



Daphniphyllum peltatum, a new species of Daphniphyllaceae from limestone areas in southwestern Guangxi, China

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(Manuscript received 29 December 2019; Accepted 7 April 2020; Online published 16 April 2020)

ABSTRACT: *Daphniphyllum peltatum* Yan Liu & T. Meng, a new species of Daphniphyllaceae from southwestern Guangxi, China, is described and illustrated. The new species is mainly similar to *D. calycinum* Benth. in the shape of leaf blade, lunate anthers, elliptic drupes and the length of infructescence, but it can be easily distinguished by blue green branchlets, peltate leaves, obviously raised midvein and lateral veins on both surfaces. We also provide a key to all species of *Daphniphyllum* in China, and a table to distinguish the new species from *D. calycinum*.

KEY WORDS: China, Daphniphyllaceae, *Daphniphyllum peltatum*, limestone flora, new taxa, southwestern Guangxi, taxonomy.

INTRODUCTION

Daphniphyllum Blume (Blume, 1826) is the sole genus of Daphniphyllaceae characterized by dioecism, unisexual and petalless flowers, degraded and often caducous calyx, extremely short or nonexistent style, and persistent stigma (Tang *et al.*, 2012). It was established by the species of *D. glaucescens*, distributed mainly in east and southeast Asia, India, Sri Lanka, Australia, and with east and southeast Asia as the distribution center (Ming and Kubitzki, 2008). *Daphniphyllum* contains more than 30 species. From China ten species are known, including three endemic. All species of *Daphniphyllum* in China distribute along the Yangtze River Basin and southern regions of Qinling Mountains. As one of the most biodiverse regions of China, the limestone areas of southwestern Guangxi has become a biodiversity hotspot in recent years, and has half of the species of *Daphniphyllum* distributed in China (Ming, 1980; Qin and Liu, 2010).

The taxonomy of *Daphniphyllum* is complicated. There are still large uncertainties remaining in the difference among species of *Daphniphyllum*. The taxonomic characters of morphology, such as branchlets, leaves, staminate flowers, fruits, are circumscribed. But the characters of pistillate flower, such as stigma, calyx, sterile stamens, are very important to solve its taxonomic problems. However, it is not easy to discover or collect their pistillate flowers due to unisexual flowers of *Daphniphyllum*. Thus, it also adds the difficulty to the taxonomy of *Daphniphyllum*.

In this paper we report a unique species of *Daphniphyllum* with peltate leaves. The earliest specimens of this species were collected from Jingxi

City, Guangxi in 2011. It is morphologically most similar to *D. calycinum* Benth. (Bentham, 1861), but it can be distinguished by the morphological characters of branchlets, peltate leaves and obviously raised leaf veins. In order to thoroughly distinguish this special species, we have conducted follow-up fieldworks from 2012 to 2018, have collected its flowered and fruited specimens, and also have particularly studied on the characters of its branchlet, leaf blade, fruit, male and female flowers. After careful studies of relevant literature (Chien, 1933; Croizat and Metcalf, 1941; Huang, 1965, 1966a, 1966b; Hurusawa, 1954; Ming, 1980; Ming and Kubitzki, 2008; Müller, 1869; Rosenthal, 1919; Tang *et al.*, 2012; Wang, 1981), as well as comparisons among this unknown species and its related species, it is confirmed as an undescribed species of *Daphniphyllum* which is described and illustrated below.

TAXONOMIC TREATMENT

Daphniphyllum peltatum Yan Liu & T. Meng, *sp. nov.*

盾葉虎皮楠 Figs. 1 & 2 A–I

Diagnosis: *Daphniphyllum peltatum* is mainly similar to *D. calycinum* Benth. in the shape of leaf blade, lunate anthers, elliptic drupes and the length of infructescence, but can be easily distinguished from the latter by branchlets blue green (*vs.* grayish brown); base of leaf blade rounded, peltate (*vs.* base broadly cuneate, not peltate); pedicels of female flower 1–1.3 cm long (*vs.* 5–7 mm long); ovary ca. 3 mm long (*vs.* 1.5–2 mm long); drupe ca. 7 mm in diam. (*vs.* 3–6 mm in diam.).

Type: CHINA. Guangxi Zhuang Autonomous Region: Jingxi City, Ande Town, Sanhe Country, rare, elev. 1100 m, 23°11'N, 106°3'E, 24 June 2012, *Y.S. Huang*

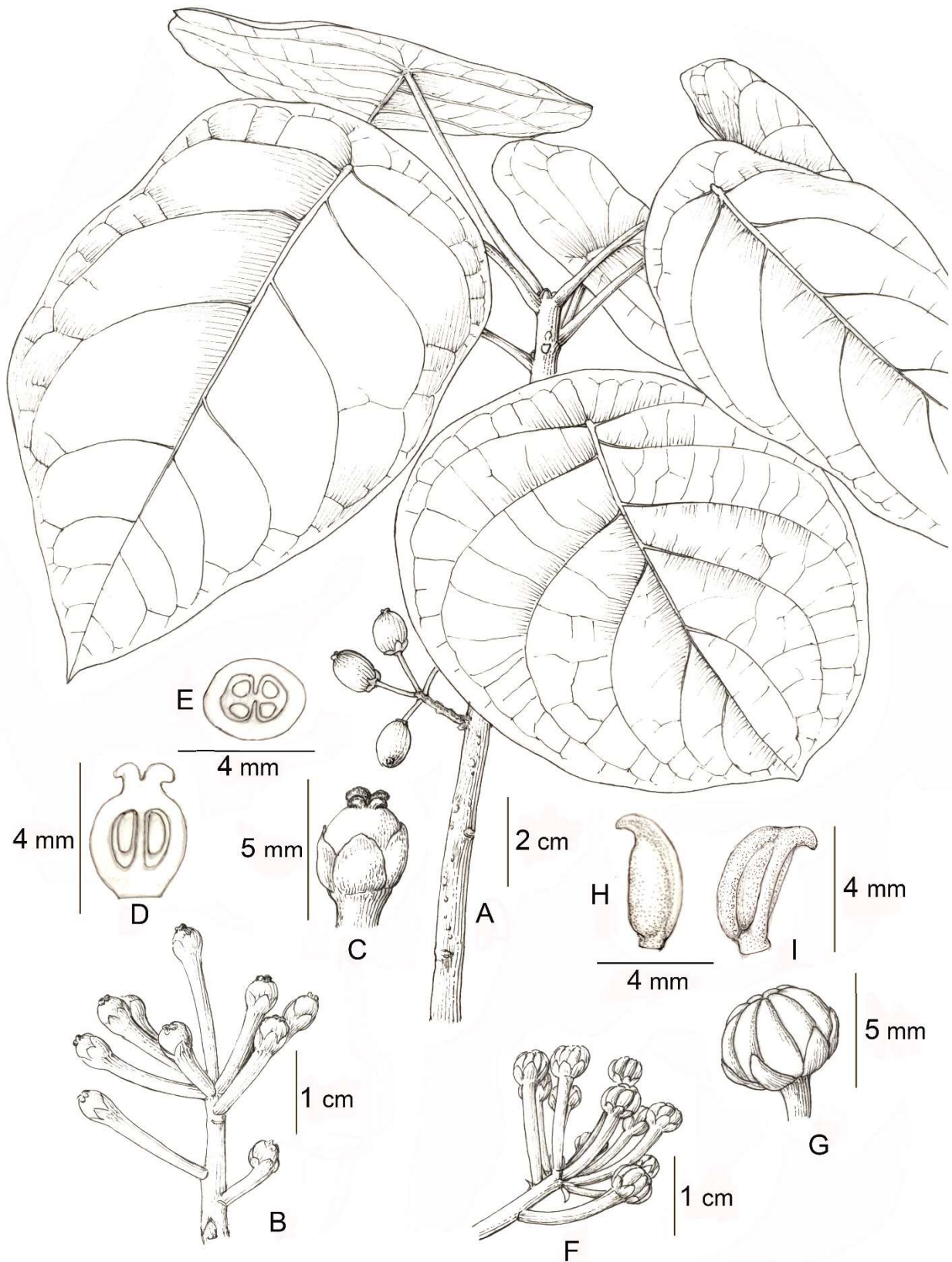


Fig. 1. *Daphniphyllum peltatum* Yan Liu & T. Meng sp. nov. **A.** Fruit branch. **B.** Female inflorescence. **C.** Female flower. **D.** Longitudinal section of ovary. **E.** Cross section of ovary. **F.** Male inflorescence. **G.** Male flower. **H.** Dorsal view of stamen. **I.** Ventral view of stamen. Illustration by Wen-Hong Lin (IBK).

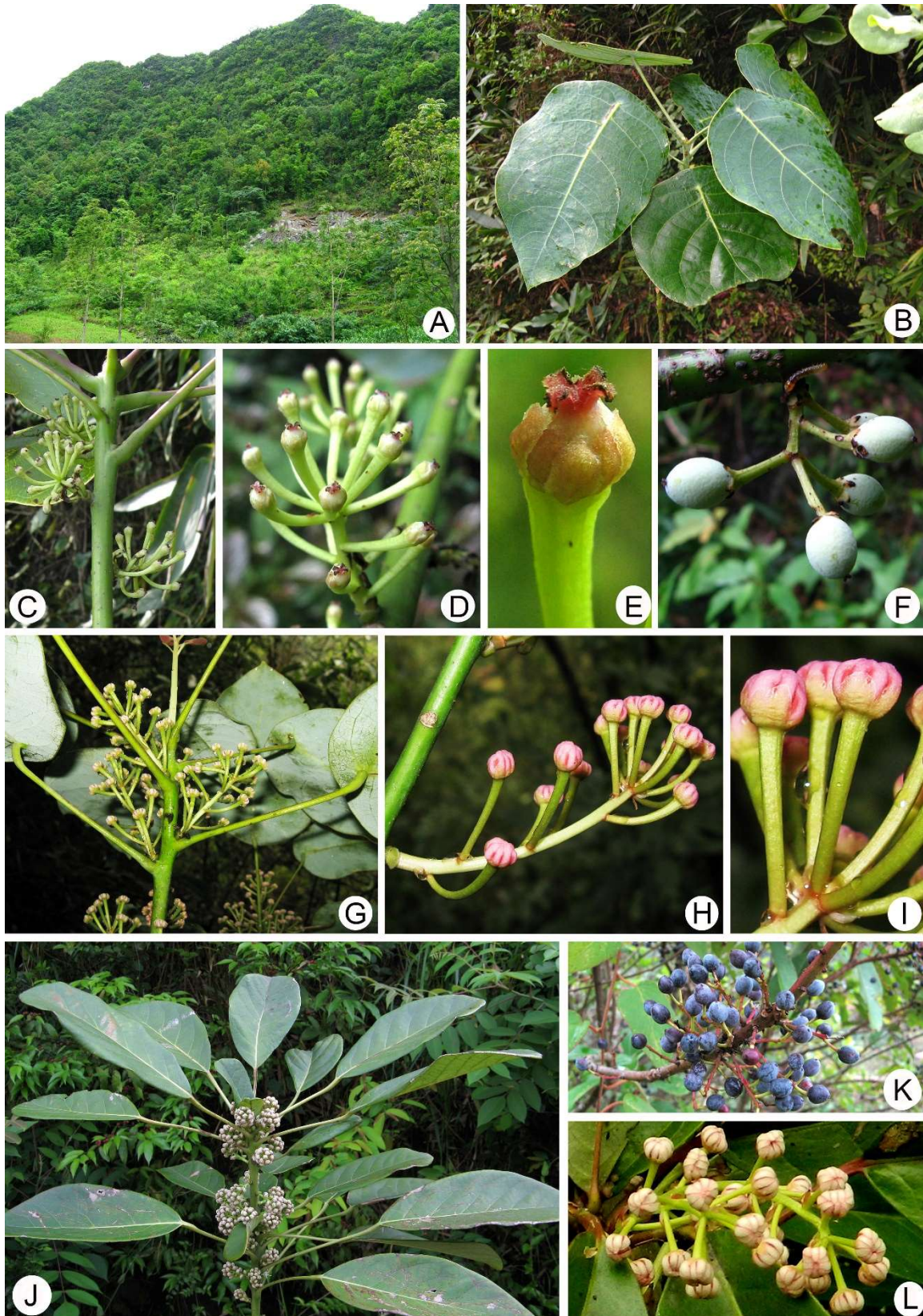


Fig. 2. *Daphniphyllum peltatum* Yan Liu & T. Meng sp. nov. (A-I). A. Habitat. B. Branch and leaves. C. Female flower branch. D. Female inflorescence. E. Female flower. F. Young fruits. G. Male flower branch. H. Male inflorescence. I. Male flowers. *Daphniphyllum calycinum* Benth. (J-L). J. Flowering branch. K. Inflorescence. L. Male flowers.

**Table 1.** Morphological comparisons between *Daphniphyllum peltatum* and *D. calycinum*

Characters	<i>D. peltatum</i>	<i>D. calycinum</i>
Branchlet	blue green	grayish brown
Leaf blade	broadly elliptic or rounded, base peltate, 6–18 cm wide	obovate or obovate-elliptic, base broadly cuneate, 4–9 cm wide
Leaf veins	6–10 pairs, prominent adaxially	8–11 pairs, visible adaxially
Petiole	4–13 cm long	4–8 cm long
Male flower	pedicel 1–1.5 cm long, calyx 4-6-parted, lobes triangular ovate, 1–2 mm long, anthers lunate	pedicel 8–10 mm long, calyx 3-4-lobed, lobes broadly triangular, lobes ca. 1.5 mm long, anthers lunate
Female flower	pedicel 1–1.3 cm long, calyx lobes 1–2 mm long, ovary ellipsoidal, ca. 3 mm long	pedicel 5–7 mm long, calyx lobes ca. 1.5 mm long, ovary ellipsoidal, 1.5–2 mm long
Infructescence	2–4 cm long	4–5 cm long
Drupe shape and size	elliptic, ca. 0.9 cm long, ca. 0.7 cm in diam.	ovoid-ellipsoidal, ca. 0.7 cm long, ca. 0.3–0.6 cm in diam.
Phenological period	flowering: March to April, fruiting: June to July	flowering: April to June, fruiting: August to November

& W.B. Xu 20120624Y1592 (holotype: IBK!, isotypes: IBK!, GXMG!)

Shrubs or small trees, 3–6 m tall. Branchlets blue green, with sparse lenticel. Leaf blade papery or slightly leather, broadly elliptic or rounded, 6–22 cm long, 6–18 cm wide, apex acute or rounded, usually with mucro, base rounded, peltate, margin entire, glabrous on both surfaces, glossy adaxially, glaucous and finely papillate abaxially, midvein prominent on both surfaces; lateral veins 6–10 pairs, obvious on both surfaces; petiole 4–13 cm long, base slightly inflated. Male inflorescence 2.5–3.5 cm long; pedicel 1–1.5 cm long; calyx 4–6-parted, lobes triangular ovate, 1–2 mm long, glabrous; stamens 8–12; anthers lunate, laterally pressed, 3–4 mm long, 1–1.5 mm wide; filaments extremely short. Female inflorescence 1.2–2.5 cm long, glabrous; pedicel 1–1.3 cm long; calyx 4–6-parted; lobes triangular ovate, glabrous, 1–2 mm long; ovary ellipsoidal, ca. 3 mm long, 2.5–3 mm wide; style 2, very short; stigma branches 2, recurved or circinate. Infructescence 2–4 cm long; drupe elliptic, ca. 0.9 cm long, ca. 0.7 cm in diam., glaucous and prominent papillate; style branches persistent.

Phenology: The new species was observed flowering from March to April, and fruiting from June to July.

Etymology: The specific epithet is derived from the peltate leaf of this new species. Chinese name is proposed here as “盾葉虎皮楠”.

Distribution and Habitat: This new species is currently known only from limestone areas of southwestern Guangxi, China, and grows in broad-leaved forests of limestone hillside. In the type locality, *D. peltatum* grows in forest of limestone hillside at an elevation of 1000–1100 m. The slope direction is to the north, the slope is up to 50°, the tree layer is up to 14 m tall, the canopy cover is 75%, the shrub layer cover is 80%, and the herb layer cover is 40%. The associated species include *Sapium rotundifolium*, *Macaranga denticulata* and *Phyllanthodendron dunnianum* (Euphorbiaceae), *Podocarpus neriifolius* (Podocarpaceae), *Pittosporum pulchrum* (Pittosporaceae), *Vaccinium bullatum* (Vacciniaceae), *Calcareaoboea coccinea* and *Ornithoboea wildeana* (Gesneriaceae), *Eria corneri* (Orchidaceae), etc.

Conservation status: Currently, *Daphniphyllum*

peltatum is known only from two subpopulations, one from the type locality and the other from Anning Country, Jingxi City (Fig. 3). The total population sizes are about 40 mature individuals. The known Area of Occupancy (AOO) is less than 2 km². The known localities are not within protected areas and being seriously affected by local residents, through clearance for cultivation, tree-cutting, and grazing, etc. Although we have been conducted fieldworks in southwestern Guangxi for more than 15 years, any subpopulations of *D. peltatum* were not been found in similar habitats of limestone areas. According to the IUCN Red List Categories and Criteria version 3.1 (IUCN 2012), *D. peltatum* is assessed as Critically Endangered (CR) (C2a(i); D).

Additional Specimens Examined (paratypes):

CHINA. Guangxi Zhuang Autonomous Region: Jingxi City, Ande Town, Sanhe Country, 7 June 2011, Y.S. Huang & D.X. Nong Y0669 (IBK!); the same location, 8 September 2011, Y.S. Huang Y0738 (IBK!); the same location, 24 March 2012, Y.S. Huang & Y.B. Liao Y1052 (IBK!); the same location, 15 April 2012, Y.S. Huang Y1232 (TAI!); the same City, Anning Town, Nalin Country, rare, 16 March 2013, X.Y. Huang et al. 451025130316001LY (IBK!, GXMG!)

Taxonomic Notes: *Daphniphyllum peltatum* is unique in morphology. It is mostly similar to *D. calycinum*, but it can be easily distinguished from all other species of *Daphniphyllum* based on the morphological characters of peltate leaf, obviously raised midvein and lateral veins on both surfaces. The morphological comparisons between *D. peltatum* and *D. calycinum* are summarized in Table 1. It can be further distinguished from all species of *Daphniphyllum* in China by the following key.

Key to the species of *Daphniphyllum* in China

- 1a. Calyx present 2
- 1b. Calyx absent 8
- 2a. Calyx deciduous or rarely persistent 3
- 2b. Calyx persistent 4
- 3a. Leaf blade lanceolate, obovate-lanceolate, oblong, or oblong-lanceolate, abaxially glaucous and papillate *D. oldhamii*
- 3b. Leaf blade oblong-elliptic or oblong, abaxially not glaucous and not papillate *D. chartaceum*
- 4a. Leaf blade peltate *D. peltatum*
- 4b. Leaf blade not peltate 5



- 5a. Leaf blade green when dry, abaxially glaucous; Calyx more than 1.5 mm long 6
 5b. Leaf blade dark brown when dry, abaxially not glaucous; Calyx less than 1.5 mm long 7
 6a. Leaf blade 9-16 cm long, 4-9 cm wide, apex obtuse or rounded; fruit ca. 7 mm long, glaucous *D. calycinum*
 6b. Leaf blade 16-37 cm long, 7-14 cm wide, apex acuminate; fruit 10-15 mm, not glaucous *D. majus*
 7a. Leaf blade 9-17 cm long, 3-6 cm wide, lateral and reticulate veins prominent on both surfaces, petiole 1.5-3.5 cm long *D. paxianum*
 7b. Leaf blade 6-9 cm long, 2-2.5 cm wide, apex acute, lateral veins visible on both surfaces, reticulate veins obscure, petiole 5-7 mm long *D. subverticillatum*
 8a. Female flower with staminodes around ovary 9
 8b. Female flower without staminodes 10
 9a. Stamines 10 around ovary; lateral veins slender and dense, visible on both surfaces *D. macropodium*
 9b. Stamines 5 around ovary; lateral veins laxly arcuate, slightly impressed adaxially, prominent abaxially *D. himalense*
 10a. Leaf blade narrowly lanceolate, 11.5-15 cm long, 2.5-3 cm wide; infructescence ca. 2.5 cm long; style branches deciduous *D. angustifolium*
 10b. Leaf blade large, oblong-elliptic, 16-26 cm long, 6-9 cm wide; infructescence 10-16 cm long; style branches persistent *D. longiracemosum*



Fig. 3. Known distributions of *Daphniphyllum peltatum* Yan Liu & T. Meng *sp. nov.* in Jingxi City of Guangxi, China.

ACKNOWLEDGMENTS

We are grateful to Mr. Wen-Hong Lin for preparing the illustration, to Prof. Yu-Song Huang, Chun-Rui Lin and Wei-Bin Xu, Mr. Bo Pan and Yun-Biao Liao, Miss Zhao-Cen Lu and Xue-Yan Huang for their assistance in field. This study was supported by the National Natural Science Foundation of China (grant no. 41661012), Special Funds for Local Science and Technology Development Guided by the Central Committee

(grant no. ZY1949013), and the Traditional Chinese medicine public health special project - The project of investigating and monitoring on the Chinese materia medica raw materials resources for national essential drugs ([2011]76) and Traditional Chinese Medicine industry research special project - Characteristic Chinese materia medica resources protection and utilization in representative regions of China (201207002).

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