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Review Article

Revision of *Rubus* (Rosaceae) in Taiwan

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ABSTRACT: The genus *Rubus* L. in Taiwan is taxonomically revised based on morphological and phytogeographical patterns. Forty taxa (34 species, 3 varieties, and 3 hybrids) of the genus are recognized, including two new hybrid species *R. croceacanthus* × *corchorifolius* and *R. rosifolius* × *fraxinifolius*. Among the *Rubus* taxa in Taiwan, *R. croceacanthus* H. Lév. exhibits tremendous variation and we do believe that more investigations are needed in the future. Several taxa described in the Flora of Taiwan, 2nd ed. are treated as synonyms of other species, and several taxa in Taiwan are revised. The existence of *R. howii* Merr. & Chun, *R. linearifoliolus* Hayata, and *R. parvifraxinifolius* Hayata in Taiwan are reconfirmed, we described *R. howii* fruit information which was absent in original literature; and the third taxon is treated as a natural hydrid *R.* × *parvifraxinifolius* Hayata which putatively derived from *R. rosifolius* Sm. and *R. linearifoliolus* based on intermediate morphology and the scarcity of fruit set. *Rubus pseudoacer* Makino ssp. *flexuosus* (Y.-C. Liu & F.-Y. Lu) H. Ohashi & C.-F. Hsieh is treated as synonym of *R. pseudoacer* Makino and is excluded in Taiwan. A key to the taxa, synonyms and taxonomic descriptions of each taxon are presented. Moreover, information about phenology, chromosome number, distribution and specimens examined for each taxon are also provided.

KEYWORDS: *Rubus*, Rosaceae, revision, hybrid, natural hybridization, Taiwan, taxonomy.

INTRODUCTION

Rubus L. (Rosaceae) is the only genus of Rubeae in Rosoideae (Potter et al., 2007) and comprises about 700 species (Lu and Boufford, 2003). The genus is distributed worldwide and has been suggested to originate from Northern Temperate Zone, while only a few species are found in the tropics and/or in Southern Hemisphere (Kalkman, 2004).

There are over 40 *Rubus* taxa that have been described in Taiwan. Fifteen of *the* 40 *Rubus* taxa are endemic to Taiwan (37.5%), higher than the overall endemism of seed plants in Taiwan (26.2%) (Hsieh, 2003). Among the rest, 23 (57.5%) also occurred in Mainland China, 12 (30%) are also found in Japan, and 6 (15%) are also distributed in the Philippines.

Taxonomic history of *Rubus* in Taiwan could be traced back to 1896 by A. Henry's pioneer survey. Five *Rubus* species, *R. formosensis* Kuntze, *R. parvifolius* L., *R. rosifolius* Sm., *R. swinhoei* Hance, and *R. tagallus* Cham. & Schltdl., were recorded in A. Henry's collecting list of Taiwan. The first comprehensive study on *Rubus* in Taiwan was done by Hayata in the 7th volume of Icones Plantarum Formosanarum published in 1918. He treated *Rubus* of Taiwan into 43 species and 1 variety and placed them in 3 subgenera, i.e. *Chamaebatus*, *Malachobatus*, and *Idaeobatus*, following the classification system proposed by Focke (1910, 1911, 1914). Detailed descriptions, leaf illustrations, and key to the species were all included in this master piece of work. Based on Hayata's framework, several taxonomic treatments of the genus *Rubus* in Taiwan have been undertaken by Koidzumi (1930), Masamune (1954), Li (1963), Liu and Su (1977), Ying (1985), Hsieh (1989), Hsieh and Ohashi (1993), Lu et al. (2000), Naruhashi (2002), and Lu & Boufford (2003). However, opinions on species delimitation and taxonomic treatment varied and were at times inconsistent among researchers. The incongruences were likely due to the lack of comprehensive, broader geographical scale studies and also the frequent hybridization of *Rubus* species (Alice and Campbell, 1999), for example, the hybrids *R. croceacanthus* × *corchorifolius* and *R. rosifolius* × *fraxinifolius* treated here.

The present work is based on newly collected materials, dried specimens, and related publications from neighboring regions of Taiwan, including Japan, China, and Malaysia. Voucher specimens examined were from the following herbaria: HAST, K, KYO, P, PE, PPI, TAI, TAIF, TCF, TI, TNM, and TNS. In this revision, 41 taxa (including 34 species, 4 varieties, and 3 hybrids) within the genus *Rubus* of Taiwan were treated. This study combined results from recent treatments on the genus *Rubus* (Lu et al., 2000; Naruhashi et al., 2002; Lu and Boufford, 2003; Hsu et al., 2007) and made many justifications from the Flora of Taiwan, 2nd ed. (Hsieh and Ohashi, 1993). Two new hybrids *R. croceacanthus* × *corchorifolius* and *R. rosifolius* × *fraxinifolius* is added to the flora of Taiwan. *Rubus parvifraxinifolius* Hayata, which was previously reduced to *R. fraxinifoliolus* Hayata (Hsieh, 1989), are now treated as a natural hybrid *R.* × *parvifraxinifolius* Hayata. The presence of *R. howii* Merr. & Chun and *R. linearifoliolus* Hayata in Taiwan are reconfirmed, which were neglected by Hsieh (1989) and Hsieh & Ohashi

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(1993). We add *R. amphidasys* Focke to the flora of Taiwan according to Hsu et al. (2007). We also made justifications on *R. cardotii* Koidz., *R. croceacanthus* H. Lév., *R. fraxinifolius* Poir., *R. inopertus* (Focke *ex* Diels) Focke, *R. lambertianus* Ser. var. *morii* (Hayata) S.-S. Ying, *R. nagasawanus* Koidz., *R. nagasawanus* Koidz. var. *arachnoideus* (Y.-C. Liu & F.-Y. Lu) S.-S. Ying, *R. parvifolius*, *R. pungens* Cambess. var. *oldhami* (Miq.) Maxim., *R. reflexus* Ker Gawl. var. *hui* (Diels *ex* Hu) F. P. Metcalf, *R. rosifolius*, *R. rufus* Focke, *R. sumatranus* Miq., *R. swinhoei* Hance var. *kawakamii* (Hayata) S.-C. Liu, *R. taitoensis* Hayata, and *R. tephrodes* Hance var. *setosissimus* Hand.-Mazz. We re-elected *R. incanus* Sasaki *ex* T.-S. Liu & T.-Y. Yang and *R. pentalobus* Hayata. *Rubus pseudoacer* Makino ssp. *flexuosus* Y.-C. Liu & F.-Y. Lu is treated as synonym of *R. pseudoacer* Makino and is excluded in the study.

Key to the taxa, synonyms for each taxon and taxonomic descriptions are presented. Moreover, information about phenology, chromosome number, distribution and specimens examined for each taxon are also provided.

TAXONOMIC TREATMENTS

***Rubus* L.** 懸鉤子屬

Shrubs, usually scandant or prostrate, sometimes erect, only few species herbaceous; deciduous or evergreen; twigs and other parts nearly always with prickles. Leaves alternate; pinnately or palmately compound or simple, when simple usually lobed; stipules free or attached to the petiole base, persistent or caducous. Inflorescences terminal, determinate, elaborate, little or not branched, rarely reduced with solitary flowers. Flowers mostly bisexual, rarely unisexual and the plants dioecious; hypanthium saucer or cup shaped; sepals 5, imbricate, often unequal, connate near the base, exposed margins lobed or not; corolla 5, imbricate, mostly white, sometimes pink or purplish, in few species absent; stamens numerous, free; carpels numerous, free, on an elevated torus, each containing 2 ovules, usually only one developing, the styles filiform, nearly terminal, persistent. Fruits consisting of many 1-seeded drupelets, exocarp red, black, yellow or orange, mesocarp juicy, drupelets cohering and falling as a collective fruit without or together with the dry torus.

A large, complex genus of about 700 species, cosmopolitan in distribution, particularly abundant in the Northern Hemisphere; 40 taxa including 34 species, 3 varieties, and 3 hybrids in Taiwan.

Key to the species and varieties

1. Leaves compound; stipules linear or filiform, adnate to the basal part of petiole. 2
1. Leaves simple; stipules linear or broad, adnate to the basal part of petiole, or at the junction of twig and petiole. 17
2. Abaxial surface of leaflets densely whitish tomentose; flowers pink to purplish red. 3
2. Abaxial surface of leaflets pubescent or glabrescent; flowers white or pink 5
3. Leaflets rounded or obtuse at apex; calyx abaxially prickled. ..... 19. *R. parvifolius*
3. Leaflets acuminate or acute at apex; calyx abaxially not prickled. 4
4. Leaflets 3-7; inflorescences narrow cymose panicles. ..... 11. *R. incanus*
4. Leaflets 3; inflorescences corymbs. ..... 16. *R. mesogaeus*
5. Leaves 3-foliolate; stems and petioles with densely long, reddish bristles; aggregate fruits yellow. ..... 35. *R. wallichianus*
5. Leaves 3-11-foliolate; stems and petioles pubescent, glabrous or with glandular hairs; aggregate fruits red, dark red, purplish black or orange. 6
6. Flowers many in cymose panicles, or umbellate cymes. 7
6. Flowers 1-several in terminal corymbs. 9
7. Leaves 5- or rarely 3-foliolate, abaxially with dense hairs; inflorescences narrow cymose panicles. ..... 18. *R. parviaraliifolius*
7. Leaves 7-11- or rarely 5-foliolate, glabrous; inflorescences broad lax cymose panicles, or umbellate cymes. 8
8. Inflorescences umbellate cymes; flowers pink; leaves usually 9-11-foliolate. ..... 12. *R. inopertus*
8. Inflorescences broad lax cymose panicles; flowers white; leaves usually 7-9-foliolate. ..... 9. *R. fraxinifolius*
9. Plants dwarf, 5-10 cm tall; leaflets very small, 1-1.5 cm long, glabrous. ..... 32. *R. taiwanicolus*
9. Plants more than 10 cm tall; leaflets more than 1.5 cm long, glabrous or pubescent. 10
10. Leaves 7-9(-11)-foliolate on sterile branch, occasionally 5-foliolate at base of inflorescence; plants glabrous, with sessile to stalked reddish glands, especially on twigs and pedicels. ..... 14. *R. linearifoliolus*
10. Leaves 3-7(-9)-foliolate; plants glabrous or pubescent, with glandular hairs, glands, or not. 11
11. Plants with reddish glandular hairs. 12
11. Plants without glandular hairs, scarcely with sparse and short glandular hairs. 13
12. Flowers 2.5-5 cm in diam.; petals suborbicular, longer than sepals; aggregate fruits globose or oblong, red at maturity. ..... 6. *R. croceacanthus*
12. Flowers 1-2 cm in diam.; petals oblong to obovate, slightly shorter than sepals; aggregate fruits oblong, orange-red at maturity. ..... 29. *R. sumatranus*
13. Plants glabrescent or glabrous; leaflets double-serrate or loosely serrate. 14
13. Plants pubescent, rarely glabrous; leaflets incised, double-serrate. 15
14. Leaflets irregular- or loose-serrate, the terminal one oblong-lanceolate; flowers 2.5-5 cm in diam. ..... 4. *R. cardotii*
14. Leaflets double-serrate, the terminal one ovate or elliptic; flowers 1-2 cm in diam. ..... 20. *R.* × *parvifraxinifolius*
15. Leaves, twigs and calyx pale yellow glandular-punctate, especially when young. ..... 27. *R. rosifolius*
15. Leaves, twigs and calyx not glandular-punctate. 16
16. Calyx with a few to many setose glandular hairs; twigs thinly glandular-hairy; terminal leaflets ovate-lanceolate, cuneate at base . ..... 6. *R. croceacanthus*
16. Calyx with needle-like prickles and stalked glands; twigs pubescent or glabrescent; terminal leaflets ovate, triangular-ovate, rounded or subcordate at base. ..... 23. *R. pungens* var. *oldhamii*
17. Stipules linear or filiform, adnate to the basal part of petiole, persistent. 18

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17. Stipules broad, often dissected, at the junction of twig and petiole, fugacious or persistent. 20
18. Leaves abaxially usually pale or whitish; flowers 3 or more, in short racemes; calyx glabrous outside. ..... 34. *R. trianthus*
18. Leaves abaxially not whitish; flower solitary, terminal on short lateral twigs, or few appearing leaf-opposed; calyx finely pubescent outside. 19
19. Calyx not prickled outside. ..... 5. *R. corchorifolius*
19. Calyx prickled outside. .....31. *R. taitoensis*
20. Terminal inflorescences broad lax cymose panicles. 21
20. Terminal inflorescences subracemes or simple racemes..... 26
21. Leaves oblong or ovate-oblong, rounded at base; petals prominent shorter than sepals; carpels 5 or more, drupelets 1-3. ....24. *R. pyrifolius*
21. Leaves broadly ovate or suborbicular, cordate at base; petals longer than or slightly shorter than sepals; carpels numerous, druplets more than 10..... 22
22. Leaves abaxially pilose or glabrous; aggregate fruits yellow or red. 23
22. Leaves abaxially densely gray tomentose; aggregate fruits purplish black. 24
23. Leaf blade and inflorescences thinly pilose.....13a. *R. lambertianus*
23. Leaf blade nearly glabrous, inflorescences glandular-punctate or with short glandular hairs.....13b. *R. lambertianus* var. *morii*
24. Leaves shallowly 5-7-lobed on sterile twigs, apically acute or acuminate. .....33. *R. tephrodes* var. *setosissimus*
24. Leaves deeply 5-lobed on sterile twigs, apically obtuse or acute. 25
25. Twigs with densely long glandular hairs and bristles. .... 17a. *R. nagasawanus*
25. Twigs without glandular hairs and bristles. ....17b. *R. nagasawanus* var. *arachnoideus*
26. Leaves oblong, ovate-oblong, or ovate, margin unlobed, undulate, or with shallow lobes on each side below middle. 27
26. Leaves suborbicular or broadly ovate, margin 3-5-lobed..... 31
27. Leaves distinctly cordate at base; stipules divided deeply. 28
27. Leaves rounded, truncate, or shallowly cordate at base; stipules apically laciniate. 29
28. Leaves oblong to ovate-oblong, with 1 or 2 broadly ovate shallow lobes on each side below middle. .....10. *R. howii*
28. Leaves ovate or narrowly ovate, undivided or undulate..... ..... 7. *R. flagelliflorus*
29. Leaves abaxially yellowish brown tomentose; inflorescences racemes..... 15. *R. liui*
29. Leaves abaxially gray tomentose or glabrous; inflorescences corymbose racemes. 30
30. Pedicels and calyx with purplish glandular hairs; leaves abaxially gray tomentose. ..... 30a. *R. swinhoei*
30. Pedicels and calyx with or without short stalked glands; leaves abaxially glabrous. ..... 30b. *R. swinhoei* var. *kawakamii*
31. Stipules and bracts laciniate shallowly to halfway, the lobes lanceolate or ovate. 32
31. Stipules and bracts divided deeply, nearly to midvein or base, the lobes linear, thread-like, or pinnately divided again into linear or linear-lanceolate lobules. 35
32. Leaves abaxially densely rusty yellow or rust colored..... 33
32. Leaves abaxially densely gray or yellowish gray tomentose. 34
33. Leaves adaxially not distinctly bullate between veins; leaf lobes acute or obtuse at apex; calyx lobes 6-8 mm long..... ..... 25. *R. reflexus* var. *hui*
33. Leaves adaxially distinctly bullate between veins; leaf lobes rounded or obtuse at apex; calyx lobes 7-12 mm long ..26. *R. rolfei*
34. Stems prostrate, usually rooting at nodes; flowers solitary or 2-3 ... . 22. *R. pentalobus*
34. Stems erect or scandent, not rooting at nodes; flowers several to many, in subracemes. .....8. *R. formosensis*
35. Stems prostrate, usually rooting at nodes; leaves apically rounded or obtuse, rarely acute ……..…….. 36
35. Stems erect or scandent, not rooting at nodes; leaves apically acute to caudate …… 37
36. Leaves abaxially with needle-like prickles along veins, margin 3-lobed or undulate-lobed; inflorescences 1-2- flowered; calyx abaxially prickled ……...…… 21. *R. pectinellus*
36. Leaves abaxially unarmed, margin 3-5-lobed; inflorescences few flowered, subracemes; calyx abaxially not prickled ….. 3. *R. buergeri*
37. Twigs with densely reddish brown long glandular hairs, usually unarmed; stipule lobes not divided again …… 2. *R. amphidasys*
37. Twigs without glandular hairs, prickled; stipule lobes pinnately divided again into linear lobules…….…… 38
38. Twigs with hairs, and sparse, recurved prickles; leaves adaxially distinctly bullate between veins, lobes irregularly coarsely serrate; outer sepals palmately to pinnately laciniate ……. 1. *R. alceifolius*
38. Twigs with hairs, brownish bristles, and sparse, needle-like prickles; leaves adaxially not distinctly bullate between veins, lobes irregularly sharply serrate; outer sepals apically shallowly laciniate... 28. *R. rufus*

1. ***Rubus alceifolius*** Poir. in Lamarck, Encycl. Meth. 6: 247. 1806; Hsieh, J. Taiwan Mus. 42: 104. 1989.
粗葉懸鉤子（羽萼懸鉤子）

Rubus moluccanus auct. non L.: Hayata, Icon. Pl. Formos. 1: 228. 1911.
Rubus laciniatostipulatus Hayata *ex* Koidz., J. Coll. Sci. Univ. Tokyo 34: 154. 1913.
Rubus pinnatisepalus auct. non Hemsl.: Li, J. Arnold. Arb. 25: 421. 1944.

Shrubs scandent. Twigs densely spreading straight tomentose-pilose, sparsely prickled. Leaves simple; blade suborbicular to broadly ovate, 7-20 × 6-18 cm, palmately 5-veined, abaxially yellowish gray colored tomentose, pilose along veins, adaxially sparsely pilose and distinctly bullate between veins, base cordate with basal incision to 4 cm, margin shallowly 5-7-lobed, lobes apically obtuse or acute, irregularly coarsely serrate; petiole 3-7 cm, densely pilose and prickled; stipules caducous, free, to 2 cm, deeply palmately or pinnately divided, tomentose abaxially, lobes filiform to linear, pinnately divided again into linear lobules. Inflorescences terminal, narrow cymose panicles or subracemes, 6-12 cm, or flowers few in axillary clusters; pedicels 5-10 mm, tomentose-pilose, with minute recurved prickles; bracts to 1.5 cm, pinnatifid to pinnatipartite, lobes filiform to linear. Flowers 1-1.6 cm in diam., hypanthium cup shaped; sepals ovate to triangular-ovate, 6-9 mm, abaxially tomentose-pilose, apex and margin of outer sepals laciniate, inner sepals entire, shortly pointed; petals white, suborbicular to elliptic, 6-9 × 4-8 mm, base clawed; stamens many, shorter than petals, filaments to 4 mm, anthers with few long hairs; carpels numerous, longer than stamens, ovary and style glabrous. Aggregate fruit red at maturity, globose, 1-1.8 cm in diam. Flowering season August to Octobor; fruiting season Octobor to December. $2n = 42$.

Distributed in Southern China, the Philippines, Vietnam, Laos, Burma, Thailand, Cambodia, Malaysia,

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and Indonesia. Taiwan, occurred in forests edges in the northern and central parts of the island at low altitudes 20-300 m.

Specimens examined: TAIWAN: Taipei City: Academia Sinica, *T. I. Chuang 4642* (HAST); Nankang, *J. M. Chao et al. 4841* (HAST); Hsinlung Rd., *S. Y. Lu s.n.* 19 Dec. 1972 (TAIF). Taipei Co.: Hsintien, Hsinwu Rd., *W. C. Leong et al. 1264* (HAST); Ankeng, *S. Sasaki s.n.* 24 Nov. 1929 (TAI); Hsintien, *Y. Shimada 11177* (TAI); Wulai, *M. T. Kao s.n.* 6 Aug. 1957 (TAI); Chuchih, *T. Suzuki, 5421* (TAI); Kueishan, *Masamune 2628* (TAI); Tachienshan, *S. C. Liu et al. 718* (HAST); Sanhsia, *S. Sasaki s.n.* 13 Nov. 1910 (TAI). Ilan Co.: Chiaochi, *C. M. Kuo 5689* (TAI); Toucheng, Huomanliaoshan, *C. H. Lin et al. 861* (HAST); Yuanshan, Hsiatsukeng, *J. J. Chen et al. 465* (HAST). Taoyuan Co.: Taikei, *Y. Shimada 861A* (HAST). Hsinchu Co.: Kuanhsi, Yushan stone area, *S. Z. Yang 5241* (PPI); Peipu, *S. Y. Lu 16884* (TAIF); Hengshan, Yulo, *M. T. Kao, 7432* (TAI). Miaoli Co.: Tunglo, changshulin, *C. H. Yu 128* (HAST); Tungho, *Y. Shimada 869C* (TAI); Toufen, Hsinglung Rd., *T. Y. A. Yang et al. 11353* (TNM). Taichung Co.: Tungshih, *H. Shimizu 540* (TAI); Hsinshe, Yuehhu Village, *C. F. Chen 2781* (TNM); Tungmaoshan, *G. P. Hsieh 2773* (TNM). Nantou Co.: Lienhuachih, *W. P. Leu et al. 295* (HAST); Tiaumikeng, *S. Y. Lu 16764* (TAIF); Puli, Liyutan, *J. J. Chen et al. 438* (HAST); Sun Moon Lake, *Kudo et al. 15508* (TAI). Changhua Co.: Kushan Temple, *S. F. Huang 4941* (TAI); Shetou, Houtanching Trail, *C. M. Wang et al. 11258* (TNM). Chiayi Co.: Meishan to Jueili, *S. Y. Lu 16810* (TAIF).

2. ***Rubus amphidasys*** Focke, Bot. Jahrb. Syst. 29: 396. 1900; Hsu, Chiang & Peng, Taiwania 52: 113. *f. 1*. 2007. 周毛懸鉤子

Rubus rufus auct. non Focke: Naruhashi, Bot. Bull. Acad. Sin. 43: 194. 2002. *pro parte.*

Shrubs trailing or scandent. Twigs with dense reddish brown long glandular hairs, soft bristles, and long yellowish hairs, usually unarmed. Leaves simple; blade broadly to narrowly ovate, 5-11 × 3.5-9 cm, palmately 5-veined, both surfaces pilose, base cordate, margin 3-5-lobed, terminal lobe much larger and longer than lateral lobes, apex acute, lateral lobes obtuse, irregularly sharply serrate; petiole 3-5.5 cm; stipules free, to 1.5 cm, deeply palmately divided, lobes lanceolate to linear, with long glandular hairs, pilose. Inflorescences terminal, subracemes, 6-12 cm, 5-15-flowered, or in clusters of 3-5 in leaf axils; pedicel 5-12 mm, rachis, pedicels, and abaxial surface of calyx with dense reddish brown long glandular hairs, soft bristles, and yellowish hairs; bracts to 9 mm, lobed, lobes linear to lanceolate. Flowers 1-1.5 cm in diam., hypanthium cup shaped; sepals narrowly lanceolate, 1-1.5 cm, apex caudate, outer sepals usually 2- or 3-laciniate; petals white, broadly ovate to oblong, 4-7 × 3-5 mm, base shortly clawed, margin erose; stamens many; carpels many, glabrous, much longer than stamens. Aggregate fruit dark red at maturity, compressed globose, ca. 1 cm in diam., glabrous. Flowering season May to July; fruiting season July to September. $2n = 28$.

Distributed in Southern China. Taiwan, occurred among shrubby thickets in the northern part of the island at low altitudes 300-700 m.

Specimens examined: TAIWAN: Taipei City: Waishuanghsi, abandonded Tsuishan Shooting Range, *Chen et al. 448* (HAST); Taluntoushan, *H. L. Chiang 468* (TAIF); Neihu, Pishan Camping Area, *J. Y. Huang 2308* (HAST). Taipei Co.: Hsichih, Hsiwan Rd., *Chen et al. 445* (HAST); Hsichih, Chepingliao, *J. Y. Huang 194* (HAST); Wuchihshan, *S. Y. Lu 14826* (TAIF).

Note: The chromosome counts were based on the description of '*Rubus rufus*' in (Naruhashi et al., 2002). As Hsu et al. (2007) mentioned, the voucher specimen for *R. rufus* [$2n = 28$: *J. J. Chen et al. 445* (HAST)] Naruhashi et al. (2002) cited should belong to *R. amphidasys*.

3. ***Rubus buergeri*** Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 36. 1867; Li, Woody Fl. Taiwan 307. 1963. 寒莓

Rubus shimadai Hayata, Icon. Pl. Formos. 3: 94. 1913.
Rubus pseudobuergeri Sasaki, Trans. Nat. Hist. Soc. Formos. 21: 249. 1931. - *Rubus buergeri* Miq. var. *pseudobuergeri* (Sasaki) T.-S. Liu & T.-Y. Yang, Sci. Ann. Taiwan Mus. 12: 7. 1969.

Subshrubs prostrate to erect. Stems slender, sometimes rooting at nodes, densely tomentose-pilose, unarmed or with sparse, minute prickles. Leaves simple; blade suborbicular to ovate, 4-15 cm in diam., palmately 5-veined, raised abaxially, both surfaces with hairs along veins, abaxially densely hirsute, adaxially slightly pubescent, base cordate to deeply cordate, margin shallowly 5-7-lobed, lobes apically rounded or obtuse, irregularly sharply serrate or dentate; petiole 4-8 cm, densely pubescent, sometimes with sparse prickles; stipules caducous, free, 8-15 mm, deeply palmately divided, lobes linear to linear-lanceolate, soft hairy. Inflorescences terminal, short subracemes, 4-5 cm, few flowered, or flowers several in axillary clusters; pedicel 5-10 mm, densely tomentose-pilose, with sparse prickles or not; bracts to 9 mm, similar to stipules. Flowers 6-10 mm in diam., hypanthium cup shaped, abaxially yellowish pilose and tomentose; sepals lanceolate or ovate-lanceolate, 5-9 mm, outer sepals often lobed apically, inner sepals entire, apex acuminate; petals white, obovate, 4-9 × 3-5 mm, apex erose; stamens many, shorter than petals, filaments glabrous; carpels glabrous, longer than stamens. Aggregate fruit red at maturity, globose, 0.6-1 cm in diam., glabrous. Flowering season August to October; fruiting season Octobor to January in next year. $2n = 56$.

Distributed in Mainland China, Japan, and Korea. Taiwan, distributed in broad-leaved forests from low to medium altitudes 400-2000 m.

Specimens examined: TAIWAN: Taipei City: Tatungshan to Hsinpeitou, *C. M. Kuo 9044* (TAI); Chihsingshan hiking trail, *J. J. Chen et al. 450* (HAST), Hsiangtienchih, *C. C. Liao 747* (HAST). Taipei Co.:

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Szukanshui to Tatungshan, *W. C. Leong et al. 1263* (HAST); Tataoshan, *Y. C. Jeng 699* (TAI); Wulai, *C. C. Chuang 2297* (TAI); Habun, *T. Nakamura 605* (TAI); Mt. Peichatien, *C. I Peng 7421* (HAST); Peichatienshan to Lupingshan, *C. I Huang et al. 1387* (HAST); Roppeizan, *T. Suzuki 18946* (TAI); Takaiyama, *T. Suzuki 18524* (TAI). Ilan Co.: Ayushan, *Y. C. Kao et al. 624* (HAST); Fushan Botanical Garden, *H. L. Chiang 103* (HAST, TAIF); Mt. Fanpao, *M. W. Jian et al. 106* (HAST); Taipinshan, *S. F. Huang 5000* (TAI). Taoyuan Co.: Takuanshan Forest Reserve, *C. I Peng et al. 14634* (HAST). Hsinchu Co.: Wufeng, Tienhu, *C. M. Wang 10969* (TNM); Yufeng Village, en route from Szumakuszu to Sacred Tree, *C. C. Liao 886* (HAST); Yuanyang Lake, *J. J. Chen et al. 387*, *390* (HAST). Miaoli Co.: Mt. Malapan, *P. F. Lu 9850* (TAIF). Taichung Co.: Low Altitute Experimental Station to the hiking entrance of Sanchiaoshan, *H. Y. Shen et al. 250* (HAST). Nantou Co.: Hsini to Hoshe, *W. P. Leu et al. 1079* (HAST); Jenai, Tatung Village, *H. F. Yen et al. 78* (TNM). Chiayi Co.: Chuchi, Shihcho, *H. F. Yen 2930* (TNM). Kaohsiung Co.: Meilan logging track 14-15 km, *C. I Peng et al. 18136* (HAST). Pingtung Co.: Chingshuiyin, *H. Shimizu 3634* (TAI); Lilungshan, *Y. K. Chen et al. 812* (HAST). Hualien Co.: Chingshuishan, Shakatang logging track, *C. C. Liao 462* (HAST); Yuli, Chinshui Farm, *C. H. Lin et al. 467* (HAST). Taitung Co.: Tajen, *K. P. Lo 818* (PPI).

4. ***Rubus cardotii*** Koidz., Fl. Symb. Orient-Asiat. 62. 1930. - *Rubus rosaefolius* Sm. var. *formosanus* Cardot in Lecomte, Not. Syst. 3: 306. 1916.
紅狹葉懸鉤子（栲葉懸鉤子）

Rubus fraxinifoliolus Hayata, Icon. Pl. Formos. 5: 46. 1915, *non* Poir. 1806 '*fraxinifolius*'. *syn. nov.*
Rubus rubro-angustifolius Sasaki, Trans. Nat. Hist. Soc. Formos. 21: 221. 1931. *syn. nov.*
Rubus croceacanthus H. Lév. var. *glaber auct. non* Koidz.: Hsieh & Ohashi in Huang *et al*., Fl. Taiwan 2nd ed. 3: 126. 1993. *pro parte.* - *Rubus asper* Wall. *ex* D. Don. var. *glaber* (Koidz.) C.-F. Hsieh, J. Taiwan Mus. 42: 106. 1989. *pro parte.*

Shrubs suberect or scandent. Twigs reddish, glabrous, sparsely prickled, prickles 2-5 mm long. Leaves imparipinnate, mostly 5-foliolate, sometimes 3-foliolate on flower bearing twigs; blade of leaflets oblong-lanceolate to ovate-lanceolate, lateral veins 7-9 per side, raised abaxially and impressed adaxially, terminal leaflet usually longer and wider than lateral leaflets, 4-9 × 1-3 cm, lateral leaflets often slightly oblique, 1.5-5 × 0.6-2.5 cm, both surfaces glabrous, abaxially usually reddish when young, with compressed brown glands near margin, usually with sparse, minute prickles along midvein, base rounded to truncate, margin irregularly or loosely serrate, apex acuminate to acute; petiole 3-5 cm, petiolule adaxially grooved and sparsely hairy, with sparse, minute prickles; stipules attached to the petiole base, linear to linear-lanceolate, 5-10 mm, glabrous. Inflorescences terminal, 1- or rarely 2-flowered; pedicel 2-2.5 cm, glabrous, with few compressed brown glands. Flowers 2.5-5 cm in diam., hypanthium saucer shaped, abaxially with few compressed brown glands; sepals oblong-triangular, 1-1.3 cm, glabrous and with few sessile glands, margin tomentose, apex caudate; petals white, obovate, 1.2-2 × 1-1.5 cm, base clawed. Stamens many, shorter than petals; carpels numerous, style and ovary glabrous, torus shortly stalked. Aggregate fruit red at maturity, ellipsoid to globose, 1.5-2 cm in diam., glabrous. Flowering season March to May; fruiting season May to July. $2n = 14$.

Endemic to Taiwan. Occurred in thickets from low to medium altitudes 100-2800 m.

Specimens examined: TAIWAN: Hsinchu Co.: Chutung, Shangpingkou, *S. F. Huang 4590* (TAI); Mamei Rd. to Litung Lodge, *Y. Y. Huang et al. 446* (HAST); Chenghsipao, *S. C. Wu et al. 1827* (TAI); Tuchang to Kuanwu, *C. I Peng et al. 14864* (HAST). Miaoli Co.: Shihtan, Tali Coal Mine, *C. I Peng 15067* (HAST); Nanchuang, Tanan logging track, *P. F. Lu 9428* (HAST). Taichung Co.: Tahsuehshan Forest Recreation Area, *J. C. Wang et al. 12140* (HAST); Yunling Lodge, *T. Y. Liu et al. 1026* (HAST). Nantou Co.: Mayfeng farm, *W. P. Leu et al. 462* (HAST); Juiyenhsi, *J. J. Chen et al. 422* (HAST); Prov. #14A Hwy 19.5 km, *W. C. Leong et al. 1312* (HAST); Yunhai, *S. F. Huang 1192* (TAI); Nenkao pass, *C. F. Chen 1382* (PPI); Pilushanhsi, Prov. #8 Hwy 99.8 km, *C. H. Lin et al. 505* (HAST). Chiayi Co.: Alishan, Prov. #18 Hwy 23-23.5 km, *H. L. Ho et al. 1132* (HAST). Kaohsiung Co.: Taoyuan, Prov. #20 Hwy 133-134 km, *C. C. Wang et al. 1061* (HAST). Hualien Co.: Pilu, *C. M. Wang s.n.* 29 Jul. 1992 (TNM); Mukuashan, *T. Shimizu 4143* (TAI); *M. T. Kao 4143* (HAST), *4487* (HAST); Wanjung logging track to Chitsaihu, *S. H. Wu et al. 1364* (HAST).

Note: International Code of Botanical Nomenclature 53.3: When two or more generic or specific names based on different types are so similar that they are likely to be confused (because they are applied to related taxa or for any other reason) they are to be treated as homonyms. According to this rule, the name *R. fraxinifoliolus* is so easily confused with *R. fraxinifolius*, so we used the name *R. cardotii* to instead of *R. fraxinifoliolus*.

From the original description and the specimens cited by Liu and Su (1977), *Rubus rubro-angustifolius* is different from *R. fraxinifoliolus* (treated as *R. cardotii* here) only by its narrower terminal leaflets; but the shape of terminal leaflets in the latter often varies even on the same individual according to our examination. Both of them have glabrous twigs, abaxially reddish young leaves, loosely serrate leaf margins, and compressed brown glands especially on pedicels, hypanthia, and abaxial surface near margin of leaves; therefore, we treat *R. rubro-angustifolius* as a synonym of *R. cardotii* here. Although *R. rubro-angustifolius* have been placed under *R. croceacanthus* var. *glaber* (treated as synonym of *R. croceacanthus* here) by Hsieh and Ohashi (1993), *R. cardotii* is easily distinguishable from *R. croceacanthus* by the characters described above.

5. ***Rubus corchorifolius*** L. f., Suppl. Pl. Syst. Veg. 263. 1781; Matsum. & Hayata, J. Coll. Sci. Univ. Tokyo 22: 120. 1906. 變葉懸鉤子

Rubus corchorifolius L. f. var. *glaber* Matsum., Bot. Mag. Tokyo 15: 157. 1901.
Rubus retusipetalus Hayata, J. Coll. Sci. Univ. Tokyo 30: 94. 1911. *syn. nov.*

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Rubus shinkoensis Hayata, J. Coll. Sci. Univ. Tokyo 30: 95. 1911.
Rubus arisanensis Hayata, Icon. Pl. Formos. 3: 87. 1913.
Rubus suishaensis Hayata, Icon. Pl. Formos. 7: 6. *f. 5-b.* 1918.
Rubus arisanensis Hayata var. *horishaensis* Hayata, Icon. Pl. Formos. 7: 15. *f. 12-c.* 1918.

Shrubs suberect. Twigs prickled, finely hairy, glabrate in age. Leaves simple; blade variable in shape, ovate to ovate-oblong, 4-12 × 3-9 cm, abaxially densely finely pubescent when young, gradually glabrescent, with sparse, small prickles along midvein, adaxially finely pubescent along veins, base rounded to cordate, margin undivided or 3-5-lobed, usually 3-5-divided on sterile branches, irregularly sharply serrate to doubly serrate, apex acuminate; petiole 1.5-2 cm, with dense fine hairs when young, with sparse, minute prickles; stipules attached to the petiole base, linear-lanceolate or linear, to 5 mm, soft hairy. Inflorescences terminal on short lateral twigs, 1-flowered or few flowers appearing leaf-opposed; pedicel 1-1.3 cm, finely pubescent. Flowers 1.5-2 cm in diam., hypanthium campanulate; sepals ovate to triangular-ovate, 6-10 mm, abaxially densely finely pubescent, unarmed, apex acute to shortly acuminate; petals white, oblong or elliptic, 9-13 mm × 6-9 mm, longer than sepals, glabrous, base clawed, apex obtuse; stamens much shorter than petals, filaments glabrous; carpels many, slightly shorter than stamens, ovary pubescent. Aggregate fruit orange-red to red at maturity, ovoid-globose, 1-1.2 cm in diam., densely finely pubescent. Flowering season January to March; fruiting season March to May. $2n = 14$.

Distributed in Mainland China, Japan, Korea, Vietnam, and Burma. Taiwan, commonly distributed from low to medium altitudes, 10-2000 m throughout the island.

Specimens examined: TAIWAN: Taipei City: Academia Sinica, *C. I Peng 4477* (HAST); Waishuanghsi, Chungyang Community, *K. F. Chung et al. 1129* (HAST); Tsutzuhu, *W. P. Leu 880* (HAST). Taipei Co.: Sanhsia, Paichi, *S. M. Liu et al. 604* (HAST); Pinglin to Shihting, *C. I Peng 15380* (HAST); Shihting, Prov. #9 Hwy 25-30 km, *S. C. Liu et al. 314* (HAST); Hsiping Rd., between Tienfengku and watchtower, *Y. C. Kao et al. 273* (HAST); Wanli, Tachienchih, *Y. Y. Huang et al. 286* (HAST); *M. T. Kao 10252* (TAI). Ilan Co.: Taipinshan, *S. Y. Lu 15669* (TAIF); Mingchih to Chishan, *C. M. Wang 5462* (HAST); Sanhsin, *T. C. Huang 10817* (TAI); Shuanglienpi, *K. C. Yang 4628* (HAST). Taoyuan Co.: Lungtan, Kunlun Medicial Plant Garden, *C. I Peng et al. 13688* (HAST); Paling to Lalashan, *P. F. Chen 32* (TAI); Lalashan, *S. C. Wu 2630* (HAST). Hsinchu Co.: Yuanyang Lake, *T. Y. Liu 912* (HAST). Taichung Co.: Lileng logging track, *C. M. Wang et al. 4759* (TNM); Tungmaoshan, *K. C. Yang 2367* (TNM). Nantou Co.: Huisunlinchang, *C. M. Wang s.n.* 21 Jan. 1992 (TNM); Mayfeng farm, *W. P. Leu et al. 435* (HAST). Chiayi Co.: Between Chushan peony garden and Chushan station of Forest Railway, *T. Kawakami 954* (TAI). Hualien Co.: Wanjung logging track 47 km, *Y. C. Kao et al. 490* (HAST). Taitung Co.: Hsinkanshan, *T. Y. A. Yang et al. 4432* (TNM); Wulu logging track, *Y. Y. Huang et al. 266* (HAST).

6. ***Rubus croceacanthus*** H. Lév., Repert. Spec. Nov. Regni Veg. 11: 33. 1912; Hsieh & H. Ohashi in Huang *et al*., Fl. Taiwan 2nd ed. 3: 125. 1993. 虎婆刺

Rubus asper Wall. *ex* D. Don., Prodr. Fl. Nepal. 234. 1825, *non* J. Presl. & C. Presl. 1822; Koidz., J. Coll. Sci. Univ. Tokyo 34: 139. 1913.
Rubus tagallus auct. non Cham. & Schltdl.: Matsum., Bot. Mag. Tokyo 16: 4. 1902.
Rubus rosaefolius Sm. var. *hirsutus* Hayata, J. Coll. Sci. Univ. Tokyo 25: 81. 1908. - *Rubus hirsutus* (Hayata) Hayata, Icon. Pl. Formos. 1: 227. 1911, *non* Thunb. 1813. *syn. nov.*
Rubus asper Wall. *ex* D. Don. var. *pekanius* Focke, Biblioth. Bot. 17 (Heft 72): 159. 1911.
Rubus sorbifolius auct. non Maxim.: Hayata, J. Coll. Sci. Univ. Tokyo 30: 96. 1911.
Rubus piptopetalus Hayata *ex* Koidz., J. Coll. Sci. Univ. Tokyo 34: 141.1913.
Rubus dolichocephalus Hayata, Icon. Pl. Formos. 3: 92. 1913. *syn. nov.*
Rubus sphaerocephalus Hayata, Icon. Pl. Formos. 3: 94. 1913.
Rubus glanduloso-calycinus Hayata, Icon. Pl. Formos. 5: 42. 1915. - *Rubus croceacanthus* H. Lév. var. *glanduloso-calycinus* (Hayata) S.-C. Liu in Lu *et al.*, Trees Taiwan 1: 122. 2000. *syn. nov.*
Rubus euphlebophyllus Hayata, Icon. Pl. Formos. 5: 44. 1915.
Rubus hirsutopungens Hayata, Icon. Pl. Formos. 5: 58. 1915. *syn. nov.*
Rubus parvipungens Hayata, Icon. Pl. Formos. 5: 65. 1915. *syn. nov.*
Rubus rosaefolius Sm. var. *polyphyllarius* Cardot in Lecomte, Not. Syst. 3: 306. 1916. - *Rubus polyphyllarius* (Cardot) Koidz., Fl. Symb. Or.-Asiat. 62. 1930. *syn. nov.*
Rubus somai Hayata, Icon. Pl. Formos. 7: 19. *f. 14a.* 1918.
Rubus croceacanthus H. Lév. var. *glaber* Koidz., Fl. Symb. Or.-Asiat. 65. 1930. - *Rubus asper* Wall. *ex* D. Don. var. *glaber* (Koidz.) C.-F. Hsieh, J. Taiwan Mus. 42: 106. 1989. *syn. nov.*
Rubus takasagoensis Koidz., Fl. Symb. Or.-Asiat. 68. 1930. *syn. nov.*
Rubus hayatanus Koidz., Fl. Symb. Or.-Asiat. 68. 1930. *syn. nov.*
Rubus hayatai Nemato *ex* Makino & Nemoto, Fl. Jap. 2nd ed. 514. 1931. *syn. nov.*
Rubus okamotoanus Koidz., Acta Phytotax. Geobot. 8: 110. 1939. *syn. nov.*
Rubus rosaefolius Sm. var. *formosanus auct. non* Cardot: Li, Woody Fl. Taiwan 314. 1963.
Rubus pungens auct. non Cambess.: Li, Woody Fl. Taiwan 317. 1963.
Rubus sumatranus auct. non Miq.: Hsieh, J. Taiwan Mus. 42: 118. 1989. *pro parte.*
Rubus pungens Cambess. var. *oldhamii auct. non* (Miq.) Maxim.: Hsieh & H. Ohashi in Huang *et al*., Fl. Taiwan 2nd ed. 3: 136. 1993.

Shrubs suberect or scandant. Twigs pubescent to glabrescent, with densely to sparsely glandular hairs, and sparse, straight to curved prickles to 4 mm. Leaves imparipinnate, usually 5-7(-9)-foliolate, sometimes 3-foliolate on flower bearing twigs; blade of leaflets variable in shape, terminal leaflet ovate-oblong to lanceolate, 1.5-7 × 0.7-5 cm, lateral leaflets ovate to lanceolate, 1-5 × 0.5-3 cm, both surfaces with dense to

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sparse soft hairs along veins, or glabrescent, sometimes with glandular hairs, usually with some small prickles along midvein abaxially, base cuneate to rounded, lateral leaflets often oblique basally, margin doubly serrate or irregularly sharply serrate, apex acute to acuminate; petiole 1-5 cm, densely soft hairy to glabrescent, with intermixed glandular hairs and sparse, minute prickles; stipules attached to the petiole base, lanceolate to linear, to 10 mm, pubescent to glabrescent, with intermixed glandular hairs. Inflorescences terminal, corymbose, 1- to several flowered; pedicel 2-4 cm, with few small prickles, glandular hairs, soft hairy or glabrescent. Flowers 2.5-5 cm in diam., hypanthium saucer shaped; sepals triangular-oblong, 0.7-1.5 cm, margin entire, apex long caudate; petals white, suborbicular, 1-2 × 0.7-1.5 cm, abaxially shortly hairy; stamens many, shorter than petals; carpels numerous, ovary with sparse, soft hairs especially apically, usually with some stalked glands, torus shortly stalked. Aggregate fruit red at maturity, globose or ovoid, rarely oblong, 1-2 cm in diam., with few glandular hairs. Flowering season February to June; fruiting season April to August. $2n = 14$.

Distributed in Japan, Korea, the Ryukyus, Vietnam, Laos, Burma, Thailand, Cambodia, and India. Taiwan, very common in open places from low to high altitudes, 10-3600 m throughout the island.

Specimens examined: TAIWAN: Taipei City: Chihsingshan, *T. Suzuki 8307* (TAI); *S. Sasaki s.n.* 28 May 1932 (TAI); Sozan, *Y. Shimada 860* (HAST); *S. Suzuki 3288* (TAI). Taipei Co.: Pali, *C. C. Hsu et al. 4392* (TAI); Tamsui to Suihsientou, *T. Suzuki 8271* (TAI); Hsiaopingting, *W. P. Leu 1660* (HAST); Wanli, Tachienchih, *Y. Y. Huang et al. 285* (HAST); Hsichih, Wuchihshan Hwy, *K. F. Chung et al. 1124* (HAST); Tapingting, *M. T. Kao 10241* (TAI); Yinhotung, *C. C. Hsu et al. 4315* (TAI); Kueishan to Huoshawchang, *T. Suzuki 8372* (TAI); Wulai, *H. L. Chiang 521* (TAIF). Ilan Co.: Pingyuan logging track 7 km, *Y. C. Kao et al. 345* (HAST); Taipinshan, *S. Sasaki s.n.* 8 May 1932 (TAI); Ssuyuanyakou, *C. I Peng et al. 17412* (HAST); Chialohu, *C. I Huang et al. 817* (HAST); Fushan Botanical Garden, *C. I Peng et al. 13876* (HAST). Taoyuan Co.: Nankan, *Y. Kudo s.n.* 5 May 1929 (TAI); Lungtan, Kunlun Medicial Plant Garden, *C. I Peng et al. 13687* (HAST); Yangmei, Puhsin, *W. C. Leong et al. 2727* (HAST); Fuhsing, Ishan village, *C. C. Liao et al. 169* (HAST); Meikueichi, *W. C. Leong et al. 2839* (HAST). Hsinchu Co.: Hengshan, Dashanbeishan, *S. C. Wu 2420* (HAST); Kuanhsi, *W. C. Leong et al. 1134* (HAST); Tuchang to Kuanwu, *C. I Peng et al. 14862* (HAST); Mamei Rd., Litung Lodge, *Y. Y. Huang et al. 447* (HAST); Taikang Rd., from Hsiuluan to Taikang, *Y. Y. Huang et al. 876* (HAST); Chenhsipao, *C. H. Lin et al. 285* (HAST); Yuanyang Lake, *K. Y. Wang et al. 1062* (HAST). Miaoli Co.: Shihtan, Hsintien Village, *C. I Peng et al. 15251* (HAST); Szumahsien to Tienkou, *T. Y. Liu et al. 83* (HAST); Hsuehshan #230 logging track 13.5 km, *S. H. Wu 1216* (HAST); Huoyenshan, *H. L. Chiang s.n.* 14 Jan. 1987 (HAST, TAIF). Taichung City: Takeng, *S. T. Chiu et al.* 3273 (HAST). Taichung Co.: Taiping, Toupienkeng, *K. Y. Wang et al. 796* (HAST); Sonhou, *M. T. Kao 9644* (TAI); Pahsienshan Forest Recreation Area, *T. Y. Liu et al. 885* (HAST); Huanshan, *Y. Y. Huang et al. 396* (HAST); Wuling Lodge, *C. I Peng et al. 17196* (HAST); Yunling Lodge to Tuochiatunshan, *W. C. Leong et al. 3252* (HAST); Hsueshan, *G. Masamune 1256* (TAI); Nanhutashan, *N. Hukuyama et al. 17747* (TAI). Nantou Co.: Tsaotun, Chiuchiufeng, *C. I Peng et al. 19247* (HAST); Hueisun Exp. Forest, *C. C. Chen 629* (TAIF); Puli, Liyutan, *C. I Peng et al. 17167A* (HAST); Lienhuachih, *S. Y. Lu 3557* (TAIF); Wushe to Chienchin, *C. S. Feung et al. 453* (TAI); Nengkao, *K. Mori et al. 107* (TAI); Peitungyenshan, *C. M. Wang 5519* (HAST); Chunyang, *C. M. Wang 2600* (HAST); Mayfeng farm, *W. P. Leu et al. 463* (HAST); Mt. Hohuanshan, Wuling to Kunyang, *C. I Peng 8278* (HAST); Chingying Village to Yunhai, *S. T. Chiu et al. 3332* (HAST); Tungpu Hot Spring to Rainbow Waterfall, *C. I Peng 6475* (HAST); Chuntashan, *T. Y. Liu et al. 956* (HAST); Prov. #21 131 km, *T. Y. Liu et al. 1230* (HAST); Hsitou, *M. T. Kao et al. 3166* (TAI); Fenghuangshan, *C. I Peng et al. 17961* (HAST). Chiayi Co.: Peitzutung logging track, between Shihchuo and Tatungshan, *C. C. Liao et al. 1678* (TAI); Fenchihu, *S. F. Huang 2611* (TAI); Shihcho, Lungyun Lodge, *K. Y. Wang et al. 736* (TAI); Alishan, County #169 Hwy, 44 km, *S. M. Liu et al. 653* (TAI); Alishan, Prov. #18 Hwy 23-23.5 km, *H. L. Ho et al. 1134* (TAI); Alishan Sacred Tree, *T. Y. A. Yang et al. 6516* (TAI, TNM); Alishan to Chushan, *T. Y. A. Yang et al. 7799* (TAI, TNM); Alishan, *S. Sasaki et al. s.n.* 17 May 1932 (TAI); Paiyun Lodge to Yushan main peak, *C. I Peng et al. 14393* (HAST); Mt. Morrison, *T. I. Chuang et al. s.n.* 25 May 1960 (TAI). Tainan Co.: Kuantzuling, *C. H. Chen et al. 1* (HAST). Kaohsiung Co.: Neimen, Shihkou, *T. Y. A. Yang et al. 14476* (HAST); Liukuei, *Y. Y. Huang et al. 236* (HAST); Meilan logging track 22-24 km, *T. Y. Liu et al. 488* (HAST); Sanping, *C. M. Wang et al. 1288* (HAST); Kuanshan, *C. K. Liou 402* (HAST); Tienchi, *C. H. Lin et al. 429* (HAST). Pingtung Co.: Kaoshihfo, *G. P. Hsieh 2517* (PPI); Lilungshan, *S. H. Wu et al. 1042* (HAST); Taiwu, Wanan, *S. M. Ku 1210* (PPI); Laiyi, *S. C. Wu 1213* (HAST); Wutai, Tawu village, *S. H. Wu et al. 1155* (HAST); Tawushan, *C. I Peng 13184* (HAST); Kuaiku Lodge to Mt. Peitawu, *C. I Huang et al. 981* (HAST). Hualien Co.: Hsiaochingshui, *S. Y. Lu 18842* (TAIF); Wanjung logging track 42.5 km, *S. H. Wu et al. 1368* (HAST); Wanjung logging track to Chitsaihu, *S. H. Wu et al. 1344* (HAST); Tungmen Check Point to Chilai electric power maitaining station, *P. J. Lin 204* (HAST); Yuli, *S. Y. Lu 1915* (TAIF). Taitung Co.: Chupang, *M. T. Kao et al. 14234* (TAI); Taimali, Hsinhsing, *Y. K. Chen 485* (HAST); Yenping logging track, *C. F. Chen 1891* (PPI); Hsiangyangshan; *S. T. Chiu et al. 2932* (HAST).

Note: Individuals of *R. croceacanthus* have variable morphologies, including shape and size of leaflets, serration of the margin, density of indumentum, and length of glandular hairs, features that probably reflect the diverse habitats they are able to grow from low to high altitudes. The taxonomic status of this species is very confusing due to many names proposed by Hayata (1918) and Koidzumi (1930) without detailed comparisons to the existing names. This confusion is further aggravated by misidentification of specimens and miscitation of names by the following researchers. We re-examined the isotype of *R. croceacanthus* var. *glaber* [Bunkiko, *U. Faurie 46* (HAST)] and considered it to be a synonym of *R. croceacanthus* here. *Rubus rubro-angustifolius*, treated as a synonym of *R. asper* var. *glaber* by Hsieh (1989) and *R. croceacanthus* var. *glaber* by Hsieh and Ohashi (1993), is treated as a synonym of *R. cardotii* (see comments under the species description). One of the specimens [Mt. Chingsui, *T. Shimizu et al. 11722* (TAI)] under the name *R. croceacanthus* var. *glaber* (Hsieh and Ohashi, 1993) should belong to *R. linearifoliolus* (see commnets under the species description).

An examination of the seven specimens cited by Hsieh (1989) under *R. sumatranus* revealed that, except *S. F. Huang 555* (TAI), others represent *R. croceacanthus*. The two species show some similarity, but *R. croceacanthus*

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can be distinguished by its larger flowers (2.5-5 cm in diam.), suborbicular petals, and globose to oblong and red aggregate fruits. *Rubus sumatranus*, on the contrary, has smaller flowers (1-2 cm in diam.), oblong petals, oblong and orange aggregate fruits. In addition, *R. dolichocephalus* has been usually treated as a synonym of *R. sumatranus* by several authers because of its ellipsoid aggregate fruits, but actually is closer to *R. croceacanthus* and should be treated as synonym of the latter because of its larger flowers and suborbicular petals.

The type specimens of *R. hirsutopungens* and *R. parvipungens* are similar to each other; both names also had been miscited to refer *R. pungens* var. *oldhamii* and *R. pungens* by Hsieh and Ohashi (1993). Both of the two taxa have rather small leaves and thinly glandular twigs, more likely present an ecotype of *R. croceacanthus* in high altitudes since the leaves of *R. croceacanthus* populations in high mountains may range from small to large and have barely to prominently glandular hairs. Finally, the type specimen [Mt. Shichiseitonzan, *S. Sasaki s.n.* 1911 (TI)] of *R. glanduloso-calycinus* [synonym of *R. sumatranus* in Hsieh (1989) and Hsieh & Ohashi (1993)] also have smaller and only slightly pubescent leaves, is treated as synonym of *R. croceacanthus* here. Taken together, *R. croceacanthus* exhibits tremendous variations in Taiwan and more indepth investigations are needed for this complex taxon in the future.

7. ***Rubus flagelliflorus*** Focke, Bot. Jahrb. Syst. 29: 393. 1900; Chang, Forest. J. Taiwan Prov. Pingtung. Inst. Agr. 21: 1. 1979. 裂緣苞懸鉤子

Shrubs scandent or trailing. Twigs densely gray tomentose when young, glabrate in age, with sparse, curved minute prickles. Leaves simple; blade ovate to ovate-oblong, 7-9 × 5-7 cm, palmately 5-veined, lateral veins 4 or 5 pairs, raised abaxially, abaxially densely rusty yellow tomentose, adaxially hirsute along veins, base deeply cordate, margin often slightly undulate or undivided, irregularly serrate, apex acute to shortly acuminate; petiole 3-5 cm, densely gray tomentose when young, with sparse minute prickles; stipules caducous, free, to 9 mm, yellow tomentose-pilose, palmately lobed, lobes lanceolate. Inflorescences terminal, short racemes, 2.5-5 cm, few flowered, or flowers several in clusters; pedicel 1-2 cm, densely yellow tomentose-pilose; bracts to 10 mm, brown tomentose, palmately divided apically, lobes lanceolate. Flowers 1-1.2 cm in diam., hypanthium cup shaped; sepals reflexed after anthesis, ovate-lanceolate, 6-8 mm, abaxially densely yellow tomentose, outer sepal margin 2- or 3-lobed, inner sepals with entire margin, apex acuminate; petals white, 5-6 × 4-5 mm, suborbicular, shorter than sepals; stamens many, glabrous or slightly pilose, anthers glabrous; carpels slightly longer than stamens, styles and ovaries glabrous. Aggregate fruit purplish black at maturity, semiglobose, 0.8-1 cm in diam., glabrous. Flowering season August to October; fruiting season Octobor to December.

Distributed in Mainland China. Taiwan, found in Lanyu and Lutao; 200-500 m.

Specimens examined: TAIWAN: Taitung Co.: Lanyu, Hongtoushan, *Y. L. Chun 553*, *591* (PPI); *W. C. Leong et al. 2484* (HAST); *T. Y. A. Yang et al. 8101* (TNM); Lutao, *C. E. Chang s.n.* 30 Sep. 1982 (PPI).

8. ***Rubus formosensis*** Kuntze, Meth. Sp.-Beschr. *Rubus*, 73. 1879. 臺灣懸鉤子

Rubus rugosus Maxim., Bull. Acad. Imp. Sci. St-Péters. 17: 149. 1872, *non* Seem 1815.
Rubus formosanus Maxim. *ex* Focke, Biblioth. Bot. 17 (Heft 72): 117. 1910.
Rubus nantoensis Hayata, J. Coll. Sci. Univ. Tokyo 30: 92. 1911.
Rubus randaiensis Hayata, J. Coll. Sci. Univ. Tokyo 30: 93. 1911.
Rubus rugosissimus Hayata, Icon. Pl. Formos. 3: 93. 1913.

Shrubs suberect or scandent. Twigs with soft yellowish gray tomentose hairs, unarmed or minutely prickled. Leaves simple; blade broadly ovate to suborbicular, 6-15 × 5-13 cm, 5-veined, reticulate veins raised and prominent abaxially, bullate between veins adaxially, abaxially yellowish gray tomentose, soft hairy along veins, adaxially soft hairy when young, base cordate, margin 3-5-lobed, lobes ovate-triangular, terminal one largest, margin irregularly coarsely serrate, apex acute or obtuse; petiole 2-4.5 cm, densely yellowish gray tomentose, usually unarmed; stipules caducous, free, brownish, broadly ovate to oblong, to 1.5 cm, entire or laciniate at apex, lobes lanceolate. Inflorescences terminal, short subracemes, 3-6 cm, several flowered, or flowers solitary in leaf axils; pedicel 3-5 mm, densely yellowish gray tomentose; bracts reddish brown, similar to stipules. Flowers 1-1.5 cm in diam., hypanthium cup shaped; sepals triangular to ovate, 5-8 mm, abaxially densely yellowish gray tomentose, margin entire or outer sepals apically with few teeth, apex acute to shortly acuminate; petals white, broadly suborbicular, 5-7 × 4-6 mm, base clawed, margin sometimes erose; stamens many, shorter than sepals, filaments linear, with few long hairs at apex of anthers; carpels slightly longer than stamens. Aggregate fruit yellow, orange-red or red at maturity, globose or broadly ovoid, 1-1.5 cm in diam., glabrous. Flowering season July to September; fruiting season September to November. 2*n* = 28.

Distributed in Southern China. Taiwan, commonly distributed in open slopes from medium to high altitudes, 500-3000 m throughout the central mountains.

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Specimens examined: TAIWAN: Ilan Co.: Suao, Chimaoshan, *T. Nakamura 5186* (TAI); Buta to Riyohen, *T. Suzuki 7562* (TAI); Ssuchi to Liumaoan, *S. Suzuki 4927* (TAI); Mimodeng, *W. C. Leong et al. 3794* (HAST); Nanshan to Matang, *C. H. Chen et al. 210* (HAST). Taoyuan Co.: Yangmei, Puhsin, *W. C. Leong et al. 2728* (HAST); Shihmenshan, *S. C. Liu et al. 712* (HAST); Tungyenshan, *W. C. Huang 215* (HAST); Kappanzan, *T. Suziki 4655* (TAI); Daman to Szleng, *T. T. Chen 9234* (TAIF). Hsinchu Co.: Yuanyanghu, *C. H. Chen et al. 180* (HAST); Leshan to Kuanwu, *J. C. Wang et al. 4723* (TAI). Miaoli Co.: Shishihshan tunnel to Mt. Huoshih, *C. M. Wang 1742* (HAST). Taichung City: Takeng, *J. Y. Huang 1017* (HAST). Taichung Co.: Chingshan, *S. F. Huang 551* (TAI); Huanshan, *S. W. Chung 49* (HAST); Pachsienshan, *M. T. Kao 2746* (TAI); Tahsuehshan Logging Station, *T. S. Liu et al. 250* (TAI); Anmashan, *C. M. Kuo 7103* (TAI); Tahsuehshan #230 logging tract, *J. C. Wang et al. 4982* (TAI). Nantou Co.: Kuantaoshi, *C. F. Hsieh et al. 1468* (TAI); Huisun Experimental Forest, *S. M. Liu et al. 20* (HAST); Lienhuachi, *K. Mori s.n.* 8 Jul. 1936 (TAI); Meifeng, *C. I Peng et al. 17172* (HAST); Chunda logging track 21 km, *M. H. Chen et al. 26* (HAST); Kuankao to Tungpu, *Y. F. Chen 3541* (TAI); Hsitou to Shanlinhsi, *Y. F. Chen 2834* (TAI). Chiayi Co.: Chushan, *Mori et al. s.n.* 6 Nov. 1932 (TAI); Yushan, *Masamune et al. s.n.* 2 Jul. 1931 (TAI). Kaohsiung Co.: Taoyuan, Likuan to Tienchi, *C. H. Lin et al. 416* (HAST); Liukuei to Peinanchushan, *T. Yamazaki 399* (TAI); Shihshan, *T. C. Huang 6526* (TAI); Prov. #20 119 km, *C. C. Wang et al. 1041* (HAST). Pingtung Co.: Wutai to Ali, *W. P. Leu et al. 997* (HAST); Ali, *H. N. Yang 2022* (TAI); Chihpenchushan, *Y. R. Lin et al. 218* (HAST); Chingshuiyin, *H. Shimizu 3822* (TAI); Tahan logging track 17 km, *K. F. Chung et al. 1267* (HAST). Hualien Co.: Nanan to Walami, *C. C. Liao et al. 1546* (HAST); Chingshuishan, Shakatang logging track, *C. C. Liao 478* (HAST); Tailukotashan, *T. Suzuki 9287* (TAI); Mukuashan, *T. Nakamura 4576* (TAI).

9. ***Rubus fraxinifolius*** Poir. in Lamarck, Encycl. Meth. 6: 242. 1806; Matsum. & Hayata, J. Coll. Sci. Univ. Tokyo 22: 121. 1906. 楹葉懸鉤子

Rubus alnifoliolatus H. Lév., Bull. Soc. Bot. France 53: 549. 1906.
Rubus fraxinifolius var. *kotoensis* (Hayata) Koidz., J. Coll. Sci. Univ. Tokyo 34: 144. 1913. - *Rubus kotoensis* Hayata, Icon. Pl. Formos. 3: 90. 1913. - *Rubus alnifoliolatus* var. *kotoensis* (Hayata) Li, Woody Fl. Taiwan 320. 1963.

Shrubs suberect. Twigs dark-reddish, glabrous, sparsely prickled or sometimes unarmed, prickles curved, to 5 mm. Leaves imparipinnate, 7-9-foliolate, rarely 5-foliolate; blade of leaflets ovate-lanceolate to oblong-lanceolate, 5-10 × 1.5-3.5 cm, lateral veins 10-13 per side, raised abaxially and impressed adaxially, both surfaces glabrous or abaxially slightly pubescent along veins, base obtuse to rounded, margin irregularly serrate or doubly serrate, apex acute to acuminate, lateral leaflets often oblique; petiole reddish, 4-8 cm, glabrous, with sparse prickles; stipules attached to the petiole base, linear-lanceolate, to 10 mm, glabrous. Inflorescences terminal, usually broad cymose panicles, to 10 cm, many flowered; pedicel 1-1.4 cm, glabrous; bracts linear, to 9 mm. Flowers 1-1.5 cm in diam., hypanthium saucer shaped; sepals ovate- lanceolate, 7-11 mm, abaxially glabrous, with few sessile glands, apex acuminate to caudate; petals white, ovate-oblong, 0.7-1.4 cm × 4-6 mm, abaxially with few hairs, apex obtuse; stamens many, glabrous, shorter than petals; carpels numerous, style and ovary glabrous, torus shortly stalked. Aggregate fruit red at maturity, oblong or ellipsoid, 1-1.5 × 0.8-1 cm. Flowering and fruiting season all year around. $2n = 14$.

Distributed in the Philippines, Malaysia, Indonesia, and Pacific Islands. Taiwan, commonly distributed from low to medium altitudes, 20-2000 m throughout the island.

Specimens examined: TAIWAN: Taipei City: Chanchushan, *T. Nakamura 2933* (TAI); Sanhsia, *S. Sasaki et al. s.n.* 25 Nov. 1910 (TAI); County #101A Hwy, near Yuyujen's grave, *S. H. Wu 1444* (HAST). Taipei Co.: Manyuehyuan Waterfall, *C. C. Liao et al. 378* (HAST); Pinglin, Prov. #9 Hwy 54 km; Hsintien, Kuanghsing, *S. C. Liu et al. 618* (HAST); Lussutan, *Y. C. Jeng 515* (TAI); Tonghouhsi, *C. M. Kuo 9213* (TAI); Ayi, Wulai, *M. T. Kao 30006* (TAI). Ilan Co.: Nanao, along Nanaonanhis, *T. Y. Liu et al. 853* (HAST); Jentse, *C. M. Wang 2358* (HAST); Tuchang to Ssuchi, *S. Suzuki 14* (TAI); Nanshan to Matang, *C. H. Chen et al. 238* (HAST); Ssuyuanyakou, *T. Yamazaki et al. 1065* (TAI). Taoyuan Co.: Hsiayun to Hsiayunping, *C. I Peng et al. 10298* (HAST); Fuhsing, Ishan village, *C. C. Liao et al. 163* (HAST). Hsinchu Co.: Hsiatienpu, *C. H. Yu 168* (HAST); Chenhsipao, *S. C. Wu et al. 1827* (HAST); Tuchang to Kuanwu, *C. I Peng 9371* (HAST). Miaoli Co.: Komokwan, *Y. Shimada 863A* (HAST). Taichung Co.: Wushihkeng, *H. Y. Shen et al. 222* (HAST); Chiapaotai, *J. P. Wu s.n.* 13 Dec. 1981 (TAI); Techi, *C. I Peng et al. 17068* (HAST). Nantou Co.: Puli, Kuanyin waterfall, *C. L. Wu s.n.* 29 Jul. 1970 (TAI); Lushan, *C. I Peng 6149* (HAST); Lihsing Private Rd., *W. C. Leong et al. 1277* (HAST); Hsinyi, Lona, *C. I Peng et al. 17001* (HAST); Hoshe, *T. C. Huang et al. 15485* (TAI). Chiayi Co.: Alishan, Tefuyeh, *W. C. Leong et al. 2561* (HAST). Kaohsiung Co.: Tengchih lodging area to Shihshan, *Y. R. Lin 442* (HAST); Tengchih, *T. C. Huang 15897* (TAI); Shanping, *T. Kiang et al. 91* (TAI). Pingtung Co.: Wutai to Ali, *W. P. Leu et al. 995* (HAST); Ali to Hsiaokueihu, *C. C. Liao et al. 576* (HAST); Chingshuiyin, *H. Shimizu 3614* (TAI); Tahan logging track 13-14 km, *K. F. Chung et al. 1222* (HAST); Mt. Wanlite, *T. Y. A. Yang et al. 2755* (HAST); Shouka, *M. T. Kao et al. 3491* (TAI). Hualien Co.: Hoping logging track 15 km, *S. M. Liu et al. 357* (HAST); Tailuko, *M. T. Kao 4093* (TAI); Honku, *M. T. Kao 9839* (TAI); Tienhsian, *M. T. Kao et al. 4416* (TAI); Hungyeh Hot Spring, *C. I Peng et al. 11599* (HAST); Wanjung logging track 23.8 km, *S. H. Wu et al. 1393* (HAST). Taitung Co.: Chengkung, *Keng & Kao 2688* (TAI); Chinwha to Tahwu, *T. S. Liu et al. 2861* (TAI); Taiwan Cycas Nature Reserve, *S. M. Liu et al. 458* (HAST); Yenping logging track; *S. M. Liu et al. 460* (HAST); Lichia logging track, *Y. C. Kao et al. 152* (HAST); Darun Farm, *Y. P. Cheng 3326* (TAIF); Kotosyo, *S. Sasaki s.n.* Jun. 1926 (TAI); Lanyu, *M. T. Kao 5428*, *8735* (TAI); Lanyu, Langtao, *C. L. Yeh 95* (PPI); Lanyu, Between Hongtou Village and Tienchi, *C. I Peng 5246* (HAST); Lutao, Ameishan, *Hayashi 13* (TNM); Lutao, *C. E. Chang 11713* (PPI).

Note: For a long time, the name *R. alnifoliolatus* had been used to refer to this taxon, while *R. fraxinifolius* had been used to refer to the unarmed population in Lanyu. We found the twigs in the isotype of *R. fraxinifolius* [Java, *Commerson s.n.* (P)] are armed with sparse prickles, and also observed the prickled and unarmed individuals in a same population in Lanyu. We treat *R. alnifoliolatus* as a synonym of *R. fraxinifolius* here according to nomenclature priority and also follow the note on HAST specimens by Naruhashi (2002).

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10. ***Rubus howii*** Merr. & Chun, Sunyatsenia 5: 71. 1940; Lu & Yang, Taiwania 25: 123. *f. 2*. 1980. 裂葉懸鉤子

Shrubs straggling. Twigs densely yellowish brown pilose, with curved, minute prickles. Leaves simple; blade oblong to ovate-oblong, 4-8 × 2-5 cm, lateral veins 6-8 pairs, prominent abaxially and impressed adaxially, both surfaces yellowish brown pilose along veins, abaxially with sparse, minute prickles along midvein, base cordate, margin irregularly coarsely serrate, with 1 or 2 broadly ovate shallow lobes on each side below middle, apex acute to shortly acuminate; petiole 1-2 cm, densely yellowish brown pilose, with few small prickles; stipules caducous, free, 6-9 mm, deeply lobed, lobes linear, yellowish brown pilose. Inflorescences terminal, subracemes, 4-6 cm, few flowered, or flowers several in clusters in leaf axils; pedicel ca. 1 cm, densely yellowish brown pilose, with sparse prickles; bracts 5-8 mm, lobes linear, yellowish brown pilose. Flowers ca. 1 cm in diam., hypanthium cup shaped; sepals ovate-lanceolate, 6-8 mm, margin entire, apex acuminate; petals white, elliptic, 5-7 × 4-5 mm, base shortly clawed, apex obtuse; stamens many, shorter than petals, filaments glabrous; carpels glabrous, longer than stamens. Aggregate fruit red at maturity, globose, 1-1.5 cm in diam., glabrous. Flowering season March to May; fruiting season May to July.

Distributed in Hainan and Taiwan. Taiwan, rarely found in forests in the eastern part of the island at medium altitudes 800-1500 m.

Specimens examined: TAIWAN: Hualien Co.: Chinshui Farm, *J. Y. Huang 2312* (HAST). Taitung Co.: Lichia logging tract, *J. Y. Huang 2340* (HAST); *S. Y. Lu 22113* (TAIF); Yenping forest road, *Y. J. Lin 200* (PPI).

Note: This taxon in Hainan is rather rare and with very few collections, the information about fruit is absent in original literature and the Flora of China. Here is the first record about color and shape of aggregate fruit. The species was neglected in Hsieh (1989) and Hsieh & Ohashi (1993), and had no other collection since the first description. We newly found several populations at the medium altitudes in Hualien and Taitung County; a few specimens wrongly identified or unidentified in herbarium are also found.

11. ***Rubus incanus*** Sasaki *ex* T.-S. Liu & T.-Y. Yang, Quart. J. Taiwan Mus. 20: 167. 1968. 白絨懸鉤子

Rubus niveus auct. non Thunb.: Hsieh, J. Taiwan Mus. 42: 112. 1989.

Shrubs suberect or scandent. Twigs tomentose when young, glabrate in age, sparsely prickled. Leaves imparipinnate, 5-7-foliolate, sometimes 3-foliolate on flower bearing twigs; blade of leaflets ovate-elliptic to rhombic, midrib and lateral veins abaxially raised and minutely prickled, adaxially slightly impressed, abaxially gray tomentose, adaxially soft hairy along veins or glabrate, terminal leaflet subrhombic, slightly longer than lateral leaflets, 4-7 × 2-4 cm, base cuneate to rounded, margin double-serrate, becoming entire toward the base, apex acute to acuminate, lateral leaflets rhombic-elliptic, 2-4.5 × 1-2.5 cm, base oblique; petiole 1.5-4 cm, tomentose, with sparse prickles; stipules attached to the petiole base, linear, to 8 mm long, pubescent. Inflorescences terminal, narrow cymose panicles or short thyrses, 5-10 cm; pedicel 5-10 mm, tomentose; bracts lanceolate or linear, pubescent. Flowers to 1 cm in diam., hypanthium saucer shaped; sepals 4-6 mm, abaxially densely tomentose, with intermixed soft hairs, apex caudate or abruptly pointed; petals pink to purplish red, unopened, suborbicular, 4-6 × 3-5 mm, shorter than sepals, base clawed; stamens many, nearly as long as petals; carpels 65-90, slightly longer than stamens, ovary gray tomentose. Aggregate fruit red at maturity, globose, 0.8-1.2 cm in diam., hairy. Flowering season June to July; fruiting season August to September. $2n = 14$.

Endemic to Taiwan. Commonly distributed in open places or forest edges at medium altitudes, 1800-3000 m throughout the central mountains.

Specimens examined: TAIWAN: Ilan Co.: Ssuyuanyakou, *C. I Peng et al. 17409* (HAST). Hsinchu Co.: Talu logging track, *J. C. Wang et al. 4864* (TAI); Kuanwu, Talu east branch, 3.4 km, *L. J. Juan et al. 21* (HAST). Taichung Co.: Chingshan to Kukuan, *T. C. Huang et al. 9629* (TAI); #710 logging track, *J. C. Wang et al. 3591* (TAI); Yunleng Lodge, *C. I Huang et al. 2612* (HAST); Nanhutashan, *M. T. Kao 8617* (TAI); Chungyangchien, *N. Fukuyama et al. 15206* (TAI). Nantou Co.: Tsuifeng, *W. H. Hu 1432* (HAST); Juiyen Protection Area, *C. H. Chen et al. 1257* (HAST); Pilushan logging track, *J. J. Chen et al. 397* (HAST); Nengkaoshan, *E. Matuda s.n.* 4 Aug. 1919 (TAI). Kaohsiung Co.: Chinching Bridge, *K. F. Chung et al. 1084* (HAST); Shishan logging track, *G. P. Hsieh 629* (HAST, PPI). Hualien Co.: Hopin logging track, *S. F. Huang et al. 5119* (TAI); Chilai, *E. Matuda s.n.* 4 Aug. 1919 (TAI); Mukuashan, *M. T. Kao 4165* (TAI); Tarokotaizan, *T. Suzuki 9613* (TAI); Pilushan to Pilushan Shenmu, *C. I Peng 9254* (HAST). Taitung Co.: Hsiangyang, *C. I Peng et al. 11829* (HAST).

Note: *Rubus incanus* was treated as a synonym of *R. niveus* by Hsieh (1989). After comparing the populations of Mainland China and Taiwan, we consider *R. incanus* and *R. niveus* are two distinct taxa. The inflorescences of *R. incanus* are narrow cymose panicles or short thyrses, which is different from umbellate corymbs of *R. niveus*.

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12. ***Rubus inopertus*** (Focke *ex* Diels) Focke, Biblioth. Bot. 17 (Heft 72): 182. 1911; Naruhashi, Bot. Bull. Acad. Sin. 43: 194. 2002.

紅花懸鉤子（李棟山懸鉤子）

Rubus ritozanensis Sasaki, Trans. Nat. Hist. Soc. Formos. 21: 250. 1931.
Rubus fraxinifolius Poir. var. *yushuni* Suzuki & Yamam. Trans. Nat. Hist. Soc. Formos. 22: 409. 1932. - *Rubus yushuni* (Suzuki & Yamam.) Suzuki & Yamam., Trans. Nat. Hist. Soc. Formos. 25: 130. 1935.
Rubus ohwianus Koidz., Acta Phytotax. & Geobot. 8: 108. 1939.
Rubus yamamotoanus H.-L. Li, Woody Fl. Taiwan 319. 1963.

Shrubs suberect or scandent. Twigs glabrescent, with sparse prickles. Leaves imparipinnate, usually 9-11-foliolate; blade of leaflets ovate to ovate-lanceolate, 3-8 × 1.5-4 cm, lateral veins 9-12 per side, raised abaxially and impressed adaxially, both surfaces nearly glabrous, slightly pubescent along veins, base rounded to truncate, margin coarsely sharp doubly serrate, apex acuminate to caudate; petiole 3.5-5 cm, glabrous or slightly pubescent, with sparse, curved minute prickles; stipules attached to the petiole base, linear-lanceolate, to 5 mm, nearly glabrous. Inflorescences terminal and axillary, umbellate cymes, 2-4 cm, several flowered, or flowers several in axillary clusters; pedicel 4-8 mm, glabrous, unarmed; bracts linear-lanceolate, to 5 mm, nearly glabrous. Flowers 1-1.2 cm in diam., hypanthium saucer shaped; sepals reflexed in fruit, triangular-ovate, 4-6 mm, glabrous, inner sepals tomentose at margin, apex acute to acuminate; petals pink to purplish red, unopened, obovate, 5-7 × 4-6 mm, base slightly hairy and shortly clawed; stamens numerous, slightly shorter than petals; carpels 65-80, slightly longer than stamens, ovary and base of style soft hairy. Aggregate fruit dark red to dark purple at maturity, globose, 0.6-1 cm in diam., thinly pubescent. Flowering season May to June; fruiting season July to August. 2*n* = 14.

Distributed in Mainland China and Vietnam. Taiwan, occurred in moist forests edges in the northern and central parts at medium altitudes 1500-2300 m.

Specimens examined: TAIWAN: Ilan Co.: Chiaping logging track, near a waterfall, *C. H. Lin et al. 594* (HAST); Taipingshan, *C. I Peng et al. 7879* (HAST); Chiliting, *T. C. Huang 7826* (TAI); Siyuanyakou, *W. C. Leong et al. 3773* (HAST). Taoyuan Co.: Lalashan, *S. Y. Lu 22221* (TAIF). Hsinchu Co.: Yuanyang Lake, #170 logging track 5.5 km, *W. C. Leong et al. 2364* (HAST); Litung Lodge, *Y. Y. Huang et al. 448* (HAST); Kuanwu, Shenmu logging track, *L. J. Juan et al. 36* (HAST). Taichung Co.: #710 logging track, *W. C. Leong et al. 2401* (HAST). Nantou Co.: Mayfeng, water source area, *C. I Peng 9113* (HAST); Juiyenhsi Forest Reserve, *J. J. Chen et al. 420* (HAST). Chiayi Co.: Alishan, *C. E. Chang 3910* (PPI). Hualien Co.: Hopin logging track, *S. F. Huang et al. 5117* (TAI).

Note: The treatment is based the note Naruhashi wrote on the specimens of *R. ritozanensis* in HAST in 2002 or earlier and we also agree this point of view.

13. ***Rubus lambertianus*** Ser. in Candolle, Prodr. 2: 567. 1825; Matsum. & Hayata, J. Coll. Sci. Univ. Tokyo 22: 121. 1906.

13a. ***Rubus lambertianus*** var. ***lambertianus*** 高粱泡

Rubus lambertianus Ser. ssp. *xanthoneurus auct. non* Focke: Koidz., J. Coll. Sci. Univ. Tokyo 34: 158. 1913.

Shrubs straggling. Twigs brown-yellow velutinous, especially when young, with sparse, curved prickles. Leaves simple; blade broadly ovate, 4-12 × 3-8 cm, 5-veined, both surfaces pilose, more densely so along veins, with sparse, minute prickles along midvein, base broadly cordate to rounded, margin indistinctly 3-5-lobed or undulate, serrulate or dentate, apex acuminate; petiole 2-4 cm, thinly pubescent, with sparse, minute prickles; stipules caducous, free, to 1 cm, shallowly to deeply laciniate, lobes linear to lanceolate, thinly pubescent. Inflorescences terminal, broad cymose panicles, 10-20 cm, sometimes flowers few in subracemes or clusters in leaf axils; pedicel 8-12 mm, thinly pubescent; bracts to 5 mm, similar to stipules. Flowers 7-9 mm in diam., hypanthium cup shaped; sepals triangular-ovate, 4-7 mm, abaxially thinly pubescent, apex acuminate, sometimes with few teeth; petals white, elliptic to obovate, 3-6 × 2-5 mm, slightly shorter than sepals, base slightly hairy and clawed; stamens many, somewhat shorter than petals; carpels ca. 15-20, shorter than stamens, glabrous. Aggregate fruit orange-red or yellow at maturity, globose, 0.6-0.9 cm in diam., glabrous. Flowering season August to October; fruiting season October to December. 2*n* = 28.

Distributed in Mainland China and Japan. Taiwan, distributed in thickets from low to medium altitudes, 100-2000 m throughout the island.

Specimens examined: TAIWAN: Ilan Co.: Chiaping logging track, *C. H. Lin et al. 612* (HAST); Mt. Taiping, *C. C. Chuang et al. 4780* (HAST); Nanshan to Matang, *C. H. Chen et al. 228* (HAST). Taoyuan Co.: Paling to Kaoyi, *C. I Peng 11052* (HAST); Fuhsing, Ronghuaciao, *C. C.* Chen *511* (HAST). Hsinchu Co.: Hengshan, Dashanbeishan, *S. C. Wu 2424* (HAST); Wuchihshan, *H. F. Yen 8902* (TAI); Chienshih, Meihua Shechu, *C. H. Lin 499* (HAST); Litung Lodge, *C. M. Wang et al. 1984* (HAST). Miaoli Co.: Nanchuang, Fengmeihsi bank, *T. Y. Liu et al. 361* (HAST); Henglongkutao, *C. H. Yu 404* (HAST). Taichung City: Takeng, *C. H. Ou et al. s.n.* 17 May 1990 (TNM). Taichung Co.: Tungshih, #200 logging tract 8 km, *J. Y. Huang 2326* (HAST); Wushihkeng, *S. W. Chung 3517* (TAIF); Kuangming Bridge to Techi Reservoir, *W. P. Leu et al. 360* (HAST); Lishan: Prov. #8 Hwy 54 km, *T. Y. Liu et al. 292* (HAST). Nantou Co.: Hsinyi, Lona, *C. I Peng et al. 16995* (HAST); Hsini to Hoshe, *W. P. Leu et al. 1074* (HAST);

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Meifeng, Sanchiaofeng, *S. H. Wu et al. 653* (HAST). Hualien Co.: Yenhai logging track, *C. I Peng et al. 12775* (HAST); Between Lienhuchih and Errdzeshan, *C. I Peng 5914* (HAST). Taitung Co.: Chiaping logging track, *C. H. Chen et al. 7407* (TNM).

13b. ***Rubus lambertianus*** Ser. var. ***morii*** (Hayata) S.-S. Ying, Tech. Bull. Exp. For. Natl. Taiwan Univ. 160: 34. 1985. - *Rubus morii* Hayata, J. Coll. Sci. Univ. Tokyo 30: 90. 1911. 尾葉懸鉤子

Rubus gelatinosus Sasaki, Trans. Nat. Hist. Soc. Formos. 21: 249. 1931.
Rubus tiponensis Hosokawa, Trans. Nat. Hist. Soc. Formos. 23: 93. 1933.
Rubus urophyllus Y.-C. Liu & F.-Y. Lu, Quart. J. Chin. Forest. 9: 133. *f. 6.* 1976. - *Rubus morii* Hayata var. *urophyllus* (Y.-C. Liu & F.-Y. Lu) S.-C. Liu in Lu *et al.*, Trees Taiwan 1: 120. 2000. *syn. nov.*
Rubus lambertianus var. *glandulosus auct. non* Cardot: Lu & Boufford in Wu & Raven, Fl. China 9: 265. 2003. *pro parte.*

This variety differs from the typical form by a combination of following characters: the leaves being glabrous or slightly pilose only along veins, the stipules being laciniate ca. 1/3 long, and the whole plant having thin glandular punctation or minute glandular hairs especially on twigs and pedicels. Flowering season July to August; fruiting season September to Octobor. $2n$ = 28.

Endemic in Taiwan. Occurred in thickets at medium altitudes 500-2800 m.

Specimens examined: TAIWAN: Ilan Co.: Siyuanyakou, *W. C. Leong et al. 3763* (HAST). Taichung Co.: #710 logging tract, *Y. C. Chen et al. 80* (HAST); *S. C. Liu 2087* (HAST); Chungyangchien, *Fukuyama et al. 16174* (TAI). Pingtung Co.: Ali, *S. Z. Yang 10302* (PPI); Tahan logging track 23 km, *K. F. Chung et al. 1321* (HAST). Hualien Co.: Hoping logging track 38-43 km, *W. H. Hu et al. 2195* (HAST); Yenhai logging track 6-9 km, *Y. Y. Huang et al. 729* (HAST); Tayuling, *J. J. Chen et al. 417* (HAST); Mukuashan, *T. Nakamura 4498* (TAI); *M. T. Kao 4195* (TAI); Yuli, Chinshui Farm, *C. H. Lin et al. 468* (HAST); Juisui logging track 32 km, *C. M. Wang W677* (TNM); Chohsi, Yamagon to Shihli, *T. P. Chiang et al. 60* (HAST). Taitung Co.: Tulanshan, *S. M. Liu et al. 492* (HAST); Lichia logging track, *Y. C. Kao 202* (HAST); Tawu logging track to Maloszu, *C. F. Chen 1604* (PPI).

Note: *Rubus morii* resembles *R. lambertianus* and is hard to be distinguished without examining their indumentum. We consider *R. morii* should be a variety of *R. lambertianus* following Ying's (1985) treatment. The type specimens of *R. urophyllus* [Lanshan, *Y. C. Liu & C. H. Ou 1720* (TAI)] and *R. tiponensis* [Wushan, *T. Hosokawa 5370a* (TAI)] are almost the same, they differs from *R. morii* by having shortly glandular inflorescences. In contrast, *R. morii* have thin glandular punctations. However, the glands being sessile or shortly stalked sometimes vary a lot even in different individuals of same species in *Rubus*; therefore, the three names, *R. morii*, *R. urophyllus*, and *R. tiponensis*, are considered conspecific and are revised as *R. lambertianus* var. *morii* here.

14. ***Rubus linearifoliolus*** Hayata, Icon. Pl. Formos. 7: 22. *f. 16a.* 1918. - *Rubus rosaefolius* Sm. var. *linearifolius* (Hayata) H.-L. Li, Woody Fl. Taiwan 315. 1963. - *Rubus tsangii* var. *linearifoliolus* (Hayata) T.-T. Yu & L.-T. Lu, Fl. Reipubl. Popularis Sin. 37: 96. 1985. 細葉懸鉤子

Rubus tsangii Merr., Lingnan Sci. J. 13: 28. 1934; Lu & Boufford in Wu & Raven, Fl. China 9: 226. 2003. *syn. nov.*
Rubus croceacanthus H. Lév. var. *glaber auct. non* Koidz.: Hsieh & Ohashi in Huang *et al*., Fl. Taiwan 2nd ed. 3: 126. 1993. *pro parte.* - *Rubus asper* Wall. *ex* D. Don. var. *glaber* (Koidz.) C.-F. Hsieh, J. Taiwan Mus. 42: 106. 1989. *pro parte.*

Shrubs suberect or scandent. Twigs glabrous, sparsely prickled, with dark red glandular punctations or minute glandular hairs 1-2 mm. Leaves imparipinnate, 7-9(-11)-foliolate, sometimes 5-foliolate on flower bearing twigs; blade of leaflets lanceolate to ovate-oblong, 5-7 × 0.8-2 cm, both surfaces glabrescent, with dark red glandular punctations when young, abaxially with sparse, small prickles along midvein, base rounded, margin irregularly sharply serrate to doubly serrate, apex acuminate; petiole 4-7 cm, with dark red sessile to shortly stalked glands, and minute prickles; stipules lanceolate, to 1.2 cm, with sparse, sessile to shortly stalked glands. Inflorescences terminal, usually 1-flowerd, or sometimes several flowered; pedicel 2-4 cm, glabrous, with dark red glandular punctations or minute glandular hairs 1-2 mm; bracts lanceolate, to 10 mm, glabrous. Flowers 3-5 cm in diam., hypanthium saucer shaped; sepals abaxially glabrous, reflexed in fruit, oblong-lanceolate, 1-2 cm, inner sepals with tomentose margin, apex long caudate; petals white, obovate to oblong, 9-14 × 7-9 mm, base clawed; stamens numerous, shorter than petals; carpels numerous; style and ovary glabrous, torus shortly stalked. Aggregate fruit red at maturity, globose, 1-1.5 cm in diam., glabrous. Flowering season December to January; fruiting season February to March. $2n$ = 14.

Distributed in Southern China. Taiwan, occurred in thickets of the eastern part of the island from low to medium altitudes 20-1500 m.

Specimens examined: TAIWAN: Ilan Co.: Mt. Oobi, *G. Masamune s.n.* 26 Apr. 1938 (TAI); Tachiaohsi, *C. H. Lin et al. 37* (HAST); Yuanshan, Fushan Station, *S. C. Hsiao et al. 1183* (HAST); along trail to Sunglohu, *Y. Y. Huang et al. 177* (HAST); Jentse to Taipingshan, *C. I Peng et al. 10323* (HAST); Aohua, *P. H. Lee 2412* (TAIF). Hualien Co.: Iwan, *M. T. Kao 6130* (TAI); Mt. Chingsui, *T. Shimizu et al. 11722* (TAI); Tali to Shenmiku, *C. H. Chen et al. 317* (HAST); Fuli, *C. L. Tiang et al. 6* (HAST); Hsinkangshan, *T. Y. A. Yang et al. 4420* (TNM). Taitung Co.: Taiyuan, *S. W. Chung 5179* (TAIF); Hungshih logging track, *S. M. Liu et al. 432* (HAST); Hsiangyang, *C. H. Lin et al. 458* (HAST); Wulu logging track, *Y. Y. Huang et al. 265* (HAST); Peinan, Chulu, *C. S. Wu 2130* (TNM); Taiwanese Walnut Reserve, *S. Z. Yang 30264* (PPI).

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Note: Hayata (1918) named this species and selected the type collected from Nanau, Ilan County [inter Nanko *et* Dainano, *B. Hayata s.n.* 13 Mar. 1916 (TI)]. The taxon was neglected in Hsieh (1989) and Hsieh & Ohashi (1993), however, we found that some specimens in herbarium collected from the northeastern and eastern parts of Taiwan should belong to this taxon; these specimens were usually misidentified under *R. cardotii*, *R. croceacanthus* var. *glaber* (treated as a synonym of *R. croceacanthus* here), or *R. alnifoliolatus* (treated as a synonym of *R. fraxinifolius* here). *Rubus linearifoliolus* could be distinguished from other species by having 7-9(-11)-foliolate leaves (but 5-foliolate on flower bearing twigs), glabrous and dark red sessile to shortly stalked (up to 1-2 mm) glandular twigs. Lu & Boufford (2003) treated it as a synonym of *R. tsangii*, but we consider they are conspecific and select the name *R. linearifoliolus* because of nomenclature priority.

15. ***Rubus liui*** Y.-P. Yang & S.-Y. Lu, Quart. J. Chin. Forest. 9: 111. *pl. 1*. 1976. 柳氏懸鉤子

Rubus ilanensis Y.-C. Liu & F.-Y. Lu, Quart. J. Chin. Forest. 9: 131. *f. 3*. 1976.

Shrubs straggling. Twigs brownish green, thinly floccose-tomentose at first, glabrate in age, with short curved prickles. Leaves simple; blade oblong-lanceolate to lanceolate, 7-11 × 1.5-2.5 cm, lateral veins 7-9 pairs, midvein distinctly raised abaxially and with prickles, impressed adaxially, abaxially densely yellowish brown tomentose, adaxially glabrous, base rounded, margin finely remotely serrate, apex acuminate; petiole 1.5-3 cm, tomentose, with few prickles; stipules caducous, free, oblong-lanceolate, to 1 cm, usually apically laciniate. Inflorescences terminal, racemes, 4-7 cm, loosely 3-7-flowered; pedicel 1-1.5 cm, tomentose, prickled; bracts similar to stipules. Flowers 1-1.5 cm in diam., hypanthium cup shaped; sepals narrowly triangular, 4-6 mm, abaxially tomentose, apex cuspidate; petals pink, rhombic-orbicular to obovate, 3-5 × 3-4 mm, shorter than sepals, shortly hairy; stamens numerous, shorter than petals, filaments sparsely hairy, anthers with few hairs on the top of connectives; carpels longer than stamens, styles to 8 mm, hairy, ovaries hairy apically. Aggregate fruit red at maturity, globose, 0.8-1 cm in diam., drupelets hairy apically. Flowering season April to June; fruiting season June to August. $2n = 28$.

Endemic to Taiwan. Rarely found in forests in the nothern, central and eastern parts at medium altitudes 1500-2400 m.

Specimens examined: TAIWAN: Hsinchu Co.: Yuanyanghu, *C. H. Chen et al. 152* (HAST); *C. I Huang et al. 1430* (HAST). Nantou Co.: Iuanfeng, *C. M. Wang W31* (TNM); Yunhai to Tienchih, *S. W. Chung et al. 6201* (TAIF); Tienchih to boundary stone, *G. P. Hsieh 153* (PPI). Hualien Co.: Hoping logging track 32.3K, *S. T. Chiu et al. 6187* (HAST); Chingshuishan to Shakatang logging track, *W. P. Leu et al. 1799* (HAST); Mukuashan, *M. T. Kao 4204* (TAI).

16. ***Rubus mesogaeus*** Focke, Bot. Jahrb. Syst. 29: 399. 1900; Liu & Su in Li *et al*., Fl. Taiwan 3: 117. 1977. 裡白懸鉤子

Rubus rarissimus Hayata, Icon. Pl. Formos. 6: 16. 1916.

Shrubs suberect or scandent. Twigs pubescent when young, glabrate in age, with sparse prickles. Leaves imparipinnate, mostly 3-, rarely 5-foliolate; blade of terminal leaflet broadly rhombic-ovate to elliptic-ovate, 4-8 × 3-6 cm, base rounded to obtuse, margin irregularly coarsely serrate, apex acuminate to acute, lateral leaflets obliquely elliptic to ovate, lateral veins raised abaxially and impressed adaxially, abaxially densely gray tomentose, adaxially appressed pubescent or glabrescent; petiole 2-6 cm, pubescent, with sparse, curved minute prickles; stipules attached to the petiole base, linear, to 1 cm, pubescent. Inflorescences terminal and axillary, umbellate cymes, 3-4.5 cm, shorter than petiole, 5-20-flowered; pedicel 6-10 mm., pubescent, with sparse, needle-like prickles; bracts linear, to 10 mm, pubescent. Flowers ca. 1 cm in diam., hypanthium saucer shaped; sepals often reflexed after anthesis, lanceolate, 4-6 mm, abaxially densely pubescent, inner sepals with tomentose margin, apex acute to shortly acuminate; petals pink or reddish pink, unopened, obovate or suborbicular, 5-6 × 4-5 mm, base slightly pubescent and shortly clawed; stamens many, as long as petals; carpels 20-30, slightly longer than stamens, styles glabrous, ovary pilose. Aggregate fruit purplish black at maturity, compressed globose, 0.5-0.8 cm in diam., glabrous. Flowering season May to June; fruiting season July to August. $2n = 14$.

Distributed in Mainland China, Nepal, Bhutan, Japan, Russia (Sakhalin). Taiwan, occurred in the central and southern parts of the island at medium altitudes 2500-3200 m.

Specimens examined: TAIWAN: Miaoli Co.: Jiujiu Lodge, *H. L. Chiang s.n.* 1 Jul. 1976 (TAIF); #230 logging tract 12 km, *C. M. Wang 1133* (HAST). Nantou Co.: Paikou, *B. Hyata 12310* (TAI); Juiyenhsi, *J. J. Chen et al. 426* (HAST); Tsuifeng, *J. Y. Huang 2304* (HAST); Iuanfeng, *C. M. Wang W7* (TNM); Yunhai to Tienchih, *T. C. Huang 5857* (TAI); Kuankao, *Y. L. Chun 57* (PPI). Chiayi Co.: Alishan, *Y. F. Chen 5301* (TAI); Tatachia Saddle to Monroe Pavilion, *C. I Huang et al. 1114* (HAST); Lulinshan, *Chuan et al. s.n.* 14 Jul. 1957 (TAI); *J. Y. Huang 1459* (HAST).

Note: Petal position of *R. mesogaeus* was illustrated as wide open in Flora of Taiwan, 2nd ed. (Vol. 3, pp. 131). According to field observation, petals of this species remain enclosed during the whole anthesis.

17. ***Rubus nagasawanus*** Koidz., Acta Phytotax. Geobot. 8: 108. 1939.

17a. ***Rubus nagasawanus*** var. ***nagasawanus*** 大同灰葉懸鉤子

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Rubus polyanthus H.-L. Li, Woody Fl. Taiwan 304. 1963.
Rubus arachnoideus Y.-C. Liu & F.-Y. Lu var. *tatongensis* S.-C. Liu in Lu *et al.*, Trees Taiwan 1: 120. 2000.

Shrubs straggling. Twigs grayish appressed-pubescent, with reddish glandular hairs 2-4 mm and few prickles. Leaves simple; blade broadly ovate, 6-10 × 4.5-7 cm, 5-veined, lateral veins prominent abaxially and slightly impressed adaxially, abaxially gray to grayish yellow tomentose, adaxially slightly hirsute especially along veins, base broadly to deeply cordate, margin deeply 5-lobed, terminal lobe longest, lobes near base shorter, irregularly sharply serrate, apex obtuse to acute; petiole 2-4 cm, tomentose, with minute prickles and glandular hairs; stipules caducous, free, to 10 mm, margin lacerate, lobes linear, with soft hairs and intermixed sparse, glandular hairs. Inflorescences terminal, broad cymose panicles, much branched, 9-18 cm, many flowered; pedicel 1-2 cm, densely tomentose, with reddish glandular hairs; bracts to 8 mm, similar to stipules. Flowers ca. 1 cm in diam., hypanthium cup shaped; sepals triangular-ovate, 5-7 mm, grayish tomentose, with sparse glandular hairs, apex acute to acuminate, usually undivided; petals white, spatulate-orbicular to obovate, 4-5 × 3-4 mm, shortly hairy, base shortly clawed; stamens many, filaments 3-4 mm, glabrous; carpels 4-5 mm, glabrous. Aggregate fruit purplish black at maturity, globose, 0.6-0.9 cm in diam., glabrous. Flowering season August to Octobor; fruiting season Octobor to December. $2n = 28$.

Endemic to Taiwan. Occurred in thickets in the northeastern part of this island at low altitudes 20-500 m.

Specimens examined: TAIWAN: Ilan Co.: Yuanshan, Hsiatsukeng, *S. Y. Lu 16724* (HAST, TAIF); *J. J. Chen et al. 463* (HAST); Chiaohsi, Huotankeng, *C. H. Lin et al. 958* (HAST); Tatung to Lunpi, *C. K. Lin et al. 28* (TNM); Luotung, *Y. Hiratsuka s.n.* 24 Jul. 1911 (TAIF).

Note: Naruhashi had already corrected the specimens of *R. nagasawanus* in HAST to *R. tephrodes* in 2002 (or earlier) and used the name *R. nagasawanus* to refer to the taxon *R. arachnoideus* var. *tatongensis* named by S.-C. Liu in 2000. After our careful examination, the specimens cited by Liu & Su (1977) and Hsieh (1989) under *R. nagasawanus* actually do not correspond to the original description by Koidzumi (1913). Koidzumi (1913) described the *R. alceaefolia* var. *emigratus* Focke in Taiwan and cited a specimen (Taitochou, Murumuri-bussha, prope Hinan, *K. Miyake 24*); Hayata (1918) had also drawn the leaf illustration of *R. alceaefolia* var. *emigratus* in Icones Plantarum Formosanarum (Vol. 7, pp. 10). The specimen by Koidzumi and the illustration coincide with *R. arachnoideus* named by Liu & Lu in 1976; Ying had the same opinion in 1985. Later in 1939, Koidzumi published the new taxa *R. nagasawanus* with prominent glandular hairs and assigned the type (Formosa, *T. Nagasawa s.n.*), and the name *R. alceaefolia* var. *emigratus* was treated as misidentified name; he also reported the existence of *R. tephrodes* var. *setosissimus* in Taiwan in the same year. According to the original description and specimens examined from Taiwan and China we believe that *R. nagasawanus* should refer to the population with densely glandular hairs in the lowland of Tatong, Ilan County. The taxon similar to *R. nagasawanus* in lowland of Taitung County without glandular hairs should use the name *R. nagasawanus* var. *arachnoideus*, and the taxon in mountains at medium altitudes should be conspecific with *R. tephrodes* var. *setosissimus*.

17b. ***Rubus nagasawanus*** var. ***arachnoideus*** (Y.-C. Liu & F.-Y. Lu) S.-S. Ying, Tech. Bull. Exp. For. Natl. Taiwan Univ. 160: 31. 1985. - *Rubus arachnoideus* Y.-C. Liu & F.-Y. Lu, Quart. J. Chin. Forest. 9: 129. *f. 1*. 1976. 灰葉懸鉤子

Rubus alceaefolia Poir. var. *emigratus auct. non* Focke: Koidz., J. Coll. Sci. Univ. Tokyo 34: 161. 1913.

This variety differs from the type variety by the twigs and inflorescences without glandular hairs and bristles. Flowering season July to September; fruiting season August to Octobor.

Endemic to Taiwan. Occurred in thickets in the eastern part of this island at low altitudes 20-500 m.

Specimens examined: TAIWAN: Hualien Co.: Fuli, *S. Y. Lu 13731* (HAST, TAIF); Fuli, Loshan Waterfall, *J. Y. Huang 2318* (HAST). Taitung Co.: Hungyeh, *S. Y. Lu 6010* (TAIF); Haituan, Longchuan Waterfall, *C. M. Wang 1211* (HAST); Yenping logging track, *Y. J. Lin 256* (PPI); Peinan, Chulu, *J. S. Wu 9-506* (TNM).

Note: See discussion under *R. nagasawanus* var. *nagasawanus*.

18. ***Rubus parviaraliifolius*** Hayata, Icon. Pl. Formos. 5: 48. 1915. 小楤葉懸鉤子

Rubus parviaraliifolius Hayata var. *laxiflorus* Y.-C. Liu & F.-Y. Lu, Quart. J. Chin. Forest. 9: 133. *f. 4*. 1976.

Shrubs suberect or scandent. Twigs villose, sparsely prickled, with thin to prominant glandular hairs. Leaves imparipinnate, mostly 5-foliolate, sometimes 3-foliolate on flower bearing twigs; blade of leaflets variable in size, terminal leaflet orbicular, 5-10 × 5-8 cm, base rounded to slightly cordate, margin irregularly doubly serrate, apex acuminate to cuspidate, abaxially densely pale villose, adaxially sparsely hairy, lateral leaflets ovate, 3-5 × 2-4 cm, base rounded, apex acute; petiole 3-5 cm, densely hairy, with stalked glands and sparse prickles; stipules attached to the petiole base, linear, to 1 cm, hairy, stalked glandular. Inflorescences terminal, narrow cymose panicles or subracemes, 7-12 cm; pedicel 5-10 mm, hairy,

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with stalked glands; bracts linear, to 8 mm. Flowers 1.2-1.8 cm in diam., hypanthium saucer shaped; sepals oblong-triangular, 6-8 mm, abaxially villose, with stalked glands, apex caudate; petals pale pink or sometimes white, unopened, orbicular, 4-7 mm, base hirsute and clawed, margin erose; stamens many, nearly as long as petals; carpels 90-100, nearly as long as stamens, ovary ca. 1 mm, hairy, styles to 2 mm, hairy at base. Aggregate fruit red at maturity, globose, 1-1.5 cm in diam, glabrous. Flowering season April to June; fruiting season June to August. 2*n* = 14.

Endemic to Taiwan. Distributed from low to medium altitudes, 300-1800 m throughout the island.

Specimens examined: TAIWAN: Ilan Co.: Mimodeng, *W. C. Leong et al. 3778* (HAST). Taoyuan Co.: Sankuang, *Y. Shimada s.n.* Jun. 1918 (TAI); Lalashan, *T. Y. A. Yang 6759* (HAST). Hsinchu Co.: Litung Lodge, *Y. Y. Huang et al. 451* (HAST); Taoshan to Chingchuan, *L. J. Juan et al. 4* (HAST). Miaoli Co.: hiking entrance of Mt. Tapachien, *C. I Peng 8438* (HAST); Nanchuang, Tanan logging track, *P. F. Lu 9430* (HAST). Taichung Co.: Chiapaotai, *M. T. Kao 9763* (TAI); Prov. #7A Hwy 65 km, *T. Y. A. Yang et al. 8382* (HAST, TNM); Lishan, *S. Y. Lu 14925* (TAIF). Nantou Co.: Huishun Forest Area, *C. I Peng et al. 14042* (HAST); Wushe, *S. F. Huang 1560* (TAI). Kaohsiung Co.: Shishan logging track, *G. P. Hsieh 662* (HAST, PPI); Tengchih, *J. C. Wang et al. 11727* (HAST). Pingtung Co.: Wutai to Ali, *W. P. Leu et al. 999* (HAST); Jhinlishan, *G. P. Hsieh 1099* (PPI). Hualien Co.: Loshao, *S. Y. Lu 1869* (TAIF); Tienhsiang, *C. F. Hsieh et al. 1512* (TAI); Tailukotashan, *T. Suzuki 10937* (TAI); Tatung to Shakatang, *T. C. Huang et al. 12773* (TAI); Tatung to Chingshuishan, *W. H. Hu et al. 1245* (HAST); Changfengshan, *S. Sasaki s.n.* 8 Jun. 1933 (TAI). Taitung Co.: Douri, *S. Suzuki 1609* (TAI); Yenping logging track, *S. C. Hsiao et al. 1267* (HAST).

19. ***Rubus parvifolius*** L., Sp. Pl. 2: 1197. 1753; Li, Woody Fl. Taiwan 315. 1963. 紅梅消

Rubus triphyllus Thunb. *ex* Murray, Syst. Veg. ed. 14, 475. 1784; Thunb., Fl. Jap. 215. 1784. - *Rubus parvifolius* L. var. *triphyllus* (Thunb.) Nak., Veg. Mt. Apoi 11. 1930.
Rubus triphyllus Thunb. var. *subconcolor* Card., Lecomte, Not. Syst. 3: 311. 1917. - *Rubus triphyllus* Thunb. var. *concolor* Makino & Nemoto var. *subconcolor* Masam. *ex* Kudo & Masam., Ann. Rep. Taihoku Bot. Gard. 3: 130. 1932. - *Rubus parvifolius* L. var. *subconcolor* (Card.) Makino & Nemoto, Fl. Jap. ed. 2. 520. 1936.
Rubus triphyllus Thunb. var. *toapiensis* Yamam., J. Soc. Trop. Agr. Formos. 4: 305. 1932. - *Rubus parvifolius* var. *toapiensis* (Yamam.) Hosokawa in Makino, Fl. Jap. Suppl. 352. 1936. *syn. nov.*

Subshrub scandent. Twigs pubescent, with sparse prickles. Leaves imparipinnate, mostly 3-, rarely 5-foliolate; blade of terminal leaflets obovate to rhombic-orbicular, 2-5 × 1.5-5 cm, lateral veins raised abaxially and slightly impressed adaxially, abaxially densely whitish tomentose, adaxially appressed-pilose, base obtuse or broadly cuneate, margin irregularly coarsely serrate or dentate, often shallowly 3-lobed, apex rounded or obtuse, lateral leaflets smaller, obovate, base oblique; petiole 1.5-5 cm, with soft hairs and sparse, minute prickles; stipules attached to the petiole base, linear, to 1.5 cm, soft hairy. Inflorescences terminal, corymbose, rarely short racemes, 4-8 cm, several flowered, or in axillary clusters; pedicel 0.5-1.5 cm, pubescent, with minute prickles; bracts linear, to 1 cm, pubescent. Flowers ca. 1 cm in diam., hypanthium saucer shaped; sepals ovate-lanceolate, 5-8 mm, abaxially densely pubescent, with unequal needle-like prickles; apex acuminate, occasionally laciniate; petals pink to purplish red, unopened, ovate-orbicular or oblong, 4-7 × 3-5 mm, base clawed; stamens numerous, somewhat shorter than petals; carpels slightly longer than stamens, ovary pubescent. Aggregate fruit red at maturity, ovoid-globose, 0.8-1.5 cm in diam., nearly glabrous. Flowering season January to May; fruiting season March to July. 2*n* = 14.

Distributed in Mainland China, Japan, Korea, and Vietnam. Taiwan, commonly distributed at low altitudes, 0-1500 m around the island.

Specimens examined: TAIWAN: Taipei City: Suidotyo, *T. Tanaka 17771* (TAI); NTU Farm, *S. Suzuki s.n.* 25 Apr. 1938 (TAI); Peitou, Tinghu, *T. Suzuki 8896* (TAI). Taipei Co.: Shihmen, *S. H. Lin 718* (TAI); Tanhai, *H. N. Yang 2266* (TAI); Tapingting, *M. T. Kao 10240* (TAI); Pali, *S. Y. Lu 15351* (HAST, TAIF); Kuanyinshan, *S. Miura et al. 59* (TAI). Keelung City: Pengchia Islet, *T. C. Huang et al. 15798* (TAI). Taoyuan Co.: Kuanyin to Yungan, *W. P. Leu et al. 1719* (HAST); Chuwei, *S. H. Lin 739* (TAI). Hsinchu Co.: Sintiku, *Y. Shimada 858A* (HAST); Hengshan, along Yulo River, *C. I Peng 13652* (HAST). Miaoli Co.: Hsihu, Public Cemetury, *C. I Peng et al. 13950* (HAST); Yuanli, *C. C. Hsu 5283* (TAI). Taichung City: Chunghsing Univ. campus, *C. M. Kuo 6615* (TAI); Tunghai Univ. Campus, *T. Y. A. Yang 1332* (TAI). Taichung Co.: Tatushan, *M. T. Kao 9682* (TAI); Tungshih, *S. Suzuki s.n.* 3 Jul. 1924 (TAI). Nantou Co.: Chingjing Farm, *C. I Peng 6118* (HAST); Yunlung Waterfall, *Y. C. Kao et al. 716* (HAST); Hoshe Tract, *T. C. Huang 2130* (TAI); Meifeng Farm, *Masamune et al. 2015* (TAI). Chiayi Co.: Juili, *J. G. Liu s.n.* 2 Jun. 1991 (TNM). Hualien Co.: Yuli, *Y. Yamamoto 3077* (TAI). Taitung Co.: Tawu, *M. T. Kao 7126* (TAI); Changpin Hsiang, *C. H. Lin et al. 702* (HAST).

Note: *Rubus parvifolius* var. *toapiensis* is very similar to *R. parvifolius*, and only differs from the latter by having 5-foliolate leaves, a variable and unreliable character in the genus *Rubus*. Some individuals of *R. parvifolius* also have 3-foliolate or 5-foliolate leaflets on the same individual, therefore, they are likely conspecific.

20. ***Rubus* × *parvifraxinifolius*** Hayata, Icon. Pl. Formos. 5: 52. 1915. 小梣葉懸鉤子

Rubus leucanthus auct. non Hance: Makino, Fl. Jap. Suppl. 350. 1936.
Rubus suzukianus T.-S. Liu & T.-Y. Yang, Quart. J. Taiwan Mus. 20: 168. 1968. *syn. nov.*
Rubus fraxinifoliolus auct. non Hayata: Hsieh, J. Taiwan Mus. 42: 108. 1989. *pro parte.*

Shrubs scandent. Twigs glabrescent, yellowish or reddish glandular-punctate, with curved prickles. Leaves imparipinnate, usually 5-7-foliolate, sometimes 3-foliolate on flower bearing twigs; blade of terminal leaflets ovate or ovate-elliptic, 3-7 × 1.5-3.5 cm, both surfaces glabrous or

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thinly hirsute, with yellowish or reddish glands, abaxially with sparse, minute prickles along midvein, base rounded, margin doubly serrate, apex acuminate or acute; petiole 2-3 cm, thinly hirsute, with sparse, minute prickles, and yellowish or reddish glands; stipules attached to the petiole base, linear or lanceolate, to 8 mm. Inflorescences terminal or in leaf axils, 1- or 2-flowered; pedicel 1-2 cm, glandular, with sparse, minute prickles; bracts linear or lanceolate, to 6 mm. Flowers ca. 2 cm in diam., hypanthium saucer shaped; sepals elliptic-ovate, 7-10 mm, abaxially thinly hirsute and glandular, apex caudate; petals white, broadly obovate, or suborbicular, 6-12 × 4-8 mm, abaxially shortly hairy, base clawed, apex rounded; stamens many, shorter than petals; carpels many, ovary glandular, torus shortly stalked. Fruit not seen. Flowering season December to February.

A natural hybrid species between *R. rosifolius* and *R. linearifoliolus*. Found in the northern and eastern parts of this island at low altitudes 10-500 m.

Specimens examined: TAIWAN: Ilan Co.: Tungshan, Maopuweishan, *C. I Huang et al. 1913* (HAST); Songlo, *J. Y. Huang 2282* (HAST); Taipinshan, *S. Y. Lu 2723* (TAIF). Hualien Co.: Kwarenko, *Y. Shimada, s.n.* Jan. 1913 (TI, holotype!).

Note: *Rubus parvifraxinifolius* and *R. suzukianus* were both treated as synonyms of *R. fraxinifoliolus* in Hsieh (1989). However, we found that the two former taxa do share some similarity but differ from *R. fraxinifoliolus* (treated as synonym of *R. cardotii* here). Only two specimens (TAI) of *R. suzukianus* were recorded (collected in 1913 and described by Liu & Yang, 1968), and no more collecting record thereafter. We searched in Ilan area and collected plants resembling *R. suzukianus*, then found this species is very likely a natural hybrid of *R. rosifolius* and *R. linearifoliolus* because of intermediate characters, i.e. leaf shape, serration of leaf margin and types of indumentum. We also found *R. parvifraxinifolius* later in Ilan, and speculated it to be conspecific with *R. suzukianus*. According to priority of nomenclature and its likely hybrid habit, a scientific name for the hybrid, *R.* × *parvifraxinifolius*, was therefore adopted. There are rare fruit sets found in the field and the holotype specimen, and nothing about fruit was mentioned in the original description, supporting the possible origin of the natural hybridization. In addition, the two putative parents have overlapping flowering season in December and January, further. Therefore, we speculate individuals of *R.* × *parvifraxinifolius* in the field are the F1 hybrids.

21. ***Rubus pectinellus*** Maxim., Bull. Acad. Imp. Sci. St-Péters., ser. 3, 17: 147. 1872; Hayata, J. Coll. Sci. Univ. Tokyo 25: 80. 1908. 刺萼寒莓

Rubus pectinellus Maxim. var. *trilobus* Koidz., J. Coll. Sci. Univ. Tokyo 34: 108. 1913.

Herbs or subshrubs. Stems slender, usually rooting at nodes, pubescent and sparsely prickled. Leaves simple; blade suborbicular, 3-5 cm in diam., palmately veined, lateral veins 2-4 pairs, raised abaxially, both surfaces pilose, abaxially with needle-like prickles along veins, base cordate, margin sometimes undulate-lobed or 3-lobed, irregularly dentate or doubly serrate, apex rounded or obtuse; petiole 3-6 cm, pilose, with needle-like prickles; stipules free, to 8 mm, pilose, deeply palmately divided, lobes linear-lanceolate. Inflorescences 1-flowered, rarely flowers 2 or 3 in axils of apical leaves; bracts similar to stipules; pedicel 2-4 cm, pilose, with needle-like prickles. Flowers to 2.5 cm in diam.; sepals ovate to ovate-lanceolate, unequal in length, outer sepals to 0.8-1.2 cm, abaxially pilose and with needle-like prickles, incised, inner sepals narrower, with few teeth or entire; petals white, obovate or elliptic, 0.8-1.2 cm × 6-8 mm, glabrous, base clawed; stamens 25-35, much shorter than petals; carpels 20-30, shorter than stamens, apex of ovary and base of style slightly hairy. Aggregate fruit red at maturity, globose, 1-1.5 cm in diam., glabrous. Flowering season April to June; fruiting season June to August. $2n = 42$.

Distributed in Mainland China, Japan, and the Philippines. Taiwan, commonly distributed on forest floor from medium to high altitudes 1500-3100 m.

Specimens examined: TAIWAN: Ilan Co.: Taipingshan, *S. Suzuki et al. s.n.* 21 Jul. 1929 (TAI); Taipingshan to Tsuifunghu, *C. H. Lin et al. 527* (HAST); Ssuyuanyakou, *C. I Peng et al. 17406* (HAST); Chiliting, *T. C. Huang 7840* (TAI). Taoyuan Co.: Lalashan, *T. Suzuki 11751* (TAI); *S. C. Wu 2631* (HAST, TAI); Chatienshan, *T. Kawakami et al. s.n.* 25 May 1909 (TAI). Hsinchu Co.: Kunpeng, *S. Sasaki s.n.* 16 Jul. 1932 (TAI); Talu logging track, Chingchuan to Kuanwu, *Y. Y. Huang et al. 89* (HAST); Chenhsipao, *S. C. Wu et al. 1774* (HAST); Yuanyanghu, *H. Y. Shen et al. 769* (HAST). Miaoli Co.: Chenshan, *C. H. Liu et al. 535* (HAST). Taichung Co.: Wuling Farm to Chika Lodge, *D. S. Hsu 647* (HAST); Yunling Lodge, *T. Y. Liu et al. 982* (HAST); Tahsuehshan Logging Station, *T. S. Liu et al. 191* (TAI); Pachsienshan, *M. T. Kao et al. 2645* (TAI). Nantou Co.: Mayfeng farm, *W. P. Leu et al. 442* (HAST); Tunyuan to Yunhai, *W. S. Tang 1820* (TAI); *C. C. Liao et al. 1285* (HAST); Kuankao to Patungkuan, *C. I Peng 8133* (HAST); Fenghuangshan, *Y. C. Kao et al. 27* (HAST). Chiayi Co.: Alishan to Erwanping, *Mori et al. s.n.* 5 Nov. 1932 (TAI). Kaohsiung Co.: Takuanshan, *C. I Peng et al. 11720* (HAST); Tengchih, *Y. K. Chen 551* (HAST); Tienchih to Yakou, *T. C. Huang 8946* (TAI). Pingtung Co.: Tashulinshan, *H. Shimizu 3920* (TAI), Chinshuiying, *S. Z. Yang et al. 22444* (PPI). Hualien Co.: Kuailin, *S. Suzuki 2107* (TAI); Prov. #8 Hwy 124-125 km, *J. L. Panero et al. 6509* (HAST). Taitung Co.: Hsiangyang, *C. H. Lin et al. 452* (HAST); Yenping logging track, *Y. J. Lin 223* (PPI).

22. ***Rubus pentalobus*** Hayata, J. Coll. Sci. Univ. Tokyo 25: 80. 1908. 玉山懸鉤子

Rubus calycinoides Hayata *ex* Koidz., J. Coll. Sci. Univ. Tokyo 34: 154. 1913, *non* Kuntze 1879.
Rubus calycinoides Hayata var. *macrophyllus* H.-L. Li, Woody Fl. Taiwan 303. 1963.
Rubus hayata-koidzumii Naruh., J. Phytogeogr. Taxon., 32: 58. 1984.
Rubus rolfei auct. non S. Vidal: Hsieh, J. Taiwan Mus. 42: 116. 1989. *pro parte.*

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Subshrub prostrate. Stems usually rooting at nodes, minutely prickled or nearly unarmed, brownish villose-tomentose when young, glabrate in age. Leaves simple; blade broadly ovate to suborbicular, 2-6 × 2-5.5 cm, palmately 5-nerved at base, lateral veins 4-5 pairs, reticulate veins prominent raised abaxially, bullate between veins adaxially, abaxially densely brownish gray tomentose, with long hairs and sparse prickles along veins, adaxially pilose when young, glabrate in age, the base deeply cordate, basal incision to 1 cm deep, margin shallowly 3-5-lobed, lobes rounded, irregularly dentate; petiole 1-3.5 cm, tomentose-villose, nearly unarmed; stipules caducous, free, ovate-oblong to obovate, to 1.2 cm, laciniate to halfway from apex, tomentose abaxially. Inflorescences terminal and axillary, 1-flowered, rarely 2-3; pedicel 5-9 mm, densely tomentose-pilose, armed or unarmed; bracts obovate to oblong, 8-10 mm, apex laciniate, hairy. Flowers to 2 cm in diam.; sepals ovate to triangular-ovate, 6-12 mm, margin always with few teeth; petals white, suborbicular or obovate, 7-10 × 5-8 mm, base clawed; stamens many, filaments to 5 mm, anthers with few long hairs; carpels numerous, glabrous. Aggregate fruit yellow at maturity, globose, 1-1.5 cm in diam., with reddish persistent calyx. Flowering season May to August; fruiting season July to October. $2n = 28$.

Endemic to Taiwan. Commonly distributed in pebbly and rocky places from medium to high altitudes, 1600-3800 m throughout central mountains.

Specimens examined: TAIWAN: Ilan Co.: Mt. Taiping, *S. Suziki 588* (TAI); *C. I Peng 7848* (HAST); Tsuifenghu, *W. C. Leong* (HAST); Chiaping logging track, near a waterfall, *C. H. Lin et al. 591* (HAST); Chiliting to Nanshan, *C. C. Hsu 5875* (TAI). Taoyuan Co.: Nanchatienshan, *Y. P. Yang et al. s.n.* 7 Oct. 1979 (TAIF). Hsinchu Co.: Yuanyang Lake, #170 logging track 0.5 km, *W. C. Leong et al. 2353* (HAST); Kuanwu, *T. C. Huang 6663* (TAI). Miaoli Co.: Etsershan, *S.Sasaki 49* (TAI); Mt. Taihasenzan, *T. Hosokawa s.n.* 13 Jul. 1931 (TAI). Taichung Co.: Hsiaohsuehshan, *C. M. Wang 1786* (HAST); Tashushan Logging Station, *T. S. Liu et al. 295* (TAI); Ssuyuan logging track, *C. I Peng et al. 17228* (HAST); Mt. Nanko, *H. Shimada et al. 18045* (TAI); Wuling Lodge to Taoshan, *C. I Peng et al. 12058* (HAST); 369 Lodge to Shueshan, *K. Mori s.n.* 24 Oct. 1936 (TAI); Hsueshan, *K. Mori s.n.* 24 Oct. 1936 (TAI). Nantou Co.: Tuikuan to Kuankao, *C. H. Chen et al. 71* (HAST); Yunhai to Tienchih. *M. T. Kao et al. 5804* (TAI); Hohuanshan, *T. H. Hsieh 967* (TAI); Nokozan, *M. Eizi s.n.* 7 Aug. 1919 (TAI); Mt. Kiraisyunanpo, *S. Suzuki 2243* (TAI); Chichia Lake, *H. Y. Chen et al. 319* (TAI). Chiayi Co.: Yushan, *T. Kawakami et al. s.n.* 9 Oct. 1909 (TAI); Tungpu Lodge to Tatachiaanpu, *W. P. Leu et al. 1157* (HAST); Alishan, *M. T. Kao et al. 6232* (TAI). Kaohsiung Co.: Tienchi, *C. H. Lin et al. 422* (HAST); Tienchih to Yakou, *T. C. Huang et al. 8913* (TAI); Kuanshan, *M. Fukuyama s.n.* 12 Jul. 1935 (TAI), *L. Y. Lin et al. 123* (HAST). Pingtung Co.: Mt. Daibu, *M. Eizi 199* (TAI); Kueihu, *C. C. Hsu 3337* (TAI). Hualien Co.: Yenhai logging track, *C. I Peng et al. 13079* (HAST); Songhsuehlou to Tayuling, *C. I Peng et al. 13126* (HAST); Chingshuishan, *W. P. Leu et al. 1792* (HAST); Kuanyuan, Kuanyun Lodge, *J. J. Chen 392* (HAST); Kuailin to Nengkao, *Y. Kudo et al. 17* (TAI); Luanshan, *C. C. Hsu 3576* (TAI). Taitung Co.: Kuanshanling, *Z. W. Lee 283* (HAST).

Note: Hsieh (1989) reduced *R. calycinoides* as a synonym of *R. rolfei* according to Kalkman's suggestion (1981), but *R. calycinoides* was different from *R. rolfei* by having usually one terminal flower and abaxially densely brownish gray tomentose leaves. *Rubus rolfei* has subracemose inflorescences and abaxially densely ferrugineous-lanate leaves. *Rubus calycinoides* was an illegal name and had been replaced to *R. hayata-koidzumii* by Naruhashi (1984). Naruhashi *et al.* (2002) also reported chromosome numbers of *R. hayata-koidzumii* ($2n = 28$) and *R. rolfei* ($2n = 42$), which supported the distinct status of these two taxa. Actually, *R. pentalobus* is the legally earliest name for this taxon and so we re-elected this.

23. ***Rubus pungens*** Cambess. var. ***oldhamii*** (Miq.) Maxim., Mél. Biol. Bull. Phys.-Math. Acad. Imp. Sci. St.-Pétersb. 8: 386. 1871. - *Rubus oldhamii* Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 34. 1867. 刺懸鉤子

Rubus pungens auct. non Cambess.: Liu & Su in Li *et al.*, Fl. Taiwan 3: 124. 1977.

Shrubs scandent. Twigs pubescent when young, glabrate in age, with sparse, curved prickles. Leaves imparipinnate, 5-9(-11)-foliolate; blade of leaflets triangular-ovate, ovate, or ovate-lanceolate, 2-5 × 1-3 cm, both surfaces thinly hairy especially along veins abaxially when young, base rounded to subcordate, margin sharply or incised doubly serrate, terminal leaflet often pinnately lobed, apex acute to acuminate; petiole 3-6 cm, pubescent or glabrescent, with sparse, minute prickles; stipules attached to the petiole base, linear, to 6 mm, pubescent. Inflorescences terminal on short lateral twigs, often 1-flowered; pedicel 1-3 cm, pubescent, with minute prickles; bracts linear, to 5 mm, pubescent. Flowers 1-2 cm in diam., hypanthium semiglobose; sepals erect, 0.8-1.2 cm, abaxially pubescent, with sparse glandular hairs, and few needle-like prickles or nearly unarmed, apex long acuminate; petals white or pale pink, oblong or obovate, 7-9 × 4-6 mm, much shorter than sepals, glabrous, base clawed; stamens many; carpels numerous, ovary soft hairy or glabrescent, styles glabrous or sparsely soft hairy basally. Aggregate fruit red at maturity, globose, 1-1.3 cm in diam., pubescent or glabrescent. Flowering season April to June; fruiting season June to August. $2n = 14$.

Distributed in Mainland China, Japan, and Korea. Taiwan, occurred in the central mountains from medium to high altitudes 1800-3600 m.

Specimens examined: TAIWAN: Ilan Co.: Ssuyuenyakou, *J. Y. Huang 2291* (HAST); Chiliting, *T. C. Huang 7757* (TAI). Miaoli Co.: Tapachienshan, *Y. P. Yang s.n.* 2 Jul. 1976 (TAIF). Taichung Co.: Nanhutashan, *J. C Wang et al. 3663* (TAI); *C. M. Wang 902* (HAST); Yunling Lodge, *T. Y. Liu et al. 990* (HAST); Hsuehshan, *T. H. Hsieh 1406* (TAI); Tsueichih to 369 Lodge, *J. C. Wang et al. 4467* (TAI). Nantou Co.: Yunhai to Tienchih, *C. C. Liao et al. 1351* (HAST); Tienchih to boundary stone, *C. C. Liao et al. 1386* (HAST); Hohuanshan,

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C. C. Hsu et al. 11149 (TAI); Sunchuankang, *H. F. Yen et al. 7757* (HAST). Chiayi Co.: Paiyun Lodge to Yushan, *C. C. Hsu et al. 7361* (TAI); Mt. Morrison, *T. C. Huang 14341A* (TAI); *T. I. Chuang et al. 3991* (HAST).

Note: The taxon *R. pungens* treated in Hsieh (1989) is different from *R. pungens* of Yunan and Xichuan after our examination and comparison. *Rubus pungens* var. *pungens* has densely prickles but no glandular hairs on the twigs and sepals, and probably does not exist in Taiwan. The related taxon found in Taiwan owns scarcely prickles and glandular hairs so should be revised as *R. pungens* var. *oldhamii*, which is also distributed in China, Japan and Korea. The name *R. pungens* var. *oldhamii* treated in Hsieh (1989) actually was a misidentification of *R. croceacanthus*, see above discussion under *R. croceacanthus*.

24. ***Rubus pyrifolius*** Sm., Pl. Icon. Ined. 3: *t. 61*. 1791; Liu & Su in Li *et al*., Fl. Taiwan 3: 123. 1977.
梨葉懸鉤子

Rubus floribundo-paniculatus Hayata, Icon. Pl. Formos. 3: 89. 1913.
Rubus parvipetalus Odash., J. Soc. Trop. Agr. 7: 81. 1935.

Shrubs straggling. Twigs densely hairy when young, glabrate in age, with sparse prickles. Leaves simple; blade ovate-oblong to oblong-lanceolate, 6-12 × 3-6 cm, lateral veins 6-8 pairs, prominent abaxially and slightly impressed adaxially, both surfaces nearly glabrous except densely hairy along veins, hairs deciduous in age, base rounded or shallowly cordate, margin irregularly coarsely serrate, apex acute to acuminate; petiole 5-10 mm, hairy, with sparse prickles; stipules caducous, free, linear-lanceolate, to 8 mm, hairy, apex laciniate into 3-5 lobes. Inflorescences terminal, broad cymose panicles, 10-25 cm, or in axillary subracemes; pedicel 5-12 mm, densely hairy or glabrescent, unarmed or with minute prickles; bracts early caducous, similar to stipules. Flowers 1-1.5 cm in diam., hypanthium shallowly cupular; sepals triangular-lanceolate, 6-8 mm, abaxially hairy or glabrescent; margin entire or apically with 2-3 teeth; petals white, elliptic to obovate, 3-4 mm, much shorter than sepals, glabrous; stamens many, longer than petals; carpels 5 or more, shorter than stamens, ovary often with many long hairs abaxially, styles to 6 mm, glabrous. Aggregate fruit red at maturity, to 1 cm in diam., composed of 1-3 drupelets, glabrous. Flowering season August to Octobor; fruiting season September to November. 2*n* = 42.

Distributed in Southern China, the Philippines, Vietnam, Laos, Thailand, Cambodia, Malaysia, and Indonesia. Taiwan, occurred in broad-leaved forests at low altitudes, 100-800 m around the island.

Specimens examined: TAIWAN: Taipei City: Taluntoushan, *J. Y. Huang 2332* (HAST). Taipei Co.: Shihting, Feitsueku, *F. H. Fan s.n.* 5 Oct. 1979 (TAIF); Pinhsi, Tengliaoshan, *C. K. Lin 164* (TNM); Wulai, *S. J. Wu 711* (TAIF). Ilan Co.: Fushan, *H. L. Chiang s.n.* 2 Dec. 1989 (TAIF). Taoyuan Co.: Chiaopanshan, *C. I Peng 8654* (HAST). Hsinchu Co.: Daping, *Y. Shimada s.n.* 28 Sep. 1907 (TAIF); Miaoli Co.: Hungmaokuan, *Y. Shimada 866A* (HAST); *866C* (TAI). Nantou Co.: Lienhuachih Station, *J. J. Chen et al. 442* (HAST). Pingtung Co.: Shouka, *T. Y. Liu et al. 1065* (HAST); Neiwen, *K. Y. Li 689* (TAIF); Mutan, *C. E. Chang 5187* (PPI); Chingshuiyin, *H. Shimizu 3649* (TAI). Taitung Co.: Tajen, *K. P. Lo 1017* (PPI).

25. ***Rubus reflexus*** Ker Gawl. var. ***hui*** (Diels *ex* Hu) F. P. Metcalf, Lingnan Sci. J. 11: 6. 1932; Yu & Lu, Fl. Reipubl. Popularis Sin. 37: 177. 1985. - *Rubus hui* Diels, Contr. Biol. Lab. Sci. Soc. China 7: 608. 1922; Liu & Su in Li *et al.*, Fl. Taiwan 3: 114. 1977.
胡氏懸鉤子

Shrubs suberect or scandent. Twigs densely dark-brownish tomentose, with minute, sparse prickles. Leaves simple; blade broadly ovate to suborbicular, 7-14 × 5-10 cm, veinlets obscure on both surfaces, abaxially rusty tomentose, with long hairs along veins, adaxially glabrous or sparsely soft hairy along veins, base cordate, margin 3-5-lobed, terminal lobe ovate-lanceolate, much longer than lateral lobes, margin irregularly coarsely serrate, apex acute; petiole 3-7 cm, tomentose-villose, with sparse, minute prickles; stipules broadly obovate, to 1.5 cm, villose, margin shallowly palmately lobed, lobes lanceolate. Inflorescences terminal, short subracemes, 5-8 cm, or flowers several in clusters in leaf axils; pedicel 3-6 mm, rusty villose; bracts obovate, 6-12 mm, villose, palmately lobed. Flowers 1-1.5 cm in diam., hypanthium cup shaped; sepals broadly ovate to ovate-lanceolate, 6-8 mm, abaxially densely rusty villose, outer sepals apically often laciniate, inner sepals entire, margin tomentose; petals white, oblong to suborbicular, 7-10 × 4-6 mm, nearly as long as sepals, glabrous, base shortly clawed; stamens shorter than petals, anthers glabrous or apically hairy; carpels longer than stamens, glabrous. Aggregate fruit red at maturity, globose, 0.7-1 cm in diam., glabrous. Flowering season June to July; fruiting season August to September. 2*n* = 42.

Distributed in Southern China. Taiwan, occurred in the northern and southern parts of the island at low altitudes 300-1200 m.

Specimens examined: TAIWAN: Taipei City: Neishuangshi, *J. Y. Wang 89* (TAIF); Taluntoushan, *H. L. Chiang 449* (HAST, TAIF). Taipei Co.: Hsichih, Hsiwan Rd., *Chen et al. 446* (HAST); Hsichih, Chepingliao, *J. Y. Huang 2309* (HAST); Linkou, Taikushan, *J. Y. Huang 2268* (HAST); Pinglin, *Y. M. Huang 172* (TAIF); Wulai, Tatunshan, *M. J. Lin 532* (TAIF); Kuaishan to Fushan Village, *C. C. Liao 1070* (HAST); Hapen, *S. Y. Lu s.n.* 5 Jul. 1982 (TAIF); Sunglohu to Chuantoumushan, *Y. Y. Huang et al. 159* (HAST); Takaiyama, *T. Suzuki, 18677* (TAI). Ilan Co.: Luenpi to Mt. Chunling, *J. Y. Huang 941* (HAST); Is. Kueishan, *S. W. Chung 6373* (TAIF). Taoyuan Co.: Caswhnaw, *S. Y. Lu 1987* (TAIF). Miaoli Co.: Sanyi, Huoyenshan, *S. T. Chiu 9249* (TNM). Pingtung Co.: Hiking entrance of Peitawushan, *Y. K. Chen 703* (HAST).

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26. ***Rubus rolfei*** S. Vidal, Phan. Cuming. Philipp. 171. 1885; Koidz., J. Coll. Sci. Univ. Tokyo 34: 157. 1913. 高山懸鉤子

Rubus rolfei S. Vidal var. *lanatus* Hayata, J. Coll. Sci. Univ. Tokyo 25: 81. 1908.

Shrubs suberect or scandent. Twigs densely ferruginous-tomentose when young, glabrate in age, unarmed or minutely prickled. Leaves simple; blade suborbicular or broadly ovate, 6-12 × 5-10 cm, 5-veined, reticulate veins raised and prominent abaxially, bullate between veins adaxially, abaxially densely ferrugineous-lanate, adaxially pilose when young, glabrate in age, base cordate, margin shallowly 3-5-lobed; lobes ovate-triangular, terminal one largest, margin irregularly serrate or crenate, apex obtuse or rounded; petioles 3-5 cm, cottony-tomentose when young, nearly glabrous in age, usually unarmed; stipules free, oblong-ovate, to 1.2 cm, tomentose abaxially, laciniate at apex. Inflorescences terminal, short racemes, 5-8 cm, several flowered; pedicel 3-5 mm, densely ferruginous-tomentose; bracts reddish brown, similar to stipules. Flowers 1.5-2 cm in diam., hypanthium cup shaped; sepals triangular-ovate to lanceolate, 7-12 mm, abaxially densely ferruginous-tomentose, margin entire, apex acute to shortly acuminate; petals white, broadly ovate to suborbicular, 7-10 × 5-8 mm, base clawed; stamens many, shorter than sepals; carpels many. Aggregate fruit orange-red at maturity, globose, 1-1.5 cm in diam., glabrous. Flowering season June to July; fruiting season August to September. $2n = 42$.

Distributed in the Philippines (Luzon and Negros). Taiwan, rarely found in the central mountains at high altitudes 2600-3300 m.

Specimens examined: TAIWAN: Chiayi Co.: Tatachia Saddle to Paiyun Lodge, *C. I Peng 8979* (HAST); *J. J. Chen et al. 671* (HAST); *C. W. Gau et al. s.n.* 11 Nov. 1990 (TNM); Paiyun Lodge to Monroo cliff, *C. C. Hsu 6329* (TAI). Kaohsiung Co.: Takuanshan, *C. I Peng et al. 11728* (HAST); Yakou, *C. E. Chang 7439* (PPI); Kuaiku to Yakou, *J. Y. Huang 2324* (HAST).

Note: See discussion under *R. pentalobus*.

27. ***Rubus rosifolius*** Sm., Pl. Icon. Ined. 3: 60. 1791; Yu & Lu, Fl. Reipubl. Popularis Sin. 37: 96. 1985. 刺莓

Rubus tagallus Cham. & Schltdl., Linnaea 2: 9. 1827; Chang, Forest. J. Taiwan Inst. Agr. 19: 12. 1977.
Rubus taiwanianus Matsum., Bot. Mag. Tokyo 16: 3. 1902.
Rubus rosaefolius Sm. subsp. *maximowiczii auct. non* Focke: Hayata, Icon. Pl. Formos. 3: 93. 1913.
Rubus glandulosopunctatus Hayata, Icon. Pl. Formos. 4: 5. 1914.
Rubus parvirosaefolius Hayata, Icon. Pl. Formos. 5: 54. 1915.
Rubus hopingensis Y.-C. Liu & F.-Y. Lu, Quart. J. Chin. Forest. 9: 130. *f. 2.* 1976.
Rubus lanyuensis C.-E. Chang, Forest. J. Taiwan Prov. Pingtung. Inst. Agr. 19: 11. *f. 1.* 1977. - *Rubus tagallus* Cham. & Schltdl. var. *lanyuensis* (C.-E. Chang) S.-S. Ying, Tech. Bull. Exp. For. Natl. Taiwan Univ. 160: 40. 1985.

Shrubs suberect or scandent. Twigs villose, rarely glabrescent, yellowish glandular-punctate, with straight to curved prickles. Leaves imparipinnate, usually 5-7-foliolate, sometimes 3-foliolate on flower bearing twigs; blade of terminal leaflets ovate or ovate-elliptic to lanceolate, 4-8 × 1.5-3 cm, both surfaces pilose, rarely glabrescent, with yellowish glands, abaxially with sparse, minute prickles along midvein, base rounded, margin sharply incised doubly serrate, apex obtuse to long acuminate; petiole 2-3 cm, with soft hairs and sparse, minute prickles, sometimes glabrescent, with yellowish glands; stipules attached to the petiole base, linear or lanceolate, to 1 cm. Inflorescences terminal or in leaf axils, 1- or 2-flowered; pedicel 2-3.5 cm, glandular, with soft hairs and sparse, minute prickles; bracts linear or lanceolate, to 8 mm. Flowers 2-3 cm in diam., hypanthium saucer shaped; sepals reflexed after anthesis, triangular-lanceolate, 0.8-1.3 cm, abaxially soft hairy and glandular, apex long caudate; petals white, oblong, narrowly obovate, or suborbicular, 0.8-1.5 × 0.8-1.2 cm, abaxially shortly hairy, base clawed, apex obtuse; stamens many, shorter than petals; carpels many, ovary glandular, torus shortly stalked. Aggregate fruit red at maturity, ovoid-globose to ellipsoid, 1-1.5 cm in diam., glabrous, with few glands. Flowering and fruiting season all year around. $2n = 14$.

Distributed in Mainland China, Japan, the Philippines, Vietnam, Laos, Burma, Thailand, NE India, Cambodia, Malaysia, Indonesia, Africa, and Australia. Taiwan, very common along roadside or forest edges from low to medium altitudes, 0-2600 m throughout the island.

Specimens examined: TAIWAN: Taipei City: Waishuanghsi, Chiennan Rd., *C. M. Wang 1834* (HAST); Academia Sinica to Nankangshan, *C. I Peng 9033* (HAST); Muchihshan, *C. H. Chen 963* (HAST); Tatungshan to Hsinpeitou, *C. M. Kuo 9034* (TAI); NCCU to Prov. #9 Hwy, *C. I Peng 4547* (HAST). Taipei Co.: Kuanyinshan, *H. Shimada 20* (TAI); Hsiping Rd., between Tienfengku and watchtower, *Y. C. Kao et al. 274* (HAST); Pinhsi, Liaochiaoliao, *C. H. Chen et al. 3801* (HAST); Shihting, Wutuhsi, *C. I Peng et al. 17787* (HAST); Hsintien, Kuanghsing, *S. C. Liu et al. 619* (HAST); Chuchih to Hsiaotsukeng, *T. Suzuki 7754* (TAI); Pataoerhshan, *C. M. Kuo 9133* (TAI); Kuaishan to Fushan Village, *C. C. Liao 1065* (HAST); Kungliao, Tsaoling Historic Trail, *P. J. Lin et al. 59* (HAST); Kungliao, Santiaochiao Lighthouse, *W. C. Leong et al. 2757* (HAST). Keelung City: Kangtzuliao, *M. J. Wu et al. 1246* (TAI); Chingjenhu, *C. C. Liao et al. 1120* (HAST). Ilan Co.: Toucheng, Huomanliaoshan, *C. H. Lin et al. 849* (HAST); Paoma Ancient Trail, *C. H. Lin et al. 763* (HAST); Piyahau to Saukan, *T. Suzuki 7112* (TAI); Chiaohsi, Lungtanhu, *S. M. Liu et al. 544* (HAST); Yuanshan, Fushan, *Boufford et al. 25132* (HAST). Taoyuan Co.: Lalashan, *M. T. Kao 10325* (TAI). Hsinchu Co.: Kuanwu, *L. J. Juan et al. 13* (HAST); Ssumakussu, *S. C. Wu 1131* (HAST). Miaoli Co.: Shukung, *N. Fukuyama, 3407* (TAI); Taian, Tahu, County #61 Hwy, *T. Y. A. Yang 12311* (TNM). Taichung Co.: Tahsuehshan, *S. Y. Lu 14876* (TAIF); Anmashan, *J. Y. Huang 2270* (HAST). Nantou Co.: Puli, Lintoukeng to Chiangtou, *C. M. Wang et al. 6426* (HAST); Chitou tract, *T. C. Huang 1130* (TAI); *F. Yamazaki et al. 93* (TAI); Hoshe, *S. Suzuki 331* (TAI).

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Chiayi Co.: Alishan, County #169 Hwy 44.5 km, *S. M. Liu et al. 632* (HAST); Shihcho, Lungyun Forest Resort, *Y. H. Lai et al. 47* (TAI). Kaohsiung Co.: Meilan logging track 12 km, *C. I Peng et al. 18128* (HAST). Pingtung Co.: Chinsuiying, *S. Z. Yang 24221* (PPI); Nanjenshan Station, *S. M. Liu et al. 74* (HAST); Mutan, Hsuhai, *C. M. Wang 2130* (HAST); Kaoshihfoshan, *Y. C. Kao et al. 678* (HAST); Kaoshih, *S. Suzuki 15941* (TAI). Hualien Co.: Tatung to Chingshuishan, *H. L. Ho et al. 1246* (HAST); Chingshuishan, *C. F. Hsieh 12818* (TAI); Yuli, *Y. Yamamoto 3075* (TAI). Taitung Co.: Hungshih logging track, *S. M. Liu et al. 456* (HAST); Peinan, along Hongyikuangtau, *W. C. Leong et al. 2637* (HAST); Tawu, *C. C. Chuang 2047* (TAI); Lanyu, Tienchih, *C. C. Liao et al. 1213* (HAST); Lanyu, Chingching Meadow, *Y. Y. Huang et al. 485* (HAST); Lutao, Nanliao to Huoshaoshan, *Y. Kudo 289* (TAI).

Note: This widespread species exhibits tremendous morphological variation, and we do believe that more investigations are needed for this complex taxon in the future.

28. ***Rubus rufus*** Focke, Biblioth. Bot. 17 (Heft 72): 108. 1910; Naruhashi, Bot. Bull. Acad. Sin. 43: 194. 2002. *pro parte.* 棕紅懸鉤子（玉里懸鉤子）

Rubus yuliensis Y.-C. Liu & F.-Y. Lu, Quart. J. Chin. Forest. 9: 135. *f. 7.* 1976.
Rubus rufus Focke var. *yuliensis* (Y.-C. Liu & F.-Y. Lu) S.-C. Liu in Lu *et al.*, Trees Taiwan 1: 130. 2000. *syn. nov.*

Shrubs scandent. Twigs pilose, with brownish bristles, and sparse, needle-like prickles. Leaves simple; blade suborbicular, 5-10 × 4.5-9 cm, abaxially yellowish brown to gray tomentose, with reddish brown hairs and sparse, needle-like prickles along veins, adaxially pilose only along veins, base broadly cordate, margin shallowly 5-lobed, lobes triangular-ovate, terminal lobe longest, irregularly sharply serrate, apex acute; petiole 5-8 cm, brownish, with soft hairs, brownish soft bristles, and needle-like prickles; stipules to 1.5 cm, palmately divided, lobes pinnately divided again into linear or linear-lanceolate lobules, soft hairy, bristly. Inflorescences terminal, subracemes, 6-8 cm, few flowered, or flowers in clusters in leaf axils; pedicel 5-8 mm, with dense soft hairs, brownish bristles, and sparse, needle-like prickles; bracts to 1.5 cm, similar to stipules. Flowers 1-1.5 cm in diam., hypanthium shallowly cupular; sepals erect in fruit, broadly ovate to oblong-ovate, 6-9 mm, abaxially brownish tomentose and bristly, apex caudate, outer sepals apically shallowly laciniate, inner sepals entire; petals white, broadly elliptic to suborbicular, 5-8 × 4-7 mm, glabrous, base shortly clawed, margin erose; stamens many, longer than petals; carpels 30-40, much longer than stamens, style and ovary glabrous. Aggregate fruit orange-red at maturity, composed of few drupelets, glabrous. Flowering season August to September; fruiting season Octobor to November.

Distributed in Mainland China, Vietnam, and Thailand. Taiwan, rarely found in broad-leaved forests in the central mountains at medium altitudes 800-1500 m.

Specimens examined: TAIWAN: Hsinchu Co.: Tuchang to Kuanwu, *C. I Peng 9366* (HAST); Taping seedbed, *C. H. Ou et al. s.n.* 28 Nov. 1990 (TNM). Pingtung Co.: Mt. Chinjie, *S. Z. Yang et al. 11404* (PPI); Payuchih, *S. Y. Lu 12988* (TAIF); Hsiaokueihu, *H. F. Yen 8230* (TNM). Hualien Co.: Yuli, Chinshui Farm, *C. H. Lin et al. 462* (HAST); Juisui logging track 15-28K, *C. M. Wang et al. 11452* (TNM); Juiwen Mining Area, *C. I Peng 17824* (HAST).

Note: Liu & Lu (1976) named this plant as *R. yuliensis*, but without detailed description for comparison to other known species. After careful comparison of Liu & Lu's specimen with individuals of *R. rufus* from Yunnan of Mainland China, we found that *R. yuliensis* and *R. rufus* should be conspecific, and it is also supported by the name changes on the specimens of *R. yuliensis* to *R. rufus* by Naruhashi in HAST. As Hsu et al. (2007) mentioned, a few specimens should belong to *R. amphidasys* among the specimens treated by Naruhashi.

29. ***Rubus sumatranus*** Miq., Fl. Ned. India, Eerste Bijv. 307. 1860; Hsieh, J. Taiwan Mus. 42: 118. 1989. *pro parte.* 紅腺懸鉤子

Shrubs suberect or scandent. Twigs hairy, with densely setose purplish red glandular hairs and curved prickles, glandular hairs and prickles unequal in length, glandular hairs to 5 mm. Leaves imparipinnate, 5-7-foliolate, sometimes 3-foliolate on flower bearing twigs; blade of leaflets ovate-lanceolate to lanceolate, 3-7 × 1.5-3 cm, abaxially pilose, with gland-tipped hairs and small prickles along midvein, adaxially pilose especially along midvein, base rounded, margin irregularly sharply serrate to doubly serrate, apex acuminate; petiole 3-5 cm, hairy, with densely setose glandular hairs and minute prickles; stipules lanceolate or linear-lanceolate, to 6 mm, ciliate, with setose glandular hairs. Inflorescences terminal, corymbose, 4-7 cm, 3- to several flowered; pedicel 2-3 cm, hairy, with densely setose glandular hairs and minute prickles; bracts lanceolate to linear, ca. 5 mm, with glandular hairs. Flowers 1-2 cm in diam., hypanthium saucer shaped; sepals reflexed in fruit, lanceolate to oblong-lanceolate, 7-14 mm, abaxially with long gland-tipped hairs, apex long caudate; petals white, oblong to obovate, 6-12 × 3-6 mm, slightly shorter than sepals, base clawed; stamens many, shorter than petals; carpels numerous, style and ovary glabrous, torus shortly stalked. Aggregate fruit orange-red at maturity, oblong, 1.2-1.8 × 0.7-1.1 cm, glabrous. Flowering season March to April; fruiting season May to June. $2n = 14$.

Distributed in Mainland China, Japan, Korea, Vietnam, Laos, Burma, Thailand, Nepal, Bhutan, N India, Cambodia, Malaysia, and Indonesia. Taiwan, occurred in the central part of the island at low altitudes 100-1500 m.

Specimens examined: TAIWAN: Taichung Co.: Chunghsingling, *S. F. Huang 555* (TAI: 194436); Tunshih, *W. C. Shieh s.n.* 6 May 1994 (TAIF). Nantou Co.: Lienhuachih, *W. F. Ho 275*

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(HAST); Lienhuachih Station, *J. J. Chen et al. 440* (HAST); Peitungyenshan, *C. M. Wang W5519* (TNM); Meifeng, *H. L. Chiang 2449* (TAIF).

Note: See discussion under *R. croceacanthus*.

30. ***Rubus swinhoei*** Hance, Ann. Sci. Nat. Bot., ser. 5, 5: 211. 1866.

30a. ***Rubus swinhoei*** var. ***swinhoei*** 斯氏懸鉤子

Rubus adenotrichopodus Hayata, Icon. Pl. Formos. 5: 49. 1915.

Shrubs straggling. Twigs shortly gray tomentose at first, glabrate in age, with sparse curved prickles. Leaves simple; blade oblong-lanceolate to ovate, 5-10 × 2-5 cm, lateral veins 6-9 per side, raised abaxially and slightly impressed adaxially, abaxially gray tomentose, or glabrescent, with small prickles along midvein, adaxially glabrous except pubescent along midvein, base rounded to shallowly cordate, margin irregularly serrate to doubly serrate, apex acuminate; petiole 6-10 mm, gray tomentose, sometimes with minute prickles; stipules caducous, free, ovate-oblong to ovate-lanceolate, to 8 mm, slightly hairy, margin entire or serrate apically. Inflorescences terminal on lateral twigs, corymbose racemes, 5-8 cm, 3-7-flowered; pedicel 1.5-3 cm, sparsely prickled, peduncle and pedicels with purplish glandular hairs to 3 mm; bracts caducous, ovate-lanceolate or lanceolate, to 5 mm, similar to stipules. Flowers 1-1.5 cm in diam., hypanthium cupular, with purplish glandular hairs; sepals reflexed in fruit, triangular-ovate to ovate, 5-8 mm, abaxially gray tomentose, with purplish glandular hairs to 3 mm, margin entire, apex shortly acuminate; petals white, broadly obovate to suborbicular, 5-7 × 4-6 mm, both surfaces thinly hairy, base shortly clawed, apex obtuse, undulate; stamens many, glabrous; carpels much longer than stamens, style and ovary glabrous. Aggregate fruit red or dark purplish at maturity, globose, 1-1.5 cm in diam., glabrous. Flowering season March to May; fruiting season May to July. 2*n* = 28.

Distributed in Mainland China and the Ryukyus. Taiwan, commonly distributed in the northern and central parts at low altitudes 20-1200 m.

Specimens examined: TAIWAN: Taipei City: Waishuanghsi, mountain foot of Talunweishan, *K. F. Chung et al. 1131* (HAST); Neihu, *C. M. Kuo 4843* (TAI); Chutzuhu, *C. I Peng et al. 15253* (HAST); Prov. #2A Hwy, *C. C. Liao 251* (HAST). Taipei Co.: Kuanyinshan, *J. Fukuyama et al. s.n.* 26 May 1940 (TAI); Tamsui, Hsinhuatien, *C. C. Hsu et al. 4444* (TAI); Chinshan, *T. C. Huang 9703* (TAI); Wanli, Tachienchih, *Y. Y. Huang et al. 287* (HAST); Hsichih, Wuchihshan Hwy, *K. F. Chung et al. 1128* (HAST); Chinkuashih, *C. M. Kuo 10780* (TAI); Pinhsi, Paiying Bridge to Chienchenlin, *S. C. Liu 445* (HAST); Pihu, *C. M. Kuo 6690* (TAI); Hsintien, Tatsukeng to Szukanshui, *C. H. Chen 3215* (HAST); Fulung, *S. F. Huang 1451* (TAI). Keelung City: Nuannuan, *S. Suzuki 4459* (TAI); Kiirun, *S. Sasaki s.n.* 14 Apr. 1929 (TAI). Ilan Co.: Toucheng, County #1 Hwy 8-10 km, *C. I Peng et al. 14980* (HAST); Nanao, Hsinliao Waterfall, *C. H. Lin et al. 320* (HAST). Hsinchu Co.: Wufeng, Niaotsuishan, *S. T. Chiu 8214* (TNM). Miaoli Co.: Sanyi, County #130 Hwy, *Y. Y. Huang et al. 429* (HAST); Sanyi, Lungteng Bridge, *C. F. Chen 2580* (TNM). Nantou Co.: Lienhuachi, *Y. Yamamoto et al. s.n.* 5 Jun. 1930 (TAI); Kuantaoshan, *C. H. Ou et al. s.n.* 4 May 1989 (TNM). Taitung Co.: Hsinkanshan, *T. Y. A. Yang 4455* (TNM).

30b. ***Rubus swinhoei*** Hance var. ***kawakamii*** (Hayata) S.-C. Liu in Lu *et al.*, Trees Taiwan 1: 130. 2000. - *Rubus kawakamii* Hayata, J. Coll. Sci. Univ. Tokyo 30: 91. 1911. 桑葉懸鉤子

This variety differs from the typical form by the leaves being abaxially glabrous, and by the pedicels and calyx with or without short stalked glands. Flowering season May to July; fruiting season July to September. 2*n* = 28.

Endemic to Taiwan. Commonly distributed in forests at medium altitudes, 1000-2500 m throughout the central mountains.

Specimens examined: TAIWAN: Ilan Co.: Mimodeng, *J. Y. Huang 803* (HAST). Hsinchu Co.: Chenhsipao, *S. C. Wu et al. 1831* (HAST, TAI); Kuanwu, Leshan logging track 3.8 km, *L. J. Juan et al. 31* (HAST). Taichung Co.: Szuyanyakou, #710 logging track, *C. H. Chen et al. 1829* (HAST); Hsuehshan logging track, 31.5 km, *S. H. Wu 1270* (HAST). Nantou Co.: Yunhai to Tienchih, *H. L. Ho et al. 612* (HAST); Lihsing Private Rd., *W. C. Leong et al. 1283* (HAST); Tsuifeng to Juiyenhsi, *S. T. Chiu 5445* (HAST); Tsuifeng to Meifeng, *T. Y. Yang 74* (TAI); Juiyen, *Ou & Kao 9333* (TAI); Pilushan logging track, *J. J. Chen et al. 400* (HAST); Hsitou to Shanlinhsi, *M. T. Kao 7206* (TAI). Chiayi Co.: Alishan, *Chuan s.n.* 12 Jul. 1957 (TAI); Chushan train station, *J. J. Chen et al. 683* (HAST). Kaohsiung Co.: Likuan to Tienchi, *C. H. Lin et al. 409* (HAST); Meilan Trail, *S. H. Hueng 68* (HAST); Taoyuan, Prov. #20 122-125 km, *C. C. Wang et al. 1045* (HAST); Tengchih, *T. C. Huang et al. 13875* (TAI); Tienchih to Yakou, *T. C. Huang 8838* (TAI). Pingtung Co.: Wutai to Tawu, *S. Z. Yang et al. 23086* (PPI). Hualien Co.: Kuailin, *S. Suzuki 2108* (TAI); Hopin logging track, *S. F. Huang et al. 5118* (TAI); Mukuashan, *M. T. Kao 4163* (TAI); Prov. #8 Hwy 138.8 km, *C. I Peng et al. 17312* (HAST). Taitung Co.: Yenping logging track, *Y. J. Lin 191* (PPI).

Note: *Rubus kawakamii* resembles *R. swinhoei* and is difficult to be distinguished without examining their indumentum. We consider *R. kawakamii* a variety of *R. swinhoei* following Liu's (2000) treatment.

31. ***Rubus taitoensis*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30: 96. 1911. - *Rubus aculeatiflorus* var. *taitoensis* (Hayata) T.-S. Liu & T.-Y. Yang, Sci. Ann. Taiwan Mus. 12: 12. 1969. 刺花懸鉤子

Rubus aculeatiflorus Hayata, Icon. Pl. Formos. 5: 39. 1915. - *Rubus taitoensis* var. *aculeatiflorus* (Hayata) H. Ohashi & C.-F. Hsieh in Huang *et al*., Fl. Taiwan 2nd ed. 3: 143. 1993. *syn. nov.* *Rubus mingetsensis* Hayata, Icon. Pl. Formos. 5: 40. *f. 11*. 1915.

Shrubs scandent. Twigs pubescent, with sparse prickles. Leaves simple; blade broadly ovate to triangular-ovate, 5-9 × 4-7 cm, abaxially pale and pubescent, with small prickles along veins, adaxially thinly pubescent especially along veins, base cordate to truncate, margin incised-serrate to doubly serrate, not

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divided or 3-lobed, central lobe sometimes contracted and becoming entire toward base, apex acuminate; petiole 1.5-4 cm, pubescent, with minute prickles; stipules attached to the petiole base, linear-lanceolate, to 8 mm, slightly pubescent. Inflorescences terminal on short lateral twigs, flowers usually solitary or in pairs; pedicel 1-2 cm, pubescent; bracts linear, to 7 mm, slightly pubescent. Flowers 1.5-3 cm in diam., hypanthium campanulate, with needle-like prickles; sepals triangular-lanceolate, 7-12 mm, abaxially pubescent, with sparse prickles, apex long caudate; petals white, broadly ovate, 7-9 × 6-8 mm, glabrous, base clawed; stamens numerous, shorter than petals; carpels shorter than stamens, styles to 4 mm, base long hairy. Aggregate fruit orange to yellow at maturity, globose, 0.9-1.3 cm in diam., nearly glabrous. Flowering season April to June; fruiting season June to August. $2n = 14$.

Endemic to Taiwan. Commonly distributed at medium altitudes, 1500-2800 m in the central mountains.

Specimens examined: TAIWAN: Ilan Co.: Szuyuanyakou, *H. F. Yen 7723* (HAST). Hsinchu Co.: Kuanwu, *L. J. Juan et al. 16* (HAST). Miaoli Co.: Tungshiishuishang, *S. C. Wu 1291* (HAST); Hsuehshan #230 logging track 11 km, *S. H. Wu 1206* (HAST); Mt. Izawa, *S. Sasaki s.n.* 18 Jul. 1932 (TAI). Taichung Co.: Yunling Lodge, *T. Y. Liu et al. 984* (HAST); Nanhutashan, *C. M. Kuo 5133* (TAI); Tayuling to Lishan, *S. Odum 89126* (TAIF). Nantou Co.: Yunhai, *T. Suzuki 2584* (TAI); Yunhai to Tienchih, *C. C. Liao et al. 1345* (HAST); Sunchuankang, *H. F. Yen et al. 7754* (HAST); Patungkuan to Kuankao, *T. Suzuki 13314* (TAI). Chiayi Co.: Alishan, *T. Y. A. Yang et al. 6544* (HAST, TNM); Tatachia saddle, *C. H. Chen et al. 1080* (HAST); Tatachianpu to Paiyun Lodge, *W. P. Leu et al. 213* (HAST). Kaohsiung Co.: Yakou logging track, *C. C. Wang et al. 1107* (HAST); Prov. #20 Hwy 137.5 km, *C. H. Lin et al. 437* (HAST). Pingtung Co.: Chunri, *C. F. Chen 1241* (PPI); Wutai, first Lodge to Chihpenchushan, *C. H. Lin et al. 409* (HAST); Mt. Chihpenchu, *S. Y. Lu 22942* (TAIF); Tahanshan, *G. P. Hseih 928* (HAST). Hualien Co.: Wanjung logging track 37 km, *S. H. Wu et al. 1317* (HAST); Chingshuishan, *T. Nakamura 5454* (TAI). Taitung Co.: Peinan, Hongyi Mine Lodge to Chipenchushan, *W. C. Leong et al. 2642* (HAST).

Note: *Rubus aculeatiflorus* is very similar to *R. taitoensis*. According to Hayata, *R. taitoensis* has more deeply lobed leaves and shorter petioles. Actually, the degree of lobing in the genus *Rubus* often varies considerably between individuals of the same species or even on the same individual, and we consider these two plants are entirely conspecific.

32. ***Rubus taiwanicolus*** Koidz. & Ohwi, J. Jap. Bot. 12: 657. 1936. 臺灣莓

Rubus elegans Hayata, Bot. Mag. Tokyo 20: 74. 1906, *non* P. J. Müller 1858.
Rubus takasagomontanus Hatus., J. Geob. Hokuriku 17: 83. 1969.

Subshrub low, up to 15 cm tall. Stems very short. Leaves imparipinnate, 9-15-foliolate; blade of leaflets elliptic to broadly oblong, 0.5-1.5 × 0.4-0.9 cm, lateral veins raised abaxially and impressed adaxially, both surfaces glabrous, only slightly hirsute along midvein abaxially, base cuneate, margin serrate above middle, becoming entire toward base, apex acute or obtuse; petiole 1-2 cm, glabrous, with curved minute prickles; stipules attached to the petiole, linear-lanceolate, to 9 mm, glabrous. Inflorescences terminal, flowers solitary or in pairs; pedicel 1.5-4 cm, glabrous, with curved minute prickles; bracts linear-lanceolate, to 5 mm, glabrous. Flowers 1-2 cm in diam.; sepals ovate to triangular-ovate, 6-8 mm, abaxially nearly glabrous, margin slightly tomentose, apex shortly caudate; petals white, broadly ovate to suborbicular, 7-10 × 5-6 mm, glabrous or sparsely hairy, base shortly clawed, apex obtuse or rounded; stamens many, shorter than petals; carpels numerous, shorter than stamens, style and ovary glabrous. Aggregate fruit red at maturity, globose, 0.8-1.5 cm in diam., glabrous. Flowering season June to September; fruiting season August to November. $2n = 14$.

Endemic to Taiwan. Distributed in the central mountains from medium to high altitudes 1500-3000 m.

Specimens examined: TAIWAN: Ilan Co.: Pingyuan logging track 7 km, *Y. C. Kao et al. 351* (HAST); Tsuifeng Lodge, *W. C. Leong et al. 2390* (HAST); Mt. Taipingshan, *C. I Peng 7863* (HAST); Nanshan village, Prov. #7A Hwy 28.3 km, *T. Y. Liu et al. 241* (HAST); Ssuyuan to Nanhutashan, *S. Suzuki s.n.* 28 Aug. 1922 (TAI). Taoyuan Co.: Lalashan, *T. Suzuki 11701* (TAI). Hsinchu Co.: Yuenyanghu, *C. C. Hsu 14541* (TAI). Nantou Co.: Sunghsuehlou, *T. C. Huang 5272* (TAI). Chiayi Co.: Yushan, *S. Sasaki s.n.* Aug. 1935 (TAI). Kaohsiung Co.: Prov. #20 Hwy, near Chinchingchiao, *L. Y. Lin et al. 88* (HAST); Tienchih to Yakou, *T. C. Huang et al. 8855* (TAI). Hualien Co.: Hoping logging track, Between Hoping and Errtzeshan, *C. I Peng 5819* (HAST); Mukuashan, *T. Nakamura 4573* (TAI); Chilaihsi to Kuailin, *S. Sasaki 420140* (TAI); Luanshan, *T. C. Huang 4210* (TAI); Tayulin, *C. C. Hsu 8635* (TAI); Hsinpiyang to Pilushan, *C. I Peng 12775* (HAST). Taitung Co.: Chihpenchushan, *T. Hosogawa 5325* (TAI); Hsiangyang, *C. H. Lin et al. 456* (HAST).

33. ***Rubus tephrodes*** Hance var. ***setosissimus*** Hand.-Mazz., Symb. Sin. 7: 492. 1933; Koidz., Acta Phytotax. Geobot. 8: 262. 1939. 粗毛懸鉤子

Rubus nagasawanus auct. non Koidz.: Liu & Su in Li *et al*., Fl. Taiwan 3: 118. 1977.
Rubus tephrodes auct. non Hance: Naruhashi, Bot. Bull. Acad. Sin. 43: 194. 2002.

Shrubs straggling. Twigs densely gray tomentose, sparsely prickled, with unequal long glandular hairs and bristles to 4 mm. Leaves simple; blade suborbicular, 5-11 × 5-10 cm, palmately 5-veined, lateral veins 3-4 pairs, abaxially densely gray tomentose, with minute prickles and glandular hairs along midvein, adaxially pilose, base cordate, margin shallowly 5-7-lobed, terminal lobe longest, lobes near base shorter, irregularly serrate, apex acute or acuminate, rarely obtuse; petiole 1-3 cm, tomentose, with minute prickles and glandular hairs; stipules caducous, free, to 8 mm, margin laciniate or pectinately parted, tomentose-pilose. Inflorescences

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terminal, broad cymose panicles, 10-20 cm, many flowered; pedicel 4-10 mm, tomentose-pilose, with glandular hairs and bristles; bracts to 7 mm, similar to stipules. Flowers ca. 1 cm in diam., hypanthium cup shaped; sepals ovate, 4-7 mm, abaxially densely gray tomentose, with glandular hairs and bristles, margin entire, apex acute; petals white, suborbicular to oblong, 4-7 × 3-5 mm, slightly pilose, base shortly clawed; stamens many, to 5 mm, glabrous; carpels 30-50, longer than stamens, style and ovary glabrous. Aggregate fruit purplish black at maturity, globose, 0.6-1 cm in diam., glabrous. Flowering season July to August; fruiting season August to September. $2n = 28$.

Distributed in Southern China. Taiwan, occurred in forests in the eastern part of the island at medium altitudes 800-1800 m.

Specimens examined: TAIWAN: Ilan Co.: Sunchitsun, *S. Suzuki s.n.* 13 Jul. 1929 (TAI); Ssuyuan, *T. C. Huang 7321* (TAI); Szuyanyakou to Nanshan, *C. H. Chen et al. 1299* (HAST). Taichung Co.: Chungyangchien, *Fukuyama et al. 16129* (TAI). Hualien Co.: Chilaihsi to Kuailin, *S. Suzuki s.n.* 22 Aug. 1929 (TAI); Panshih electric power maitaining station, *J. Y. Huang 2089* (HAST); Kuailin to Nengkao, *S. Suzuki s.n.* Aug. 1926 (TAI); Holiu to Matakan, *T. Hosokawa 5073A* (TAI); Prov. #8 Hwy 144 km, *C. H. Lin et al. 478* (HAST). Taitung Co.: Chiaping logging track, *C. H. Chen et al. 7417* (TNM).

Note: see discussion under *R. nagasawanus* var. *nagasawanus*.

34. ***Rubus trianthus*** Focke, Biblioth. Bot. 17 (Heft 72): 140. 1911; Li, Woody Fl. Taiwan 310. 1963.
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Rubus conduplicatus Duthie *ex* Hayata, J. Coll. Sci. Univ. Tokyo 30: 89. 1911. - *Rubus incisus* Thunb. var. *conduplicatus* (Duthie *ex* Hayata) Koidz., J. Coll. Sci. Univ. Tokyo 34: 122. 1913.
Rubus incisus auct. non Thunb.: Koidz., J. Coll. Sci. Univ. Tokyo 34: 121. 1913.
Rubus koehneanus Focke var. *formosanus* Card., Lecomte, Not. Syst. 3: 306. 1916. - *Rubus incisus* Thunb. subsp. *koehneanus* (Focke) Koidz. var. *formosanus* Masam. *ex* Kudo & Masam., Ann. Rep. Taihoku Bot. Gard. 2: 130. 1932.
Rubus subcrataegifolius auct. non (H. Lév. & Vaniot) H. Lév. & Vaniot: Naruhashi, Bot. Bull. Acad. Sin. 43: 194. 2002.

Shrubs suberect or scandent. Stems dark purplish, glabrous, with sparse prickles. Leaves simple; blade ovate to ovate-oblong, 4-12 × 2-9 cm, lateral veins raised abaxially and impressed adaxially, both surfaces glabrous, abaxially usually pale or glaucous, base cordate, margin 3-lobed or not, usually deeply 3-lobed on sterile twigs, terminal lobe ovate-lanceolate, irregularly incised-serrate to doubly serrate, apex acuminate; petiole 1-3 cm, glabrous, with sparse, minute prickles; stipules attached to the petiole, lanceolate or linear, to 9 mm, glabrous. Inflorescences terminal on short lateral twigs, flowers 3-7 in cymose racemes, 3-5 cm; pedicel 1-2.5 cm, glabrous; bracts lanceolate or linear, to 7 mm, glabrous. Flowers 1-1.8 cm in diam., hypanthium campanulate, abaxially somewhat glaucous and glabrous; sepals triangular-ovate to lanceolate, 5-8 mm, apex acuminate to long caudate, blackish when dry; petals white, oblong to elliptic, longer than sepals, both surfaces slightly pubescent or glabrous, base clawed; stamens many, shorter than petals; carpels 40-55, shorter than stamens, style to 2 mm, ovary glabrous. Aggregate fruit red at maturity, globose, ca. 1 cm in diam., glabrous. Flowering season April to June; fruiting season June to August. $2n = 14$.

Distributed in Southern China and Vietnam. Taiwan, distributed along roadsides and edges of forests from low to medium altitudes 100-2800 m.

Specimens examined: TAIWAN: Taipei Co.: Hsintien, Hualin to monte-hiking entrance of Tatungshan, *T. Y. Liu et al. 201* (HAST); Wulai, *L. S. Chern 55* (TAI); Kabosan, *N. Fukuyama 19238* (TAI); Tamanzan, *T. Suzuki et al. 18240* (TAI). Ilan Co.: Szuyuanyakou, *Y. Y. Huang et al. 387* (HAST); Chialo Hu, *C. I Huang et al. 861* (HAST); Taipingshan, *S. Suzuki s.n.* 4 Aug. 1928 (TAI). Taoyuan Co.: Rarazan, *E. Matuda 305* (TAI). Hsinchu Co.: Peipu, Hsiadahushan, *S. C. Wu 2400* (HAST); Wuchihshan, *Y. Shimada 3373C* (TAI); Litung Lodge, *Y. Y. Huang et al. 452* (HAST); Kuanwu, *L. J. Juan et al. 12* (HAST); Yuanyanghu, *C. H. Chen et al. 169* (HAST). Miaoli Co.: Szumahsien to Tienkou, *T. Y. Liu et al. 86* (HAST); Chialishan, *C. C. Wu et al. 814* (HAST); Hsuehshan #230 logging track 9 km, *S. H. Wu et al. 1187* (HAST). Taichung Co.: Chunghsingling, *S. F. Huang 563* (TAI); Tungmaoshan, *K. C. Yang 2321* (TNM); Hsiaohsueh Lodge to Hsiaohsuehshan, *C. M. Wang 1789* (HAST); Pachsienshan, *S. Sasaki s.n.* 11 May 1933 (TAI). Nantou Co.: Exp. forest of Chunghsin Univ., *C. C. Hsu 10630* (TAI); Lienhuachi, *T. C. Huang 7571* (TAI); Mayfeng farm, *W. P. Leu et al. 449* (HAST); Tsuifeng, *J. C. Wang et al. 10172* (HAST); Peitungyenshan, *C. M. Wang 5554* (HAST, TNM); Chihyuanchuang, *W. S. Tang 463* (TAI); Hsitou to Shanlinhsi, *M. T. Kao 7199* (TAI); Prov. #21 Hwy 140.5 km, *T. Y. Liu et al. 1241* (HAST). Chiayi Co.: Alishan to Ehlwahnpirng, *J. C. Wang 6311* (HAST); Chushan train station, *J. J. Chen et al. 686* (HAST). Hualien Co.: Hoping to Hsiaohsingshan, *W. S. Tang 1763* (TAI); Kuailin to Wuchiapengshan, *C. C. Liao et al. 1391* (HAST).

35. ***Rubus wallichianus*** Wight & Arn. in Wight, Catal. 61. 1833; Hsieh, J. Taiwan Mus. 42: 120. 1989. 鬼懸鉤子

Rubus fasciculatus Duthie, Ann. Bot. Gard. Calcutta 9: 39. *t. 48.* 1901, *non* P. J. Müll. 1858. - *Rubus ellipticus* Sm. subsp. *fasciculatus* (Duthie) Focke, Biblioth. Bot. 17 (Heft 72): 199. 1911. - *Rubus ellipticus* Sm. var. *fasciculatus* Masam. *ex* Kudo & Masam., Ann. Rep. Taihoku Bot. Gard. 2: 129. 1932.
Rubus pinfaensis H. Lév. & Vaniot, Bull. Soc. Agr. Sci. Art. Sarthe 39: 320. 1914; Li, Woody Fl. Taiwan 312. 1963.

Shrubs scandent. Twigs pubescent, with densely long red bristles to 7 mm, sparsely prickled. Leaves imparipinnate, 3-foliolate; blade of terminal leaflets elliptic or ovate, rarely obovate, 6-15 × 4-12 cm, larger than lateral leaflets, base rounded to broadly cuneate, margin irregularly sharply serrate, apex acuminate to

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caudate, lateral leaflets elliptic-ovate, oblique, 4-8 × 3-5 cm, lateral veins raised abaxially and impressed adaxially, both surfaces nearly glabrous except slightly pubescent along midvein; petiole 2-4.5 cm, densely setose and pubescent, with sparse prickles; stipules linear, to 1.4 cm, setose and pubescent. Inflorescences terminal and axillary, 4-8 flowers in umbellate cyme; pedicel 4-7 mm, setose and pubescent, with minute prickles; bracts linear to linear-lanceolate, to 1 cm. Flowers 1-1.5 cm in diam., hypanthium saucer shaped; sepals triangular-ovate, to 7 mm, abaxially densely tomentose, apex obtuse, abruptly long pointed; petals white, spatulate to elliptic-obovate, 6-10 × 4-6 mm, both surfaces tomentose, base clawed, apex rounded, erose; stamens many, shorter than petals; carpels nearly as long as stamens, apex of ovary and base of style soft hairy. Aggregate fruit yellow at maturity, globose, 0.6-1.2 cm in diam., glabrous. Flowering season January to March; fruiting season March to May. $2n = 14$.

Distributed in Southern China, Vietnam, India, Nepal, and Bhutan. Taiwan, distributed in forest edges from low to medium altitudes, 200-1800 m throughout the island.

Specimens examined: TAIWAN: Taipei Co.: Kuaishan to Fushan Village, *C. C. Liao 1057* (HAST). Ilan Co.: Nanao, *T. Suzuki 8890* (TAI). Taoyuan Co.: Lalashan, *C. T. Wang 975* (TAI). Hsinchu Co.: Wuchihshan, *Y. Shimada 3376B* (TAI); Sankuang Primary School to Litungshan, *C. C. Liao 111* (HAST); Shihlu Historic Rd., Yushan Relic to Chaojih Relic, *Y. Y. Huang et al. 962* (HAST); Tuchang to Kuanwu, *C. I Peng et al. 14866* (HAST); Chenhsipao, *Y. Y. Huang et al. 826* (HAST). Taichung Co.: Songhe, *M. T. Kao 9261* (TAI); Chingshan to Malun Bridge, *C. I Peng 12447* (HAST); Pachsienshan, *S. Sasaki s.n.* 10 May 1933 (TAI). Nantou Co.: Huishun Forest Area, *C. I Peng et al. 14056* (HAST); Wuchieh logging track, *T. Y. A. Yang et al. 6018* (TAI); Hoshe, *M. T. Kao 3849* (TAI); Shenmu logging track, *C. I Peng et al. 11492* (HAST); Yinu Waterfall to Kuankao, *Y. C. Kao 729* (HAST); Fenghuangshan, *M. T. Kao s.n.* 14 Feb. 1955 (TAI); Shalishienhsi, *T. Shimizu 10792* (TAI). Chiayi Co.: Shihcho, Lungyun Lodge to Shihpalohantung, *K. Y. Wang et al. 753* (HAST); Chaoliping, *T. Sata s.n.* 26 Mar. 1932 (TAI); Alishan, *S. Sasaki s.n.* Mar. 1911 (TAI). Kaohsiung Co.: Liukuei, *J. M. Chao 730* (TAI); Paoshan Village, Chuyunshan logging track, *H. L. Ho et al. 927* (HAST); Meilan logging track 8.5 km, *T. Y. Liu et al. 409* (HAST); Nanfonshan, *C. C. Chuang et al. 3263* (TAI). Pingtung Co.: Tawushan, *C. I Peng 13183* (HAST); Hongyikuangtau, Ali to Hongyi mine, *W. C. Leong et al. 2620* (HAST); Baryiuchih, *S. F. Huang 3382* (TAI); Tahan logging track 22-23 km, *K. F. Chung et al. 1274* (HAST). Hualien Co.: Hopin logging track, *W. S. Tang 1750* (TAI); Tali to Tatung, *C. H. Chen 1667* (HAST); Kuailin to Wuchiapengshan, *C. C. Liao et al. 1438* (HAST); Hsinkangshan, *T. Y. A. Yang et al. 4458* (TAI). Taitung Co.: Chienching, *S. Suzuki 10826* (TAI); Wulu logging track, *Y. Y. Huang et al. 267* (HAST); Yenping logging track, *S. C. Hsiao et al. 1256* (HAST).

EXCLUDING SPECIES

Rubus pseudoacer Makino, Bot. Mag. Tokyo 6: 53. 1892.

Rubus pseudoacer Makino var. *flexuosus* Y.-C. Liu & F.-Y. Lu, Quart. J. Chin. Forest. 9: 133. *f. 5.* 1976. - *Rubus pseudoacer* Makino ssp. *flexuosus* (Y.-C. Liu & F.-Y. Lu) H. Ohashi & C.-F. Hsieh in Huang *et al*., Fl. Taiwan 2nd ed. 3: 136. 1993.
Rubus hunanensis auct. non Hand.-Mazz.: Lu & Boufford in Wu & Raven, Fl. China 9: 258. 2003.

Note: The type specimen of *R. pseudoacer* ssp. *flexuosus* was collected from Chinshui Farm, located in Chinshui logging track in Hualien County. It has no flower and there is no other collection ever since the type collectiotn. We have tried to find this species in nearby area and could not find any trace. This species was supposed to be remaining planted species of Chinshui Farm, which was a testing herbal garden during Japanese colonization period and probably never naturalized in Taiwan. According to identification then, *R. pseudoacer* ssp. *flexuosus* was slightly different from the Japanese species *R. pseudoacer*, but without speficifying the difference between these two taxa. We consider that the difference might be variation caused by environment. *Rubus pseudoacer* ssp. *flexuosus* is treated as synonym of *R. pseudoacer* and is excluded from Taiwan.

NOTES ON OTHER NATURAL HYBRIDS

Rubus croceacanthus* × *corchorifolius

Specimens examined: TAIWAN: Nantou Co.: Puli, Liyutan, *J. J. Chen et al. 439* (HAST). Kaohsiung Co.: Shahis logging track, *K. P. Lo 994* (PPI); *J. Y. Huang 2338* (HAST).

Note: The specimen [*J. J. Chen et al. 439* (HAST)] is possibly a natural hybird of *R. corchorifolius* and *R. somai* (treated as synonym of *R. croceacanthus* here) identified by Naruhashi. After careful examination, we also confirm this idea and propose a natural hydrid *R. croceacanthus* × *corchorifolius*, putatively derived from *R. croceacanthus* and *R. corchorifolius* which is recognized based on intermediate morphology.

Rubus rosifolius* × *fraxinifolius

Specimens examined: TAIWAN: Pingtung Co.: Kaoshihfo, *Kudo & Suzuki 15940* (TAI); Mt. Silinge, *T. Y. A. Yang et al. 21430* (TNM); *J. Y. Huang 2335* (HAST).

Note: The specimen [*Kudo & Suzuki 15940* (TAI)] was identified as *R. parvifraxinifolius* by Liu and Su (1977). After field collecting in Pingtung area, we consider that this specimen is possibly a natural hybrid between *R. rosifolius* and *R. fraxinifolius* and is different from *R.* × *parvifraxinifolius* (hybrid between *R. rosifolius* and *R. linearifoliolus*, see discussion under *R.* × *parvifraxinifolius*). The two hybrids show very close appearence, but *R. rosifolius* × *fraxinifolius* can be distinguished by its pale yellow glands and chartaceous leaves. *Rubus* × *parvifraxinifolius*, on the contrary, has orange glands and thin-chartaceous leaves.

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臺灣產薔薇科懸鉤子屬植物訂正

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摘要：本文處理臺灣產懸鉤子屬植物的分類，更新為 40 個分類群(34 種、3 變種與 3 雜交種)，其中 *Rubus croceacanthus* × *corchorifolius* 與 *Rubus rosifolius* × *fraxinifolius* 為首次記載。臺灣產懸鉤子屬植物當中，以虎婆刺 (*Rubus croceacanthus* H. Lév.) 的形態最為多變，將來仍須進一步研究。臺灣植物誌第二版中的許多學名在此被處理為同物異名，許多分類群也被加以訂正。重新確認裂葉懸鉤子 (*Rubus howii* Merr. & Chun)、細葉懸鉤子 (*Rubus linearifoliolus* Hayata) 與小楞葉懸鉤子 (*Rubus parvifraxinifolius* Hayata) 存在於臺灣，清水懸鉤子 [*Rubus pseudoacer* Makino ssp. *flexuosus* (Y.-C. Liu & F.-Y. Lu) H. Ohashi & C.-F. Hsieh] 則併入 *Rubus pseudoacer* Makino，並確認此分類群不產於臺灣。另外，根據形態特徵將小楞葉懸鉤子之學名處理為 *Rubus* × *parvifraxinifolius* Hayata，推測其為刺莓 (*Rubus rosifolius* Sm.) 與細葉懸鉤子 (*Rubus linearifoliolus* Hayata) 之雜交種。本文首次描述裂葉懸鉤子在原始文獻缺乏之聚合果特徵，此外提供了各分類群之檢索表、同物異名與特徵描述，並加上了物候、染色體數、地理分佈與檢閱標本等資訊。

關鍵詞：懸鉤子屬、薔薇科、分類訂正、雜交、天然雜交種、臺灣、分類。

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