

# Four new species of *Begonia* sect. *Coelocentrum* (Begoniaceae) from limestone areas in Guangxi, China

Shin-Ming KU<sup>1,2</sup>, Yan LIU<sup>3</sup>, and Ching-I PENG<sup>1,\*</sup>

<sup>1</sup>Herbarium (HAST), Research Center for Biodiversity, Academia Sinica, Nangang, Taipei 115, Taiwan

<sup>2</sup>Department of Life Sciences, National Cheng-Kung University, Tainan 701, Taiwan

<sup>3</sup>Guangxi Institute of Botany, Guangxi Zhuangzu Autonomous Region and the Chinese Academy of Sciences, Guilin 541006, P.R. China

(Received October 22, 2005; Accepted February 1, 2006)

**ABSTRACT.** Four new species of *Begonia* (sect. *Coelocentrum*), namely *B. debaoensis*, *B. pseudodaxinensis*, *B. pseudoleprosa* and *B. semiparietalis*, from the limestone areas in Guangxi Zhuangzu Autonomous Region, southern China are described and illustrated. A somatic chromosome number of  $2n = 30$  is determined for three of them. *Begonia debaoensis* resembles *B. bonii* Gagnep., differing in having smaller leaves; a slender rhizome with long internodes; bicolored outer tepals that are pink toward the margins and whitish in the middle; and bearing abnormal, feminized stamens on staminate flowers. It is perhaps of hybrid origin. *Begonia pseudodaxinensis* is similar to *B. daxinensis* T.C. Ku, differing in the leaves being entirely green and without white maculation; the stipule apex obtuse or emarginate; and the rhizome stout and nearly glabrous. *Begonia pseudoleprosa* bears a superficial resemblance to *B. leprosa* Hance (sect. *Leprosae*), differing in the fruits being winged, trigonous obovoid-ellipsoid and with parietal placentation. It also resembles *B. bonii* Gagnep., differing in the leaves being subcoriaceous, nearly flat and very sparsely setulose or subglabrous on the adaxial surface; and petioles and the main veins on the lower leaf surface being appressed hairy. *Begonia semiparietalis* is also somewhat similar to *B. bonii* Gagnep., differing in the leaves having white maculation along main veins and the upper surface sparsely setose-pilose; ovaries and fruits long glandular-pilose; placentation parietal on upper half of the ovary and axile on the lower half.

**Keywords:** *Begonia debaoensis*; *Begonia pseudodaxinensis*; *Begonia pseudoleprosa*; *Begonia* sect. *Coelocentrum*; *Begonia semiparietalis*; Begoniaceae; China; Chromosome number; Guangxi; Limestone flora; New species.

## INTRODUCTION

In continuation of our research on eastern Asian *Begonia* (Peng et al., 1988; Peng and Chen, 1990, 1991; Peng and Sue, 2000; Peng and Chiang, 2000; Chiang et al., 2001; Oginuma and Peng, 2002; Shui et al., 2002; Ye et al., 2004; Ku et al., 2004; Peng et al., 2005 a, b, c; Liu et al. 2005; Li et al., 2005; Peng et al., 2006; Fang et al., 2006; Peng et al., 2006), we report the discovery of four new species of *Begonia* sect. *Coelocentrum* from the limestone areas in Guangxi, China.

## NEW SPECIES

**1. *Begonia debaoensis*** C.-I Peng, Yan Liu & S. M. Ku, sp. nov.—TYPE: China. Guangxi Zhuangzu Autonomous Region, Baise Shi, Debao Xian, Jixingyan,

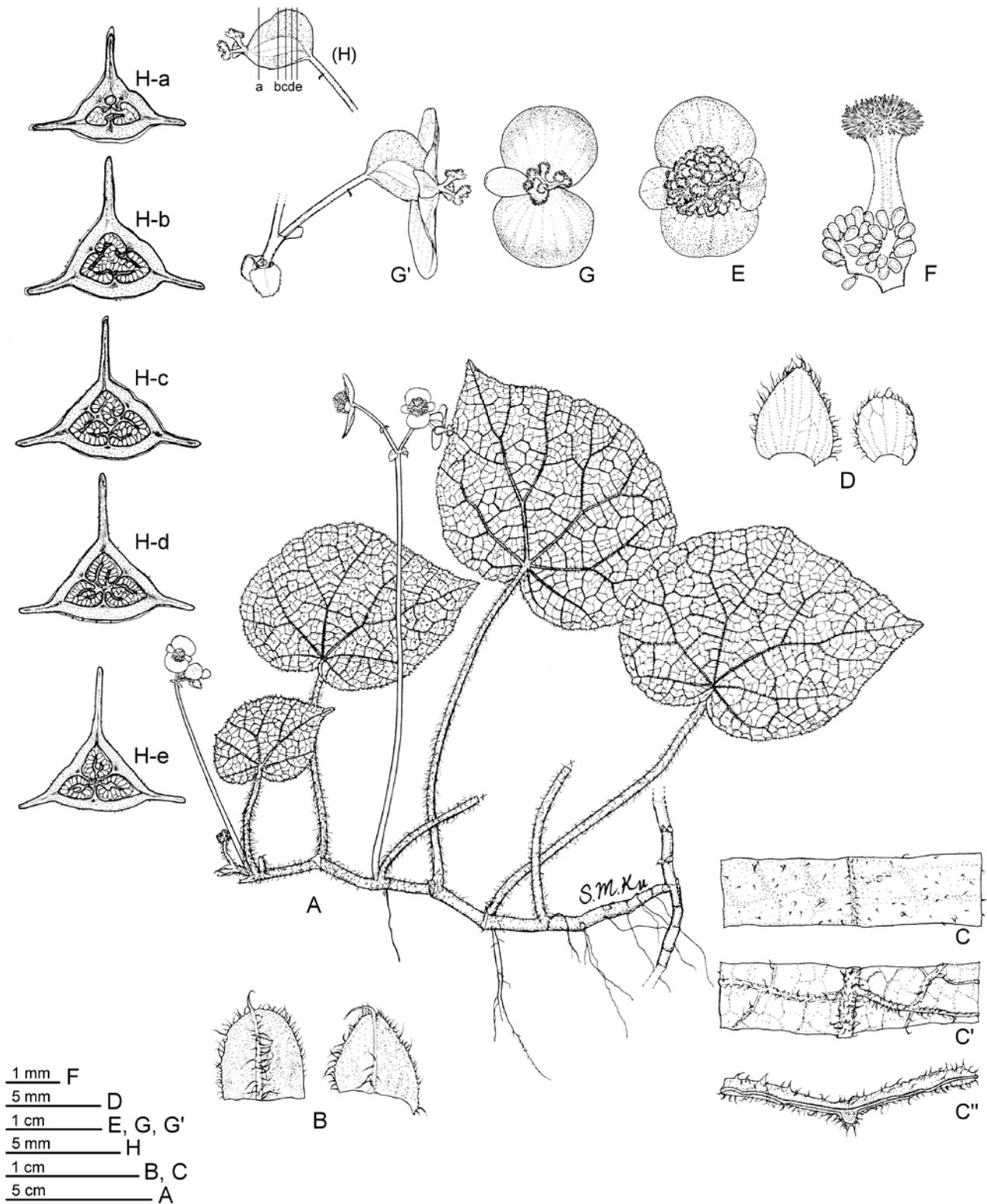
ca. 12 km S of Debao. 23°15'10''N, 106°38'16''E, elevation ca. 600 m, grassy vegetation, at entrance of a limestone cave at base of a steep rocky hill, on rocky slope face, shaded, moist, frequent. Living collection made on 25 May 2004; type specimens (in flower) pressed from plants in cultivation on 30 Nov 2005, Ching-I Peng, Wai-Chao Leong, Shin-Ming Ku & Yan Liu 19712-A (holotype: HAST; isotypes: IBK). 德保秋海棠

Figure 1, 2

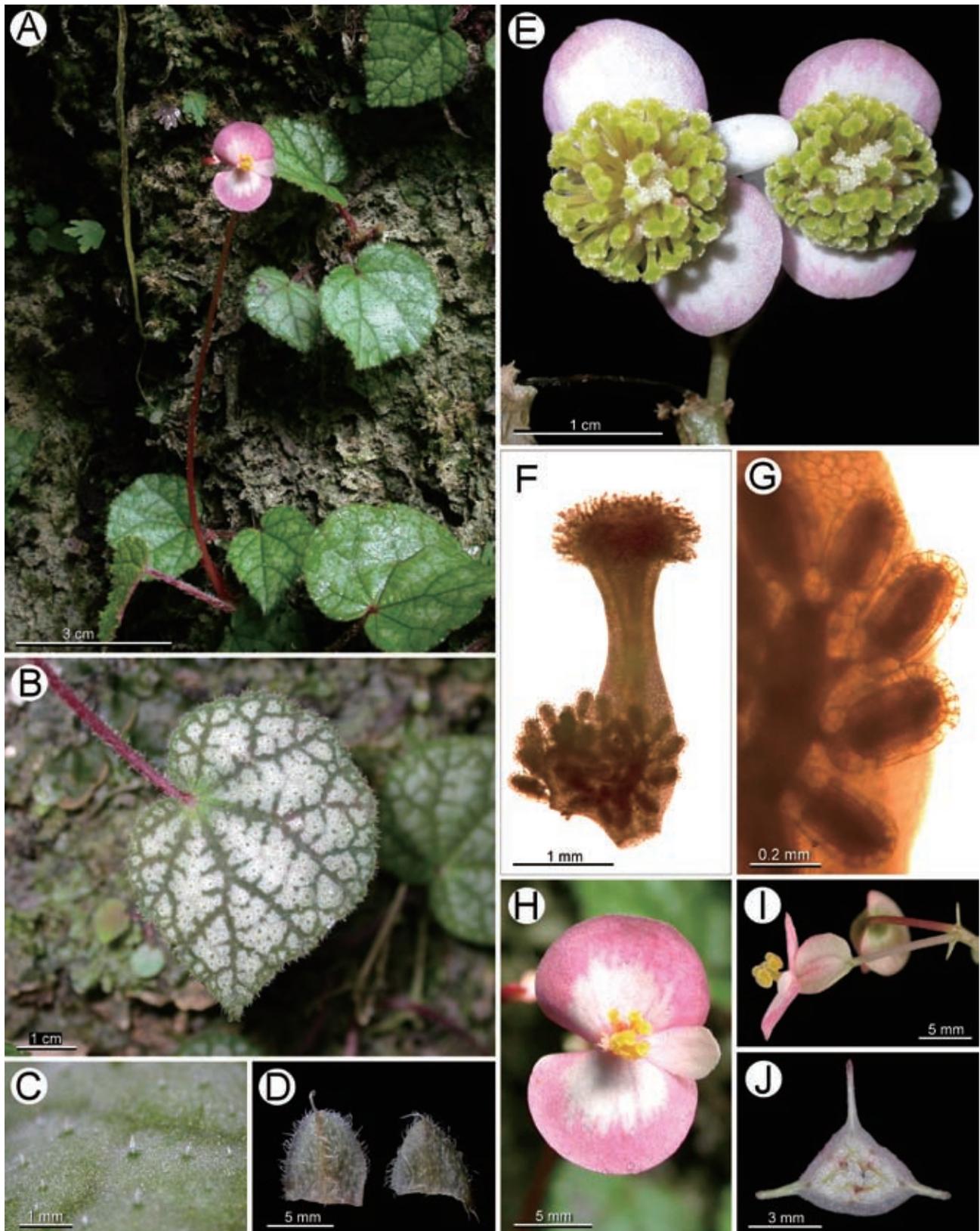
Similis *Begoniae bonii* Gagnep., sed a qua differt foliis parvis, rhizomate gracili internodiis longis instructo, tepalis exterioribus bicoloribus margine roseis alibi albidis, floribus staminatis staminibus abnormalibus femineis praeditis.

Herbs, monoecious; epipetric; perennial; rhizomatous. *Rhizome* slender, 20-60 cm or longer, 2.5-6 mm thick, internodes (15-)18-30(-35) mm long, sparsely villous. *Stipules* eventually deciduous, triangular to ovate-triangular, apex acute or obtuse, 4-9 mm long, 4-6 mm wide, reddish-hyaline, weakly keeled, without reddish

\*Corresponding author: E-mail: bopeng@sinica.edu.tw; Tel: +886-2-2789-3821; Fax: +886-2-2789-1623.



**Figure 1.** *Begonia debaensis* C.-I Peng, Yan Liu & S. M. Ku. A, Habit. B, Stipules; C, Portion of leaf, adaxial surface; C', abaxial surface; C'', cross section. D, Bracts. E, Abnormal staminate flower. F, Abnormal stamen. G, Carpellate flower, face view; G', side view. H, Serial cross sections of ovary. (All from C.-I Peng *et al.* 19712, HAST).



**Figure 2.** *Begonia debaoensis* C.-I Peng, Yan Liu & S. M. Ku. A, Habit and habitat. B, Leaf. C, Leaf upper surface, showing setulose trichomes. D, Stipules. E, Abnormal staminate flower. F, An abnormal stamen with placentae and ovule-like structures near the base and with stigmatic papillae at the tip. G, Ovule-like structures. H, A carpellate flower with two normal styles and one abnormal style. I, Side view of carpellate flower. J, Middle cross section of ovary. (All from C.-I Peng *et al.* 19712, HAST).

nerves, with sparse minute subsessile brown glandular hairs on abaxial surface, villous along midrib, margin serrulate and ciliate, apex aristate, arista 1-3 mm long, hair-like. *Leaves* 5-14 or more, alternate, simple, asymmetric, unlobed, broadly ovate or suborbicular, base deeply cordate, margin denticulate and ciliate, apex shortly acuminate or acute, (5-)6-8(-9.5) cm long (basal lobes included), (3.6-)4-6(-6.8) cm wide, green or dark green on adaxial surface, pale green to silver white (with white maculation on intercostal area in juvenile plants) and with green or brownish green veins, usually reddish on abaxial surface, texture thinly herbaceous, surface slightly rugose, adaxially sparsely setulose (trichomes 0.3-1 mm long, whitish-hyaline), abaxially sparsely pilose on veins; venation basally palmate, veins 5 or 6, midrib distinct, with 1-3 major lateral veins on each side, other primary veins branching dichotomously or nearly so, tertiary veins percurrent and loosely reticulate, forming a divergence angle of 80-90° to major veins, minor veins reticulate, all veins on abaxial surface slightly raised; petiole terete, (5-)6-10(-12) cm long, 1.5-3 mm thick, brownish or brownish red, villous. *Inflorescences* axillary, 1-3, arising directly from rhizome, flowers 4-7, in a dichasial cyme, cyme branched 1-3 times; staminate flowers 3-5, carpellate flowers 1 or 2; peduncle well developed, terete, erect or ascending, 6-15 cm long, 1.5-2 mm thick, glabrous or subglabrous. Bracts caducous, ovate to orbicular, margin denticulate and ciliate, apex obtuse or rounded, 3-5 mm long, 3-4 mm wide, membranaceous. *Staminate flowers*: pedicel 9-17 mm long; tepals 4, outer 2 tepals suborbicular, base rounded or slightly cordate, margin entire (or dentate and ciliate when abnormal), apex rounded, 6-11 mm long, 7-12 mm wide, glabrous or with sparse minute, subsessile, brown glandular hairs on outer surface, bicolor, pink toward margin, whitish in the middle, inner 2 tepals oblong or narrowly obovate, apex obtuse, 8-10 mm long, 3-4 mm wide, white, glabrous (or dentate and ciliate when abnormal); stamens abnormal,

feminization, filaments 2-4 mm long, base with exposed ovule-like structures, tip forming a stigma-like structure, without anthers. *Carpellate flowers*: pedicel 7-11 mm long, sometimes with a bracteole on upper part; tepals 3, caducous, if persistent not thickened when fruiting, outer 2 tepals suborbicular, margin entire, eciliate, (5-)7-9(-11) mm long, (5-)8-9(-11) mm wide, bicolor as staminate flowers, inner tepal oblong or narrowly obovate, apex obtuse, 4-7 mm long, 2.5-3.5 mm wide, white, glabrous; ovary trigonous ellipsoid, 5-8 mm long, 3.7-4.1 mm thick (wings excluded), with sparse, minute, subsessile, brown glandular hairs, 3-winged; wings unequal or subequal; lateral wings 1-1.7 mm tall; abaxial wing crescent-shaped or nearly so, 3-5 mm tall, 5-7 mm wide; locule 1, placentation intruded parietal from lower 1/3 of ovary to summit; placentae 3, each 2-branched; styles 3, fused in lower 1/4, yellow, 3-3.3 mm long, apically C-shaped; stigmatic band slightly spiraled. *Fruits* not seen. Somatic chromosome number,  $2n = 30$  (Figure 3).

*Additional specimens examined.* CHINA. Guangxi Zhuangzu Autonomous Region, Baise Shi, Debao Xian, Jixingyan, ca. 12 km S of Debao (where the type was collected). 23°15'10"N, 106°38'16"E, elevation ca. 600 m, 25 May 2004, C.-I Peng et al. 19712 (HAST).

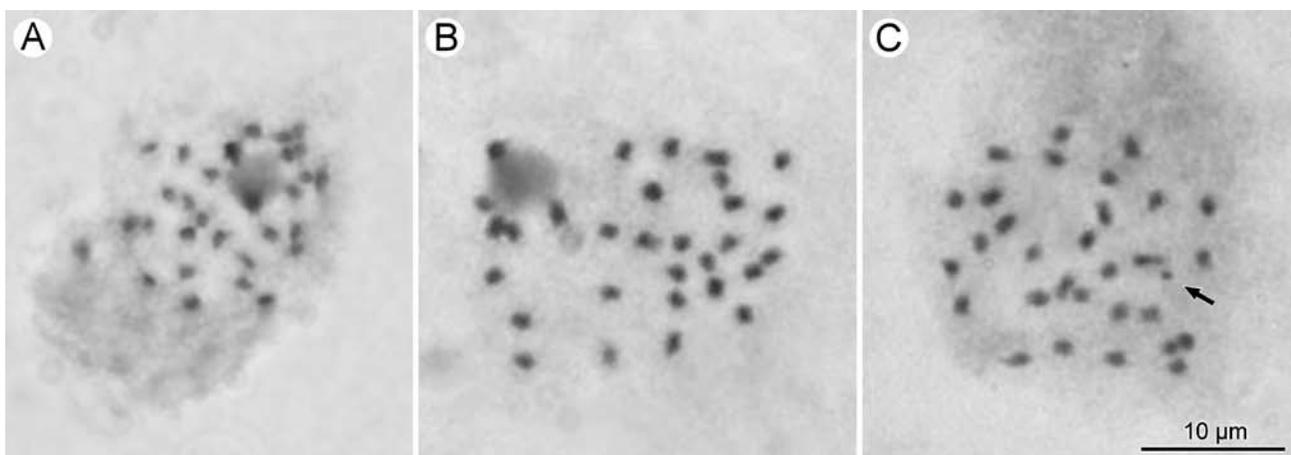
*Ecology.* On wall of a cave at base of a steep limestone hill.

*Distribution.* Southwestern Guangxi, China (Figure 4).

*Etymology.* The specific epithet is derived from the type locality, Debao Xian, Guangxi, China.

*Phenology.* Flowering August to January.

*Notes.* Like many species of *Begonia* sect. *Coelocentrum*, *B. debaoensis* is highly restricted in distribution, currently known only from one limestone cave in western Guangxi. It resembles *B. bonii* Gagnep. in being sparsely or moderately setulose on the upper surface of the leaves, differing by the smaller leaves;



**Figure 3.** Mitotic chromosome spread of *Begonia*. A, *Begonia debaoensis* ( $2n=30$ ); B, *Begonia pseudodaxinensis* ( $2n=30$ ); C, *Begonia semiparietalis* ( $2n=30$ ), arrow indicating a probable B-chromosome. (A from C.-I Peng et al. 19712; B from W.C. Leong et al. 3360; C from C.-I Peng et al. 20327. All vouchers at HAST).



**Figure 4.** Distribution of *Begonia debaoensis* (■), *B. pseudodaxinensis* (●), *B. pseudoleprosa* (▲) and *B. semiparietalis* (★) in Guangxi Zhuangzu Autonomous Region, China.

slender rhizome and with long internodes (vs. stout and with congested internodes); showy bicolored outer tepals that are pink toward margins and whitish in the middle (vs. white or pink throughout); and bearing abnormal, feminized stamens in the staminate flowers (Figure 2: E, F, G). It does not produce normal stamens and fruit set is impossible. Nevertheless, it reproduces vegetatively, forming large, uniform colonies in the cave. We suspect that *B. debaoensis* represents a natural hybrid involving *B. bonii* as one of the putative parents. The other parent is not obvious to us. Further biosystematic studies are in progress. Table 1 summarizes the morphological differences between *Begonia debaoensis* and other somewhat similar species.

**2. *Begonia pseudodaxinensis*** S. M. Ku, Yan Liu, & C.-I Peng, sp. nov.—TYPE: China. Guangxi Zhuangzu Autonomous Region, Chungzuo Shi, Daxin Xian, Naling Xiang, along province road 316, SE side of road, behind a small village, 22°55'09"N, 107°01'11"E, elevation ca. 400 m, mixed bamboo and broadleaf forest, at base of limestone hill, on limestone rock face, semishaded, frequent. Living collection made on 26 May 2004; type specimens pressed from plants in cultivation on 26 Jan 2005, *Ching-I Peng, Wai-Chao Leong, Shin-Ming Ku & Yan Liu 19747-A* (holotype: HAST; isotypes: IBK).

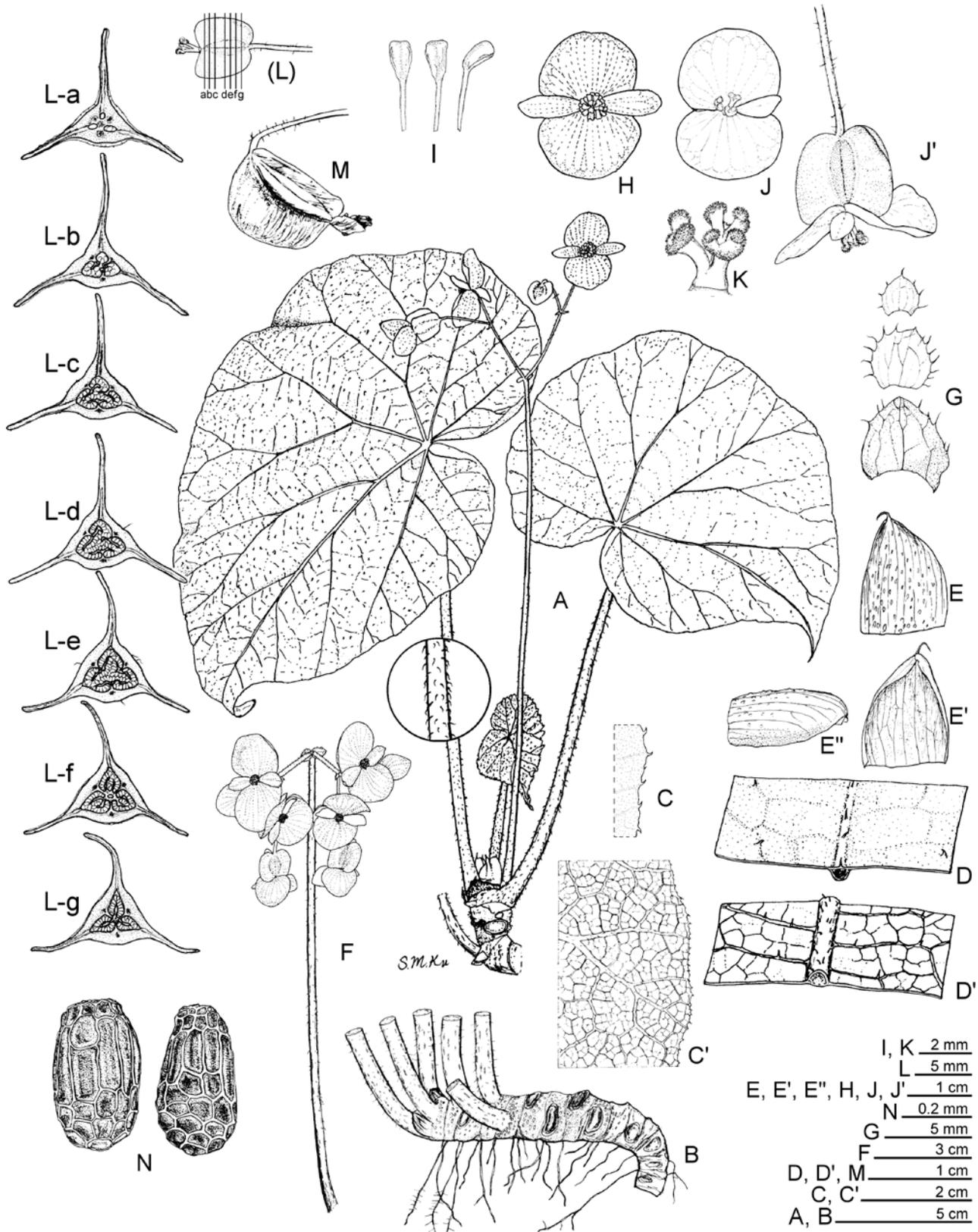
假大新秋海棠

Figure 5, 6

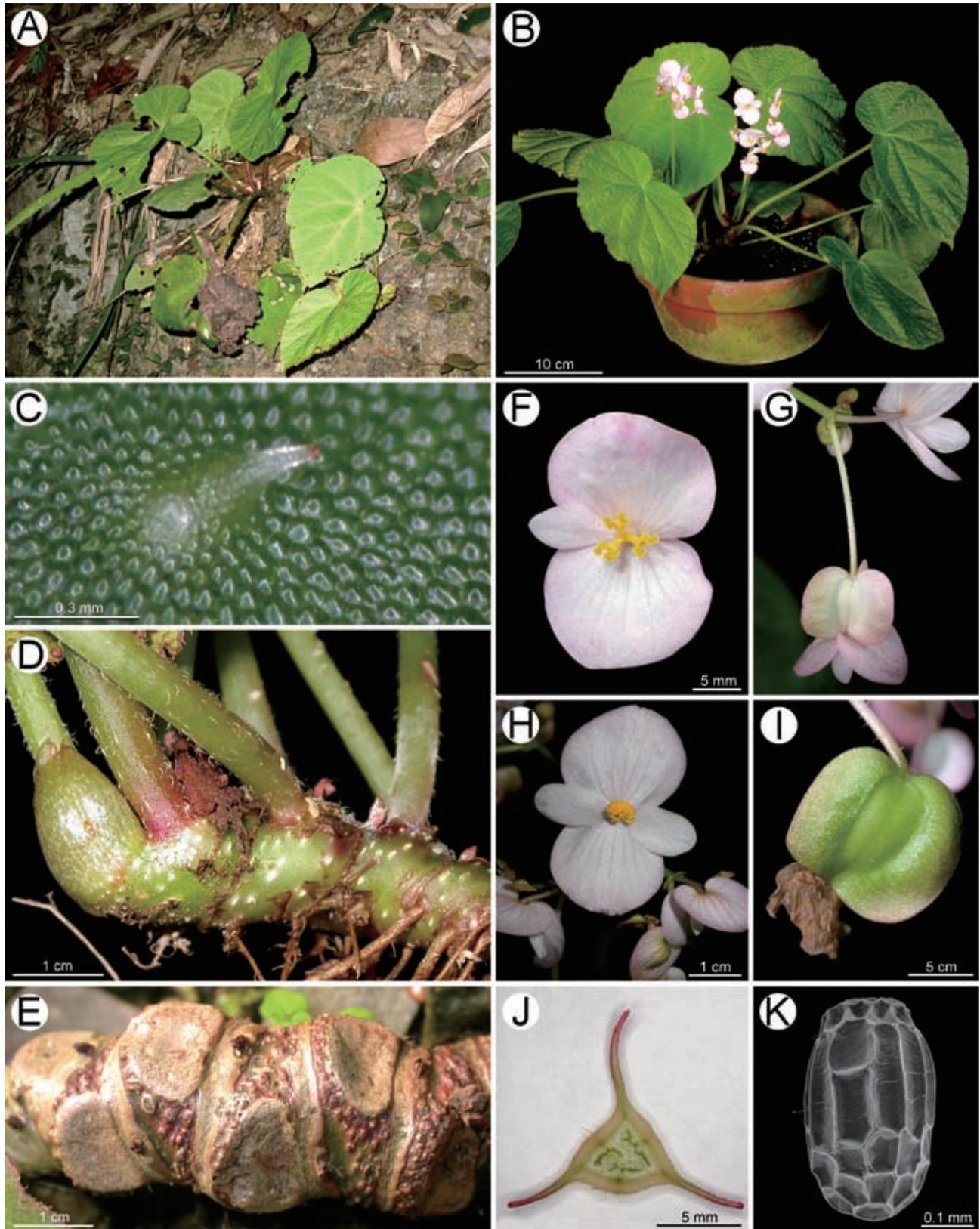
Similis *Begoniae daxinensi* T. C. Ku, sed a qua differt foliis omnino viridibus haud albo-maculatis, stipulis apice obtusis vel emarginatis, rhizomate crasso subglabro.

Herbs, monoecious; epipetric; perennial; rhizomatous. *Rhizome* stout, distinctly woody when older, 10-30 cm or longer, (6-)11-15(-30) mm thick, internodes 6-12 mm

long, nearly glabrous. *Stipules* deciduous, ovate-triangular, subcucullate to cucullate, 10-20 mm long, 7-18 mm wide, weakly keeled, nearly glabrous, margin more or less involute, entire and eciliate, or sometimes ciliate, apex obtuse or emarginate, aristate, arista 1-2 mm long, hair-like. *Leaves* 2-7, alternate, simple, asymmetric, unlobed, broadly ovate or suborbicular, base deeply cordate, margin denticulate and ciliolate, apex shortly acuminate or acute, (16-)20-30(-38) cm long (basal lobes included), (12-)15-20(-26) cm wide, green, without maculation (but with white maculation in seedlings), texture herbaceous, surface slightly rugose, adaxially sparsely setose (trichomes 0.2-0.6 mm long), abaxially sparsely shortly pilose on major veins; venation basally palmate, veins (6 or 7 or 8, midrib distinct, with 1-3 major lateral veins on each side, other primary veins branching dichotomously or nearly so, tertiary veins loosely reticulate and weakly percurrent, forming a divergence angle of 60-75° to major veins, minor veins reticulate, all veins on abaxial surface raised; petiole terete, (15-)20-30(-35) cm long, 4.5-7 mm thick, greenish, reddish at base, sparsely reflexed pilose. *Inflorescences* axillary, 1 or 2, arising directly from rhizome, flowers slightly fragrant, 25-57, in dichasial cymes, cymes branched 3-6 times; first staminate flowers opening before elongation of peduncle, staminate flowers 20-50, carpellate flowers 4-7; peduncle well developed, terete, erect or ascending, 14-28 cm long, 3-5 mm thick, greenish, subglabrous or sparsely pilose. Bracts caducous, widely ovate to rounded, margin denticulate and ciliate, 2-5.5 mm long, 2-5 mm wide, greenish, membranaceous. *Staminate flowers*: pedicel 10-20(-30) mm long, pilose; tepals 4, outer 2 suborbicular, base rounded or slightly cordate, margin entire, eciliate, apex rounded, 15-21 mm long, 18-23 mm wide, pinkish or whitish, abaxially sparsely pilose; inner 2 tepals oblong or obovate, apex obtuse, 6-10 mm long, 4-7 mm wide, white, glabrous; androecium zygomorphic, subglobose, stamens 28-40, golf club shaped; filaments subequal, 1.5-2 mm long, nearly free; anthers ± ascending, locules 2, slightly compressed, oblong-obovoid or shortly so, apex of connective slightly emarginate, 1-1.5 mm long, 0.8-1 mm wide, yellow. *Carpellate flowers*: pendent, pedicel 13-19 mm long, bracteole absent; tepals 3, caducous, if persistent not thickened in fruit, outer 2 tepals suborbicular or oblate, margin entire, eciliate, 11-14.5 mm long, 14-17 mm wide, pinkish, glabrous or subglabrous; inner tepal oblong or obovate, 5-10 mm long, 3-4 mm wide, white, glabrous; ovary trigonous ellipsoid or ovoid-ellipsoid, 8-10 mm long, 3-5.5 mm thick (wings excluded), with or without few pilose trichomes (0.3-1 mm long), 3-winged; wings equal or subequal; abaxial wing crescent-shaped or subrectangular, 4-5 mm tall, 9-11 mm wide; locule 1, placentation intruded parietal from lower 1/4 of ovary to summit; placentae 3, each 2-branched; styles 3, fused in lower 1/4, yellow, ca. 2-4 mm long, apically C-shaped; stigmatic band slightly spiraled. *Capsule* nodding, stipe 20-25 mm long, fruit body 13-14 mm long, 5-6 mm thick, greenish or reddish when fresh, apex with persistent



**Figure 5.** *Begonia pseudodaxinensis* S.M. Ku, Yan Liu & C.-I Peng. A, Habit. B, Rhizome. C, Leaf margin, adaxial surface; C', abaxial surface. D, Portion of leaf, adaxial surface; D', abaxial surface. E, Stipules, abaxial side; E', adaxial side; E'', lateral side. F, Inflorescences. G, Bracts. H, Staminate flower. I, Stamens. J, Carpellate flower, face view; J', side view. K, Pistil. L, Serial cross sections of ovary. M, Fruit. N, Seeds. (All from *W.-C. Leong 3360*, HAST).



**Figure 6.** *Begonia pseudodaxinensis* S.M. Ku, Yan Liu & C.-I Peng. A, Habit and habitat. B, Cultivated plant at anthesis. C, Setose hair on leaf upper surface. D, Young rhizome with stipules. E, Woody rhizome. F, Carpellate flower. G, Side view of carpellate flower. H, Staminate flower. I, Fruit. J, Middle cross section of ovary. K, Seed SEM micrograph. (A from C.-I Peng et al. 19747; B-K from W.-C. Leong 3360. All at HAST).

styles; abaxial wing 4-7 mm tall. *Seeds* numerous, brown, ovoid-ellipsoid or ellipsoid, 0.4-0.48 mm long, 0.23-0.29 mm thick, chalazal end rounded, micropylar end obtuse or slightly constricted, outer periclinal walls of mature seeds concave; collar cells elongated, straight, nearly rectangular, 11-13 cells in a ring, occupying 1/3-1/2 of seed length. Somatic chromosome number,  $2n = 30$  (Figure 3).

*Additional specimens examined.* **CHINA.** Guangxi Zhuangzu Autonomous Region, Chungzuo Shi, Daxin Xian, Naling Xiang, along Province Road 316, SE side of road, behind a small village, 22°55'09"N, 107°01'11"E, elevation ca. 400 m, mixed bamboo and broadleaf forest, at base of limestone hill, on limestone rock face, semishaded, frequent, 26 May 2004, *C.-I Peng et al. 19747* (HAST); same locality, 22°49'55"N, 107°01'11"E, 28 Aug 2004, *W.C. Leong et al. 3360* (HAST), *3360-A* (HAST: specimen pressed from plant grown in the greenhouse on 21 Jan 2005), *3360-B* (HAST: specimen pressed from plant grown in the greenhouse on 5 Feb 2005).

*Ecology.* On limestone hills.

*Distribution.* Southwestern Guangxi, China (Figure 4).

*Etymology.* The specific epithet is derived from its resemblance to *Begonia daxinensis* T.C. Ku.

*Phenology.* Flowering November to March; fruiting February to June.

*Notes.* *Begonia pseudodaxinensis* is similar to *B. daxinensis* T.C. Ku, differing in the leaves being entirely green and without white maculation (vs. adorned with a showy white ring); apex of stipules obtuse or emarginate (vs. acute); and rhizome stout, nearly glabrous (vs. less stout and moderately villous). They also differ in phenology: *B. pseudodaxinensis* flowers from December to March, whereas *B. daxinensis* flowers from March to June. For a detailed morphological comparison see Table 1.

**3. *Begonia pseudoleprosa*** C.-I Peng, Yan Liu & S. M. Ku, sp. nov.—**TYPE:** China. Guangxi Zhuangzu Autonomous Region, Chungzuo Shi, Daxin Xian, Shulong Zhen, Rendi Hydroelectric Power Station, 22°49'10"N, 106°51'16"E, elevation ca. 250 m. 14 Mar 2005, *Ching-I Peng, Yan Liu, Shin-Ming Ku & Huan-Yu Chen 20335* (holotype: HAST; isotype: IBK).

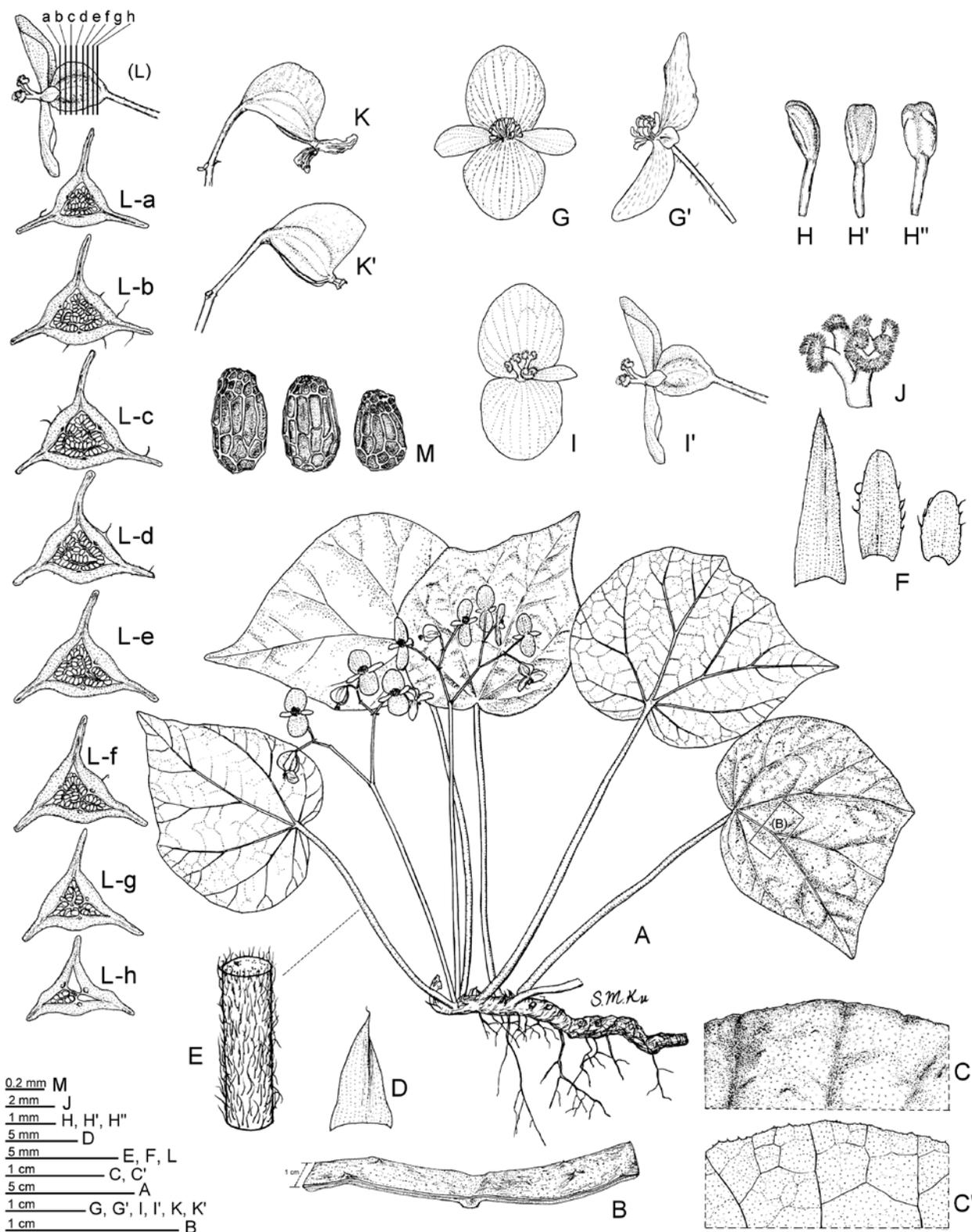
假癩葉秋海棠

Figure 7, 8

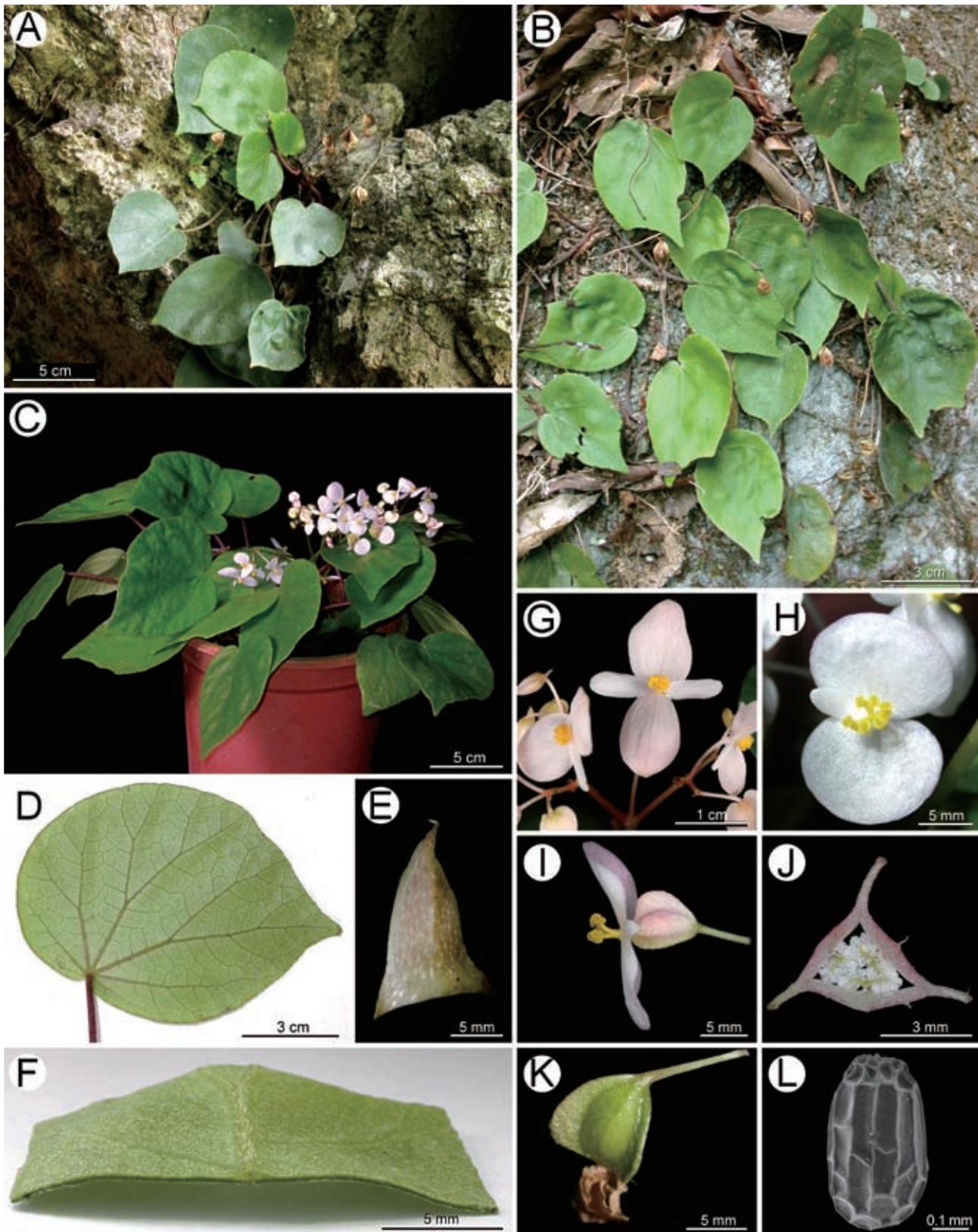
*Similis Begoniae leprosa* Hance, sed a qua differt fructibus alatis trigono-obovoido-ellipsoideis, placentatione parietali; etiam similis *B. bonii* Gagnep., sed a qua differt foliis subcoriaceis, subplanis, supra sparissime setulosis, petiolis et costis subtus appresse pilosis.

Herbs, monoecious; epipetric; perennial; rhizomatous. *Rhizome* 20-60 cm or longer, 4-7.5 mm thick, internodes 3.5-5 mm long, brown, initially with sparsely appressed hairs, glabrescent. *Stipules* eventually deciduous,

triangular, narrowly triangular, 5-10 mm long, 3-4 mm wide, weakly keeled near apex, glabrous or with sparse minute subsessile brown glandular hairs on abaxial surface, margin entire and eciliate, apex acute, aristate, arista 1.5-3 mm long, hair-like. *Leaves* 5-12, alternate, simple, asymmetric, unlobed or sometimes shallowly lobed, broadly ovate to suborbicular, base shallowly cordate, margin sparsely and weakly denticulate and ciliolate, apex shortly acuminate or acute, (5-)7-9(-11) cm long (basal lobes included), (4-)5-7(-8.5) cm wide, adaxial surface entirely green, abaxial surface pale green, subcoriaceous, surface nearly flat, adaxially sparsely setulose (trichomes 0.2-0.5 mm long) or nearly glabrous, abaxially appressed hairy along major veins; venation basally palmate, veins 5 or 6, midrib distinct, with 1-3 major lateral veins on each side, other primary veins weakly percurrent and reticulate, forming a divergence angle of 65-80° to major veins, minor veins obscure or not seen, major veins slightly raised or flat on adaxial surface and raised on abaxial surface; petiole terete, (5-)7-13(-20) cm long, 2-3 mm thick, brownish or brownish red, with appressed hairs. *Inflorescences* axillary, 1-3, arising directly from rhizome, dichasial cymes, branched 2 or 3 times, flowers 5-15; staminate flowers 3-11, carpellate flowers 1-4; peduncle well developed, terete, erect or ascending, 4-14 cm long, 1.5-2 mm thick, glabrous. Bracts caducous, lanceolate, ligulate or oblong, margin denticulate and ciliate or ciliolate, 3-7 mm long, 1.5-2.5 mm wide. *Staminate flowers:* pedicel 8-20(-30) mm long, glabrous or with few minute subsessile glandular hairs; tepals 4, outer 2 suborbicular, rarely oblong-ovate, base rounded or slightly cordate, margin entire, eciliate, apex rounded, 10-13(-20) mm long, 10-11(-12) mm wide, white or pinkish, glabrous or outer surface sparsely pilose; inner 2 tepals oblong, 5-13 mm long, 2.5-4.5 mm wide, white; androecium zygomorphic, subglobose, stamens (15-)20-30(-40), golf club-shaped; filaments subequal, 0.8-1.5 mm long, nearly free; anthers ± ascending, locules 2, slightly compressed, oblong-obovoid, connective apex slightly emarginate, 0.9-1.3 mm long, 0.6-0.8 mm wide, yellow. *Carpellate flowers:* pedicel 6.5-13 mm long, bracteole absent; tepals 3, caducous, if persistent not thickened in fruit, outer 2 tepals suborbicular, margin entire, 10-12 mm long, 12-14 mm wide, white or pinkish; inner tepal oblong or narrowly obovate, 5-8 mm long, 2.5-4 mm wide, white; ovary trigonous obovoid-ellipsoid, 7-8 mm long, 3.5-4.5 mm thick (wings excluded), with or without few pilose trichomes (0.4-0.8 mm long) and sparse, minute, subsessile, brown glandular hairs, 3-winged; wings unequal or subequal; lateral wings 1-2 mm tall; abaxial wing crescent-shape, 1.5-3 mm tall; locule 1, placentation intruded parietal from lower 1/4 of ovary to summit; placentae 3, each 2-branched; styles 3, fused in lower 1/4, yellow, ca. 3.5-4 mm long, apically C-shaped; stigmatic band slightly spiraled. *Capsule* nodding, stipe 6-11 mm long, fruit body 10-12 mm long, 4.5-5.5 mm thick, greenish when fresh, apex



**Figure 7.** *Begonia pseudoleprosa* C.-I Peng, Yan Liu & S.M. Ku. A, Habit. B, Cross section of leaf. C, Leaf margin, adaxial surface; C', abaxial surface. D, Stipules, abaxial side. E, Petiole, showing appressed pilose or villous hairs. F, Bracts. G, Staminate flower, face view; G', side view. H, Stamen, side view; H', dorsal view; H'', ventral view. I, Carpellate flower, face view; I', side view. J, Pistil. K, K', Fruits. L, Serial cross sections of ovary. M, Seeds. (A, B, C, E, F, K, K' from C.-I Peng *et al.* 20347; D, G, G', H, H', H'', I, I', J, L, M from C.-I Peng *et al.* 20335. All at HAST).



**Figure 8.** *Begonia pseudoleprosa* C.-I Peng, Yan Liu & S.M. Ku. A, Habit & habitat, the leaves unlobed. B, Habit & habitat, the leaves shallowly lobed. C, Cultivated plant at anthesis. D, Leaf abaxial surface showing venation. E, Stipule. F, Portion of leaf abaxial surface, showing appressed hair on the major vein. G, Staminate flower. H, Carpellate flower, face view. I, Carpellate flower, side view. J, Middle cross section of ovary. K, Fruit. L, Seed SEM micrograph. (A, D, F, G, H from C.-I Peng *et al.* 20347; B, C, E, I, J, K, L from C.-I Peng *et al.* 20335. All at HAST).

**Table 1.** Comparison of *Begonia bonii*, *B. daxinensis*, *B. debaensis*, *B. leprosa*, *B. pseudodaxinensis*, *B. pseudoleprosa* and *B. semiparietalis*

	<i>B. bonii</i>	<i>B. daxinensis</i> (Ku et al., 2004; Figures 9, 10)	<i>B. debaensis</i> (Figures 1, 2)	<i>B. leprosa</i> (sect. <i>Leprosae</i> )	<i>B. pseudodaxinensis</i> (Figures 5, 6)	<i>B. pseudoleprosa</i> (Figures 7, 8)	<i>B. semiparietalis</i> (Figures 9, 10)
Rhizome							
Indumentum	Sparsely or moderately villous	Moderately villous	Sparsely villous	Villous	Glabrous	Initially with sparsely appressed hairs, glabrescent	Nearly glabrous
Diam. (mm)	4-10	5-10	2.5-6	8-15(-18)	(6-)11-15(-30)	4-7.5	9-12
Internode (mm)	5-10	(5-)10-20(-35)	(15-)18-30(-35)	5-10	6-12	3.5-5	4-17
Stipules							
Shape	Not subcucullate	Not subcucullate	Not subcucullate	Not subcucullate	Subcucullate	Not subcucullate	Not subcucullate
Margin	Ciliate or ciliolate	Ciliolate	Ciliate	Eciliate	Sometimes ciliate	Eciliate	Eciliate
Apex	Acute	Acute	Acute or obtuse	Acute	Obtuse or emarginate	Acute	Acute
Leaf							
Base	Deeply cordate	Deeply cordate	Deeply cordate	Shallowly cordate	Deeply cordate	Shallowly cordate	Deeply cordate
Size (cm)	(6-)10-18 (-22) × (4.5-) 7-15 (-18) (wide variation among different individuals)	(7.5-)14-20(-24) × (5.5-) 10-13(-17)	(5-)6-8(-9.5) × (3.6-) 4-6(-6.8)	(6-)8-20(-28) × (5-) 6-15(-22) (wide variation among different individuals)	(16-)20-30(-38) × (12-)15-20(-26)	(5-)7-9(-11) × (4-)5-7(-8.5)	(3.5-)8-12(-15) × (3-) 6-10(-13)
Upper surface	Slightly rugose	Slightly rugose	Slightly rugose	Nearly flat	Slightly rugose	Nearly flat	Rugose
Texture	Chartaceous	Chartaceous to thinly herbaceous	Thinly herbaceous	Herbaceous	Herbaceous	Subcoriaceous	Thinly herbaceous
Maculation	Without maculation or with white maculation in intercostal area	With a white ring	With green veins, otherwise white	Entirely green, without maculation	Entirely green, without maculation	Entirely green, without maculation	Usually with white maculation along major veins
Indumentum on adaxial surface	Sparsely or moderately setulose	Very sparsely setose	Sparsely or moderately setulose	Glabrous or nearly so	Very sparsely setose	Very sparsely setulose or nearly glabrous	Sparsely setose-pilose
Indumentum on abaxial surface	Pilose or short-villous along major veins	Short-pilose along major vein; sparsely so along tertiary veins	Short-villous along major and tertiary veins	Long-villous along major veins	Sparsely short-pilose along major veins	Sparsely appressed pilose along major veins	Pilose or tomentose along major and tertiary veins
Petiole	Villous	Villous	Villous	Long-villous	Sparsely reflexed pilose	Appressed pilose or villous	Villous
Tepal color	Pink, pinkish or white	Pinkish or white	Bicolored, pink toward margin, whitish otherwise	White	Pinkish or white	Pinkish or white	Pink
Androecium	Actinomorphic or zygomorphic (in different populations)	Zygomorphic	Zygomorphic	Actinomorphic	Zygomorphic	Zygomorphic	Zygomorphic
Capsule	3-winged	3-winged	3-winged	Wingless	3-winged	3-winged	3-winged
Placentation	Parietal from lower 1/3 to 1/4 of ovary to summit	Parietal from lower 1/4 of ovary to summit	Parietal from lower 1/3 of ovary to summit	Axile	Parietal from lower 1/4 of ovary to summit	Parietal from lower 1/4 of ovary to summit	Parietal from lower 1/2 of ovary to summit

with persistent styles; lateral wings 2-2.5 mm tall; abaxial wing crescent-shaped or nearly so, 4-6 mm tall. *Seeds* numerous, brown, ellipsoid or obliquely triangular with obtuse apex, 0.35-0.53 mm long, 0.23-0.29 mm thick, chalazal end rounded, micropylar end obtuse or slightly constricted, outer periclinal walls of mature seeds concave; collar cells elongate, straight, nearly rectangular, 11-13 cells in a ring, 1/4-1/2 of seed length.

*Additional specimens examined.* CHINA. Guangxi Zhuangzu Autonomous Region, Chungzuo Shi, Daxin Xian, Shulong Zhen, Rendi Hydroelectric Power Station, 22°49'10"N, 106°51'16"E, on concave limestone face, N-facing, semishaded, abundant. Living collection made on 14 Mar 2005; specimen pressed from cultivated plant on 30 Nov 2005, *C.-I Peng et al.* 20355-A (HAST); same locality, along cement trail to a waterfall, on rock face, broadleaf forest margin, semishaded, moist to dry, abundant, *C.-I Peng et al.* 20347 (HAST).

*Ecology.* On limestone hills in broad-leaved forests.

*Distribution.* Southwestern Guangxi, China (Figure 4).

*Etymology.* The specific epithet is derived from its superficial resemblance to *B. leprosa* Hance.

*Phenology.* Flowering November to December; fruiting December to March.

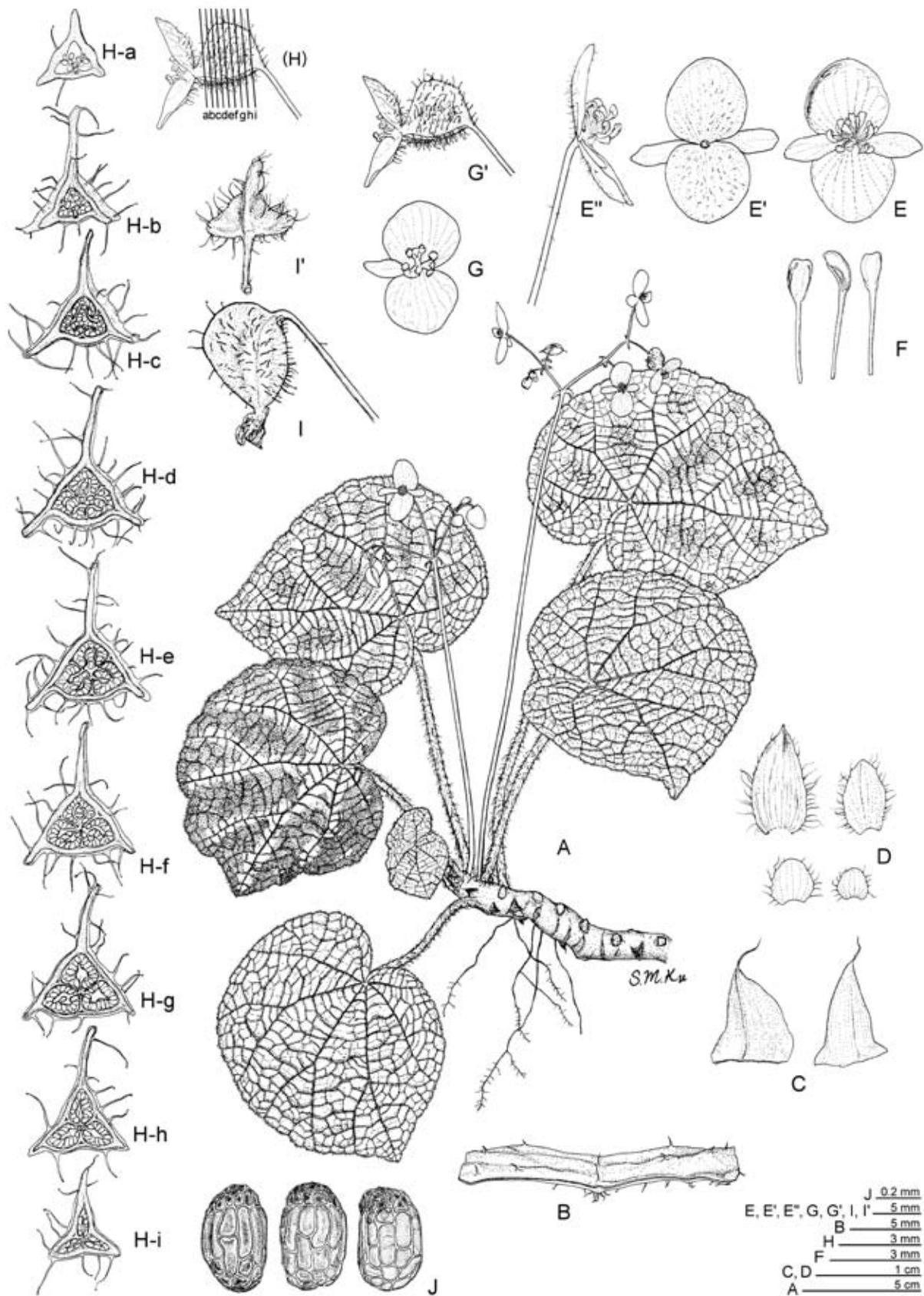
*Notes.* *Begonia pseudoleprosa* bears a superficial resemblance to *B. leprosa* Hance (sect. *Leptosae*), differing in the fruits being winged, trigonous obovoid-ellipsoid (vs. clavate and wingless) and in the parietal (vs. axile) placentation. It also resembles *B. bonii* Gagnep., but differs in the leaves being subcoriaceous, nearly flat and the upper surface sparsely setulose (vs. chartaceous, slightly rugose and sparsely to moderately setulose); and petioles and main veins on the lower leaf surface appressed hairy (vs. villous). Detailed morphological comparison is shown in Table 1.

**4. *Begonia semiparietalis*** Yan Liu, S.M. Ku & C.-I Peng, sp. nov. —TYPE: China. Guangxi Zhuangzu Autonomous Region, Chungzuo Shi, Fusui Xian, Bapen Xiang, Nongyixiu, 22°27'46"N, 107°52'39"E, elevation ca. 120 m, on limestone rock face, shaded, moist to dry, occasional. Associated with *Monocladus*, *Buxus*, *Cephalomappa sinense*, *Diospyros siderophylla*, *Radermachera sinica*, *Justicia*, *Callicarpa*, *Drynaria*, *Alocasia odora*. Living collection made on 12 Mar 2005; types pressed from cultivated plant on 4 Oct 2005, *Ching-I Peng, Yan Liu, Shin-Ming Ku & Huan-Yu Chen* 20327-A (holotype: IBK; isotype: HAST). 半側膜秋海棠

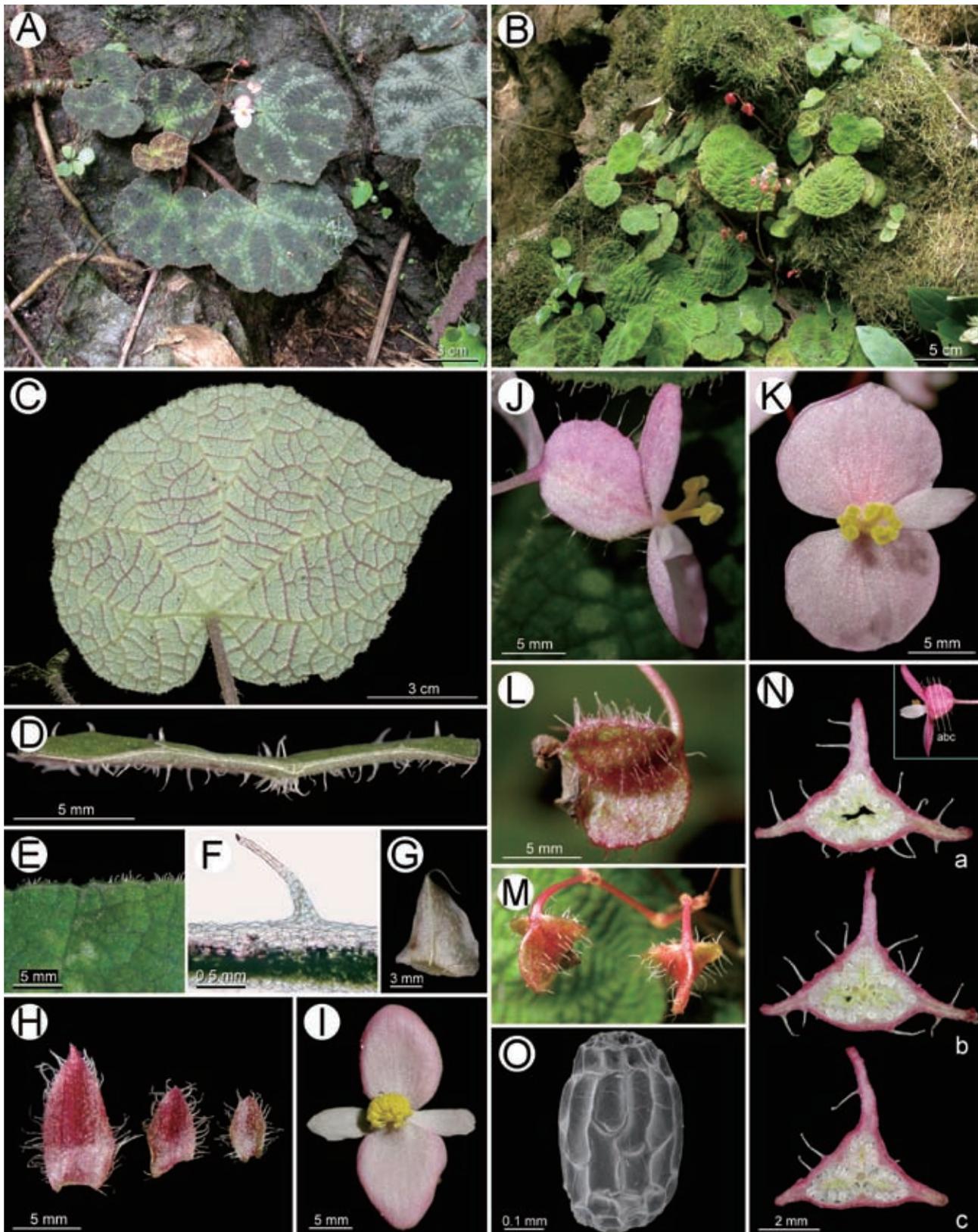
Figure 9, 10

Similis *Begoniae bonii* Gagnep., sed a qua differt foliis ad costas albo-maculatis, supra sparse setoso-pilosis, ovariis et fructibus longe glanduloso-pilosis, placentatione parietali in superiore 1/2 parte, sed axili in inferiore 1/2 parte.

Herbs, monoecious; epipetric; perennial; rhizomatous. *Rhizome* 10-30 cm or longer, 9-12 mm thick, internodes 4-17 mm long, nearly glabrous or sparsely villous near petiole base and leaf scars. *Stipules* eventually deciduous, triangular or ovate-triangular, 7-10 mm long, 5-9 mm wide, scarcely keeled, margin entire, apex aristate, arista 2-4 mm long, hair-like. *Leaves* 4-8, alternate, simple, asymmetric, unlobed, broadly ovate or suborbicular, base deeply cordate, margin denticulate and ciliate, apex shortly acuminate or acute, rarely obtuse, (3.5-)8-12(-15) cm long (basal lobes included), (3-)6-10(-13) cm wide, green, dark green or dark brown on adaxial surface, adorned with white maculation (these areas pale green abaxially) along major veins, sometimes dark brown with pale green major veins (without white maculation), rarely entire green, abaxial surface reddish or pale green with reddish venation, texture thinly herbaceous, surface rugose, adaxially sparsely pilose-setose (trichomes 0.7-1 mm long), abaxially shortly villous or tomentose, particularly pronounced on veins; venation basally palmate, veins 5-7, midrib distinct, with 1-3 major lateral veins on each side, other primary veins branching dichotomously or nearly so, tertiary veins percurrent and loosely reticulate, divergence angle 90-120° to major veins, minor veins reticulate, all veins on abaxial surface raised; petiole terete, (4-)12-20(-25) cm long, 3.5-4(-6) mm thick, villous. *Inflorescences* axillary, 1-6 or more, arising directly from rhizome, flowers 6-11(-25) in a dichasial cyme branched 2-3(-5) times; staminate flowers 5-10(-20), carpellate flowers 1-5; peduncle well developed, terete, erect or ascending, 12-30 cm long, 1.5-2 mm thick, glabrous. Bracts caducous, ovate, oblong or rounded, margin denticulate and ciliate, 3-11 mm long, 2.5-5 mm wide, reddish. *Staminate flowers*: pedicel 13-42 mm long, glabrous or pilose with few glandular hairs; tepals 4, outer 2 suborbicular, base rounded, margin entire, eciliate, 8-13 mm long, 6.5-12 mm wide, reddish or pinkish, abaxially glandular pilose; inner 2 tepals narrowly obovate or oblanceolate, apex obtuse, 7-10 mm long, 3-4.5 mm wide, white; androecium zygomorphic, subglobose, stamens 13-40, golf club-shaped; filaments subequal, 2.5-3 mm long, nearly free; anthers ± ascending, locules 2, slightly compressed, oblong-obovoid, connective apex slightly emarginate, 1.5-2 mm long, 0.7-0.9 mm wide, yellow. *Carpellate flowers*: pedicel 12-14 mm long, bracteole absent; tepals 3, caducous, if persistent not thickened when fruiting, outer 2 tepals suborbicular, margin entire, eciliate, 6.5-8.5 mm long, 7-9.5 mm wide, pinkish or reddish, abaxially glandular pilose; inner tepal oblanceolate or narrowly obovate, 6-7 mm long, 2.5-3 mm wide, pinkish white, glabrous; ovary trigonous ellipsoid, 5.5-7 mm long, 3-4 mm thick (wings excluded), reddish, with long glandular pilose trichomes (0.6-2.4 mm long), 3-winged; wings unequal or subequal; lateral wings 1-2 mm tall; abaxial wing crescent-shaped or nearly so, 2.5-4 mm tall, 6-7 mm wide; locule 1, placentation intruded parietal from lower 1/2 of ovary to summit; placentae 3, each 2-branched; styles 3, fused in lower 1/5 or nearly



**Figure 9.** *Begonia semiparietalis* Yan Liu, S. M. Ku & C.-I Peng. A, Habit. B, Portion of leaf upper surface, showing trichomes. C, Stipules. D, Bracts. E, Staminate flower, face view; E', back view; E'', side view. F, Stamens. G, Carpellate flower, face view; G', side view. H, Serial cross sections of ovary. I, Fruit, side view; I', back view. J, Seeds. (All from C.-I Peng 20327, HAST).



**Figure 10.** *Begonia semiparietalis* Yan Liu, S. M. Ku & C.-I Peng. A, B, Habit and habitat. C, Leaf, abaxial surface of leaf. D, Leaf, cross section, showing trichomes. E, Leaf margin. F, Cross section of leaf in LM, showing trichome morphology on adaxial surface. G, Stipule. H, Bracts, left to right, showing one of the first to third bracts. I, Staminate flower. J, Carpellate flower, side view. K, Carpellate, face view. L, M, Fruits. N, Cross sections of ovary. O, Seed SEM micrograph. (All from C.-I Peng 20327, HAST).

free, yellow, 3-4.8 mm long, apically C-shaped; stigmatic band slightly spiraled. *Capsule* nodding, stipe 11-15 mm long, fruit body 7-10 mm long, ca. 4 mm thick, reddish when fresh, apex with persistent styles; lateral wings 1.5-2.3 mm tall; abaxial wing crescent-shaped or nearly so, 4-5 mm tall. *Seeds* numerous, brown, ellipsoid or broadly so, 0.45-0.5 mm long, 0.26-0.3 mm thick, chalazal end rounded, micropylar end obtuse or slightly constricted, outer periclinal walls of mature seeds concave; collar cells elongated, straight, nearly rectangular, 10-14 cells in a ring, occupying 1/4-2/3 of seed length. Somatic chromosome number,  $2n = 30$  (Figure 3).

*Additional specimens examined.* CHINA. Guangxi Zhuangzu Autonomous Region: Chungzuo Shi, Fusui Xian, Bapen Xiang, Bapen Reserve, limestone hill, valley or hill slope, sparse forest, elev. ca. 110 m, 18 Aug 2004, *Comprehensive Expedition Team of White-headed Langur Reserve B0095* (IBK); Chungzuo Shi, Fusui Xian, Bapen Xiang, Nongyixiu, 22°27'46"N, 107°52'39"E (type locality), *Ching-I Peng et al. 20327, 20327-B* (HAST).

*Ecology.* On limestone hills in broad-leaved forests.

*Distribution.* Southwestern Guangxi, China (Figure 4).

*Etymology.* The specific epithet is derived from its semi-parietal placentation.

*Phenology.* Flowering August to December; fruiting October to February. In cultivation, *B. semiparietalis* just started to flower in late March at the time this manuscript was sent to the printer.

*Notes.* *Begonia semiparietalis* is somewhat similar to *B. bonii* Gagnep., differing in the leaves having white maculation along the main veins and the upper surface sparsely setose-pilose; ovaries and fruits long glandular-pilose; placentation parietal on upper half of ovary and axile on lower half of ovary. Detailed morphological comparison is shown in Table 1.

**Acknowledgments.** We thank David E. Boufford (A/GH) for improving the manuscript; Qiner Yang (PE) for the Latin diagnosis; Wai-Chao Leong and Huan-Yu Chen (HAST) for field assistance. This study was supported in part by the Guangxi Natural Science Foundation to Yan Liu (IBK) and grants from the National Science Council and Academia Sinica, Taiwan, to Ching-I Peng (HAST).

## LITERATURE CITED

- Chiang, T.Y., K.H. Hong, and C.-I Peng. 2001. Experimental hybridization reveals biased inheritance of the internal transcribed spacer of the nuclear ribosomal DNA in *Begonia × taipeiensis*. *J. Pl. Res.* **114**: 343-351.
- Fang, D., S.M. Ku, Y.G. Wei, D.H. Qin, and C.-I Peng. 2006. Three new taxa of *Begonia* (sect. *Coelocentrum*, Begoniaceae) from limestone areas in Guangxi, China. *Bot. Stud.* **47**: 97-110.
- Ku, S.M., C.-I Peng, and Y. Liu. 2004. Notes on *Begonia* (sect. *Coelocentrum*, Begoniaceae) from Guangxi, China, with the report of two new species. *Bot. Bull. Acad. Sin.* **45**: 353-367.
- Li, H.J., H. Ma, K.Y. Guan, and C.-I Peng. 2005. *Begonia rubinea* (sect. *Platycentrum*, Begoniaceae), a new species from Guizhou, China. *Bot. Bull. Acad. Sin.* **46**: 377-383.
- Liu, Y., S.M. Ku, and C.-I Peng. 2005. *Begonia picturata* (sect. *Coelocentrum*, Begoniaceae), a new species from limestone areas in Guangxi, China. *Bot. Bull. Acad. Sin.* **46**: 367-376.
- Oginuma, K. and C.-I Peng. 2002. Karyomorphology of Taiwanese *Begonia* (Begoniaceae): taxonomic implications. *J. Pl. Res.* **115**: 225-235.
- Peng, C.-I, Y.K. Chen, and H.F. Yen. 1988. *Begonia ravenii* (Begoniaceae), a new species from Taiwan. *Bot. Bull. Acad. Sin.* **29**: 217-222.
- Peng, C.-I and Y.K. Chen. 1990. *Begonia austrotaiwanensis* (Begoniaceae), a new species from southern Taiwan. *J. Arnold Arbor.* **71**: 567-574.
- Peng, C.-I and Y.K. Chen. 1991. Hybridity and parentage of *Begonia buimontana* Yamamoto (Begoniaceae) from Taiwan. *Ann. Missouri Bot. Gard.* **78**: 995-1001.
- Peng, C.-I and C.Y. Sue. 2000. *Begonia × taipeiensis* Peng (Begoniaceae), a new hybrid in Taiwan. *Bot. Bull. Acad. Sin.* **41**: 151-158.
- Peng, C.-I and T.Y. Chiang. 2000. Molecular confirmation of unidirectional hybridization in *Begonia taipeiensis* Peng (Begoniaceae) from Taiwan. *Ann. Missouri Bot. Gard.* **87**: 273-285.
- Peng, C.-I, Y.M. Shui, Y. Liu, and S.M. Ku. 2005a. *Begonia fangii* (sect. *Coelocentrum*, Begoniaceae), a new species from limestone areas in Guangxi, China. *Bot. Bull. Acad. Sin.* **46**: 83-89.
- Peng, C.-I, S.M. Ku, and W.C. Leong. 2005b. *Begonia liuyanii* (sect. *Coelocentrum*, Begoniaceae), a new species from limestone areas in Guangxi, China. *Bot. Bull. Acad. Sin.* **46**: 245-254.
- Peng, C.-I, Y.K. Chen, and W.C. Leong. 2005c. Five new species of *Begonia* (Begoniaceae) from Taiwan. *Bot. Bull. Acad. Sin.* **46**: 255-272.
- Peng, C.-I, W.C. Leong, and Y.M. Shui. 2006. Novelty in *Begonia* sect. *Platycentrum* for China: *B. crocea*, sp. nov. and *B. xanthina* Hook., a new distributional record. *Bot. Stud.* **47**: 89-96.
- Shui, Y.M. and W.H. Chen. 2005. New data of sect. *Coelocentrum* (Begonia) in Begoniaceae. *Acta Bot. Yunnan.* **27**(4): 355-374.
- Shui, Y.M., C.-I Peng, and C.Y. Wu. 2002. Synopsis of the Chinese species of *Begonia* (Begoniaceae), with a reappraisal of the sectional delimitation. *Bot. Bull. Acad. Sin.* **43**: 313-327.
- Ye, H.G., F.G. Wang, Y.S. Ye, and C.-I Peng. 2004. *Begonia coptidifolia* (Begoniaceae), a new species from China. *Bot. Bull. Acad. Sin.* **45**: 259-266.

## 中國廣西石灰岩地區秋海棠屬側膜組四新種植物

古訓銘<sup>1,2</sup> 劉演<sup>3</sup> 彭鏡毅<sup>1</sup>

<sup>1</sup> 中央研究院生物多樣性研究中心 植物標本館

<sup>2</sup> 國立成功大學生命科學系

<sup>3</sup> 廣西壯族自治區 中國科學院廣西植物研究所

本文報導中國廣西壯族自治區西南部石灰岩地區的秋海棠屬側膜組 (*Begonia* sect. *Coelocentrum*) 四個新種：德保秋海棠 (*B. debaoensis*)、假大新秋海棠 (*B. pseudodaxinensis*)、假癩葉秋海棠 (*B. pseudoleprosa*) 及半側膜秋海棠 (*B. semiparietalis*)，提供線繪圖與彩色照片以資辨識，並報導其中三種的染色體數 ( $2n = 30$ )。德保秋海棠與越南秋海棠 (*B. bonii* Gagnep.) 相似，區別在於德保秋海棠具有較小的葉片、節間長而纖細的根莖、外花被具有兩種顏色（邊緣粉紅色而中央與基部接近白色）；此外，值得注意的是，其雄花發育異常，所有雄蕊都雌性化而於基部產生裸露的胚珠狀構造、頂端產生具有乳突的柱頭狀構造，推測德保秋海棠可能是一個天然雜交種。假大新秋海棠與大新秋海棠近似，區別在於其葉片全綠無斑紋、托葉先端鈍或凹頭，以及具有粗壯且近無毛的根莖。假癩葉秋海棠與癩葉秋海棠 (*B. leprosa* Hance) 外表相似，區別在於前者果實具有三翅以及具有側膜胎座；假癩葉秋海棠亦與越南秋海棠相似，區別在於前者葉片近革質、近於平整、葉上表面具極稀疏的短剛毛或近於光滑，以及葉柄與葉片下表面具有倒伏的細毛。半側膜秋海棠亦與越南秋海棠略似，區別在於前者葉片常有沿主脈分布的白色斑紋、葉上表面被稀疏的剛毛狀柔毛、子房與果實具有較長的腺狀柔毛、子房或果實的上半部呈側膜胎座，中部向基部漸變為中軸胎座。

**關鍵詞：**德保秋海棠；假大新秋海棠；假癩葉秋海棠；半側膜秋海棠；秋海棠科；中國；染色體數；廣西；石灰岩植物；新種；側膜組。