

**Studies on Schismatoglottideae (Araceae)
of Borneo XXIII:
Piptospatha colata and *P. deceptrix*,
taxonomic novelties from Borneo**

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ABSTRACT. *Piptospatha colata* P.C.Boyce & S.Y.Wong and *P. deceptrix* P.C.Boyce & S.Y.Wong are newly described, respectively from Kalimantan Barat and Kalimantan Utara, Indonesian Borneo. Recognition of these novelties takes to 13 the number of described, accepted species of *Piptospatha*. An updated key to the genus is provided and both species are illustrated, along with those species that are most similar.

Keywords. Aroid, Indonesian Borneo, Kalimantan Barat, Kalimantan Utara, *Piptospatha*

Introduction

Since the last full revision of *Piptospatha* (Bogner & Hay 2000) a combination of molecular and morphological research has resulted in generic changes, and recognition of a number of new taxa (Okada & Tsukaya 2010; Wong & Boyce 2010, 2012, in press; Wong et al. 2009, 2011).

Major herbaria with significant tropical Asian collections (e.g., BO, L, SAR, SING) abound in specimens of unnamed rheophytic aroids. These, however, frequently defy attempts at identification owing to their incomplete nature, and frequently inadequate preparation prior to preservation. Failing attempts to recollect at original localities or, in the case of older material the distinct possibility that such localities no longer support an indigenous ecology, such material will quite likely forever remain undetermined. Given this situation, it is ironic that fieldwork and subsequent cultivation of plants from Borneo continues to reveal numerous taxonomically novel rheophytic aroid species, which should come as no great surprise given that, has been noted on numerous occasions, many aroids are highly localised.

Where possible, attempts are made to match cultivated novelties with pre-existing herbarium specimens. However, often this not practicable owing to the

problems highlighted above. Two such ‘unmatchable’ novelties belonging to the genus *Piptospatha* N.E.Br. are here described.

Key to *Piptospatha*

- 1a. Sterile, staminodial interstice between pistillate and staminate flower zones well-defined 2
- 1b. Sterile interstice absent, or at most defined by one or two staminodes 5
- 2a. Stem long, repent. (N Kalimantan Tengah) *P. repens*
- 2b. Stem short, erect 3
- 3a. Pistillate flowers green; spathe terminus slightly beaked but not pileate, glossy deep pink 4
- 3b. Pistillate flowers pinkish grey; spathe limb strongly pileate, deep magenta-purple. (Shales; N Kalimantan Utara) *P. pileata*
- 4a. Staminodes rounded, convex, white. Leaf blades with primary lateral veins hardly visible abaxially. (NE Sarawak at Miri, Limbang; Brunei; W Sabah) *P. burbidgei*
- 4b. Staminodes prismatic, truncate, yellow. Leaf with primary lateral veins impressed. Granite. Indonesian Borneo (Kalimantan Barat: Nanga Taman) *P. colata*
- 5a. Connective extended into a pronounced elongate central beak. (? NE Sarawak) *P. insignis*
- 5b. Connective not raised centrally above the thecae, or at most shortly elevated and obtuse 6
- 6a. Staminate flowers pubescent..... 7
- 6b. Staminate flowers glabrous..... 10
- 7a. Connective of stamens swollen (dome-shaped). (Peninsular Malaysia) *P. ridleyi*
- 7b. Connective not swollen..... 8
- 8a. Spathe white at anthesis; stamen in closely-appressed, regularly-arranged pairs; leaf blades abaxially with conspicuously tessellate 2-order veins. (Malay Peninsula and southern peninsular Thailand) *P. perakensis*
- 8b. Spathe pink; stamens irregularly arranged; leaf blades abaxially with 2-order veins not conspicuously tessellate, or only very faintly so. (Borneo) 9

- 9a. Diminutive plants up to 14 cm tall with decumbent-creeping stems; leaf blade elliptic, 4–6 cm long, tertiary venation abaxially forming a very faint tessellate reticulum; spadix 8–12 mm long; pistillate flower zone with 3–5 oblique whorls of staminodes at the base; fruiting spathe up 1 cm long and wide. (Plants of travertine; Kalimantan Timur: Sangkulirang) *P. manduensis*
- b. Robust plants to 25 cm tall or more, with short, erect stems; leaf blade very narrowly oblong-elliptic, 12–20 cm long, all veins parallel pinnate; spadix c. 2 cm long; pistillate flower zone fertile to the base; fruiting spathe 2.5 cm long and wide. (Plants of exposed shales; Sarawak: Kapit) *P. marginata*
- 10a. Pistillate flowers bright green; spadix bullet-shaped, staminate portion bright yellow; thecae broadly excavated, the excavations of adjacent anthers forming a butterfly-shaped depression; interior of spathe tip rostrum with 5–7 conspicuous keels; persistent fruiting spathe wide-flared. (Alkaline geologies (limestone, basalt); SW Sarawak, N Kalimantan Barat) *P. viridistigma*
- b. Pistillate flowers pink or dirty whitish; spadix cylindrical; staminate portion not bright yellow; thecae longitudinally sulcate with the pores ventral and dorsal to the sulcae; interior of the spathe tip rostrum with 2–3 conspicuous keels or keels absent; persistent fruiting spathe narrowly obconic. (Plants not of alkaline geologies) 11
- 11a. Stigmas mid-deep pink; stamen connective with smooth raised rim. (Granites; SW Sarawak) *P. elongata*
- b. Stigmas dirty whitish; stamen connective margins not smooth, rim-like. (Sandstones or shales) 12
- 12a. Stamen connective with a triangular wing on each side; staminodes at base of pistillate zone white, rounded. (Sandstones; NW Sarawak) *P. impolita*
- b. Stamen connective with frilled margins; staminodes at base of pistillate zone cream, truncate with a central depression. (Hard shales; Kalimantan Utara) *P. deceptrix*

***Piptospatha colata* P.C.Boyce & S.Y.Wong, sp. nov.**

Piptospatha colata shares green pistils (or stigmas) with *P. viridistigma* P.C.Boyce, S.Y.Wong & Bogner and *P. burbidgei* (N.E.Br.) M.Hotta. From *P. viridistigma* it may be separated by the presence of a zone of staminodes at the interstice of the pistillate and staminate flower zones, and by the staminate flowers much more densely arranged, with cream (not deep yellow) stamens, and truncate (not excavated) connectives. *Piptospatha burbidgei* and *P. colata* are distinguished from one another by truncate yellow, not convex white, staminodes at the interstice and at the base of the pistillate flower zone. Leaf morphology also serves to separate *P. colata* and *P. burbidgei*; the leaf blades of *P. burbidgei* are narrowly oblong and obtuse, with the adaxial surface smooth with the primary lateral veins almost invisible. *Piptospatha colata* vegetatively

closely approaches *P. pileata* S.Y.Wong & P.C.Boyce and *P. deceptrix* S.Y.Wong & P.C.Boyce. From both, *P. colata* is distinguished by spathe morphology. Spathe overall morphology of *P. colata* rather resembles that of *P. pileata* and *P. elongata* (Engl.) N.E.Br., although again their individual spadix morphologies distinguished them with ease.

TYPE: *K.Nakamoto AR-3780*, Indonesian Borneo, Kalimantan Barat, Sekadau, Nangataman, west of Nangataman, Gunung Canayang east slope, 4 Feb 2012 (holo SAR! iso BO!). (Fig. 1A, 2A, 3A)

Clumping rheophytic herb to 35 cm tall. **Roots** strong, c. 2 mm in diameter. **Stem** short, condensed, to 20 mm in diameter, all except the oldest portions obscured by leaf bases. **Leaves** many together, spreading or arching, forming a dense rosette; petiole bases clasping stem; petiole 5–8 cm long, up to 2.5 mm in diameter, D-shaped in cross-section, minutely scabrous, dull reddish green; petiolar sheath with free ligular portion, c. 4 cm long, marcescent and ultimately deciduous, pale reddish-pink when fresh, drying dark reddish brown; leaf blades narrowly elliptic, 5–20 cm long \times 2–4.5 cm wide, base cuneate, somewhat obtuse, apex acute with stout tubule, c. 5 mm long, in life semi-glossy medium green adaxially, paler abaxially with the mid-rib and primary lateral veins pale reddish, drying dark reddish brown with abaxial venation slightly darker; mid-rib bluntly raised adaxially, rounded-raised and minutely scabrous adaxially; primary lateral veins c. 6 per side, parallel pinnate, impressed adaxially, very slightly raised abaxially; interprimary lateral veins weaker than primary laterals although still conspicuous, interprimary veins joining a weakly defined submarginal collecting vein; primary lateral and interprimary veins very slightly raised abaxially and adaxially; interprimary veins irregularly visible as semi-translucent broken lines running parallel to the primary laterals. **Inflorescence** solitary, erect; peduncle 11–15 cm long (at anthesis), c. 3.5 mm in diameter, minutely but distinctly scabrous, reddish brown. **Spathe** initially erect, later held at c. 90° to peduncle, later still (post anthesis) again erect, not constricted, deep pink in late bud, spathe limb opening mainly in shades of glossy deep pink, with the median keel and terminal rostrum deep purple-pink, the rostrum ultimately deep reddish brown, proximal part of spathe dull olive-greenish brown with pale speckles; spathe limb, c. 6 cm long, the base c. 1 cm wide, mid-way inflated to c. 2.5 cm, then ventrally constricted and terminating in a rostrum c. 6 mm long, internally without rostral keels, or with one only and these weakly defined. Spadix 2.3–2.8 cm long \times 6.5–7.5 mm in diameter, base slightly obliquely inserted onto spathe/peduncle; pistillate flower zone with 1–4 rows of rhomboidal truncate pale yellow staminodes inserted basally, pistillate flower zone jade-green, weakly barrel-shaped, 5.5–8.5 mm long \times 6–7.5 mm in diameter, pistils cylindrical, truncate, very congested, c. 0.6 mm diameter; stigma weakly umbonate, papillate, as wide as ovary; pistillate and staminate zones separated by a zone c. 2 mm long comprised of c. 2 whorls of staminodes, these rhomboidal-polygonal, truncate, pale yellow; staminate flower zone cream, equalling the pistillate zone in width, 1.5–21 cm long \times 6.5–7.5 mm in diameter, weakly fusiform to slightly tapering, apex blunt; staminate flowers congested, comprised of paired stamens, irregularly oblong and very weakly butterfly

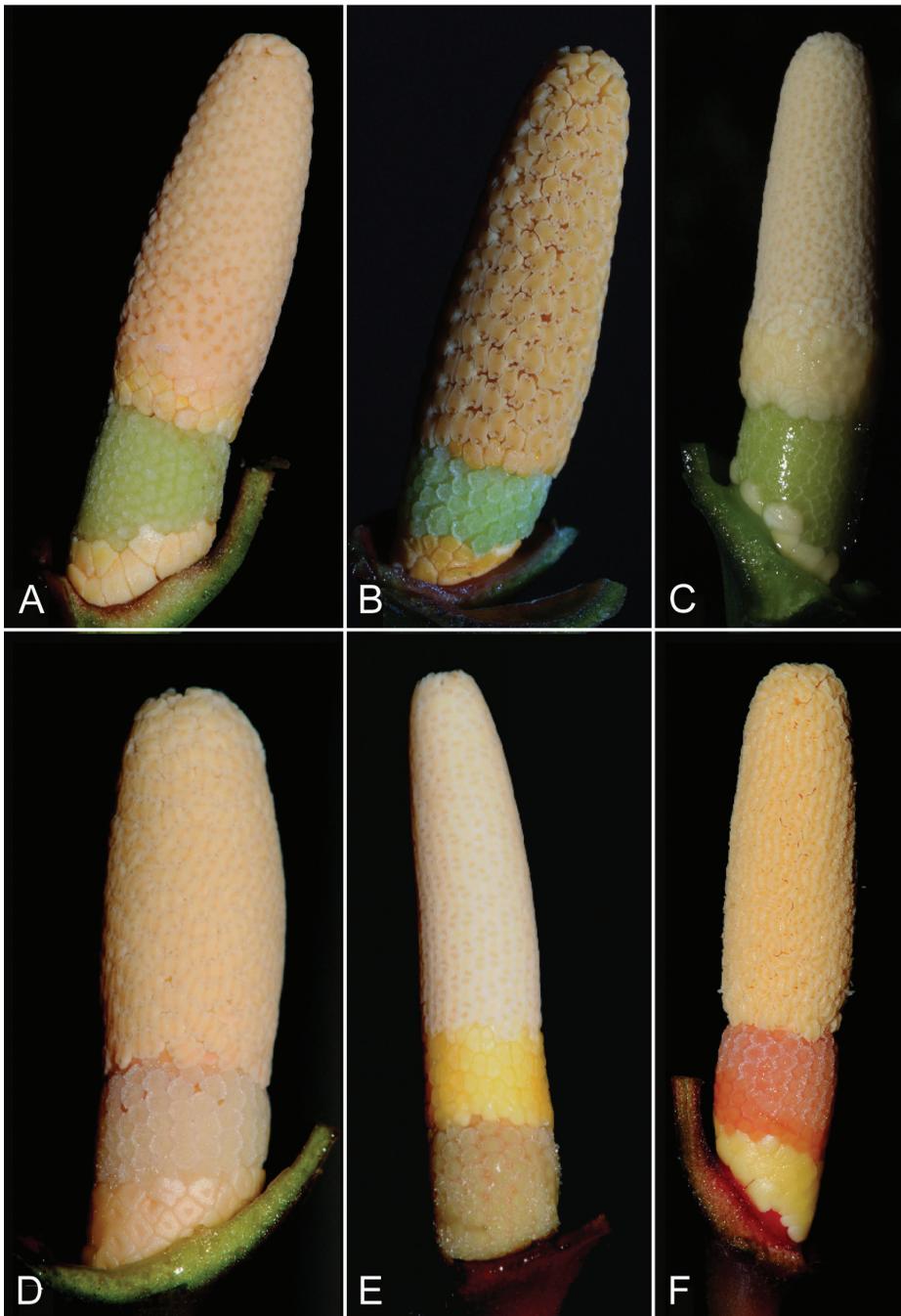


Fig. 1. **A.** *Piptospatha colata* P.C.Boyce & S.Y.Wong. **B.** *Piptospatha viridistigma* P.C.Boyce, S.Y.Wong & Bogner. **C.** *Piptospatha burbidgei* (N.E.Br.) M.Hotta. **D.** *Piptospatha deceptrix* P.C.Boyce & S.Y.Wong. **E.** *Piptospatha pileata* S.Y.Wong & P.C.Boyce. **F.** *Piptospatha elongata* (Engl.) N.E.Br. **A–F.** Spadices at pistillate anthesis, in each instance the spathe artificially removed. A. from AR-3665; B. from AR-250; C. from AR-1973; D. from AR-3980; E. from AR-3923; F. from AR-3601. (Photos: Peter C. Boyce)



Fig. 2. **A.** *Piptospatha colata* P.C.Boyce & S.Y.Wong. **B.** *Piptospatha viridistigma* P.C.Boyce, S.Y.Wong & Bogner. **C.** *Piptospatha burbidgei* (N.E.Br.) M.Hotta. **D.** *Piptospatha deceptrix* P.C.Boyce & S.Y.Wong. **E.** *Piptospatha pileata* S.Y.Wong & P.C.Boyce. **F.** *Piptospatha elongata* (Engl.) N.E.Br. A. from AR-3665; B. from AR-2432; C. from AR-1973; D. from AR-3980; E. from AR-3923; F. from AR-3601. (Photos: Peter C. Boyce)

shaped, c. 0.5 mm wide \times c. 1 mm long, connective truncate, glabrous; thecae lateral, c. 0.3 mm, ellipsoid with a wide rim, sunken into a shallow pit. *Infructescence* not observed.

Other specimens seen: **INDONESIAN BORNEO. Kalimantan Barat.** Sekadau, Sekadau Hilir, Kayu Lapis, south of Kayu Lapis, 0°2.38'S 111°0'33.99"E, 20 Sep 2011, Nakamoto AR-3665 (SAR); Sekadau, south east of Nanga Taman, Kampung Seri Punti, Gunung Raya, south slope, 3 Feb 2012, Nakamoto AR-3776 (SAR).

Distribution. Indonesian Borneo, Kalimantan Barat, known from two localities at Nanga Taman, and a third near Kayu Lapis, c. 37 km (in a straight line) to the NE.

Ecology. Obligate rheophyte on waterfalls and river boulders on granite under moist lowland forest; 100–400 m. asl.

Notes. *Piptospatha colata* is defined by the combination of green pistils, pale yellow, prismatic staminodes, a deep pink spathe with a prominent rostrum, semi-glossy medium green leaves with primary lateral veins impressed adaxially.



Fig. 3. **A.** *Piptospatha colata* P.C.Boyce & S.Y.Wong. **B.** *Piptospatha viridistigma* P.C.Boyce, S.Y.Wong & Bogner. **C.** *Piptospatha burbidgei* (N.E.Br.) M.Hotta. **D.** *Piptospatha deceptrix* P.C.Boyce & S.Y.Wong. **E.** *Piptospatha pileata* S.Y.Wong & P.C.Boyce. **F.** *Piptospatha elongata* (Engl.) N.E.Br. **A–F.** Plants in habitat. A. from AR-3776; B. from AR-3669; C. from AR-1973; D. from AR-3980; E. from AR-3923; F. from AR-2052. (Photos: A & D–E, K. Nakamoto; B–C & F, Peter C. Boyce)

Piptospatha colata is the third species described to have green pistils and stigmas. The others are vegetatively somewhat similar to *P. viridistigma* P.C.Boyce, S.Y.Wong & Bogner, (alkaline geologies, NW Borneo), and the vegetatively very dissimilar *P. burbidgei* (N.E.Br.) M.Hotta, (shales, N Borneo) (Fig. 1A–C). *Piptospatha colata* is distinguished from *P. viridistigma* by the presence of a zone of staminodes at the interstice of the pistillate and staminate flower zones, by the staminate flowers much more densely arranged, with cream (not deep yellow) stamens, and truncate (not excavated) connectives (Fig. 1A & B), and the spadix barely one third as long at the spathe. Leaves of *P. colata* differ by the combination of the relatively shorter petiole and relatively longer, narrower erect, not arching blades. *Piptospatha burbidgei* and *P. colata* are differentiated by staminode morphology and colour, with the staminodes truncate, prismatic, yellow, and not convex, rounded, white (Fig. 1A & C). Leaf morphology also readily distinguishes *P. colata* from *P. burbidgei*; leaf blades of *P. burbidgei* are narrowly oblong, obtuse, and adaxially smooth, with the primary lateral veins almost invisible, and of a characteristically rather peculiar olive-green (Fig. 3A & C).

Piptospatha colata vegetatively rather resembles *P. deceptrix* S.Y.Wong & P.C.Boyce and *P. pileata* S.Y.Wong & P.C.Boyce (both from shales, Kalimantan Utara). The leaf blades of *P. colata* are adaxially semi-glossy medium green with impressed primary lateral veins and noticeably different to matte leaf blades with only slightly impressed veins of *P. deceptrix* (Fig. 3A & D), and the deep green, glossy blades with barely impressed venation of *P. pileata* (Fig. 3A & E). In addition, *P. colata* is distinguished from both by spadix morphology (Fig. 1A, D & E).

Spathe morphology of *P. colata* is similar that of both *P. pileata* and *P. elongata* (Engl.) N.E.Br. (granites, NW Borneo—Fig. 2A, E & F), although the terminal portion of the spathe of *P. colata* is much less pronounced-rostrate.

Etymology. From Latin *colatus* [fem. *colata*], cleansed, purified, in whimsical allusion to this new species being for some time muddled by the authors with *P. viridistigma*, a situation rectified here.

***Piptospatha deceptrix* P.C.Boyce & S.Y.Wong, sp. nov.**

Flowering *Piptospatha deceptrix* is reminiscent of *P. burbidgei*, with the blunt, rose-pink spathe with short terminal rostrum almost indistinguishable. However, *P. deceptrix* is readily distinguished from *P. burbidgei* by the much longer zone of truncate, centrally impressed (not weakly convex) pale yellow (not white) staminodes below the pistillate flower zone; by the absence (or at most very depauperate) interstice staminodial zone; and by the very pale pinkish grey (not green) pistils and stigmas. The narrowly elliptic, acute leaf blades with the primary lateral veins adaxially impressed are quite different to those of *P. burbidgei*, in which the leaf blades are narrowly oblong, obtuse, and adaxially smooth with the primary lateral veins almost invisible. *Piptospatha deceptrix* most closely approaches *P. pileata* in overall appearance, although the latter is readily differentiated by the spadix with much longer zone of yellow interstitial

staminodes, by almost lacking a zone of staminodes below the pistillate flowers, and by the deep magenta-purple (not pale rose-pink) strongly pileate spathe limb. Leaves of *P. deceptrix* and *P. pileata* are somewhat similar, but distinguished by the leaf blades being glossy (*P. pileata*) rather than matte (*P. deceptrix*), and (in *P. deceptrix*) the petioles lacking the crispulate hyaline wings along the dorsal edges. From both *P. burbridgei* and *P. pileata*, *P. deceptrix* is distinct by the stouter, blunt-tipped spadix.

TYPE: Nakamoto AR-3980, Indonesian Borneo, Kalimantan Utara, Malinau Selatan, Mentarong village, near the confluence of Sungai Mentarang and Sg. Malinau, 18 June 2012 (holo SAR! iso BO!). (Fig. 1D, 2D, 3D)

Clumping rheophytic herb to 35 cm tall. **Roots** strong, c. 3 mm in diameter. **Stem** short, condensed, to 25 mm in diameter, obscured by leaf bases. **Leaves** many together, arching, forming a loose rosette; petiole bases clasping stem; petiole 5–8 cm long, up to 2 mm in diameter, D-shaped in cross-section, basal portion of petiole minutely scabrous, dull medium green; petiolar sheath with free ligular portion, 2–4 cm long, marcescent and ultimately deciduous; persistent part of ligular sheath with hyaline margin, somewhat dark reddish brown; leaf blades narrowly elliptic to narrowly oblanceolate, 7–22 cm long \times 2–4.5 cm wide, base cuneate, somewhat obtuse, apex acute with stout tubule, c. 5 mm long, in life matte medium green adaxially, paler abaxially, drying dull pale brown with abaxial venation darker; mid-rib bluntly raised adaxially, rounded-raised and minutely scabrous adaxially; primary lateral veins c. 8 per side, parallel pinnate, very slightly impressed adaxially, slightly raised abaxially; interprimary lateral veins weaker than primary laterals although still conspicuous, interprimary veins joining a weakly defined submarginal collecting vein; primary lateral and interprimary veins very slightly raised abaxially and adaxially; interprimary veins irregularly visible as semi-translucent broken lines running parallel to the primary laterals. **Inflorescence** solitary, erect; peduncle 9–17 cm long (at anthesis), c. 3 mm in diameter, minutely by distinctly scabrous, reddish brown. **Spathe** initially erect, later held at c. 45° to peduncle, later still (post anthesis) once again erect, not constricted, rose-pink in late bud, opening with spathe limb bright rose-pink shading to medium pink and then pale olive-brown (base) proximally; spathe limb inflated at anthesis, shedding during staminate anthesis, c. 3.5 cm long, the base c. 1.5 cm wide, mid-way inflated to c. 2.5 cm, terminal rostrum c. 3 mm long, with 3–5 very weak internal rostral keels. **Spadix** 1.8–2.2 cm long \times 6–7 mm in diameter, base obliquely inserted onto spathe and peduncle; pistillate flower zone with 2–4 rows of cream rhomboidal, apically impressed staminodes inserted basally, pistillate flower zone pale grey, cylindrical, c. 3.5 mm long \times c. 5 mm in diameter, pistils cylindrical, truncate, very congested, c. 0.6 mm diameter; stigma pale grey, with a slight central depression, strongly papillate, as wide as ovary; pistillate and staminate zone mostly contiguous, occasionally with a few scattered cream staminodes between, these rhomboidal-polygonal, with a central impression; staminate zone pale cream, slightly exceeding the pistillate zone in width, c. 1.3 cm long \times 6–7 mm in diameter, stoutly fusiform, apex blunt; staminate flowers congested, comprised of obscurely paired stamens, irregularly oblong, c. 0.5 mm wide \times c. 1 mm long, connective with a weak longitudinal sulcus and slightly frilled margins,

these extending around the thecae, glabrous; thecae lateral, c. 0.3 mm, ellipsoid with a wide rim, the opposite stamens linked by a the connective transverse sulcus. **Fruiting spathe** deeply cyathiform, dull olive-green, c. 1 cm long \times 1.2 cm wide, the base obliquely inserted on peduncle. Fruits and seeds not observed.

Distribution. Indonesian Borneo, Kalimantan Utara, known only from the type locality

Ecology. Obligate rheophyte on waterfalls and river boulders on very hard shales under moist lowland forest; c. 200 m. asl.

Notes. *Piptospatha deceptrix* is defined by the combination of lacking a zone of staminodes above the pistillate flowers, a blunt, rose-pink spathe, and matte medium green leaf blades with (abaxially) slightly impressed primary lateral veins.

Inflorescences of *P. deceptrix* are very reminiscent of those of *P. burbidgei*, with the blunt, rose-pink spathe with short terminal rostrum (Fig. 2C & D). However, *P. deceptrix* is readily distinguished from *P. burbidgei* by the much longer zone of truncate, centrally impressed (not weakly convex) pale yellow (not white) staminodes below the pistillate flower zone, the absence (or at most very depauperate) interstice staminodial zone, and the very pale pinkish grey (not green) pistils and stigmas (Fig. 1C & D). The narrowly elliptic, acute leaf blades with the primary lateral veins adaxially impressed are quite different to those *P. burbidgei*, where the leaf blades are narrowly oblong, obtuse, and adaxially smooth with the primary lateral veins almost invisible (Fig. 3C & D).

In overall appearance *P. deceptrix* most closely approaches *P. pileata*, although the latter is readily differentiated by the spadix with much longer zone of yellow interstitial staminodes, by almost lacking a zone of staminodes below the pistillate flowers, and by the deep magenta-purple (not rose-pink) strongly pileate spathe limb (Fig. 1D & E; Fig. 2D & E). Leaves of *P. deceptrix* and *P. pileata* are somewhat similar, but distinguished by the leaf blades that are glossy (*P. pileata*) instead of matte (*P. deceptrix*), and (in *P. deceptrix*) the petioles lacking the crispulate hyaline wings along the dorsal edges.

From both *P. burbidgei* and *P. pileata*, *P. deceptrix* is distinct by the stouter, blunt-tipped spadix (Fig. 1C–E).

Etymology. Latin *deceptus* [fem. *deceptrix*], to deceive, in allusion to this novelty resembling one species vegetatively, and another in floral morphology.

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References

- Bogner, J. & Hay, A. (2000) Schismatoglottideae in Malesia II - *Aridarum*, *Bucephalandra*, *Phymatarum* and *Piptospatha*. *Telopea* 9(1): 183–194.
- Okada, H. & Tsukaya, H. (2010) A new species of *Piptospatha* (Araceae: Schismatoglottideae) from West Kalimantan, Indonesian Borneo. *Acta Phytotax. Geobot.* 61: 87–92.
- Wong, S.Y., Bogner, J. & Boyce, P.C. (2011) Studies on Schismatoglottideae (Araceae) of Borneo XIV: *Piptospatha marginata* resurrected and observations on *Piptospatha*, notably for the Rejang drainages. *Webbia* 66: 29–32.
- Wong, S.Y., Boyce, P.C. & Bogner, J. (2009) Studies on Schismatoglottideae (Araceae) of Borneo VIII: A review of *Piptospatha elongata* in Sarawak. *Gard. Bull. Singapore* 61(1): 217–233.
- Wong, S.Y. & Boyce, P.C. (2010) Studies on Schismatoglottideae (Araceae) of Borneo XI: *Ooia*, a new genus, and a new generic delimitation for *Piptospatha*. *Bot. Stud. (Taipei)* 51: 543–552.
- Wong, S.Y. & Boyce, P.C. (2012) Araceae of Indomalaya II: *Piptospatha* N.E.Br. *Malayan Nat. J.* 64(1): 9–32.
- Wong, S.Y. & Boyce, P.C. (in press) Schismatoglottideae of Borneo XIX - *Piptospatha pileata*, a remarkable new species from Kalimantan Timur, Indonesian Borneo. *Willdenowia*.

