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A new section and a new species of *Philodendron (Araceae)* from Ecuador

Abstract

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A new section of *Philodendron*, *P.* sect. *Dolichogynium,* is described. It is characterised by pistils with an elongated, divergent, narrowly tapered style with a minute globular stigma and small, 6–9-locular ovaries with a single ovule per locule. Other distinctive characters include deciduous, unribbed cataphylls, cordate to ovate-triangular or three-lobed leaf blades with distinct posterior ribs, and small, numerous inflorescences per axil with non-constricted spathes. The new section is represented by *P. sparreorum* and *P. delinksii,* the latter a species also described as new to science.

Additional key words: aroids, *Philodendron* sect. *Dolichogynium*, *Philodendron delinksii*, Colombia, taxonomy

Introduction

The last full revision of *Philodendron* Schott (Krause 1913) recognised nine sections in what is now considered to belong to *P.* subg. *Philodendron* (Croat 1997). Following largely Engler's (1899) previous revision, gynoecial characters, such as the number of ovules per locule or the shape of the style, played a major role in Krause's classification (Mayo 1990). Seven of Krause's sections and the vast majority of the species have hemispherical or globose styles barely distinguishable from the remainder of the ovary (Mayo 1986). In fresh state, the styles of these species are rather uniform superficially, although they exhibit high morphological diversity upon dissection (Mayo 1989).

In contrast to this homogeneous style appearance throughout most *Philodendron* species, two monotypic sections of Krause's treatment feature very distinctive elongated styles. *P.* sect. *Camptogynium* K. Krause is represented by a single Amazonian species, *P. longistilum* K. Krause, described from Brazil. It is characterised by its unique prolonged, strongly curved style with a cupular stigma. While Croat (1997) suspected that it could possibly be incorporated in *P.* sect. *Calostigma* (Schott) Pfeiffer (now *P.* sect. *Macrobelium* (Schott) Sakuragui), a molecular phylogeny of the genus found it in a clade together with members of *P.* sect. *Baursia* (Rchb. ex Schott) Engl. (Gauthier & al. 2008). The other section, *P.* sect. *Macrogynium* Engl., consists of *P. jacquinii* Schott from Central and northern South America. It shares the character of an elongated style but has erect pistils and a standard, cushion-shaped stigma. Vegetatively, it is very distinct in having a setose stem and thin, ovate-cordate leaves, which may be deciduous in the dry season.

Croat (1997) followed Krause's classification of *Philodendron* subg. *Philodendron* in maintaining *Camptogynium* and *Macrogynium* as separate sections. However, in his discussion of *P.* sect. *Camptogynium* he mentioned specimens of undescribed species from western Ecua-

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dor with prolonged styles deflected to one side. In 2004, Croat described a new species having elongated styles, *P. sparreorum* Croat, from Pacific Colombia and Ecuador. In his description, Croat emphasised the unusual long, protruding, tapering styles with a globular stigma, but did not discuss possible affinities to other species (Croat & Finch 2004). Two years later, during their field work on epiphyte diversity at Bilsa Biological Station in western Ecuador, N. Köster and A.-M. Schnell collected specimens of *P. sparreorum* and another, undescribed species with similar styles. Besides the elongated styles, both species share deciduous, unribbed cataphylls, leaf blades with distinct posterior ribs, small, numerous inflorescences with non-constricted spathes, and a single ovule per locule with basal placentation.

Despite having protruding styles, this probably natural group of two sympatric species seems not to be closely related to one of Krause's two sections with prolonged styles. *Philodendron* sect. *Camptogynium* differs distinctly in having a single inflorescence per axil, a cup-shaped stigma, and the style strongly perpendicular to the body of the truncate ovary. In addition, the leaf blades of *P. longistilum* are oblong-lanceolate compared to the ovate-triangular or three-lobed leaf blades of *P. sparreorum* or the undescribed species, respectively. The other section with elongated styles, *P.* sect. *Macrogynium,* differs even more pronouncedly in having a broad, roomy spathe, erect pistils, a short-necked style with a standard, cushion-shaped stigma, and two ovules per locule with sub-basal placentation. Furthermore, it has unusual deciduous leaves with thin, ovate-cordate blades and a pubescent stem.

The only other group with clusters of inflorescences in each axil and a single ovule per locule with basal or sub-basal placentation is *Philodendron* sect. *Macrobelium* (Schott) Sakuragui subsect. *Oligocarpidium* (Engl.) Mayo. However, this group otherwise has leaf blades lacking a posterior rib, ovules surrounded by a distinct ovule sac and, most notably, pistils which differ in no way from most other *Philodendron* species.

Some of Krause's sections are likely to be rather artificial (Gauthier & al. 2008) and further molecular phylogenies are urgently required to redefine the sectional boundaries of *Philodendron* subg. *Philodendron*. Morphological and biogeographic evidence suggest, however, that *P. sparreorum* and the related, undescribed species from western Ecuador do form a natural group. As a result, it seems necessary to establish a new section within *P.* subg. *Philodendron* to accommodate these two species adequately. Together with the undescribed species, the new section is described in the following.

Philodendron (subg. ***Philodendron***) sect. ***Dolichogynium*** Croat & Köster, **sect. nov.**
Type: *Philodendron delinksii* Croat & Köster

Caulis elongatus, scandens; internodia 2–15 cm longa, 1.5–4 cm diam.; cataphylla 25–32 cm longa, plerumque decidua; folia lamina cordata, ovato-triangulata vel trilobata; inflorescentia 2–7(–10) in quoque axilla, erecta, parva; pedunculus teres, 4–20(–25) cm longus; spatha 6–10 cm longa; pistillum plerumque 6–9-loculare, loculis 1-ovulatis; stylus plerumque tenuis, elongatus, curvatus; stigma ovoideum vel subangulatum.

Etymology. — The sectional epithet *Dolichogynium* is derived from Greek δολιχός (long) and γυνή (woman, female), referring to the prolonged styles.

At present, *Philodendron* sect. *Dolichogynium* comprises only two species, *P. sparreorum* Croat from the Pacific lowlands and lower Pacific slopes of Colombia and Ecuador as well as the newly described *P. delinksii* Croat & Köster (see below) apparently endemic to western Ecuador. The section is characterised by deciduous, unribbed cataphylls, cordate, ovate-triangular or three-lobed leaf blades with distinct posterior ribs, small, numerous inflorescences with non-constricted spathes, and 6–9-locular ovaries with a single ovule per locule and basal placentation. However, the most distinct character of *P.* sect. *Dolichogynium* separating it clearly from all other *Philodendron* groups is the prolonged style that is much narrower than the ovary, long-tapered, curved upward and has an almost circular to irregularly angular stigma.

In both species, the sterile staminate portion of the spadix, if existing at all, is not distinguishable from the fertile staminate portion. This suggests, together with the unique shape of the pistillate flowers, a pollination system different to the vast majority of *Philodendron* species, which are generally pollinated by beetles feeding on the sterile staminate flowers.

Key to the species of *Philodendron* sect. *Dolichogynium*

1. Leaf blade distinctly 3-lobed, with posterior ribs arising at 80–90° and arching forward; pistils white, 3–4.5 mm long, 6-locular . . . . . 1. *P. delinksii*
– Leaf blade entire, ovate-cordate to ovate-triangular, with posterior ribs arising at 120–130° and being nearly straight; pistils pale green, 6–8 mm long, 8–9-locular . . . . . 2. *P. sparreorum*

1. *Philodendron delinksii* Croat & Köster, **sp. nov.**
Holotype: Ecuador, Esmeraldas, Quinindé Cantón, Montañas de Mache-Chindul, Bilsa Biological Station, 0°21'N, 79°44'W, 450–650 m, tropical and premontane wet forest, Oct. 2006, *N. Köster & A.-M. Schnell 1967* (MO 6194930; isotypes QCA, QCNE). – Fig. 1–2.

Planta epiphytica vel terrestris; caulis elongatus, scandens; internodia 2–12 cm longa, 1.5–4 cm diam.; cataphylla 30–32 cm longa, decidua, purpureo-rubra; petiolus subteres, adaxialiter leviter convexus, 59.5–71.5 cm longus, 5–7 mm diam.; folia lamina 43.5–50 cm longa, 45.5–51 cm lata, trilobata, lobis posticis paten-

Fig. 1. *Philodendron delinksii* – A: holotype specimen at MO, *Köster & Schnell 1967;* B: habit of specimen at type locality, Ecuador, Esmeraldas, Bilsa Biological Station; C: leaf of specimen at type locality, Ecuador, Esmeraldas, Bilsa Biological Station; D: fresh inflorescence of type collection, *Köster & Schnell 1967*. – Photographs by C. Kostelac (A) and N. Köster (B–D).

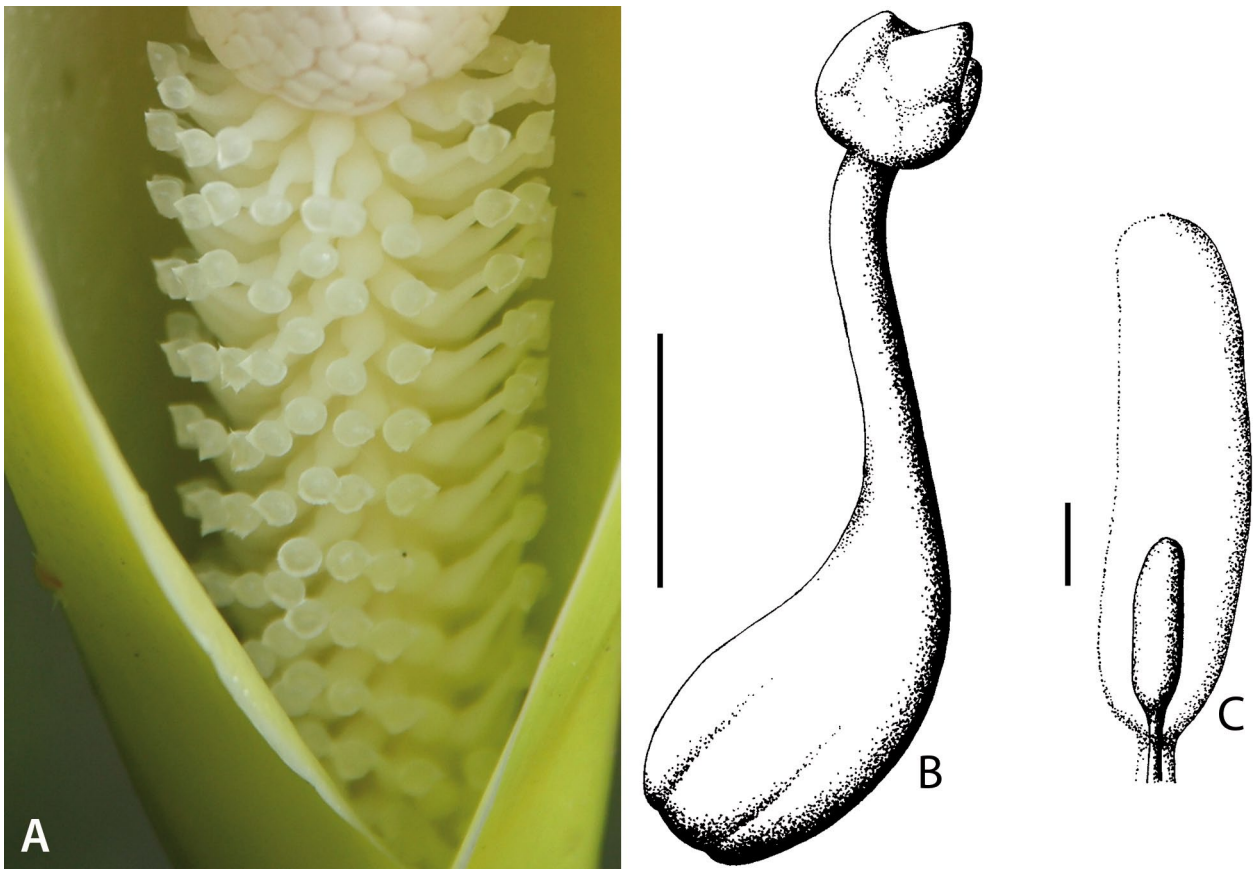

Fig. 2. *Philodendron delinksii* – A: fresh pistillate flowers of type collection, *Köster & Schnell 1967;* B: pistil with characteristically elongated style and ovoid, irregularly angular stigma; C: ovule embedded in a gelatinous envelope. – Scale bars: B = 1 mm, C = 0.1 mm. – Drawings (based on *Köster & Schnell 1967*) and photograph by N. Köster.

tibus 22.5–26 cm longis, 8.5–13 cm latis, lobis anterioribus 33–39 cm longis, 9–16 cm latis, venis basalibus (8–)9–10–(11) utroque, 1–2 liberis ad basim, venis primariis lateralibus 5–6 utroque; inflorescentia 2–6 in quoque axilla, erecta, parva; pedunculus teres, 5–9 cm longus, 4–6 mm diam.; spatha 6–8(–9) cm longa, 2–3.5 cm lata, extus flaveoviridis ad pallide purpureorubra, intus virido-cremea ad albida suffusa rubra; spadix 5.2–7.1 cm longus, parte pistillata 2.2–3.3 cm longa, 5.2–8 mm diam.; pistillum 6-loculare, loculis 1-ovulatis; stylus tenuis, elongatus, curvatus; stigma ovoideum; parte staminata 2.5–3.7 cm longa, 5–8.5 mm diam.; baccae ignotae.

Epiphytic or terrestrial root-creeper, *roots* 2.5–3 mm diam., dark purple-red when young, epidermis maroon and partly flaking off upon drying; *internodes* short (2–4 cm) to elongated, up to 15 cm long, 1.5–4 cm diam; epidermis light bluish grey, light beige and partly flaking off upon drying; *cataphylls* 30–32 cm long, medium purple-red, unribbed, deciduous; latex sometimes oxidising white (fide *Pitman & M. Bass 823*). *Leaves* up to 8 per plant, semi-erect to spreading, 98–115 cm long; *petioles* semiterete with convex adaxial surface, dark purple-red, 59.5–71.5 cm long, 5–7 mm diam. upon drying; *sheath* up to 5 cm long, shortly ligulate (3 mm); *blades* three-lobed, with undulate margins, 43.5–50 cm long, 45.5–51 cm wide, about as long as wide (length/width ratio 0.95–1.1), broadest across the tip of the posterior lobes, medium green and semiglossy above, slightly paler and weakly glossy below, drying medium yellowish brown to occasionally light yellowish grey above and light yellowish brown to occasionally light yellowish grey below; *anterior lobe* 33–39 cm long, narrowly triangular, gradually long-acuminate at apex, 9–16 cm wide at base; *lateral lobes* arching forward, 22.5–26 cm long, 8.5–13 cm wide at base of the lobes, rounded at apex, with prominent auricle at lower margin, broadly confluent with anterior lobe at upper margin, upper margin markedly folded upward between anterior and lateral lobe; *sinus* subhippocrepiform to nearly closed, 3–6.5 cm deep, 4–9 cm wide midway upon pressing; *basal veins* (8–)9–10(–11) pairs, 3 pairs acroscopic, 5–7 basioscopic, the first pair free or nearly so at base, the remainder fused forming the *posterior ribs* which arise at an 80–90° angle, running to the tip of the lateral lobes; posterior ribs and *midrib* flat-sunken, tinged light purple-red above, weakly round-raised, medium purple-red below, drying smooth and light yellow brown above, irregularly ribbed and light yellow-brown below; *primary lateral veins* 5–6 pairs, arising acute from the midrib and spreading at 30–55° angle, basal and primary lateral

veins flat-sunken, tinged light purple-red above, drying light yellow-brown above, moderately acute, irregularly ribbed and light yellow-brown below; *interprimary veins* present, distinctly less conspicuous than primary lateral veins; *minor veins* moderately visible above, inconspicuous below. *Inflorescences* 2–6 per axil, erect at anthesis, spreading to pendent in fruit; *peduncle* terete, 5–9 cm long at anthesis, 10–13 cm in fruit, 4–6 mm wide, medium green with minute, pale green stripes at anthesis, demarked from the spathe by purple-red ring, in fruit completely purple-red and darker than spathe; *spathe* 6–8(–9) cm long, 2–3.5 cm wide at anthesis, about as long as peduncle, acuminate at apex, not constricted, opening nearly completely with a slightly convolute base, yellowish green and tinged purple-red at apex with a whitish margin outside, greenish cream inside, tinged slightly salmon-red towards apex, with scattered white resin glands; spathe bright orange-red in fruit, drying matte, brownish orange inside, darker outside; *spadix* 5.2–7.1 cm long; *pistillate portion* 2.2–3.3(–3.7) cm long, 5.2–8 mm in diam. midway upon drying; *pistils* 3–4.5 mm long, white, drying medium red-brown; *ovary* ovate, with 6 locules, 1.4–1.6 mm long, 0.8 mm wide at anthesis, drying with 6 longitudinal ridges; *ovules* 1 per locule, basal, 0.2 mm long, funicle 0.1 mm, ovules borne in a shortly stalked (0.05 mm) gelatinous envelope 0.8 mm long, 0.2 mm diam.; *style* prolonged, much narrower than the ovary, long-tapered, 1.5–2.9 mm long, 0.3 mm diam. at base, 0.2 mm diam. near apex, curved upward; *stigma* almost circular to ovoid or irregularly angular, 1–3 pointed, glossily gelatinous, translucent white, 0.7–0.9 mm diam.; *staminate portion* narrowly ovate, 2.5–3.7 cm long, 5–8.5 mm wide at widest portion near base, matte, milky white, protruding very weakly forward out of the spathe at anthesis; sterile staminate portion, if present, not distinguishable from fertile staminate portion. *Berries* unknown.

Eponymy. — The species is named in honour of Thomas Delinks, an American botanist who spent several years exploring and collecting in Ecuador, starting in the Amazon basin with a three month stint at the Jatun Sacha field station and later on a two year project with Nigel Pitman in the Parque Nacional Yasuní. He explored the Cordillera del Cóndor with David Neill and in 1998, with Tom Croat's encouragement, he began collecting *Araceae,* working at sites in the coastal mountain ranges of Manabí Province, especially in the southern Mache-Chindul Mountains where, with the help of Ecuadorian botanist Carlos Robles, he collected some of the first vouchers of *Philodendron delinksii*.

Delimitation. — *Philodendron delinksii* is a distinctive species characterised by its long, climbing stems, deciduous, unribbed cataphylls, three-lobed leaf blades, small, numerous inflorescences with non-constricted spathes, 6-locular ovaries with a single ovule per locule, and a prolonged, long-tapered style, which is much narrower than the ovary and curved upward. Juvenile plants bear narrowly triangular, sagittate-hastate leaf blades, gradually increasing in size and approaching the typical blade shape of the adult plants. The leaves of juvenile plants also tend to dry medium greenish brown, in contrast to adult leaves drying medium to light yellowish brown. The species is closely related to the sympatric *P. sparreorum* with long-creeping stems and cordate blades. However, it is easily to distinguish from that species by its distinctly 3-lobed leaves and by having the posterior ribs arising at an 80–90° angle and arching forward. It also has white, 6-locular pistils which are only 3–4.5 mm long.

Distribution, habitat and conservation. — *Philodendron delinksii* is apparently endemic to Ecuador, known only from the type locality in the Montañas de Mache-Chindul in Esmeraldas and Manabí Provinces. At Bilsa Biological Station, it is a fairly common epiphytic or terrestrial herb occurring at elevations between 400 and 650 m in Tropical wet forest and Premontane wet forest (Holdridge & al. 1971). These forests are predominantly non-flooded and have an average height between 30 m and 35 m. Common tree species are *Otoba gordoniifolia* (A. DC.) A. H. Gentry, *Virola dixonii* Little (both *Myristicaceae*), *Simira cordifolia* (Hook. f.) Steyerm. *(Rubiaceae)*, *Carapa guianensis* Aubl. *(Meliaceae)* and *Iriartea deltoidea* Ruiz & Pav. *(Arecaceae)*. The forests at Bilsa Biological Station harbour an abundant and diverse epiphyte flora of 381 species belonging to 29 families of vascular plants (Köster & al. 2011). With 59 species, *Araceae* represent the second most important epiphyte family (after *Orchidaceae*), including 26 species of *Anthurium* Schott and 17 species of *Philodendron. P. delinksii* was found in 29 of 110 study plots at Bilsa examined for epiphyte species by N. Köster and A.-M. Schnell between September 2006 and February 2007 (Köster 2008). Of these 29 study plots harbouring *P. delinksii,* 7 were located in a contiguous primary forest, 8 in smaller primary forest fragments surrounded by pastures, 12 on isolated remnant trees in pastures and only 2 in secondary forests. Thus, the species appears to tolerate a certain degree of habitat alteration due to human land-use. Within its host trees, *P. delinksii* occurs both on the trunk and in the inner canopy. In the study of Köster (2008), it was found 15 times on the lower trunk, 3 times on the upper trunk, 8 times in the inner third of the tree crown and 4 times in the middle third of the crown. As by far most of the epiphytic aroids, it is not able to grow in the outermost canopy of its host trees due to the scarcity of water and nutrients in that micro-habitat.

Paratypes. — Ecuador: Esmeraldas: Quinindé Cantón, Montañas de Mache-Chindul, Bilsa Biological Station, 35 km W of Quinindé, 5 km W of Santa Isabel, along old road to Mono, 0°21'N, 79°44'W, 400–600 m, Oct. 1994, *N. Pitman & M. Bass 823* (MO 04641738, QCNE

89230); about 300 m NW of station, Nov. 1994, *M. Bass & N. Pitman 260* (MO 05077621); Manabí, Pedernales Cantón, Cerro Pata de Pájaro, 10 km east of Pedernales, 0°01'N, 79°58'W, 500 m, Nov. 1998, *T. Delinks & C. Robles 118* (MO 5310741); 510 m, Sep. 1998, *T. Delinks & C. Robles 92* (MO 5898374), subadult; 600 m, Sep. 1998, *T. Delinks & C. Robles 93* (MO 5898373), juvenile; 600 m, Sep. 1998, *T. Delinks & C. Robles 81* (MO 5898371), juvenile; 600 m, Sep. 1998, *T. Delinks & C. Robles 69* (MO 5898372), juvenile.

2. *Philodendron sparreorum* Croat in Aroideana 27: 53. 2004.
Holotype: Ecuador, Esmeraldas, 8.8 km NW of Quinindé, 85 km SE of Esmeraldas, 0°26'N, 79°03'W, 270 m, 31.3.1983, *Croat 55555* (MO 3641840-42; isotypes AAU, B, F, K, NY, QCA, QCNE, US).

Philodendron sparreorum is recognised by its thick, long internodes, drying with a smooth, light brown epidermis. It has numerous small, more or less pale orange inflorescences per axil and pistils typical for *P.* sect. *Dolichogynium* with long, protruding, tapering styles. From the other species of the section, it differs in having ovate-cordate to ovate-triangular leaf blades with straight posterior ribs arising at an 120–130° angle. Furthermore, it has pale green, 8–9-locular pistils longer (6–8 mm) than those of *P. delinksii*.

Distribution, habitat and conservation. — *Philodendron sparreorum* ranges from Colombia (Cauca, Chocó and Nariño) to Ecuador (Cotopaxi, EI Oro, Esmeraldas, Guayas, Los Ríos and Pichincha). It occurs in the Pacific lowlands and along the lower Pacific slopes of the Andes in Tropical wet forest, Premontane wet forest and Premontane pluvial forest (Holdridge & al. 1971). At Bilsa Biological Station in the Montañas de Mache-Chindul (Esmeraldas, Ecuador), it is a fairly rare epiphytic or terrestrial herb. In the study of N. Köster and A.-M. Schnell, it was found in 7 of 110 study plots surveyed for epiphyte species: six times on isolated remnant trees in pastures and once in a small primary forest fragment surrounded by pastures (Köster 2008). Since it was absent both from the contiguous primary forest and secondary forests, it seems to tolerate anthropogenic habitat alteration to some extent and to even benefit in a certain degree from the euphotic conditions on isolated remnant trees. Accordingly, *P. sparreorum* was always found on the lower trunk of the isolated remnant trees, while in the forest fragment, it grew in the inner crown of its host tree where light is more abundant than on the lower trunk.

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