# Studies on *Schismatoglottideae* (*Araceae*) of Borneo LVI — Two new species of *Schismatoglottis* for the Nervosa Grade

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# Studies on *Schismatoglottideae* (*Araceae*) of Borneo LVI – Two new species of *Schismatoglottis* for the Nervosa Grade

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**Abstract:** *Schismatoglottis amosyui* S. Y. Wong, S. L. Low & P. C. Boyce, sp. nov. and *S. pocong* S. Y. Wong, S. L. Low & P. C. Boyce, sp. nov. are described and illustrated as taxonomically novel species belonging to the Nervosa Grade, a paraphyletic grade defined, uniquely for *Schismatoglottideae*, by aromatic vegetative tissues.

**Key words:** *Araceae*, *Schismatoglottideae*, *Schismatoglottis*, Indonesia, Borneo, Kalimantan Utara, Sarawak, new species, polyphyletic, sandstones

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## Introduction

Phylogenetic analyses by the second author (Low 2016) recovered a grade (sensu Huxley 1959) equivalent to a combined *Schismatoglottis* Nervosa Complex (Wong 2010; Ting & al. 2012), *S.* Multinervia Complex (Boyce & Wong 2015; Wong & Boyce 2011), *S. patentinervia* Engl. (sensu Hay & Yuzammi 2000), and three morphologically similar but ostensibly taxonomically isolated species [*S. antu* S. Y. Wong & P. C. Boyce (2015), *S. camera-lucida* P. C. Boyce & S. Y. Wong (2014), and *S. gui* P. C. Boyce & S. Y. Wong (2014)]. Despite shared morphological characteristics, notably the occurrence of aromatic vegetative tissues otherwise absent from *Schismatoglottis* species, repeated molecular analyses failed to recover these combined taxa as a monophyletic unit, although they consistently formed a paraphyletic cluster, which for the sake of convenience we are referring to as the *S.* Nervosa Grade (Fig. 1).

Species of the Nervosa Grade (Fig. 2) are small to medium-sized compact to sprawling mesophytes with resin-aromatic vegetative tissues (probably terpenoids), leaf blades with conspicuously tessellate secondary venation, petioles commonly longitudinally ribbed and/or scabrid, and erect inflorescences in which the lower persistent part has pronouncedly thickened walls, and with the spathe limb either white, wide-spreading, and soon deliquescing at the onset of staminate anthesis, or more or less uniformly green, hardly opening, and persisting until post anthesis before partially rotting. Many species in the Nervosa Grade propagate spontaneously from whole or fragmentary leaves, and several species produce viviparous plantlets on still-active leaves, either along the length of the abaxial midrib (*Schismatoglottis amosyui*, sp. nov., *S. ulusarikeiensis* S. Y. Wong), or from the leaf blade tip (*S. hayi* S. Y. Wong & P. C. Boyce, *S. puberulipes* Alderw.). Most species are locally endemic and almost all are geologically obligated. The Nervosa

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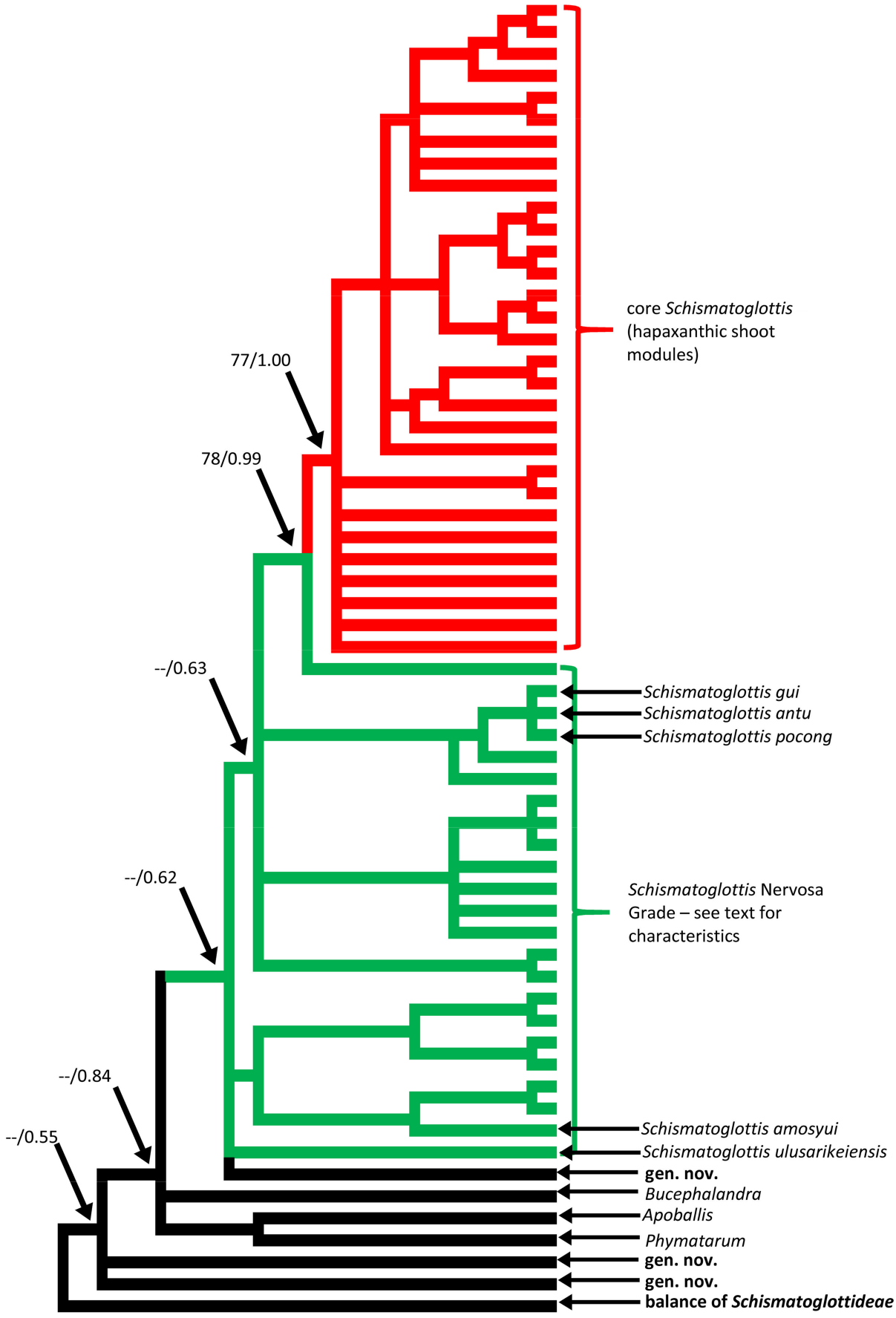


Fig. 1. Partial cladogram showing the *Schismatoglottis* Nervosa Grade (Low 2016).

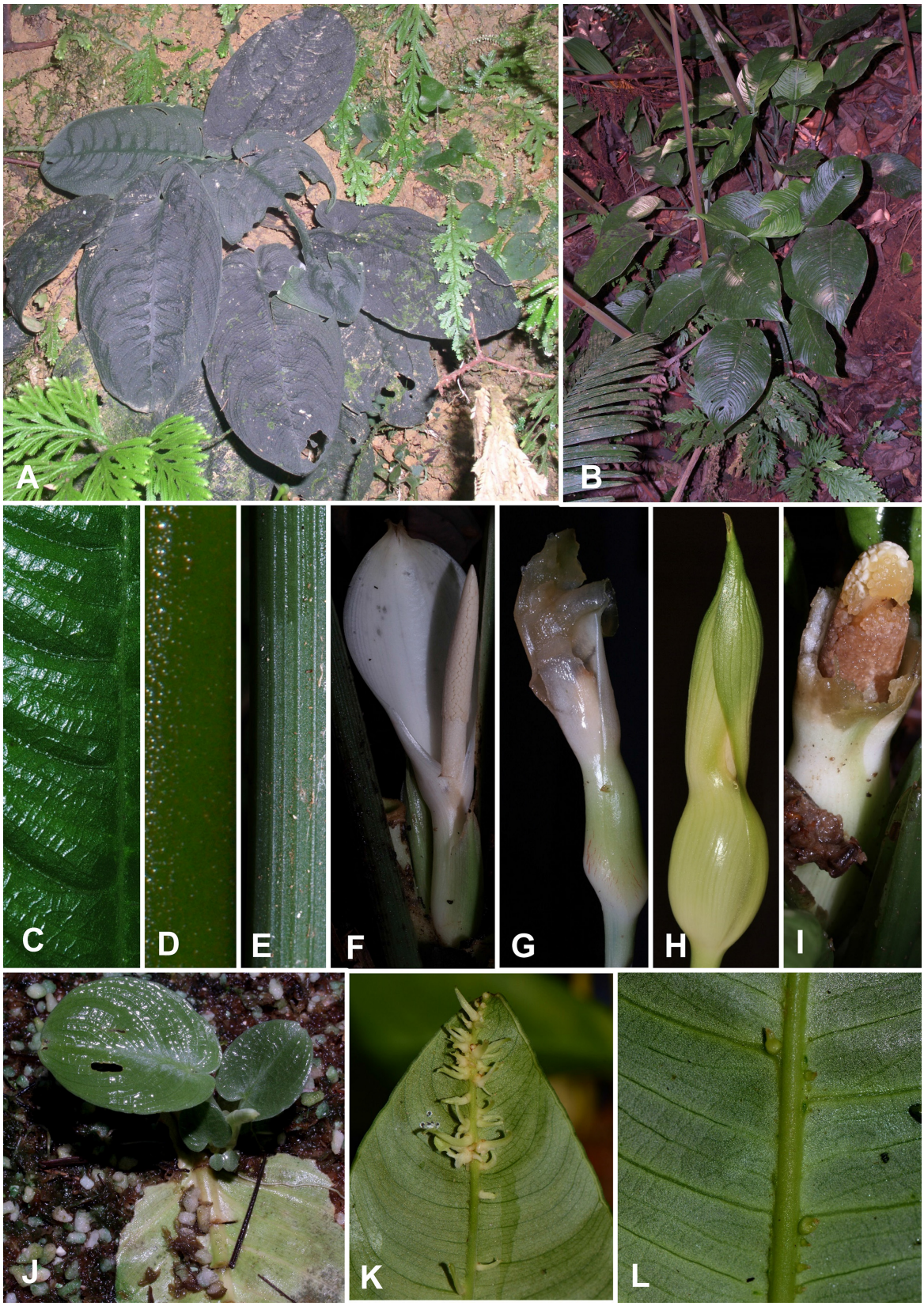


Fig. 2. Characteristics of the *Schismatoglottis* Nervosa Grade – A: compact rosette habit (*S. puberulipes*); B: sprawling habit (*S. simonii*); C: tessellate secondary venation (*S. tessellata* S. Y. Wong); D: scabrid petioles (*S. amosyui*); E: longitudinally ribbed petioles (*S. matangensis*); F & G: spathe limb white, opening wide, deliquescing at onset of staminate anthesis (*S. matangensis*); H & I: spathe limb green, hardly opening, partially rotting post anthesis (*S. ulusarikeiensis*); J: spontaneous propagation from leaf fragment (*S. puberulipes*); K: viviparous plantlets from leaf blade tip (*S. hayi*); L: viviparous plantlets along abaxial midrib (*S. amosyui*). – All photographs by Peter C. Boyce.

Grade comprises at least 45 species, although at present only 20 are formally described. All are restricted to Borneo except *S. brevicuspis* Hook. f. (Sumatera, Peninsular Malaysia, and the far south of the Isthmus of Kra, Thailand). There is compelling evidence for vicariance events, in particular with spatially isolated limestone outcrops associated with allopatric local endemism (Ting & al. 2012; Wong 2010; Wong & Boyce 2011).

## Results and Discussion

***Schismatoglottis amosyui*** S. Y. Wong, S. L. Low & P. C. Boyce, **sp. nov.** – Fig. 3.
Holotype: Malaysian Borneo, Sarawak, Sri Aman Division, Lubok Antu, Batang Ai, without exact locality, *Amos Yu AR-5268* (SAR!; isotype: SBC!).

*Diagnosis* — *Schismatoglottis amosyui* resembles *S. liniae* S. Y. Wong, *S. matangensis* S. Y. Wong, *S. nervosa* Ridl., *S. simonii* S. Y. Wong and *S. turbata* S. Y. Wong by the strongly aromatic vegetative tissues, erect stems, and cordate-elliptic leaves with conspicuous tessellate secondary venation, but differs by the spathe limb remaining green throughout anthesis, hardly opening, and persisting until after anthesis (vs spathe limb white at onset of anthesis, opening widely, and deliquescing at the start of staminate anthesis), by the large septum intruding from the spathe wall coincidental with the spadix interstice, and by the conspicuous zone of pistillodes on the lower part of the spadix interstice (vs interstice furnished only with staminodes). *Schismatoglottis amosyui* also differs from *S. nervosa* by the presence of viviparous outgrowths occurring along the midrib on the abaxial surface of the leaf blade. *Schismatoglottis amosyui* resembles *S. brevicuspis* Hook. f. and *S. ulusarikeiensis* S. Y. Wong by the green, hardly opening, semi-persistent spathe limb, but differs from the former by the erect (not sinuous-sprawling/decumbent) stems, and from the latter by the cordate-elliptic, thinly stiff leaf blades (vs leaf blades oblong-ovate, sometimes ovate, softly coriaceous).

*Description* — Solitary to slightly clumping mesophytic herbs c. 20 cm tall, cut vegetative tissues strongly aromatic of mango resin. *Stem* pleionanthic, erect, often rooting adventitiously from lowermost parts; *internodes* elongated to 2 cm long, c. 0.5 cm in diam. *Modules* subtended by a stiff 2-keeled prophyll c. 3 cm long, c. 0.3 cm wide. *Leaves* c. 15 together; *petiole* 10–20 cm long, c. 3 mm in diam., erect, portion of petiole distal to petiolar sheath narrowly canaliculate in cross-section, channel dorsal margins rather sharp, semi-glossy medium green, slightly scabrid; *petiolar sheath* 2–10 cm long, c. 3 mm wide between margins, $^1/_5$–$^1/_2$ as long as petiole, wings long persistent, slightly unequal with tips auriculate, pale green, oldest petioles with sheath margins marcescent, pale brown; *leaf blade* spreading, elliptic-cordate to oblong-cordate, 10–20 cm long, 5–11 cm wide, rather stiffly chartaceous, medium green variegated with a greyish band on each side between midrib and margin, base cordate, sinus shortly spathulate, margins minutely erose, especially when seen from above, apex acuminate, mucronate for c. 2 mm; *midrib* abaxially rounded raised, adaxially ± impressed into surface of blade, to 3 mm wide; *primary lateral veins* c. 14 on each side of midrib, diverging at c. 65° from midrib, abaxially and adaxially slightly raised; *interprimary veins* almost indiscernible from primaries; *secondary venation* forming a conspicuous tessellate reticulum, flush abaxially, raised adaxially; *tertiary venation* invisible; *all veins* running into a thickened intramarginal vein. *Inflorescences* c. 3 together, each subtended by a narrowly triangular 2-keeled stiff prophyll, erect at anthesis; *peduncle* almost completely obscured by subtending prophyll, c. 2 cm long, c. 0.2 cm in diam., strongly flattened, pale green. *Spathe* thick, with faint constrictions coinciding with sterile interstice and staminate flower zone, c. 6 cm long; *lower spathe* c. 2 cm long, c. 1.2 cm wide, ellipsoid, strongly obliquely inserted on peduncle, with a conspicuous umbonate septum intruding from ventral wall coincidentally with sterile interstice, semi-glossy medium green externally, basal part paler with darker longitudinal veins, internally glossy pale green; *limb* c. 4 cm long, c. 1.5 cm wide, barely opening at pistillate anthesis, narrowly ovate, exterior pale green with darker longitudinal veins, interior pale green, tipped with a stout blunt mucro c. 1.5 mm long. *Spadix* c. 6 cm long, clavate, with well-demarcated sterile interstice; *pistillate zone* 9 mm (dorsal side) to 15 mm long (ventral side), narrowly conic, obliquely inserted, distally c. 4 mm in diam., very pale yellow; *pistils* small, crowded, c. 2 mm tall, c. 1 mm in diam., cylindric; *stigma* sessile, discoid, narrower than top of pistil, c. 1 mm wide, papillose; *interpistillar staminodes* absent; *interpistillar pistillodes* forming an incomplete row at junction with peduncle, c. 2 mm long, squat with a large overhanging discoid stigmatic surface, waxy white, stigmatic remnant yellow; *sterile interstice* well defined, lower part clothed with squat pistillodes comprising a compressed sterile ovary c. 2 mm in diam. and a vestigial stigma, these transitioning to staminodes in upper part of interstice; *staminate zone* cylindric, c. 1.5 cm long, c. 0.5 cm in diam., white; *stamens* irregularly crowded, individual flowers difficult to distinguish, rectangular-butterfly-shaped from above, truncate with thick connective very slightly elevated above thecae, dull cream; *thecae* opening by a single pore; *appendix* fusiform, pointed, proximally slightly wider than top of staminate zone, c. 2.5 cm long, widest part c. 0.5 cm in diam., distally tapering, white; *appendix staminodes* rectangular-butterfly-shaped from above, much resembling stamens in shape and size but more regularly arranged. *Fruiting spadix* not seen.

*Distribution* — Known only from the type locality.

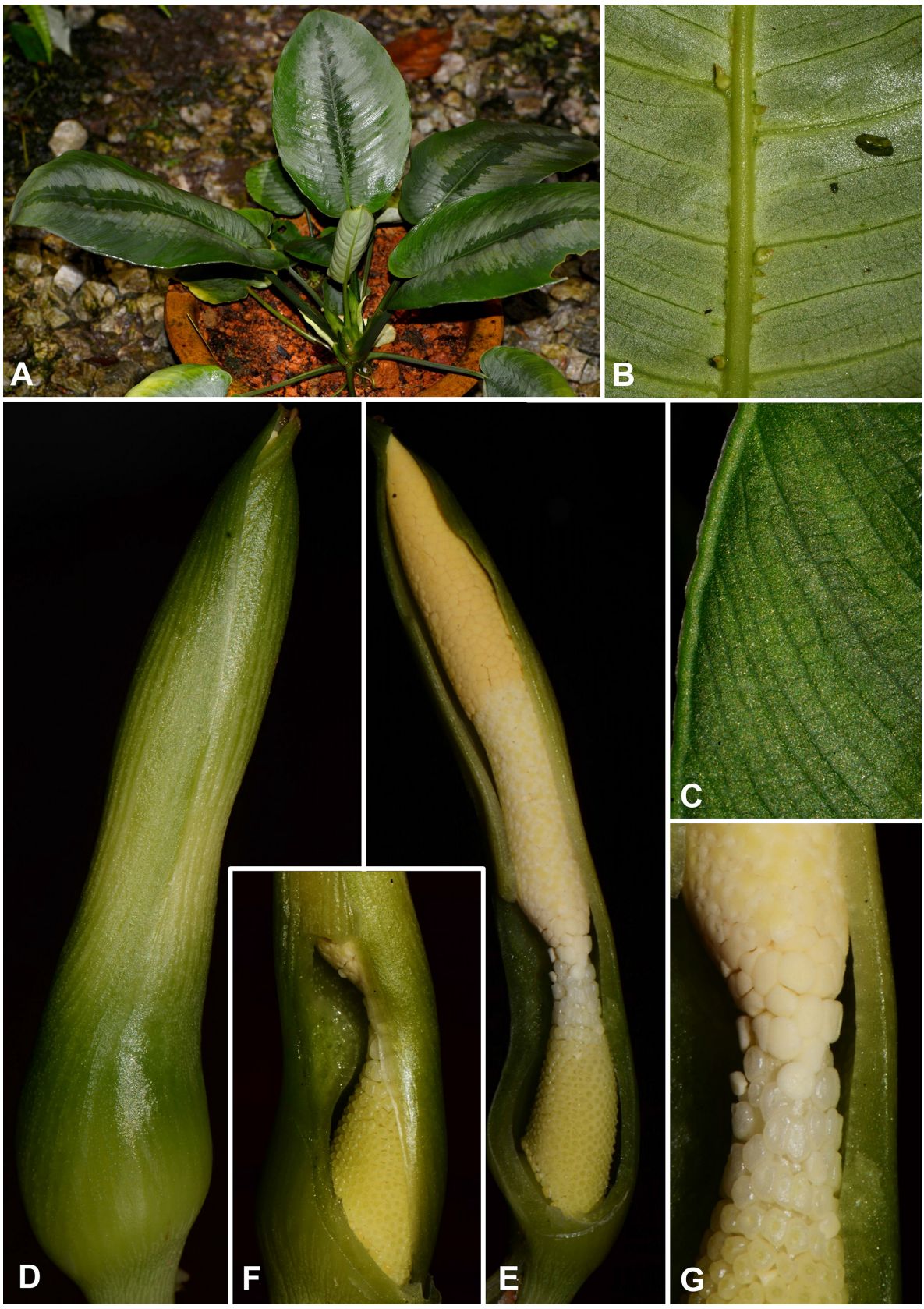


Fig. 3. *Schismatoglottis amosyui* – A: cultivated plant; B: leaf blade abaxial surface showing viviparous buds along midrib; C: leaf blade adaxial surface showing erose hyaline margin and tessellate secondary veins; D: inflorescence at pistillate anthesis; note that spathe limb hardly opens; E: inflorescence at pistillate anthesis, nearside spathe artificially removed; F: detail of lower spathe, partially removed to reveal septum coincident with spadix interstice; G: detail of interstice with pistillodes transitioning into staminodes. – All from *A. Yu AR-5268*. – All photographs by Peter C. Boyce.

*Ecology* — Unknown with certainty, but very probably from moist gallery forest at low elevations.

*Eponymy* — Named for Amos Yu, who alerted us to this plant when we visited his outstanding private collection.

*Remarks* — *Schismatoglottis amosyui* combines characteristics from two species groups of the Nervosa Grade. In overall habit and leaf blade shape *S. amosyui* is reminiscent of *S. nervosa* and its closest allies (see diagnosis). However, the persistent green spathe recalls that of *S. brevicuspis* and *S. ulusarikeiensis*.

Very curious, too, is the presence of a row of clearly defined pistillodes, rather than staminodes, at the base of the pistillate flower zone at its insertion with the peduncle. While pistillodes in this position are known in other *Schismatoglottideae*, notably *Ooia* S. Y. Wong & P. C. Boyce (Wong & Boyce 2016), they have never before been reported in *Schismatoglottis*.

***Schismatoglottis pocong*** S. Y. Wong, S. L. Low & P. C. Boyce, **sp. nov.** – Fig. 4.
Holotype: Indonesian Borneo, Kalimantan, Kalimantan Utara, Malinau, Metarang Hulu, Longberang, 03°48'25.2"N, 116°11'24.7"E, 18 Jun 2012, *Kazuya Nakamoto AR-3984* (BO!; isotype: SAR!).

*Diagnosis* — *Schismatoglottis pocong* is unique in the genus by the entire spathe limb persisting long after anthesis and the loss of the staminate portion of the spadix, forming an obliquely funnelform receptacle surrounding the developing infructescence. The overall spathe shape during anthesis is similar to that of *S. antu* and *S. gui*, from which *S. pocong* differs by the spathe limb long-persistent after anthesis (vs spathe limb deliquescing during staminate anthesis), and adaxially pale grey (vs deep green) broader elliptic leaf blades.

*Description* — Clumping mesophytic herbs c. 18 cm tall, with cut vegetative tissues strongly aromatic of turpentine. *Stem* pleionanthic, erect and branching from bases, rooting copiously from lower portions with older clumps becoming stilt-rooted; *internodes* congested c. 1 cm long, c. 0.4 cm in diam. *Modules* subtended by a slender 2-keeled prophyll c. 1.5 cm long, c. 0.3 cm wide, and 1 or more similar, keel-less cataphylls. *Leaves* dense, many together and each clump often with several stems; *petiole* 4–9 cm long, c. 3 mm in diam., portion of petiole distal to petiolar sheath narrowly canaliculate with edges acute, semi-glossy medium green; *petiolar sheath* c. 2.5 cm long, c. 0.2 cm wide between margins, c. ⅓ length of petiole, wings long persistent, margins stiff, decurrent, pale green; *leaf blade* elliptic to broadly lanceolate, 10–16 cm long, 5–8 cm wide, stiffly leathery, abaxially pale green, adaxially pale grey, base narrowly rounded to truncate, apex acute and long acuminate (acumen curling and twisting to 2 cm long); *midrib* abaxially rounded raised, adaxially ± impressed, to 2 mm wide; *primary lateral veins* c. 12 on each side of midrib, diverging at c. 35° from midrib, abaxially sharply raised, adaxially impressed, with blade in between slightly quilted; *interprimary veins* barely less conspicuous than primaries; *secondary venation* abaxially forming a conspicuous dark tessellate reticulum; *tertiary venation* invisible; *all veins* running into an abaxially raised intramarginal vein. *Inflorescences* up to 4 together, each subtended by a small narrowly triangular 2-keeled prophyll, erect at anthesis; *peduncle* almost completely obscured by subtending prophyll, c. 1.5 cm long, c. 0.3 cm in diam., somewhat flattened, medium green. *Spathe* stiffly thin, with a shallow but distinct constriction coinciding with spadix interstice, 3–3.5 cm long; *lower spathe* c. 1.5 cm long, c. 0.5 cm wide, laterally compressed ellipsoid, obliquely inserted on peduncle, semi-glossy medium green externally, minutely scabrid, internally glossy pale green; *limb* c. 2 cm long, c. 1 cm wide, spreading wide at pistillate anthesis, narrowly ovate, exterior pale green with darker longitudinal veins, interior pale green, tipped with a stout blunt mucro c. 1 mm long. *Spadix* c. 2.8 cm long, slender clavate; *pistillate zone* 9 mm (dorsal side) to 12 mm long (ventral side), narrowly conic, obliquely inserted, distally c. 3 mm in diam., green; *pistils* small, crowded, c. 1.5 mm tall, c. 1 mm in diam., cylindric; *stigma* sessile, capitate, narrower top of pistil, c. 0.5 mm wide, papillose; *interpistillar staminodes* absent; *sterile interstice* clothed with squat staminodes, these c. 1.5 mm in diam., dull yellow; *staminate zone* cylindric, c. 5 mm long, c. 2 mm in diam., cream; *stamens* irregularly crowded, individual flowers very difficult to distinguish, rectangular-dumbbell-shaped from above, thick connective truncate, dull cream; *thecae* opening by a single pore; *appendix* slender conic, proximally slightly wider than top of staminate zone, c. 5 mm long, widest part c. 2 mm in diam., distally tapering, white; *appendix staminodes* polygonal from above, dull cream; *infructescence spathe* stiffening and wholly persistent until fruit almost mature, then upper portion of limb irregularly rotting. *Fruiting spadix* not seen.

*Distribution* — Known only from the type locality.

*Ecology* — *Schismatoglottis pocong* occurs on Cretaceous sandstones in moist lowland forest at about 170 m.

*Etymology* — A pocong (pronunciation *pochong*) is an Indonesian and Malaysian ghost said to be the soul of a dead person trapped in its shroud. The trivial epithet is selected in allusion to the spathe limb persisting long after the death of the staminate portion of the spadix, and the manner in which the spathe limb remains open to reveal where the staminate flowers were.

*Remarks* — *Schismatoglottis pocong* is a curious species in the manner by which the spathe limb not only persists long after anthesis but also stiffens. Nothing similar is


Fig. 4. *Schismatoglottis pocong* – A: plants in habitat; B & C: leaf blade abaxial (B) and adaxial (C) surface showing erose margin and tessellate secondary veins; D: leaf blade tip; E: inflorescence at pistillate anthesis; F: inflorescence at pistillate anthesis, near-side spathe artificially removed; G: post-anthesis inflorescences; note that left-hand inflorescence spadix is shed but spathe limb remains intact; right-hand inflorescence is older with spathe limb shed. – All from *K. Nakamoto AR-3984*. – Photographs: A by K. Nakamoto; B–G by Peter C. Boyce.

known from the genus, although semi-persistent spathe limbs occur in other species of the Nervosa Grade (e.g., *S. amosyui* described above) and persistent limbs partially persisting during fruit maturation are known (Boyce & Wong 2007; Wong & Boyce 2014). Only towards infructescence maturity does the spathe limb of *S. pocong* at last begin to degrade and partially fall.

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