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A NEW SPECIES OF *Billolivia* (Gesneriaceae) FROM VIETNAM

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ABSTRACT

Billolivia maiana is described as a new species narrowly endemic to Cu Prong mountain, Dak Lak province, Central Highlands of Vietnam. This third recorded yellow-flowered species of the genus is characterized by the absence of stolons, glabrous young leaves, smaller leaves with short petioles, compacted inflorescence with short peduncles, rays and pedicels, white upper lobes of corolla with yellow margin and purple lines throughout, undulate disc-lobes and glabrous ovary. The new taxon is described and illustrated with field photographs of detailed botanical characteristics and assessed as CR following the IUCN Redlist Categories. A key to all yellow-flowered *Billolivia* taxa is provided.

Keywords: *Billolivia maiana*, Gesneriaceae, narrowly endemic, Central Highlands, Vietnam.

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INTRODUCTION

Billolivia (Middleton et al., 2014a) is a genus of Gesneriaceae endemic to Vietnam. Prior to this paper, there have been fourteen species described for the genus, most of which are confined to the southern Annamite Range (Hareesh et al., 2019 & 2020; Luu et al., 2015, 2018a & 2018b; Ly, 2017; Middleton et al., 2014a & 2014b; Nguyen et al., 2016; Vu et al., 2015). Of these, there were two species with yellow flowers, namely *Billolivia citrina* and *Billolivia yenhoae* (Luu et al., 2018b). In our recent botanical survey in the Central Highlands, we encountered another yellow-flowered *Billolivia* species that looked much like the later. After examination of its morphological characteristics, we describe it as a new species in this paper.

MATERIALS AND METHODS

The studied material was collected from Cu Prong mountain, Um Village, Cu Prong Commune, Ea Kar District, Dak Lak province, Central Highlands of Vietnam. Specimens were sampled and processed using conventional methods guided by the Royal Botanic Gardens, Kew (Bridson & Forman, 1999). Detailed photographs and descriptions of taxonomically important characters of the new taxon were taken of fresh materials in the field using a digital camera. Taxonomic identification was done using morphological vegetative and reproductive characters.

RESULTS

Billolivia maiana Luu, N.L.Vu, H.Đ.Trần & H.C.Nguyen, sp. nov. (Fig. 1)

Billolivia maiana is morphologically closest to *B. yenhoae* in having obovate to oblanceolate leaves and bright yellow flowers but is easily distinguishable from the later by a number of morphological characteristics: the absence of stolons, mostly oblanceolate leaves, smaller leaves with short petioles, compacted inflorescence with short peduncles, rays and pedicels, white upper lobes of corolla with yellow margin and purple lines throughout, undulate disc-lobes and glabrous ovary.

Terrestrial herb to 10 cm tall; stems to 10 cm, internodes congested, densely pubescent. Leaves alternate; petioles 3–5 cm long, pubescent with brown multicellular uniseriate hairs to 3 mm long; lamina mostly oblanceolate, sometimes ovate or elliptic, slightly asymmetric, 6–14 cm long, 3.5–6 cm wide, base round, apex subacute, margin coarsely dentate, 5–9 of secondary veins on each side of the midrib, margin ciliate, adaxial lamina dark green, glabrous, abaxial lamina pale green, with dense erect brown hairs to 3 mm long on midrib and venation, shorter hairy on lamina between veins. Inflorescences short thyrse, less than 7 cm long, axillary, to 4–8-flowered; peduncle light green to light purple, to 5 mm long, densely pubescent; ray light green to light purple, to 3 mm long, pubescent; bracts linear, light green, to 3 × 1 mm, apex acute, abaxially densely pubescent; pedicels light green to light purple, 2.0–3.5 cm long, pubescent. Calyx of 5 lobes divided to base, light green, outside densely long brown pubescent, inside glabrous; lobes narrowly triangular, to 11 mm long, to 2.5 mm wide at base, acute at apex. Corolla 22–30 mm long, composed of a narrow tube and a 2-lipped limb with lobes recurved; tube 18–22 mm long, white, contracted below the middle, outside pubescent, inside glabrous, lower tube globose, upper tube cylindrical; throat glabrous, lower throat yellow, upper throat white with purple lines; upper lip 2-lobed, lobes 5–6 × 5–6 mm, ovate, white with yellow margin and purple lines, inside sparsely glandular hairy, outside pubescent with multicellular uniseriate hairs to 5 mm; lower lip 3-lobed, lobes 6–8 × 4–6 mm, slightly obovate, bright yellow with purple fainted lines at base, inside densely glandular hairy, outside densely pubescent with multicellular uniseriate hairs to 5 mm. Stamens inserted at the middle of the corolla tube; filaments 5–6 mm long, strongly S-curved, white with a red dot on the lower part, with sparse glandular hairs on the upper half. Disc bowl-shaped, 5-lobed, 1.5 mm high. Ovary 5–6 mm long, 2.5 mm in diameter, glabrous; style 13−15 mm long, densely covered with glandular hairs; stigma obscurely bi-lobed, densely covered with glandular hairs. Fruits

ovoid, 10–12 mm × 0.5–0.6 mm, brown hairy, translucent brown and with persistent part of style.

Types: Vietnam, Dak Lak province, Ea Kar district, Cu Prong commune, Um village, Cu Prong mountain, 12º43’52”N; 108º40’49”E, 792 m asl, 19 January 2019, *Luu Hong Truong, Nguyen Hieu Cuong, Hoang Tuan Vu & Tran Huu Dang Tran 965* (holotype SGN!, isotypes SGN!, PHH!).

Ecology: The new species was found growing in scattered clumps on stream banks and moist gulleys in moist evergreen broad-leaf forest at around 792 m elevation. Flowering was seen in December to February and fruiting in January to April.

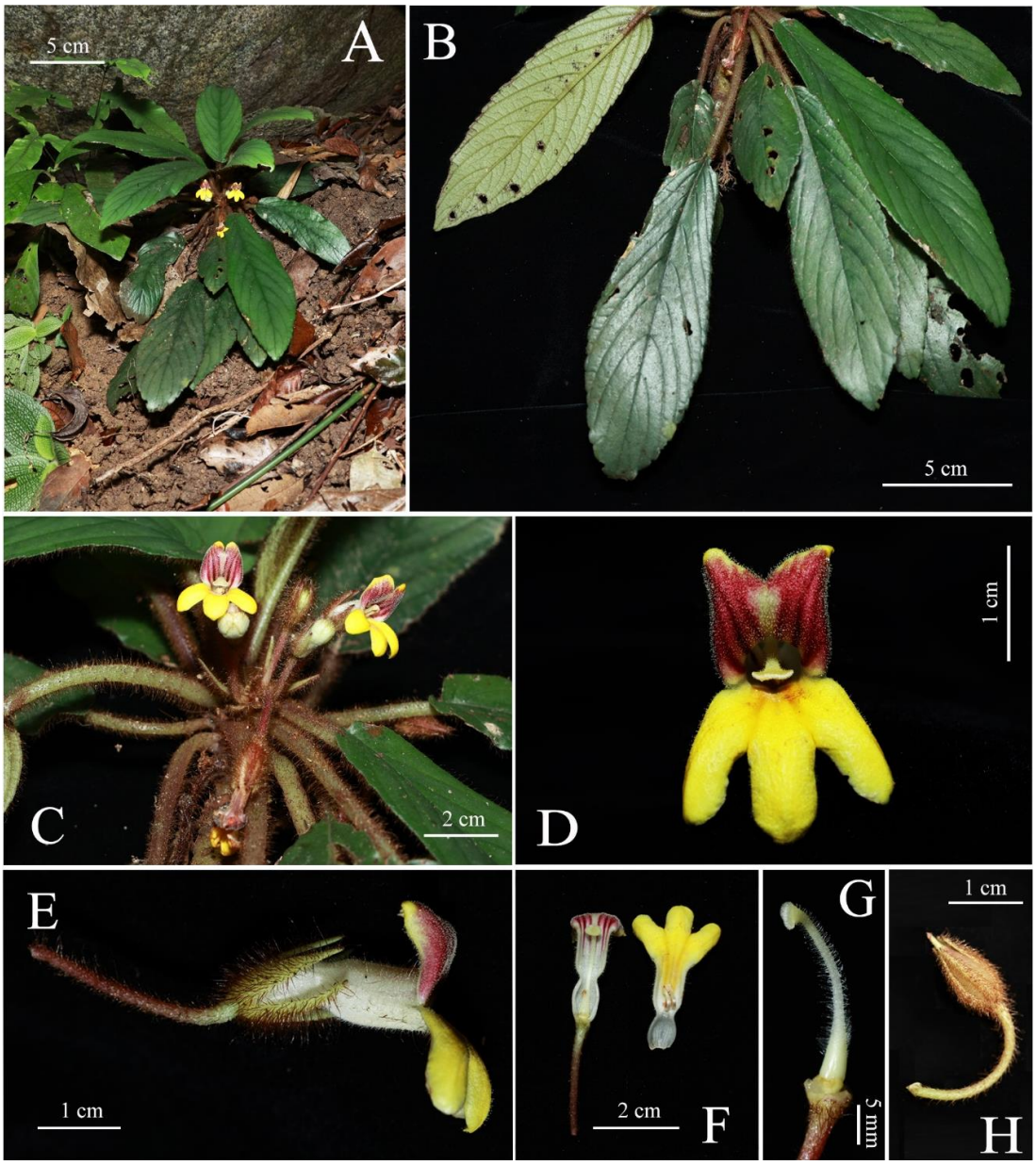

Figure 1. Billolivia maiana. A. Habit; B. Leaves; C. Inflorescence; D. Flower, front view; E. Flower, dorsal view; F. Flower, dissection; G. Pistil; H. Fruit

Etymology: The species is named after Ms. Luu Hong Mai, one of the corresponding author's beloved daughters.

Suggested Vietnamese name: Luu hoa Mai.

Conservation status: The new species is endemic to Cu Prong mountain in Dak Lak province, occurring in two very small subpopulations less than one km apart, each having less than 50 individuals. Its total area of occupancy (AOO) is estimated to be less than 1 km^2 and its extent of occurrence (EOO) is much less than 4 km^2. Their habitat is located in an unprotected evergreen broad-leaf forest under on-going severe reduction by agriculture expansion. Like many other *Billolivia* species that grow on stream banks or moist gulleys, this herb is easily swept away by erosion, land slide and flooding which may be caused by heavy rains and intensified by deforestation. Given this situation, we assess this species as CR B1+B2b+c or C1+C2a(i)+b (IUCN Standards & Petitions Subcommittee, 2022).

Notes: *Billolivia maiana* is the third species of *Billolivia* that has yellow flowers. It is morphologically closest to *B. yenhoae* in having mostly oblanceolate (sometimes obovate) leaves and bright yellow flowers but differs in a number of characteristics as stated in the diagnosis. Their key morphological differences are summarized in Table 1. The other yellow-flowered *B. citrina* is very different from these two taxa in its ovate leaves and citrus yellow flowers with short corolla tube.

Table 1. Key morphological differences between *Billolivia maiana* and *Billolivia yenhoae*

Characteristics	*Billolivia maiana*	*Billolivia yenhoae*
Stolons	Absent	Present
Petioles	3–5 cm long	4–9 cm long a
Leaves	Mostly oblanceolate, sometimes ovate or elliptic, 6–14 cm long, base round, adaxially glabrous when young, abaxially short hairy between veins	Mostly obovate, sometimes oblanceolate, 13–20 cm long, adaxially hairy when young, abaxially glabrous between veins
Inflorescence	Short thyrse with penducle to 5 mm long, ray to 3 mm long, 4–8-flowered	Long thyrse with penducle 10–52 cm long, ray to 15 cm long, to 15-flowered
Bracts	Linear, to 3 × 1 mm	Oblong to oblanceolate, to 3.5 × 1 cm
Pedicels	2.5–3.5 cm long	4–5.5 cm long
Upper part of tube	Not flaring	Slightly flaring
Upper lobes of corolla	White with yellow margin and purple lines	Bright yellow, with purple lines at base
Lower lobes of corolla	Plan yellow without purple lines	Bright yellow, with purple lines at base
Disc	Undulate lobed	Obscurely lobed
Ovary	Glabrous	Densely glandular hairy

Key to yellow-flowered *Billolivia* species

1. Leaves ovate; flowers citrus yellow with corolla tube < 16 mm……*B. citrina*
1. Leaves ovate, elliptic to oblanceolate; flowers bright yellow with corolla tube > 16 mm….2

2. Stolons absent; leaves mostly oblanceolate; inflorescence short with peduncle to 0.5 cm; ovary glabrous……*B. maiana*

2. Stolons present; leaves mostly elliptic to obovate; inflorescence long with peduncle 10–52 cm; ovary gladular hairy……..……*B. yenhoae*

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