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Aristolochia bidoupensis sp. nov. from southern Vietnam

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Aristolochia bidoupensis Do sp. nov. is newly described. This new species, currently only known from southern Vietnam, is most similar to *Aristolochia faviogonzalezii* (northern Vietnam) and *A. moupinensis* (China), but can be distinguished from the latter two by the following characters: flowers terminal, axillary, solitary, peduncle 1.3–1.5 cm long, bracteole ovate, 3–4 × 2–3 mm, limb discoid-shaped with three expanded lobes, not revolute, internal surface uniformly dark purple, smooth, throat uniformly golden without dots. Morphological characters such as a 3-lobed gynostemium and a 3-lobed limb place the new species in *A.* subgen. *Siphisia*.

Aristolochia L., the largest genus of Aristolochiaceae, comprises about 500 species and is widely distributed throughout the tropics, subtropics, but also extending into temperate regions (Hwang et al. 2003, Neinhuis et al. 2005). Recent phylogenetic studies suggested a subdivision of this genus into three monophyletic subgenera: *Aristolochia* (Schmidt) Ma, *Siphisia* (Rafinesque) Duchartre, and *Pararistolochia* (Hutchinson & Dalziel) Schmidt (González and Stevenson 2002, Ohi et al. 2006, Wanke et al. 2006). A strongly curved perianth, a 3-lobed limb, as well as a 3-lobed gynostemium characterize the subgenus *Siphisia*. This subgenus is known to comprise 78 species, 58 of which occur in southeast Asia while 20 species are found in north and central America. Within the former, China (especially the southern part) and Vietnam harbor the majority of the diversity (35 out of 58 species), followed by the Indian region (8 out of 58 species) (Do et al. 2015).

While working on a taxonomic revision of *Aristolochia* from Vietnam and adjacent areas, a fertile *Aristolochia* specimen collected in southern Vietnam was found in the collection at NIMM. The material is most similar to a recently described *Aristolochia* from northern Vietnam (*A. faviogonzalezii* T. V. Do, S. Wanke & C. Neinhuis; Do et al. 2015). Both species share a broadly ovate to cordate leaf blade, and densely appressed white trichomes on the abaxial surface. However, recent field investigations recollecting flowering material in southern Vietnam revealed that the specimen at NIMM is different from *A. faviogonzalezii*, representing a yet undescribed species. All specimens share morphological synapomorphies with other species of *Aristolochia* subgenus *Siphisia* such as a strongly curved perianth, a 3-lobed limb, as well as a 3-lobed gynostemium. After thorough investigation and comparison with previously described southeast Asian species of *A.* subgen. *Siphisia* (Liu and Lai 1976, Hou 1984, Phuphathanaphong 1987, Hansen and Phuphathanaphong 1999, Samanta et al. 1999, Hwang et al. 2003, Liu and Deng 2009, Xu et al. 2011, Yao 2012, Huang et al. 2013, Wu et al. 2013, 2015, Do et al. 2014, 2015, Huong et al. 2014) we conclude that these specimens match neither the protologues nor the type specimens of any known species. Hence, we here describe a new species of *A.* subgen. *Siphisia* from southern Vietnam. In addition to the description, information about distribution, ecology, phenology, uses and conservation status is provided, as well as a comparison with morphologically similar species.

Aristolochia bidoupensis Do sp. nov. (Fig. 1–2)

Type: Vietnam. Lam Dong province, Lac Duong district, Bidoup-Nui Ba National Park, on way to Thien Thai waterfall, plot 96, 02°31′265″N, 13°43′691″E, 1570 m a.s.l., 9 Feb 2015, T. V. Do 90 (holotype: VNMN!, isotype: DR!).

Etymology

The specific epithet refers to the name of the mountain range in southern Vietnam where *A. bidoupensis* occurs.

Description

Perennial woody lianas, 6–8 m long, with oblong to ovoid underground organs (Fig. 2B). Stem slightly round in cross section; young branches densely villous, becoming glabrescent; bark corky and furrowed when mature. Petiole 6–8(–10) cm long, twisted, densely pubescent. Leaf blade broadly ovate to cordate, 25–32(–35) cm long, 14–18(–22) cm wide, subcoriaceous; base cordate, with sinus 2–3 cm deep and 0.8–1.0 cm wide; margin entire; apex acute; both surfaces and margin densely covered with appressed hairs

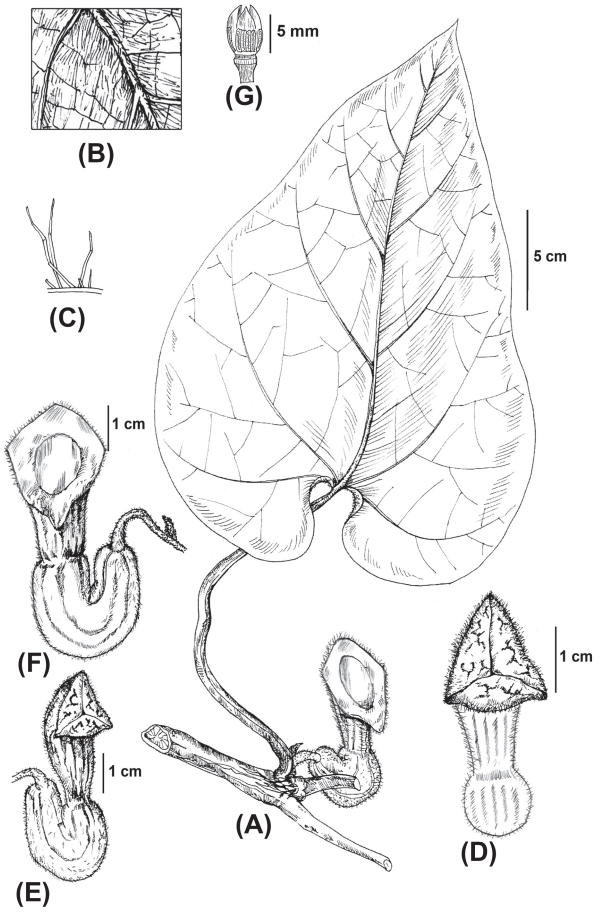

Figure 1. *Aristolochia bidoupensis* sp. nov. (A) branch with a terminal flower, (B) abaxial leaf surface densely covered with appressed white trichomes, (C) close up of multicellular hairs, (D) front view of pre-anthesis flower, (E) lateral view of pre-anthesis flower, (F) front view of open flower, (G) close up of gynostemium. Drawn by Nguyen Huu Quyet from the type specimen.

when young, later the adaxial surface becomes dark-green and glabrous, while the abaxial surface remain densely covered with appressed white trichomes. Basal veins 5, palmate; secondary veins four to five pairs, pinnate; tertiary veins coarsely reticulate, slightly sunken adaxially, clearly prominent abaxially. Flowers terminal, axillary, solitary. Bracteole, peduncle, ovary, and external surface of the perianth densely covered with yellow-brown multicellular hairs (Fig. 1C). Bracteole ovate, scale-like, 3–4 mm long, 2–3 mm wide, sessile, inserted near the base of the peduncle, conspicuous, persistent. Peduncle 1.3–1.5 cm long, pendulous. Ovary oblong, 0.6–0.7 cm long, 0.3–0.4 cm in diameter. Perianth horseshoe-shaped (in lateral view), 3.5–4.0 cm high, yellowish, outside with parallel purple veins or dots, glabrous inside. Utricle indistinct from the tube, cylindrical in shape, 0.7–0.8 cm long, 0.4–0.5 cm in diameter, on the inside with a dark purple band and densely distributed trichomes. Tube curved, folded upwards at its middle, lower tube strongly inflated, 1.3–1.4 cm in diameter, and upper tube elongated funnel-shaped, with visible veins and dots, gradually constricted at base, 2.0–2.8 cm high, narrower at base, 0.6–0.7 cm in diameter and broader (1.3–1.4 cm) at apex. Limb with three unequal lobes, valvate before anthesis; the two lateral

Table 1. Comparison of *Aristolochia bidoupensis* sp. nov. and morphological similar species. * = Morphological characters follow Do et al. (2015), ** = Morphological characters following the description of Hwang et al. (2003) and own field observations.

Character	*A. bidoupensis*	*A. faviogonzalezii* *	*A. moupinensis* **
Underground organs	oblong to ovoid	cylindrical	cylindrical
Leaf blade (cm)	broadly ovate to cordate, 25–32(–35) × 14–18(–22), subcoriaceous	broadly ovate to cordate, (15–)18–23(–25) × (13–)15–20, subcoriaceous	ovate to ovate-cordate, 6–16 × 5–12, leathery
Flower	terminal, axillary, solitary	cymose on woody stem, with clusters of 6–8(–10) cymes	terminal, axillary, solitary
Peduncle (cm)	1.3–1.5	5–9	3–8
Bracteole (mm)	ovate, 3–4 × 2–3	triangular, 2.5–3.0 × 2.0–2.5	ovate, 15 × 10
Perianth (cm)	3.5–4.0, yellowish with dark purple veins or dots	3.5–4, yellowish-white with dark purple veins or dots	4–5, yellowish with purple veins
Tube	upper tube yellowish with dark purple veins	upper tube uniformly dark purple without veins	upper tube yellowish with purple veins
Limb shape	discoid-shaped, 2.2–2.3 cm in diameter	trumpet-shaped, nearly rectangular, 2.4–2.6 cm high, 1.8–2.0 cm wide,	discoid-shaped, 3.0–3.5 cm in diameter
Limb lobes	three lobes expanded, not revolute, internal surface uniformly dark purple, smooth	three lobes revolute, internal surface densely covered with dark purple warts	three lobes revolute, internal surface yellow, densely covered with purple dots
Throat	uniformly golden without dots	upper half white covered with dark purple dots, lower half pinkish without dots	uniformly golden without dots
Annulus	present	absent	present
Distribution	southern Vietnam	northern Vietnam	China

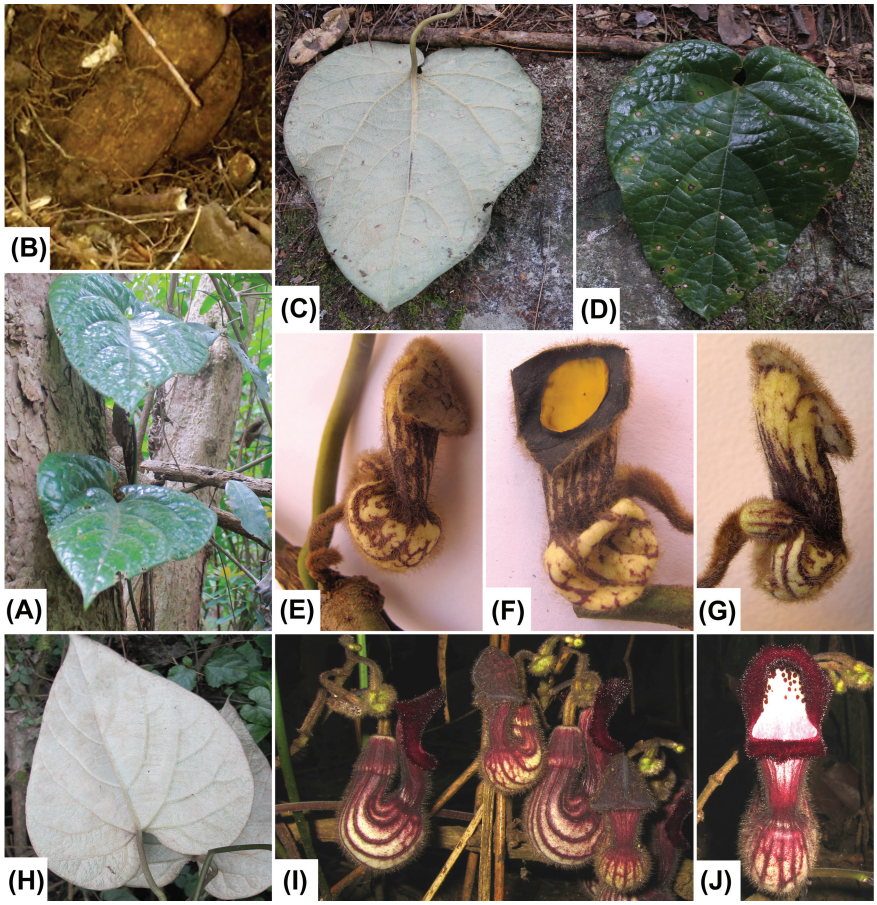

Figure 2. (A)–(G) *Aristolochia bidoupensis* sp. nov. (A) habit, (B) oblong to ovoid underground organ, (C) abaxial leaf surface densely covered with appressed white trichomes, (D) abaxial leaf surface dark green with sunken veins, (E) terminal flower in axillary, (F) front view of open flower, (G) dorsal view of pre-anthesis flower. (H)–(J) *Aristolochia faviogonzalezii.* (H) abaxial leaf surface covered densely with appressed white trichomes, (I) cymose inflorescence, (J) front view of open flower. (A)–(H) photographed by Do Van Truong, and (I)–(J) photographed by Nghiem Duc Trong.

lobes deltoid, each 1.5–1.7 cm wide and 0.5–0.6 cm high; median lobe triangular, 1.8–2(–2.1) cm wide and 0.4–0.5 cm high; margins of all lobes expanded, not revolute during anthesis forming a discoid-shaped limb, 2.2–2.3 cm diameter; external surface of lobes yellowish, densely covered by yellow-brown pluri-cellular hairs; internal surface uniformly dark purple, smooth, without dots. Throat uniformly golden without dots; annulus present, dark purple, 1.1–1.2 cm in diameter. Gynostemium with acute apices, 6–7 mm high, 4–5 mm in diameter, smooth, anthers 2.5–3.0 mm long, yellow. Capsule not seen.

Phenology

The flower of *Aristolochia bidoupensis* has been observed in February, but the fruit has not yet been seen.

Distribution and ecology

Aristolochia bidoupensis is known from some protected forest areas in Lam Dong province, southern Vietnam (Fig. 3). The species was found on humid soil in evergreen, tropical, broadleaf forest, along the edges of streams. Dominant plants at these sites were species of Actinidiaceae (*Saurauia*), Dilleniaceae (*Dillenia*), Ebenaceae (*Diospyros*), Euphorbiaceae (*Mallotus*), Fagaceae (*Castanopsis*, *Lithocarpus*), Lauraceae (*Litsea*, *Machilus*), Primulaceae (*Maesa*), Rubiaceae (*Hedyotis*, *Wendlandia*), Smilacaceae (*Smilax*).

Uses

The underground organs are used for treatment of arthritis and rheumatism.

Conservation status

Aristolochia bidoupensis has been found in the core-zone of Bidoup-Nui Ba National Park as well as other well-protected forest areas in Lam Dong province, southern Vietnam. Furthermore the individuals are healthy and many saplings are growing well from seeds. Thus, this species is probably not at risk but may be vulnerable.

Similar species

Aristolochia bidoupensis is most similar to *A. faviogonzalezii* by sharing a broadly ovate to cordate leaf blade the abaxial surface of which is densely covered by appressed white trichomes (Table 1). However, the new species can be distinguished from the latter by the following diagnostic characters: flower terminal, axillary, solitary (vs cymose on woody

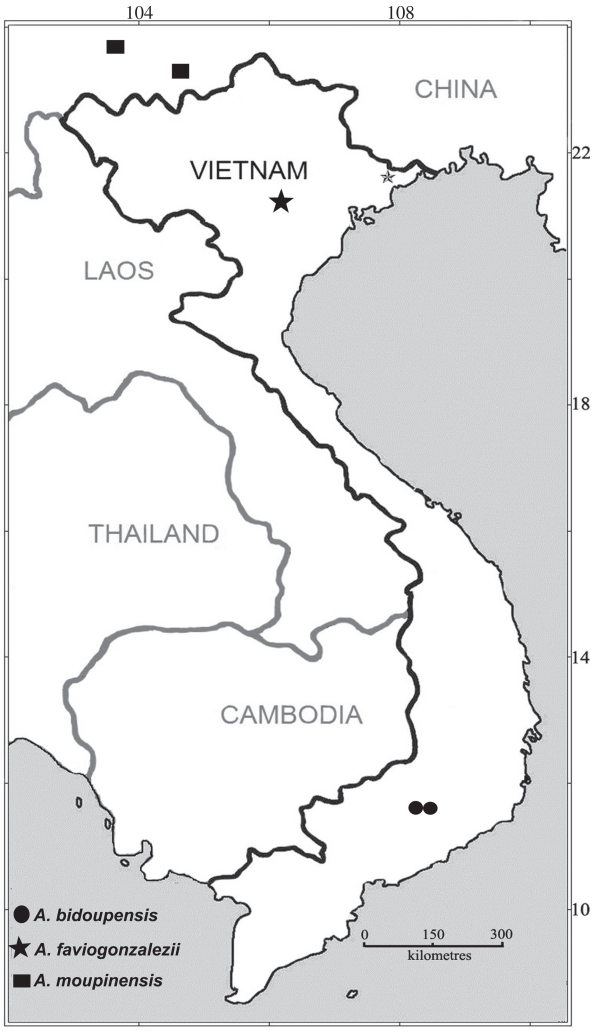

Figure 3. Map showing the distribution of *Aristolochia bidoupensis* sp. nov. and two similar species.

stem, cluster of several cymes), color of perianth yellowish (vs yellowish-white), limb discoid-shaped (vs trumpet-shaped), limb lobes not revolute and with inner surface smooth without dots (vs revolute, inner surface covered densely with dark purple warts), throat uniformly golden without dots (vs upper half of throat white, covered with dark purple dots, lower half pinkish without dots). The new species is also similar to *A. moupinensis* Franch. by sharing the discoid-shaped limb with three nearly united lobes, and the golden throat. However, it clearly differs from the latter by the following characters: leaf blade subcoriaceous, 25–32 × 14–18 (vs leathery, 6–16 × 5–12 cm), peduncle 1.3–1.5 cm long (vs 3–8 cm), bracteole 3–4 × 2–3 mm (vs 15 × 10 mm), and limb lobes expanded with internal surface uniformly dark purple without dots (vs revolute, internal surface yellow, covered with dark purple dots).

Additional specimens examined (paratypes)

Vietnam. Lam Dong province, Da Lat city, Xuan Truong commune, plot 169B, 10 Apr 2008, N. Tap 106 (NIMM); 7 Feb 2015, T.V. Do 86 (VNMN); Datanla waterfall, 8 Feb 2015, T.V. Do 88 (VNMN).

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