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**Alexander P. Karney & Michael
H. Grayum**

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Notes on Economic Plants

A New *Monstera* Species (Araceae) of Economic Importance from Honduras¹ALEXANDER P. KARNEY^{*,2} AND MICHAEL H. GRAYUM³²GreenWood, with support of the United States Forest Service, 80 Academy Street, South Berwick, ME 03908, USA³Missouri Botanical Garden, P. O. Box 299, St. Louis, MO 63166-0299, USA

*Corresponding author; e-mail: alexp.karney@gmail.com

Monstera maderaverde Grayum & Karney (Araceae: Monsteroideae: Monstereae), here described as new to science, is an endemic, secondarily hemiepiphytic species from Honduras producing a saleable product. Remarkably, it has been completely missed in scientific identification. Many tropical communities worldwide employ fibrous Araceae for household applications and commercial sale. Hemiepiphytic Araceae are important medicinally and ornamentally in Bolivia, and pendent Araceae roots have been used for basket-weaving in Mexico (*Monstera deliciosa* Liebm., *Syngonium podophyllum* Schott) and Tonga (*Epipremnum pinnatum* [L.] Engl.), while *Epipremnum cermaense* has been used in canoe outriggering on the Indonesian island of Halmahera (Acebey et al. 2010; Hettinger and Cox 1997; Martínez-Romero et al. 2004). Further, basket-weaving and construction applications of aroids belonging to the genus *Heteropsis* have been documented in Amazonia (Knab-Vispo et al. 2003).

In the case of *Monstera maderaverde*, pendent, fibrous roots 2–10 m in length are removed from plants growing in or near the canopy, with stems, leaves, and the supporting tree left intact. The roots are peeled, dried, and made into commercial products such as hats (Figs. 1, 2) and visors, containers for flowers, jewelry, and tortillas, waste-baskets, key-chains, furniture, mirror frames, and figurines. The raw material is known locally as “mimbre” (i.e., “wicker”).

Honduras is within the Mesoamerican biodiversity hotspot (Myers et al. 2000), but has been poorly studied floristically, with neither a national flora nor any comprehensive treatment of Honduran Araceae yet available. Florulas of two Atlantic coastal regions, the Lancetilla and Aguán

Valleys, were published by Standley (1931) and Yuncker (1940), respectively. Only one new species of Araceae was described in the latter work, and just three (none in *Monstera*) have been described from Honduras since 1940. Croat (1998) noted only one endemic species of *Anthurium* (Araceae) in Honduras, relative to far more in Costa Rica and Panama. The recognition of *Monstera maderaverde* suggests that a lack of research effort may be partly responsible for this apparent dearth, and it is probable that the forests where *M. maderaverde* occurs are of high biodiversity significance.

The understudied nature of the Honduran flora is especially troubling given recent deforestation trends. Carr (2005) acknowledged Central America as the world region with the highest deforestation percentage in the latter half of the 20th century, with Honduras accounting for the regional peak during 1990–2005 (DeClerck et al. 2010). From 2005–2010, forested land area in Honduras was estimated to have been reduced from 5,744,000 ha to 5,150,000 ha (Oqueli et al. 2010). This trend is especially problematic for species showing an affinity for continuous primary forests, such as climbing epiphytes (Koster et al. 2009). The potentially benign harvest of a useable species like *Monstera maderaverde* could provide an economic incentive to conserve remaining forests.

Materials and Methods

Semistructured interviews were conducted from 2–17 June 2011, with *Monstera maderaverde* artisans (11), raw-material extractors (2), distributors (5), community leaders (5), and staff from the Honduran NGO Fundación Madera



Fig. 1. Elaboration of *Monstera maderaverde* (“mimbre”) hat on a wooden mold.

Verde (3). Communities surveyed included any known area of *Monstera maderaverde* collection: Mezapita (population 1,840), San Juan Pueblo (population 5,735), Matarras (population 966), Jilamito Nuevo (population 562), Piedras de Afilas (population 709), and Siempre Viva (population 1,047), all in Departamento de Atlántida (Depto. Atlántida, population 344,099) (2001 census data, INE 2011). Merendon, a neighborhood of San Pedro Sula (800,000–900,000, USSD 2010) and home of two artisans, is located in the Depto. Cortés, though material is harvested and sold in Depto. Atlántida. The *M. maderaverde*-harvesting community of Sinaí, in the neighboring Depto. Yoro, could not be visited.



Fig. 2. Finished products ready for sale, left after and right before bleaching.

Permits were received for shipment of herbarium samples on 8 March 2011, and this material was studied taxonomically April–May 2011 at the Missouri Botanical Garden.

Results and Discussion

Historic and current markets for *M. maderaverde* products and raw material have been reduced substantially in recent years, but were identified within the major Honduran cities of Tegucigalpa, San Pedro Sula, La Ceiba, and at least five smaller towns. Total current income from *M. maderaverde* is estimated at just over USD 10,700 annually in Depto. Atlántida (Table 1), and production never occupies more than 5 % of the work force in any community. With reduced collection and trade over the past decade, most remaining producers and artisans of *M. maderaverde* were connected to the NGO Fundación Madera Verde (FMV), which provides product exposure, financial training, and the only written records of sales.

A once-vibrant trade in *Monstera maderaverde* roots to El Salvador from San Juan Pueblo has declined in the last 10–15 years. While up to 1,000 lbs. of harvested roots were reportedly sent monthly from each of three or four distributors (25–40 “mimbros”—harvesters of *Monstera maderaverde*) (Table 1) in the 1980s to the mid-1990s, this has been severely diminished. No Salvadoran orders were reported within the last 3–5 years (as of 16–17 June 2011), with widely acknowledged over-harvesting. Walking distance to the crop increased from 2 hours in the early 1990s to 12–15 hours currently, likely owing to the now-uncommon practice of felling supporting trees to make roots more accessible. Lack of current *M. maderaverde* harvesting activity in communities surrounding San Juan Pueblo suggests a stark decline.

Collectors and artisans based out of the community of Mezapita appeared more conscious of the regeneration requirements of *Monstera maderaverde*. Only slight increases in walking distances (1–2 hours) in the last 10–20 years were reported, with the longer initial travel distance (4–5 hours minimum) encouraging greater per-unit efficiency and the development of value-added products. The widely stated root-regeneration rate of six months to one year, supported by preliminary FMV data, is consistent with the Nombre de Dios Cooperative’s legal “special mimbre management plan” (GreenWood/Fundación Madera Verde 2009). Current extrac-

TABLE 1. TOTAL AND HISTORIC EXTRACTION OF *MONSTERA MADERAVERDE* ROOTS. CURRENT INCOME ESTIMATES WERE DETERMINED THROUGH INTERVIEWS WITH ARTISANS, COLLECTORS, AND DISTRIBUTORS OF *M. MADERAVERDE* AS WELL AS COMMUNITY MEMBERS. CURRENT RAW MATERIAL EARNINGS BASED ON THE JUNE 2011 PRICE OF HNL (HONDURAN LEMPIRAS) 30 (USD 1.58)/LB.

Community	Number of Individuals Currently Collecting <i>Monstera maderaverde</i>	Maximum Number of Individuals Collecting <i>Monstera maderaverde</i>	Current Number of Artisans	Estimated Maximum Extraction (lbs./year)	Estimated Current Extraction (lbs./year)	Estimated Current Income (USD)
Jilamito	2	4–6	0	1,500	300	473.68
Merendon/San Pedro Sula	0	0	2	0	0	842.11
Mezapita	5–6	10–20	9	5,000	1,000	8,210.00
Piedras de Afilas	4	6	0	1,200	600	947.37
San Juan Pueblo	0	10–20	1	30,000	0	252.63
Siempre Viva	0	4	0	1,800	0	0
TOTAL	11–12	30–52	12	39,600	1,900	10,725.69

tion is well below the legal allowance of 3,785 lbs. (FMV 2010 sales were only 94 lbs.). The low level of extraction combined with consciousness of *Monstera maderaverde* growth limitations suggests long-term harvest potential.

Validation of the New Species Name

Monstera maderaverde Grayum & Karney, sp. nov. TYPE: Honduras. Atlántida: Mezapita Cloud Forest, Cordillera Nombre de Dios, ca. 7.2 km SSE of Mezapita (as the crow flies), on ridge forming the divide between the basins of the Ríos Mezapa and Mezapita, 15°30'39" N, 87°19'41" W, 1160 m, 7 Nov. 2010, Alex Karney s.n. (holotype: MO-6240501, MO-6240502; isotype: CURLA). Figures 3, 4 and 5.

Inter species sectionis *Monsterae* aspectu cum *Monstera obliqua* Miq. optime congruens, sed differt laminis foliorum coriaceis plerumque proportione latioribus inflorescentiis solitariis spadiceis crassioribus fructibus viridulis vel luteolis.

Secondarily hemiepiphytic vine; juvenile plants with the leaves exserted (not shingle-forming). Adult stems green, 0.5–0.7 cm thick; internodes 0.8–4.2 cm long. Leaves with petiole 12.5–17.5 cm long, smooth, vaginate for 7/10–9/10 of its length; sheath margins marcescent to deciduous; geniculum ca. 0.5–0.8 cm long; blade deep green when fresh, blackish when dried, 12.8–16 cm (or longer) × 8–14.6 cm, slightly shorter to slightly longer than the petiole, ovate to suborbicular, truncate to cordulate at the base,

short-acuminate at the apex, entire and imperforate or with occasional perforations (to at least 1.5 cm in diameter), coriaceous, with 2–4 poorly defined primary lateral veins per side; secondary lateral veins parallel (or becoming reticulate toward margin). Inflorescences borne on free-



Fig. 3. *Monstera maderaverde* growth habit.



Fig. 4. *M. maderaverde* stems, leaves, and fruiting spadix in situ on a dead tree.

lateral stems, solitary, erect; peduncle 9–13 cm long, ca. 0.3 cm thick, terete, smooth; spathe (at staminate anthesis) yellow with a green tinge, ca. 5.2 cm long, 4.9 cm wide, and 5.2 cm deep, cucullate, broadly rounded abaxially and enclosing a hemispherical volume; spadix (at staminate anthesis) white with a yellow tinge, 4.8–5.9 cm long, ca. 1.6 cm thick, the basal 3–5 rows of flowers sterile; fertile flowers with anthers ca. 1 mm long; pistil ca. 4–7 mm wide, prismatic, truncate at the apex, the stigma vertical, 0.8–1.7 mm long, linear. Inflorescences (when fully mature) deep green at the tip and with a lighter, yellowish tinge towards the base, ca. 6.2–7.8 cm long, 1.8–2.2 cm thick; fruits white-yellow to green with maturity (stylar plate), 4–12 mm wide (narrowest at the base).



Fig. 5. *M. maderaverde* inflorescence at late staminate anthesis.

Distribution and Phenology. *Monstera maderaverde* must presently be considered endemic to Honduras, where it is known only from the region of the type locality in premontane wet forest (Holdridge et al. 1971:6–17; J. H. Townsend, pers. comm.) at elevations of 700 m to 1250 m in the Cordillera Nombre de Dios, mainly between the Ríos San Juan and Lean (estimated area 150–300 km²) in Depto. Atlántida. No vouchers have yet been collected from the adjacent Depto. Yoro, where suitable habitat is also available. Flowering of *M. maderaverde* has been observed in May, June, and November. As this species is known only from the type locality, it must be listed as Data Deficient (DD) according to IUCN Red List criteria (IUCN 2001).

Common Names and Etymology. *Monstera maderaverde* is known locally most commonly as “mimbres” (“wicker”), and also occasionally as “mimbrillo” or “bejuco” (“vine”). Elsewhere, the name “mimbres” can refer to other neotropical hemiepiphytic aroids such as *Heteropsis oblongifolia* Kunth in Colombia (Vargas and van Andel 2005) and *Philodendron rigidifolium* K. Krause in Costa Rica (Murillo and Arias 2005). The specific epithet, *maderaverde*, refers to the non-profit

Fundación Madera Verde, working with communities where this new aroid is known.

Taxonomic Relationships. *Monstera maderaverde* is a distinctive species characterized by non-shingle-like juvenile foliage and adult plants with relatively long petioles, small, proportionately broad, entire and imperforate (or very sparingly perforate) leaf-blades, not or scarcely cordate at the base, with the primary lateral veins indistinct, and small, erect inflorescences with relatively long peduncles borne on free-lateral stems. In the untested and possibly artificial infrageneric classification of Madison (1977), it would be assigned to sect. *Monstera* Madison. Within sect. *Monstera*, *Monstera maderaverde* is most similar to *M. obliqua* Miq., a largely South American species extending northward to Costa Rica, and the Colombian *M. xanthospatha* Madison, and (whether its leaf-blades are considered perforate or imperforate) will key directly to those species in Madison (1977:33–35). But *M. obliqua* comprises much smaller plants with membranaceous, generally proportionately narrower leaf-blades, inflorescences borne on clinging (rather than free-lateral) stems, often in sympodial groupings, narrower spadices, and dull orange fruits, while *M. xanthospatha* has longer and narrower leaf-blades, longer peduncles, and inflorescences with a longer spathe and a longer and thicker spadix. The new species is also very similar superficially to the rare Costa Rican endemic *M. luteynii* Madison, with which it shares coriaceous leaf-blades of similar size and shape. However, *M. luteynii* belongs to *Monstera* sect. *Marceraviopsis* Madison (characterized in part by juvenile plants with shingle-forming leaves), and differs from the new species by its pendent habit, shorter petioles (ca. 8–13 cm), only about 2/3 as long as the leaf-blades, and somewhat larger spadices (ca. 6–8×1.8–2.1 cm) on much shorter peduncles (ca. 3.5–5 cm).

Monstera maderaverde should also to be compared with *M. deliciosa* Liebm., indigenous throughout the Mesoamerican region (and also widely cultivated for its ornamental foliage and edible infructescences), which comprises the monospecific sect. *Tornelia* (Gutiérrez ex Schott) Madison. Both species are characterized by relatively long petioles and peduncles (with respect to the leaf blades and spadices, respectively), and entire, imperforate juvenile leaf-blades of *M. deliciosa* (e.g., Croat 43912, MO; Oaxaca) may bear a striking resemblance to typical adult blades

of *M. maderaverde*. However, adult plants of *M. deliciosa* are generally much larger in all of their parts (with fruits 10–18 mm wide and seeds 16–22 mm long) than *M. maderaverde*, and have leaf-blades that are prominently cordate at the base, regularly both pinnatifid and perforate, and with the secondary lateral veins reticulate throughout.

The following artificial key, adapted and abridged from Madison (1977), distinguishes *Monstera maderaverde* from the similar species mentioned in the foregoing discussion, as well as all of its congeners known to occur (naturally or cultivated) in Honduras:

- 1 Leaf-blades of adult plants regularly pinnatifid (on at least one side) . . . *Monstera deliciosa*, *M. dissecta* (Schott) Croat & Grayum, *M. dubia* (Kunth) Engl. & K. Krause.
- 1' Leaf-blades of adult plants with the margins entire on both sides (though sometimes torn through at the perforations).
- 2 Peduncle shorter than the flowering spadix . . . *M. acuminata* K. Koch, *M. luteynii*, *M. siltepecana* Matuda.
- 2' Peduncle longer than the flowering spadix. Petiole sheath persistent (and remaining green) . . . *M. dissecta*.
- 3' Petiole sheath marcescent and ultimately deciduous. Petioles 16–45 cm long; flowering spadix ca. 1.2–1.6× longer than peduncle . . . *M. adansonii* Schott.
- 4' Petioles 5–18 cm long; flowering spadix ca. 1.8–3.2× longer than peduncle. Flowering spadix 2.5–6 cm long, ca. 0.5–1 cm thick . . . *M. obliqua*.
- 5' Flowering spadix ca. 4.8–5.9 cm long, ca. 1.6–2 cm thick.
- 6 Leaf-blades ca. 12.8–16×8–14.6 cm, ovate to orbicular; peduncle 9–13 cm long; flowering spadix ca. 4.8–5.9 cm long, ca. 1.6 cm thick; Honduras . . . *M. maderaverde*.
- 6' Leaf-blades 16–25×5–8 cm, obliquely lanceolate; peduncle 15–26 cm long; flowering spadix 6–8 cm long, ca. 2 cm thick; Colombia . . . *M. xanthospatha*.

Conclusion

The newly described hemiepiphyte *Monstera maderaverde* possesses unique botanical characteristics and relatively stable populations that provide

estimated thousands of dollars annually to Honduran communities. At current harvest rates, it is possible that *M. maderaverde* roots can be extracted indefinitely if the forests retain their structural and ecological integrity and the one-year harvest rule is respected. If indefinitely prolonged, mimbre harvest from *Monstera maderaverde* could provide a significant local economic alternative to activities requiring forest clearance.

It is likely that other plant species new to science may be present in the Cordillera Nombre de Dios, given that such a locally familiar and widely used species as *Monstera maderaverde* has been overlooked taxonomically. Another species similarly exploited in the region, “mimbrón,” represents a species of *Asplundia* (Cyclanthaceae) that may be undescribed and is at least a new country record (B. E. Hammel, pers. comm.). We have also observed evident richness and species potentially new to science in other genera of Araceae (e.g., *Philodendron*), and a new species of *Piper* (Piperaceae) was recently described from the area (Bornstein and Coe 2009). Expanded biological inventories of the region are imperative to better document this biodiversity and inform future land-use decisions.

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