Resurrection and New Species of the Neotropical Genus Adelomema
(Araceae: Philodendron Clade)

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Abstract—Previous studies have shown Homalomena as traditionally defined to be polyphyletic, with Neotropical species phylogenetically distinct from Asian species. This study of 29 accessions of 10 Neotropical taxa, and a total of 135 accessions representing 92 taxa of Homalomena, Furtadoa, and Philodendron for nuclear ITS and plastid matK regions, supports resurrection of the genus Adelomema for Neotropical species currently assigned to Homalomena. Adelomema is here delimited as a Neotropical genus of 16 species divided into two new sections: sect. Adelomema and sect. Curmeria, based on morphologically supported molecular results. The genus Adelomema is distinguished by a hypogeous rhizome, crushed vegetative tissues smelling of anise, an extensively sheathing, sometimes prickly petiole, chartaceous often variegated leaf blades, a spadix either obliquely inserted on the spathé/peduncle (sect. Adelomema), or stigmate (sect. Curmeria), ovaries with 2–4-pluriplumulate locules, and anatropous ovules on an axile placentá. Four new species are described: Adelomema allenii, A. crinites, A. hamelii, A. keivistii, A. moffleriana, A. peltata, A. picturata, A. roezlii, A. speareii, A. wallisii, and A. wendlandii.

Keywords—Curmeria, Homalomena, ITS, matK, new combinations, taxonomy.

Cusimano et al. (2011) resolved Philodendron Schott, Homalomena Schott, and Furtadoa M. Hotta in a clade (the Philodendron clade) equivalent to the combined tribes Homalomenae and Philodendreae sensu Mayo et al. (1997) and Cabrera et al. (2008), and sister to African tribe Culcasieae. Together these, termed the Homalomena clade (Cusimano et al. 2011, Fig. 2, clade 27), are supported by synapomorphic anatomical character states observed by French (1985, 1987a, b); occurrence of sclerified hypodermis (or known as exoderms tissues in Tenorio et al. 2014) and resin canals in the roots, and absence of endothecial thickenings in the anthers (except in Homalomena itself). The Culcasieae clade (11) is supported synapomorphically by a hemiepiphytic climbing habit, and the Philodendron clade (12) by female-sterile-male spadix floral zonation. Plants of Homalomena are aromatic (terpenoids), diminutive to robust terrestrial or epiphytic herbs with mainly epigetal stems and almost entirely pleonanthic modules. In most species an obscure pulvinus is present ca. two thirds along the petiole, although a few species have a pronounced pulvinus at the petiole-leaf blade junction. Inflorescences are produced in a simple or gorgonoid synflorescence (most Homalomena; see Ray 1987, 1988), or are solitary (Furtadoa, some Homalomena). Flowers are unisexual with the pistillate flowers below and staminate above on the spadix, with the pistils usually with an associated staminode (most Homalomena, Furtadoa), and staminate flowers with an associated pistillode (Furtadoa). Staminate flowers in Homalomena are almost all comprised of 2–6 anthers with a single exception, Sumatran H. monandra M. Hotta, with unistaminate flowers. Furtadoa has unistaminate flowers. Where observed, placation is parietal (Asian Homalomena), axial (Neotropical Homalomena), or basal (Furtadoa). In all species of Homalomena and Furtadoa the entire spathe is persistent throughout fruiting, splitting at the junction of the peduncle at fruit maturity to expose the fruits (where known, ripe fruits are sweetly fragrant). Seeds, where investigated, are small (> 1.5 mm long) with a longitudinally ribbed testa, and lack micropylar elaboration (Seubert 1993).

Homalomena as currently circumscribed (Mayo et al. 1997) is distributed in the Neotropics and Asian tropics. However, Gauthier et al. (2008) and Wong et al. (2013) showed the Neotropical species of Homalomena to form a separate clade to the Asian species. The type of Homalomena is H. cordata Schott, from Java (Asia). Homalomena sensu stricto (i.e. excluding the Neotropical species) comprises four sections: Homalomena (‘Euhomalomena’ of Engl. & K. Krause); Cyrtoclada (Griff.) Furtado; Chamaecladon (Miq.) Engl. & K. Krause, and Geniculatae M. Hotta. Two pre-existing generic names are available for Neotropical species of Homalomena: Adelomema Schott (1860) and Curmeria Linden & André (1874). The type of Adelomema is A. erythropus Schott (currently Homalomena erythropus (Schott) Engl.). Curmeria, typified on C. picturata Linden & André, is presently called Homalomena picturata (Linden & André) Regel. Engler and Krause (1912), because of the then incompletely known inflorescences, treated Adelomema, with a single species, A. erythropus, as of uncertain affinity, stating that it probably belonged to Homalomena sect. Curmeria, in which they placed all other South American species treated: Homalomena roezlii (Mast.) Regel, H. wallisianii Regel, H. crinites Engl., H. wallisianii Schott, H. picturata (Linden & André) Regel, and H. peltata Mast. Section Curmeria has been uncritically employed for all the Neotropical species in all subsequent treatments (Furtado 1939; Hotta 1967; Mayo et al. 1997).

Gauthier et al. (2008) and Wong et al. (2013) focused on Philodendron and Asian Homalomena, respectively (using nuclear ITS region only), and included only five (Gauthier et al. 2008) and six (Wong et al. 2013) representatives of 12 known species of Neotropical Homalomena (hereinafter termed Adelomema). The aim of the current study was to sample an expanded representation of Adelomema for nuclear ITS and plastid matK regions. To this end, 29 accessions of 10 Adelomema taxa were included to test
support for removal of Adelonema species from Homalomena. A formal transfer of all Adelonema species is made in this study. The other aim of this study was to describe four novel Adelonema species based on morphological work.

**Materials and Methods**

**Taxon Sampling**—One hundred and sixteen accessions of 90 taxa of Homalomena (50 accessions of 39 taxa, ca. 30% of described species), Furtadoa (two accessions of one taxon, 100% of described species), Adelonema (22 accessions of 10 taxa, ca. 62% of species assessed in this paper), Philodendron (41 accessions of 38 taxa, less than 10% of described species, but including representation of the three subgenera), and an accession of Lasia spinosa (L.) Thwaites as outgroup were included for the analyses of the nuclear ITS region. Fifty-five accessions of 37 taxa (Homalomena: 37 accessions of 24 taxa, Furtadoa: two accessions of one taxon, Adelonema: 10 accessions of six taxa, Philodendron: three accessions of three taxa), and one accession each of three outgroups (Calacasia lberica and Cercisites mirabilis, Lasia spinosa) were included for the plastid matK partial trnK (matK) region. Overall this study included 135 accessions of 92 taxa of Homalomena (57 accessions of 41 taxa), Furtadoa (5 accessions of two taxa), Adelonema (29 accessions of 10 taxa), Philo- dendron (12 accessions of 9 taxa), and one accession of each of two outgroups (C. lberica and C. mirabilis), and two accessions of L. spinosa. Seventy-six accessions were newly generated and deposited in GenBank. These sequences were combined with previous sequences from Wong et al. (2013), Cusimano et al. (2011), and Cabrera et al. (2008). Voucher information and GenBank accession numbers for all taxa are provided in Appendix 1. Data matrices were deposited to TreeBASE (study numbers S16751, S17301, and S18151).

**DNA Extraction, PCR Amplification, and Sequencing**—Total DNA was extracted using a modified version of the 2 x CTAB protocol (Doyle and Doyle 1987) with the addition of PVP (Polyvinylpyrrolidone; Wong et al. 2010). ITS1, 5.8S subunit, and ITS2 were amplified using the primer pairs 1F/1R and 3F/4R, respectively (White et al. 1990). Polymerase chain reaction (PCR) amplification for matK were carried out using the forward primer 19F (Gravendeel et al. 2001) and reverse primer 2R (Steele and Vilgalys 1994). Two internal primers, 390F or/and 1236R (Cuénoud et al. 2002) were used for sequencing. The PCRs and PCR product cleaning of ITS and matK were conducted according to Wong et al. (2013) and Wong et al. (2010), respectively. PCR products were sent for sequencing in forward and reverse directions at BGI Tech Solutions (Hong Kong) Co., Limited, Hong Kong.

**Sequence Alignment and Phylogenetic Analyses**—Newly generated sequences for both regions were manually trimmed and assembled for each taxon. These sequences were combined with previously generated sequences for each region. The data matrices were aligned using MUSCLE (Edgar 2004) as implemented in Geneious Pro v5.6.4 (Biomatters Ltd., Auckland, New Zealand; www.geneious.com; Drummond et al. 2012) and Clustal X (Thompson et al. 1994) with the addition of PVP (Polyvinylpyrrolidone; Wong et al. 2013) and Wong et al. (2010), respectively. PCR products were sent for sequencing in forward and reverse directions at BGI Tech Solutions (Hong Kong) Co., Limited, Hong Kong.

**Systematic Botany**
Fig. 1. Bayesian tree of 116 taxa based on the ITS1, ITS2, and the 5.8S regions of the nuclear rRNA gene. Posterior probability (PP, above 0.7) and bootstrap (BS, maximum likelihood, above 50%) values are shown above/below/next to each internal branch. Subgenus/section circumscriptions are indicated at far right. Taxa in single quotation marks are yet to be formally described. Furtadoa taxa are highlighted in bold. Sections and subgenera are indicated in shaded bars.

2016] WONG: RESURRECTION OF ADELONEMA
Fig. 2. Bayesian tree of 55 taxa (Adelonema, Homalomena, Philodendron and outgroup) based on matK and partial trnK (matK) plastid region. Posterior probability (PP, above 0.7) and bootstrap (BS, maximum likelihood, above 50%) values are shown above/below/next to the branch. Subgenus/section circumscriptions are indicated at far right. Taxa in single quotation marks are yet to be formally described. Furtadoa taxa are highlighted in bold. Sections and subgenera are indicated in shaded bars.
Adelonema Resurrected—Twenty-nine accessions of 10 taxa of Neotropical Adelonema included in this study were recovered as a clade separate from the Asian Homalomena clade, supporting resurrection of Adelonema as a genus distinct from Asian Homalomena. The estimated divergence between these Asian and Neotropical clades is ca. 25 Ma during the Oligocene, calibrated on fossil records (Nauheimer et al. 2012).

Discussion

Adelonema Resurrected—Twenty-nine accessions of 10 taxa of Neotropical Adelonema included in this study were recovered as a clade separate from the Asian Homalomena clade, supporting resurrection of Adelonema as a genus distinct from Asian Homalomena. The estimated divergence between these Asian and Neotropical clades is ca. 25 Ma during the Oligocene, calibrated on fossil records (Nauheimer et al. 2012).
As here defined, *Adelonema* is a Neotropical genus composed of two sections, *Adelonema* and *Curmeria*, totalling 16 species and utilizing the name *Curmeria* for the clade that excludes the type species of *Adelonema*. The sections are distinguished by several distinctive morphological signatures (see key below). Eleven new taxonomic combinations are proposed here, along with descriptions of four taxonomically novel species of *Adelonema*. *Adelonema* is defined by a hypogeous rhizome, crushed vegetative tissue smelling of anise, an extensively sheathing, sometimes prickly petiole, chartaceous and often variegated leaf blades, a spadix either obliquely inserted on the spathe/peduncle (sect. *Adelonema*) or stipitate (sect. *Curmeria*), ovaries with 2–4 pluriovulate locules, and anatropous ovules on an axial placenta.

The chromosome numbers for *Homalomena* sensu Mayo et al. (1997; i.e. Asian and Neotropical species combined) are 2n = 38, 40, 42 and 80, while Cusimano et al. (2012) cited 2n = 38, 40, 42 and 56. *Furtadoa* has a chromosome count of 2n = 40 (Mayo et al. 1997; Cusimano et al. 2012). Miffler and Bogner (1984) recorded chromosome counts of *Homalomena wallisii* and *A. speariae* of 2n = 42.

*Adelonema* is resolved into two sections (Fig. 4): *Adelonema* and *Curmeria*. Sect. *Adelonema* comprises 10 species (A. erythropus, A. allenii, A. hammei, A. kivistii, A. moelleriana, A. orientalis sp. nov., A. palidinervia sp. nov., A. roezlii, *A. speariae*, and *A. wallisii*). Sect. *Curmeria* has six species (A. crinipes, A. panamensis sp. nov., A. peltata, *A. wendlandii*, and *A. yanamonoensis* sp. nov.).

*Philodendron subgen. Pteromischum*—Mayo (1989) elevated the section *Pteromischum* to the subgenus rank (as subgen. *Philodendron*) based on anatomical characters with ca. 75 species (Mayo et al. 1997). Despite marked differences in overall habit (species of subgen. *Pteromischum* are vining), *Adelonema* species display several striking similarities to *Pteromischum* species as compared to other species of *Philodendron* (subgen. *Meconostigma* and *Philodendron*), including adult vegetative shoots with anisophyllous sympodial growth with several to many leaves per stem article, absent (or at least highly inconspicuous) cataphylls, and extensively and conspicuously sheathing petioles. Apart from these characters, the subgen. *Philodendron* and *Meconostigma* have a vascular plexus formed by branched vascular bundles, while the vascular plexus of *Pteromischum* species is composed of simple vascular bundles (Tenorio et al. 2012). With *Adelonema* resurrected in the current paper, *Philodendron* subg. *Pteromischum* should deserve generic recognition with the name *Elopium* (Schott 1865) available. These are patently significant taxonomic changes, and much more comprehensive sampling, especially of subgen. *Pteromischum*, is required before these formal changes are undertaken.

*Furtadoa, a Synonym of Homalomena?—* *Furtadoa* was described based on *Furtadoa sumatrensis* (Hotta 1981), characterized by basal placentation and unistaminate flowers, each associated with a pistillode. A second *Furtadoa* species was described by transfer of *Homalomena mixta* Ridl. (Hotta, 1985). Unistaminate flowers lacking an associated staminode, however, occur in *Homalomena* (uniquely in Sumatran *H. monandra*). None of our trees recovered *Furtadoa* as monophyletic, leading us to speculate that staminate flowers reduced to a single stamen and the presence of a pistillode may have arisen more than once in the *Philodendron* clade. Nevertheless, *Furtadoa* remains a morpologically defined taxon and this, together with a dearth of knowledge of the Sumatran species of *Homalomena*, leads us to retain *Furtadoa* at least for the moment.

**Taxonomic Treatment**


**Distribution**—Costa Rica to Colombia.

**Ecology**—Tropical wet forest (bmh-T) and pluvial forest (bp-T), frequently along streams between 20–900 m elevation. Ecological data above and hereinafter are categorized by the Holdridge Life Zone system (Holdridge 1947).

*Adelonema crinipes* (Engl.) S. Y. Wong & Croat, comb. nov. *Homalomena crinipes* Engl., Bot. Jahrb. Syst. 37: 124. 1905; Engler & K. Krause, Pflanzenr., 55(IV.23Da): 78, Figure 52. 1912.—**Type**: ex. hort. Herrenhausen, Wendland s.n. (B). NEOTYPE (designated here): PERU. Loreto Department: Province Maynas; Iquitos, Munich (Río Itaya), bosque inuinuable estacional (Ribera del Río), 03°50’S, 73°20’W, 130 m, Vasquez & Jaramillo 13038 (K!, MO, US!, USM!).

**Distribution**—Colombia (Amazonas, Putumayo) to Brazil (Acre), Ecuador (Morona-Santiago, Napo, Pastaza, Zamora-Chinchipe), Peru (Amazonas, Loreto, Madre de Dios, Pasco) and Bolivia (Beni, La Paz, Cochabamba).

**Ecology**—Tropical moist forest (bmh-T) or tropical wet forest (bh-T), sometimes premontane wet forest (bmh-P). 1,050–1,450 (1,800) m.

**Note**—The neotype collection, Vasquez & Jaramillo 13038, was selected based on its very close resemblance to the detailed illustration in Engler and Krause (1912, Fig. 52), and is reasonably well distributed to major herbaria.

*Adelonema erythropus* Schott, Prodr. Syst. Aroid, 317. 1860. *Philodendron erythropus*


Bras. 3(2): 172. 1878. *Homalomena erythropus* (Schott) Engl., Pflanzenr., 55(IV.23Da): 130. 1912.—**Type**: BRAZIL. Province Río-negro, Martius s.n. (holotype: M!).

**Distribution**—Amazon basin, restricted to northern Brazil and southern Colombia.

**Ecology**—Areas of white sand soil under tropical moist forest (bh-T).

*Adelonema hammelii* (Croat & Grayum) S. Y. Wong & Croat, comb. nov. *Homalomena hammelii* Croat & Grayum, Phytologia 82(1): 37. 1997.—**Type**: COSTA RICA. Heredia: Zona Protectora La Selva, 5 hr. walk S of La Selva Biological Station, between Rios Peje and Guáctimo, 10°21’N, 84°03’W, 300–400 m, 15 Mar. 1985,
Fig. 4. *Adelonema* Schott. Sect. *Adelonema* (A–D) and Sect. *Curmeria* compared (E–H). In Sect. *Adelonema*, leaf blade is glabrous and petiole is unarmored (A, C), and interpistillar staminodes are absent (B, D); but in Sect. *Curmeria*, leaf blade is puberulent and petiole is armored (E, G, H), and interpistillar staminodes are present (F). A–B. *Adelonema allenii* (Croat) S. Y. Wong & Croat. C–D. *Adelonema speariae* (Bogner & Moffler) S. Y. Wong & Croat. E–F. *Adelonema crinipes* (Engl.) S. Y. Wong & Croat. G. *Adelonema picturata* (Linden & André) S. Y. Wong & Croat. H. *Adelonema peltata* (Mast.) S. Y. Wong & Croat. C, D, F. Photo courtesy of David Scherberich.
**Adelonema kvistii** (Croat) S. Y. Wong & Croat, comb. nov. *Homalomena kvistii* Croat, Aroideana 27: 135. 2004.—TYPE: COLOMBIA. Valle: along old rd. from Buenaventura and Cali, 5 km S of Río Sabateras, 3°44′N, 76°57′W, 145 m, 10 Feb. 1990, Croat & Watt 70418 (holotype: MO-3784768; isotypes: JAUH!, K!, US!).

**Distribution**—Colombia and Ecuador, Pacific slope of the Andes.

**Ecology**—Primary and secondary forest in areas of pluvial forest (bp-PM), 100–145 m.

**Adelonema moffleriana** (Croat & Grayum) S. Y. Wong & Croat, comb. nov. *Homalomena moffleriana* Croat & Grayum, Aroideana 27: 137. 2004.—TYPE: COLOMBIA. Chocó: ca. 10–15 km S of Quibdó on rd. to Istmina, then 8–10 km E on rd. to petroleum exploration camp, 5°35′N, 76°36′W, 90 m, 9 July 1986, Grayum et al. 7644 (holotype: MO-3689954; isotypes: HUA!, K!, US!).

**Distribution**—Colombia (Chocó), Pacific slope.

**Ecology**—Pluvial forest (bp-T) transition to tropical wet forest (bp-PM), 100–145 m.

**Adelonema orientalis** Croat, sp. nov.—TYPE: PERU. Huánuco: Leoncio Prado, along road to Monzon above Río Huallaga, across the bridge from Tingo María, 9°15′S, 75°59′W, 680 m, 31 Oct. 1980, Croat 50971 (MO-2817206; isotype: K!, US!, USM!).

**Distribution**—Endemic to Peru, occurring on the eastern slopes of the Andes.

**Ecology**—Tropical moist forest (bh-T), tropical montane moist forest (bh-MBT) and in premontane wet forest (bh-P) transition to moist forest (bh-PT), 500–1,550 m.

**Note**—Local names. Peru: “canton masha” (Schunke-Vigo 12132); “kushi tsúke” (Leveau 267). The inflorescence of *Adelonema orientalis* produces a sweet anise-like aroma, which apparently serves as an attractant for pollination. This scent, which was observed in the area of Tingo María (Croat 50971), is sufficiently intense to be smelled up to 10 m away just after dusk. Pollination in this and other species of *Adelonema* is most likely by ruteline scarab beetles.

**Adelonema orientalis** is characterized by the shiny yellow-drying stems and peltate leaf blades. *Adelonema orientalis* could be confused with *A. peltata*, which occurs in much wetter relatively non-seasonal areas along the western coast of Colombia and Ecuador but differs from *A. peltata* by occurring in more seasonally dryer habitats, frequently in tropical moist forest and by having smooth, spineless petioles often more yellowish in color and glabrous except for the often dense puberulence near the apex. Sometimes, such as in populations around Tocache Nuevo (Croat 57991, Schunke 12132, Plowman & Schunke 11638 and Plowman & Ruey 11310), the petioles are wholly glabrous. Detailed bio-systematic studies need to be carried out on *A. peltata* and *A. orientalis* in central Peru and in western South America to determine the degree of their relationship.

**Representative Specimens Examined**—PERU. San Martín: Mariscal Cáceres, Distrito Tocache, Río de la Plata, Gran Fundo La Bella Durmiente Manuel Gatica ca. 5 km NE of bridge over Río Huallaga, 8°08′S, 76°23′W, 1,050 m, 7 Apr. 1984, Croat 57991 (MO, USM); 15 km SE of Tocache Nuevo, 8°12′S, 76°25′W, 500 m, Plowman & Ruey 11310 (MO, USM); Dist. Campilla, carretera Marginal de la Selva, 7.4 km N of Pulcahe, 7°43′S, 70°40′W, 900–950 m, 21 Dec. 1981, Plowman & Schunke 11638 (MO, SEL, USM); Distrito. Tocache Nuevo, Río de la Plata. Fundo del Sr. Manuel Gatica, 550–700 m, 12 Aug. 1980, Schunke-Vigo 12132 (IBE); Ucayali, Coronel Portillo, 968 m, Tingo María-Pucalca, 3.4 km NE of border with Huánuco, 9°03′45″S, 75°47′45″W, 3 June 1998, Croat & Sizemore 81277 (MO, USM). Huánuco: on 60° rocky slope above Río Huallaga at Tingo María, 4 Oct. 1972, Croat 21057 (F, MO); along road from Huánuco to Tingo María, vic. km 479, 9°34′S, 76°03′W, 1,200 m, 1 June 1998, Croat & Sizemore 81582 (MO, USM); Distrito. Rupa Rupa,
Fig. 5.  A–B. *Adelonema orientalis* Croat. A. Note the leaf blade is basifixed. B. Inflorescence. C–D. *Adelonema panamensis* Croat & Mansell. Note the peltate leaf blade with a shiny upper blade surface and white major veins on the upper surface.
Al este de Tingo María, cerca de Cerro Quemado, 680 m, 7, 10, 13, 15, 18 Sep. 1978, Schunke-V. 10605 (MO); La Divisora, Plantación La Margarita, 17 Apr. 1976, Plowman 5926 (GH); Tingo María airport-Huayna Capac, 10.0 km W of bridge over Río Huallaga, 9°14’56”S, 76°02’16”W, 1294 m, 6 June 1998, Croat & Sizemore 81874 (MO, USM).

**Cultivated**—Plant from unknown origin, originally from John Banta, cultivated by Richard Mansell, and vouchered as *Croat 83635* (MO).

**Adelonema palidinervia** Croat, sp. nov.—TYPE: ECUADOR.

Orellana: Along road between Coca and Narupa (jct. of Baeza-Tena Hwy.), 12.9 km W of jct. in Coca, 284 m, 00°29’47”S, 77°07’50”W, 7 Oct 2007, Croat, Carlson & Levin 99438 (MO, USM).

*Adelonema palidinervia* is characterized by its small stature, broadly ovate leaves with subcordate, overlapping lobes and by a broad whitish fish-tail pattern on the midrib. *Adelonema palidinervia* is closest to *A. picturata*, which differs by having narrowly rounded lobes and a usually parabolic to arcuate, sometimes spathulate sinus, as well as by its smaller inflorescence, with the peduncle only weakly puberulent near the apex in contrast to being densely scurfy-pubescent throughout in *A. picturata*.

Terrestrial on steep slopes in lateritic soil; stems growing to ca. 10 cm depth then spreading laterally, usually with plants clustered in small groups; internodes short 1–1.5 cm diam; petioles 19.5–22.5 cm long, creamy pink, pale-striate at base, sheath 6–10 cm long, pale yellow-green, in-curled, sharply flattened adaxially near sheath, broadly sulcate and toward apex, olive-green and matte, tinged red in lower 1/2, finely ridged, the ridges finely pubescent; blades 15–20 cm long, 9–12.2 cm wide, 1.6 times longer than wide, 0.9–1.3 times longer than petioles, subcoriaceous, darker green and matte above with fish-tail feathering of pale gray-green along midrib, this blending to gray-white on midrib; midrib weakly sunken and whitish above narrowly rounded and finely pubescent-rigded, slightly darker below; primary lateral veins 8–10 pairs, quilted-sunken and concolorous above, pleated-raised and concolorous below; minor veins few, moderately visible. Inflorescence solitary, erect; peduncle 3.5–6 cm long, 4–6 mm diam, purplish-violet, finely ribbed, densely puberulent, especially in distal 1/2, drying dark brown, 2.5–4 cm diam; spathe 5.2–6.3 cm long, only weakly constricted above tube; tube 4 cm long, 2.3 cm diam, green heavily tinged purpulish-violet, with fine rows of short pale-ribbed above, to apex outside reddish inside, finely ribbed throughout, flattening 5.7–6.2 cm wide, drying dark brown and matte outside, slightly paler and semi-glossy inside throughout; blade pale greenish-white, matte outside, greenish, tinged red in lower half inside; spadix 5.3–5.5 cm long; staminate spadix 4.5 cm long, 6 mm diam; staminate portion 3.8 cm long, 6 mm diam; pistillate spadix 4.3 cm long in front, 1.8 mm long in rear, 6.2 mm diam at base, 6 mm diam at apex.

**Etymology**—The epithet is from the Latin *palidus* (pale) and *nervus* (nerve or vein), referring to the pale midvein of the leaf blade.

**Distribution**—Ecuador (Orellana, 284 m).

**Ecology**—Tropical moist forest (bh-T).

**Adelonema panamensis** Croat & Mansell, sp. nov.—TYPE: PANAMA.

Cultivated—Plant from unknown origin, originally from the former by its peltate leaf blades with a shiny upper surface and from the latter, a species from Colombia and Ecuador, by its shiny upper blade surface, white major veins on the upper surface, as well as by the prominent rather than flat and inconspicuous minor veins on the upper surface and the relatively pointed posterior lobes — these absent altogether or much shorter and broadly rounded in *A. pellata*.

Internodes very short, 2–4 cm diam; sap anise-scented; petioles 46–106 cm long, 7–10 mm diam, brown more or less terete and obtusely flattened adaxially, firm, semi-glossy, spiny and puberulent throughout, spines denser and longer toward the base, sheathed for 0.15–0.37 their length; blades peltate, petiole attached mostly 1–12 cm above base (rarely basifixed on younger leaves), 2.5–7(–12) cm at base, 38–86.5 cm long, 18–42 cm wide, 1.6–2.3 times longer than broad, 0.7–0.8 times as long as petioles or to about as long as petioles narrowly ovate-triangular, gradually acuminate to narrowly long-acuminate, subcoriaceous, dark green and glossy above, moderately pale and matte below, drying brownish to greenish above, yellow-brown to greenish below (rarely dark brown above, reddish-brown below); anterior lobes 21–46 cm long, broadly convex on margin; posterior lobes directed usually somewhat outward, 12–31.7 cm long, 7.7–17 cm wide, usually and bluntly pointed at apex; basal veins 4–6, the first and sometimes the second free to the base, the third and fourth (fifth) coalesced 5–12 cm; posterior rib straight; midrib, posterior rib and lower portions of lateral veins whitish above; midrib weakly sunken to flat or weakly raised, narrowly rounded and concolorous below; primary lateral veins sunken and marginally discolored above, convex and paler below, pale greenish-white; minor veins prominently visible and weakly raised above but not markedly distinct below. Inflorescence erect at anthesis; peduncle 5–10 cm long at anthesis, 8–10 mm diam (to 18 cm long in fruit); spathe greenish, mottled pinkish-white and brown outside, paler and glossier inside, drying light pinkish-tan inside, grayish-green outside with pinkish-brown mottling, (8–)11–13 cm long (to 18.5 cm in fruit), 3.0–3.3 cm diam, weakly constricted above tube; spadix (7.3–)9.5–11.5 cm long, slightly shorter than spathe; staminode portion 8.5 cm long, slightly constricted above the sterile staminode portion, the latter to 2 cm long, 1.3 cm diam; sterile staminode portion 2 cm long, 1.4 cm diam at base. Diameter 1.1 cm at apex; pistillate portion 2.5–3 cm long in front, 1.5–1.7 cm long in rear, 1.3–2.5 cm diam midway; flowers 14–17 visible per spiral, alternating with an equal number of toadstool-shaped staminodia; pistils 1–1.5 cm long, 1–1.2 cm diam; style not apparent; stigma depressed-globose, 0.8 mm thick, 1.8 mm diam, cream-colored in pickled condition; staminodia equally as long as pistils, bright white in life but yellow-brown in spirit collection, much thickened at apex, subrounded in outline, broadly rounded at apex but tapering to a slender whitish filament; ovary 3(4)-locular; ovules ca. 20, ca. 0.1 mm long; funicle about as long as ovule. Infructescence pendent or reclining on ground; peduncle to 24 cm long, peduncle and spathe purple-brown, ranging from B&ampK yellow-red 2/10 to yellow 2/7.5; spathe to 21 cm long; pistillate spadix 8–8.5 cm long, 3–3.5 cm diam, fruiting pistils green; old staminate spadix to 11 cm long.

**Etymology**—The species is named for the type locality in Panama.
Fig. 6. Adelonema paladinervia Croat. A. Whole plant with an inflorescence emerging. B. Broadly ovate leaf with subcordate bases, overlapping lobes and with a broad whitish fish-tail pattern on the midrib. C. Petiolar sheath broadly open with puberulent petioles. D, E. Inflorescence.
**Distribution**—Apparently restricted to eastern Panama from the Canal Area along the Caribbean coast to the Colombian border (and no doubt in adjacent Colombia as well).

**Ecology**—Areas of premontane wet forest (P-wf).

**Note**—*Adelonema panamensis* is recognized by its ovate-cordate, weakly peltate, glossy blades with a rather prominent white midrib on the upper surface. It rather closely resembles *A. peltata* from the Pacific slope of Colombia, but differs by the narrowly ovate-triangular blades, rather than broadly ovate for *A. peltata*, by having a typically much glossier upper blade surface, much paler major veins, prominulous rather than flat and inconspicuous minor veins on the upper surface, and relatively pointed posterior lobes (posterior lobes absent altogether or much shorter and broadly rounded in *A. peltata*). Although living material of the two species is easily separable, dried specimens are more difficult to determine without good field notes. *Adelonema panamensis* differs more readily from the Central American forms of *A. wendlandii*. Despite the strong similarities of the two species based on dried material, the differences in living material where they occur together, such as on the Pipeline Road in the Canal Area, is startling. The two are easily distinguished even from a distance because of the glossy blade surface and the pale upper midrib of *A. panamensis* versus matte to weakly glossy blade with a rather more concordant midrib for *A. wendlandii*. *Adelonema panamensis* also differs from the Central American material of *A. wendlandii* in having peltate rather than basifixed blades.

*Representative specimens examined*—PANAMA. Canal Area: Navy Pipeline Road, ca. 6 km N of Gamboa, ca. 200 m, 13 July 1976, Croat 37029 (MO); Pipeline Road at Río Aqua Salud, 26 Sep. 1970 (st), Pipeline Road, ca. 6 km N of Gamboa, ca. 200 m, 13 July 1976, Croat 32379; for. from Gamboa gate, 14 Aug. 1971 (fr), Croat 16678 (MO); ca. 90 m, 12 Aug. 1976 (st), Croat 32825 (MO, SEL); Pipeline Preserve, NW of Panama City, 12 May 1966 (st), Nicolson 3391 (US); N of Frijoles, 19 Dec. 1923 (st); Colón: Matachui, 1 Mar. 1905 (st), Cowell 203 (NY, US); Ft. Espinar (Ft. Gulick), along path behind Panama Canal Company water tank, 6 June 1994, M. Akers 15 (MO); Río Guanche, ca. 5 km upstream from road to Portobello, 9°30'N, 79°40'W, 50 m, 15 Mar. 1986 (st), Hammel & Trainer 14760 (MO); Río Guanche between Puerto Pilón and Portobello, ca. 1.5 mi S of road, 100 m, 19 June 1994, Croat & Zhu 76338 (MO, PMA); Puerto Obaldia, ca. 50 m, 18 Aug. 1971, Croat & Csendes 18011 (MO).


**Distribution**—Colombia, Cordillera Central.

**Ecology**—Original collection site is too indefinite for establishing life zone.

*Adelonema speariae* (Bogner & Moffler) S. Y. Wong & Croat, comb. nov. *Homalomena speariae* Bogner & Moffler, Aroideana 7: 37, 1984.—TYPE: COLOMBIA. Caldas: road from Medellín to Bogotá, 1979, living plant collected by Elaine Spear, Miami; voucher by Bogner s.n. (holotype: MO!).

**Distribution**—Colombia, Cordillera Central.

**Ecology**—Locality data by Spear is too imprecise for establishing life zone.


**Distribution**—Costa Rica, Panama and Colombia Panama and Colombia.

**Ecology**—Tropical wet forest (bh-T), premontane wet forest (bmh-P) and tropical wet forest (bmh-T), between 300-500 m.


**Distribution**—Costa Rica to N. Colombia.

**Ecology**—Tropical moist forest (bh-T); premontane wet forest (bh-P) and tropical wet forest life zones (bmh-T), frequently along streams.

*Adelonema yanamonoensis* Croat & Mansell, sp. nov.—TYPE: PERU. Loreto: Maynas, Yanamono Tourist Camp, on Río Sucasuri, 50 m. NE of Iquitos, 30°30'S, 72°30'W, 106 m, originally collected by Jack Willford, Croat 56925 (holotype: MO!; isotypes: F, NY!, US!, USFL, USM!). Figure 7.

*Adelonema yanamonoensis* is closely similar to *A. crinipes* but is smaller in stature, growing usually less than 40 cm tall, with leaf blades markedly hastate, and with the spathes purplish rather than greenish at anthesis, such as those of typical *A. crinipes* in the Iquitos region. *Adelonema crinipes* is typically more robust, ranging between 1 and 2 m tall. Blades of *A. crinipes* are typically not markedly hastate and while they may have narrow posterior lobes they do not typically flare outwards, while the lateral margins of the blades are typically convex, not convex as in *A. yanamonoensis*.

Terrestrial herb to 50 cm tall; stems typically branching and clustered; internodes short, to 2 cm diam; cataphylls to 10 cm long, sharply 2-ribbed, turning reddish-brown, persistent intact; petioles sub-terete, obtusely somewhat flattened adaxially, dark green, variegated with short pale green thick lines, semi-glossy, minutely puberulent, sparsely spiny throughout, but more dense near the base; sheath reddish, 8–12 cm long, turning reddish-brown the thin margins often falling free; blades triangular-hastate, 12–30 cm long
Fig. 7. *Adelonema yanamonoensis* Croat & Mansell. A. Whole plant. B, C. Hastate leaf blade. C, D. Purple spathe.
1. Leaf blades cordate to hastate, base evidently lobed (though sometimes with lobes united with each other through much of their length); foliage with trichomes, those on petiole sometimes much thickened and spinescent ........................................... 2

2. Petioles sulcate on dorsal surface, densely to slightly pubescent with filamentous trichomes, especially near apex, but never with spines ................................................................. 3

3. Leaf blades broadly ovate with broadly ovate subcordate blades that barely touch or overlapping lobes, sheaths lacking; peduncle weakly puberulent near apex ................................................................. 4

4. Spadix stipitate. Petiole often armored with prickles; leaf blade pubescent; interpistillar staminodes always absent ................................................................. Adelonema sect. Adelonema

5. Peduncle weakly puberulent throughout ................................................................. A. picturata
2. Petioles terete or nearly so, usually with scattered spineous trichomes towards base ......................................................... 4
4. Leaf blades clearly peltate at base .................................................. 5
5. Blades glossy and glabrous on upper surface, posterior lobes flat; midrib and proximal portion of primary lateral veins pale green to whitish; minor veins of living specimens prominent and easily visible on upper surface, pale green where they merge with midrib; Central Peru, less than 300 m ................................................................. A. panamensis
5. Blades usually matte and obscurely puberulent on upper surface; posterior lobes directed prominently upward at an angle to midrib; midrib and primary lateral veins conspicuous to pale green; minor veins of living material flat and not conspicuous, not at all paler than surrounding blade; South America (Pacific slope and Central Peru), more than 300 m ................................................................. A. orientalis
6. Petioles smooth and spineless, glabrous except for dense puberulence near apex, usually yellowish in color; Central Peru (Huánuco and San Martin), 500–1,550 m ................................................................. A. peltata
7. Plants to 30–50 cm tall; spathe less than 12 cm long, usually dark violet-purple; Peru, vicinity of Iquitos ................................................. A. yanamonoensis
7. Plants typically to 1 m or more tall; spathe more than 12 cm long, green; widespread species, ranging from Nicaragua to the N. Colombia ................................................................. A. wendlandii
8. Petioles glabrous to densely spiny; Amazon basin from southern Colombia to Bolivia ......................................................... A. crinites
8. Petioles broadly to narrowly ovate or elliptic, base not lobed; foliage without trichomes or spines ... 9
9. Petioles 1.5–4 (–6.5) cm long, sheath usually extending nearly to blade; spathe 5–7 (–16) cm long ......................... A. wulissii
9. Petiole over 6.5 cm long, sheath usually extending to no more than about mid-petiole ......................... 10
10. Spathe 25 cm long; leaf blades conspicuously mottled ................................................................. A. sparioi
10. Spathe 5–20 cm long; leaf blades not mottled or if mottled then mottling very weak ......................... 11
11. Leaves broadest at or near middle, dark green (almost black) with conspicuous hyaline margins ............................................. A. mufferiana
11. Leaves broadest at or near midrib, medium green, hyaline margins usually inconspicuous ................... 12
12. Primary lateral veins more than 15 per side ................................................................. A. kristii
12. Primary lateral veins 10 or fewer per side ......................... 13
13. Blades matte, ovate to broadly ovate or elliptic, 1.6–1.8 times longer than wide, rounded to weakly subacute at base; petioles 1.3–2.6 times longer than blades; inflorescences to ca. 20 cm long; Colombia & Ecuador, 100–140 m ................................................................. A. harnellii
13. Blades semi-glossy, elliptic to narrowly ovate, 2.0–2.2 times longer than wide, broadly rounded at base; petioles about as long as blades; inflorescence less than 13 cm long; Atlantic slope of N. Costa Rica (Volcán Barva), 300–400 m ................................................................. A. erthropolis
14. Adult blades more than 20 cm wide; Colombia (unknown origin, but probably in Andes of N. Colombia) ......................... A. roezli
15. Leaves membranaceous, minor veins frequently branching moderately distinct; epidermal cells on lower blade surface smooth; Amazon basin; tropical moist forest (bh-T) in areas of mostly white sand soil ........................................................................................................ 15
15. Leaves subcoriaceous (drying chartaceous), minor veins on lower blade surface generally not distinct, epidermal cells on lower blade surface minutely granular at high magnifications; Central America and northern Colombia; tropical wet forest (bmf-T) in areas of alluvial or lateritic soil ........................................................................................................ A. allenii

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Adelonema picturata (Linden & André) S.Y. Wong & Croat, Brazil, Acre, Igarape Ure Oetro, 120 m., Rio Juruá, 09°16'00"W, 54°52'00"S, cultivated ex Borneo Landscaping Nursery, Ar4307 (SAR), KP986969.

Adelonema picturata (Linden & André) S.Y. Wong & Croat, Brazil, Acre, Igarape Ure Oetro, 120 m., Rio Juruá, 09°16'00"W, 54°52'00"S, cultivated ex Borneo Landscaping Nursery, Ar4307 (SAR), KP986969.

Adelonema wendlandii (Schott) S.Y. Wong & Croat, Brazil, Acre, Igarape Ouro Preto, 120 m., tributary of Rio Juruá, 09°16'00"W, 54°52'00"S, cultivated ex Borneo Landscaping Nursery, Ar4307 (SAR), KP986969.

Adelonema wendlandii (Schott) S.Y. Wong & Croat, Brazil, Acre, Igarape Ouro Preto, 120 m., tributary of Rio Juruá, 09°16'00"W, 54°52'00"S, cultivated ex Borneo Landscaping Nursery, Ar4307 (SAR), KP986969.
Homalomena gastrofructa
Sarawak, Kuching, Padawan, Sikog Village, 01.20 N; 110.20 E,
Temple, 01.35 N; 110.13 E,
Malaysia, Pahang, Jerantut, Krau Wildlife Centre, 03.49 N; 102.13 E,
Homalomena expedita
Croat 77907
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2016
WONG: RESURRECTION OF ADELONEMA
Ai, Nanga Sumpa, Sungai Pulau,
(SAR), JX076795,
Sarawak, Sri Aman, Lubok Antu, Batang Ai,
01.12 N; 112.03 E,
Park, 01.41 N; 109.51 E,
P. C. Boyce et al. Ar2145
Homalomena hanneae
(SAR), JX076790, KM580693.
(SAR), JX076785 + JX076806, KM580698.
(Jack) Hook.
(SAR), JX076783,–
(SAR), JX076784, KM580715.
(SAR), JX076785, KM580694.
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