

## **Studies on Homalomeneae (Araceae) of Borneo II: The *Homalomena* of Nanga Sumpa (Batang Ai) – Novel and Pre-existing Taxa, and Notes on Iban Usages**

P. C. BOYCE<sup>1</sup>, S. Y. WONG<sup>2</sup> AND FASIHUDDIN B. A.<sup>3</sup>

<sup>1</sup> Visiting Scientist, Pusat Pengajian Sains Kajihayat  
(School of Biological Sciences), Universiti Sains Malaysia  
1180 USM, Pulau Pinang, Malaysia  
Email: phymatarum@gmail.com

<sup>2</sup> Department of Plant Science & Environmental Ecology, Faculty of Resource  
Science & Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan,  
Sarawak, Malaysia

<sup>3</sup> Deputy Dean (Postgraduate & Research), Faculty of Resource  
Science & Technology, Universiti Malaysia Sarawak,  
94300 Kota Samarahan Sarawak, Malaysia

### **Abstract**

Fieldwork targeting indigenous *Homalomena* at Nanga Sumpa, part of the Batang Ai drainage system (Sri Aman Division, Sarawak) revealed 14 species of which six are novel and herewith described: *Homalomena atrox* P.C.Boyce, S.Y.Wong & Fasihuddin, *H. clandestina* P.C.Boyce, S.Y.Wong & Fasihuddin, *H. hanneae* P.C.Boyce, S.Y.Wong & Fasihuddin, *H. sengkenyang* P.C.Boyce, S.Y.Wong & Fasihuddin, *H. symplocarpifolia* P.C.Boyce, S.Y.Wong & Fasihuddin, and *H. vivens* P.C.Boyce, S.Y.Wong & Fasihuddin. Of the six *Homalomena* species present at Batang Ai for which there are pre-existing names, two, *H. borneensis* Ridl. & *H. humilis* (Jack) Hook.f., are species complexes still awaiting a full taxonomic and systematic investigation, and are treated here as morpho-taxa to which we apply the earliest applicable epithet. The remaining four species with available names have only recently been described: *H. geniculata* M.Hotta (1967); *H. vagans* P.C.Boyce (1994), and *H. josefii* P.C.Boyce & S.Y.Wong, and *H. pseudogeniculata* P.C.Boyce & S.Y.Wong (2008). Additionally, two further species located during fieldwork, that while unarguably novel based on their vegetative morphology, were not located as fertile plants and have yet to flower in cultivation; they are here treated as sp. nov. A & B. Of the 14 species present at Batang Ai, five have significance in the ethnobotany of the indigenous Iban people of the Ai drainage, and of these five, four are novel. A key to the *Homalomena* in the Batang Ai drainage area is given, and all species are illustrated.

## Introduction

As noted in the first of these papers (Boyce & Wong, 2008), *Homalomena* is the most abundant, speciose and conversely least well understood mesophytic aroid genus in tropical Asia. It is also now becoming the focus for pharmaceutical studies by virtue of the prevalence of uses amongst Malaysian indigenous peoples mainly due to the presence of aromatic compounds in almost all tissues.

That a taxonomic study is urgently required is no better exemplified than by the work of Hanna Christensen (Christensen, 2000) in which five *Homalomena* species are highlighted as having moderate to significant importance as plants utilized by the indigenous Iban community of Nanga Sumpa, Batang Ai, yet four of the five species are scientifically novel. These are among the novelties dealt with here in this preliminary account of *Homalomena* on the Ai drainage system.

Five of the species here newly described, namely, *H. clandestina* P.C.Boyce, S.Y.Wong & Fasihuddin, *H. hanneae* P.C.Boyce, S.Y.Wong & Fasihuddin, *H. sengkenyang* P.C.Boyce, S.Y.Wong & Fasihuddin, *H. symplocarpifolia* P.C.Boyce, S.Y.Wong & Fasihuddin & *H. vivens* P.C.Boyce, S.Y.Wong & Fasihuddin, belong in the informal Cyrtocladon supergroup, and one, *H. atrox* P.C.Boyce & S.Y.Wong, in the Chamaecladon supergroup (see Boyce & Wong, 2008).

## Usage among Iban indigenous people at Nanga Sumpa

Christensen (2000) listed 6 *Homalomena* utilized by the Iban community of Nanga Sumpa, although only one, *H. borneensis* (reported under the synonym *H. ovata* in Christensen, 2000) is identified to species. Four of the *Homalomena* utilized at Nanga Sumpa are known collectively by the Iban as “*kemuyang*”; a fifth (here described as *H. clandestina*) is called “*subung tilan*”, while a sixth species occurs wild with populations near the longhouse artificially managed, here described as *H. sengkenyang*, is called “*sengkenyang bakung*”.

The uses of the species known as *kemuyang* are rather generic (see below under each relative species), while *subung tilan* is used solely to flavour dishes such as fish. More interesting is the usages of the semi-managed *Homalomena* known as *sengkenyang bakung*, which is utilized as a protector of rice plants. Plants utilized for *sengkenyang* are enormously important to the Iban as they are believed to protect the rice plants against malevolent spirits and prevent the beneficial rice spirits from leaving the farm. Very few plants have the potential to be appointed to the status of *sengkenyang*.

This species is here described as *Homalomena sengkenyang* (see below).

### Key to the *Homalomena* of the Batang Ai drainage

1. Leaf lamina base\* truncate, cordate, or sagittate ..... 2
1. Leaf lamina base acute to decurrent ..... 6
2. Leaf base sagittate ..... 3
2. Leaf base truncate or cordate ..... 8
3. Pistils not associated with interpistillar staminodes ..... 12. *H. vivens*
3. Pistils associated with interpistillar staminodes ..... 4
4. Spadix producing copious amber resin droplets at anthesis; pistils apricot ..... 5. *H. hanneae*
4. Spadix not producing resin droplets at anthesis; pistils various colours but never apricot ..... 5
5. Medium plants not exceeding 50 cm tall and often only half this height; pistils bright green; stigma entire ..... 9. *H. sengkenyang*
5. Large plants often exceeding 1 m tall; pistils cream; stigma trisulcate ..... 7. *H. josefii*
6. Leaf lamina oblong, venation deeply impressed adaxially; spathe with a conspicuous dorsal median ridge; female and male flower zones equal in diameter; contiguous ..... 10. *H. symplocarpifolia*
6. Leaf lamina ovate to very weakly ovato-sagittate; venation not impressed; spathe without a ridge; female flower zone exceeding male zone in diameter ..... 7
7. Lamina abaxially glaucous; male flower zone more or less contiguous with the female flower zone, female flower zone stoutly fusiform; pistils densely arranged, not ascending, with stigmas coherent ..... 2. *H. borneensis*
7. Lamina not glaucous abaxially; male flower zone separated from the female flower zone by a brief naked interstice; female flower zone weakly fusiform; pistils somewhat lax, ascending, stigmas not coherent ..... 3. *H. clandestina*
8. Leaves in a strictly distichous arrangement ..... 4. *H. geniculata*
8. Leaves not so arranged ..... 9

9. Diminutive plants, microscopically puberulent, with a velvety or scintillating quality ..... 10
9. Larger plants, without a velvety or scintillating quality ..... 11
10. Leaf lamina oblong-lanceolate to oblanceolate laminae, long-decurrent; spadix sessile, top-most flowers sterile ..... 1. *H. atrox*
10. Leaf lamina oblong-ovato-sagittate, base shallowly cordate; spadix stipitate, fertile to the tip ..... 6. *H. humilis*
11. Facultative rheophytes, lamina l pendent on the petiole, lanceolate-elliptic 11-23.5 × 1.5-6 cm, infructescence with peduncle declinate and spathe ascending ..... 11. *H. vagans*
11. Terrestrial on slopes, lamina spreading, oblongo-lanceolate, sometimes oblongo-elliptic to ovate, 18-33 cm long × 6-15 cm wide ..... 8. *H. pseudogeniculata*

\*The leaf shape is based on leaves of mature, preferably flowering, shoots; juvenile *Homalomena* are virtually impossible to identify to species by leaf shape alone.

### Taxonomic part

1. *Homalomena atrox* P.C.Boyce, S.Y.Wong & Fasihuddin, *sp. nov.*

*Ab aliis specibus flumenicolis Borneensibus folliis et petiolis scintillans et spadice sessile cum antheris terminalis sterilis differt.* – **Typus:** Malaysia, Sarawak, Sri Aman Division, Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 12' 16.2"; 112° 03' 26.0", 24 May 2008, P.C.Boyce et al. AR-2375 (holo, SAR, + spirit). **Fig. 1.**

Diminutive, almost odourless evergreen microscopically pubescent **herbs** to ca 10 cm tall. **Stem** pleioanthic, erect to decumbent, ca 5 mm thick, dull red, internodes to ca 3 mm long. **Leaves** up to ca 6 together; petiole very shallowly channelled adaxially, rounded abaxially, sub-erect, up to 5 cm long, with a weak articulation ca 1/3 way along, microscopically asperate, matte dull reddish, drying dark brown; petiolar sheath to ca 3 cm long, over ½ of petiole length, sheath long-persistent, lower clasping part with undulate-bullate margins; lamina oblong-lanceolate to oblanceolate, 8-12 cm long × 2-3 cm wide, thinly and rather softly, glossy mid-green adaxially (fresh), drying pale olive green, abaxially pale and slightly refractive (fresh), drying pale brown, base cuneate-decurrent, posterior lobes absent, lamina tip acute, thence apiculate for ca 3.5 mm; midrib prominently rounded-raised abaxially, (fresh and dry), same colour as lamina, adaxially flush with or very slightly sunken

into lamina (fresh and dry), *ca* 1.5 mm wide, with *ca* 5 primary lateral veins on each side, diverging at 20°- 30° from the midrib, adaxially impressed (fresh), flush with lamina when dry, abaxially slightly raised (fresh and dry), joining a near the margin; interprimary veins *ca*  $\frac{3}{4}$  width of the primary lateral veins, alternating irregularly with primaries, posterior lobes each with 3-4 primary lateral veins; secondary venation rather obscure, striate; tertiary venation not visible, all veins running into a thickened intermarginal vein, this particularly conspicuous at the leaf tip, drying paler than the lamina. **Inflorescences** 1-2 together, erect at anthesis, later declinate; peduncle to *ca* 3 cm long  $\times$  *ca* 1 mm diam., matte dull red. **Spathe** 1-1.2 cm long, not constricted, matte dull red externally, shiny greenish red internally, with a terminal short mucro (*ca* 0.5 mm long), spathe opening at anthesis by inflation and thence a broad slit; lower spathe and spathe limb not obviously differentiated. **Spadix** 1-1.2 cm long  $\times$  0.30-0.35 cm diam., the uppermost portion sterile by the presence of 2-4 sterile male flowers, sessile; **female flower zone** 0.5 mm long; pistils somewhat distant, broadly ovoid, *ca* 1 mm tall  $\times$  0.8-0.9 mm diam. greenish whitish, stigma sessile to subsessile, disk-like, 0.3-0.4 mm diam.; each pistil with a single staminode situated on ventral side of the flower relative to the base of the spadix; interpistillar staminodes irregularly clavate, *ca* 0.2 mm long, white; suprapistillar interstice zone very short, less than 0.1 mm, naked, pale pink; **male flower zone** 10-12 mm long, apex acute; **male flowers** broadly dumbbell shaped, each consisting of two stamens, stamens rounded, *ca* 0.5 mm tall, 0.6-0.8 mm long  $\times$  *ca* 0.4 mm wide, ivory-white, anther thecae opening by a broad terminal slit. **Infructescence** declinate, dull red, peduncle matte dark red. **Fruits** and **seeds** not observed.

*Distribution:* Borneo. Sarawak, Sri Aman Division – endemic to riverine shales of the Batang Ai drainage system.

*Habitat:* Riverine forest on red soils overlying shale, plants exclusively on exposed shales, 80-150 m asl.

*Notes:* *Homalomena atrox* is immediately recognizable by the thinly soft-leathery, oblong-lanceolate to oblanceolate laminae with decurrent bases, and sessile spadix with the terminal portion sterile by the presence of 2-4 sterile flowers. In overall habit is vaguely reminiscent of *H. paucinervia* Ridl. (sandstones, Matang area) but is readily distinguished by the much softer textured leaves not slightly glaucous abaxially.

*Homalomena atrox* is often sympatric with riverside populations of *H. humilis sensu lat.*, but always grows nearer the water. It appears to be a facultative rheophyte, this view is further supported by the stenophyllous habit.

*Uses:* No recorded uses among the Iban communities at Batang Ai.

*Iban name:* None recorded.

*Etymology:* The specific epithet is from the Latin *atrox* – terrible – in gently chiding allusion to the taxonomic complexity of the Chamaecladon supergroup to which this remarkably distinctive new species belongs.

*Other specimens seen:* **SARAWAK. Sri Aman Division:** Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 11' 40.8"; 112° 04' 04.2", 28 Jul 2004, *P.C.Boyce et al. AR-1115* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Sungai Pedali, 01° 11' 58.9"; 112° 03' 27.0", 25 May 2008, *P.C.Boyce et al. AR-2389* (SAR).

2. *Homalomena borneensis* Ridl., J. Straits Branch Roy. Asiat. Soc. 44: 173 (1905). – **Typus:** Malaysia, Sarawak, Kuching, *Ridley* s.n. (holo, SING). **Fig. 2.**

Syn: *Homalomena ovata* Engl. *non* (Schott) Hook.f., Fl. Brit. Ind. 6: 536 (1893), *nom. illeg.*, based on Malaysia, Sarawak, Kuching Division, Matang, *Beccari* p.b. 1780.

Medium, rather robust strongly aromatic (mango-resin) evergreen glabrous **herbs** to *ca* 85 cm tall. **Stem** pleionanthic, erect, up to *ca* 3 cm thick, pale green, internodes to *ca* 1.5 cm long. **Leaves** up to *ca* 15 together, *ca* 5 per module; petiole weakly D-shaped in cross section, erect, 15-45 cm long, obscurely pulvinate *ca*  $\frac{2}{3}$  along length, pulvinus *ca* 2 cm long; petiole bases clasping, pale green, sometimes suffused reddish for the basal  $\frac{1}{4}$ , matte, drying medium brown, petiolar sheath *ca* 9-20 cm long, *ca*  $\frac{1}{3}$  of petiole length, equal, decurrent at apex, margin erect when fresh, margins membranous, pale green, persistent, occasionally slightly scarious on the oldest leaves, these oldest sheathes often red; lamina ovate to very weakly ovato-sagittate, 10-22 cm long  $\times$  9-15 cm wide, thinly leathery, pale green adaxially, drying medium olive-brown, abaxially slightly glaucous(fresh), drying glaucous pale brown, base subtruncate to very shallowly cordate, posterior lobes absent or very short, straight, if present the n ovato-triangular, 0.5-3 cm long, tip acute, acuminate for *ca* 1 cm thence tubular-apiculate for *ca* 2-3 mm; midrib raised abaxially (fresh and dry), glaucous green when fresh, adaxially sunken slightly into lamina, *ca* 3 mm wide, with *ca* 7-10 primary lateral veins on each side, diverging at 30°-70° from the midrib, adaxially impressed (fresh), flush with lamina when dry, abaxially slightly raised (fresh and dry), distal-most veins curved slightly towards the apex when near the margin, interprimary veins *ca*  $\frac{1}{4}$  width of the primary lateral veins,

alternating with primaries; secondary venation very obscure, striate; tertiary venation not visible, all veins running into a slightly thickened intermarginal vein, this often reddish-flushed. **Inflorescences** up to 6 together, erect and smelling of anise at anthesis, thence sinuous-declinate, each subtended by prophyll, to *ca* 10 cm long; peduncle to *ca* 15 cm long  $\times$  *ca* 3.5 mm diam., pale green. **Spathe** 9-11 cm long, tightly furled prior to anthesis, lower spathe inflating at female anthesis, spathe limb loosening at female anthesis, thence inflating and then opening wide, entire spathe white at anthesis; lower spathe ovoid-ellipsoid, equalling spathe limb, 5-6 cm long, constricted at the junction of the spathe limb, the constriction coinciding with junction of the male and female flower zones; spathe limb ovato-triangular, *ca* 5-6 cm long  $\times$  *ca.* 3.5 cm wide (at male anthesis), spathe limb margins recurving at male anthesis, apex mucronate to *ca* 5 mm long. **Spadix** subequalling the spathe, *ca* 9-10.5 cm long, stipitate; stipe *ca* 4 mm long  $\times$  3 mm diam., cylindrical, and inserted obliquely on peduncle, white, **female flower zone** *ca* 4.5 cm long  $\times$  *ca* 1 cm wide, *ca*  $\frac{1}{2}$  length of spadix, stoutly fusiform; pistils *ca* 1.3 mm  $\times$  0.75 mm, densely arranged, globose-cylindrical, white; stigma globose-capitate, slightly exceeding the ovary and coherent with its neighbours, staining deep brown in alcohol, each pistil associated with one interpistillar staminode; interpistillar staminodes clavate on a stout stipe *ca* 0.4 mm diameter, equalling or slightly overtopping the associated female flower waxy white; suprapistillar interstice zone  $\pm$  absent; **male flower zone** more-or-less contiguous with female flower zone but markedly narrower, to *ca* 5 cm long, *ca*  $\frac{1}{2}$  length of spadix, separated from female zone by the prominently truncate upper part of the latter, with the lowest portion of male flower zone comprised of sterile male flowers intergrading into a single row of staminodes intermixed, this zone separated from the remainder of the male flower zone by a distinct constriction; **male flowers** *ca* 3 mm  $\times$  2 mm trapezoid, comprising 3–5 truncate stamens, each overtopped by a large, flat connective. **Infructescence** declinate, spathe entirely persistent, pale green, somewhat glaucous, ripening mid-green, less often deep red, peduncle matte medium green. **Fruits** and **seeds** not observed.

*Distribution:* Borneo. Sarawak, widespread west of the Rejang valley. This species is recorded from scattered localities in Kalimantan Barat, Kalimantan Tengah & west Kalimantan Timur.

*Habitat:* Ever moist to slightly seasonal evergreen forest on sandstone or shale-derived clays with deep leaf litter. 30-600 m asl.

*Notes:* The leaf laminae almost always lacking posterior lobes, and pale green, rather matte adaxially and moderately to conspicuously glaucous

abaxially are diagnostic throughout Sarawak. The spathe limb shorter than the lower part of the spathe is shared with *H. borneensis*, *H. clandestina*, along with numerous undescribed species.

At Batang Ai *H. borneensis* may be confused with *H. clandestina*, with which it grows intermixed. *Homalomena borneensis* may be distinguished by the male flower zone being contiguous with the female flower zone (not separated by a naked interstice); the female flower zone being far more stoutly fusiform, with much more densely arranged pistils that are not ascending, and with coherent stigmas.

Sterile plants are immediately recognizable by the leaf lamina abaxially glaucous with the primary lateral venation much less pronounced.

*Homalomena ovata* Engl. non . (Schott) Hook.f., a *nom. illeg.*, based on a specimen from Matang, Kuching, is incontrovertibly the same as *H. borneensis*.

*Uses:* Used as an antidote to snakebites, scorpion stings, *etc.* The bitten area is kept in the smoke of the burning stems (reported as rhizomes) as long as the patient can stand it. The leaves are used in post-partem *petangas*, a herbal sauna. The rhizomes are also used to treat sick chickens by keeping them in the smoke from burning 'rhizomes' of this and other species. Traditionally burning rhizomes were also used to keep monkeys away from fields. The aromatic rhizome is used in perfume mixtures. The ripe fruit is edible, with a sourish taste.

*Iban name:* Kemuyang.

*Etymology:* "*Borneo + ensis*", referring to origins on the Sunda shelf island of Borneo.

*Otherspecimensseen:* **SARAWAK. Kuching Division:** Bau, Kampung Segong, Sungai Adis, 11 Mar 2004, *P.C.Boyce & Jeland ak Kisai AR-5.4* (SAR); Bau, Kampung Segong, Ulu Sungai Adis, Sungai Bronand, 4 May 2004, *Jeland ak Kisai & Jipom ak Tisai AR-45* (SAR); Matang, Maha Mariamman Temple, trail to Indian Temple, 2 Mar 2004, *P.C.Boyce & Jeland ak Kisai AR-227* (SAR); Bau, Kampung Jugan, 26 Mar 2004, *P.C.Boyce & Jeland ak Kisai AR-275* (SAR); Bau, Rieng Opui, 28 May 2004, *Jeland ak Kisai & Jipom ak Tisai AR-406* (SAR); Bau, Kampung Segong, Ulu Sungai Adis, 9 May 2004, *Jeland ak Kisai & Jipom ak Tisai AR-411.1* (SAR); Padawan, Subang, 7 Dec 2004, *M.Gibernau AR-830* (SAR); Krokong, Kampung Tringgus, 01° 15' 40.2"; 110° 05' 35.9", 19 Feb 2005, *P.C.Boyce et al. AR-991* (SAR); Bau, Kampung Segong, 01° 32' 00.9"; 110° 08' 58.8", 10 Aug-05, *P.C.Boyce et al. AR-1330* (SAR); Bau, Gunung Juita, 01° 23' 48.7"; 110° 08' 07.2", 28 Oct 2005,



*P.C.Boyce et al. AR-1497* (SAR); Padawan, Kampung Tubih, Labak Payang, 25 Jan 2006, *Simon Kutuh ak Paru AR-1674* (SAR); Matang, Kubah National Park, Waterfall Trail, 01°35' 40.2"; 110° 10'45.9", 28 July 2007, *P.C.Boyce et al. AR-2112* (SAR); Bau, Bongo Range, trail to Tegora Mine, 01° 19' 41.5"; 110° 09' 19.0", 8 Sep 2007, *P.C.Boyce et al. AR-2190* (SAR). **Samarahan Division:** Serian, Gunung Ampungan, 01° 09' 08.2"; 110° 37' 21.2", 11 Nov 2003, *P.C.Boyce & Jeland ak Kisai AR-5.2* (SAR), *AR-158* (SAR); Serian, Pichin, Umon Murut, Tiab Belanting, 01° 08' 03.7"; 110° 27' 00.3", 20 Aug 2004, *Simon Kutuh ak Paru AR-653* (SAR); *AR-654* (SAR); Serian, Pichin, Bung Biringan, 28 Oct 2004, *Simon Kutuh ak Paru AR-736* (SAR); Serian, Pichin, Gunung Kedadum, Sugun Kerang, 13 Nov 2004, *Simon Kutuh ak Paru AR-743* (SAR); Serian, Pichin, Utak Dibung, 8 Mar 05, *Simon Kutuh ak Paru AR-1022* (SAR); Serian, Pichin, Sungai Abu Sijo, 19 Mar 2005, *Simon Kutuh ak Paru AR-1110* (SAR); Serian, Pichin, Labak Singong, 8 Mar 2005, *Simon Kutuh ak Paru AR-1023* (SAR); Kuap, Pangkalan Kuap, 01° 26' 16.7"; 110° 22' 18.9", 25 Oct 2005, *P.C.Boyce et al. AR-1486* (SAR). **Sri Aman Division:** Lubok Antu, Batang Ai, Nanga Sumpa, 01° 12' 02.3"; 112° 03' 09.3", 27 Jul 2004, *P.C.Boyce et al. AR-544* (SAR); *AR-546* (SAR); Serian, Pichin, Kampung Bidak, 6 Mar 2006, *Simon Kutuh ak Paru AR-1718* (SAR); Serian, Pichin, Pakan Jilayau, 1 Apr 2006, *Simon Kutuh ak Paru AR-1758* (SAR); *AR-1800* (SAR); Serian, Pichin, Sungai Jarak, 25 Apr 2006, *Simon Kutuh ak Paru AR-1805* (SAR). Sarikei: Pakan, Binatang, Ulu Binatang, 02° 02' 30.1"; 111° 43' 34.4", 6 Dec 2005, *P.C.Boyce et al. AR-1571* (SAR); *AR-1572* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 12' 16.2"; 112° 03' 26.0", 24 May 2008, *P.C.Boyce et al. AR-2361* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Sungai Pedali, 01° 11' 58.9"; 112° 03' 27.0", 25 May 2008, *P.C.Boyce et al. AR-2386* (SAR).

3. *Homalomena clandestina* P.C.Boyce, S.Y.Wong & Fasihuddin, *sp. nov.*  
*Ab H. borneensis sed foliis foliis subtus non glaucis, venis lateralibus primariis abaxialiter plus prominentis, inflorescentia femina ab inforescentia mascula interstitio neutro separatus, pistillis sublaxis ascendens et stigmatem non confluentibus distinguenda. –Typus:* Malaysia, Sarawak, Sri Aman Division, Lubok Antu, Batang Ai, Nanga Sumpa, Sungai Pedali, 01° 11' 58.9"; 112° 03' 27.0", 25 May 2008, *P.C.Boyce et al. AR-2385* (holo, SAR, + spirit). **Fig. 3.**

Medium, strongly aromatic (bitter lime (limau-purut) peel) evergreen glabrous **herbs** to ca 75 cm tall. **Stem** pleionanthic, erect to ascending, ca 2.5 cm thick, medium green, internodes to ca 1 cm long. **Leaves** up to ca 10 together, ca 3-5 per module; petiole terete, erect, 30-32 cm long, obscurely pulvinate ca  $\frac{2}{3}$  along length, pulvinus ca 2 cm long; petiole bases clasping, petioles medium green, sometimes suffused reddish for the basal  $\frac{1}{4}$ ,

semi-glossy, drying dark brown; petiolar sheath *ca* 11-13 cm long, *ca*  $\frac{1}{3}$  of petiole length, equal, decurrent at apex, margin erect when fresh, margins persistent; lamina narrowly weakly ovato-sagittate, 16-20 cm long  $\times$  9-11 cm wide, thinly leathery, glossy dark green adaxially (fresh), drying medium olive-brown, abaxially pale green (fresh), drying medium brown, base shallowly cordate, posterior lobes short, straight, ovato-triangular, 1-3 cm long, apex acute, acuminate for *ca* 2 cm, thence tubular-apiculate for *ca* 2-3 mm; midrib raised abaxially (fresh and dry), green when fresh, drying reddish brown, adaxially sunken slightly into lamina, *ca* 2 mm wide, with *ca* 7-11 primary lateral veins on each side, diverging at 30°-80° from the midrib, adaxially impressed (fresh), flush with lamina when dry, abaxially slightly raised (fresh and dry), distal-most veins curved slightly towards the apex when near the margin, interprimary veins *ca*  $\frac{1}{2}$  width of the primary lateral veins, alternating irregularly with primaries; secondary venation very obscure, striate; tertiary venation not visible, all veins running into a slightly thickened intermarginal vein. **Inflorescences** up to 4 together, erect and smelling of anise at anthesis, thence declinate, each subtended by prophyll, to *ca* 14 cm long that soon degrades into fibres, peduncle to *ca* 18 cm long  $\times$  *ca* 2.5 mm diam., medium green. **Spathe** 9-10 cm long, tightly furled prior to anthesis, lower spathe inflating at female anthesis, spathe limb loosening at female anthesis, thence inflating and then opening wide, entire spathe white at anthesis; lower spathe ovoid-ellipsoid, 5-6 cm long, moderately constricted at the junction of the spathe limb, the constriction coinciding with junction of the male and female flower zones; spathe limb narrowly ovato-triangular, *ca* 5-6.5 cm long  $\times$  *ca.* 2 cm wide (at male anthesis), limb margins recurving at male anthesis, apex mucronate to *ca* 5 mm long. **Spadix** subequalling the spathe, *ca* 8.5-9.5 cm long, stipitate; stipe *ca* 3 mm long  $\times$  2 mm diam., cylindrical, and inserted obliquely on peduncle, white; **female flower zone** *ca* 4 cm long  $\times$  *ca* 1 cm wide, *ca*  $\frac{1}{2}$  length of spadix, weakly fusiform; pistils *ca* 1.3 mm  $\times$  0.75 mm, somewhat laxly arranged, globose-cylindric, directed upwards, white; stigma globose-capitate, slightly exceeding the ovary, dirty grey in nature, staining paler brown than ovary in alcohol, each pistil associated with one interpistillar staminode; interpistillar staminodes clavate on a very slender stipe *ca* 0.4 mm diameter, equalling or slightly overtopping the associated female flower, waxy white, suprapistillar interstice zone to *ca* 2 mm long  $\times$  2 mm wide, lower part with scattered pistils, these seemingly sterile (ovary slender cylindrical) and intermixed with a single row, and a few scattered staminodes each comprising a single or rarely 2 anthers, upper part of interstice naked; **male flower zone** to *ca* 5 cm long, *ca*  $\frac{2}{3}$  length of spadix, separated from naked part of interstice by a prominently truncate lower part, with the lowest portion comprised of fertile male flowers intergrading into a single row of staminodes intermixed

with one to several pistils, lowermost flowers fertile male, this lower part separated from the remainder by a weak constriction; **male flowers** ca 3 mm × 2 mm trapezoid, comprising 3 – 5 truncate stamens, each overtopped by a large, flat connective. **Infructescence** declinate, reddish, peduncle matte dark green. **Fruits** and **seeds** not observed.

*Distribution:* Borneo. Sarawak, Sri Aman Division – endemic & known only from the type.

*Habitat:* Terrestrial on shales in evermoist forest, 80 m asl.

*Notes:* Sterile plants resemble the widespread and abundant *H. borneensis* but are readily identifiable by the abaxial venation much more prominent, and the leaf laminae not abaxially glaucous. The spadix with a naked interstice, longer ( $ca^{2/3}$  spadix length) male flower zone truncate proximally with the lowermost male flowers intermixed with pistillodes, and the weakly fusiform female flower zone with somewhat laxly arranged pistils are diagnostic.

*Uses:* The sour-tasting leaves of *Homalomena clandestina* are utilized as flavouring, especially for fish.

*Iban name:* Subung tilan (Christensen, 2002: 283)

*Etymology:* From the Latin, *cladestinus*, hidden, in allusion to the fact that the authors initially overlooked this species due to its overall similarity to sympatric *H. borneensis*.

*Other specimen seen:* **SARAWAK. Sri Aman Division:** Lubok Antu, Batang Ai, Nanga Sumpa, Sungai Pedali, 01° 11' 58.9"; 112° 03' 27.0", 7 Apr 2005, P.C.Boyce et al. AR-1160 (SAR).

4. *Homalomena geniculata* M.Hotta, Acta Phytotax. Geobot. 22: 155 (1967). –**Typus:** Malaysia, Sarawak, Bintulu Division, vicinity of Minah camp, Hotta 15779 (holo, KYO!). **Fig. 4.**

Small, aromatic (mango/resin) evergreen glabrous solitary, rarely weakly clustering **herbs** to ca 35 cm tall. **Stem** pleionanthic, initially erect but soon spreading-decumbent with the active shoot tip weakly ascending, ca 1.5 cm thick, medium green, internodes to ca 1 cm long. **Leaves** up to ca 20 together, ca 3-5 per module but exact number obscured by the tightly distichous leaf bases; petiole terete, spreading, 5-22 cm long, strongly pulvinate at the lamina

insertion, pulvinus *ca* 1-1.5 cm long; petiole bases distichous-clasping, petioles medium green, sometimes suffused brownish-reddish basal, matte, petiolar sheath *ca* 2-12 cm long, *ca* ½ of petiole length, decurrent at apex, margin erect when fresh, persistent; lamina narrowly oblanceolate, 10-30 cm long × 2.5-7 cm wide, chartaceous, matte medium green adaxially (fresh), drying olive-brown, abaxially glaucous (fresh), drying glaucous-brownish, base acute, tip acute, acuminate for *ca* 2 cm thence tubular-apiculate for *ca* 3 mm; midrib raised abaxially (fresh and dry), adaxially sunken slightly into lamina, *ca* 1.5 mm wide, with *ca.* 5-11 primary lateral veins on each side, diverging at 30°-70° from the midrib, adaxially impressed (fresh), flush with lamina when dry, abaxially slightly raised (fresh and dry), distal-most veins curved slightly towards the apex when near the margin, interprimary veins *ca* ½ width of the primary lateral veins, alternating regularly with primaries; secondary venation obscure, striate; tertiary venation not visible, all veins running into a slightly thickened intermarginal vein. **Inflorescences** solitary, erect and smelling powerfully of anise at anthesis, declinate beneath the leaf fan soon after anthesis and there remaining until fruit dispersal, thence decomposing, subtended by a prophyll to *ca* 5 cm long, peduncle to 7-12 cm long × *ca* 2 mm diam., medium green. **Spathe** 7-8.5 cm long, tightly furled prior to anthesis, lower spathe inflating at female anthesis, spathe limb loosening at female anthesis, thence inflating and then opening wide, entire spathe white at anthesis; lower spathe ovoid-ellipsoid, 2.5-3 cm long, constricted at the junction of the spathe limb, the constriction coinciding with junction of the male and female flower zones; spathe limb narrowly ovato-triangular, *ca* 2-3 cm long × *ca.* 2 cm wide (at male anthesis), apex mucronate to *ca* 1.5 cm long. **Spadix** subequalling the spathe, *ca* 6-7 cm long, stipitate; stipe *ca* 3 mm long × 2 mm diam., cylindrical, inserted obliquely on peduncle, pale green; **female flower zone** *ca* 1.5-2.5 cm long × *ca* 0.5 cm wide, *ca* ⅓ length of spadix, fusiform; pistils *ca* 1.3 mm × 0.75 mm, without interpistillar staminodes, very densely arranged, cylindrical-globose; stigma discoid, slightly exceeding the ovary and coherent with adjacent stigmas; suprapistillar interstice zone to *ca* 4 mm long × 1.5 mm wide, entirely clothed with staminodes comprising 2 anthers and these intergrading with fertile stamens; **male flower zone** to *ca* 2.5-2.8 cm long, *ca* ½ length of spadix, the lowest portion comprised of fertile male flowers intergrading into a few rows of staminodes intermixed; **male flowers** *ca* 3 mm × 2 mm trapezoid, comprising 2-4 truncate stamens, each overtopped by a large, flat connective. **Infructescence** erect above the leaf fan, spathe entirely persistent, reddish at fruit maturity, peduncle matte dark green. **Fruits** pale green, exposed by the circumscissile splitting and tearing of the spathe; weakly fruit-smelling. **Seeds** ovoid, *ca* 1.5 mm long, dark-brown, longitudinally sulcate.

*Distribution:* Borneo. Sarawak, only known with certainty north and east of the Batang Lupar (but see below).

*Habitat:* Terrestrial on soils overlying shales & sandstones, usually on step to vertical banks with the plants projecting horizontally, 80-430 m asl.

*Notes:* The tightly distichous leaf arrangement, the habit on vertical or near vertical earth banks and the petioles prominently pulvinate at junction of the lamina make *H. geniculata* immediately recognizable. However, it appears that there are at least two species involved. As defined here true *H. geniculata* has leaf narrowly oblong leaf laminae that are pronouncedly glaucous abaxially occurs east of the Batang Lupar ('Lupar Divide') whereas plants with the leaves broadly oblongo-lanceolate and abaxially pale green and occurring in NW Sarawak (specifically on the Matang Range, Kuching Division) are referable to *H. crassinervia* Ridl. The status of *geniculata*-like plants from Kuching (excluding Matang) and Samarahan Divisions requires clarification. If these plants all prove to be conspecific, the name *H. crassinervia* has priority.

*Homalomena geniculata* is not utilized at Batang Ai, and no record exists for its utilization elsewhere in Sarawak.

*Uses:* None recorded.

*Iban name:* None recorded.

*Etymology:* Latin, *geniculatus*, 'kneed' in allusion to the conspicuous swelling (geniculum, or more accurately pulvinus) at the junction of the petiole and lamina.

*Other specimens seen:* **SARAWAK. Sri Aman Division:** Pantu, Gunung Gaharu, 01° 02' 39.5"; 110° 53' 18.3", 8 Aug 2004, *P.C.Boyce et al. AR-644* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Wong Ensalai, 01° 11' 51.0"; 112° 03' 39.9", 26 May 2008, *P.C.Boyce et al. AR-2424* (SAR). **Kapit Division:** Nanga Gaat, Rejang Wood Concession, Sungai Piat, 01° 38' 09.1"; 113° 24' 09.9", 14 Oct. 2003, *P.C.Boyce & Jeland ak Kisai AR-112.1* (SAR); Nanga Gaat, Rejang Wood Concession, stream below Camp Gahada, 01° 41' 49.4"; 113° 26' 16.3", 15 Oct 2003, *P.C.Boyce & Jeland ak Kisai AR-112.2* (SAR); Nanga Gaat, Rejang Wood Concession, km 65 road to Camp Gahada, 01° 42' 01.1"; 113° 31' 14.8", 12 May 2004, *P.C.Boyce et al. AR-319, AR-335 & AR-365* (SAR); Rejang Wood Concession, km 3.5 after heli-logging camp on road to Camp Gahada, Sungai Bereng, 01° 45' 36.0"; 113° 27' 54.7", 15 Dec 2004, *P.C.Boyce et al. AR-903* (SAR); Belaga, Belaga road,

02° 43' 45.8"; 113° 45' 37.1", 12 Oct 2005, *P.C.Boyce et al. AR-1424* (SAR). **Bintulu Division:** Bukit Satiam, 02° 58' 47.6"; 112° 56' 37.5", 10 Aug 2004, *P.C.Boyce & Jeland ak Kisai AR-579* (SAR); Bukit Satiam, 02° 59' 10.0"; 112° 55' 42.8", 14 Jul 2006, *P.C.Boyce et al. AR-1905* & 15 Jul 2006, *AR-1907* (SAR); Tatau, Bukit Sarang, Ulu Sungai Sarang, 13 Jul 2006, *Skornickova 144 sub. AR-2028* (SAR). **Limbang Division:** Mulu, Long Lama, Mulu N.P., Sungai Empangau, tributary from Sungai Mendalam, 04° 13' 41.6"; 114° 52' 50.5", 30 Sep 2007, *P.C.Boyce et al. AR-2250* (SAR).

5. *Homalomena hanneae* P.C.Boyce, S.Y.Wong & Fasihuddin, *sp. nov.*

*Ab aliis speciebus Homalomenae combination pistillis armeniacus et spadice resinifer per anthesin mascula unica est.* –**Typus:** Malaysia, Sarawak, Sri Aman Division, Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 12' 16.2"; 112° 03' 26.0", 24 May 2008, *P.C.Boyce et al. AR-2360* (holo, SAR,+ spirit). **Fig. 5.**

Medium, strongly aromatic (mango resin) evergreen glabrous **herbs** to *ca* 50 cm tall. **Stem** pleionanthic, erect to ascending, *ca* 3 cm thick, dull red, internodes to *ca* 1 cm long. **Leaves** up to *ca* 10 together, *ca* 3 per module; petiole sub-terete, erect, 30-35 cm long, obscurely pulvinate *ca*  $\frac{2}{3}$  along length, pulvinus *ca* 2 cm long; petiole bases clasping, petioles medium green, suffused deep red or red-brown for the basal  $\frac{1}{4}$ , semi-glossy, drying dark brown, **petiolar sheath** *ca* 6-10 cm long, *ca*  $\frac{1}{5}$  of petiole length, equal, decurrent at apex, margin erect when fresh, soon degrading, reddish to scarlet; lamina narrowly to rather broadly ovato-sagittate, 16-22 cm long  $\times$  9-16 cm wide, thinly leathery, glossy dark green adaxially (fresh), drying medium brown, abaxially pale green (fresh), drying medium brown, base hastato-cordate to cordate, posterior lobes short, straight, ovate to ovato-triangular, 3-5 cm long, tip acute, acuminate for *ca* 2 cm thence tubular-apiculate for *ca* 2-3 mm; midrib raised abaxially (fresh and dry), green when fresh, drying reddish brown, adaxially sunken slightly into lamina, *ca* 3 mm wide, with *ca* 7-11 primary lateral veins on each side, diverging at 30°-80° from the midrib, adaxially impressed (fresh), flush with lamina when dry, abaxially slightly raised (fresh and dry), distal-most veins curved slightly towards the apex when near the margin, interprimary veins *ca*  $\frac{1}{2}$  width of the primary lateral veins, alternating irregularly with primaries; secondary venation obscure, striate; tertiary venation not visible, all veins running into a slightly thickened intermarginal vein. **Inflorescences** up to 7 together, with additional synflorescences often arising after the next foliage leaf, thus plants with 20 or more inflorescences at various developmental stages not uncommon, erect and smelling powerfully of anise at anthesis, thence declinate, each subtended by prophyll, to *ca* 11 cm long; peduncle to *ca* 20

cm long  $\times$  ca 4 mm diam., pale creamy green. **Spathe** 10-14 cm long, tightly furred prior to anthesis, lower spathe inflating at female anthesis, spathe limb loosening at female anthesis, thence inflating and then opening wide, entire spathe white at anthesis; closing post anthesis and then turning pink and finally deep red; lower spathe ovoid-ellipsoid, about equalling the spathe limb in length, 5-7 cm long, moderately constricted at the junction of the spathe limb, the constriction coinciding with junction of the male and female flower zones; spathe limb ovato-triangular, ca 5-7 cm long  $\times$  ca 2.5 cm wide (at male anthesis), limb margins very slightly recurving at male anthesis, apex mucronate to ca 3 mm long. **Spadix** slightly exceeding the spathe, ca 8.5-9.5 cm long, briefly stipitate; stipe ca 3 mm long  $\times$  2 mm diam., gibbose-cylindrical, and inserted slightly obliquely on peduncle, pale yellow, **female flower zone** ca 5 cm long  $\times$  ca 1.5 cm wide, slightly less than ca  $\frac{1}{2}$  length of spadix, stoutly fusiform; pistils ca 1.8 mm  $\times$  0.9 mm, densely arranged, stoutly cylindrical, very pale apricot, each associated with a large staminode; stigma globose-capitate, slightly exceeding the ovary, very pale apricot, staining paler brown than ovary in alcohol, each pistil associated with one interpistillar staminode; interpistillar staminodes stoutly clavate on a slender stipe ca 0.4 mm diameter, equalling or slightly overtopping the associated female flower, waxy white; suprapistillar interstice zone almost absent, at most to ca 0.5 mm long, naked; **male flower zone** to ca 8 cm long, just exceeding ca  $\frac{1}{2}$  length of spadix, lowest portion comprised of a few sterile male flowers, producing large numerous amber-coloured resin droplets during late female and at onset of male anthesis; **male flowers** moderately well defined from one another, ca 3 mm  $\times$  2 mm trapezoid, comprising 3-5 truncate stamens, each overtopped by a large, flat connective, white. **Infructescence** declinate to pendent, spathe entirely persistent, matte deep red, peduncle deep green with darker green, short striae, matte. **Fruits** and **seeds** not observed.

*Distribution:* Borneo, Sarawak, Sri Aman Division – endemic to the Batang Ai drainage system.

*Habitat:* Terrestrial in deep leaf litter on red soils over shales, often on step banks above the river, 80-200 m asl.

*Notes:* *Homalomena hanneae* belongs to the large and taxonomically complex Cyrtocladon supergroup. Species have usually cordate leaf laminae and inflorescences with a distinct constriction between the lower spathe and spathe limb. The numerous species separate on subtle combinations of characters in the spathe and spadix that may or may not relate to morphological differences, and *vice versa*, linked to often highly localized distributions.

At Batang Ai *H. hanneae* is immediately identifiable by apricot-coloured pistils and the presence of copious amber-coloured resin droplets on the spadix at the onset of male anthesis. These droplets mix with the pollen to form a sticky paste that adheres readily to visiting insects, notably beetles of Scarabaeidae, and Chrysomelidae (*Dercetina* sp.) and is seemingly linked to pollination strategy. Similar resin-pollen pastes have been observed in Neotropical *Philodendron* (cf. Gottsberger and Amaral, 1984; Grayum, 1990; Mayo, 1991).

*Uses:* Used as an antidote to snakebites, scorpion stings, etc. The bitten area is kept in the smoke of the burning stems (reported as rhizomes) as long as the patient can stand it. The leaves are used in post-partem *petangas*, a herbal sauna. The rhizomes are also used to treat sick chickens by keeping them in the smoke from burning ‘rhizomes’ of this and other species. Traditionally burning rhizomes were also used to keep insect pest away from fields. The aromatic rhizome is used in perfume mixtures. The ripe fruit is edible, with a sourish taste.

*Iban name:* Kemuyang.

*Etymology:* Named for Hanne Christensen whose meticulous work on the ethnobotany of the indigenous peoples of Sarawak drew attention to the many new species yet to be described.

*Other specimens seen:* **SARAWAK. Sri Aman Division:** Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 11' 58.9"; 112° 03' 27.0", 28 Jul 2004, *P.C.Boyce et al.* AR-560 (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Wong Enseluai, 01° 11' 00.9"; 112° 04' 20.8", 6 Apr 2005, *P.C.Boyce et al.* AR-1137 (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Sungai Pedali, 01° 11' 58.9"; 112° 03' 27.0", 25 May 2008, *P.C.Boyce et al.* AR-2382 & AR-2406 (SAR, + spirit); Lubok Antu, Batang Ai, Nanga Sumpa, Wong Ensalai, 01° 11' 51.0"; 112° 03' 39.9", 26 May 2008, *P.C.Boyce et al.* AR-2408 (SAR, + spirit).

6. *Homalomena humilis* (Jack) Hook.f., Fl. Brit. India 6: 533 (1893). – **Typus:** Malaysia, Penang, *Wallich* (holo, K-W). **Fig. 6.**

Syn: *Calla humilis* Jack, Malayan Misc. 1(1): 22 (1820) – *Chamaecladon humile* (Jack) Miq., Fl. Ned. Ind. 3: 213 (1856).

Very small to small, very weakly aromatic (resin-like) peel, clumping, evergreen, microscopically puberulent **herbs** to ca 20 cm tall, but usually much less tall. **Stem** pleioanthic, erect to creeping, occasionally pendent under its



own weight, *ca* 4 mm thick, medium green to deep maroon, internodes to *ca* 4 mm long. **Leaves** up to *ca* 15 together, *ca* 5-7 per module; petiole sub-terete in cross section, erect to spreading, 5-15 cm long, obscurely pulvinate *ca*  $\frac{2}{3}$  along length, pulvinus *ca* 1 cm long; petiole bases weakly clasping, petioles bright to dark green, brownish pink, or deep maroon, drying dark brown; petiolar sheath *ca* 2-4 cm long, *ca*  $\frac{1}{3}$  of petiole length, equal, decurrent at apex, margin erect when fresh, margins persistent; lamina ovato-sagittate, 2-16 cm long  $\times$  1-9 cm wide, softly thinly leathery, scintillating bright to dark green, brownish pink or deep maroon adaxially (fresh), drying medium olive-brown, abaxially paler (fresh), drying medium brown, base shallowly cordate, posterior lobes short, straight, ovato-triangular 1-3 cm long, tip acute, acuminate for *ca* 2 mm thence tubular-apiculate for *ca* 2-3 mm; midrib raised abaxially (fresh and dry), same colour as lamina when fresh, drying reddish brown, adaxially sunken slightly into lamina, *ca* 2 mm wide, with *ca* 4-7 primary lateral veins on each side, these diverging at 30°-80° from the midrib, adaxially impressed (fresh), flush with lamina when dry, abaxially slightly raised (fresh and dry), distal-most veins curved slightly towards the apex when near the margin, interprimary veins *ca*  $\frac{1}{2}$  width of the primary lateral veins, alternating irregularly with primaries; secondary venation very obscure, striate; all veins running into a slightly thickened intermarginal vein. **Inflorescences** up to 10 together, erect and smelling slightly sour at anthesis, thence declinate, each subtended by small prophyll, to *ca* 2 cm long; peduncle to *ca* 4 cm long  $\times$  *ca* 1 mm diam., medium green, brownish pink, or deep maroon. **Spathe** *ca* 1 cm long, tapering-cylindrical, tightly furled prior to anthesis, gaping at female anthesis, then closing, *lower spathe* not differentiated from spathe limb, spathe narrowly ovato-triangular, *ca* 1 cm long  $\times$  *ca*. 5 mm wide (at male anthesis), margins recurving at male anthesis, apex mucronate to *ca* 1 mm long. **Spadix** exceeding the spathe at anthesis, *ca* 1.2 cm long, stipitate; stipe *ca* 0.5-2 mm long  $\times$  0.5 mm diam., cylindrical, and inserted obliquely on peduncle, pale green or pink, **female flower zone** *ca* 4 mm long  $\times$  *ca* 1 cm wide, *ca*  $\frac{1}{3}$  length of spadix, cylindrical; pistils *ca* 0.5 mm  $\times$  0.4 mm, loosely arranged, cylindrical-globose, pale green, brownish pink m, or pink; stigma globose-capitate, less than ovary diam., each pistil associated with one interpistillar staminode; interpistillar staminodes clavate on a slender stipe *ca* 0.1 mm diameter, shorter the associated female flower, **suprapistillar interstice zone** absent; **male flower zone** to *ca* 7 mm long, *ca*  $\frac{2}{3}$  length of spadix, with the lowest portion comprised of a very few sterile male flowers; **male flowers** *ca* 0.3 mm  $\times$  1 mm, dumbbell-shaped, comprising 1-2 truncate stamens, overtopped by a larger rounded connective. **Infructescence** declinate, spathe entirely persistent, reddish, peduncle matte dark green, brownish pink, or deep maroon. **Fruits** oblong-ovoid, pale green or tinged pinkish, *ca* 2  $\times$  1 mm. **Seeds** not observed.

*Distribution:* As defined here distributed from southern Peninsular Thailand throughout Peninsular Malaysia, and thence into Borneo, but see note below.

*Habitat:* Lowland to upper hill evergreen perhumid to everwet forest on a variety of substrates including limestone. Sometimes on bare limestone under forest. 10-700 m asl.

*Notes:* The taxonomy of *H. humilis* is chaotic and thus the full distribution is not clear. The small stature of the plants, their natural variability, and the small and fleeting nature of the inflorescences, coupled with over-dependence on dried specimens, has compounded an extremely unwieldy infraspecific classification, without a key and with labyrinthine synonymy proposed by Furtado [Gard. Bull. Straits Settlem. 10 (1939): 199], and including taxa at the levels of variety, subvariety and forma (some illegitimate). The synonymy given above intentionally omits all synonyms previously cited for *H. humilis* in, e.g., Hay *et al.* (1995), Govaerts & Frodin (2002), and Govaerts *et al.* (2009). The *humilis* complex requires an exhaustive study throughout its range.

*Uses:* No recorded uses among the Iban communities at Batang Ai.

*Iban name:* None recorded.

*Etymology:* Latin, *humilis* - low or low-growing, refers to the growth habit.

*Other specimens seen:* **SARAWAK. Kuching Division:** Bau, Gunung Juita, 01° 23' 48.7"; 110° 08' 07.2", *C.C.Lee AR-4.1* (SAR); Bau, Krokong, Gua Peri-peri, 01° 22' 51.9"; 110° 07' 09.3", 29 Oct 2003, *P.C.Boyce & Jeland ak Kisai AR-4.3*(SAR); Lundu, Gunung Gading, 01° 42'; 109° 50', 3 Mar 2004, *P.C.Boyce & Jeland ak Kisai AR-4.4* (SAR); Matang, Maha Mariamman Temple trail to Indian Temple, 2 Mar 2004 *P.C.Boyce & Jeland ak Kisai AR-4.5* (SAR); Padawan, Bukit Manok, 01° 12'; 110° 18', 18 Mar 2004, *P.C.Boyce, Jeland ak Kisai & A.Shafreena AR-4.6* (SAR); *AR-4.7* (SAR); Bau, Gunung Ti-Ton, 01° 23'; 110° 07', 17 Mar 2004, *P.C.Boyce & Jeland ak Kisai AR-4.8* (SAR); Bau, Jambusan, Kampung Seromah, 2 Apr 2004, *P.C.Boyce & Jeland ak Kisai AR-4.9* (SAR); Bau, Gunung Singai, 18 Apr 2004, *P.C.Boyce & Jeland ak Kisai AR-4.10* (SAR); Serian, 13th mile Kuching - Serian road, Bukit Quap, 01° 23' 44.6"; 110° 21' 10.6", 1 Sep 2004, *P.C.Boyce & Jeland ak Kisai AR-669* (SAR); Bau, Gunung Juita, 01° 23' 48.7"; 110° 08' 07.2", 18 Jun 2005, *P.C.Boyce & Jeland ak Kisai AR-1238* (SAR); Padawan, Kampung Sadir, 2 Feb 2006, *P.C.Boyce & Simon Kutuh ak Paru AR-1698* (SAR); Bau,

Kampung Stenggang, Sungai Topah, 25 Mar 2006, *P.C.Boyce & Jipom ak Tisai AR-1747* (SAR); AR-1748 (SAR); Lundu, Gunung Gadin, trail to Waterfall Trail above Batu Apek, 01° 41' 48.2"; 109° 50' 20.5", 14 Dec 2006, *P.C. Boyce et al. AR-2063* (SAR); Matang, Kubah National Park, Waterfall Trail, 01°35' 40.2"; 110° 10' 45.9", 8 Jul 2007, *P.C.Boyce et al. AR-2109* (SAR). **Samarahan Division:** Serian, Pichin, Enteng Sabung, 28 Feb 2005, *P.C.Boyce & Simon Kutuh ak Paru AR-1009* (SAR); AR-1010 (SAR); AR-1011 (SAR); Serian, Pichin, Bubung, Sungai Bomo, 23 Apr 2005, *P.C.Boyce & Simon Kutuh ak Paru AR-1176* (SAR); 5 May 2005, *P.C.Boyce & Simon Kutuh ak Paru AR-1186* (SAR); Serian, Pichin, Jalan Tahang Nodoi, 10 Jul 2005, *P.C.Boyce & Simon Kutuh ak Paru AR-1263* (SAR) AR-1264 (SAR); Serian, Pichin, Sungai Umpu Sabai, 12 Jul 2005, *P.C.Boyce & Simon Kutuh ak Paru AR-1265* (SAR); Serian, Pichin, Labu Sungai Tiyab, 26 Jul 2005, *P.C.Boyce & Simon Kutuh ak Paru AR-1294* (SAR); AR-1297 (SAR); Serian, Pichin, Gunung KedadumBubung Darud, 6 Aug 2005, *P.C.Boyce & Simon Kutuh ak Paru AR-1312* (SAR); Serian, Pichin, Ampan Balah, Dawu, 6 Aug 2005, *P.C.Boyce & Simon Kutuh ak Paru AR-1323* (SAR); Serian, Pichin, Sungai Kerasik, 15 Sep 2005, *P.C.Boyce & Simon Kutuh ak Paru AR-1382* (SAR); Serian, Pichin, Darud Tirimun, Tiab Lawak, 20 Oct 2005, *P.C.Boyce & Simon Kutuh ak Paru AR-1493* (SAR). **Sri Aman Divison:** Lubok Antu, Batang Ai, 01° 13' 18.0"; 112° 03' 21.2", 28 Jul 2004, *P.C.Boyce & Jipom ak Tisai AR-538* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 11' 40.8"; 112° 04' 04.2", 28 Jul 2004, *P.C.Boyce et al. AR-563* (SAR); AR-564 (SAR); 24 May 2008, *P.C.Boyce et al. AR-2372* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Sungai Pedali, 01° 11' 58.9"; 112° 03' 27.0" 25 May 2008, *P.C.Boyce et al. AR-2401*(SAR). **Bintulu Division:** Bukit Merairi, 02° 46' 26.9"; 113° 39' 19.8", *S.Julia & L.Chan-24 AR-1288* (SAR, SING); Bintulu, Bukit Satiam, 02° 59' 13.3"; 112° 55' 57.5", 14 Jul 2006 *P.C.Boyce et al. AR-1891* (SAR); Tatau, Bukit Sarang, Grand Perfect field station, path to Gua Lubang, Batu Rusa L-45, 12 Jul 2006, *J. Leong-Škorničková 106 (AR-2008)* (SAR, SING). **Sarikei Division:** Pakan, Berasok, 01° 54' 30.8"; 111° 38' 59.1", 06 Dec 2005, *P.C.Boyce et al. AR-1567*(SAR). **Miri Divison:** Niah Suai, Niah N.P., Madu Trail, 03°48' 57.9"; 113° 46' 18.3", 13 Jul 2006, *P.C.Boyce et al. AR-1886* (SAR); Marudi, Long Lama, Mulu N.P., trail from Clearwater Cave, 04° 03' 49.2"; 114° 49' 51.7", 8 Aug 2006, *P.C.Boyce et al. AR-1961* (SAR); Marudi, Long Lama, Mulu N.P., trail to Long Lansat, Sungai Licat, 04° 00' 03.5"; 114° 48' 49.8", 9 Aug 2006, *P.C.Boyce et al. AR-1978* (SAR). **Limbang Division:** Limbang, Nanga Medamit, Mulu N.P., Sungai Empangau, tributary from Sungai Mendalam, 04° 13' 41.6"; 114° 52' 50.5", 30 Sep 2007, *P.C.Boyce et al. AR-2245* (SAR); AR-2246 (SAR); Limbang, Nanga Medamit, Mulu N.P., Sungai Abun Kiri, tributary from Sungai Terikan, from the back of Mentawai Research Station,

04° 14' 07.4"; 114° 52' 27.6", 2 Oct 2007, *P.C.Boyce et al. AR-2295* (SAR); Limbang, Nanga Medamit, Mulu N.P., Melinau Gorge, 3 Oct 2007, *P.C.Boyce et al. AR-2318* (SAR). **INDONESIA. Kalimantan Barat:** Gunung Saran, 22 Nov 1999, *C.C.Lee AR-4.2* (SAR).

**7. *Homalomena josefii*** P.C.Boyce & S.Y.Wong, Gard. Bull. Singapore 60(1): 13 (2008). – **Typus:** Malaysia, Sarawak, Bintulu Division: Bukit Satiam, 02° 59' 10.0"; 112° 55' 42.8", 14 Jul 2006, *P.C.Boyce et al. AR-1894* (holo, SAR, + spirit). **Fig. 7.**

Medium to robust strongly aromatic (ginger/resin) evergreen glabrous **herbs** to ca 125 cm tall. **Stem** pleionanthic, erect to ascending, ca 5 cm thick, dark red to green, internodes to ca 1 cm long. **Leaves** up to ca 15 together, ca 5-7 per module; petiole terete, erect to decumbent, 50-70 cm long, petiole bases clasping, eventually falling to leave a conspicuous lunate scar, petioles matte dark reddish to matte green, dark reddish forms with longitudinal ridges, green forms always with pinkish red bases, drying dark brown; petiolar sheath ca 16-21 cm long, ca ¼ to ⅓ of petiole length, equal, sometimes unequal, broader side rounded at apex, narrower side, weakly decurrent at apex, margin always convolute when fresh, sometimes wide open with broader petiolar sheath, sheath initially long-persistent with the marginal 1.5 mm soon drying paler, eventually the whole sheath marcescent; lamina broadly ovato-sagittate, 25-45 cm long × 18-32 cm wide, thinly leathery, glossy dark to pale green adaxially (fresh), drying pale olive green, abaxially matte medium green (fresh), drying pale brown, base cordate, posterior lobes spreading, subtriangular 7-9 cm long, tip obtuse, short-acuminate for ca 1 cm thence stiffly apiculate for ca 2-7 mm; midrib raised abaxially (fresh and dry), green when fresh, drying reddish brown, adaxially flush with lamina, ca 1.5 mm wide, with 6-9 primary lateral veins on each side, diverging at 50°-90° from the midrib, adaxially impressed (fresh), flush with lamina when dry, abaxially slightly raised (fresh and dry), curved sharply towards the apex when near the margin, interprimary veins ca ½ width of the primary lateral veins, alternating irregularly with primaries, posterior lobes each with 3-4 primary lateral veins; secondary venation rather obscure, striate; tertiary venation not visible, all veins running into a thickened intermarginal vein, often red when fresh, this particularly conspicuous at the leaf tip and there drying paler than the lamina. **Inflorescences** 1-7 together, erect at anthesis, later declinate, each subtended by prophyll, to ca 9 cm long, followed by cataphyll, ca 2-8 cm long; peduncle to ca 15 cm long × ca 5 mm diam., matte deep red. **Spathe** 6.5-15.3 cm long, tightly furled prior to anthesis, lower spathe inflating at female anthesis, spathe limb loosening at female anthesis, thence inflating and then opening wide, lower spathe pale green, stained deep red at insertion of peduncle, flushed pink above, spathe limb

white at anthesis, with apex and mucro shading to dark pink during anthesis; lower spathe ovoid-ellipsoid, 2.5-6.5 cm long, moderately constricted at the junction of the spathe limb, the constriction coinciding with the lower-most fertile male flowers; spathe limb narrowly to broadly elliptic, *ca* 3.3-8.5 cm long  $\times$  2.3 cm wide (at male anthesis), prominently keeled along the dorsal midline, limb margins with the middle *ca* 2/3 reflexing slightly at male anthesis, apex mucronate to *ca* 3.5 mm long. **Spadix** equalling the spathe, *ca* 6-15.3 cm long, elongate cylindrical-fusiform, narrowing in the lower male zone coinciding with the constriction of the spathe and there intergrading with staminodes, stipitate; stipe *ca* 3.5 mm long  $\times$  5 mm diam., shortly fusiform, with a few staminodes present at the insertion of peduncle, similar to interpistillar staminodes; **female flower zone** *ca* 2 cm long  $\times$  *ca* 1.2 cm wide, *ca* 1/3 length of spadix, weakly fusiform; pistils *ca* 1.3 mm  $\times$  0.75 mm, densely arranged, globose-cylindric; **stigma** as broad or slightly exceeding the ovary, raised and weakly trisulcate, staining pale brown in alcohol, extending beyond the ovary as a translucent collar, lowermost flowers each mostly associated with two or more interpistillar staminodes, and seemingly sterile; interpistillar staminodes truncate on a very slender stipe *ca* 0.3 mm diameter equalling or slightly overtopping the associated female flower, a few pistillodes at the base of interstice, these of similar size to pistils; suprapistillar interstice zone, to *ca* 1 cm long  $\times$  5 mm wide, sometimes wider than female zone; suprapistillar staminodes each comprising a single anther; **male flower zone** to *ca* 4 cm long, *ca* 1/2 length of spadix, separated from interstice by weakly constricted lower part of male zone, clothed with fertile male flowers intergrading into a single row of staminodes., distal- and proximal-most flowers apparently sterile; **male flowers** *ca* 3 mm  $\times$  2 mm trapezoid, comprising 3-5 truncate stamens, each overtopped by a large, flat connective, terminal-most flowers sterile and spadix often topped with a vestigial naked appendix. **Infructescence** declinate, spathe entirely persistent, pale green stained reddish pink, sometimes whole reddish pink, peduncle matte dark red, matte. **Fruits** and **seeds** not observed.

*Distribution:* Borneo. In Sarawak endemic to Bintulu & Sri Aman Divisions.

*Habitat:* Terrestrial on shales and seasonally inundated alluvium, 7-200 m asl.

*Notes:* This is a new Division record, hitherto known only from Bintulu Division. *Homalomena josefii* is rare at Batang Ai, with only single small population so far located. It is by far the largest *Homalomena* species present, often exceeding 1m tall and with a stem up to 5 cm thick. The spathe is keeled along the dorsal median line much as in the much smaller

*H. symplocarpifolia* described elsewhere in this paper, aside from the much greater size and ovato-sagittate leaves, *H. josefii* also differs by the weakly trisulcate stigma.

*Uses:* No recorded uses among the Iban communities at Batang Ai.

*Iban name:* None recorded.

*Etymology:* Named for Dr Josef Bogner (formerly of Botanischer Garten München, Germany), one of the foremost experts on the aroids and perhaps the only person to have seen all currently recognized aroid genera in the field.

*Other specimens seen:* **SARAWAK. Sri Aman Division:** Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 11' 58.9"; 112° 03' 27.0", 28 July 2004, *P.C.Boyce et al. AR-559* (SAR). **Bintulu Divison:** Bukit Satiam, 02° 59' 13.3"; 112° 55' 57.5", 14 Jul. 2006, *P.C.Boyce et al. AR-1900* (SAR, + spirit); Bukit Satiam, 02° 59' 07.4"; 112° 55' 47.0", 15 Jul. 2006, *P.C.Boyce et al. AR-1908* (SAR, + spirit); Bintulu, road to Kampung Jepak, ca 3.3 km after bridge over Batang Kemena en route to Sibul from Bintulu, 03° 08' 32.3"; 113° 03' 24.3", 15 Jul. 2006, *P.C.Boyce et al. AR-1911* (SAR, + spirit).

8. *Homalomena pseudogeniculata* P.C.Boyce & S.Y.Wong, Gard. Bull. Singapore 60(1): 17 (2008). – **Typus:** Malaysia, Sarawak, Sarikei Division, Ulu Sarikei, 01° 55' 05.4"; 111° 29' 35.8", 7 Dec 2005, *P.C.Boyce et al. AR-1583* (holo, SAR). **Fig. 8.**

Medium to moderately robust, strongly aromatic (pine resin) evergreen glabrous **herbs** to ca 50 cm tall. **Stem** pleionanthic, decumbent with apex erect, frequently creeping for several metres and branching laterally while still continuing a physiognomically unbranched primary axis, stem green, internodes to ca 1 cm long. **Leaves** ca 8-12 together, ca 5 per module, each module subtended by prophyll, up to ca 12 cm long; petiole terete, erect to decumbent, up to ca 30 cm long, pulvinate apically, distance ca 3-13 cm from lamina base, roots penetrating petiole bases, petioles matte green when fresh, drying light brown; petiolar sheath to ca 14 cm long, ca ½ of petiole length, sheath convolute, initially persistent, eventually the whole sheath marcescent; lamina oblongo-lanceolate, sometimes oblongo-elliptic to ovate, 18-33 cm long × 6-15 cm wide, rather thinly coriaceous, matte mid-green adaxially, sometime the mid-rib paler (fresh), drying pale olive green, abaxially matte pale green, sometimes with conspicuous pellucid

dots when fresh, very occasionally red (fresh), drying pale brown, base decurrent to truncate, tip obtuse, acuminate for *ca* 2 cm thence apiculate to *ca* 9 mm; midrib raised abaxially (fresh and dry), drying straw-coloured, adaxially flush with lamina, but slightly channelled towards the leaf base, *ca* 2.5 mm wide, with 6-9 primary lateral veins on each side, diverging at 45°-55° from the midrib, adaxially impressed (fresh), flush with lamina when dry, abaxially slightly raised (fresh and dry), curved towards the apex when near the margin, interprimary veins *ca* ½ width of the primary lateral veins, alternating irregularly with primaries, secondary venation rather obscure, striate; tertiary venation not visible, all veins drying in intermittent raised and flush strips especially when near to leaf margin, all veins running into intermarginal vein. **Inflorescences** 1-5 together, erect, each subtended by a prophyll up to *ca* 6.2 cm long; peduncle to *ca* 12-15 cm long × 1.5-1.6 cm diam., yellowish green. **Spathe** *ca* 10.6 cm long, tightly furled prior to anthesis, loosening at female anthesis and yet further at male anthesis, lower spathe yellowish green to white at maturity, spathe limb white prior to and at anthesis, with apex and mucro pale green at anthesis; lower spathe narrowly ellipsoid, *ca* 3.5 cm long, weakly constricted at the junction of the spathe limb, the constriction coinciding with the lower-most fertile male flowers; spathe limb narrowly lanceolate, *ca* 7 cm long, mucronate to *ca* 7 mm long. **Spadix** shorter than the spathe, *ca* 8.3 cm long, stipitate; stipe *ca* 4.5 mm long, weakly dorso-ventrally flattened, obliquely inserted on peduncle; **female flower zone** *ca* 2.2 cm long × 6.5 mm wide, *ca* ¼ length of spadix, weakly fusiform; pistils densely arranged, *ca* 1.3 mm diam. × 1 mm tall, round-cylindrical, lower-most pistils *ca* twice the size of fertile females, stigma exceeding the ovary, coherent to adjacent stigma, slightly raised, staminodes absent at the base of insertion, pistils with no associated interpistillar staminode, suprapistillar interstice zone wider than the other zones; staminodes truncate, *ca* 1.5 mm wide, slightly overtopping the pistils, **male flower zone** *ca* 4.8 cm long × 5.2 mm wide, *ca* ½ length of spadix, cylindrical, tapering to a sharp end, narrowing in the lower part coinciding with the constriction of the spathe, distal- and proximal-most flowers apparently sterile; **male flowers** *ca* 3 mm × 1.6 mm trapezoid comprising (3) 4-7 truncate stamens overtopped by a large connective, seemingly fertile to the tip. **Infructescence** declinate, spathe entirely persistent, lower spathe dark red, limb green, peduncle green. **Fruits and seeds** not observed.

*Distribution:* A Bornean endemic: Sarawak, Kuching, Sarikei, Sri Aman, Kapit and Miri Divisions; and Brunei.

*Habitat:* Terrestrial mostly under full shade in deep soil on various substrates, frequently on shales, rarely on granite. 62-600 m asl.

*Notes:* *Homalomena pseudogeniculata* is distinctive by its pulvinate petioles and remarkable decumbent-creeping stem giving rise to short leafy side shoots while maintaining a primary axis. Plants frequently occur growing down steep forested slopes giving the impression of several individual plants in a row but on investigation revealing a single creeping stem/rhizome with numerous short lateral branches.

The other currently recognized species with geniculate (pulvinate) petioles is the Sumateran endemic *H. elegantula* A.Hay, which differs from *H. pseudogeniculata*, among other characters, by hapaxanthic shoots, overall much smaller and less robust habit, and smaller (1 cm long) spathes with only a very weak constriction between the limb and lower part.

*Uses:* No recorded uses among the Iban communities at Batang Ai.

*Iban name:* None recorded.

*Etymology:* The specific epithet is coined from the superficial similarity of the leaves of this species to *H. geniculata* – hence *pseudo* – false.

*Other specimens seen:* **SARAWAK. Kuching Division:** Lundu, Gunung Gading, trail to Waterfall, trail above Batu Apek, 01° 41' 48.2"; 109° 50' 20.5", 14 Dec 2006, *P.C. Boyce et al. AR-2064* (SAR). **Kapit Division:** Nanga Gaat, Rejang Wood Concession, stream below Camp Gahada, 01° 41' 49.4"; 113° 26' 16.3", 15 Oct 2003, *P.C. Boyce & Jeland ak Kisai AR-141.1* (SAR); Nanga Gaat, Rejang Wood Concession, km 65 road to Camp Gahada, 01° 42' 01.1"; 113° 31' 14.8", 12 May 2004, *P.C. Boyce et al. AR-363* (SAR); Nanga Gaat, Rejang Wood Concession, km 55 road to Camp Gahada, 01° 44' 44.5"; 113° 28' 32.3", 13 May 2004, *P.C. Boyce et al. AR-385* (SAR); Nanga Gaat, Rejang Wood Concession, trail to water catchment behind main camp, 01° 53' 00.2"; 113° 26' 53.9", 14 Dec 2004, *P.C. Boyce et al. AR-882* (SAR); Nanga Gaat, Rejang Wood Concession, km 65 road to Camp Gahada, 01° 41' 59.7"; 113° 31' 13.7", 16 Dec 2004, *P.C. Boyce et al. AR-907* (SAR); Pelagus, Pelagus Rapids, Woodpecker Trail, 02° 11' 15.1"; 113° 03' 29.01", 14 Mar. 2005, *P.C. Boyce et al. AR-1034* (SAR); Belaga, Belaga road, 02° 43' 45.8"; 113° 45' 37.1", 12 Oct 2005, *P.C. Boyce et al. AR-1455* (SAR); Belaga, Belaga road, 02° 42' 55.9"; 113° 45' 29.3", 12 Oct 2005, *P.C. Boyce et al. AR-1457* (SAR); Belaga, Belaga road, 02° 42' 55.9"; 113° 45' 29.3", 12 Oct 2005, *P.C. Boyce et al. AR-1461* (SAR + spirit); Belaga, km 10 Bakun, Bintulu-Miri road junction, 02° 50' 51.7"; 114° 01' 57.6", 11 Oct 2005, *P.C. Boyce et al. AR-1481* (SAR, + spirit). **Miri Division:** Mulu, Long Lama, Mulu National Park, trail to Gunung Mulu Summit, 04° 02' 18.7"; 114° 49' 44.2", 7 Aug 2006, *P.C. Boyce et al. AR-1955* (SAR); Mulu National Park, trail to Long Lansat, Sungai Licat, 04° 00' 03.5";



114° 48' 49.8", 9 Aug 2006, *P.C.Boyce et al. AR-1985* (SAR); Miri, Marudi, Sungai Silat Basin, Sungai Palutan, 02° 49.59'; 115° 00.30', 25 Mar 2003, *Lim S.P. S.90424* (SAR). **Limbang Division:** Limbang, Nanga Medamit, Mulu National Park, trail from Camp 5 to Kuala Terikan, 04° 12' 58.0"; 114° 53' 20.1", 29 Sep 2007, *P.C.Boyce et al. AR-2237* (SAR). **BRUNEI. Temburong District:** Sungai Temburong at Kuala Belalong, banks of Sungai Belalong. 4° 32', 225° 9', 24 Jun 1989, *P.C. Boyce 431* (BRUN, K, L).

9. *Homalomena sengkenyang* P.C.Boyce, S.Y.Wong & Fasihuddin, *sp. nov.*

*Per pistillis viride clarus* Homalomena sengkenyang *mirabilis est.* – **Typus:** Malaysia. Sarawak, Sri Aman, Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, 01° 12' 16.2"; 112° 03' 26.0", 24 May 2008, *P.C.Boyce et al. AR-2362* (holo, SAR + spirit). **Fig. 9.**

Medium, strongly aromatic (juniperus/mango resin) evergreen glabrous weakly clumping **herbs** to *ca* 50 cm tall. **Stem** pleioanthic, erect to ascending, *ca* 2.5 cm thick, pale green, internodes to *ca* 2 cm long. **Leaves** up to *ca* 7 together, *ca* 3-4 per module; petiole terete, erect, 25-30 cm long, obscurely pulvinate *ca*  $\frac{2}{3}$  along length, pulvinus *ca* 2.5 cm long, petiole bases clasping, petioles medium matte green, suffused reddish from the pulvinus to the lamina insertion in moist plants, slightly glossy, drying brown; petiolar sheath *ca* 19-13 cm long, *ca*  $\frac{1}{3}$  of petiole length, slightly unequal, decurrent at apex, margin erect when fresh, margins soon scarious, brown, remainder of the sheath remaining medium green; lamina narrowly ovato-sagittate, 10-22 cm long  $\times$  5-13 cm wide, thinly leathery, glossy dark green adaxially (fresh) with scattered darker glands (extrafloral nectaries?), drying medium olive-brown, abaxially pale green (fresh), drying medium brown, base shallowly and narrowly, cordate, posterior lobes short, straight, ovato-triangular 1-3 cm long, tip acute, acuminate for *ca* 2 cm thence tubular-apiculate for *ca* 3-5 mm; midrib raised abaxially (fresh and dry), green when fresh, drying reddish brown, adaxially sunken slightly into lamina, *ca* 2 mm wide, with *ca* 7-9 primary lateral veins on each side, diverging at 30°-80° from the midrib, adaxially deeply impressed, giving a weakly quilted effect (fresh), almost flush with lamina when dry, abaxially slightly raised (fresh and dry), distal-most veins curved slightly towards the apex when near the margin, interprimary veins *ca*  $\frac{1}{2}$  width of the primary lateral veins, alternating irregularly with primaries; secondary venation very obscure, striate; tertiary venation not visible, all veins running into a slightly thickened intermarginal vein. **Inflorescences** up to 3 together, erect and smelling powerfully of anise at anthesis, thence declinate, each subtended by prophyll, to *ca* 14 cm long soon marcescent, peduncle to *ca* 13 cm long  $\times$  *ca* 3 mm diam., matte pinkish

brown. **Spathe** 9-10 cm long, tightly furled prior to anthesis, lower spathe inflating at female anthesis, spathe limb loosening at female anthesis, thence inflating and then opening wide, entire spathe white at anthesis; lower spathe ovoid-ellipsoid, 3-3.5 cm long, constricted at the junction of the spathe limb, the constriction coinciding with junction of the male and female flower zones; spathe limb narrowly ovato-triangular, *ca* 7-6.5 cm long  $\times$  *ca*. 2.5 cm wide (at male anthesis), apex mucronate to *ca* 4 mm long. **Spadix** subequalling the spathe, *ca* 9-9.5 cm long, stipitate; stipe *ca* 3 mm long  $\times$  2 mm diam., weakly obconical, glossy pale green; **female flower zone** *ca* 3 cm long  $\times$  *ca* 1 cm wide, *ca*  $\frac{1}{3}$  length of spadix, fusiform; pistils *ca* 1.5 mm  $\times$  0.75 mm, densely arranged, globose, bright green; stigma capitate, slightly exceeding the ovary, pale green, staining brown and darker than ovary in alcohol, each pistil associated with one interpistillar staminode; interpistillar staminodes clavate on a slender stipe *ca* 1 mm diameter, overtopping the associated female flower, waxy white, suprapistillar interstice zone to *ca* 1 cm long  $\times$  1 cm wide, contiguous with and equalling diam. of female flower zone, covered with large scattered staminodes, these intergrading to the lowermost fertile flowers of the male flower zone; **male flower zone** to *ca* 5 cm long, *ca*  $\frac{1}{3}$  length of spadix; **male flowers** *ca* 3 mm  $\times$  3 mm trapezoid, comprising 3-5 truncate stamens, each overtopped by a large, flat connective. **Infructescence** declinate, spathe entirely persistent, pinkish to reddish, peduncle matte dark green flushed and stained dull red and with paler conspicuous longitudinal striate, these particularly prominent on the distal-most portion. **Fruits** and **seeds** not observed.

*Distribution:* Borneo. Sarawak: Sri Aman Division – endemic to the Batang Ai drainage system.

*Habitat:* Terrestrial in deep leaf litter on red soils over shales, often on step banks above the river, 80-165 m asl.

*Notes:* A common species at Batang Ai with extensive colonies in the forest and also in areas close to the longhouses, in which areas the plants are maintained artificially.

*Homalomena sengkenyang* is immediately identifiable by the bright green pistils, a character hitherto never reported for *Homalomena*.

*Uses:* This is by far the most important aroid utilized at Batang Ai, with the status of *sengkenyang bakung*, plants of which are utilized as a protector of rice plants. Plants utilized for *sengkenyang* are enormously important to the Iban, as they are believed to protect the rice plants against malevolent spirits and prevent the beneficial rice spirits from leaving the farm. Very few

plants have the potential to be appointed to the status of *sengkenyang*.

*Iban name:* Sengkenyang bakung.

*Etymology:* The species epithet is derived from the Iban *sengkenyang*.

*Other specimens seen:* **SARAWAK. Sri Aman Divison:** Lubok Antu, Batang Ai, Nanga Sumpa, 01° 12' 02.3"; 112° 03' 09.3", 27 Jul 2004, *P.C.Boyce et al. AR-547* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, 01° 12' 07.6"; 112° 02' 51.2", 27 Jul 2004, *P.C.Boyce et al. AR-548* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Sungai Pedali, 01° 11' 58.9"; 112° 03' 27.0", 25 May 2008, *P.C.Boyce et al. AR-2381, AR-2387, AR-2388 & AR-2403* (SAR,+ spirit).

10. ***Homalomena symplocarpiifolia*** P.C.Boyce, S.Y.Wong & Fasihuddin, *sp. nov.*

*Species notabilis ab combinatio foliis oblongo et spathe exterior cum carina longitudinalis dorsalis. Ab spathe inferior cum lamina spathae equalis H. borneensis simillima est sed folis oblongo et inflorescentiae mascula et feminae eadem diametro differt. – Typus:* Malaysia. Sarawak, Sri Aman, Lubok Antu, Batang Ai, Nanga Sumpa, Wong Ensalai, 01° 11' 51.0"; 112° 03' 39.9", 26 May 2008, *P.C.Boyce et al. AR-2411* (holo, SAR, + spirit). **Fig. 10.**

Robust, very strongly aromatic (pinene) evergreen glabrous **herbs** to ca 50 cm tall. **Stem** pleioanthic, erect, ca 3 cm thick, glossy medium green, internodes to ca 1 cm long. **Leaves** up to ca 5 together, ca 3-5 per module; petiole weakly D-shaped in cross section, spreading, 20-30 cm long, stoutly pulvinate ca  $\frac{2}{3}$  along length, pulvinus ca 1.5 cm long; petiole bases loosely clasping, medium green, semi-glossy, drying almost black; petiolar sheath ca 8-10 cm long, less than  $\frac{1}{3}$  of petiole length, equal, weakly auriculate at apex, margin strongly incurved, persistent, open; lamina oblong, 10-20 cm long  $\times$  9-12 cm wide, leathery, glossy medium green adaxially (fresh), drying medium olive-brown, abaxially pale (fresh), drying medium brown, base very shallowly cordate, posterior lobes almost absent, tip blunt, very briefly tubular-apiculate for ca 2-3 mm; midrib raised abaxially (fresh and dry), green when fresh, drying reddish brown, adaxially sunken slightly into lamina, ca 4 mm wide, with ca 8-10 primary lateral veins on each side, these diverging at 30°-80° from the midrib, adaxially impressed (fresh), abaxially slightly raised (fresh and dry), distal-most veins curved slightly towards the apex when near the margin, interprimary veins ca  $\frac{1}{2}$  width of the primary lateral veins, alternating with primaries; secondary venation very obscure, striate; tertiary venation not visible, all veins running into a slightly thickened intermarginal

vein. **Inflorescences** up to 4 together, erect and smelling of overripe banana/anise at anthesis, thence declinate, each subtended by somewhat persistent prophyll, to *ca* 10 cm long, peduncle to *ca* 10 cm long  $\times$  *ca* 3 mm diam., glossy green. **Spathe** 7-9 cm long, tightly furled prior to anthesis, lower spathe inflating at female anthesis, spathe limb loosening at female anthesis, thence inflating and then opening moderately wide, entire spathe white at anthesis; lower spathe narrowly ovoid-ellipsoid, 4-5 cm long, the dorsal side often with a pronounced ridge, moderately constricted at the junction of the spathe limb, the constriction coinciding with junction of the male and female flower zones; spathe limb narrowly ovato-triangular, *ca* 3-4 cm long  $\times$  *ca* 2 cm wide (at male anthesis), limb margins incurved at male anthesis, apex mucronate to *ca* 3 mm long. **Spadix** subequalling the spathe, *ca* 8.5-9 cm long, stipitate; stipe *ca* 5 mm long  $\times$  4 mm diam., cylindrical, and inserted obliquely on peduncle and spadix, **female flower zone** *ca* 2.4 cm long  $\times$  *ca* 1 cm wide, somewhat isodiametric, *ca*  $\frac{1}{3}$  length of spadix, weakly conical cylindrical, basally oblique; pistils *ca* 1 mm  $\times$  0.75 mm, densely arranged, globose-cylindrical; stigma globose-capitate, slightly exceeding the ovary, greyish at anthesis, staining deep brown in alcohol, most pistils associated with one interpistillar staminode; interpistillar staminodes stoutly clavate on a slender stipe *ca* 0.6 mm diameter, equalling the associated female flower; suprapistillar interstice zone contiguous with female and male flower zones and almost indistinguishable from male flower zone, to *ca* 5 mm long  $\times$  1 cm wide, covered with scattered staminodes each comprising a single or rarely 3 anthers; **male flower zone** to *ca* 5 cm long, *ca*  $\frac{2}{3}$  length of spadix, the lowest portion comprised of sterile male flowers intergrading with staminodes; **male flowers** *ca* 3  $\times$  2 mm regularly trapezoid, comprising 3-4 truncate stamens, each overtopped by a large, flat connective. **Infructescence** declinate, pale pinkish red, peduncle glossy medium green. **Fruits** and **seeds** not observed.

*Distribution:* Borneo. Sarawak: Sri Aman Division – endemic to the Batang Ai drainage system.

*Habitat:* Terrestrial in deep litter on red soils on seasonally inundated alluvium and shale mud banks mostly in riverine forest. 100 m asl.

*Notes:* A highly distinctive species by virtue of the almost oblong leaves and conspicuously longitudinally dorsally ridged lower spathe. The lower spathe exceeding the spathe limb is a character shared with *H. borneensis*, from which *H. symplocarpifolia* is readily distinguished by leaf shape.

*Uses:* Same as in *Homalomena hanneae* as an antidote to snakebites, scorpion stings, etc.

*Iban name:* Kemuyang.

*Etymology:* The trivial epithet is based on the lamina shape which in outline and general, but not detailed, venation much resembles that of *Symplocarpus foetida* Salisb. (Araceae: Orontoideae).

11. *Homalomena vagans* P.C.Boyce, Kew Bull. 49(4): 799 (1994). – **Typus:** Brunei. Temburong; Batu Apoi Forest Reserve, Sungai Belalong, steep bank near river, 4° 33' N, 115° 9' E, 14 Mar 1992, Poulsen & Motte 273 (holo, AAU; iso, BRUN, K). **Fig. 11.**

Relatively small, creeping, strongly aromatic (pinene) facultatively rheophytic **herbs**, 20-45 cm tall. **Stem** pleionanthic, epigeal-creeping, 10-20 cm × 6-8 mm, lower part leafless with age, upper part obscured by densely overlapping leaf bases, rooting along length and attaching strongly to substrate, roots emerging through the splitting leaf sheath. **Leaves** many together, *ca* 5 per module; petiole slender, subterete, canaliculate basally, 11-19 cm × 2-6 mm, base moderately expanded, pulvinate *ca*  $\frac{2}{3}$  along length, pulvinus marked, *ca* 2 cm long; petiolar sheath 4.5-7 cm long, persistent, open, the margins incurved; lamina 11-23.5 × 1.5-6 cm, pendent on the petiole, lanceolate-elliptic, leathery, base decurrent, apex long acuminate, lamina (living) dark green adaxially, yellow green abaxially, lamina (dry) dull grey-green adaxially, pale brownish green abaxially; midrib prominent abaxially, rounded, flush to somewhat impressed adaxially; primary lateral venation slightly impressed adaxially, prominent abaxially, all other venation ± obscure. **Inflorescences** several together, each sympodium subtended by a persistent linear-lanceolate prophyll 2-4 cm × 2-5 mm, inflorescences smelling sickly-sweet at anthesis; peduncle 7-8 cm × *ca* 1.5 mm; spathe *ca* 6 cm × 9 mm; lower spathe *ca* 2 cm, then constricted and distally tapering, yellow-green, later pure white; **spadix** 3-5 cm × *ca* 5 mm (lower part) to 3 mm (upper part), stipitate; stipe 3 × 1.5 mm, terete, white; **female flower zone** 1-2 × *ca* 5 mm, cylindrical, usually with a few stamens interspersed with the first few pistils, and with each pistil with an associated staminode; pistils 1 × *ca* 0.75 mm, ovary obpyriform, pale green; stigma circular, *ca* half ovary diam., *ca* 0.5 mm diam., stigma surface slightly papillate and wet at anthesis; interpistillar staminodes clavate, truncate, slightly shorter than the pistil, 0.75-1 × *ca* 0.5 mm; suprapistillar interstice zone narrower than female flower zone, clothed with a few rows of sterile male flowers, white; **male flower zone** 2-3 cm × *ca* long, narrowly cylindrical; **male flowers** *ca* 0.75 × 0.75 mm, polygonal, densely arranged, white. **Infructescence** peduncle declinate with the spathe erect at maturity, 8-11 cm × *ca* 2 mm. **Fruit** ± globose, 1.5-3

× *ca* 1.5 mm, slightly truncate apically, pale to mid-green, stigma remaining darker. **Seed** ellipsoid, *ca* 0.75 × 0.5 mm, mid-brown.

*Distribution:* Malaysia (Sarawak) & Brunei.

*Habitat:* Facultative rheophyte on sandstones and shales in lowland evergreen perhumid or everwet forest, 60-450 m asl.

*Notes:* *Homalomena vagans* forms extensive colonies along river bank just above the high-water mark and is readily identifiable by the long-creeping rhizome-like stem and dull-green, rather coriaceous, lanceolate leaves pendent on the petioles.

Boyce (1997) reported the species to be rheophytic but further observations seem to show that this is in error, and that *H. vagans* is at most only facultatively rheophytic.

There are several facultatively rheophytic, lanceolate-leaved riverside *Homlaomena* in Sarawak, including *H. lancea* Ridl. (Matang), and a number of undescribed species.

*Uses:* No recorded uses among the Iban communities at Batang Ai.

*Iban name:* None recorded.

*Etymology:* Named from Latin *vagans*, wandering, in allusion to the long-creeping rhizome-like stem, a feature that at the time of publication was considered unusual in the genus.

*Other specimens seen:* **SARAWAK. Kuching Division:** Bau, Kampung Jugan, Sungai Merah, 27 Apr 2004, *P.C.Boyce & Jeland ak Kisai AR-33* (SAR); Bako, trail to N.P., *ca* 3 hours by foot from park boundary, 13 Feb 2004, *P.C.Boyce & Jeland ak Kisai AR-219* (SAR); Bau, Kampung Apar, 17 Mar 2006, *P.C.Boyce & Jipom ak Tisai AR-1735* (SAR). **Sri Aman Division:** Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 11' 40.8"; 112° 04' 04.2", 28 Jul 2004, *P.C.Boyce et al. AR-553* (SAR); Pantu, Gunung Gaharu, 01° 02' 39.5"; 110° 53' 18.3", 8 Aug 2004, *P.C.Boyce et al. AR-645* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Sungai Pedali, 01° 11' 58.9"; 112° 03' 27.0", 25 May 2008, *P.C.Boyce et al. AR-2390* (SAR). **Sarikei Division:** Sarikei, Sungai Lepong, 01° 57' 12.9"; 111° 30' 34.9", 8 Dec 2005, *P.C.Boyce et al. AR-1602* (SAR); Maradong, Sungai Matob, 01° 52' 06.1"; 111° 55' 30.7", 8 Dec 2005 *P.C.Boyce et al. AR-1616* (SAR). **Limbang Division:** Limbang, Nanga Medamit, Mulu N.P., Sungai Abun Kanan, tributary from Sungai Terikan, from the back of Mentawai Research

Station, 04° 14' 08.7"; 114° 52' 17.3", 1 Oct 2007, *P.C.Boyce et al. AR-2272* (SAR); Limbang, Nanga Medamit, Mulu N.P., Sungai Abun Kiri, tributary from Sungai Terikan, from the back of Mentawai Research Station, 04° 14' 07.4"; 114° 52' 27.6", 2 Oct 2007 *P.C.Boyce et al. AR-2297* (SAR). BRUNEI. **Temburong:** along the Sungai Temburong and Sungai Belalong, near their junction, 4° 30', 115° 10', 2 Oct 1958, *Jacobs 5615* (BRUN, G, L!, K!, US); Batu Apoi Forest Reserve, Sungai Belalong, steep bank near river, 4° 33', 115° 9', 14 Mar 1992, *Poulsen & Motte 47* (AAU! BRUN! K, spirit!).

12. *Homalomena vivens* P.C.Boyce, S.Y.Wong & Fasihuddin, *sp. nov.*

*Ab allii Homalomenae foliis sagittato Batang Aiensis similis* H. *hanneae praesertium, sed ab allii staminodiis inter pistilla nullis distinguida. Folia laminarum produnde viride, nervis lateralibus primariis impressus et petioli vagina long persistens unika est.* – **Typus:** Malaysia, Sarawak, Sri Aman, Lubok Antu, Batang Ai, Nanga Sumpa, Sungai Pedali, 01° 11' 58.9"; 112° 03' 27.0", 25 May 2008, *P.C.Boyce et al. AR-2402* (holo SAR + spirit). **Fig. 12.**

Medium, aromatic (camphor) evergreen glabrous **herbs** to *ca* 45 cm tall. **Stem** pleionanthic, erect, *ca* 2 cm thick, dark green, internodes to *ca* 1.5 cm long. **Leaves** up to *ca* 8 together, *ca* 3-5 per module; petioles dark green, suffused reddish for the apical  $\frac{1}{4}$ , semi-glossy, drying dark brown, terete, erect, 25-35 cm long, obscurely pulvinate *ca*  $\frac{2}{3}$  along length, pulvinus *ca* 2 cm long, petiole bases clasping; petiolar sheath *ca* 12-15 cm long, *ca*  $\frac{1}{3}$  of petiole length, equal, decurrent at apex, margin erect when fresh, margins persistent and remaining bright green; lamina narrowly sagittate, 16-20 cm long  $\times$  9-11 cm wide, thinly and rather softly leathery, semi-glossy dark green adaxially (fresh), drying olive-brown, abaxially paler green (fresh), drying medium brown, base cordate-sagittate, posterior lobes, straight, ovato-triangular 3-5 cm long, tip acute, acuminate for *ca* 1 cm thence tubular-apiculate for *ca* 24 mm; midrib raised abaxially (fresh and dry), green when fresh, drying reddish brown, adaxially sunken slightly into lamina, *ca* 2 mm wide, with *ca* 7-11 primary lateral veins on each side, diverging at 30°-80° from the midrib, adaxially impressed (fresh), flush with lamina when dry, abaxially slightly raised (fresh and dry), distal-most veins curved slightly towards the apex when near the margin, interprimary veins *ca*  $\frac{1}{2}$  width of the primary lateral veins, alternating irregularly with primaries; secondary venation very obscure, striate; tertiary venation not visible, all veins running into a slightly thickened intermarginal vein. **Inflorescences** up to 6 together, erect and smelling powerfully of anise at anthesis, thence declinate, each subtended by prophyll, to *ca* 5 cm long; **peduncle** to *ca* 16 cm long  $\times$  *ca* 3.5 mm diam., semi-glossy pale pink to somewhat reddish. **Spathe** 10-13 cm long, tightly furled prior to anthesis, lower spathe inflating at female anthesis, spathe

limb loosening at female anthesis, thence inflating and then opening wide, entire spathe white at anthesis; lower spathe ovoid-ellipsoid, 3-5 cm long, constricted at the junction of the spathe limb, the constriction coinciding with junction of the male and female flower zones; spathe limb ovato-triangular, ca 5-8.5 cm long  $\times$  ca. 3 cm wide (at male anthesis), limb margins recurving at male anthesis, apex mucronate to ca 5 mm long. **Spadix** exceeding the spathe at anthesis, ca 10-14 cm long, stipitate; stipe ca 5 mm long  $\times$  2 mm diam., gibbose-cylindrical, glossy white; **female flower zone** ca 5 cm long  $\times$  ca 1 cm wide, just over  $\frac{2}{3}$  length of spadix, weakly fusiform; pistils ca 1.3  $\times$  0.75 mm, very densely arranged, cylindric-globose; stigma capitate, slightly exceeding the ovary, coherent with its neighbours, staining paler brown than ovary in alcohol, interpistillar staminodes absent; suprapistillar interstice zone to ca 6 mm long  $\times$  9 mm wide, completely covered with sterile male flowers, lower part with coherent with female flower zone, upper part of interstice contiguous with male flower zone; **male flower zone** to ca 7 cm long, over  $\frac{1}{2}$  length of spadix, separated interstice by a weak constriction; **male flowers** ca 3 mm  $\times$  3 mm trapezoid, comprising 4-5 truncate stamens, each overtopped by a large, very slightly convex connective, white. **Infructescence** declinate, deep scarlet, peduncle matte dark green or slightly reddish. **Fruits** and **seeds** not observed.

*Distribution:* Borneo. Sarawak: Sri Aman Division – endemic to the Batang Ai drainage system.

*Habitat:* Terrestrial in deep litter over red on shale mud banks in riverine forest. 80-200 m asl.

*Notes:* *Homalomena vivens* resembles several of the sagittate-leaved *Homalomena* at Batang Ai, particularly *H. hanneae*, but is readily identifiable from all by lacking interpistillar staminodes. The narrowly sagittate glossy deep green leaf lamina, with the primary veins adaxially impressed, and the petiolar sheaths bright green and long-persistent are diagnostic.

*Etymology:* From the Latin for living (*vivens*) to highlight the bright green, long persistent petiolar sheaths that are a distinctive feature of this plant.

*Other specimens seen:* **SARAWAK. Sri Aman Division:** Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 11' 58.9"; 112° 03' 27.0", 28 Jul 2004, *P.C.Boyce et al. AR-555* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Wong Enseluai, 01° 11' 00.9"; 112° 04' 20.8", 6 Apr 2005, *P.C.Boyce et al. AR-1145* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 12' 16.2"; 112° 03' 26.0", 24 May 2008,



*P.C.Boyce et al. AR-2363* (SAR,+ spirit); Sri Aman, Lubok Antu, Batang Ai, Nanga Sumpa, Sungai Pedali, 01° 11' 58.9"; 112° 03' 27.0", 25 May 2008, *P.C.Boyce et al. AR-2384* (SAR, + spirit).

### Inadequately known species

#### 13. *Homalomena* sp. A. Fig. 13A.

Medium, very strongly aromatic (mango peel resin) evergreen glabrous **herbs** to *ca* 30 cm tall. **Stem** pleionanthic, erect to decumbent-ascending, *ca* 2 cm thick, very dark green, internodes to *ca* 2.5 cm long. **Leaves** up to *ca* 8 together, *ca* 3-4 per module; petiole terete, erect, 20-30 cm long, very obscurely pulvinate *ca*  $\frac{2}{3}$  along length, pulvinus *ca* 2 cm long, petiole bases clasping; petioles dark green, glossy, drying dark brown; petiolar sheath *ca* 10-15 cm long, *ca*  $\frac{1}{2}$  petiole length, equal, decurrent at apex, margin erect when fresh, margins persistent, later degrading into papery wings and then shedding; lamina spreading, elliptic, 10-15 cm long  $\times$  6-11 cm wide, stiffly chartaceous, semi-glossy dark green adaxially (fresh), drying olive-brown, abaxially much paler green (fresh), drying medium brown, base broadly cuneate, tip acute, acuminate for *ca* 1 cm thence tubular-apiculate for *ca* 2 mm; midrib raised strongly abaxially (fresh and dry), green when fresh, adaxially sunken slightly into lamina, *ca* 3 mm wide, with *ca* 9-14 primary lateral veins on each side, these diverging at 70°-80° from the midrib, adaxially impressed (fresh), abaxially prominently raised (fresh and dry), distal-most veins curved slightly towards the apex when near the margin, interprimary veins almost the same width as primary lateral veins, alternating with primaries and occasionally arching to meet them; secondary venation semi-obscure, striate; tertiary venation not visible, all veins running into a slightly thickened intermarginal vein. **Inflorescences, infructescences, fruits and seeds** not observed.

*Distribution:* Borneo. Sarawak: Sri Aman Division, Batang Ai drainage.

*Habitat:* Terrestrial on shales in evermoist gallery forest, 100 m asl.

*Notes:* Although as yet found only sterile and as yet to flower in cultivation the leaf morphology of this species is so distinctive we have no hesitation in assigning this to an undescribed species.

*Specimen seen. SARAWAK. Sri Aman Division:* Lubok Antu, Batang Ai, Lubok Antu, Batang Ai, Nanga Sumpa, Wong Ensulai, 01° 11' 51"; 112° 03' 39.9", 26 May 2008, *P.C.Boyce et al. AR-2414* (SAR).

**14. *Homalomena* sp. B. Fig. 13B.**

Small, strongly aromatic (citrus peel) evergreen glabrous **herbs** to *ca* 25 cm tall. **Stem** pleionanthic, decumbent-ascending, *ca* 1.5 cm thick, medium green, internodes to *ca* 2.5 cm long. **Leaves** up to *ca* 7 together, *ca* 3-4 per module; petioles pale purple, glossy, drying medium brown, terete, erect, 10-15 cm long, obscurely pulvinate *ca*  $\frac{2}{3}$  along length, pulvinus *ca* 1.5 cm long, petiole bases weakly clasping; petiolar sheath *ca* 5-10 cm long, *ca*  $\frac{1}{2}$  petiole length, equal, decurrent at apex, margin erect when fresh, margins persistent, open; lamina spreading, oblong, 12-18 cm long  $\times$  7-11 cm wide, thinly leathery, glossy deep green adaxially (fresh), drying olive-brown, abaxially glossy maroon (fresh), drying medium brown, base broadly cuneate, tip obtuse, acuminate for *ca* 1 cm thence tubular-apiculate for *ca* 2 mm; midrib raised abaxially (fresh and dry), adaxially slightly sunken slightly into lamina, *ca* 3 mm wide, with *ca* 7-10 primary lateral veins on each side, these diverging at 50°-70° from the midrib, adaxially impressed (fresh), abaxially raised (fresh and dry), distal-most veins curved slightly towards the apex when near the margin, interprimary veins much less prominent than primary lateral veins, alternating with primaries; secondary venation semi-obscure, striate; tertiary venation not visible, all veins running into a slightly thickened intermarginal vein. **Inflorescences, infructescences, fruits and seeds** not observed.

*Distribution:* Borneo. Sarawak: Sri Aman Division, Batang Ai drainage.

*Habitat:* Terrestrial on sandstone-derived clays in evermoist gallery forest, 100 m asl.

*Notes:* This species resembles the widespread *H. insignis* N.E.Br. from west of the Lupar, but differs by the leaf lamina adaxially glossy and abaxially shiny deep maroon (vs. leaf lamina semi-glossy and abaxially glaucous).

*Specimens seen.* **SARAWAK. Sri Aman Division:** Lubok Antu, Batang Ai, Nanga Sumpa, Rumah Gumbang, Sungai Delok, 01° 11' 40.8"; 112° 04' 04.2", 28 Jul 2004, *P.C.Boyce et al. AR-562* (SAR); Lubok Antu, Batang Ai, Nanga Sumpa, Wong Enseluai, 01° 11' 51.0"; 112° 03' 39.9", 26 May 2008, *P.C.Boyce et al. AR-2407* (SAR).



**Figure 1.** *Homalomena atrox* P.C.Boyce, S.Y.Wong & Fasihuddin. A. Flowering shoot, note the scintillating quality of the petioles and abaxial surface of the lamina; B. Inflorescence at female anthesis with spathe partially artificially removed. All photos from P.C.Boyce et al. AR-2375 (SAR).



**Figure 2.** *Homalomena borneensis* Ridl. A. Flowering plant; B. Inflorescence just prior to female anthesis, note the entire spathe still tightly furled; C. Inflorescence at late female anthesis, note the inflated lower spathe and fully expanded spathe limb; the insects are *Colocasiomyia* (Diptera: Drosophilidae); D. Spadix at female anthesis (spathe artificially removed), note the dense pistils and coherent stigmas. A-B photos from *P.C.Boyce et al. AR-544* (SAR); C-D photos from *P.C.Boyce et al. AR-546* (SAR).



**Figure 3.** *Homalomena clandestina* P.C.Boyce, S.Y.Wong & Fasihuddin. A & B. Inflorescence at early male anthesis, note the damage to the male flower zone resulting from beetles chewing the spadix; C. Spadix at female anthesis (spathe artificially removed), note naked interstice between the male and female flower zones, the lax, ascending pistils, and separate stigmas; D. Details of the female flower zone and lowermost part of the male flower zone; E. Post-anthesis spadix, note the beetle-damaged male flower zone, and that the interpistillar staminodes are now missing, having been eaten. All photos from P.C.Boyce *et al.* AR-2385 (SAR).



**Figure 4.** *Homalomena geniculata* M.Hotta. A. Plant in habitat; B. Inflorescence at female anthesis; C. Spadix at female anthesis, spathe artificially removed; note that there are no interstaminal staminodes; D. Detail of distichous leaf arrangement. All photos from *P.C.Boyce et al. AR-2424 (SAR)*.



**Figure 5.** *Homalomena hanneae* P.C.Boyce, S.Y.Wong & Fasihuddin. A. Flowering plant; B. Inflorescence at early anthesis, note amber-coloured resin droplets on the spadix; C. Detail of post-anthesis female flower zone and lowermost part of the male flower zone; the black lines are fly larvae; D. Spadix at female anthesis, spathe artificially opened; note the resin droplets of the spadix and also the resin exuded from the cut spathe; E-F. Post anthesis spadix showing extensive beetle damage. All photos from *P.C.Boyce et al. AR-2360* (SAR).



**Figure 6.** *Homalomena humilis* (Jack) Hook.f. A. Flowering plant, red expression; B. Plant with inflorescences at various stages of development, the sequence running from right (youngest) to left (oldest); C. Detail of inflorescence at female anthesis; note that spadix is fertile to the tip. A photo from *P.C.Boyce & Jipom ak Tisai AR-538* (SAR); B photo from *P.C.Boyce et al. AR-563* (SAR), and C photo from *P.C.Boyce et al. AR-2401* (SAR).





**Figure 7.** *Homalomena josefii* P.C.Boyce & S.Y.Wong. A. Plant; B. Petioles of green form with inflorescences and infructescences; C. Emerging inflorescence bud, with declinate infructescences behind; D. Inflorescence at late anthesis. All photos from P.C.Boyce et al. AR-1894 (SAR).



**Figure 8.** *Homalomena pseudogeniculata* P.C.Boyce & S.Y.Wong. A. Plant in habitat; B. Emerging inflorescence showing the distinctive mucro; C. Two infructescences. All photos from P.C.Boyce et al. AR-1583 (SAR).



**Figure 9.** *Homalomena sengkenyang* P.C.Boyce, S.Y.Wong & Fasihuddin. A. Plant in habitat; B. Detail of petioles showing scarious petiolar sheath margins; C. Spadix, spathe artificially removed to show the diagnostic green pistils; D. Developing infructescences. All photos from P.C.Boyce *et al.* AR-2362 (SAR).



**Figure 10.** *Homalomena symplocarpifolia* P.C.Boyce, S.Y.Wong & Fasihuddin. A. Plant in habitat, note the oblong leaves; B. Inflorescence at late male anthesis; C. Spadix, spathe artificially removed to show the contiguous male and female flower zones; the lowermost flowers of the male zone are sterile; D. Detail of female flower zone. All photos from P.C.Boyce et al. AR-2411 (SAR).



**Figure 11.** *Homalomena vagans* P.C.Boyce. A. Plant in habitat; B. Detail of the older part of the creeping stems; C. Spadix, spathe artificially removed; D. Detail of female flower zone, note the proportionately small stigmas; E. Inflorescences with the diagnostic declinate peduncle and erect spathe. All photos from *P.C.Boyce et al. AR-2380* (SAR).



**Figure 12.** *Homalomena vivens* P.C.Boyce, S.Y.Wong & Fasihuddin. A. Flowering plant in habitat; B-C. Inflorescence at male anthesis; C. Spadix, spathe artificially removed, note the female flower zone lacks interstaminal staminodes. All photos from *P.C.Boyce et al. AR-2402* (SAR).



**Figure 13.** *Homalomena* sp. A & B. A. Plant of *H. sp. A* in habitat, note the pronounced abaxial venation and somewhat ascending stem; B-C. Plants of *H. sp. B* in habitat. A photo from *P.C.Boyce et al. AR-2414* (SAR); B & C from *P.C.Boyce et al. AR-2407*

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