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Studies on Homalomeneae (Araceae) of Borneo X: Two new *Homalomena* species from Brunei, and a new Informal Species Complex for Supergroup Cyrtocladon

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Studi sulle Homalomeneae (Araceae) del Borneo X: due nuove specie di Homalomena del Brunei e un nuovo gruppo informale nell'ambito del supergruppo Cyrtocladon — È proposto un nuovo gruppo informale nell'ambito del Supergruppo Cyrtocladon relativamente alle entità di Homalomena (Araceae: Homalomeneae) dell'area sundaica e vengono descritte due nuove specie **Homalomena wongii** S.Y. Wong & P.C. Boyce e **Homalomena terajaensis** S.Y. Wong & P.C. Boyce. Vengono inoltre forniti sia i caratteri differenziali che una chiave identificativa relativamente al nuovo gruppo proposto e alle due nuove specie qui descritte.

Key words: Araceae, Borneo, Brunei, *Homalomena wongii*, *Homalomena terajaensis*, Wongii Complex.

Introduction

Homalomena Schott, with perhaps as many as 500 species, the majority yet to be formally described, is the largest and yet most understudied genus of mesophytic aroids in South East Asia. To date just 26 accepted names are available for Bornean *Homalomena* (Boyce et al., unpublished data), of which 14 are recently described (Baharuddin & Boyce, 2010; Boyce & Wong, 2008; Boyce et al., 2010; Tung et al., 2010; Hoe et al., 2011; Kurniawan et al., 2011).

No attempt has yet been made to tackle the internal phylogeny of *Homalomena*, in the main because the alpha taxonomy remains in such a preliminary state. However, Boyce & Wong (2008) and Ng et al. (2011) have delimitated informal Supergroups and Species Complexes in order to create manageable taxonomic units to aid identification, and from which to attempt phylogenetic analyses.

Homalomena specimens are abundant in Herbaria. However, the overwhelming majority of specimens are either undetermined, or bear incorrect determinations. Many herbarium specimens, while certainly representing undescribed species, are of insufficient quality to enable description. In part this is owing to much of the material, even when not subject to post-preservation depredations by beetles, having been collected too far into anthesis by which time critical floral morphologies, notably interpistillar staminodes, have been irreparably damaged during pollination. Additionally much of the herbarium material is prepared in a manner by which the spathe obscures

critical floral morphologies. Post-preservation removal of a long-dry spathe, without damaging the spadix, is almost impossible. Provided concise locality data are available attempts must be made to re-visit and prepare adequate samples (images, inflorescences in alcohol) for any suspected novelties.

Examination of the Araceae collections of the Herbarium, Brunei Forestry Department (BRUN), and subsequent fieldwork in Brunei late in 2010 confirmed two highly distinctive novel *Homalomena* restricted to forested vertical sandstone bluffs in the Teraja area. There are here described as *Homalomena wongii* S.Y. Wong & P.C. Boyce and *Homalomena terajaensis* S.Y. Wong & P.C. Boyce, belonging to the Cyrtocladon (sensu Boyce & Wong, 2008) and Chamaecladon supergroup (sensu Boyce & Wong, 2008) respectively.

While *H. terajaensis* fits incontrovertibly into the Humilis Complex (see Kurniawan et al., in press), *H. wongii* combines a suite of morphologies that do not permit it to be included into any of the five current defined complexes in the Cyrtocladon Supergroup (Ng et al., 2011). Therefore, for this species we are proposing a new informal complex, the Wongii Complex.

Wongii Complex

Mesophytic solitary or slightly clumping lithophytic herbs. *Petiolar sheath* with margins ultimately marcescent. *Leaf blade* cordiform, matte pale green adaxially with conspicuous pellucid striate vein-like glands running parallel to the primary lateral veins. *Spathe* with a constriction separating the limb from the lower part; lower spathe exceeding the spathe limb. *Pistillate flowers* each associated with a single staminode.

TYPICAL SPECIES: ***Homalomena wongii*** S.Y. Wong & P.C. Boyce

DISTRIBUTION: Currently one species, endemic to Brunei, Borneo.

Key to species complexes

The **Wongii Complex** can be accommodated in the key in Ng, et al. (2011) by the following modification to couplet 4:

4a. Leaf blade abaxially with conspicuous pellucid vein-like glands running parallel to the primary lateral veins **11**
4b. Leaf blade without pellucid vein-like glands ..... **5-10 as per original key.**
11a. Pellucid vein-like glands comprised of lines of close-packed punctilliform spots. Lower spathe longer than spathe limb. Leaf blade with conspicuous posterior lobes; spathe limb separated from the lower spathe by a distinct constriction; each pistil associated with a staminode ..... **Wongii Complex**
11b. Pellucid vein-like glands comprised of unbroken striae. Spathe limb longer than lower spathe. Leaf blade lacking posterior lobes, base obtuse to truncate, sometimes minutely peltate; spathe lacking a distinct constriction; pistils without staminodes ..... **Havilandii Complex**

Homalomena wongii S.Y. Wong & P.C. Boyce, **sp. nov.**

DIAGNOSIS - *Ab ominus ceteris speciebus foliis abaxialiter glandulis conspicuis pellucidis parallelis ad venas primarias laterales, spatha constrictione inter partem inferiorem et limbum, spathae parte inferiore limbo breviore, pistillis omnibus staminodio provisis differt.*

TYPUS: Brunei, Belait District, Labi, Hill dipterocarp forest, Bukit Teraja south of summit, 04° 20'; 114° 27', 20th March 1991, *R.J. Johns 6875* (holotypus BRUN - barcode B 008 060; isotypus K). Figs. 1, 2.

DESCRIPTION - Medium, evergreen, glabrous, strongly aromatic lithophytic **herbs**, to ca 80 cm tall.

Fig. 1 – *Homalomena wongii* S.Y. Wong & P.C. Boyce. Holotype (BRUN, B 008 060).

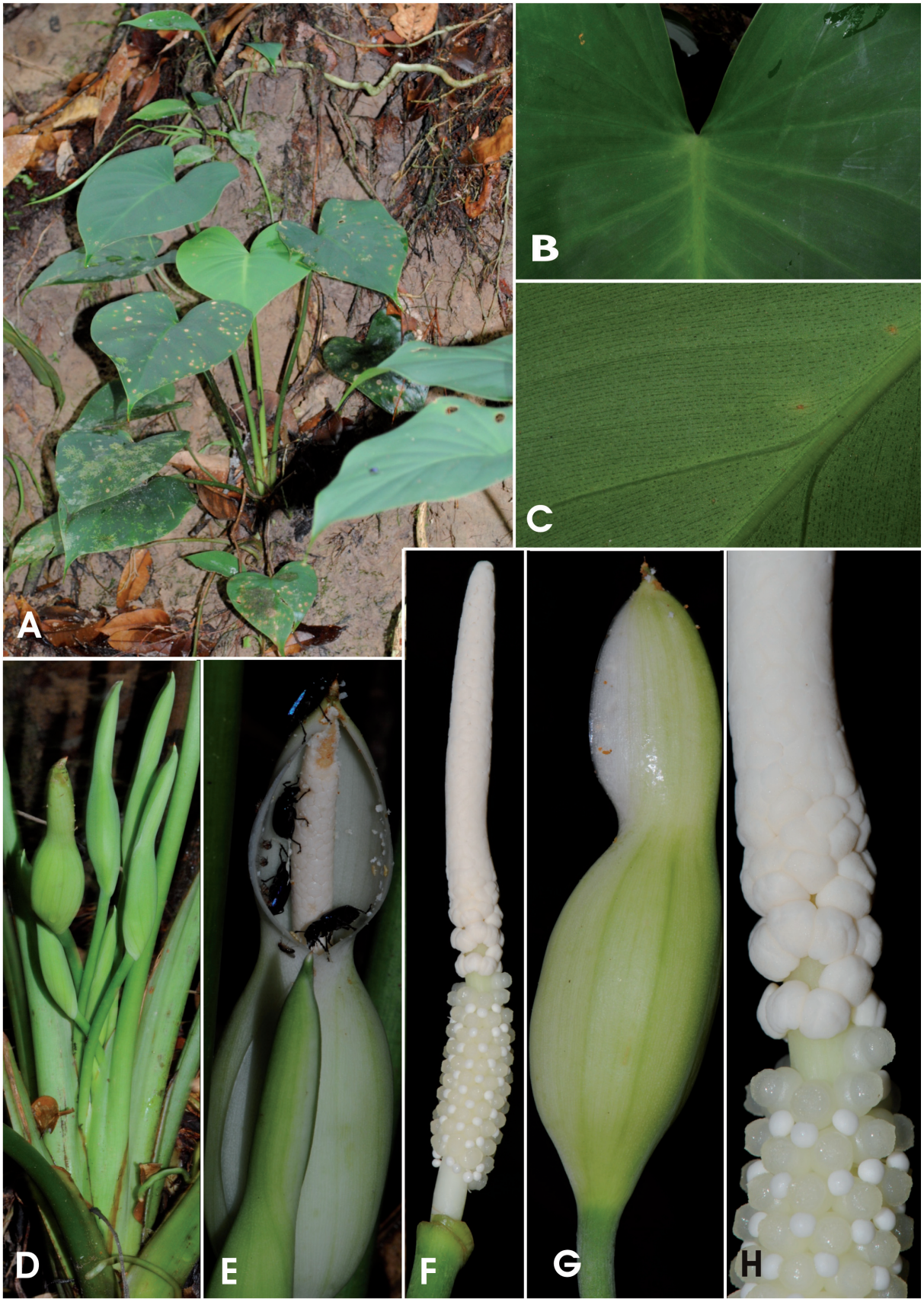

Fig. 2 – *Homalomena wongii* S.Y. Wong & P.C. Boyce. A. Whole plant. B. Leaf blade, the sinus. C. Adaxial surface of the leaf blade showing the conspicuous pellucid punctilliform-striate vein-like glands. D. Immature inflorescences. E. Inflorescence at pistillate anthesis with two genera of visiting Coleoptera: Chrysomelidae. F. Spadix (spathe removed artificially). G. Detail of the lower spathe exceeding spathe limb in length. H. Interstice.

Stem pleionanthic, erect, older plants with stems trailing and the active portion ascending, 2-3 cm thick, green, internodes to ca 1.5 cm long, green, later becoming pale brown, adventitious roots abundant, often penetrating the leaf bases. **Leaves** 5-15 together, petiole 50-70 cm length × 7-10 mm width, adaxially shallow wide-grooved, petiole weakly D-shaped in cross-section, erect to spreading, green, smooth, pale to medium green, the lower-most part with a few darker green longitudinal striae; a weak pulvinus always present, ca ⅕ way from blade base; petiole bases clasping, always green; **petiolar sheath** to ca 15 cm long, ca ¼ of petiole length, width between both margins ca 1 cm at the base, narrowing towards the apex, sheath margins 0.5-1 cm, both equal, clasping, strongly decurrent at apex, green, initially persistent, soon drying paler, eventually the marginal 3 mm marcescent, turning bright brown; **blade** broadly ovate-cordate, 25-30 cm length × 20-24 cm width, thinly leathery, matte, pale green adaxially (fresh), drying pale brown, abaxially pale green (fresh), drying pale brown, base cordate, posterior lobes spreading, subtriangular side to 11-16 cm long, blade tip obtuse, short-acuminate for ca 2.5 cm, apiculate, 4-5 mm; midrib raised abaxially (fresh and dry), ca 6 mm wide at the base and 4 mm wide at the centre, adaxially flush with blade (fresh and dry), ca 5 mm at the base and 3 mm at the centre; 5-6 primary lateral veins on each side, diverging at 60°-80° from the midrib, adaxially impressed (fresh and dry), abaxially raised (fresh and dry), curved sharply towards the apex when near the margin; interprimary veins impressed, alternating irregularly with primaries, posterior lobes each with 2-3 primary lateral veins; secondary venation visible as conspicuous pellucid punctilliform-striate vein-like glands running parallel to the primary lateral veins, tertiary venation not visible, all veins running into a thickened intermarginal vein. **Inflorescences** up to 6 together, erect at anthesis, each subtended by a prophyll, 5-7 cm long, this initially pale green, soon turning pale brown; **peduncle** 16-18 cm long × ca 4 mm wide, matte pale green. **Spathe** ca 8 cm long, whitish green with numerous darker green longitudinal veins, and three median bands abaxially; **lower spathe** ovoid-ellipsoid, 4-4.5 cm long × 2 cm wide at staminate anthesis, weakly constricted at the junction of the spathe limb, the constriction coinciding with the lower-most fertile staminate flowers, **spathe limb** shorter than lower spathe with ca 3 cm long × 2 cm wide at pistillate anthesis, ovate-triangular, white, abaxially with green median stripe, mucro 2-4 mm long, green. **Spadix** almost equal to spathe at pistillate anthesis, ca 7 cm length, elongate-cylindrical-fusiform, narrowing in the lower part of staminate zone coinciding with the constriction of the spathe; **stipe** ca 1 cm long × 3 mm width, weakly globose-cylindrical and attached slightly obliquely to peduncle, glossy pearly white; **pistillate zone** ca 2 cm length × 8 mm width, ca ⅓ length of spadix, weakly fusiform; **ovary** ca 1.2 mm tall, shortly cylindrical, mostly associated with one interpistillar staminode except for the lower-most (each with 2-3 staminodes), upper-most lacking staminodes; **stigma** 1.25-1.5 mm in diam., raised, rounded, overtopping ovary, densely arranged, wet and glossy-grey when fresh, pale brown in alcohol, **style** barely differentiated; **staminodes** clavate, stipe very slender, clavate head ca. 1 mm diam., very slightly irregular, waxy white when fresh and in alcohol; **interstice** naked at proximal end with pistillate zone, c. 1-4 mm length, staminodes scattered, 1 cm length × 0.6 mm width, 1-2 mm diam., waxy white, rounded or unequally polygonal, each comprising a single sterile anther; **staminate zone** ca 3.5 cm length × 4 mm width, ca ½ length of spadix , lower part weakly constricted; **staminate flowers**, white, 2.5 mm - 4 mm diameter, unequally polygonal, comprising 4-10 truncate stamens, each overtopped by large and flat connective tissues, turning pale brown in alcohol; **terminal staminode zone** occasionally present, ca 4 mm length × 3 mm width, staminodes round or unequal polygonal, waxy white (fresh), becoming pale brown in alcohol. **Infructescences** up to 4 together, declinate; peduncle green, matte; spathe entirely persistent, green. **Fruit** and **seed** not seen.

DISTRIBUTION: Brunei, Bukit Teraja. Known only from the type locality, ca 390 m alt.

EPONYMY**:** This species is named after Dr Wong Khoon Meng, currently Malaysia's most eminent botanist, formerly of BRUN, and now Keeper of the Herbarium, Singapore Botanic Gardens.

HABITAT: Lowland humid mixed dipterocarp forest on Belait series sandstones. Occurring under full shade on vertical sandstone cliffs with slowly running surface water.

NOTES: *Homalomena wongii* is distinguished by the combination of cordiform leaf blades abaxially

with conspicuous pellucid punctilliform-striate vein-like glands running parallel to the primary lateral veins, spathes with a conspicuous constriction, and pistillate flowers each with an associated staminode. By the pellucid glands and cordiform leaves *S. wongii* approaches *H. curvata* Engl. (West Malaysia - Homalomena Supergroup), but may be distinguished by spathes with a constriction. Similar striate pellucid glands occur in the Havilandii Complex but species of this complex have leaf blades lacking posterior lobes, a spathe without a distinct constriction, and in lacking interpistillar staminodes. Furthermore, the lower spathe is longer than the spathe limb in *H. wongii*, while the lower spathe is shorter than the spathe limb in *H. havilandii* Ridl.

Homalomena terajaensis S.Y. Wong & P.C. Boyce, **sp. nov.**

DIAGNOSIS - *Ab speciebus ceteris Humilis complexionis floribus masculis praecipue in serie una vel interdum secunda incomplete, staminodiis lacrimiformibus deorsum deflexis differt.*

TYPUS: Brunei, Belait District, Labi, Teraja Longhouse, 29 Sept. 1988, *K.M. Wong WKM 533* (holotypus BRUN - bar code B 008 039; isotypus K). Figs. 3, 4.

DESCRIPTION - Small evergreen mesophytic lithophytic herbs to ca 10 cm tall with aromatic (terpenoids) vegetative tissues. **Stem** pleionanthic, subterranean, erect, ca 15 mm thick, deep red, internodes to ca 2 mm long. **Leaves** many together, 9-15; petiole mainly terete, distal-most portion shallowly, rounded abaxially, 3-5 cm long, semi-glossy, green to reddish brown; petiolar sheath up to 5 mm long, almost ⅙ length of petiole, red, sheath margins remaining open, persistent, terminal part tapering; blade elliptic, 4-6 cm long × 3.5-5 cm wide, softly leathery, glossy medium to dark green adaxially, paler green abaxially, sometimes adaxially reddish-purple to reddish-brown, if so paler red abaxially, margins smooth, base cordulate, weakly oblique, tip acute, apiculate for 1 mm; midrib somewhat rounded-raised abaxially, adaxially somewhat impressed, ca 0.5 mm wide, with ca 4 primary lateral veins on each side, these diverging at 30°-40° from the midrib, abaxially flush to slightly raised, adaxially flush or very slightly impressed; interprimary veins ca ½ width of the primary lateral veins, regularly interspersed; secondary venation very inconspicuous; tertiary venation invisible, all veins running into a weakly defined thickened intermarginal vein. **Inflorescences** up to 5 together, erect at anthesis, later declinate; peduncle to ca 1.5 cm long × ca 1 mm diam., pinkish to dark red. **Spathe** 0.8-1 cm long, ca 3 mm wide, not constricted, semi-glossy yellowish green externally, somewhat shiny pale green internally, with a terminal short mucro to 2-3 mm long, red, spathe opening at anthesis by inflation and thence by a broad slit, later closing by which time spadix has extended to project beyond the tip of the closed spathe. **Spadix** up to1 cm long × 2.5 mm diam., sterile at the tip by the non-development of the staminate flowers, stipitate, stipe ca 1 mm, pale green; **pistillate flower zone** 1.5 mm long; pistils few, scattered, usually only 1-2 spirals, obliquely globose, ca 1 mm tall × 0.8-0.9 mm diam. greenish white, stigma sessile, somewhat punctate, 0.2-0.3 mm diam.; occasionally basal pistillate flowers associated with one staminode, teardrop-shaped, deflexed downwards, 0.5 mm long; suprapistillar interstice absent; **staminate flower zone** 8.5 mm long, apex acute; **staminate flowers** somewhat densely arranged, staminate flowers broadly dumbbell shaped, consisting of two stamens, stamens rounded, ca 0.5 mm tall, 0.5 mm long × ca 0.4 mm wide, white to very pale green, anther thecae opening by a broad terminal slit. **Fruiting spathe** declinate by flexing of the basal portion of the peduncle, red. **Fruits** and **seeds** not observed.

DISTRIBUTION: Brunei, Belait District, Labi, Endemic to the the Teraja drainages.

ECOLOGY: Lowland humid dipterocarp forest, shaded areas, on wet sandstones 25-40 m asl.

ETYMOLOGY: From Bukit Teraja, the type locality.

***Other material seen*: Brunei: Belait.** Labi, Sungai Rampayoh, track along river, 4°22' N; 114° 28' E, 30 July 1993, *S.Atkins 603* (BRUN - bar code B 008 311; K); Labi, Kampung Teraja, path along the Sungai Teraja, 4°17' N; 114° 25' E, 6 June 1989, *P.C.Boyce 255* (BRUN - bar code B 008 041; L); Labi, Mendarum Waterfall, 4°20' N; 114° 27' E, 7 June 1989, *P.C.Boyce 266* (BRUN - bar code B 008 620; L).

Fig. 3 – *Homalomena terajaensis* S.Y. Wong & P.C. Boyce. Holotype (BRUN, B 008 039).

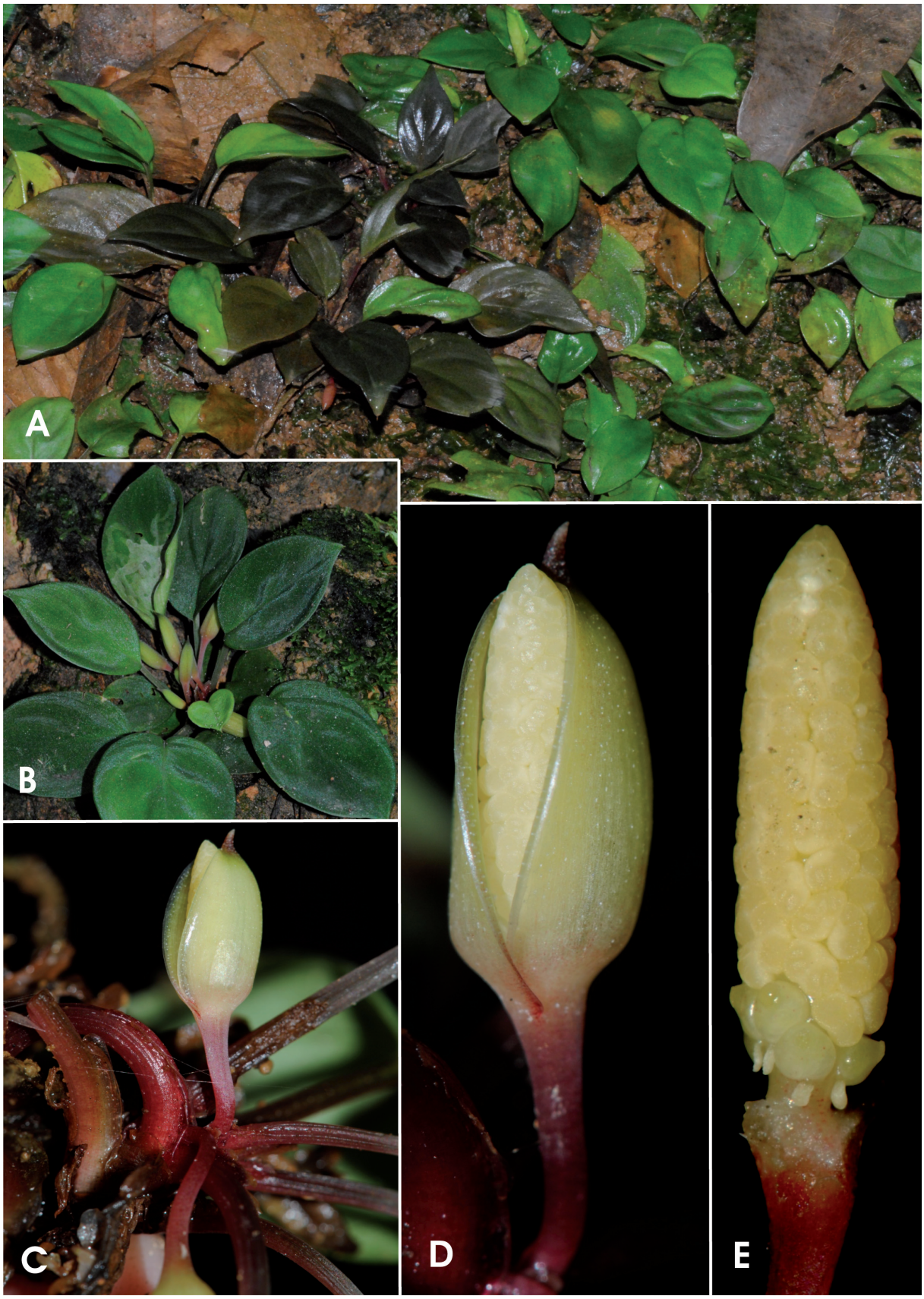

Fig. 4 – *Homalomena terajaensis* S.Y. Wong & P.C. Boyce. A. Population of the species showing a mixed different colour morphs: green and red. B. Whole plant. C & D. Pistillate anthesis. E. Spadix shown with spathe removed artificially.

NOTES: *Homalomena terajaensis* is placed in the Humilis Complex (see Kurniawan et al., 2011), distinguished by the distinct velvety nature of the upper surface of the leaf blade and petioles. *Homalomena terajaensis* is distinguishable by the single (or rarely with a second incomplete) row of pistillate flowers and teardrop-shaped, deflexed staminodes.

Pending a full taxonomic revision of the Humilis Complex, we are taking a pragmatic approach to dealing with apparent taxonomic novelties in order to provide a baseline framework from which to facilitate naming of locally distinctive entities. Fieldwork so far has reinforced our long-standing view that ecological distinctions within this complex are as taxonomically important as morphological ones.

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Summary: One new informal complex, Wongii complex is proposed in the Cyrtocladon Supergroup for Sundaic *Homalomena* (Araceae: Homalomeneae) and two new species are described, **Homalomena wongii** S.Y. Wong & P.C. Boyce and **Homalomena terajaensis** S.Y. Wong & P.C. Boyce. Defining characters are enumerated and illustrated, and keys to the complex and species provided.