AROIDEANA

International Aroid Society, Inc.

Volume 37E
No 1
May 22,2014
ISSN 2310-0745

Studies on Schismatoglottideae (Araceae) of Borneo XXXVII – Three enigmatic new species of *Schismatoglottis* from the "Heart of Borneo"

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ABSTRACT

Three new species of *Schismatoglottis* of uncertain taxonomic affinity (*S. camera-lucida* P.C.Boyce & S.Y.Wong, *S. gampsospadix* P.C.Boyce & S.Y.Wong, and *S. gui* P.C.Boyce & S.Y.Wong) are described and illustrated from the north western part of the "Heart of Borneo".

KEY WORDS

Araceae, *Schismatoglottis,* Borneo, Malaysia, Indonesia, Sarawak, Kalimantan.

INTRODUCTION

The World Wide Fund for Nature's "Heart of Borneo" initiative – http://wwf.panda.org/what_we_do/where_we_work/borneo_forests/ – sets out to both protect and undertake research in an extensive area of Borneo (**Figure 1)**. While a significant part of the HoB initiative focusses on animals, there is a plant element – http://wwf.panda.org/what_we_do/where_we_work/borneo_forests/about_borneo_forests/borneo_animals/borneo_plants/ – which agreeably includes flora other than

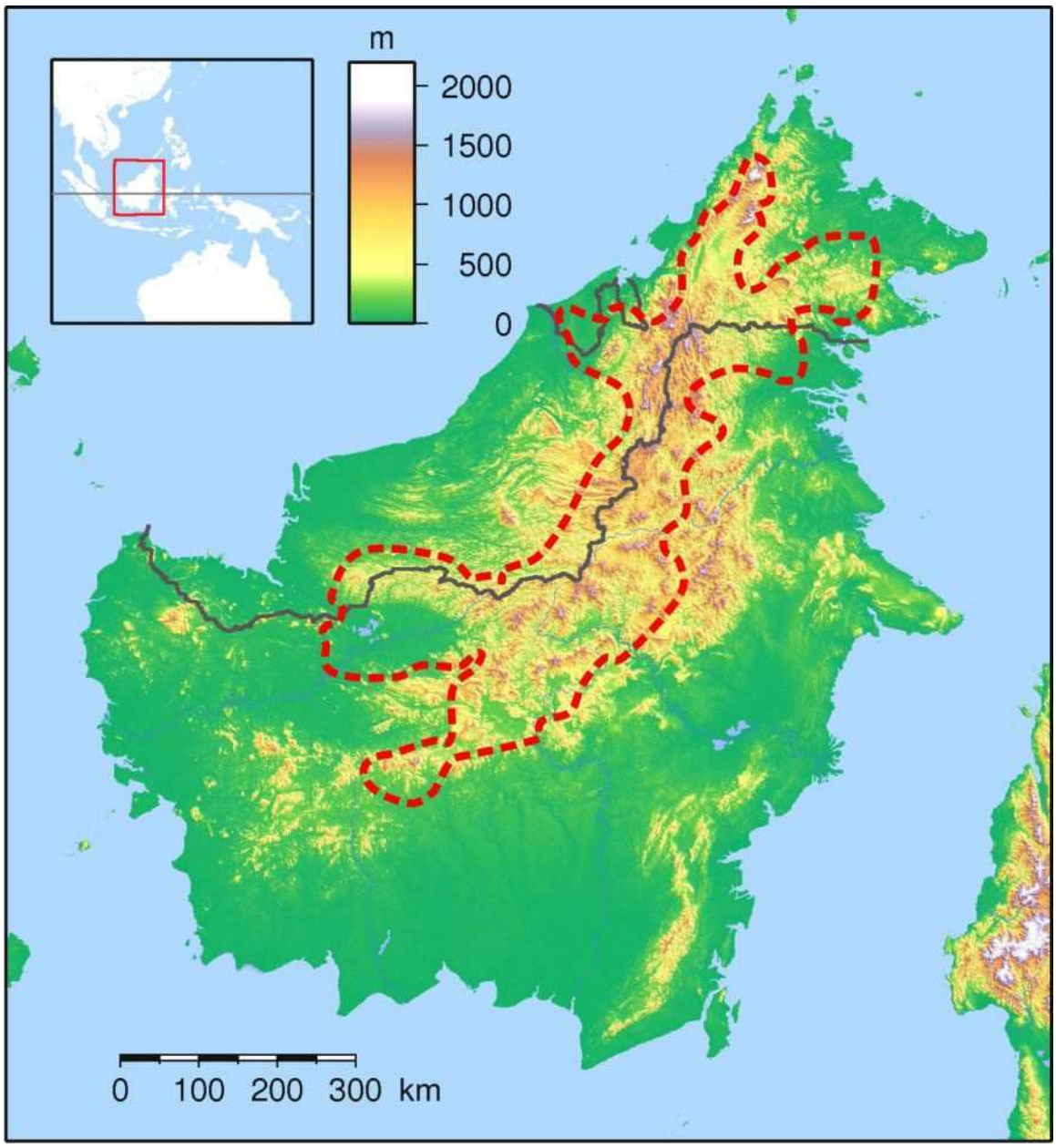

Figure 1. Map showing the extent of the 'Heart of Borneo' area. Wikimedia Commons.

carnivorous plants, horticulturally significant orchids, and giant-flowered holoparasites.

Aroid-focused fieldwork in the northern part of the HoB area has revealed numerous taxonomic novelties, some of them perplexing as to affinity, of which we are here describing three intriguing species of the genus *Schismatoglottis*.

Schismatoglottis camera-lucida P.C. Boyce & S.Y. Wong, **sp. nov.** Type: Indonesian Borneo, Kalimantan Barat, Melawi, Nanga Pinoh, 97km south of Nanga Pinoh Camp 97, 4 April 2012, *K. Nakamoto AR-3849* (holo SAR!; iso SBC). **Figure 2.**

Diagnosis

Schismatoglottis camera-lucida most closely approaches *S. gui* but is diagnosed by the translucent (not opaque) lower spathe walls, the longitudinally ridged (vs smooth) spathe exterior, the spathe with two constrictions (one below and one above the staminate flower zone), and by the fusiform staminate flower zone equalling in length and (at the widest point) exceeding the appendix in width (vs. staminate flower zone obconic and only half as long as, and entirely narrower than, the appendix).

Description

Small, tufted evergreen, mesophytic herbs to 20 cm tall. **Stem** abbreviated, epigeal, erect, densely leafy. **Leaves** arching-ascending, thinly chartaceous, ca 4 per module but modules very closely aggregated, subtended by a short, stiff **prophyll** ca 2 cm long, with the prophyll sheath wings hyaline and transparent; **petioles** up to 8 cm long, sheathing for ca 1/3 their length, ascending, petiole above the petiolar sheath carinate, the dorsal edges sharp, petiole bright dark green; **petiolar sheath** persistent, margins hyaline, more-or-less transparent, open, tips oblique with one side extended into a rounded auricle ca 3 mm long; **blade** up to 20 × 3 cm; elliptic, base cuneate, apex attenuate with a very short tubular mucro, bright green on first emerging, maturing deep semi-glossy green adaxially, matte pale green abaxially; midrib conspicuous, bluntly raised adaxially, rounded-raised abaxially; primary lateral veins about 5 per side, weakly impressed adaxially, slightly raised abaxially; interprimary veins barely distinguishable from the much less numerous primaries; secondary conspicuously tessellate abaxially and darker than surrounding tissue, weakly raised adaxially. **Inflorescences** solitary or occasionally two together; **peduncle** stoutly compressed obconic, ca 5 mm long × 2 mm wide at the base, sub-equalling the lower spathe in width at the top, not emerging from the sheath, white; **spathe** with two weak constrictions, one below and one above the staminate flower zone, the exterior with several conspicuous longitudinal ridges; **lower spathe** compressed-ellipsoid, ca 1 cm long × 8 mm wide, fleshy, whitish green, translucent (pistillate flower zone clearly discernible through the walls); **spathe limb** very

Figure 2. ***Schismatoglottis camera-lucida*** P.C.Boyce & S.Y.Wong. **A.** Plant in habitat, Type locality. **B.** Inflorescence at pistillate anthesis. Note that lower spathe walls are translucent and that the staminate flower zone is clearly visible; note, too that the spathe limb barely opens. **C.** Spadix at pistillate anthesis, spathe artificially removed. **D.** Detail of the appendix and the upper part of the staminate flower. All from *K. Nakamoto AR-3849*. Images: A. © K.Nakamoto; B – D © P.C.Boyce.

narrowly triangular, ca 3.5 cm long, white, the tip green, spathe limb barely opening, weakly inflating during anthesis to form a very narrow slit the length mid-portion of the spathe limb, limb soon deliquescing into a brownish white slime, lower spathe persisting. **Spadix** sub- equalling the spathe, ca 3.5 cm long, sessile; **pistillate flower zone** ca 1/3 the length of the spadix, ca 1cm × 3 mm, weakly obconic; **pistils** somewhat loosely arranged, compressed-globose with three or four distinct sutures, ca 1 × 0.6 mm, bright green; **style** very short, slightly narrower than the ovary; **stigma** ca ¼ width of the ovary, impressed, capitate, greyish white, papillate at pistillate anthesis; **interpistillar staminodes** occurring as an incomplete row at the base of the pistillate flower zone, rhombic-clavate on a short, very slender stipe, ca 0.5 mm wide, and slightly exceeding the height of the associated pistils, waxy white; **interstice** ca 2 mm long, about the same diameter as the top of the pistillate flower zone, covered with rhombic staminodes ca 0.7 mm diam., the tops somewhat impressed with the rims raised, waxy white; **staminate flower zone** ca 9mm × 3mm, fusiform, the mid-point wider than the rest of the spadix; waxy white; **staminate flowers** very densely arranged, probably 2-staminate, but almost impossible to distinguish individual flowers; stamens globose, vaguely dumbbell shaped, connective embedded and ± invisible; thecae opening by a tiny single pore; **appendix** ca 1.5cm long, slender-conical, the base minutely truncate, appendix composed of irregularly rhombohexagonal staminodes, ca 2 mm diam., the tops flat, ivory. **Infructescence** not observed.

Distribution — *Schismatoglottis camera-lucida* is known only from the Type locality.

Ecology — *Schismatoglottis camera-lucida* occurs on lightly shaded earth river banks over granite under perhumid lowland gallery forest at ca 250 m asl.

Etymology — The trivial epithet is from Latin *camera lucida* (which translates as 'bright room'), and chosen by way of allusion to the translucent walls of the lower spathe enabling light to enter the lower spathe chamber.

Notes — *Schismatoglottis camera-lucida* is taxonomically enigmatic. While the overall morphology, and especially the inflorescence structure and spathe limb senescence, appears to assign it to Nervosa Complex of *Schismatoglottis* (Wong, 2010) the tissues lack the terpenoid smell that characterizes the Nervosa Complex. Molecular analyses are needed to address the correct placement.

The translucent lower spathe walls have no direct equal in the Araceae, although the combination of a *dark* spathe limb and much paler lower spathe occurs in many aroid genera, where it is presumably linked to a light-trap pollination syndrome, although direct studies are lacking, a combination of a pale spathe limb and

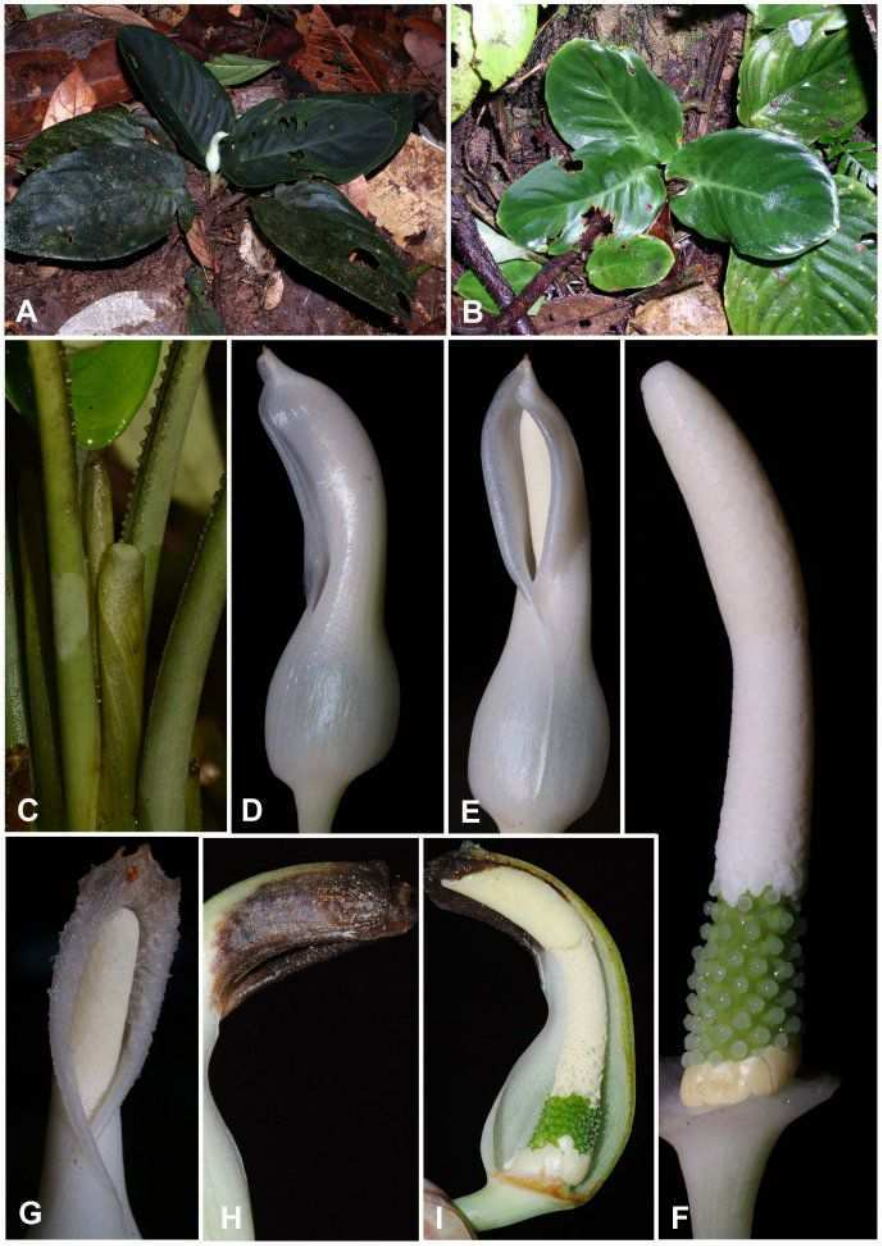

Figure 3. ***Schismatoglottis gampsospadix*** P.C.Boyce & S.Y.Wong. **A.** & **B.** Plants in habitat. Note that the rosettes of leaves in B are each attached to a common rhizome-like stem. **C.** Detail of the petioles, showing the ligular extension to the petiolar sheath and the crispulate dorsal edges to the petiole. **D.** & **E.** Inflorescence at pistillate anthesis. **F.** Spadix at staminate anthesis, spathe artificially removed. Note the large staminodes at the base of the pistillate flower zone. **G.** Detail of the deliquescing spathe limb margins, inflorescence at late staminate anthesis. **H.** Spathe limb with dry-marcescent margins, end of staminate anthesis. **I.** Inflorescence at end of staminate anthesis, nearside half of spathe artificially removed. A, C – G from *P.C.Boyce, Wong Sin Yeng & Jepom ak Tisai AR-2420*; B, H – I from *P.C.Boyce & Jepom ak Tisai AR-540*. Images: © P.C.Boyce.

translucent lower spathe is so far unique for *S. camera-lucida*.

Schismatoglottis gampsospadix P.C. Boyce & S.Y. Wong, **sp. nov.** Type: Malaysian Borneo, Sarawak, Sri Aman, Lubok Antu, Batang Ai, Nanga Sumpa, Wong Ensalai, 01°11′51.0″N 112°03′39.9″E, 26 May 2008, *P.C.Boyce, Wong Sin Yeng & Jepom ak Tisai AR-2420* (holo SAR!; iso SBC). **Figure 3.**

Diagnosis

Schismatoglottis gampsospadix combines morphological characteristics otherwise known to occur in taxa of quite different species-complexes. The leaf blades in appressed rosettes are reminiscent of those of *Schismatoglottis gamoandra* M.Hotta and *S. puberulipes* Alderw. although the leaf blades are fleshy (not stiffly chartaceous), and lack the strongly raised tessellate secondary venation diagnostic for *S. gamoandra* and *S. puberulipes*. Leaf blades and petioles of *S. gampsospadix* are most similar to those of species related to *S. asperata* Engl., although the inflorescences (of *S. asperata*) are quite different, most notably in the entire spathe limb deliquescing as it senesces, whereas in *S. gampsospadix* only the spathe limb margins are marcescent. This type of marginal senescence, together with the overall spathe and spadix shape, is in turn closely matched by *Schismatoglottis tecturata* (Schott) Engl., although the shoot architecture of *S. tecturata* is quite dissimilar to that of *S. gampsospadix* by having the petiolar sheath reduced to a tiny collar and the protective role of the sheath taken on by the large prophylls subtending each leaf (i.e., monophyllous modules). The large staminodes present at the base of the pistillate flower zone in *S. gampsospadix* are very similar to those occurring in *S. tecturata*, *S. gamoandra*, and *S. puberulipes*, although these latter three species are vegetatively quite dissimilar. The elongated rhizome-like stem with leaf rosettes forming at intervals has no parallel in the genus.

Description

Small mesophytic herbs with leaves in dense rosettes along a sub-epigeal rhizome-like stem. Stem (in nature) rhizome-like, in cultivation remaining erect, ca 25 cm tall. **Leaves** appressed to the ground, up to 10 per module; **petioles** up to 4 cm long, sheathing for ca ¼ of their length, spreading, petiole above the petiolar sheath stoutly crispulate, petiole dull dark green; **petiolar sheath** persistent, open, tips extended into unequal ligules, the longer ca 1.5 cm long, rounded auricle; **blade** 8–11 × 3–7 cm; fleshy, broadly elliptic, base cordiform, apex rounded, medium to deep semi-glossy green adaxially, matte pale green abaxially; midrib conspicuous, bluntly raised adaxially, rounded-raised abaxially; primary lateral veins about 5 per side, weakly impressed adaxially, slightly raised abaxially; interprimary and higher order veins more-or-less invisible. **Inflorescences** solitary; **peduncle** stout, ca 1 cm long × 3 mm wide, not emerging from the sheath, pale green; **spathe** hardly constricted, strongly curved forwards; **lower spathe** broadly globose-

ellipsoid, ca 1.7 cm long × 1.5 cm wide, thinly fleshy, white; **spathe limb** triangular, fornicate, ca 3 cm long × 1.5 cm wide, rather fleshy, spathe limb inflating and opening by a narrow slit at pistillate anthesis, gaping and remaining fornicate at onset of staminate anthesis, then the margins deliquescing and drying-marcescent, limb white, all except the marcescent margins persisting into at least early fruiting (observations wanting). **Spadix** sub equalling the spathe, sessile; **pistillate flower zone** ca 1/5 the length of the spadix, ca 5 × 5 mm; **pistils** dense, ovoid, ca 1 × 0.6 mm, bright green; **style** nipple-like, much narrower than the ovary; **stigma** capitate, greyish white, papillate at pistillate anthesis; **interpistillar staminodes** very conspicuous below the pistillate zone, oblong, with the long sides perpendicular to the spadix axis, ca 3 mm long × 1.5 mm wide, waxy white; **staminate flower zone** contiguous with the pistillate flower zone, ca 1.5 cm × 4 mm, curving-cylindrical, ivory; **staminate flowers** tiny, (<0.3 mm), probably mainly 2-staminate, but chaotically arranged and some seemingly forming lines of up to 10 stamens, lowermost staminate flowers somewhat irregularly scattered, those further up very dense; stamens elongate-globose, connective embedded and ± invisible; thecae opening by a two coalesced pores; **appendix** ca 1.5 cm long, very slightly wider than the staminate flower zone, curving, blunt-tipped, covered with very many tiny (> 0.3mm) irregularly polygonal staminodes. **Infructescence** not observed.

Distribution — *Schismatoglottis gampsospadix* is known only from area of the Batang Ai drainages, where it occurs as scattered populations.

Ecology — *Schismatoglottis gampsospadix* occurs on earth banks over shale in moist to wet lowland gallery forest between 100–120m asl.

Etymology — From Greek *gampsos* (crooked, curved), and *spadix* – hence 'curved spadix', alluding to the spadix in this species.

Notes — *Schismatoglottis gampsospadix* is a most peculiar species combining distinctive morphologies of four species occurring in widely separated parts of the genus (Wong et al., 2010), in addition to a so far unique growth habit in which the stem forms a sub-epigeal rhizome along which arise rosettes of leaves. Oddly, plants in cultivation retain an erect stem bearing tufts of leaves along its length, the older plants reaching to 25 cm or more tall and somewhat resembling an *Aglaonema*.

Other material examined: MALAYSIAN BORNEO: **Sarawak**, Sri Aman, Lubok Antu, Batang Ai, 01°13′18.0″N 112°03′21.2″E, 28 July 2004, *P.C.Boyce & Jepom ak Tisai AR-539* (SAR, SBC) & *P.C.Boyce & Jepom ak Tisai AR-540* (SAR, SBC).

Schismatoglottis gui P.C. Boyce & S.Y. Wong, **sp. nov.** Type**:** Malaysian Borneo,

Figure 4. ***Schismatoglottis gui*** P.C.Boyce & S.Y.Wong. **A.** Plant in habitat, Type locality. **B.** Detail of venation, abaxial surface of leaf blade; note the tessellate secondaries. **C.** Synflorescence. **D.** Inflorescence at pistillate anthesis. Note that the spathe limb barely opens. **E.** Spadix at staminate anthesis, spathe artificially removed. **F.** Inflorescence post-anthesis. Note that the spathe limb has largely deliquesced. **G.** All from *P.C.Boyce & S.Y.Wong AR-3536*. Images: © P.C.Boyce.

Sarawak, Kapit, Ulu Batang Baleh, Nanga Septi, 4 April 2012, *P.C.Boyce & S.Y.Wong AR-3536* (holo SAR!; iso SBC). **Figure 4.**

Diagnosis

Schismatoglottis gui most closely resembles *S. camera-lucida* but is easy to distinguish by the opaque (not translucent) lower spathe walls, the smooth (not longitudinally ridged) spathe exterior, the spathe with a single constriction, and by the obconic staminate flower zone only half as long as and narrower than the appendix (vs staminate flower zone fusiform, equalling the appendix, and at the widest point exceeding the appendix in width)

Description

Small, dense-clumping evergreen, mesophytic herbs to 20 cm tall. **Stem** much-abbreviated, epigeal, erect, densely leafy. **Leaves** spreading, thinly chartaceous, ca 6 per module but modules very closely aggregated, subtended by a short, stiff **prophyll** ca 2 cm long, with the prophyll sheath wings hyaline and transparent; **petioles** up to 4.5 cm long, sheathing for ca ½ their length, ascending, petiole above the petiolar sheath carinate, the dorsal edges sharp, petiole dull dark green; **petiolar sheath** persistent, margins hyaline, more-or-less transparent, open, tips oblique with one side extended into a rounded auricle ca 3 mm long; **blade** up to 20 × 3 cm, very narrowly elliptic, base decurrent to weakly cuneate, apex long-attenuate, tip truncate, with a very short tubular mucro, bright green on first emerging, maturing deep semi-glossy green adaxially, matte pale green abaxially; midrib conspicuous, bluntly raised adaxially, rounded-raised abaxially; primary lateral veins about 5 per side, weakly impressed adaxially, slightly raised abaxially; interprimary veins barely distinguishable from the much less numerous primaries; secondary conspicuously tessellate abaxially and darker than surrounding tissue, weakly raised adaxially. **Inflorescences** up to 6 together, produced sequentially in a very dense synflorescence that barely extends from the subtending petiolar sheath, individual inflorescences alternating with much reduced leaves; **peduncle** slender, very short, ca 3 mm long × 1 mm wide, not emerging from the sheath, white; **spathe** weakly constricted; **lower spathe** ellipsoid, ca 1 cm long × 3 mm wide, somewhat fleshy, very pale green; **spathe limb** narrowly triangular, ca 3 cm long, of which ca 1 cm a slender stiff rostrum, spathe limb opening only slightly, weakly inflating during anthesis to form a narrow slit the length mid-portion of the spathe limb, limb white, rostrum green, limb soon deliquescing to ca half way down (not to the constriction), into a brownish white slime, lower spathe persisting. **Spadix** shorter than the spathe, ca 3.2 cm long, sessile; **pistillate flower zone** ca ¼ the length of the spadix, ca 6mm × 3 mm, weakly obconic; **pistils** somewhat dense, compressed-globose with three or four distinct sutures, ca 0.9 × 0.6 mm, pale green; **style** very short, narrower than the ovary; **stigma** ca ¼ width of the ovary, impressed, capitate, greyish white, papillate at pistillate anthesis; **interpistillar**

staminodes absent below the pistillate flower zone; **interstice** ca 2 mm long, slightly narrower than the pistillate flower zone, covered with mushroom-shaped staminodes ca 1 mm diam., the tops rounded, dull white; **staminate flower zone** ca 7mm × 3mm, obconic, waxy white; **staminate flowers** very densely arranged, seemingly 2-staminate, but very difficult to distinguish individual flowers; stamens globose, vaguely dumbbell shaped, connective embedded and ± invisible; thecae opening by a tiny single pore; **appendix** ca 1cm long, slender-pointed, composed of irregularly oval staminodes, these shallowly concave with a raised rim, ivory. **Infructescence** enclosed within a fleshy persistent spathe, the orifice of which is only slightly constricted and does not coincide with the spathe constriction; **fruits** not observed.

Distribution — *Schismatoglottis gui* occurs from central Kapit (the Type) to northern Kalimantan Barat, an extensive distribution for a terrestrial Bornean aroid, the majority of which show high levels of localised endemism. Given this extensive range it is curious that *S. gui* appears to be unrepresented in any of the major herbarium collections of Bornean plants (i.e., BO, L, SAR, and SING).

Ecology — *Schismatoglottis gui* occurs on very shaded riverside granite boulders under moist lowland to hill gallery forest between 65–400m asl.

Etymology — From *guǐ* (simplified Chinese 鬼), pronounced as 'gwee', and meaning a ghost. The trivial epithet is in quaint allusion to the unopened inflorescences that could be likened to huddles of small ghosts among the leaf bases.

Notes — *Schismatoglottis gui*, like *S. camera-lucida* (see this paper), is puzzling as to taxonomic placement, combining characteristics of three species complexes (Asperata, Patentinervia, and Nervosa). Molecular analyses are needed.

The deliquescing spathe limb is reminiscent of *Schismatoglottis nervosa* Ridl. and allies (Nervosa Complex), but in those the limb melts back to the spathe constriction. Similar partially degrading spathe limbs occur in *Schismatoglottis barbata* Engl. (Asperata Complex), which are otherwise quite distinct in the form of the foliage.

Schismatoglottis gui grows exclusively on heavily shaded riverside rocks, although it is not a rheophyte (Wong, 2013). It seems to require the constant humidity that the habitat provides.

Other material examined: INDONESIAN BORNEO. **Kalimantan Barat**. Sekadau, Nanga Taman, south east of Nanga Taman, Gunung Taman, east slope, 00°27'35.41"S 111°02'3.21"E, 5 Feb. 2012, *K. Nakamoto AR-3779* (SAR, SBC) & *AR-3793* (SAR, SBC); Sekadau, Nanga Taman, west of

Nanga Taman, Gunung Canayang, east slope, 4 Feb. 2012, *K. Nakamoto AR-3783* (SAR, SBC); Sekadau, Hulu Kayu Lapis, 2 hours walk to west from Simpang Tp Perodah, Kampong 23km south of Kayu Lapis, 19 km main road west of Sekadau, 00°9'56.64"S 111°3'28.67"E, 22 May 2012, *K. Nakamoto AR-3943* (SAR, SBC); Melawi, Gunung Saran, Kampung Entebah, 02°00'25.24"S 111°17'42"E, 25 Aug. 2012, *K. Nakamoto AR-4013* (SAR, SBC).

References

Wong S.Y. 2010. Studies on Schismatoglottideae (Araceae) of Borneo XIII: A revision of the *Schismatoglottis nervosa* complex. *Gard. Bull. Singapore* 62(1): 177–209.

Wong S.Y. 2013. Rheophytism in Bornean Schismatoglottideae (Araceae). *Syst. Bot.* 38(1): 32–45.

Wong S.Y., P.C. Boyce, A. Sofiman Othman & C.P. Leaw. 2010. Molecular phylogeny of tribe Schismatoglottideae based on two plastid markers and recognition of a new tribe, Philonotieae, from the neotropics. *Taxon* 59(1): 117–124.

ACKNOWLEDGEMENTS

This is part of an on-going research programme funded by the Ministry of Education Malaysia by the Niche Research Grant Scheme Vote No. NRGS/1089/2013-(03).

Fieldwork was most recently under Sarawak Forestry DepartmentPermission to Conduct Research on Biological Resources - Permit No. NCCD.907,4.4(J|d.9)-69 and Park Permit No 140/2013. The collaboration and support of the Sarawak Forestry Department and the Sarawak Biodiversity Centre are gratefully acknowledged.