



## *Passiflora menghaiensis*, a new species of Passifloraceae from Yunnan, China

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**ABSTRACT:** *Passiflora menghaiensis* (Passifloraceae), a new species from Menghai, Yunnan, China, is described and illustrated. The species is placed in *Passiflora* subgenus *Decaloba*, supersection *Disemma*, section *Octandranthus*. It is compared with two morphologically similar species in section *Octandranthus*, *P. kwangtungensis* and *P. geminiflora*. *Passiflora menghaiensis* differs from the preceding species by the combination of two flowers per inflorescence, the outer series of coronal filaments white, the inner series of coronal filaments light green, and puberulous fruit. A complete morphological description of *P. menghaiensis* is provided, together with line drawings, photographs, a conservation assessment, and a diagnostic key to fourteen species of *Passiflora* subgenus *Decaloba* supersection *Disemma* section *Octandranthus* from China.

**KEY WORDS:** China, *Decaloba*, *Disemma*, *Octandranthus*, *Passiflora menghaiensis*, Passifloraceae, Xishuangbanna, Yunnan.

### INTRODUCTION

The genus *Passiflora* L. consists of ca. 600 species of vines, lianas, and small trees distributed in tropical, subtropical, and occasionally temperate areas (Feuillet and MacDougal, 2007; Espinoza *et al.*, 2018). The genus is most diverse in Central and South America, with 24 species found in Southeast Asia and the Pacific (Krosnick *et al.*, 2013). The Old World species are divided across two subgenera: subgenus *Tetrapathea* (DC.) Rechb. and subgenus *Decaloba* (DC.) Rechb., Subgenus *Tetrapathea* is comprised of just three functionally to completely dioecious lianas found in Australia, New Zealand, and Papua New Guinea (Krosnick *et al.*, 2009). In contrast, subgenus *Decaloba* consist of approximately 260 species (Feuillet and MacDougal, 2003) with flowers that generally have two to three series of coronal filaments, a plicate, membranous operculum, and variegation in juvenile leaves (Krosnick *et al.*, 2013).

Within subgenus *Decaloba*, all Old World species are recognized in supersection *Disemma* (Labill.) J.M. MacDougal & Feuillet, with distributions throughout Asia, Southeast Asia, and the Austral Pacific (Krosnick *et al.*, 2005). Supersection *Disemma* contains three sections: *Octandranthus* Harms, with 17 Asian and Southeast Asian species, section *Disemma* (Labill.) J.M. MacDougal & Feuillet, with three Australian endemics, and lastly, the monotypic section *Holrungiella* Harms from Papua New Guinea. Section *Octandranthus* has its center of diversity in China with 13 of the 17 species in this group distributed there (Krosnick, 2006). In addition to the 13 species in section *Octandranthus*, seven introduced species are also present in China (Wang *et al.*, 2007).

In China, nine of the 13 native species are found in

Yunnan Province (Wang *et al.*, 2007), suggesting this region has played an important role with respect to the diversification of *Passiflora*. During extensive botanical studies in Xishuangbanna Prefecture in Yunnan, the authors collected an unknown species in Menghai. This species is similar to *P. kwangtungensis* Merrill and *P. geminiflora* D. Don, and after literature review as well as morphological examination, the conclusion was made that this represents a new species. Given the relative rarity of *Passiflora* throughout the Old World in comparison to the New World, the discovery of new species in this region is especially notable. Only three species of *Passiflora* (*P. papilio* H.L. Li, *P. jianfengensis* S.M. Hwang & Q. Huang and *P. xishuangbannaensis* Krosnick) have been discovered in nearly 80 years, and China is the center of diversity for this group in the Old World.

### TAXONOMIC TREATMENT

*Passiflora menghaiensis* X. D. Ma, L. C. Yan & J. Y. Shen, *sp. nov.*

勐海西番蓮 Figs. 1 & 2

**Type:** CHINA, Yunnan, Menghai, Mengzhe, Manwang village, Xishuangbanna National Nature Reserve, in dense forests, climbing on the tree, 22°2'N, 100°17'E, alt. 1291 m, 29 Aug. 2018, L. C. Yan & X. D. Ma 103 (holotype: HITBC; isotype: HIB, TAI)

**Diagnosis:** *P. menghaiensis* can be distinguished from *P. kwangtungensis*, and *P. geminiflora* by several morphological features. *Passiflora menghaiensis* has two flowers per inflorescence, the outer series of coronal filaments are white, the inner series of coronal filaments are light green, and the fruit is puberulous.

Weakly herbaceous perennial vine, 3–6 m long. Branches 1.5–2 mm wide, cylindrical, striated, yellowish-

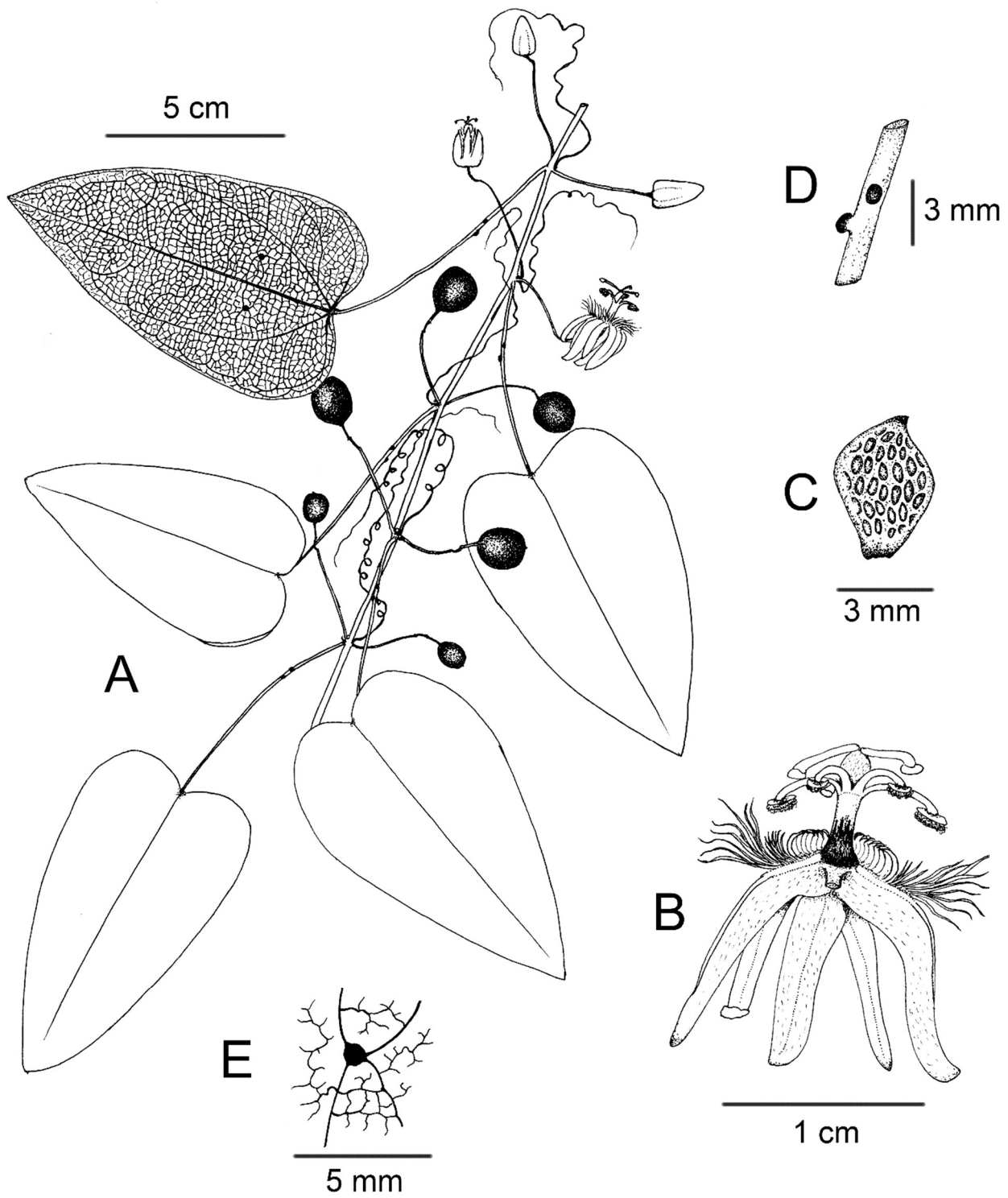
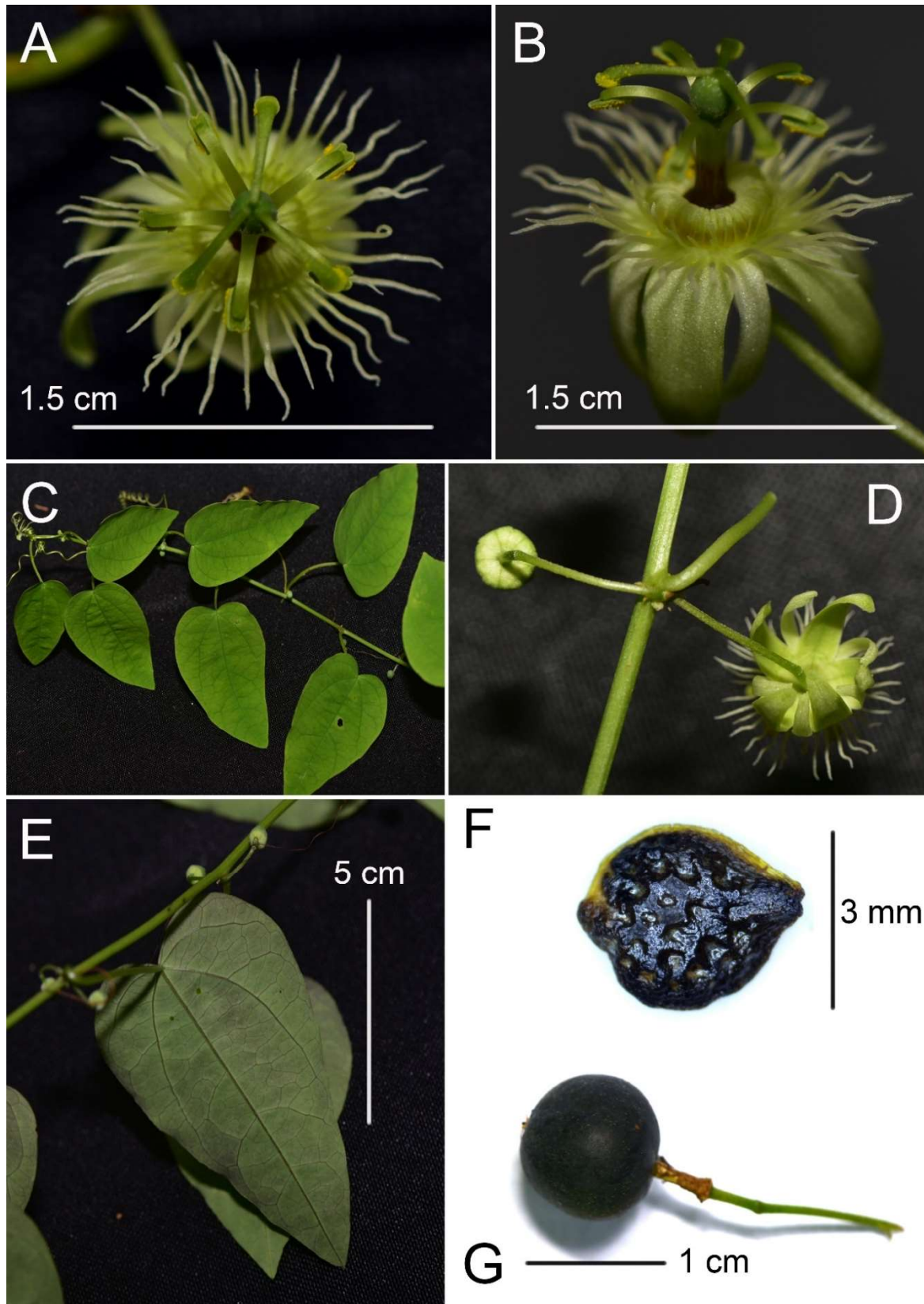


Fig. 1. *Passiflora menghaiensis* X. D. Ma, L. C. Yan & J. Y. Shen. A. Habitat. B. Longitudinal section of flower. C. Seed. D. Petiole glandular nectaries. E. Abaxial leaf nectary. Drawn by Zhen-Long Liang



**Fig. 2.** *Passiflora menghaiensis* X. D. Ma, L. C. Yan & J. Y. Shen. **A.** Front view of flower. **B.** Lateral view of flower. **C.** Habitat. **D.** Back view of flower. **E.** Abaxial leaf surface. **F.** Mature seed. **G.** Mature fruit. Photo by Jian-Yong Shen.

**Table 1.** Morphological comparison of *P. menghaiensis*, *P. kwangtungensis*<sup>1</sup>, and *P. geminiflora*<sup>2</sup>.

Characters	<i>P. menghaiensis</i>	<i>P. kwangtungensis</i>	<i>P. geminiflora</i>
Leaf shape	oblong to ovate-elliptic, mucro 0.5 mm long, base cordate.	lanceolate to ovate, apex acute to acuminate, mucro 1 mm long, base cordate	lanceolate to cordate, apex acute, mucro 1-2 mm long, base rounded to cordate
Leaf size (cm)	7.5–10.2 × 3.8–5.6	9.0–13.0 × 2.0–5.0	(3.5–) 5.0–11.0 × (1.8–) 2.5–6.0
Petiolar nectaries	usually 2 in the distal third, 1 (if present) at the base	2 in the upper half	2 in the upper half
Abaxial laminar nectaries	1–7, scattered near the midrib	(0–) 2–7, scattered submarginally on abaxial surface	2–8, arranged in V-shaped pattern on either side of the midvein
Inflorescences	two flowers per inflorescence	cymose, branched through the third order, (1–) 4–6 flowered	cymose, sessile, branched through the second (rarely third) order, 2–6 (–8) flowered
Coronal filaments			
Outer series	6.0–9.0 mm, white	3.0–5.0 mm, yellow-green in lower half, yellow in upper half	3.0–5.0 mm, white
Inner series	3.0–4.0 mm, light green	1.0–2.0 mm, yellow-green	2.0 mm, white
Ovary	2.0 × 1.5 mm, ellipsoid, puberulous.	3.0 × 1.5 mm, ovoid, glabrous.	1.0–1.75 × 0.5–1.75 mm, globose, pubescent
Fruit size	ca. 1.0 cm in diam., puberulous	ca. 1.0 cm in diam., glabrous	ca. 1.5 cm in diam., glabrous

<sup>1</sup>from Krosnick et al., 2013. <sup>2</sup>from Krosnick, 2006.

green, glabrous. Stipules not seen. Petiole 4.2–6.5 × 0.1 cm, slightly puberulous or glabrous, often with 2 short cylindrical glandular nectaries, usually in the distal third, the nectary 0.5–1 mm diam., 1 mm long. Leaf blade slightly peltate, 6.0–10.2 × 3.8–5.6 cm, oblong to oblong-lanceolate, membranous, margin entire, apex acuminate or mucronate, mucro 1 mm long, base cordate, the adaxial surface dark green and glabrous, basal veins five or seven, palmate, the abaxial surface light green and glabrescent, with 1 to 7 nectaries, scattered near the midrib, discoid and sessile. Two flowers per inflorescence, pedicels 1.2–2.1 cm long, puberulous, bearing 3 floral bracts, floral bracts narrow triangular, 0.5–1 mm long, sessile, inserted at base of pedicel, flower buds conic, flowers white, ca. 2 cm in diam., hypanthium 4–5 mm in diam., sepals 7–9 × 2.5–3 mm, abaxial green, puberulous, adaxial white, glabrous, apex rounded, triangular-ovate, petals 7–9 × 1–1.5 mm, abaxial green, glabrous, adaxial white, glabrous, apex rounded, lanceolate, sepals and petals completely reflexed at anthesis. Corona with two series of filaments, fimbriate, outer series 6–9 mm long, white, spreading at anthesis, inner series 3–4 mm long, light green. Operculum ca. 2 mm high, plicate, the upper portion white-green, the basal portion light brown. Limen ca. 3 mm in diam., annular, light green, nectary brown, 1 mm deep. Staminal filaments connate around the androgynophore, the free portions 4–5 mm long, flat; anthers 2 mm long, versatile, elongated with a small basal protrusion. Ovary 2 × 1.5 mm, ellipsoid, sessile on the gynophore, puberulous, styles 4–5 mm long including stigmas, stigma 0.5–1 mm wide, obliquely expanded at the apex, stigmatic surface papillate. Fruit ca. 1 cm in diam., subglobose, puberulous, blackish at maturity. Seeds 7–10 per fruit, arils yellowish orange, 4 × 3 mm, 1–1.5 mm thick, obovate, foveolate-reticulate with 25 to 35 foveae per side.

**Distribution & habitat:** *Passiflora menghaiensis* is

only known from three specimens collected at the type locality. Specimens were found in shaded, wet forest openings near a stream, growing in sandy soil. Dominant broadleaf-evergreen species in the surrounding area included *Helwingia himalaica* Hook. f. & Thomson ex C.B. Clarke, *Ficus semicordata* Buch.-Ham. ex Sm., *Acalypha brachystachya* Hornem., *Caryota maxima* Blume ex Mart., *Debregeasia orientalis* C.J. Chen, *Lithocarpus grandifolius* (D. Don) S.N. Biswas, and *Hypoestes triflora* (Forssk.) Roem. & Schult.

**Phenology:** Flowers and mature fruits were observed from late August to early September.

**Etymology:** The specific epithet is derived from the type locality, Menghai County, Xishuangbanna Prefecture, Yunnan, China.

**Conservation assessment:** There is only one known population of *P. menghaiensis* in Menghai, Xishuangbanna, Yunnan. All the surrounding forests were surveyed carefully, but no additional populations were identified. Within the single population in Menghai, only six individual plants were observed. The site of this population grows along the edge of the Xishuangbanna National Nature Reserve. While this designation should provide some protection for *P. menghaiensis*, nearby villagers often collect bamboo shoots and mushrooms in this area resulting in disturbance. In addition, the site is very close to farmland (ca. 100 m) and the authors observed glyphosate herbicide damage within 30 m of the population.

Krosnick (2006) noted that population sizes of *Passiflora* in China are often quite small; often just a single plant may be observed over several kilometers. The small population of *P. menghaiensis* in Menghai may be the only location where this new species remains. This geographical isolation could easily lead to issues with inbreeding depression, and is compounded by the fact that most *Passiflora* are self-incompatible (Ulmer and MacDougal, 2004).



To protect this rare species, the authors collected ca. 30 seeds for ex-situ cultivation, yet only one seedling has germinated. It is not clear why the germination rate is so low; one possible explanation could be reduced viability from inbreeding resulting from limited population size. Additional work is underway to determine how best to conserve this species through cuttings or seed propagation. Based on the limited population size and restricted distribution of *P. menghaiensis*, this new species should be assessed as Critically Endangered (CR; criteria B1ab (i, v) + 2ab (i, v), D).

**Features and affinities:** *Passiflora menghaiensis* is presently placed in subgenus *Decaloba* supersection *Disemma* section *Octandranthus* for being a weakly tendrillate, clambering herb, consisting of two flowers per inflorescence, two series of coronal filaments and an incurved, plicate operculum, ca. 2 mm tall at its highest point.

Morphological similarities shared among *P. menghaiensis*, *P. kwangtungensis* (Guangdong and Hunan Provinces, China), and *P. geminiflora* (Assam, India and Nepal) could suggest a relationship among these species (Table 1). *Passiflora menghaiensis* exhibits leaf morphology similar to *P. kwangtungensis* and *P. geminiflora*, both of which have lanceolate to ovate leaves, entire margins, cordate leaf bases, and flattened abaxial nectaries. However, *P. kwangtungensis* exhibits prominent impression of the major veins, and has 2–7 abaxial nectaries scattered submarginally. *Passiflora geminiflora* lacks the impression in the veins and has 2–8 abaxial nectaries arranged in a loose V-shaped pattern on either side of the midvein. *Passiflora menghaiensis* has 1–7 abaxial nectaries near the leaf apex and also lacks the impression in the veins. While the outer series of coronal filaments in *P. kwangtungensis* is yellow-green, both *P. geminiflora* and *P. menghaiensis* have entirely white filaments. In *P. kwangtungensis* the outer series is filiform and clavate at the apex, while in the latter two species the filaments are fimbriate throughout. *Passiflora kwangtungensis* and *P. geminiflora* both have inflorescences that exhibit branching from the second through fourth order (Krosnick and Freudenstein, 2005) and glabrous fruits, while *P. menghaiensis* exhibits first order branching only and has puberulous fruit.

In order to facilitate identification, we here provide a diagnostic key to the 14 species of *Passiflora* subgenus *Decaloba*, supersection *Disemma*, section *Octandranthus* known from China.

Diagnostic key to species of *Passiflora* subgenus *Decaloba* supersection *Disemma* section *Octandranthus* from China.

- 1a. Leaves entire, linear, lanceolate, or cordate ..... 2  
 1b. Leaves 2- or 3-lobed or truncate ..... 8  
 2a. Two flowers per inflorescence ..... 1. *P. menghaiensis*  
 2b. Inflorescence 2- to many flowered ..... 3

- 3a. Sepals with apical appendage ..... 2. *P. eberhardtii*  
 3b. Sepals lacking apical appendage ..... 4  
 4a. Leaves suborbicular to broadly orbicular ..... 3. *P. henryi*  
 4b. Leaves linear-lanceolate, broadly lanceolate, or lanceolate to ovate ...  
 ..... 5  
 5a. Flowers with 5 stamens and 3 carpels ..... 6  
 5b. Flowers with variable numbers of stamens and carpels ..... 7  
 6a. Leaves leathery, ovate, subopposite to opposite .....  
 ..... 4. *P. cochinchinensis*  
 6b. Leaves membranous, lanceolate to ovate, alternate .....  
 ..... 5. *P. kwangtungensis*  
 7a. Stem and leaves pubescent; leaves oblanceolate, alternate .....  
 ..... 6. *P. siamica*  
 7b. Stem and leaves glabrous; leaves lanceolate, spirally arranged .....  
 ..... 7. *P. tonkinensis*  
 8a. Coronal filaments ca. 1/2 as long as sepals or shorter; leaves  
 truncate, lobes generally equal in length ..... 9  
 8b. Coronal filaments more than 1/2 as long as sepals; leaves shallowly  
 to deeply lobed, lobes unequal in length ..... 11  
 9a. Petiole with 2 discoid nectaries ..... 8. *P. jianfengensis*  
 9b. Petiole with 2 peg-shaped nectaries ..... 10  
 10a. Plants pubescent throughout; abaxial surface often with 2 or 3  
 pairs of nectaries, leaf apex usually 3-lobed truncate .. 9. *P. jugorum*  
 10b. Plants glabrous, rarely glabrescent; abaxial surface usually with 1  
 pair of nectaries, leaf apex usually truncate ..... 10. *P. wilsonii*  
 11a. Lobes of leaves apically obtuse; sepals with apical appendage .....  
 ..... 11. *P. cupiformis*  
 11b. Lobes of leaves apically acute; sepals lacking awn ..... 12  
 12a. Inflorescence 5–8-flowered; leaves truncate, base of leaves  
 truncate ..... 12. *P. papilio*  
 12b. Inflorescence 1–16-flowered; leaves deeply truncate; base of  
 leaves lanceolate ..... 13  
 13a. Stem striate; leaves and stems pubescent; flowers 2–16 per  
 inflorescence; coronal filaments white throughout .....  
 ..... 13. *P. altebilobata*  
 13b. Stem subtriangular, smooth; leaves and stems glabrous; flowers 1  
 or 2 per inflorescence; coronal filaments brown at base, yellow at  
 apex ..... 14. *P. xishuangbannaensis*

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