

7. TRIPTEROSPERMUM Blume, Bijdr. 849. 1826.

双蝴蝶属 *shuang hu die shu*

Perennials. Stems elongated and twining or prostrate and creeping, rarely erect in some individuals. Leaves opposite. Inflorescences axillary and terminal, 1-flowered or in cymes. Flowers 5-merous. Calyx tube usually with 5 keeled ridges. Corolla tubular or broadly tubular, plicae present. Stamens inserted at basal part of corolla tube, unequal, apically recurved. Nectaries conspicuously developed, forming a collarlike disc surrounding base of ovary. Ovary 1-locular; ovules many. Style slender, slightly recurved; stigma linear, recurved at anthesis. Fruit a capsule or berry, many seeded. Seeds triquetrous to compressed, winged or wingless.

About 25 species: E and S Asia; 19 species in China.

Some species of *Tripterospermum* are very similar in flower, and fruit with seeds may be necessary for positive identification.

- 1a. Gynophore somewhat shorter to almost as long as ovary at anthesis, distinctly elongated in fruit; corolla persistent in fruit.
 - 2a. Fruit a capsule.
 - 3a. Calyx lobes 2–4 mm, tube wingless or narrowly winged; petiole 3–10 mm; leaf blade membranous 2. *T. discoideum*
 - 3b. Calyx lobes 6–9 mm, tube with 5 keeled ridges; leaves sessile or subsessile; leaf blade herbaceous 3. *T. chinense*
 - 2b. Fruit a berry.
 - 4a. Corolla white; seeds distinctly winged 6. *T. volubile*
 - 4b. Corolla pale yellow, pink, blue, violet, or purple (occasionally white in *T. lanceolatum*); seeds obscurely winged or wingless (unknown in *T. filicaule*).
 - 5a. Anthers ca. 1.5 mm; leaf blade usually ovate 7. *T. filicaule*
 - 5b. Anthers 1–1.2 mm; leaf blade usually lanceolate, occasionally narrowly ovate.
 - 6a. Calyx tube narrowly winged; fruit exserted from corolla 5. *T. lanceolatum*
 - 6b. Calyx tube wingless; fruit included in corolla 8. *T. pingbianense*
- 1b. Gynophore distinctly shorter than ovary at anthesis and in fruit; corolla not persistent or at least withered in fruit.
 - 7a. Stems trailing and rooting at nodes, not twining; leaf blade ovate to cordate (usually lanceolate to ovate in *T. microphyllum*).
 - 8a. Leaf blade base rounded to truncate; corolla less than 3.5 cm 9. *T. microphyllum*
 - 8b. Leaf blade base of larger leaves cordate; corolla over 3.5 cm.
 - 9a. Calyx lobes linear to oblanceolate; gynophore of mature fruit 4–7 mm; pistil exserted from corolla 10. *T. cordifolium*
 - 9b. Calyx lobes linear-subulate to lanceolate; fruit scarcely stipitate; pistil included in corolla 11. *T. cordifolioides*
 - 7b. Stems twining; leaf blade lanceolate to ovate.
 - 10a. Fruit a capsule 1. *T. coeruleum*
 - 10b. Fruit a berry.
 - 11a. Calyx tube cylindric, with puberulent and/or scabrous-ciliate ridges; lobes shorter than tube 16. *T. hirticalyx*
 - 11b. Calyx tube campanulate, smooth or with nonciliate ridges; lobes usually longer than tube.
 - 12a. Corolla white, greenish white, or pale yellow, at most tinged with purple.
 - 13a. Bracts ovate to triangular; ovary distinctly longer than calyx tube 14. *T. taiwanense*
 - 13b. Bracts lanceolate; ovary as long as calyx tube.
 - 14a. Calyx lobes linear to linear-lanceolate; corolla plicae semiorbicular; seeds narrowly winged 12. *T. pallidum*
 - 14b. Calyx lobes lanceolate; corolla plicae ovate to triangular; seeds wingless 15. *T. alutaceifolium*
 - 12b. Corolla distinctly rose-violet, blue, or purple.
 - 15a. Fruit subglobose; corolla 1.8–3.2 cm 4. *T. luzonense*
 - 15b. Fruit ellipsoid; corolla 3.3–5 cm.
 - 16a. Ovary about as long as calyx tube.
 - 17a. Peduncle with scalelike or subulate bracts; calyx lobes arcuate spreading 13. *T. australe*
 - 17b. Peduncle with leafy bracts; calyx lobes ascending or recurved only near tip 17. *T. cordatum*

- 18a. Corolla dark violet-blue; leaves thicker than membranous 18. *T. nienkui*
 18b. Corolla rose-violet; leaf blade membranous 19. *T. membranaceum*

1. *Tripterospermum coeruleum* (Handel-Mazzetti) Harry Smith, Notes Roy. Bot. Gard. Edinburgh 26: 246. 1965.

盐源双蝴蝶 yan yuan shuang hu die

Crawfordia coerulea Handel-Mazzetti, Symb. Sin. 7: 950. 1936; *Gentiana cyanea* C. Marquand.

Stems twining, terete, 2–3 mm in diam. Petiole 5–10 mm, slender; leaf blade lanceolate to ovate-lanceolate, 6–7 × 1–2.5 cm, base rounded, margin entire or sometimes slightly revolute, apex acuminate to sometimes caudate, veins 3. Inflorescences 1–3-flowered cymes; bracts 1–3 pairs, ovate, to 1 cm. Pedicel 3–10 mm. Calyx campanulate; tube 1–1.4 cm, broadly winged; lobes linear-lanceolate, 5–6 mm. Corolla blue, narrowly campanulate, 3.5–4 cm; lobes ovate-triangular, 5–6 mm, apex acuminate and caudate; plicae semiorbicular, 1.5–2 mm, margin entire or crenulate. Filaments linear, 1.8–2 cm; anthers ellipsoid, ca. 1.5 mm. Disc ca. 1 mm. Style 8–10 mm. Capsules ellipsoid to obovoid-ellipsoid, ca. 3 mm, included in persistent corolla; gynophore less than 5 mm. Seeds light brown, discoid to compressed triquetrous, 2–2.5 mm, broadly winged along ridges. Fl. and fr. Sep-Oct.

- Scrub, bamboo thickets; 2500–3100 m. SW Sichuan.

2. *Tripterospermum discoideum* (C. Marquand) Harry Smith, Notes Roy. Bot. Gard. Edinburgh 26: 244. 1965.

湖北双蝴蝶 hu bei shuang hu die

Gentiana discoidea C. Marquand, Bull. Misc. Inform. Kew 1931: 72. 1931; *G. caudata* C. Marquand.

Stems terete, 1–3 mm in diam. Petiole 3–10 mm; leaf blade lanceolate to ovate-lanceolate, 3–10 × 1.5–5.5 cm, membranous, base rounded to subcordate, margin entire and sometimes slightly revolute, apex ± short acuminate to acuminate-caudate, veins 3–5. Inflorescences 1–5-flowered cymes; bracts 1–5 pairs, lanceolate to triangular, 2–6(–10) mm. Pedicel 3–10 mm. Calyx campanulate; tube 1–1.4 cm, wingless or narrowly winged; lobes linear-subulate to linear-lanceolate, 2–4 mm. Corolla pale blue, blue, blue-purple, or purple, narrowly campanulate to campanulate, 3–5 cm; lobes ovate-triangular, 6–9 mm, apex acuminate; plicae semiorbicular, 1.5–3 mm, margin entire or crenate. Filaments linear to linear-subulate, 1.3–2.2 cm; anthers ellipsoid to ovoid, ca. 1.5 mm. Disc 1–5 mm. Style 8–11 mm. Capsules ellipsoid, 2–2.5 cm × 7–8 mm, partially exerted from persistent corolla; gynophore 1–1.5 cm. Seeds light brown, orbicular, compressed, 2–2.5 × 0.7–0.8 mm; wings discoid. Fl. and fr. Aug-Dec.

- Grassland slopes; 600–2000 m. W Hubei, S Shaanxi, E Sichuan.

3. *Tripterospermum chinense* (Migo) Harry Smith in S. Nilsson, Grana Palynol. 7(1): 144. 1967.

双蝴蝶 shuang hu die

Crawfordia chinensis Migo, J. Shanghai Sci. Inst. 3: 154. 1939; *Tripterospermum carlesii* Harry Smith.

Stems terete, to 1.5 m, 2–3 mm in diam. Basal leaves 2 pairs, prostrate, sessile, elliptic, broadly oblong, or obovate-oblong, 3–6.5 × 1.5–5.5 cm, base rounded, margin entire, apex acuminate and mucronate; stem leaves sessile to subsessile with petiole 0.2–0.3 mm; leaf blade ovate-lanceolate to lanceolate, 5–10 × 2–3.5 cm, herbaceous, base rounded, truncate, or cordate, margin entire, apex ± short acuminate to acuminate-attenuate; veins 3, prominent. Inflorescences 1–4-flowered cymes. Pedicel 5–10 mm; bractlets 1–3 pairs, small. Calyx 1.6–2 cm; lobes linear-lanceolate, 6–9 mm. Corolla blue-purple to pale purple, narrowly campanulate, 4–4.5 cm; lobes ovate-triangular, 5–6 mm, apex acuminate to acute; plicae semiorbicular, 2.5–3 mm, margin crenate. Filaments linear, 1.3–2 cm; anthers ovoid, ca. 1.5 mm. Disc ca. 1.5 mm. Style linear, 8–11 mm. Capsules ellipsoid, 2–2.5 cm × 7–8 mm; gynophore 1–1.5 cm. Seeds light brown, orbicular, compressed, ca. 2 mm in diam.; wings discoid. Fl. and fr. Oct-Dec.

- Grasslands, scrub, forest margins, forests; 300–1100 m. Anhui, Fujian, Guangxi, Jiangsu, Jiangxi, Zhejiang.

4. *Tripterospermum luzonense* (Vidal) J. Murata, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 14: 305. 1989.

高山双蝴蝶 gao shan shuang hu die

Crawfordia luzonensis Vidal, Revis. Pl. Vasc. Filip. 191. 1886; *Tripterospermum taiwanense* (Masamune) Satake var. *alpinum* Satake.

Plant size variable, generally smaller at higher elevations. Stems slender, spirally twisted, twining, terete. Petiole to 1.7 cm; leaf blade lanceolate to triangular-ovate, occasionally linear-lanceolate, 1.5–7 × 0.3–2.3 cm, base rounded to shallowly cordate, margin crenulate, apex long acuminate and caudate, veins 3. Flowers 1 or 2, axillary and terminal on an axillary peduncle; peduncle 0.5–2 cm; bracts leafy, triangular-ovate or scaly. Flowers sessile or pedicel to 3 mm. Calyx campanulate; tube 3–7 mm, wingless, expanded in fruit; lobes ascending, linear, 1–7 mm. Corolla light pink-purple, longitudinally purple striped outside, narrowly campanulate, 1.8–3.2 cm; lobes triangular, 2–3 mm; plicae suborbicular, 1–1.5 mm. Filaments 1.2–2 cm; anthers ellipsoid, ca. 0.8 mm. Disc 1–1.5 mm. Ovary 6–12 mm; gynophore 2–4 mm. Style 1–1.2 cm. Berries red-purple, subglobose, 0.7–1.6 × 0.7–1.2 cm. Seeds brown, triquetrous, wingless. Fl. and fr. Sep-Mar.

- Forest margins, roadside scrub; (1500–)2000–3000 m. Taiwan [Indonesia, Philippines].

The Taiwanese material of *Tripterospermum luzonense* has often been incorrectly reported as *T. japonicum* (Siebold & Zuccarini) Maximowicz, which occurs in Japan and Korea.

5. *Tripterospermum lanceolatum* (Hayata) H. Hara ex Satake, J. Jap. Bot. 26: 108. 1951.

玉山双蝴蝶 yu shan shuang hu die

Crawfordia lanceolata Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 201. 1911.

Stems spirally twisted, twining, slender, terete, striate. Petiole 0.5–1.5 cm, slender; leaf blade lanceolate, occasionally narrowly ovate, 3–8.5 × 0.6–3 cm, base rounded to subcordate, margin entire or crenulate, apex acuminate; veins 3. Inflorescences 1-flowered or cymes; bracts usually 1(–4) pairs, to 1 cm. Pedicel 0.2–1.5 cm. Calyx campanulate; tube (5–)7–12 mm, narrowly winged; lobes linear to linear-lanceolate, 5–14 mm, apex acuminate. Corolla white, pale yellow, pink, blue, or dark purple, narrowly campanulate, (2.5–)3–5 cm; lobes triangular, 4–5 mm, apex acuminate to acute; plicae semiorbicular, 1.5–2 mm, margin crenulate to erose. Filaments linear-subulate to linear, 1.5–2.2 cm; anthers ellipsoid, ca. 1 mm. Disc 1–1.2 mm. Ovary 0.8–1.5 cm; gynophore (0.3–)0.5–1.5 cm. Style 1–1.5 cm. Berries fusiform to ellipsoid, exserted from corolla. Fl. and fr. Aug–Dec.

• Scattered scrub, roadside slopes; 1500–3000 m. Taiwan.

6. *Tripterospermum volubile* (D. Don) H. Hara, J. Jap. Bot. 40: 21. 1965.

尼泊尔双蝴蝶 ni bo er shuang hu die

Gentiana volubilis D. Don, Prodr. Fl. Nepal. 126. 1825.

Stems spirally twisted, twining, slender, terete, striate. Petiole 0.5–1.5 cm, slender; leaf blade ovate-lanceolate, 6–9 × 2–2.5 cm, base rounded to subcordate, margin subentire to sometimes crenulate, apex acuminate and caudate, veins 3–5. Inflorescences 1- or 2-flowered; bracts sometimes present, lanceolate, 1–2 cm. Pedicel 5–8 mm. Calyx campanulate; tube 6–9(–11) mm, broadly winged; lobes lanceolate, 0.7–1.3 cm, apex acuminate. Corolla white, narrowly campanulate, 2.5–3 cm; lobes ovate-triangular, ca. 4 mm, apex acute; plicae semiorbicular, ca. 2 mm, margin crenulate. Filaments linear, 1.2–1.5 cm; anthers ellipsoid, ca. 1 mm. Disc ca. 1 mm. Ovary 7–12 mm; gynophore ca. 6–10 mm at anthesis. Style linear, 6–9 mm. Berries red to dark purple, narrowly ellipsoid, (1.5–)2–4 cm; gynophore 1–2 cm. Seeds dark purple, elliptic, triquetrous, compressed, ca. 2 mm, distinctly winged. Fl. and fr. Aug–Sep.

Forests; 2300–3100 m. Xizang [Bhutan, India, Nepal, Sikkim].

7. *Tripterospermum filicaule* (Hemsley) Harry Smith, Notes Roy. Bot. Gard. Edinburgh 26: 238. 1965.

新疆双蝴蝶 xin jiang shuang hu die

Gentiana filicaule Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 127. 1890.

Stems spirally twisted, twining, slender, terete, striate. Basal leaves cespitose; petiole ca. 1 cm, slender; leaf blade ovate, (2–)3–5 × 1–2 cm, base truncate, margin crenulate, apex acuminate to acute, veins 3 and distinct. Stem leaves

with petiole (0.5–)1–2 cm, slender; leaf blade lanceolate, ovate-lanceolate, or ovate, (3–)4–11 × 1.5–3(–4.5) cm, base rounded, subcordate, or truncate, margin crenulate, apex acuminate, veins 3–5. Inflorescences 1-flowered; bracts 1–4 pairs, linear to lanceolate. Pedicel 3–11 mm. Calyx campanulate; tube 6–12 mm, narrowly winged; lobes linear to linear-lanceolate, 5–12 mm, apex acuminate. Corolla pink, blue, or violet, narrowly campanulate, 4–5 cm; lobes ovate-triangular, 5–7 mm, apex acute; plicae triangular to semiorbicular, 1.5–2 mm, margin crenulate. Filaments linear, 1.6–2.2 cm; anthers ellipsoid, ca. 1.5 mm. Disc ca. 1 mm. Style linear, 1.2–1.5 cm. Mature fruit unknown. Fl. and fr. Sep–Jan.

• Forests; ca. 3000 m. W Hubei.

8. *Tripterospermum pingbianense* C. Y. Wu & C. J. Wu, Bull. Bot. Res., Harbin 4(3): 131. 1984.

屏边双蝴蝶 ping bian shuang hu die

Stems spirally twisted, twining, terete, striate. Petiole 0.5–1 cm, slender; leaf blade lanceolate, 3–8 × 0.7–3 cm, base rounded to truncate and slightly oblique, margin crenulate, apex acuminate, veins 3. Inflorescences 1-flowered or cymes. Pedicel 0.5–1.5 cm; bractlets lanceolate. Calyx narrowly campanulate; tube 1–1.2 cm, wingless; lobes linear, 1–1.4 cm, apex acuminate. Corolla purple, narrowly campanulate, ca. 4 cm; lobes triangular, 4–5 mm, apex acute; plicae semiorbicular, 1.5–2 mm, margin erose. Filaments linear-subulate, 1.5–2.2 cm; anthers ellipsoid, ca. 1.2 mm. Disc ca. 1 mm. Style linear, ca. 1.5 cm; stigma lobes linear. Berries ellipsoid, ca. 2 cm, included in corolla; gynophore ca. 1.5 cm. Seeds dark purple, ellipsoid to ovoid, ca. 3 mm, triquetrous, narrowly winged. Fl. and fr. Sep–Dec.

• Scattered forests, valleys; 1400–2700 m. SE Yunnan.

The spelling of this species in the original protologue is *pinbianense*, but this spelling is an orthographic error as the species is named for its occurrence in Pingbian, Yunnan.

9. *Tripterospermum microphyllum* Harry Smith in S. Nilsson, Grana Palynol. 7(1): 144. 1967.

小叶双蝴蝶 xiao ye shuang hu die

Gentiana parvifolia Hayata.

Stems slender, terete, long creeping on ground, producing rootlets from nodes. Petiole 2–5 mm, slender; leaf blade lanceolate to ovate, 1–2(–3) cm × 3–5(–7) mm, base rounded to truncate, margin crenulate and slightly revolute, apex acuminate, veins 1–3. Flowers solitary; bracts ovate, ca. 1 cm. Pedicel 3–7 mm. Calyx campanulate; tube 5–7 mm, winged, papillate or pubescent along ridges; lobes linear, as long as or longer than tube. Corolla blue, campanulate, ca. 2.5 cm; lobes ovate-triangular, 3.5–4.5 mm, apex acute; plicae semiorbicular, 1–1.5 mm, margin crenulate. Filaments linear-subulate, 2–2.2 cm; anthers ovoid, ca. 1 mm. Disc ca. 0.5 mm. Ovary fusiform, 1–1.2 cm; gynophore ca. 2 mm. Style linear, 1.2–1.7 cm. Fl. Jul–Sep.

- Subalpine coniferous forests and margins of forests. Taiwan.

10. *Tripterospermum cordifolium* (Yamamoto) Satake, J. Jap. Bot. 26: 108. 1951.

高山肺形草 gao shan fei xing cao

Crawfordia cordifolia Yamamoto, Trans. Nat. Hist. Soc. Taiwan 19: 104. 1929.

Stems slender, terete, long creeping on ground, producing rootlets from nodes. Petiole 0.5–1.5 cm, slender; leaf blade ovate to cordate, 0.7–1.7 × 0.6–1.6 cm, base rounded to cordate, somewhat decurrent, margin entire, apex acute, veins 3–5. Flowers solitary; bracts 1–3 pairs, ovate, ca. 5 mm. Pedicel 2–3 mm. Calyx campanulate; tube 6–7 mm, winged; lobes linear to oblanceolate, (5–)7–8 mm, base contracted, apex acuminate. Corolla purple, campanulate, ca. 3.5 cm; lobes ovate-triangular, ca. 5 mm, apex acute; plicae semiorbicular, ca. 2 mm, margin crenulate. Filaments linear, 1.5–2 cm; anthers ellipsoid, ca. 1 mm. Disc ca. 1 mm. Ovary narrowly ellipsoid, ca. 8 mm. Style ca. 1.8 cm, exerted from corolla. Berries spindle-shaped, subsessile to gynophore 4–7 mm. Fl. Oct.

- Wet subalpine coniferous forest bed; 2300–2700 m. Taiwan.

11. *Tripterospermum cordifolioides* J. Murata, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 14: 299. 1989.

心叶双蝴蝶 xin ye shuang hu die

Stems scarcely twisted, long creeping, producing rootlets from nodes. Petiole slightly shorter than blade; leaf blade deltate-ovate to ovate, to 6 × 4 cm, herbaceous, base rounded to cordate, apex acuminate. Flowers axillary, usually 1 per node; bracts 0–3, scalelike. Calyx tube campanulate, 7–10 mm, slightly keeled; lobes 5, linear-subulate to lanceolate, nearly as long as tube. Corolla whitish to pale blue, narrowly campanulate, 3.5–4 cm, deciduous before fruit maturity. Style 1–1.3 cm, included in corolla tube. Ovary subsessile, 0.8–1.2 cm. Fruit fusiform, subsessile. Seeds black, triquetrous, wingless.

- Wet dark forest floor; 600–4000 m. Guizhou, Hubei, Sichuan, NE Yunnan.

12. *Tripterospermum pallidum* Harry Smith, Notes Roy. Bot. Gard. Edinburgh 26: 247. 1965.

白花双蝴蝶 bai hua shuang hu die

Stems spirally twisted, twining, terete, striate. Petiole 1.5–2 cm, slender; leaf blade ovate-lanceolate to ovate, 4–6 × 3–4 cm, base cordate, margin crenulate, apex acuminate, veins 3. Flowers solitary; bracts 1–3 pairs, lanceolate, ca. 5 mm. Pedicel 2–3 mm. Calyx subcampanulate; tube 6–8 mm, winged; lobes linear to linear-lanceolate, 5–9 mm, apex acuminate. Corolla white, narrowly campanulate, 3.5–4 cm; lobes ovate-triangular, 4.5–5 mm, apex acute; plicae semiorbicular, 1–1.5 mm, margin erose. Filaments linear, 1.2–1.6 cm; anthers ellipsoid, 1.5–2 mm. Disc ca. 1.5 mm. Ovary subsessile, 7–10 mm. Style linear, 2–2.5 cm. Berries ovoid.

Seeds compressed, discoid, narrowly winged. Fl. Sep.

- Forests; 500–1300 m. Sichuan, Yunnan.

13. *Tripterospermum australe* J. Murata, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 14: 300. 1989.

南方双蝴蝶 nan fang shuang hu die

Stems spirally twisted and twining, nearly 4-angled. Petiole 0.5–1.5 cm; leaf blade lanceolate to ovate, 4–9 × 1.5–4 cm, base rounded to shallowly cordate, margin not revolute, apex acuminate to acute; veins 3–5, abaxially distinct. Inflorescences clusters of 2–5 flowers; bracts scalelike or subulate. Pedicel 0–5 mm; bractlets 1 pair per flower, oblanceolate, 2–6 mm. Calyx narrowly campanulate; tube 0.7–1.3 cm, winged; lobes linear-subulate, arcuate spreading, 0.6–2 cm, apex acuminate to attenuate. Corolla greenish blue to pale purple, narrowly campanulate, 3.3–5 cm; lobes ovate-triangular, 7–9 mm, apex acuminate; plicae semiorbicular or triangular, 1–3 mm, margin entire or occasionally few toothed. Filaments 2–2.5 cm; anthers ellipsoid, 1.5–2 mm. Disc 1.5–3 mm. Ovary subsessile, 7–10 mm. Style 1.7–2 cm. Berries ellipsoid, 1.8–2.2 cm × 8–10 mm.

- 1300–1900 m. Fujian, Guangdong, Guangxi, Guizhou [Vietnam].

14. *Tripterospermum taiwanense* (Masamune) Satake, J. Jap. Bot. 26: 108. 1951.

台湾双蝴蝶 tai wan shuang hu die

Crawfordia japonica Siebold & Zuccarini var. *taiwanense* Masamune, Trans. Nat. Hist. Soc. Taiwan 28: 144. 1938.

Stems spirally twisted, twining, terete. Petiole 1–3 cm; leaf blade lanceolate, ovate-lanceolate, or ovate, 4–7 × 2–3.5 cm, base rounded to truncate, margin crenulate, apex acuminate, veins 3. Inflorescences 1-flowered or cymes; bracts 1–4 pairs, usually leafy, ovate to triangular. Pedicel 2–3 mm. Calyx campanulate; tube 7–9 mm, winged; lobes subulate to linear, 0.9–1.5 cm, apex acuminate. Corolla white, occasionally tinged purple outside, narrowly campanulate, 4–4.2 cm; lobes triangular, 4–5 mm, apex acuminate; plicae obliquely triangular, 1–2.5 mm, margin crenulate. Filaments linear, 1–2 cm; anthers ellipsoid, 1–2 mm. Disc 1–1.5 mm. Ovary 1–1.5 cm; gynophore 2–3 mm. Style linear, 1.5–2.5 cm. Berries dark purple, ellipsoid, 2–3.5 cm × 4–7 mm; gynophore 1–3 mm. Seeds dark purple, ellipsoid to ovoid, triquetrous, 1.5–2 mm, wingless.

- Forest margins; 500–2300 m. C and S Taiwan.

15. *Tripterospermum alutaceifolium* (Liu & Kuo) J. Murata, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 14: 301. 1989.

台北双蝴蝶 tai bei shuang hu die

Tripterospermum taiwanense (Masamune) Satake var. *alutaceifolium* Liu & Kuo, Fl. Taiwan 4: 198. 1978.

Stems spirally twisted, twining, terete. Petiole 2–3 cm; leaf blade lanceolate, ovate-lanceolate, or ovate, 6–11 × 2.5–

3.5 cm, base rounded to shallowly cordate, margin crenulate, apex acuminate, veins 3. Inflorescences 1-flowered or cymes; bracts 1–4 pairs, scalelike, narrowly lanceolate. Pedicel 2–3 mm. Calyx campanulate; tube 7–9 mm, winged; lobes lanceolate, 0.9–1.5 cm, widely keeled, apex acute to acuminate. Corolla yellowish white, narrowly campanulate, 3.5–4 cm; lobes triangular, 4–5 mm, apex acuminate; plicae obliquely triangular, 1–2.5 mm, margin crenulate. Filaments linear, 1–2 cm; anthers ellipsoid, 1–2 mm. Disc 1–1.5 mm. Ovary 7–9 mm; gynophore 2–3 mm. Style linear, 1.5–2.5 cm. Berries red-purple, subglobose, 1–1.8 × 0.8–1.1 cm, included in corolla; gynophore 1–3 mm. Seeds dark purple, ellipsoid to ovoid, discoid, 1.5–2 mm, wingless.

- Forests; 300–1700 m. N Taiwan.

16. *Tripterospermum hirticalyx* C. Y. Wu ex C. J. Wu, Bull. Bot. Res., Harbin 4(3): 129. 1984.

毛萼双蝴蝶 mao e shuang hu die

Stems spirally twisted, twining, terete, striate, glabrous or sometimes hirsute along striae. Petiole 0.5–1.5(–2) cm, slender, scabrous; leaf blade lanceolate, ovate-lanceolate, or ovate, 4–9 × 1–2.5(–3) cm, base rounded to cordate, margin crenulate, apex acuminate and sometimes caudate, veins 3–5. Inflorescences 1–6-flowered cymes; bracts 1–3 pairs, lanceolate to ovate, 0.5–2 cm. Pedicel 2–5 mm, hirsute. Calyx cylindrical; tube 1–1.4 cm, wingless or narrowly winged, with puberulent and/or scabrous-ciliate ridges; lobes linear-lanceolate, 3–5(–9) mm, apex acuminate. Corolla pale purple to blue, campanulate, 4–5 cm; lobes ovate-triangular, 5–6 mm, apex acuminate; plicae semiorbicular, 1.5–2 mm, margin crenulate. Filaments linear, 1.8–2 cm; anthers ellipsoid, 2–3 mm. Disc ca. 1.5 mm. Ovary subsessile, ca. 1.3 cm. Style linear, 1.8–2 cm. Berries purple, subsessile, fusiform, 1.4–2 cm, included in withered corolla. Seeds ellipsoid, discoid, wingless. Fl. and fr. Aug–Nov.

Forests, scrub, roadsides in forests, grassland slopes; 1400–2100 m. N Guizhou, W Hubei, S Sichuan, SE Yunnan [Vietnam].

17. *Tripterospermum cordatum* (C. Marquand) Harry Smith, Notes Roy. Bot. Gard. Edinburgh 26: 244. 1965.

峨眉双蝴蝶 e mei shuang hu die

Gentiana cordata C. Marquand, Bull. Misc. Inform. Kew 1931: 77. 1931.

Stems weakly twisted, twining, terete. Petiole 1–3(–4.5) cm; leaf blade ovate-lanceolate, ovate, or cordate, (1.5–)3.5–12 × (1–)2–5 cm, leathery, abaxially sometimes purple, base rounded to cordate, margin entire, apex acuminate and usually caudate; veins 3–5, indistinct. Inflorescences 1-flowered or cymes; bracts 1–4 pairs, leafy, lanceolate, 3–10 mm. Pedicel 0.5–1.5 cm. Calyx campanulate; tube (0.5–)1–1.3 cm, winged; lobes ascending or recurved only near tip, linear-lanceolate, 0.7–1.6 cm, apex acuminate. Corolla purple, campanulate, 3.5–4 cm; lobes ovate-triangular, 4–6 mm, apex acute; plicae broadly triangular, 1.5–2 mm, margin crenulate. Filaments linear-subulate, 1.5–1.8 cm; anthers ellipsoid, 1–2 mm. Disc 1–2 mm. Style linear, 1.5–2 cm. Berries dark purple, narrowly ellipsoid, 2–3 cm × 7–8 mm; gynophore less

than 5 mm. Seeds dark purple, ellipsoid to ovoid, discoid, 2–2.5 mm, wingless. Fl. and fr. Aug–Dec.

- Forests, scrub, forest margins, river valleys; 700–3200 m. Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

Murata (J. Fac. Sci. Univ. Tokyo III, 14: 302. 1989) adopts more strict morphological criteria and gives a narrower distribution of *Tripterospermum cordatum* to include only Hubei and Sichuan. This difference may be due to problems in interpreting *T. cordatum* and the close relatives *T. cordifolioides*, *T. lanceolatum*, and *T. pallidum*.

18. *Tripterospermum nienkui* (C. Marquand) C. J. Wu, Bull. Bot. Res., Harbin 4(3): 132. 1984.

香港双蝴蝶 xiang gang shuang hu die

Gentiana nienkui C. Marquand, Bull. Misc. Inform. Kew 1931: 76. 1931.

Stems sometimes dark purple, spirally twisted, twining, terete, striate. Basal leaves cespitose; leaf blade ovate, 3–6 × 1.5–3 cm, abaxially sometimes purple, base rounded, apex acuminate. Stem leaves with petiole 1–1.5 cm, slender; leaf blade ovate-lanceolate to ovate, 5–9 × 2–4 cm, base rounded to subcordate, margin crenulate, apex acuminate and sometimes caudate, veins 3–5. Inflorescences 1-flowered or cymes; bracts 1–4 pairs, lanceolate to ovate, 3–10 mm. Pedicel less than 1 cm. Calyx campanulate; tube 0.8–1.2 cm, winged; lobes linear-lanceolate, 7–10 mm, apex acuminate. Corolla dark violet-blue, sometimes with green spots, narrowly campanulate, 4–5 cm; lobes ovate-triangular, 4–5(–7) mm, apex acute; plicae ovate, 2–3 mm, margin crenulate to erose. Filaments linear, 1.5–2 cm; anthers ellipsoid, 1.2–2 mm. Disc ca. 2 mm. Style linear, 1.6–2 cm. Berries dark purple, ellipsoid, 2.5–4 cm × 6–8 mm, included in corolla; gynophore 1–3 mm. Seeds dark purple, ellipsoid to ovoid, triquetrous, 1.5–2 mm, wingless. Fl. and fr. Sep–Jan.

Forests; 500–1800 m. S Fujian, Guangdong, N Guangxi, S Hunan, S Zhejiang [Vietnam].

19. *Tripterospermum membranaceum* (C. Marquand) Harry Smith, Notes Roy. Bot. Gard. Edinburgh 26: 244. 1965.

膜叶双蝴蝶 mo ye shuang hu die

Gentiana membranacea C. Marquand, Bull. Misc. Inform. Kew 1931: 75. 1931.

Stems spirally twisted, twining, terete. Petiole 0.8–1.2 cm; leaf blade membranous, oblong-lanceolate to lanceolate, 4–9 × 1–2 cm, base rounded to cordate, margin crenulate, apex long acuminate, veins 3. Flowers 1 (or 2), usually terminal on an axillary peduncle 0.5–1.5 cm; bracts leafy, ovate to triangular, occasionally scaly. Pedicel 3–5 mm. Calyx campanulate; tube 7–10 mm, weakly winged; lobes straight, ascending in fruit, linear-lanceolate to lanceolate, 8–11 mm. Corolla rose-violet, narrowly campanulate, 3.6–4.2 cm; lobes widely triangular, ca. 3 mm; plicae semiorbicular, 1–1.5 mm, margin crenulate. Filaments 2–2.5 cm; anthers ellipsoid, ca. 1.5 mm. Disc 1.5–2 mm. Ovary subsessile, 1.8–2.5 cm. Style 1.2–1.7 cm. Berries red, subsessile, narrowly ellipsoid, 3–4.5 cm × ca. 7 mm. Seeds black, compressed, wingless. Fl. and fr. Aug–Jan.

Forests, forest margins; 2000–3700 m. Xizang, Yunnan [India,

Myanmar].

