



## *Monstera limitaris* (Araceae), a new species from the border between Costa Rica and Panama

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### Abstract

Species of genus *Monstera* are among the most representative hemi-epiphytic Araceae in the Neotropics. They are widely distributed and abundant in the tropical forests of Costa Rica and Panama. During recent exploration in the border region between the two countries, an undescribed species belonging to the genus has been identified. The new species, *Monstera limitaris*, is described and illustrated here, using a color plate based on photographs of the vegetative and reproductive structures of live material.

**Key words:** Central America, fieldwork, *Monstera*, Monsteroideae, taxonomy

### Introduction

Araceae (Jussieu 1789: 23) is a family of herbaceous plants, mainly with tropical distribution and with highest diversity in Asia and tropical America (Croat 1998). It includes approximately 144 genera and 3645 species (Cabrera *et al.* 2008; Boyce & Croat 2018). In Central America, where the diversity of species is mainly concentrated in Costa Rica and Panama (Croat 2017), 778 species in 23 genera are reported. In Costa Rica, the family is represented by 20 genera and 249 species (Grayum 2003); while, in Panama, there are about 436 species in 26 genera (Ortiz *et al.* 2018). The species of Araceae in both countries are broadly distributed and considered abundant, mainly found growing in the very humid tropical lowland forest and cloud forest. The most representative genera are *Anthurium* Schott (1829: 828), *Philodendron* Schott (1829: 780) and *Monstera* Adanson (1763: 470).

The genus *Monstera* belongs to subfamily Monsteroideae and tribe Monstereae (Cusimano *et al.* 2011, 2012). It is exclusively Neotropical and represents an abundant hemi-epiphytic group with broad distribution in the mountainous ecosystems of Costa Rica and Panama (Madison 1977; Zuluaga & Cameron 2018). The most recent taxonomic study comprising the genus reports 22 species in Costa Rica (Grayum 2003). Similarly, in Panama 23 species of *Monstera* are reported (Ortiz *et al.* 2018). Despite the relatively recent revisions (Madison 1977; Grayum 2003), *Monstera* is considered the least understood genus of Araceae (Grayum 2003). The wide infraspecific variation makes it challenging to identify herbarium specimens using traditional diagnostic morphological features (Madison 1977; Grayum 2003). Field studies of living material is therefore a necessary complement to understand and circumscribe species of *Monstera* adequately.

Whilst preparing a revision of *Monstera* for Costa Rica, an unnamed species from the border of Costa Rica and Panama was discovered. It is formally described and illustrated here.

## Materials and methods

Fieldwork was carried out in Costa Rica and Panama in 2017 and 2018. The material was prepared according to Croat (1985). Herbarium specimens were compared with the collections at USJ, CR, PMA and MO. The descriptive terminology follows Madison (1977). The methodology used by Lankester Botanical Garden for the documentation of the Orchidaceae Jussieu (1789: 64) was used and modified for *Monstera* (Pupulin & Bogarín 2004). Color photographs of each of the vegetative and reproductive structures are presented in order to compare key features of the species that may be difficult to observe in herbarium specimens due to fragmentation. The acronyms of all herbaria mentioned are according to Thiers (2018). An estimation of the conservation status was made based on the criteria of the International Union for Conservation of Nature (IUCN 2001).

## Taxonomy

### *Monstera limitaris* M. Cedeño, sp. nov. (Fig. 1)

*Monstera limitaris* is characterized by having leaves with verruculose petioles at base, semi-persistent and convolute sheaths, crenate geniculum margins, blades with pinnatifid margins and fenestrations along the midrib as well as by the white-yellowish acuminate spathe, a creamy-white spadix and flowers with lateral-flattened stigmatophore and linear stigma which have a colorless stigmatic secretion.

**Type:** COSTA RICA. Puntarenas: Corredores. Canoas. Barrio el Triunfo, margen del Río, 8°33'56,45"N, 82°51'15,48"W, 130 m, 27 de septiembre 2017, M. Cedeño, I. Chinchilla A.P. Karremans & G. Rojas-Alvarado 1129 (holotype: USJ!, mounted on 2 sheets; isotype: PMA!, mounted on 2 sheets).

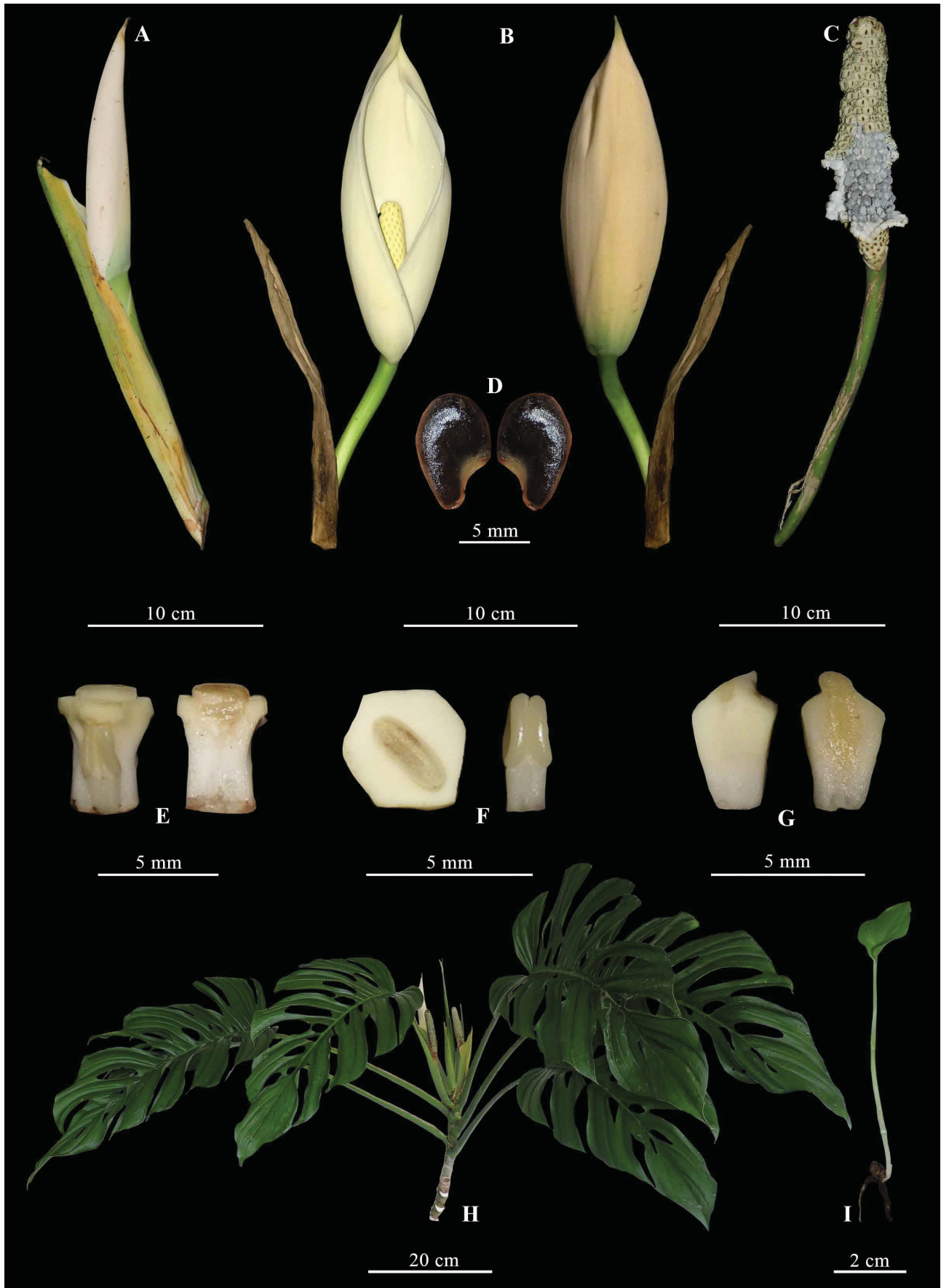
Appressed-climber epiphyte herbs. **Seedling** terrestrial. **Juvenile plant** with stems adpressed to the host (without blades adhered to the substrate of the phorophyte), stem light green with internodes 3–4 cm long, 4–10 mm diam. **Adult plant** appressed-climber; **Stem** terete, brown or beige, internodes 2–3 cm long, 1.5–3.5 cm diam. **Roots** dimorphic; anchor roots brown, 2–3 cm long; feeder roots light beige, suberous. **Leaves** numerous, erect or almost erect; **petioles** whitish, 30–55 cm long, 0.5–1.5 cm diam., dark-brownish verruculose on the base, smooth towards the base of the geniculum, sheathed along its entire length; **sheaths** semi-persistent, convolute, ligule 2–4 mm long; **geniculum** with undulate margins, 3–4.5 cm long concave, smooth, abaxially sulcate, adaxially convex; **blades** sub-ovate to sub-orbicular, oblique, cordate to obtuse at base, acuminate at apex, thinly coriaceous, 35–55 × 20–35 cm, decurrent onto geniculum, with 5–7 undulations of 3–5 mm wide, pinnatifid, the pinnae 3–6 in number on each side; **midrib** sulcate on the upper surface, convex on the lower surface; **primary lateral veins** 17–23 per side, bifurcated or trifurcated, sunken above, raised below; tertiary veins reticulated; **collective veins** prominent; fenestrate usually on both sides, the fenestrae to within 0.2–1.3 mm from the midrib. **Inflorescences** in ascending stems, 1–3 simultaneously in time of flowering, axillary or subtended by a greenish prophylls; **peduncle** smooth, 10–15 cm long; **spathe** 13–18 × 6–10 cm, thin, white at pre-anthesis, white-yellowish externally and white internally at anthesis, open at the apical part forming a tube in the basal region, deciduous after the anthesis; **spadix** 9–12 cm long, 1–2.5 cm diam., white at pre-anthesis, cream at anthesis; **flowers** 5–6 mm long; ovary 4–5 × 2–3 mm, rectangular and ribbed; style 1–3 × 4–5 mm, hexagonal; stigma 1–2 mm long, linear, stigmatophore lateral-flattened, stigmatic secretion colorless; stamens 4–8 mm long, filament laminar, 2–5 mm long, anther 2–3 mm; sterile flowers not decurrent on the peduncle, 3–5 mm long. **Infrutescence** erect, fruiting spadix 10–12 cm long, 2–2.5 cm diam.; stylar cap greenish at post-anthesis, white cream at maturity; berries with white pulp; seeds 4–6 mm, lung-shape, black.

**Eponymy:**—The name *limitaris*, from the Latin “*limitis*”, refers to a border or boundary, alluding to the type locality, which is on the Costa Rica and Panama border.

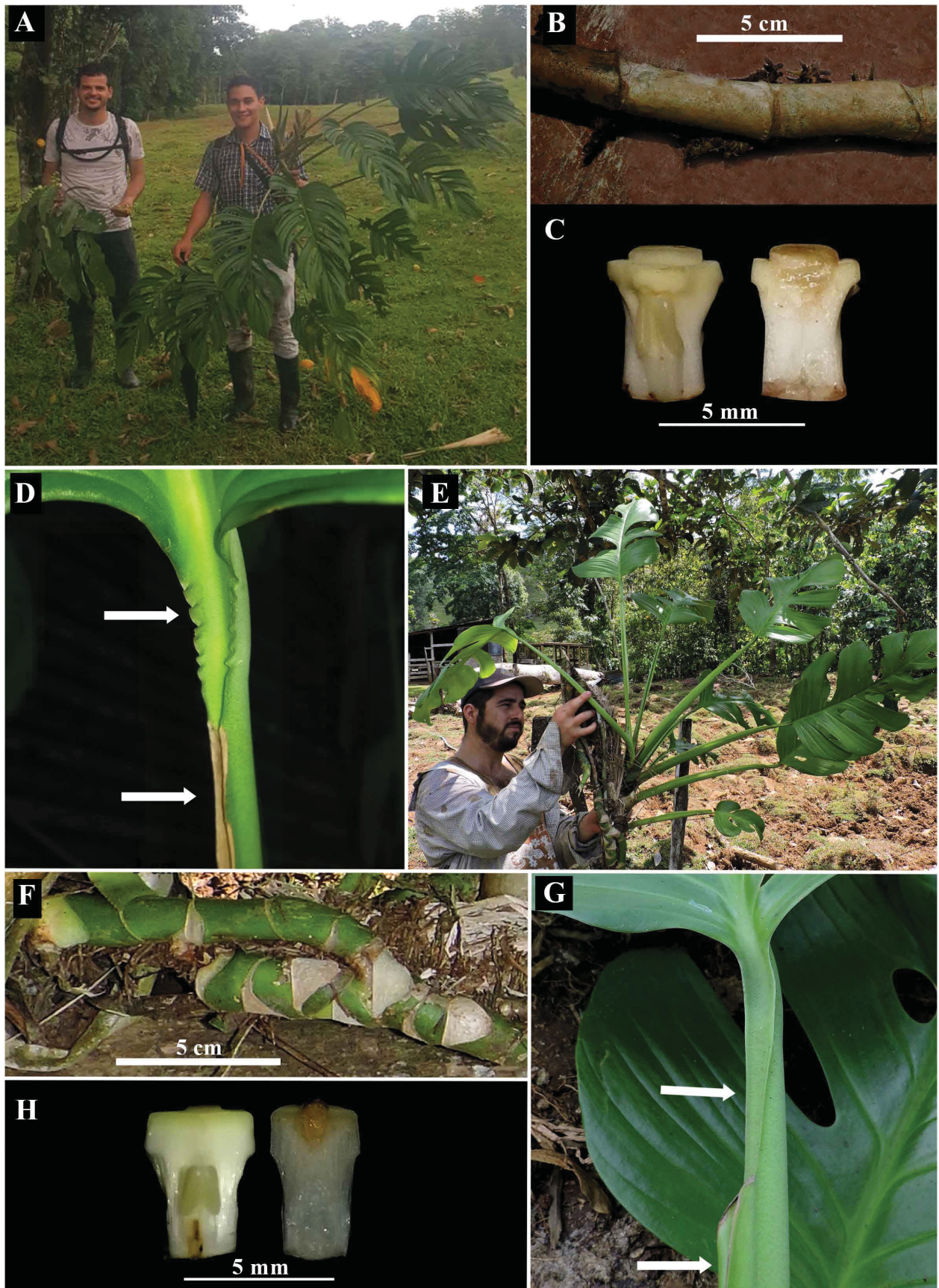
**Distribution and habitat:**—*Monstera limitaris* is known only from the border between Costa Rica (Puntarenas province) and Panama (Chiriquí province) (Fig. 3). The collection sites consist of isolated trees in open agricultural areas (potreros), on the banks of a small rivers.

**Phenology:**—Flowering was registered in October and May. Fruiting was registered between October and December.

**Conservation status:**—*Monstera limitaris* is restricted to isolated populations in a small geographic area. The habitat where it grows, in both countries, is strongly impacted by human activities, especially due to agricultural expansion. We consider it in the CR B2ab (ii, iii, iv, v) category according to the IUCN Red List Criteria.



**FIGURE 1.** Lankester Composite Dissection Plate (LCDP) of *Monstera limitaris* sp. nov. **A.** Inflorescence development: **B.** Frontal and back part-opened inflorescence: **C.** Infructescence (detachment styling cape): **D.** Seeds: **E.** Complete flower (left); cross-section flower (right): **F.** style and stigma (left); Anther (right): **G.** Sterile flowers: **H.** Adult plant: **I.** seedling.

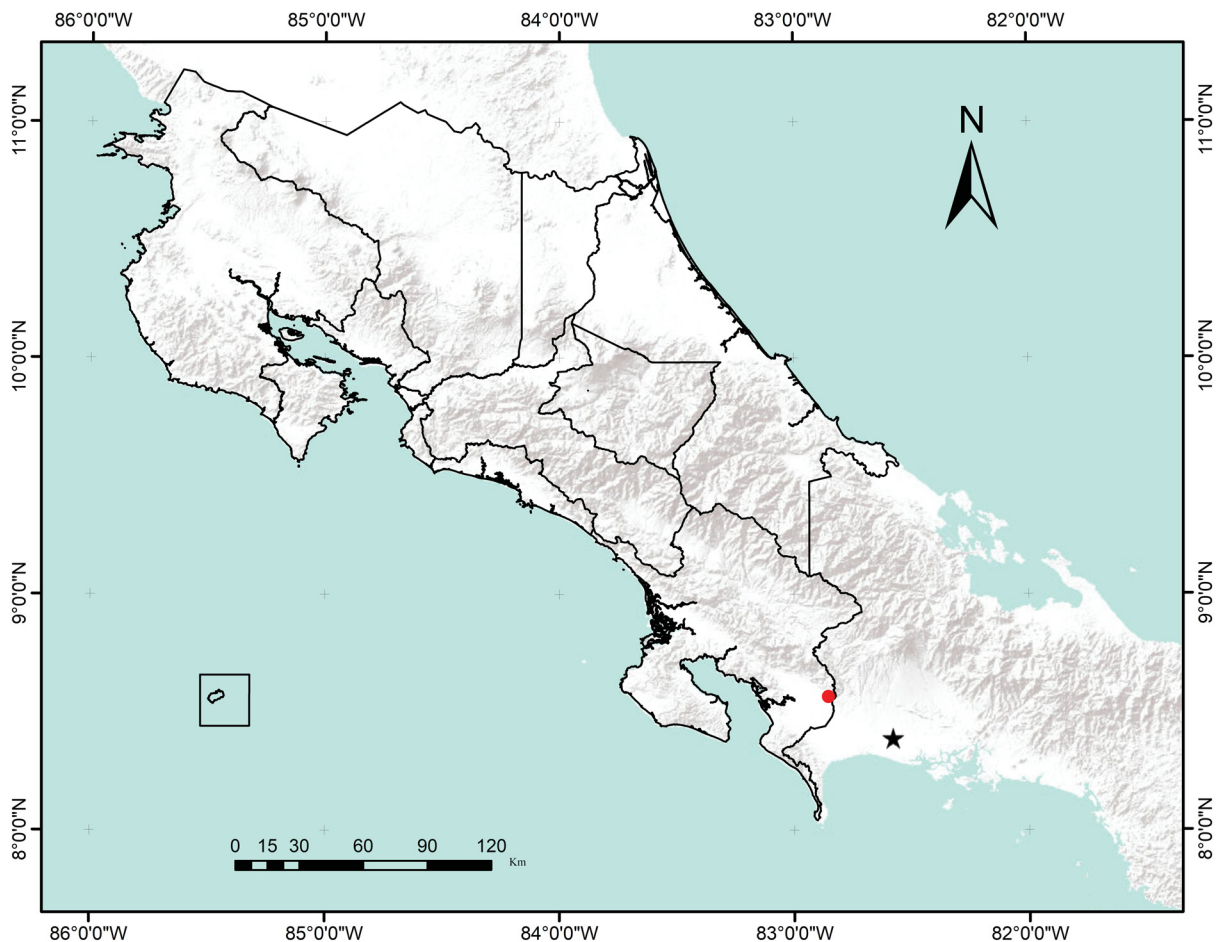


**FIGURE 2.** Comparison between *Monstera limitaris* (A–D), and *M. dissecta* (E–H). **A.** Adult plant. **B.** Brown stem. **C.** Flower (left); flower in cross section (right). **D.** Geniculum with crenate margins (upper arrow) and petiole with semi-persistent sheath (lower arrow). **E.** Adult plant. **F.** Green stem. **G.** Geniculum with entire margins (upper arrow) and petiole with persistent sheath (lower arrow). **H.** Flower (left); flower in cross section (right).

**Additional specimens examined (paratypes):**—PANAMÁ. Chiriquí: distrito de Alanje, Las Moras, creciendo en cerca viva en terrenos semi-inundable, 20 m, 8°21'46" N, 82°35'49" W, 6 Junio 2018, *M. de Stapf 1307* (PMA!, MO!, USJ!, FT!).

**Discussion:**—According to the classification of Madison (1977), *Monstera limitaris* must be included in the section *Monstera*, by having exserted leaves during early juvenile phase as well as for its slender pistils and small seeds. *Monstera limitaris* (Fig. 1, 2) is similar to *Monstera dissecta* (Schott, 1858: 179) Croat & Grayum (1987: 659) (Fig. 2), but the latter species differs in having leaves with smooth petioles (not verruculose) with persistent and revolute sheaths, non-crenate geniculum margins, blades with entire to pinnatifid margins without fenestrations along the midrib, a yellow-cream spathe externally, semi-conical stigmatophore and orange stigmatic secretion (Table 1; Fig. 2).

In Panama, *Monstera limitaris* is used by local people for flower arrangements during the religious festivities. The leaves and the inflorescences are placed in all the churches of the town, during the festivities.



**FIGURE 3.** Distribution map of *Monstera limitaris* in Costa Rica (red circle, Puntarenas Province; holotype *M. Cedeño et al. 1129*) and Panama (black star, Chiriquí Province; paratype *M. de Stapf 1307*).

**TABLE 1.** Characters distinguishing *Monstera limitaris* from *M. dissecta* (also see Fig. 2)

	<i>M. limitaris</i>	<i>M. dissecta</i>
<b>Leaves</b>		
Petiole surface	Verruculose	Smooth
Sheaths	Semi-persistent and convolute	Persistent and revolute
Blade margins	Pinnatifid	Entire to pinnatifid
Fenestrations along the midrib	Present	Absent
Geniculum margins	Crenate	Entire
<b>Inflorescence</b>		
Spathe color (externally)	White-yellowish	Yellow-cream
Stigmatophore shape	Linear, lateral-flattened	Semi-conical
Stigmatic secretion color	Colorless	Orange

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