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Two new endemic species of *Monstera* (Araceae: Monsteroideae: Monstereae) from Golfito in southern Costa Rica

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Abstract. *Monstera croatii* M.Cedeño & A.Hay and *M. gambensis* M.Cedeño & M.A.Blanco (Araceae: Monsteroideae: Monstereae) are newly described and illustrated from cantón Golfito in the Pacific lowlands of southern Costa Rica. Notes are provided on how they can be differentiated from similar species. *Monstera croatii* is unique in the genus because it reaches its adult vegetative morphology while growing as a terrestrial plant on the forest floor, and climbs only to a very limited height before flowering. *Monstera gambensis* is one of the smallest species in the genus.

Keywords: Aroids, Central America, Osa Peninsula.

INTRODUCTION

In Costa Rica there are some 24 genera and 256 species of Araceae (including subfamily Lemnoideae, commonly treated as a separate family), the most well-represented of the genera being *Anthurium* Schott, *Philodendron* Schott, and *Monstera* Adans. (Grayum 2003; Ortiz et al. 2018). These groups are abundant and diverse in very humid lowland forests and in cloud forests (Grayum 2003). *Monstera* is a genus that consists mostly of nomadic vines (sometimes referred to as hemi-epiphytes, but see Zotz 2013), and is best known for its often conspicuously perforated leaves (Grayum 2003; Cedeño-Fonseca et al. 2018; Hay 2019). Molecular-phylogenetic analyses of subfamily Monsteroideae agree in finding *Monstera* to be a monophyletic genus most closely allied to the tropical Asian genus *Amydrium* Schott and some (but not all) species of the likewise Asian *Epipremnum* Schott, and it is the only neotropical member of the pantropical tribe Monstereae or '*Rhaphidophora*

clade' (Tam et al. 2004; Zuluaga et al. 2019). It is considered one of the taxonomically most poorly understood aroid groups in Mesoamerica (Madison 1977; Croat 1992; Jácome and Croat 2002; Grayum 2003). The most recent taxonomic revision (Madison 1977) recognized 22 species in the entire genus. However, the first author's current research, revising *Monstera* for Central America, indicates that there are more than 40 species in this region alone (Cedeño-Fonseca 2019), with an as yet undetermined number of further species from Mexico, tropical South America, and the Caribbean.

The genus is currently divided into four sections — *Echinospadix* Madison, *Marcgraviopsis* Madison, *Tornelia* (Gutiérrez ex Schott) Madison, and *Monstera* (Madison 1977; Mayo et al. 1997; Croat et al. 2010) — though it is doubtful whether this infrageneric classification will stand up to molecular analysis (e.g., Zuluaga et al. 2019). Section *Monstera* includes, among others, several small, mainly South American species — *Monstera obliqua* Miq. (Costa Rica to Ecuador, Perú, Venezuela, the Guianas and Brazil), *M. xanthospatha* Madison (western Colombia), and *M. minima* Madison (Panama and Colombia) (Madison 1977; Jácome and Croat 2002) — and during recent fieldwork in the forests of La Gamba, Golfito, a new diminutive species was collected, which is described and illustrated here. In addition, a species with terrestrial (or near terrestrial) habit was also collected in Golfito, which only ascends on the phorphyte to about 1.5 m above ground level. This species has also proven to be undescribed, and is named here. It too belongs to sect. *Monstera sensu* Madison (1977).

***Monstera croatii* M.Cedeño & A.Hay, sp. nov.**

Type: Costa Rica, Puntarenas Province, Golfito Canton, Golfito, camino hacia las antenas, 8°38'55.1"N, 83°9'30.8"W, 389 m, 4 February 2019 (fr.), *M. Cedeño & A. Hay 1624* (holotype: USJ [2 sheets]). (Figures 1, 2).

Diagnosis

Monstera croatii is recognized by its terrestrial or very low nomadic-vining habit, petioles glaucous at the base, with the sheath extending to about half the total length, the sheath margins involute, and the free portion terete, greyish-glaucous leaf blades, adult leaf blades deeply pinnatifid, peduncles with a persistent mucronate cataphyll, and spadices with more or less spherical basal sterile flowers.

Description

Moderately robust terrestrial herb to appressed nomadic vine, flowering at ca. 0.5–1.5 m above ground level. *Seed-*

lings not observed. *Juvenile plants* terrestrial; *stem* pale to dark green, smooth, terete, with internodes 1–2.4 cm long by 0.5–1 cm diam.; *petioles* visible (i.e., the blades not shingling), pale to dark green, smooth, 8–10 cm long, sheathed in the lower 3–6 cm, the wings persistent, above the sheath more or less terete to slightly channeled; *leaf blades* not appressed to the substrate, 10–20 × 4–10 cm, lanceolate, narrowed to the base, acuminate at the apex, thinly coriaceous, with or without fenestrations and if fenestrate then generally on only one side and breaking at the margin. *Adult plants* terrestrial and eventually becoming appressed-climbing before flowering; *stem* dark green to pale brown, terete, the internodes 1–1.5 cm long, 1.5–2 cm diam., with pale brown-hairy support and feeder roots; *petioles* rather pale bluish green, glaucous/pruinose, smooth, 34–45 cm long, sheathed in the lower 20–28 cm, with the wings persistent and involute, the free portion terete, slightly canaliculate near the geniculum; *geniculum* more or less terete, very slightly canaliculate adaxially, 2–2.5 cm long; *leaf blades* 30–45 × 25–33 cm, oblong-ovate, rounded to asymmetric at the base, shortly acuminate at the apex, subcoriaceous, deeply pinnatifid but not fenestrate, not decurrent onto the geniculum, glaucous abaxially, the anterior costa canaliculate adaxially, convex abaxially, *primary lateral veins* 8–13 per side, adaxially impressed, abaxially prominent; secondary and tertiary venation parallel; *collective vein* visible at the margins of each lobe; *lobes* 6–12 per side, 0.5–2.5 cm wide, with 1 or 2 primary veins each, sometimes distally bifid. *Inflorescences* on ascending shoots, 1–2 per flowering episode, subtended by basally sheathing, greenish, distally 3-keeled, apically mucronate, persistent cataphylls; *peduncle* smooth, 20–25 cm long; *spathe* acuminate, with two longitudinal keels, membranaceous, light green at pre-anthesis, white-yellowish externally and white internally at anthesis, marcescent after the anthesis, 9–14 × 3–5 cm; *spadix* white in pre-anthesis and anthesis, 6–8 × 2.5–3 cm in early fruit, the basal zone of sterile flowers slender, very conspicuous; *sterile flowers* 3–5 mm long, round with a very prominent stigmatophore; *fertile flowers* 5–6 mm long; *stamens* with laminar filaments 2–5 mm long; *anthers* 1–2 mm de long; *ovary* square-prismatic, 1.5–3 × 1.5–2 mm; *style* squarish, rounded or hexagonal, 0.5–1 × 2–3 mm; *stigma* linear. *Infructescence* with the stylar caps green after anthesis; *mature fruits* not observed; *seeds* not observed.

Etymology

The new species is named for Dr. Thomas B. Croat (MO), the leading authority on neotropical Araceae. He also realized that some herbarium specimens of this spe-



Figure 1. *Monstera croatii*. A. Developing inflorescence. B. Front and back views of open inflorescence. C. Fertile flower in lateral view (left) and in longitudinal section (right). D. Styler plate, top view (left), and individual stamen (right). E. Sterile flower in lateral view (left) and in longitudinal section (right). F. Infructescence. G. Juvenile plant. H. Adult plant.



Figure 2. Adult plant of *Monstera croatii* (see description for dimensions). **A.** Hemi-epiphytic habit, ascending to only 1.5 m above the ground, showing the glaucous leaf colour especially on the youngest leaves. **B.** Terrestrial habit, with the same morphology as that of reproductive individuals. **C.** Young infructescences with the green stylar layer, conspicuous basal sterile zone, and persistent subtending cataphylls. **D.** The base of the glaucous/pruinose petiole and persistent involute petiole sheath (arrow). **E.** Part of the petiole completely terete beyond the sheath. **F.** Leaf with two primary veins per lobe, sometimes bifid into lobules that divide up to 4 cm away from the costa (arrow). Photographs: M. Cedeño-Fonseca.

cies, previously identified as *M. pinnatipartita* Schott, could represent a different, undescribed species.

Distribution and habitat

Monstera croatii is endemic to Costa Rica, where it is known only from the south on the Pacific side in the region of Golfito and the Parque Nacional Corcovado (both in the cantón of Golfito) at ca. 300–600 m, in primary and secondary forest and in open areas (Figure 6).

Phenology

Immature infructescences recorded in February; flowering observed in October and November.

Conservation status

Monstera croatii is protected in the Refugio Nacional de Vida Silvestre Golfito and in the Parque Nacional Corcovado.

Notes

Monstera croatii is differentiated from all other Costa Rican species of *Monstera* by having pruinose/glaucous stems and petioles, the petioles sheathing for about half their length, with the sheath wings involute and persistent and the free (distal) part terete or only weakly channeled. It is further differentiated by the deeply pinnatifid and bluish green leaf blades, sometimes with bifid lobes, and the pruinose peduncles with a persistent sheathing mucronate cataphyll.

A unique characteristic of this species is its terrestrial habit, reaching the adult vegetative stage in this state and climbing only to very limited height before flowering. Fertile terrestrial individuals were not found, but one plant was observed fertile after climbing only 50 cm above ground level with the same stem and leaf morphology as terrestrial examples.

Monstera croatii has sterile flowers with the ovary spherical, as is also the case in *M. glaucescens* Croat & Grayum, which too has glaucous stems and briefly sheathed petioles, but that species (known only from the Caribbean side of Costa Rica) has the leaves pinnately lobed (never deeply pinnatifid), the petiolar sheath persistent but not with involute margins, and the non-sheathing part of the petiole channeled (never terete). *Monstera croatii* can also be confused with *Monstera pinnatipartita*, but that species has the petioles green or speckled (never glaucous), never develops to the adult vegetative form on the ground, is fertile only after significantly ascending its phorophyte, and has acuminate and marcescent (not mucronate and persistent) cataphylls.

Additional specimens studied (Paratypes):

COSTA RICA. Puntarenas, Golfito, Golfito, camino hacia las antenas, 8°38'55.1"N, 83°9'30.8"W, 389 m, 4 February 2019 (fr.), *M. Cedeño & A. Hay* 1625 (USJ [2 sheets]). Puntarenas, Golfito, Golfito, camino a las torres del I.C.E., aprox. 2 km antes de llegar, 8°39'25"N, 83°9'25"W, 389 m, 29 January 1992 (fr.), *Á. Fernández* 205 (CR, MO [3 sheets]). Puntarenas, Golfito, Parque Nacional Corcovado, Estación Agujas, Cerro Rincón, 8°31'34.467"N, 83°28'3.9"W, 600 m, 11 November 1999 (fl.), *E. Mora* 725 (CR [2 sheets]).

Monstera gambensis M.Cedeño & M.A.Blanco, **sp. nov.**

Type: Costa Rica, Puntarenas Province, Golfito Canton, Golfito, La Gamba, sendero sobre quebrada, 8°41'02" N, 83°12'15"W, 94 m, 27 May 2016, *M. Cedeño, A. P. Karremans & I. Chinchilla* 890 (holotype: USJ) (Figures 3, 4, 5).

Diagnosis

Monstera gambensis is recognised by its small entire leaves with or without fenestrations, and its asperous petioles with involute sheath margins that appear whitish. Similar in size to *Monstera obliqua*, it differs from that species by having asperous (vs. smooth) petioles, with the sheath margins persistent (vs. completely deciduous), and smaller leaf blades (12–24 × 5–10 cm, vs. ca. 35 × 14 cm).

Description

Nomadic vines, fertile at ca. 2 m above the ground. *Seedlings* unknown. *Juvenile plants* appressed-climbing; *stem* dark green, slightly rough, internodes 3–5 cm long, 4–10 mm diam.; *petioles* visible (*i.e.*, the leaves not shingling), dark green or light, slightly rough, 3–5 cm long, sheathed to the base of the geniculum, the wings persistent; *leaf blades* more or less horizontal, not flattened to the substrate of the phorophyte, 4–7 × 3–4 cm, obovate or lanceolate, subcordate to truncate at the base, acuminate at the apex, thinly coriaceous, without fenestrations. *Adult plants* appressed-climbing; *stem* terete, dark green, rough, internodes 1–4 cm long, 5–10 mm diam.; supporting *roots* black and corky, 4–6 cm long, feeder roots black and semi-corky, both with black root hairs; *leaves* numerous, sub-erect; *petioles* light green or whitish, rough to the geniculum, 17–22 cm long, sheathed to 2–3 cm below the base of the geniculum with the wings involute and persistent, the free portion slightly grooved; *geniculum* elongated, 0.5–1 cm long; *leaf blades* 12–24 × 5–10 cm, lanceolate, attenuate and decurrent on the

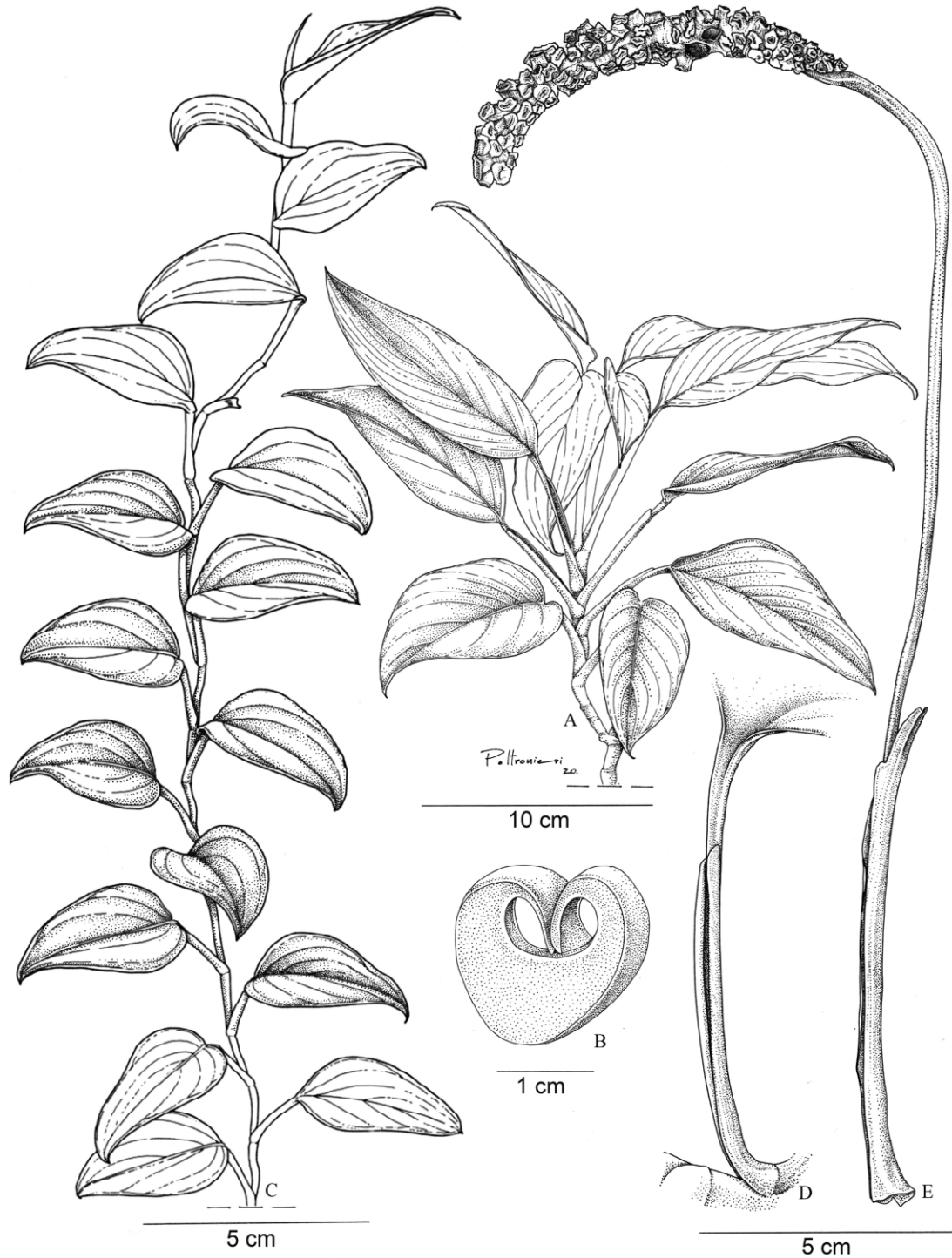


Figure 3. *Monstera gambensis*. A. Adult plant showing leaves without perforations. B. Cross-section of petiole showing involute sheath wings. C. Juvenile plant. D. Petiole of adult plant with persistent sheath and involute sheath wings. E. Mature infructescence with persistent cataphylls at the base. Illustration by Sara Díaz Poltronieri.

geniculum at the base (the decurrent part 0.5–1 mm wide), acuminate at the apex, without or (less commonly) with fenestrations (when present, one to two perfora-

tions close to each other on the same side of the blade near its middle part), often only one side fenestrated, with entire margins, subcoriaceous; anterior costa chan-



Figure 4. *Monstera gambensis*. A. Adult plant with non-perforated leaves. B. Juvenile plant. C. Adult leaf with two perforations. Photographs: M. Cedeño-Fonseca.

neled adaxially, convex to the middle of the blade abaxially, slightly rough, with 5–13 primary lateral veins on each side, impressed or indistinct abaxially, prominent on the underside, collective vein not visible. *Inflorescences* on ascending stems; *peduncle* rough throughout, 20–25 cm long; *spathe* unknown; *spadix* 7–10 × 1.3–1.6 cm, colour at and before anthesis unknown; *sterile flowers* 3–4 mm long; *fertile flowers* 4–5 mm long; *stamens* with laminar filaments 2–4 mm long; *anther* 1–2 mm long; *ovary* prismatic, longitudinally ribbed, 2–3 × 2–3 mm; *stylar region* hexagonal, 1–2 × 3–5 mm; *stigma* linear. *Infructescence* yellow when ripe; *fruits* with white pulp; seeds black, 2–3 mm long.

Etymology

The epithet *gambensis* refers to the type locality.

Distribution and habitat

Monstera gambensis is endemic to Costa Rica, where it has been found growing low on the supporting trees (ca.

2 m above ground level), in rain forest at La Gamba Biological Station, cantón Golfito, mostly at 50–100 m. (Figure 6).

Phenology

Flowering has not been observed. An infructescence was recorded in May.

Conservation status

It is protected at the La Gamba Biological Station, the only known locality for this species.

Notes

Monstera obliqua, a species whose type is from Surinam and which in its current, broad conception extends into Amazonia, is known in Costa Rica only from the southeastern corner of the country (Grayum 2003), while the Costa Rican endemic *M. gambensis* is known only by a single collection from La Gamba, Golfito. *Monstera gambensis* is one of the smallest species in the genus,



Figure 5. *Monstera gambensis*. A. Support roots (*i*) and a feeding root (*ii*) both corky and blackened. B. Petiole sheath margins persistent and involute in adult plants (arrow). C. Petioles with sheath margins persisting, whitish and asperous (arrow). D. Internodes of adult plant (arrow). E. The shallowly channeled distal portion of the petiole (arrow). F. Portions of either dead epidermis or epicuticular waxes that give a whitish appearance and an asperous texture to the surface of the petioles. Photographs: M. Cedeño-Fonseca.

together with *M. obliqua* and *M. minima*. The latter, with smaller petioles (2–6 cm), leaf blades (9–14 × 2–4 cm), and spadices (ca. 4.4 × 0.9–1 cm) even smaller than

those of *M. gambensis* (Jácome & Croat 2002), is only known from the northern (Caribbean) coast of Panama and along the Pacific slope of northern Colombia, in the



Figure 6. Distribution of *Monstera croatii* (triangles), in Golfito and Corcovado National Park, and *M. gambensis* (circle), in Golfito, Costa Rica.

Chocó region (Jácome and Croat 2002). In Costa Rica, *M. gambensis* is found in lowland tropical wet forest at elevations of up to ca. 100 m. The individuals observed were climbing in the undisturbed forest on small trees no more than 2.5 m high, with abundant shade in the understory.

Most adult leaves of *Monstera gambensis* are not fenestrated, but occasionally leaves are produced with up to two perforations, close to each other on the same side of the blade near its middle part. The measurements for the flowers of *M. gambensis* given above were taken from flower remnants of a single fruiting spadix, so they should be interpreted with caution.

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