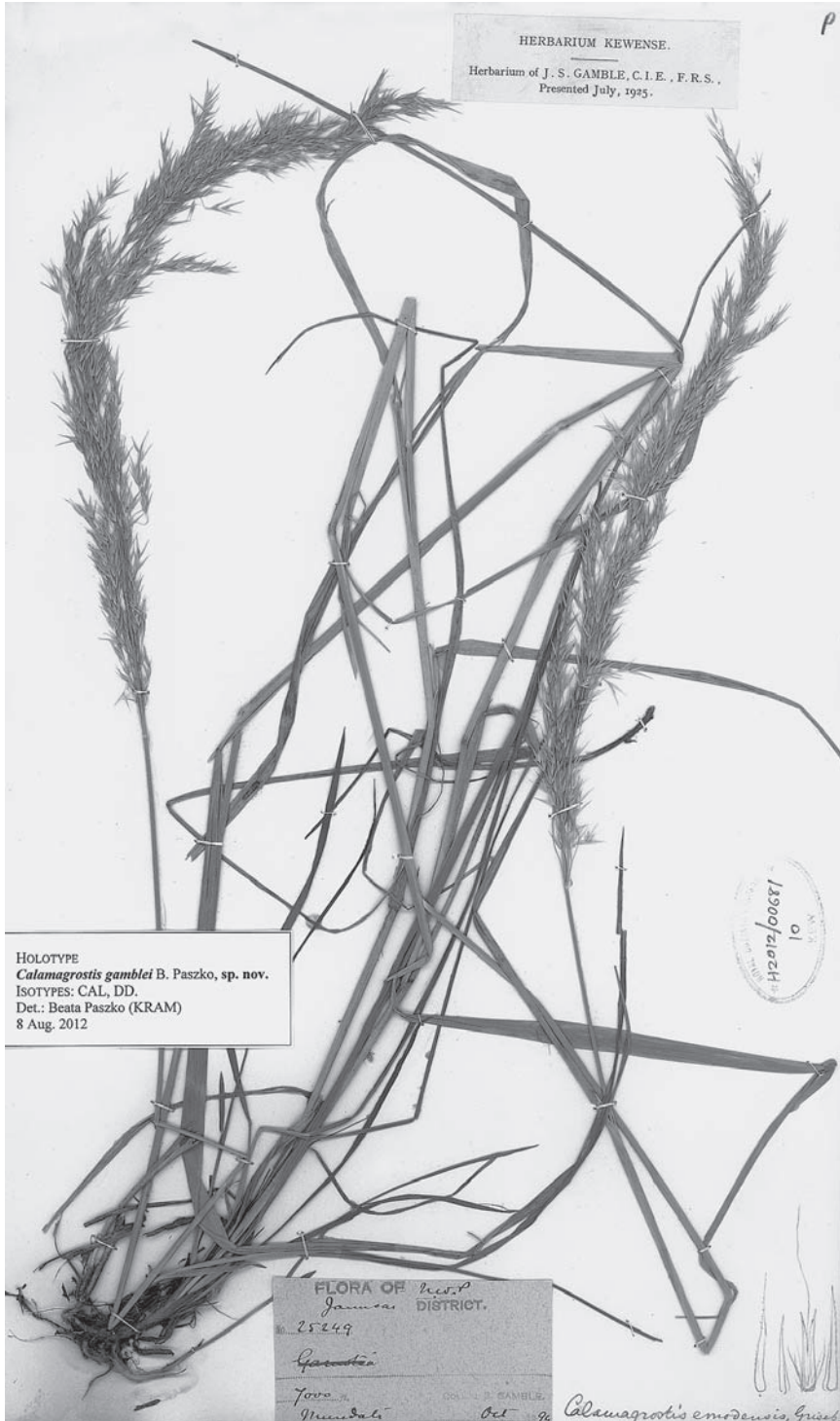


Fig. 2. Holotype of *Calamagrostis gamblei* B. Paszko, sp. nov. (J. S. Gamble 25249, K).

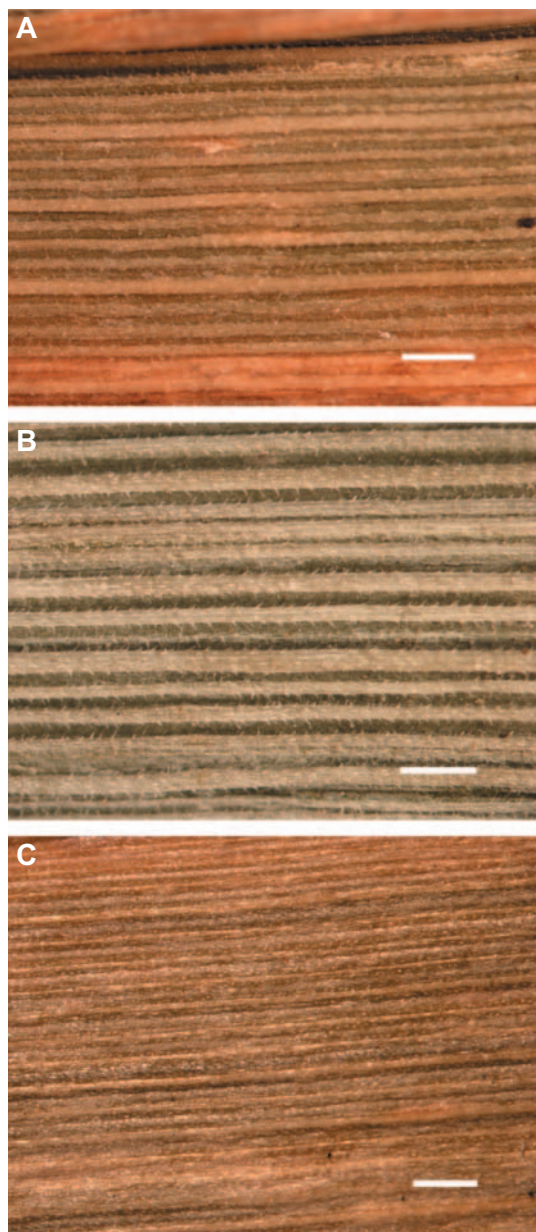


Fig. 3. Adaxial leaf surface. A – *Calamagrostis gamblei* B. Paszko, *sp. nov.* (*W. Koelz 21708a*, US); B – *C. stolizkai* Hook. f. (*L. Klimeš 383*, Klimeš herb.); C – *C. moupinensis* Franch. (*A. David s.n.*, P). Scale bar = 0.5 mm.

rarely 3-veined (versus almost always 3-veined, rarely 5-veined in *C. pseudophragmites*). In addition, the rachilla prolongation of *C. gamblei* is rather well developed in the form of a rachis 0.3–

1.5 mm long, with hairs 3–5 mm long (Table 1). By contrast, the *C. pseudophragmites* complex is characterized by the absence of a rachilla prolongation, except rarely there is a short naked rachis. *C. gamblei* differs from *C. emodensis* by having longer anthers (1.5–1.9 versus 0.6–1.1 mm), longer lemmas (3.9–4.7 versus 2.0–3.4 mm), higher ratios of lemma to lower glume length (0.60–0.76 versus 0.34–0.50), and higher ratios of callus hairs to lemma length (0.6–1.0 versus 1.4–2.3). A comparison of the morphology of *C. gamblei* and its four allies from NW India is provided in Table 1.

Calamagrostis gamblei also shows some similarity to the Chinese *C. moupinensis*, described by Franchet (1888) based on Armand David's collection from Moupin (now known as Baoping) in Central Sichuan, China. However, the former can be distinguished from the latter by its longer lower glumes (5.3–6.9 versus 3.8–4.5 mm), longer upper glumes (4.8–6.3 versus 3.5–4.1 mm), longer lemmas (3.9–4.7 versus 2.8–3.0 mm), longer paleas (1.9–2.6 versus 1.7–1.9 mm), leaf ligule shape (acute versus truncate) (Fig. 4A & C), longer leaf ligules (3.3–14.0 versus 0.3–0.9 mm) (Fig. 4A & C), lower ratios of callus hairs to lemma length (0.6–1.0 versus 0.96–1.20), longer rachilla prolongations with hairs (3–5 versus 2.8–3.3 mm long), and upper leaf surface texture (slightly ribbed, glabrous or slightly scabrous versus flat and glabrous) (Fig. 3A & C).

Calamagrostis moupinensis is placed in the genus *Deyeuxia* as *D. moupinensis* (Franch.) Pilg. in *Flora of China* (Lu *et al.* 2006). Its description includes inaccurate information about the upper leaf surface, described there as scabrid. My examination of the type collection and additional collections shows that *C. moupinensis* has leaves with glabrous and almost flat upper leaf surfaces (Fig. 3C) unlike the other taxa I examined (Fig. 3A, B). This information is important to avoid confusion during identification.

ADDITIONAL SPECIMENS EXAMINED. INDIA. HIMACHAL PRADESH: [Kulu distr.] Kulu division, Pulga, alt. 9500 ft., 7 Oct. 1940, *leg. K. Ram 13777* (DD); UTTARAKHAND: [Chamoli distr.], above That on the road to Parkhal, alt. 6000 ft., 2 Sept. 1885, *leg. s. c.* (E); [Dehradun distr.], Jaunsar, Molta, alt. 8000 ft., May 1896,

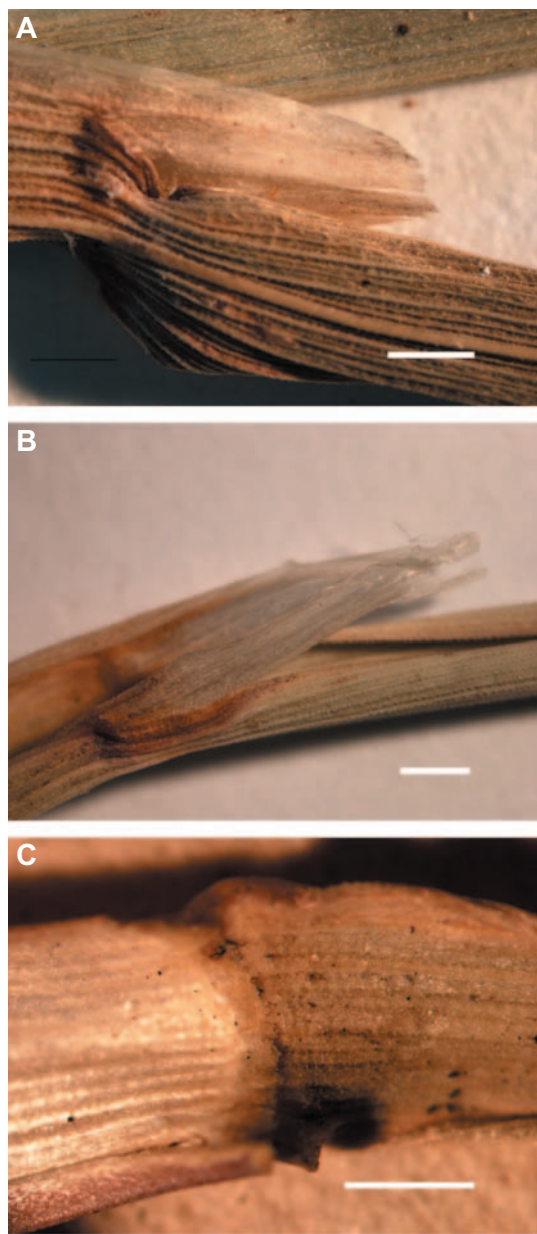


Fig. 4. Leaf ligule. A – *Calamagrostis gamblei* B. Paszko, *sp. nov.* (*W. Koelz 21785*, US), scale bar = 1 mm; B – *C. stolizkai* Hook. f. (*L. Klimeš 5185*, Klimeš herb.), scale bar = 1 mm; C – *C. moupinensis* Franch. (*A. David s.n.*, P), scale bar = 1 mm.

leg. J. S. Gamble 25725 (K); [Tehri Garhwal distr.], Tehri, Kadukal, alt. 7000 ft., 11 Sept. 1948, *leg. W. Koelz 21708a* (US); [Tehri Garhwal distr.], Tehri, Kaudia, alt. 7000 ft., 14 Sept. 1948, *leg. W. Koelz 21785* (US); [Tehri

Garhwal distr.], ‘Aill’ above Ramri, alt. 9000 ft., 19 Sept. 1885, *leg. s. c.* (E); UNLOCATED: British Garhwal, unlocated, alt. 7–8000 ft., 2 Sept. 1895, *leg. J. F. Duthie s.n.* (K); British Garhwal, alt. 7–8000 ft., 2 Sept. 1895, *leg. J. F. Duthie 5128* (CAL, K, US).

KEY TO *CALAMAGROSTIS GAMBLEI* AND CLOSELY RELATED SPECIES IN NW INDIA

1. Lemma 2.0–4.2 mm long, 0.34–0.63 the length of lower glume. Callus hairs 3.0–6.5 mm long, 1.3–2.6 the length of lemma 2
- 1* Lemma 3.3–6.0 mm long, 0.54–0.77 the length of lower glume. Callus hairs 2.8–6.3 mm long, 0.6–1.3 the length of lemma 4
2. Lemma awn 0.9–4.0 mm long *C. pseudophragmites* complex
- 2* Lemma awn 4.5–8.5 mm long 3
3. Anthers 0.6–1.1 mm long. Leaf ligule 0.4–5.2 mm long *C. emodensis*
- 3* Anthers 1.2–1.7 mm long. Leaf ligule 3–13 mm long. *C. garhwalensis*
4. Plants robust in habit. Lemma with lateral veins prolonged into 2–4 awnlike teeth, awned from between teeth or occasionally awn inserted subapically. Callus hairs 0.9–1.4 the length of lemma *C. stolizkai*
- 4* Plants weak in habit. Lemma apex acute, 2–4-toothed; lemma awned dorsally from above midpoint. Callus hairs 0.6–1 the length of lemma *C. gamblei*

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