

Montgomery Botanical NEWS

Advancing Research, Conservation, and Education
through Scientific Plant Collections

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TEAMWORK FOR CYCADS IN THE DOMINICAN REPUBLIC

Teamwork is always the best work; cycad research is no exception.

MBC joined an international team focused on *Zamia pumila* in the Dominican Republic this June, along with experts from Jardín Botánico Nacional Dr. Rafael Ma. Moscoso de Santo Domingo (JBSD), Florida International University (FIU), and Fairchild Tropical Botanic Garden (FTBG).

The MBC and FTBG co-sponsored project collected DNA samples from *Z. pumila* to study evolution of Caribbean *Zamia*. Ongoing study led by Alan Meerow from the USDA is part of a broad collaboration including FIU, FTBG, MBC, The New York Botanical Garden (NYBG), and many other colleagues throughout the Caribbean. This latest fieldwork builds upon similar research in Puerto Rico and Jamaica (2003, 2005, and 2008) by Alan Meerow, Michael Calonje (MBC), and Andreas Oberli (Kingston). This ideal team leverages the skills and strengths of each institution.

A CONSERVATION FOCUS

In addition to DNA collections, the team collected specimens for the herbaria at JBSD and FTBG. These specimens provide critical documentation for our study, and provide a snapshot in

time of wild *Zamia* populations in the Dominican Republic.

Documenting the *Zamia* is critical. Over the course of our travel, we learned that many plants known in the 1980s are now gone. Although *Z. pumila* was locally abundant in places, its range con-

data, their scientific and conservation value was limited.

LOOKING AHEAD

Addition of living *Z. pumila* collections from the Dominican Republic—from seven distinct populations—is very valuable for *ex situ* research and conservation. These collections greatly strengthen MBC representation of Caribbean basin cycads. As the plants develop and mature, significantly augmenting existing MBC Caribbean cycad collections dating to the 1930s, they will contribute to this unique and important resource.

Research is currently underway on these Dominican collections. Planning, preparation, and fundraising for future Caribbean *Zamia* fieldwork are ongoing. Step by step, and plant by plant, together we are building a foundation for greater conservation and understanding of these living gems.

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Alberto Veloz, Javier Francisco-Ortega, Michael Calonje, and Francisco Jiménez Rodríguez with *Zamia pumila* at the Jardín Botánico Nacional, Santo Domingo.

tinues to shrink as the island continues to develop.

The most important conservation outcome was the collection of *Z. pumila* seeds from multiple populations. Prior to this fieldwork, MBC had only two living plants of *Z. pumila* from Dominican Republic, collected in 1981—both female. With no detailed provenance

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To advance science, education, conservation and horticultural knowledge of tropical plants, emphasizing palms and cycads. Montgomery Botanical Center curates living plant collections from around the world in population-based, documented, scientific collections, for use by botanists, scientists, and educators, in a 120-acre botanical garden exemplifying excellent design.

Montgomery Botanical Center is a tax-exempt, nonprofit institution established by Nell Montgomery Jennings in memory of her husband, Colonel Robert H. Montgomery, and his love of palms and cycads.

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Masthead photo of Montgomery Palm
(*Veitchia arecina*)

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F r o m t h e
Executive Director



Dear Friends,

There is no greater satisfaction than MEETING THE MISSION. Montgomery Botanical Center excels at this, by any measure.

Our 50th year is a good time to look back and also forward. Both ways, we see the mission solidly met. Research, conservation, and education flourish through living botanical collections.

Let me highlight one measure: creation of new knowledge through Montgomery's collections. We looked carefully, and discovered over 200 published papers, books, and articles had benefitted from our plants. Well over half of these works are in the last decade, showing our increasing relevance to the plant sciences.

My favorite early example is the description of *Veitchia montgomeryana* by H. E. Moore in 1957, from living material grown by Colonel Montgomery. By naming this species after the Colonel, Dr. Moore honored Robert Montgomery "whose name so richly deserves to be associated with a member of the [Palm] family."

Here, you'll see other ways we meet the mission: solid efforts to collect and cultivate our plant collections, and connect them to the community. Three articles share studies from our colleagues at New York, Longwood, and Germany.

It is great to look back, but the future is our main focus. The team is developing novel ways to share the plant collections. For example, this November MBC will host a special 50th anniversary symposium. MBC is planning and working for greater service to the botanical sciences.

Thanks for sharing our 50th year with us. MBC looks forward to many more years of advancing botany with you.

Pictured: Dr. Griffith with *Archontophoenix alexandreae*, planted for Colonel Robert Montgomery in the 1940s.

PSEUDOPHOENIX AT ITS LIMITS: 2009 BELIZE FIELDWORK

Belize has great diversity of habitat types, which support an abundant palm flora. In fact, studies of species richness concluded that Belize's palm flora is above average in number of species relative to area, and very far above average in genera.



The rare *Pseudophoenix sargentii* in Belize

AN EXCEPTIONAL POPULATION

Pseudophoenix is a fascinating genus of Caribbean palms, often with distinctive swollen trunks. In Florida, *Pseudophoenix* is at its northern limits, with *P. sargentii* growing in isolated parts of the Keys. Across the Gulf of Mexico

on the Yucatan Peninsula is the westernmost limit for *Pseudophoenix*, also *P. sargentii*, in the seasonally dry forests of northern Belize.

In March 2009, I had the great opportunity to collect seed from these beautiful rare palms, in collaboration with Jan Meerman of Green Hills Botanical Collections. Jan had firsthand experience with this population, and generously showed me the way there.

Two good field days with these palms were important work for Montgomery, as *P. sargentii* has a short fruiting season, only available at that time of year. We were fortunate to make good seed collec-



The perils of fieldwork: Repair near Belmopan

tions for this species from several mother plants, as this population has great research and conservation value.

AN UNSCHEDULED STOP

Returning from the site, we hit a small problem with the rented vehicle. Fortunately, our brakes failed on flat terrain close enough to a gas station to get the problem fixed in time to reach Green Hills by nightfall.

A CONSERVATION SUCCESS

We obtained enough seed to bring these palms into protective cultivation at Belize Botanic Garden, Green Hills Botanical Collections, and here at MBC. This genus is known for its slow growth, so we plan far into the future for these to be added to the landscape.

I am very grateful to the Paul Drummond Fund for supporting this productive collaboration, the Belize Forest Department for permitting this botanical fieldwork, and especially my Belizean colleagues, Heather duPlooy and Jan Meerman.

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BRANCHING CONES: AN INSIDE LOOK AT CYCADS

Cycads have an interesting and ancient branching pattern. These most primitive seed plants can help us understand the ancient origins of how branches are formed in all land plants.

At this summer's Botany 2009 conference, I presented new studies of cycad branching. Cycads branch dichotomously: a single vascular cylinder becomes two equal vascular (wood) cylinders. In contrast, flowering plants and conifers make many branches from buds stored where the leaf meets the stem.

The collections at Montgomery Botanical Center made this recent work possible. These living collections are essential for botany.

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In addition to stem branching, I was also able to study this branching *Zamia* cone. Branched cones are uncommon, but follow the same principles as branched stems.

NEW PALMS TAKE ROOT

This year, MBC planted out three new palm genera: *Kentiopsis piersoniorum* from New Caledonia, *Colpothrinax cookii* from Panama, and three species of *Brahea* (*B. armata*, *B. nitida*, and *B. sarukhanii*) from Mexico. Each novel addition brings challenges in creating the right growing environment, including nutrition, soil, water, and sunlight requirements. These three genera are no exception.

Kentiopsis piersoniorum is only found on Mt. Panié in New Caledonia, a rainforest with mica-rich soils. Although many New Caledonia soils are similar to South Florida, Mt. Panié is not. To compensate for this stressful condition, the *Kentiopsis* were planted in an area with both canopy and understory shade, well-drained soil, and aboveground irrigation in an effort to prevent oversteering the plant.

Likewise, although the *Colpothrinax cookii* planted this year were collected from acidic, rocky soils in Panama, they are rainforest palms with similar shade and moisture requirements as the *Kentiopsis*, so they were planted in the same area. The cura-

tors are monitoring these plants for early signs of deficiencies, in order to supply corrective supplemental fertilizer.

The *Brahea* may pose the most interesting cultivation challenge. Despite growing at a latitude comparable to Orlando, *Brahea armata* is native to arid and sandy Baja California. *Brahea nitida* is sometimes found in calcareous rock, but also in arid conditions. *Brahea sarukhanii* is found in more humid mountain conditions, but in rich, black, basaltic soil with good drainage.

The attempted solution was to plant all three *Brahea* species near the limestone escarpment, with full sun, good drainage, and frequent offshore breezes. We hope that this will provide favorable conditions for these interesting palms.

Careful monitoring and suitable placement of plants ensures development and diversity of MBC's extensive palm collection and contributes to greater knowledge about growing palms in South Florida.

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Colpothrinax cookii from Panama.



Cycas maconochiei ssp. *lanata*.



Cycas maconochiei ssp. *lanata* showing eight inches of growth in one year.

A MONTGOMERY SUCCESS STORY

CYCAS MACONOCHEIE SSP. LANATA

By John Harshaw, Assistant Curator

Montgomery hosts the largest cycad collection in the Western Hemisphere. Even so, not every species we plant at Montgomery performs as we would like it to, and some simply refuse to adapt to conditions in south Florida. Sometimes, though, we experience what can only be called an unqualified success with a difficult plant.

Such is the case with *Cycas maconochiei* ssp. *lanata*. Growing in a raised bed of sand, mulched with granite chips and irrigated only by rain, our 42 plants are thriving, and some individuals are adding as much as eight inches per year to their trunks. Accessioned in 1997, a number of our plants have reached maturity and are already producing cones, both male and female. Seedlings in cultivation are reportedly difficult to maintain, usually succumbing to crown rot at an early age, but those that have survived here are vigorous and strikingly attractive plants.

Native to the Northern Territory of Australia, *Cycas maconochiei* ssp. *lanata* occurs on sandy soils, often in association with various *Eucalyptus* species in areas where fires are frequent. Like many of the Australian *Cycas*, it is deciduous. Shedding the old leaves before the fire season keeps the combustible material well away from the crown, helping with the plant's survival.

Although rare in cultivation, *Cycas maconochiei* ssp. *lanata* is extremely common within its restricted range, and is often the dominant species in some areas. Initial estimates suggest that the population of this taxon may number in the tens of millions.

HELPING BOTANICAL GARDENS THROUGH NATURAL DISASTERS

Planning for natural disasters is not a glamorous topic; in fact it is a topic most of us wish we could avoid. Recent research revealed that only one in five botanical gardens have a plan to deal with damage to their collections due to disaster. Natural disaster damage is a reality that we have to face as stewards of living collections. As such I chose to focus on the topic for my Master's thesis research in the Longwood Graduate Program.

During thesis research, I collected qualitative and quantitative data. One of the most valuable aspects of the research was site-specific interviews with six gardens in southern Florida and Miami. The interviews were conducted thanks to the Kelly Foundation and the resources that were granted to the project by the Montgomery Botanical Center. During this phase of the research, information was gathered from gardens in the Miami area which had been through a disaster and could offer their experience on the practicalities of disaster planning.

I interviewed staff from the Naples Botanical Garden, Fairchild Tropical Botanical Garden, Vizcaya House and Gardens, the Gifford Arboretum, The Kampong, and Montgomery Botanical Center, all in one incredibly informative week! In June 2009 I was able to follow these talks with a research presentation given to MBC and Miami area garden staff to share the results of the entire project—a disaster planning template for gardens to safeguard their collections.

Specific results of the interviews can be found in my thesis, available through the Longwood Graduate Program at the University of Delaware. I am grateful to MBC and to all of the gardens that contributed to and participated in the interviews. Your candidness helped me to develop a robust disaster planning template that can help the 80% of US botanical collections that are in need of disaster plans.



Jackie Bergquist at the Kampong

Jackie Bergquist, Longwood Fellow
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CONIFERS WITHOUT CONES?

The Podocarp family is a diverse family of tropical conifers with 18 genera and 194 species. The Podocarpaceae are mainly found in the southern hemisphere. Many Podocarpaceae are threatened or endangered, and like cycads they are mostly remnant species of an earlier time. Podocarps typically inhabit cloud forests, but in limited numbers. The fruit-like female cones are reduced and often have only one seed (see picture). They are dispersed by birds, bats, and small mammals.

Montgomery is well known for exceptional cycad and palm collections, but also has an impressive conifer collection. Colonel Montgomery's first collection in Connecticut consisted of conifers, and now the rare tropical conifers at MBC are readily expanding by the intense efforts of Collections Manager and Botanist Dr. Chad Husby. Many of the specimens at MBC are wild collected rarities. Plant exchange among botanical institutions is a key contributor to the collections at Montgomery. The Institute for

Evolution and Biodiversity of Plants (IEBP), Ruhr-University Bochum, is one of these exchange partners.

At present, we are working on a monograph of the ancient conifer families Podocarpaceae and Araucariaceae, focused on leaf anatomy. We are also working on the Cupressaceae and on molecular phylogenies of Podocarpaceae, Taxaceae and the genus *Agathis*.

One of the main aims of our work with MBC is to further a strategy to conserve endangered species. For conservation of rare species with few individuals in the wild, it is important to propagate each genotype and to distribute to different institutions. One of the best places to plant tropical conifers outdoors is at Montgomery. Climate conditions at Montgomery foster cone development, and the focus on collections stewardship ensures that these pre-

cious plants will be well maintained and propagated for study and conservation.



Dacrycarpus dacrydioides, from New Zealand, has a cone which resembles a fruit. Swollen bracts form the red peduncle, and a single fertile bract surrounds the seed. This species grows well in the MBC lowlands.

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INORGANIC GARDENING AT MBC

Montgomery Botanical Center continually strives to find the best ways to propagate rare cycads and palms. This effort often requires experimentation with new growing methods.

Soil conditions have significant effects on root health and plant growth.



Zamia cunaria with three substrates: MBC cycad mix, coarse silica sand, and crushed clay.

For cycads in containers, appropriate substrate conditions are crucial for successful cultivation. This requirement is especially true with regard to drainage. Typical cycad substrates, including

MBC's cycad mix, contain significant portions of organic materials (e.g. bark and peat) that decompose over time, eventually reducing drainage and increasing water retention.

We have been working to evaluate two inorganic materials as alternative substrates to improve drainage: crushed clay and coarse silica sand. For this purpose, we grew three rare *Zamia* species from seed in different substrates over a period of fourteen months and assessed their growth at the end.

All three substrates performed adequately for germination, survival and growth of *Zamia*, with some differences in plant performance among the substrates, depending on the species involved and its natural habitat.

Crushed clay and silica sand appear to require more frequent watering, or a water reservoir beneath the pot, to improve their performance as cycad substrates, especially for rainforest cycads. This requirement is because they sometimes

dry out too quickly during the normal watering schedule designed for the MBC cycad mix. Once the watering program is fine-tuned, these inorganic substrates will likely be promising for consistent long-term cycad cultivation in containers.



Zamia cunaria caudices grown in crushed clay.

Our experiments are continuing into the next growth stage of these *Zamia* plants. We hope that the knowledge gained will help us to improve our *ex situ* conservation efforts to propagate and cultivate rare cycad species.

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YESTERDAY, TODAY, AND TOMORROW

Although there are but a few *Brunfelsia* shrubs, commonly called “Yesterday, Today and Tomorrow,” presently remaining on the property, the most enduring legacy of “yesterday, today and tomorrow” is manifested in the past, present and future landscape of the Montgomery Botanical Center.

Looking back over some of the larger projects undertaken by the Horticulture and Facilities team over the years, I cannot help but be amazed and enthused by how vision and planning by the landscape architect, leadership and support provided by the Board of Directors and the implementation on the part of the curators, landscapers and facilities personnel has resulted in Montgomery as we experience it today.

In retrospect, major projects—such as the dredging and revitalizing of the lowland lakes with concurrent removal



Palm Walk, 1997: Study by Landscape Architect Alan Ward.

of exotic overgrowth; the transformation of what was essentially a landfill into today's Palm Walk, an extensive palette of palm, cycad, and conifer collections; and the intricacies of the Cycad Walk—are all stellar examples of how vision, support and innovative implementation can result in a truly unique and valuable collection, beautifully displayed.

That was “yesterday and today.” What about “tomorrow?” As before, planning, support, and people are currently in place to sustainably continue ongoing development and advancement of that most fundamental asset: the Montgomery Botanical Center Landsite.

Lee Anderson, Superintendent
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CORAL GABLES RECOGNIZES 50 YEARS OF MBC ACCOMPLISHMENT

Montgomery Botanical Center was recently given unique recognition by the City of Coral Gables, in commemoration of the 50th anniversary of MBC. The Mayor and City Commission issued an official proclamation, recognizing April 29, 2009 as MONTGOMERY BOTANICAL CENTER DAY IN CORAL GABLES. The proclamation was sponsored by City Commissioner Wayne “Chip” Withers.

Robert and Nell Montgomery contributed a great deal to the horticultural and botanical tradition here in Coral Gables. The proclamation highlighted the accomplishment of Robert, Nell, and the MBC team in helping botany to flourish in South Florida. Quoting the proclamation:

[Nell] created the Montgomery Foundation, Inc., on November 20, 1959, as a private, non-profit, operating institution devoted to advancing the science of tropical botany by building research oriented plant collections, eventually becoming known as Montgomery Botanical Center; . . . where directors and staff alike have worked to secure and promote Nell’s Vision; . . . we congratulate said facility for its fifty years of involvement in our Coral Gables and South Florida community.

The support and recognition of the City of Coral Gables for MBC’s work affirms and strengthens the MBC mission.

*Dr. Patrick Griffith, Executive Director
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MBC TEAM NEWS

Michael Calonje described two new species, *Zamia decumbens* and *Zamia meermanii*, in the Journal of the Botanical Research Institute of Texas this year.

Chad Husby defended his doctoral dissertation and graduated this year from Florida International University with a Ph.D. in Biology. Chad studied the primitive giant horsetail, *Equisetum giganteum*.

Four members of MBC were honored at the March 28, 2009 Members Meeting for their long term service. **Walter Haynes** (40 years), **John Popenoe** (33 years), **Stanley Kiem** (33 years), and **Loyd Kelly** (30 years) were recognized and celebrated for their service.

THANK YOU TO WHOLE FOODS

Montgomery would like to thank Whole Foods Market for their generous donation. Whole Foods donated a wonderful spread of pastries, fruit, and coffee for our National Science Foundation AToL Conference.

Whole Foods Market is a generous supporter of local non-profit organizations, and we thank them for supporting Montgomery.

If you would like to sponsor MBC events, please contact us. We appreciate your support.

*Tracy Magellan, Outreach Manager
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MBC was recently honored by the City of Coral Gables: (Left to Right) Executive Director, Patrick Griffith; President, Charles P. Sacher; Coral Gables City Commissioner, Wayne “Chip” Withers; Vice President, Dr. Karl Smiley; Superintendent, Lee Anderson; and Outreach Manager, Tracy Magellan.

ZAMIA PUMILA

Zamia pumila is seen here growing in its native habitat on the coast of the Dominican Republic (please see the cover article). *Zamia pumila* is mostly found growing in limestone soils.

The native *Zamia* of Florida also went by the name *Zamia pumila* for many years. Many botanists now accept the name *Zamia floridana* for the Florida plants.



FROM THE MONTGOMERY ARCHIVE



In this April 1, 1935 photo, Nell and Colonel Robert Montgomery are hosting family and friends at the Coconut Grove Palmetum, now known as Montgomery Botanical Center.

Front and center: Colonel Robert Montgomery. From left to right around the table: Elizabeth M. Gellatly (Robert Montgomery's daughter), Mrs. Benjamin Y. Morrison, an unidentified gentleman, Nell Montgomery, Benjamin Y. Morrison, and Elmer D. Merrill.

That year, Benjamin Morrison was head of Plant Exploration and Introduction for the USDA and Elmer Merrill was transitioning from Director of The New York Botanical Garden to his new position as Director of the Arnold Arboretum. In the 1930s, The Coconut Grove Palmetum was already a center for advancing plant exploration and study.

Today, Montgomery Botanical Center continues to value our friends, family and colleagues, and the increasingly important work of living botanical collections.