

VAN DU NGUYEN^{1*}, THOMAS B. CROAT², HONG TRUONG LUU³, CHANG YOUNG LEE⁴, JOONGKU LEE⁴ & ROGIER DE KOK⁵

Two new species of *Alocasia* (*Araceae*, *Colocasieae*) from Vietnam

Abstract

Nguyen V. D., Croat T. B., Luu H. T., Lee C. Y., Lee J. & de Kok R.: Two new species of *Alocasia* (*Araceae*, *Colocasieae*) from Vietnam. – Willdenowia 43: 293–299. December 2013. – ISSN 0511-9618; © 2013 BGBM Berlin-Dahlem.

Stable URL: <http://dx.doi.org/10.3372/wi.43.43209>

Two new species, *Alocasia evrardii* and *A. vietnamensis* (*Araceae*, *Colocasieae*), are described and illustrated from Vietnam. Although *A. evrardii* was described previously by Gagnepain in 1942, also with a historical record from Cambodia, its name was not validly published. A key to the species of *Alocasia* in Cambodia, Laos, and Vietnam is provided.

Additional key words: taxonomy, Cambodia, Laos, identification key

Introduction

Recently, during fieldwork carried out by the Institute of Tropical Biology at Takou Mountain located in the Takou Nature Reserve in the Binh Thuan province of southern Vietnam, one of the present authors (H. T. Luu) collected a flowering individual belonging to the genus *Alocasia* (Schott) G. Don. The morphological characters of the plant match those of a species originally described by F. Gagnepain (1942) as *A. evrardii*. Gagnepain's name was based on gatherings made by F. Evrard in Dalat, Lam Dong province, Vietnam; by B. Hayata, also from Dalat; by L.-M. Cadière from Cua Tung, Quang Tri province, Vietnam, and by C. Thorel from Chedom, Peunongs, Cambodia. Among these, the present authors

have not seen the material collected by Cadière. Unfortunately, Gagnepain did not provide a Latin description or diagnosis, which is a requirement for the valid publication for names published between 1935 and 2011, inclusive, under Art. 39.1 of the International Code of Nomenclature for algae, fungi, and plants (McNeill & al. 2012). The name is validated here with an English description and diagnosis and the designation of a specimen in the Paris herbarium (P) from Evrard's gathering as the holotype.

During fieldwork carried out in the Ba Na-Nui Chua National Park, Da Nang province, Vietnam, in October, 2008, a specimen of an *Alocasia* was collected and recognized as another new species. It is here described as *A. vietnamensis* V. D. Nguyen & de Kok.

1 Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, Hoang Quoc Viet Street, Cau Giay, Hanoi, Vietnam; *e-mail: vandul78@gmail.com (author for correspondence).

2 Missouri Botanical Garden, P.O. Box 299, St Louis, Missouri 63166-0299, U.S.A.; e-mail: thomas.croat@mobot.org

3 Southern Institute of Ecology, Vietnam Academy of Science and Technology, 01 Mac Dinh Chi, District 1, Ho Chi Minh City, Vietnam.

4 Korea Research Institute of Bioscience and Biotechnology (KRIBB), 111 Gwahangno, Yuseong-gu, Daejeon 305-806, Korea.

5 Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AE, U.K.

Results and Discussion

Alocasia evrardii Gagnep. ex V. D. Nguyen, **sp. nov.** – Fig. 1, 2

Holotype: Vietnam, Lam Dong province, Da Lat, 19 Aug 1924, *F. Evrard 1154* (P 00751091!).

– *Alocasia evrardii* Gagnep. in Lecomte & al., *Fl. Indo-Chine* 6: 1150–1151, fig. 109, 7–11. 1942, nom. inval. (McNeill & al. 2012: Art. 39.1).

Diagnosis — *Alocasia evrardii* differs from all other species of *Alocasia* except *A. vietnamensis* in having a stipitate spadix with staminodes at the base of the female portion; it is close to *A. putii* Gagnep. (from Thailand) in its tuberous stem, but differs from that species in having ovate to suborbicular leaf blades (vs. elliptic in *A. putii*); it differs from *A. vietnamensis* in having a tuberous stem, peduncles c. ½ as long as the petioles, and a spathe

limb dark green when young, light yellow at the base and violet-pink distally at anthesis, becoming reddish violet before falling off.

Description — *Herbs* seasonally dormant (?), 40–60 cm tall; *stem* tuberous, subglobose, 2–2.5 cm in diam., outside covered by fibres originating from dried petiole sheaths. *Leaves* 2 or 3 together, moderately peltate; *petiole* slender, 40–42 cm long, c. 1.5 cm in diam., sheathing for 10–14 cm from base, sheath light to medium green, sometimes light reddish to brownish, c. 1.5 cm wide at widest point; *blade* lighter green abaxially, medium green adaxially, ovate to suborbicular, 12–17(–25) × 10–15(–20) cm, base cordate and shallowly concave, apex obtuse or rounded, abruptly and conspicuously cuspidate, cusp 1–1.5 mm long; *basal lobes* adnate for c. 3 cm, semiorbicular or semielliptic, 5–6 × 5–6 cm; *veins*: primary lateral veins c. 5 pairs, basal veins c. 2

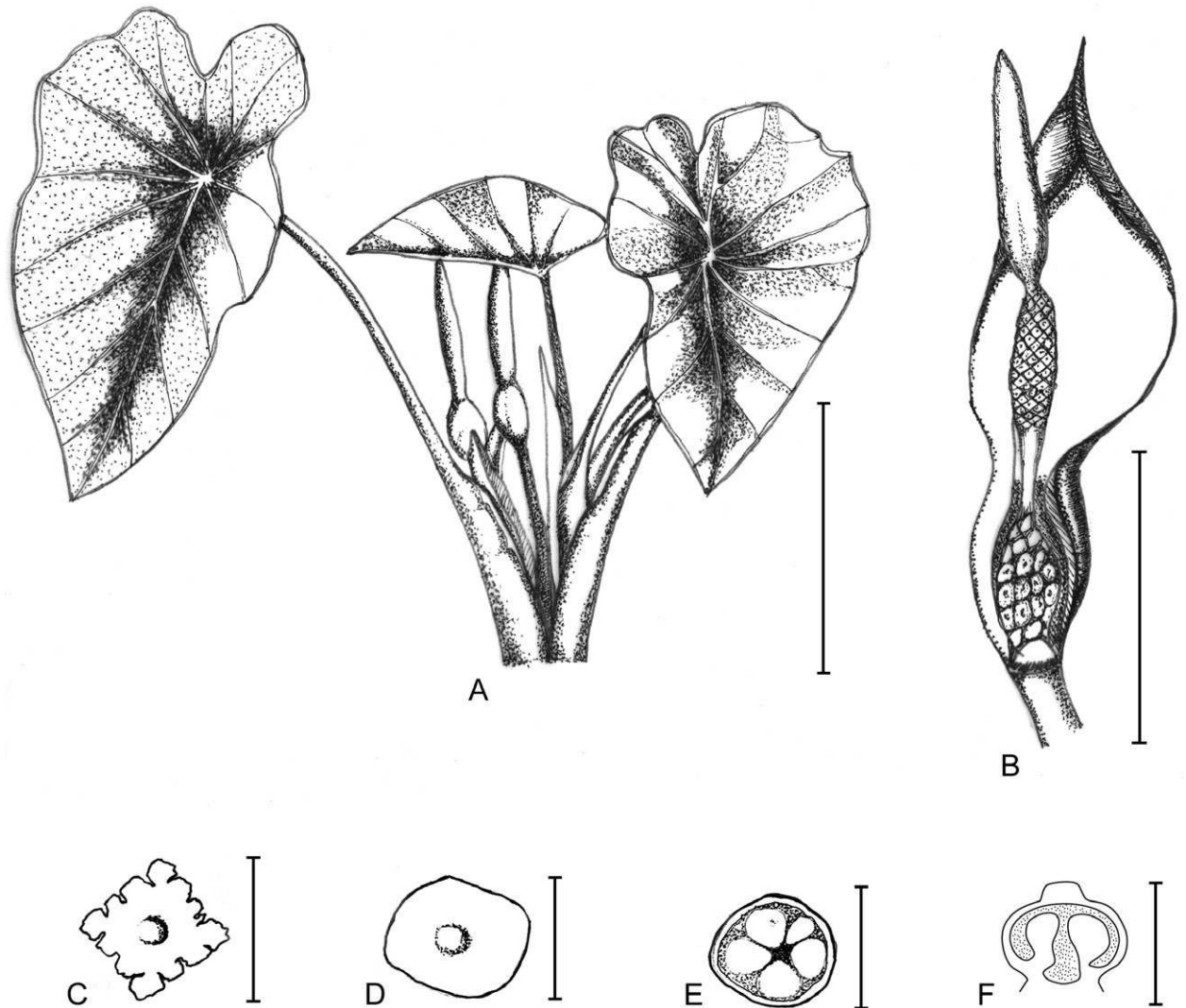


Fig. 1. *Alocasia evrardii* – A: leaves and inflorescences; B: inflorescence with spathe tube opened to show spadix; C: male flower (synandrium) apical view; D: ovary apical view; E: ovary cross-section; F: ovary longitudinal section. – Drawings by Ly Tho and Truong Anh Tho based on *H. T. Luu 428–433* (HN, VNM). – Scale bars: A = 20 cm; B = 6 cm; C = 2 mm; D–F = 1 mm.



Fig. 2. *Alocasia evrardii* – A: plant in habitat; B: tuberous stem; C: inflorescence at anthesis; D: young inflorescence with spathe tube opened to show spadix. – Photographs: Vietnam, Binh Thuan province: Takou Nature Reserve area, 2 Oct 2009, H. T. Luu.

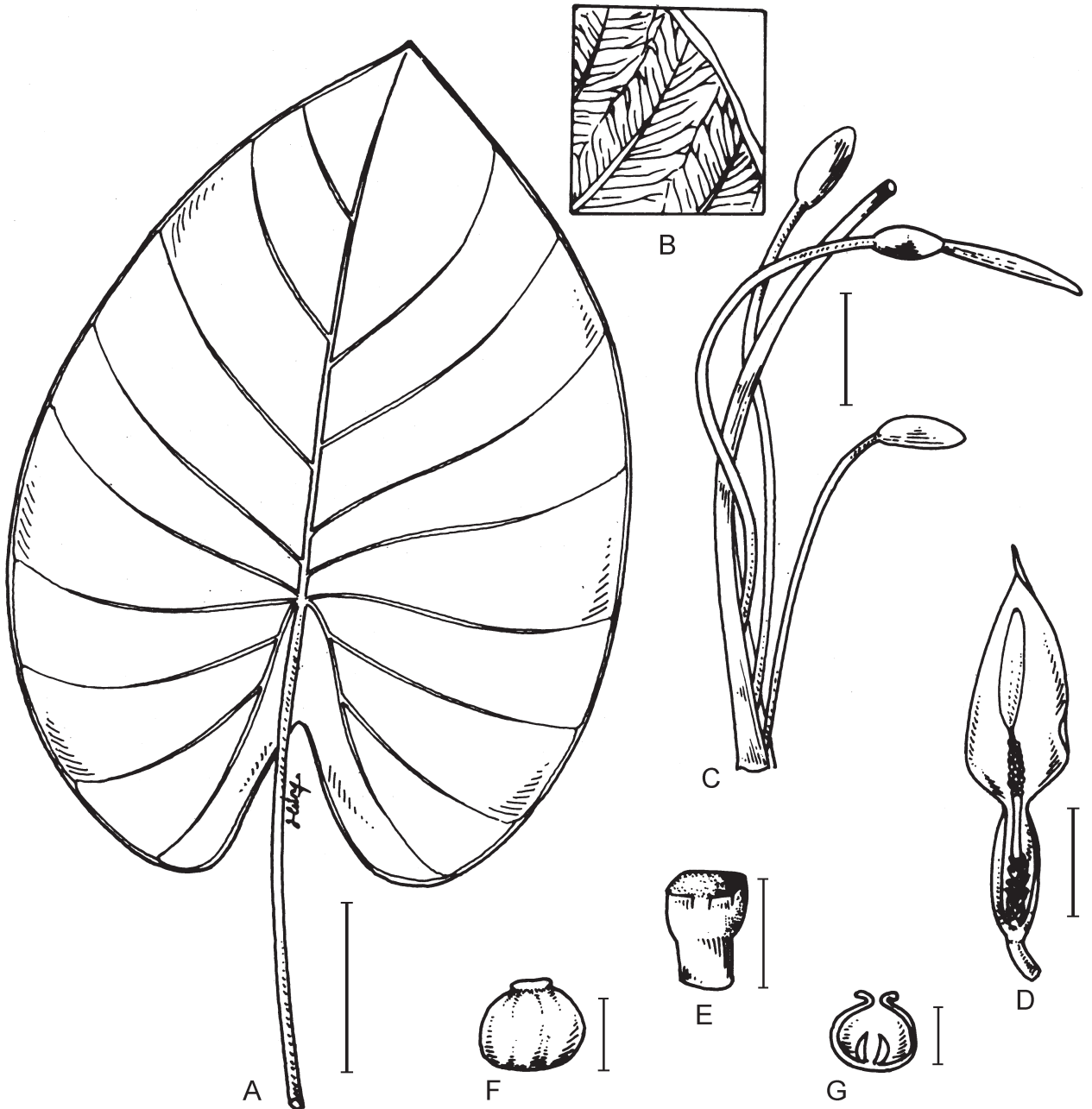


Fig. 3. *Alocasia vietnamensis* – A: leaf; B: detail of leaf venation; C: inflorescences; D: inflorescence with spathe tube opened to show spadix; E: male flower (synandrium) lateral view; F: ovary lateral view; G: ovary longitudinal section. – Drawn by Le Kim Chi based on the holotype. – Scale bars: A = 4 cm; C = 6 cm; D = 3 cm; E = 3 mm; F, G = 2 mm.

pairs, minor veins originating from both lateral veins and midrib and proceeding directly or indirectly forward to margin. *Inflorescences* 2–4 together, maturing sequentially; *peduncle* encased by a cataphyll for c. $\frac{1}{3}$ its length, pale to medium green, more slender than petiole, c. 20 cm long; *spathe* 9.5–12 cm long; *tube* ovate to elliptic, 2–3 cm long, 1.5 cm in diam., persisting in fruit; *limb* dark green when young, light yellow at base and violet-pink distally at anthesis, becoming reddish violet before falling off, cymbiform at anthesis, 8–10 cm long, c. 4 cm wide when flattened; *spadix* stipitate, shorter than spathe, c. 6.5 cm

long; *stipe* rather stout, c. 4 mm long; *female portion* slightly conical, c. 6 mm long, 2–2.5 mm in diam., base overed by staminodes; *sterile portion* slender, c. 15 mm long, 1.5–2 mm in diam., covered by staminodes; *male portion* light brown, oblong, c. 15 mm long, c. 4 mm in diam. at middle; *appendix* stipitate or sessile, dull white or light brown when young, light yellow or deep yellow during and after anthesis, stoutly subulate or subcylindric, c. 18 mm long, surface with many shallow concavities when young, deeply and elongate sulcate during and after anthesis, base truncate or oblong, equal to male portion in



Fig. 4. *Alocasia vietnamensis* – A: plant in habitat; B: habit; C: inflorescence with spathe tube opened to show spadix. – Photographs: Vietnam, Da Nang province, Ba Na-Nui Chua National Park, 24 Oct 2008, V. D. Nguyen.

diam., apex acute; *appendix stipe* brown, 1–4 mm long, covered by thin soft projections. *Female flowers*: ovaries unilocular, subglobose, c. 1 mm in diam.; ovules 2–4, basal; style conspicuous, c. 0.3 mm long; stigma lobed, concave medially, margin shallowly divided into 4 lobes. *Male flowers* with 6 or 7 stamens united into a synandrium, 1.5–2 mm wide. *Staminodes* at base of female portion prominent, creamy brown to dark brown, 1.5–2 × c. 0.6 × c. 1 mm, surface concave at middle; staminodes of sterile portion long, flattened, parallelogram-shaped, 1–1.5 mm long, c. 0.3 mm wide, those at base of sterile portion longer, slightly concave at middle.

Distribution — Lam Dong and Binh Thuan provinces, S Vietnam, and Quang Tri province, C Vietnam; also Peunongs, Cambodia. Recent records only from Binh Thuan.

Ecology — Growing in humus deposits on sandstone under semievergreen forest at about 400 m above sea level.

Conservation — *Alocasia evrardii* was collected from three locations in Cambodia and Vietnam prior to 1942, when Gagnepain originally described the species. Since that date, it appears that no further gatherings were made from the forest around Da Lat (Lam Dong province, Vietnam). Meanwhile, the forests at Cua Tung (Quang Tri province, Vietnam) and Chedom (Peunongs, Cambodia) have been reduced in size or destroyed. However, in 2009, a small population with several tens of plants was found in the Takou Nature Reserve (Binh Thuan province, Vietnam). Further research is needed to gain a more complete and detailed knowledge of the distribution, size and stability of populations of the species. According to IUCN (2012) criteria, *A. evrardii* is provisionally categorized as Data Deficient (DD).

Etymology — The specific epithet *evrardii* was coined by Gagnepain in honour of the French collector, François Evrard (1885–1957), who collected in Vietnam during the years 1923–1929.

Additional specimens seen (paratypes) — VIETNAM: Lam Dong province: Dalat, 10 Jun 1921, *B. Hayata* 758 (P 00751089); Binh Thuan province: Takou Nature Reserve area, 2 Oct 2009, *H. T. Luu* 428, *H. T. Luu* 429, *H. T. Luu* 431 & *H. T. Luu* 432 (VNM), *H. T. Luu* 430 & *H. T. Luu* 433 (HN). — CAMBODIA: Peunongs, *C. Thorel* (P 00751090); Chedom, *C. Thorel* (P 00751087).

Alocasia vietnamensis V. D. Nguyen & de Kok, **sp. nov.** — Fig. 3, 4.

Holotype: Vietnam, Da Nang province, Ba Na-Nui Chua National Park, 24 Oct 2008, *V. D. Nguyen*, *V. T. Pham*, *T. C. Vu*, *H. Q. Bui*, *R. de Kok*, *R. P. Clark*, *C. J. A. M. Sinou*, *M. D. Xanthos*, *A. Moore* & *P. I. Little* HNK 3381 (HN!; isotype: K!).

Diagnosis — *Alocasia vietnamensis* differs from all other species of *Alocasia* except *A. evrardii* in having a stipitate spadix with staminodes at the base of the female portion; it differs from *A. evrardii* in having a rhizomatous stem, peduncles c. ¼ as long as the petioles, and a spathe limb ivory white with a little pale green at the middle outside, white and glossy inside.

Description — *Herbs* evergreen, slightly robust, 70–80 cm tall; *stem* rhizomatous, elongate, 2–3 cm in diam., older parts covered by remains of old leaf bases and cataphylls. *Leaves* up to 5 together; *petiole* glabrous, red-brown at base, dull green mixed with grey distally, slender, 60–80 cm long, sheathing for 15–25 cm from base, remains persisting as dark brown fibres when dried; *blade* bright grey abaxially, dark green adaxially, suborbicular to broadly elliptic, 20–33 × 15.5–21.5 cm, base shallowly concave, apex obtuse or rounded; *basal lobes* adnate for 4–5 cm, subtriangular to semielliptic, 7.5–9 cm long, 7.5–10 cm wide at base; *veins*: lateral veins 4 or 5 pairs, basal veins c. 3 pairs with smaller veins connecting to a middle vein from lateral veins and toward leaf margin. *Inflorescences* c. 3 together; *peduncle* erect at first, then bent down at apex at fruiting, dull green to light brown-grey, 15–23 cm long, covered at base by dark brown cataphylls when decayed; *spathe* c. 9 cm long; *tube* pale green outside, light grey inside, elongate subelliptic, c. 30 mm long, c. 8 mm in diam. at middle; *limb* almost spreading outward at anthesis with apex still convolute, ivory white with a little pale green at middle outside, white and glossy inside, ovate-oblong, c. 6.5 cm long, c. 2.5 cm wide near base, both surfaces smooth, apex acuminate; *spadix* stipitate, shorter than spathe, c. 7 cm long; *stipe* white, c. 5 mm long, c. 2.5 mm in diam.; *female portion* subcylindric, c. 13 mm long, base narrowed, covered by staminodes; *sterile portion* corresponding with spathe constriction, white, c. 2.5 cm long, c. 5 mm in diam. at base, c. 2.5 mm in diam. at apex, narrower than fertile portions, covered by staminodes; *male portion* light yellow, subcylindric, c. 13 mm long, c. 3 mm in diam., base oblong, apex truncate; *appendix* stipitate, dull white, oblong-conical, c. 2.8 cm long, c. 5 mm in diam. at base, apex acuminate; *appendix stipe* c. 5 mm long, covered by several rows of white ellipsoid synandrodies. *Female flowers*: ovaries arranged in 2 or 3 rows, unilocular, green, subglobose, c. 2 mm in diam.; stigma dull yellow, broad, slightly concave, with 2 lobes directed upward on both sides; ovules 4 or 5, basal, straight with very short funicle. *Male flowers* in groups of 2 or 3, c. 1.2 mm long; *stipe* 0.6–0.7 mm long; *thecae* conical or cylindrical, c. 0.5 mm long, dehiscing by a pore at apex. *Staminodes* at base of female portion white, subconical; staminodes of sterile portion long, flattened, parallelogram-shaped.

Distribution — Known only from the type locality in Da Nang province, C Vietnam.

Ecology — Growing as an epiphyte on medium-sized trees in evergreen forests in high wet mountain areas at c. 1560 m above sea level.

Conservation — Although *Alocasia vietnamensis* is not common in the forest, its propagating capacity is high and it occurs in a National Park. However, details of the distribution, size and stability of its populations are lacking. Therefore, according to IUCN (2012) criteria, we categorize the species as Data Deficient (DD).

Etymology — *Alocasia vietnamensis* is named after its native country, Vietnam.

Key to the species of *Alocasia* in Cambodia, Laos and Vietnam

1. Leaf blade without a connection (adnate portion) between 2 basal lobes 2
- Leaf blade with a connection between 2 basal lobes 3
2. Appendix subcylindric, apex acute; spathe bright yellow, straight, open and bent out at anthesis (Cambodia, Laos, Vietnam) *A. macrorrhizos* (L.) G. Don
- Appendix elongate conical; spathe light to dark pink, conspicuously cymbiform, open but not bent out at anthesis (Laos) *A. hypnosa* J. T. Yin & al.
3. Leaf blade with lateral veins originating almost from base, basal lobes not distinct (Laos, Vietnam) *A. cucullata* (Lour.) G. Don
- Leaf blade with lateral veins originating from midrib, basal lobes clearly distinct 4
4. Connection between 2 basal lobes of leaf blade more than ½ length of lobes 5
- Connection between 2 basal lobes of leaf blade less than ½ length of lobes 7
5. Leaf blade ovate to obovate, apex acute; spadix not stipitate; staminodes absent at base of female portion of spadix (Vietnam) *A. lecomtei* Engl.
- Leaf blade elliptical or ovate to orbicular, apex obtuse or rounded; spadix stipitate; staminodes present at base of female portion of spadix 6
6. Plants tuberous; peduncles c. ½ as long as petioles; spathe limb dark green when young, light yellow at base and violet-pink distally at anthesis, becoming reddish violet before falling off (Cambodia, Vietnam) *A. evrardii* Gagnep. ex V. D. Nguyen
- Plants rhizomatous; peduncles c. ¼ as long as petioles; spathe limb ivory white with a little pale green at middle outside, white and glossy inside (Vietnam) *A. vietnamensis* V. D. Nguyen & de Kok
7. Basal lobes of leaf blade triangular, equalling or greater than ½ terminal lobe in length, lateral veins 3 or 4 pairs (Cambodia, Laos, Vietnam) *A. longiloba* Miq.

- Basal lobes of leaf blade semielliptic, apex obtuse or rounded, less than ½ terminal lobe in length; lateral veins 5–10 pairs 8
- 8. Connection between 2 basal lobes of leaf blade less than ⅓ length of lobes 9
- Connection between 2 basal lobes of leaf blade ⅓–½ length of lobes 10
- 9. Plants large; petiole to 100 cm or more; appendix stoutly conical, 5–10 cm long (Cambodia, Laos, Vietnam) *A. odora* (Roxb.) K. Koch
- Plants small to medium-sized; petiole 28–32 cm long; appendix slender conical, c. 1.1 cm long (?Vietnam) *A. hainanica* N. E. Br.
- 10. Male portion of spadix longer than appendix, female portion subglobose (Laos, ?Vietnam) *A. acuminata* Schott
- Male portion of spadix and appendix almost equal in length, female portion cylindric (Laos, ?Vietnam) *A. navicularis* (K. Koch & C. D. Bouché) K. Koch & C. D. Bouché

Acknowledgements

The first author would like to express thanks for support from grant 106.11.38.09 from the National Foundation for Science and Technology Development (NAFOSTED) and grant 904011 from the National Geographic Society. We are also grateful for the cooperation between the Institute of Ecology and Biological Resources (IEBR), the Vietnam Academy of Science and Technology, and the Royal Botanic Gardens, Kew, for plant investigation in Vietnam in 2008, in which the type specimens of *Alocasia vietnamensis* were collected. The finding of *A. evrardii* was funded by IUCN NL, project VN CBD 600174. Finally we thank three anonymous reviewers for their comments on an earlier version of this paper.

References

- Gagnepain F. 1942: Aracées. – Pp. 1075–1196 in: Gagnepain F. (ed.), Flore générale de l'Indo-Chine **6**. – Paris: Masson et Cie.
- IUCN 2012: IUCN Red List categories and criteria: Version 3.1, ed. 2. – Gland & Cambridge: IUCN.
- McNeill J., Barrie F. R., Buck W. R., Demoulin V., Greuter W., Hawksworth D. L., Herendeen P. S., Knapp S., Marhold K., Prado J., Prud'homme van Reine W. F., Smith G. F., Wiersema J. H. & Turland N. J. (ed.) 2012: International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011. – Königstein: Koeltz Scientific Books. [Regnum Veg. **154**].