

SYSTEMATICS  
CHAPTER 27

*Overview of the Cycad Flora of Honduras*

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## Abstract

The cycad flora of Honduras includes two fairly well known species, *Dioon mejiae* and *Zamia standleyi*, and at least four undescribed species. The current state of knowledge of the distribution, taxonomy, and conservation of these cycads is reviewed.

## Resumen

La flora de cícadas de Honduras incluye dos especies, *Dioon mejiae* y *Zamia standleyi*, bastante bien conocidas, y por lo menos cuatro especies no descritas. El estado actual

del conocimiento de la distribución, taxonomía, y conservación de estas cícadas se repasa.

## Introduction

The most recent *World List of Cycads* (Hill et al., 2007) lists three species as occurring in Honduras: *Dioon mejiae* Standl. & L. O. Williams, *Zamia standleyi* Schutzman, and *Z. herrerae* Calderón & Standl. No verifiable records seem to exist for *Z. herrerae* in Honduras, however, and, given the small amount of habitat available for it on Honduras's Pacific slope, it is highly unlikely that it even exists in the country. Therefore, one should not consider *Z. herrerae* a member of Honduras's cycad flora until indisputable proof is obtained. The status of the former two species in the wild was, until recently, not well known (Haynes & Bonta, 2003)—owing partly to a paucity of botanical exploration in the region and, in the case of *D. mejiae*, to an inadequate and partially erroneous species description (see Haynes & Bonta, 2007). Four new species have been discovered in Honduras in recent years, thus tripling the total cycad flora to six species. Because one of the new species is in the genus *Ceratozamia*, Honduras is now only the second country in the New World known to possess representatives of three cycad genera (the other is Mexico).

This chapter represents the published form of the first of three presentations given during a Workshop on Honduran Cycads at CYCAD 2005, organized and led by Mark Bonta and the current author. General ranges are provided for the two described species, but specific locality information has been intentionally omitted for all species to protect the plants from poaching. Notes regarding known vernacular names, human uses, associated insects, and herbarium specimens—including those collected by the author and deposited in the Herbario Nacional de Honduras (TEFH), Universidad Nacional Autónoma de Honduras, Tegucigalpa, as well as those examined in the Herbario Paul C. Standley, Escuela Agrícola Panamericana (EAP), Danlí, Honduras—are included at the end of each respective species summary.

## Described Species

### *DIOON MEJIAE* STANDL. & L. O. WILLIAMS

The renowned Mesoamerican botanists Paul C. Standley and Louis O. Williams described *D. mejiae* Standl. & L. O. Williams in 1950 from a cultivated specimen growing in

the garden of Dr. Isidoro Mejía H. of Danlí, El Paraíso, Honduras. *Dioon mejiae* has long been an enigma owing, in part, to the inadequate and partially incorrect description, which, unfortunately, resulted in misinformation being perpetuated about the species for more than half a century. No reproductive structures were available when the species was described, and hence this information was not included in the description. In addition, the description misnamed one of the towns in the location reference of the population from which Mejía collected his seeds 40 years earlier, indicated that only a single population occurred in the wild, and grossly underestimated the maximum size of the plants.

Based on Bonta's (2003) earlier work and the present study (HN03), it is now known that *D. mejiae* is a giant "tree" cycad with multiple trunks reaching greater than 10 m in height. It is common and widespread, occurring in at least 30 populations, encompassing 10,000 ha in the departments of Olancho and Yoro, and totaling in excess of 650,000 mature plants—thus making it the most abundant cycad in the New World (Haynes & Bonta, 2003). Population sizes and densities vary widely (from 6 to 150,000 plants/population and from 10 to 240 plants/ha, respectively), as do the habitats and soil conditions in which it grows (lowland evergreen rain forest to deciduous mixed forest to arid thorn forest; 120–1000 m above sea level [masl]; 800–2000 mm annual precipitation; and soils characterized by 6.3–8.0 pH, 2.2–18.9% organic matter, 2.7–123 ppm P, 166–610 ppm K, and 1330–14,500 ppm Ca). It is the southern- and easternmost *Dioon* species of an otherwise Mexican genus, occurring greater than 700 km east of its nearest congener. There are anecdotal reports of domestic plants in Nicaragua (Stevenson, 2001), but its presence in the wild there remains unsubstantiated (see Haynes & Bonta, 2007 for an emended description of this species.)

*Dioon mejiae* was listed as "Rare" or "Vulnerable" based on the IUCN Red Data categories set forth in Lucas and Synge (1978) and Mace et al. (1992), respectively (Osborne, 1995). The 1997 IUCN Red List of Threatened Plants also considered it "Rare" (Walter & Gillett, 1998), whereas it was more appropriately deemed "Data Deficient" in the IUCN Cycad Action Plan (Stevenson et al., 2003). Although much of its preferred habitat is affected by human burning regimens—its most serious threat—the plants can survive such fires. Therefore, it is recommended that the IUCN category be changed from "Data Deficient" to "Least Concern," based on the IUCN Red List Categories and Criteria v. 3.1 (IUCN, 2001).

**Notes:**

- Known locally as “tiusinte” (Spanish) or “tiñúk” (Tol) (Bonta & Osborne, 2007; Haynes & Bonta, 2003).
- The seeds are an important food source for 30–40,000 people (see Bonta, 2007 for details on human uses of this and other Honduran cycads).
- It appears to be an exclusive host species for the “tiusinte” hairstreak butterfly, *Eumaeus childrenae* (Haynes & Bonta, 2003).
- A new species of *Rhopalotria* weevil is thought to be the pollinator (Haynes & Bonta, 2003).
- TEFH specimens collected: 39075, 39078–39080, 39082, 39085, 39086, 39092, 39093, 39095, 39097–39100.
- EAP specimens examined: Merrill 15717, Standley 16522 (isotype), Standley & Williams 16756, Valerio 3805 (labeled *Cycas circinalis*).

**ZAMIA STANDLEYI SCHUTZMAN**

In his description of *Z. standleyi* Schutzman, Schutzman (1989) indicated that it had first been reported from Honduras (as *Z. fufuracea*) by Standley (1931), who claimed that its range extended from the Lancetilla Valley, Atlántida, into southern Mexico. Work conducted since then separated out several Mexican species that were poorly known at that time (Schutzman, 1989) and eliminated all evidence of *Z. standleyi* occurring outside of Honduras. Although the true extent of its range is still uncertain, it is now known that the species is common and widely distributed in Honduras; in fact, its range may encompass as many as 500,000 ha in the northern river valleys of the departments of Colón, Olancho, and Yoro alone (Haynes & Bonta, 2003). Schutzman (1989) stated that the type specimen was collected in Atlántida, that he had also examined specimens from the departments of Cortés and Santa Barbara, and that the species had been reported as far east as the Río Plátano in the Department of Gracias a Dios (also known as “La Mosquitia”). Although some authors have suggested that it may also extend into Nicaragua and/or Guatemala (Whitelock, 2002), this claim is unsubstantiated at present, and most recent references refer to *Z. standleyi* as a Honduran endemic (Hill & Stevenson, 2007; Hill et al., 2007; Stevenson et al., 2003).

It typically grows in colonies of only 10–20 plants (populations are difficult to circumscribe), sometimes growing in sympatry with *D. mejiae*. It generally prefers moist hill-sides under dense tree canopy below 650 masl. Plant density is fairly consistent from place to place, reaching only ca. 0.10 plants per hectare. A conservative estimate of the number of wild plants in Honduras is 50,000 (Haynes & Bonta, 2003). An earlier estimate of 6500 wild plants resulted in this species being considered “Rare” or “Vulnerable” based on the IUCN Red Data categories set forth in Lucas and Syngé (1978) and Mace et al. (1992), respectively (Osborne, 1995). The 1997 IUCN Red List of Threatened Plants considered it “Rare” (Walter & Gillett, 1998), and the more recent estimate of Stevenson et al. (2003) of less than 1000 wild plants suggested a “Vulnerable” listing. However, because the previous population estimates were at least an order of magnitude too low, much of the preferred habitat is not easily converted to farmland, and several well-protected national parks and biosphere reserves are found within its range, it is recommended that the IUCN category be downgraded from “Vulnerable” to “Near Threatened,” based on the IUCN Red List Categories and Criteria v. 3.1 (IUCN, 2001).

**Notes:**

- *Zamia standleyi* Schutzman is known locally as “camotillo” or “yuca de ratón” (Bonta & Osborne, 2007; Haynes & Bonta, 2003).
- It is widely regarded for its poisonous properties and has been used in Pech, Ladino, and Tol ethnic communities to kill both rodent pests and human enemies (Bonta, 2007; Haynes & Bonta, 2003).
- Several preserved specimens were collected during the HN03 expedition; unfortunately, none of them survived in good enough condition to be catalogued into the herbarium.

## Undescribed Species

### ZAMIA SPECIES 1

*Zamia* species 1 is a beautiful arborescent plant with 2 m or greater trunks and 16 cm diameter. It carries 30 or more dark green, glossy leaves measuring to 1.5 m in length, and its long-lanceolate, basally subfalcate, apically acute, papyraceous leaflets measure up to

36 cm long and 4.5 cm wide (Haynes & Bonta, 2003). Its large seed cones (to 30 cm long and 11 cm in diameter) and pollen cones (to 36 cm long and 4 cm in diameter) most closely resemble those of *Z. tuerckheimii* Donn. Sm., although the cones of the latter are significantly smaller (Haynes & Bonta, 2003; Hill & Stevenson, nd; pers. obs.). Highly ornamental, even in habitat, the species also resembles *Z. tuerckheimii* in leaf, leaflet, and trunk characteristics, but it differs from the latter by carrying many more, slightly shorter leaves with numerous stout prickles along the petiole and extending up onto the rachis, and by having many more, longer but narrower leaflets.

Plants grow on steep slopes of 700–1300 masl in deep humus within dense tropical deciduous forest understory. In the higher elevations, the plants actually grow within a cloud forest transition zone. As many as 10,000 plants of every size, from seedling to large adult, were observed during HN03 in the only known population. Even though the population occurs within a protected area and the estimated total number of mature plants in the wild is relatively high, the threat of over-collecting is very real. Therefore, it is recommended that the species be considered “Critically Endangered” at present (IUCN Red List Criteria = CR B1ab(iv)+2ab(iv) [IUCN, 2001]).

**Notes:**

- *Zamia* species 1 is known locally as “camotillo” (Bonta & Osborne, 2007; Haynes & Bonta, 2003), like many of the smaller cycads in Honduras (as well as some ferns and even angiosperms [Bonta, 2007]).
- *Zamia* species 1 has been in cultivation since the 1990s, and seeds are being collected and grown in a local nursery as well as exported to the United States.
- A new species of *Pharaxonotha* beetle—thought to be the pollinator—was collected from a dehiscing pollen cone during HN03; it is currently being described.
- TEFH specimens collected: 39182–39189.

**ZAMIA SPECIES 2**

*Zamia* species 2 is known as the Honduran “cliff-dwelling” *Zamia* because of its tendency to grow on steep hillsides and road cuts. It has an acaulescent habit and holds one or two pendant leaves that can reach 2.5 m in length. It is sometimes informally referred to as

*Z. "lacanophila"* because of its morphological resemblance to *Z. lacandona* Schutzman & Vovides and its pendant leaves and cliff-dwelling habit reminiscent of *Z. cremnophila* Vovides, Schutzman & Dehgan (R. Adams, pers. comm.). It resembles the former species in having linear-lanceolate, falcate leaflets, and similarly shaped, although slightly larger seed cones. However, it differs from it in having much longer, green-emergent leaves, a four-sided petiole and rachis, and truly coriaceous leaflets.

It typically occurs in small colonies of 6–12 plants on steep, rocky hillsides that are not likely to be converted to farmland. Its distribution and range are not well known, but it seems to grow in isolated, disjunct populations along the Atlantic slope. Although the total number of plants and populations is unknown at present, it is recommended that the species be considered "Endangered" at present, owing to the threat of over-collecting (tentative IUCN Red List Criteria=EN B1ac(i,iii)+2ac(i,iii); C1+2a(i) [IUCN, 2001]).

**Notes:**

- *Zamia* species 2 is known locally as "camotillo" and "yuca de ratón" (Bonta & Osborne, this volume; Haynes & Bonta, 2003), and it is reportedly the most cold-sensitive of all the zamias in cultivation.
- *Zamia* species 2 has been in cultivation since the 1990s; it exists in several private collections and at least one ex situ research collection (MBC).
- Larvae of a second hairstreak butterfly, *Eumaeus toxea*, were observed feeding on the leaves in habitat.
- TEFH specimens collected: 39155–39159, 39190–39193.

**ZAMIA SPECIES 3**

*Zamia* species 3 is the least known undescribed species in Honduras. At one time, a single acaulescent plant with red-emergent leaves, numerous narrow and variable leaflets, and resembling a dwarf version of *Z. chigua* Seem. existed in the New York Botanical Garden's living collection (D. Stevenson, pers. comm.). Although B. Schutzman (pers. comm.) suggested that this plant may have been nothing more than a red-emergent form of *Z. herrerae*, it differs from this species in having smaller, red-emergent leaves and smaller, thinner leaflets (D. Stevenson, pers. comm.). Moreover, the presence of *Z. herrerae* on the Atlantic coast of Honduras, in a highly distinct biogeographical province and across the Isthmus

from the known Pacific slope range of the species in El Salvador, is extremely unlikely (M. Bonta, pers. comm.). This species was not observed during HN03, but plants fitting this general description were photographed on the Atlantic coast by R. Steiner in January 2005. Nothing more can be said about this species until it is better understood or formally described. It is recommended that this species be listed as "Data Deficient" based on the IUCN Red List Categories and Criteria v. 3.1 (IUCN, 2001).

### CERATOSAMIA SPECIES

The undescribed species of *Ceratozamia* is acaulescent and highly ornamental, holding up to 20 or more elegantly arching leaves measuring 2.5 m or more in length. Its broad, papyraceous leaflets (up to 13 cm wide and 30 cm long) suggest that it belongs to the *C. miqueliana* Miq. species complex, and it most closely resembles *C. euryphyllidia* Vázq. Torres, Sabato & D.W. Stev. However, it differs from the latter in having many more, shorter, shiny lime-green emergent leaves and dark green, glossy, nearly symmetrically obovate leaflets with acuminate tips that are only slightly off-center phyllodistally. It should be noted that various herbarium specimens of this species have been mislabeled *Z. tuerckheimii* (see later), with which it shares no affinities.

Although its range and distribution are not well known, it is most likely a Honduran endemic. It occurs in isolated, widely disjunct populations along the Atlantic slope. It grows in small to medium-sized colonies (from 6 to 24 or more plants), generally on moist hillsides along streams and under dense canopy in tropical lowland forest. Two of only three populations confirmed before and during the HN03 expedition are now extinct: one has been converted to farmland and the other was wiped out by collectors in 2003 (pers. obs.). The third confirmed population occurs in a protected area, but its size and extent are unknown. Because of its apparent scarcity and the fact that at least one entire population has been extirpated by collectors, it is recommended that this species be considered "Endangered" at present (tentative IUCN Red List Criteria=EN A2acd; B1ac(i,ii,iii,iv,v)+2ac(i,ii,iii,iv,v); C1+2a(i)b [IUCN, 2001]).

#### Notes:

- The undescribed *Ceratozamia* species is the southeasternmost *Ceratozamia* species known to date.



- The only known vernacular name is “camotillo” (Bonta & Osborne, 2007; Haynes & Bonta, 2003).
- It has been in cultivation since the 1990s, and it exists in only a handful of private collections.
- TEFH specimens collected: 39165, 39177–39180.
- EAP specimens examined (all incorrectly labeled *Z. tuerckheimii*): A. E. Brant & R. Zúniga 2830; D. L. Hazlett, A. E. Brant & R. Zúniga 8036; R. L. Leisner & D. Mejía 26238; P. C. Standley 7593.

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