

27. PETROCOSMEA Oliver, Hooker's Icon. Pl. 18: t. 1716. 1887.

石蝴蝶属 shi hu die shu

Vaniotia H. Léveillé.

Herbs, perennial, terrestrial or epipetric, rhizomatous, stemless. Leaves few to many, basal; leaf blade puberulent to pilose, rarely sericeous or velutinous, base cuneate to cordate, rarely peltate. Inflorescences usually lax, rarely subumbel-like, axillary, 1–4(–7)-flowered cymes; bracts usually 2, opposite or alternate. Calyx actinomorphic, rarely zygomorphic, 5-sect from base, rarely 3-lobed to 3-sect from base; segments equal, rarely unequal. Corolla blue to purple or white, zygomorphic, inside glabrous, sometimes puberulent; tube broadly tubular, not swollen, shorter than limb, 2–5 mm in diam.; limb 2-lipped; adaxial lip 2-lobed, equalling or much shorter than abaxial lip; abaxial lip 3-lobed, lobes equal or subequal, apex rounded. Stamens 2, adnate to abaxial side of corolla tube near base, included; anthers basifixed, coherent at apex, thecae parallel, confluent at apex or not, dehiscing longitudinally; connective not projecting; staminodes (absent or 1–)3, adnate to adaxial side of corolla tube. Disc absent. Ovary conical to broadly ovoid, 1-loculed; placentas 2, parietal, projecting inward, 2-cleft. Stigma 1, terminal, capitate, often nearly globose, undivided. Capsule straight in relation to pedicel, narrowly ellipsoid to oblong to ovoid, nearly as long as calyx, dehiscing loculicidally to base; valves 2, straight, not twisted. Seeds unappended.

Twenty-seven species: China, NE India, Myanmar, Thailand, S Vietnam; 24 species in China.

1a. Anthers constricted near apex, forming a short thick beak.

2a. Calyx zygomorphic, 3-parted or 3-sect 24. *P. kerrii*
2b. Calyx actinomorphic, 5-sect.

3a. Leaf blade 7.5–8.5 cm; bracts subulate to lanceolate, 3–4 mm; corolla black at throat, not purple at base, sparsely puberulent outside, scaly inside 22. *P. menglianensis*

3b. Leaf blade 8–17.5 cm; bracts ovate to lanceolate, 5–12 mm; corolla not black at throat, dark purple adaxially near base, glabrous outside, densely minutely yellow glandular and sparsely pubescent below abaxial lip inside 23. *P. grandifolia*

1b. Anthers not constricted near apex.

4a. Adaxial corolla lip 9–12 mm, abaxial lip 13–15 mm 6. *P. grandiflora*

4b. Adaxial corolla lip 0.7–5 mm, abaxial lip 2–12 mm.

5a. Abaxial corolla lip nearly equalling adaxial.

6a. Calyx glabrous or nearly so outside; corolla glabrous outside 2. *P. oblata*

6b. Calyx puberulent outside; corolla puberulent or sparsely so outside.

7a. Leaf blade veins abaxially conspicuous 1. *P. nervosa*

7b. Leaf blade veins abaxially subconspicuous or indistinct.

8a. Petiole 0.5–9 cm; anthers triangular; leaf blade 1–3.5 × 1–4.4 cm 3. *P. flaccida*

8b. Petiole 0.5–3.5(–4.5) cm; anthers oblong or oblong ovoid; leaf blade 0.7–3(–4) × 0.7–2.8(–3.8) cm.

9a. Corolla glabrous inside; ovary and base of style puberulent; bracts 2.5–4 mm; anthers ca. 3 mm; pistil 9–11 mm 4. *P. sinensis*

9b. Corolla puberulent on adaxial lip inside; ovary and style spreading villous; bracts 1.6–2 mm; anthers ca. 1.2 mm; pistil ca. 5.2 mm 5. *P. qinlingensis*

5b. Abaxial corolla lip at least 2 × longer than adaxial.

10a. Adaxial corolla lip indistinctly 2-lobed, emarginate, or undivided.

11a. Leaf blade base cordate or rounded; calyx segments narrowly lanceolate; style glabrous.

12a. Capsule 7–11 mm; calyx 5–7 mm; corolla tube ca. 6.5 mm; bracts 2.5–4 mm; leaf blade 1.5–3.8(–4.9) × 1–4.5 cm; lateral veins abaxially conspicuous; cymes (1 or)2–4-flowered 18. *P. iodoides*

12b. Capsule 3.5–5 mm; calyx 2.5–3 mm; corolla tube to 3 mm; bracts 1–2 mm; leaf blade 0.7–2(–2.6) × 0.5–1.5(–1.9) cm; lateral veins inconspicuous; cymes 1(or)2-flowered 19. *P. martinii*

11b. Leaf blade base cuneate, broadly cuneate, rarely rounded; calyx segments linear or narrowly triangular; style puberulent near base.

- 13a. Peduncle, outer calyx surface, petiole, and leaf blade brownish yellow appressed puberulent; pedicel 0.4–1.2 cm; capsule to 12 mm 20. *P. sericea*
- 13b. Peduncle, outer calyx surface, petiole, and leaf blade adaxially whitish to tan pubescent, abaxially densely puberulent; pedicel 1.4–2.5 cm; capsule 5–8(–10) mm 21. *P. minor*
- 10b. Adaxial corolla lip 2-parted near base or at least in apical 1/3.
- 14a. All leaves peltate 17. *P. coerulea*
- 14b. Most or all leaves not peltate.
- 15a. Filaments puberulent.
- 16a. Adaxial corolla lip 2-parted to near base; anthers 2.5 × or more longer than filaments; petiole 1–8 cm; peduncle 4.5–10 cm 7. *P. duclouxii*
- 16b. Adaxial corolla lip 2-lobed in apical 1/3–1/2; anthers 0.5–2 × filament length; petiole 0.3–5.5 cm; peduncle 2.2–7 cm.
- 17a. Pistil 7–10 mm; capsule ca. 13 mm; petiole 1.2–5.5 cm; leaf blade 0.5–4 × 0.6–3 cm 14. *P. begoniifolia*
- 17b. Pistil 4–6 mm; capsule 4–6 mm; petiole 0.3–3.7 cm; leaf blade 0.4–2.5 × 0.4–2.2 cm.
- 18a. Style glabrous; anthers ca. 1.8 mm; petiole 0.3–2.5 cm; leaf blade 0.4–1.7 cm 15. *P. sichuanensis*
- 18b. Style pilose basally; anthers 0.5–1.2 mm; petiole 0.3–3.7 cm; leaf blade 0.5–2.5 cm.
- 19a. Leaf lateral veins conspicuous; bracts ca. 0.8 mm; anthers 1–1.2 mm; pistil 5.2–6 mm 8. *P. mairei*
- 19b. Leaf lateral veins inconspicuous; bracts ca. 2 mm; anthers 0.5–0.6 mm; pistil ca. 4 mm 13. *P. cavaleriei*
- 15b. Filaments glabrous.
- 20a. Anthers 0.6–1 mm; leaf blade 0.4–1.2 cm; petiole 0.1–2 cm.
- 21a. Corolla white, puberulent inside, tube ca. 2 mm, abaxial lip ca. 2.8 mm, adaxial lip ca. 6.8 mm; leaf blade 6–12 mm; peduncle to 8 cm; pedicel 2–3.5 cm; style pubescent near base 12. *P. longipedicellata*
- 21b. Corolla blue, glabrous inside, tube ca. 4 mm, abaxial lip ca. 0.7–1.5 mm, adaxial lip 2–2.8 mm; leaf blade 4–6 mm; peduncle 1.5–2.4 cm; pedicel 0.2–0.7 cm; style glabrous 16. *P. confluens*
- 20b. Anthers 1–2 mm; leaf blade 0.5–4 cm; petiole 1–6 cm.
- 22a. Pistil ca. 12 mm, ovary ca. 5 mm; capsule 10–12 mm; calyx segments ca. 5 mm; leaf blade 0.5–4 cm 10. *P. rosettifolia*
- 22b. Pistil 5–7 mm, ovary 1–2 mm; capsule 4–6 mm; calyx segments 2–4 mm; leaf blade 0.5–2.8 cm.
- 23a. Cymes 1-flowered; leaf blade base broadly cuneate, margin shallowly crenulate to entire; staminodes 3 9. *P. forrestii*
- 23b. Cymes 1–4-flowered; leaf blade base cordate to broadly cuneate, margin crenulate; staminodes 2 11. *P. barbata*

1. *Petrocosmea nervosa* Craib, Notes Roy. Bot. Gard. Edinburgh 11: 272. 1919.

显脉石蝴蝶 xian mai shi hu die

Petiole 0.3–7 cm, pilose; leaf blade broadly ovate, rhombic-ovate, or broadly obovate to nearly orbicular, 1–5 × 1.2–5.2 cm, adaxially pilose, hairs both short and long, abaxially pilose, base broadly cuneate to nearly truncate or cordate, margin entire to repand-crenulate,

apex obtuse to rounded; lateral veins abaxially conspicuous. Cymes 1(–4)-flowered; peduncle 3–11 cm, puberulent; bracts linear, 0.8–4 mm. Pedicel 0.6–3.2 cm. Calyx actinomorphic, 5-sect from base; segments equal, narrowly lanceolate, 2–4.5 × 0.8–2 mm, outside puberulent. Corolla blue-purple, outside appressed puberulent, inside glabrous; tube ca. 3 mm; adaxial lip ca. 5 mm, distinctly 2-lobed; abaxial lip ca. 5 mm.

Filaments 0.7–1.2 mm, glabrous; anthers ovoid, 2–2.8 mm, beakless; staminodes 2 or 3. Pistil 7–7.5 mm; ovary 1–1.5 mm, sparsely puberulent. Style sparsely puberulent near base. Capsule 5–6.5 mm. Fl. Apr–May, Sep, fr. Sep, Jan, Apr.

• Rocks in forests; 300–3100 m. SW Sichuan (Huili Xian), NW Yunnan (Eryuan Xian, Yongsheng Xian).

2. *Petrocosmea oblata* Craib, Notes Roy. Bot. Gard. Edinburgh 11: 270. 1919.

扁圆石蝴蝶 *bian yuan shi hu die*

Petiole 0.7–4 cm, puberulent to glabrescent; leaf blade obovate to orbicular-ovate or nearly orbicular, 0.7–2.8 × 0.9–3.2 cm, sparsely puberulent, base nearly cordate to truncate-cordate or broadly cuneate, margin repand, apex rounded to truncate; lateral veins inconspicuous. Cymes 1-flowered; peduncle 3.5–8.5 cm, puberulent; bracts linear to narrowly triangular, 1.1–1.5 mm. Pedicel 2–3.2 cm. Calyx actinomorphic, 5-sect from base; segments equal, narrowly lanceolate to linear or triangular-ovate, 1–3 × 0.3–1.7 mm, outside glabrous or sparsely puberulent. Corolla blue, glabrous; tube 2.5–3 mm; adaxial lip ca. 6 mm, distinctly 2-lobed; abaxial lip 6–8 mm. Filaments ca. 1.5 mm, glabrous; anthers ovoid, 1.5–2.5 mm, beakless; staminodes 2 or 3. Pistil 7–8.8 mm; ovary ca. 2.5 mm, puberulent. Style puberulent near base. Capsule ca. 4 mm. Fl. and fr. Aug–Sep.

• Montane regions or limestone soils; 2200–3000 m. SW Sichuan, NE Yunnan.

- 1a. Bracts linear, ca. 1.5 mm; calyx segments narrowly lanceolate to linear, 1–3 × 0.3–1 mm, outside sparsely puberulent, inside glabrous; staminodes 2, ca. 1 mm 2a. var. *oblata*
- 1b. Bracts narrowly triangular, ca. 1.1 mm; calyx segments triangular-ovate, 2–3 × 1–1.7 mm, glabrous; staminodes 3, ca. 0.1 mm 2b. var. *latisepala*

2a. *Petrocosmea oblata* var. *oblata*

扁圆石蝴蝶(原变种) *bian yuan shi hu die* (*yuan bian zhong*)

Bracts linear, ca. 1.5 mm. Calyx segments narrowly lanceolate to linear, 1–3 × 0.3–1 mm, outside sparsely puberulent. Staminodes 2. Fl. and fr. Aug–Sep.

• Montane regions; ca. 3000 m. SW Sichuan (Muli Xian).

2b. *Petrocosmea oblata* var. *latisepala* (W. T. Wang) W. T. Wang, Acta Bot. Yunnan. 7: 55. 1985.

宽萼石蝴蝶 *kuan e shi hu die*

Petrocosmea latisepala W. T. Wang, Bull. Bot. Res., Harbin 1(4): 37. 1981.

Bracts narrowly triangular, ca. 1.1 mm. Calyx segments triangular-ovate, 2–3 × 1–1.7 mm, glabrous. Staminodes 3. Fl. and fr. Aug–Sep.

• Limestone soils; ca. 2200 m. NE Yunnan (Huize Xian).

3. *Petrocosmea flaccida* Craib, Notes Roy. Bot. Gard. Edinburgh 11: 272. 1919.

菱软石蝴蝶 *wei ruan shi hu die*

Petiole 0.5–9 cm, spreading pilose; leaf blade obovate to orbicular-ovate or nearly orbicular, 1–3.5 × 1–4.4 cm, adaxially sparsely puberulent, hirsute, or nearly glabrous, abaxially pubescent, pilose along veins, base broadly cuneate to nearly truncate, margin entire to repand, apex rounded; lateral veins abaxially subconspicuous. Cymes 1-flowered; peduncle 3.4–8.5 cm, puberulent; bracts linear, 1–2 mm. Pedicel 1.7–2.8 cm. Calyx actinomorphic, 5-sect from base; segments equal, narrowly triangular to lanceolate, 3.2–4.2 × 0.8–1.5 mm, outside pubescent. Corolla blue-purple, outside sparsely puberulent, inside glabrous; tube ca. 2.5 mm; adaxial lip ca. 6 mm, distinctly 2-lobed; abaxial lip ca. 7 mm. Filaments ca. 1.5 mm, glabrous; anthers triangular, ca. 2 mm, beakless; staminodes 3. Pistil 8.5–10 mm; ovary ca. 3 mm, puberulent. Style puberulent near base. Capsule ca. 5 mm. Fl. Aug–Sep, fr. Sep.

• Rocky alpine cliffs; 2800–3100 m. SW Sichuan (Muli Xian), NW Yunnan (Lijiang Xian).

Petrocosmea flaccida and *P. sinensis* are very closely related and may be difficult to distinguish. The largest plants of *P. sinensis* have leaves which fit well into *P. flaccida*, and the leaf shape and indument also occasionally are similar.

4. *Petrocosmea sinensis* Oliver, Hooker's Icon. Pl. 18: pl. 1716. 1887.

中华石蝴蝶 *zhong hua shi hu die*

Petiole 0.5–3.5(–4.5) cm, puberulent to spreading pilose; leaf blade broadly rhombic to broadly rhombic-obovate or nearly orbicular, 0.9–2.5 × 0.7–1.8 cm, puberulent to densely pilose, base broadly cuneate or rounded to truncate, margin entire to repand-crenate toward apex, apex rounded to obtuse; lateral veins indistinct. Cymes 1-flowered; peduncle 3–7.5 cm, puberulent; bracts linear, 2.5–4 mm. Pedicel 1.5–3.3 cm. Calyx actinomorphic, 5-sect from base; segments equal, narrowly triangular, 3.5–6 × 1–1.5 mm, outside puberulent. Corolla purple to blue, outside puberulent to sparsely puberulent, inside glabrous; tube 3–3.5 mm; adaxial lip 6.5–8 mm, distinctly 2-lobed; abaxial lip ca. 6.5 mm. Filaments ca. 1.2 mm, glabrous; anthers oblong, ca. 3 mm, beakless; staminodes 3. Pistil 0.9–1.1 cm; ovary ca. 4 mm, appressed puberulent. Style appressed puberulent to puberulent near base. Capsule 4–6 mm. Fl. Aug–Nov, fr. Aug–Dec.

• Shaded rocks in hilly regions; 400–1700 m. W Hubei, Sichuan, N Yunnan.

5. *Petrocosmea qinlingensis* W. T. Wang, Bull. Bot. Res., Harbin 1(4): 36. 1981.

秦岭石蝴蝶 qin ling shi hu die

Petiole 0.5–2.5 cm, sparsely puberulent; leaf blade broadly ovate to rhombic-ovate or nearly orbicular, 0.7–3 × 0.7–2.8 cm, sparsely appressed puberulent, base broadly cuneate, margin repand to indistinctly crenate, apex rounded to obtuse; lateral veins indistinct. Cymes 1-flowered; peduncle 3–5 cm, sparsely puberulent; bracts linear-lanceolate, 1.6–2 mm. Pedicel 1.5–2 cm. Calyx actinomorphic, 5-sect from base; segments equal, narrowly triangular, ca. 3.8 × ca. 1 mm, outside puberulent. Corolla purplish, outside sparsely appressed puberulent, inside densely white puberulent on adaxial lip; tube ca. 2.8 mm; adaxial lip ca. 4.8 mm, distinctly 2-lobed; abaxial lip ca. 4.8 mm. Filaments ca. 1.2 mm, glabrous; anthers oblong ovoid, ca. 1.2 mm, beakless; staminodes 2. Pistil ca. 5.2 mm; ovary ca. 1 mm, spreading pubescent. Style spreading pubescent. Fruit unknown. Fl. Aug–Sep.

• Rocks in hilly regions; 700–1100 m. S Shaanxi (Mian Xian).

6. *Petrocosmea grandiflora* Hemsley, Bull. Misc. Inform. Kew 1895: 115. 1895.

大花石蝴蝶 da hua shi hu die

Petiole 0.2–8.5 cm, pilose; leaf blade elliptic or lanceolate to broadly ovate, 1.2–6.5 × 0.8–2.4 cm, adaxially sericeous, abaxially sparsely sericeous, hirsute along veins, base sometimes oblique, 1 side cuneate to broadly cuneate, other cordate to rounded or cuneate, sometimes peltate, margin shallowly crenate, apex acute to broadly acute; lateral veins conspicuous. Cymes 1–3-flowered; peduncle 2.5–5 cm, pilose; bracts linear, ca. 5 mm. Pedicel 1–1.4 cm. Calyx actinomorphic, 5-sect from base; segments equal, lanceolate, ca. 6 × 1.1 mm, outside appressed puberulent. Corolla blue, outside puberulent near base, inside glabrous; tube ca. 6 mm; adaxial lip 0.9–1.2 cm, distinctly 2-lobed; abaxial lip 1.3–1.5 cm. Filaments ca. 4 mm, puberulent; anthers oblong, ca. 2 mm, beakless; staminodes 3. Pistil 9–10 mm; ovary ca. 2 mm, pilose. Style pilose near base, glabrous above. Fruit unknown. Fl. Dec.

• Rocks of limestone hills; ca. 2000 m. SE Yunnan (Mengzi Xian).

7. *Petrocosmea duclouxii* Craib, Notes Roy. Bot. Gard. Edinburgh 11: 274. 1919.

石蝴蝶 shi hu die

Petiole 1–8 cm, puberulent; leaf blade ovate to nearly orbicular, 0.5–2.8 × 0.4–2.2 cm, adaxially densely appressed puberulent, abaxially densely pubescent, sometimes brownish pubescent along veins, base sometimes oblique, cordate to truncate, margin crenate to shallowly crenate, apex rounded to obtuse; lateral veins abaxially sometimes conspicuous. Cymes 1(or 2)-flowered; peduncle 4.5–10 cm, puberulent; bracts narrowly ovate, ca. 1 mm. Pedicel ca. 1 cm. Calyx

actinomorphic, 5-sect from base; segments equal, narrowly lanceolate, 2–4 × 0.5–1 mm, outside sparsely puberulent. Corolla blue-purple, outside sparsely puberulent, inside glabrous; tube 3–5.2 mm; adaxial lip 2.2–3 mm, distinctly 2-lobed; abaxial lip ca. 8 mm. Filaments ca. 0.7 mm, rust-brown puberulent; anthers ovoid, ca. 2.5 mm, beakless; staminodes 3. Pistil 7–9 mm; ovary ca. 2 mm, puberulent. Style appressed puberulent near base. Capsule ca. 5 mm. Fl. May–Jun, fr. Jun.

• Shaded rocks in hilly regions; 2000–2600 m. C Yunnan.

8. *Petrocosmea mairei* H. Léveillé, Bull. Acad. Int. Géogr. Bot. 25: 24. 1915.

东川石蝴蝶 dong chuan shi hu die

Petiole 0.3–3.5 cm, pilose; leaf blade ovate to nearly orbicular or elliptic, 0.5–2.5 × 0.4–1.5 cm, adaxially pilose, abaxially densely puberulent, base slightly oblique, cuneate to nearly cordate, margin entire near base, crenate-dentate toward apex, apex acute to rounded; lateral veins conspicuous. Cymes 1-flowered; peduncle 2.6–5 cm, pilose; bracts linear, ca. 0.8 mm. Pedicel ca. 6 mm. Calyx actinomorphic, 5-sect from base; segments equal, lanceolate-linear, 2.5–3.2 × 0.8–1.5 mm, outside pilose. Corolla blue, outside puberulent, inside glabrous or puberulent; tube 3–4 mm; adaxial lip ca. 3 mm, distinctly 2-lobed; abaxial lip ca. 6 mm. Filaments 0.5–2 mm, rust-brown puberulent; anthers nearly globose, 1–1.2 mm, beakless; staminodes 2(or 3). Pistil 5.2–6 mm; ovary ca. 3 mm, pilose. Style pilose near base. Capsule 4–6 mm. Fl. May, Aug, fr. Aug.

• Hilly regions; 2000–2600 m. SW Sichuan, NE Yunnan.

1a. Corolla inside sparsely puberulent below

adaxial lobes; staminodes 2 8a. var. *mairei*

1b. Corolla glabrous inside; staminodes 2 or 3

..... 8b. var. *intraglabra*

8a. *Petrocosmea mairei* var. *mairei*

东川石蝴蝶(原变种) dong chuan shi hu die (yuan bian zhong)

Corolla inside sparsely puberulent below adaxial lobes. Staminodes 2. Fl. and fr. Aug.

• Hilly regions; ca. 2600 m. SW Sichuan (Ebian Xian), NE Yunnan (Dongchuan Xian).

8b. *Petrocosmea mairei* var. *intraglabra* W. T. Wang, Acta Bot. Yunnan. 7: 57. 1985.

会东石蝴蝶 hui dong shi hu die

Corolla inside glabrous. Staminodes 2 or 3. Fl. May.

• Near rocks in shaded areas in hilly regions; ca. 2000 m. SW Sichuan (Huidong Xian).

9. *Petrocosmea forrestii* Craib, Notes Roy. Bot. Gard. Edinburgh 11: 273. 1919.

大理石蝴蝶 da li shi hu die

Petiole 1–4 cm, puberulent; leaf blade rhombic-elliptic to broadly elliptic or nearly orbicular, 0.5–2.8 × 0.4–2.6 cm, adaxially appressed puberulent to sericeous, abaxially densely pilose, base broadly cuneate, margin shallowly crenulate to entire, apex obtuse to rounded;

lateral veins inconspicuous. Cymes 1-flowered; peduncle 4–7 cm, puberulent; bracts linear, ca. 2 mm. Pedicel ca. 1.4 cm. Calyx actinomorphic, 5-sect from base; segments equal, lanceolate, 3–4 × 0.7–1 mm, outside puberulent. Corolla blue-purple, outside sparsely puberulent, inside densely pubescent on adaxial lip; tube 3.5–4 mm; adaxial lip 3.5–5 mm, distinctly 2-lobed; abaxial lip 7–9 mm. Filaments 1.5–2 mm, glabrous; anthers oblong, 1–2 mm, beakless; staminodes 3. Pistil 5–7 mm; ovary 1–2 mm, puberulent toward style. Style puberulent to glabrescent. Capsule 4–5 mm. Fl. and fr. Jul.

• Rocks in shady areas; 1600–2000 m. SW Sichuan, N Yunnan.

10. *Petrocosmea rosettifolia* C. Y. Wu ex H. W. Li, Bull. Bot. Res., Harbin 3(2): 19. 1983.

莲座石蝴蝶 *lian zuo shi hu die*

Petiole to 4 cm, puberulent; leaf blade broadly ovate to orbicular or broadly elliptic, 0.5–4 × 0.4–3 cm, sparsely pubescent, base broadly cuneate to nearly rounded, margin entire to crenulate-serrulate toward apex, apex obtuse to broadly acute; lateral veins inconspicuous. Cymes 1-flowered; peduncle to 6 cm, puberulent; bracts subulate to linear-lanceolate, 1–3 mm. Pedicel ca. 1.5 cm. Calyx actinomorphic, 5-sect from base; segments equal, linear-lanceolate, ca. 5 × 1 mm, outside densely puberulent. Corolla color unknown, outside sparsely pubescent; tube ca. 4.5 mm; adaxial lip ca. 5 mm, distinctly 2-lobed; abaxial lip 7–8 mm. Filaments ca. 1 mm, glabrous; anthers ovoid-oblong, ca. 2 mm, beakless; staminodes 3. Pistil ca. 1.2 cm; ovary ca. 5 mm, puberulent. Style puberulent near base. Capsule 1–1.2 cm. Fl. and fr. Oct.

• Rocks in hilly regions; ca. 1400 m. Yunnan (Jingdong Xian).

11. *Petrocosmea barbata* Craib, Notes Roy. Bot. Gard. Edinburgh 11: 273. 1919.

髯毛石蝴蝶 *ran mao shi hu die*

Petiole 1.4–6 cm, puberulent; leaf blade ovate to orbicular, 0.6–2.8 × 0.5–2.9 cm, adaxially sparsely puberulent, abaxially densely puberulent, base cordate to broadly cuneate, margin crenulate, apex broadly obtuse to rounded; lateral veins inconspicuous. Cymes 1–4-flowered; peduncle 6–9 cm, sparsely puberulent; bracts linear, ca. 2 mm. Pedicel 0.5–3 cm. Calyx actinomorphic, 5-sect from base; segments equal, lanceolate, 2–3.5 × 0.5–1 mm, outside puberulent. Corolla purplish, outside puberulent, inside adaxial lip and tube near mouth densely puberulent; tube ca. 2.8 mm; adaxial lip ca. 4 mm, distinctly 2-lobed; abaxial lip 8–9 mm. Filaments ca. 1.5 mm, glabrous; anthers globose-ovoid, 1–1.5 mm, beakless; staminodes 2. Pistil ca. 5.5 mm; ovary ca. 1 mm, villous. Style villous near base. Capsule 4–6 mm. Fl. Oct.

• Rocks in shady places of hilly regions; ca. 2100 m. Yunnan (Kunming Xian, Songming Xian).

12. *Petrocosmea longipedicellata* W. T. Wang, Acta Bot. Yunnan. 7: 58. 1985.

长梗石蝴蝶 *chang geng shi hu die*

Petiole to 2 cm, puberulent; leaf blade orbicular-ovate to deltoid-ovate or deltoid, 6–12 × 6–14 mm, appressed puberulent to densely appressed puberulent, base cordate-truncate to truncate, margin repand, apex rounded; lateral veins inconspicuous. Cymes 1–3-flowered; peduncle to 8 cm, puberulent; bracts linear, 1.5–2 mm. Pedicel 2–3.5 cm. Calyx actinomorphic, 5-sect from base; segments equal, triangular-linear, ca. 2.2 × 0.8 mm, outside puberulent. Corolla white, outside sparsely puberulent, inside puberulent; tube ca. 2 mm; adaxial lip ca. 2.8 mm, distinctly 2-lobed; abaxial lip ca. 6.8 mm. Filaments ca. 1 mm, glabrous; anthers ellipsoid, ca. 0.6 mm, beakless; staminodes 2. Pistil ca. 4 mm; ovary ca. 1 mm, spreading pubescent toward style. Style spreading pubescent near base. Capsule ca. 5 mm. Fl. Sep–Oct, fr. Oct.

• Forests of hilly regions; 1100–1200 m. Yunnan (Suijiang Xian).

13. *Petrocosmea cavaleriei* H. Lévillé, Repert. Spec. Nov. Regni Veg. 9: 329. 1911.

贵州石蝴蝶 *gui zhou shi hu die*

Petiole 1–3.7 cm, puberulent; leaf blade orbicular-ovate to broadly ovate, 0.6–2.4 × 0.6–2.2 cm, adaxially pubescent, abaxially sparsely puberulent, base nearly cordate to cordate-truncate, margin crenate to shallowly crenate, apex obtuse to rounded; lateral veins inconspicuous. Cymes 1-flowered; peduncle 3.5–7 cm, sparsely pilose; bracts linear, ca. 2 mm. Pedicel 1.2–1.5 cm. Calyx actinomorphic, 5-sect from base; segments equal, narrowly lanceolate, 1.8–3 × 0.3–0.6 mm, outside pilose. Corolla purplish, outside puberulent near base, inside sparsely pilose on adaxial lip; tube 2–3 mm; adaxial lip 2–4 mm, distinctly 2-lobed; abaxial lip 5–8 mm. Filaments ca. 1 mm, pilose; anthers broadly oblate, 0.5–0.6 mm, beakless; staminode 1. Pistil ca. 4 mm; ovary ca. 1.5 mm, pilose. Style pilose near base. Capsule ca. 5 mm. Fl. and fr. Oct.

• Guizhou (Pingba Xian, Huishui Xian).

14. *Petrocosmea begoniifolia* C. Y. Wu ex H. W. Li, Bull. Bot. Res., Harbin 3(2): 22. 1983.

秋海棠叶石蝴蝶 *qiu hai tang ye shi hu die*

Petiole 1.2–5.5 cm, puberulent; leaf blade obliquely ovate to nearly orbicular, 0.5–4 × 0.6–3 cm, puberulent, base cordate to truncate, margin crenulate-denticulate to remotely serrate, apex obtuse to acute; lateral veins indistinct. Cymes 1 (or 2)-flowered; peduncle 2.5–6.5 cm, puberulent; bracts linear, 1–4 mm. Pedicel ca. 8 mm. Calyx actinomorphic, 5-sect from base; segments equal, linear-lanceolate, 3–5 × ca. 0.8 mm, outside puberulent. Corolla white, outside sparsely puberulent, inside glabrous; tube 7–8 mm; adaxial lip 3.5–5 mm,

distinctly 2-lobed; abaxial lip 6.5–8 mm. Filaments ca. 3 mm, densely pubescent; anthers nearly globose, ca. 2.5 mm, beakless; staminodes 2. Pistil 7–10 mm; ovary 3.5–5 mm, sparsely pubescent. Style glabrous. Capsule ca. 1.3 cm. Fl. and fr. Apr–May.

• Steep cliffs or rocks in valleys; 1600–2200 m. Yunnan (Jingdong Xian).

15. *Petrocosmea sichuanensis* W. Y. Chun ex W. T. Wang, Bull. Bot. Res., Harbin 4(1): 10. 1984.

四川石蝴蝶 si chuan shi hu die

Petiole 0.3–2.5 cm, puberulent; leaf blade ovate to broadly ovate, seldom elliptic, 4–17 × 4–12 mm, puberulent to densely puberulent, base cordate to broadly cuneate, sometimes peltate, margin crenulate to subentire, apex broadly acute to obtuse; lateral veins inconspicuous. Cymes 1-flowered; peduncle 2.2–5 cm, puberulent; bracts unknown. Calyx actinomorphic, 5-sect from base; segments equal, lanceolate, 2–2.5 × 0.8–1 mm, outside puberulent. Corolla purple-blue, outside sparsely puberulent, inside glabrous; tube ca. 4 mm; adaxial lip 2–3 mm, distinctly 2-lobed; abaxial lip 5–6 mm. Filaments ca. 1.2 mm, densely brownish puberulent toward apex; anthers nearly oblong, ca. 1.8 mm, beakless; staminodes apparently absent. Pistil ca. 5 mm; ovary ca. 1 mm, puberulent toward style. Style glabrous. Capsule ca. 5 mm. Fl. and fr. Jun.

• Rocks in valleys; 500–2200 m. Sichuan (Yuexi Xian).

16. *Petrocosmea confluens* W. T. Wang, Bull. Bot. Res., Harbin 4(1): 9. 1984.

汇药石蝴蝶 hui yao shi hu die

Petiole 0.1–1.7 cm, spreading puberulent; leaf blade broadly ovate to nearly orbicular, 4–6 × 4–9 mm, densely puberulent, base nearly cordate, margin crenulate, apex rounded to obtuse; lateral veins indistinct. Cymes 1-flowered; peduncle 1.5–2.4 cm, spreading puberulent; bracts linear, ca. 1 mm. Pedicel 2–7 mm. Calyx actinomorphic, 5-sect from base; segments equal, linear-lanceolate, 1.8–2.9 × 0.6–0.9 mm, outside densely puberulent. Corolla blue, outside puberulent, inside glabrous; tube 2.2–3 mm; adaxial lip 0.7–1.5 mm, distinctly 2-lobed; abaxial lip 2–2.8 mm. Filaments 1–1.2 mm, glabrous; anthers triangular, ca. 1 mm, beakless; staminode 1. Pistil ca. 4.5 mm; ovary ca. 1.3 mm, densely puberulent. Style glabrous. Fruit unknown. Fl. Apr.

• Rocky slopes in valleys; ca. 1300 m. S Guizhou (Wangmo Xian).

17. *Petrocosmea coerulea* C. Y. Wu ex W. T. Wang, Acta Bot. Yunnan. 7: 60. 1985.

蓝石蝴蝶 lan shi hu die

Petiole 1.5–2.7 cm, densely appressed puberulent; leaf blade slightly oblique, oblong to elliptic or elliptic-ovate, 1–6.6 × 0.7–2.2 cm, densely appressed puberulent, base peltate, margin nearly entire to

indistinctly few repand-crenate, apex slightly obtuse; lateral veins abaxially slightly impressed. Cymes 1-flowered; peduncle 1.5–2.2 cm, spreading puberulent; bracts linear, 1–1.2 mm. Pedicel 1–1.5 cm. Calyx actinomorphic, 5-sect from base; segments equal, lanceolate-linear, 3–3.2 × ca. 1 mm, outside puberulent. Corolla blue, outside puberulent, inside glabrous; tube ca. 4.5 mm; adaxial lip ca. 3.5 mm, distinctly 2-lobed; abaxial lip ca. 6 mm. Filaments ca. 1.2 mm, puberulent above; anthers cordate-ovoid, ca. 2.2 mm, beakless; staminodes 2. Pistil ca. 8 mm; ovary ca. 2.5 mm, puberulent. Style glabrous. Fruit unknown. Fl. Apr.

• Rocks in valleys; ca. 500 m. SE Yunnan (Jinping Xian).

18. *Petrocosmea iodioides* Hemsley, Hooker's Icon. Pl. 26: pl. 2599. 1899.

蒙自石蝴蝶 meng zi shi hu die

Petiole 2–6(–8) cm, matted hirsute; leaf blade ovate to nearly orbicular, 1.5–3.8(–4.9) × 1–4.5 cm, adaxially hirsute, abaxially velutinous, base cordate, margin denticulate to crenulate or serrate, apex broadly acute; lateral veins abaxially conspicuous. Cymes (1 or) 2–4-flowered; peduncle 4–7.5 cm, pubescent; bracts linear, 2.5–4 mm. Pedicel 0.4–1.6 cm. Calyx actinomorphic, 5-sect from base; segments equal, narrowly lanceolate, 5–7 × 1–1.2 mm, outside villous. Corolla blue-purple, outside sparsely puberulent, inside glabrous; tube ca. 6.5 mm; adaxial lip ca. 3 mm, indistinctly 2-lobed; abaxial lip ca. 1.2 cm. Filaments 2.2–2.5 mm, puberulent; anthers ellipsoid, ca. 3 mm, beakless; staminodes 2. Pistil ca. 9 mm; ovary 2–2.5 mm, densely puberulent. Style glabrous. Capsule 7–11 mm. Fl. May, Nov, fr. Nov.

• Forests, on shaded cliffs in hilly regions; 1100–2500 m. SW Guangxi, SE Yunnan (Mengzi Xian).

19. *Petrocosmea martinii* (H. Léveillé) H. Léveillé, Repert. Spec. Nov. Regni Veg. 9: 329. 1911.

滇黔石蝴蝶 dian qian shi hu die

Petiole 0.5–3.5 cm, spreading hirsute; leaf blade ovate to orbicular-ovate, 0.7–2(–2.6) × 0.5–1.5(–1.9) cm, adaxially pilose, abaxially densely pilose, base cordate to rounded, margin crenulate to denticulate, apex rounded to obtuse; lateral veins inconspicuous. Cymes 1(or) 2-flowered; peduncle 3–5 cm, pilose; bracts linear, 1–2 mm. Pedicel 3–14(–19) mm. Calyx actinomorphic, 5-sect from base; segments equal, narrowly lanceolate, 2.5–3 × 0.8–1.5 mm, outside puberulent. Corolla blue-purple, outside puberulent, inside glabrous; tube to 3 mm; adaxial lip ca. 3 mm, indistinctly 2-lobed; abaxial lip ca. 8.5 mm. Filaments 2–3 mm, rust-brown puberulent or glabrous; anthers oblong, ca. 2 mm, beakless; staminodes 2. Pistil 6–8 mm; ovary 1.5–2 mm, puberulent. Style glabrous. Capsule 3.5–5(–7) mm. Fl. and fr. May–Jun.

• Rocky, shaded cliffs in hilly regions; ca. 1000 m. Guizhou, SE Yunnan.

1a. Filaments rust-brown puberulent 19a. var. *martinii*

1b. Filaments glabrous 19b. var. *leiandra*

19a. *Petrocosmea martinii* var. *martinii*

滇黔石蝴蝶(原变种) dian qian shi hu die (yuan bian zhong)

Vaniotia martinii H. Léveillé, Bull. Acad. Int. Géogr. Bot. 12: 166. 1903.

Filaments rust-brown puberulent. Fl. and fr. Jun.

• Rocky cliffs in hilly regions; ca. 1000 m. Guizhou (Pingba Xian, Qingzhen Xian), SE Yunnan.

19b. *Petrocosmea martinii* var. *leiandra* W. T. Wang, Bull. Bot. Res., Harbin 4(1): 11. 1984.

光蕊滇黔石蝴蝶 guang rui dian qian shi hu die

Filaments glabrous. Fl. and fr. May.

• Steep, shaded cliffs. Guizhou (Qingzhen Xian).

20. *Petrocosmea sericea* C. Y. Wu ex H. W. Li, Bull. Bot. Res., Harbin 3(2): 21. 1983.

丝毛石蝴蝶 si mao shi hu die

Petiole 1–4 cm, densely brownish yellow appressed puberulent; leaf blade elliptic to ovate, 1.5–6.5 × 0.8–3.5(–4.5) cm, brownish yellow appressed puberulent, base broadly cuneate to cuneate, margin nearly entire to repand-crenate, apex broadly acute; lateral veins abaxially conspicuous. Cymes 1–3-flowered; peduncle 5.5–7 cm, densely brownish yellow appressed puberulent; bracts linear, 3–6 mm. Pedicel 4–12 mm. Calyx actinomorphic, 5-sect from base; segments equal, linear, 5.5–6 × ca. 1 mm, outside densely brownish yellow appressed puberulent. Corolla purple-blue, outside sparsely puberulent, inside glabrous; tube ca. 5 mm; adaxial lip ca. 5 mm, indistinctly 2-lobed; abaxial lip ca. 8 mm. Filaments ca. 3 mm, minutely hispid; anthers ca. 1 mm, beakless; staminodes 2. Pistil ca. 1 cm; ovary ca. 3 mm, appressed puberulent. Style sparsely puberulent near base. Capsule to 1.2 cm. Fl. Oct, fr. Nov–Jan.

• Rocks in valley forests; 1000–1700 m. SE Yunnan (Malipo Xian, Pingbian Xian).

21. *Petrocosmea minor* Hemsley, Hooker's Icon. Pl. 26: pl. 2600. 1899.

小石蝴蝶 xiao shi hu die

Petrocosmea henryi Craib.

Petiole 0.5–5(–7) cm, whitish to tan densely pubescent; leaf blade rhombic to elliptic to ovate or obovate, rarely nearly orbicular, (0.5–)1–2(–5) × 0.5–1.5(–2.4) cm, adaxially densely whitish to tan pubescent, hairs both long and short, abaxially densely puberulent, base broadly cuneate to cuneate, rarely rounded, margin crenate to repand-crenulate or serrate, apex broadly acute to rounded; lateral veins abaxially

conspicuous. Cymes 1- or 2-flowered; peduncle 3.5–7.5 cm, whitish to tan pubescent; bracts linear, 2–4 mm.

Pedicel 1.4–2.5 cm. Calyx actinomorphic, 5-sect from base; segments equal, narrowly triangular, 3–6 × 0.6–

1.2 mm, outside whitish to tan pubescent. Corolla

purple with whitish base, outside pubescent, inside

glabrous; tube 2.5–5 mm; adaxial lip 2–4 mm,

indistinctly 2-lobed; abaxial lip 0.8–1.2 cm. Filaments

ca. 2.2 mm, densely brown puberulent near apex;

anthers narrowly ovoid, ca. 3 mm, beakless; staminodes

2. Pistil 8–11 mm; ovary 2–3 mm, appressed

puberulent. Style appressed puberulent near

base. Capsule 5–8(–10) mm. Fl. and fr. Aug–Nov.

• Limestone rocks in forests, forest margin; 1000–2200 m. SE Yunnan.

22. *Petrocosmea menglianensis* H. W. Li, Bull. Bot. Res., Harbin 3(2): 23. 1983.

孟连石蝴蝶 meng lian shi hu die

Petiole 1.4–10 cm, rust-brown villous; leaf blade

oblique, elliptic to elliptic-ovate, 7.5–8.5 × 5–6 cm,

adaxially rust-brown pubescent, abaxially rust-brown

pubescent along midrib and lateral veins, base

sometimes oblique, rounded to cuneate on 1 side,

rounded on other, margin irregularly dentate, apex

broadly acute to obtuse; lateral veins abaxially

conspicuous. Cymes ca. 3-flowered; peduncle ca. 8 cm,

rust-brown pubescent; bracts subulate to lanceolate, 3–4

mm. Pedicel 1.1–1.4 cm. Calyx actinomorphic, 5-sect

from base; segments equal, linear-lanceolate, 5–6 × ca.

1.5 mm, outside rust-brown pubescent. Corolla white,

inside blackish near mouth, outside sparsely white

puberulent, inside with small scales; tube ca. 3 mm;

adaxial lip ca. 3.5 mm, distinctly 2-lobed; abaxial lip ca.

4 mm. Filaments ca. 1 mm, puberulent; anthers broadly

ellipsoid, ca. 3 mm, beaked ca. 0.5 mm; staminodes 3.

Pistil ca. 5.5 mm; ovary ca. 2.5 mm, minutely villous.

Style glabrous. Fruit unknown. Fl. Aug.

• Damp rocks in forests on limestone hills. SW Yunnan (Menglian Xian).

23. *Petrocosmea grandifolia* W. T. Wang, Acta Bot. Yunnan. 7: 63. 1985.

大叶石蝴蝶 da ye shi hu die

Petiole 5–15 cm, densely brownish pubescent; leaf

blade oblique, ovate to broadly ovate, 8–17.5 × 5.2–

13.5 cm, adaxially pubescent, abaxially puberulent,

base very oblique, broadly cuneate on 1 side, nearly

cordate to auriculate-peltate on other, margin

irregularly denticulate, apex acute; lateral veins abaxially

conspicuous. Cymes 3–7-flowered; peduncle 6–10

cm, pubescent; bracts ovate to lanceolate, unequal, 5–

12 mm. Pedicel 0.5–2.2 cm. Calyx actinomorphic, 5-

sect from base; segments equal, lanceolate-linear to

narrowly triangular, 6.5–8 × 1.5–2.5 mm, outside

puberulent. Corolla white, purplish adaxially near base,

outside glabrous, inside densely minute yellow

glandular and sparsely pubescent below abaxial lip; tube ca. 4 mm; adaxial lip ca. 7 mm, distinctly 2-lobed; abaxial lip ca. 6 mm. Filaments 0.8–1 mm, puberulent; anthers narrowly ovoid, 2.8–3 mm, beaked ca. 0.3 mm; staminodes 3. Pistil ca. 1 cm; ovary ca. 3.5 mm, puberulent. Style glabrous. Capsule ca. 6 mm. Fl. Aug–Sep, fr. Sep.

- Rocky crevices in forests; ca. 1000 m. SW Yunnan (Zhenkang Xian).

24. *Petrocosmea kerrii* Craib, Bull. Misc. Inform. Kew 1918: 365. 1918.

滇泰石蝴蝶 dian tai shi hu die

Petiole 0.5–9.5 cm, pubescent to densely hirsute; leaf blade oblique, elliptic to rhombic-elliptic or ovate, 1.8–13.5 × 1.2–8.5 cm, densely hirsute to densely puberulent, base usually oblique, rounded on 1 side, broadly cuneate to rounded on other, margin dentate, apex broadly acute to obtuse, rarely rounded; lateral veins abaxially conspicuous. Cymes subumbel-like, 1–7-flowered; peduncle 2–6 cm, densely hirsute to appressed puberulent; bracts lanceolate, ca. 2 × 0.5 mm. Pedicel 1–1.5 cm. Calyx zygomorphic, 3-sect from base, outside puberulent to woolly; adaxial lobe larger, 3-lobed from near to above middle, 3–5 × ca. 4 mm; abaxial 2 lobes smaller, entire, triangular to ovate-rhombic, 2.5–5 × 1.5–2 mm. Corolla white, outside puberulent, inside glabrous or somewhat puberulent; tube ca. 4 mm; adaxial lip ca. 6 mm, distinctly 2-lobed; abaxial lip ca. 8 mm. Filaments ca. 1.2 mm, puberulent; anthers ellipsoid, ca. 3 mm, beaked ca. 0.5 mm; staminodes 3. Pistil ca. 8.5 mm; ovary 2–2.5 mm, sparsely puberulent. Style sparsely puberulent near base. Capsule 5–6.5 mm. Fl. Jun–Sep.

Rocks in forests; 1500–3100 m. S and SW Yunnan [N Myanmar, N Thailand].

- 1a. Calyx puberulent outside, margin denticulate to subentire with very small, narrowly triangular teeth, abaxial 2 lobes narrowly triangular 24a. var. *kerrii*
- 1b. Calyx woolly outside, margin denticulate with small, deltoid teeth, abaxial 2 lobes triangular to ovate-rhombic 24b. var. *crinita*

24a. *Petrocosmea kerrii* var. *kerrii*

滇泰石蝴蝶(原变种) dian tai shi hu die (yuan bian zhong)

Damrongia kerrii (Craib) Pellegrin; *Petrocosmea wardii* W. W. Smith.

Calyx with abaxial 2 lobes narrowly triangular, outside puberulent, margin denticulate to subentire with very small, narrowly triangular teeth. Fl. Jun, Sep.

Rocks in forests; 1900–3100 m. SW Yunnan [N Myanmar, N Thailand].

24b. *Petrocosmea kerrii* var. *crinita* W. T. Wang, Acta Bot. Yunnan. 7: 66. 1985.

棉毛石蝴蝶 mian mao shi hu die

Calyx with abaxial 2 lobes triangular to ovate-rhombic, outside woolly, margin denticulate with small, deltoid teeth. Fl. Jul.

- Forests; ca. 1500 m. S Yunnan (Mengzi Xian).

