

研究報告

臺灣外來種禾草補註

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【摘要】作者報導3種臺灣新歸化外來種禾草：柔毛大黍 (*Megathyrsus infestus* (Andersson) B.K.Simon & S.W.L.Jacobs)、毛大黍 (*M. maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs var. *pubiglumis* (K. Schum.) B.K. Simon & S.W.L. Jacobs) 及巨黍 (*Zuloagaea plena* (Hitchc. & Chase) M.J. Jung, *comb. nov.*)，並且提供這些新歸化禾草的彩色照片和線描圖以供辨識。巨黍的新組合名在本文中一併提出。此外，作者確認歸化於南臺灣的彎柄尾稈草 (*Urochloa deflexa* (Schumach.) H. Scholz) 應為展序黍 (*Steinchisma laxum* (Sw.) Zuloaga) 的鑑定錯誤。

【關鍵詞】柔毛大黍、毛大黍、彎柄尾稈草、展序黍、巨黍。

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Research Paper

Supplements to the alien grasses (Poaceae) of Taiwan

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【Abstract】 Here I reported three new-naturalized grasses to the flora of Taiwan: *Megathyrsus infestus* (Andersson) B.K.Simon & S.W.L.Jacobs, *M. maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs var. *pubiglumis* (K. Schum.) B.K. Simon & S.W.L. Jacobs and *Zuloagaea plena* (Hitchc. & Chase) M.J. Jung, *comb. nov.*, and offered color photos and line-drawings of these grasses benefit for identification. New combination of *Zuloagaea plena* (Hitchc. & Chase) M.J. Jung is suggested, too. In addition, I confirmed the naturalized grass to southern Taiwan, which was misapplied as *Urochloa deflexa* (Schumach.) H. Scholz, should be *Steinchisma laxum* (Sw.) Zuloaga.

【Key words】 *Megathyrsus infestus*; *M. maximus* var. *pubiglumis*; *Steinchisma laxum*; *Urochloa deflexa*; *Zuloagaea plena*.

Introduction

Field surveys for Poaceae species in Taiwan were made steadily by the author as interests (Jung et al. 2012 Jung & Chen 2013, Jung 2016, 2018, 2019ab, 2020ab, 2021). Based on the results of phylogenetic analyses, several members of the genus *Panicum* L. were split and separated into different genera, ie. *Megathyrus* (Pilg.) B.K. Simon & S.W.L. Jacobs (Barkworth et al. 2003), *Steinchisma* Raf. (Freckmann & Lelong 2007), *Zuloagaea* E. Bess etc (Bess et al. 2006; Verloove 2006; Zuloaga et al. 2007; Washburn et al. 2015; Soreng et al. 2017; Zuloaga et al. 2018). For example, Guinea grass (*Panicum maximum* Jacq.) was reported as an alien species naturalized at plains in Taiwan (Liu 2000; Chen & Stephen 2006; Chen et al. 2014), nowadays this species was segregated to genus *Megathyrus* (Pilg.) B.K. Simon & S.W.L. Jacobs as *M. maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs (Bess et al. 2006; Verloove 2006; Freckmann & Lelong 2007; Washburn et al. 2015).

In my personal botanical surveys, I found a strange grass similar to Guinea grass in outline at riverbanks, northern Taiwan. After careful examination of related type specimens' images, the strange grass was determined as *M. infestus* (Andersson) B.K. Simon & S.W.L. Jacobs (Figures 1 & 2), a newly naturalized perennial grass to Taiwan. Secondly, two subpopulations of the variety of Guinea grass, *M. maximum* (Jacq.) B.K. Simon & S.W.L. Jacobs var. *pubiglumis* (K. Schum.) B.K. Simon & S.W.L. Jacobs (Figures 3F

& 4), were found as weeds at plains in Pingtung Hsien, southern Taiwan.

Thirdly, I found a strange giant grass (Figures 5 & 6) fit the description of *Panicum plenum* Hitchc. & Chase by Freckmann & Lelong (2007) at plains and roadsides in low elevations, western Taiwan. Freckmann & Lelong (2007) considered that *Panicum plenum* Hitchc. & Chase is closely related to *P. bulbosum* Kunth in phylogeny, and both of these two species are members of *Panicum* section *Bulbosa* Zuloaga. Bess et al. (2006) discussed the phylogeny and taxonomy of *Panicum* section *bulbosa* Zuloaga and its relatives, then established the monotypic genus *Zuloagaea* E. Bess, and treated *Panicum plenum* Hitchc. & Chase as synonym of *Zuloagaea bulbosa* (Kunth) E. Bess. After careful examination of images of type specimens and protologues of these two species and their relative treatments (Bess et al. 2006; Freckmann & Lelong 2007; Zuloaga et al. 2007; Washburn et al. 2015; Soreng et al. 2017; Zuloaga et al. 2018), I treated the taxonomic status of *Panicum plenum* Hitchc. & Chase as a distinct species, and transferred it to the genus *Zuloagaea* E. Bess in following, then described the naturalization of the grass in Taiwan.

Fourthly, *Urochloa deflexa* (Schumach.) H. Scholz was reported as a naturalized grass in southern Taiwan in past (Jung 2019). This grass species was identified as *S. laxum* (Sw.) Zuloaga by Mr. Liao, Hsien-Chun, another independent researcher (personal communication). After having examined the type specimens' images of *S.*

laxum (Sw.) Zuloaga and *U. deflexa* (Schumach.) H. Scholz, I adopted the Mr. Liao's viewpoint and determination, and corrected it in following.

Taxonomic treatments

I. *Megathyrsus* (Pilg.) B.K. Simon & S.W.L. Jacobs, *Austrobaileya* 6(3): 572. 2003; Barkworth et al., *Fl. North Amer.*, electronic version, 2003. 大黍屬

Two or three species in global, two species and one represents in two varieties in Taiwan.

Key to the species and their varieties in Taiwan

1. Pedicels short, sparsely pilose near apex. 1. *M. infestus*
1. Pedicels short or long, totally glabrous. 2. *M. maximus*
2. Glumes and lower lemma glabrous at abaxial surface. 2a. var. *maximus*
2. Glumes and lower lemma densely hairy at abaxial surface. 2b. var. *pubiglumis*
1. *Megathyrsus infestus* (Andersson) B.K.Simon & S.W.L.Jacobs, *Austrobaileya* 6: 573, 2003. — *Panicum infestum* Andersson, *Naturw. Reise Mossambique* 2: 546. 1865.

Isotype: Mozambique: Standort, Auf feuchten sandigen Feldern der Querimba-Küste, 1/2 - 1 Stunde von Meere, im Monat Mai eingesammelt, *Peters s.n.* (K, <https://apps.kew.org/herbcat/getImage.do?imageBarcode=K000282478>)

柔毛大黍 Figures 1 & 2

Perennials; caespitose or with short horizontal stems, culms erect; 50-200 cm tall, nodes pilose with retrose hairs. Leaf-sheaths glabrous or hispidulate with tubercle-based hairs; collar chartaceous, margin long-pilose with tubercle-base hairs; ligule a ciliate membrane; leaf-blades 15-50 cm long; to 10 mm wide, blade surface glabrous or pilose with tubercle-based hairs. Inflorescence a apical panicle composed by racemose branches or panicle-like branches at basal ones; axis 10-28 cm long, branches 7-10, 7-12 cm long, simple, or secondarily branched; pedicel apex usually sparsely pilose. Spikelets oblong, 2.5-4.1 mm long, lower glume ovate, 1-3-veined, apex round to obtuse. Upper glume oblong, 5-veined, apex obtuse. Lower lemma similar to upper glume, outline oblong, 5-veined, apex obtuse. Upper lemma oblong in outline, 2.5-4 mm long, surface rugose, margins involute, apex obtuse. Upper palea involute, indurate, surface rugose. Anthers 3, 1.5 mm long.

Specimen examined: Taiwan. Taipei City, Sherlin District, Sherlin, 5 Jan 2021, *Ming-Jer Jung* 6395 (TAIF), same loc., 8 Nov 2022, *Ming-Jer Jung* 6600 (TAIF).

Notes: *Megathyrsus infestus* (Andersson) B.K.Simon & S.W.L.Jacobs is native to Africa except Sahara (POWO 2022). In Taiwan, this grass naturalized at riverbank in Taipei City (Figure 7), and its population was stable, coexisted with *Bidens chilensis* DC. In outlines, this grass has rather short branchlets of the lowermost panicle branches (Figures 1A & 2A), and pilose hairs at the pedicel apical parts (Figures 1B & E & F).

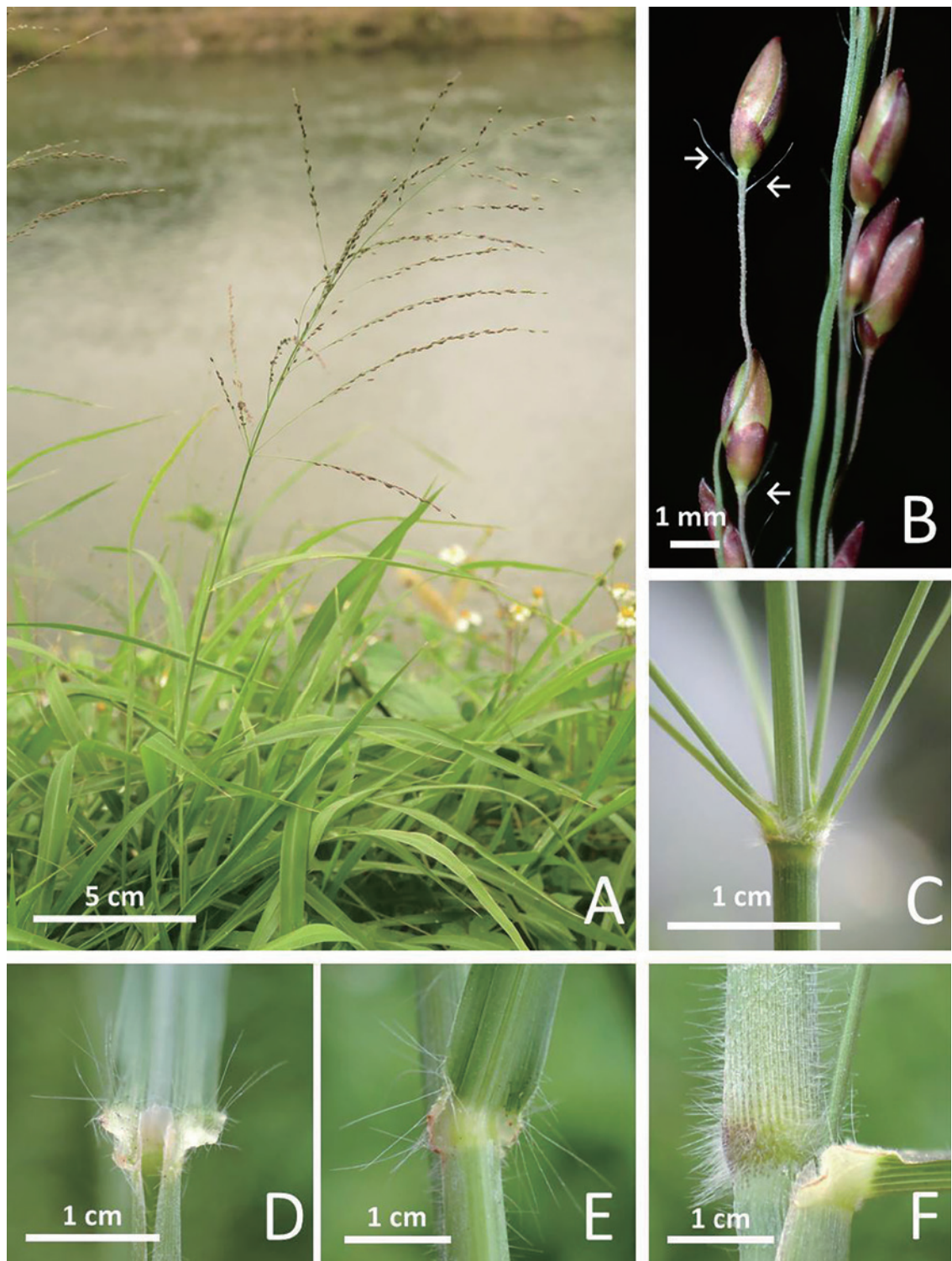


Figure 1. *Megathyrsus infestus* (Andersson) B.K.Simon & S.W.L.Jacobs. A. Habit. B. Spikelets and panicle branches, showing the long hairs (arrows) at pedicel apex. C. Lowest axils of panicle. D – E. Blade base and collar, D: adaxial view, E: abaxial view. F. Node and basal leaf sheath.

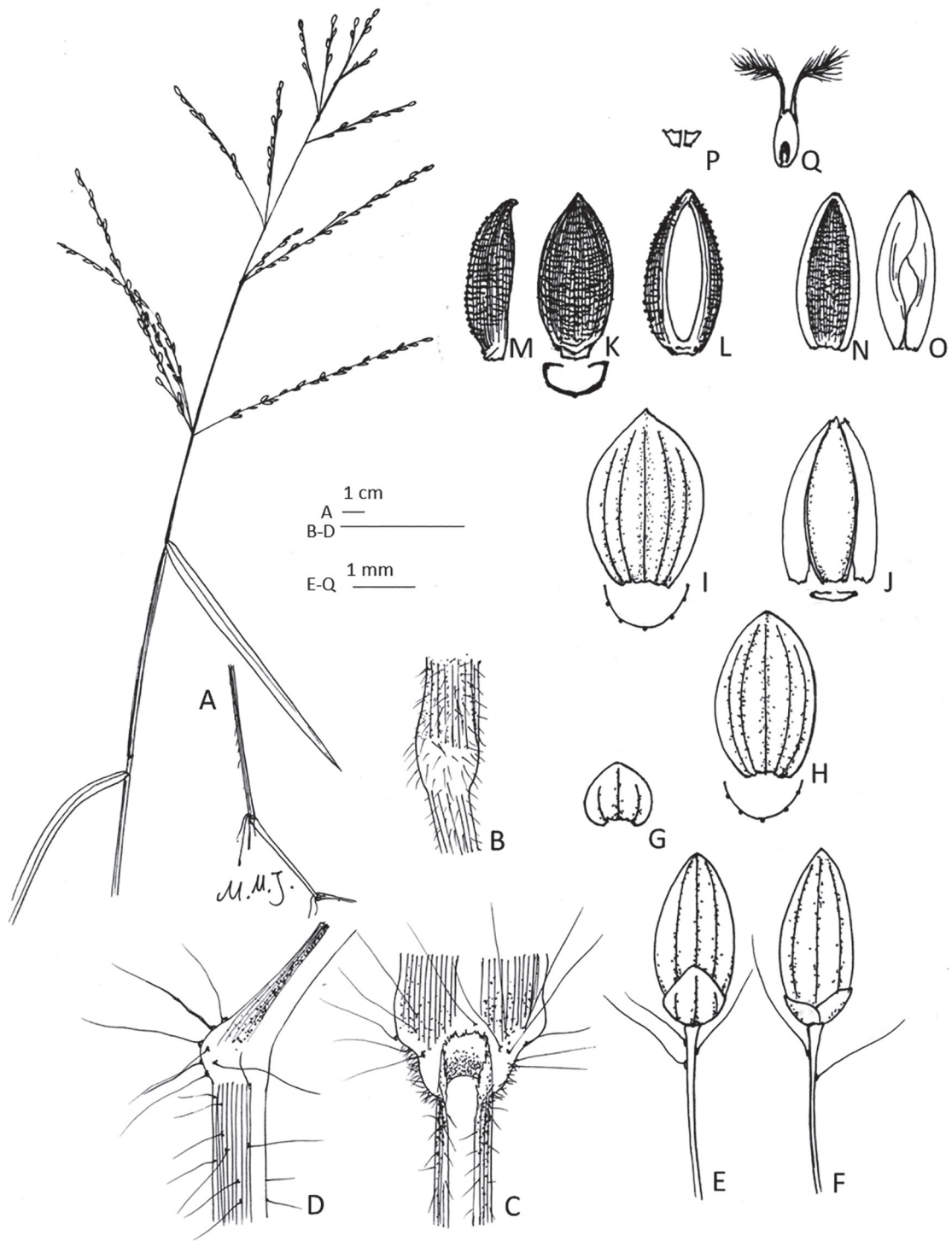


Figure 2. *Megathyrsus infestus* (Andersson) B.K.Simon & S.W.L.Jacobs. A. Habit. B. Node and sheath base. C & D. Blade bases and collars, D: lateral view. E & F. Spikelets. G. Lower glume. H. Upper glume. I. Lower lemma. J. Lower palea. K – M. Upper lemmas, L, ventral view, M: lateral view. N & O: Upper palea, O: ventral view. P. Lodicules. Q. Pistil.

2. *Megathyrsus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs, *Austrobaileya* 6(3): 572. 2003; Barkworth et al., *Fl. North Amer.*, electronic version, 2003. — *Panicum maximum* Jacq., *Icon. Pl. Rar.* 1: 2. 1781; *Fl. Taiwan* (2nd edit.) 5: 490, pl. 205; Chen & Stephen, In: Wu and Raven (eds.) *Fl. China* 22: 505, 2006; *Grass Fl. Taiwan* 2: 67, pl. 15, 2014. — *Urochloa maxima* (Jacq.) R.D. Webster, *Austral. Paniceae* 241. 1987.

Holotype: West Indies: *N. Jacquin s.n.* (W, http://jacq.nhm-wien.ac.at/djatoka/jacq-viewer/viewer.html?rft_id=w_0011326&identifiers=w_0011326)

Protologue: Jacquin, Nicolaus (Nicolaas) Joseph von, *Icones Plantarum Rariorum* 1: pl. 13. 1781. (<https://www.biodiversitylibrary.org/page/270327#page/54/mode/1up>)

大黍 Figure 3

2a. var. *maximum*

Perennials; caespitose or with short horizontal stems, culm erect, nodes glabrous or densely retrorse hirsute. Blade 30-75 cm long,

to 35 mm wide; sheath glabrous to hirsute with tubercle-based hairs; ligule 4-6 mm long, membranous, fringed at margin. Panicle spreading, apical, 20-35 cm long, axils glabrous to pilose, lower branches whorled, usually with secondarily branched. Spikelet elliptic in outline, apex obtuse, 3-3.5 mm long, usually glabrous, faintly veined, mostly purplish red or flushed with purple; lower glume ca. 1/3 length of spikelet, apex round, 1-3-veined or veinless; upper glume ovate, apex acute, 5-nerved, glabrous; lower lemma usually staminate, rarely empty, 5-7-veined, glabrous; upper lemma ovate, apex obtuse, surface rugose, margins involute, distinctly transversely rugose, coriaceous. Anthers 3, 1.5 mm long.

Notes: Vernacular name of *M. maximum* (Jacq.) B.K. Simon & S.W.L. Jacobs is Guinea Grass. This alien grass is native to tropical Africa, then was introduced elsewhere including grasslands, roadsides, riverbanks, plantations and disturbed places from coastal regions to low-elevations in Taiwan (Liu 2000; Chen & Stephen 2006; Chen et al. 2014).



Figure 3. *Megathyrus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs. A. Habit. B & C. Blade bases and collars. D – F. Spikelets, F. spikelet of var. *pubiglumis* (K. Schum.) B.K. Simon & S.W.L. Jacobs. G. Lower glume. H. Upper glume. I. Lower lemma. J. Lower palea. K. Anther. L – N. Upper lemmas, M. ventral view, N. rugose surface, enlargement. O & P. Upper paleas, P, ventral view.

2b. var. *pubiglumis* (K. Schum.) B.K. Simon & S.W.L. Jacobs, *Austrobaileya* 6(3): 572, 2003; Verloove, *Bouteloua* 1: 55, 2006. — *Panicum maximum* Jacq. var. *pubiglume* K. Schum., *Pflanzenw. Ost-Afrikas* B(2–3): 85. 1895.

Isotyp=e: Tanzania: Usambara, Mashewa, *Holst 8716* (K, <https://apps.kew.org/herbcat/getImage.do?imageBarcode=K000255575>)

Similar to var. *maximum* but pubescent on glumes and lower lemmas dominantly.

毛大黍 Figures 3F & 4

Specimens examined: Taiwan. Pingtung County, Kaoshu Township, Kaoshu, 17 Jun 2022, *Ming-Jer Jung 6589* (TAIF), same loc., 10 Nov 2022, *Ming-Jer Jung 6601* (TAIF), Wanluan Township, Sangosui, 27 Sep 2021, *Ming-Jer Jung 6547* (TAIF).

Notes: The vernacular name of *M. maximum* (Jacq.) B.K. Simon & S.W.L. Jacobs var. *pubiglumis* (K. Schum.) B.K. Simon & S.W.L. Jacobs is Green Panic. This variety was reported as alien weed to Spain (Verloove 2006). Pubescence on glumes and lower lemmas (Figures 3F & 4B) is the diagnose characters of this variety compared to the variety maximum. Population of this variety was found at plains, orchards and roadsides in Pingtung County, southern Taiwan (Figure 7).

II. *Zuloagaea* E. Bess, *Systematic Botany* 31(4): 666. 2006.

Type species: *Zuloagaea bulbosa* (Kunth) E. Bess, *Systematic Botany* 31(4): 666. 2006.

Isotype: Mexico: Guanajuato, Santa Rosa, Septembri; *von Humboldt, W.H.A. & Bonpland, A.J.A. 4250* (US-2907467 (fragm. & photo ex P))

巨黍屬

The genus includes two or three species, and one species naturalized in Taiwan.

1. *Zuloagaea plena* (Hitchc. & Chase) M.J. Jung, *comb. nov.*

Basionym: *Panicum plenum* Hitchc. & Chase, *Contr. U.S. Natl. Herb.* 15: 80, f. 69. 1910.

Holotype: United States: New Mexico, Mangas Springs, northwest of Silver City; alt. 4770 ft., *Metcalf, O. B. 739* (US, <https://collections.nmnh.si.edu/search/botany/?ti=3#new-search>)

Protologue: Hitchcock, A. S. & Chase, M. (née Merrill), *Agnes Contributions from the United States National Herbarium* 15: 80, f. 69. 1910.

巨黍 Figures 5 & 6

Plants perennial; cespitose, rhizomatous, rhizomes short, thin. Culms 50-200 cm tall, 2-3(5) mm thick, slightly compressed, erect or geniculate at the lower nodes; nodes glabrous or pilose; internodes slightly compressed, glabrous. Sheaths longer or shorter than the internodes, keeled, glaucous, glabrous or pilose, hairs papillose-based near the throat; ligules 0.5-2 mm, membranous, dissected ciliate; blades (6)20-65 cm long, 2-15 mm wide, flat, adaxial surfaces glabrous or densely pubescent, particularly

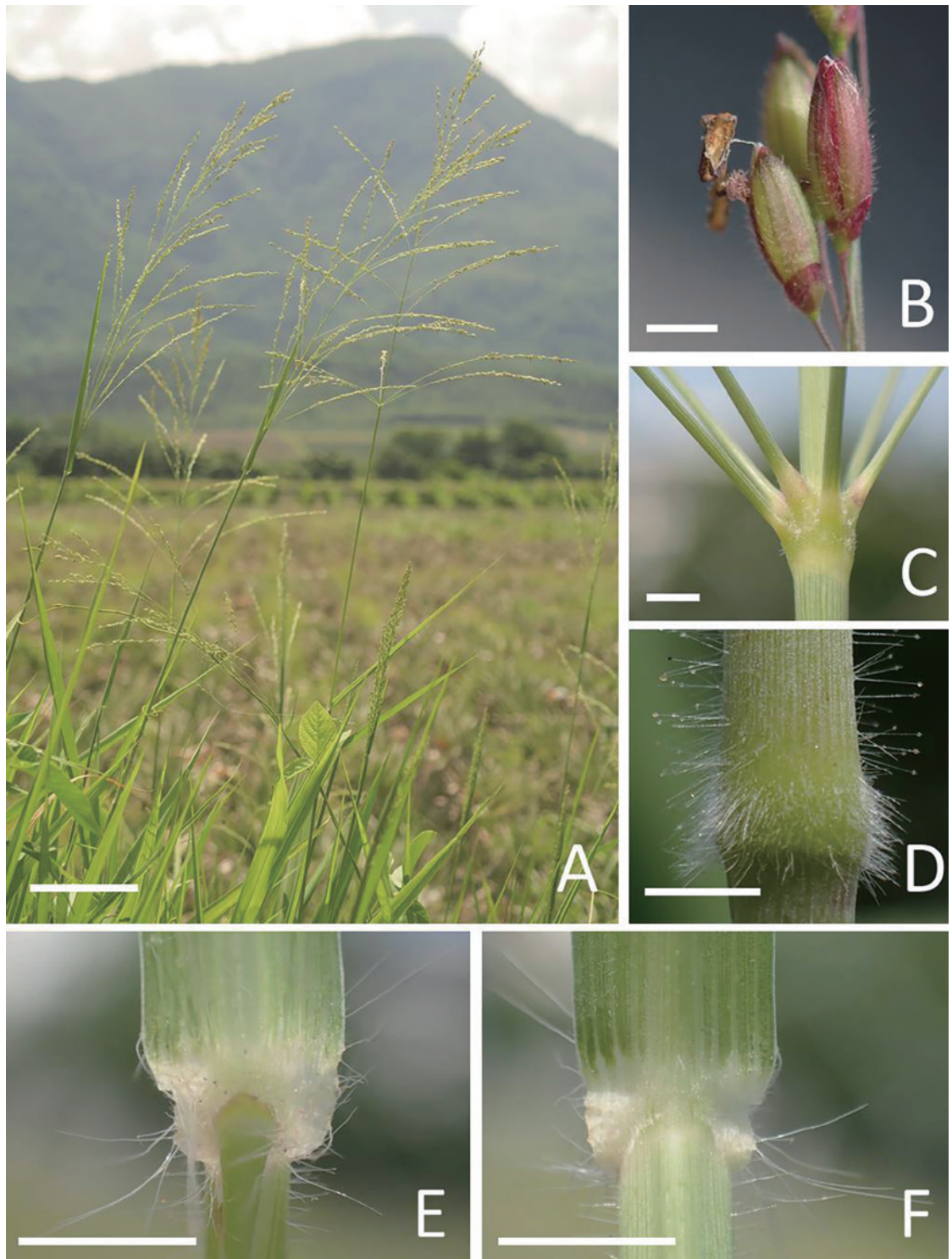


Figure 4. *Megathyrsus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs var. *pubiglumis* (K. Schum.) B.K. Simon & S.W.L. Jacobs. A. Habit. B. Spikelets. C & D. Nodes and leaf sheaths. E & F. Blade bases and collars, E: adaxial view, F: abaxial view.

basally, occasionally pubescent on both surfaces, hairs papillose-based, bases subcordate to rounded. Panicles 9-50 cm long, 1.5-12 cm wide, open; branches opposite and alternate, straight or flexible, strongly ascending to reflexed; pedicels 0.5-5 mm, scabridulous, divergent. Spikelets 2.8-4.2(5.4) mm long, 1-2 mm wide, ellipsoid or lanceoloid, often purplish, glabrous. Lower glumes ovate, 1.2-3.5 mm, apex acute, 3-5-veined; upper glumes ovate, apex acute, glabrous, 5-7-veined; lower florets sterile or staminate; lower lemmas ovate, glabrous, 5-7-veined; lower paleas elliptic, apex round, 3-4 mm, 2-keeled; upper florets bisexual, upper lemma ovate, apex acute and puberulent, 3-4 mm long, chartaceous, dorsal surface finely transversely rugose; upper palea narrowly ovate, apex round, to 2.5 mm long, chartaceous, 2-keeled, intercostal region finely transversely rugose; anther 3, to 1 mm long.

Specimens examined: TAIWAN. New Taipei City, Banqiao District, Shinyue Bridge, 5 May 2021, *Ming-Jer Jung* 6499 (TAIF), Sanchung District, Campus of Wu-Hua Elementary School, 4 Sep. 2021, *Ming-Jer Jung* 6531 (TAIF), Wugu District, Wugu, 24 Feb. 2021, *Ming-Jer Jung* 6462 (TAIF), Xinzhuang District, Shishen, 5 May 2021, *Ming-Jer Jung* 6498 (TAIF); Taoyuan City, Dashi District, Kanding, 18 Aug. 2017, *Ming-Jer Jung* 6117 (TAIF), same loc., 23 Feb. 2021, *Ming-Jer Jung* 6460 (TAIF); Chanhua Hsien, Hsichou Township, Hsichou, 14 Oct. 2021, *Ming-Jer*

Jung 6560 (TAIF); Tainan City, Hsinhua District, Hsinhua, 25 Feb. 2021, *Ming-Jer Jung* 6463 (TAIF), Muchiashan, 22 Feb. 2021, *Ming-Jer Jung* 6457 (TAIF), Zuojhen District, Zuojhen, 25 Feb. 2021, *Ming-Jer Jung* 6464 (TAIF); Pingtung Hsien, Chaochou Hsiang, Nanchou, 30 Oct. 2020, *Ming-Jer Jung* 6367 (TAIF); Liuchiu Township, Shialiuchiu, 5 Oct. 2021, *Ming-Jer Jung* 6557 (TAIF).

Notes: Taxonomic status of *Zuloagaea* E. Bess has been supported based on several phylogenetic researches (Bess et al. 2006; Verloove 2006; Zuloaga et al. 2007; Washburn et al. 2015; Soreng et al. 2017; Zuloaga et al. 2018), but its infrageneric taxonomic treatments are incompact. Based on the differences between *Z. bulbosa* (Kunth) E. Bess (*Bonpland* 4250 (US, photo), bulbs present) and *Z. plena* (Hitc. & Chase) M.J. Jung (*Metcalf*, 739 (US, photo), bulbs wanted), I considered they are different species and transferred *Panicum plenum* Hitc. & Chase to the genus *Zuloagaea* E. Bess as *Z. plena* (Hitc. & Chase) M.J. Jung (see previous). Vernacular name of *Z. plena* (Hitc. & Chase) M.J. Jung is Canyon Panicgrass. This grass is native to North America (Bess et al. 2006, POWO 2022), and naturalize at plains and disturbed areas in low elevations, western Taiwan (Figure 7). In Taiwan, this alien grass grows with *M. maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs in usual.

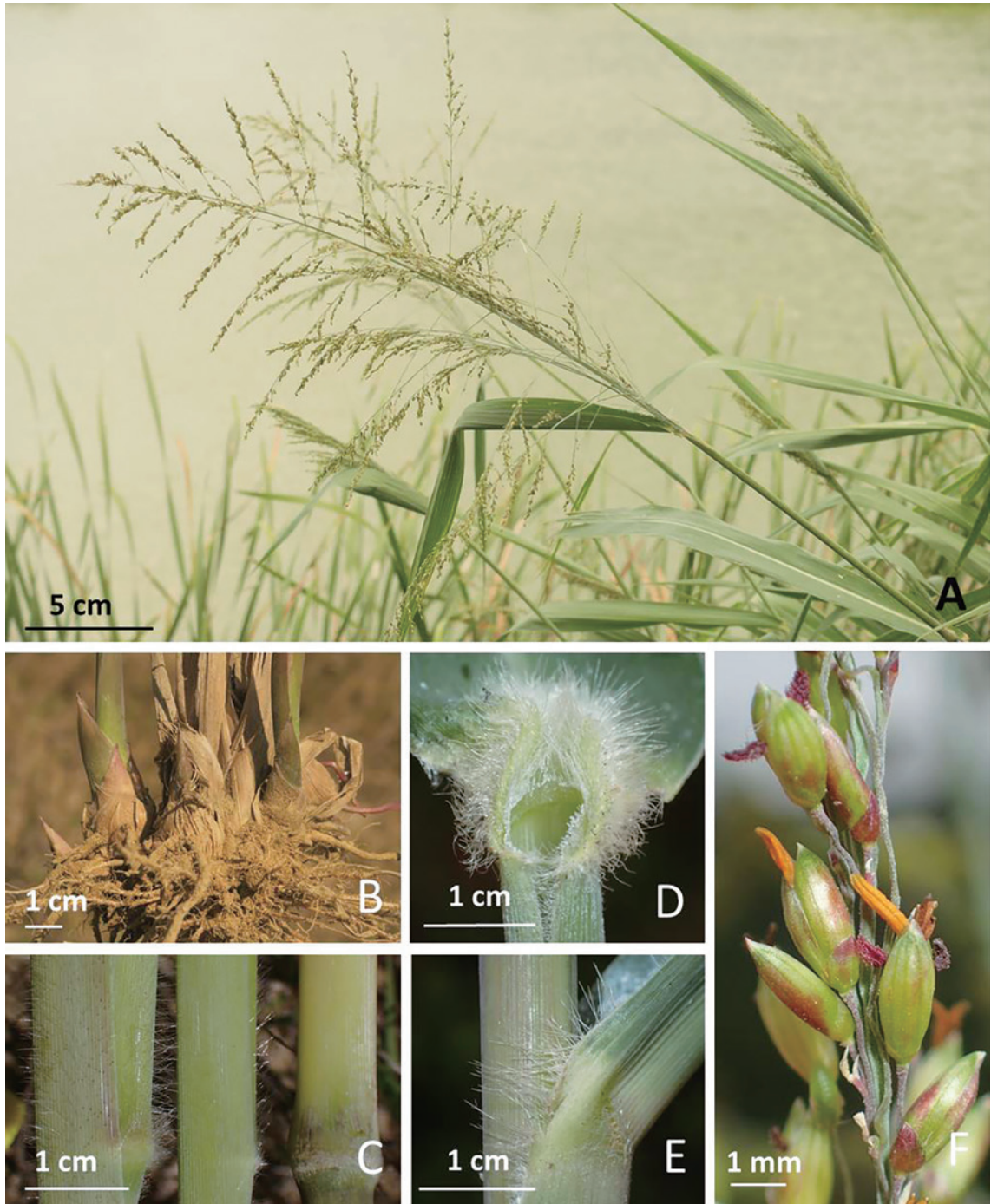


Figure 5. *Zuloagaea plena* (Hitc. & Chase) M.J. Jung. A. Habit. B. Cespitose culms. C. Nodes and leaf sheaths. D & E. Blade bases and collars. F. Spikelets.

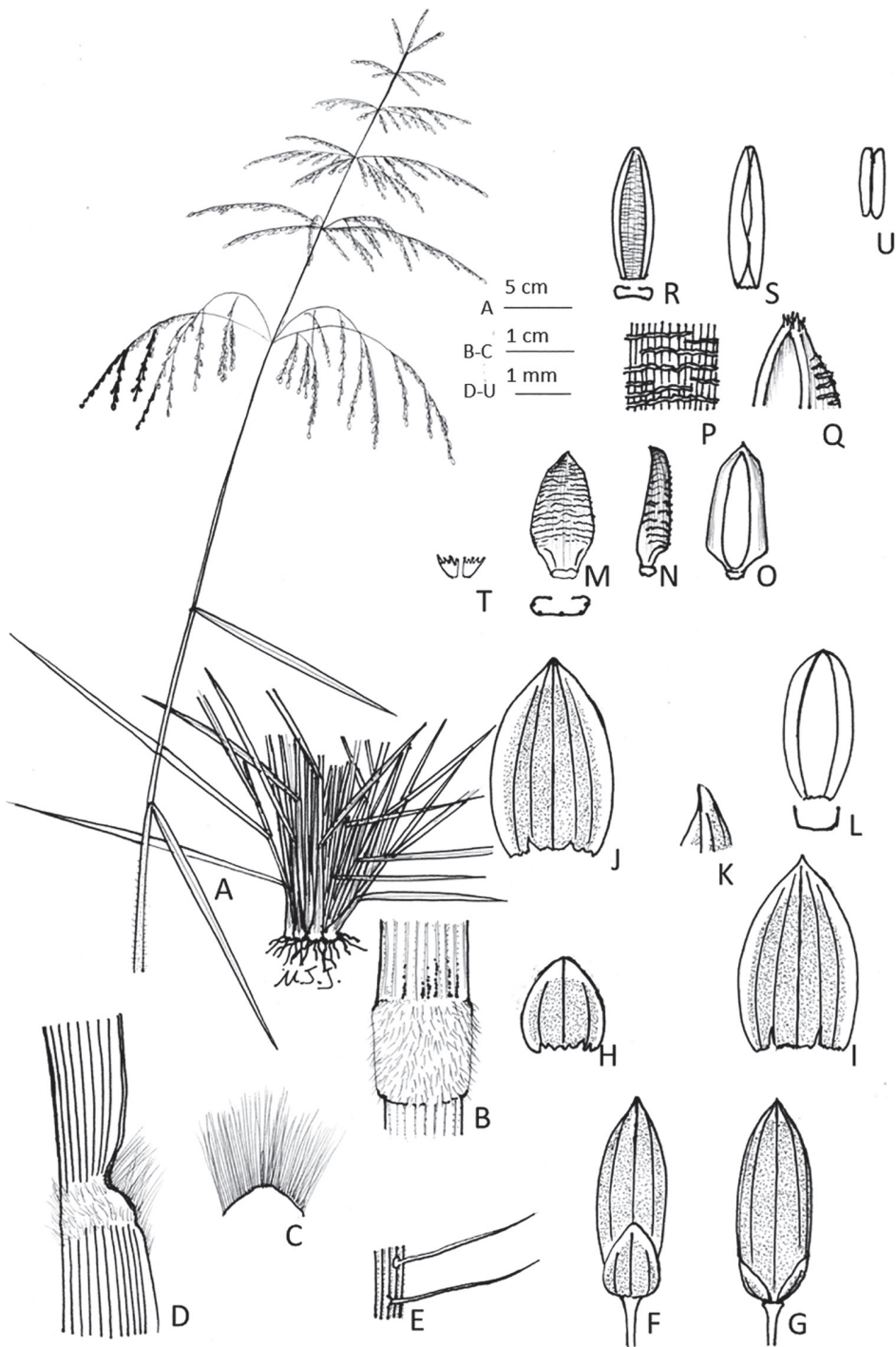


Figure 6. *Zuloagaea plena* (Hitchc. & Chase) M.J. Jung. A. Habit. B. Node. C. Ligule. D. Blade base and collar, lateral view. E. Papillose-based hairs. F & G. Spikelets. H. Lower glume. I. Upper glume. J & K. Lower lemmas, K, apex, lateral view. L. Lower palea. M – Q. Upper lemmas, N, lateral view, O, ventral view, P, rugose surface, enlargement, Q, upper lemma apex, lateral view, enlargement. R & S. Upper paleas, S, ventral view. T. Lodicules. U. Anther.

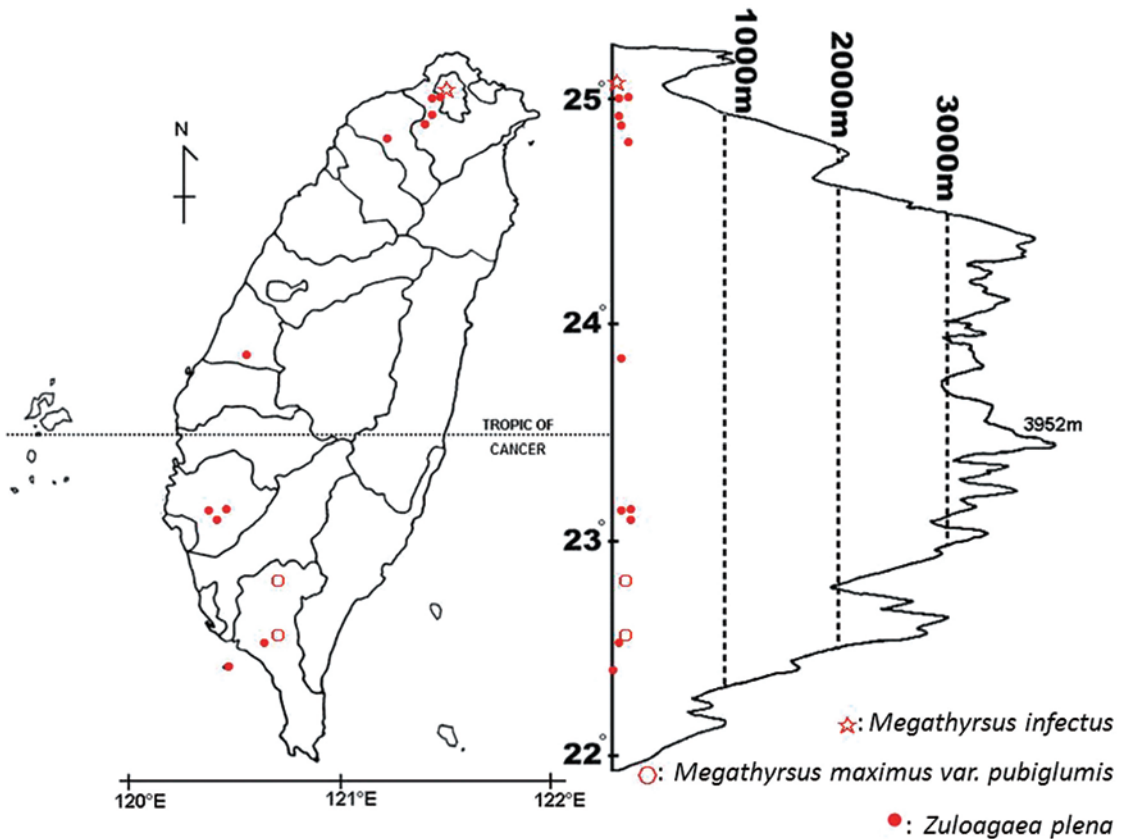


Figure 7. Distribution map of *Megathyrsus infectus*, *M. maximus* var. *pubiglumis* and *Zuloagaea plena*.

III. *Steinchisma* Raf., Bull. Bot. (Geneva) 1: 220. 1830; Aliscioni et al., Amer. J. Bot. 90(5): 817. 2003; Freckmann and Lelong, In: Barkworth et al. (eds) Fl. North Amer. 24: 563, 2007. 展序黍屬

Nine species in global, one species recorded in Taiwan.

1. *Steinchisma laxum* (Sw.) Zuloaga, Amer. J. Bot. 90(5): 817. 2003.

— *Panicum laxum* Sw., Prodr. 23. 1788.

Holotype: Jamaica: Swartz s.n. (S).

Urochloa ramosa auct. non. Jung, Quar. J Forest Res. 41(4): 322, Figure 4, 2019.

展序黍

Notes: Vernacular name of *Steinchisma laxum* (Sw.) Zuloaga is lax panic grass. This grass was misapplied as *Urochloa ramosa* (Schumach.) H. Scholz by Jung (2019), who described and illustrated this alien grass based on vouchers from Taiwan. Based on Jung's description and illustration of the alien grass presents "densely arranged spikelets on panicle branches, shorter spikelets, and hairy surface on upper part of upper lemmas", Mr. Liao, Hsien-Chun considered it

maybe *S. laxum* but not *U. ramosa*. Mr. Liao shared his thought to me and reminded that this grass was also found in Shenzhen City, Guangdong Province, PRC, based on the record shared on website iNaturalist. After careful examination of the holotype image of *Steinchisma laxum* (Sw.) Zuloaga, and syntypes' images of *Urochloa ramosa* (Schumach.) H. Scholz (*Thonning, P., 390*) deposited in Natural History Museum of Denmark University of Copenhagen Pakkecentralen (C), I adopted Mr. Liao's correct and annotated here. Naturalization event of this exotic grass in Taiwan could be found in relative descriptions by Jung (2019). It is native to America, and naturalized in Australia, South Asia, Southeastern Asia and West Africa (Simon & Alfonso 2011, POWO 2022).

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