



# MONTGOMERY BOTANICAL CENTER

Advancing Research, Conservation, and Education  
through Scientific Plant Collections

## EXPEDITION REPORT

### GUAM & ROTA 2007 WORKING AGAINST CYCAD EXTINCTION

*Cycas micronesica* is a large, arborescent cycad found in the remote Pacific islands of Guam, Rota, Palau, and Yap. Uniquely adapted to its island environment, it withstands frequent typhoons, and, along with other closely related species, it has a spongy flotation layer within the seed coat to aid in ocean dispersal. Montgomery Botanical Center (MBC) is playing a key role in the conservation of this cycad.

#### AN ENDANGERED CYCAD

Until recently, *Cycas micronesica* was the most common forest tree in Guam. In 2003, a tiny insect forever altered the future of Guam's forest giants. *Aulacaspis yasumatsui*, commonly known as cycad aulacaspis scale (CAS), made its way to Guam in 2003 via the importation of king sago (*Cycas revoluta*) plants. With no native predators, widespread hosts, and year-round trade winds to aid dispersal, CAS quickly spread throughout Guam. CAS attacks *Cycas* leaves by inserting needle-like mouthparts and feeding on the plant's sap. It reproduces very rapidly and leaves are quickly covered by white scale, eventually overwhelming the plant until it dies. The effect on Guam's native cycads has been so devastating that *C. micronesica* was listed as Endangered (EN) in the 2006 IUCN Red List of threatened species.

In addition, the cycad blue butterfly (*Chilades pandava*) arrived in Guam in 2005. The butterfly lays its eggs on newly emerging *Cycas* leaves. Soon after hatching, the

caterpillars begin consuming tender leaves. Any remaining leaves may be infested by CAS after hardening.

#### COLLABORATIVE EFFORTS

Funding from the Association of Zoological Horticulture allowed MBC to obtain an *ex situ* conservation collection

of *Cycas micronesica* from Guam. Montgomery Botanical received seeds from Dr. Thomas Marler, botany professor and cycad researcher at the University of Guam, in early 2007. At the same time, Dr. Irene Terry, University of Utah, discovered CAS had made its way to a native *C. micronesica* population on the island of Rota, 60 km north of Guam.

Dr. Marler is coordinating multi-institutional efforts to combat CAS, gain a better understanding of *Cycas micronesica*, and preserve its genetic diversity. He is studying pollination biology of *C. micronesica* with Dr. Terry, and releasing natural CAS predators for biological control with colleagues from the University of Guam and the Guam National Wildlife Refuge. Despite intensive *in situ* conservation efforts, the infestation is not contained and populations continue to decline at an alarming rate.

In late 2007, I had the unique opportunity to work with Dr. Marler in Guam and Rota; collect *Cycas micronesica* leaflet

samples for DNA extraction for genetic studies by Dr. Angélica Cibrián-Jaramillo and Dr. Eric Brenner of



Michael Calonje next to *Cycas micronesica* in Guam

(continued)

## GUAM & ROTA 2007 WORKING AGAINST CYCAD EXTINCTION *(continued)*

The New York Botanical Garden (NYBG); and collect seeds and biogeographic data to augment MBC's *ex situ* conservation collection. During an intense month of non-stop fieldwork, we studied a total of 25 different populations of *C. micronesica* in Guam and Rota. Funding from the Western Pacific Tropical Research Center, College of Natural and Applied Sciences, University of Guam, generously supported Montgomery Botanical's work.

### GUAM

The collecting protocol for NYBG's gene flow studies required sampling a total of 15 plants every 20 meters along



*Cycas micronesica* population on Rota, devastated by CAS

a straight transect. This presented an enormous challenge as Guam has very rugged terrain, abundant limestone cliffs, and areas of scrub forest with virtually impenetrable vegetation. Moreover, scale had infested the entire island and, in several populations, over 80 percent of standing cycads were dead — finding live plants in the correct transect location was difficult. In some populations, cone production had ceased entirely and seeds could not be found. In the 17 populations I visited in Guam, I observed only one, single-leaf seedling, likely to soon succumb to scale.

### ROTA

The environment on Rota was more encouraging, with large, healthy, actively reproducing *Cycas micronesica* populations — as Guam's populations must have been before CAS

invaded. Nine months after Dr. Terry first found CAS on a single population in Rota, the scale remained confined to that single population. Although a natural scale predator beetle (*Rhyzobius lophanthae*) was introduced into Rota just two months after Dr. Terry's discovery, extensive devastation from CAS in that population was still evident. It is probably only a matter of time before the scale spreads throughout Rota. This demonstrates the vital importance of our quarantine procedures.



Cycad Blue butterfly, wingspan to 3 cm

### EX SITU CONSERVATION

Montgomery Botanical's Guam and Rota 2007 Expedition secured valuable DNA collections for studies at NYBG, and MBC obtained 561 seeds from 18 populations of *Cycas micronesica* for *ex situ* conservation. MBC now has 150 accessions of *C. micronesica* from 24 different populations — the most complete single-species representation of any cycad in MBC's collection. With native *C. micronesica* populations declining rapidly, the crucial role of *ex situ* conservation collections has never been clearer — Montgomery Botanical Center is working directly to prevent extinction of cycad populations.



Healthy *Cycas micronesica* population on Rota

*Michael Calonje, Cycad Biologist  
Montgomery Botanical Center  
michaelc@montgomerybotanical.org*