

***Arisaema vietnamense* (SECTION *Nepenthoidea*, Araceae):
A NEW SPECIES FROM VIETNAM**

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ABSTRACT

Arisaema vietnamense is described as a new species from Pu Ta Leng Mountain in Tam Duong District of Lai Chau province. This find expands the hitherto Sino-Himalayan distribution of *Arisaema* sect. *Nepenthoidea* southwards to Vietnam, adding to the six sections with twenty six species already known for the country. The new taxon is described and illustrated with field photographs of detailed botanical characteristics.

Keywords: Araceae, *Arisaema vietnamense*, *Nepenthoidea*, new species, Vietnam.

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INTRODUCTION

In March 2019 the authors of this paper started botanical surveys in Pu Ta Leng Mountain in Tam Duong District, Lai Chau Province, Vietnam. One of the interesting collected plants was a cobra lily with remarkable inflorescences that could not match any of the twenty five *Arisaema* species in six sections known in Vietnam (Boyce et al., 2012; Bruggemen et al., 2013; Gagnepain, 1942; Gusman & Gusman, 2006; Hoang et al., 2015; Le et al., 2020; Li et al., 2010; Luu et al., 2013, 2014 & 2020; Nguyen, 1998, 2000, 2002, 2005a, 2005b, 2007 & 2017; Nguyen & Boyce, 2005; Nguyen & Vu, 2009; Nguyen et al., 2014; Pham-Hoang, 2000; Van, 2017; Van et al., 2016a, 2016b & 2017). Our careful examination showed that it belongs to *Arisaema* sect. *Nepenthoidea* (Engl.) Gusman & L. Gusman ex J. Murata as it has underground tuberous stems, quincuncial phyllotaxy, abaxially glaucous 3-foliolate leaves and erect and terete spadix appendix with stipitate base (Engler, 1920; Gusman & Gusman, 2006; Li et al., 2010; Ma & Li, 2017; Murata, 2011; Murata et al., 2013; Ohi-Toma et al., 2016). Section *Nepenthoidea* was accepted by Gusman & Gusman (2006) to have four species, namely *A. meleagris* Buchet, *A. nepenthoides*, *A. shimienense* H.Li and *A. wattii* Hook. f. but Li et al. (2010) reduced *A. shimienense* under *A. meleagris*. Notably, *A. pangii* H.Li (1992), which was synonymized with *A. nepenthoides* by Gusman & Gusman (2006) and with *A. wattii* by Li et al. (2010) was recently proved to be a good species based on morphological and molecular characteristics (Arunkumar et al., 2018). Nevertheless, the distribution of all reported species was confined to the Sino-Himalayan regions. Prior to this paper, none of them has been known from Vietnam.

In the section, the new taxon is superfluous to *A. nepenthoides*, *A. pangii* and *A. wattii* (Arunkumar et al., 2018; Chatterjee, 1951; Griffith, 1848; Gusman & Gusman, 2006; Handel-Mazzetti, 1936; Hara, 1971; Hooker, 1894; Li et al., 2010; Manudev et al., 2019; Murata, 1991; Schott, 1859; Smith,

1914; Wallich, 1924). However, they do not share many morphological characteristics in common as summarized in Table 1, and it is hard to satisfactorily assign the Vietnamese plant to any of the known species of the section. It appears to be most similar to *A. pangii* and *A. wattii* as it has 3-foliolate leaves. Based on the morphological comparison, we here propose the plant from Vietnam as new species. This discovery is the utmost southern record of section *Nepenthoidea*.

MATERIALS AND METHODS

The studied material was collected from the Pu Ta Leng Mountain, Tam Duong District, Lai Chau Province, 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 newly recorded species were taken of fresh materials in the field using a digital camera. Taxonomic identification was done using morphological vegetative and reproductive characters following the aforementioned literature, especially Gusman & Gusman (2006).

RESULTS

***Arisaema vietnamense* Luu, Q. B. Nguyen, H. C. Nguyen & T. Q. T. Nguyen, sp. nov. (Fig. 1)**

The new species differs from all known species of *Arisaema* sect. *Nepenthoidea* by possessing a combination of morphological characteristics: small-sized habit, 3-foliolate leaves with carmine-mottled margins, asymmetrical lanceolate lateral leaflets often with an acuminate basal side-lobe, inflorescence emerging together with leaves, obovate spathe limb with constricted base, adaxially light green spathe tube with brown mottling and widely recurved auriculate mouth, 1–4-ovuled ovaries, stout spadix appendix with slightly rugose clavate apex and dilated, lobed base and 2–3-androus synandria.

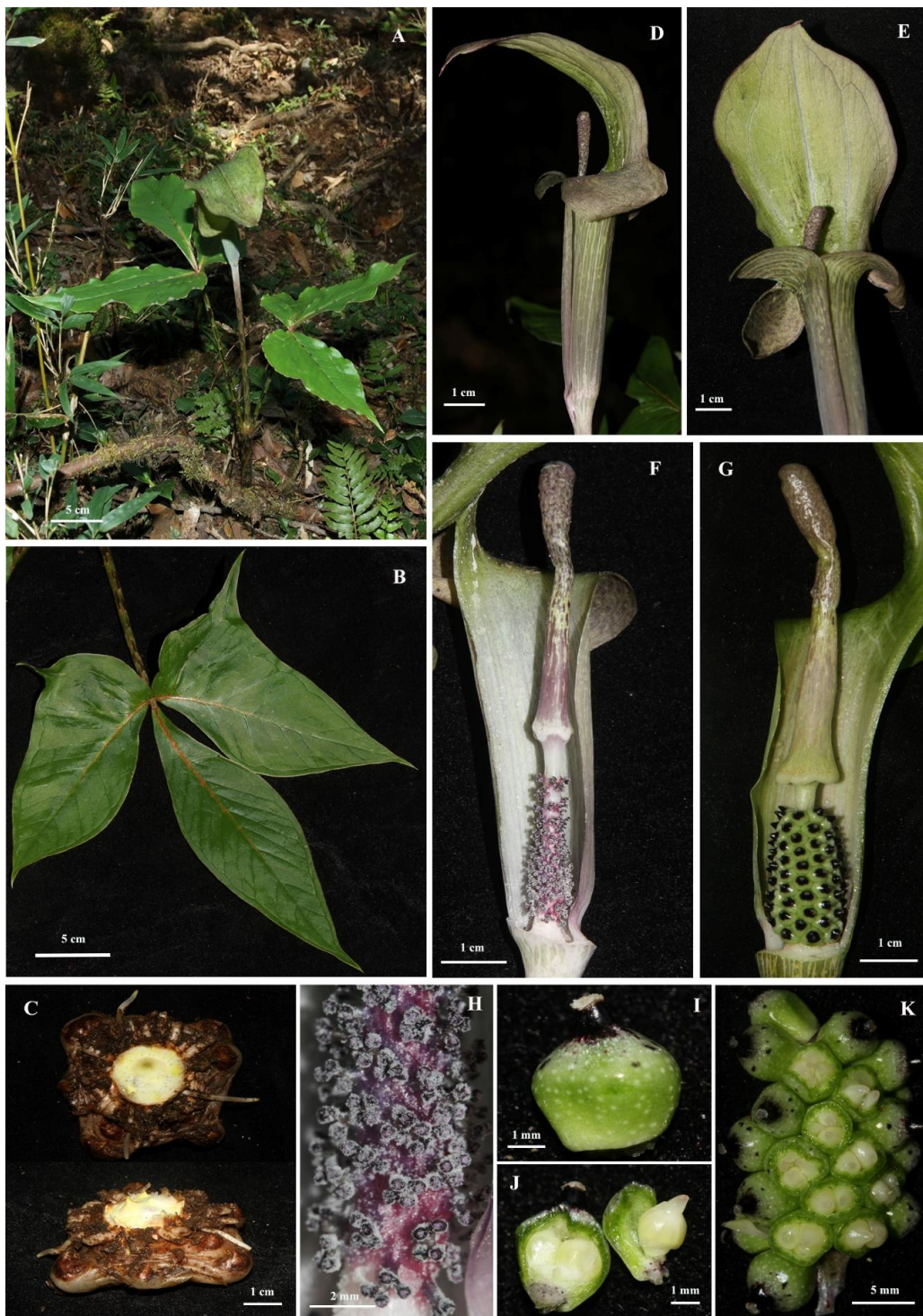


Figure 1. *Arisaema vietnamense*. A. Habit. B. Leaf blade. C. Stem. D. Inflorescence. E. Spathe limb. F. Male spadix. G. Female spadix. H. Synandria. I. Ovary. J. Longitudinal section of ovary. K. Cross section of ovary. Note: The appendices in F and G are curved due to icy rain happening just before the field survey; they should be naturally straight

Herb 30–40 cm high. Subterranean stem a depressed orbiculate tuber, 4–6 cm in diameter, 2–3 cm high, brown, proliferous bumpy with raised tubercles. Roots slightly hard branched. Phyllotaxy quincuncial. Pseudostem 10–25 cm long, 1.3–1.5 cm in diameter, to 2 cm at base, basically green, mostly covered with brown spots consisting of irregular parallel striae and carmine mottling. Cataphylls 3, slightly brown with carmine mottling, to 15 cm long. Leaves 1–2; petioles sheathing into pseudostem at the lower part, free above; free part 10–20 cm long, 6–8 mm in diam. at base and 4–7 mm in diam. at apex, similar in colour and pattern to the pseudostem; leaf blade trifoliolate, green adaxially, glaucous abaxially, margins carmine mottled, apex acuminate with up to 1.8 cm long caudate tip; venation yellow with carmine and orange mottled, adaxially impressed and abaxially prominent, lateral veins 9–14, collective vein at 2–3 mm from the margin; central leaflet long-ovate, 15–20 cm long and 2–4 cm wide, basally cuneate, subsessile; lateral leaflets asymmetrical, lanceolate, 15–20 cm long and 4–6 cm wide, sessile, often with an acuminate basal side-lobe up to 3 cm long. Inflorescence emerging from the pseudostem; peduncle almost equal to petiole, 1.4–1.6 mm diam., similar in colour and pattern to the pseudostem; spathe green with brown or greenish brown spots consisting of irregular parallel striae; spathe tube cylindrical, 1.3–1.5 cm in diam. and 4–5 cm long in male inflorescences, 1.7–2.0 cm in diam. and 6–7 cm long in female inflorescences, mouth margins largely auriculate, auricles 1.5–2 cm wide, widely recurved, abaxially light green with brown mottling; spathe limb obovate, curved over the mouth, ca. 7 cm long and 5 cm wide in male inflorescence, ca. 9 cm long and 5 cm wide in female inflorescence, spathe tip acute, base constricted. Spadix-appendix slightly exerted from the spathe-tube, 5–7 cm long and 1 cm wide, stout, cylindrical, straight, constricted at middle, stipitate, basically olive green with dark brown mottling; apex clavate, rounded, slightly rugose; base light green, dilated and lobed. Fertile portion ca. 2.5 cm

long, ca. 0.5 cm in diameter in male spadix, 1.6 cm in diameter in female spadix. Male spadix with fertile portion ca. 2.5 cm long, ca. 0.5–0.6 cm in diameter; stamens loosely arranged; synandrium of 2–3 stamens, on 0.4–0.9 mm stipe; anthers purple borne on a purple stalk; thecae dehiscent by a rounded pore; pollen white. Female spadix with fertile portion 2.5 cm long, ca. 1.4–1.7 cm in diameter; pistils densely arranged, sometimes with a few neuters inserted among apical ovaries. Ovaries ovoid to bottle-shaped, 2.5–4 mm long, 3–4 mm in diameter, 2–4-ovuled, green, apically black-carmine; stigma white penicillate and born on a 1 mm long black-carmine style.

Types

Vietnam, Lai Chau Province, Tam Duong District, Pu Ta Leng Mountain, 20 February 2019, approximate coordinates 22°24'58.32"N 103°35'43.22"E, 2333 m asl, *Luu Hong Truong, Nguyen Hieu Cuong & Nguyen Quoc Binh 1322* (Holotype SGN!, isotypes SGN!, VNMN!).

Ecology

Arisaema nepenthoides was found growing in scattered clumps along a stream in the evergreen broad-leaved forests dominated by the Fagaceae, Lauraceae, Theaceae, Ericaceae and Magnoliaceae on Pu Ta Leng Mountain. Further exploration would yield its expanded distribution on this mountain and in adjacent forests of the Hoang Lien Son Range, which is geographically considered part of the southern extension of the Himalayas and phytogeographically located in the Sikang-Yunnan Province (Averyanov et al., 2003).

Etymology

The species is named after the country where the new taxon was discovered.

Proposed Vietnamese name

Nam tinh Việt Nam.

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Table 1. Key morphological differences among *Arisaema vietnamense* and closest congeners of sect. *Nepenthoidea*

Characteristics	<i>A. vietnamense</i>	<i>A. nepenthoides</i>	<i>A. pangii</i>	<i>A. wattii</i>
Plant height (cm)	< 40	< 100	< 50	< 100
Leaves	3-foliolate, adaxially green, abaxially glaucous, margins carmine mottled	5-foliolate, adaxially deep shiny green, abaxially green	3-foliolate, adaxially dark glossy green and abaxially pale and glaucous	3-foliolate, adaxially glossy green, abaxially pale and glaucous
Leaflets	15–20 cm long, 2–4 cm wide	10–14.5 cm long, 2–4.5 cm wide	14–24 cm long, 7–14 cm wide	10–20 cm long, 4–8 cm wide
Lateral leaflets	lanceolate, asymmetrical often with an acuminate basal side-lobe up to 3 cm long	elliptic, symmetrical with cuneate base	elliptic to ovate or oblanceolate, asymmetrical with oblique base	elliptic, asymmetrical with oblique base
Length of pseudostem (cm)	10–25	51–63	4–21	28–47
Inflorescence emergence	together with leaves	before leaves	before leaves	before leaves
Spathe limb	obovate, ca. 7–9 cm long, 5 cm wide	lanceolate, 5–12 cm long, 3–7 cm wide	ovate, 4.5–6.5 cm long, 3 cm wide	ovate, 4–5 cm long, 2.5–3.5 cm wide
Spathe tube	green with brown or greenish brown spots consisting of irregular parallel striae, inside light green with brown mottling	yellow-green with longitudinal dark brown dotted lines and white veins, inside pale green	olive green with longitudinal dark purple spots or streaks, inside pale white, sometimes glaucous	purplish brown or purplish green, finely dark spotted, inside white
Mouth of spathe tube	auriculate, widely recurved	auriculate, widely recurved	not auriculate, slightly recurved	auriculate, not recurved
Ovary	ovoid to bottle-shaped, 1–4-ovuled	bottle-shaped, 2–3-ovuled	bottle-shaped, 1–4-ovuled	bottle-shaped, 4-ovuled
Spadix appendix	5–7 cm long, 1 cm in diameter, cylindrical with clavate apex and dilated and lobed base	6–8 cm long, club-shaped with truncate or subtruncate base	4.5–5 cm long, cylindrical with dilated base	2.5–4.5 cm, 4.5–5 mm in diameter, cylindrical with truncate base
Anthers	2–3	4	3–5	2
Distribution	Vietnam	Bhutan, China, India, Myanmar and Nepal	China and India	China, India and Myanmar

