

Three New *Arisaema* Species from Thailand and Some Taxonomic/Nomenclatural Notes

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ABSTRACT

Three new Thai species from the genus *Arisaema*, section *Fimbriata*, are described and illustrated. Their relations with other species in *Fimbriata* are discussed and the lectotypification of *A. putii* Gagnep. is made.

KEY WORDS

Araceae, Thailand, *Arisaema* section *Fimbriata*, *Arisaema* section *Anomala*, *Arisaema putii*, *Arisaema maxwellii*, *Arisaema fimbriatum*, *Arisaema pachystachyum*, *Arisaema sizemoreae*.

INTRODUCTION

From past expeditions by Mrs M. Sizemore (USA) and Dr. J. F. Maxwell (Thailand), living plants have been raised in the research collection of the Leiden Botanical Garden by the first author. With increasing new data and knowledge concerning the genus *Arisaema*, notably demonstrated in the book by the second author and his wife on *Arisaema* (G. & L. Gusman, 2002) it became clear that among those living plants three new species from section *Fimbriata* Engl. (1920) can now be proposed. During the establishment of the new species it became apparent that the name *A. putii* Gagnep. has to be lectotypified since the syntype collection is a mixture with the new species *A. maxwellii* as presented here. The result of the lectotypification

(synonymy of *A. putii* with *A. fimbriatum* Mast.) is presented under *A. maxwellii*.

In G. & L. Gusman (2002) the section *Fimbriata* has been narrowed down to contain only tuberous species. This narrow concept has been used here and, accordingly, in this paper, section *Fimbriata* does not include the evergreen, rhizomatous species, which are now included in the new section *Anomala* (see appendix below).

SPECIES DESCRIPTIONS

1. *Arisaema maxwellii* Hett. & G. Gusman. **sp. nov.**—Type: Maxwell 96-904, (L, holotype), THAILAND (north), Lampang prov., Jae Sawn National Park, northern part, Wahng Nua District, Wahng Die Subdistrict, Pah Ngahm (Nahn Kaht) caves & limestone mountain, Maw Cave, shaded area in cracks and depressions in limestone, thin soil, in fire-prone, seasonal, very degraded deciduous hardwood forest with much bamboo, rugged limestone terrain, alt. 575–625 m., 26 June 1996; Fig. in G. & L. Gusman, 2002, p. 171 (from Chang Kian Valley, Muang District, east side of Doi Suthep, Chiang Mai prov., N. Thailand) sub *A. album sensu* Craib (1912) and Gagnepain (1942). Figures 1–4

(N.B.: a second collection Maxwell 96-904 is kept in CMU. The authors have not seen this specimen but according to J. F.



Fig. 1. *Arisaema maxwellii*: female inflorescence.



Fig. 3. *Arisaema maxwellii*: male inflorescence.



Fig. 2. *Arisaema maxwellii*: female spathe.



Fig. 4. *Arisaema maxwellii*: male spathe, detail.



Fig. 5. *Arisaema pachystachyum*: leaf.



Fig. 7. *Arisaema pachystachyum*: female spadix.



Fig. 6. *Arisaema pachystachyum*: female inflorescence.



Fig. 8. *Arisaema pachystachyum*: male spadix, detail.

Maxwell it is a second plant collected from the same population from which the holotype collection was made. Since we have not seen this specimen we designated the Leiden specimen the holotype. The CMU specimen is technically not an isotype as it represents a different gathering.).

Diagnosis—Ab Arisaemate albo spadice foemineae staminodiis in appendicis parte inferiore congregatis biformis, inferioribus superioribus minoribus, superioribus ut minimum 4-plo eis *A. albi* longioribus differt.

Seasonally dormant herb. Tuber depressed globose, 5–6 cm in diam., to 4 cm high, producing a few small, subglobose offsets annually when mature. Shoot monophyllous or diphyllous and with pseudostem when flowering, inflorescence and leaf simultaneous, flowering before full leaf expansion. Petiole (entire) 14–53 cm long, 0.3–1.2 cm in diam. at the base, smooth, uniformly reddish brown or grey to greenish grey, with or without pinkish–reddish striations, sheathing part (pseudostem) 7–17 cm long; lamina trifoliolate, 11–40 cm long, 10–40 cm in diam.; anterior leaflet petiolulate (petiolule 0.3–3.5 cm long), elliptic, 6.5–30 cm long, 3–13 cm in diam., leathery, top acuminate then aristate; posterior segments petiolulate (petiolule 0.3–1.5 cm long), obliquely elliptic–ovate, 6–32 cm long, 2.5–16 cm wide. Peduncle 12–36 cm long, free part 5–20 cm long, 0.5–0.9 cm in diam., uniformly dark reddish brown or greyish to greenish grey, with or without pinkish–reddish striations; spathe elongate triangular, 11.5–14 cm long, 4–7 cm in diam., basal part slightly convolute, cylindric, 3.5–5.5 cm long, 2–2.2 cm in diam., outside whitish to pale greenish yellowish or whitish flushed green, inside glossy whitish with a faint greenish flush, limb hooded, ovate, apex long acuminate (3–4 cm) or aristate, outside bright yellow with green flushes near the top or basal part white and rest green, inside as outside but slightly brighter. Female spadix sessile, shorter than spathe, 6.5–8.5 cm long; female part elongate conical, 2–3.5 cm long, 0.7–1 cm in diam. at

the base, 0.5–0.6 cm in diam. at the top, flowers congested; appendix 4.5–5.7 cm long, lower 1 cm with short bristle-like staminodes, remaining part with long bristle-like staminodes, top filiform, acute, 1 mm in diam., whitish yellow flushed with pale green or all pale green. Lowermost staminodes uncinatate or almost straight, 4–8 mm long, green with or without purple tips, upper staminodes aristate, 1–1.7 cm long, almost parallel to the spadix axis, whitish yellow with greenish top or uniformly green, acute. Ovaries depressed, 3 mm in diam., 2 mm high, subangulate, bright green, top with grooves radiating from the centre, unilocular, 5–7 basal ovules; style short, conical, 0.2 mm long, 0.3 mm in diam. at the base, green; stigma subhemispheric, penicillate, ca. 0.3 mm high, ca. 0.4 mm in diam., white. Male spadix (only one seen) 6.5 cm long, short stipitate; male part 2.5 cm long, 0.9 cm in diam. (incl. anthers), axis quite thick (5 mm, pale green), flowers distant; appendix 3.5 cm long, lower and upper staminodes not very different, furthermore as female appendix. Stamens consisting of 2–3 anthers; filaments fused to a column, 2–3 mm long, 0.3 mm in diam., pale green; thecae irregularly clustered at the top, globose to reniform, sometimes laterally fused, white, maturing pale orange, opening by a long, lateral pore.

Additional material—THAILAND: *Hettterscheid H.AR.230* (L, spirit coll.), Thailand, Kamphaeng Phet prov., off route 1117, alt. 320 m (from a plant cultivated in the Leiden Botanical Garden; orig. coll. Sizemore s.n.); *Hettterscheid H.AM.261* (L, spirit coll.), THAILAND, type locality (from a plant cultivated in the Leiden Botanical Garden; orig. coll. Maxwell s.n.); *Maxwell 88-629* (L), THAILAND (N), Chiang Mai prov., Doi Suthep, Chang Kian Valley; *Put 4020* (P), THAILAND (north), Lampang Prov., Muang Ngao (see note 1).

Etymology—The species is named after Dr J. F. Maxwell, who collected the holotype and has been very helpful over the years in bringing to light valuable infor-

mation on Thai members of the Araceae family.

Note 1—*Lectotypification of Arisaema putii* Gagnep.: the name *A. putii* was published by Gagnepain in 1941, mentioning three collections and not choosing one in particular as the holotype. It turns out that the syntypes represent at least two different species. *Put* 4020 (P, a drawing of a flowering specimen), represents the new species described here. It originates from Muang Ngao, Lampang prov., N Thailand. The other two syntypes are *Kerr* 15899 (K) and *Put* 1004 (K). *Put* 1004 consists of a trifoliate leaf only and originates from peninsular Thailand, Isthmus of Kra (Chumphon). *Kerr* 15899 originates from the extreme south of peninsular Thailand, near the Malaysian border, Kuan Nieng, Khao Chang Low (Jacobs, 1962), and represents *A. fimbriatum* Mast. The protologue of *A. putii* clearly matches *A. fimbriatum* in nearly all details. Later, *A. putii* was not included in Gagnepain's treatment of the Araceae in Lecomte's *Flore Générale de l'Indo-Chine*, 1942. As written in the introduction of the Tome Préliminaire, 1944, the geographical location covered the area from 23°N to 8°35'N latitude, explicitly excluding the Thai-Malaysian border where *Kerr* 15899 (K) was collected, an additional proof of the implicit choice made by Gagnepain for his protologue representing *A. fimbriatum*, that had not been (and has not been so far) found in Thailand north of the Thai-Malaysian border. In consequence and in order to lift possible confusion between the name *A. putii* and *A. maxwellii* as presented here, we have decided to lectotypify the name *A. putii* by choosing *Kerr* 15899 (K) as the lectotype of *A. putii* Gagnep., thereby satisfying ICBN art. 9.10.

Arisaema putii Gagnep., *Not. Syst.* 9:127 (1941): Lectotype (chosen here!): *Kerr* 15899 (K), THAILAND (peninsular), Kuan Nieng, Khao Chang Low; additional material *Put* 1004 (K), THAILAND (peninsular), Chumphon; excluded: *Put* 4020 (= *A. maxwellii* n.

sp.). This lectotypification renders *A. putii* a full synonym of *A. fimbriatum* and corresponds well with the protologue of *A. putii* and the intentions of the author of the name.

Note 2—*Arisaema maxwellii* is a member of *Arisaema* sect. *Fimbriata* (sensu G. & L. Gusman, 2002). It does resemble *A. album* N.E. Br. but the differences mentioned in the diagnosis are distinct enough to separate both. The bright yellow colour of the spathe of one of the plants cultivated by the first author is very rare in *Arisaema* and only otherwise encountered in *A. flavum* Schott.

2. *Arisaema pachystachyum* Hett. & G. Gusman. **sp. nov.**—Type: *Hetterscheid* H.AR.238-T (L, spirit coll., holotype.), collected from a cultivated plant (Leiden Botanical Garden), 23 May 2003, orig. coll. *Sizemore s.n.*, THAILAND, Loei prov., S. of Loei, between Wang Saphung and Nong Bua Lamphu, Highway 210, 25 km E of Wang Saphung, medium shade in rock crevices on steep slope. Figures 5–8.

Diagnosis—Ab *Arisaemate* albo foliolis lateralibus petiolulatis, appendicis parte superiore nuda differt.

Seasonally dormant herb. Tuber depressed globose, to ca. 6 cm in diam., ca. 4 cm high, producing a few annual, depressed globose offsets. Shoots either unifoliate (smaller specimens) or bifoliate (larger specimens) and then with a pseudostem. Largest cataphyll greyish green chequered extensively dark pink. Petiole 27–45 × 1–1.5 cm, lower 5–20 cm sheathing and forming a pseudostem with the peduncle, smooth, pale green; lamina trisect, to 70 cm in diam; leaflets elliptic or obovate, 18–35 cm long, 9–18 cm wide, top short aristate, median leaflet long petiolulate (to 4 cm long), lateral leaflets shorter petiolulate (to ca. 1.5 cm). Peduncle sturdy, shorter than petiole, 16–24 cm long (from tuber to top), 0.5–1.5 cm in diam., as petiole; spathe 9–16 cm long, 4–5 cm in diam. (base), lower 2.5–6 cm con-



Fig. 9. *Arisaema sizemoreae*: leaf.



Fig. 11. *Arisaema sizemoreae*: female spadix.



Fig. 10. *Arisaema sizemoreae*: inflorescences.



Fig. 12. *Arisaema sizemoreae*: male spadix.

volute, 1–2 cm in diam., tubular, slightly tapering to the top, outside and inside white but ventral side flushed with green or with faint green stripes near the base, limb hooded, 4.5–6 cm long, 2–4 cm in diam., triangular or elongate triangular, acute or drawn out in a long acuminate tip, veins thickened, outside and inside green. Male spadix shorter than spathe, 5–6 cm long; male zone conical, with distinct swollen axis, 1.5–2 cm long, 0.4–0.6 cm in diam. at the base, 0.2–0.3 mm at the top, flowers distant, upper part of male zone with few staminodes; appendix very thin, 1 mm in diam., gradually tapering to the acute top, pale olive green, basal part erect, then curved downwards. Female spadix 6.5 cm long, sessile; female part elongate conical, 1.3–2.5 cm long, 1–1.2 cm in diam. at the base, 0.5 cm in diam. at the top; appendix elongate, 5–6 cm long, basal part slightly thickened and with regularly arranged but distant staminodes, remainder smooth, filamentous, 1–2 mm in diam., dull olive green, top curved forward and sometimes downward, acute. Ovaries elongate, truncated, 3 mm long, 2 mm in diam., unilocular, 5–7-ovulate, glossy dark green with whitish striations; style short but distinct, to 0.2–0.5 mm long, conical, glossy dark green; stigma depressed or subhemispheric, slightly broader than style, penicillate, white. Male flowers consisting of 2–3 stamens; stamens 1–2 mm long; filaments basally or entirely connate and branching at the top, 0.5–1 mm long, white; anthers elliptic, ca. 0.8 mm long, white, the top dark purple, opening apically with oval pores; pollen pale blue. Staminodes aristate, thin, 0.5–5 mm long, 0.1–0.8 mm in diam., dirty greenish with purple spots and flushes or upper part purple, top obtuse.

Additional material—THAILAND: *Geesink, Hattink & Phengklae 6947* (L), Thailand, Chaiyaphum prov., Ban Lui Lai, 15°40'N 102°0'E, alt. 700 m.; *Hetterscheld H.AR.236* (L, spiritcoll.), Thailand, Petchabun prov., NW of Petchabun, Rt. 2258, alt. 340 m. (coll. from a plant cultivated in

the Leiden Botanical Garden, orig. coll. *Sizemore s.n.*).

Etymology—The species epithet refers to the thick lower half of the spadix axis. Notes: compared to all other tuberous species in *Arisaema* sect. *Fimbriata* (*sensu* G. & L. Gusman, 2002, excluding rhizomatous species), *A. pachystachyum* morphologically resembles *A. album* (from Meghalaya) because the two share the same shape of the spathe viz. a tubular base slightly constricted near the mouth, whose margins are nearly straight and green, a spadix conical near the base with many staminodes above the fertile part in both female and male spadices, and an appendage protruding from the tube but shorter than the spathe. *Arisaema pachystachyum* differs from *A. album* by the appendage having the part protruding from the spathe mouth being naked, 2 leaves with sessile lateral leaflets, instead of 1 leaf only in *A. album* with petiolulate laterals and finally a peduncle much shorter than the petioles such that the spathe is held below the foliage in *A. pachystachyum* while it is at foliage level in *A. album*. The monophyllous condition in *A. album* may be a sampling artefact, as few specimens are known and it is known that species from section *Fimbriata* occasionally have both monophyllous and diphyllous stems.

3. *Arisaema sizemoreae* Hett. & G. Gusman, **sp. nov.**—Type: *Hetterscheld H.AR.447-T* (L, spirit coll., female inflorescence, holotype), THAILAND, Nakhon Sawan prov., Route 1084, 20 km n of Warun (coll. from a living plant cultivated in the Leiden Botanical Garden., 23 May 2003, orig. coll. by M. Sizemore). Figures 9–12.

Diagnosis—Ab *Arisaemate albo appendicis foemineae* basi crassa parte superiore condensata staminodiis valde congestis differt.

Seasonally dormant herb. Tuber depressed globose, to 5 cm in diam., to 3 cm high, gradually budding off depressed globose offset tubers. Shoot unifoliate, flowering shoots with a pseudostem; pseudo-

stem 6–12 cm long. Petiole 15–35 cm long, 0.3–1 cm in diam., smooth, pale olive green to mid green, base with a brownish hue, free part of petiole up to 26 cm long; lamina trisect; central leaflet petiolulate (petiolule 1–4 cm long, 2–5 mm in diam.), elliptic-ovate, 6.5–18 cm long, 3.5–12 cm wide, base not decurrent, top subacuminate-aristate (arista 4–8 mm long), margin thinly chartaceous, irregularly minutely crenulate-serrulate, upper surface glossy green, sometimes variegated with a mosaic of mid green and pale green (only found on one lateral leaflet). Peduncle as petiole, thin, terete, 14–28 cm long, 2.5–4 mm in diam., lower 3–10 cm sheathed; spathe ovate elliptical, 7–11 cm long, 3.5–5 cm in diam. (limb), base convolute, 1.5–2.5 cm, tubular or slightly widening at the top, base of the tube with a distinct, slightly expanded annulus, limb broadly expanded, not auriculate, largely obliquely erect or hooded but upper part reflexed, triangular, top acuminate-aristate, outside base pale green, annulus whitish, inside whitish green, limb outside pale green, inside as outside but the basal half paler in the centre. Female spadix sessile, 5 cm long; female part subcylindric, slightly tapering to the top, 1.5 cm long, 0.8 cm in diam. at the base, 0.7 cm at the top, flowers congested; appendix 3.5 cm long, 4 mm in diam. at the base, lower $\frac{3}{4}$ terete, then quickly tapering to the filamentous top, lower 1 cm with staminodes, these distant, middle part naked, upper part dissolving into numerous staminodes, these quite closely set, apex filamentous, acute; lower staminodes slightly clavate, curved upwards, rarely downwards, 0.5–2 mm long, base decurrent, white, top obtuse; upper staminodes bristle-like, tapering to the top, 3–10 mm, green, top acute. Male spadix sessile, 3.5–4 cm long; male part sturdy, $1.7\text{--}2.2 \times 0.4\text{--}0.5$ cm, lower flowers distant, irregularly placed, upper flowers more congested; appendix short, 1.5–1.8 cm long, entirely consisting of fleshy bristle-like staminodes, these ca. 4 mm long, 0.5 mm in diam., bases decurrent or over a larger distance fused to the main body of the appendix, upper staminodes

entirely fused with appendix, appearing as costae, top of appendix acute, surface pale green to yellowish green. Ovaries 2 mm long, 2 mm in diam., angulate, top broadly conical, bright glossy dark green, unilocular, 4 basal ovules; style ca. 0.3 mm long, 0.5 mm in diam., pale white-green, stigma subhemispheric or slightly depressed, strongly penicillate, ca. 0.6 mm high, ca. 1 mm in diam. Male flowers consisting of 1–3 stamens; filaments short or entirely fused to the spadix axis, 0.1–0.3 mm long; anthers consisting of two thecae; thecae subglobose to ellipsoid, entirely free, dirty orange brown, opening apically with an elliptic to slit-like pore.

Etymology—The species is named after Mary Sizemore (USA) for bringing to light so many new data on Araceae in Asia, collected during her travels.

Note—*Arisaema sizemoreae* resembles *A. album* and *A. maxwellii* (described in this publication) in spathe and spadix. It differs from both in having a very thick appendix base on the female spadix and a very condensed upper part in both spadix types, in which the staminodes are very congested.

Appendix: Nomenclatural Establishment of *Arisaema* sect. *Anomala* G. & L. Gusman

Section *Anomala* was created (Gusman, G. & L., 2002) to take into account important differences in morphology and way of growth of the rhizomatous, evergreen and tropical *Arisaema* species, previously placed in section *Fimbriata*. This aspect was thoroughly discussed (ibid.) but the description of section *Anomala* was not validly published because its Latin translation was overlooked: an omission rectified below:

Section *Anomala* G. & L. Gusman

Type—*A. anomalum* Hemsl.

Plantae rhizomatae, acaules sive pseudo-caulescentes. Folia persistentia, singula, bina vel plura, nova cum spathis novis emergentia quando vetustiores etiamtum

praesentia. Receptaculum cremeum. Planta cum folio simplici post germinationem.

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