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Three Newly Naturalized Asteraceae Plants in Taiwan

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ABSTRACT: Three newly naturalized Asteraceae species are reported in this paper. *Cotula australis* (Sieber ex Spreng.) Hook. f. and *Erigeron bellioides* DC. are well established and naturalized in urban areas of northern Taiwan. *Ageratina riparia* (Regel) R.M. King & H. Rob. is naturalized to northern and central Taiwan. Descriptions and illustrations of these alien Asteraceae plants are provided.

KEY WORDS: Newly naturalized, Asteraceae, *Ageratina riparia*, *Cotula australis*, *Erigeron bellioides*, Taiwan.

INTRODUCTION

Asteraceae, one of the largest families of flowering plants, is the major contributor to the naturalized flora globally as well as in Taiwan (Pyšek et al., 2004; Wu et al., 2004; Wu and Wang, 2005). Many naturalized Asteraceae plants were reported in Taiwan in recent years (Chang et al., 2002; Chen, 2007; Chung et al., 2007, 2008; Hsu et al., 2006; Jung et al., 2005, 2006, 2008; Tseng and Peng, 2004, Tseng et al., 2008; Wang and Chen, 2006; Yang et al., 2001; Yang and Hsieh, 2006). Most of them were introduced casually (Chang et al., 2002; Chen, 2007; Chung et al., 2007, 2008; Hsu et al., 2006; Jung et al., 2005, 2006, 2008; Wang and Chen, 2006; Yang and Hsieh, 2006). Several species, such as *Gymnocoronis spilanthoides* DC., were introduced purposely and subsequently escaped and naturalized in the field (Yang et al., 2001). Some newly naturalized Asteraceae plants, such as *Acmella uliginosa* (Swartz) Cass., *Mikania micrantha* Kunth, and *Praxelis clematidea* (Griseb.) R. M. King & H. Rob., which were reported as locally naturalized (Chang et al., 2002; Chen, 2007; Chung et al., 2007; Chung et al., 2008), have become rampant in Taiwan. In this report we document the naturalization of three additional Asteraceae species in Taiwan: *Ageratina riparia* (Regel) R. M. King & H. Rob., *Cotula australis* (Sieber ex Spreng.) Hook. f., and *Erigeron bellioides* DC. *Cotula australis* and *Erigeron bellioides* have been well established and naturalized in urban areas of northern Taiwan. *Ageratina riparia* is naturalized in northern and central Taiwan. Descriptions and line drawings of these species are provided.

TAXONOMIC TREATMENTS

1. ***Ageratina riparia*** (Regel) R. M. King & H. Rob., Phytologia 19(4): 216. 1970.

澤假藿香薊 Figs. 1 & 2

Herb or shrubs, erect, stems pubescent, villous; leaves opposite, petiole 7-15 mm long, blade elliptic, apex acuminate, base attenuate, margin serrate; capitulum turbinate, 5-7 mm in diameter, homogamous, comprising solely of disc florets, arranged as cymose panicles, involucral bracts linear to lanceolate, apex acute, ciliate, *ca.* 2.5-4 mm long, pappus scabrous, 2.5-3 mm long, attached on a hyaline ring; corolla 5-lobed at apex, abruptly narrowed into a tube in the lower half, whitish, the lobes ciliate adaxially ly, anthers *ca.* 0.75 mm long; style bifid, exerted; achenes 5-ribbed, ribs hispidulous.

Specimens examined: Taiwan. Taipei City, Taipei Botanical Garden (cultivated), 10 Apr 2008, *M.-J. Jung 2670* (TAIF). Taipei Co., Wulai Township, Fushan, 23 Feb 2002, *P.-H. Lee et al. 1468* (TAIF); Taoyuan Co., Fuhsing Township, Mingchih, 9 May 2006, *M.-J. Jung 1439* (TAIF). Nantou Co., Yuchih Township, Sun Moon Lake, 17 Mar 2008, *M.-J. Jung 2461* (TAIF).

Distribution and note: The genus *Ageratina* Spach comprises about 290 species in South and North America (Peng et al., 1998). *Ageratina adenophora* was reported as being naturalized at 900-1,500 m altitude in southern Taiwan (Peng et al., 1998). *Ageratina riparia* is native in Mexico and is introduced into Pacific islands including Australia, Hawaii and New Zealand (King and Robinson, 1987; USDA, NRCS, 2004). *Ageratina riparia* has naturalized in northern and central Taiwan in recent years. Both *Ageratina adenophora* and *A. riparia* appear to be triploid apomicts (King and Robinson, 1987). *Ageratina adenophora* and *A. riparia* are notorious weeds in Asia (Hsu et al., 2006). Vernacular names of *Ageratina riparia* include: creeping croftonweed, mist flower, river eupatorium, spreading snakeroot and William Taylor. Leaf shape of *Ageratina adenophora* (deltoid to ovate) and *A. riparia* (elliptic) serves readily to distinguish the two species.

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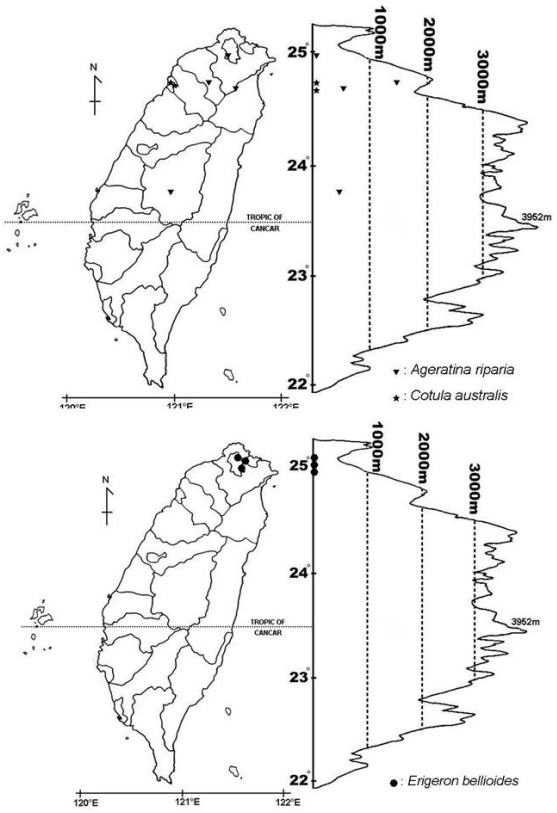


Fig. 1. Distribution of *Ageratina riparia* (▼), *Cotula australis* (★), and *Erigeron bellioides* (●) in Taiwan.

2. ***Cotula australis*** (Sieber ex Spreng.) Hook. f., Fl. Nov.-Zel. 1: 128. 1852. Kuo, Fl. Matsu: 629. 1994; Walsh and Entwisle, Fl. Victoria 4: 931-934. 1999.
南方山芫荽 Figs. 1 & 3

Herbs, erect to ascending, 3-20 cm tall, stems dichotomous, pilose; leaves cauline, alternate, base nearly amplexicaul; blade obovate, 7-35 mm long, 7-15 mm wide, parted, pinnatisect to bipinnatisect, lobes linear, apex acuminate, sparsely to densely pilose, hairs to 2 mm long. Capitulum 3-6 mm in diameter, terminal or axilary, peduncle unbranched, 15-70 mm long; involucral bracts 2-seriate, elliptic, apex round, margin hyaline, 1-nerved, glabrous to sparsely pilose, hairs 0.3-0.5 mm long; florets dimorphic: marginal florets pedicellate, pedicel *ca.* 0.5 mm long, ovary obovate, papillose, compressed, *ca.* 0.6 mm long, corolla lacking, pistilate, pistil *ca.* 0.4 mm long; central florets 1.2-1.5 mm long, ovary glabrous, smooth, corolla tabulate, pale yellow. Achenes obovate, apex round, strongly flattened; achenes of marginal florets 1.2-1.5 mm long, margins thinly winged, wings membranous, style and stigma persistent, *ca.* 0.3 mm long; achenes of central florets wingless, 1.1-1.2 mm long.

Specimens examined: Taiwan. Hsinchu City, Chertuchi Park, 9 May 2008, *M.-J. Jung 2905* (TAIF); Nanya Park, 11 Apr 2008, *M.-J. Jung 2677* (TAIF), 9 May 2008, *M.-J. Jung 2885* (TAIF); Park of Hsinchu Performing Arts Center, 11 Apr 2008, *M.-J. Jung 2682* (TAIF).

Distribution and note: The genus *Cotula* L. has about 50 species mainly from Southern Hemisphere (Peng et al., 1998; Walsh and Entwisle, 1999). One species, *Cotula hemisphaerica*, was reported in Taiwan but rarely collected (Peng et al., 1998). *Cotula australis* is native to Australia and naturalized in America, Canary Island, Chile, Hawaii, Japan, Mexico, New Zealand, S. Africa, and as far north as Norway (Grierson, 1980; Kuo, 1994; USDA, NRCS, 2004). The dispersal of *Cotula australis* from Australia to several other countries was assumed to be associated with imports of Australian grain (Grierson, 1980). *Cotula australis* was also recorded in Matzu, Fujian Province (Kuo, 1994). Recently, *Cotula australis* was found in grassy parks and at roadsides in Hsinchu City, northern Taiwan. Vernacular names of *Cotula australis* include: Australia waterbuttons, Australian brass buyyons, bachelor's button, carrotweed, and common cotula (USDA, NRCS. 2004; Walsh and Entwisle, 1999). Peduncle of *Cotula australis* is much longer than *C. hemisphaerica*. Involucral bracts are elliptic and with prominant membranous margins in *Cotula australis*. In contrast, those of *C. hemisphaerica* are oblong and with scarious margins.

3. ***Erigeron bellioides*** DC., Sp. Pl. 2: 863-865. 1753. Walsh and Entwisle, Fl. Victoria 4: 882-885. 1999.
類雛菊飛蓬 Figs. 1 & 4

Herbs, shortly rhizomatous, stem short, leaves rosetted, blade obovate to spathulate, base petiole-like, apex acute, sparsely hirsute, margin entire to shallowly dentate. Capitulum turbinate, solitary, 3-6 mm in diameter, peduncle unbranched, 3-7 cm long, with small bracts; involucral bracts linear, apex acute, margin hyaline, outer bracts *ca.* 0.5 mm long, pubescent; inner bracts glabrous to pubescent, 0.7-0.8 mm long, ray florets 2-seriate, pistilate, ligules whitish to pale yellow, *ca.* 0.7 mm long, disc florets bisexual, corolla 5-lobed, whitish to pale yellow, *ca.* 1.3 mm long, anthers *ca.*0.3 mm long; achene uniform, pubescent, pappus 1-seriate, thin, with fragile bristles, subequal to corolla.

Specimens examined: Taiwan. Keelung City, Cidu District, Padu, *9 Jul 2008, M.-J. Jung 3054* (TAIF). Taipei City, Zhongshan District, Dajia Riverside Park, 19 Apr 2008, *M.-J. Jung 2699* (TAIF); Nangang District, Academia Sinica Campus, 7 Nov 2005, *M.-J. Jung 1313* (NCKU), 28 Jan 2006, *M.-J. Jung 1351* (NCKU), 19 Dec 2007, *M.-J. Jung 2075* (TAIF).

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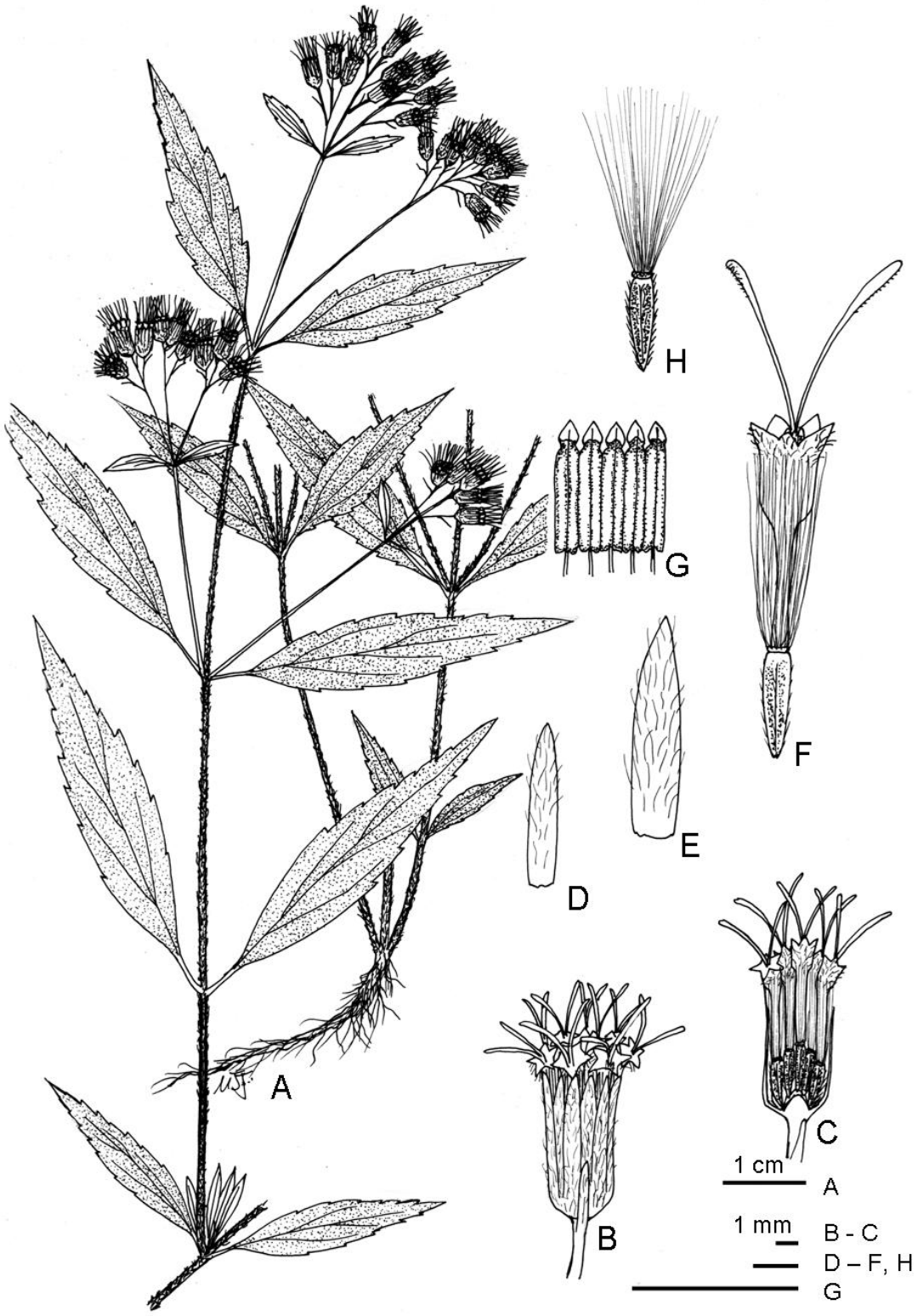


Fig. 2. *Ageratina riparia*. A: Habit. B: Capitulum. C: Dissected capitulum. D: Outer involucral bract. E: Inner involucral bract. F: Floret. G: Anthers. H: Achene.

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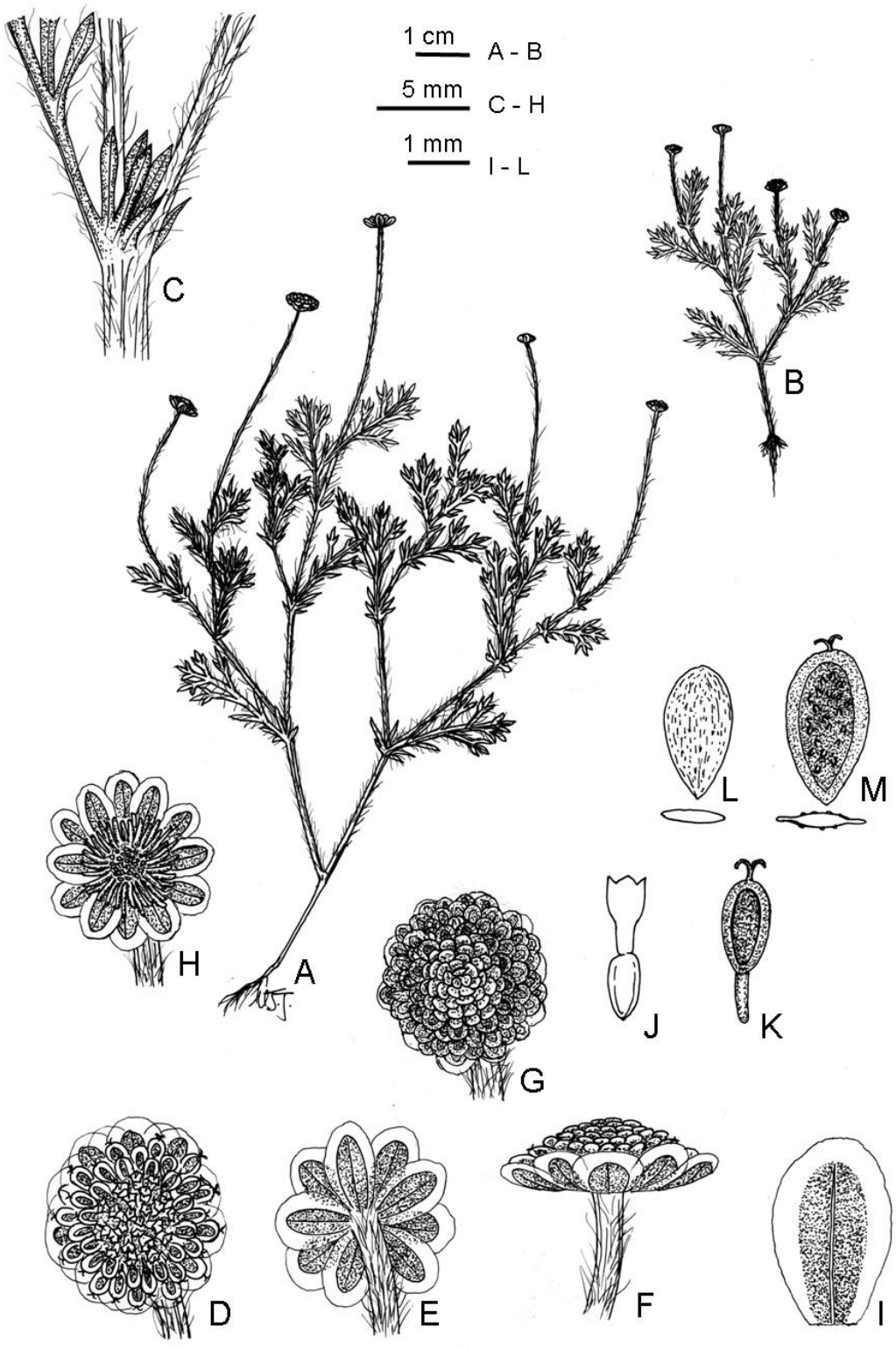


Fig. 3. *Cotula australis*. A and B: Habit. C: Leaf base. D: Capitulum, flowering. E: Capitulum, showing involucre. F: Capitulum, lateral view. G: Capitulum,in fruit. H: Capitulum, showing receptacle and persistent pedicels. I: Involucral bract. J: Central floret. K: Marginal floret. L: Achene of central floret. M: Achene of marginal floret.

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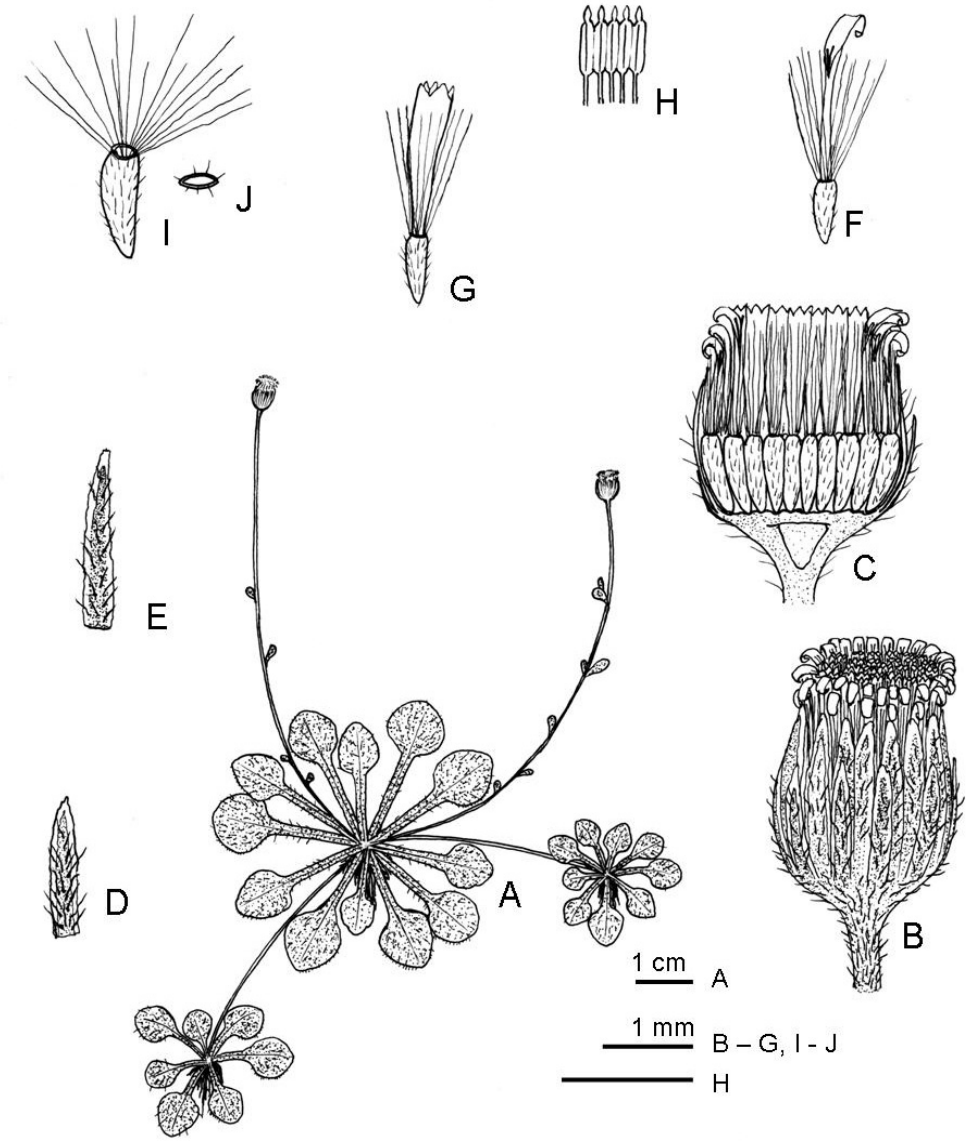


Fig. 4. *Erigeron bellioides*. A: Habit. B: Capitulum. C: Dissected capitulum. D: Outer involucral bract. E: Inner involucral bract. F: Ray floret. G: Disc floret. H: Anthers. I: Achene. J: Achene, cross section.

Distribution and notes: *Erigeron* is a cosmopolitan genus of more than 200 species. Two species, one naturalized and the other (with an additional variety) native, were recorded in the Flora of Taiwan, 2nd ed. (Peng et al., 1998). *Erigeron bellioides* is native in South America; naturalized to Australia, Hawaii and Puerto Rico (USDA, ARS, 2008; USDA, NRCS, 2004; Wagner et al., 1990; Walsh and Entwisle, 1999). In Taiwan, *Erigeron bellioides* occurs in grasslands and along roadside in Taipei City, northern Taiwan. Vernacular name of *Erigeron bellioides* is bellorita. Dispersal of *Erigeron bellioides* was suggested to be associated with the movement of soil (Wagner et al., 1990).

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臺灣三種新歸化菊科植物

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摘要：本文報導三種新近歸化於臺灣的菊科植物：南方山芫荽(*Cotula australis* (Sieber ex Spreng.) Hook. f.)及類雛菊飛蓬(*Erigeron bellioides* DC.)歸化北部都會區，澤假藿香薊(*Ageratina riparia* (Regel) R.M. King & H. Rob.)歸化於中北部。本文並提供這三種外來菊科植物的描述及線繪圖。

關鍵詞：新歸化種、菊科、澤假藿香薊、南方山芫荽、類雛菊飛蓬、臺灣。

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