

Research note

Taxonomic Revision of *Lindernia* All. (Scrophulariaceae sensu lato) In Taiwan

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【 Summary 】

The genus *Lindernia* (Scrophulariaceae) in Taiwan was taxonomically revised based on morphological and ecological studies. Thirteen species and 2 varieties of this genus, including a newly recorded species, *L. nummularifolia* (D. Don) Wettst. and a newly naturalized species, *L. rotundifolia* (L.) Alston are treated. Three species: *L. hyssopioides* (L.) Haines, *L. mollis* (Benth.) Wettst., and *L. viatica* (Kerr ex Barnett) Philcox are excluded from the flora of Taiwan. A key to sections and species is presented.

Key words: *Lindernia*, revision, Scrophulariaceae, new records, Taiwan.

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研究簡報

台灣產玄參科母草屬植物訂正

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摘要

本文處理台灣產母草屬(*Lindernia*)植物分類，共包含13種、2變種，其中包含1新紀錄種寬葉母草(*L. nummularifolia* (D. Don) Wettst.)以及1新歸化種(*L. rotundifolia* (L.) Alston)。而尖果母草(*L. hyssopioides* (L.) Haines)、見風黃(*L. mollis* (Benth.) Wettst.)與擬泥花草(*L. viatica* (Kerr ex Barnett) Philcox)則為排除種，並不分布於台灣。本文提供台灣產本屬下節與種類檢索表。

關鍵詞：母草屬、分類訂正、玄參科、新紀錄、台灣。

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The genus *Lindernia* All. traditionally belonged to the Scrophulariaceae. Rahmanzadeh et al. (2005) treated this genus as a member of the new family Linderniaceae which was accepted by APG III (2009). This genus contains about 100 species throughout most of the Old and New World tropics. They fall in 3 main geographical groups, the largest in Asia followed by those in Africa and the Americas (Philcox 1968). *Lindernia* currently contains 12 or more different genera, of which 3 other genera: *Vandellia* L., *Bonnaya* Link & Otto, and *Ilysanthes* Rafin are most commonly used (Pennell 1935, Philcox 1968). In the past, these 4 genera were distinguished by the androecium, capsule, leaf, and calyx: *Vandellia* and *Lindernia* have 2 pairs of fertile stamens but are distinguished by the pinnately nerved and 3~5 veins arising from the base of the lamina; *Bonnaya* and *Ilysanthes* have 1 pair of fertile androecium and 1 pair of staminodes, but in *Ilysanthes*, the anterior staminodes have large appendages, while in *Bonnaya*, these staminodes are only simple (Bentham 1846, Philcox 1968). Haines (1922) reduced *Bonnaya* to *Vandellia* and *Ilysanthes* to *Lindernia*, as did Yamazaki

(1954, 1955a) and Li (1978). On the other hand, Pennell (1935) reduced *Vandellia*, *Bonnaya*, and *Ilysanthes* to *Lindernia* because these genera have uniform corolla and similar curiously recurved anterior filaments and similar septicidal dehiscence capsules. The circumscription of *Lindernia* sensu Pennell was accepted by subsequent authors such as Hara (1943), Li (1950, 1961), Yamazaki (1977), and Tsoong and Ku (1979).

Taiwanese *Lindernia* species were recorded by Japanese taxonomists, such as Hayata (1908, 1920), Mori (1936), and Yamazaki (1952) who published some new taxa in Taiwan. The first revision was made by Li (1950), who recorded 9 species in Taiwan. Yamazaki (1955a, 1955b) reviewed the genera *Lindernia*, *Vandellia*, and *Torenia* in eastern Asia including 10 species listed in Taiwan, which was followed by Li (1978) in the *Flora of Taiwan*. Yamazaki (1977) reviewed the genus *Lindernia* sensu Pennell (1935) in Taiwan and Japan, and reported 14 species in 6 sections. In the *Flora of Taiwan* 2nd edition (Liu 1998), 15 species were recorded in Taiwan, 3 of which (*L. hyssopioides*, *L. mollis*, and *L. viatica*) were not included in previous studies.

After consulting all relevant literature and examining herbarium collections from BM, C, HAST, K, L, KYO, PPI, TAI, TAIF, TI, and TNM, we recognized 13 species and 2 varieties in Taiwan. In addition, we also examined 10~20 seeds to determine the length and width. The seed length is from the hilum to the other apex, and the width is the widest length perpendicular to the hilum-apex line. The length and width ratio (L/W) was also determined. The sectional treatment follows Philcox (1968). The nomenclature citation, synonyms, key to taxa, taxonomic descriptions, and notes are presented below.

Taxonomic Treatment

Lindernia Allioni, Misc. Taur. 3: 178, 1762-1765; Li, Q. J. Taiwan Mus. 3: 66. 1950; Li, Q. J. Taiwan Mus. 14: 10. 1961; Yamazaki, J. Jap. Bot. 52(8): 255. 1977; Tsoong and Ku, Fl. Reipubl. Popularis Sin. 68: 126. 1979; Yamazaki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 32. 1981; Liu, Fl. Taiwan. 2nd Ed. 4: 603. 1998.

Vandellia L., Mant. Pl. 1: 12, 1767; Matsumura & Hayata, J. Coll. Sci. Univ. Tokyo 22: 281. 1906 (Enum. Pl. Form.); Hayata, Icon. Pl. Form. 9: 79. 1920; Li, Fl. Taiwan 4: 601. 1978.

Bonnaya Link et Otto, Ic. Pl. Select. 25. 1820; Matsumura & Hayata, J. Coll. Sci. Univ. Tokyo 22: 281. 1906; Hayata, Icon. Pl. Form. 9: 79. 1920.

Ilysanthes Rafin., Ann. Nat. 13. 1820; Mori in Masamune, Short Fl. Form. 191. 1936.

Annuals or perennials. Stem erect to prostrate, usually quadrangular. Leaves opposite, simple, pinnately or palmately nerved, entire or serrate. Flowers in terminal or axillary racemes or in subumbellate clusters. Calyx deeply to shallowly 5-lobed, 5-nerved, each nerve with an obscure or distinct rib. Co-

rolla tubular, bilabiate; posterior lip 2-lobed, entire or emarginate; anterior lip 3-lobed. Stamens 2 or 4; posterior pair fertile; anterior pair fertile, sterile or reduced to simple staminodes; anterior filaments usually each with a distinct appendage or geniculum arising near base; anthers touching in pairs under posterior lip, anther cells divaricate. Style filiform; stigma 2-parted. Ovary obliquely or symmetrically ovate, oblong or cylindric, glabrous. Capsule septicidally 2-valved, valves separated from placentiferous septum. Seeds small, numerous, ellipsoid, shortly cylindric or triangle-like to polygonal, reticulate or scrobiculate.

About 100 species ranging from South Asia to tropical Africa, and the Americas. There are 13 species and 2 varieties in Taiwan.

Key to the sections, species, and varieties in Taiwan

1. Leaves palmately 3~5-nerved 2
1. Leaves pinnate nerved, serrate or crenate, or rarely entire 5
2. Stamens 4, all fertile. Upper leaves entire (Sect. 1. *Lindernia* 1. *L. procumbens*
2. Stamens 2, staminodes 2. Leaves more or less with 3~5 pairs of serrate teeth (Sect. 2. *Brachycarpae*) 3
3. Staminodes without spur-like appendage. Seeds falcate-oblong. Corolla white or light-blue 2. *L. rotundifolia*
3. Staminodes with spur-like appendage. Seeds oblong to ovate. Corolla pink or very pale-purple 4
4. Pedicle typically shorter than subtending leaves, 0.6~1 mm in diameter 3a. *L. dubia* var. *dubia*
4. Pedicle typically 1.2~3-times longer than subtending leaves, 0.1~0.5 mm in diameter 3b. *L. dubia* var. *anagallidea*
5. Stamens 4, anterior filament geniculate,

- usually with appendages..... 6
5. Stamens 2, anterior pair of staminodes 2, filiform, simple (Sect. 8. *Bonnaya*) 11
6. Anterior pair of filaments geniculate with blunt clavate appendages..... 7
6. Anterior pair of filaments geniculate with thick geniculum or subglobose appendages at base..... 9
7. Calyx shorter 5-lobed, lobes shorter than calyx tube (Sect. 3. *Torenioides*) 4. *L. crustacea*
7. Calyx deeply 5-lobed almost to base, lobes longer than calyx tube..... 8
8. Capsule linear-cylindric, 2~3-times longer than calyx (Sect. 4. *Angustifolia*) 5. *L. anagallis*
8. Capsule oblong, equal or subequal to calyx (Sect. 5. *Setulosae*)..... 6. *L. scutellariiformis*
9. Calyx shallowly 5-lobed, lobes subequal to calyx tube, ridged when flowering. Capsule linear-cylindric (Sect. 6. *Numularia*)..... 7. *L. nummularifolia*
9. Calyx deeply 5-lobed almost to base, lobes much longer than calyx tube, not ridged when flowering. Capsule subglobose, ovate (Sect. 7. *Tittmannia*)..... 10
10. Flowers solitary and axillary. Calyx densely hirsute and glandular hairy. Capsule subglobose 8. *L. pusilla*
10. Flowers in racemes. Calyx with glandular hairs only. Capsule ovate..... 9. *L. viscosa*
11. Plant stoloniferous or creeping..... 10. *L. ruellioides*
11. Plant erect to ascending..... 12
12. Leaf margin sharply serrate with fine aristate teeth 11. *L. ciliata*
12. Leaf margin serrate with acute teeth 13
13. Leaves linear. Flowers in racemes. Stamens pale-blue 12. *L. tenuifolia*
13. Leaves oblanceolate to obovate-oblong. Flower solitary, axillary or in racemes. Stamens yellow 13. *L. antipoda*

Sect. 1. *Lindernia*

1. *Lindernia procumbens* (Krock.) Borbas, Bekesm Fl. 80. 1881; Tsoong and Ku, Fl. Reipubl. Popularis Sin. 68: 131. 1979; Yamazaki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 3. 1981; Liu, Fl. Taiwan 2nd Ed. 4: 606. 1998..... 陌上草
Anagalloides procumbens Krock., Fl. Siles. 2: 398. 1790.

Lindernia pyxidaria L. Mant. Pl. 2: 252, 1771, *nom. illeg.*; Yamazaki, J. Jap. Bot. 30: 171. 1955; Li, Q. J. Taiwan Mus. 14: 2. 1961.

Lindernia pyxidaria Allioni, Misc. Tourin. 3: 178. 1776; Mori in Masamune, Short Fl. Form. 191. 1936; Li, Q. J. Taiwan Mus. 3: 65. 1950.

Vandellia erecta Benth., Scroph. Ind. 36. 1835 (Lectotype: K!, *Wallich*, 3947C); Matsuura and Hayata, J. Coll. Sci. Univ. Tokyo 22: 280. 1906 (Enum. Pl. Form.).

Lindernia procumbens (Krock.) Philcox, Taxon 14: 30. 1965; Philcox, Kew Bull. 22(1): 29. 1968; Yamazaki, J. Jap. Bot. 52(8): 254. 1977; Li, Fl. Taiwan 4: 571. 1978.

Annual herb 5~20 cm tall. Stem erect or ascendant, obscurely quadrangular, glabrous. Leaves palmately 3~5-nerved, sessile, elliptic or ovate-elliptic, obtuse at apex, 6~25(~30) mm long, 4~12 mm wide, entire, rarely obscurely crenate, glabrous. Flowers solitary-axillary; pedicels usually opposite, 5~20(~25) mm long, obscurely quadrangular, glabrous. Calyx deeply 5-lobed almost to base, 2.5~3 mm long, lobes linear-lanceolate, glabrous. Corolla pale-pink, 3~5 mm long; posterior lip ovate, emarginated; anterior lip with 3 rounded lobes. Stamens 4, all fertile; anterior filaments each with a clavate to linear spur 0.4~1 mm long arising near base. Ovary ellipsoid; disk small, at ovary bottom, yellow. Capsule ellipsoid, 2.5~4 mm long, 2~3 mm wide, acute, subequal or slightly longer than persistent calyx. Seeds oblong or oval, 0.29~0.41

mm long, 0.14~0.19 mm wide, length/width (L/W) ratio ca. 1.93, seed-coat smooth or reticulate. Flowering and fruiting Apr.~Nov.

Widely spread over tropical to warm-temperate regions from Eastern Europe to Asia. Taiwan in rice fields, marshy ground, river sides below 1000 m in elevation.

Specimens examined: TAIWAN: New Taipei City: Tanshui Dist., elev. 50 m, May 28, 2006, *Y. S. Liang 838* (TNM); Shihmen Dist.: near Laomei Elementary School, elev. 50 m, May 28, 2006, *Y. H. Liang 860* (TNM); Sanchih Dist.: Shanchuchueh, elev. 50 m, May 28, 2006, *Y. S. Liang 853* (TNM); Tanshui Dist., July 25, 1909, *Kawakami, Takiya et al. s.n.* (TAIF 23323); National Taiwan Univ. (NTU) campus, elev. ca. 0~50 m, *W. C. Leong 1099* (HAST). Miaoli Co.: Shihtan Township: Peiwo, May 8, 2003, *C. H. Chen 4770* (TNM). Taichung City: Taya Dist., May 30, 2000, *C. M. Wang 4231* (TNM); Hsinshue Dist., July 6, 2000, *C. M. Wang 4439* (TNM); Shengkang Dist.: Peichuang, elev. 176 m, Oct. 24, 1995, *C. M. Wang 1820* (TNM). Nantou Co.: Puli Town: Liyutan, June 22, 1998, *C. M. Wang 3384* (TNM). Yunlin Co.: Dounan, Sept. 28, 1986, *C. H. Ou 9883* (TCF). Chiayi Co.: Minhsiung Township, Sept. 26, 1987, *H. F. Yen 1671* (TNM); Hukou Township, May 21, 1987, *H. F. Yen 914* (TNM); Yichu Township: Yichu to Lutsao, elev. 10 m, Nov. 3, 1986, *H. F. Yen 121* (TNM). Tainan City: Liuying Dist.: Kuoyihou, Oct. 23, 2000, *C. M. Wang 4528* (TNM); Madou Dist.: Anle, Sep. 7, 1993, *H. F. Yen 8158A* (TNM). Pingtung Co.: Wukoushui, Apr. 5, 2001, *C. C. Lin 189* (TAIF). Ilan Co.: Chuangwei, July 18, 1984, *C. I Peng 7105* (HAST); Ilan, June 4, 2006, *G. H. Chen 102* (TCF). Taitung Co.: Chengkung, Jan. 20, 1995, *T. C. Huang 16725* (TAI).

Sect. 2. *Brachycarpae* (Benth.) Philcox, Kew Bull. 22(1): 50. 1968.

Ilysanthes sect. *Euilysanthes* Urban, Ber. Deut. Bot. Ges. 2: 434. 1884. *Lindernia* sect. *Euilysanthes* (Urban) Yamazaki, J. Jap. Bot. 52: 254. 1977; Yamazaki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 4. 1981. *syn. nov.*

In Philcox's treatment (1968), characteristics of the section *Brachycarpae* are 1 pair of stamens, 1 pair of stamenoides, and the broadly ovoid capsule. The type species is *L. hyssopioides* (L.) Haine. On the other hand, Yamazaki (1977) transferred section *Euilysanthes* from *Ilysanthes* to *Lindernia*. In Yamazaki's treatment, the section *Euilysanthes* was characterized by having fertile posterior stamens and anterior stamenoides. The type species of section *Euilysanthes* is *L. dubia* (L.) Pennell. In Yamazaki's treatment (1981), *L. hyssopioides* was under section *Euilysanthes*. We found that all species under these 2 sections had palmate leaf veins, 1 pair of stamens, 1 pair of stamenoides, and a broadly ovate capsule. In addition, section *Brachycarpae* was published earlier than section *Euilysanthes*. We concluded that section *Euilysanthes* should be treated as a synonym of section *Brachycarpae*.

2. *Lindernia rotundifolia* (L.) Alston in Triemen, Hand-Book Fl. Ceylon 6. Suppl.: 214. 1931. (Fig. 1).....圓葉母草
Gratiola rotundifolia L., Mant. 174. 1771 (Lectotype: LINN, photo!, Herb. Linn. No. 30.4).

Annual trailing herb. Stems green, 2.5~18 cm long, rooting at lower, most, or all nodes, glabrous; branching from base of stem. Leaves palmately 3~5-nerved, sessile, minutely glandular-punctate on both surfaces; lamina elliptic, ovate, obovate, or orbicular, 2~16 mm long, 1~12 mm wide; base cuneate to rounded; margin 2 or 3(4) pairs serrate or remotely toothed, occasionally entire; apex acute or obtuse. Flowers solitary in axils; pedicels alternate or occasionally opposite,

2~18 mm long, about 1/2 length of subtending leaf, stipitate-glandular, especially near base of pedicel; erect to spreading, often reflexed in fruit. Calyx deeply 5-lobed, zygomorphic or irregular, occasionally nearly actinomorphic, 1.4~2.5 mm long, lanceolate, acuminate, glandular. Corolla white or light-blue with purple blotches on throat and purple spots on lower lobes, tufts of trichomes at base of anterior lobes; tube 9~12.2 mm long. Androecium of 2 fertile stamens and 2 staminodes; free part of staminodial filament

2~3.2 mm long, staminodes slightly exerted from corolla tube, incurvate, with yellow glands; fertile anthers coherent, filaments 1.4~1.7 mm long, glabrous. Ovary ellipsoid, ca. 2 mm long; disk small, at ovary bottom, yellow; style 3~5.5 mm long, often persisting until capsule dehisces; stigma 2-parted. Capsule 1.5~3 mm long, approximately equaling and infrequently exceeding length of calyx, ovate to ellipsoid, apex acute, glabrous. Seeds yellow, falcate-oblong, rugate, 0.34~0.36 mm long, 0.15~0.16 mm wide, L/W ratio ca. 2.3.

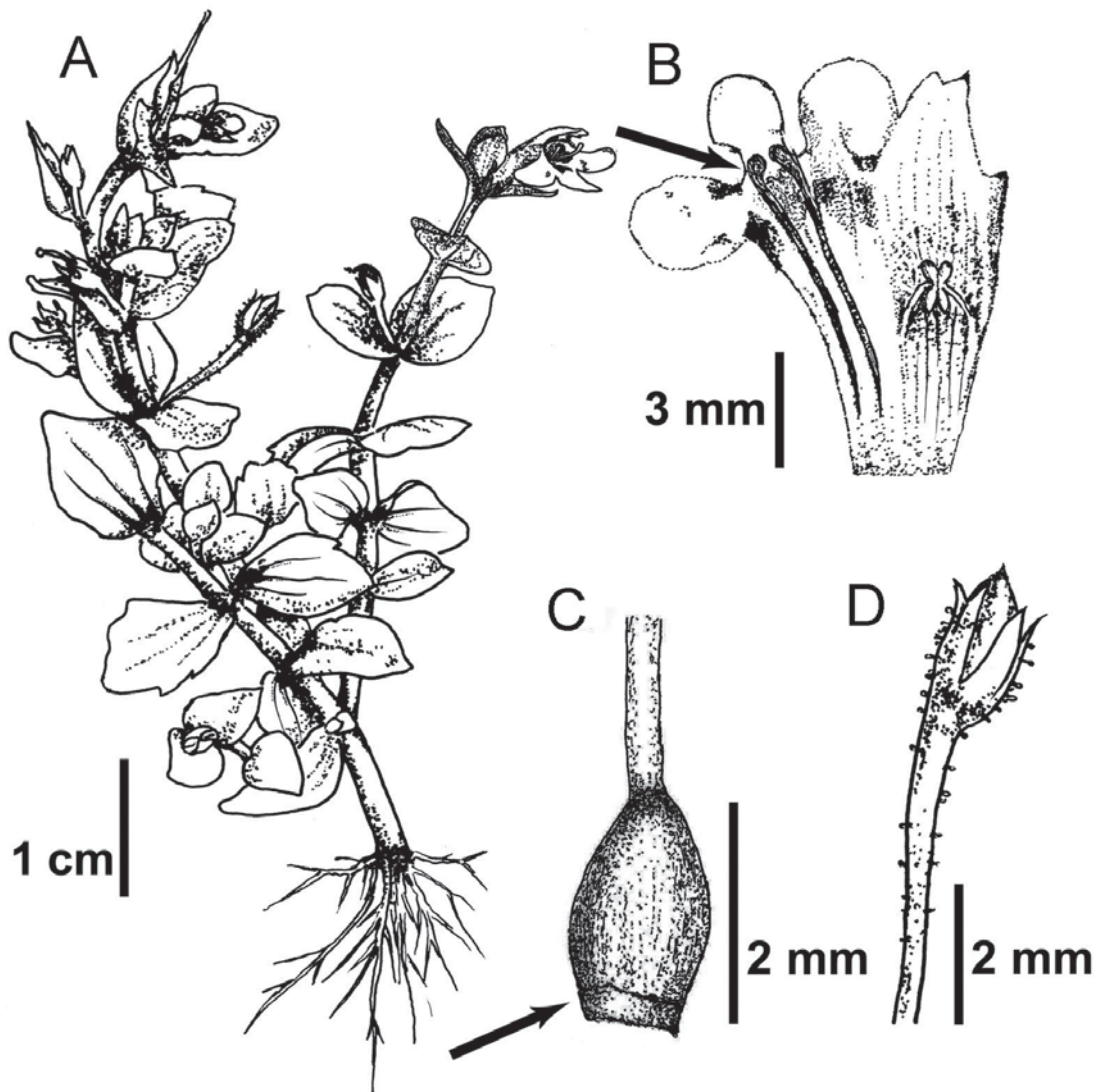


Fig. 1. *Lindernia rotundifolia* (L.) Alston. (A): Habit; (B): corolla and a pair each of stamens and anterior staminodes (arrow); (C): ovary and disk (arrow); (D): capsule.

Flowering and fruiting throughout year.

Widespread form Central and South America, Africa, India, Sri Lanka, and Vietnam. Naturalized in northern Taiwan (Ilan and Taipei counties), in wet meadows.

Specimens examined: TAIWAN: Ilan Co.: Ilan City, June 23, 2006, *Y. S. Liang 943* (TNM). New Taipei City: Shuangxi Dist., Feb. 20, 2008, *Y. S. Liang 1551A* (TNU).

This newly naturalized species is widespread in the Neotropics and Old World tropics. It is a widely used aquarium plant. In Taiwan, it is usually found in the northern and northeastern parts, in rice fields, wet meadows, and along streams.

3a. *Lindernia dubia* (L.) Pennell, Acad. Nat. Sci. Phil. Monogr. 1: 141. 1935; Ou, Bull. Exp. Forest. Natl. Chung Hsing Univ. 8: 19. 1987; Liu, Fl. Taiwan. 2nd ed. 4:605. 1998.

.....美洲母草
Gratiola dubia L., Sp. Pl. 17. 1753 (Lectotype: BM, photo!, Clayton 164).

Annual glabrous herb, erect to ascending, stem green, section quadrate, 5~20 cm long, much-branched near base, often rooting at lower nodes. Leaves sessile, elliptical, subspatulate, occasionally lanceolate, 5~25(~30) mm long, 7~14 mm wide, largest leaves near base, middle of stem, palmately 3~5-nerved, apex acute, base cuneate to attenuate, occasionally obtuse, margin 3 or 4 (5) pairs crenate, occasionally 3 or 4 (5) pairs sub-serrate, glabrous. Flowers solitary, axillary. Pedicel typically shorter than subtending leaves, occasionally approximately equaling or slight longer, 0.6~1 mm in diameter, 4~25(~30) mm long, section quadrate. Calyx actinomorphic, 3~6 mm long, sepals basally connate, lobes lanceolate, linear, surface asperate or gibbous. Corolla pink or pale-purple, occasionally very pale-purple to white, anterior lobes rarely with purple markings or spots, 6.5~11.9 mm long. Androecium 4; anterior pair of

staminodes, linear, ca. 8 mm long, apex free, 0.46~1.1 mm long, with spur-like appendages near apex, 1~1.6 mm long, posterior pair fertile, anthers 2-locule, coherent, included, posterior filament 1.1~1.9 mm long. Style 2.6~4 mm long, often presenting until fruit dehisces; stigma 2-parted. Disk small, at ovary bottom, yellow. Capsule ovate to oblong, apex acute, equaling or slightly longer than persistent calyx, at most 1.4-times longer than calyx, 3~4.3 mm long. Seeds numerous, oblong, 0.37~0.5 mm long, 0.12~0.22 mm wide, L/W ratio 2.26~2.84, seed-coat smooth. Flowering and fruiting May~Oct.

Native to the Americas. Taiwan, naturalized in paddy-fields, and marshy areas in the northern and central parts of the island, occasionally found in the south.

Specimens examined: TAIWAN: New Taipei City: Shuangshi Dist., elev. 100 m, Aug. 8, 2000, *P. F. Lu 1222* (TAIF); Tanshui Dist., elev. 50 m, May 28, 2006, *Y. S. Liang 844* (TNM); Shihmen Dist.: near Laomei Elementary School, elev. 50 m, May 28. 2006, *Y. H. Liang 859* (TNM). Taoyuan Co.: Lujhu Township: Fujhu, elev. 0~20 m, Oct. 12, 2002, *S. C. Liu 846* (TNU, HAST); Siouchaiwo, elev. 100~300 m, Aug. 30, 2001, *C. H. Chen 3964* (TNM); Puhsin, July 27, 1995, *H. F. Yen 10418* (TNM); Niaojuhueijan, elev. 350~400 m, *C. H. Chen 4053* (TNM). Hsinchu Co.: Hsinfeng Township: road mark ca. 65 km on Prov. Hwy 61, elev. ca. 0 m, Aug. 23, 1999, *C. I Peng 17680* (HAST). Taichung City: Taichung, Nov. 3, 1986, *C. H. Ou 10040* (TCF); Tali Dist., Oct. 21, 1986, *C. H. Ou 9967* (TCF); Taoyuan, elev. 0~50 m, June 22, 1988, *T. C. Huang et al. 135287* (TAI). Nantou Co.: Puli: Liyutan, elev. 530 m, June 22, 1998, *C. M. Wang 3381* (TNM). Pingtung Co.: Wanlwan Township, Mar. 21, 2001, *S. M. Ku 1296* (PPI). Ilan Co.: Tungshan Township: Wushiherchia, elev. ca. 5 m, July 9, 1998,

Y. C. Kao 576 (HAST); Yuanshan Township, elev. 50 m, June 23 2006, *Y. S. Liang 937* (TNM).

3b. *Lindernia dubia* (L.) Pennell var. *anagallidea* (Michx.) Cooperrider, *Castanea* 41(3): 224. 1976; Chaw and Kao, *J. Taiwan Mus.* 42: 97. 1989.....擬櫻草
Gratiola anagallidea Michx., *Fl. Bor. Am.* 1: 6. 1803.

Lindernia anagallidea (Michx.) Pennell, *Acad. Nat. Sci. Phil. Monogr.* 1: 141. 1935; Liu, *Fl. Taiwan*. 2nd ed. 4: 603. 1998.

Annual glabrous herb, erect to ascending, stem green, basal stem usually red to dark-red, section quadrate, 3~25(~36) cm long, much-branched near base, often rooting at lower nodes. Leaves sessile, lanceolate, ovate, slightly 3 or 4 pairs serrate or entire, apex acute, base rounded to truncate, margins subentire, glabrous, 5~20(~24) mm long, 3~13 mm wide, largest leaves near base, middle of stem palmately 3~5-nerved. Flowers solitary, axillary; stem terminal ones more or less subumbel-like (terminal leafy racemes). Pedicel occasionally approximately equaling to more typically 1.2~3-times longer than subtending leaves, 0.1~0.5 mm in diameter, 3~30 mm long, section quadrate. Calyx actinomorphic, 3~5 mm long, sepals basally connate, lobes lanceolate, linear, surface asperate or gibbous. Corolla white or very pale-purple with purple markings or spots at base of anterior lobes, 5~7.6 mm long. Androecium 4; anterior pair of staminodes linear, 4~6 mm long, apex free, 1~1.3 mm long, with spur-like appendages near apex, 0.5~0.8 mm long, posterior pair fertile, anthers 2-locule, coherent, included, posterior filament 1.2~1.4 mm long. Style 3~6 mm long, often presenting until fruit dehiscence; stigma 2-parted. Disk small, at ovary bottom, yellow. Capsule ovate to oblong, apex acute, equaling or slightly longer than persistent calyx, 2.5~4.6 mm long.

Seeds numerous, oblong to oval, 0.28~0.36 mm long, 0.13~0.14 mm wide, L/W ratio ca. 2.3, seed-coat smooth. Flowering and fruiting Apr.~Oct.

Native to the Americas. Taiwan, naturalized in paddy fields, and marshy areas in the north, rarely in the south.

Specimens examined: TAIWAN: Taoyuan Co.: Yangmei Town: Pushi, elev. ca. 200 m, Mar. 19, 2002, *W. C. Leong 2732* (HAST); Longtan, Aug. 31, 1988, *M. T. Kao 10746* (TAI, HAST); Jhongli: Shuangzunkou, elev. 0~100 m, Sept. 9, 2002, *C. C. Chen 396* (HAST); Hsinwu: Dajhuangpu, elev. ca. 40~60 m, Sept. 11, 2002, *S. C. Liu 804* (TNU, HAST). Hsinchu Co.: Hsinfeng Township: road mark ca. 65 km on Prov. Hwy. 61 elev. ca. 0 m, Aug. 23, 1999, *C. I. Peng 17677* (HAST); Hsinfeng Township: Lienhwa Temple, Sept. 5, 1984, *C. I. Peng 7239* (HAST). Pingtung Co.: Tungkang, elev. 30 m, Dec. 30, 1999, *Y. P. Cheng 2881* (TAIF).

Lindernia dubia var. *anagallidea* was recorded in the *Flora of Taiwan* 2nd ed. (Liu 1998) as *L. anagallidea*. In a revision of New World *Lindernia* (Lewis 2000), *L. dubia* was treated as having 4 varieties of which var. *anagallidea* was included, and the author pointed out the difficulty in distinguishing var. *anagallidea* and var. *dubia* in some areas. Var. *anagallidea* may be distinct from var. *dubia* by the shorter leaves, darker-gold seeds, pedicels longer than the leaf, and a greater number of filiform pedicels (Pennell 1935, Diaz-Miranda 1977, Lewis 2000). In Taiwan, these 2 taxa also could be distinguished by the leaf shape: var. *dubia* is elliptical or subspatulate, and var. *anagallidea* is lanceolate to ovate. Var. *dubia* with lanceolate leaves was only recorded in Kaohsiung (Mei-Nung Dist.) and Ilan (Wu-Wei Gang). It is commonly naturalized in Japan according to herbarium records (KYO, TI). In a handbook of wetland

plants, var. *dubia* with lanceolate leaves was claimed to be an un-approved new species (Lin 2009). We confirmed it as *L. dubia* var. *dubia*.

Sect. 3. *Torenioides* (Benth.) Pennell, Acad. Sci. Phil. Monogr. 1: 139, 1935.

4. *Lindernia crustacea* (L.) F. Muell., Syst. Census. Aust. pl. 97. 1887; Mori in Masamune, Short Fl. Form. 191. 1936; Li, Q. J. Taiwan Mus. 3: 65. 1950; Li, Q. J. Taiwan Mus. 14: 3. 1961; Philcox, Kew Bull. 22(1): 17. 1968; Yamazaki, J. Jap. Bot. 52(8): 254. 1977; Tsoong and Ku, Fl. Reipubl. Popularis Sin. 68: 129. 1979; Yamazaki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 36. 1981; Liu, Fl. Taiwan. 2nd ed. 4: 605. 1998.....藍豬耳
Capraria crustacea L., Mant. Pl. 87. 1767 (Lectotype: LINN, photo!, Herb. Linn. no. 785.3).

Vandellia crustacea (L.) Benth., Scroph. Ind.: 25. 1835; Matsumura and Hayata, J. Coll. Sci. Univ. Tokyo 22: 279. 1906 (Enum. Pl. Form.); Yamazaki, J. Jap. Bot. 30: 178. 1955; Li, Fl. Taiwan 4: 603. 1978.

Annual herb. Stems ascendant or dif-fused, 5~25(~40) cm long, occasionally rooting at nodes, quadrangular, sparsely pubescent on angles and nodes. Leaves ovate-oblong, ovate or broadly ovate; acute, acuminate or occasionally obtuse at apex, rounded or subtruncate at base, subacute-serrate, 8~16.5 mm long, 5~11.3 mm wide, glabrous on both surfaces, shortly hirsute on margin and veins; veins pinnately nerved; petioles 2~5(~7) mm long, glabrous or sparsely pubescent. Flowers solitary, axillary, or stem terminal ones more or less subumbel-like; pedicels (4~)7.5~17.5(~20.5) mm long when flowering, 12~25.9 mm long when fruiting, quadrangular, glabrous or sparsely pubescent at angle. Calyx tubular, 4~5.5 mm long when

flowering, 4~6 mm long when fruiting, shortly 5-lobed, slightly pubescent on the main nerves giving rise to pronounced ridges. Corolla purple or blue, 7~8.5 mm long, posterior lip ovate, shallowly bilobed, anterior lip with 3 rounded lobes, with darker-blue marker at basal central lobe; outer surface of tube glabrous-like, sparsely glandular and clavellate at margin, internally yellow on basal ventral side. Stamens 4, all fertile; posterior anthers each with connective of lower cell produced into a short projection; posterior filements 1.2~1.5 mm long; anterior filaments geniculate, 2.5~3.2 mm long, finely glandular between basal filament, each with a blunt linear appendage, 0.4~1.2 mm long. Ovary ovoid, ca. 2.2 mm long, 1.3 mm wide; disk yellow, entirely surrounding ovary, a little concave on dorsal side, ca. 0.4 mm long. Capsule ovate to elliptical, apex obtuse, rotundate, 3.7~5.15 mm long, 2~2.6 mm wide, enclosed with persistent calyx. Seeds oval to orbicular, 0.34~0.41 mm long, 0.28~0.33 mm wide, L/W ratio ca. 1.35, scrobiculate, with many projections. Flowering and fruiting throughout year.

India, Nepal, Sri Lanka, Malaysia, Indo-China, China, Japan, the Philippines, Australia, and New Guinea, Polynesia, Madagascar. Taiwan in meadows, roadsides, rice fields, dry ground, sandy ground, and semi-open forests below 1000 m in elevation.

Specimens examined: TAIWAN: Taipei City: Taipei Botanic Garden, Aug. 10, 1910, Y. Fukuda s.n. (TAIF 72618). New Taipei City: Shihting Dist.: Wu-Keng, elev. 200~300 m, Dec. 15, 2000, C. H. Chen 3754 (HAST); Pinglin Dist.: Talin Village, elev. ca. 300 m, Oct. 24, 1991, C. I Peng 14680 (HAST). Hsinchu Co.: Henshan Township: Mafu, Nov. 21, 2004, C. M. Wang 7943 (TNM). Miaoli Co.: Tungshiao Township: close to Tzuyun Temple, elev. ca. 200 m, Apr. 12, 2000, C. H. Lin.

159 (HAST). Taichung City: Loungchin Dist., elev. 295 m, July 8, 2006, *T. Y. A. Yang 18294* (TNM); Tatu Dist., elev. 100 m, Nov. 2, 2005, *C. M. Wang 8390* (TNM); Mai-Psin, Nov. 28, 1923, *S. Sasaki s.n.* (TAIF). Nantou Co.: Chushan Town: Shuili Township, Erhpingsai, elev. 450 m, May 7, 1998, *C. M. Wang 3210* (TNM); Yuchih Township: Lienhuachih, elev. ca. 640 m, Aug. 1, 1994, *C. M. Wang 1136* (TNM, HAST). Yunlin Co.: Kukeng Township: Shanfeng, Kukeng Farm, July 30, 1994, *H. F. Yen 9560* (TNM). Chiayi Co.: Minhsiung Township, Jan. 16, 1994, *H. F. Yen 8985* (TNM); Chiayi City, Aug. 14, 1994, *H. F. Yen 9617* (TNM). Tainan City: Shinhua Forest, Oct. 10, 1970, *Y. C. Liu et al. s. n.* (TCF). Kaohsiung City: Meinung Dist., elev. 30 m, Oct. 21, 1987, *H. F. Yen 1791* (TNM). Alien Dist., elev. 40 m, Nov. 16, 1987, *H. F. Yen 1933* (TNM). Pingtung Co.: Changjih, Nov. 26, 1985, *L. C. Zhang 2* (PPI); Neipu Township, Nov. 6, 1987, *S. Z. Yang 3893* (PPI); Neipu Township, Oct. 26, 1999, *S. M. Ku 192* (PPI). Ilan Co.: Yuanshan Hsiang, elev. 50 m, June 23 2006, *Y. S. Liang 939* (TNM); Taitung Co.: Southern Cross-Island Highway 73 k, May 23, 2003, *C. H. Chen 4811* (TNM). Hualien Co.: Tehsing, elev. 30 m, Nov. 5, 1998, *T. Y. A. Yang 11572* (TNM); Hualien, Sept. 2, 1987, *S. Z. Yang 5283* (PPI); Michan, elev. 100 m, Sep. 26, 2000, *T. T. Chen 10995* (TAIF). Taitung Co.: Lanyu Township, Hungtuo Village, Orchid Island, Apr. 28, 1983, *T. C. Huang et al. 9355* (TAI); Lanyu Township, Aug. 30, 1985, *Q. E. Zhang 17199* (PPI); Lutaο (Green Island), Sept. 30, 1982, *C. E. Chang 16507* (PPI).

Sect. 4. *Angustifolia* Hara, J. Jap. Bot. 19: 205, 1943.

5. *Lindernia anagallis* (Burm. f.) Pennell, J. Arnold. Arbor. 24: 252. 1943; Yamazaki, J. Jap. Bot. 52(8): 255. 1977; Tsoong and Ku,

Fl. Reipubl. Popularis Sin. 68: 143. 1979; Liu, Fl. Taiwan. 2nd ed. 4: 604. 1998.

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Ruellia anagallis Burm. f., Fl. Ind. 135. 1768 (Holotype: L!, Java, 1759, *Kleinhof s.n.*).

Gratiola cordifolia Colsm., Prodr. Desc. Grat.: 15. 1793 (Type: C!, Ceylon, *Koenig s.n.*).

Vandellia pedunculata Benth., Scroph. Ind. 37. 1835 (Holotype: K!, East Bengal, Sylhet, *Wallich 3949G*); Matsumura and Hayata, J. Coll. Sci. Univ. Tokyo 22: 279. 1906 (Enum. Pl. Form.).

Lindernia cordifolia (Colsm.) Merr., Enum. Borean Pl. 524. 1921; Mori in Masamune, Short Fl. Form. 191. 1936; Li, Quart. J. Taiwan Mus. 3: 66. 1950.

Vandellia cordifolia (Colsm.) G. Don, Gen. Syst. 4: 549. 1838; Merr., Fl. Manila. 425. 1912; Yamazaki, J. Jap. Bot. 30: 175. 1955; Li, Fl. Taiwan 4: 603. 1978.

Annual herb. Stems erect or creeping and rooting at nodes, 20~40(~60) cm long, glabrous, quadrangular. Leaves very shortly petiolate or subsessile; lamina pinnately nerved, broadly deltoid-ovate to ovate, obtuse or acute at apex, rounded to subcordate at base, adpressedly crenate, 5~25 mm long, 3~12 mm wide, glabrous on both surfaces. Flowers solitary, axillary, or stem terminal ones more or less subumbel-like (leafy racemes); pedicels slender, 1~4 cm long, glabrous, quadrangular. Calyx deeply 5-lobed almost to base, 3.5~5.5 mm long, lobes narrowly lanceolate, acute, glabrous. Corolla purple or pink, 8.3~12 mm long, posterior lip ovate, shallowly bilobed, anterior lip with 3 rounded lobes, central one slightly larger than laterals, with yellow spot on central lobe, tube glandular on outer surface, internal surface glabrous. Stamens 4, all fertile; posterior filament 1.5~1.95 mm long, anterior filament geniculate, 2.9~4.5 mm long, with appendages arising near base, ca.

0.4~1.5 mm long; posterior anthers ca. 2 mm long, each with a connective of lower cells, terminal cells produced into a long tail of ca. 1 mm. Ovary elliptical, ca. 2.5 mm long; style ca. 4 mm long; disk yellow, surrounding basal ovary with cleft on dorsal side, ca. 0.9 mm long. Capsule cylindrical, acute, 8~13 mm long, ca. 1.5 mm wide, much longer than persistent calyx. Seeds oval or a short cylinder, 0.3~0.34 mm long, 0.18~0.20 mm wide, L/W ratio 1.65, scrobiculate, with many projections. Flowering and fruiting throughout year.

India, Malaysia, Indochina, S. China, the Ryukyus (Japan), the Philippines, Australia, and New Guinea. Taiwan in marshy ground, riversides, rice fields, and meadows below 1000 m in elevation.

Specimens examined: TAIWAN: Taipei: Yangmingshan National Park, Tsuitsuiku, elev. ca. 760 m, July 1, 1993, *C. H. Chen* 12 (HAST); Taipei, Sept., 1918, *S. Sasaki* s.n. (TAIF); Taipei, June, 1913, *Mori*, *U. s.n.* (TAIF); Chinshan Dist.: Chinshan, elev. 50 m, May 28, 2006, *Y. S. Liang* 856 (TNM). Taoyuan Co.: Longtan, Aug. 31, 1988, *M. T. Kao* 10744 (TAI); Jenmei, May 14, 1975, *C. M. Kuo* 6157 (TAI); Gueishan Township: Fungshu, elev. 100~200 m, Sept. 28, 2002, *C. C. Chen* 468 (TNU, HAST, TNM). Hsinchu Co.: Hsinchu, May 13, 1923, *Y. Simada* 908c (TAI); Sintiku, May 13, 1923, *Y. Simada* 928B (TAIF). Miaoli Co.: Cholan, June 28, 1984, *W. S. Tang* 553 (TAI); Nanchuang Township: Shuilung, July 7, 2002, *C. M. Wang* 5785 (TNM). Taichung City: campus of National Chung Hsing Univ., elev. 5~10 m, Mar. 7, 1984, *C. I. Peng* 6440 (HAST); Shuikutou, Nov. 30, 1984, *T. Y. Yang* 820 (TAI); Taichung, July 18, 1975, *C. H. Ou et al.* 3509 (TCF). Changhua Co.: Puhsin, Oct. 13, 1988, *S. M. Chaw* 745 (TNM). Nantou Co.: Kan-tzu-lin, elev. 300 m, Oct. 16, 1988, *G. S. Wang* 385 (TNM; TAI). Yunlin Co.:

Kukeng Township: Shanfeng, Kukeng Farm, July 30, 1994, *H. F. Yen* 9562 (TNM); Tounan Township: Tounan granary, elev. 20 m, Mar. 12, 1987, *H. F. Yen* 607 (TNM). Chiayi Co.: Talin, elev. 30 m, Jan. 11, 1987, *H. F. Yen* 329 (TNM); Chuchi Township: Neipu to Chiushe, elev. 150 m, Sept. 30, 1990, *H. F. Yen* 4176 (TNM); Chuchi City, Nov. 6, 1995, *H. F. Yen* 10879 (TNM). Tainan City: Tsochen Dist., elev. 80 m, Aug. 22, 1988, *H. F. Yen* 3902 (TNM). Pingtung Co.: Tachin, Kaosu, Jan. 17, 1982, *M. T. Kao* 9572 (TAI); Suchungchi, June 13, 1984, *M. T. Kao* 10011 (TAI); Wanlwan Township, Apr. 15, 2000, *S. Z. Yang* 28947 (PPI). Ilan Co.: Yuanshan Township: near Pitouhu, elev. ca. 150 m, Nov. 15, 2000, *C. H. Lin* 921 (HAST); Shuanglienpei, June 23, 2006, *Y. S. Liang* 941 (TNM). Hualien Co.: Michan, elev. 100 m, Sept. 26, 2000, *T. T. Chen* 11003 (TAIF).

Sect. 5. *Setulosae* (Yamazaki) Philcox, Kew Bull. 22: 32. 1968.

6. *Lindernia scutellariiformis* Yamazaki, J. Jap. Bot. 27(2): 67. 1952 (Holotype: TII, Taiwan, Tainan. *Sasaki* s.n.); Li, Q. J. Taiwan Mus. 14: 13. 1961; Yamazaki, J. Jap. Bot. 52(8): 255. 1977; Tsoong and Ku, Fl. Reipubl. Popularis Sin. 68: 138. 1979; Liu, Fl. Taiwan. 2nd Ed. 4: 607. 1998.
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Vandellia scutellariiformis (Yamazaki) Yamazaki, J. Jap. Bot. 30: 174. 1955; Li, Fl. Taiwan 4: 605. 1978.

Annual herb, repent to procumbent, branched stem usually ascending, stem green, section quadrate, setulose at angle and nodes, 20~48 cm long, often rooting at procumbent stem nodes, branched at procumbent stems. Leaves petiolate, petiole ca. 2.5 mm long, leaves ovate, 13~30 mm long, 10~22 mm wide, pinnately nerved, apex acute to obtuse, base truncate to cordate, margin serrate, 4~6

pairs, sub-glabrous to slightly scarios above, rarely slightly setulose, sparsely setulose below, more on veins. Flowers in 3~10-flowered racemes. Inflorescence 3.3~13 cm long, basal flower (first flower) usually leaf-opposite or bract-opposite. Pedicel 11~27 mm long, opposite, section quadrate, with subtending bract, 3.1~3.3 mm long, lanceolate. Calyx actinomorphic, 5.7~9.8 mm long, sepals basally connate, lobes lanceolate, linear, thinly puberulous. Corolla white, upper outer surface red to dark-red, upper inner surface yellow, anterior lobes occasionally with purple marks, outer surface of corolla tube densely glandular, 10~14.5 mm long. Androecium 4, all fertile; anterior pair of stamens ca. 8 mm long, filament geniculate, 2.8~4 mm long, with clavate appendages, 1.7~3.1 mm long, yellow, anthers 2-locule, ca. 2 mm long, posterior pair of filaments 1.7~2.9 mm long, anthers 2-locule, 0.8~1.3 mm long, coherent, included, posterior anthers longer than anterior ones. Style ca. 8 mm long; stigma 2-parted. Disk yellow, slender, glandular. Capsule oval to elliptical-oblong, apex acute, equaling or slightly shorter than persistent calyx, 7.5~8 mm long. Seeds numerous, orbicular, scrobiculate, 0.30~0.34 mm long, 0.29~0.30 mm wide, L/W ratio ca. 1.08, seed-coat with many projections. Flowering and fruiting May~Dec.

Endemic to Taiwan. In wet semi-open forests in southern of Taiwan at 300~1500 m in elevation.

Specimens examined: TAIWAN: New Taipei City: Urai, Aug. 17, 1914, *S. Kawagoe s.n.* (L). Yunlin Co.: Kukeng Township, elev. 500 m, July 20, 1990, *H. F. Yen 3957* (TNM). Chiayi Co.: Chiayi Farm, elev. 250 m, July 1, 1989, *T. C. Huang et al. 14192* (TAI); Chiayi, Chonglun, elev. 600 m, June 14, 1988, *H. H. Yen et al. 10709* (TAI); Meishan Township: Taiping to Tachienshan, Nov. 28, 1993, *H. F. Yen 8455* (TNM); Chuchi Township:

Chiaoliping to Rueili, Aug. 8, 1993, *H. F. Yen 8123* (TNM); Tapu Township: Tingpinglin, Pienfutung, elev. 500 m, Nov. 17, 1990, *H. F. Yen 4370* (TNM); Fanlu Township: Laitou to Tsaoshan, elev. 900~1000 m, Oct. 24, 1987, *H. F. Yen 1850* (TNM); Chuchi Township: Yuntan Rest Station to Shuisheliao, elev. 955 m, Sept. 10, 2004, *C. M. Wang 7734* (TNM); Tsaoshan, broadleaf forest, elev. ca. 1000~1100 m Oct. 24, 1987, *Y. K. Chen 325* (HAST); Chiehtung Villa to Tienyunshan, elev. ca. 700~1300 m, Nov. 1, 1985, *C. I Peng 8822* (HAST); Fanlu Township: Longmei to Tsaoshan, elev. ca. 900~1000 m, Nov. 9, 1986, *C. I Peng 10033* (HAST). Tainan City: Tungshan Dist.: Hsienkung Temple to Kantoshan, elev. ca. 500~800 m, May 26, 1992, *C. C. Wang 1172* (HAST). Kaohsiung City: Taoyung Dist.: Tenhchih, Chuyunshan logging tract, elev. ca. 1500 m, July 8, 1997, *J. C. Wang 10409* (TNU, HAST).

Lindernia scutellariiformis is the only endemic species of the genus in Taiwan. Based on our field surveys and herbarium records, the main distribution is at several restricted low-elevation mountain areas in southwestern Taiwan. Only 1 specimen in the northern part of Taiwan was recorded by Kawagoe (in the L herbarium) in 1914.

Sect. 6. *Numularia* (Benth.) Philcox, Kew Bull. 22: 10. 1968.

7. *Lindernia nummularifolia* (D. Don)

Wettst. in Engler and Prant, Nat. Pflanzenfam. IV, 3B: 79. 1891. (Fig. 2).....寬葉母草

Vandellia nummularifolia D. Don, Prodr. Fl. Nep. 86. 1825.

Annual herb 4~10 cm tall. Stems simple or slightly branched, erect, more or less quadrangular, with short hispid hairs on angles. Leaves sessile, pinnately nerved but appearing palmately nerved, suborbicular or ovate-orbicular, acute-serrate, 3~25 mm long

and wide, glabrous above, sparsely hirsute beneath only on nerves, shortly pubescent at margin. Flowers solitary-axillary, or in racemes with few flowers; pedicels slender, 3~15 mm long, glabrous except sparsely his-

pid on upper parts. Bracts setaceous, 0.7~1 mm long. Calyx 1.5 mm long, 5-lobed near middle, lobes ovate, subacute, about as long as calyx-tube. Corolla violet to white, ca. 7 mm long, tube externally sparsely glandular,

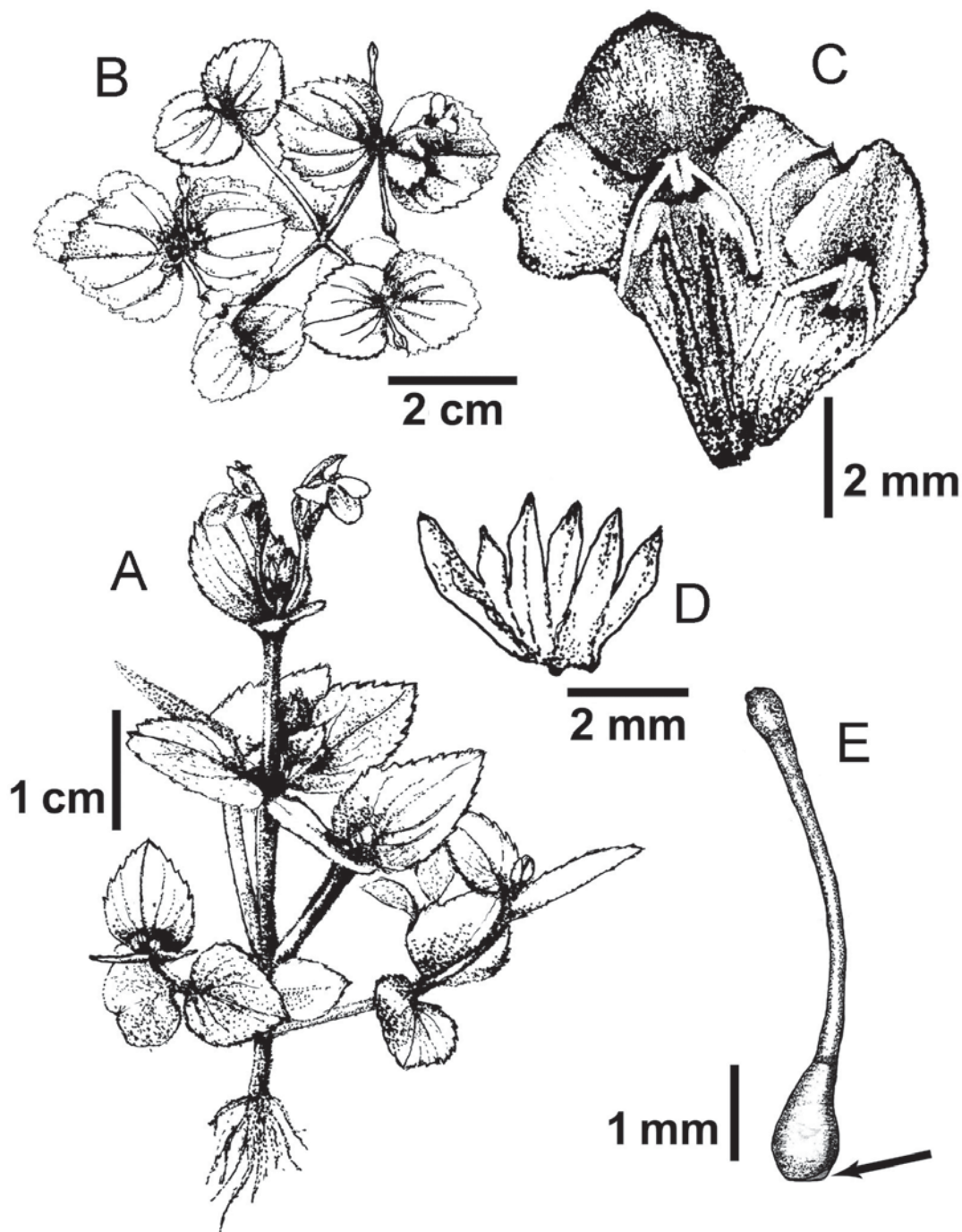


Fig. 2. *Lindernia nummularifolia* (D. Don) Wettst. (A, B): Habit; (C): corolla and stamens; (D). calyx; (E): ovary and disk (arrow).

internally densely lanate on ventral side, posterior lip broadly ovate, ca. 3 mm long, 2.5 mm wide, emarginated, anterior lip with 3 rounded lobes. Stamens 4, all fertile; anterior filaments each with a thick geniculum at base. Capsule linear-cylindric, acute at apex, 5~6 mm long, 2 mm wide, 1.5~2-times as long as persistent calyx. Seeds oval to ellipsoidal, 0.45~0.48 mm long, 0.26~0.32 mm wide, scrobiculate, with many projections. Flowering July~Sept. and fruiting Aug.~Nov.

India, Nepal, Burma, Thailand, Vietnam, Malaysia, W. and C. China, Madagascar, Taiwan in wet meadows in south (Pingtung County).

Specimens examined: TAIWAN: Pingtung Co.: Ma-Kua, Sept. 11, 1973, *T. C. Huang 7476* (TAI).

This newly recorded species was collected from Ma-Kua, Pingtung. It is an Old World species widespread in Africa, India, Nepal, Burma, Thailand, Vietnam, to W. and C. China. This species belongs to section *Numularia* which contain 2 taxa (the other is *L. sessiliflora* Wettst). The venation of section *Numularia* is pinnate, but appears palmate because the secondary veins are elongated toward the leaf apex. In Asian *Lindernia*, this kind of venation was observed only in plants of this section and a very similar genus, *Craterostigma*, in the tribe Linderniae.

Sect. 7. *Tittmannia* (Rchb.) Philcox, Kew Bull. 22: 33. 1968

8. *Lindernia pusilla* (Willd.) Boldingh, Zahl. Landoustr. Java 165. 1916; Mori in Masamune, Short Fl. Form. 191. 1936; Yamazaki, J. Jap. Bot. 52(8): 254. 1977; Tsoong and Ku, Fl. Reipubl. Popularis Sin. 68: 133. 1979; Liu, Fl. Taiwan. 2nd Ed. 4: 607. 1998.....見風紅

Gratiola pusilla Willd., Sp. Pl. 1: 105. 1797.

Vandellia scabra Benth., Scroph. Ind. 36. 1835 (Syntype: K!, India, *Wallich 3545A, 3945B, 3945D, 3945E, 3946A, 3946B*); Matsumura and Hayata, J. Coll. Sci. Univ. Tokyo 22: 279. 1906 (Enum. Pl. Form.).

Lindernia stellarifolia Hayata, Icon. Pl. Form. 9: 77. 1920 (Type: TII!, Aug. 5, 1917, *Matsuda s.n.*); Mori in Masamune, Short Fl. Form. 191. 1936; Li, Q. J. Taiwan Mus. 3: 67. 1950; Li, Q. J. Taiwan Mus. 14: 13. 1961.

Lindernia hirta (Cham. & Schlecht.) Pennell, J. Arnold. Arbor. 24: 250. 1943; Li, Q. J. Taiwan Mus. 3: 67. 1950; Li, Q. J. Taiwan Mus. 14: 5. 1961.

Vandellia hirta (Cham. & Schlecht.) Yamazaki, J. Jap. Bot. 30: 174. 1955; Li, Fl. Taiwan 4: 605. 1978.

Annual herb 5~15 cm tall. Stems simple and erect, or slightly branched and diffused, sparsely to densely pubescent mixed with spreading long hairs. Leaves broadly ovate to suborbicular, obscurely crenate, 4~11(~15) mm long, 4~10 mm wide, pubescent above, hirsute beneath, veins pinnately nerved; leaves subsessile or sessile. Flowers solitary-axillary, or in pairs or clusters at each axil; pedicels slender, 5~13 mm long, longer than subtending leaf, sparsely hispid mixed with glandular hairs. Calyx deeply 5-lobed almost to base, actinomorphic, lower lobes slightly longer than upper, 3.1~4 mm long, lobes lanceolate, acuminate, hispid, mixed with glandular hairs. Corolla 5.5~8.8(~9.8) mm long, usually white, outer surface glabrous, posterior lip broadly ovate-emarginate, anterior lip with 3 rounded lobes, basal central lobe with yellow marks. Stamens 4, all fertile; posterior filaments 1.2~1.9 mm long, anterior filaments in 2 parts, 2.5~3 mm long at incurvate part, 1.5~1.7 mm long at straight part, each with a broad geniculum arising near base, ca. 0.2 mm long, sparsely villose between basal anterior stamens; anthers without tail at terminal.

Ovary globose, glabrous, ca. 2 mm long; style 4.5~5.8 mm long; disk yellow, adhering to ovary on ventral side, about 1/3 length of ovary, ca. 0.7 mm long. Capsule subglobose, 2~2.5 mm long and wide, slightly shorter than persistent calyx, caudate at apex. Seeds sub-oblong, 0.36~0.40 mm long, 0.25~0.29 mm wide, lophate. Flowering and fruiting throughout year.

India, Burma, Sri Lanka, Malaysia, Indo-China, S. China, the Philippines, and New Guinea. In Taiwan, usually found in rice fields, wet meadows, and marshy fields below 1000 m in elevation.

Specimens examined: TAIWAN: Taipei: Taipei, Sept., 1918, *S. Sasaki s.n.* (TAIF); Yangmingshan, Sept. 14, 1991, *M. T. Kao s.n.* (TNM). Taitung Co.: Lanyu Township, Hongtou, Orchid Island, Oct. 25, 1989, *M. T. Kao 10816* (TAI). Chengkung, elev. 0~20 m, Jan. 20, 1995, *T. C. Huang et al. 16727* (TAI); Lanyu Township: Yunghsing Farm, July 17, 2003, *C. K. Yang 269B* (TNM). Yunlin Co.: Kukeng Township: Shanfeng, Kukeng Farm, elev. ca. 250 m, July 30, 1994, *H. F. Yen 9556* (HAST); Kukeng Township: Shanfeng, Kukeng Farm, July 30, 1994, *H. F. Yen 9556* (TNM). Kaohsiung City.: Liukuei Dist.: Hsinhsing Village, border of rice paddy, elev. ca. 150 m, Nov. 21, 1987, *C. I Peng 11207* (HAST); Meinung Dist., elev. 30 m, Oct. 21, 1987, *H. F. Yen 1789* (TNM). Pingtung Co.: Kaoshu, Apr. 20, 1983, *M. T. Kao 10195* (TAI). Hualien Co.: Hungyeh, elev. ca. 200 m, June 17, 1989, *S. F. Huang et al. 14123* (TAI). Ilan Co.: Ilan City, June 23, 2006, *Y. S. Liang 942* (TNM); Litse, Nov. 12, 1994, *S. P. Li s.n.* (TNM); Nanao, near paddy field, Dec. 28, 1987, *T. C. Huang et al. 13369* (TAI).

9. *Lindernia viscosa* (Hornem.) Boldingh, Zahl. Landoustr. Java 165. 1916; Mori in Masamune, Short Fl. Form. 191. 1936; Hara, J. Jap. Bot. 19: 207, 1943; Yama-

zaki, J. Jap. Bot. 52: 254. 1977; Yamazaki, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 13: 14. 1981; Liu, Fl. Taiwan. 2nd ed. 4: 609. 1998.屏東見風紅
Gratiola viscosa Hornem., Enum., Pl. Hort. Hafn. 19. 1807 (Lectotype: C!, 1808, *Hornemann s.n.*).

Vandellia hirsuta Hamilt. ex Benth., Scroph. Ind. 36. 1835 (Syntype: K!, *Wallich 3942A~D*); Matsumura and Hayata, J. Coll. Sci. Univ. Tokyo 22: 279. 1906 (Enum. Pl. Form.).

Vandellia viscosa (Hornem.) Merr., Philip. J. Sci. Bot. 7: 246. 1912; Yamazaki, J. Jap. Bot. 30: 173. 1955; Li, Fl. Taiwan 4: 606. 1978.

Lindernia cruciformis Hayata, Icon. Pl. Form. 9: 78. 1920 (Type: TI!, Taiwan, Ako. July 2, 1915, *T. Soma s.n.*); Mori in Masamune, Short Fl. Form. 191. 1936.

Lindernia viscosa (Hornem.) Merr., Sp. Blaco. 14: 4. 1918; Tsoong and Ku, Fl. Reipubl. Popularis Sin. 68: 133. 1979.

Lindernia viscosa (Hornem.) Boldingh var. *glabra* Yamazaki, Fl. Jap. 3a: 338. 1993, *syn. nov.* (Type: TI!, Taiwan. Aug. 7, 1928, *S. Matsumoto s.n.*).

Annual herb 4~20 cm tall. Stems slightly branched, erect or ascendently diffused, quadrangular, sparsely to densely hispid mixed with spreading gland. Leaves pinnately nerved; lower leaves petiolate, petioles 3~8 mm long, hirsute to sub-hirsute; lamina ovate, oblong-ovate, or obovate, obtuse at apex, base gradually narrowing to petiole, 2~3.5 cm long, 1~2 cm wide, undulate or crenate-dentate; upper leaves subsessile to sessile, ovate-lanceolate to broadly ovate, 10~20 mm long, 4~12 mm wide; both upper and lower leaves hirsute or slightly glandular on both surfaces, particularly on nerves on underside. Inflorescences racemose at ends of stems, glandular, slightly flowered; pedicles slender,

4~8 mm long, opposite, glandular-pubescent; bracts lanceolate to subulate, 1~2 mm long. Calyx deeply 5-lobed almost to base, 2~3.1 mm long, lobes linear-lanceolate, acuminate to acute, hairs glandular. Corolla white, 3.7~5 mm long, upper exterior surface of tube pale-brown, glabrous, posterior lip broadly ovate, emarginated or undulate at margin, anterior lip with 3 suborbicular lobes, central lobe with small yellow mark at base. Stamens 4, all fertile; posterior filaments 0.8~1 mm long, anterior filaments in 2 parts, 1.2~2 mm long at incurvate part, 0.7~1 mm long at straight part, each with a broad geniculum arising near base, ca. 0.15 mm long, sparsely villose between basal anterior stamens and geniculum; anthers without tail at terminal. Ovary ovate, glabrous, ca. 1.5 mm long; style ca. 4 mm long; disk yellow, adhering to ovary on ventral side, ca. 0.4 mm long. Capsule ovate to globose, 2.5~3.6 mm long and wide, equaling or slightly shorter than persistent calyx. Seeds oval, 0.27~0.32 mm long, 0.20~0.23 mm wide, L/W ratio ca. 1.37, scrobiculate, seed-coat with many projections. Flowering and fruiting June~Nov.

India, Nepal, Burma, Malaysia, Indo-China, S. China, the Philippines. In Taiwan, in forest edges or roadsides in the south below 500 m in elevation.

Specimens examined: TAIWAN: Tainan City: Hsikang Dist., elev. ca. 15 m, Oct. 14, 1987, *H. F. Yen 1764* (TNM). Kaohsiung City: Kangshan, *Shimada 140* (TAI). Pingtung Co.: Pingtung, 1915, *Matuda s.n.* (TAI).

In the *Flora of Japan* (1993), Yamazaki listed a new variety, *L. viscosa* var. *glabra*, which was distributed in southern Taiwan and Luzon (the Philippines). The diagnosis of the variety was very sketchy ('*planta glabra*'), and only 1 type specimen was listed. In the present study, the type specimen of the variety in TI and other specimens of *L. viscosa*

in TI, KYO, PNH, TAI, IBSC, TNM, and KUN were examined and compared. The glandular and hirsute hairs of this species in Luzon, Thailand, Taiwan, and China are the same in most specimens. Additionally, in our field survey, the young plant of *L. viscosa* is somewhat nearly glabrous on the leaf upper surface, and the stem has somewhat glandular hairs which may disappear in dried specimens. Thus, we consider *L. viscosa* var. *glabra* a synonym of the typical variety.

Sect. 8. *Bonnaya* (Link & Otto) Philcox, Kew Bull. 22: 51. 1968.

10. *Lindernia ruellioides* (Colsm.) Pennell, Brittonia 2: 182. 1936; Yamazaki, J. Jap. Bot. 52(8): 256. 1977; Tsoong and Ku, Fl. Reipubl. Popularis Sin. 68: 146. 1979; Liu, Fl. Taiwan. 2nd ed. 4: 607. 1998. 旱田草
Gratiola ruellioides Colsm., Prodr. Desc. Gratiola 12. 1793 (Type: C!, Java & India, *Koenig s.n.*).

Lindernia ruellioides (Colsm.) Hara, J. Jap. Bot. 19: 208, 1943.

Vandellia antipoda auct. non L.: Yamazaki, J. Jap. Bot. 30: 177. 1955.

Perennial herb. Stems slightly branched, stoloniferous, obscurely quadrangular, rooting at the nodes, 10~45 cm long, sparsely pubescent. Leaves pinnately nerved, elliptic to orbicular-elliptic, rounded at apex; 1~5 cm long, 0.8~2.5 cm wide, serrulate to dentate with teeth inwardly curved and acute at apex, veins on both surfaces sparsely scabrid; petioles 4~1.5 mm long, sparsely pubescent. Inflorescence racemose, slightly flowered; bracts linear-lanceolate, ca. 5 mm long; pedicels opposite, ca. 5 mm long when flowering, 5~10 mm long when fruiting, glabrous. Calyx deeply 5-lobed almost to base, glabrous, 7~9 mm long, lobes linear-lanceolate, acuminate, scarious-margined. Corolla pale-purple or pale-blue, 10~15 mm long, outer surface

sparsely glandular, internally densely yellow clavellate between basal staminodes, posterior lip oblong, rounded at apex, anterior lip ca. 4 mm long, with 3 rounded lobes. Stamens 2, posterior, fertile, posterior filament 1.3~2.4 mm long. Staminodes 2, anterior, filiform, 2~3 mm long, yellow, uncinately curved at apex. Ovary elliptical, ca. 1.5 mm long; style ca. 7 mm long; disk pale-yellow, adhering to ovary on ventral side, about 2/3 length of ovary, ca. 1 mm long. Capsule cylindrical, acute, 1~2 cm long, 1.2~2 mm wide, 2~2.5-times as long as persistent calyx. Seeds triangular to polygonal, 0.41~0.46 mm long, 0.33~0.35 mm wide, L/W ratio ca. 1.29, scrobiculate, seed-coat with many projections. Flowering and fruiting June~Nov.

India, Nepal, Burma, Malaysia, Indo-China, S. China, the Ryukyus (Japan), the Philippines, and New Guinea. In Taiwan, in wet semi-open forests or semi-open meadows below 1300 m in elevation.

Specimens examined: TAIWAN: Taipei: Taipei, Sept. 27, 1926, *S. Sasaki s.n.* (TAI 98851); Pinglin Dist.: Koulai, elev. 350~400 m, Nov. 11, 2002, *S. C. Liu 960* (HAST); Sijhih Dist.: from Hongnei to Menghu, elev. ca. 150 m, Oct. 31, 1990, *C. I Peng 13531* (HAST); Taihoku, June 6, 1931, *T. Suzuki 4487* (TAI). Taoyuan Co.: Fuhsing Township: Dongyanshan Forestry Recreation Area, elev. 820 m, Aug. 13, 1998, *B. Bartholomew 7890* (HAST); Dasi: Shihgueikeng, elev. 300~400 m, Sept. 11, 2002, *C. C. Chen 442* (HAST). Hsinchu Co.: Hsinchu, Sept., 1924, *Y. Simada s.n.* (TAI 180919); Kuanhsi Township: along County Rd. 118, around Fukung Junior High School, elev. ca. 160 m, Sept. 10, 1999, *C. I Peng 17695* (HAST); Nansyo, July 3, 1923, *Y. Simada 880B* (TAIF). Miaoli Co.: Cholan, June 22, 1957, *I. M. Liu et al. s.n.* (TAI 98849); Nanchuang Township: Kueichulin, elev. 240 m, June 26, 2000, *C. M. Wang*

4297 (TNM). Taichung City: Hoping Dist.: Sanchiaoshan, elev. 1250 m, *H. Y. Shen 255* (HAST, TNM, TNU). Nantou Co.: Chitou, elev. 1200 m, Aug. 23, 2003, *G. P. Hsieh 1162* (PPI); Luku Township: Chito Forestry Recreation Area, elev. 1115 m, Aug. 27, 2003, *R. Y. Tsou 1* (TNM). Yunlin Co.: Hwashan, elev. 700~800 m, Oct. 19, 1996, *Y. F. Huang 13* (PPI). Chiayi Co.: Chuchi Township, elev. 900 m, Aug. 7, 1989, *H. F. Yen 1497* (TNM). Tainan City: Tungshan Dist., Chingshan, Kantoushan, elev. 550~800 m, Oct. 23, 1987, *H. F. Yen 1820* (TNM). Pingtung Co.: Machia Township: Chenlishan, elev. 1012 m, July 21, 2004, *T. Y. A. Yang 16779* (TNM); Lilungshan, elev. 670~890 m, Oct. 7, 1993, *C. M. Wang 463* (TNM); Shuangliu, Aug. 12, 2000, *S. M. Ku 660* (PPI); Nanrenshan, Oct. 14, 1988, *C. E. Chang 18358* (PPI). Ilan Co.: Chiaohsi Township: Paoma Ancient Trail, elev. ca. 300 m, Sept. 20, 2000, *C. H. Lin 758* (HAST, TNM); Yuanshan Township: Shuanglienpei, June 23, 2006, *Y. S. Liang 940* (TNM). Hualien Co.: Shihtiping, elev. 200 m, July 7, 2001, *K. Y. Wang 1502* (TAIF). Taitung Co.: Anton-Tauhu, Aug. 30, 1951, *M. T. Kao et al. 2643* (TAI); Taimaili Township: Taimali, Sept. 29, 1999, *S. T. Chiu 5478* (TNM).

11. *Lindernia ciliata* (Colsm.) Pennell, Brittonia 2: 182. 1936; Li, Q. J. Taiwan Mus. 3: 66. 1950; Li, Q. J. Taiwan Mus. 14: 9. 1961; Yamazaki, J. Jap. Bot. 52(8): 256. 1977; Tsoong and Ku, Fl. Reipubl. Popularis Sin. 68: 146. 1979; Yamazaki, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 13: 57. 1981; Liu, Fl. Taiwan. 2nd ed. 4: 605. 1998.

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Gratiola ciliata Colsm., Prodr. Desc. Gratiola 14. 1793. (Type: C!, Java, *Koenig s.n.*).

Ilysanthes serrata (Roxb.) Urban, Ber. Deutsch. Bot. Ges. 2: 436. 1884; Mori in Masamune, Short Fl. Form. 191. 1936.

Bonnaya aristato-serrate Hayata, Icon. Pl. Form. 9: 79. 1920 (Type: TI!, Taiwan, Chiayi. Sept. 1913, *T. Soma s.n.*).

Ilysanthes aristato-serrate Hayata, Icon. Pl. Form. 9: 79. 1920 (Type: TI!, Taiwan, Chiayi. Sept. 1913, *T. Soma s.n.*); Mori in Masamune, Short Fl. Form. 191. 1936.

Vandellia antipoda auct. non (L.) Yamazaki: Li, Fl. Taiwan 4: 602. 1978, *pro. parte*.

Vandellia ciliata (Colsm.) Yamazaki, J. Jap. Bot. 30: 176. 1955; Li, Fl. Taiwan 4: 603. 1978, *pro. parte*.

Annual herb, 5~20 cm tall. Stem slightly branched, erect or ascendant, quadrangular, glabrous but with sparse hirsute hairs at nodes. Leaves pinnately nerved, sessile, oblong or elliptic, rounded at apex, cuneate at base, amplexicaul-like, 1~2.5(~3.3) cm long, 0.5~1.1 cm wide, sharply serrate with triangular aristate teeth, glabrous on both surfaces, occasionally with scattered hispid hairs beneath. Racemes of flowering shoots with small linear-lanceolate bracts, 3.1~7(~9.5) cm long, slightly flowered; pedicels opposite, 1.5~3.5 mm long when flowering, 3~7.5 mm long when fruiting, glabrous. Calyx cylindrical, glabrous, ca. 3.7 mm long, deeply 5-lobed almost to base, lobes subulate acuminate, scarious-margined, sparsely ciliate at margin. Corolla white, 5.5~7 mm long, outer surface of tube glandular, internally glabrous, posterior lip oblong, slightly bilobed at apex, anterior lip with 3 rounded lobes, central lobe larger than lateral ones, with pink marks at central lobe. Stamens 2, posterior, fertile, filament ca. 0.9 mm long; anthers ca. 0.4 mm long. Staminodes 2, anterior, filiform, ca. 1.5 mm long, uncinately outcurving at apex, pale pink at apex, base glandular and pilose. Ovary elliptical, ca. 0.8 mm long; style ca. 4 mm long; disk pale-yellow, adhering to ovary on ventral side, about 1/2 length of ovary, ca. 0.4 mm long. Capsule cylindrical, acuminate, 7~14 mm

long, 0.8~1.2 mm wide, 2~3-times as long as persistent calyx. Seeds triangular to polygonal, 0.39~0.48 mm long, 0.30~0.37 mm wide, L/W ratio ca. 1.35, scrobiculate, with many projections. Flowering and fruiting July~Nov.

India, Nepal, Burma, Malaysia, Indo-China, S. China, the Ryukyus (Japan), the Philippines, Australia, and New Guinea. In Taiwan, in open meadows, moist fields, and dry fields below 1000 m in elevation in southern and central parts.

Specimens examined: TAIWAN: Yunlin Co.: Kukeng Township: Shanfeng, Kukeng Farm, elev. ca. 250 m, July 30, 1994, *H. F. Yen 9559* (TNM, HAST). Taichung City: Tso-Lung-Pu, July 18, 1968, *C. C. Hsu 4674* (TAI). Chiayi Co.: Chuchi City, Sept. 21, 1987, *H. F. Yen 1634* (TNM); Chuchi City, Aug. 19, 1994, *H. F. Yen 71* (TNM); Zengwen Reservoir, Aug. 21, 1985, *C. E. Chang 17396* (PPI). Tainan City: Experimental Stat., Oct. 16, 1969, *C. C. Hsu 6454* (TAI). Kaohsiung City: Mito, July 14, 2001, *C. C. Lin 316* (TAIF).

12. *Lindernia tenuifolia* (Colsm.) Alston in Trimen, Hand-Book Fl. Ceylon 6. Suppl.: 214. 1931; Li, Q. J. Taiwan Mus. 3: 67. 1950; Li, Q. J. Taiwan Mus. 14: 12. 1961; Yamazaki, J. Jap. Bot. 52(8): 256. 1977; Tsoong & Ku, Fl. Reipubl. Popularis Sin. 68: 126. 1979; Tsoong and Ku, Fl. Reipubl. Popularis Sin. 68: 144. 1979; Liu, Fl. Taiwan. 2nd ed. 4: 608. 1998. 薄葉見風紅

Gratiola tenuifolia Colsm. Prodr. Desc. Gratiola 8. 1793 (Holotype: C!, Ceylon, *Koenig s.n.*).

Bonnaya tenuifolia (Colsm.) Spreng., Syst. Veg. 1: 42. 1825; Matsumura and Hayata in J. Coll. Sci. Univ. Tokyo 22: 281. 1906 (Enum. Pl. Form.).

Ilysanthes tenuifolia (Colsm.) Urban, Berl. Deutch. Ges. 2: 435. 1884; Mori in Masamune, Short Fl. Form. 191. 1936.

Vandellia tenuifolia (Colsm.) Haines, Bot. Bihar Orissa 4: 634. 1922; Li, Fl. Taiwan 4: 606. 1978; Yamazaki, J. Jap. Bot. 30: 175. 1955.

Annual herb 5~20 cm tall. Stems simple or slightly branched, erect or ascendant, glabrous. Leaves pinnately nerved, linear or linear-lanceolate, sessile, obtuse or subacute at apex, 8~30 mm long, 0.5~5 mm wide, distantly crenate or subentire, glabrous on both surfaces. Inflorescence sparse at terminal of stems, 3~6 cm long, with 4~10(~13) flowers, each with substending bract of ca. 1.2 mm long; pedicels stout, opposite, 2~10 mm long, upward-erect when flowering, slightly downwardly curved when fruiting, occasionally pedicel leaf-opposed in inflorescence. Calyx deeply 5-lobed almost to base, 1.5~3 mm long, glabrous, lobes lanceolate, obtuse or subacute, slightly scabrid towards apex. Corolla purple to pale-blue, 4~8 mm long, outer surface of tube sparsely glandular, posterior lip broadly oblong, obtuse at apex, anterior lip with 3 rounded lobes. Stamens 2, posterior, fertile, filament ca. 1 mm long. Staminodes 2, anterior, filiform, 0.4~1.7 mm long, slightly curved, puberulous at basal staminodes. Ovary elliptical, ca. 1.1 mm long; style ca. 4 mm long; disk pale-yellow, adhering to ovary on ventral side, about 1/2~1/3 length of ovary, ca. 0.4 mm long. Capsule slender, cylindric, acute, 5~1.2 mm long, 0.7~1 mm wide, 2.5~4-times as long as persistent calyx. Seeds triangular to polygonal, 0.26~0.36 mm long, 0.19~0.25 mm wide, L/W ratio ca. 1.38. scrobiculate, seed-coat with many projections. Flowering and fruiting May~Oct.

India, Malaysia, Vietnam, S. China, the Ryukyus (Japan). In Taiwan, in northern part and rarely in southern part; moist rice fields, and marshes below 500 m in elevation.

Specimens examined: TAIWAN: Hsinchu Co.: Hsinfeng Township: Fengkeng Vil-

lage, elev. 15 m, Oct. 30, 2004, C. M. Wang 779 (TNM); Koko, Sept. 22, 1924, Y. Simada 878b (TAI); Sept. 22, 1924, Y. Simada 878c (TAI). Chiayi Co.: Mito, elev. 0~50 m, July 14, 2001, C. C. Lin 309 (TAIF). Kaohsiung City: Chishan Dist., Nov. 6, 1985, Y. L. Zhong 1261 (PPI).

13. *Lindernia antipoda* (L.) Alston in Trimen, Hand-Book Fl. Ceylon 6. Suppl.: 214. 1931; Li, Q. J. Taiwan Mus. 3: 66. 1950; Li, Q. J. Taiwan Mus. 14: 10. 1961; Yamazaki, J. Jap. Bot. 52(8): 256. 1977; Tsoong and Ku, Fl. Reipubl. Popularis Sin. 68: 145. 1979; Yamazaki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 55. 1981; Liu, Fl. Taiwan. 2nd ed. 4: 604. 1998.

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Ruellia antipoda L., Sp. Pl. 2: 635. 1753.

Gratiola veronicifolia Retz., Obs. Bot. 4: 8. 1768 (Holotype: C!, Koenig s.n.).

Bonnaya veronicifolia auct. non (Retz.) Spreng., Syst. Veget. 1: 41, 1824; Matsumura and Hayata, J. Coll. Sci. Univ. Tokyo 22: 281. 1906 (Enum. Pl. Form.).

Ilysanthes antipoda (L.) Merr., Interpr. Rumph. Herb. Ambion. 467. 1917; Mori in Masamune, Short Fl. Form. 191. 1936.

Vandellia anagallis (Burm. f.) Yamazaki, J. Jap. Bot. 30: 176. 1955; Li, Fl. Taiwan 4: 601. 1978.

Vandellia anagallis (Burm. f.) Yamazaki var. *verbenaeifolia* (Colsm.) Yamazaki, J. Jap. Bot. 30: 176. 1955; Li, Fl. Taiwan 4: 602. 1978.

Vandellia antipoda auct. non (L.) Yamazaki: Li, Fl. Taiwan 4: 602. 1978, *pro. parte*.

Annual herbs Stems many-branched, quadrangular, ascending or diffused, occasionally rooting at nodes, 5~30 cm long, glabrous. Leaves pinnately nerved, sessile, oblanceolate to obovate-oblong, acute or subacute at apex, narrowing to base, 1~4 cm long, 0.5~1 cm wide, acute-serrate, glabrous.

Flowering shoots with solitary-axillary flowers, or in slightly flowered racemes with small linear-lanceolate bracts; pedicels stout, opposite rarely alternate, 4~15 mm long, glabrous. Calyx deeply 5-lobed almost to base, 4~6 mm long, glabrous, lobes linear-lanceolate, acuminate to acute, slightly acute-serrate at ends. Corolla pale-pink to pale-purple, rarely white, 8~12.5 mm long, outer surface of tube sparsely glandular, posterior lip broadly ovate, entire at apex, anterior lip with 3 rounded lobes. Stamens 2, posterior, fertile; posterior filament 1.7~2 mm long, anthers ca. 1.3 mm long. Staminodes 2, anterior, 3.3~4.3 mm long, yellow, white or yellow lanate between basal staminodes, curved at apex. Ovary elliptical, 1.7~2 mm long; style 2.5~4 mm long; disk pale-yellow, adhering to ovary on ventral side, about 1/2 length of ovary, ca. 1.2 mm long. Capsule cylindrical, 10~14.5 mm, acute at apex. Seeds triangular to polygonal, 0.37~0.41 mm long, 0.23~0.31 mm wide, L/W ratio ca. 1.5, scrobiculate, with many projections. Flowering and fruiting throughout year.

Southeast Asia, Indochina, Australia, Polynesia, S. and C. China, Japan. In Taiwan, in marshy ground, riversides, rice fields, and meadows below 1000 m in elevation.

Specimens examined: TAIWAN: Taipei: Shihfen Waterfall, elev. 50~100 m, Sept. 24, 2003, *H. L. Chiang* 3398 (TAIF); Taipei, Aug. 9, 1927, *S. Sasaki s.n.* (TAI 98853); Shihting Dist., elev. 300~450 m, Dec. 10, 1999, *J. C. Wang* 11334 (TNU, HAST); Taipei, Aug. 9, 1927, *S. Sasaki s.n.* (TAI 98856). Taoyuan Co.: Pate, Dec. 13, 2004, *S. P. Huang* 14 (TAI); Lujhu Township: Fujhu, elev. 0~20 m, Oct. 12, 2002, *S. C. Liu* 843 (TNU, HAST, TNM). Hsinchu Co.: Hsinchuangu, Feb. 6, 1984, *C. I Peng* 6378 (HAST); Rueifu, elev. 140 m, Oct. 15, 1993, *C. M. Wang* 507 (TNM); Shanchiao, Dec. 12, 2004, *T. D. Kao* 34

(TAI). Miaoli Co.: Chunan Township, Aug. 6, 1990, *Z. Z. Lin* 296 (PPI); Chunan Township: seaside, elev. ca. 0 m, Sept. 30, 1990, *C. H. Lin* 576 (HAST); Yuanli, Dec. 20, 1976, *Y. U. Jeng* 491 (TAI); Tongshiru, Aug. 2, 1964, *M. T. Kao* 5684 (TAI). Taichung City: Loungchin Dist., Oct. 19, 1999, *K. C. Yang* 5713 (TNM); Shengkang Dist.: Peichuang, elev. 176 m, Oct. 24, 1995, *C. M. Wang* 1821 (TNM). Changhua Co.: Lukang, July 25, 1969, *K. S. Shyu s.n.* (TAIF); Tienchung, elev. 0~50 m, Jan. 16, 1992, *S. F. Huang* 4626 (TAI). Yunlin Co.: Tounan, Sept. 28, 1986, *C. H. Ou* 9887 (TNM). Chiayi Co.: Chiayi City, Aug. 14, 1994, *H. F. Yen* 9618 (TNM); Minhsiung Township, Sept. 26, 1987, *H. F. Yen* 1670 (TNM); Minhsiung Township: Huweiliao, Jan. 16, 1994, *H. F. Yen* 8989 (TNM). Kaohsiung City: Chishan Dist., Sept. 18, 1999, *S. Z. Yang* 28561 (PPI). Pingtung Co.: Neipu Township, Nov. 6, 1987, *S. Z. Yang* 3915 (PPI); Wanluan Township, elev. 0~10 m, Dec. 21, 1996, *S. Z. Yang* 27447 (PPI). Ilan Co.: Tungshan, elev. 0 m, Oct. 6, 2001, *P. F. Lu* 2014 (TAIF); Yuanshan Township, June 24, 2006, *Y. S. Liang* 945 (TNM); Yuanshan Township: near Pitouhu, elev. ca. 150 m, Nov. 15, 2000, *C. H. Lin* 920 (HAST). Hualien Co.: Yuli Township, Jan. 30, 1977, *C. H. Ou* 4932 (TNM); Honglin, Aug. 24, 1982, *M. T. Kao* 9798 (TAI); Yuli, Jan. 30, 1977, *C. H. Ou et al.* 4932 (TCF). Taitung Co.: Lutao (Green Island), Aug. 19, 2005, *G. P. Hsieh et al.* 2188 (PPI); Lanyu Township, Hongtuo Village to Yuzen Village (Orchid Island), elev. ca. 0~5 m, June 9, 1983, *C. I Peng* 5275 (HAST).

Species excluded from the Flora of Taiwan

1. *Lindernia hyssopioides* (L.) Haines, Bot. Bihar Orissa 4: 635. 1922; Liu, Fl. Taiwan. 2nd ed. 4: 606. 1998.

Gratiola hyssopioides L. (Lectotype: LINN, photo!, Herb. Linn. no. 30.6).

Lindernia hyssopioides was first recorded in the *Flora of Taiwan*, 2nd edition (Liu 1998). We examined the cited specimen (Taoyuan: Tachuang, *Huang & Huang* 13527) which has a many-branched stem, elliptic, sessile leaves, and an ovate to oblong capsule. We conclude that this specimen is actually *L. dubia*.

Lindernia dubia and *L. hyssopioides* belong to the section *Brachycarpae* which is characterized by having palmately 3~5-nerved leaves and 2 anterior staminodes. *Lindernia hyssopioides* and *L. dubia* differ in stem branching, calyx, capsule, and distribution. Stem branching in *L. hyssopioides* is few but *L. dubia* is many; the capsule is 1.5-times longer than the calyx in *L. hyssopioides* but are equal length in *L. dubia*. The distribution of *L. hyssopioides* is native to Southeast Asia and S. China (Hainan Island and Yunnan Province). *Lindernia dubia* is native to North and South America, but is now naturalized in East Asia (Taiwan, Japan, and Korea).

2. *Lindernia mollis* (Benth.) Wettst., Engler & Prantl, Nat. Pflanzenfam. IV. 3B. 79. 1891; Liu, Fl. Taiwan. 2nd ed. 4: 606. 1998.

Vandellia mollis Benth., Scroph. Ind. 37. 1835 (Holotype: K!, E. Bengal, Sylhet, *Wallich* 3948B); Li, Fl. Taiwan 4: 605. 1978.

Lindernia cruciformis was published by Hayata (1920) with no specimens cited, and its distribution was just described as Ako. Only 1 specimen (*Matuda s.n.*, 1915. TAI 099062) was identified as *L. mollis* (Benth.) Wettst. by H.-L. Li who annotated on the label "as Hayata's type of *L. cruciformis*". That specimen was also cited in the *Flora of Taiwan*, 2nd edition (Liu, 1998). We examined that specimen and found that it was not comparable to specimens of *L. mollis* (Benth.) Wettst. collected from SW China and deposited in KUN, PE, and TNM. We identified it as *L. viscosa* (Hornem.) Boldingh.

3. *Lindernia viatica* (Kerr ex Barnett) Philcox, Taxon 19: 649. 1970; Yamazaki, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 53. 1981. Liu, Fl. Taiwan. 2nd ed. 4: 608. 1998.

Ilysanthes viatica Kerr ex Barnett, Kew Bull. 16: 489. 1963 (Holotype: BM!, Thailand, Aran Pralet. Aug. 9, 1930, *Kerr* 19604).

Lindernia oppositifolia auct. non (Willd.) Mukerjee; Yamazaki, J. Jap. Bot. 52: 256. 1977.

The species in Taiwan was first reported by Yamazaki (1977) as *L. oppositifolia* (Willd.) Mukerjee without citing any specimens. Later, Yamazaki (1981) reported the presence *L. viatica* (Kerr ex Barnett) Philcox distributed in Taiwan but without vouchers. *Lindernia viatica* was misspelled as "*L. vitacea*" in Yamazaki (1981) and also misspelled in the *Flora of Taiwan* 2nd edition. In the *Flora of Taiwan* 2nd edition (Liu 1998), the specimen *Simada* 878C was cited under *L. viatica*, but the same collection number *Simada* 878B was cited as *L. tenuifolia* (Colsm.) Alston. Both specimens were collected from Hsinchu on the same day. We compared these 2 specimens and examined the types of *L. tenuifolia* and *L. viatica*. We identified both as *L. tenuifolia* (Colsm.) Alston.

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