

## **Studies on Schismatoglottideae (Araceae) of Borneo XII: Three New Species of *Schismatoglottis* in the Multiflora Group**

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### **Abstract**

Fieldwork since 2002 has revealed three novel taxa of *Schismatoglottis* in Sarawak, Malaysian Borneo. Based on the presence of a free ligular portion to the petiolar sheath, these new taxa belong to the Multiflora Group *sensu* Hay and Yuzammi (2000). Here, these species, *Schismatoglottis clausula* S.Y.Wong, *S. dulosa* S.Y.Wong, and *S. jitinae* S.Y.Wong are described, and illustrated, and a key to the Multiflora Group in Sarawak is presented.

### **Introduction**

The last revision of *Schismatoglottis* was that of Hay & Yuzammi (2000), at which time *Schismatoglottis* in Malesia stood at 94 species, of which 63 occurred in Borneo. Since then, a further 7 taxa have been published: *Schismatoglottis hayana* Bogner & P.C.Boyce, *S. jelandii* P.C.Boyce & S.Y.Wong, *S. jipomii* P.C.Boyce & S.Y.Wong, *S. maelii* P.C.Boyce & S.Y.Wong, *S. ardenii* A.Hay, *S. tahubangensis* A.Hay & Herscovitch, and *S. bulbifera* H.Okada, H.Tyukaya & Y.Mori (see Bogner and Boyce, 2009; Boyce and Wong, 2006; Hay, 2002; Hay and Herscovitch, 2003; Okada *et al.*, 1999, and Wong and Boyce, 2008). These taxa are all endemic to Borneo. Here, a further three novel Bornean endemic taxa, *Schismatoglottis clausula* S.Y.Wong, *S. dulosa* S.Y.Wong, and *S. jitinae* S.Y.Wong are described. These taxa belong to the Multiflora Group *sensu* Hay and Yuzammi (2000).

### **Multiflora Group**

Based on fieldwork observations, and of plants in cultivation in the Botanical Research Centre, Semenggoh (BRC), *Schismatoglottis pudenda* A.Hay does not belong to the Multiflora Group. The foliage leaves of *S. pudenda*

alternate with cataphylls, and have the petiolar sheath very much reduced, with the role of protecting the emerging leaf/shoot/inflorescence taken over by the subtending cataphyll, therefore, this species belongs to the Tecturata Group. A separate paper (Boyce and Wong, in prep.) will address this and other changes in the Tecturata Group. Based on molecular work on two plastid regions on the Schismatoglottid Alliance (Tribe Schismatoglottideae + Cryptocoryneae + Philonotieae) (Wong, *et al.*, in press), *Schismatoglottis josefii* A.Hay and *S. sarikeensis* (Bogner & Hotta) Bogner & Hay do not belong in *Schismatoglottis*, but rather in one of the 'satellite' genera, possibly in a redefined *Hottarum* Bogner & Nicolson. Therefore, *S. josefii* and *S. sarikeensis* are here excluded, These changes mean that currently there are thirteen species in the Multiflora Group in Sarawak.

### Key to *Schismatoglottis* Multiflora Group in Sarawak

1. Petiolar sheath fully attached to the petiole, either long or extremely abbreviated (sometimes with a short apical ligulate portion) .....  
..... ***Schismatoglottis* excl. Multiflora Group**
1. Petiolar sheath attached to the petiole only at the base, the remainder free-ligulate and comprising at least half of the entire sheath .....  
..... **2. *Schismatoglottis* Multiflora Group**
2. Stem elongated, erect, sometimes ascending ..... 3
2. Stem condensed, sometimes more-or-less creeping but never erect ..... 4
3. Plant medium; petiolar sheath marcescent; petiole asperulate ; lamina softly leathery, matte at least adaxially; peduncle stout and short, not elongated; lower spathe succulent; female zone almost as wide as long; appendix present. Never rheophytic ..... ***S. jitinae***
3. Plant small; petiolar sheath persistent; petiole glabrous; lamina thinly leathery, glossy at least adaxially; peduncle slender, elongated during anthesis; lower spathe softly coriaceous; female zone longer than wide; appendix absent. Always rheophytic ..... ***S. erecta***
4. Lamina corrugated adaxially; primary and interprimary veins prominently raised adaxially; spathe limb green at anthesis; inflorescence strongly fruity-smelling at anthesis ..... ***S. maelii***
4. Lamina never corrugated; primary and interprimary veins smooth adaxially; spathe limb always white at anthesis; inflorescences usually smelling powerfully esteric at anthesis ..... 5

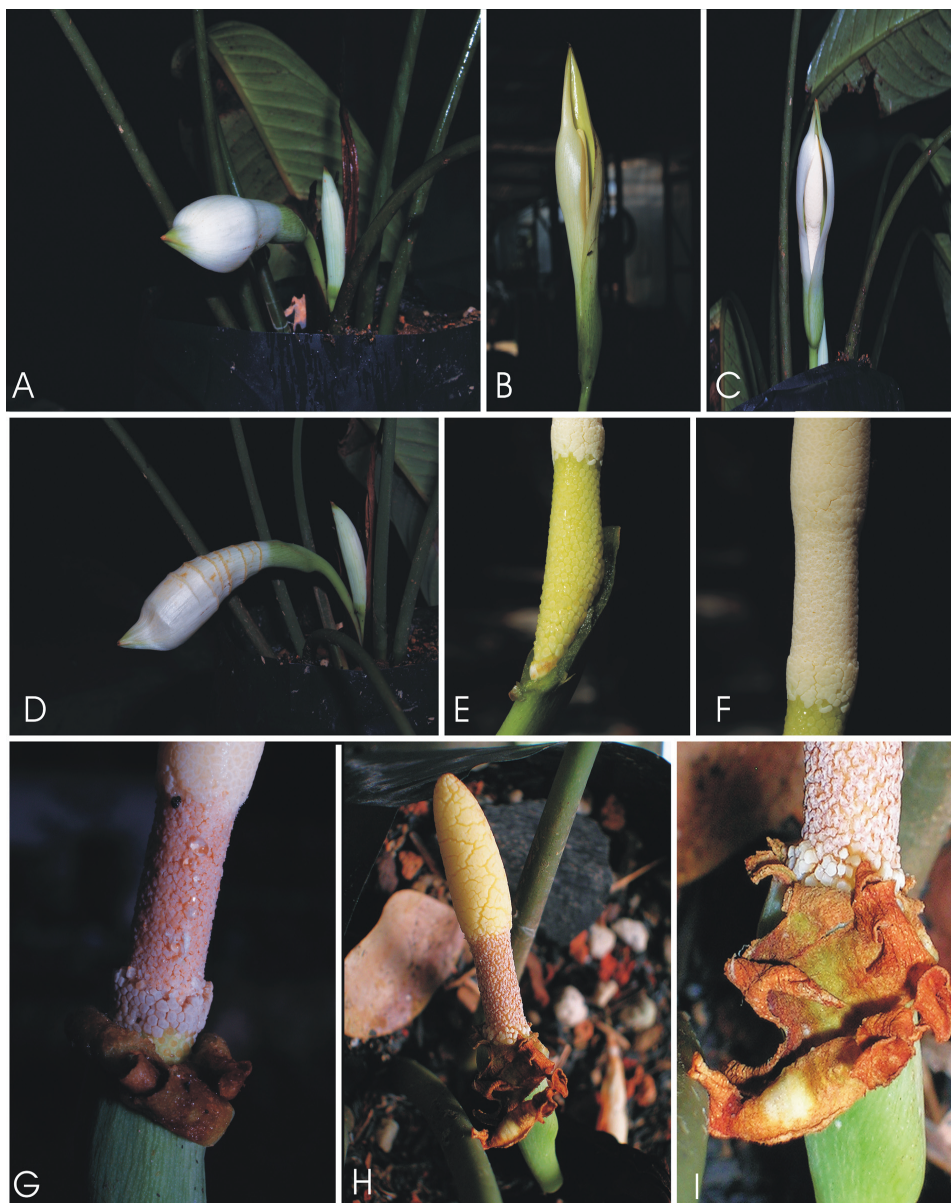
5. Appendix absent or very reduced (comprising just a few terminal staminodes) ..... 6
5. Appendix present ..... 10
6. Plants not rheophytic ..... 7
6. Plants rheophytic ..... 8
7. Lamina abaxially not glaucous, base obtuse to slightly decurrent, secondary and tertiary venation obscure; pore at edge of stamen, punctiform (c. 0.15 mm) with protruding tissue from innermost surface, connective elevated, male zone remained white basally and stained brown distally in alcohol. Lithophytic on limestones, Bau, Kuching Division ..... ***S. bauensis***
7. Lamina abaxially glaucous, leaf base always decurrent, secondary venation prominent, tertiary venation sometimes pronouncedly tessellate; pore at inner surface of stamen, oblong (ca 0.3 mm), connective flat, male zone completely stained brown in alcohol. Terrestrial in deep soil on limestones and sandstones, Padawan, Kuching Division and Serian, Samarahan Division ..... ***S. confinis***
8. Spathe inflated at anthesis; spadix with a blunt end ..... 9
8. Spathe unrolling slightly at anthesis but not inflated; spadix with a tapering end ..... ***S. multiflora***
9. Leaf adaxially very glossy; primary lateral veins are flush adaxially; spathe caducous, pink at anthesis. Rejang Valley ..... ***S. roseospatha***
9. Leaf adaxially slightly glossy; primary lateral veins are sunken adaxially; spathe Marcescent, white at anthesis. Sematan ..... ***S. hayana***
10. Plant large, up to ca 1 m tall; lamina to ca 40 cm long; placenta 1 per ovary; Mulu Limestones ..... ***S. monoplacenta***
10. Plant medium, less than 60 cm tall, lamina less than 30 cm long; placenta more than 1 per ovary; West Sarawak, never on limestone ..... 11
11. Spathe limb marcescent ..... 12
11. Spathe limb caducous ..... 13
12. Spathe limb disarticulating into numerous circumferential rings along the length, and then collapses downwards; appendix thicker than the male zone; sterile interstice wider than the distal portion of female zone, and the male zone ..... ***S. clausula***
12. Spathe limb remaining erect marcescent in one piece; appendix contiguous from the male zone; sterile interstice contiguous with the distal portion

- pf female zone, and the proximal portion of the male zone .....  
 ..... *S. dulosa*
13. Spadix usually *ca* 8 cm long, with a short sterile interstice of sterile stamens between the fertile zones; stamens and appendical staminodes large, *ca* 1 mm across; Matang ..... *S. mayoana*
13. Spadix usually *ca* 4.5 cm long, with the fertile zones contiguous; stamens and appendical staminodes small, *ca* 0.3 mm across; Bako .....  
 ..... *S. nicolsonii*

***Schismatoglottis clausula*** S.Y.Wong, *sp. nov.*

*Ab Schismatoglottis mayoana (in sylvis mons Matangae restrictus) spathae laminarum tempore anthesis clausus, lamina senescens per disarticulatis circumferentialis numerosis, mox collabens inde marcescens remanens postanthesin; staminis parva (0.2-0.3 mm), cum margini thecae elevates connectivo antherae superantis, fovea latus profunde cingens differt* – **Typus:** Malaysia, Sarawak, Sarikei, Ulu Sarikei, 01° 55' 05.4"; 111° 29' 35.8", 7 Dec 2005, P.C.Boyce et al. AR-1582 (holo, SAR). **Fig. 1.**

**Herbs** to *ca* 30 cm tall. **Stem** pleionanthic, condensed, more or less creeping, *ca* 2 cm diam., green. **Leaves** *ca* 5-7 together; petiole terete, 18-26 cm long, densely scabrid, green, sheathing only at the extreme base, the sheath extended into a bicarinate narrowly lanceolate free ligular portion to *ca* 10 cm long, drying red-brown; laminae lanceolate to oblongo-ovate, *ca* 15-25 cm long × 4-9 cm wide, matte dark green adaxially, abaxially paler, drying brown, base obtuse, sometimes slightly decurrent, tip acute and acuminate for up to *ca* 2 cm and with a cylindric mucro to 2 cm long; midrib grooved adaxially and abaxially very prominent (dry) with 14-16 primary lateral veins on each side alternating with fine interprimaries and diverging at *ca* 60°; secondary venation fine and very dense, adaxially obscure, mostly arising from the midrib; tertiary venation obscure. **Inflorescences** up to 2 together, pendent, *ca* 8-10 cm long, subtended by cataphylls resembling the ligular leaf sheaths; peduncle less than the length of the free ligules. **Spathe** 8-10 cm long; lower spathe obliquely inserted from peduncle, *ca* 2.4 cm long, thickly coriaceous, green, differentiated from the limb by a weak constriction corresponding to the distal portion of the female zone; spathe limb 5-6 cm long, white, oblongo-lanceolate, apiculate for 3 mm, barely open during anthesis, senesce by disarticulating into numerous circumferential rings along the length, and this then collapsing downwards, and remaining marcescent post anthesis. **Spadix** sessile, 5.5-6.0 cm long, subcylindric; female zone 2.2-2.4 cm long × 0.5 cm proximally (0.4 cm distally) diam., adnate to the spathe in the lower ½, somewhat conic in the free part; pistils many and crowded, more or less



**Figure 1.** *Schismatoglottis clausula* S.Y.Wong. A. A pair of inflorescences. B & C. Inflorescence at female anthesis. D. Spathe limb senescence by disarticulating into numerous circumferential rings along the length; E. female zone (spathe removed artificially); F. Sterile interstice, male zone and appendix at female anthesis; G. Spadix at the end of male anthesis; H & I. Spathe limb marcescent.

globose, *ca* 0.4 mm diam., green when fresh; stigma sessile, button-like, *ca* 0.3 mm diam., turn orange post female anthesis; interpistillar staminodes confined to a basal row along the spathe/spadix adnation, shortly stalked, clavate, round-topped, *ca* 0.5 mm wide; sterile interstice present, above the spathe constriction, *ca* 0.3-0.5 cm long  $\times$  0.6 cm diam., wider than the distal portion of the female zone and the male zone, crowded, irregularly polygonal, flat-topped, 0.5 – 0.6 mm diam., white prior to anthesis, greyish orange post anthesis; male zone cylindrical, 1.1 cm long  $\times$  0.5 cm diam.; stamens crowded, small, *ca* 0.2-0.3 mm diam., truncate, dumbbell-shaped, white when fresh, turn orange post male anthesis, connective narrow; thecae with slightly elevated rims (overtopping the connective) surrounding a deep broad pit-like pore; appendix *ca* 2 cm long, slightly wider than the top of the male zone, in the distal half tapering to an acute point; staminodes of appendix flat-topped, irregularly polygonal, small, *ca* 0.3 mm diam., white when fresh, turn yellow post male anthesis. **Infructescence** unknown.

*Distribution*: Malaysia, endemic to Sarawak, known only from the type locality.

*Habitat*: Lithophytic in shade of primary lowland dipterocarp forest on shales, 60 m asl.

*Etymology*: The specific epithet is derived from the Latin *clausus* meaning closed, referring to the spathe limb barely opening at anthesis.

*Notes*: *Schismatoglottis clausula* is most similar to *Schismatoglottis mayoana* Bogner & M.Hotta but is readily distinguished by the senescence mechanics of the spathe limb. The spathe limb senesces by disarticulating into numerous circumferential rings along the length, and then collapses downwards, while remaining marcescent post anthesis. The stamen is small (0.2-0.3 mm), with thecae rims slightly elevated and overtopping the connective, these rims each surrounding a deep, broad, pit-like pore. The interstice staminodes become markedly elevated prior to male anthesis. This latter character has so far only been observed in *S. mayoana*.

***Schismatoglottis dulosa*** S.Y.Wong, *sp. nov.*

*Ab* *Schismatoglottis multiflora similis, combinatio appendice spadicis, inflorescentis erectis et spathe laminarum marcescenti remanens, non reflexis postanthesis, distinguitur* – **Typus**: Malaysia, Sarawak, Kuching, Bau, Kampung Jugan, 01° 28' 46.4"; 110° 05' 08.5", 26 Mar 2004, P.C. Boyce & Jeland ak Kisai AR-279 (holo, SAR). **Fig. 2.**

**Herbs** to *ca* 35 cm tall. **Stem** pleionanthic, condensed, more or less creeping, *ca* 2 cm diam. **Leaves** *ca* 8-12 together; petiole terete, 20-30 cm long, always tinged reddish towards the base, glabrous, sheathing only at the extreme base, the sheath extended into a bicarinate narrowly lanceolate free ligular portion to *ca* 12 cm long, drying red-brown; laminae broadly lanceolate, softly coriaceous, *ca* 15-25 cm long x 4-9 cm wide, dull dark green adaxially, abaxially paler and glaucous when fresh, drying brown, base always obtuse, tip acute and acuminate for 2 cm and with a cylindric mucro to 2 cm long; midrib adaxially grooved and abaxially very prominent (dry) with 14-16 primary lateral veins on each side alternating with fine interprimaries and diverging at *ca* 60°; secondary venation fine and very dense, adaxially obscure, mostly arising from the midrib; tertiary venation tessellate but obscure. **Inflorescences** up to 3 together, up to *ca* 13 cm long, emerging and remaining erect throughout anthesis, subtended by cataphylls resembling the ligular sheath extensions; peduncle less than the length of the free ligules. **Spathe** *ca* 13 cm long, lower spathe obliquely inserted from peduncle, *ca* 4 cm long, thickly coriaceous, pale green at base, whitish towards the distal portion, differentiated from the limb by a weak constriction corresponding with the top portion of the female zone; spathe limb *ca* 9 cm long, white, oblongo-lanceolate, apiculate for 5 mm, forming a hook, remaining marcescent, not reflexing, turning brownish red. **Spadix** sessile, *ca* 10 cm long, subcylindric; female zone *ca* 4 cm long × 1 cm proximally (0.6 cm distally) diam., adnate to the spathe in the lower ½, somewhat conic in the free part; pistils crowded, more or less globose, *ca* 0.5 mm diam., yellowish green when fresh; stigma sessile, overtopping the ovary, pappilate, *ca* 0.6 mm diam.; interpistillar staminodes present, scattering, shortly stalked, clavate, round-topped, *ca* 0.4 mm wide, white when fresh; sterile interstice present, monometric with female and male zone, cylindrical, *ca* 0.5 cm long × 0.6 cm diam., white when fresh; male zone cylindrical, *ca* 2.3 cm long x 0.6 cm diam.; stamens laxly arranged, truncate, more or less rectangular, *ca* 0.7 mm long × 0.5 mm wide, pale orange when fresh, with the connective wide and about the height of the thecae, the thecae at the short ends, each with one pore; appendix contiguous from the male zone, *ca* 4 cm long, in the distal half tapering to an acute point; staminodes of appendix flat-topped, cylindrical, white when fresh, turn yellow post male anthesis, *ca* 1.0 mm diam. **Infructescence** unknown.

*Distribution*: Malaysia, endemic to Sarawak, known only from the type locality.

*Habitat*: Lithophytic in shade of lowland forest on limestone, 50 m asl.



**Figure 2.** *Schismatoglottis dulosa* S.Y.Wong. Adaxial (A) and abaxial (B) side of lamina; C. Petiole with marcescent free petiolar sheath; D. An inflorescence at male anthesis with two emerging inflorescences; E & F. Female zone at female anthesis; G. Male zone; H. Spathe limb marcescent; I. Spadix at male anthesis.



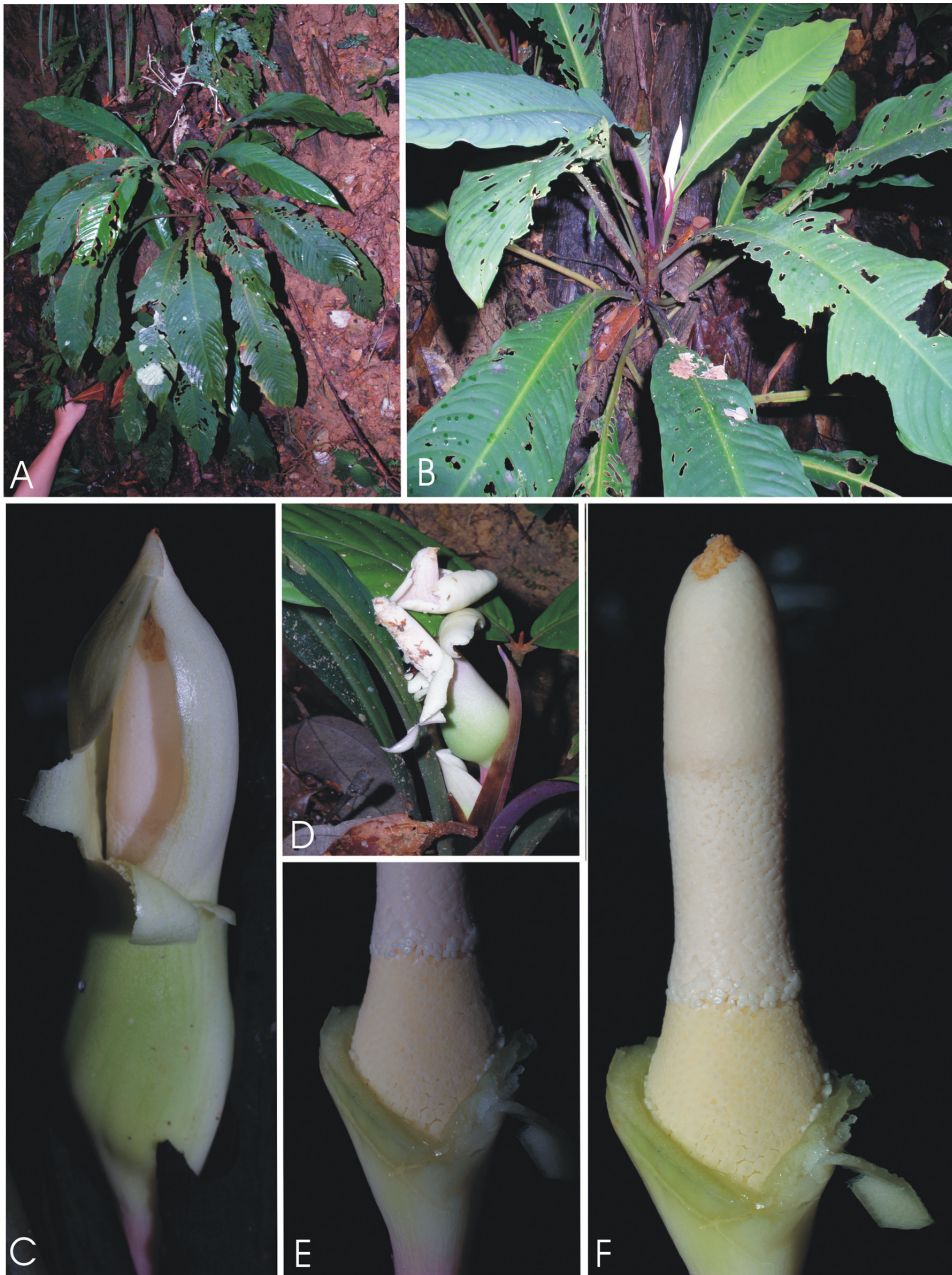
*Etymology*: The specific epithet is derived from the Latin *dulon* meaning enslaving, referring to the spathe limb remaining marcescent and enclosing the spadix post anthesis.

*Notes*: *Schismatoglottis dulosa* is vegetatively most similar to *Schismatoglottis multiflora* Ridl. except an appendix is present in *S. dulosa* (absent in *S. multiflora*), and the inflorescence remains erect in *S. dulosa* (declinate by flexing of the peduncle in *S. multiflora*). *Schismatoglottis dulosa* is further distinguished by the spathe limb marcescent, not reflexing and falling caducous post anthesis as occurs in *S. multiflora*.

***Schismatoglottis jitinae*** S.Y.Wong, *sp. nov.*

*Inter alii specibus Schismatoglottidorum grex Multiflorae per combinatio caulis elongatis, erectis ascendentis, cum inflorescentia femina et inflorescentia mascula in partem conubialiter intra spatham inferiorem contentis cum constricta spathae supra media Schismatoglottis jitinae proprius. Ab S. erectus ligulis vaginae petiolaris marcescentis et laminis foliorum lenis coriacea, impolitus, abaxialiter pro totam longitidinem, et basali (adaxialiter) roseus, pedunculo valde brevis et crassus, erectus, differ; spathae fructiferorum succulentus differt.*  
 – **Typus**: Malaysia, Sarawak, Kapit, Pelagus Rapids, 02° 11' 15.1"; 113° 03' 29.01", 14 Mar 2005, P.C. Boyce et al. AR-1038 (holo, SAR). **Fig. 3.**

**Herbs** to ca 40 cm tall. *Stem* pleioanthic, elongated, erect, sometimes ascending, ca 2-2.5 cm diam.. **Leaves** ca 12-15 together; petiole short, 10-15 cm long, terete, always D-shaped towards the base, asperulate, pink in new leaf, sometimes remain dark red at base, puberulent, sheathing only at the extreme base, the sheath extended into a bicarinate narrowly lanceolate free ligular portion to ca 12 cm long, drying red-brown; laminae lanceolate to obovate, ca 18-25 cm long × 4-9 cm wide, softly leathery, matte green adaxially, paler and glaucous abaxially, base decurrent, always unequal, the tip acute then acuminate for 2 cm and with a cylindrical mucro to 2 cm long; midrib adaxially grooved, always pink during innovation at the base (adaxially) and at the whole length (abaxially), primary lateral veins very prominent abaxially, 14-16 on each side alternating with fine interprimaries and diverging at ca 60°; secondary venation fine and very dense, adaxially obscure, mostly arising from the midrib; tertiary venation obscure. **Inflorescences** solitary, up to ca 8 cm long, emerging erect, remains throughout anthesis, peduncle short, ca 2.5 cm, stout, subtended by cataphylls resembling the ligular sheath extensions, always pink. **Spathe** ca 5.0 cm long; lower spathe, obliquely inserted from peduncle, ca 2.3 cm long, succulent, pale green at base, whitish towards the distal, differentiated from the limb by a weak constriction coinciding with the male zone; spathe limb ca 2.7 cm long, oblongo-lanceolate, white,



**Figure 3.** *Schismatoglottis jitinae* S.Y.Wong. A. Whole plant; B. Emerging inflorescence; C. Inflorescence at female anthesis; D. Spathe limb caducous in small pieces; E. Female zone (spathe removed artificially); F. Spadix (spathe removed artificially).

apiculate for 1 mm, caducous, fragmenting into small pieces. **Spadix** sessile, *ca* 4.5 cm long, subcylindric; female zone *ca* 1.3 cm long  $\times$  1.2 cm proximally (0.7 cm distally) diam., adnate to the spathe in the lower  $\frac{2}{3}$ , somewhat conic in the free part; pistils crowded, more or less globose, yellowish green when fresh, *ca* 0.5-0.7 mm diam.; stigma sessile, button-like, pappilate, overtopping ovary; interpistillar staminodes confined to the basal of female zone, a few, shortly stalked, clavate, round-topped, *ca* 0.5 mm wide, white when fresh; sterile interstice present, *ca* 0.4 mm long  $\times$  0.7 cm wide, monometric with the female and male zone, white when fresh; male zone cylindric, *ca* 1.4 cm long  $\times$  0.6 cm diam.; stamens packed, truncate, dumbbell shaped, *ca* 0.5 mm long  $\times$  0.3 mm wide, white when fresh, with the connective wide and taller than the thecae, the thecae at the short ends, each with one pore; appendix contiguous from the male zone, *ca* 1.7 cm long, in the distal half tapering to a blunt point; staminodes of appendix flat-topped, irregularly polygonal, small, white when fresh, *ca* 0.3 mm diam. **Infructescence** unknown.

*Distribution*: Malaysia, endemic to Sarawak, Kapit Division.

*Habitat*: Mesophytic in steep gallery forest on shales, 50-430 m asl.

*Etymology*: The specific epithet is for Madam Jitin ak. Ojek, one of the nursery staff at Malesiana Tropicals Sdn. Bhd., and who formerly assisted with the maintenance of the Araceae research collection.

*Notes*: *Schismatoglottis jitinae* is distinctive by its elongated and erect aerial stem, the leaf laminae basally attenuate and usually unequal, and softly leathery, with the midribs of the innovations longitudinally bright pink abaxially and basally adaxially. Cataphylles are also always pink.

In having erect, elongated stems, *S. jitinae* approaches *S. erecta* M.Hotta, from which it differs by the short and stout peduncle not elongating during anthesis, the succulent lower spathe and the spathe constriction coinciding with the middle part of the male zone.

*Other specimens seen*: MALAYSIA. Sarawak: Kapit Division, Nanga Gaat, Rejang Wood Concession, Sungai Bereng, 01° 45' 36.0"; 113° 27' 54.7", 15 Dec 2004, *P.C. Boyce et al. AR-891* (SAR); Pelagus, Pelagus rapids, 02° 11' 15.1"; 113° 03' 29.01", 14 Mar 2005, *P.C. Boyce et al. AR-1039* (SAR); Kapit, Taman Rekreasi Sebabai, 01° 56' 45.6"; 112° 54' 16.8", 19 Apr 2006, *P.C. Boyce et al. AR-1785* (SAR).

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