NOTE

# Supplements to the Grasses (Poaceae) in Taiwan (II)

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ABSTRACT: *Bromus commutatus* Schrad., which was misapplied as *Bromus secalinus* L., was annotated. The occurrence of *Ischaemum timorense* Kunth. on the Lanyu Island, off the southeast coast of Taiwan was confirmed for the first time. *Spartina alterniflora* Loisel., an alien grass to the flora of Taiwan, was naturalized in central Taiwan. Descriptions, illustrations, and a distribution map of these three grasses were offered.

KEY WORDS: *Bromus commutatus, Bromus secalinus, Ischaemum timorense, Spartina alterniflora,* Poaceae, Taiwan.

## INTRODUCTION

*Bromus* L. *sensu lat.* is the genus of ca. 150 species in global, and 8 species (include 6 alien species) were recorded in Taiwan (Kuoh and Chen, 2000; Jung et al., 2006). *B. secalinus* L. was reported as an alien grass, occurred in middle elevations, central Taiwan (Jung et al., 2006). The first author considered the line-drawing, fig. 5, attached by Jung et al. (2006) fit perfectly to *B. commutatus* Schrad., not to *B. secalinus*. After cautiously examining the vouchers cited by Jung et al. (2006), the specimens must be annotated as *B. commutatus*, a European species described from Germany. In recent botanical survey, *B. commutatus* was also found in low elevations, northern Taiwan (Fig. 1). Illustration and related notes to *B. commutatus* and *B. secalinus* were offered.

*Ischaemum* L. is a genus of ca. 70 species, native to tropical regions of Eastern Hemisphere, 5-7 species were reported in the flora of Taiwan (Barkworth et al., 2003; Koyama, 1987; Hsieh, 2006; Liu, 2000; Sun and Phillips, 2006a). *I. timorense* in Taiwan was recorded by Koyama (1987) and Sun and Phillips (2006a), however this grass was treated as conspecies of *I. indicum* by Hsu (1978, 2000). Furthermore, *I. indicum* was recognized as synonym of *I. ciliare* (Veldkamp, 1991). During our botanical survey, *Ischaemum timorense* was found in Lanyu, coastal lowland in eastern Taiwan. Description and illustration (Fig. 3) of *I. timorense* and its differences from *I. ciliare* were offered.

*Spartina* Schreb. is a genus native to Africa, America, and Europe (Barkworth et al., 2003; Quattrocchi, 2006). It has been reported as a alien genus to Asia (Sun and Phillips, 2006b). Since the species *S. alterniflora* has been collected at coastal region in central Taiwan recently, we reported here that *Spartina* was a newly recorded genus to the flora of Taiwan. Description and illustration (Fig. 5) of this alien grass were presented

## TAXONOMIC TREATMENTS

***Bromus commutatus*** Schrad., Fl. Germ.: 353. 1806. Barkworth, M. E. et al. In: Fl. North Amer. 24: 193-237. 2007; Smith, P. M. In: Flora Europaea 5: 182-189. 1980. 歐雀麥 Figs. 1 & 2

*Bromus secalinus auct. nom.* Jung et al. 2006. Taiwania 51: 131-138.

Specimens examined: Taiwan. Taipei Co., Tamshui Township, Mt. Datun, 2 Jul 2008, *M.-J. Jung 3029* (TAIF); Nantou Co., Shinyi Township, Lulin Lodge, *T.-H. Hsieh, 3030* (NTNTC); Lu-lin sacred tree, *M.-J. Jung, 1123 (x053005)* (NCKU), at the same site, *M.-J. Jung 1173 (x062709)* (NCKU), at the same site, *M.-J. Jung 1174 (x062710)* (NCKU), at the same site, *M.-J. Jung 1175 (x062711)* (B, NCKU).

Distribution and note: A close examination of the vouchers cited by Jung et al. (2006) results as follows: For the flora of Taiwan the name *Bromus secalinus* must be replaced by *Bromus commutatus* Schrad., an European species described from Germany. The main criteria of *B. commutatus* against *B. secalinus* (given here in brackets) are compared as the following: Leaf-sheaths and leaf-blades pubescent (glabrous or nearly so); lemmas 7.5-11 mm long (5-9 mm); in fruiting states not or scarcely incurved (strongly inrolled); awn insertion 0.5-1 mm below the bidentate lemma apex (0.8-1.2 mm below apex); palea shorter than lemma (palea as long as lemma, or even longer overtopping the lemma apex); caryopses ± thin , in cross-section flat or concave (thick, in cross-section U-or V-shaped).

*Bromus commutatus* was introduced to many extra-European countries (e.g. USA, Canada, S. Africa, Russian Far East) with commercial grass seeds and seems to be naturalized there. Beside the reported sites where *B.*

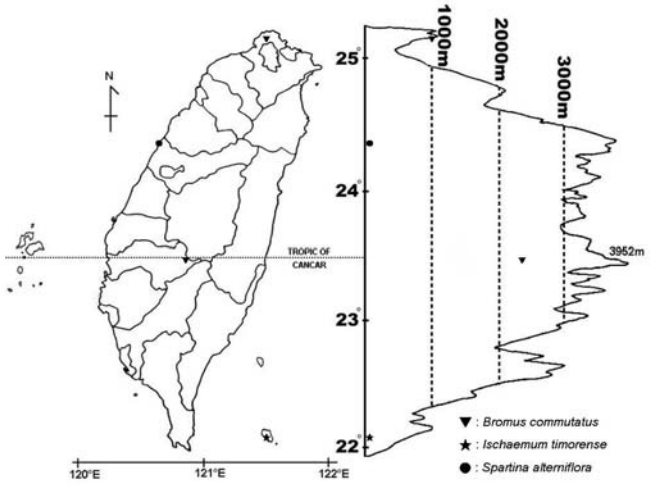


**Fig. 1. Distribution map of *Bromus commutatus* (▼), *Ischaemum timorense* (★), and *Spartina alterniflora* (●).**

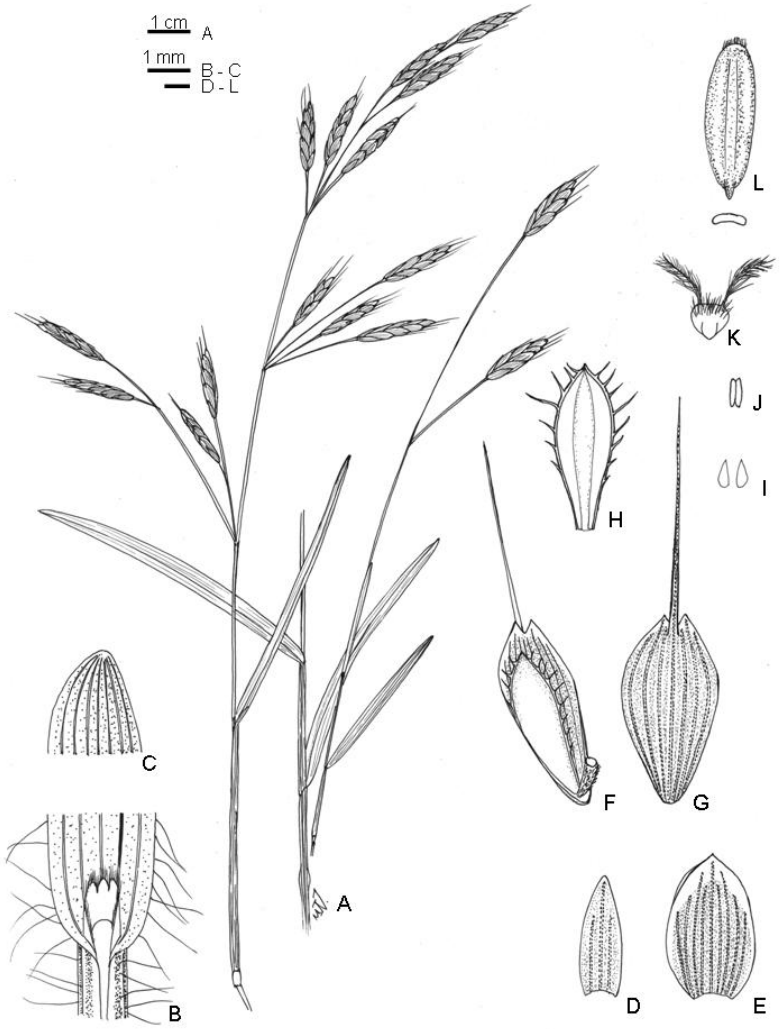


**Fig. 2. *Bromus commutatus* Schrad. A: Habit. B: Part of sheath and blade with ligule. C: Blade apex. D: Lower glume. E: Upper glume. F: Floret. G: Lemma. H: Palea, adaxial view. I: Lodicules' J: Anther. K: Pistil. L: Caryopsis and outline of it's transverse section.**

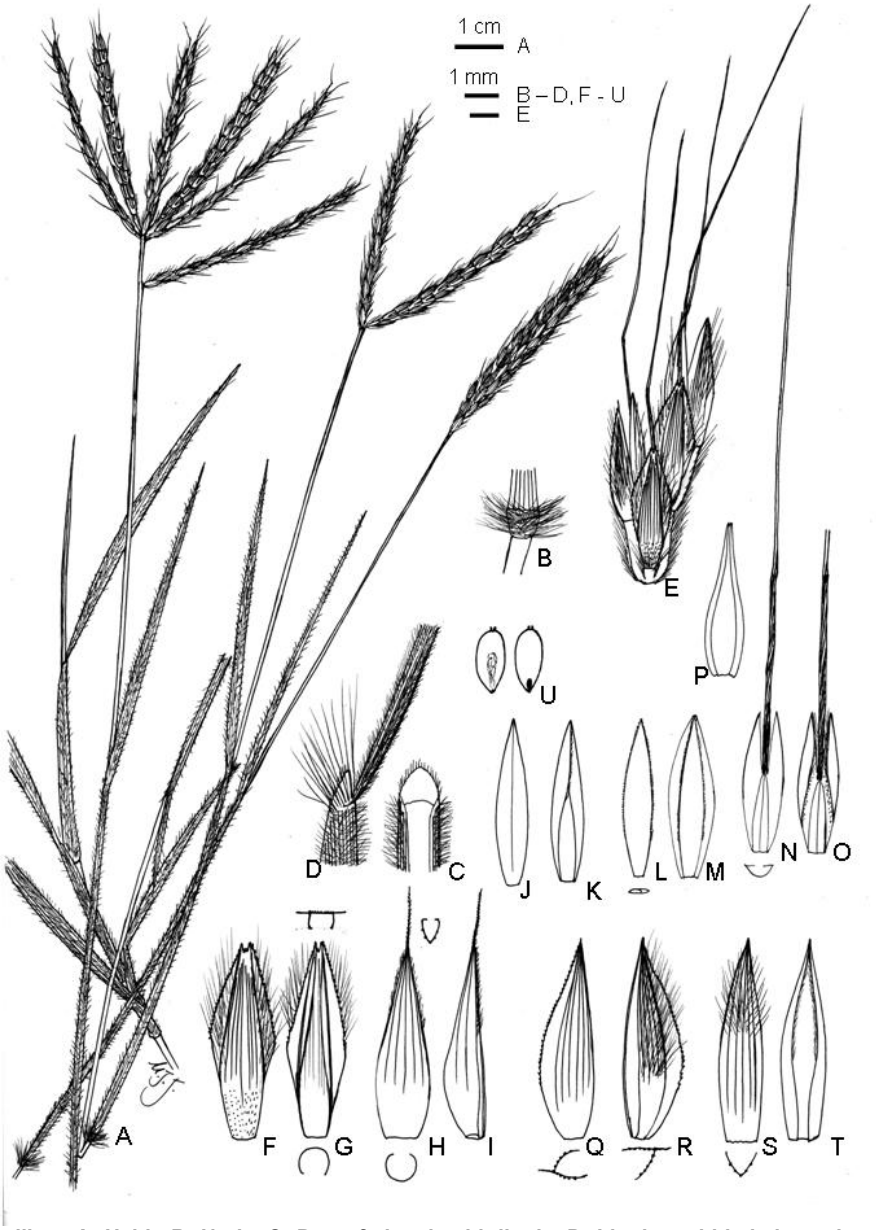


**Fig. 3. *Ischaemum ciliate*. A: Habit. B: Node. C: Part of sheath with ligule. D: Ligule and blade base, lateral view. E: Part of raceme. F-I: parts dissecting from sessile spikelet. Q-T: Parts dissecting from pedicelled spikelet. F & G, Q & R: Lower glumes. G: Adaxial view. Q & R: Lateral view. H & I, S & T: Upper glumes. T: adaxial view. I: Lateral view. J & K: Lemmas of first floret. K: Adaxial view. L & M: Paleas of first floret. M: Flatten. N & O: Lemmas of second floret. O: Adaxial view. P: Palea of second floret.**

*commutatus* naturalized in central Taiwan, this grass was also found at Mt. Datun in low elevations, northern Taiwan.

Liu et al. (2006) relegates *Bromus commutatus* in the synonymy of *B. racemous* L.. This procedure is contrary to all flora works such as Flora Europaea (Smith, 1980), and Flora of North America (Barkworth et al., 2007) and all national and regional Floras. *B. racemous* (two subspecies) exhibits narrow panicles and distinct shorter spikelets due to 6.5-8 mm long lemmas.

***Ischaemum timorense*** Kunth. Révis. Gramin. 1: 369, pl. 98. 1830; Koyama. Grasses of Japan and Its Neighboring Regions, 457-458, 1987; Sun and Phillips. In: Fl. Reipubl. Popularis Sin. 22: 609-613, 2006; Quattrocchi. CRC World Dictionary of Grasses: 1136-1137, 2006. 帝汶鴨嘴草 Figs. 1 & 4

Culms ascending, internodes glabrous, nodes pilose, hairs 1-1.5 mm long. Leaf sheath longer than internodes, sparsely shortly pilose, hairs to 0.5 mm long; ligule

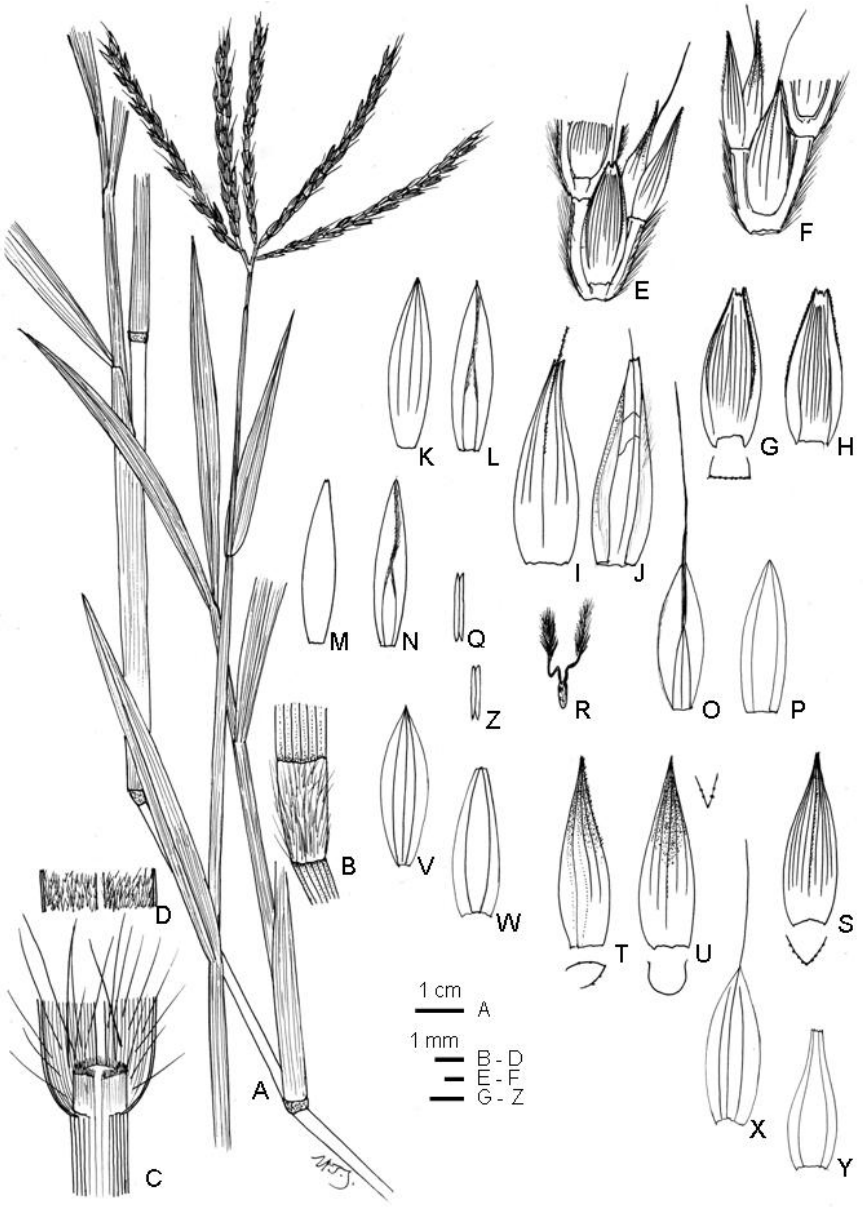


**Fig. 4.** ***Ischaemum timorense*** **Kunth. A: Habit. B: Node. C: Part of sheath and blade with ligule. D: Abaxial surface of blade. E & F: Part of raceme. G-Q: Parts dissecting from sessile spikelet. S-Z: Parts dissecting from pedicelled spikelet. G & H, S: Lower glumes. I & J, T & U: Upper glumes. J: Adaxial view. T: Lateral view. K & L, V: Lemmas of first floret. M & N, W: Paleas of first floret. O & X: Lemmas of second floret. P & Y: Paleas of second floret. Q & Z: Anther; R: Pistil.**

membranous, apex obtuse, membranous, margin ciliate; blade linear, adaxial surface long-hispidulate, hairs 2-4 mm long, abaxial surface shortly pilose, hairs to 0.5 mm long. Raceme 2-6, apical, spikelets paired, sessile spikelet dorso-ventral compressed, shortly pedicelled, pedicel ca. 1.2 mm long, glabrous, lower glume ovate, apex truncate, bifid, keeled, unwinged or slightly winged on keels, 11-13-nerved, coriaceous, ca. 4.5 mm long; upper glume lanceo-ovate, 5-nerved, glabrous on surface, ca. 5.2 mm long, apex acuminate to truncate, awned, awn rising from apex, awn to 1 mm long; first floret staminate, lemma obovate, apex acute, 3-nerved, ca. 4.8 mm long, margin membranous, reflexed, slightly ciliate, palea obovate, 2-nerved, glabrous on veins, intercostal region lanceolate, herbaceous to coriaceous, margin membranous, anther 3, ca. 2.3 mm long; second floret pistilate, with abort stamens, lemma ovate, 3-nerved, membranous, apex acute, awned, awn to 4.5 mm long, rising from apex, palea lanceo-ovate, apex acute, membranous, 2-nerved, glabrous on veins. Pedicelled

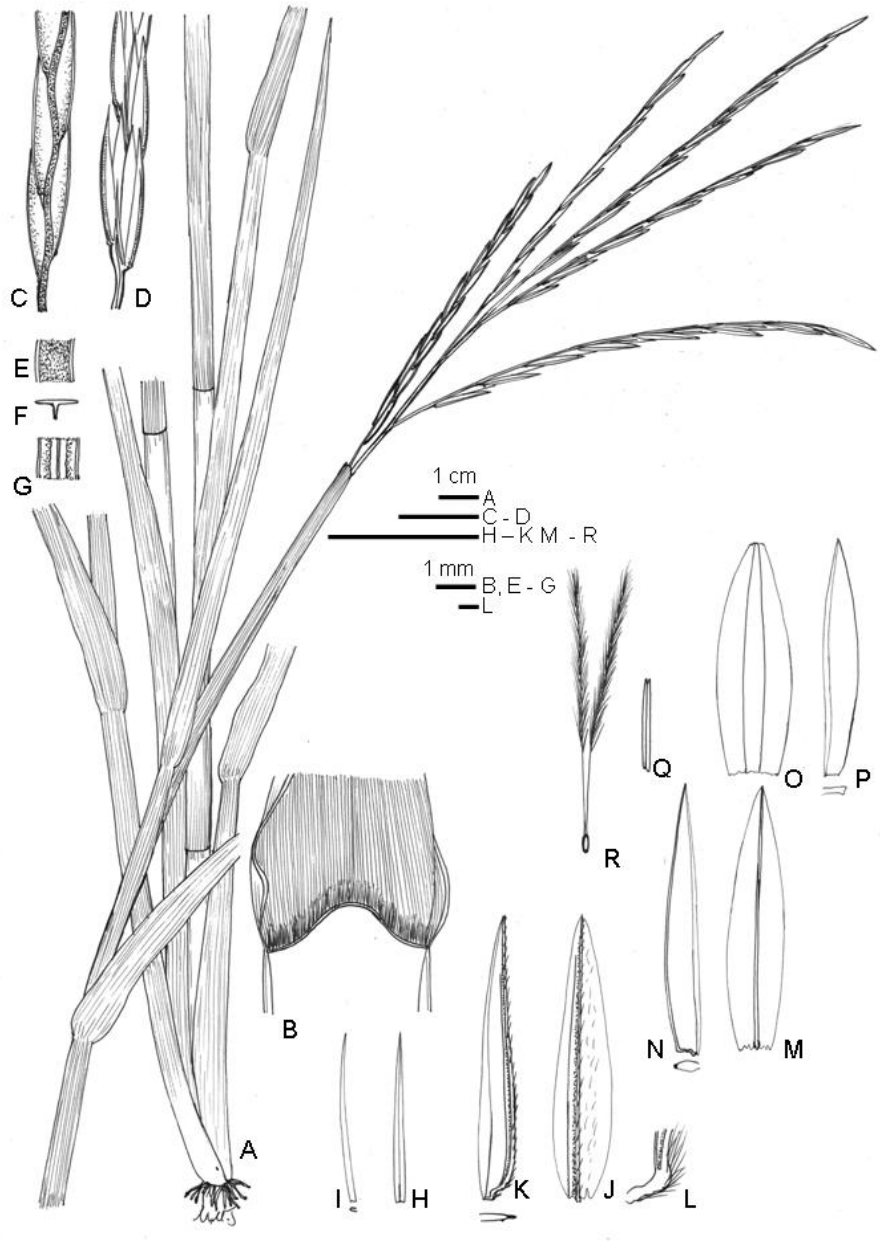


**Fig. 5. *Spartina alterniflora* Loisel. A: Habit. B: Part of sheath and blade with ligule. C & D: Part of raceme. E-G: Raceme axis. E: Abaxial view. G: Adaxial view. H-I: Lower glumes. I: Lateral view. J-L: Upper glumes. K: Lateral view. L: Enlarged base. M & N: Lemmas. N: Lateral view. O-P: Paleas. P: Lateral view. Q: Anther. R: Pistil.**

spikelet laterally compressed, pedicel ca. 3.5 mm long, pilose, lower glume ovate, apex acuminate, coriaceous, ca. 4.8 mm long, 9-11-nerved, keeled on central vein, unwinged, upper glume lanceo-ovate, 5-nerved, glabrous on surface, ca. 5.2 mm long, apex acuminate to truncate, awned, awn rising from apex, awn to 1 mm long; first floret staminate, lemma obovate, apex acute, membranous, 3-nerved, ca. 4.3 mm long, palea lanceo-ovate, apex truncate, membranous, 2-nerved, glabrous on veins, anther 3, ca. 2 mm long, second floret pistillate with abort stamens, lemma ovate, membranous, apex acute to obtuse, 3-nerved, base oblique, apex awned, awn to 3 mm long, rising from apex, palea lanceo-ovate, apex acuminate, bifid, membranous, ca. 3.5 mm long, 2-nerved, glabrous on veins.

Specimens examined: Taiwan. Taitung Co., Lanyu Township, Yeyou, 20 Oct 2008, *M.-J. Jung 3595* (TAIF).

Distribution and note: *Ischaemum timorense* is native to Asia and Pacific Islands, and introduced to Africa and

America (Koyama, 1987; Quattrocchi, 2006; Sun and Phillips, 2006a). *I. timorense* distributes in dump grass lands near the coastal region (Koyama, 1987; Quattrocchi, 2006). In Taiwan, *I. timorense* is most similar to *I. ciliare* (= *I. indicum*), a broadly distributed weed in low elevations in Taiwan. Wings on keels of lower glumes in both sessile and pediceled spikelets are wanted or not dominant (narrower than 0.2 mm) in *I. timorense* (Fig. 4) but are dominant (to 0.5 mm wide) in *I. ciliare* (Fig. 3). Besides, nodes of *I. ciliare* are coated with long and dominant pilose hairs (usually longer than 2 mm, spreading) (Fig. 3), rather than that hairs of *I. timorense* (to 1.5 mm long, antrose)(Fig. 4). In Taiwan, one population of *I. timorense* was found in dasheen paddy field in Lanyu Island, Taitung Co., south-eastern Taiwan (Fig. 1).

***Spartina alterniflora*** Loisel. Fl. Gall.: 719. 1807. Barkworth, M. E. et al. In Fl. N. Amer. 25: 240-250. 2003; Sun and Phillips. In: Fl. Reipubl. Popularis Sin. 22: 493-494. 2006; Quattrocchi. CRC World Dictionary of Grasses: 2088-2090, 2006.

互花米草 Figs. 1 & 5

Perennial herb, culms erect, leaf sheath longer than internode, glabrous, ligule a ring of hairs, hair ca. 1 mm long, blade linear, to 40 cm long. Inflorescence a composed racemes, raceme solitary, ca. 1 mm wide, margin entire; spikelets alternate, solitary, pedicelled, pedicel ca. 0.8 mm long, oblong, lower glume linear, apex acuminate, membranous, ca. 8.5 mm long, 1-nerved, compressed; upper glume lanceolate, apex acute, herbaceous, base oblique, compressed, glabrous to pubescent, 1-nerved, hispidulate on vein; one-floreted, lemma lanceolate, apex acute, herbaceous, compressed, glabrous, ca. 11 mm long, 1-nerved, glabrous on vein, palea lanceo-ovate, apex acute, membranous, 2-nerved, glabrous on veins; anther 3, ca. 5 mm long, ovary ellipse, glabrous, ca. 1.7 mm long, style ca. 5 mm long, stigma ca. 9 mm long.

Specimens examined: Taiwan. Taichung Co., Daan Township, Daan coast, 8 Oct 2008, *M.-J. Jung 3564* (TAIF).

Distribution and notes: *Spartina alterniflora* (smooth cordgrass) is native to atlantic coast (eastern coast) of North and South America, and naturalized in intertidal zone of Europe, China, and west coast of America (Barkworth et al., 2003; Sun and Phillips, 2006b). *S. alterniflora* is considered as a notorious and aggressive weed to coastal ecosystem in America and China (Barkworth et al., 2003; Sun and Phillips, 2006b). Population of *Spartina alterniflora* in Taiwan was found at tidal zone in Daan Township (Fig. 1), near the Kaomei wetland, the Kaomei Wildlife Refugee in Taichung, central Taiwan. *Bolboschoenus planiculmis* and *Phragmites australis* could be found near the population of *S. alterniflora*. By the aggressive habit of *S. alterniflora*, population dynamics of this potential invasive grass should be observed and concerned about.

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摘要：本文訂正日前歸化的禾草：歐雀麥 (*Bromus secalinus* L.)，應為 *Bromus commutatus* Schrad. 的鑑定錯誤；此外，確認近日於蘭嶼尋獲的禾草：帝汶鴨嘴草 (*Ischaemum timorense* Kunth)；以及臺灣中部新歸化的外來種禾草：互花米草 (*Spartina alterniflora* Loisel.)，文中提供這三種禾草的描述、線繪圖及分布圖。

關鍵詞：歐雀麥、帝汶鴨嘴草、互花米草、禾本科、臺灣。