广西植物 Guihaia Oct. 2020, 40(10): 1445-1449 http://www.guihaia-journal.com

DOI: 10.11931/guihaia.gxzw202004026

陆昭岑, NGUYEN KS, PHAN KL, 等. 苦苣苔科凹柱苣苔属在越南的发现及水晶凹柱苣苔的补充描述 [J]. 广西植物, 2020, 40(10): 1445-1449.

LU ZC, NGUYEN KS, PHAN KL, et al. Discovery of a rare genus *Litostigma* (Gesneriaceae) from northern Vietnam with the supplementary description of *L. crystallinum* [J]. Guihaia, 2020, 40(10): 1445-1449.

Discovery of a rare genus *Litostigma* (Gesneriaceae) from northern Vietnam with the supplementary description of *L. crystallinum*

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Abstract: The Sino-Vietnamese limestone karsts show specially high levels of plant diversity among Indo-China floras, and also are biodiversity hotspots in the world, and many new species or genera of Gesneriaceae have been found there recently. The genus *Litostigma* Y. G. Wei, F. Wen & M. Möller (Gesneriaceae) was reported firstly from limestone areas of southwestern China in 2010, included two species, namely *Litostigma coriaceifolium* Y. G. Wei, F. Wen & M. Möller (Typus generis) from southwestern Guizhou, and *Litostigma crystallinum* Y. M. Shui & W. H. Chen from southeastern Yunnan. We fortunately found *Litostigma crystallinum* from Ha Giang, northern Vietnam, and reported here to sufficiently know the diversity of Gesneriaceae in Vietnam. The description of *Litostigma crystallinum* was supplemented base on the collections from Ha Giang, northern Vietnam, and the habitat photos were also provided. The discovery of *Litostigma crystallinum* from northern Vietnam demonstrates the closely floristic relationship between northern Vietnam and southern China once again. The new localities are also very important for the conservation of *Litostigma crystallinum*.

Key words: flora of Vietnam, limestone flora, Sino-Vietnamese limestone karsts

CLC number: Q949 **Document code**: A

Article ID: 1000-3142(2020)10-1445-05 **Open Science Identity(OSID)**:

收稿日期: 2020-04-12

基金项目: 国家自然科学基金(31860043);越南科学技术研究院项目(NVCC 42.04/20-20);中央引导地方科技发展专项资金项目(桂科ZY1949013) [Supported by the National Natural Science Foundation of China (31860043); the Program of Vietnam Academy of Science and Technology (NVCC 42.04/20-20); Special Fund for Local Science and Technology Development Guided by the Central Committee (ZY1949013)]。

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苦苣苔科凹柱苣苔属在越南的发现及水晶凹柱苣苔的补充描述

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摘 要: 中越边境喀斯特地区有着异乎寻常的植物多样性,已经成为全球生物多样性研究和保护的热点区域,近年来在该区发现了多个苦苣苔科植物的新种或新属。凹柱苣苔属是 2010 年才被建立的新属,该属的花与叶相比,花较大,叶相对较小,叶片边缘稍外卷,花序仅单花,柱头盘状或凹坑状,蒴果长椭球形而有别于苦苣苔科的其他属。凹柱苣苔属为喀斯特专性植物,目前仅包括分布于黔西南的凹柱苣苔和分布于滇东南的水晶凹柱苣苔两个物种。作者在开展中越边境喀斯特地区植物多样性调查时,在越南北部的河江省发现了水晶凹柱苣苔,基于该新发现居群的植物标本,对其进行了补充描述,确认其花期为 11 月—12 月,并对该物种濒危状况进行了重新评估,同时提供了野外生态照片以资辨认。目前,越南已记录苦苣苔科植物 32 属 150 余种,凹柱苣苔属在越南北部的发现,不仅丰富了该国苦苣苔科植物的多样性,再一次充分证明了中越边境喀斯特地区是一个完整的植物区系地理单元,而且为稀有的水晶凹柱苣苔提供了更加丰富的野外本底资料,对其将来的深入研究和保护具有重要的生物地理学和保护生物学意义。

关键词: 越南植物区系, 石灰岩植物区系, 中越边境喀斯特地貌

1 Introduction

The genus *Litostigma* Y. G. Wei, F. Wen & M. Möller was described with two species from limestone areas of southern China, *Litostigma coriaceifolium* Y. G. Wei, F. Wen & M. Möller (Typus generis) was recorded from southwestern Guizhou, and *Litostigma crystallinum* Y. M. Shui & W. H. Chen was found from southeastern Yunnan, China (Wei et al., 2010). *Litostigma crystallinum* only occurred at limestone caves in Malipo County, Yunnan, southwestern China, near the Sino-Vietnamese boundary when it was published, so it maybe also distributed in northern Vietnam due to its similar habitat and proximity to the type locality (Wei et al., 2010). Until now, two collections of *Litostigma crytallinum* had been collected in Ha Giang Province, northern Vietnam, but they are not recorded for the Gesneriaceae of Vietnam in any relevant literatures from Vietnam (Pham, 2000; Vu, 2005, 2017; Luu et al. 2018). According to the original literature and specimens from northern Vietnam, the supplementary description, ecology, and colour photos of *Litostigma crystallinum* are provided here.

2 Taxonomic treatment

Litostigma Y. G. Wei, F. Wen & M. Möller in Edinb. J. Bot., 67 (1): 178. 2010. Type: *Litostigma coriaceifolium* Y. G. Wei, F. Wen & M. Möller

Perennial, stemless, rhizomatous herbs. Leaves basal, distinctly petiolate. Cymes 1-flowered, 1-bracteate. Sepals 5. Corolla zygomorphic, infundibuliform, adaxial lip 2-parted, abaxial lip 3-parted, all lobes

divided nearly to the base, orbicular-ovate. Stamens 2, staminodes 3. Disc annular, ovary ovoid-ellipsoid, 1-loculed; placentae 2, parietal, intrusive, bifid. Stigma crateriform or disciform. Fruit narrowly ovoid, glabrous, dehiscing into 4 valves. Seeds reticulate, with raised testa cell walls. Only two species in the genus *Litostigma* at present, *L. coriaceifolium* is endemic to southwestern Guizhou, China, and *L. crystallinum* is endemic to the limestone areas of boundary between northern Vietnam and southwestern China.

Litostigma crystallinum Y. M. Shui & W. H. Chen in Edinb. J. Bot., 67 (1): 181. 2010. (Fig. 1)

Perennial herb, stemless. Rhizome subterete, 3–5 mm long, 2–3 mm in diameter. Leaves 5–14, basal; leaf blade thickly papery, elliptic, 4.5–8 cm long, 3–5 cm wide, apex acute, obtuse to rounded, base broadly cuneiform, margin entire, slightly revolute, glabrous, green above, greyish green beneath; lateral veins 5–6 on each side of midrib, flat adaxially and prominent abaxially; petiole 4–15 cm long, glabrous. Cymes 1–2, 1-flowered; peduncle 3–10 cm long, pubescent; 2-bracteate, small, lanceolate, ca. 3 × 0.8 mm; pedicel 2.5–3 cm long, pubescent. Sepals 5, lanceolate, ca. 7 × 2 mm, pubescent outside, glabrous inside. Corolla purple, infundibuliform, 1.5–2.1 cm long, slightly pubescent outside, glabrous inside; corolla tube 0.7–1.2 cm long with short proximal undilated part, 2 yellow spots inside the tube under the anthers; adaxial lobes 2, rather oblong, ca. 7 × 6 mm, abaxial lobes 3, oblong or obovate, 7–9 × 6–7 mm. Stamens 2 in anterior position, adnate to ca. 3 mm above base of corolla tube; filaments linear, slightly erect, ca. 4 mm long; anthers elliptic, ca. 2 mm long, pilosous, coherent adaxially. Staminodes 2, 1–2.5 mm long, glabrous, adnate to 2–3 mm above corolla base. Disc annular. Pistil 1.2–1.5 cm long; ovary ovoidellipsoid, ca. 1.5 mm long, ca. 1 mm in diameter, 1-loculed with 2 parietal and intrusive placentae; style 9.5–13 mm long, pubescent. Stigma disciform, ca. 0.5 mm in diameter. Fruit 4–5 mm long, narrowly ovoid, glabrous, dehiscing into 4 valves. Seeds ovoid, obliquely reticulate with raised testa cell walls, 0.3 × 0.1 mm.

Distribution and habitat: So far, only two localities have been recorded for the *Litostigma crystallinum*, one is in Tianbao Town, Malipo County, Yunnan Province, China, and the other closed to Yunnan Province is in Du Gia Commune, Yen Minh District, Ha Giang Province, Vietnam. *L. crystallinum* grows on the moist rock surface of the entrance of limestone caves at elevation of ca. 850 m a.s.l. in China and on the humid open cliffs of travertine caves at elevation of 500–850 m a.s.l. in Vietnam.

Phenology: Flowering from November to December.

Conservation assessment: According to Wei et al. (2010), *Litostigma crystallinum*, was assessed as Critically Endangered (CR) [B1ab(v)+C2a(i)+D] based on the single population found in the type locality with steadily declined mature individuals recorded from 2002 to 2008. However, with the newly discovered population having many mature plants in Vietnam, about 40 km away from the northwestern type locality, and the extent of occurrence of this species more than 100 km^2 but it will be less than 5 000 km^2. Thus, following the IUCN (2019) red list categories and criteria, we propose the conservation status of *L. cystallinum* as Endangered (EN) [B1ab (iii,v)]. At the same time, we believe that more populations of *L. crystallinum* will be found out at cave mouths in many limestone areas between southeastern Yunnan, China and Ha Giang, Vietnam if field investigations are extensively conducted there.

Specimens examined: —VIETNAM. **Ha Giang**: Yen Minh, Du Gia, Giang Chu, 105° 09′ 47″ E, 22°56′54″ N, alt. 540 m, 15 November 2004, *Ching-I Peng et al.* 20212 (HAST 111912!); Yen Minh, Du Gia, 105°10′24″ E, 22°56′51″ N, alt. 500–850 m, 28 November 2004, *S. K. Wu et al.* WP738 (MO 04825175!).

A. Habitat; **B**,**C**. Habit; **D**,**E**. Flower face view. All photos were taken by PHAN Ke Loc.

Fig. 1 **Litostigma crystallinum**

3 Disccusion

Hitherto, the number of species and genera of Gesneriaceae in Vietnam have not been adequately inventoried, while Vu (2017) recorded 147 species of 31 genera of Gesneriaceae for the *Flora of Vietnam*, Luu et al. (2018) only recognized 130 species of 28 genera in Vietnam. In recent years, some new taxa or records of Gesneriaceae have been reported from the

boundary between northern Vietnam and southern China (Do & Vu, 2011; Vu et al., 2011; Truong et al., 2016; Chen et al., 2018; Nguyen & Wen, 2018; Yang et al., 2018; Nguyen et al., 2019; Wen et al., 2020), which sufficiently demonstrates a closely floristic relationship of Gesneriaceae between northern Vietnam and southern China, especially the Sino-Vietnamese limestone karsts. The discovery of *Litostigma crystallinum* from northern Vietnam once again proves the above statement.

Acknowledgements We are grateful to the curators and staffs of HAST, HN, IBK, KUN, MO, PE and SING offering facilities to check Gesneriad specimens and special to Dr. KF Chung (HAST) and Dr. DJ Middleton (SING) for their enthusiastic help.

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