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Paraboea nanxiensis (Gesneriaceae), a new species from southeastern Yunnan Province, China

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Abstract: *Paraboea nanxiensis* Lei Cai & Gui L. Zhang, a new species of Gesneriaceae from karst area around the Sino-Vietnamese border, is described here. The new species is morphologically similar to *P. nutans* D. Fang & D. H. Qin in the shape and indumentum characters of leaf blade, color of flower, length of the inflorescence and glabrous pistil, but it can be easily distinguished by the shape of the corolla, the color of flower interior, the shape and indumentum of calyx lobes, and capsule morphology. The detailed descriptions, color photographs, distribution and ecology, as well as its morphological relationship with similar species are also provided. In recent years, many new taxa or newly record species have been found in limestone areas along the Sino Vietnam border, it is necessary to strengthen the investigation of plant diversity for better understanding the high biodiversity in this area.

Key words: *Paraboea*, new taxon, limestone area, taxonomy, Flora of Yunnan

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云南东南部苦苣苔科植物一新种——南溪蛛毛苣苔

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摘 要: 中越边境的石灰岩地区不仅具有较丰富的植物多样性, 而且特有现象十分突出。该文描述了中越边境石灰岩地区位于云南东南部河口境内的苦苣苔科一个植物新种——南溪蛛毛苣苔 (*Paraboea nanxiensis* Lei Cai &

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Gui L. Zhang)。该新种在叶片的形状和毛被、花的颜色、花序短于叶片以及雌蕊无毛等性状上与产自广西那坡的垂花蛛毛苣苔(*P. nutans* D. Fang & D. H. Qin)最为相似。两者的主要区别在于:该新种的花萼裂片先端最宽且光滑无毛,花冠浅宽钟形、花冠筒不明显、花冠管内面基部白色,花丝无毛以及蒴果稍微扭曲;该新种生于云南海拔 530~610 m 的河口及马关一带,而垂花蛛毛苣苔产于广西那坡的海拔 900~1 150 m 段的石灰山。此外还讨论了该新种与蛛毛苣苔属其他几种基生叶类型的近缘种[如三萼蛛毛苣苔(*P. trisepala* W. H. Chen & Y. M. Shui)、蔓耗蛛毛苣苔(*P. manhaoensis* Y. M. Shui & W. H. Chen)及河口蛛毛苣苔(*P. hekouensis* Y. M. Shui & W. H. Chen)]的区别,并提供了相关物种的彩色图片及区分说明,主模式标本存放于中国科学院昆明植物研究所标本馆(KUN)中。近年来,由于中越边境的石灰岩地区不断有新分类群或新记录物种的发现,所以很有必要加强对该区域的植物多样性考察。

关键词: 蛛毛苣苔属, 新类群, 石灰岩地区, 分类学, 云南植物区系

1 Introduction

The genus *Paraboea* (C. B. Clarke) Ridl. has become one of the larger genera in the Old World Gesneriaceae after the revision (Xu et al., 2008), combination (Puglisi et al., 2011), transfer (Puglisi et al., 2016), and descriptions of many new species (Triboun & Middleton, 2012, 2015; Guo et al., 2016; Wen & Wei, 2016; Xu et al., 2017a; Middleton, 2018; Averyanov et al., 2020). Up to now it includes more than 130 species mainly distributed in the eastern Himalayas and Indo-China Peninsula and the adjacent areas (Puglisi et al., 2015; He et al., 2018). China harbours a high diversity of *Paraboea* with many endemic species (Middleton, 2018), and hitherto, 33 species are recorded in South and Southwest China, such as Guangdong, Guangxi, Guizhou and Yunnan (Wang et al., 1990, 1998; Li & Wang, 2005; Chen et al., 2012; Xu et al., 2017b; Lu et al., 2019; Wen et al., 2019).

In the floristic surveys in the limestone areas of southeastern Yunnan, China in 2016, we discovered a plant belonging to the Subfamily Didymocarpoideae, Family Gesneriaceae. We confirmed it belonged to the genus *Paraboea* when we observed its flower and fruit characteristics (such as: two fertile stamens, twisted capsule and cobwebby-woolly hair on the leaf blade) in the following years. After a careful examination of the

specimens and the related literature of *Paraboea* from the adjacent regions, we concluded that this plant represents a new species to science (Wang et al., 1990, 1998; Li & Wang, 2005; Chen et al., 2012; Xu et al., 2017a; Middleton, 2018; He et al., 2018). Here, the new species, *P. nanxiensis* Lei Cai & Gui L. Zhang, is described, and its morphological characters are compared with the closely related species *P. nutans* D. Fang & D. H. Qin (Fig. 2: A-E).

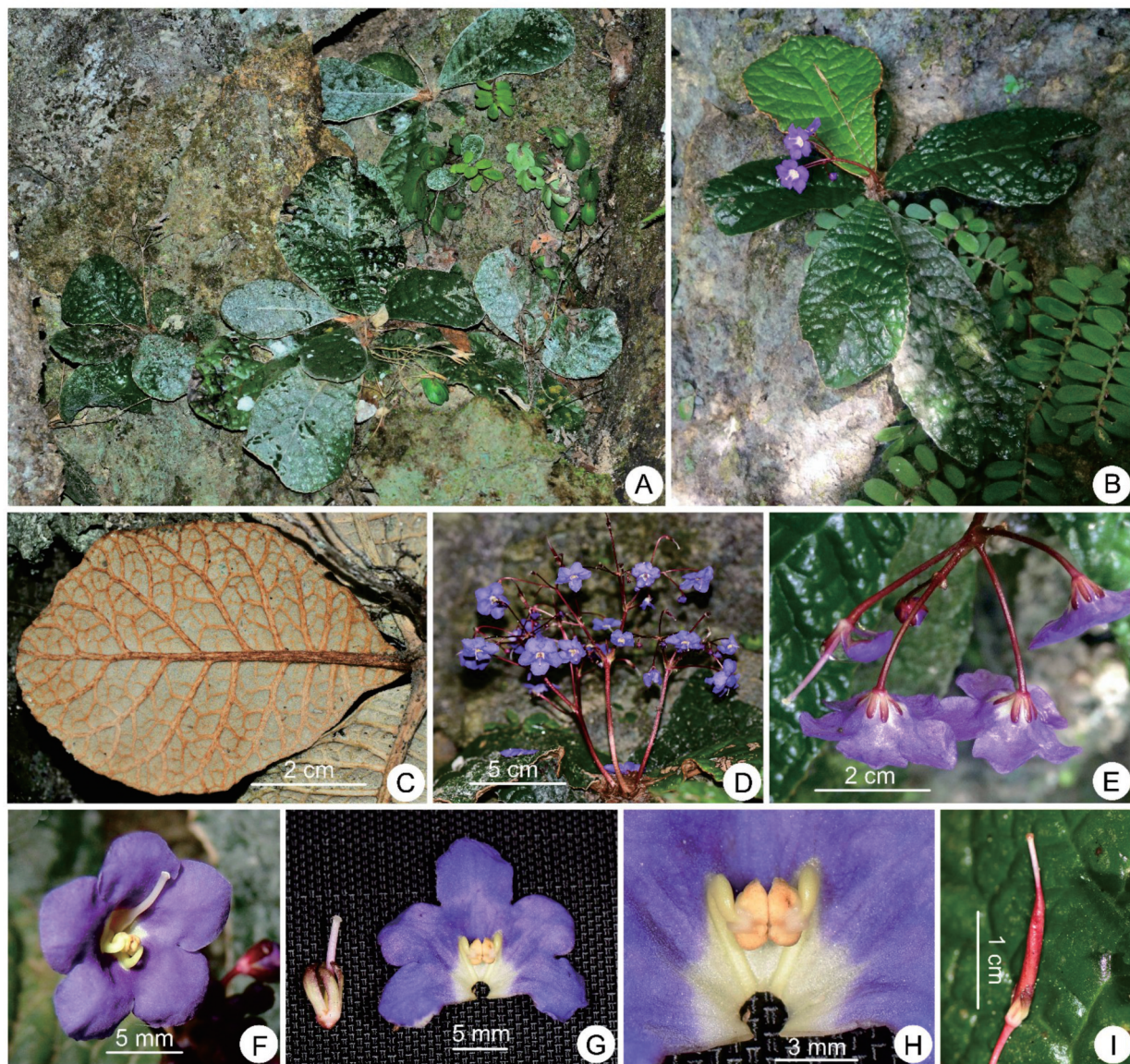
2 Taxonomy treatment

Paraboea nanxiensis Lei Cai & Gui L. Zhang, sp. nov. (Fig. 1)

Type: CHINA. Yunnan Province: Hekou County, Nanxi Township, Baishahe, Laolongtian, 22°41'56" N, 103°57'19" E, alt. 536 m, on the rocks under the tropical rainforest in karst region, in flowering, 14 July 2017, *G.L. Zhang et al.* CL2017085 (holotype KUN!, isotypes KUN! IBK!).

Diagnosis: The new species is morphologically similar to *Paraboea nutans* in the obovate leaf blade with cobwebby-woolly and brownish woolly hair on both sides, absent or short petiole and purplish blue flowers, but it can be easily distinguished from *P. nutans* by its calyx lobes oblong to oblanceolate, glabrous, corolla broadly shallow campanulate, tube inside white below the middle, filament glabrous and capsule slightly twisted.

Description: Perennial herbs, stemless. Leaves

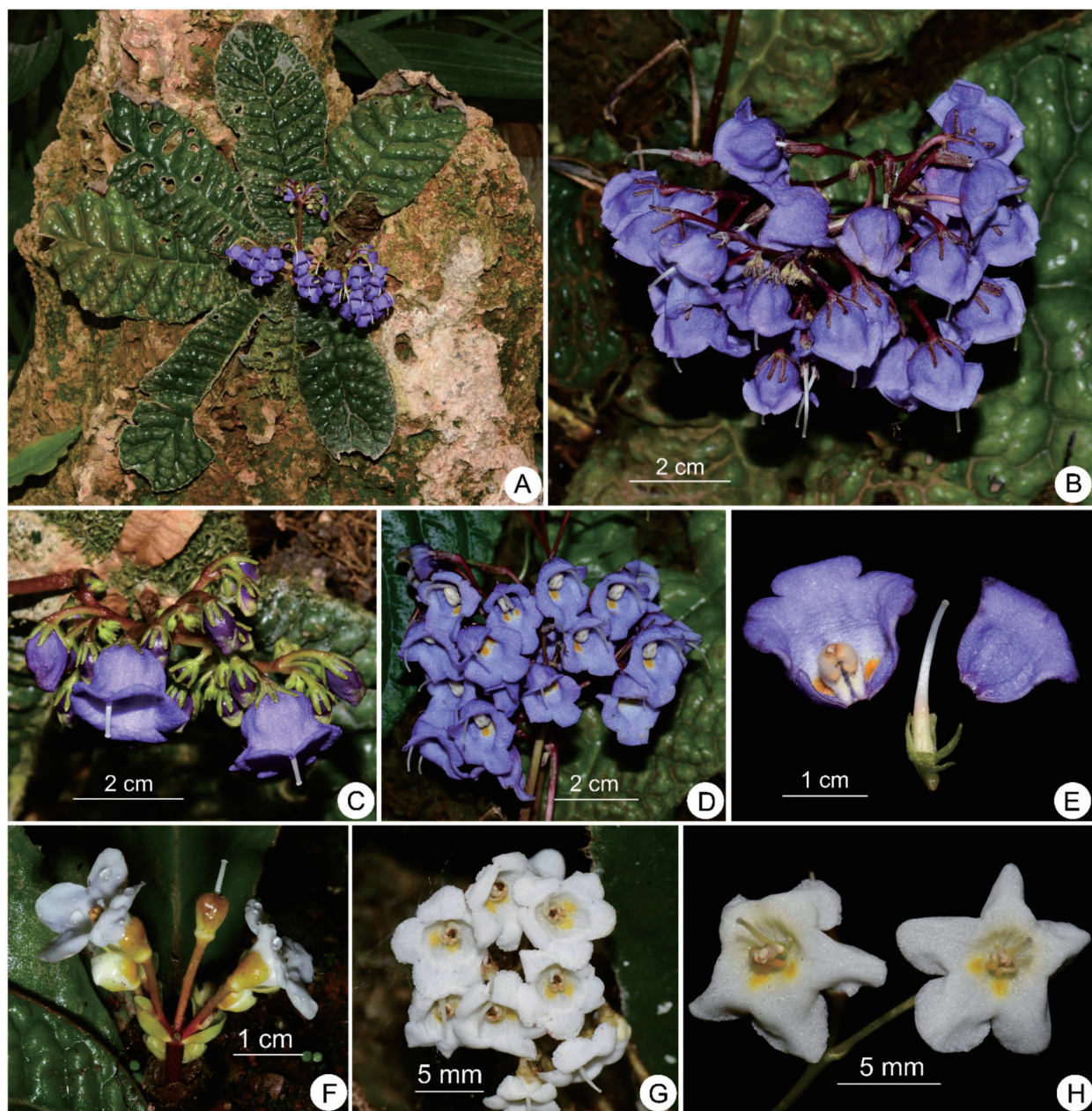


A. Habitat; B. Plants with flowers; C. Abaxial leaf surfaces; D. Front view of inflorescence; E. Top view of inflorescences; F. Front view of a flower; G. Opened corolla showing stamens and staminode, and pistil with calyx; H. Stamens; I. Young fruit.

Fig. 1 *Paraboea nanxiensis* Lei Cai & Gui L. Zhang

basal; petiole (absent or) 2–5 mm long, rust-brown woolly; leaf blade obovate, $6.5-22.5 \times 2.5-10.5$ cm, leathery, adaxially dark green, cobwebby-woolly, later glabrescent, abaxially brown cobwebby-woolly to pannose, rust-brown woolly along margin and veins, lateral veins 7–12 on each side of midrib, base attenuate to broadly cuneate, margin undulate, apex rounded. Cymes 1–4, axillary, 1–2-branched, inflorescence 5–15-flowered; peduncle 4–8 cm long,

brown cobwebby-woolly, later glabrescent; bracts linear lanceolate, ca. 5×2 mm, outside brown cobwebby-woolly; pedicel 1.4–2.4 cm long, glabrous. Calyx 5-parted to base, lobes equal, oblong to oblanceolate, $4-6 \times 2-2.2$ mm, glabrous, margin entire. Corolla purplish blue, broadly shallow campanulate, outside glabrous; tube short, 5–7 mm long, white below the middle inside, ca. 2 mm in diameter at base, 8–12 mm in diameter at throat;



A. Plants with flowers; B, C, F. Top view of inflorescences; D, G, H. Front view of inflorescence; E. Opened corolla showing stamens and staminode, and pistil with calyx. (F: Provided by Dr. Fang Wen)

Fig. 2 *Paraboea nutans* (A-E), *P. triseipala* (F), *P. hekouensis* (G) and *P. manhaoensis* (H)

limb slightly 2-lipped; adaxial lip 2-lobed, lobes semicircular to broadly ovate, $5-7 \times 6-9$ mm, abaxial lip 3-lobed, lobes semicircular to broadly ovate, $6-8 \times 7-10$ mm. Stamens 2, included; filaments yellowish white, ca. 2 mm long, glabrous, curved in the middle, adnate to 3–4 mm above corolla tube base; anther 2, confluent at apex;

staminodes 3, ca. 0.4 mm long, adnate to ca. 1 mm above corolla tube base. Disc inconspicuous. Pistil glabrous; ovary conical, 3–6 mm long, ca. 1 mm in diameter; style linear 5–8 mm long, ca. 0.5 mm in diameter; stigma 1, capitate. Capsule linear, slight twisted, 1.2–1.8 cm long, ca. 1.5 mm in diameter, with persistent style.

Phenology: Flowering from July to August; fruiting from September to December.

Distribution & Ecology: *Paraboea nanxiensis* is found from Hekou County and Maguan County with two separate populations in southeastern Yunnan Province, near the border between China and Vietnam. It grows on the surface of the moist rocks under the tropical rainforest in limestone area with other lithophytic plants (e.g. *Adiantum* L., *Begonia* L., and *Elatostema* J. R. Forster & G. Forster).

Etymology: The specific epithet “*nanxiensis*” is derived from the name of the type locality, Nanxi Township, Hekou County, Yunnan Province, China. The Chinese name is “*nán xī zhū máo jù tái*” (南溪蛛毛苣苔).

Conservation status: Approximately only 50 individuals were found in two separate locations during filed investigation. Base on the result of field surveys and available data, *Paraboea nanxiensis* is provisionally assessed as Critically Endangered (CR) B2a according to IUCN Red List categories and criteria (IUCN, 2019), and we will continue to pay attention on the dynamics of this plant species with extremely small populations.

Additional specimens examined: China, Yunnan Province, Maguan County, Gulinqing Community, Juziyuan, Zhankengdaokou, 103° 54' 09. 91" E, 22°43'41.92" N, alt. 610 m, on the surface of moist rocks, 20 November 2017, L. Cai et al. CL2017092 (KUN!).

Notes: *Paraboea nanxiensis* morphologically resembles *P. nutans* in the obovate leaf blade with cobwebby-woolly and brownish woolly hair, absent or short petiole and purplish blue, however, *P. nanxiensis* can be clearly distinguished from *P. nutans* by several vegetative characters, e.g. the calyx lobes oblong to oblanceolate, glabrous (*vs.* oblong or lanceolate-oblong, outside sparsely brownish woolly); corolla broadly shallow campanulate (*vs.* helmet shaped); limb slightly 2-lipped (*vs.* limb obviously 2-lipped); tube inside

white below the middle (*vs.* two yellow patches underside of tube near base); filament glabrous (*vs.* glandular puberulent), and capsule slightly twisted (*vs.* not twisted). Additionally, the new species grows in the altitude of 530–610 m in southeastern Yunnan, while its congener grows at an altitude of 900–1 150 m in Guangxi. It also resembles *P. triseipala* W. H. Chen & Y. M. Shui from Guangxi in the shape and indumentum characteristic of leaf blade, but obviously different in the three calyx lobes and straight capsule of the latter (Chen et al., 2008) (Fig. 2: F). There are also two basal leaves *Paraboea* species (*P. hekouensis* Y. M. Shui & W. H. Chen and *P. manhaoensis* Y. M. Shui & W. H. Chen) in the same geographic region, but they are very different from the new species. *P. hekouensis* has white flowers and golden-brown simple long trichomes on the lower leaf surface, petioles, peduncles and pedicels, while *P. manhaoensis* has tiny white flowers and golden subsessile glands on lower leaf surface on the veins, petioles, peduncles and filaments (Chen et al., 2012) (Fig. 2: G, H). At the same time, the type locality is in the Sino-Vietnamese limestone region which is one of the biodiversity hotspots in the world, many species of Gesneriaceae (including the genus *Paraboea*) were discovered in this area in recent years (Chen et al., 2012, 2014; Cai et al., 2017, 2019; Xu et al., 2017a; Middleton, 2018; Chen et al., 2019; Lu et al., 2019; Averyanov et al., 2020), therefore, we will continue to pay more attention to the Gesneriaceae species diversity in this area and adjacent region.

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References:

- AVERYANOV LV, XU WB, NGUYEN KS, et al., 2020. *Paraboea villosa* (Gesneriaceae), a new species from Northern Vietnam [J]. *Taiwania*, 65(1): 33–36.
- CAI L, LIU DT, ZHANG P, et al., 2019. Two new species of *Henckelia* (Gesneriaceae) from Southeastern Yunnan, China [J]. *PhytoKeys*, 130: 151–160.
- CAI L, ZHANG GL, ZHANG GS, et al., 2017. *Loxostigma hekouensis* (Gesneriaceae), a new species from Yunnan Province, China [J]. *Ann Bot Fenn*, 54: 429–433.
- CHEN L, CHEN WH, GUO SW, et al., 2019. *Petrocodon tenuitubus* (Gesneriaceae), a new species from Southeast Yunnan, China [J]. *Guihaia*, 39(5): 574–580. [陈力, 陈文红, 郭世伟, 等, 2019. 云南东南部石山苣苔属一新种——细管石山苣苔 [J]. *广西植物*, 39(5): 574–580.]
- CHEN WH, MÖLLER M, SHUI YM, et al., 2008. A new species of *Paraboea* (Gesneriaceae) from a karst cave in Guangxi, China, and observations on variations in flower and inflorescence architecture [J]. *Bot J Linn Soc*, 158: 681–688.
- CHEN WH, MÖLLER M, SHUI YM, et al., 2014. Three new species of *Petrocodon* (Gesneriaceae), endemic to the limestone areas of Southwest China, and preliminary insights into the diversification patterns of the genus [J]. *Syst Bot*, 39(1): 316–330.
- CHEN WH, MÖLLER M, ZHANG MD, et al., 2012. *Paraboea hekouensis* and *P. manhaoensis*, two new species of Gesneriaceae from China [J]. *Ann Bot Fenn*, 49: 179–187.
- GUO J, LU ZC, LIU J, et al., 2016. *Paraboea crassifila*, a new species of *Paraboea* (Gesneriaceae) from Danxia landform in Guangxi, China [J]. *Taiwania*, 61(1): 8–12.
- HE DM, FENG YF, PAN FZ, et al., 2018. *Paraboea wenshanensis*, a new species of Gesneriaceae from Yunnan, China [J]. *PhytoKeys*, 95: 83–91.
- IUCN, 2019. Guidelines for Using the IUCN Red List Categories and Criteria. Version 14. Prepared [EB/OL]. The Standards and Petitions Subcommittee of the IUCN Species Survival Commission. <http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf>
- LI ZY, WANG YZ, 2005. Plants of Gesneriaceae in China [M]. Zhengzhou: Henan Science and Technology Publishing House: 1–721. [李振宇, 王印政, 2005. 中国苦苣苔科植物 [M]. 郑州: 河南科学技术出版社: 1–721.]
- LU ZC, LIU ED, HAN MQ, et al., 2019. Discovery of *Paraboea minutiflora* (Gesneriaceae) from southeastern Yunnan, China with supplementary description [J]. *Guihaia*. DOI: 10.11931/guihaia.gxzw201909027. [陆昭岑, 刘恩德, 韩孟奇, 等, 2019. 微花蛛毛苣苔在中国云南的发现及其补充描述 [J]. *广西植物*. DOI: 10.11931/guihaia.gxzw201909027.]
- MIDDLETON DJ, 2018. Two new species of *Paraboea* (Gesneriaceae) from Vietnam [J]. *Edinb J Bot*, 75(3): 421–425.
- PUGLISI C, MIDDLETON DJ, TRIBOUN P, et al., 2011. New insights into the relationships between *Paraboea*, *Trisepalum*, and *Phylloboea* (Gesneriaceae) and their taxonomic consequences [J]. *Taxon*, 60(6): 1693–1702.
- PUGLISI C, SUDDEE S, TRIBOUN P, et al., 2015. A new species of *Paraboea* (Gesneriaceae) from Thailand [J]. *Gard Bull Singapore*, 67(1): 101–106.
- PUGLISI C, YAO TL, MILNE M, et al., 2016. Generic recircumscription in the Loxocarpaceae (Gesneriaceae), as inferred by phylogenetic and morphological data [J]. *Taxon*, 65(2): 277–292.
- TRIBOUN P, MIDDLETON DJ, 2012. Twenty new species of *Paraboea* (Gesneriaceae) from Thailand [J]. *Gard Bull Singapore*, 64: 333–370.
- TRIBOUN P, MIDDLETON DJ, 2015. Three new species of *Paraboea* (Gesneriaceae) from Thailand [J]. *Thai For Bull (Bot)*, 43: 18–23.
- WANG WT, PAN KY, LI ZY, 1990. Gesneriaceae [M]//WANG WT. Flora Reipublicae Popularis Sinicae. Beijing: Science Press, 69: 460–471. [王文采, 潘开玉, 李振宇, 1990. 苦苣苔科 [M]//王文采. 中国植物志. 北京: 科学出版社, 69: 460–471.]
- WANG WT, PAN KY, LI ZY, 1998. Gesneriaceae [M]//WU ZY, RAVEN PH. Flora of China. Beijing: Science Press; St. Louis: Missouri Botanical Garden Press, 18: 362–367.
- WEN F, LI S, XIN ZB, et al., 2019. The updated plant list of Gesneriaceae in China under the new Chinese naming rules [J]. *Guangxi Sci*, 26(1): 37–63. [温放, 黎舒, 辛子兵, 等, 2019. 新中文命名规则下的最新中国苦苣苔科植物名录 [J]. *广西科学*, 26(1): 37–63.]
- WEN F, WEI YG, 2016. *Paraboea yunfuensis*: A new calcicolous species of Gesneriaceae from Yunfu, Guangdong Province, China [J]. *Telopea*, 19: 125–129.
- XU WB, GUO J, PAN B, et al., 2017a. Three new species of *Paraboea* (Gesneriaceae) from limestone karsts of China based on morphological and molecular evidence [J]. *Bot Stud*, 58(1): 1–14.
- XU WB, GUO J, PAN B, et al., 2017b. Diversity and distribution of Gesneriaceae in China [J]. *Guihaia*, 37(10): 1219–1226. [许为斌, 郭婧, 盘波, 等, 2017. 中国苦苣苔科植物的多样性与地理分布 [J]. *广西植物*, 37(10): 1219–1226.]
- XU ZR, BURTT BL, SKOG LE, et al., 2008. A revision of *Paraboea* (Gesneriaceae) [J]. *Edinb J Bot*, 65: 161–347.

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