

In the Company of Giants

One Botanist's Humbling Encounters with Ancient Dioons

Article and photos (unless otherwise indicated) by Jody Haynes



Fig. 1. The author is dwarfed by a giant *Dioon mejiae* in Olancho, Honduras (photo by Mark Bonta).

If one is lucky, s/he enjoys but a handful of genuine, life-altering experiences in his/her lifetime. As the Cycad Biologist for Montgomery Botanical Center (MBC) in Miami, FL, USA, I have been "blessed" with several special moments that I would like to share with my fellow Cycad Society members.

My first—and most awe-inspiring, yet humbling—experience "in the company of giants" occurred in July 2003 during a 30-day MBC-sponsored cycad expedition to Honduras (HN03). My next encounters occurred this past January during a cycad ecotour of southern Mexico (MX05)—led by Jeff Chemnick and Tim Gregory—in which we visited eight populations of six species of *Dioon* in just 11 days.

In this article, I will provide some photos of the largest plants of seven of the eight *Dioon* species that I have seen in habitat and describe their respective populations and habitats in some detail (the eighth species, *D. edule*, doesn't measure up to the other "giants" I have seen and so is not included here). The species are listed in the order in which they were visited.

Dioon mejiae—Although we visited more than 20 populations of this species during the HN03 expedition, we discovered the largest plants in what seemed like the middle of nowhere in the Department of Olancho, Honduras. We reached the population on the second day in the field, after hiking for what seemed like many hours up and down mountains with very little water (stupid?) and with me being pitifully out of shape (no comment!). To my astonishment, my all-too-fresh memories of the pain and agony that I endured during the hike completely evaporated when I found myself standing in the shadow of a multi-headed colossus with a 9+ m main trunk going by the name of 'tiusinte' (Fig. 1). And if that wasn't enough, there were many such individuals of this size in this population. My colleague, Mark Bonta, told me later that he and I were probably the first 'gringos' ever to see these massive and ancient plants. I also later determined that the giant plants in this population may very well have been alive when the reign of the Roman Empire was coming to an end some

1,400 years prior! This population occurs in tropical oak forest alongside a small stream; such a setting is quite common for many of the 30+ populations of this species in Honduras. There were no cones evident, but seedlings were present. Due to its remoteness and relative inaccessibility, this population—and the giants therein—is almost certainly not threatened.

During the HN03 expedition, Mark and I visited more than 20 populations of *Dioon mejiae*, documented at least ten more, and elevated the conservation status of this species to Not Threatened from previous assessments suggesting that it was Rare (Lucas & Syngé, 1978) or Vulnerable (Mace *et al.*, 1992; Walter & Gillett, 1998). We also revised the estimate of the total number of wild plants, increasing it 120-fold from the previous estimate of 5,000 (Osborne, 1995) to no less than 600,000 mature plants spread across 10,000 ha in northern Olancho and eastern Yoro (Haynes & Bonta, 2003; Haynes & Bonta, *In press*).

Dioon spinulosum—The population of this species that we visited in northern Oaxaca is approximately 120 km from the type locality. The plants were growing on a karst (limestone) mogote rising up out of the surrounding farm fields (Fig. 2). Many large and hundreds of medium-sized and juvenile plants were growing on this mogote. In one area, female cones and seedlings were abundant, whereas cones and seedlings were essentially absent in another nearby area. The most likely explanation for the latter situation is that living material (seeds, seedlings, and possibly small plants) is being harvested for the ornamental plant market. Even so, the population in question does not appear to be threatened. One large plant that had begun its life as a seedling atop a large rock (similar to the seedlings in Fig. 3) had sent down roots over the rock; once they hit soil, they enlarged until they reached up to 20 cm diam. The tallest plants in this population had erect, solitary trunks measuring an estimated 10+ m tall (Fig. 4). This species consists of tens of thousands of plants, most occurring on less accessible hills. Associated species included *Ceiba* sp., *Bursera* sp., *Carica* sp. (a wild papaya relative), and the endemic palm, *Gaussia gomez-pompae*.

Dioon merolae—We visited two and possibly three populations of this species (one population is still controversial, as it may represent a distinct species). One large plant in the Oaxacan population that is affectionately (but misleadingly) known by some as the "golden merolae" had a



Fig. 2. Dr. John Donaldson and Roy Osborne admire large *Dioon spinulosum* plants growing on a karst mogote in Oaxaca, Mexico.

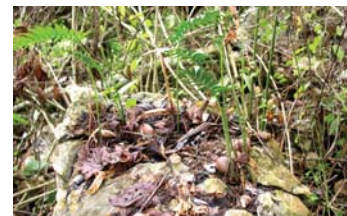


Fig. 3. *Dioon spinulosum* seedlings growing atop a large rock in Oaxaca.



Fig. 4. Closeup of giant *Dioon spinulosum* plants in Oaxaca.



Fig. 5. Large *Dioon merolae* plant in the “golden merolae” Oaxaca population showing multiple broken trunks.



Fig. 6. The two “sleeping giant” *Dioon merolae* plants in Chiapas, Mexico.

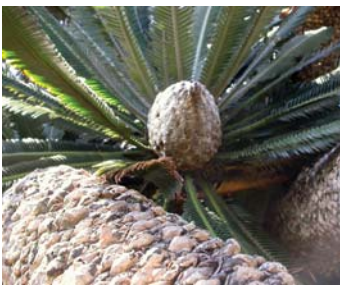


Fig. 7. Closeup of female cone on the giant female *Dioon merolae* in Chiapas.



Fig. 8. Wind-swept pine (*Pinus macrocarpa*) at the *Dioon merolae* locality in Chiapas.

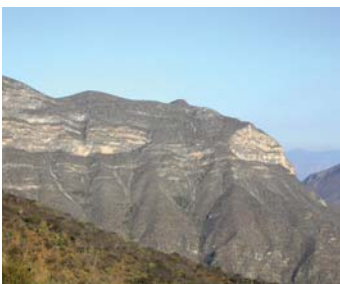


Fig. 9. High-desert habitat of *Dioon caputoi* in Puebla, Mexico.

main trunk at least 7 m tall, but unfortunately it had been broken off 3 m above ground (Fig. 5). This population is fairly well-known among collectors, and plants originating from there—most likely as wild-collected seeds—are not uncommon in cultivation. Many of the trees in the area are being cut down, and the cut logs roll or slide down the hillside, threatening any cycads in their paths. Yet, in spite of these obvious threats, the population seems fairly stable, and there were several three-meter-tall plants and numerous seedlings present. The habitat in which this population grows is an amazing botanical wonderland consisting of ponytails (*Beaucarnea* sp.), true agaves (*Agave angustifolia*), “wax” agaves (*Echeveria* sp.), columnar cacti (*Neobuxbaumia* sp.), Mexican wild yams (*Dioscorea* sp.), palms (*Chamaedorea seifrizii*), bird’s nest anthuriums (*Anthurium* sp.), shrimp plants (*Justicia* sp.), orchids (possibly *Laelia* sp. and/or *Sobralia* sp.), and bromeliads (*Tillandsia* sp. and *Hechtia* sp.).

Although the aforementioned population is aesthetically quite appealing, by far the largest and most impressive individuals of this species are the two multi-headed plants in Chiapas pictured in Plate 207 of Loran Whitelock’s book, *The Cycads* (Whitelock, 2002). To me, these two plants resemble octopi, each possessing several 8 m long, prostrate trunks reaching out haphazardly in all directions (Fig. 6). One of these plants is a male and the other is a female. The male had recently coned and bore spent cones, whereas the female had one quite large cone on each of several apices (Fig. 7). Interestingly, these are the only two plants growing at the top of the hill. I discovered one small seedling about 20 m away (and 5 m downhill) from the female, and a few smaller plants were growing in a gully at the bottom of the hill (100 m downhill), but this population is quite small and possibly relictual. The day we visited, hurricane-force winds rushing up the mountainside made walking on the already steep slope somewhat treacherous. Nonetheless, a few of us die-hard cycadologists could not resist the urge to touch and photograph these “sleeping giants.” These two plants are perched just above the transition zone between tropical oak forest and pine forest—and, in fact, the pines in the area (*Pinus macrocarpa*) seemed quite well adapted to the horrendous winds that must be commonplace (Fig. 8).

Dioon caputoi—This species has long been shrouded in mystery—at least for me. I had heard from numerous growers and collectors that it was both a difficult species to grow and extremely slow-growing in cultivation. I had also heard that it grows in a high-desert habitat in Puebla, Mexico, that experiences cold weather and even some frost in the winter (see Fig. 9). Before participating in the MX05 ecotour, I had seen only a handful of plants in person—mostly seedlings, in addition to the sole small individual at MBC. Thus, I was not prepared for what I was to behold on the eighth day of the tour: a seven-headed female *D. caputoi* with trunks up to 3.5 m (Fig. 10)! Several plants in the population had 1 m trunks, and many were pushing new leaves. We documented the presence of *Eumaeus* sp. caterpillars, and many of the newer leaves had been predated (Fig. 11). Both male and female cones were present (Fig. 12), but there was no evidence of seedlings. The local name for the plant is ‘palma real’ (meaning “royal palm”)—although this species was not regarded as being anything special by the local inhabitants until researchers from the Sociedad para el Estudio de los Recursos Bióticos de Oaxaca (SERBO) visited the area and explained its importance. The soil in the area is referred to as granodierite, with a pH around 6.5 and a reddish-orange color (J. Marshall, pers. comm.). The elevation is around 2,000 m, and rainfall totals only around 40 cm per year. One local told us that when it rains, it pours, so most of the rain comes down in a relatively short amount of time—between June to November—and flash floods are common. Associated species included *Agave triangularis*, *Bursera* sp., *Beaucarnea gracilis*, *Yucca mixtequensis*, *Mammillaria sphaelata*, *Matilocactus* sp., *Pachycereus* sp., *Stenocereus marginatus*, *Ferocactus* sp., and *Acacia* sp. This population consists of around 2,000 plants, and it is threatened by cattle grazing and road construction and “improvement.” Fortunately, a resident of the nearby town has taken it upon himself not only to protect the local population but also to start his own seedling nursery (Fig. 13).

Dioon califanoi—The most well-known population of this species occurs at a relatively high elevation (1,800 m) in Puebla, where the plants are regularly bathed in cool, moisture-laden air and often



Fig. 10. Author posing next to a giant female *Dioon caputoi* (photo by Chris Dalzell).



Fig. 11. Caterpillars of an unidentified hairstreak butterfly (*Eumaeus* sp.) defoliating a new flush of *Dioon caputoi*.



Fig. 12. Male (A) and female (B) cones of *Dioon caputoi* in habitat.



Fig. 13. *Dioon caputoi* seedling nursery operated by an inhabitant of a nearby town in Puebla.



Fig. 14. New flush of leaves on a medium-sized *Dioon califanoi* plant.



Fig. 15. *Mammillaria cacti* growing on the trunk of a large *Dioon califanoi*.



Fig. 16. Habitat of the "giant purpusii" locality in Oaxaca.



Fig. 17. Author posing next to a giant, multi-headed female *Dioon purpusii* plant in the "giant purpusii" locality (photo by Jeff Chemnick).

experience frost in the winter. The largest plant that we observed was a multi-headed individual with up to 4 m tall, erect trunks growing in a cleared field; with its recurved leaves, it resembled *Encephalartos longifolius* from a distance. (Unfortunately, this plant was too far away to photograph well, and we didn't have time to hike up to it.) Plants in this population were growing on steep slopes in loose, granite-derived soil of pH 5.5-6.0 and containing lots of silica and humus (J. Marshall, pers. comm.). Those growing in areas not yet cleared seemed to be reproducing quite well. I observed five male plants with relatively recently dehisced cones and at least ten females with recently disarticulated cones and numerous germinated seeds beneath them. Often times, seeds remained in the crowns of the mother plants, and all had been cleaned of their sarcotestas by small rodents. There were very few juvenile plants in this population, and we speculated that smaller plants may be poached periodically for the ornamental plant market. Goats routinely forage in the area, further threatening recruitment of seedlings into the breeding population. Most plants had flushed recently (Fig. 14), although many of the newer leaves had been eaten by *Eumaeus* caterpillars. Many of the plants were growing at the base of stunted oak trees, and most had *Mammillaria* cacti growing epiphytically on their trunks (Fig. 15).

Dioon purpusii—The population of this species that we visited is referred to as the "giant purpusii" locality (Fig. 16) in Oaxaca. The largest plant in this population is a multi-headed female with a main, erect trunk 4 m tall (Fig. 17). Plants in this population were growing in soil derived from ultra-basic schist, which has a pH of 6.0-6.5 and which is high in Magnesium (Mg) and Iron (Fe) and low in Calcium (Ca) (J. Marshall, pers. comm.). Many plants were growing on the steep slopes, but only a few occurred along the ridge. I observed three times the number of males (12) as females (4). Most of the females had seeds and seedlings below them, and recruitment in this population seemed high, based on the presence of numerous juveniles. "Giant purpusii" plants have longer, broader leaves than plants in the other *D. purpusii* populations, and the new leaves present on a few of the plants were a steel blue color and were covered in a silvery white tomentum (Fig. 18). Although *D. purpusii* and *D. califanoi* are obviously related, the leaves of the two species are quite distinct (Fig. 19). Associated species included a variety of oaks (*Quercus* spp.), *Agave potatorum*, *Senecio* sp., and *Acacia* sp. We did not observe any evidence of collecting here, and this population seemed to be relatively secure and not currently threatened.

***Dioon* sp. (*oaxacaensis*)**—The last *Dioon* population that we visited on the MX05 tour was a new species from Oaxaca that is currently being investigated by researchers and students from SERBO. This is one of the few populations that does not occur on steep slopes. This unique characteristic, in addition to the sheer abundance of plants, makes it a very attractive population for study. There were thousands of plants in this population—ranging from seedlings to juveniles to large adults—growing in among oaks, *Bursera* sp., and giant *Agave marmoratum* (Fig. 20). Numerous male and female plants were observed bearing cones. Many of the plants had been chopped off at around 1 m above ground and had re-grown multiple apices from a single trunk; such females often had two large cones on separate apices (Fig. 21). The largest plant that I observed in the population was a stunningly gorgeous, multi-headed individual with two prostrate trunks measuring 6 and 4 m, respectively (Fig. 22). As was true for many of the *Dioon* populations we visited, there was obvious evidence of the presence of *Eumaeus* butterflies. Even though chopping of the trunks had been commonplace in the past, the locals have a new-found respect for the plants and, as a result, the population does not appear to be threatened.

Acknowledgments

I would personally like to thank Dr. Terrence Walters, Montgomery Botanical Center, and several private donors for the opportunities I have been given to observe more than 20 species and nearly 60 populations of cycads in four countries—in just the past year and half! I would also like to acknowledge and thank Dr. Mark Bonta and the leaders of the MX05 cycad ecotour, Jeff Chemnick and Dr. Tim Gregory, for providing the opportunities for me to experience the



Fig. 18. Underside of a new *Dioon purpusii* leaf from the "giant purpusii" locality, showing the silvery-white tomentum.



Fig. 19. Leaf comparison of *Dioon purpusii* (left) and *D. califanoi* (right).



Fig. 20. Small adult plant of *Dioon* sp. (*oaxacaensis*) growing next to a large *Agave marmoratum*.



Fig. 21. Two large female cones on a *Dioon* sp. (*oaxacaensis*) plant.



Fig. 22. Giant *Dioon* sp. (*oaxacaensis*) plant with four- and six-meter prostrate trunks.

numerous wonders of the botanical world discussed in this article. (The entire MX05 group is pictured in Fig. 23.)

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Fig. 23. *Pachycereus weberi* dwarfing participants of the Mexico 2005 post-conference cycad tour, from left to right: Chris Dalzell, John & Marion Marshall, Tim Gregory, Jeff Chemnick, Piet Vorster (kneeling); Paul Forster, Jenny Beard, Doris Francis, Stan Walkley, Virginia Hayes, Lou Randall, Harvey Ottley, John Donaldson, Roy Osborne, Jody Haynes, Nan Li, Elsa Vorster (standing).