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Source: Willdenowia, 47(3) : 311-316

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.47.47312

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Willdenowia
Annals of the Botanic Garden and Botanical Museum Berlin-Dahlem

LI-HUA YANG[1,2] & BO PAN[3*]

Primulina albicalyx (*Gesneriaceae*), a new species from a karst area in Guangxi, China

Version of record first published online on 20 November 2017 ahead of inclusion in December 2017 issue.

Abstract: *Primulina albicalyx*, a new species of *Gesneriaceae* from Guangxi Zhuang Autonomous Region, SW China, is described and illustrated. This new species is similar to *P. leprosa* by its yellow flowers, white calyx lobes and large bracts, but can be easily distinguished from the latter by some qualitative and quantitative characters in the leaf blade, peduncle and corolla. The conservation status of *P. albicalyx* can be considered as Critically Endangered (CR) according to the IUCN Red List categories and criteria.

Key words: China, *Gesneriaceae*, Guangxi, karst, limestone, new species, *Primulina*, *Primulina albicalyx*, *Primulina leprosa*, taxonomy

Article history: Received 21 June 2017; peer-review completed 9 October 2017; received in revised form 22 & 27 October 2017; accepted for publication 3 November 2017.

Citation: Yang L.-H. & Pan B. 2017: *Primulina albicalyx* (*Gesneriaceae*), a new species from a karst area in Guangxi, China. – Willdenowia 47: 311–316. doi: https://doi.org/10.3372/wi.47.47312

Introduction

The previously monotypic genus *Primulina* Hance (1883) has recently been redefined based on molecular data (Wang & al. 2011; Weber & al. 2011). The new *Primulina* has a predominant distribution in S and SW China, as well as N Vietnam. It displays a high degree of edaphic habitat specialization, i.e. the majority of species occur in karst limestone areas (Wang & al. 1990, 1998; Li & Wang 2004; Wei & al. 2010). This genus has rapidly drawn great attention from many botanists, and more than 50 new species have been described from China after its redefinition. The discovery of many new taxa of this group in a only few years suggests that *Primulina* diversity is not well understood, and further floristic surveys of *Gesneriaceae* in China are needed (Möller & al. 2016).

Flower colour in *Primulina* shows great variation and has been used as an important character for the description of new species, such as *P. alutacea* F. Wen & al. and *P. versicolor* F. Wen & al. and (Pan & al. 2016). However, most *Primulina* species have been described as having a purple-blue corolla, and yellow flowers are relatively rare. At the beginning of the redefinition of *Primulina*, there were only four species with yellow flowers: *P. cordifolia* (D. Fang & W. T. Wang) Y. Z. Wang (Wang 1982, under *Chiritopsis*; Wang & al. 2011), *P. lutea* (Yan Liu & Y. G. Wei) Mich. Möller & A. Weber (Liu & Wei 2004, under *Chirita*; Weber & al. 2011), *P. pteropoda* (W. T. Wang) Yan

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Liu (Wang 1985, under *Chirita*; Wang & al. 2011) and *P. xiuningensis* (X. L. Liu & X. H. Guo) Mich. Möller & A. Weber (Liu & Guo 1989, under *Chiritopsis*; Weber & al. 2011). Soon after, another two species, both with yellow flowers, were transferred to the new *Primulina*, i.e. *P. danxiaensis* (W. B. Liao & al.) W. B. Liao & K. F. Chung (Shen & al. 2010, under *Chiritopsis*; Xu & al. 2012) and *P. leprosa* (Yan Liu & W. B. Xu) W. B. Xu & K. F. Chung (Xu & al. 2010, under *Chirita*; Xu & al. 2012). In recent years, five additional species, all with yellow flowers, have been newly described, i.e. *P. alutacea* and *P. versicolor* (Pan & al. 2016), *P. jiangyongensis* X. L. Yu & Ming Li (Li & al. 2014), *P. lepingensis* Z. L. Ning & M. Kang (Ning & al. 2014) and *P. moi* F. Wen & Y. G. Wei (Zhou & al. 2015). Up to now, there are 11 species with yellow flowers known in *Primulina*. In this paper, we describe a 12th species with yellow flowers.

At the end of June 2015, during field explorations in Du'an County, W Guangxi, China, one of the present authors (Pan) found some plants of a *Primulina* species at the end of their flowering period. Several remaining flowers showed yellow colour, which drew this author's attention. Several living individuals were collected and brought to the Guilin Botanical Garden (GBG) and were cultivated there, and also herbarium specimens were collected. Further field work was done in April 2016, and several living individuals were brought to the South China Botanical Garden (SCBG) and were cultivated there. Detailed morphological observations were done both in GBG and SCBG. The results show this species is similar to *P. leprosa*, an endemic species occurring near Du'an County, by its yellow flowers, white calyx lobes and large bracts. Nevertheless, the two entities differ in several important characters, which are discussed below. To confirm the identity of the plants from Du'an County, we conducted a comprehensive study of the literature and herbarium specimens. The results make us consider these plants to represent a new species, which is described and illustrated here.

Material and methods

Living material of the new species from both the wild and the greenhouses of GBG and SCBG, as well as herbarium specimens collected from the wild, were observed. All morphological characters were measured using a dissecting microscope and were described using the terminology presented by Wang & al. (1998). Literature studies included all relevant monographs, i.e. Wang & al. (1990, 1998), Li & Wang (2004) and Wei & al. (2010), and also some recently published literature, such as Liu & Wei (2004), Shen & al. (2010), Xu & al. (2010, 2012), Li & al. (2014), Ning & al. (2014) and Pan & al. (2016). Study of specimens was conducted at IBSC, IBK, and via online databases, such as the Chinese Virtual Herbarium (http://www.cvh.ac.cn/) and JSTOR Global Plants (http://plants.jstor.org/).

Results and Discussion

Primulina albicalyx B. Pan & Li H. Yang, **sp. nov.** – Fig. 1 & 2.

Holotype: China, Guangxi Zhuang Autonomous Region, Du'an County, Dongmiao Town, on moist rocky surface of limestone, 22 Jun 2015, *B. Pan & X. H. Hu. P1028* (IBK!).

Diagnosis — The new species is similar to *Primulina leprosa*, but mainly differs by its ovate to broadly ovate leaf blade with flat adaxial surface (vs elliptic to broadly elliptic with bullate adaxial surface in *P. leprosa*), nearly tubular corolla tube (vs funel-form in *P. leprosa*), different corolla colour pattern: tube yellowish, with several brownish yellow striations on the entrance and a brownish yellow swelling between the two upper lip lobes (vs tube white, with brown lines on upper lip and without brownish yellow swelling in *P. leprosa*).

Description — Herbs perennial. *Rhizome* subterete, 1–3 cm long, 8–15 mm in diam. *Leaves* 6–10, all basal, opposite; *petiole* 2.1–4.2 cm long, 4–6 mm wide, appressed pubescent on both surfaces; *leaf blade* ovate to broadly ovate, 4.5–8.6 cm long, 3.5–6.8 cm wide, slightly fleshy when fresh, thickly papery when dried, abaxially glabrescent and only puberulent along veins, adaxially flat and densely appressed pubescent, base cuneate to broadly cuneate, margin inconspicuously crenate, apex obtuse to subacute; *lateral veins* 3 on each side, abaxially conspicuous, adaxially inconspicuous. *Cymes* 2–5, axillary, 6–14-flowered; *peduncle* 6.8–12 cm long, 2.5–3.5 mm in diam., densely appressed pubescent; *bracts* 2, opposite, green, ovate to narrowly ovate, 1.8–2.5 cm long, 9–14 mm wide, abaxially densely appressed pubescent, adaxially sparsely pubescent, margin entire, apex acute. *Pedicel* 7–10 mm long, densely pubescent. *Calyx* 5-lobed to near base; *lobes* white, lanceolate, 4–6 mm long, 1.5–2 mm wide, abaxially densely glandular pubescent, adaxially sparsely pubescent, margin entire. *Corolla* yellowish with several brownish yellow striations on entrance, 3.5–4.5 cm long, outside densely glandular pubescent, inside sparsely glandular pubescent; *corolla tube* nearly tubular, 2.2–2.8 cm long, 6–8 mm in diam. at base, 10–12 mm in diam. at mouth; *corolla limb* distinctly 2-lipped; *upper lip* 2-lobed, lobes broadly ovate, 5–7 mm long, 7–9 mm wide, apex rounded, with a brownish yellow swelling between lobes; *lower lip* 3-lobed, lobes oblong, 7–9 mm long, 5–6 mm wide, apex rounded. *Stamens* 2, adnate to corolla tube 15–18 mm above tube base; *filaments* yellowish, linear, 9–12 mm long, obviously geniculate near middle, sparely glandular pubescent; *anthers* fused by entire adaxial surfaces, 2–2.5 mm long, 1.2–1.5 mm wide, glabrous; *staminodes* 2, 5–7 mm long, adnate to corolla tube 12–15 mm above tube base. *Disc* circular, c. 1.2 mm high, with repand margin. *Pistil* 2.2–2.8 cm long; *ovary* cylindric, 16–20 mm

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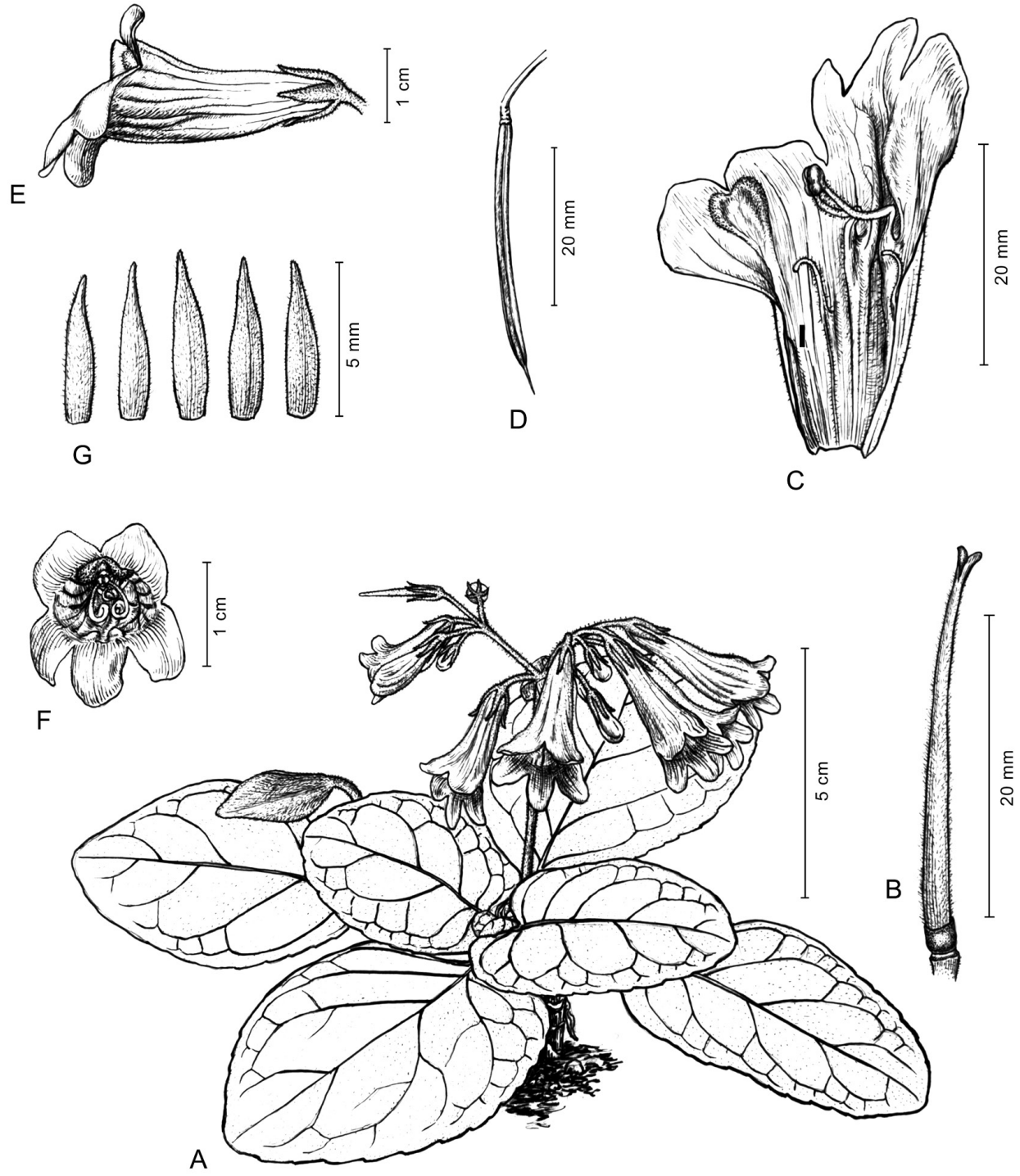


Fig. 1. *Primulina albicalyx* – A: habit; B: pistil; C: opened corolla, showing stamens and staminodes; D: fruit; E: flower in lateral view; F: flower in front view; G: calyx lobes. – Drawn from cultivated individuals collected from the type locality by Yun-Xiao Liu.

long, c. 1.5 mm in diam., densely glandular pubescent; *style* 6–8 mm long, densely glandular pubescent; *stigma* 1, c. 2 mm long, c. 1.5 mm wide, upper lobe absent, lower lobe obtrapeziform, apex 2-lobed. *Capsule* linear, 3.1–3.6 cm long.

Phenology — The new species flowers from May to June and fruits from June to July.

Distribution and ecology — At present, *Primulina albicalyx* is known only from the type locality in Du'an County, W Guangxi Zhuang Autonomous Region, SW China (Fig. 3). Plants grow on moist and shady limestone rocks under northern tropical limestone seasonal rain forest.

Conservation status — Based on our careful field explorations on three occasions over the past several years,

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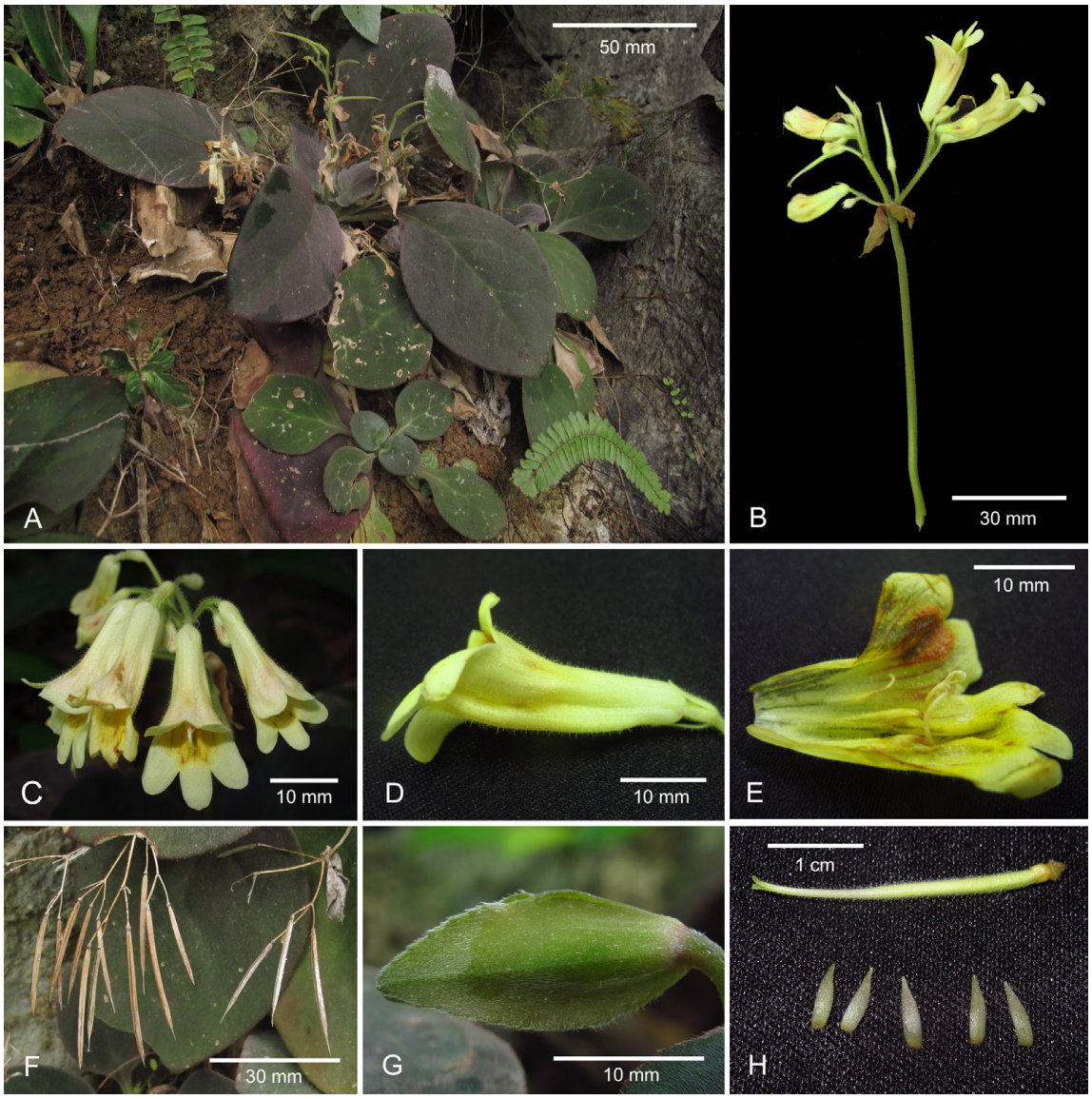


Fig. 2. *Primulina albicalyx* – A: habit; B: cyme; C: flowers in front view; D: flower in lateral view; E: opened corolla, showing stamens and staminodes; F: fruits; G: bract; H: pistil and calyx lobes. – A, F: photographed at the type locality on 21 June 2015 by Bo Pan; B–E, G, H: photographed at Guilin Botanical Garden on 14 May 2016 by Bo Pan.

the new species is known from only one population and occupies an area of less than 100 m^2. This population is located at a roadside, and is therefore easily subjected to destruction by human activities. According to our observations, there were about 200 mature individuals in 2015. However, the population size had been reduced to no more than 100 mature individuals in 2016. Based on the current information, *Primulina albicalyx* can be considered as Critically Endangered (CR) B1ab(iii,v)+2ab(iii,v); C2a(ii), following the IUCN categories and criteria (IUCN 2016).

Etymology — The specific epithet "*albicalyx*" refers to the white calyx lobes.

Vernacular name — Chinese: 白萼报春苣苔 (bái è bào chūn jù tái). The first two characters mean "white calyx", the last four are the Chinese name for *Primulina*.

Remarks — *Primulina albicalyx* is morphologically similar to *P. leprosa* by its yellow flowers, white calyx lobes and large bracts, and mainly differs from the latter by the characters described in the diagnosis as well as in Table 1. Moreover, there is no overlap in the geographical distributions of these two species (Fig. 3). It is worth noting that yellow flowers in *Primulina* species have evolved independently, according to the phylogenetic tree in Kang & al. (2014), which suggests that *P. albicalyx* is perhaps not closely related to *P. leprosa* in phylogeny. The phylogenetic affinities of the new taxon need further work.

Additional specimen seen (paratype) — China: Guangdong: Guangzhou City, cultivated in South China Botanical Garden, 29 May 2017, *L. H. Yang, YLH384* (IBSC!), introduced from the same locality as the holotype.

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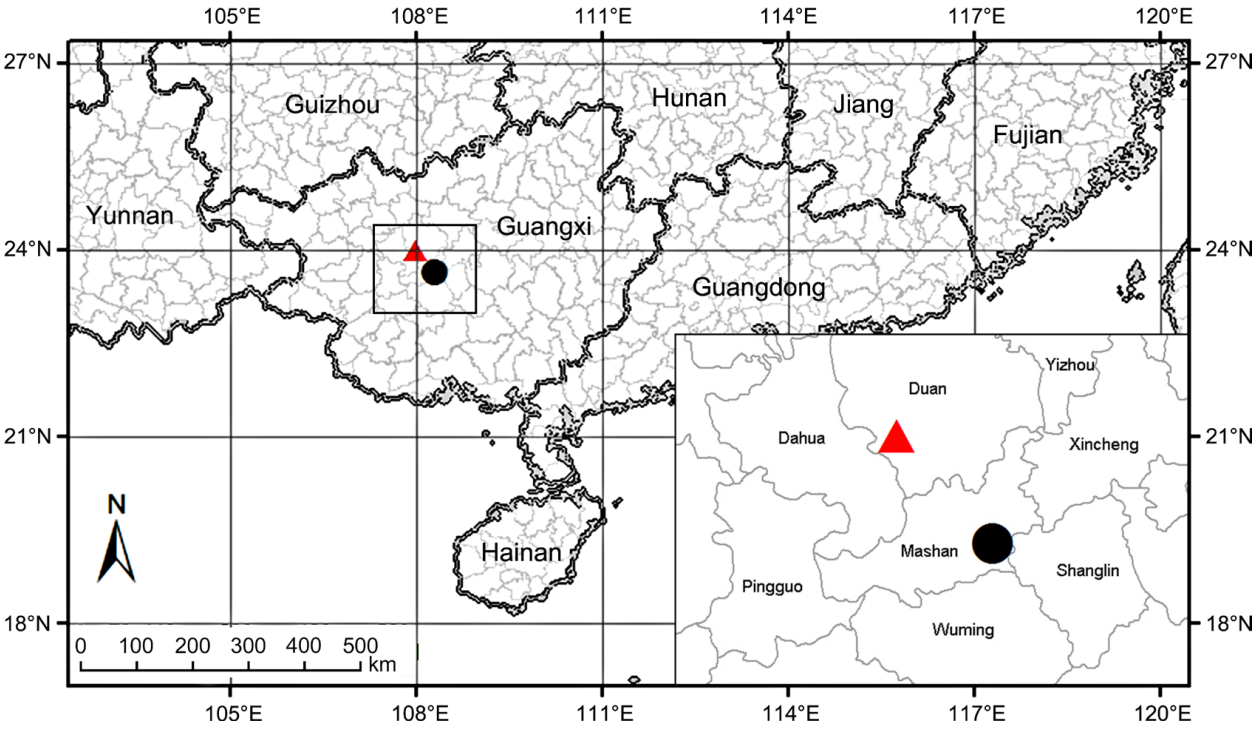


Fig. 3. Geographical distribution of *Primuina albicalyx* (▲) and *P. leprosa* (●).

Table 1. Morphological comparison of *Primuina albicalyx* and *P. leprosa*.

	Primulina albicalyx	***Primulina leprosa***
Leaf blade shape	ovate to broadly ovate, adaxial surface flat	elliptic to broadly elliptic, adaxial surface bullate
Peduncle length	6.8–12 cm	4.5–7 cm
Corolla colour	tube yellowish, with several brownish yellow striations on entrance and a brownish yellow swelling between 2 upper lip lobes	tube white, with brown lines on upper lip, without brownish yellow swelling
Corolla tube shape	nearly tubular	funnelform
Corolla tube dimensions	6–8 mm in diam. at base, 10–12 mm in diam. at mouth	c. 3.5 mm in diam. at base, c. 12 mm in diam. at mouth
Corolla lower lip lobes length	7–9 mm	11–14 mm
Number of staminodes	2	3
Flowering time	May to June	October to November

Acknowledgements

We thank Dr. Xi-Hua Hu (Guangxi Institute of Botany) for collecting specimens and living plants, and Yun-Xiao Liu for the illustration (Fig. 1). We also thank Yi-Qing Yao (Washington State University) for revision of the English. This work was supported by the NSFC-Guangdong Natural Science Foundation Joint Project (U1501211) and the Foundation of Key Laboratory of Plant Resources Conservation and Sustainable Utilization, South China Botanical Garden, Chinese Academy of Sciences. Finally we thank the two anonymous reviewers for their comments on an earlier version of this paper.

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Online ISSN 1868-6397 · Print ISSN 0511-9618 · Impact factor 0.680

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