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Author(s): Wong Sin Yeng, Alan W. Meerow and Thomas B. Croat


Published By: The American Society of Plant Taxonomists

Resurrection and New Species of the Neotropical Genus Adelonema (Araeaceae: Philodendron Clade)

Wong Sin Yeng,1,2,5 Alan W. Meerow,3 and Thomas B. Croat4

1Department of Plant Science and Environmental Ecology, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Samarahan, Sarawak, Malaysia.
2Harvard University Herbaria, 22 Divinity Avenue, Cambridge, Massachusetts 02138, U. S. A.
3National Germplasm Repository, United States Department of Agriculture/Agricultural Research Service (USDA-ARS), 13601 Old Cutler Road, Miami, Florida 33158-0000, U. S. A.
4Missouri Botanical Garden, Monsanto Research Building, Post Office Box 299, St. Louis, Missouri 63166, U. S. A.
5Author for correspondence (sywong@unimas.my)

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 Adelonema for Neotropical species currently assigned to Homalomena. Adelonema is here delimited as a Neotropical genus of 16 species divided into two new sections: sect. Adelonema and sect. Curmeria, based on morphologically supported molecular results. The genus Adelonema is distinguished by a hypogaeal 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 spathe/peduncle (sect. Adelonema), or stipitate (sect. Curmeria), ovaries with 2–4 pluriovulate locules, and anatropous ovules on an axile placenta. Four new species are described: Adelonema orientalis, A. paludinerea, A. panamensis, and A. yanamanoensis. Eleven new combinations are made: Adelonema allenii, A. crispipes, A. hamelii, A. kvistii, A. moffleriana, A. peltata, A. picturata, A. roezlii, A. speariae, A. wallisi, and A. wendlandi.

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

Cusimano et al. (2011) resolved Pholidodrond Schott, Homalomena Schott, and Furtadoa M. Hotta in a clade (the Philodendron clade) equivalent to the combined tribes Homalomeceae and Philodendraceae 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 exodermis 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 rheophytic herbs with mainly epigal stems and almost entirely pleioanthic modules. In most species an obscure pulvinus is present ca. twothirds 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 pistilloide (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); Cyrtocladon (Griff.) Furtado; Chamacladon (Miq.) Engl. & K. Krause, and Geniculatae M. Hotta. Two pre-existing generic names are available for Neotropical species of Homalomena: Adelonema Schott (1860) and Curmeria Linden & André (1874). The type of Adelonema 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 Adelonema, 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. wallisi Regel, H. crispipes Engl., H. wendlandi 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 Pholidodrond 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 Adelonema). The aim of the current study was to sample an expanded representation of Adelonema for nuclear ITS and plastid matK regions. To this end, 29 accessions of 10 Adelonema 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 sixty accessions of 90 taxa of Homalomena (50 accessions of 39 taxa, ca. 30% of described species), Furtadoa (two accessions of two taxa, 100% of described species), Adelonema (22 accessions of 10 taxa, ca. 62% of species accepted 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 (Culcasia libera and Cercestis mirabilis, Lasia spinosa) were included for the plastid matK-partial 3′ trnK (matK) region. Overall this study included 135 accessions of 92 taxa of Homalomena (57 accessions of 41 taxa), Furtadoa (3 accessions of two taxa), Adelonema (29 accessions of 10 taxa), Philodendron (19 accessions of 9 taxa), two accessions each of two outgroups (C. libera and C. mirabilis), and two accessions of L. spinosa. Seventy-six sequences 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. DNA matrices were aligned in TreeBASE (study numbers S16371, S17301, and S18151).

**DNA Extraction, PCR Amplification, and Sequencing**—Total DNA was extracted using a modified version of the 2 × 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) amplifications for matK were carried out using the forward primer 19F (Gravendeel et al. 2001) and reverse primer 2R (Steele and Vilgays 1994). Two internal primers, 390F or/am 1236F (Cuénot et al. 2002) were used for sequencing. The PCRs and PCR product cleaning of ITS and matK were conducted according to Wong (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) followed by minor manual adjustment following the similarity criterion (Sims 2004). Indels were treated as missing data. To infer phylogenetic relationships, we applied maximum likelihood (ML; Felsenstein 1985) optimization with the software RAxML (7.3.2; Stamatakis 2006) and RAxML-Gui (Silvestro and Michalak 2012), as well as a Bayesian approach (Yang and Rannala 1997) with the software MrBayes (3.2.1; Huelsenbeck and Ronquist 2001). The ML analyses were performed using the generalized time-reversible substitution model with gamma rate heterogeneity, and statistical support was accessed via 1,000 replicates (repeated 10 times). The Bayesian analyses were performed using the JModelTest-Nei plus Gamma (for ITS) and General Time Reversible plus Gamma (for matK and combined regions), as identified by the Akaike information criterion (AIC; Akaike 1974) in FindModel (http://hcv.lanl.gov/content/sequence/findmodel/findmodel.html). Statistical support was accessed via posterior probability (PP). The Markov chain Monte Carlo (MCMC) analyses were conducted twice to check for parameter convergence. The MCMC algorithm was run for 2,000,000 generations with one cold and three heated chains, starting from random trees and sampling one out of every 100 generations. Convergence was assessed by using the standard deviation of split frequencies as convergence index with values < 0.005 interpreted as indicating good convergence. The first 10% of trees were discarded as burn-in. The remaining trees were used to construct 50% majority-rule consensus trees. Throughout this paper, PP of 0.9-0.95 and ML support (BS) value of 70-84% are considered as moderate, a PP of 0.95-1 and BS value of 85-100% are considered as strong support.

**Results**

**Alignment**—The sequence pherograms for the ITS region provided a clear and unambiguous signal without any indication of polymorphisms. Furthermore, each PCR reaction produced a single band. The length of ITS1 varied between 200 and 453 bp, and the length of ITS2 varied between 169 and 420 bp, while the length of the 5.8S subunit was consistent (160 bp) among all taxa investigated. The length of matK region varied between 1,707 and 1,811 bp. A total of 1,394 and 1,859 nucleotide positions were aligned for ITS and matK regions, respectively. The ITS and matK alignment included no ambiguously aligned sections, and were used in its entire length of 1,394 and 1,859 aligned positions, respectively. Both regions were combined with 38 accessions of 30 taxa (including two outgroup taxa).

**Phylogenetic Analysis**—For ITS analysis, Adelonema and Philodendron species are members of a clade distinct from Homalomena species (Fig. 1). Additionally, Philodendron subgen. Philodendron and Meconosigma are weakly supported as sisters to [Adelonema + Philodendron subgen. Pteromischum] (PP = 0.89). Five accessions of four Adelonema taxa are strongly supported (PP = 1.00; BS = 100) and this clade is sister to the remainder of the Adelonema species (PP = 1; BS = 83). The rest of the Adelonema species are reconstructed in a clade (PP = 0.91), with three accessions of A. picturata and A. sp. M533 as sister taxa. A clade of Asian Homalomena is strongly supported (PP = 1; BS = 90). Homalomena cochinchnensis and H. pygmaea are resolved in a clade (PP = 1.00; BS = 99). Groupings within the Homalomena clade are congruent with Wong et al. (2013): sect. Cyrtocladon, sect. Geniculatae, sect. Chamaeleadon, and sect. Homalomena. Homalomena thorulorganisation is sister to sect. Chamaeleadon and sect. Homalomena. Homalomena sp. (Ar4584) from Sumatra and two Homalomena taxa (Ar4763 and Ar4764) fell within the sect. Chamaeleadon. Two Philippine taxa, H. philippinensis and H. ‘zippeliamum’ are sister taxa to sect. Homalomena. Furtadoa is not supported as a genus: the two described species resolved separately in sect. Homalomena (Furtadoa sunatnativensis) and sect. Chamaeleadon (Furtadoa mixta).

Ten accessions of six Adelonema taxa were included in the matK analysis (Fig. 2). Adelonema formed a distinct group (PP = 1.0; BS = 96) separate from the Asian species. Two accessions of A. picturata are sister taxa to this clade (PP = 1.00; BS = 96). The other accession of A. picturata resolved together with A. crinipes and A. petlata (PP = 1.00; BS = 94), suggesting that the taxonomy of A. picturata is imperfect. Adelonema speariae, A. allenii and A. wallissii formed a well-supported clade (PP = 1.00; BS = 100). For Homalomena species, Homalomena sect. Cyrtocladon is weakly supported (BS = 60). Homalomena sect. Chamaeleadon, Geniculatae, and Homalomena are not supported in the matK analysis. Two accessions of F. sumatrensis resulted in separate clades with one accession forming a weak clade with H. isepifolia (BS = 58), and the other accession resolved in sect. Chamaeleadon (PP = 1.00).

For combined ITS and matK regions (Fig. 3), as the number of taxa in Adelonema and Philodendron is reduced to three and two taxa, respectively, the relationships among the three major clades (Adelonema, Philodendron and Homalomena) are not well resolved. However, individual clades are strongly supported: Adelonema (PP = 1.00; BS = 100), Philodendron (PP = 0.99; BS = 94), and moderately supported: Homalomena (PP = 0.99; BS = 68). For Homalomena, sect. Cyrtocladon is strongly supported (PP = 1.00; BS = 88) and is sister to one that includes the other three sections
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.
Bayesian tree of 55 taxa (Adelomema, 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.
Sect. Geniculatae, Sect. Homalomena, and Sect. Chamaecladon are moderately supported (PP = 1.00; BS = 76) with Sect. Geniculatae as sister to the other two sections. *Furtadoa sumatrensis*, *H. tonkinensis*, and *H. sp Ar4759* (from Sumatra) are weakly supported within sect. Homalomena and sect. Chamaecladon clades. Maximum likelihood trees are available from the Dryad Digital Repository: http://dx.doi.org/10.5061/dryad.rr85h.

**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, *Adelonia* is a Neotropical genus composed of two sections, *Adelonia* and *Curmeria*, totalling 16 species and utilizing the name *Curmeria* for the clade that excludes the type species of *Adelonia*. 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 *Adelonia*. *Adelonia* is defined by a hypogaeal 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. *Adelonia*) 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). Moffler and Bogner (1984) recorded chromosome counts of *Homalomena wallyi* and *A. speariae* of $2n = 42$.

*Adelonia* is resolved into two sections (Fig. 4): *Adelonia* and *Curmeria*. Sect. *Adelonia* comprises 10 species (A. erythropus, A. allenii, A. hammei, A. kivistii, A. moffleri, A. orientalis sp. nov., A. palidinervia sp. nov., A. roezlii, A. speariae, and A. wallyi). Sect. *Curmeria* has six species (A. crinipes, A. Align., A. palidinervia sp. nov., A. picturata, A. wendlandii, and A. yanamonoensis sp. nov.).

*Curtis* 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), *Adelonia* species display several striking similarities to *Pteromischum* species as compared to other species of *Philodendron* (subgen. *Mecosigstra* 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 *Mecosigstra* 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 *Adelonia* resurrected in the current paper, *Philodendron* subg. *Pteromischum* should deserve generic recognition with the name *Eleopium* (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 unistamine flowers, each associated with a pistillode. A second *Furtadoa* species was described by transfer of *Homalomena mixta* Ridl. (Hotta, 1985). Unistamine 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 stamine 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 morphologically easily 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).


**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 (bh-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.

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


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

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

*Adelonia hammei* (Croat & Grayum) S. Y. Wong & Croat, comb. nov. *Homalomena hammei* 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 Ríos Peje and Guá čimo, 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 interpetiolar staminodes are absent (B, D); but in Sect. *Curmeria*, leaf blade is puberulent and petiole is armored (E, G, H), and interpetiolar 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.
Schätz & Fetcher 1047 (holotype: MO-3382690; isotypes: CR!, DUKE!, WIS!).

**Distribution**—Endemic to Costa Rica, restricted to the Atlantic slope of Volcán Barva.

**Ecology**—Tropical wet forest (bmh-T), 50–400 m.


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

**Ecology**—Pluvial forest (bp-T) transition to tropical wet 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**—Primary and secondary forest in areas of pluvial forest (bp-T), 50–150 m.

*Adelonema orientalis* Croat, sp. nov.—TYPE: PERU. Huánuco: Leoncio Prado, along road to Monzón 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!). Figure 5.

*Adelonema orientalis* is characterized by the stems glabrous except for the often dense puberulence near the apex, by drying shiny yellow, and by peltate leaf blades. It seems to be most closely related to *A. crinipes*, a more widespread species which occurs in the Amazon basin but differs in having basifixed, not peltate, blades. *Adelonema orientalis* could be confused with *A. peltata*, another species with peltate blades occurring in much wetter and relatively non-seasonal areas along the western coast of Colombia and Ecuador.

Herb 1.5–2 m tall; internodes short, 2.5–6 cm diam, dark brown; cataphylls fleshy, light green; petioles (45–)66–115, obtusely flattened adaxially, yellow-green, drying light yellow-brown, finely ribbed; blades peltate (4.5–)7–12 cm, narrowly-ovate-sagittate, 32–62 cm long, 16.5–39.5 cm wide, 1.12–2 times longer than broad (averaging 1.6 times), 0.44–0.86 times as long as petioles, gradually acuminate to acute at apex, prominently lobed at base, thinly coriaceous, semiglossy and dark green above with the major veins lighter yellow-green, moderately paler and yellow-green, matte below; anterior lobe (21–)28–44 cm long, broadly convex on margins; posterior lobes (9.7–)14–26.5 cm long, narrowly rounded at apex, (6–)10.5–16.5 cm wide at point of fusion of posterior lobes; midrib sunken and slightly paler above, narrowly rounded and paler below; primary lateral veins weakly sunken and concolorous above, narrowly rounded and paler below. Inflorescence solitary, producing strong anise scented aroma at dusk: peduncle (6.5–)11–15 cm long, slightly flattened, 7 × 5 mm diam, brownish-red to faintly purplish-violet with sparse pale yellowish-green stripes and with a solid pale yellowish-green strip along abaxial surface, sparsely puberulous with short-shanked, T-shaped trichomes, sometimes reddish at base; spathe 16–28 cm long, caudate-acuminate at apex; tube 4.5–8 cm long, 3 × 2.5 cm diam, brownish-red to dark purple-violet with irregular greenish-yellow spots or to purplish-brown, weakly glossy both outside and inside; spathe blade 12 × 17 mm diam when furled, matte, greenish-yellow to greenish-white and tinged weakly with yellow abaxially outside, semi-glossy and greenish-white inside, the minor veins on the blade close and weakly raised outside, slightly darker and flat inside; spadix 12 cm long; sterile stamine portion white, 12 mm diam ca. 3 mm long; fertile stamine spadix creamy-white, 9 mm diam at base, 7 mm diam midway, 3 mm diam. 1 cm below apex; pistillate portion 3.1 cm long in front, 1.7 cm long in rear, 1.3 cm diam at base, 1.4 mm diam midway, 1.3 cm diam at apex, pistils green, arranged in spirals and alternating with spirals of staminodia.

**Etymology**—The specific epithet is from the Latin verb, *orientalis* (meaning eastern) referring to the fact that this species is restricted to the eastern slopes of the Andes.

**Distribution**—*Adelonema orientalis* is endemic to Peru, occurring on the eastern slopes of the Andes in Huánuco and San Martín Departments.

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

**Note**—Local names. Peru: “canton mashá” (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 & Riley 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); Dist. Camilla, carretera Marginal de la Selva, 7.4 km N of Pucalche, 7°43′S, 70°40′W, 900–1,160 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-V. 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 81737 (MO, USM). Huánuco: on 60° rocky slope above Río Huallaga at Tingo María, 4 Oct. 1972, Croat 216057 (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.
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, Carlsen & Levin 99438 (MO-6192212!). Figure 6.

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, 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 glossy 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; stamineate portion 8.5 cm long, slightly constricted above the sterile staminate portion, the latter to 2 cm long, 1.3 cm diam; sterile staminate 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. Infertile stem pendant or reclining on ground; peduncle to 24 cm long, peduncle and spathe purple-brown, ranging from B&K 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 epithet is from the Latin palidus (pale) and nervus (nervous 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. Canal Area: Parque Nacional Soberania, Old Pipeline Road N of Gamboa, 6 mi. N of Gamboa, Río Mendoza, 9°11'N, 79°46'W, 23 July 1994, Croat & Zhu 77079 (holotype: MO-05053131!; isotypes: K!, PMA!). Figure 5.

Adelonema panamensis is most similar to A. wendlandi and A. peltata (Fig. 1). It differs 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 prominulous 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. peltata.

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 basified 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 glossy 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; stamineate portion 8.5 cm long, slightly constricted above the sterile staminate portion, the latter to 2 cm long, 1.3 cm diam; sterile staminate 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. Infertile stem pendant or reclining on ground; peduncle to 24 cm long, peduncle and spathe purple-brown, ranging from B&K 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 palidinervia* 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.
**Adelonema picturata** (Linden & André) S. Y. Wong & Croat, comb. nov. *Curmeria picturata* Linden & André, Ill. Hort. 20: 45, t. 121, 1873. *Homalomena picturata* (Linden & André) Regel, Gartenflora 26: 33, 1877. — TYPE: COLOMBIA, cultivated source, original collection: *Roelz* s.n., 18 Dec. 1874 (fl.), Masters s. n. (K!).

**Distribution** — Colombia, Cordillera Central.

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


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

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


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

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

**Adelonema yanamonoensis** Croat & Mansell, sp. nov.— TYPE: PERU. Loreto: Maynas, Yanamono Tourist Camp, on Rio Sucasari, 50 m. NE of Iquitos, 30°30'S, 72°50'W, 106 m, originally collected by Jack Willford, Croat 56925 (holotype: MO; isotypes: F!, NY!, US!, USF!, 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 spathe purplish rather than greenish at anthesis, such as those of typical *A. crinipes* in the Iquitos region. *Adelonema crinipes* is typically much 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, persisting 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.
and wide, usually markedly concave along the margins, subcoriaceous, dark green and matte sub-velvety to weakly glossy above, moderately paler and matte below; anterior lobe acuminate, 5.5–13 cm wide midway; posterior lobes 14–17 cm long, 2–6.5 cm wide, narrowly rounded at apex, flaring from 90–120° angle from the midrib, held more or less flat or directed upward from the plane of the blade; midrib flat to weakly sunken, paler below, moderately paler above, slightly thicker than broad, bluntly angular to narrowly rounded and slightly paler below; primary lateral veins 3–4 per side, arising at 40–50° angle, moderately straight to the margins, etched to weakly sunken and usually slightly paler above (especially in the lower half), drying slightly paler or darker than the surface; minor veins fine, moderately distinct, darker than surface, arising from both the midrib and primary lateral veins; basal veins 4–5 per side, the first free to the base or nearly so, the third to fifth coalesced 2.4–5 cm; posterior rib straight, scarcely or not at all naked along the sinus, the green tissue diminishing very gradually toward the petiole, the naked portion rarely 1 or 2 cm long. Inflorescences one per axil; peduncle 4–5.5 cm long, densely puberulent to scabridulous (extending weakly onto base of spathe), reddish at base, purplish-violet toward apex, subterete; spathe (5–)7–10.5 cm long, 1.5–2.0 cm diam, (flattening to 5–6 cm wide) dark violet-purple, purple-brown, mottled with greenish- to creamy-white spots, weakly glossy to semi-glossy and minutely granular outside with magnification (10x), glossy and much paler, tinged pink inside, densely pale-speckled and white maculate, rather prominently constricted above the tube, caudate-acuminate at apex; spadix 7.3–10.3 cm long; pistillate portion 2.0–3.5 cm long in front, 1.7–2.6 cm long in back, 0.8–1.5 cm diam; pistils medium green, 1.8–2.0 mm long, 1.0–1.2 mm diam, tapered toward the base; stigmas disk-shaped, 0.6–0.8 mm diam, pale green; staminodia white, one per pistil, 0.6–1.0 mm diam, borne on slender stalk; stamineate spadix 4.8–7.0 cm long, constricted to 7–10 cm diam. At base, the sterile section 2.3 mm long, gradually tapered to a blunt point at apex, drying yellow-brown, the broadest portion 0.7–1.1 cm diam. Inflorescence unknown.

**Etymology**—The species is named for the type locality at Yanamono Tourist Camp on the Río Sucusuri in Loreto Department.

**Distribution**—*Adelonema yanamonoensis* is restricted to the region of the Amazonas and Napo Rivers in the region of Iquitos, Peru.

**Ecology**—Tropical moist forest (bh-T), between 100–130 m.

**Note**—*Adelonema yanamonoensis* is characterized by its small stature, branching clustered stem, sharply 2-ribbed cataphyll turning reddish-brown and persisting intact; dark green minutely puberulent, sparsely spiny peitioles which are variegated with short pale green thick lines, triangular-hastate blades prominently lobed at base and matte-sub-velvety to weakly glossy above, usually markedly concave along margins with 4–5 pairs of basal veins, the first pair of which is free to base or nearly so, a posterior rib that is scarcely or not at all naked along the sinus, as well as by the densely puberulent to scabridulous peduncle, a dark violet-purple or purple-brown spathe that is mottled with greenish to creamy-white spots outside and tinged pink inside.

**Representative Specimens Examined**—PERU. Loreto: Yanamono, Explorana Tourist Camp, between India and mouth of Río Napo, 130 m, 3°28’S, 72°48’W, 18 Feb. 1981, Gentry et al. 31378 (MO); NE of Iquitos, 30°30’S, 72°50’W, 17 Oct. 1980, Vásquez & Jaramillo 511 (MO, USM); Varadera de Mazan, trail from Río Amazonas to Río Napo, 22 Aug. 1972, Croat 15535A (MO); vic. Iquitos, 100 m, 3–11 Aug. 1929, Killip & Smith 27445 (NY, US); Río Itaya, ca. 5 km above Iquitos, 6 Aug. 1972, Croat 18817 (MO); ca. 6 km upstream from Iquitos, 11 Aug. 1972, Croat 19075 (MO); ca. 19 km above Iquitos, 13 Aug. 1972, Croat 19137 (MO, USM); 14 Dec. 1979, Davidson & Jones 9863 (MO, RSA); 130 m, 3°50’S, 73°20’W, Vásquez & Jaramillo 13038 (K, MO, Iquitos, US, USM).

**Cultivated**—ECUADOR. Amazonas: collected by D. Fisk, vouchered as Croat 78340 (MO). PERU. Loreto: Explorana Tourist Camp on Río Sucusari near Río Napo, collected and cultivated by M. Johnson, vouchered 29 Sep. 1988, as Croat 69710 (MO).

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**Revised Key to Philodendron Clade**

1. Climbing hemiphtytes, epiphytes or terrestrial herbs with petiolar sheath much reduced; if petiolar sheath well-developed then plants climbing, leaves lanceolate, elliptic, or citrus peel, or ginger. Anthesis (where observed) begins at dawn. Old world tropics .......................... 3

2. Placemation basal or parietal; petiole unarmed; leaf blade usually glabrous, if hairy then pilose or hirsut, never puberulent, never variagated; tissues smelling of terpenoids – frequently reminiscent of mango or citrus peel, or ginger. Anthesis (where observed) begins at dawn. Old world tropics .......................... 3

3. Stamineate flowers each with 2–6 stamens, very rarely monandrous (and then stamineate flower never associated with a pistillode); placemation parietal .......................... 3

4. Spadix sessile, inserted obliquely on spathe/peduncle. Petiole not armed; leaf blade glabrous; interpetiolar staminodes always absent .......................... 3

5. Stamineate flowers monandrous, each associated with a pistillode; placemation basal .......................... 3

6. Spadix stipitate. Petiole often armed with prickles; leaf blade pubescent; interpetiolar staminodes sometimes present .......................... 3

7. **Philodendron**

8. **Homalomena**

9. **Aделonema** sect. *Aделonema*

10. **Aделonema** sect. *Curmera*

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**Key to Species of Aделонema**

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 spinose .......................... 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 narrowly ovate with narrowly rounded lobes that have a parabolic to arcuate (rarely spatulate) sinus; peduncle densely scurfy-pubescent throughout .......................... *A. picturata*
2. Petioles terete or nearly so, usually with scattered spinose 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 prominulous and easily visible on upper surface, pale green where they merge with midrib; Central Panama, 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 concolorous 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 ......................... 6
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. orientalis
6. Petiole puberulent and spiny throughout their length, usually brown to yellow-brown and matte; N. slope of Central Cordillera and W. slope of Western Cordillera, 280–1,030 m ................. A. pelta
4. Leaf blades basified ............................................................... 7
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 .................................................. 8
8. Petioles weakly spinous; Central American and northern Colombia .......................................................... A. wendlandii
8. Petioles glabrous to densely spiny; Amazon basin from southern Colombia to Bolivia ........................................ 9
1. Leaf blades broadly to narrowly ovate or elliptic, base not lobed; foliage without trichomes or spines ........................................... 9
9. Petiole 1.5–4(–6) cm long, sheath usually extending nearly to blade; spathe 5–7(–16) cm long A. wallisii
9. Petiole over 6.5 cm long, sheath usually extending to no more than about mid-petiole ................................................. 10
10. Spathe ca. 25 cm long; leaf blades conspicuously mottled .......................................................... A. sparsia
10. Spathe 5–20 cm long; leaf blades not mottled or if mottled then mottling very weak .................................................. 11
11. Leaves broadest above the middle, dark green (almost black) with conspicuous hyaline margins A. sellmeyeri
11. Leaves broadest at or near middle, medium green, hyaline margins usually inconspicuous ........................................ 12
12. Primary lateral veins more than 15 per side ............................................. 13
13. Blades matte, ovate to broadly ovate or elliptic, 1.6–1.8 times longer than wide, rounded to weakly subcordate at base; petioles 1.3–2.6 times longer than blades; inflorescences to ca. 20 cm long; Colombia & Ecuador; 100–140 m .................................................. A. krivitzii
13. Blades semi-glossy, elliptic to narrowly ovate, 2.5–2.2 times longer than wide; broadly curved 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. hammelii
12. Primary lateral veins 10 or fewer per side ............................................. 14
14. Adult blades more than 20 cm wide; Colombia (unknown origin, but probably in Andes of N. Colombia) .................................................. A. roezli
14. Adult blades less than 15 cm wide .................................................. 15
15. Leaves membranaceous, minor veins frequentely branching moderately distinct; epidermal cells on lower blade surface smooth; Amazon basin; tropical moist forest (bh-T) in areas of mostly white sand soil A. erythraceus
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 (bh-m-T) in areas of alluvial or lateritic soil .......................................................... A. allentii

Acknowledgments. This study was partially funded by Ministry of Higher Education Malaysia through No. ERGS/01(02)/2008/2011(03), FRGS/STWN10(01)985/2013 (2b) and NRC/S/1089/2013-02(3). Many thanks to Carla V. Kostelac for her assistance in image searching. We thank two anonymous reviewers for constructive comments on an earlier version of the manuscript.

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