NOTE

Elymus L. (Poaceae) in Taiwan and Related Species in Neighbor Areas

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ABSTRACT: Three *Elymus* (Poaceae) species: *E. ciliaris*, *E. formosanus* and *E. tsukushiensis* were confirmed and illustrated in this article. A distribution map of these three *Elymus* species was offered, too. In Taiwan, *E. tsukushiensis* were misapplied as *E. ×mayebaranus* (=*Agropyron* × *mayebaranum*), which is a rare sterile hybrid endemic to Japan. The information of two related species: *E. ×mayebaranus* and *E. shandongensis* were also described.

KEY WORDS: *Agropyron* × *mayebaranum*, *Elymus*, Poaceae, Taiwan

INTRODUCTION

The genus *Elymus* L. sensu lato including all members of the genus *Roegneria* K. Koch and parts members of the genus *Agropyron* Gaertn, has *ca.* 170 species in temperate of both hemispheres (Barkworth et al., 2007; Clayton and Renvoize, 1986; Melderis, 1980). Following these taxonomic concepts (Barkworth et al., 2007; Clayton and Renvoize, 1986; Melderis, 1980), lemmas of species in the genus *Elymus* sensu lato have 5(–7) nerves, and nerves ribbed to keeled on upper part of lemmas; and lemmas of *Roegneria* species have 5 nerves, and nerves totally keeled on lemma surfaces. Two *Agropyron* species: *A. formosanus* Honda and *A. mayebaranum* Honda, which were recorded in the flora of Taiwan (Hsu, 1971, 1975; Kuoh and Chen, 2000), had been transferred to the genus *Elymus* L. sensu lato by Salomon (1990), Chen and Zhu (2006) and Chen et al. (2011). In addition, another two species: *Elymus ciliaris* (Trin. ex Bunge) Tzvelev and *E. shandongensis* B. Salomon were recorded in Taiwan by Salomon (1990) and Chen and Zhu (2006).

Elymus mayebaranus (Honda) S. L. Chen (= *Agropyron meyebaranum*) was recorded in China (Keng, 1965; Kuo, 1987), Japan (Koyama, 1987; Ohwi, 1965) and Taiwan (Hsu, 1971, 1975; Kuoh and Chen, 2000). However, *Elymus mayebaranus* had been confirmed as a natural hybrid (highly female sterile and completely male sterile) between *E. tsukushiensis* Honda and *E. humidorus* (Ohwi & Sakamoto) Löve, and rarely distributed in Japan (Koyama, 1987; Salomon, 1990; Wu et al., 2006; Yang et al., 1997). By the way, the grass misidentified as *E. ×mayebaranus* in China and *A. meyebaranum* in Taiwan in previous were applied as *E. shandongensis* (Wu et al., 2006; Yang et al., 1997; Chen et al., 2011), a new species published by Salomon (1990). *E. shandongensis* B. Salomon was recorded as an endemic species to eastern mainland China (Salomon, 1990; Yang et al., 1997) until it was recorded in Taiwan (Chen and Zhu, 2006), but no voucher was cited. Salomon (1990) considered that *E. shandongensis* is easily confused with *E. ciliaris* and *E. tsukushiensis*. Glumes and lemma of *E. tsukushiensis* have narrow hyaline margins, but the hyaline margin is wanted in glumes and lemmas of *E. shandongensis* (Salonom, 1990). Glumes of *E. shandongensis* are larger in length and more nerves (5–7 nerves) than *E. tsukushiensis* (3–5 nerves) (Salonom, 1990).

The grass, *Roegneria mayebarana*, described and illustrated by Keng (pl. 286, 1965), has acute apex of glumes, (3–) 5–7-nerved glumes and glabrous lemma, fit the characters of *Elymus shandongensis*, and is different to the grass described by Kuo (1987). Kuo's *Roegneria mayebarana* has tapered or awned (awn to 3 mm) apex of glumes, 5–7 nerved glumes, and glabrous lemma, fit the grass *E. tsukushiensis* described by Koyama (1987), Ohwi (1965), and Salonom (1990).

In our surveys on Taiwan grasses, caryopses and functional anthers could be found in most of our *Elymus* specimen from Taiwan. We considered these specimens were misidentified as *Agropyron mayebaranum* and *E. shandongensis* in previous (Hsu, 1971, 1975; Kuoh and Chen, 2000; Chen et al., 2011) are all *E. tsukushiensis*. Besides, we confirmed the existence of *E. ciliaris* in middle elevations, central Taiwan. Based on these revision, we offered the distribution map, line-drawings, and descriptions of *Elymus* species in Taiwan: *E. ciliaris*, *E. formosanus* and *E. tsukushiensis* and information related to *E. ×mayebaranus* and *E. shandongensis*.

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TAXONOMIC TREATMENTS

Elymus *L.* Sp. Pl.: 83; 1753. Melderis, A., In: Flora Europaea 5: 182. 1980; Clayton and Renvoize, Genera Graminum, Grasses of the World, Kew Bulletin Additional Series XIII: 150. 1986; Osada, T., Ill. Grasses Jap.: 402, 1993. Chen and Zhu, In: Wu and Raven (eds.), Fl. Reipubl. Popularis Sin. 22: 400. 2006. Barkworth M. E. et al., *Elymus*. In: Barkworth et al. (eds.). Fl. North America 24: 288, 2007. 披鹼草屬

Key to *Elymus* species in Taiwan

1. Paleas significantly shorter than lemmas, keels smooth or sparsely hispidulate; lemma apex with two teeth and a long awn. …… ***E. ciliaris***
1. Paleas equal or near equal to lemmas in length, keels totally hispidulate; lemma apex acute with a long awn ……..… 2
2. Palea keels not winged; lemma awns abaxially recurved when caryopses mature. ……..……..…….. ***E. formosanus***
2. Palea keels with narrow wings, lemma awn straight and acropetal. …….. ***E. tsukushiensis***

Elymus ciliaris (Trin. ex Bunge) Tzvelev, Novosti Sist, Vysa. Rast. 9: 61, 1972. Barkworth et al. In: Barkworth et al., (eds.) Fl. North America 24: 336, 2007; Salomon, Willdenowia 19: 449, 1990; Chen and Zhu, In: Wu and Raven (eds.), Fl. Reipubl. Popularis Sin. 22: 408, 2006. 纖毛披鹼草

Herb erect, to 60 cm tall, leaf sheathes longer or shorter than internodes, ligule membranous, margin ciliate, *ca.* 1 mm long, spike apical, spikelet bisexual, 2-many floreted, lower glume and upper glume oblong, apex acute to trifid, base oblique, margin leathery, 5-nerved, nerves ribbed, lower glume 6–6.3 mm long, upper glume 6.5–7 mm long, slightly longer than lower glume, lemma oblong, apex truncate, with two teeth and one long awn at apex, lemma 7–8.5 mm long, 5-nerved, nerves ribbed, surface scabrous, margin with rows of prickles, palea obovate, 2-keeled, keels glabrous or sparsely hispidulate, intercostal regions oblanceolate, apex truncate, 6–6.7 mm long, 3/4–5/4 length of lemma, lodicules 2, lanceolate, apex acute, margin ciliate, membranous, anther 3, *ca.* 1.5 mm long, caryopsis outline oblanceolate, 4–4.5 mm long; apex with appendage, appendage pilose.

Specimens examined: CHINA Hunan Prov., Xinning Co., Mt. Wanfeng, 16 May 1998, *Z.-C. Luo 1878* (TAIF); Shandong Prov., Zoucheng City, Tianhuang Town, 21 May 2005, *C.-Y. Guo 052159-7* (TAIF); Sichuan Prov., Dujianyan City, Lianghe Township, Heping Village, 28 May 2002, *D.-H. Zhu et al. 369* (TAIF). TAIWAN. Taichung City, Lishan, 18 Apr 1977, *C.-M. Kuo s. n.* (TAIF); Ilan Co., Tatung Township, Ssuyuan, 710 forest road, 2 Jun 2003, *S.-H. Su et al. 1301* (TAIF).

Distribution and notes: *Elymus ciliaris* broadly distributed in China, Japan, the Ryukyus and Taiwan (Salomon, 2005). Paleas are significantly shorter than lemmas in *E. ciliaris*, rather paleas are equal or near equal to lemmas in length in *E. shandongensis* and *E. tsukushiensis* (Salomon, 1990). Salomon (2005) mentioned that *E. ciliaris* distributes in Taiwan, and was neglected by the flora of Taiwan, but didn't cited any voucher.

Elymus formosanus (Honda) Á. Löve, Feddes Repert. 95: 449. 1984; Chen and Zhu, In: Wu and Raven (eds.), Fl. Reipubl. Popularis Sin. 22: 411, 2006; Chen, Lin and Kuoh. Grass Fl. Taiwan. 1: 84, 2011. — *Agropyron formosanum* Honda, Bot. Mag. (Tokyo) 41(485): 385. 1927; Hsu, Taiwania 16 (2): 247, 1971; Koyama, T., Grasses of Japan and Its Neighboring Regions, an Identification Manual: 67, 1987; Kuoh and Chen, In: Huang et al. (eds.), 2000. Fl. Taiwan. 2nd ed., 5: 399, 2000. — *Roegneria formosana* (Honda) Ohwi, Acta Phytotax. Geobot. 10 (2): 95. 1941; Kuo, In: Lu et al. (eds.), Fl. Reipubl. Popularis Sin. 9 (3): 94, 1987.
台灣披鹼草 Fig. 2

Elymus formosanus (Honda) S. S. Ying. Mem. Coll. Agric. Natl. Taiwan Univ. 31(1): 33. 1991.

Perennial herbs, tufted. Culms erect, 30–90 cm tall; nodes glabrous. Leaf sheaths glabrous; ligule membranaceous, glabrous, 0.1–0.5 mm long; blades linear, flat, 5–20 cm long, margin scabrous. Spike apical, to 40 cm long; spikelets solitary, outline oblong to oblong-lanceolate, to 3 cm long, with 5–8 florets. Lower glume lanceolate, apex acute, 5–7 mm long, subcoriaceous, 5-nerved, raised on abaxial surface but not keeled, scabrous. Upper glume lanceolate, apex acute, 6–9 mm long, subcoriaceous, 5–7-nerved, raised on abaxial surface but not keeled, scabrous. Rachilla *ca.* 1 mm long, hispidulate. Lemma narrow-ovate to ovate, 8–10 mm long, subcoriaceous, 5-nerved, upper part of nerves ridged and scabrous, apex acute, awned, awn curved basepetally when caryopses mature, 10–20 mm long. Palea ovate, apex round, 2-keeled, keels totally hispidulate, intercoastal region oblong to oblanceolate. Lodicules 2, ovate, apex bifid, margin ciliate. Anthers 3, *ca.* 2.5 mm long.

Specimens examined: TAIWAN. Ilan Co., Mt. Nanhuta, 30 Jul 1989 *S.-Y. Lu s.n.* (TAIF), Nanhu cirque, 4 Nov 1986, *S.-Y. Lu s. n.* (TAIF); Miaoli Co., Taian Township, 99 villa, 11 Aug 1985, *C.-I Peng 8483* (HAST), Tshichih, 12 Sep 1986, *S.-Y. Lu 19926* (TAIF); Taichung City, Heping Township, Anma Lodge, 17 Jul 2002, *C.-H. Liu 131* (HAST), Crying slope, 11 Sep 2002, *C.-I Huang 1235* (HAST), Hsuehshan Cirque, 12 Sep 2002, *C.-I Huang 1288* (HAST), Mt. Shuan, 13 Jul 1983, *T.-T. Lin and T.-H. Hsieh s. n.* (TAIF), same loc., 23 Aug 1995, *C.-K. Liou 245* (TAIF), Nanhu Cirque, 31 Jul

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2006, *C.-I Huang 2664* (HAST), Taosaifeng, 14 Jul 2002, *W.-C. Leong 3202* (HAST), Yunleng Shelter, 12 Sep 2007, *M.-J. Jung z091202* (TAIF); Nantou Co., Jenai Township, Nengkao, 13 Aug 1986, *S.-Y. Lu 19776* (TAIF); Hualian Co., Hsoulin Township, Chilai main peak, Oct 1918, *Y. Simada 2231* (HAST), 24 Aug 1929, *S. Sasaki s. n.* (TAIF), Hohuanshan, Jul 14 1989, *S.-Y. Lu s. n.* (TAIF), same loc., 10 Aug 2000, *T.-T. Chen 10830* (TAIF); Kaohsiung City, Taoyuan Township, Chungchihkuan Alley, 14 Jul 2008, *P.-F. Lu 16444* (TAIF), Nanyushan, 15 Sep 2005, *C.-I Huang 2273* (HAST), Yushan Yuanfeng, 14 Sep 2005, *C.-I Huang 2238* (HAST).

Distribution and notes: *Elymus formosanus* is endemic to Taiwan, and distributes in high elevations of Taiwan (Fig. 1). Chen et al. (2011) described lemma awns of this grass are geniculate. However, lemma awns of *E. formosanus* are all abaxially recurved, but never geniculate (Fig. 2).

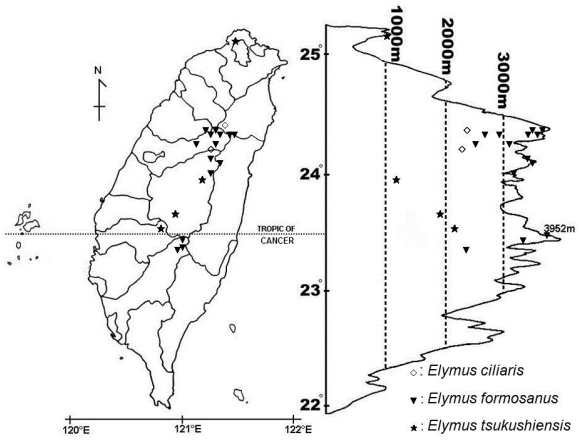


Fig. 1. Distribution map of *Elymus ciliaris* (◇), *E. formosanus* (▼) and *E. tsukushiensis* (★).

Elymus tsukushiensis Honda, Bot. Mag. (Tokyo) 50: 391, 1936. Barkworth et al. In: Barkworth et al. (eds.) Fl. North America 24: 336, 2007; Osada, Ill. Grasses Jap.: 408, 1993; Salomon, Willdenowia 19: 449, 1990; von Bothmer et al., Bot. Jahrb. Syst. 126(3): 332, 2005. — *Agropyron tsukushiense* (Honda) Ohwi, Acta Phytotax. Geobot. 6(1): 54, 1937; Ohwi, In: Meyer and Walker (eds.). Fl. Japan (in English): 154, 1965; Koyama, Grasses of Japan and Its Neighboring Regions, an Identification Manual: 65, 1987. 膜緣披鹼草 Fig. 3

Elymus shandongensis sensu Chen, Lin and Kuoh. Grass Fl. Taiwan. 1: 84, 2011.
Elymus tsukushiensis var. *transiens* (Hack.) Osada. J. Jap. Bot. 65(9): 266, 1990; Osada, Ill. Grasses Jap.: 406, 1993.—*Agropyron semicostatum* Nees var. *transiens* Hackel, Bull. Herb. Boiss. sér. 2, 3(6): 507. 1903. — *A. tsukushiense* (Honda) Ohwi var. *transiens* (Hack.) Ohwi, Bull. Natl Sci. Mus., Tokyo No. 33, 67. 1953; Ohwi, In: Meyer and Walker (eds.). Fl. Japan (in English): 154, 1965; Walker, Fl. Okinawa S Ryukyu Islands. 183, 1976.
Elymus kamoji (Ohwi) S.L. Chen, Bull. Nanjing Bot. Gard. 1987: 9, 1987 [1988]. Chen and Zhu, In: Wu and Raven (eds.), Fl. Reipubl. Popularis Sin. 22: 422, 2006.—*Agropyron kamoji* Ohwi, Acta Phytotax. Geobot. 11: 179, 1942.—*Roegneria kamoji* (Ohwi) Keng & S.L. Chen, J. Nanjing Univ., Nat. Sci. Ed. 3 (1): 15, 1963.
Roegneria kamoji Ohwi ex Keng, Fl. Illust. Pl. Prim. Sin. 351, f. 281. 1959; Keng, Fl. Illust. Pl. Prim. Sin.: 351, pl. 281, 1965; Kuo, In: Lu et al. (eds.), Fl. Reipubl. Popularis Sin. 9 (3): 59, 1987.
Agropyron mayebaranum auct. non. C.-C. Hsu, Taiwania 16 (2): 247, Fig. 5, 1971; Hsu, Taiwan Grasses: 357, 1975; Kuoh and Chen, In: Huang et al. (eds.), Fl. Taiwan. 2nd ed., 5: 399, 2000.
Roegneria mayebaranum auct. non. P.-C. Kuo, In: Lu et al. (eds.), Fl. Reipubl. Popularis Sin. 9 (3): 62, 1987.

Perennial, culms erect or ascending at base. Leaf sheaths glabrous, margins membranous, one side with minute cilia; ligule membranous, apex truncate, aristate, *ca.* 1 mm long; blade linear, base round. Inflorescence a terminal spike, solitary; spikelet solitary, with many florets. Lower glume lanceo-ovate, apex acuminate, 5-nerved, nerves ridged, scabrous; upper glume lanceolate, apex acuminate, 5-nerved, nerves ridged, scabrous. Lemma ovate, lower surface scabrous, with dominant prickles, 5- or 7-nerved, nerves ridged at sub-apical part, margins reflexed, apex acute and awned, awn straight, acropetal, 15–20 mm long; paleas obovate, apex round, 2- keeled, keels totally scabrous and narrowly winged, intercostal region oblanceolate. Lodicules 2, ovate, hyaline, margin ciliate, apex bifid. Anthers 3, 2–3 mm long. Pistil 1, upper part of ovary pilose.

Specimens examined: **CHINA.** Fujian Pro., Datian Co., Datian, 8 Mar 2005, *S. Huang DT0072* (TAIF), Fuzhou City, Gushan, 1 May 2006, *Herbal Community gs0186* (TAIF), Sanming City, Mingxi, 7 Apr 2005, *Y.-G. Chen SM0118* (TAIF), Lianjiang Co., Lianjiang, 5 Apr 2005, *X.-J. Zheng LJ0078* (TAIF), Youxi Co., Youxi, 3 May 2005, *M. Wang YX0205* (TAIF); Hunan Prov., Xinning Co., Jinshi Town, Jinshi, 10 May 1995, *L.-B. Luo 671* (TAIF), Shuichong, 2 May 1998, *Z.-C. Luo 1883* (TAIF); Jiangxi Prov., Jiujiang Co., Shahe, 3 May 1995, *C.-M. Tan 95114* (TAIF); Shandong Prov., Changqing Dist., Zhangxia Township, Mt. Mantou, 21 May 2005, *C.-Y. Guo 055124-2* (TAIF), Shanting District, Mt. Lianqing, 3 Oct 2006, *C.-Y. Guo 20065-489-6* (TAIF), Sishui Co., Shengshuiyu Township, 24 May 2005, *C.-Y. Guo 054159-6* (TAIF), Xingcun Township, 24 May 2005, *C.-Y. Guo 054154-2* (TAIF), Zoucheng city, Dashu Township, 21 May 2005, *C.-Y. Guo 052150-7* (TAIF); Sichuan Pro., An Co., Jiuliandong, 6 May 2005, *X.-Y. Xiong et al. 83* (TAIF), Chungchou City, Kouchia Forestry Centre, 24 May 2003, *P. Wei & L.-J. Yang 239* (TAIF), same loc., 6 Jun 2003, *P. Wei & L.-J. Yang 321* (TAIF), Chongchou Co., Zhangjiashan, 4 May 2005, *C. Chang 83* (TAIF), Dayi Co., Mojia Ditch, 5 May 2005, *Z.-P. Fong et al. 83* (TAIF), Deyang Co., Jiudingshan, 12 May 2005, *D.-X. Yu et al. 165* (TAIF), Dujianyan City, Hongkou Township, Shenxi Ditch, 6 Jun 2004, *D.-H. Zhu et al. 2734* (TAIF), same loc., 14 May 2005, *D.-H. Zhu et al. 3391* (TAIF), Lianghe Township, Heping Vil., 28 May 2002, *D.-H. Zhu et al. 369* (TAIF), Mao Co., Mt. Qianfo, 7 May 2005, *W. Sun et al. 83* (TAIF), Pengzhau City, Yingchanggou, 4 Jun 2003, *P. Wang & J.-S. Wu 761* (TAIF), Pengzhou Co., Yincanggou, 3 May 2005, *Y.-P. Zhou et al. 83* (TAIF), Wenchuan Co., Qipangou, 26 May

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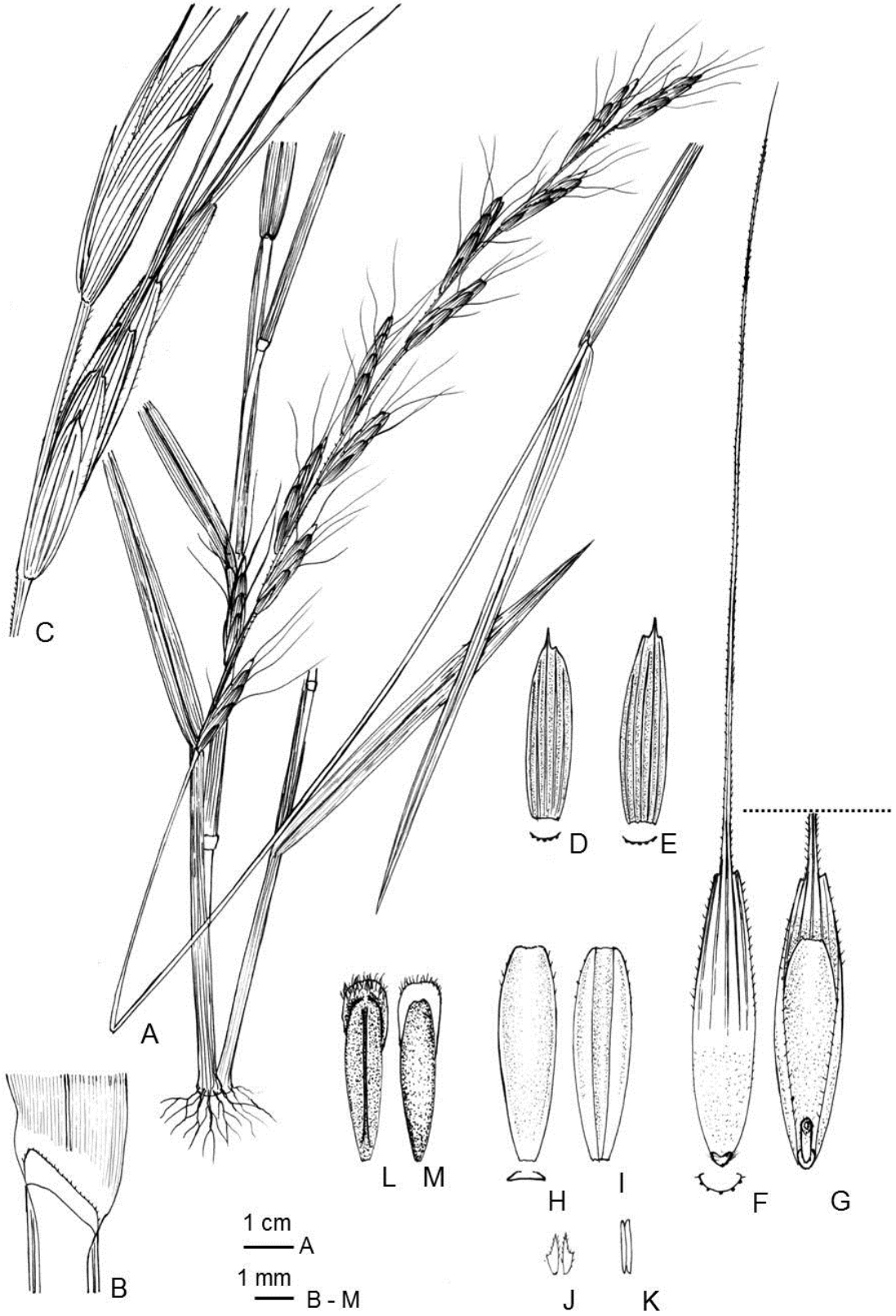


Fig. 2. ***Elymus ciliaris*****. A: Habit. B: Ligule. C: Spikelets. D: Lower glume. E: Upper glume. F and G: Florets. H and I: Paleas. J: Lodicules. K: Anther. L and M: Caryopses. G and I: Adaxial side view; L: Hilium side.**

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2004, *K. Xiong & Y.-J. Zou 225* (TAIF), same loc., 29 May 2004, *K. Xiong & Y.-J. Zou 307* (TAIF), same loc., 26 May 2004, *K. Xiong & Y.-J. Zou 225* (TAIF), same loc., 2 May 2005, *X.-B. Su et al. 83* (TAIF), Yaan Co., Bifengxia, 10 May 2005, *Y. Liu et al. 165* (TAIF); Zhejiang Prov., Hangzhou City, Xihu Dist., 26 Jun 2002, *s. n. 33* (TAIF). **JAPAN.** Honshu, Iwate Pref., Shimohei-gun, Kawai-mura, Nakakawai, 5 Jul 1995, *K. Yonekura, M. Suzuki & T. kurosawa 3793* (HAST), Ishikawa-ken, Kushi-machi, Komatsu-shi, 13 Jun 2007, *S. Tsugaru et al 34756* (HAST), Pref. Kyoto, Chitose-cho, Kameoka-shi, 14 May 2006, *S. Tsugaru, M. et al. 2967* (HAST), Hodzucho, Kameoka-shi, 24 May 2001, *S. Tsugaru & T. Sawada 30447* (HAST), Mt. Aoba, Matsuo, Maidzuru-shi, 1 Jul 1994, *S. Tsugaru & Takashi Takahashi 20409* (HAST); Kankgawa, Zushi-shi, Jinmu-ji, 16 Jul 1985, *K. Inoue s. n.* (TAIF); Is. Kikaijima, Kyushu Pref., Kagoshima, Mt. Miyabaru-yama, Kikai-cho, Ooshimagun, 19 Apr 1998, *M. Harumichi 406* (HAST). **TAIWAN**. New Taipei City, Mt. Tatun, 2 Jul 2008, *M.-J. Jung 3027* (TAIF); Nantou Co., Jenai Township, Chingching Farm, 23 Nov 2007, *M.-J. Jung 1932* (TAIF), Jhushan Township, Shanlinshi Forest Recreation Area, 21 Oct 2007, *M.-J. Jung 1726* (TAIF); Chiayi Co., Alishan, 6 Jan 1964, *M.-T. Kao 5627* (HAST), 22 Jun 1983, *F.-H. Fan s. n.* (TAIF); Ilan Co., Chihtwan, 10 Jun 1977, *C.-M. Kuo 8700* (TAIF).

Distribution and notes: Koyama (1987) considered that *E. tsukushiensis* (= *A. tsukushiense*) occurs in China, Korea and Japan, and is conspecific with *E. kamoji* (= *A. kamoji*). Chen and Zhu (2006) considered that *E. kamoji* and *E. tsukushiensis* are different species. They listed *E. kamoji* in the flora of China, and considered that *E. tsukushiensis* var. *transiens* is a synonym of *E. kamoji* (Chen and Zhu, 2006). Ohwi (1965), Walker (1976), and Osada (1993) considered that lemma surfaces are long-ciliate in *E. tsukushiensis*, different to glabrous lemma of its variety *transiens*. This treatment was not adopted by Koyama (1987) and von Bothmer et al. (2005). *E. tsukushiensis* var. *transiens* was treated as a forma of *E. tsusushiensis* by Koyama (1987). von Bothmer et al. (2005) considered that there is no reason for telling *E. tsukushiensis* and its variety *transiens* apart, and *E. tsukushiensis* Honda and *E. kamojii* are conspecific. Herein, the author accepted viewpoint of Koyama (1987), von Bothmer et al. (2005) and Barkworth et al. (2007).

Occurrence of *E. tsukushiensis* in Taiwan was mentioned by von Bothmer et al. (2005), but no voucher was cited. Vouchers of *E. tsukushiensis* we examined from Taiwan have mature caryopses in florets. Salomon (1990) described and illustrated the differences of upper glume between *E. tsukusiensis* and *E. shandongensis*. Upper glume of *E. shandongensis* has unawned apex, 5–7 nerved, and longer length, but upper glume of *E. tsukushiensis* has 3–5 nerved, scarious margin, awned apex, and shorter in length. Characters described and illustrated by Hsu (197, 1975), Kuoh and Chen (2000), Chen et al. (2011) and vouchers we examined positively fit characters of *E. tsukushiensis* by Koyama (1987) and Salomon (1990). After examination of vouchers from China, Japan and Taiwan, we adopted the concept of Barkworth et al. (2007), Osada (1993), Salomon (1990), von Bothmer et al. (2005).

Elymus tsukushiensis is native in China, Japan, Korea, the Ryukyu (Ohwi, 1965; Walker, 1976; Koyama, 1987; Osada, 1993), locally introduced to America (Barkworth et al., 2007), and low to middle elevations of Taiwan (Fig. 1). Lemma surfaces of *E. tsukushiensis* were scabid, glabrous to long ciliate (Koyama, 1987; Barkworth et al., 2007). In wild, mature caryopses could be easily found on spikes of *E. tsukushiensis* in Taiwan. Lemma surfaces of *E. tsukushiensis* are scabrous, glabrous to sparsely ciliate in Taiwan.

Excluded Species To The Flora Of Taiwan

Elymus* × *mayebaranus (Honda) S. L. Chen. Bull. Nanjing Bot. Gard. 1987: 9, 1987. — *Agropyron mayebaranum* Honda. Bot. Mag. (Tokyo) 41: 384. 1927; Ohwi, In: Meyer and Walker (eds.). Fl. Japan (in English): 154, 1965; Koyama, Grasses of Japan and Its Neighboring Regions, an Identification Manual: 65, 1987. — *Roegneria mayebarana* (Honda) Ohwi, Acta Phytotax. Geobot. 10(2): 98. 1941. 前原披鹼草

Distribution and notes: *Elymus* × *mayebaranus* is a natural hybrid (low fruit set and anther sterile) between *E. tsukushiensis* and *E. humidorum*, rarely distributes in Japan (Koyama, 1987; Salomon, 1990; Chen and Zhu, 2006; Yang et al., 1997; Chen et al., 2011).

Elymus shandongensis B. Salomon, Willdenowia 19: 449, fig. 1, 1990; Chen and Zhu, In: Wu and Raven (eds.), Fl. Reipubl. Popularis Sin. 22: 427, 2006. —*Roegneria shandongensis* (B. Salomon) J. L. Yang, Y. H. Zhou et Yen, Guihaia 17 (1): 22, 1997. 山東披鹼草

Roegneria mayebaranum auct. non. Y.-L. Keng, Fl. Illust. Pl. Prim. Sin: 357, pl. 286, 1965

Specimens examined: CHINA. Anhui Pro. Yuexi Co., Baojia Township, Yaoluoping, 18 Jul 2002, *Z.-Z. Zhou 148* (TAIF); Sichuan Pro., Yaan Co., Bifengxia, 10 May 2005, *Y. Liu 165* (TAIF).

Distribution and notes: *Elymus shandongensis* is endemic in eastern China. This grass was misapplied as *A. ×mayebaranum* by Keng (1965) with acute apex of glumes fit the characters of *E. shandongensis*. Upper glumes of *E. shandongensis* are 7–9 mm long with 7–9 nerves and glumes acute apex, and without hyaline margin (Salomon, 1990; Wu et al., 2006).

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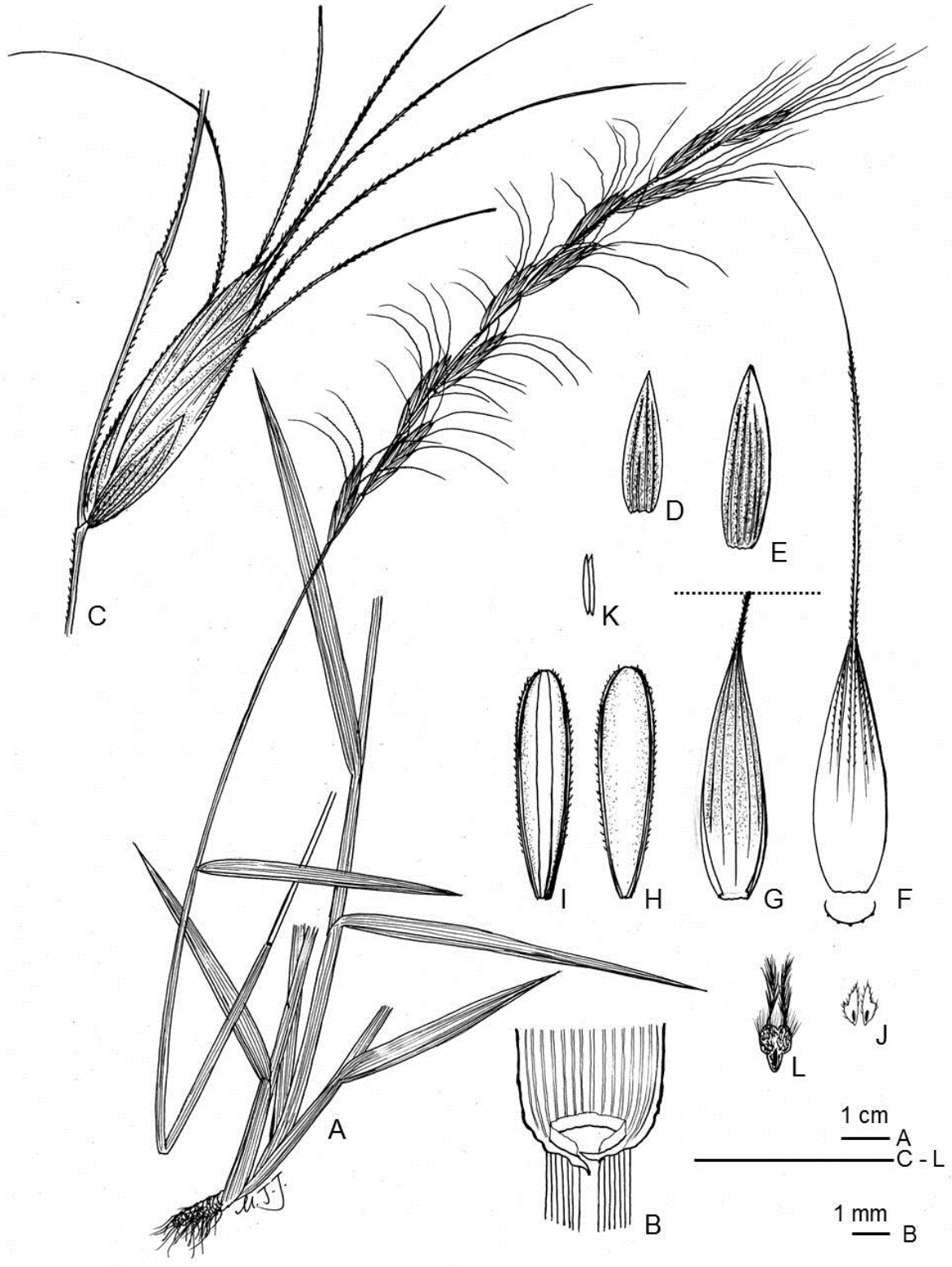


Fig. 3. ***Elymus formosanus.*** **A: Habit. B: Ligule. C: Spikelet with part of axis. D: Lower glume. E: Upper glume. F and G: Lemmas. H and I: Paleas. J: Lodicules. K: Anther. L: Pistil. G & I: adaxial view.**

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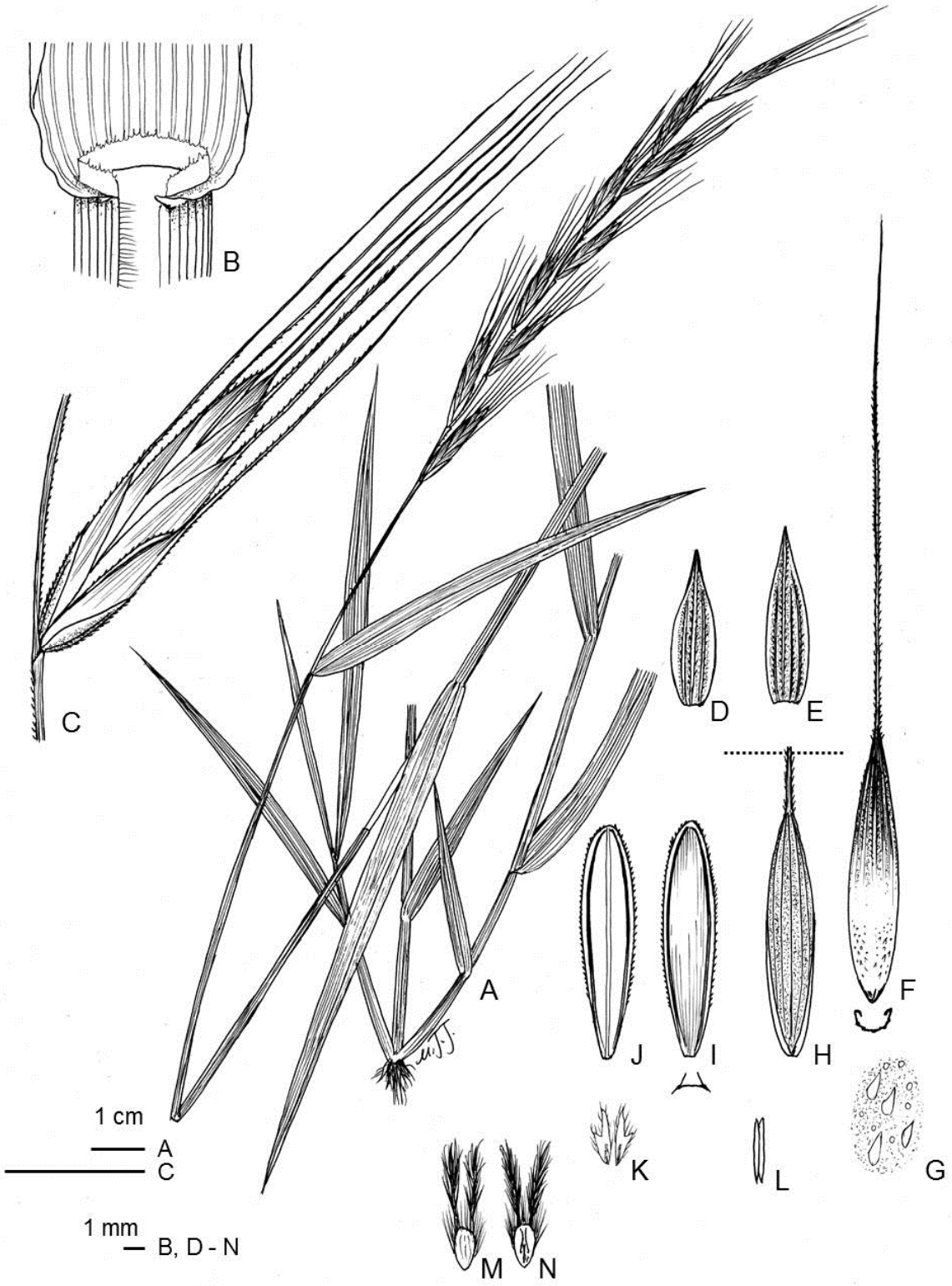


Fig. 4. *Elymus tsukushiensis*. A: Habit. B: Ligule. C: Spikelet and part of axis. D: Lower glume. E: Upper glume. F–H: Lemmas, G: prickles of lower surface of lemma. I and J: Paleas. K: Lodicules. L: Anther. M and N: pistils. H and J: adaxial view; N: Hilium side view.

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台灣產披鹼草屬（*Elymus* L.）植物及其臨近地區相關物種

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摘要：本文確認並描述台灣產三種披鹼草屬（*Elymus*）植物：纖毛披鹼草（*E. ciliari s*）、台灣披鹼草（*E. formosanus*）與膜緣披鹼草（*E. tsukushiensis*），並提供它們的台灣分布圖與線繪圖；以往台灣產膜緣披鹼草被誤認為日本特產的稀有不孕雜交種：前原披鹼草（*E. × mayebaranus*（= *A. × mayebaranum*）。另外提供鄰近地區產相關披鹼草屬植物：前原披鹼草與山東披鹼草（*E. shandongensis*）的資訊。

關鍵詞：前原鵝觀草、披鹼草屬、禾本科、台灣。

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