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Notes on Newly Recorded Grasses in Taiwan

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ABSTRACT: *Agrostis avenacea* J. F. Gmel., *Agrostis stolonifera* L., *Alopecurus pratensis* L., and *Deschampsia atropurpurea* (Wahl.) Scheele were recently found at middle elevations of southern and central Taiwan, respectively. We present their descriptions, distribution map, and line-drawings.

KEY WORDS: ***Agrostis avenacea*, *Agrostis stolonifera*, *Alopecurus pratensis*, *Deschampsia atropurpurea*, Gramineae, Naturalized grasses, Poaceae, Taiwan, Taxonomy.**

INTRODUCTION

In participation of a long term project, we have been collecting plant materials in Taiwan for drug screening since 2002. We found four species of grasses new to the flora of Taiwan recently. They are two species of *Agrostis*, one species of *Alopecurus*, and one species of *Deschampsia*, respectively. The genus *Agrostis* L. consists of ca. 220 species in temperate areas and on tropical mountains (Clayton and Renvoize, 1986). In Taiwan, *Agrostis* has been revised by several authors (Hsu, 1978; Veldkamp, 1982; Kuoh and Chen, 2000), and five taxa were treated in the Flora of Taiwan (Huang et al., 2003). The genus *Alopecurus* L. contains ca. 50 species worldwide (Clayton and Renvoize, 1986), and two taxa, including a rare species, *A. myosuroides* Huds., in Taiwan (Kuoh and Chen, 2000; Huang et al., 2003). The genus *Deschampsia* P. Beauv. has ca. 40 species worldwide (Clayton and Renvoize, 1986), and two taxa in Taiwan (Kuoh and Chen, 2000; Huang et al., 2003). We describe the four grasses: *Agrostis avenacea* J. F. Gmel., *Agrostis stolonifera* L., *Alopecurus pratensis* L., and *Deschampsia atropurpurea* (Wahl.) Scheele, and provide the distribution map, and illustrations.

TAXONOMIC TREATMENT

Agrostis avenacea J. F. Gmel., Syst. Nat. 1: 171, 1791; A. S. Hitchcock, Manual of grasses of the United States., 337. 1951. 類燕麥翦股穎 Fig. 1

Culms erect, to 1 m tall, 3-5-noded; prostrate at fruiting. Leaf sheath glabrous, ligule ca. 5 mm long, membranous, apex acuminate; blades 5-20 cm long. Inflorescence a panicle, effuse, asymmetrical, with 2-4 nodes, 12-30 cm long; pedicels 5-10 cm long, scabrous. Spikelet pedicellate, laterally compressed, with one floret. Lower glume ca. 3 mm long, one-veined, scabrous on vein, apex acuminate. Upper glume slightly shorter than lower glume, one-veined, scabrous on vein, apex acuminate. Rachilla ca. 0.3 mm long, hairy; callus bearded. Lemma elliptical to ovate, hairy, awn arising from middle, ca. 4 mm long, scabrous; column ca. 1.5 mm long. Palea nearly as long as lemma, ovate, membranous, 2-veined, apex bifid. Stamens 3, anthers ca. 0.3 mm long. Ovary ca. 0.2 mm long, glabrous; style persistent. Caryopsis obovate, ca. 1 mm long; embryo ca. 1/3 as long as caryopsis.

Distribution and Notes: *Agrostis avenacea* (Pacific bentgrass) is native to Australia and Hawaii; and was introduced to Mexico (Nava-Rojo *et al.*, 2002); California, Ohio, South Carolina, and Texas, USA (Hitchcock, 1951; USDA, NRCS., 2004). In southern Taiwan, it occurs along Teng-chih Forestry Road, at middle elevations, Taoyuan Hsiang, Kaohsiung Hsien (Fig. 2). It is associated with some native plants: *Agrostis clavata* Trin. and *Juncus tenuis* Willd. and naturalized plants: *Hypochaeris radicata* L., *Plantago lanceolata* L., *Senecio inaequidens* DC., and *Verbena bonariensis* L.

Agrostis avenacea can be distinguished from other species in the genus by its long effuse panicle, pubescent lemmas, columnate awns, and well developed paleas.

Specimens examined: Taiwan. Kaohsiung Hsien: Taoyuan Hsiang. Teng-chih Forestry Road, *M.-J. Jung x041903, x041904, x041905, x041906, x041907, x041908, x041909* (NCKU).

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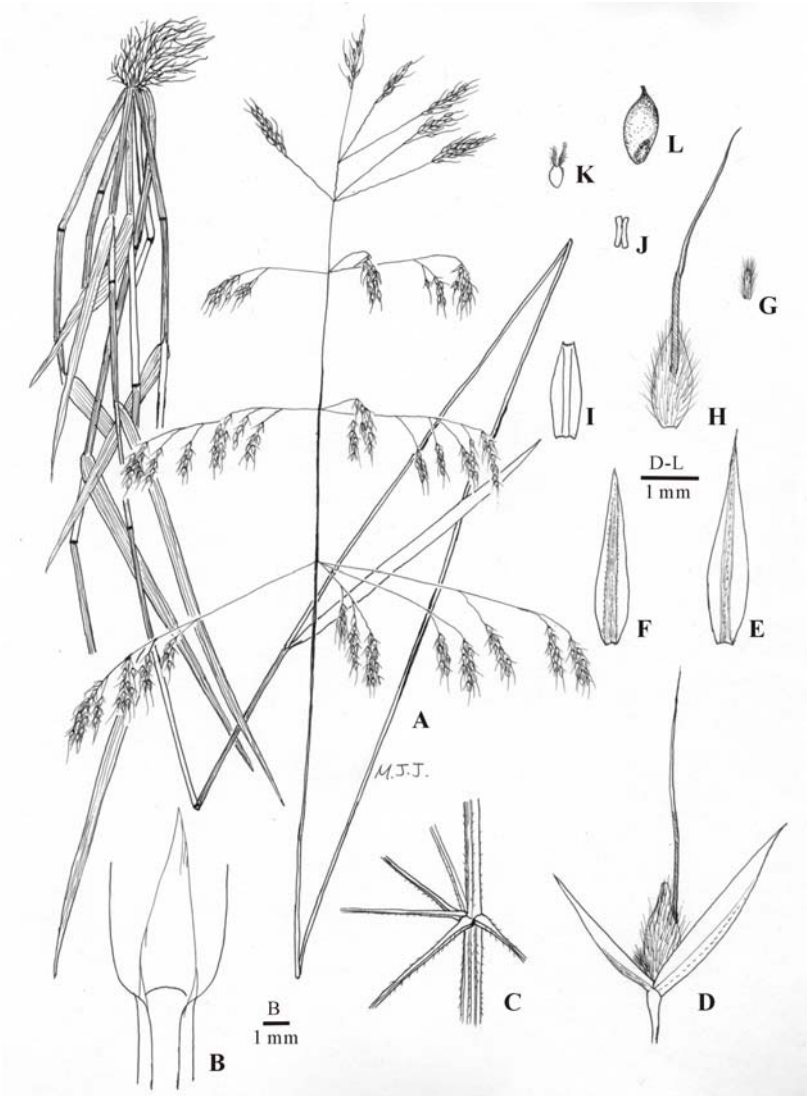


Fig. 1. *Agrostis avenacea* J. F. Gmel. A: Habit. B: Ligule. C: Lower node of inflorescence.D: Spikelet. E: Lower glume. F: Upper glume. G: Rachilla. H: Lemma. I: Palea. J: Anther. K: Pistil. L: Caryopsis.

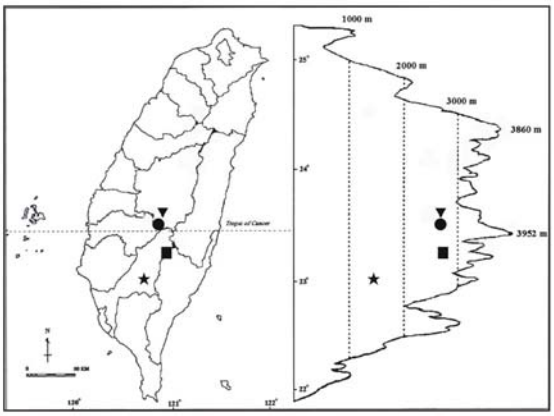


Fig. 2. Distribution of *Agrostis avenacea* J. F. Gmel. (★), *Agrostis stolonifera* L. (▼), *Alopecurus pratensis* L. (●), and *Deschampsia atropurpurea* (Wahl.) Scheele (■) in Taiwan.

Agrostis stolonifera L., Sp. Pl. 62, 1753; A. S. Hitchcock, Manual of Grasses of the United States., 338-339, 1951. 匍匐翦股穎 Fig. 3

Culms ascending, to 30 cm tall; nodes articulate, internodes longer than sheaths. Ligule ca. 0.5 mm long, membranous, margin serrate; blade linear, long to 15 cm. Inflorescence a panicle, 10-20 cm long. Lower glume lanceolate, 1-veined, ca. 2 mm long. Upper glume ovate, slightly shorter than lower glume, margin membranous, 1-veined. Lemma ovate, 5-veined, membranous, apex truncate or dentate; awnless or with short awn arising from middle, not exserted from spikelet. Palea ovate, membranous, 2-veined, apex obtuse. Lodicules 2, lanceolate, hyaline. Stamens 3, anthers ca. 0.5 mm long.

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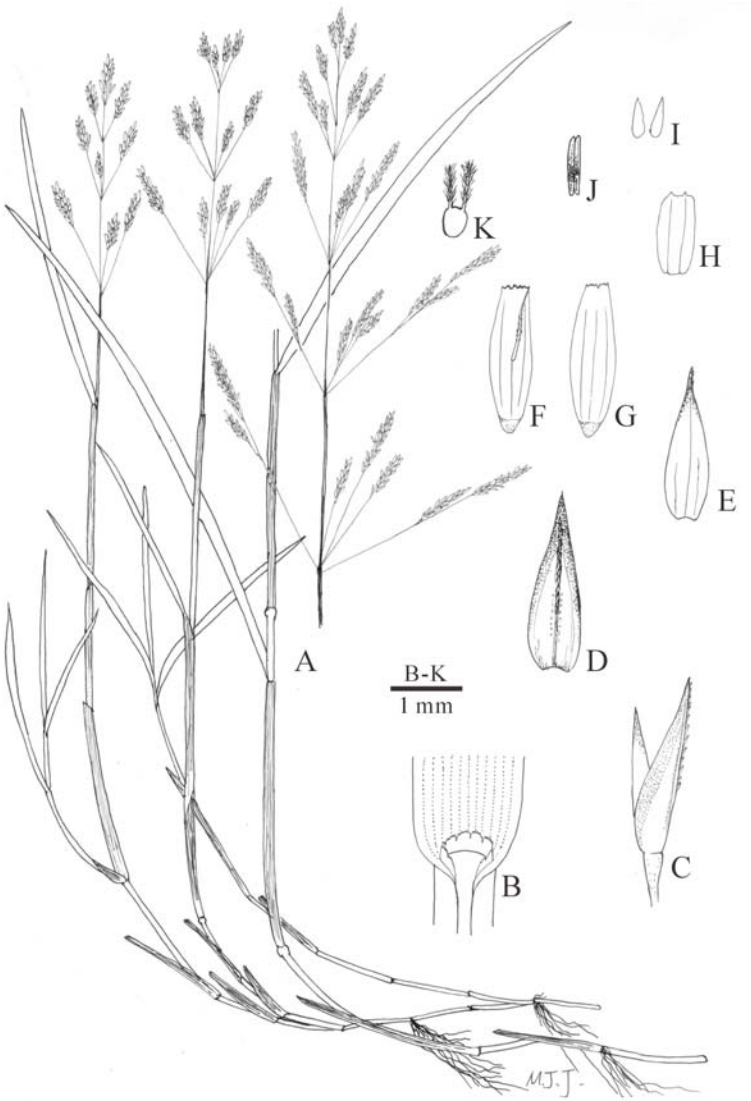


Fig. 3. *Agrostis stolonifera* L. A: Habit. B: Ligule. C: Spikelet. D: Lower glume. E: Upper glume. F: Lemma with one awn. G: Lemma with no awn. H: Palea. I: Lodicules. J: Anther. K: Pistil.

Distribution and notes: The common names of *Agrostis stolonifera* L. include creeping bentgrass and red top. It is widely distributed in temperate regions of the Northern Hemisphere (Hitchcock, 1951; Osada, 1993). The population of *A. stolonifera* occurs between Ta-ta-chia and Fu-Chi Tree, along the New Central Highway (Taiwan Highway No. 21), Shin-yi Hsiang, Nantou Hsien (Fig. 1). It is associated with *Artemisia somae* Hayata, *Bromus catharticus* Vahl, *Dactylis glomerata* L., *Dendranthema arisanense* (Hayata) Y. Ling and C. Shih, *Festuca arundinacea* Schreb., *Miscanthus sinensis* Anders., *Poa annua* L., and *Senecio inaequidens* DC.

Specimens examined: Nantou Hsien: Shin-yi Hsiang. Fu-chi Tree, *M.-J. Jung x060611, x060612, x062702, x062706, x062707, x062708* (NCKU); Ta-ta-chia, *M.-J. Jung x080203* (NCKU).

Alopecurus pratensis L., Sp. Pl. 60, 1753; A. S. Hitchcock, Manual of Grasses of the United States., 358, 1951. 原野看麥娘 Fig. 4

Perennial with short rhizomes. Culms erect, to 150 cm tall. Leaf blade ca. 20 cm long, 1 cm wide; ligule ca. 2 mm long, membranous, margin and abaxial surface ciliate. Inflorescence a contracted panicle, ca. 4 cm long; spikelet strongly laterally compressed, with one floret. Glumes ovate, ca. 5 mm long, ca. 3 mm wide, membranous, apex acuminate, 3-veined, with ca. 1.5 mm long pilose hairs on veins. Lemma ovate, ca. 5.5 mm long, 5-veined, lower part united, apex obtuse; awned. Awn arising from back of lemma, ca. 1/3 from base, 3-5 mm, included within or protruding from the glumes. Anther ca. 2.5 mm long. Ovary ca. 0.75 mm long, stigma ca. 5 mm long.

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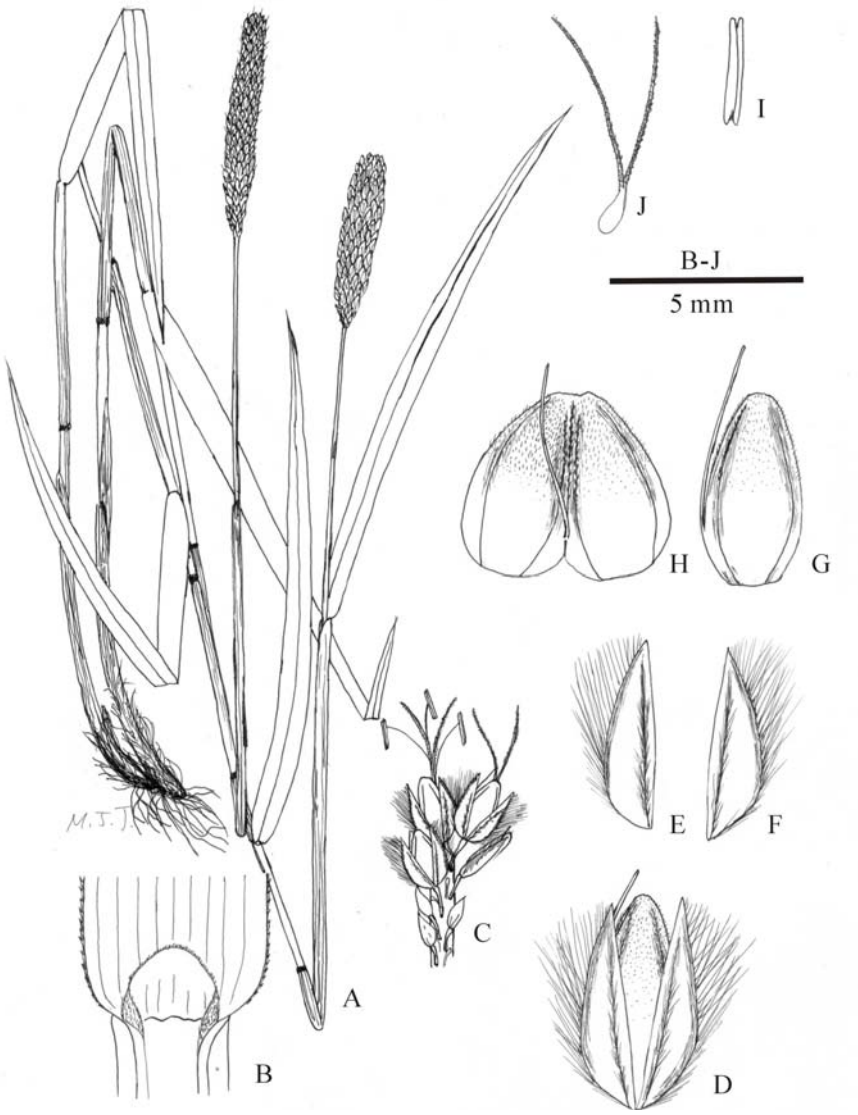


Fig. 4. *Alopecurus pratensis* L. A: Habit. B: Ligule. C: Base of panicle. D: Spikelet. E: Lateral view of lower glume. F: Lateral view of upper glume. G: Lateral view of lemma. H: Lemma.. I: Pistil.

Distribution and notes: *Alopecurus pratensis* L. (meadow foxtail) (Cody et al., 2000) is native to Europe and the northern part of Asia (Osada, 1993). It was introduced to Australia (Weiller *et al.*, 1995), North America (Hitchcock, 1951; USDA, NRCS, 2004) including Canada (Cody et al., 2000). In Taiwan, it occurs near Dongpu Hostel and milestone 87.5 km, along Taiwan Highway No. 18, Shin-yi Hsiang, Nantou Hsien, at middle elevations (Fig. 1).

Alopecurus pratensis can be distinguished from both *A. aequalis* var. *amurensis* (Komar.) Ohwi and *A. myosuroides* by the shorter panicles and ovate glumes.

Specimens examined: Taiwan. Nantou Hsien: Shin-yi Hsiang. Lu-lin Shan, *M.-J. Jung x052404, x052407, x052408, x052412* (NCKU); Dong-Pu Hostel, *M.-J. Jung x060602, x060606, x060607* (NCKU).

Deschampsia atropurpurea (Wahl.) Scheele, Flora 27: 56. 1844; A. S. Hitchcock, Manual of Grasses of the United States., 294, 1951.

高山髮草 Figs. 5 & 6

Perennial, with short rhizomes ca. 5 cm long. Culms to 30 cm tall, nodes articulate, exposed. Ligule 0.5-2 mm long, membranous, margin with ciliate hairs; blades linear, ca.10 cm long. Inflorescence a spreading panicle, ca. 10 cm long. Lower glume lanceolate, ca. 5 mm long, 1-veined, apex acuminate; upper glume elliptical to lanceolate, ca. 5 mm long, slightly shorter than lower glume, apex acuminate. Spikelet with 1-3 florets, only the basal one or two florets fertile; terminal or second floret sterile. Callus hairy, the hairs ca. 1/2 -1/3 as

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Fig. 5. *Deschampsia atropurpurea* (Wahl.) Scheele. A: Habit. B: Ligule. C: Spikelet. D: Lower glume. E: Upper glume. F: Florets. G: Lemma. H: Palea. I: Lodicules. J: Anther. K: Pistil. L: Rachilla.

long as lemmas. Lemma ovate, boat-shaped, ca. 4.5 mm long, 5-veined, central vein connected to an awn, the awn arising from lower part of the lemma; marginal and middle veins enter into narrow teeth at apex; margin of apex ciliate. Palea ca. 3.5 mm long, 2-veined, membranous, hyaline, apex truncate. Lodicules 2, lanceolate to ovate, ca. 1 mm long, hyaline.

Anthers ca. 1.5 mm long. Terminal floret reduced, with one lemma, ca. 3 mm long; or one awn, 4.5-5 mm long. Second floret similar to first floret if fertile, slightly shorter than first floret; if sterile, lemma linear, margin membranous, shorter than fertile one. Rachilla hairy, hairs ca. as long as callus hairs.

Distribution and notes: The common name of *Deschampsia atropurpurea* (Wahl.) Scheele is mountain hairgrass. It is distributed from western North America, Alaska to northern Europe (Hitchcock, 1951). In Taiwan, it occurs at Tianchih, and along the Ya-Kou Forestry Road, Taoyuan Hsiang, Kaohsiung Hsien; and from Da-Kuanshan Tunnel to Shian-Yang, along the Southern Cross-Island Highway (Taiwan Highway No. 20),

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Hai-duan Hsiang, Taitung Hsien (Fig. 1). It is associated with *Aniselytron agrostoides* Merr., *Artemisia somae* Hayata, *Cirsium arisanense* Kitam., *Dactylis glomerata* L., *Erigeron morrisonensis* Hayata var. *fukuyamae* (Kitam.) Kitam., *Festuca ovina* L., *Ixeridium transnokoensis* (Y. Sasaki) J. H. Pak & Kawano, *Poa annua* L., *Trisetum spicatum* (L.) Rich. var. *formosanum* (Honda) Ohwi, *Valeriana kawakamii* Hayata, *Yushania niitakayamensis* (Hayata) Keng f. and a vulnerable endemic plant, *Nemosenecio formosanus* (Kitam.) B. Nord.

Specimens examined: Taiwan: Kaohsiung Hsien, Tao-yuan Hsiang: Entrance of Ya-Kou forestry road, *M.-J. Jung: x061008, x071105, x071110, x071111, x071112, x071113* (NCKU); Tianchih, *Y.-F. Chen: 21990* (NCKU); Taitung Hsien, Hai-duan Hsiang: Ya-Kou to Shian-Yang, *Y.-F. Chen: 22030* (NCKU).

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摘　　要

擬燕麥翦股穎（新擬中名）(*Agrostis avenacea* J. F. Gmel.)、匍匐翦股穎 (*Agrostis stolonifera* L.)、原野看麥娘（新擬中名）(*Alopecurus pratensis* L.) 及高山髮草（新擬中名）(*Deschampsia atropurpurea* (Wahl.) Scheele) 分別為近期在臺灣南部及中部中海拔山區發現之新記錄種植物。本文描述此四種植物，並提供其分布圖及線繪圖。

關鍵詞：擬燕麥翦股穎、匍匐翦股穎、原野看麥娘、高山髮草、禾本科、歸化禾草、臺灣、分類。

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