



A new species of *Hapaline* (Araceae: Caladieae) from Da Nang province, Vietnam

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ABSTRACT: *Hapaline kimthoae* K.Z.Hein, Vuong & V.C.Nguyen from Da Nang province, Vietnam, is described and illustrated as a species new to science. Description, colour plates, discussion of similar taxa, phenology, distribution and a preliminary conservation status assessment are provided. With this discovery, Vietnam now holds a total of five *Hapaline* species. An identification key to these species is provided.

KEY WORDS: Aroideae, Caladieae, granite, *Hapaline locii*, *H. kimthoae*, plant taxonomy, South Central Coast.

INTRODUCTION

Hapaline Schott (1858: 44) belonging to the family Araceae, is a small genus of diminutive to moderate-sized, slender, tuberous and/or stoloniferous, clump-forming, terrestrial and seasonally dormant or evergreen herbs that inhabit forest floor or on deposits of humus on limestone, sandstone, shale or basalt rocks in tropical humid forests (Boyce, 1996; Mayo *et al.*, 1997). Boyce (1996) recognized seven species occurring from Myanmar to China (Yunnan) and south to north Borneo. Subsequently one new species, *H. locii* V.D.Nguyen & Croat was added (Nguyen and Croat, 2006). The genus is characterized by having non-peltate leaves, a spathe-spadix fusion, uniovulate ovaries and sterile male flowers above and below the fertile male flowers. (Grayum, 1990; Boyce, 1996). In Vietnam, the genus is represented by four species namely *H. benthamiana* Schott, *H. colaniae* Gagnep., *H. ellipticifolium* C.Y.Wu & H.Li and *H. locii* V.D.Nguyen & Croat (Nguyen, 1999; Nguyen and Croat, 2006).

During the field work in Da Nang province, in April of 2021, a large population of unknown *Hapaline* was found terrestrial under the closed canopy forest. The specimen was collected and living plants were brought back to Dak Lak province for cultivation. After careful investigation of relevant literature and comparison of available digitized type specimens from Vietnam and neighboring countries, it became apparent that the collected specimen does not match any other known *Hapaline* species. Thus, we herein described it as a species new to science and the 5th representative of the genus in Vietnam.

MATERIALS AND METHODS

The measurements and description of *Hapaline kimthoae* were based on the living flowering plants. Studied voucher herbarium specimens and additional alcohol-preserved material are stored at VNM Herbarium. Terminology for the morphological description follows Beentje (2016). An assessment of conservation status was carried out following the IUCN Standards and Petitions Subcommittee (2019). The extent of occurrence (EOO) and area of occupancy (AOO) were estimated using GeoCAT (Bachman *et al.*, 2011).

TAXONOMIC TREATMENT

Hapaline kimthoae K.Z.Hein, Vuong & V.C.Nguyen, *sp. nov.* **Figs. 1–3**

Type: VIETNAM. Originally collected by Nguyen Van Canh from Da Nang province, Hoa Vang district, forest around Hoa Bac commune, terrestrial along the small stream, elevation around 700 m. Cultivated in Dak Lak province, Buon ma Thuoc by Nguyen Van Canh, 10 January 2022, *Truong Ba Vuong, Nguyen Van Canh, BV 1343* (holotype, VNM 00069934!)

Diagnosis: This new species is morphologically similar to *Hapaline locii* V.D.Nguyen & Croat in having peduncle longer than petiole and spadix with sterile apex formed of fused synandrodies. But it differs significantly in having cuneate or obtuse leaf base (vs. rounded to cordate leaf base), pinkish white spathe with reddish brown tessellation (vs. dull light green or lime green spathe) and ovoid ovaries arranged in a single row (vs. bottle-shaped ovaries arranged in two alternating rows).

Description: Slender, tuberous, evergreen perennial

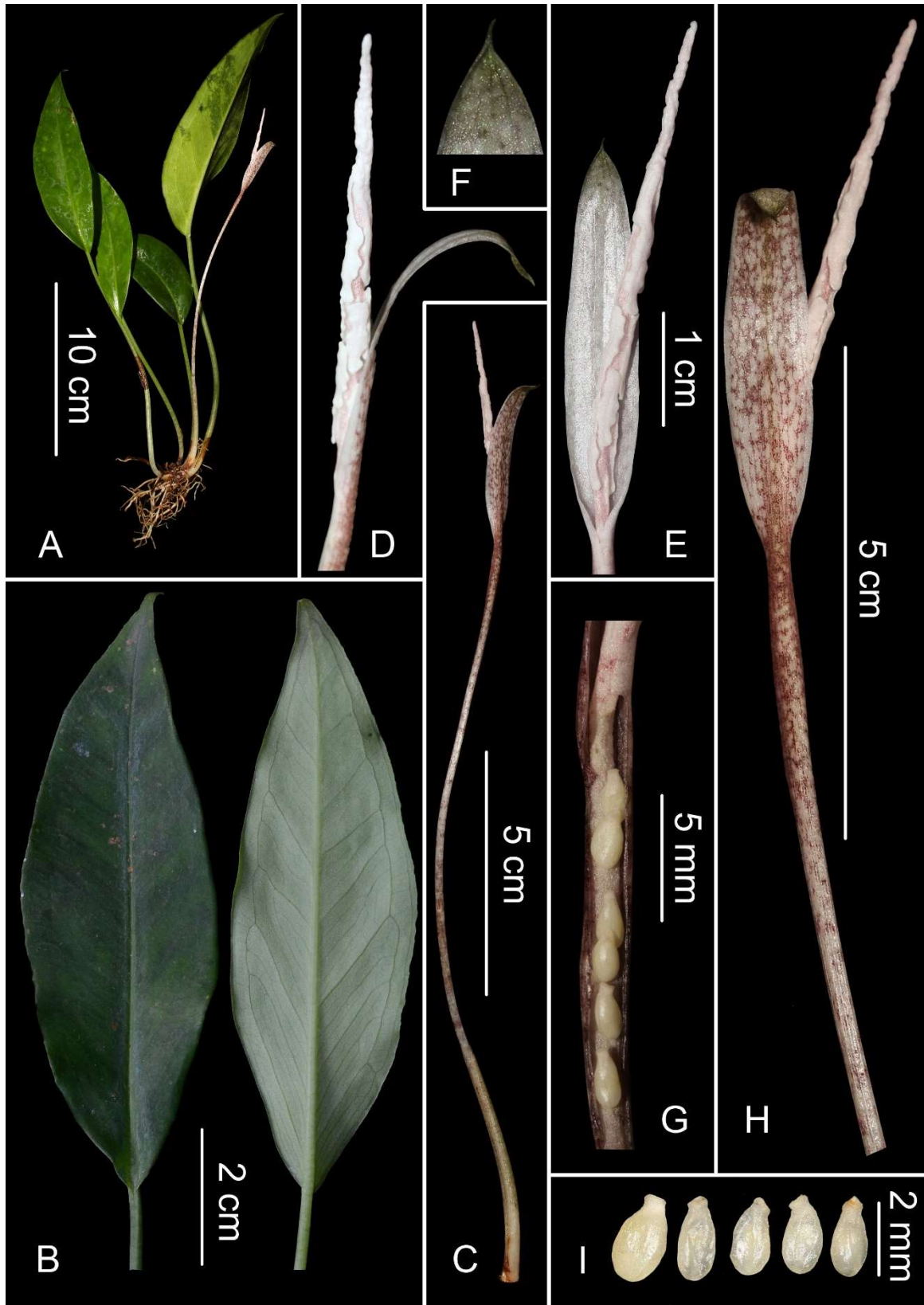


Fig. 1. *Hapaline kimthoae* sp. nov. **A.** Excavated plant, **B.** Leaf (left showing adaxial surface; right showing abaxial surface), **C.** Inflorescence, **D.** Front Side view of inflorescence, **E.** Front view of inflorescence, **F.** Apex of spathe limb, **G.** Female portion of spadix showing ovaries, lower spathe removed, **H.** Back view of inflorescence, **I.** Ovaries. Photos by: Ba Vuong Truong.



Fig. 2. Habit of *Hapaline kimthoae* sp. nov. Photo by: Van Canh Nguyen.

herb up to 28 cm tall. **Stem** tuberous, ± cylindric, 1.3–1.5 cm in diam.; **stolons** unknown; **roots** 1–2 mm in diam. **Leaves** 2–5 together; **petiole** 9.0–14.5 cm long, 0.3–0.4 cm in diam., slender, smooth, green, basal 1/3 subtended by dried membranous cataphyll; **lamina** lanceolate or elliptic-lanceolate, 11.0–14.5 long by 3–5 cm wide, thinly coriaceous, glabrous, dark green, occasionally with various pale green spots or blotchy markings adaxially, pale green abaxially, margin entire to repand, apex attenuate or acute, base cuneate or obtuse, slightly oblique; **midrib** impressed adaxially, prominently raised abaxially; **primary lateral veins** 4–6 per side, arising at 30–60° to the midrib, slightly impressed adaxially, impressed and clearly visible abaxially, anastomosing into intramarginal collective vein at 0.3–0.6 cm from margin; **interprimary veins** much less prominent, running into intramarginal collective vein; **secondary** and **tertiary veins** weakly visible abaxially. **Inflorescence** 2 together held level with or above the leaves; **peduncle** 16.5–18.5 cm long, 0.2–0.5 cm in diam., terete, smooth, pinkish white with reddish brown streaks and spots, subtended by cataphyll; **cataphyll** ca. 6 cm long, subhyaline, greenish brown, membranous, apex acute; **spathe** ca. 7 cm long; **spathe limb** narrowly linear-lanceolate, ca. 3.8 cm long, ca. 0.7 cm wide, curved, outside pinkish white, tessellated with reddish brown, inside pinkish white, apex acute and mucronate, base decurrent into lower spathe; **lower**



Fig. 3. Holotype of *Hapaline kimthoae* sp. nov. Photo by: Ba Vuong Trung.

spathe ca. 3.2 cm long, ca. 0.3 cm in diam., outside pinkish white, tessellated with dark reddish brown, inside pinkish white, margins clasping the ovaries; **spadix** longer than spathe, ca. 8.3 cm long, 0.2–0.3 cm in diam., free portion cylindric, up to 5 cm long, tapering apically into a greatly attenuated appendix to 1.3 cm long composed of connate synandrodes. **Flowers** **synandria** irregularly oblong-elliptic in plan view, 7.5–9.0 mm long, ca. 2 mm wide, creamy white, slightly pinkish; **ovaries** ovoid, ca. 2.5 x 1 mm, ivory, 7–8 in a single row aligned longitudinally along the spadix axis; **stigma** disciform, ca. 0.5 mm in diam., much smaller than the ovary; **style** very short. **Infructescence** not seen.

Distribution and habitat: The new species can be found only from the type locality, Da Nang province of Vietnam. The species occurs along stream bank under lowland broadleaf evergreen forests in deep leaf litter soils over granites, at an altitude of about 700 m and associated with *Aspidistra* sp.

Phenology: Observed flowering in October – January.

Eponymy: The species named after Ms. Pham Thi Kim Thoa, Da Nang University of Science and Technology, who kindly supported the budget for the fieldworks.



Provisional conservation status: The species occurs at a single site on the top of a granite mountain and is spread over an Area of Occupancy (AOO) of <<10 km² when calculate in the GeoCAT system (Bachman *et al.* 2011). Number of individuals are much more than 1000 and the juvenile plants are also observed in the area pointing towards successful natural regeneration. Although the species qualifies for the Category of VU under D2, with such natural regeneration there is a chance of expansion of the species' distribution range to the adjacent mountains. Hence, the category down listed to Near Threatened.

Notes: The elliptic leaves of *Hapaline kimthoae* resembles *H. ellipticifolium* C.Y.Wu & H.Li, but is readily distinguishable from the latter by having cuneate or obtuse leaf base (vs. parallel posterior lobes), a short appendix composed of fused synandrades (vs. an appendix composed of free synandrades) and ovoid ovaries (vs. bottle-shaped ovaries). This new species also resembles *H. brownii* Hook.f. from Thailand and Peninsular Malaysia in having a short appendix composed of fused synandrades and ovaries arranged in a single row. But the latter species differs in having leaf with rounded posterior lobes (vs. leaf lacking posterior lobes in *H. kimthoae*) and 2–4 ovaries (vs 7–8 ovaries in *H. kimthoae*). A key to the species of *Hapaline* occurring in Vietnam is provided below.

Additional specimens examined (Paratypes). VIETNAM, Da Nang province, Hoa Vang district, forest around Hoa Bac commune, terrestrial along the small stream, elevation around 700 m, 12 November 2021, *Truong Ba Vuong, Nguyen Van Canh, BV 1344* (VNM 000699351).

Key to the species of *Hapaline* in Vietnam

1. Leaf blade elliptic to lanceolate or ovate 2
 - Leaf blade hastate or variably sagittate 4
2. Ovaries arranged longitudinally along the spadix axis in a single row 3
 - Ovaries arranged longitudinally along the spadix axis in two alternating rows *H. locii*
3. Leaf lacking posterior lobes; spadix appendix composed of fused synandrades; ovaries ovoid *H. kimthoae*
 - Leaf with parallel posterior lobes; spadix appendix composed of free synandrades; ovaries bottle-shaped *H. ellipticifolia*
4. Leaf blade variably sagittate, occasionally constricted above the posterior lobes; ovaries ovoid, arranged in two rows
 - *H. benthamiana*
 - Leaf blade hastate, strongly constricted above the posterior lobes; ovaries bottle-shape, arranged in a single row *H. colaniae*

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