THE MONTGOMERY NEWS

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Collections for Conservation

Terrence Walters, Ph.D.
MBC Executive Director

Over the last four decades, the word "conservation" has popped into the mission and purpose statements for many botanical gardens, arboreta, and zoos, as well as other species-oriented organizations. But when you ask how the word "conservation" in their mission statement is reflected in their practices, you receive an amazing array of interpretations.

The problem with defining conservation, or even how the word should be applied, is that it has been linked to a great many different policies, practices, and activities both great and small. From its earliest use, when the concept led to the establishment of America's first national park system, the word incited fierce debates over its definition and how it would be interpreted to form U.S. government policy (see www.yosemite.ca.us).

One hundred years later, the word is so widely used—and misused—that the claim is beginning to be met with skepticism. I have studiously avoided using the word at MBC for many years for that very reason. But, unfortunately, I have not found a worthy substitute. And today, with entire species virtually disappearing before our eyes, it has never been more important to back up claims of practicing conservation with substantive actions.

Within MBC's purpose statement, we make a commitment "to advance science, education, conservation and horticultural knowledge of tropical plants." We have given serious thought to how MBC, as a botanical institution that builds and maintains large scientific collections of palms and cycads, would define and practice conservation in a way that meets our purpose and is truly meaningful. We are guided by the succinct, yet broad, definition developed in the Global Biodiversity Strategy report of 1992: "[Conservation is] the management of human use of the biosphere so that many yield the greatest sustainable benefit to current generations while maintaining its potential to meet the needs and aspirations of future generations."

This definition covers all the required goals and activities that are, or should be, associated with conservation efforts, programs, and policies, including such hot issues as sustainability, restoration, utilization, enhancement, maintenance, preservation, and protection.

We believe that a comprehensive conservation program for threatened and critically endangered plant species should have two main objectives: 1) the protection and 2) the preservation of plant populations.

Protection measures applied *in situ* (on site) attempt to keep populations in a pristine native environment so they are allowed to evolve naturally (without any human impact to the environment in which the population exists). Preservation measures applied *ex-situ* ("off-site") keep populations at the evolutionary stage they attained at the point when samples were removed from their areas of natural occurrence through human intervention.

The combined objectives of preservation and protection are generally considered achievable with the development of both *ex-situ* and *in-situ* conservation programs, especially if both programs are interdependent. Sadly, the threats to biodiversity *in situ* continue to expand, and species sur-

A bird's eye view of MBC's Cycad Walk includes *ex-situ* collections of palms, cycads, and tropical dicots.

vival increasingly depends on human-modified environments despite the best efforts of conservation initiatives. As the possibility of survival for a growing number of species *in situ* decreases, the significance of *ex-situ* preservation programs increases.

In accordance with our mission and capabilities, MBC directs the bulk of its resources, energy, and funds towards the *ex-situ* preservation of scientifically valuable palm and cycad populations. From these living collections emanate our policies, programs, and activities.

By incorporating a rigorous scientific approach in developing our collections, the conservation value of the plants is multiplied. We are able to provide a resource for researchers who increase the understanding of the plants, offer an educational venue for students who will become the next generation of scientists and conservationists, and benefit host countries with backup collections and reintroductions.

In 1995, MBC defined how collections would be obtained to develop a world-class *ex-situ* preservation collection of scientifically useful palms and cycads, and how the resulting collections would be planted onto the property. Our Collections Development Program determined stringent protocols for collecting in the wild, including the number of mother plants to sample within a population and how many seeds to obtain from each mother. MBC expedition leaders are required to obtain extensive and detailed field data for each collection including herbarium specimens and images necessary for future research. From the moment the seeds arrive at MBC until they grow to reproductive maturity and beyond, the MBC team collects horticultural, phenological, and life-history data on representative plants to further increase the conservation value and scientific usefulness of the *ex-situ* collections.

Each year, we undertake an average of four expeditions, in collaboration with a local botanical institution in the country, to obtain seeds of threatened and endangered palm and cycad populations. In addition to supporting the costs for local botanists and governmental officials to join the expedition team, MBC donates 30 to 50% of the resulting seed collections to the host country. Two *ex-situ* collections, then, are produced from each expedition. One is developed in the country where the plants are native and the other at MBC. If one collection is destroyed, seeds from the other would be available for redeveloping the lost collection. It wasn't long before we put this policy in action.

In the late 1990s, we completed a South African expedition to obtain population-based samples of their native cycads across a broad geographic range. We donated half the seeds for a living collection to a botanical garden in South Africa and grew the other half here at MBC.

In 2003, a researcher from South Africa wished to access scientific populations for his investigations in the evolutionary history of the group; however, the South African *ex-situ* collection had not survived. Without MBC's backup collection, the researcher's only other recourse would have been to travel to all the native sites—if they still existed. We not only fulfilled the researcher's needs, but MBC will be able to donate seeds from the original wild-collected populations when South Africa's garden is ready to reestablish a collection of its rapidly disappearing native cycads.

Closer to home, the Florida Park Service needed to restore and invigorate populations of *Roystonea regia*, the native Florida royal palm, in the Fakahatchee Strand Preserve State Park. Since we had worked with the park's botanists to collect seeds from this species the previous year, they turned to MBC to help with this *in-situ* conservation project. The state botanists knew MBC's young royals were grown from wild-collected seeds that were thoroughly documented, so they could be confident they would be reintroducing a true native population.

Not only could MBC donate the requested seedlings, but the park staff learned how MBC's nursery successfully germinated and grew the healthy seedlings. With the seedlings, they also took with them horticultural data and the genetic relationship among each of the seedlings extracted from MBC's database that would support the state's reintroduction policies.

As MBC's *ex-situ* collections grow each year, an increasing number of researchers across the globe access our plants and associated data to better understand the life history, biology, and taxonomy of the many threatened, rare, and endangered cycad and palm species of the world. Research results, in turn, are used to develop conservation initiatives to strengthen *in-situ* protection protocols.

No matter how you define the word "conservation," we must all agree that the practice of meaningful conservation has never been more vital. Though this concept applies to any species or ecological system, our own field-work experience in the world's tropical and subtropical regions has revealed that the majority of wild cycad populations and a large number of palm populations are threatened, critically endangered, or on the brink of extinction. MBC remains committed to directing our resources towards an important conservation objective—preserving these populations in a living collection for propagation, research, education, and as a potential source for reintroduction back into native habitats. ■

Puerto Rico's Biodiversity:

In the Path of Progress

By Alvaro Calonje and Michael Calonje

▲ A majestic pair of *Sabal causiarum*.

◀ The authors find a spot in the sun to write up field notes on a *Zamia* population.

On a warm November afternoon in 1493, the men in Christopher Columbus' second expedition to the Americas became the first Europeans to discover the island of Puerto Rico. When they set foot on the white beaches of the island, they must have beheld a pristine forest inhabited by the native Taino Indians who generously greeted these strange visitors thinking them to be immortal gods. It is ironic that the Tainos showered the Spaniards with gold that, as colonization of the island began fifteen years later, they would be mining as slaves.

Centuries of agriculture and urbanization decimated the original forest cover until by the late 1940s only 6% remained. Agriculture yielded to industry and commerce as the main economic activity, and Puerto Rico gained back about a third of the original forest cover by 1990. However, urban areas began to encroach, and Puerto Rico is once again experiencing rapid forest loss.

One afternoon while visiting Dr. Terrence Walters at Montgomery Botanical Center, he mentioned that MBC had only a small number of Puerto Rican palm and cycad accessions. Because the rampant urbanization in Puerto Rico was resulting in a threat to biodiversity, we agreed that it would be advantageous to sample some of the native palm and cycad flora for MBC's *ex-situ* scientific collection as soon as possible. And so, a few months later, another kind of expedition set out towards Puerto Rico; this one seeking seeds rather than gold and sponsored, not by Spain, but by Montgomery Botanical Center—an expedition to preserve rather than exploit.

After Michael and I arrived in Puerto Rico for the three-week field expedition, we were soon joined by my other son Christopher, Sabra Turnbull from New York Botanical Garden (NYBG), and cycad enthusiasts Irvin McDaniels and Bruce Ironmonger. We met in the town of Coamo in the southern part of the island on the leeward, dry side. It was a perfect Caribbean day, the sky a deep blue and the breeze gentle and balmy.

Our main goal was to sample cycad populations on the island while possibly shedding some light on their confused taxonomy. In our preliminary investigations, we heard mentions of three different cycad species native to the island: *Zamia amblyphyllidia*, *Z. portoricensis* and *Z. pumila*. We were armed with a list of localities to explore that came from various sources, including some compiled by Sabra from the NYBG herbarium. Unfortunately, most of their vouchers were very old, some dating back to the late 1800s. A lot had changed in Puerto Rico since then. We came to the sad realization that most of the once-forested localities on the list were now covered by concrete.

We commenced our expedition seeking out populations of *Z. portoricensis*, an endemic species growing in the limestone soils of western Puerto Rico. Arnaldo Astacio from the Puerto Rico Department of Agriculture assisted us with permitting and served as our guide.

Our first stop was an area by a river where Arnaldo had seen a healthy population of *Z. portoricensis* 10 years ago. When we arrived there were no cycads in sight. After searching for over an hour with no luck, we decided it was a lost cause, and we headed down to the river for a picnic lunch. As we descended towards the river, we were astonished to see there was a single small *Z. portoricensis* plant growing on a sheer cliffside below us. The drop was over 100 feet and there was no way to get closer to the plant; we even got nervous as Bruce carefully leaned over the cliff to photograph it.

What was once a healthy population a decade ago was now represented by a single individual clinging to the side of an inaccessible cliff. With no other plants in the vicinity, its chances of reproducing were greatly diminished. Most likely, this cycad population was devastated by over collecting for commercial nurseries.

Not to be discouraged, we proceeded to visit a population of *Z. portoricensis* near Ponce, at a place we referred to as "The Dump." There were a few plants scattered about the understory of a beautiful dry forest that was situated next to enormous heaps of old couches, rusty cars, refrigerators, and you name it discarded by environmentally unconscious people.

Experiencing first-hand the region's heavy annual rainfall, the expedition team discovers an unusually large and healthy population of *Zamia portoricensis* growing within the protection of Puerto Rico's Susua Commonwealth Forest.

The *Zamia* population was not very dense nor the individuals very old. We suspected this site had fallen victim to some over-collecting as well. It took over two hours to find a single seed, but at least it indicated some pollination was occurring. The few coning plants showed little evidence of seedling regeneration. It had been a dry year so we hoped there were hidden seedlings covered by the abundance of leaf litter.

Nonetheless, we felt energized after seeing our first coning plants as we headed to Guanica International Biosphere Reserve in Puerto Rico's most arid zone. It holds the largest remaining tract of coastal dry forest in the world. We were deeply impressed by its wonderful feeling of austerity and simplicity.

We followed a map drawn by Dennis Stevenson of NYBG to the site to find very large plants but little evidence of seedling regeneration. Ancient herbarium vouchers from NYBG mentioned *Z. portoricensis* and *Z. pumila* occurring in the park, but the park rangers assured us only *Z. portoricensis* occurred there.

For our last search for *Z. portoricensis*, in the Susua Commonwealth Forest, we were joined by Brian Brunner, head of the Master's Program in Horticulture at the University of Puerto Rico.

The forest's ecosystem is similar to that of Guanica but differs substantially in its soil composition and climate. It receives twice as much annual rainfall (1400 mm), and consequently the trees are much taller and leafier. A great deal of the yearly rainfall must have decided to fall that day, soaking us completely through. Fortunately the rain was nicely warm.

We were happy to see that the conservation outlook for this population was much more promising. Before us were hundreds of plants at all stages of coning and very healthy seedling regeneration. We even found evidence of dispersal in small, scattered piles of seeds, often away from any possible mother plants. Many had telltale rodent bite marks on the seed's fleshy layer. We were fortunate to find enough mature seeds at this site to finally obtain a population sample of this species for MBC.

This experience marked the end of our *Z. portoricensis* itinerary, and we headed to a house we had rented in the mountains bordering Maricao State Forest. The deck had an amazing view of a highland forest where *Prestoea montana* palms were dominant. As night crept in, we had a lovely moonlit dinner while listening to the musical chants of coqui frogs.

The next morning, we started our quest to visit populations of *Zamia amblyphyllidia* in Puerto Rico's north coastal limestone hills (mogotes). Our first site was on a mogote marked by a stately *Gaussia attenuata* palm with an understory containing a young population of cycads. The plants exhibited extreme differences in leaflet width and arrangement. Close by, we found a cycad with leaflets so small, it could easily be mistaken for a *Zamia pumila*, the elusive species we never did find during our trip. It left us to wonder if it ever existed on the island, and if reported sightings had been a misidentified species.

For our next adventure, our group was joined by Papo Vives, an enthusiastic Puerto Rican chemist, talented amateur botanist, and expert on the island's flora.

Papo led us to a banana plantation by the Guajataca river where he knew of a *Z. amblyphyllidia* population. They were to be found two miles up and down a hot, dusty road. The effort proved worthwhile, as the population had many large plants with cones at all stages of maturity, including eight female plants with bright red ripe seeds. This was the healthiest cycad population we had seen to date, as well as the most successful collection.

But even this happy find did not prepare us for our next discovery in the moist forest of the Cambalache Natural Reserve. The *Zamia amblyphyllidia* population at Cambalache was the largest population most of us had ever seen, and had to be one of the most dense cycad populations in the world. We could hardly take three steps without running into another plant.

We sampled the population range for hours when a ranger offered to drive us to a site where *Gaussia attenuata* occurred. The Gaussias were interesting-looking palms, much taller than the surrounding canopy, albeit with a very sparse crown, supported by an incredible mass of thick roots tightly wrapped around coral rocks.

But sadly, our visit to the reserve was a case of saving the best for last because this, our most successful collection, marked the end of our trip. Driving back towards San Juan as the mogote and forest panorama changed to buildings and cars, we reflected on what we had seen that weighed heavily against the fate of Puerto Rico's biodiversity. Apart from the decimated and declining populations, we noted a proliferation of invasive species in many of the sites visited. We saw a population of *Sabal causiarum* living its last days surrounded by a golf course. A stately *Coccothrinax barbadensis* palm was bulldozed before our very eyes. How much of what we saw would be there if we returned in ten years' time?

On a more positive note, we were glad to see that many incredible ecosystems were preserved in Puerto Rico's national parks, and several concerned institutions and individuals were making efforts to salvage Puerto Rico's biodiversity for future generations.

Only by understanding the elements of biodiversity can we understand how to save it. We were content that the material we collected would be caringly nurtured at MBC—the germplasm preserved and as the plants grew in a living collection, they would play a role in increasing the understanding of the palms and cycads of Puerto Rico and the rest of the world. ■

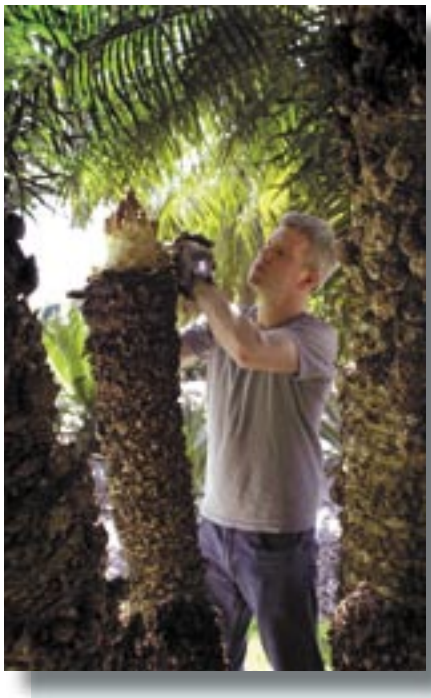
Seeds of the Past Germinate Future Studies

In March, the Cycad Program Team helped further the research of the New York Botanical Garden's Cycad Genomics Project. Under the direction of Drs. Dennis Stevenson and Eric Brenner, the project investigates the prehistoric cycads to gain understanding of seed evolution and set the groundwork for future studies.

"Cycads are the oldest living seed plants with a history stretching back before the time of the dinosaurs, so we study these ancient plants to understand the origin of seeds," Dr. Brenner explained. "The first seed plants and today's ferns may have come from a common ancestor. In fact, careful inspection of cycads shows many characteristics similar to the ancient seed ferns.

"In an effort to use new technologies to understand this very important question, we have tapped into the cycad-rich resources at Montgomery Botanical Center to capture them at specific developmental stages when seeds are being formed. We study the genes that might cause formation of seeds, and seek vital clues to understand how these structures developed in these early plants."

MBC cycad biologist Jody Haynes identified a veteran *Cycas rumphii* with promising side stems for Dr. Brenner to dissect. With careful cutting, the interior of the apex was exposed. Photographs were taken and early seed forming structures (ovules) from the crown were collected for the project. Christine Wiese, MBC's cycad horticulturist, was on hand to safeguard the health of the plant.



Dr. Eric Brenner carefully dissects an apex on a multi-stemmed *Cycas rumphii* for NYBG's Cycad Genomics Project.

Dr. Brenner was very excited about being given the unusual opportunity to dissect part of a living specimen in a botanical garden: "This was a tremendous opportunity to collect some very rare and important tissue for critical genomic studies among researchers at the New York Plant Genomics Consortium."

To learn more about the work of the consortium, visit their website at sciweb.nybg.org/science2/GenomicsLab.asp.

Montgomery Fellows Program Brings Together Research and Education

With start-up funds granted by the Kelly Foundation, MBC will be launching the Montgomery Botanical Fellows Program in 2005. This innovative new program is intended to accelerate and link research and education in tropical botany. The program will bring distinguished nationally and internationally renowned tropical biologists to Miami to undertake research projects using MBC's tropical plant collections. The Fellows will participate in special educational opportunities for college students and others in the Florida horticulture and botanical communities. The program is currently undergoing the candidate selection process with plans to host the first Fellow at MBC next fall. ■

Christina Lopez-Gallego, graduate student, University of New Orleans, Louisiana, spent two days at MBC in April undertaking a study on MBC's collection of *Zamia fairchildiana*. Christina is researching the population genetics and life history of this cycad native to Costa Rica and Panama for her dissertation project.

Research Notes

Dr. Thomas Ding, Center for Neurologic Diseases, Brigham & Women's Hospital and Harvard Medical School, obtained leaflet samples from the cycad genera *Bowenia*, *Macrozamia*, and *Cycas* for his research on cycad neurotoxins.

Dr. Jack Fisher (senior scientist, FTBG) continues to access MBC's native soils for his research on mycorrhizal associations with native palms and cycads.

Dr. F.W. Howard, associate professor of entomology at the University of Florida, Fort Lauderdale, examined MBC's palm collection to provide data for his research on hosts for palm leaf skeletonizers.

Chad Husby, graduate student at Florida International University (FIU), obtained New Zealand conifer stem cuttings, branches, and seeds from MBC's conifer collection for propagation into FIU's teaching conifer collection and Atlanta Botanical Garden's conifer collection.

Dr. Sharon Klavins, professor, Department of Ecology and Evolutionary Biology, University of Kansas, obtained male cones from five cycad taxa. Dr. Klavins required the cones so she could examine fecal pellets of the beetles and weevils that are feeding on MBC's pollen cones and compare the pellets with those obtained from a fossil cycad pollen cone dating from the Triassic of Antarctica.

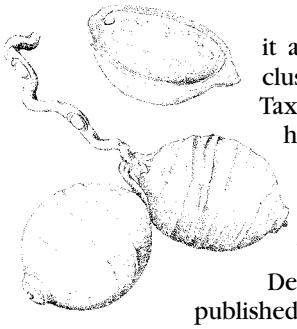
Dr. Andrew Vovides, Institute de Ecología, Xalapa, Veracruz, Mexico, obtained leaflet samples from MBC's Honduran cycad collection for his molecular phylogenetic work on *Dioon*. MBC's collection, just obtained in 2003, is the only known documented population-based collection outside of Honduras.

Joko Witono, graduate student, School of Science, Hiroshima University, Japan, obtained leaflet samples from MBC's collection of *Pinanga* for his dissertation project on the molecular systematics of this genus.

Bob Pemberton, USDA, and **Drs. Hong Liu** and **Peter Stiling**, University of South Florida, are researching the reproductive biology of sewer vine (*Paederia cruddasiana*) using populations found along MBC's fence line and natural areas. Understanding how the species reproduces will assist efforts to control this Asian invasive.

What's in a Name

MBC Palm Biologist Publishes Descriptions of Two New Palm Species



After nine years of patient anticipation, Dr. Larry Noblick, MBC's palm biologist, was able to officially christen an elegant new palm species he discovered in Brazil during a 1994 MBC collecting expedition. Though fast growing, it took that long in the ground before the population became reproductive.

"To complete my description, I needed to examine the structure of the female flower and provide a sample to the botanical illustrator," Dr. Noblick explained. "This stage was missing when I found the population in the wild."

Dr. Noblick named the species *Syagrus vermicularis* to refer to the palm's unusual showy inflorescence that resembles a tangle of bright yellow noodles or worms when newly emerging from the bract.

Presently unknown in the nursery industry, the species has great potential as an ornamental landscaping plant once seeds are distributed through MBC's SeedBank Program. But more urgently, the palm can be evaluated for conservation status now that it has been scientifically described.

During the same time, Dr. Noblick officially described *Syagrus cearensis*, a dichotomously branching or "twin" palm that had been in cultivation in the U.S. for years as a misidentified species.

Successfully locating the palm in its native habitat, he was able to distinguish it as its own species rather than a clustering form of a similar species. Taxonomic clarifications like this have broad implications for conservation and the nursery industry alike as it adds to the number of species to consider for both protection and cultivation.

Descriptions of each species were published successively in this year's June and September issues of *Palms*, the journal of the International Palm Society. ■

▲ Botanical illustration of *Syagrus cearensis* habit and (above) fruit of *Syagrus vermicularis*, two of many detailed drawings artist Wes Jurgens completed for both species descriptions.

Dr. Noblick climbs a *Syagrus vermicularis* to get a close-up shot of its unusual inflorescence. ▶

Lots of Class

Increasingly, educators and their students enrich their coursework with MBC's resources while others tap into staff expertise for professional education and training. Since 1997, MBC has provided curricula, workshops, resources, and venues for over 30 different courses or workshops.

Botanical gardens from around the world seek training for their staff in topics ranging from taxonomy and tropical biology to managing *ex-situ* collections, data collection, mapping, and labeling.

Two professors from the University of Florida make annual visits to MBC as part of their curricula. **Dr. Bijan Deghan**'s Public Garden Management class gets real-life exposure and one-on-one interaction with MBC staff. **Dr. Walter Judd** gives his field lecture in MBC's outdoor "classroom" to participants in his tropical botany course.

Students from the University of Miami School of Architecture study our historical buildings and archived records. Several times a year, UM geology professor **Dr. Harold Wanless** conducts an undergraduate field class featuring MBC's ancient limestone escarpment and sinkholes.

Not only Florida schools tap into our resources, but such institutions of science and higher education as Harvard, Duke, the Smithsonian, and the University of Pittsburg. Recently, **Dr. Barry Tomlinson**, National Tropical Botanic Garden (NTBG) and Harvard University, **Dr. Paul Cox**, NTBG director, and **Dr. Gaugau Tavana**, NTBG director of education, brought their graduate tropical biology class. Dr. Terrence Walters gave a 4-hour educational lecture/tour to the students, the majority of whom were professors from universities in non-tropical regions of the U.S.

For more information about educational opportunities at MBC, contact Evelyn Young by e-mail: younge@fiu.edu, or phone 305-667-3800 x101. ■

Integrated Pest Management: Practice & Practicality

Christine Wiese
MBC Cycad Horticulturist

Cornell Cooperative Extension defines integrated pest management (IPM) as "a sustainable approach to managing pests, using methods that minimize environmental, health, and economic risks." At MBC, we consider IPM a common-sense approach to handling pest and disease issues.

Plant pests commonly refer to insects, but can include other animals such as snails, slugs, or moles. Disease results from damage caused by pathogens including bacteria, fungi, viruses, and nematodes. Signs of a pest include the animal itself, anything it leaves behind, such as feces or molt, and evidence of chewing. Symptoms include changes in the plant's appearance. For example, a plant with chlorotic (yellowing) leaves or an unusual shedding of leaves may indicate that there has been insect or disease damage to plant tissues.

There are several steps in a system of IPM, but the first line of defense is to address the cultural needs of the plants, such as appropriate light conditions, soil conditions, and water supply. Location also can be significant if your plant is heavily influenced by microclimatic factors. A plant situated under appropriate cultural conditions is less susceptible to fungal invasions and many types of insect pests. It also lessons the likelihood that symptoms of distress are due to inappropriate cultural practices rather than pest or disease damage.

Secondly, it is important to monitor plants regularly for early detection. Become familiar with pests and diseases that are common for your plants so that you can be alert for their signs and symptoms. It is important to evaluate several leaves on multiple plants in each plant group. Pest and disease activity may vary between species or between areas of a property depending on how the plants are sited.

The third step is the correct identification of the pest or disease. If you are unsure of a pest's identity, have the pest or the tissue that is showing signs or symptoms identified by a knowledgeable entomologist or plant pathologist.

The fourth and a key step is to determine your threshold of tolerance for each pest. Once you have reached that threshold, you need to utilize a control method. Options include mechanical control, biological control, and chemical control (pesticides). When choosing a method that utilizes chemicals, vary them as much as possible to prevent pests from becoming resistant to a particular chemical treatment.

It's a good idea to keep detailed records of the treatment and results so you can recognize trends over time. Records also help determine future control methods and the timing of those methods. You can keep abreast by attending seminars or reading journals in your subject area.

To illustrate MBC's IPM system, the following two examples are actual pest problems we have encountered.

The first case study describes our methods for controlling the Atala butterfly larvae (*Eumaeus atala*). Native to southeastern Florida, the Atala butterfly is small, primarily black and blue with a bright red-orange abdomen. The reddish orange, yellow-spotted larvae use the native coontie (*Zamia pumila*) as its host plant. However, Atala larvae will also feed on many other species of *Zamia*, causing a problem for MBC's valuable collection.

The Atala larvae, feeding on soft new leaves, can rapidly defoliate a small plant. Because the Atala population varies throughout the year, we regularly monitor our *Zamia* collection for signs of infestation. We look for eggs on the underside of new leaves, chewing of new leaves, and the presence of the larvae themselves. Since the health of the plant is severely reduced when all leaves are removed, our threshold is established at a point where sufficient leaves remain on the plants and aesthetic damage is minimal.

Our method of control varies with the intensity of infestation. If only a few larvae or eggs are found, they are removed by hand (mechanical control). If a light infestation is more widespread, we use an application of the bacteria, *Bacillus thuringiensis* (Bt) (biological control). Bt does not kill on contact; the larvae must ingest it. It works slowly but effectively with a very low toxicity for other organisms. When there are widespread infestations of Atala larvae, a synthetic insecticide is used to obtain faster results (chemical control). Detailed records are kept of all our control procedures as well as the results of these procedures. These records have helped us refine our control methods as well as the timing of our procedures.

The second case study illustrates our management of the armored cycad scale, *Aulacaspis yasumatusi*. In its native Thailand, this pest is generally kept under control by natural predators. When accidentally introduced into the Miami area in the mid 1990s, the cycad aulacaspis scale (CAS) lacked natural enemies and spread extremely rapidly. Although still a serious cycad pest, we are developing a system for maintaining infestations below our threshold level.

COMMUNITY CONNECTIONS

Populations of CAS are seasonal. The insects die off during winter months and reappear in late spring. It's important to begin treatment once there is a widespread population of juveniles or "crawlers." They are much easier to kill than the adult female scale, which is protected by its hard outer covering. The host range of CAS includes most cycads to some degree, but the heaviest infestations are generally observed on species of *Cycas* and on *Stangeria eriopus*. CAS spreads extremely rapidly and, if uncontrolled, can kill a large plant, so our threshold is low.

We combine many control measures to manage this difficult pest. Older infested leaves are often removed and destroyed to reduce CAS populations (mechanical control). Highly susceptible species are now planted farther apart to reduce the speed with which the scale can spread. Extended spacing also allows for better access to plants for monitoring and treatment (cultural control). Light or spotty infestations can be managed with foliar applications of virtually non-toxic horticultural oils (chemical control). Oils tend not to be effective against heavy infestations or adult females. Under those conditions, we apply Distance® (pyriproxifen), an insect-growth regulator (chemical control).

We also began to utilize the parasitoid wasp, *Coccobius fulvus* (biological control) after the University of Florida-IFAS and the USDA conducted experiments at MBC. A predator of CAS in its native ecosystem, this tiny wasp is able to parasitize scale on extremely tall or dense plants where sprays often cannot reach. Since the wasp is not effective in controlling the scale alone, chemical controls are added that cause minimal harm to the wasp.

With published data and our own detailed records, we continually work to refine the available control measures to best manage this pest in a field situation.

Pests and diseases are a part of every ecosystem and an ever-present part of the landscape at MBC. But, in order to maintain healthy plants for scientific research, pests and diseases must be kept below our established threshold levels. Our IPM program allows us to achieve this goal while minimizing risks to the environment—a sustainable, common sense method of handling pest issues. ■

Enthusiasts Tour MBC's Tropical Flowering Tree Collection

In July, Dicot Horticulturist Scott Massey and Executive Director Terrence Walters hosted the Tropical Flowering Tree Society's annual tour. Over 20 members met at the Walter Haynes Overlook for a breakfast reception before Scott guided the group through a selection of 60 species in MBC's Dicot Collection.

With some trees from the original Montgomery collection reaching the ripe age of 70 years, the society welcomed the chance to see specimens in a mature state. They were very impressed with the huge *Chukrasia tabularis* from China, the largest single-trunked tree in the collection. At the other end of the scale was the unusually dainty (for the genus) *Tabebuia bahamensis*.

The opportunity to see trees either rarely seen in the U.S. or rare globally also caused a buzz of interest. A member pointed out that MBC's *Shorea talura*, wild-collected in Malaysia, is possibly the only representative of its entire family (Dipterocarpaceae) known to be in the ground in this country. Scott was pleased to show off the wild-collected *Atelia popenoei*. Named in honor of MBC member John Popenoe, the small tree is the rarest dicot in the collection since it is now seldom found in its native Bahamas. Another species they were excited to see for the first time was the aptly named guest-tree or *Kleinhovia hospita*, known for both its decorative and medicinal uses.

"I think I learned more than they did," remarked Terrence Walters. "I was very impressed with the depth of knowledge and experience they have with tropical trees. Their excitement in seeing many of our specimens deepened my own appreciation for our dicot collection."

Cannonball Fodder

What do you do when you have only one cannonball tree, and it takes two to tango? Call upon Judy Kay, MBC's SeedBank coordinator. Fairchild Tropical Botanic Garden and The Kampong did. Using hand-pollinating techniques she refined from observing nature, Judy takes MBC's cannonball (*Couroupita guianensis*) pollen and literally paints it on the other gardens' flowers. So far, so good. Each garden reported success. The unusual fruits, the size of a cantaloupe, hang on the tree trunk for over a year before fully maturing. In a collaborative exchange, FTBG and The Kampong will give back half the resulting seeds for the opportunity to have a highly visible and unusual public display.

The most interesting part for Judy is when she opens the tan-skinned fruit to harvest the seeds. The interior is a colorful mix of chartreuse and magenta pulp. "If you don't wear gloves," she warned us, "you can expect your hands to turn a lovely shade of purple." Cleaning seeds is also a sensory adventure for the nose. Although the flower is sweetly fragrant, the opened fruit has a strong, clinging, noxious odor. Once cleaned, sorted, and bagged, the seeds will benefit other institutions through MBC SeedBank distributions.

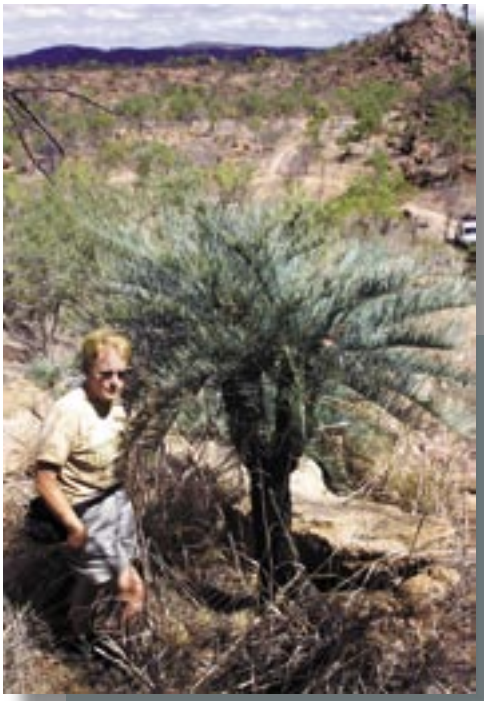
Getting the Australian Cycad "Blues"

Two very dedicated cycad enthusiasts endured bruising drives through wild and rough terrain to seek out populations of Australian cycads—and then collected seeds and data to MBC's stringent scientific and conservation standards. Bruce and Suzie Ironmonger chose a very hands-on way to support MBC's scientific collections.

This spring the couple shared both seeds and adventures with MBC and staff that culminated from their first exploration of Queensland's Cape York area. The trip yielded seed from eight taxa including two rare and prized Australian blue cycads, *Cycas platyphylla* and *C. cairnsiana*.

On the second day out, their expedition came upon several locations where *C. platyphylla* was growing. When they spotted some wild specimens with an especially attractive blue coloration, they soon felt blue themselves when they saw evidence that the population had been severely reduced in size by illegal poaching.

The next day, however, their spirits soared when, as Suzi described, "We came across the most spectacular cycad habitat we have visited to date." The area was aptly named Mt. Surprise. Suzie was awed with the prehistoric-like setting dotted with a large population of *C. cairnsiana*.



Suzi Ironmonger takes a close look at one of the many healthy specimens of *Cycas cairnsiana* at Mt. Surprise.

"The intense blue of the plants looked stunning against the rugged backdrop of red boulders," she told a rapt audience. "I expected a dinosaur to come ambling over the ridge at any moment."

Thanks to the Ironmongers' scientific vacations and support of MBC, it won't be long before the beautiful Australian "blues" will make a stunning addition to MBC's developing Cycad Ecologic Garden. ■

Three New Staff are Welcomed to the MBC Team

Jared Fogg | Sergio Najera | Harvey Bernstein

Supported through a grant from the Ajax Foundation, **Jared Fogg** filled the position of reference archivist. Jared applies over 25 years of management and organizational skills to evaluate and manage The Montgomery Archive and MBC's collections library. Jared will take on the challenge of adding a digital dimension to the archive's storage and retrieval capabilities.

Sergio Najera, a certified pest control operator, had four years experience as a spray technician before he took on that responsibility at MBC. "I love working outdoors in such a beautiful place," he told us. "This is the first time I have looked forward to going to work each morning."

Former volunteer, **Harvey Bernstein**, joined the Collections Development team as image specialist. His training as a Florida Master Gardener coupled with his accomplishments as an award-winning fine art photographer prove to be great assets as he raises the bar for obtaining and enhancing database images.

MBC Staff Active in Botanical Societies

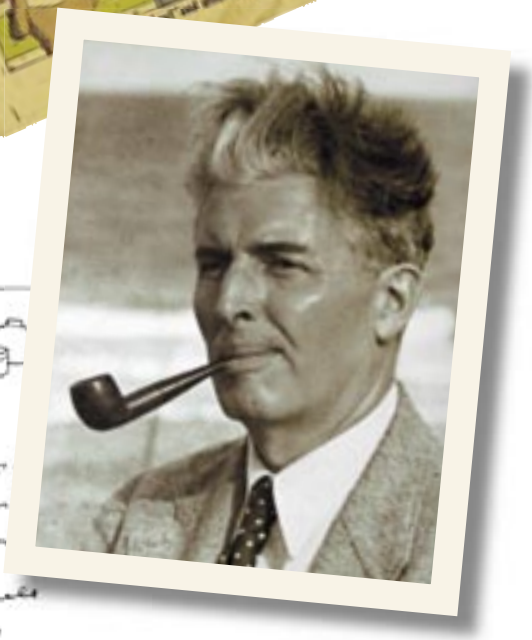
This summer, Executive Director Dr. Terrence Walters was brought on board The Friends of Chapman Field board of directors to give technical assistance to the USDA Germplasm Repository at that location. He was also re-elected vice-president of The Cycad Society's board of directors. Jody Haynes, MBC cycad biologist, was re-elected secretary for the same society.

Larry Noblick, MBC Collections Development manager and palm biologist, was chosen to join the board of directors of the International Palm Society. Wasting no time, he immediately accepted responsibility as chair of the Bylaws and Policies Committee. ■

The H.T. Webster Collection

Exploration in the Montgomery Archive reveals that Colonel Robert and Nell Montgomery hosted an eclectic group of friends while residing at their Florida estate. Many guests were renowned, not only in botany, but in finance, politics, and the arts.

Among the celebrated artists was American illustrator, Harold Tucker Webster. Referred to as "Webby" in one of the note cards, he visited and corresponded off and on with the Colonel and Nell from the mid-1930s until a short time before his death in 1952. The letters and original drawings held in the Montgomery Archive provide a small glimpse into their close friendship.



With a passion for bridge, sunshine, and tropical fruit, Webster expressed how much he relished his invitations to Montgomery's tropical home. In one drawing, he showed his "idea of heaven" as an angelic bridge game played in the clouds with eternal servings of mangos. In another drawing, he pictures himself clad in bathing trunks laying in the snow at the edge of a piney forest reminiscing with his two pet dogs about his stays in sunny Florida with his friends, Bob and Nell.

He returned the favor by including the Montgomerys in an imaginative world peopled by his comic inventions. Leading this motley company was the iconic comic strip, Caspar Milquetoast, whose surname quickly entered the American lexicon, and is the only name of a cartoon character found in the dictionary.

Described by his creator as "the man who speaks softly and gets hit with a big stick," this hapless star of the old *New York Herald Tribune*'s Sunday colored comic pages appears in a 1937 entry in Nell's guest book. Webster sketches a nervous Caspar sitting on a beach blanket shaded by an umbrella; a jug of vinegar is close at hand. The drawing is inscribed:

"Mr. Milquetoast has heard that the sun's rays are full of poison and takes suitable precautions when exposing himself—To Bob and Nell, Webster."

In September 1941, Webster celebrated Robert Montgomery's birthday by making it the subject of his popular comic strip, *The Timid Soul*, and later presenting the Colonel with the original drawing and a copy of the printed page.

The cartoonist's generosity and eagerness to delight is evident through his correspondence and the humorous original illustrations he had given the Montgomerys over the years—gifts that today can be included among MBC's, if not America's, historical treasures. ■

IN THIS ISSUE...

About the Cover: One of the attractive Australian cycads, *Cycas calcicola* unfurls its distinctive bronze tinged bluish grey flush.
Photography by Mary Andrews

WE CARE ABOUT CONSERVATION
MBC uses recycled paper. We encourage you to recycle it again by passing it along to an interested friend when you have finished reading it.

A Tribute to a Life Well Lived

Jeanne Bellamy Bills
1911 ~ 2004

On March 27, 2004, Jeanne Bellamy was eulogized at a reception held, according to her wishes, at Montgomery Botanical Center. It was not surprising that she chose MBC as a place where a gathering of her friends and admirers could give her a final farewell.

The connections and passionate interests she, the Montgomerys, and other seminal community leaders shared are forever interwoven into the fabric of South Florida history. The Montgomerys' founding and continued promotion of Fairchild Tropical Botanic Garden led to Jeanne's close friendship with Nell and volunteer service at Fairchild. Her energetic devotion, in turn, led to her being chosen to help carry out Nell's vision that was to become Montgomery Botanical Center.

Jeanne Bellamy's long list of achievements and awards as journalist, entrepreneur, and environmental preservationist are widely recognized. At Montgomery Botanical Center, it was her support of and service to our mission for which she will best be remembered. MBC Director Loyd Kelly, who knew her longer than any other MBC member, shares some personal reflections:

> My first chance to become acquainted with Jeanne Bellamy was on a trade-mission trip to several cities of South America in the 1960s. The excursion was led by the governor of Florida and mayor of Miami on a chartered plane full of business and political people from every corner of Florida. I had the good fortune to spend a large amount of time conversing with this remarkable lady.
>
> Later we shared a mutual association with Nell Montgomery Jennings, and an active involvement in Fairchild Garden. Jeanne was a volunteer there for many years, chaired the Publications committee, and was appointed to FTG's Executive Committee. When she served as president of the Garden in 1997, I worked with her as senior vice-president. The ever assertive and outspoken Jeanne was very supportive and easy to work with—as long as a job was being handled expeditiously.
>
> When Nell passed away and left us with the task of turning her estate into a center for research and education in tropical botany, Jeanne was the logical choice to fill a vacancy on the Montgomery Board in 1991. When she was elected president of the board from 1996 to 1999, I recall an incident that encapsulated her character. One of the problems confronting Montgomery was the need to renovate the lakes in the lowlands. There was no money to finance this expensive undertaking, but when she recognized the need, she was determined. Her words were, "Let's do it!". It wasn't long before the funds were found, and it was done.
>
> Although Jeanne was active in many varied interests, it is my feeling she valued her association with Montgomery above almost any other involvement. She faithfully attended board meetings through the years until, in her 90s, she was finally physically unable to do so. Jeanne was dedicated, trustworthy, intelligent, assertive, and altogether a most remarkable individual—as well as a true friend to Montgomery Botanical Center.

Loyd Kelly