NOTE

Three New-naturalized Plants in Taiwan

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3. Posthumous publication.
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(Manuscript received 1 March 2012; accepted 9 Octorber 2012)

ABSTRACT: Naturalization of three alien plants: *Clinopodium brownei* (Lamiaceae), *Neptunia pubescens* (Fabaceae) and *Praxelis pauciflora* (Asteraceae) in Taiwan were reported here. Description, line-drawing and relative information of these plants were presented, too.

KEY WORDS: Alien plant, *Clinopodium*, *Neptunia*, *Praxelis*.

INTRODUCTION

After publish of latest checklist of alien plant in Taiwan (Ku et al., 2011), we reported further three newly naturalized plants in Taiwan: *Clinopodium brownei* (Sw.) Kuntze (Lamiaceae), *Neptunia pubescens* Benth (Fabaceae) and *Praxelis pauciflora* (Kunth) R. M. King & H. Rob (Asteraceae). Three species of the genus *Clinopodium* (Lamiaceae), including one represented in two varieties, had been recorded in the flora of Taiwan (Huang et al., 1998; Boufford et al., 2003). During our field survey in five years ago, a wild population of aromatic herb was found in central Taiwan. In Taiwanese relative handbooks (Chang et al., 2003a) and websites, this herb was misidentified as *Mentha requienii* (Lamiaceae), an aromatic and horticultural mint. In following days, more wild populations were found at wetlands, in northern and eastern Taiwan. After examined relative specimens and literatures, the second author confirmed this alien herb as *Clinopodium brownei* (Sw.) Kuntze. Based on opinions from Godfrey and Wooten (1981), Cantino and Wagstaff (1998), Christain et al. (2005, 2008), we tentatively placed this species in genus *Clinopodium sensu lato*, and described and illustrated this aromatic Lamiaceae species.

In past, the alien legume: *Neptunia gracilis* Benth. (Fabaceae) was locally occurred in Hengchun Peninsula, southern Taiwan (Huang and Huang, 1996; Boufford et al., 2003; Ku et al., 2011). Another aquatic vegetable, *N. oleracea* Lour., which was misidentified as *N. plena* by Ying (1993) was locally cultivated in southern Taiwan. The second alien plant we represented here, *N. pubescens* Benth (Fabaceae) were collected broadly at plains and hills in southern Taiwan. We suggested this *Neptunia* legume would be an aggressive alien plant at grasslands and river beds, and offered morphological description and distribution map of it. A taxonomic key of recorded *Neptunia* spp. in Taiwan were attached, too.

The last new-naturalized plant we presented here is *Praxelis pauciflora* (Kunth) R. M. King & H. Rob. (Asteraceae), which is locally abundant in northern Taiwan. Lots of aggressive weeds are members of Asteraceae, including *P. clematidea*, which is an aggressive and notorious weed broadly invading grasslands, parks, farms and roadsides in low elevations, western Taiwan (Chen, 2007; Jung, 2011; Ku et al., 2011). Herein, we offered a taxonomic key for *Praxelis* species in Taiwan, and presented description and line-drawing of this alien plant for identification.

TAXONOMIC TREATMENTS

Clinopodium brownei (Sw.) Kuntze, Revis. Gen. Pl. 2: 514. 1891.-*Thymus brownei* Sw., Prodr. Descr. Veg.: 89.1788. - *Micromeria brownei* (Sw.) Benth. Labiat. Gen. Spec. 372. 1834. Chang, Wang, and Wang. Handbook Taiwan Arom. Herbs Strains: 37. 2003.-*Micromeria brownei* (Sw.) Benth. var. *pilosiuscula* Gray. Godfrey and Wooten. Aqu. Wet. Pl.: SE United States, Dicot: 601. 1981.

伏生風輪菜 Figs. 1 & 4

Mentha requienii auct. non Chang, Hong, and Wang. Handbook Aromatic Med. Herbs: 87. 2003.

Perennial herb, aromatic, creeping then ascending when flowering, rooting at nodes; stem rectangular, sparsely or densely hirsute; phyllotaxis opposite. Leaves

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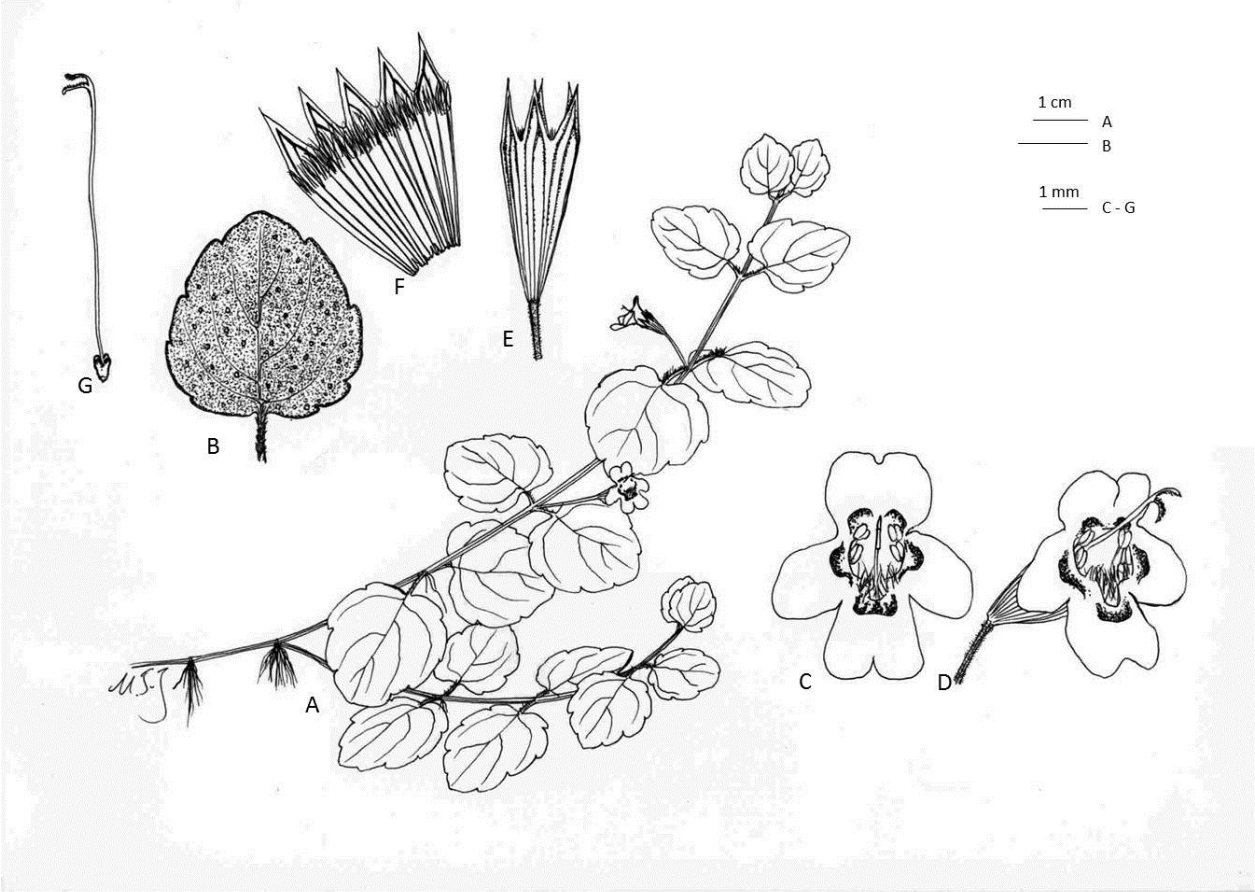


Fig. 1. *Clinopodium brownei* (Sw.) Kuntze. A: Habit. B: Leaf blade, adaxial surface. C and D: Flowers, D: lateral view. E and F: Calyxes, F: dissected one for showing a ring of hairs inside. G: Pistil.

ovate to broadly ovate, base truncate to shallowly cordate, margin crenate, apex obtuse to round, adaxial surface glandular; petiole to 5 mm long, adaxial surface pubescent, abaxial surface glabrous. Flower solitary, axillary at upper ascending stem, stalk shorter than 1 cm; calyx greenish, 4–4.3 mm long, 5-lobed, lobes apex acute, *ca.* 1 mm long, calyx tube ribbed, with a ring of hairs inside; corolla bilabiate, white, pinkish-white to lavender, upper lip 2-lobed, lower lip *ca.* 2.5 mm long, 3-lobed, central lobe apex notched; stamens 4, didynamous and epipetalis, anther exposed, *ca.* 0.5 mm long; Pistil 1, ovary 4-lobed, stigma bi-lobed, exposed.

Specimens examined: TAIWAN. Taipei City, Taipei Botanical Garden, 23 Jun 2009, *M.-J. Jung 4070* (TNU); Ilan Co., Yuanshan Township, Hsuan-lien Lake, 23 Apr 2010, *M.-J. Jung 4946* (TNU); Nantou Co., Puli Township, Liyu Lake, 19 Mar 2008, *M.-J. Jung 2514* (TAIF).

Distribution and notes: The vernacular name of *Clinopodium brownei* is Browne's Savory. This aromatic herb is native to Europe, North America and western Asia, and was introduced to Taiwan for horticultural uses (Chang et al., 2003b). In past, this creeping aromatic herb was misidentified as *Mentha requienii*, another aromatic mint native to West Europe. However, *M. requienii* has verticillaster cyme with 2–6 whitish or pink flowers and tiny leaf blade (shorter than 1 cm; Stace, 1997; Harley, 2001; Lawton, 2002), which is differed to solitary whitish flowers tinged with purplish spots and ovate or broadly ovate leaf blade (wider than 1 cm) in *C. brownei*. Based on previous misidentifications and naturalization events, we documented this broadly used and escaped horticultural herb.

Neptunia pubescens Benth. J. Bot. Hook. 4: 356. 1841; Windler, Aust. J. Bot. 14: 385, 1966.

毛水含羞 Figs. 2 & 4

Perennial herb, terrestrial, stems prostrate. Stems terete, glabrous to sparsely pubescent; stipules lanceolate, apex acuminate, base obliquely cordate, membranous, 4–10 mm long, 1.5–3.5 mm wide, strongly nerved, glabrous, with the margins frequently ciliate; leaves bipinnate, usually with 3 pairs of pinnae; petioles 1–3.2 cm long, angled, pubescent to glabrous, glandless; rachis angled,

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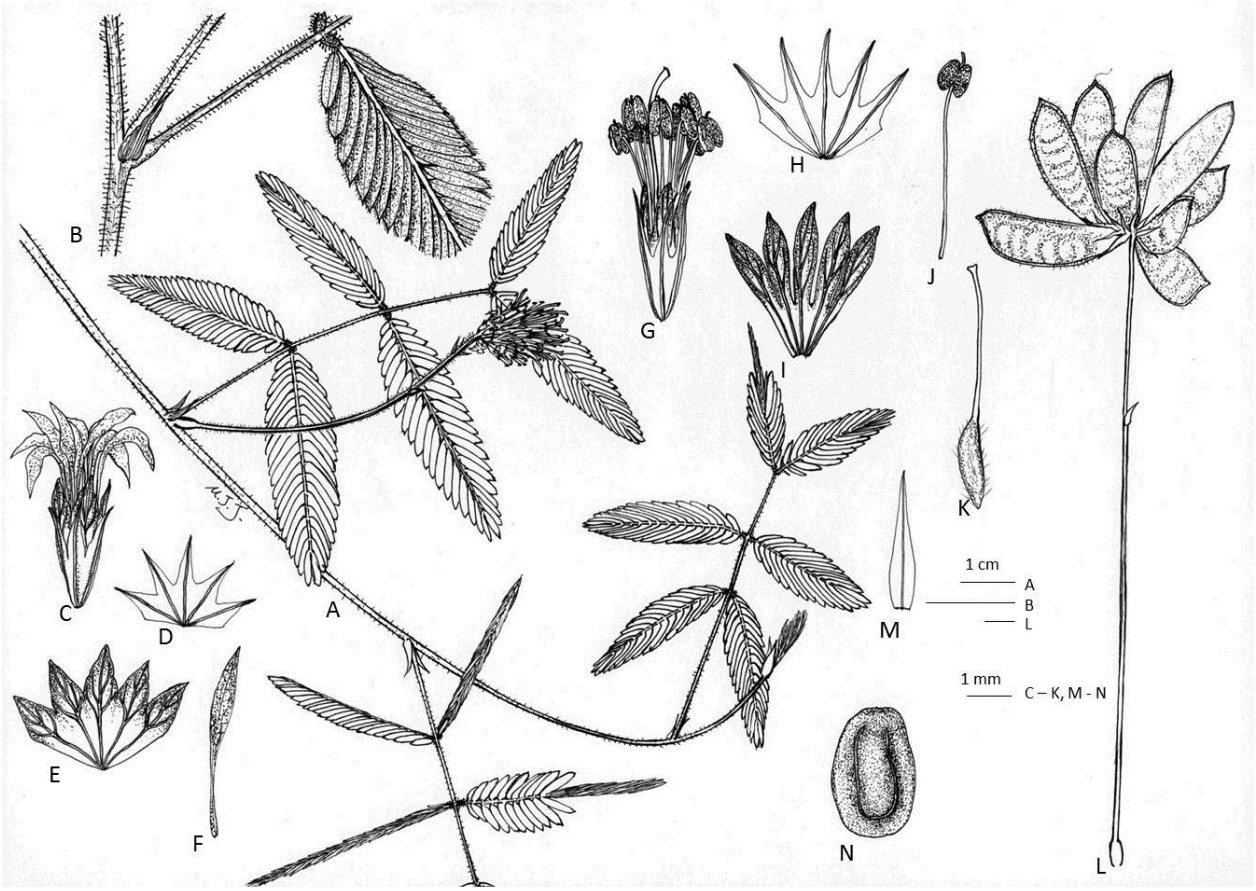


Fig. 2. *Neptunia pubescens* Benth. A: Flowering branch. B: Stipule, petioles and petiolets. C: Sterile flower, lateral view. D: Calyx of sterile flower. E: Corolla of sterile flower. F: Sterile stamen. G: Fertile flower, lateral view. H: Calyx of fertile flower. I: Corolla of fertile flower. J: Stamen of fertile flower. K: Pistil. L: Infructescence. M: Bract. N: Seeds.

sparsely pubescent, prolonged into a linear leaflike projection 1–4 mm long, the projection pubescent or glabrous; pinna rachis distinctly winged, extended beyond the attachment of the terminal pair of leaflets, pubescent to glabrous, with the margins usually ciliate; leaflets 14–43 pairs per pinna, 2.3–8.5 mm long, 0.8–2 mm broad, oblong, obtuse or broadly acute, asymmetrical, entire or ciliate on the margins, with the lower surface glabrous or pubescent, the surface appearing minutely punctuate, venation raised, reticulate. Inflorescence a congested solitary spike, pedunculate, axillary. Peduncles 2.5–6 cm long, sparsely pubescent, with 2 separated lanceolate bracts in the upper half, bracts 1.5–4 mm long, and several smaller lanceolate bracts near the spike base. Flowers 15–30 per spike, sessile or subsessile, each subtended by a single bract 2–3 mm long. Lower flowers sterile, sessile; calyx campanulate, 5-lobed, hyaline, 1.5–2 mm long, with the lobes 0.7–1 mm long, acute; corolla 5-lobed, regular, 1.7–2.1 mm long, lobes triangular, apex acute, *ca.* 0.7 mm long; stamens 10, sterile, petal-like, yellow, *ca.* 3.5 mm long; gynoecium absent. Upper flowers perfect, sessile, each subtended by a campanulate, green calyx, 2.5–3 mm long, 5-lobed, lobes 0.7–1 mm long, acute to acuminate, hyaline, marginally ciliate or entire; corolla 5-lobed, free or slightly coalescent at the margins, green, 2.5–4 mm long; stamens 10, free, 4.5–5 mm long, with the filaments slender, flattened, yellow-white, *ca.* 4.5 mm long, anthers exserted, bilocular, yellow to brown, *ca.* 0.5 mm long, bearing a terminal tip *ca.* 0.2 mm long; pistil *ca.* 6 mm long, exserted beyond the stamens; ovary *ca.* 2 mm long, sparsely coated with white cilia; style slender, elongate; stigma truncate, concave. Legume oblong, flat, thin-coriaceous, glabrous or sparsely pubescent, marginally dehiscent, 1–4.2 cm long, 0.6–0.8 mm broad, tapering or rounded to the stipe. Seeds 4–11 per legume, dark brown, ovoid, compressed, 2.8–3.2 mm long.

Specimens examined: TAIWAN. Kaohsiung City, Jiading District, Lover Seaport, 14 Mar 2010, *M.-J. Jung 4886* (TNU), Tienlao District, Tienlao, 15 Oct 2010, *U.-F. Hsu s. n.* (TNU); Pingtung Co., Hengchun Township, Houpihu, 19 Jun 2009, *S.-H. Wu*

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et al. AZH005 (HAST, TAIF), same loc., 1 Jun 2010, *S.-H. Wu s. n.* (TNU, TAIF), Longluantan, 16 May 2010, *M.-Y. Kuo s. n.* (TNU), same loc., 16 May 2011, *M.-J. Jung 5470* (TAIF).

Distribution and notes: Windler (1966) revised the genus *Neptunia* (Fabaceae) in global, and his taxonomic treatments were adopted by Huang et al. (1996), Kumar and Sane, (2003), Lock and Ford (2004) and Lewis et al. (2005). *N. pubescens* is native to southern North America and South America (Windler, 1966). We didn't found any record of this species in eastern Hemisphere after literature revisions (Windler, 1966; Kumar and Sane, 2003; Lock and Ford, 2004; Lewis et al., 2005) and implied this first naturalization event in eastern Hemisphere. In Hengchun Peninsula, wild population of this prostrate plant was occurred at seasonal wetlands at lakesides and coastal grasslands, and was firstly recorded in 2009. The other two wild populations were occurred at grasslands in Kaoshiung City. Nowaday, this alien legume has been broadly distributed in southern Taiwan.

Key to *Neptunia* species in Taiwan

1. Plant floating with cylindrical whitish spongy tissues, stems freshy ……..… ***N. oleracea***
1. Plant creeping or prostrate, stem thin and woody, without whitish spongy tissue.
2. Pinnae shorter than 3 cm ……..… ***N. gracilis***
2. Pinnae longer than 5 cm …….. ***N. pubescens***

Praxelis pauciflora (Kunth) R. M. King & H. Rob. Phytologia 20: 195. 1970; Berry, Holst, and Yatskievych. Fl. Venezuelan Guayana 3: 348. 1997; Souza and Lorenzi. Botânica sistemática : guia ilustrado para identificação das famílias de Angiospermas da flora brasileira, baseado em APG II. 594. 2000. — *Eupatorium pauciflorum* Kunth. Harri. Manual De IdentificaÇÃo E Controle De Plantas Daninhas: 89. 1949.

鋸葉貓腥草 Figs. 3 & 4

Erect stout herb to 1 m tall. Leaves opposite, petioles 0.5–1.8 cm long; blades 2–4.5 cm long, 1–3 cm wide, elliptic to deltoid, dentate or incised, the both surface pilose and glandular or weakly so. Capitula arranged in a terminal cymb, capitula closely spaced; capitula *ca.* 7.5 mm long, 3.5 mm wide; pedicels 4–7 mm long, pubescent; involucre 4–5 mm diam., narrowly campanulate; phyllaris 2–3 seriate, with scattered short simple hairs at base, glabrous above, margins ciliate, apex long-attenuate; receptacle conical; florets *ca.* 35–40, corollas 3.2–3.8 mm long, bright lilac-blue, corolla-lobes long-papillose on inner surface, glabrous; anther-appendages longer than wide, apex acute; style bright glabrous, not swollen at base, lilac-blue; style-arms coarsely papillose; achenes *ca.* 2 mm long, setose; pappus 3.5–4.5 mm long.

Specimens examined: TAIWAN. New Taipei City, Sanzhi District, Dakung Streamside, 15 Jan 2010, *M.-J. Jung 4709* (TAIF); Hengshan, 30 Apr 2010, *S.-W. Huang 900* (TNU), same loc. 19 Apr 2010, *M.-J. Jung 4932* (TNU), Kuchuan, 19 Oct 2011, *M.-J. Jung 5670* (TNU); Shermen District, Shermen, 22 Apr 2010, *P.-H. Tsai s. n.* (TNU).

Distribution and notes: *Praxelis pauciflora* is native to northern South America, include: Bolivia, Colombia, Guyana, Suriname, French Guiana, Amazonian Peru, Brazil (King and Robinson, 1987; Berry et al., 1997). After revised available *Praxelis* specimens and relative literatures, we adopted taxonomic treatments of Berry et al. (1997), Souza and Lorenzi (2000), and identified these individuals as *P. pauciflora*. Based available specimens and information, taxonomic key was attached to aid for identification of these two alien *Praxelis* weeds in Taiwan.

Key to *Praxelis* species in Taiwan

1. Plant rather slender, stem glabrous to sparsely hirsute; leaf blade margin crenate or serrate; distal cymb branches elongated to 1 cm long when capitula blooming. ……..… ***P. clematidea***
1. Plant stout, stem densely hirsute; leaf blade margin dentate or incised; distal cymb branches shorter than 0.5 cm when capitula blooming. ……..….. ***P. pauciflora***

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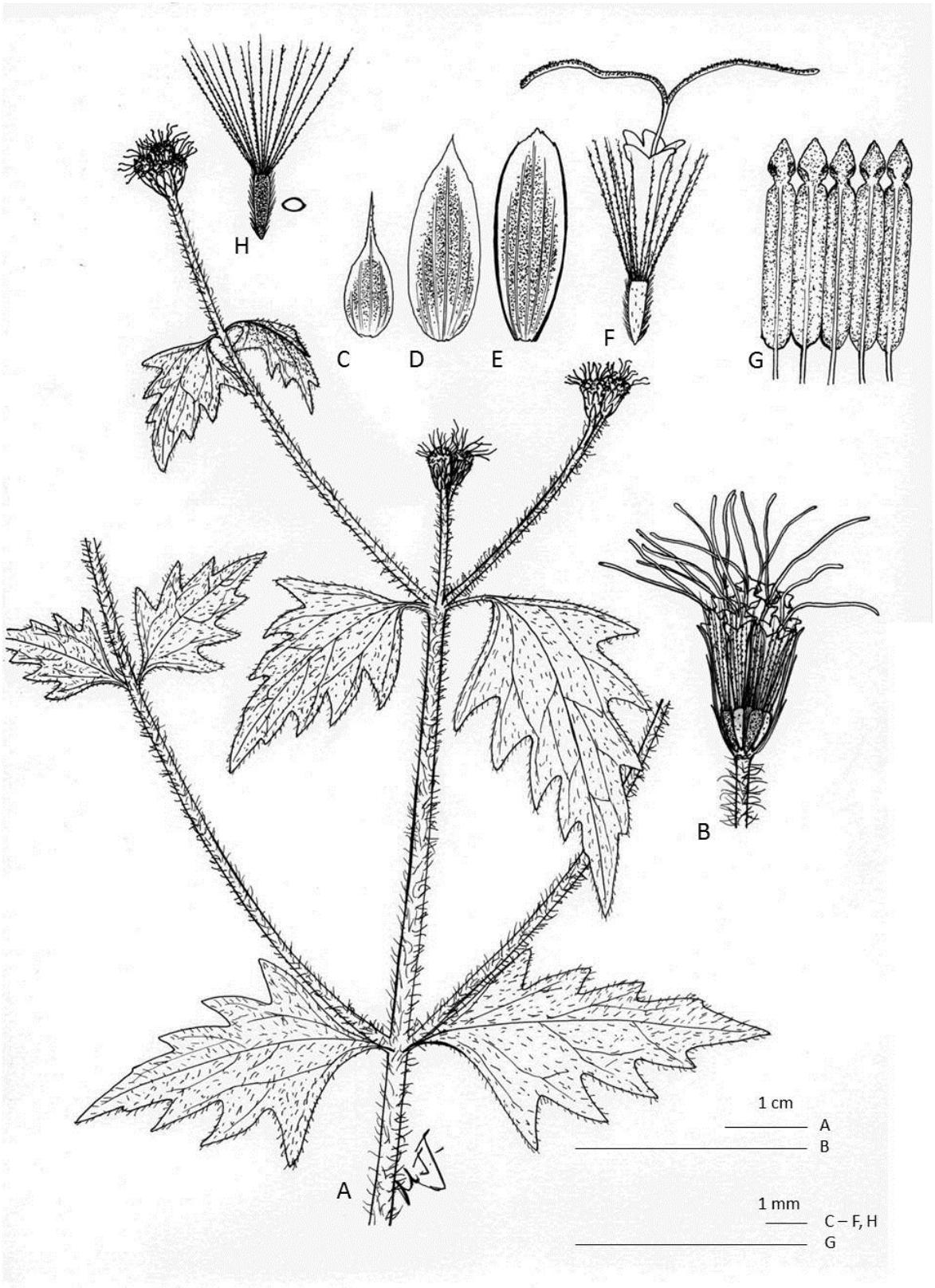


Fig. 3. ***Praxelis pauciflora*** **(Kunth) R. M. King & H. Rob. A: Habit. B: Dissected capitulum, lateral view. C – E: Phyllaris. F: Disc floret. G: Anthers. H: Achene.**

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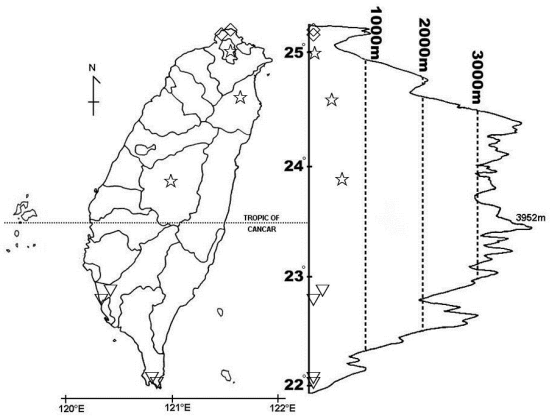


Fig. 4. Distribution map of *Clinopodium brownei* (☆), *Neptunia pubescens* (▽), and *Praxelis pauciflora* (◇) in Taiwan.

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三種臺灣新歸化植物

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（收稿日期：2012年3月1日；接受日期：2012年10月9日）

摘要：本文報導三種臺灣新歸化植物：伏生風輪菜（*Clinopodium brownei*，唇形科）、毛水含羞（*Neptunia pubescens*，豆科）與鋸葉貓腥草（*Praxelis pauciflora*，菊科），並提供特徵描述、手繪圖與相關資訊。

關鍵詞：外來植物、風輪菜屬、水含羞屬、貓猩草屬。

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