

A revision of *Elatostema* (Urticaceae) of Taiwan

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Abstract. Fifteen species of *Elatostema* are recognized and described in Taiwan. Six of them are new species, namely, *Elatostema acuteserratum* Shih & Yang, *Elatostema multicanaliculatum* Shih & Yang, *Elatostema rivulare* Shih & Yang, *Elatostema subcoriaceum* Shih & Yang, *Elatostema strigillosum* Shih & Yang, and *Elatostema villosum* Shih & Yang. Line drawings of ten species are provided.

Keywords: *Elatostema*; Taiwan; Taxonomy; Urticaceae.

Introduction

The only revisionary work of Urticaceae of Taiwan available was made over two decades ago by Huang (1971). Some taxonomic literature relevant to members of this family have since been published, (e.g., Liu and Huang, 1976; Shih et al., 1995; Wang, 1980; Ying, 1988) and many specimens have been added to the herbaria on this island. It is therefore imperative to provide a new revision for this family. *Elatostema* is here revised first because it is the largest genus of the family in Taiwan.

ELATOSTEMA Forster & Forster f. nom. cons.

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Monoecious or dioecious herbs; stems mostly succulent, herbaceous, rarely woody at base, simple to many branched. Leaves alternate, with or without reduced leaves (nanophylls) opposite to normal ones, sessile to short petiolate, stipulate; lamina somewhat flush with the stem, very unequal-sided at base, the proximal half facing the stem narrower, mostly chartaceous, rarely subcoriaceous to coriaceous, mostly with somewhat dense linear cystoliths on both sides or mostly on adaxial side, rarely without cystolith, trinerved to triplinerved or penninerved, coarsely serrate to nearly entire; stipules intrapetiolar, two at a node, the stipule of the reduced leaf opposite to the normal one's, usually caducous, rarely deciduous or persistent. Inflorescences mostly of many-flowered discoid heads, usually with a well-developed receptacle, rarely 1–3-flowered; heads usually two-valved, each valve including several glomerules which consist of several flowers and are subtended by a few large bracteoles; flowers sessile to long-pedicellate, mostly subtended by small bracteoles. Male flowers with (3–)4–5 sepals; sepals connate at base, the segments slightly imbricate, usually corniculate or shortly horned below the apex; stamens (3–)4–5; rudimentary ovary small. Female flowers with 3–5 or nearly com-

pletely reduced sepals; staminodes small, 3–5, scale-like, usually very small when blooming, becoming larger during fruiting, rarely absent; stigma penicillate, ovary straight. Achenes circular in cross section, mostly with longitudinal ribs, rarely smooth, usually dispersed by reflexing staminodes.

About 350 species in the world (Wang, 1980); fifteen species found in Taiwan.

Key to Species in Taiwan

1. Plants with nanophylls 9. *E. parvum*
1. Plants without nanophyll.
 2. Female inflorescences 1-flowered, less than 2.5 mm wide; leaves oblong or obovate, 9–18 mm long, margins with 3–4(–5) obtuse teeth.. 14. *E. trilobulatum*
 2. Female inflorescences many-flowered, more than 3 mm wide; leaves usually more than 20 mm long, margins with more than 6 teeth.
 3. Plants less than 20 cm high; lower parts of main stems less than 3 mm in diameter.
 4. Stems glabrescent to glabrous.
 5. Stems quadrangular, greenish 5. *E. hypoglaucum*
 5. Stems semiterete, deeply brown-red to green 7. *E. microcephalanthum*
 4. Stems densely hairy.
 6. Leaves with long, soft hairs 15. *E. villosum*
 6. Leaves with short, rigid hairs 12. *E. strigillosum*
 3. Plants more than 30 cm high; lower parts of stems more than 5 mm in diameter.
 7. Leaves glabrous or nearly so.
 8. Leaf margin of proximal half entire (at least at lower portion).
 9. Leaf margin sharply toothed; stigmatic hairs unicellular 2. *E. edule*

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9. Leaf margin obtusely toothed; stigmatic hairs multicellular 13. *E. subcoriaceum*
8. Leaf margin of proximal half serrate.
10. Achenes distinctly 12-ribbed; male flowers hairy on the abaxial side 1. *E. acuteserratum*
10. Achenes indistinctly 6-ribbed; male flowers glabrous 8. *E. multicanaliculatum*
7. Leaves distinctly hairy.
11. Stems densely hirsute (especially at nascent parts) 6. *E. lineolatum* var. *majus*
11. Stems nearly glabrous to glabrescent.
12. Leaf-apices entire.
13. Leaves sparsely hirsute; achenes distinctly 8-ribbed 3. *E. herbaceifolium*
13. Leaves hirtellous hairs; achenes unribbed 4. *E. hirtellipedunculatum*
12. Leaf-apices serrulate.
14. Distal half of leaf base earlike, across petiole or midrib 10. *E. platyphylloides*
14. Distal half of leaf base shallowly cordate, not across petiole or midrib 11. *E. rivulare*

1. *Elatostema acuteserratum* Shih & Yang, sp. nov. ♀
f. ... 花 Figure 1

Species nova affinis *Elatostemati hirtellipedunculato* Shih & Yang, sed differt lamina glabra nec hirsuta, bractea feminea integra nec lobata.—TYPE: Taiwan. Taitung Hsien: Lanyu, *Shih 3187* (holotype: NSYSU; isotypes: HAST, TAI, TAIF).

Perennial monoecious or dioecious herbs, slightly branched, erect or ascending, up to 80 cm long; stems terete, branchlets slightly geniculate, glabrous, with very dense cystoliths in exsiccate specimens, somewhat dark-green. Leaves alternate, sessile to short-petiolate, stipulate; lamina membranous to thick chartaceous, nearly glabrous, cystoliths minute, densely on adaxial side, densely along veins on abaxial side, lanceolate or narrowly elliptic to elliptic, up to 18 cm long, 5 cm wide, acuminate to caudate at apex, with a (1–)2–5(–6)–serrulate acumen, sharply serrate to dentate at margins, broadly cuneate at base of the distal half, penninerved, with 7–9 pair lateral nerves; petioles semi-terete, canaliculate on upper side, less than 3 mm long; stipules intrapetiolar, persistent, nearly glabrous, ciliolate, narrowly triangular, 1.5–2.3 mm long, acuminate at apex, 1-veined. Inflorescences in discoid heads, sessile or subsessile; male one slightly puberulent outside, ellipsoidal, ca. 12 mm in diameter; female one somewhat puberulent outside, sub-quadrate-discoid, ca. 7 mm in diameter. Male flowers puberulent outside at up-

per parts, lateral-compressed, widely depressed-obovoid, ca. 1.6 mm long, 1.9 mm wide, with 5 sepals, the sepals connate about half way, valvate, cymbiform, ca. 2 mm long, 0.9 mm wide, corniculate, the stamens 5; pedicels terete, up to 2.4 mm long; bracteoles ciliolate at upper margins and apex, obliquely shallowly cymbiform, ca. 3.7 mm long, 0.7 mm wide. Female flowers with 4 rudimentary sepals; stigma formed with septate hairs, penicillate, slightly longer than the ovary; ovary ellipsoidal, ca. 0.4 mm long, 0.15 mm wide; staminodes 4, rudimentary, enlarged when fruiting; bracteoles linear-lanceolate, ca. 1 mm long, 0.16 mm wide. Achenes ellipsoidal, ca. 0.75 mm long, 0.28 mm wide, with 12 ribs.

Additional specimens examined. TAITUNG HSIEN: Lanyu, *Shih 2768, 3407* (NSYSU); *Chang 17429, 17440, 17753, 19241* (PPI).

Distribution. Endemic to Island Lanyu. Found along ravines, on shady and moist forest floors. Flowering in spring and autumn.

Notes. This species is related to *Elatostema hirtellipedunculatum* Shih & Yang, but can be distinguished by its glabrous leaves and entire involucre of female inflorescences. So far, it is known only from Island Lanyu.

2. *Elatostema edule* C. Robinson, Philip. J. Sci. Bot. 5: 531. 1910; Liu & Huang in Li et al., Fl. Taiwan 2: 179. 1976, p. p.; Ying, Coloured Ill. Fl. Taiwan 3: 454, *quoad photo 554*, *excl. f. 865*. 1988, p. p. ♀, ... 花

Figure 2

Elatostema platyphyllum auct. non Wedd.: Ying, Coloured Ill. Fl. Taiwan 3: 456, *quoad photo 555*. 1988, p. p.

Perennial monoecious herbs; stems very succulent, quadrate-angular, prostrate at lower parts, ascending toward apex, up to 2 m long, 1.5 cm thick, branched, glabrous, greenish, slightly geniculate. Leaves alternate, distichous, sessile to short-petiolate; lamina membranous to herbaceous, glabrous, with up to 0.7 mm long cystoliths densely on upper surface and absent from lower surface, deep green to green on adaxial side, pale green to light green on abaxial side, asymmetrically elliptic to narrowly oblong or oblong, 10–23(–25) cm long, 3–7.5(–8.0) cm wide, the base of the distal half semi-cordate with an earlike limb, the margins crenate to serrulate along the distal half above one-third, almost entire or sometimes 1–3-toothed near apex along the proximal half, the apex cuspidate to acuminate-caudate, entire or rarely inconspicuously 1–2-toothed, the semi-triplines prominent beneath, the secondary veins 5–7 at the distal half, 3–4 at the proximal half; petioles up to 5 mm long; stipules 2, opposite, caducous, glabrous, greenish with brownish spots, lanceolate-cymbiform, up to 2.5 cm long. Inflorescences sessile to short-pedunculate, whitish-green, slightly minute-puberulent outside, elliptic- to oblong-discoid, the male ones 1.0–3.0 × 0.8–1.5 cm in diameter, with a glabrous, 3–15 mm long peduncles, the female ones up to 25 × 16 mm in size, sessile or subsessile; bracts slightly minute-puberulent, completely connate into an unlobed,

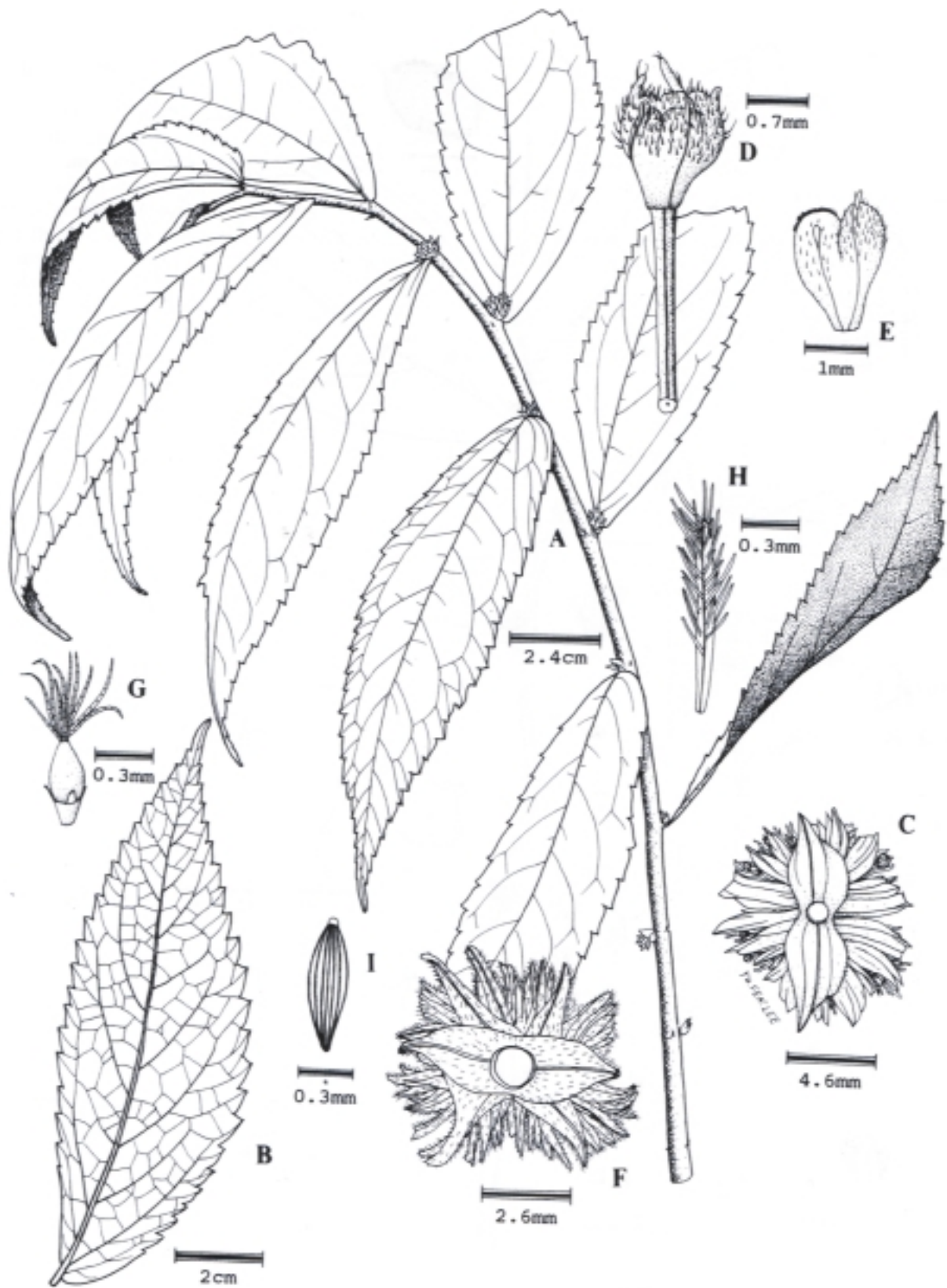


Figure 1. *Elatostema acuteserratum* Shih & Yang, from *Shih 3407*. **A**, A flowering branch. **B**, Leaf (abaxial view). **C**, Male inflorescence (ventral view). **D**, Male flower. **E**, Two male sepals (abaxial view). **F**, Female inflorescence (ventral view). **G**, Female flower. **H**, Female bracteole. **I**, Achene.

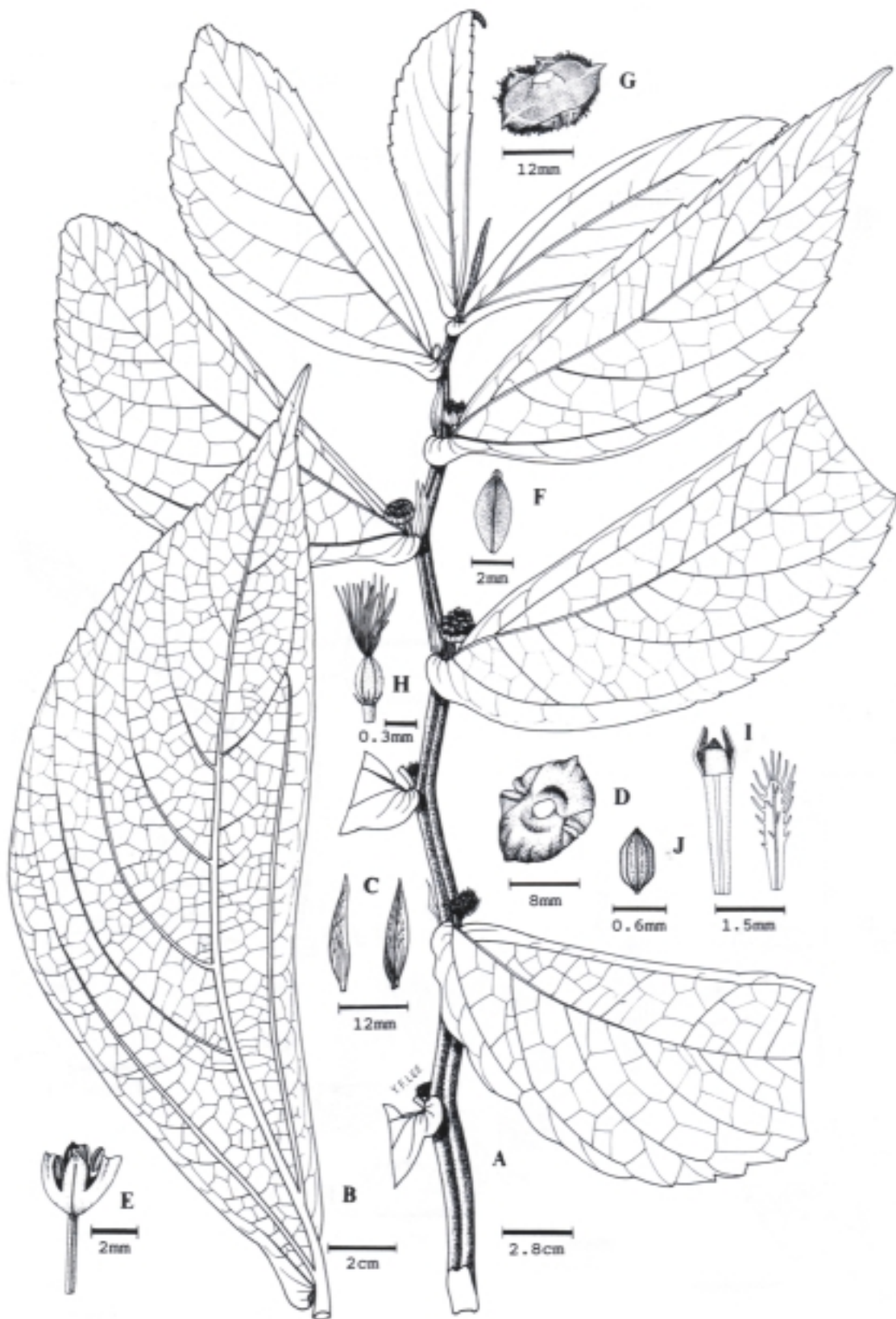


Figure 2. *Elatostema edule* C. Robinson, from *Shih 3408*. **A**, A flowering branch. **B**, Leaf (abaxial view). **C**, Stipules, left: lateral view, right: abaxial view. **D**, Male inflorescence (ventral view). **E**, Male flower in blooming. **F**, Male sepal (abaxial view). **G**, Female inflorescence (ventral view). **H**, Female flower. **I**, Left: staminodes & pedicel, right: bracteole (abaxial view). **J**, Achene.

narrowly oblong to oblong involucre, up to 3 cm long, 1 cm wide in male inflorescences, up to 25 mm long, 10 mm wide in female's. Male flowers obovoid, ca. 2.5 mm long and wide, pedicellate, subtended by bracteoles; bracteoles semi-transparent, with minute linear cystoliths dispersed parallelly to the midvein, cymbiform, ca. 3.5 mm long, the apex ciliolate, truncate or mucronate, the margins entire, minutely hirsute on one-third of the abaxial veins; sepals 4, connate halfway, semi-transparent, glabrous, corniculate, cymbiform, ca. 2.3 mm long in blooming flowers, acute at apex; pedicels sparsely puberulent. Female flowers pedicellate, subtended by bracteoles; bracteoles semi-transparent, narrowly oblong, ca. 0.9 mm long, 0.3 mm wide when blooming, enlarged when fruiting, the upper margins and apex ciliolate, the lower margins entire, the abaxial veins puberulent subterminally; sepals 4, free, rudimentary; staminodes 4, minute, enlarged when fruiting; stigma penicillate; ovary glabrous, ellipsoidal, ca. 0.4 mm long, 0.2 mm wide. Achenes ellipsoidal, ca. 0.7 mm long, 0.35 mm wide.

Specimens examined. TAITUNG HSIEN: Lanyu, Kawakami & Nakahara 1052 (TAIF, paratypus), Shih 2747, 2754, 2766, 3165, 3169, 3408 (NSYSU); Lutao, Yang 6856 (NTNU).

Distribution. Batan islands. Taiwan, found on Islands Lanyu and Lutao, growing along streams, ravines, and on moist forest floors.

Notes. This species is confined to Islands Lutao, Lanyu of Taiwan and Island Batan of the Philippines. Liu and Huang (1976) and Ying (1988) reported that *E. edule* is widely distributed in Taiwan. Wang (1980) also reported its occurrence in Hainan Province, China. However, the plants they referred to belong to *Elatostema platyphylloides* Shih & Yang (Wilmot-Dear, 1995, pers. comm.).

3. *Elatostema herbaceifolium* Hayata, Icon. Pl. Formosa. 6: 57. 1916. "herbaceifolia"; Liu & Huang in Li et al., Fl. Taiwan 2: 179, pl. 257. 1976; Wang, Bull. Bot. Lab. N.E. Forest. Inst., Harbin. 4(7): 67. 1980; Ying, Coloured Ill. Fl. Taiwan 3: 456, excl. photo 556. 1988, excl. syn. ㄨ... ㄈㄌ Figure 3

Pilea melastomoides auct. non (Poir.) Wedd.: Ying, Coloured Ill. Fl. Taiwan 3: 434, quoad photo 542. 1988.

Perennial herbs; stems terete, pendent or ascending, usually rooting at lower parts, several-branched, nearly glabrous, pale-green, sometimes brownish-red at lower parts, up to 70 cm long, 5 mm thick. Leaves alternate, distichous, sessile to short-petiolate, stipulate; lamina membranous to chartaceous, slightly hirsute and with dense vermicular, 0.2–0.3 mm long cystoliths on adaxial sides, sparsely minute-hirtellous and with dense cystoliths on abaxial side, green on adaxial side, pale-green on abaxial side, asymmetrically narrow-elliptic to elliptic, up to 15 cm long, less than 5 cm wide, the base of the distal half acute to rounded, the margins very sparsely ciliolate, sharply serrate, the apex with an entire acuminate, the

penninerves with 4–5 pairs of lateral nerves, articulated with secondary nerves; petioles up to 5 mm long; stipules 2, opposite, caducous, 1-nerved, minutely hirtellous on abaxial nerves, glabrous on adaxial sides, minute-ciliolate, greenish, lanceolate-cymbiform, ca. 5 mm long. Female inflorescences sessile or subsessile, greenish to green, slightly puberulent outside, subquadrate, up to 15 mm in length and 13 mm in width when fruiting; bracts slightly puberulent, connate into a narrowly oblong or lanceolate involucre, up to 10 mm long, 2.5 mm wide. Female flowers short pedicellate, subtended by bracteoles; bracteoles puberulent at apex and subapex, semi-transparent, subquadrate, ca. 1.3 mm long, 0.46 mm wide at apex and 0.31 mm wide at base, truncate and ciliolate at apex; sepals 3, minute, subequal, ciliolate at margins and apex, triangular, ca. 0.23 mm long, 0.15 mm wide when fruiting; staminodes 3, minute, enlarged when fruiting; stigma formed with less than 7 simple hairs, penicillate, ca. 0.25 mm long; ovary glabrous, ellipsoidal, ca. 0.2 mm long, 0.1 mm wide. Achenes conspicuously 8-ribbed, whitish to brown, ellipsoidal, ca. 0.7 mm long, 0.3 mm wide.

Specimens examined. TAIPEI HSIEN: Bunzangun, Suzuki 18446 (TAI). TAOYUAN HSIEN: Kuanhsi-Fusing, Huang 4815 (TAI); Rarashan, Shih 3108, 3228 (NSYSU). NANTOU HSIEN: Peishan-keng, s.d., Ito s. n. (TAIF); Hsinyi Hsiang, Tili, Shih 2967 (NSYSU); Tungpu, Shih 2972 (NSYSU). CHIAYI HSIEN: Alishan Highway, Shih 2954 (NSYSU); Chiaoliping-Juili, Yang 3571 (TAI); Tapu Shiang, Shih 2728 (NSYSU). KAOHSIUNG HSIEN: Chaishen Shiang, Shih 3327 (NSYSU). TAITUNG HSIEN: Chipen Logging Trail, Shih 3272 (NSYSU).

Distribution. Mainland China. Taiwan, found at low to medium altitudes, mostly growing in ravines, or on moist forest floors near ravines.

Notes. Male flowers of this species have never been found.

4. *Elatostema hirtellipedunculatum* Shih & Yang, Bot. Bull. Acad. Sin. 36: 160, f. 3. 1995. "hirtellipedunculata". ㄨ... ㄈㄌ

Perennial monoecious herbs; stems suberect or ascending, sometimes suspending from moisture rocks, often simple branched, canaliculate at the side opposite to the substrate, somewhat hirtellous at nascent parts, soon glabrescent or nearly glabrous, red-brown or whitish-green, up to 1 m long, 8 mm thick. Leaves alternate, sessile to subsessile, rarely short-petiolate, distichous; lamina chartaceous, somewhat hirtellous on both sides and with somewhat dense, 0.15–0.35 mm long cystoliths on upper surface, sometimes very sparse cystoliths near the margins, light yellowish-green to green on adaxial side, pale-greenish on abaxial side, narrowly asymmetrical-elliptic to oblique-ovate, up to 20 cm long, 1.5–7.0 cm wide, the base of the distal half rounded, the margins entire at least 1/3 lower part of the distal-half and 1/2 lower part of the proximal-half, dentate to crenate or crenulate at other parts,

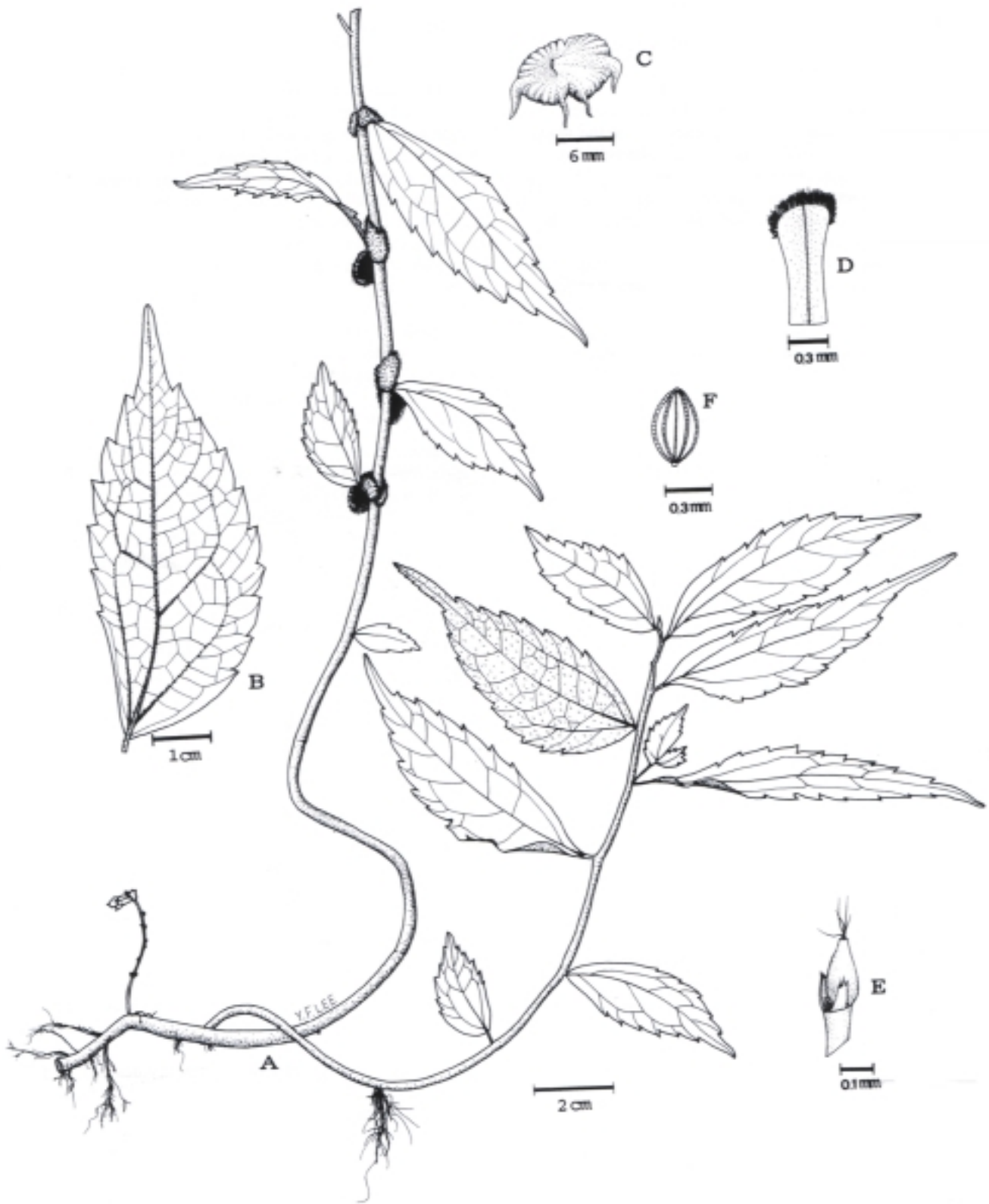


Figure 3. *Elatostema herbaceifolium* Hayata, from Shih 3327. **A,** A fruiting plant. **B,** Leaf (abaxial view). **C,** Female inflorescence (sub-ventral view). **D,** Bracteole (abaxial view). **E,** Female flower. **F,** Achene.

sometimes entire throughout, the apex long-acuminate to long-caudate, the acuminate entire, up to 5 cm long, the palmate-veins, semi-triple-veins and penninerves prominent beneath, the secondary veins 4–7 pairs; petioles 0–2 mm long; stipules 2, opposite, persistent, white-greenish, subulate, 2–5 mm long. Inflorescences 1–2 at nodes, sometimes simple-branched, greenish-white, somewhat puberulent outside, discoid, the male ones ellipsoidal, 7.0–18.0 × 7.0–12.0 mm in diameter, the peduncles somewhat densely hirtellous, (1–)1.5–4.5(–5) cm long, the female ones ellipsoidal, up to 8 × 6 mm in size when fruiting, sessile or subsessile, rarely with a peduncle of 5–8 mm long; bracts somewhat puberulent, free or connate at base only, ovate to elliptic, up to 9 mm long, 7 mm wide in male inflorescences, almost completely connate into an asymmetrical involucre with 6 teeth of ca. 2 mm long in female inflorescences. Male flowers subtended by bracteoles, ca. 3.5 mm long, 3 mm wide, pedicellate; bracteoles semi-transparent, corniculate, cymbiform, up to 6 mm long, acute to acuminate, the margins entire or somewhat ciliate near the apex, glabrous; sepals 5, connate at base, semi-transparent, glabrous, corniculate, cymbiform, acute at apex; pedicels glabrous, ca. 4.5 mm long. Female flowers subtended by bracteoles, pedicellate; bracteoles semi-transparent, linear, ca. 2.5 mm long, 0.3 mm wide when blooming, the upper margins and apex fimbriate, the lower margins entire; sepals rudimentary; staminodes 5, minute, enlarged when fruiting; stigmas penicillate; ovary glabrous, ovoid. Achenes ovoid, ca. 1 mm long.

Specimens examined. TAIPEI CITY: Peitou, 1908, *Kawakami & Sasaki s.n.* (TAI). ILAN HSIEN: Wushihpi, 1992, Suao, *Ying s.n.* (NTUF). TAITUNG HSIEN: Chipen Logging Trail, *Shih 3269, 2599, 2645* (NSYSU); Taiyuan, *Shih 2787* (NSYSU); Dutwoshan, *Shih 2736* (NSYSU); Lanyu, *Shih 3400* (NSYSU). HUALIEN HSIEN: Chingshuishan, *Shih 3314* (NSYSU); Chimay, *Shih 3257* (holotype: NSYSU; isotypes: HAST, TAI, TAIF).

Distribution. Endemic; found in vicinity of Taipei, the eastern part of the island, and Island Lanyu at low to medium altitudes. Mostly growing along streams, ravines, sometimes on moist forest floors or rocky places.

Notes. This species bears a strong superficial resemblance to *Elatostema herbaceifolium* Hayata because of their similarity in leaf shape and size. However, the former has leaves and stems with very sparse, short hairs and leaf-teeth with obtuse to rounded tips, whereas the latter has leaves and stems with many long-hirsute hairs, and leaf-teeth with very sharp tips.

5. *Elatostema hypoglaucum* Shih & Yang, Bot. Bull. Acad. Sin. 36: 162, f. 4. 1995. “hypoglauca”.

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Monoecious perennial slender herbs; stems juicy, ascending, quadrate with distinct angles, often simple-branched, sparsely puberulent at nascent parts, soon glabrescent, greenish, 15–25 cm high, rarely up to 35 cm

high, 1–2 mm thick. Leaves alternate, sessile to subsessile, distichous; lamina membranous, very sparsely puberulent or mostly glabrous, with somewhat dense cystoliths on upper surface, very sparsely puberulent on lower surface, light green on adaxial side, pale-green or white-greenish on abaxial side, narrowly elliptic, obovate or oblong, (1.5–)2.0–3.5(–5.5) cm long, (0.5–)1.0–1.5(–2.0) cm wide, semi-cordate or semi-rounded at base, sparsely minutely ciliate or without and dentate or crenate at margins, acute at apex, minutely ciliate and acute or obtuse at the tip of apex, semi-triplinerved or penninerved, the nerves elevated beneath and impressed above, the secondary veins 2–3 pairs; stipules caducous or deciduous, ciliate near apex, entire at lower margins, glabrous on adaxial sides, minutely puberulent on abaxial side, greenish white, lanceolate, ca. 2 mm long, 0.5 mm wide. Inflorescences greenish, somewhat minutely puberulent outside, disclike, the male ones ellipsoidal, ca. 7 mm in diameter, with sparsely minute-puberulent peduncles to 4 cm long, the female ones usually in a oblique-quadrate outline, up to 4 × 3 mm in size when fruiting, sessile or subsessile; bracts sparsely minute-puberulent, completely connate into an unlobed, oblong involucre, up to 3.5 mm long, 2 mm wide in female inflorescences. Male flowers subtended by bracteoles, ca. 1 mm long and wide, pedicellate; sepals 5, connate at base, semi-transparent, somewhat minute-puberulent outside, mostly corniculate, cymbiform, acute at apex; pedicels glabrous. Female flowers subtended by bracteoles, pedicellate; bracteoles semi-transparent, cymbiform, acute, fimbriate at the upper half, entire at the lower half, the abaxial veins puberulent at upper half; sepals 3, free, very minute or rudimentary; staminodes 3, minute, enlarged when fruiting; stigmas penicillate, deciduous; ovary glabrous, ovoid. Achenes ovoid or ellipsoidal, ca. 0.7 mm long, 0.4 mm wide.

Specimens examined. TAIPEI HSIEN: Saukan & Kyanrawa, *Suzuki 6999* (TAI). ILAN HSIEN: Taipingshan, *Suzuki 545* (TAI). TAOYUAN HSIEN: Rarashan, *Shih 3111* (holotype: NSYSU; isotypes: HAST, TAI, TAIF), *3121* (NSYSU). NANTOU HSIEN: Randaishan, *Kawakami & Hayata 7129* (TAIF). CHIAYI HSIEN: Mt. Morrison, *Kawakami & Mori 1987* (TAIF).

Distribution. Endemic; found at medium altitude, growing on moist forest floors or beside streams and ravines.

Notes. This species is related to *Elatostema cuspidatum* Wedd., but can be distinguished by a combination of the following characters: plants dwarf, less than 35 cm high; stems slender; leaves with obtuse teeth; and male inflorescence with a distinct peduncle. This species is also similar to *E. microcephalanthum* Hayata, but can be distinguished by its quadrate-angular and sparsely puberulent stems and completely connate female involucre.

6. *Elatostema lineolatum* Wight var. *majus* Wedd., Arch. Mus. Hist. Nat. Paris 9: 312. 1856 et in DC., Prodr. 16 (1): 182. 1869; Thwaites, Enum. Pl. Zeyl. 260. 1864; Wang, Acta Phytotax. Sin. 28 (4): 309. 1990; Yamazaki, J. Jap. Bot. 70(3): 176. 1995.

Pellionia scabra auct. non Benth.: Ying, Coloured Ill. Fl. Taiwan 3: 445, *quoad photo* 550. 1988.

Monoecious or dioecious subshrubs; stems erect or ascending, terete, branched, hirsute, gray-brown, up to 1 m high, 5.5 mm thick. Leaves alternate, sessile or subsessile, stipulate; lamina chartaceous, pubescent and with dense, up to 0.3 mm long cystoliths on adaxial side, with appressed hairs along veins and without cystolith on abaxial side, green on adaxial side, pale-green on abaxial side, asymmetrically narrowly elliptic, oblong to lanceolate, up to 15.5 cm long, 4.5 cm wide, the base of the distal half acute, the margins sharply serrate, the apex acuminate, the semi-triplinerves articulated with lateral and secondary nerves; stipules 2, opposite, deciduous, hirsute at abaxial side, mostly along veins, ciliolate at margins, greenish, narrowly triangular, the one of reduced leaf 1-veined, ca. 5.2 mm long, 0.8 mm wide, the other of normal leaf 2-veined, ca. 5.8 mm long, 1.3 mm wide. Male inflorescences subsessile, ellipsoidal-discoid, up to 5 × 4 mm in size; bracts connate into a oblong involucre, the involucre hirsute outside, up to 5 mm long, 2 mm wide. Female inflorescences sessile or subsessile, whitish-green, hirsute outside, ellipsoidal-discoid, up to 8 × 6 mm in size when fruiting; bracts hirsute, connate into a narrowly oblong involucre, up to 8 mm long, 2 mm wide. Male flowers hirsute outside, lateral-compressed, widely obovoid, up to 1.6 mm long, 1.4 mm wide, pedicellate, subtended by bracteoles; sepals 4, valvate, dimorphic, unequal, obovate-cymbiform of larger ones, ca. 1.2 mm long, 1.1 mm wide, elliptic-cymbiform of smaller ones, ca. 1.2 mm long, 0.56 mm wide; bracteoles cymbiform, ca. 1.6 mm long, 0.45 mm wide; pedicels ca. 2.2 mm long. Female flowers pedicellate, subtended by bracteoles; bracteoles semi-transparent, ciliate at upper margins and apex, densely hirsute at abaxial side, linear, ca. 1.5 mm long, 0.2 mm wide; sepals 3, minute; staminodes 3, minute, enlarged when fruiting; stigma penicillate, formed with less than 5 hairs; ovary glabrous, ellipsoidal, ca. 0.3 mm long, 1.9 mm wide. Achenes brown, conspicuously 8-ribbed, ellipsoidal, ca. 0.65 mm long, 0.34 mm wide.

Specimens examined. TAIPEI CITY: Muchihshan, *Kuo 6491* (TAI); TAIPEI HSIEN: Shihmen, *Shih 3218* (NSYSU); Wulaishan, *Shih 3398* (NSYSU). KEELUNG CITY: 1916, *Hayata s. n.* (TAIF). TAOYUAN HSIEN: Tachi, 1934, *Sasaki s. n.* (TAI). HSINCHU HSIEN: Wutzushan, 1914, *Ito s. n.* (TAIF). TAICHUNG HSIEN: Lienhuachi, 1936, *Mori s. n.* (TAI); Lishan, 1977, *Kuo s. n.* (TAIF). CHIAYI HSIEN: Alishan Highway, *Shih 2953* (NSYSU); Funchifu, *Huang & Huang 15951* (TAI). TAINAN HSIEN: Kuantzuling, 1918, *Shimada s. n.* (TAIF). KAOHSIUNG: Laulong Logging Trail, *Shih 2640* (NSYSU); Meilong, *Shih 2635* (NSYSU); Shanping, 1995, *Lin s. n.* (NSYSU); Shihshan, *Shih 3383* (NSYSU). PINGTUNG HSIEN: Wuweishan, 1920, *Matuda s. n.* (TAIF). TAITUNG: Chihpen, *Shih 2588* (NSYSU); Dutwoshan, *Shih 2739* (NSYSU); Lichai Logging Trail, *Shih 3354* (NSYSU); Tajen, *Shih 3287* (NSYSU); Tanan, *Shih 2576* (NSYSU); Tawu, *Shih 3289* (NSYSU).

Distribution. Distributed in Nepal, Bhutan, India, and China. Taiwan, found at low to medium altitudes throughout the island, growing along trails, in moist forest floors and in ravines. Flowering from late October to next May.

Notes. This variety is characterized by its linear-lanceolate leaves, and densely hirsute stems and leaves. The typical variety is distributed in India, Ceylon, Himalaya, and Burma (Hara and Williams, 1979). *Elatostema lineolatum* var. *majus* has leaves with larger, more coarsely serrate, margins, whereas the typical variety has leaves with conspicuously but shallowly crenate or serrate margins (Grierson and Long, 1983).

Hooker f. (1888) cited a variety 'major' of *Elatostema lineolatum* and attributed it to Thwaites, which was followed by many, such as Matsumura and Hayata (1906), Hayata (1916), Yamamoto (1925), Liu and Huang (1976), Wang (1980), and Ying (1988). After checking Thwaites' (1964) "Enumeration of Ceylon Plants", we found that he did not describe the variety. In fact all varieties of this species in his book followed Weddell's treatment (1856).

7. *Elatostema microcephalanthum* Hayata, Icon. Pl. Formosan. 6: 59. 1916. "microcephalantha"; Wang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 4(7): 43. 1980. Figure 4

Perennial monoecious herbs; stems ascending, prostrate at base, usually rooting at lower parts, branched, canaliculate at upside, glabrous, deeply brown-red, brownish-green to green, up to 60 cm long, 3 mm thick. Leaves alternate, sessile to short-petiolate, stipulate; lamina membranaceous, sparsely to slightly hirsute and with slightly dense, ca. 0.3 mm long cystoliths on adaxial side, sparsely hirsute along veins and without cystolith on abaxial sides, deep-green on adaxial side, pale-green on abaxial side, asymmetrically obovate, ovate to obovate-lanceolate, 1.5–6.0 cm long, 0.8–2.0 cm wide, the base of the distal half rounded to semi-cordate, the margins slightly minute-ciliolate, obtusely serrate, the apex obtusely acute to acutely acuminate, the semi-triplinerves articulated with lateral and secondary nerves; stipules 2, opposite, persistent, 1-nerved, glabrous, greenish, lanceolate, 1–2 mm long, the margins minute-ciliolate. Male inflorescences long-pedunculate, up to 8 × 5 mm in size; bracts connate into a narrowly oblong involucre of ca. 8 mm long, 1 mm wide; peduncle up to 4 cm long. Female inflorescences sessile or subsessile when blooming, pedunculate when fruiting, whitish-green, ellipsoidal, up to 6 mm in length and 5 mm in width when fruiting; bracts slightly puberulent, connate into a narrowly oblong involucre, up to 6 mm long, 0.8 mm wide; peduncles up to 1.7 cm long when fruiting. Male flowers hirtellous outside, widely obovate, ca. 1 mm long and wide; sepals 5, hirtellous at abaxial side, subequal, ovate-cymbiform, ca. 2 mm long, 0.7 mm wide, slightly corniculate; pedicels up to 1.5 mm long. Female flowers short pedicellate; sepals 3 or 4, minute, unequal, linear-acicular, 0.1–0.2 mm long; staminodes 3 or 4, minute, enlarged when fruiting; stigma penicillate; ovary

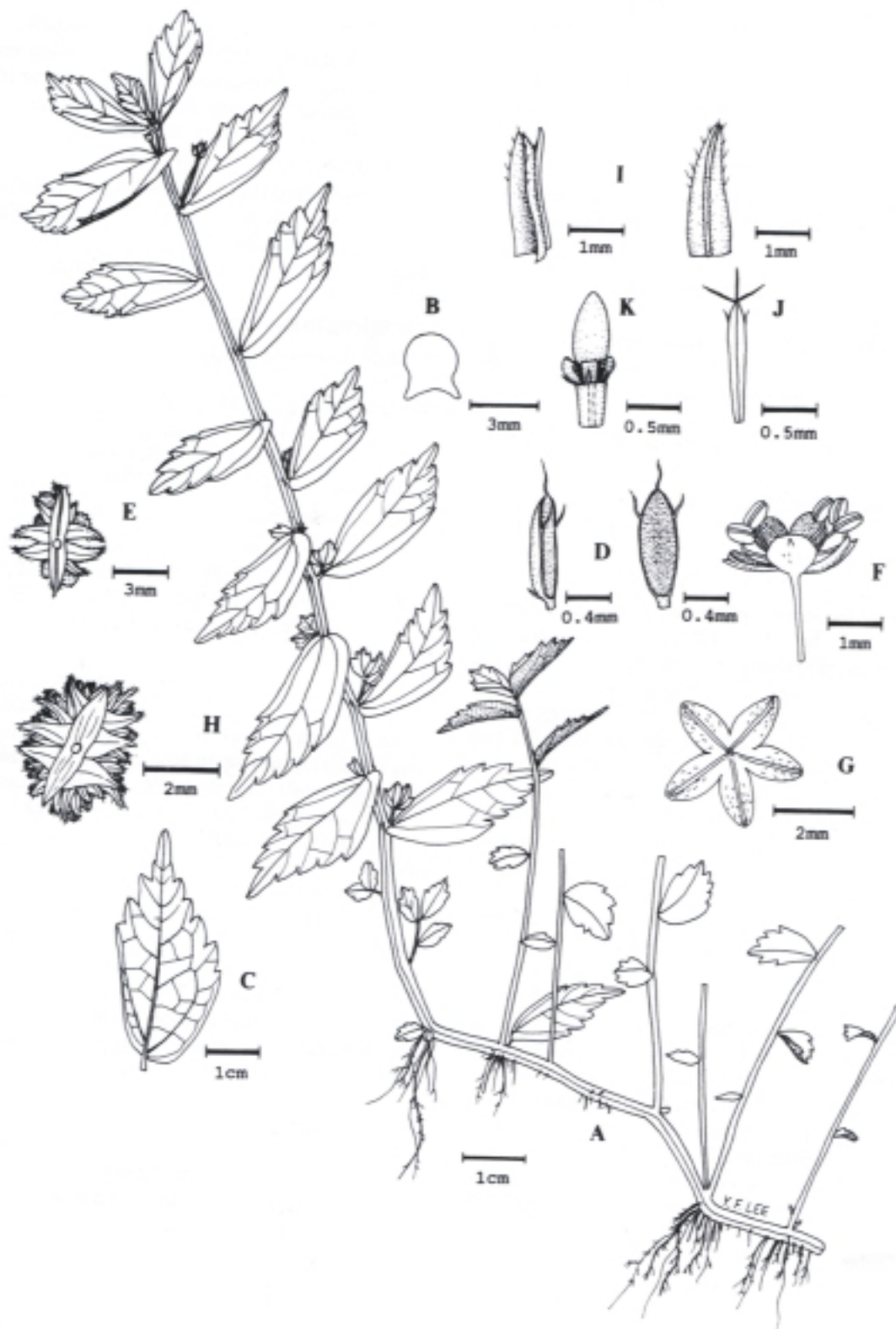


Figure 4. *Elatostema microcephalanthum* Hayata, from *Shih 3409*. **A**, Habit. **B**, Cross section of upper stem. **C**, Leaf (abaxial view). **D**, Stipules, left: sub-lateral view, right: abaxial view. **E**, Male inflorescence (ventral view). **F**, Male flower in blooming. **G**, Male sepals (ventral view). **H**, Female inflorescence (ventral view). **I**, Male bracteoles, left: sub-lateral view, right: abaxial view. **J**, Female bracteole (abaxial view). **K**, Achene with staminodes.

glabrous, ovoid, ca. 0.4 mm long. Achenes inconspicuously 5- or 6- ribbed at subapex toward apex, ovoid, ca. 0.7 mm long, 0.3 mm wide; pedicels subquadrate when fruiting.

Specimens examined. TAIPEI HSIEN: Peichatienshan, *Shih* 3142, 3144, 3148, 3150 (NSYSU). ILAN HSIEN: Chaishiang Bridge, *Shih* 2876 (NSYSU). TAOYUAN HSIEN: Rarashan, *Shih* 3103, 3104, 3106 (NSYSU). CHIAYI HSIEN: Alishan, 1912, *Hayata s. n.* (TI, *syntype*). KAOHSIUNG HSIEN: Shihshan, *Shih* 3409 (NSYSU). TAITUNG HSIEN: near Tongho Farm, *Shih* 3267 (NSYSU).

Distribution. Endemic; found at medium altitude throughout the island, mostly growing in ravines or on moist floors near ravines. Flowering from June to January.

Note. This species is quite common at medium altitude throughout this island. Plants of this species were neglected previously. Its male inflorescences are long-pedunculate. Wang (1980) erroneously indicated that this species has sessile or subsessile male inflorescences.

8. *Elatostema multicanaliculatum* Shih & Yang, sp. nov.
Figure 5

Species nova affinis *Elatostemati ficoidi* Wedd., sed inflorescentiis discoideis nec sycocarpi.—TYPE: Taiwan. Taoyuan Hsien: Rarashan, *Shih* 3226 (holotype: NSYSU; isotypes: TAI, TAIF, HAST)

Perennial herbs; stems repent or ascending, usually rooting at lower parts, branched, with 5 or more longitudinal canals, glabrous, greenish, sometimes brown-red at lower parts, up to 80 cm long, 12 mm thick. Leaves alternate, sessile or subsessile, stipulate, alternate, distichous; lamina membranous, sparsely hirsute and with dense ca. 0.2 mm long cystoliths on adaxial side, glabrous and without cystolith on abaxial sides, green on adaxial side, pale-green on abaxial side, asymmetrically elliptic to lanceolate-oblong, usually 5–14(–14.5) cm long, 2.5–5.0(–5.5) cm wide, the base of the distal half semi-cordate, the margins slightly minute-ciliolate, serrulate to coarsely serrate, the apex with a nearly entire, 5–15 mm long acumens, the triplinerves or penninerves articulated with lateral and secondary nerves; stipules 2, opposite, deciduous, 1-nerved, glabrous, greenish, lanceolate, 5–7 mm long, ca. 2 mm wide, the nerve not reaching the apex, the margins minute-ciliolate. Female inflorescences sessile or subsessile, whitish-green, slightly puberulent outside, subquadrate, up to 12 mm in length and 8 mm in width when fruiting; bracts slightly puberulent, connate into a narrowly oblong or lanceolate involucre, up to 10 mm long, 2.5 mm wide. Female flowers short pedicellate, subtended by bracteoles; bracteoles semi-transparent, narrowly lanceolate, ca. 0.5 mm long, ciliolate at apex, glabrous; sepals 3 or 4, minute, unequal, linear-acicular, 0.1–0.25 mm long; staminodes 3 or 4, minute, enlarged when fruiting; stigma penicillate; ovary glabrous, ovoid, ca. 0.4 mm long. Achenes inconspicuously 5- or 6- ribbed at subapex toward apex,

ovoid, ca. 0.7 mm long, 0.3 mm wide; pedicel subquadrate when fruiting.

Additional specimen examined. TAOYUAN: Rarashan, *Shih* 3127 (NSYSU).

Distribution. Endemic; found only at medium altitude around Rarashan area, mostly growing on moist floors near a ravine. Flowering from September to November.

Notes. This species superficially resembles *Elatostema ficoides* Wedd., but differs from it in having receptacles not enclosing inflorescences and not splitting irregularly when blooming. In contrast, *E. ficoides* has receptacles forming ficoid heads enclosing inflorescences and splitting irregularly when blooming.

Matsumura and Hayata (1906) indicated the occurrence of *E. ficoides* in Taiwan, which is doubtful. Such specimens are not available in any herbaria of this island. Dr. Wilmot-Dear (pers. comm., 1995) informed us that some specimens (in K) from Taiwan annotated as "*E. ficoides*" may belong to this new species.

Male flowers of this species have never been seen.

9. *Elatostema parvum* (Blume) Miq. in Zoll., Syst. Verz. Ind. Archip. 102. 1854; Chun & Chang, Fl. Hainanica 2: 409. 1965; Wang, Bull. Bot. Lab. N.E. Forest. Inst., Harbin 4(7): 34. 1980. †† ... -fl

Procris parvum Blume, Bijdr. 512. 1825.

Elatostema minutum Hayata in J. Coll. Sci. Imp. Univ. Tokyo 25(9): 198, pl. 36. 1908 & Icon. Pl. Formosan. 6: 60, f. 7. 1916; Liu & Huang in Li et al., Fl. Taiwan 2: 181. 1976; HSIEN Ying, Coloured Ill. Fl. Taiwan 3: 458, photo 557, 1988.

Perennial monoecious herbs; stems prostrate or ascending, usually rooting at lower parts, branched, subterete, densely hirsute at nascent parts, glabrescent toward base, slightly dark-green, up to 40 cm long, 3 mm thick. Leaves alternate, sessile or subsessile, stipulate, alternate, distichous; nanophylls opposite the leaves, ovate to obovate, less than 0.4 cm long, deciduous, ciliate, glabrous on adaxial side, slightly hirsute on abaxial side; lamina chartaceous, slightly hirsute on both sides, with ca. 0.2 mm long cystoliths on adaxial sides, without cystolith on abaxial side, green to deep-green on adaxial side, pale-green on abaxial side, asymmetrically obovate, ovate to lanceolate, 1.0–5.5 cm long, 0.5–2.0 cm wide, the base of the distal half rounded to semi-cordate, the margins sharply serrate, the apex acute to acuminate, the triplinerves or penninerves articulated with lateral and secondary nerves to form a reticulated venation; stipules 2, opposite, persistent, 1-nerved, glabrous to glabrescent, greenish, obliquely lanceolate, 3.0–4.0 mm long, the margins ciliolate. Male inflorescences sessile to short-pedunculate, hirsute outside, ellipsoidal, up to 5.0 × 4.0 mm in diameter; peduncles hirsute, up to 5 mm long. Female inflorescences sessile or subsessile, greenish, hirsute outside, ellipsoidal, up to 4.5 × 3.5 mm in diameter when fruiting. Male flowers with 5 sepals, hirtellous outside, obovoid, ca. 2 mm long, 2.5 mm wide. Female flowers with 4 se-

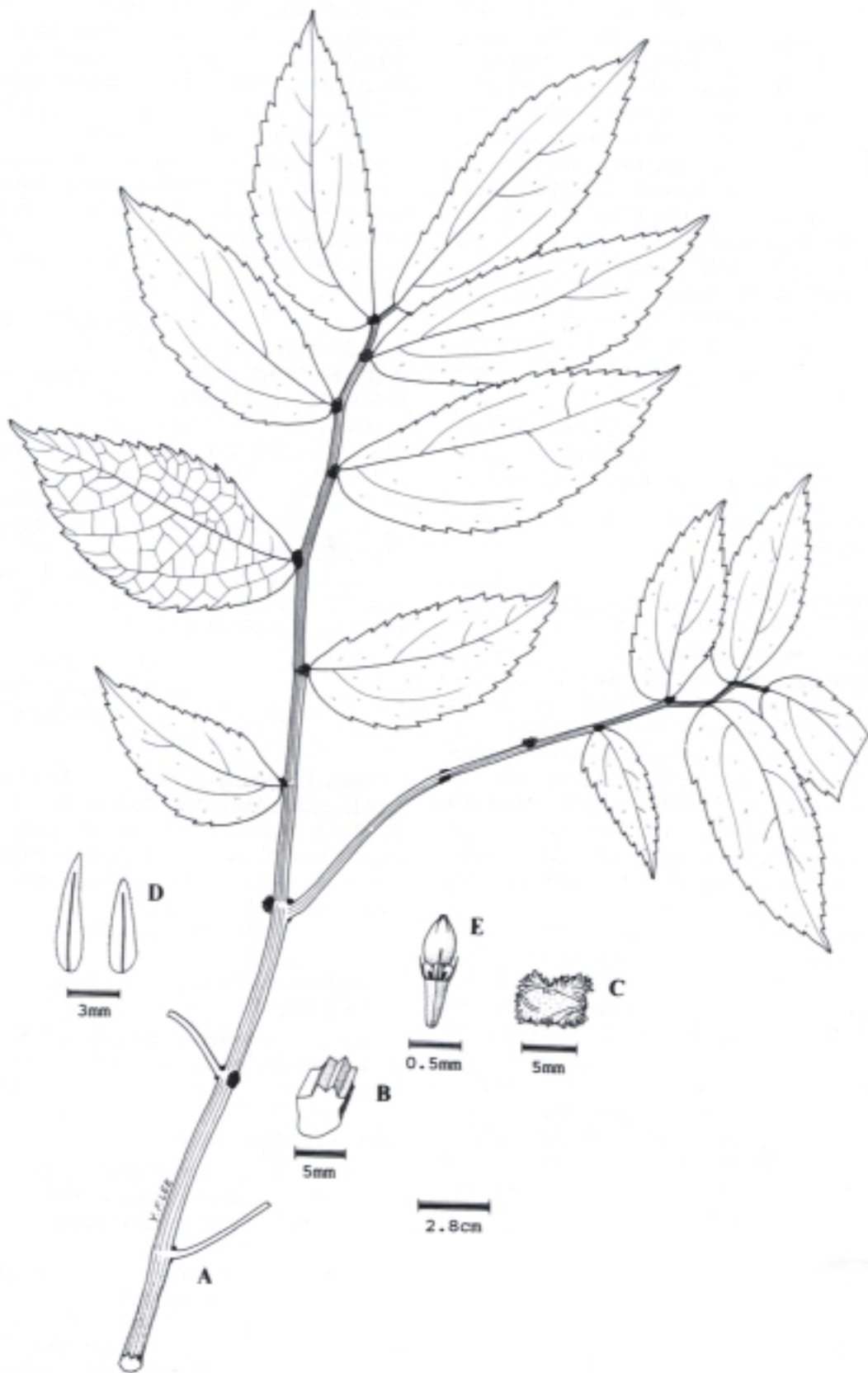


Figure 5. *Elatostema multicanaliculatum* Shih & Yang, from Shih 3127. **A**, A branch. **B**, Cross section of upper stem. **C**, Female inflorescence (ventral view). **D**, Stipules (abaxial view). **E**, Achene with staminodes, sepals & pedicel.

pals; staminodes 4, minute, enlarged when fruiting; stigma penicillate; ovary glabrous, ovoid, ca. 0.4 mm long. Achenes ovoid, ca. 0.5 mm long, 0.3 mm wide.

Specimens examined. TAIPEI HSIEN: Peichatienshan, *Shih 3141* (NSYSU). ILAN HSIEN: Fushan, *Shih 2828* (NSYSU); Taipingshan, *Huang 4988*(TAI). TAOYUAN HSIEN: Rarashan, *Shih 3105, 3107* (NSYSU). TAICHUNG HSIEN: Lishan, *Shih 2890* (NSYSU); Piluchi, *Shih 2992* (NSYSU). NANTOU HSIEN: Mt. Morrison, *Kawakami & Mori 1986* (TAIF, type of *E. minutum* Hayata); Nengkaoshan, 1919, *Matuda s. n.* (TAIF); Tongpu, *Shih 2985* (NSYSU). CHIAYI HSIEN: Heisyana, 1914, *Hayata s. n.* (TAIF). PINGTUNG HSIEN: Tawushan, 1921, *Matuda s. n.* (TAIF); Wutoushan, *Yang 10427* (PPI). TAITUNG HSIEN: Chipentsushan, *Yang & Lin 11282* (PPI); Lichai Logging Trail, *Shih 3365* (NSYSU). HUALIEN HSIEN: Kiraikei-Asahi, 1919, *Matuda s. n.* (TAIF); Sarkatang Logging Trail, *Shih 3065* (NSYSU); Mt. Taroko, *Keng & Kao 2624* (TAI); Tzuen, *Shih 3253* (NSYSU).

Distribution. Distributed in Nepal, Northern India, Java, and China. Taiwan found at medium altitude throughout the island, mostly growing on moist floors near ravines.

Notes. This species is characterized by having a nanophyll opposite to a normal leaf.

10. *Elatostema platyphylloides* Shih & Yang, Bot. Bull. Acad. Sin. 36: 158, f. 2. 1995. ♀, ♂, ... 𐄀

Perennial monoecious or dioecious herbs; stems somewhat woody at base, branched, somewhat hirsute at nascent parts, glabrescent, green, slightly geniculate, distinctly striated in specimens, up to 1.5 m high, 1 cm thick. Leaves alternate, sessile to short-petiolate, distichous; lamina chartaceous, somewhat hirsute, with very dense, 0.3–0.4 mm long cystoliths on upper surface and mostly along veins on lower surface, dark green to green on adaxial side, pale green to light green on abaxial side, narrowly elliptic to oblong, (5–)10–25(–30) cm long, (2–)4–7.5(–8.5) cm wide, the base of the distal half semi-sagittate with a earlike limb which crossing the petiole to the opposite side, the margins ciliate and serrate to serrulate, the apex caudate, ciliate and densely serrulate, the semi-triple-nerves prominent beneath, the secondary veins 4–6 pairs; petioles 0–5 mm long; stipules 2, opposite, caducous, ciliate, glabrous on adaxial side, hirsute on abaxial veins, greenish with minute brown spots, lanceolate-cymbiform, 1.5–2.5(–3) cm long, 3–5.5 mm wide. Inflorescences greenish, somewhat minutely puberulent outside, discoid, the male ones with two ellipsoidal parts, 1.5–3.0 × 1.0–2.5 cm in diameter, the peduncles glabrous, 3–18 mm long, the female ones usually in a butterfly-like outline, up to 7 × 6 mm in size, sessile or subsessile; bracts somewhat minutely puberulent, completely connate into an unlobed, narrowly oblong to oblong involucre, up to 3 cm long, 1 cm wide in male inflorescences, up to 7 mm long, 2 mm wide in female's. Male flowers subtended by bracteoles, pedicellate; brac-

teoles semi-transparent, with minute linear cystoliths dispersed parallel to the midvein, cymbiform, ca. 5 mm long, the apex ciliate, truncate or mucronate, the margins entire, minutely hirsute on one-third of the abaxial veins; sepals 4, connate at base, semi-transparent, somewhat puberulent and minutely ciliate near apex, somewhat corniculate, cymbiform, ca. 2.3 mm long in blooming flowers, acute at apex; pedicels sparsely puberulent. Female flowers subtended by bracteoles, pedicellate; bracteoles semi-transparent, narrowly oblong, ca. 0.9 mm long, 0.3 mm wide when blooming, the upper margins and apex fimbriate, the lower margins entire, the abaxial veins puberulent subterminally; sepals 3, free, slightly unequal, narrowly triangular, ca. 0.1–0.3 mm long; staminodes 4, minute, enlarged when fruiting; stigma penicillate; ovary glabrous, ellipsoidal. Achenes ellipsoidal.

Specimens examined. TAIPEI HSIEN: Yin-ho-tung, *Wang 2745* (TAI). ILAN HSIEN: Tu-chian, *Suzuki 3734* (TAI). HSINCHU HSIEN: Wuchihshan, *Liau 404* (TAI). TAICHUNG HSIEN: Maopu-Chinghu, *Yang 1323* (TAI). NANTOU HSIEN: Chitou, *Ou & Kao 9126* (TAI). CHIAYI HSIEN: Van-lu Shiang, Alisan-Highway, *Shih 2948* (NSYSU); The Third Highway (at 353.3 km), *Shih 2727* (NSYSU). KAOHSIUNG HSIEN: Shan-ping, 1995, *Lin s. n.* TAITUNG HSIEN: Chipen Logging Trail, *Shih 2598* (holotype: NSYSU, Isotypes: HAST, TAI, TAIF); Lichai Logging Trail, *Shih 3366* (NSYSU); Du-two-shan, *Shih 2738* (NSYSU). HUALIEN HSIEN: Tienhsiang, *Shimizu & Kao 10613* (TAI).

Distribution. Hainan, China. Distributed almost throughout this island except Hengchun Peninsula from low to medium altitude, mostly growing along streams, ravines, also on moist forest floors.

Notes. This species is widely distributed in Taiwan, except Hengchun Peninsula. It has been erroneously recognized as *E. edule* C. Robinson for a long time. It is sharply distinct from *E. edule* in having hairs on plants, serrate tips at apex of leaves, and chartaceous leaves when fresh. In contrast, plants of *Elatostema edule* are glabrous and have leaves fleshy when fresh and with entire tip at apex.

11. *Elatostema rivulare* Shih & Yang, sp. nov. ♀, ♂, ... 𐄀 Figure 6

Affine *Elatostemati platyphylloidi* Shih & Yang, sed foliis ovato-elliptica, acumine sparse serrato, inflorescentia feminea lobata nec integra differt.—TYPE: Taiwan. Kaohsiung Hsien: Meishankou, *Shih 2613* (holotype: NSYSU; isotypes: HAST, TAI, TAIF)

Perennial herbs; stems slightly woody at base, simple to several-branched, ascending or suberect, sparsely puberulent, glabrescent, green to deep-green or brownish-to brown-green, slightly geniculate, up to 80 cm high, 8 mm thick. Leaves alternate, sessile to subsessile, distichous; lamina chartaceous, slightly hirsute, with densely 0.2–0.3 mm long cystoliths on upper surface, with sparse not more than 0.2 mm long cystoliths on lower surface, green to deep-green on adaxial side, pale green on abaxial

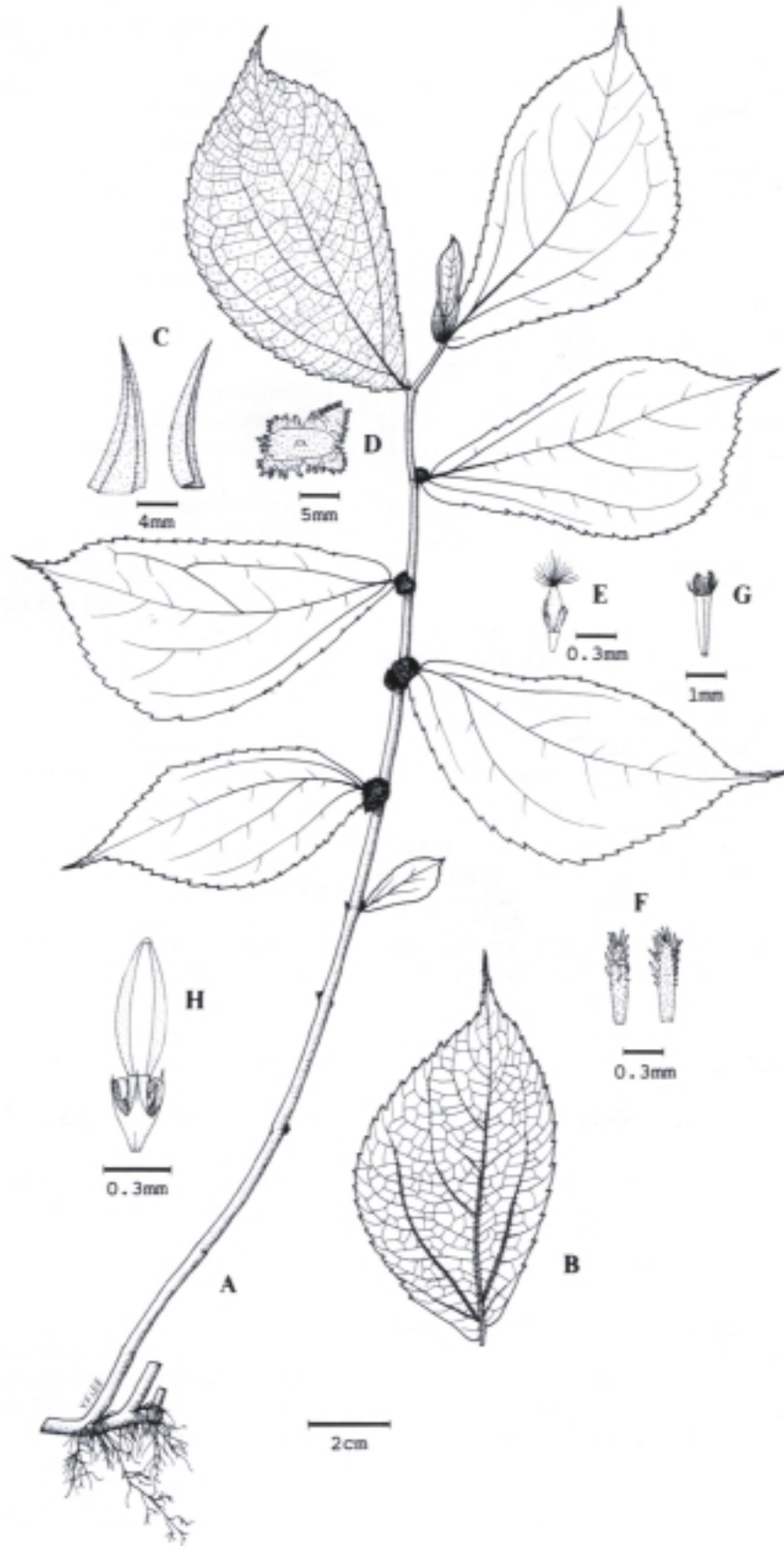


Figure 6. *Elatostema rivulare* Shih & Yang, from *Shih* 2987. **A**, Habit. **B**, Leaf (abaxial view). **C**, Stipules, left: abaxial view, right: sublateral view. **D**, Female inflorescence (ventral view). **E**, Female flower. **F**, Female bracteoles, left: abaxial view, right: abaxial view. **G**, Staminodes, sepals & pedicel. **H**, Achene with staminodes & sepals.

side, narrow-oblong, narrow-elliptic to elliptic, (4–)6–15(–16)cm long, (2–)3–6(–6.5)cm wide, the base of the distal half acute to semi-cordate, the margins ciliolate, serrate, the apex abruptly caudate, ciliolate and sparsely 1–5-serrulate, the semi-triplinerves prominent beneath, the secondary veins 4–6 pairs; stipules 2, dimorphic, opposite, caducous, ciliolate, glabrous on adaxial sides, hirsute on abaxial nerves, greenish, the 1-nerved stipule lanceolate-cymbiform, 13–17.5 mm long, 2–4 mm wide, the 2-nerved stipule obliquely triangular-lanceolate, 13–15 mm long, 3–5 mm wide. Inflorescences greenish, slightly dense-puberulent outside, very thin-discoid, somewhat into a butterfly outline, up to 12 × 8 mm in size, sessile or subsessile; bracts slightly puberulent, completely connate into an unlobed, narrowly oblong to oblong involucre, up to 10 mm long, 4 mm wide. Female flowers short pedicellate, subtended by bracteoles; bracteoles semi-transparent, narrowly oblong, ca. 0.6 mm long, 0.2 mm wide when blooming, the upper margins and apex ciliolate, the lower margins entire, the abaxial sides puberulent; sepals 3, free, subunequal, very minute, not more than 0.2 mm long; staminodes 3, minute, enlarged when fruiting; stigma penicillate; ovary glabrous, slightly compressed, ovoid-ellipsoidal. Achenes ellipsoidal, ca. 0.6 mm long, 0.3 mm wide, 6-ribbed.

Additional specimens examined. TAICHUNG HSIEN: Hsinchayang, *Shih 3002* (NSYSU). NANTOU HSIEN: Chitou, *Chang 18273* (PPI). KAOHSIUNG HSIEN: Meishankou, *Shih 3403* (NSYSU); Shan-ming Bridge, *Shih 2814, 3405* (NSYSU). TAITUNG HSIEN: South Cross Highway, *Shih 2662* (NSYSU); Tungho Farm, *Shih 2797* (NSYSU).

Distribution. Endemic. Distributed at medium altitude, mostly growing along ravines, rare on moist forest floors near ravines. Flowering from February to July.

Note. This new species is very similar to *Elatostema platyphylloides* Shih & Yang in leaf-texture, but is different from it in having usually elliptic leaves, sparsely serrulate leaf acumene, and larger female inflorescences (up to 12 × 8 mm in size).

12. *Elatostema strigillosum* Shih & Yang, sp. nov. 䄀
† / ... 䄀 Figure 7

*Species nova affinis *Elatostemati delicatulo* Wedd., sed caule brevi, breviter strigilloso, foliis magnis obovatis, inflorescentiis minoribus differt.*—TYPE: Taiwan. Taitung Hsien: near Tonghou farm, *Shih 3268* (holotype: NSYSU; isotypes: HAST, TAI, TAIF)

Perennial herbs; stems terete, prostrate or suspending from the substrate it grows, usually rooting at nodes, several branched, densely strigillose throughout, dark brown-green, less than 20 cm long, 3 mm thick. Leaves alternate, distichous, sessile or subsessile; lamina chartaceous, scabrous on upper surface, densely hirtellous, with dense up to 0.43 mm long cystoliths on upper surface and along veins beneath, deep green to green on adaxial side, pale green on abaxial sides, asymmetrically obovate or oblong-

obovate, 9–25 mm long, 5–11 mm wide, the base of the distal half acute to obtuse, the margins ciliolate, 1–4-serrate at proximal half and 3–5-serrate at distal half near subapex, entire ca. halfway to the base, the apex acute, ciliolate, the semi-triple-nerves slightly raised beneath, the lateral nerves 2–3 pairs; stipules 2, opposite, persistent, ciliolate, glabrous on adaxial sides, hirtellous on abaxial side, greenish at nascent parts and brown at older parts, narrowly triangular, less than 1.8 mm long. Female inflorescences sessile or subsessile, greenish, turning into brownish with deep brown dots when fruiting, densely puberulent outside, elliptic-discoid, up to 3.5 mm in length and 2.5 mm in width; bracts densely puberulent, incompletely connate into a narrow-elliptic involucre, up to 3 mm long and 1 mm wide. Female flowers subtended by bracteoles, short-pedicellate; bracteoles semi-transparent, narrowly oblong-cymbiform, ca. 0.7 mm long, 0.25 mm wide when fruiting, the margins ciliolate, the abaxial side puberulent; sepals rudimentary, with 1–2 minute hairs on each one; staminodes 3 or 4, minute, enlarged when fruiting; stigma penicillate; ovary glabrous, ovoid. Achenes ovoid, ca. 0.6 mm long, 0.25 mm wide, with 8 winglike ribs.

Additional specimen examined. TAITUNG HSIEN: near Tungho Farm, *Shih 2803* (NSYSU).

Distribution. Endemic; found in a ravine. Flowering from June to October.

Notes. This new species is closely related to *Elatostema delicatulum* Wedd., but differs from it by having longer stems, larger leaves and smaller inflorescences. This new species is also similar to *E. villosum* Shih & Yang, but differs from it by having smaller leaves, shorter hairs, and smaller inflorescences. Male flowers of this new species are unknown.

13. *Elatostema subcoriaceum* Shih & Yang, sp. nov. 䄀
†, >... 䄀 Figure 8

*Species nova affinis *Elatostemati eduli* C. Robinson, sed caule profunde viridi, foliis oblique-ellipticis, inflorescentiis masculis minoribus, ca. 1.8 cm. nec 3 cm. diametro differt.*—TYPE: Taiwan. Taitung Hsien: Lanyu, *Shih 3188* (holotype: NSYSU; isotypes: HAST, TAI, TAIF).

Perennial monoecious herbs; stems subterete, aggregated, stout, erect or ascending, usually several-branched, glabrous, deep-green, up to 70 cm long, 7 mm thick. Leaves alternate, subsessile to short petiolate, distichous; lamina chartaceous to subcoriaceous, glabrous, with dense up to 0.5 mm long cystoliths on both surfaces, deep green to green on adaxial side, pale green on abaxial side, asymmetrically narrow-elliptic to elliptic, 6–21(–24) cm long, 3–7(–8) cm wide, the base of the distal half rounded, the margins dentate or crenate, entire at least halfway toward base at the proximal half and one-third toward base at the distal half, the apex long acuminate to caudate, usually entire, sometimes 1–2-denticulate, the nerves prominent beneath, the secondary veins 4–8(–9) of the distal half and

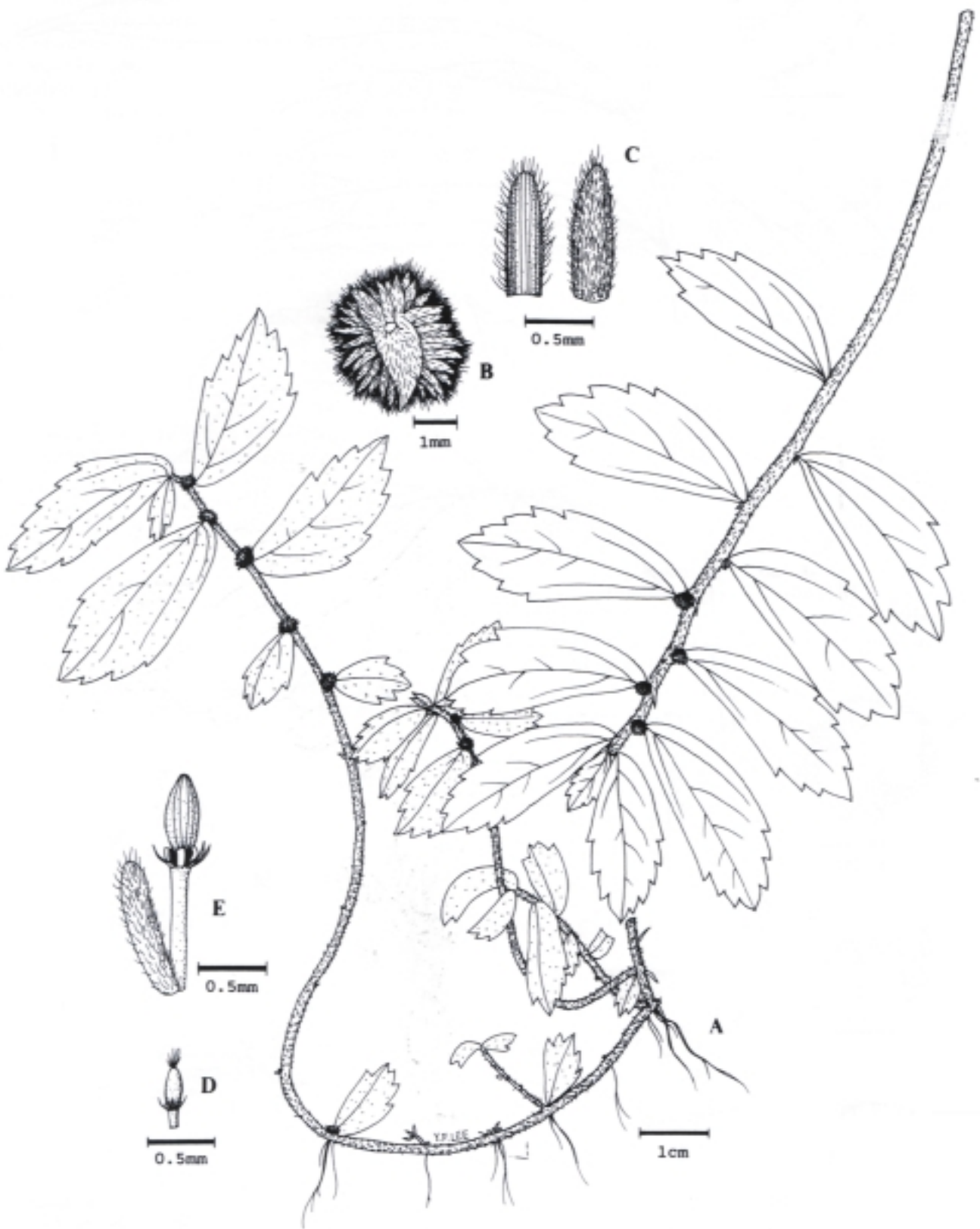


Figure 7. *Elatostema strigillosum* Shih & Yang, from Shih 3268. **A**, Habit. **B**, Female inflorescence (ventral view). **C**, Female bracteoles, left: abaxial view, right: abaxial view. **D**, Female flower. **E**, Achene with staminodes, sepals, pedicel & bracteole.

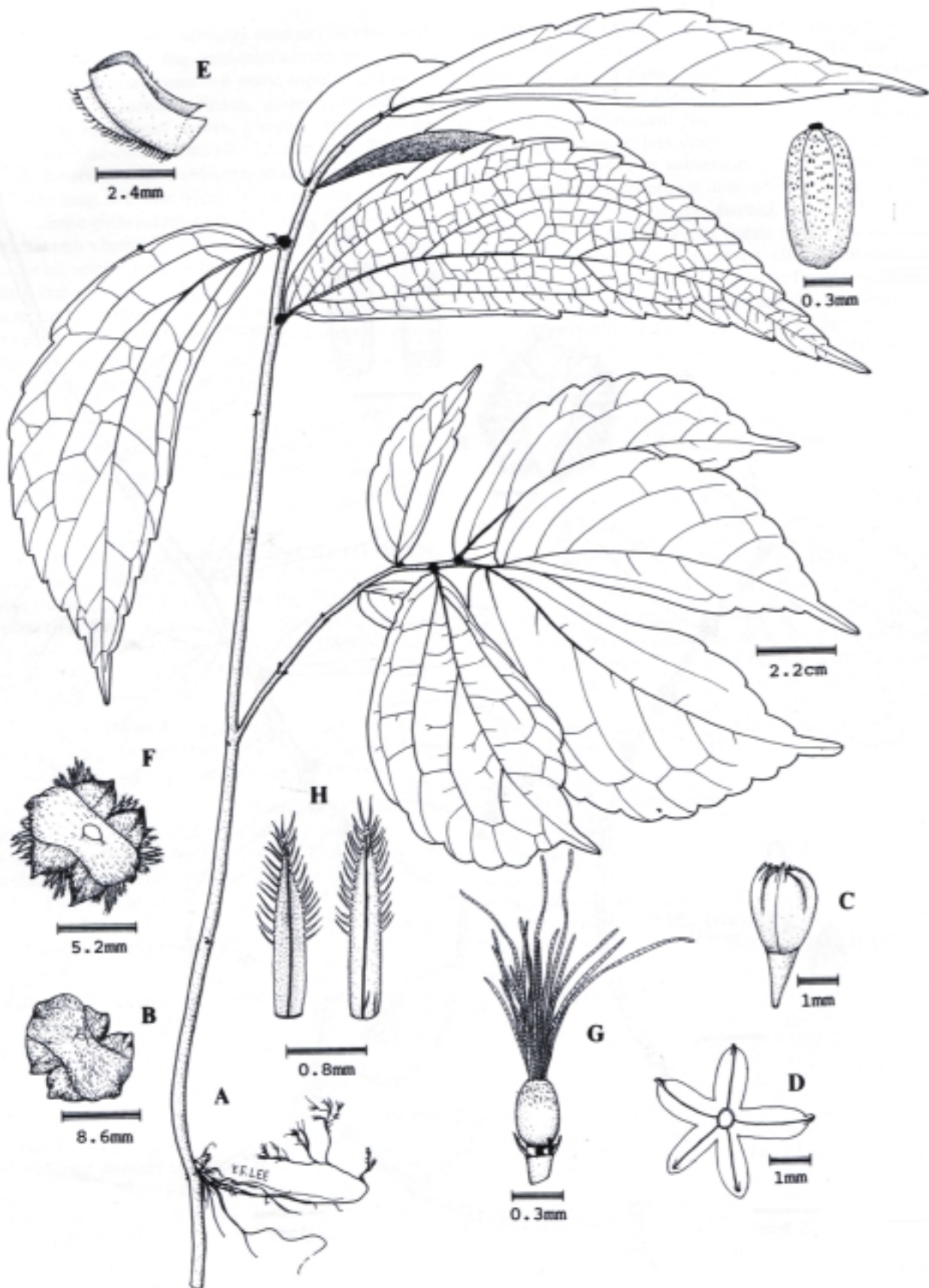


Figure 8. *Elatostema subcoriaceum* Shih & Yang, from *Shih 3188*. **A**, Habit. **B**, Male inflorescence (ventral view). **C**, Male flower. **D**, Male sepals (ventral view). **E**, Male bracteoles (sub-lateral view). **F**, Female inflorescence (ventral view). **G**, Female flower. **H**, Female bracteole, left: abaxial view, right: abaxial view. **I**, Achene.

3–6 of the proximal half; petioles glabrous, up to 1 cm long; stipules 2, opposite, caducous or deciduous, glabrous on both sides, brown, lanceolate, triangular or narrow-elliptic, up to 14 mm long, 3 mm wide. Male inflorescences sessile to short petiolate, greenish, nearly glabrous, elliptic-discoid, up to 18 mm long, 16 mm wide, the peduncle up to 10 mm long. Female inflorescences sessile or subsessile, greenish, slightly puberulent outside, elliptic-discoid, up to 12 mm long, 6 mm wide. Bracts slightly puberulent, completely connate into a oblong involucre, the involucre up to 16 mm long, 6 mm wide. Male flowers obovoid, ca. 1.8 mm long, 1.5 mm wide, pedicellate, subtended by bracteoles; bracteoles cymbiform, up to 3.6 mm long, 1.8 mm wide when blooming, the apex truncate and ciliolate, the margins ciliolate at upper parts, the abaxial vein puberulent; sepals 5, glabrous, valvate, elliptic-cymbiform, the largest one ca. 2 mm long, 0.9 mm wide, corniculate at subapex, the smallest one ca. 1.7 mm long, 0.7 mm wide, nearly entire, slightly corniculate. Female flowers pedicellate, subtended by bracteoles; bracteoles semi-transparent, lanceolate, ca. 1.8 mm long, 0.3 mm wide when blooming, the upper margins and apex ciliate, the abaxial side nearly glabrous; sepals 5, rudimentary, less than 0.2 mm long; staminodes 5, minute, enlarged when fruiting; stigma formed with septate hairs, penicillate, 1.5 to 5 times as long as ovary; ovary glabrous, oblong, ca. 0.4 mm long, 0.26 mm wide. Achenes with obscurely 6 ribs from apex faded toward base, oblong, ca. 0.9 mm long, 0.43 mm wide, densely brown-spotted.

Additional specimens examined. TAITUNG HSIEN: Lanyu, *Shih* 3163, 3166, 3174, 3193 (NSYSU); *Chang* 17800, 19595, 19781 (PPI). HUALIEN HSIEN: Chimay, *Shih* 3094 (NSYSU).

Distribution. Endemic; found in Island Lanyu and Hualien County at low altitude, growing along ravines and on moist forest floors. Flowering from July to October.

Note. This is a distinct species of uncertain affinities, although it superficially resembles to *Elatostema edule* C. Robinson. The former has stems dark-green and terete or subterete, male inflorescences 1.8 cm in diameter and plants without mint-like odor, whereas the latter has stems greenish and angular, male inflorescences 3 cm in diameter and plants with mint-like odor.

14. *Elatostema trilobulatum* (Hayata) Yamazaki, J. Jap. Bot. 47(6): 180, f. 1. 1972. Figure 9

Pellionia trilobulata Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 280; Icon. Pl. Formosan. 6: 56. 1916; Liu & Huang, Li et al., Fl. Taiwan 2: 205. 1976; Ying, Coloured Ill. Fl. Taiwan 3: 452, photo 552, 1988.

Elatostema obtusum Wedd. var. *trilobulatum* (Hayata) Wang, Bull. Bot. Lab. N.E. Forest. Inst., Harbin. 4(7): 66. 1980.

Elatostema obtusum auct. non Wedd.: Ying, Coloured Ill. Fl. Taiwan 3: 459, photo 558. 1988, excl. syn.

Perennial herbs; stems slender, subterete, canaliculate at upper side when living, with retrorse hairs along the two

edges of the furrow, with many brown 4-celled scales, usually creeping or ascending, rooting at nodes, branched, greenish, up to 50 cm long, 2 mm thick. Leaves alternate, sessile or subsessile, stipulate, distichous; lamina membranaceous to herbaceous, sparsely hirsute and with dense up to 0.5 mm long linear cystoliths on adaxial side, glabrous and without cystolith on abaxial side, greenish on adaxial side, pale-green on abaxial side, asymmetrically oblong or obovate, 0.9–1.8 cm long, 0.35–1.2 cm wide, the base of the distal half semi-cordate, the margins slightly minute-ciliolate, with 2–3 serrate teeth at the distal half and 1–2 teeth at the proximal half, the apex acute, obtuse or rounded, the triplinerves articulated with lateral and secondary nerves; stipules 2, unequal, opposite, persistent, 1-nerved, glabrous, greenish, the one of normal leaves triangular, ca. 0.5 mm long, 0.18 mm wide, the other linear-triangular to narrowly triangular, ca. 2 mm long, 0.3 mm wide. Male inflorescences usually of (1–)5–6-flowered glomerules, sometimes of more than 25-flowered cymose glomerules; bracts 2, incompletely connate into an involucre, sparsely hirsute and puberulent outside, cymbiform, ca. 2.3 mm long, 1.7 mm wide, keeled, corniculate; peduncles up to 1.3 cm long. Female inflorescences sessile or subsessile, usually 1-flowered; bracts 2, hirsute, ciliate, connate at base, cymbiform, up to 3.3 mm long, 2 mm wide. Male flowers slightly lateral-compressed, obovoid, up to 2.5 mm long, 3 mm wide; sepals 4, connate halfway, unequal, sparsely puberulent and ciliate, cymbiform, up to 2.5 mm long, 2.4 mm wide, corniculate; pedicels ca. 1.3 mm long. Female flowers with 6–7 rudimentary sepals; staminodes 6 or 7, minute, enlarged when fruiting; stigma penicillate; ovary glabrous, ovoid, ca. 0.3 mm long, 0.2 mm wide. Achenes glabrous, inconspicuously 4-ribbed at subapex toward apex, ovoid, ca. 1.7 mm long, 0.9 mm wide.

Specimens examined. ILAN HSIEN: Taipingshan, *Huang* 4776, 4969 (TAI). TAOYUAN HSIEN: Rarashan, *Shih* 3109 (NSYSU). HSINCHU HSIEN: Kuanwu, *Huang* 6671 (TAI). TAICHUNG HSIEN: Hohuan Chanel, *Shih* 3249 (NSYSU). NANTOU HSIEN: Randaishan, 1908, *Kawakami & Mori s. n.* (TAIF); *Kawakami*, 1908, *Hayata & Mori s. n.* (TAIF); Yushan (en route), *Huang et al.* 14271 (TAI); *Chang* 18088 (PPI). CHIAYI HSIEN: Alishan, 1914, *Ito s. n.* (TAIF); *Kuoh* 7445 (TAI). PINGTUNG HSIEN: Tawushan, *Yang* 23454 (PPI). TAITUNG HSIEN: Chipentsushan, *Shih* 2670, 2679 (NSYSU). HUALIEN HSIEN: Hohuanshan, *Shih* 2893, 2918, 3246 (NSYSU); Kiraikei-Asahi, *Matuda* 269 (TAIF).

Distribution. Endemic. Distributed at medium and high altitudes throughout the Central Ridge, mostly growing on moist floors and ravines.

Note. This species is very similar to *Elatostema obtusum* Wedd. However, *E. trilobulatum* always has semiterete stems and hairs confined to the two ridges of the concave sides of the canaliculate stems whereas *E. obtusum* usually has quadri-angular stems and hairs throughout the stems. In addition, the male inflorescences of *E.*

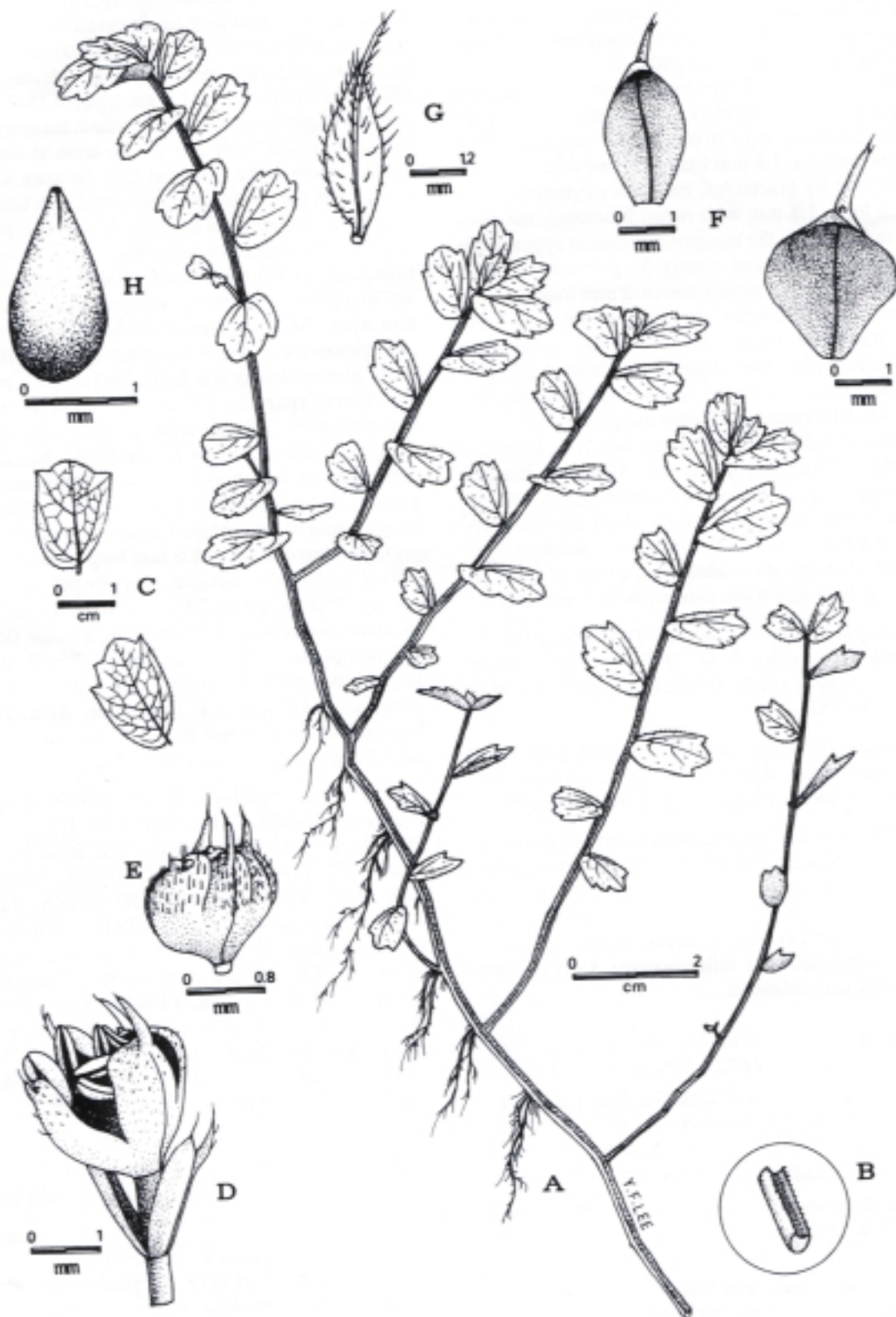


Figure 9. *Elatostema trilobulatum* (Hayata) Yamazaki, from *Shih 2670*. A, Habit. B, Portion of stem (enlarged). C, Leaves (abaxial view). D, Male inflorescence in blooming. E, Male flower. F, Male sepals (ventral view). G, Male bracteole (abaxial view). H, Achene.

trilobulatum usually have 5-6 flowers, whereas those of the latter have 1-3 flowers.

15. *Elatostema villosum* Shih & Yang, sp. nov.

Figure 10

Species nova affinis Elatostemati strigilloso Shih & Yang, sed caulibus dense villosis nec breve strigilloso, foliis magnis obovato-oblongatis nec parvis obovatis.—TYPE: Taiwan. Taitung Hsien: Lanyu, *Shih 2808* (holotype: NSYSU; isotypes: HAST, TAI, TAIF)

Perennial herbs; stems aggregated, ascending or suspending from the substrate it growing, usually rooting at nodes of lower parts, branched, densely villous throughout, dark brownish-green, up to 45 cm long, 3 mm thick. Leaves alternate, sessile or subsessile, distichous; lamina chartaceous, densely villous, with very dense, 0.2-0.3 mm long cystoliths on upper surface, deep green to green on adaxial side, pale green on abaxial side, asymmetrically obovate-oblongate, 2-5(-5.5) cm long, 7-20(-22) mm wide, the base of the distal half semi-

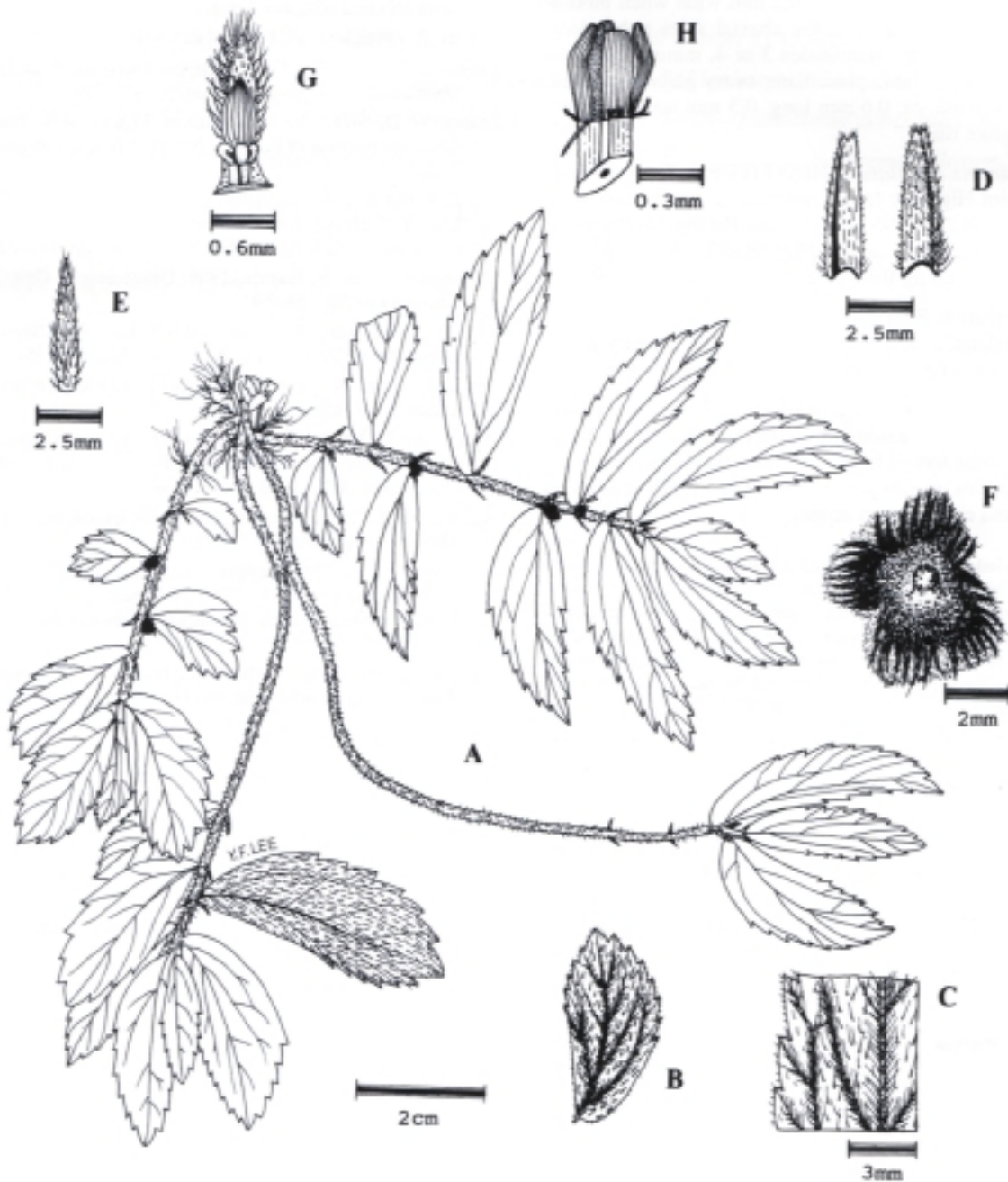


Figure 10. *Elatostema villosum* Shih & Yang, from *Shih 2808*. **A**, Habit. **B**, Leaf (abaxial view). **C**, Portion of leaf margin. **D**, Stipules, left: abaxial view, right: sublateral view. **E**, Stipule (abaxial view). **F**, Female inflorescence (ventral view). **G**, Achene with staminodes & bracteole. **H**, Stamines, rudimentary sepals & pedicel.

cordate, the margins ciliate and serrate, the apex cuspidate ciliate, the nerves prominent beneath, the secondary veins 4–6 of distal half and 3–5 of the proximal half; stipules 2, opposite, persistent, ciliate, glabrous on adaxial sides, hirsute on abaxial sides, greenish at nascent parts and brownish at older parts, narrowly triangular, 3–5.5 mm long. Female inflorescences sessile or subsessile, greenish, turning into brownish with deep brown dots when fruiting, densely puberulent outside, subquadrate, up to 4.5 mm in length and width; bracts densely puberulent, incompletely connate into a subquadrate involucre, up to 3 mm long and wide. Female flowers subtended by bracteoles, pedicellate; bracteoles semi-transparent, narrowly lanceolate, ca. 0.6 mm long, 0.2 mm wide when blooming, the margins ciliolate, the abaxial sides puberulent; sepals rudimentary; staminodes 3 or 4, minute, enlarged when fruiting; stigma penicillate; ovary glabrous, ovoid. Achenes ovoid, ca. 0.6 mm long, 0.3 mm wide, with ca. 12 winglike ribs.

Specimens examined. CHIAYI HSIEN: Ta-pu Hsiang, The Third Highway (at the entrance of Cheng-wen Reservoir), *Shih 2723* (NSYSU); Tsuchi Hsiang, Kuanyin Fall Forest Recreation Area, *Leu 1625* (HAST). KAOHSIUNG HSIEN: Shanming Bridge, *Shih 3334, 3406* (NSYSU).

Distribution. Endemic. Distributed in the southern parts of this island, at low to medium altitudes. Mostly growing along ravines, sometimes in moist forest floors.

Note: The new species shows a resemblance in habit, plant size and propagation to *Elatostema strigillosum* Shih & Yang. However, the former has villous hairs on plants and twelve winglike ribs on achenes, the latter has strigillose hairs on plants and eight ribs on achenes.

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台灣樓梯草屬（蕁麻科）之訂正

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本文中確認並描述台灣蕁麻科樓梯草屬 (*Elatostema* Forster & Forster f.) 15 種；其中 6 種為新種，即銳齒樓梯草 (*Elatostema acuteserratum* Shih & Yang)，多溝樓梯草 (*Elatostema multicanaliculatum* Shih & Yang)，溪澗樓梯草 (*Elatostema rivulare* Shih & Yang)，近革葉樓梯草 (*Elatostema subcoriaceum* Shih & Yang)，微粗毛樓梯草 (*Elatostema strigillosum* Shih & Yang)，及柔毛樓梯草 (*Elatostema villosum* Shih & Yang)；其中 10 種附予手繪圖。

關鍵詞：樓梯草屬；台灣；分類訂正；蕁麻科。