

***Billolivia antoanensis* (Gesneriaceae), A NEW SPECIES FROM VIETNAM**

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ABSTRACT

Billolivia antoannensis is described as a new species from Central Vietnam, representing the seventeenth species in this endemic genus. The new taxon is characterized by a short and glabrous stem, thick leaves with coarsely dentate margins and glabrescent petioles, a 3–8-flowered inflorescence with short peduncle, ellipsoid calyx that is lobed to the base, glabrous or sparsely hairy bracts, and predominantly violet flowers. Detailed botanical characteristics are illustrated with field photographs. Information on the plant's phenology, distribution, ecology, and a provisional assessment of its conservation status is also provided.

Keywords: An Toan Nature Reserve, *Billolivia antoanensis*, Central Vietnam, endemic, new taxon.

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INTRODUCTION

Since the establishment of the genus *Billolivia* (Middleton et al., 2014a) within the Gesneriaceae family, initially comprising five species, eleven additional species have been described, all endemic to Vietnam (Hareesh et al., 2019; Hareesh et al., 2020; Luu et al., 2015; Luu et al., 2018a; Luu et al., 2018b; Ly, 2017; Middleton et al., 2014b; Nguyen et al., 2016; Vũ et al., 2015; Vu et al., 2023). The center of species diversity for *Billolivia* appears to be confined to the southern Annamite Range. The northernmost distributed species is *B. cadamensis* Q. D. Nguyen, N. L. Vu & Luu (synonym: *B. middletonii* N. S. Ly) (Ly, 2017; Nguyen et al., 2016), found in Quang Ngai province, while the southernmost distributed species is *B. vietnamensis* D. J. Middleton & Luu (Middleton et al., 2014a), located in Binh Phuoc province.

During our ongoing botanical survey of An Toan Nature Reserve in Binh Dinh province, Central Vietnam, we collected a *Billolivia* species characterized by predominantly bright violet flowers, distinctly different from all previously documented species. After careful examination of its morphological traits, we determined that this represents an undescribed species. Herein, we provide a formal description based on observations of living specimens.

MATERIALS AND METHODS

The studied material was collected from An Toan Nature Reserve in An Lao district, Binh Dinh province, Central Vietnam. Specimens were sampled and processed using conventional methods as outlined by the Royal Botanic Gardens, Kew (Bridson & Forman, 1999). Detailed photographs and descriptions of taxonomically significant characters of the newly recorded species were captured in the field using a digital camera and fresh materials. Taxonomic identification was conducted based on morphological vegetative and reproductive characters, following the referenced literature.

RESULTS

***Billolivia antoanensis* Luu, Luc Nguyen & T. Q. T. Nguyen, sp. nov. (Fig. 1)**

Urn: lsid: ipni.org: names: 77369147-1

The new species is most morphologically similar to *Billolivia tichii*, sharing features such as thick leaves with coarsely dentate margins, an ellipsoid calyx, and a similar shape and color pattern of the corolla. However, it can be distinguished by several characteristics: a short stem, glabrescent petioles, a short peduncle, glabrous or sparsely hairy bracts, a sparse strigose calyx that is lobed to the base, a short corolla tube, predominantly violet coloration on the inside of the corolla lobes, and wholly white filaments inserted 6–8 mm from the corolla base.

Terrestrial herb; stems up to 20 cm long, decumbent and then erect, yellowish-greenish, glabrous. Leaves alternate; petioles 7–11 cm long, glabrescent with very sparse appressed brown multicellular uniseriate hairs when young; lamina ovate to obovate, 7–17 cm long, 7–12 cm wide, base round, apex acute, 10–12 of secondary veins on each side of midrib, adaxial lamina dark green, glabrous, abaxial lamina pale green, with sparse appressed brown hairs on midrib and venation, margin coarsely toothed, teeth round. Inflorescences axillary, 3–8-flowered; peduncle yellowish green to brownish red, 0.3–0.5 cm long, strigose; bracts brownish red, ovate, 10–12 mm long, 5–7 mm wide, apex acute, glabrous on both surfaces or sparsely hairy on abaxial venation and along margins; pedicels pinkish white, 2.5–3.2 cm long, strigose. Calyx brownish red, ellipsoid, 5-lobed to base; lobes ovate, 12–14 mm long, 7–9 mm wide, subequal, sparse strigose outside. Corolla 22–28 mm long, composed of a narrow tube which slightly flares towards oblique mouth and a 2-lipped limb; tube 12–13 mm long, white, outside strigose, inside glabrous; throat white, with two yellow patches on the lower, shortly stalked to subsessile glands and purple lines from inside tube and on the base of lobes (3 lines per lobe); upper lip 2-lobed, lobes 10–12 mm

long, 9–10 mm wide; lower lip 3-lobed, lower lobes sub-similar, 10–12 mm long, 7.5–8.5 mm wide; all lobes obovate, recurved, predominantly bright violet with white base and shortly stalked glands on the inside, predominantly pale violet with sparsely pubescent with multicellular uniseriate hairs on the outside, basally white. Stamens 5 (2 fertile and 3 staminodes), inserted at 6–8 mm from corolla base; 2 fertile filaments curved,

3.5–4.5 mm long, white, sparsely glandular puberulent. Disc bowl-shaped, lobed or slightly lobed at apex, 1–2 mm high. Ovary red or pinkish, 2-locular, 2.5–3 mm long, 2.5 mm in diameter, glabrous, apically densely hairy; style 4–5 mm long, densely covered with glandular hairs; stigma lobes 1–1.5 mm long. Berries ellipsoid, 17–18 mm long, 6–7 mm in diameter, hairy at apex, reddish brown, with many seeds.

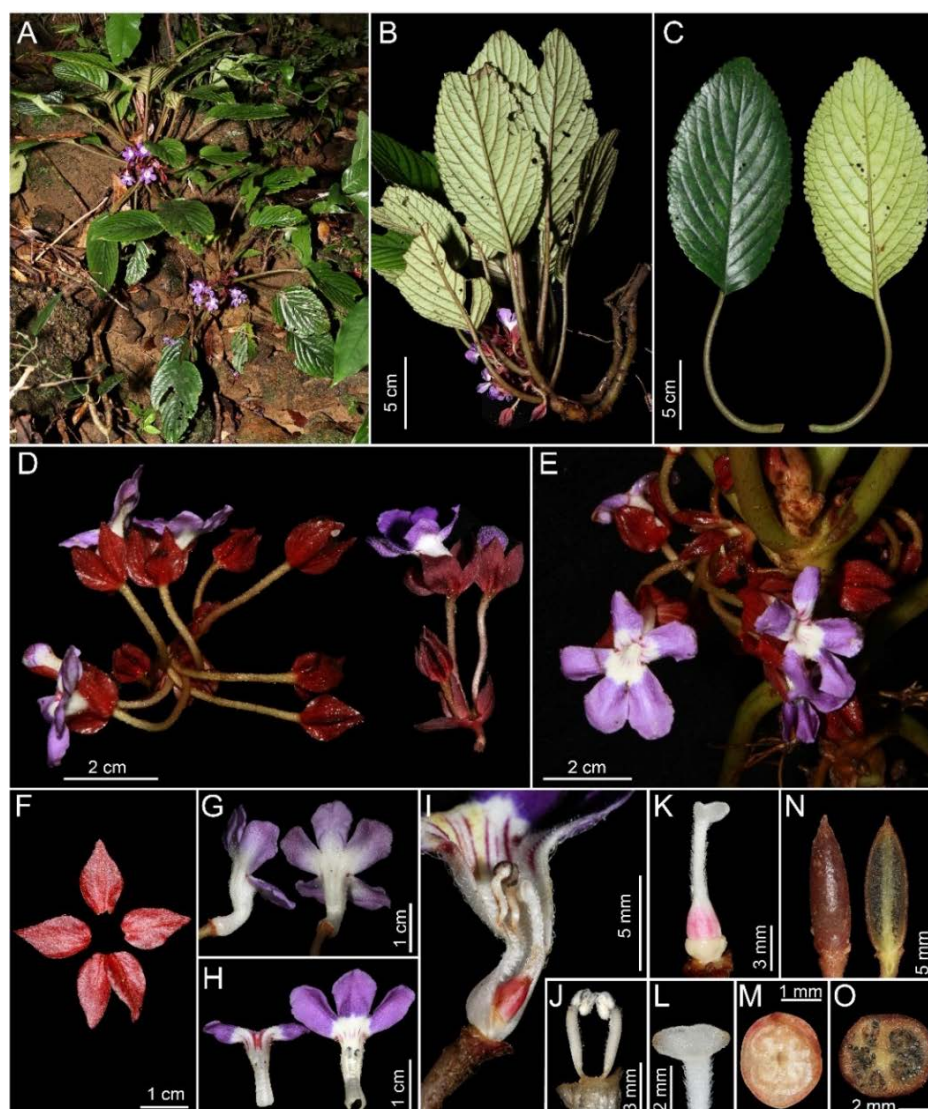


Figure 1. Billolivia antoanensis Luu, Nguyen-Thanh & T.Q.T.Nguyen, sp. nov. A. The plant in situ. B. Whole plant. C. Leaves. D. Inflorescences. E. Flowers. F. Calyx. G: Corollas. H: Longisection of corolla. I. Closeup of opened corolla. J. Stamens. K. Disc, ovary and style. L. Closeup of stigma. M. Cross section of ovary. N. Fruit. O. Cross section of fruit.

Types. Vietnam, Binh Dinh province, An Lao district, An Toan commune, An Toan Nature Reserve, coordinates 14°30'29"N - 108°46'12"E, 904 m elevation, 13 September 2023, *Nguyen Quoc Dat, Nguyen Hieu Cuong, Nguyen Qui Bien Cu042* (Holotype: SGN! [SGN006390]; Isotypes: SGN!, [SGN006391, SGN006392, SGN006393], PHH!, VNMN!); coordinates 14°31'39"N - 108°44'45"E, 895 m elevation, 14 September 2021, *Luu Hong Truong, Nguyen Le Xuan Bach, Nguyen Quoc Dat BN0013* (Paratypes: SGN! [SGN006394, SGN006395]).

Ecology. The new species was found growing along stream banks within lower montane evergreen forests at elevations of around 900 m. The forest is dominated by species of the families Rubiaceae, Fagaceae,

Lauraceae, Myrtaceae, Clusiaceae, and Fabaceae. Flowering was seen in August to November and fruiting in September to December.

Etymology. The species is named after the locality where the new taxon is discovered.

Vietnamese name. Luru hoa an toàn.

Conservation status. The new species is known only from three populations of total less than 1,000 mature individuals. It is likely to occur in adjacent forests in Gia Lai and Quang Ngai provinces. Further surveys are necessary to determine its precise conservation status. Given this situation, we assess this species as Data Deficient (IUCN Standards & Petitions Subcommittee, 2024).

Table 1. Key morphological differences between *Billolivia antoanensis* sp. nov. and *Billolivia tichii*

Characteristics	<i>Billolivia antoanensis</i> sp. nov.	<i>Billolivia tichii</i>
Stem	up to 20 cm long, glabrous	up to 1 m long, densely pubescent
Petioles	glabrescent with very sparsely hairy when young	densely pubescent
Leaves	ovate to obovate	obovate to elliptic
Peduncle	0.3–0.5 cm long	0.5–2.5 cm long
Bracts	glabrous on both surfaces or sparsely hairy on abaxial venation and along margins	pubescent on outer surface
Calyx	sparse strigose outside, lobed to base, lobes ovate	densely long brown strigose outside, lobed on apical half, lobes triangular
Corolla tube	12–13 mm long	20–22 mm long
Corolla lobes	predominantly bright violet on the inside	predominantly reddish violet to pink on the inside
Filaments	inserted at 6–8 mm from corolla base, white without a red dot in the middle	inserted at 16–17 mm from corolla base, white with a red dot in the middle
Ovary	red or pinkish, 2.5–3 mm long, glabrous with densely hairy apex	white, 3.5–4 mm long, glabrous
Style	4–5 mm long	15–17 mm long

Notes. *Billolivia antoanensis* sp. nov. is most morphologically similar to *B. tichii* Luru, Q.D.Nguyễn & N.L.Vũ, particularly in their thick leaves with coarsely dentate margins, ellipsoid calyx, and corolla shape and coloration pattern (Vu et al., 2015). Both

species feature plain purple lines extending from the inside of the tube to the base of the lobes (three lines per lobe). Additionally, they share a bi-colored pattern on the corolla lobes, which are predominantly colorful with a short white band at the base. However, *Billolivia*

antoanensis can be readily distinguished from *B. tichii* by the bright violet coloration on most of the adaxial surface of its corolla lobes, compared to the reddish violet to pink hue in *B. tichii*. Other distinguishing characteristics are summarized in Table 1.

A comparable bi-colored pattern on the corolla lobes has been documented in two

other *Billolivia* species: *B. longipetiolata* D. J. Middleton & Luu and *B. violacea* D. J. Middleton & H. J. Atkins (Middleton et al., 2014a). However, in these species, less than half of the inner surface of the corolla lobe exhibits coloration, which is pink or red in *B. longipetiolata* and violet in *B. violacea*.

Key to known *Billolivia* species

1. Calyx divided into 5 lobes almost to base.....2
 - Calyx connate into a tube at base for at least 4 mm, margin 5-lobed.....16
2. Calyx lobes > 4.5 mm wide.....3
 - Calyx lobes ≤ 4 mm wide.....7
3. Leaf lamina thick, adaxially glabrous.....***B. antoanensis* sp. nov.**
 - Leaf lamina thin, adaxially hairy.....4
4. Leaves hairy on both surfaces.....*B. poilanei*
 - Leaves glabrous on both surfaces.....*B. thongii*
7. Corolla lobes white.....8
 - Corolla lobes of other colors.....13
8. Leaf lamina thick, adaxially glabrous.....9
 - Leaf lamina thin, adaxially hairy.....10
9. Calyx lobes ≤ 2 mm wide.....*B. noanii*
 - Calyx lobes > 3 mm wide.....*B. cadamensis*
10. Stem tough with stolons; peduncles to 10 cm long.....*B. trucii*
 - Stem slender without stolons; peduncles ± sessile.....11
11. Leaf abaxially with pubescence on venation and occasionally between veins; corolla 12–15 mm long.....*B. minutiflora*
 - Leaf abaxially with pubescence throughout; corolla 18–25 mm long.....12
12. Calyx lobes narrowly ovate, 10–12 × ca. 0.5 mm.....*B. vietnamensis*
 - Calyx lobes linear, 10–12 × ca. 0.5 mm.....*B. lamdongensis*
13. Flowers dark red to purple.....*B. kyi*
 - Flowers yellow.....14
14. Stolons present.....*B. yenhoae*
 - Stolons absent.....15
15. Flowers citrus yellow with corolla tube < 16 mm.....*B. citrina*
 - Flowers bright yellow with corolla tube > 16 mm.....*B. maiana*
16. Tips of corolla lobes violet.....17
 - Tips of corolla lobes pink to red.....18

17. Leaf adaxially glabrous or with very few hairs on midrib; calyx to 11 mm long; corolla c. 36 mm long.....*B. violacea*
 - Leaf adaxially sparsely long hairy; calyx 14–15 mm long; corolla c. 25 mm long.....
*B. moelleri*
 18. Corolla throat with purple lines in tube and onto lobes.....*B. tichii*
 - Corolla throat without purple lines in tube and onto lobes.....*B. longipetiolata*

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