



## *Piper peltatifolium*, a new species of Piperaceae from Hainan, China

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*Piper peltatifolium*, a new species of Piperaceae from Hainan, China, is here described and illustrated. The new species is morphologically similar to *P. hongkongense*, but the former can be easily distinguished by the combination of characteristics: trophophyll blades peltate and subleathery with nonbranched hairs; leaves with longer sheaths; stamens usually only two; anthers ovoid and shorter than filaments; ovaries ellipsoid to ovoid; stigmas 3 or 4, or rarely 5; bracts suborbicular, sessile, and adnate to rachis; and drupes slightly hispidulous.

**Key words:** diversity, morphology, taxonomy, tropical flora

*Piper* Linnaeus (1753: 28) is the largest genus of the Piperaceae family, comprising approximately 1,050 species, mainly distributed in the tropics (Mabberley & David 2008), and is one of the most diverse lineages among basal angiosperms (Tebbs 1993, Soltis *et al.* 1999). Distinctive characteristics of *Piper* include swollen stem nodes and minute, usually unisexual flowers compacted together on a fleshy rachis. Its flowers lack perianth and consist only of the male and female reproductive parts, which are subtended by one to three floral bracts. The number of stamens varies from 3 to 12 (Suwanphakdee & Chantaranothai 2014). The anther is distinguished by two or four thecae, with longitudinal or transverse dehiscence. Fruits of the majority of *Piper* are drupes, whereas only *P. umbellatum* Linnaeus (1753: 30) bears nutlets (Suwanphakdee 2012). Asian taxa of the Piperaceae have been studied in numerous publications (Wallich 1824–1849, Blume 1826, Hooker 1887, De Candolle 1910, 1912, 1923, Ridley 1924, Backer & Bakhuizen van den Brink 1963, Long 1984, Huber 1987, Gardner 2006, Suwanphakdee *et al.* 2006, 2008, 2011, 2012, 2014). More than 60 species of *Piper* can be found in China, of which half are endemic (Gilbert & Xia 1999, Cheng *et al.* 1999, Gajurel *et al.* 2001, Hao *et al.* 2012).

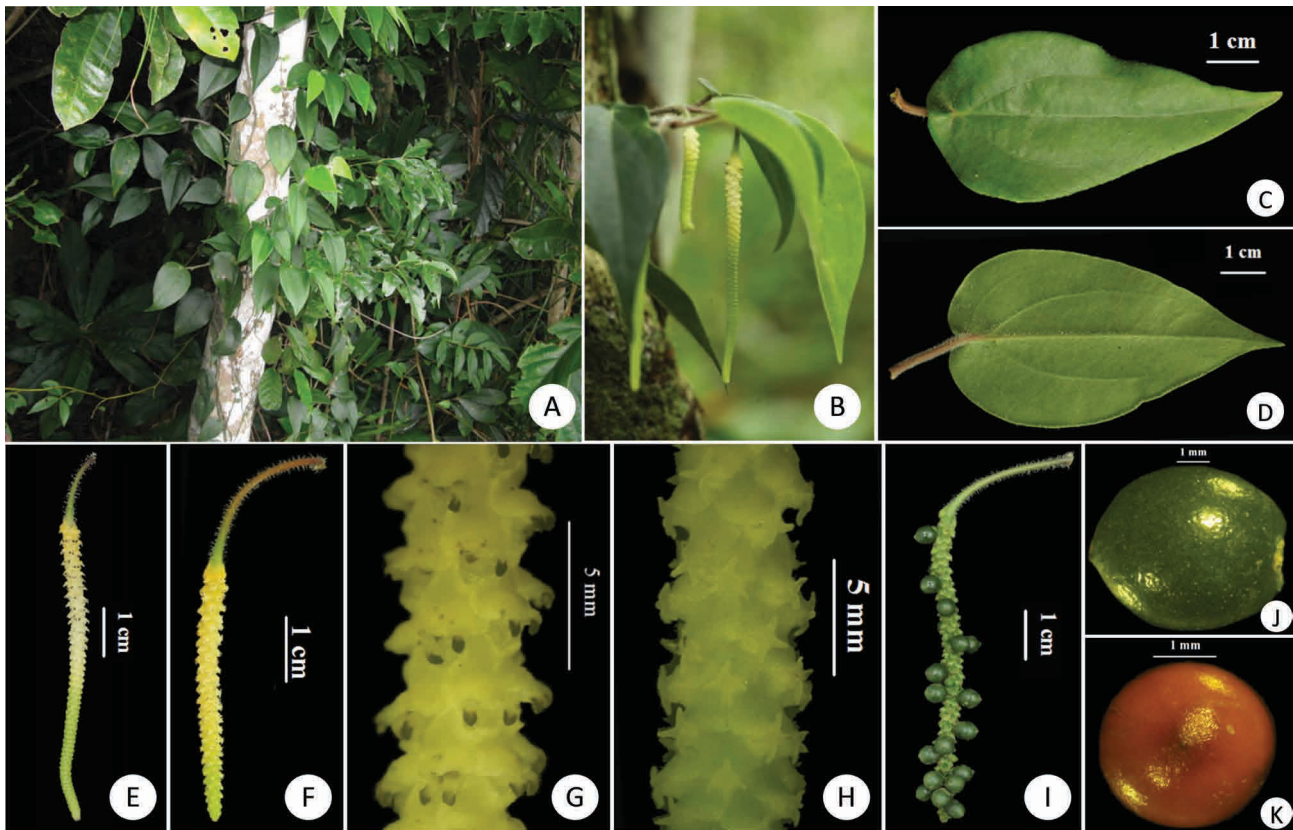
Floristic surveys of *Piper* in Hainan, China between 2011 and 2013 yielded a specimen of *Piper* that morphologically did not match any of the known species from China because this sample exhibited distinct peltate trophophyll blades and puberulous abaxial leaf blade surfaces. On the basis of a detailed examination of the morphological characteristics of this plant and its possible relatives (Gilbert & Xia 1999, Cheng *et al.* 1999, Gajurel *et al.* 2001), as well as specimens of different herbaria (PE, IBK, IBSC, KUN, HITBC, VNM, K, E, P, A) (Thiers 2015), we conclude that it is a species new to science, which we hereby describe and illustrate.

### Taxonomic treatment

*Piper peltatifolium* C. Y. Hao, H. S. Wu & Y. H. Tan, *sp. nov.* (Figs. 1–2)

Similar to *P. hongkongense* De Candolle (1868: 347) but can be distinguished by the following characteristics: trophophyll leaf blades peltate; leaves subleathery with non-branched hairs; stamens usually only two; anthers ovoid and shorter than filaments; ovary ellipsoid to ovoid; stigmas 3 or 4, and rarely 5; bracts suborbicular, sessile, and adnate to rachis; and drupes slightly hispidulous.

**Type:**—CHINA. Hainan: Wanning County, Sifang Mountain, moist place at mountain stream sides and under evergreen broad leaved forests, ca. 305 m, 18°43'0.15"N, 110°4'16.94"E, 8 October 2012, *Chao-Yun Hao 2012089* (holotype HITBC!; isotype IBSC!, HITBC!).



**FIGURE 1.** *Piper peltatifolium*. A, B. Habit; C. Adaxial surface of gonophyll; D. Abaxial surface of gonophyll; E. Male spike; F. Female spike; G. Florets in male spike; H. Florets in female spike; I. Infructescence; J. Drupe (side view); K. Seed (top view); Photographed by C.-Y. Hao.

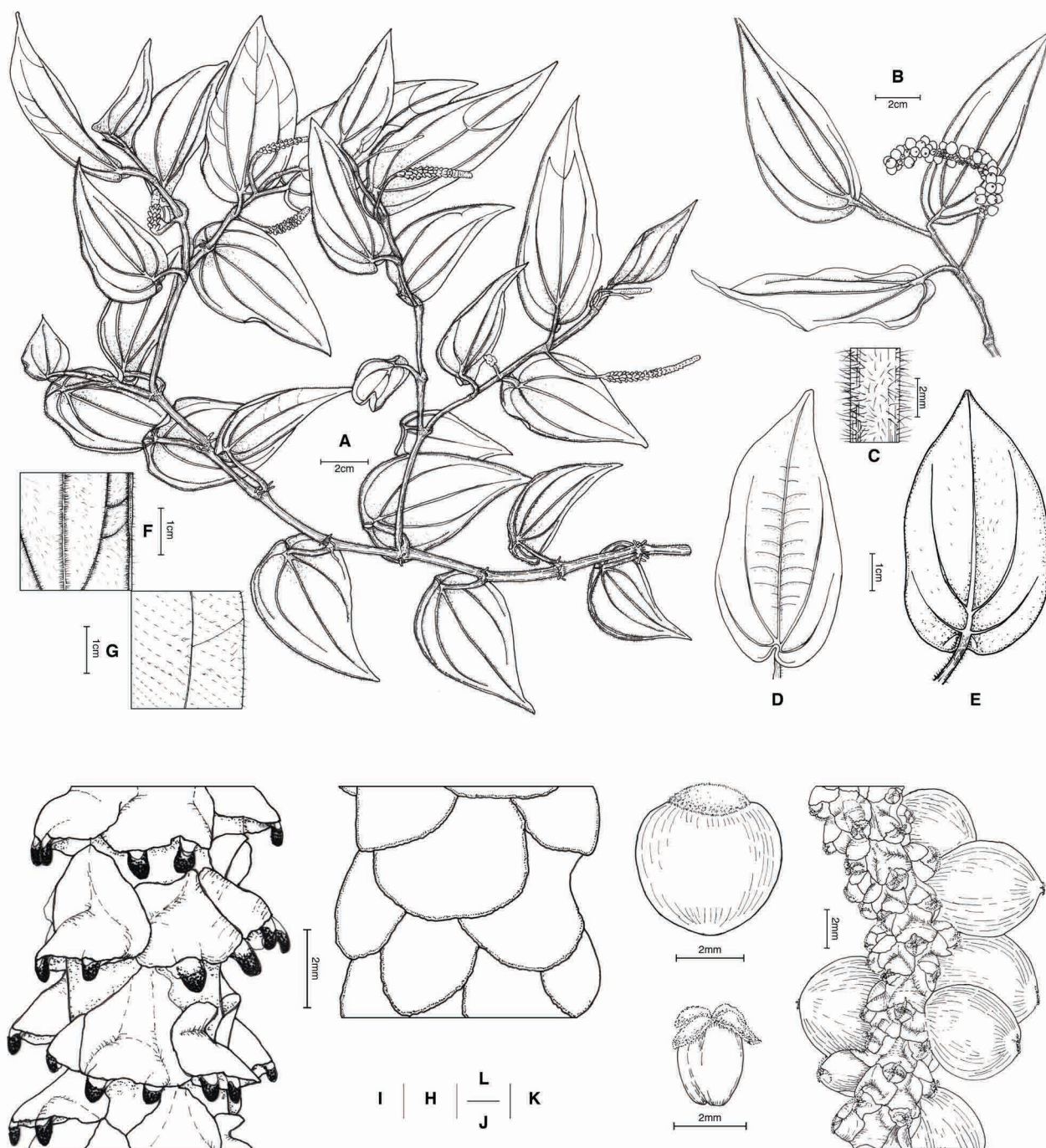
Woody climbers, more than 5 m high, dioecious. Stems dark green, brown when dry, 0.5–1.5 cm in diameter, finely ridged, puberulous, or velutinous when young, glabrescent when mature; swollen nodes, with climbing adventitious roots. Leaves subleathery, glandular; petioles 1.5–2.5 cm in length, pilose, sheath 0.4–1.2 cm, 1/4–1/2 as long as petioles; trophophyll leaf blade ovate to cordate, 4.5–6.5 cm × 3.5–5.5 cm, base cordate to auriculate, symmetric, apex attenuate; adaxial surface dark green, glabrous; abaxial surface pale green, puberulous; veins 5, all basal; gonophyll leaf blade peltate, glandular, elliptic, ovate or ovate-lanceolate, 7.5–9 cm × 2.5–5.5 cm, base cordate or rounded, symmetric or slightly oblique, apex attenuate to acuminate; adaxial surface dark green, glabrescent; abaxial surface pale green or yellow, puberulous or pilose, especially on the veins; veins 5, all basal. Inflorescence a pedunculate spike, leaf-opposed, solitary, pendulous, cylindrical, green; the fertile rachis hairy, with densely compacted flowers; floral bracts orbicular or suborbicular, approx. 1.5 mm in diameter, undulate throughout the margin. Male inflorescence 5–7 cm × 0.4–0.5 cm, white to pale green; peduncles 1–2 cm in length, pilose. Stamens usually only two, or rarely three; filaments approx. 1 mm long; anthers ovoid, 0.6–0.8 mm long, 2-locules and lateral dehiscence, ±exserted at anthesis. Female inflorescence 3.5–6.0 cm × 0.4–0.6 cm, white to pale green; peduncles 1.5–2.5 cm long, pilose. Female flowers with ovary ellipsoid to ovoid; style over 2 mm long, persistent and stiff-pointed; stigma star-shaped, 3- or 4-lobed, or rarely 5-lobed, hairy. Infructescence 4–9 cm × 1.0–1.5 cm, glabrous, pendulous, cylindrical, with an echinate appearance from the persistent styles, peduncles 2.5–4.0 cm long, pilose. Fruit a drupe, connate on rachis and hispidulous, with persistent floral bracts and spine-like styles, globose, 4.0–6.5 mm in diameter, dark green. Seed pale brown, globose, 2.5–3.5 mm in diameter, smooth.

**Phenology:**—Flowering from March to May; fruiting from June to September.

**Distribution and habitat:**—*Piper peltatifolium* can currently be found only in southern Wanning, Hainan Province, China (Fig. 3). It climbs on trees or rocks, close to streams under wet tropical montane forest, at elevation of 200–600 m.

**Etymology:**—The epithet refers to the peltate attached leaf blade, which is unique in Chinese *Piper* species.





**FIGURE 2.** *Piper peltatifolium*. A. Branch with male inflorescence. B. Branch with infructescence. C. Detail hairs of petiole. D. Adaxial surface of gonophyll; E. Abaxial surface of gonophyll; F–G. Detail of hairs on the leaf blade; H. Floral bracts; I. Male inflorescence; J. Ovary; K. Infructescence; L. Seed; Illustration based on the holotype C.-Y. Hao 2012089.

**Relationships:**—The species that is morphologically most similar to this new plant is *P. hongkongense*, which can also be found in Hainan, Guangdong, and Guangxi (Cheng *et al.* 1999). After comparison with the specimens and the literature (De Candolle 1868, Cheng *et al.* 1999), we found that *P. peltatifolium* can be clearly differentiated from *P. hongkongense* by several characteristics, as described in the diagnosis above and summarized in Table 1.

**Additional specimens examined (Paratypes):**—CHINA. Hainan: Wanning County, Fenghuang Mountain, ca. 430 m, 22 November 2013, C.-Y. Hao & H.-S. Wu 2013154 (HITBC!); Wanning County, Longnanwang, 23 April 1995, F.-W. Xing 6403 (IBSC!).

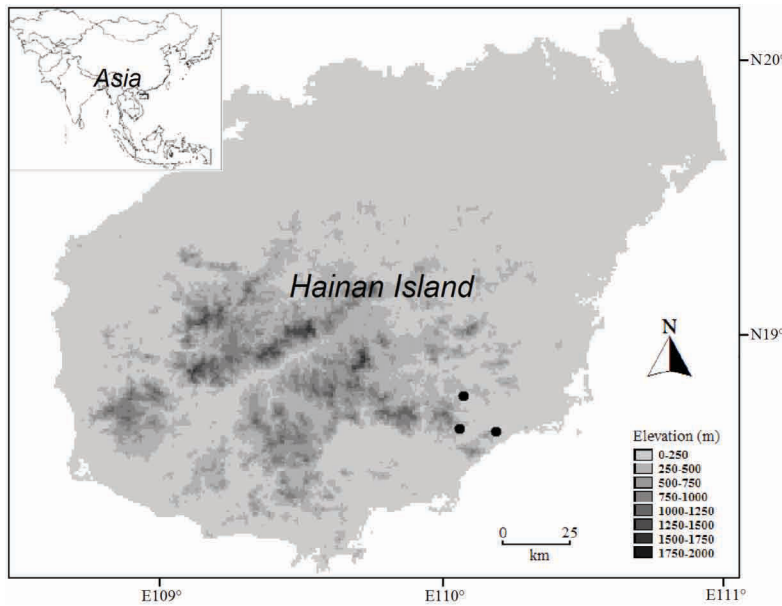


FIGURE 3. Distribution of *Piper peltatifolium* in Hainan, China.

TABLE 1. Morphological comparisons among *Piper peltatifolium*, *P. hongkongense* and *P. sintenense*.

	<i>P. peltatifolium</i>	<i>P. hongkongense</i>	<i>P. sintenense</i>
Leaves	leaf blade peltate, subleathery, elliptic, ovate or ovate-lanceolate, hairs non-branched; stipules adnate to sheaths, 4–12 mm long	leaf blade not peltate, papery, ovate or ovate-lanceolate, hairs dichotomous; stipules 3–5 mm long	leaf blade not peltate, membranous, ovate or ovate-oblong, hairs curved; stipules 3–4 mm long
Male flowers	stamens usually 2, anthers ovate	stamens usually 3, anthers reniform, longer than filaments	stamens 2, anthers subglobose, longer than filaments
Female flowers	ovary elliptical or ovate stigmas 3 or 4, or rarely 5	ovary subglobose stigmas 4	ovary subglobose stigmas 4
Bracts	suborbicular, adnate to rachis, sessile	orbicular, sometimes slightly tapered, peltate, with short stalk	orbicular, peltate, with short stalk
Drupes	globose, slightly hispidulous	globose, smooth	obovoid, smooth

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