Celebrating 50 Years of Palms

Palms

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THE INTERNATIONAL PALM SOCIETY, INC.

The International Palm Society

Founder: Dent Smith

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OFFICERS:

President: Paul Craft, 16745 West Epson Drive, Loxahatchee, Florida 33470 USA, e-mail licuala@earthlink.net, tel. 1-561-514-1837.

Vice-Presidents: Bo-Göran Lundkvist, PO Box 2071, Pahoa, Hawaii 96778 USA, e-mail bglpalms@earthlink.net, tel. 1-808-965-0081.
Leland Lai, 21480 Colina Drive, Topanga, California 90290 USA, e-mail lelandlai@aquafauna.com, tel. 1-310-973-5275.

Corresponding Secretary: Sue Rowlands, 6966 Hawarden Drive, Riverside, California 92506 USA, e-mail palmyview@earthlink.net, tel. 1-951-780-8771.

Administrative Secretary: Libby Besse, 6729 Peacock Road, Sarasota, Florida 34242 USA, e-mail libbesse@aol.com, tel. 1-941-349-0280.

Treasurer: Randal J. Moore, 15615 Boulder Ridge Ln., Poway, California 92064 USA, e-mail randal.moore@cox.net, tel. 1-858-513-4199.

Directors: 2006–2010: Elena Beare, Uruguay; Norman Bezona, Hawaii; Faith Bishock, Florida; Tim Cooke, California; Larry Davis, Florida; John Dransfield, United Kingdom; Horace Hobbs, Texas; Don Kurth, California; Bo-Göran Lundkvist, Hawaii; Gerald Martinez, France; Randy Moore, California; Santiago Orts, Spain; Jeanne Price, Australia; Fernando Roca, Peru; Toby Spanner, Germany. 2004–2008: Lyle Arnold, California; Bill Baker, Texas; Libby Besse, Florida; Jeff Brusseau, California; Jim Cain, Texas; Paul Craft, Florida; John DeMott, Florida; Garrin Fullington, Hawaii; Haresh, India; Rolf Kyburz, Australia; Leland Lai, California; Leonel Mera, Dominican Republic; Larry Noblick, Florida; John Rees, California; Sue Rowlands, California; Scott Zona, Florida.

Bookstore: Tim Cooke, PO Box 1911, Fallbrook, CA 92088-1911 USA, e-mail books@palms.org

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FRONT COVER

Coccothrinax spissa, near Baní, Dominican Republic. This palm was one of the highlights enjoyed by IPS Biennial attendees. Photo by Scott Zona.

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Editors: John Dransfield, Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, United Kingdom, e-mail j.dransfield@rbgkew.org.uk, tel. 44-20-8332-5225, Fax 44-20-8332-5278.
Scott Zona, Fairchild Tropical Garden, 11935 Old Cutler Road, Coral Gables, Miami, Florida 33156, USA, e-mail szona@fairchildgarden.org, tel. 1-305-667-1651 ext. 3419, Fax 1-305-665-8032.

Associate Editor: Natalie Uhl, 228 Plant Science, Cornell University, Ithaca, New York 14853, USA, e-mail nwu1@cornell.edu, tel. 1-607-257-0885.

Growing Palms Editor: Randal J. Moore, 15615 Boulder Ridge Ln., Poway, California 92064 USA, e-mail randal.moore@cox.net, tel. 1-858-513-4199.

Supplement Editor: Jim Cain, 12418 Stafford Springs, Houston, Texas 77077, USA, e-mail palm_dude@pobox.com, tel. 1-281-558-6153.

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BACK COVER

Fruits of *Pelagodoxa henryana* collected from a tree growing in Suva, Fiji. Photo by J.L. Dowe. See article p. 185.

Elegant and graceful specimens of *Coccothrinax argentea,* growing in the Jardín Botánico 'Rafael M. Moscoso' in Santo Domingo. Photo by S. Zona.

NEWS FROM THE WORLD OF PALMS

This year's Biennial, in the Dominican Republic, was an outstanding event. Organized in large part by IPS Board Member Leonel Mera and IPS President Paul Craft, the event gave attendees a chance to see palms that are not often seen, even by locals. Attendees came away with indelible memories – and full memory cards – of the country's beautiful palms. No one will soon forget *Coccothrinax boschiana* growing in splendid isolation on limestone cliffs overlooking the blue Caribbean Sea, or hundreds of *Pseudophoenix ekmanii* as seen from a helicopter. The unforgettable sight of *Coccothrinax spissa* on a hillside in the golden light of the late afternoon (Front Cover) was truly sublime. Attendees enjoyed seeing a newly constructed golf and country club where the native *Acrocomia aculeata* was rescued from land being developed and used as the signature palm throughout the project's grounds. Never has *Acrocomia aculeata* looked more beautiful.

As seasoned Biennial attendees know, there is more to Biennials than just beautiful palms. Biennials are educational as well, and on this trip, attendees were treated to presentations by Elena Beare, Ricardo García, Santiago Orts, Fernando Roca, Franco Simonetti and Raúl Verdecia. Attendees also enjoyed food, music and dancing, and a tour the historic colonial center of Santo Domingo. At the final banquet, as IPS members said good-bye to one another, everyone spoke enthusiastically of the Dominican Republic and its spectacular palms.

We were gratified that half of this year's Biennial attendees were from outside the USA. The IPS is truly an international organization, and we look forward to growing participation from our diverse membership. The next Biennial will be in Costa Rica in 2008 and promises to be every bit as memorable. We hope to see you there!

From time to time, nuts of *Attalea* palms are unearthed in unexpected places in Britain and the Netherlands. These almost indestructible endocarps have been dredged up from sediments in the North Sea, have been found partially encrusted with lime in a chalk quarry in southern England and discovered in a Roman archaeological site on the banks of the Thames in London. Several of these finds were sent for identification at the Royal Botanic Gardens Kew, where they gave rise to all sorts of speculation! Were they fossils from the Eocene or even Cretaceous periods? Were they known to the Romans, who somehow obtained nuts from the as yet undiscovered New World? In fact the nuts are clearly recent – apart from the encrustations of lime, the internal structure appears fresh. The nuts are contaminants of these sites – they have either been dumped with other rubbish in the chalk quarry, have fallen in and contaminated earlier deposits or simply been washed out to sea. However, this all begs the question of why the *Attalea* nuts should be in Europe in the first place. A recent paper in Environmental Archaeology 11: 247–251 (2006) by Marloes Rijkelijkhuizen and Louise van Wijngaarden-Bakker described the use of *Attalea* (and coconut) in the Netherlands from the 17th to the 19th Centuries as a source of material for making buttons and other objects. Exploration of Dutch shipwrecks has shown that the *Attalea* nuts were imported directly from South America. Objects made from palm endocarp were mostly buttons, but they include one remarkable object illustrated in the paper: a statuette of a stocky man, beautifully carved from an *Attalea* endocarp with a neat row of buttons down the front of his coat – but the buttons here are made from bone rather than palm endocarp!

THE EDITORS

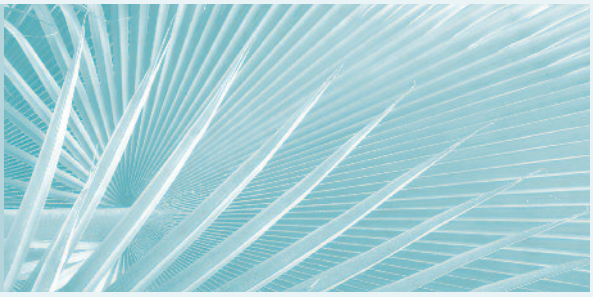
GROWING PALMS

Horticultural and practical advice for the enthusiast

Edited by Randy Moore

Contents

- More on *Licuala* Horticulture
- *Dinapate wrighti*: California's Giant Palm Boring Beetle
- Remembering Robert Lee Riffle (1940–2006)

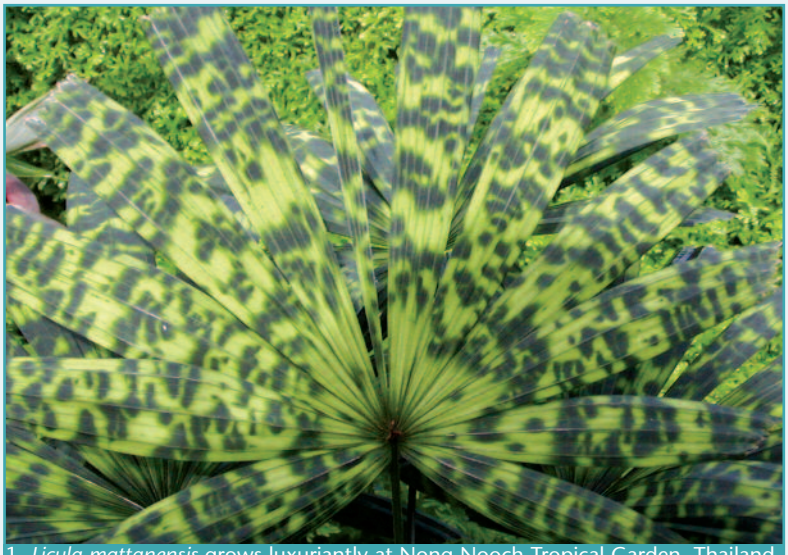


More on *Licuala* Horticulture

Licuala mattanensis (referred to as '*mapu*') (Fig. 1) occurs in very peaty and acid soils in Sarawak. It is also found on the Kalimantan side of the border in Indonesia. Estimates vary on the pH of the native soil within the range of 2 and 3! Obviously, to grow this sensitive palm successfully avoid having alkaline soils at all costs.

Canadian peat is the perfect growing medium. Sand, perlite and vermiculite can be added to peat to create a low pH container mix. Watering should always be generous and done on an almost daily basis but not at flooding levels. Feeding with a broad scope, slow-release fertilizer such as Nutricote, Macrocote or Osmocote will meet all nutritional needs.

The water should be of a neutral to acidic pH level. Do not use hard water as over time it will take its toll by burning the foliage tips and will affect the palm's overall health. The best results come from maintaining an even and moist local environment all year round. The palms should not be subjected to any sudden drops in or rises in temperature or ambient humidity. Ideally, keep the temperature between 28°C and 35°C. The shading level should be around 80 percent, but can be lightened up to 70 percent. However, I have seen them happily growing in Bogor, Indonesia in full sun!



1. *Licula mattanensis* grows luxuriantly at Nong Nooch Tropical Garden, Thailand.

Humidity should be as high as 80 percent and never below 50 percent. If the humidity drops below this minimum level, scorching will occur around the leaf edges. The leaves will dry in no time at all! In their native habitat a person can barely stand the high humidity. Beads of sweat are rolling off of one's forehead in under three minutes. This is the humidity level that *Licuala 'mapu'* really likes.

This palm is very reluctant to re-establish once it has been shocked by a transplant move. It takes months (sometimes years) to re-establish itself if such a drastic event happens. *Licuala radula* is almost as exacting in its requirements but can tolerate a broader range of soil types including alkalinity levels.

Licuala 'mapu' is probably one of the most difficult *Licuala* species to cultivate. However, once the code to keeping it happy is cracked, the result is one of the most fantastically mottled leaves in the palm world. – *Michael D. Ferrero, Nong Nooch Tropical Garden, Thailand*

Dinapate wrighti: California's Giant Palm Boring Beetle

Dinapate wrighti is certainly one of the most impressive insects found in California. It is the giant palm boring beetle that inhabits the *Washingtonia filifera* oases in the deserts of southern California (Fig. 1). It is enormous at nearly 60 mm (2.5 in.) in length. It has a massive head and powerful jaws. Because of its distinctive characteristics, large size and relative rarity, learning more about this beetle has been a pursuit of mine for several years.

The first taxonomic description of *Dinapate wrighti* was published in 1886 by George H. Horn from specimens collected by W.G. Wright of San Bernadino, California (Trans. American Entomol. Soc. 13: 1–4. 1886.). For several years, Wright protected his discovery and remained very secretive about the habitat where the specimens were found. The only clues Wright gave were that the explorations took place in the Mojave Desert, the beetle infests only one plant, and the beetle is likely to be rare and may disappear. Wright's monopoly on specimens of this beetle meant he could sell this odd rarity to museums for as much as $1000 per pair!

However, in 1899 Wright's secrets were revealed to the world. Henry G. Hubbard published "Letters From the Southwest: The Home of *Dinapate wrighti* Horn." (Proc. Acad. Nat. Sci. 10(4): 83–89. 1899.). He provided a description of the habit and distribution of *D. wrighti*, as observed during his visits to Palm Springs, California in 1897. As Wright had feared, once word spread, more

1. *Washingtonia filfera* grove in the Thousand Palms Oasis in the Coachella Valley, California. These groves are the natural habitat of *Dinapate wrighti.*

2 A cross-section of the stem of *Washingtonia filifera* containing the numerous interior boring holes.

specimens were collected and became available to museums and collectors.

Until recently, *Dinapate* was a monotypic genus. A new species named *Dinapate hughleechi* was found in *Sabal mexicana* in east-central Mexico. It was described by Kenneth W. Cooper (Trans. San Diego Soc. Nat. Hist. 21: 81–87. 1986.). The first specimens were collected in 1946 and 1965 from eastern Mexico. They are comparable in size and appearance to smaller specimens of *D. wrighti*.

July is the time when the adults bore a hole and emerge from the palm (Fig 2). The logs also contain beetles at the very temporary pupal stage during July and August. It is believed that the beetles emerge during the summer months because of the monsoonal conditions found in the Sonoran and Mojave deserts. During damp weather, the male and female can locate each other more easily since pheromones travel better with moist air. Also, the exposed adult beetles probably have a better chance of surviving with the moisture provided by summer thunderstorms.

Dinapate wrighti is a species of bostrychid beetle (Bostrichidae), which typically feed on live plant tissue. There are about 500 species in the family. Only five of these species feed on palms. *Dinapate wrighti* is by far the largest bostrychid beetle in existence. It is twice the length of the next longest bostrychid beetle, attaining a length of 38–60 mm (1.5–2.4 in.) (Fig. 3). It has an enormous thorax which it uses as a wedge so that it can lever itself and tunnel with its huge jaws. Two large posterior horns are found on both sexes that it uses to back out of its tunnel instead of exiting head first, leaving a characteristic exit hole in the trunk (Fig. 4). Males are significantly larger than females. The ultimate size of *D. wrighti* is influenced by the environmental conditions under which they mature. The quantity and quality of food available to the individual larvae has much to do with the rate of development. Temperature is another factor.

3. An adult specimen of *Dinapate wrighti*, the giant palm boring beetle.

During reproduction, the female bores a tunnel in the softer tissue in the crown of the palm. The male, or several males, enter the chamber to mate. The female lays about 500 white eggs. The resulting larvae feed aggressively on the inner stem of the palm. Therefore, a large number

4. The tell-tale exit hole on the trunk of *Phoenix dactylifera.*

of larvae in a single palm can be devastating. The larvae pupate in the Spring (April and May). A chamber is formed about three centimeters under the surface of the stem. The pupal stage lasts about two months, followed by emergence of the adult from the exit hole.

Dinapate wrighti emerge at night. They bore a one-inch long, dime-sized exit hole through the stem and leaf skirt. Along with cooler temperatures provided by nightfall, the cloak of nighttime also provides protection from from its bird predators the Common Flicker and two species of woodpeckers. These birds locate the grubs by hearing them tunnel. They then peck a small hole and remove the larvae. The beetles provide food for birds and also nesting sites. The stem of *Washingtonia filfera* is too hard for woodpeckers to excavate nesting holes. However, breeding woodpeckers can build a nest in older palms that have been softened by large numbers of feeding larvae and exit holes. The California carpenter bee (*Xylocopa californica*) also uses the empty exit holes as a nesting site.

5 Collecting palm rounds of *Phoenix dactylifera* in Borrego Springs, California containing larvae and adult specimens.

How *Dinapate wrighti* became dispersed among the distant and isolated palm oases separated by barren desert is still a mystery. The beetle can fly only short distances. Many of the palm oases are separated by a distance of 25 km or more. One theory is that the beetle has occupied these palms since long ago when the climate was warmer and wetter. The palms were more plentiful and formed an almost continuous grove. As the climate changed, the once-continuous palm population was fragmented into isolated populaitons we see today. An alternative theory is that the beetles dispersed in more modern times after the distinct groves were established, possibly aided by humans moving infested palms or cultivating palms in areas between oases thereby providing "bridges" for the beetles.

One area of interest to entomologists is the life cycle of *Dinapate wrighti*. Roy E. Campbell collected sections of *Washingtonia filifera* containing larvae in 1917 (J. Entomol. Zool. 15: 61–65. 1923.). Campbell kept the embedded larvae in a wire cage and waited nearly three years for the adults to emerge. He concluded that the life cycle must be between three and five years. In one extreme case, an adult emerged after seven years! Fires tend to speed up the life cycle to as little as one year if the palm is killed. The drying stem and the increased heat from the blackened surface appear to stimulate the larvae into a higher metabolic rate.

It was believed that *Dinapate wrighti* attacked only a single palm species, *Washingtonia filifera*. Following the examination of natural palm groves in northwestern Mexico, I found no evidence of *D. wrighti* in *W. robusta* or *Brahea calcarea* (syn. *B. nitida*). However, there are exit holes in

6. The large larva of *Dinapate wrighti*.

some *Brahea armata* found in northern Baja California. Moreover, *D. wrighti* has migrated to cultivated *Phoenix dactylifera*.

My search for this elusive beetle began in 2004 culling through piles of green waste in the Coachella Valley near Palm Springs, California. I was looking for sections of discarded *Washingtonia filifera* that might be infested. Several months of effort yielded one dead and disfigured specimen. Finally, in 2006 I had the opportunity to search again in live palms where the chance of finding living larvae and adults was much better.

Date palms (*Phoenix dactylifera*) from a former grove were being transplanted to line roads in a new golf resort being developed in Borrego Springs, California. Several of the palms were dying for an unknown reason. Because of my work as the arborist for the City of San Diego, and as an amateur entomologist, I was invited to dissect several living palms in an attempt to determine the cause of the distress. We used a chainsaw to split open the stems (Fig. 5). The cause of the problem was *Dinapate wrighti*. We were rewarded with living larvae (Fig. 6) and adult specimens.

Dinapate wrighti can be a cause of death in *Washingtonia filifera* and *Phoenix dactylifera*. About one-half of the mature palms found in most groves exhibit some exit holes. These holes damage the palm's tissue. In severe cases where the palm contains hundreds of exit holes, the *D. wrighti* are the cause of death. The extent of death caused by boring beetles is difficult to determine. However, they appear to have a preference for attacking older palms.

Dinapate wrighti plays an important role in the ecosystem of California's native *Washingtonia filifera* palm groves. It also has horticultural consequences for cultivated specimens of *W. filifera* and *Phoenix dactylifera*. – *Mike Marika, Park Arborist, San Diego, California, USA*

[Editors' Note: The spelling of the family name Bostrichidae and species epithet for Dinapate wrighti *is confused in the literature. We have brought the spelling in line with the spelling used by the Integrated Taxonomic Information Database (www.itis.gov).]*

Remembering Robert Lee Riffle (1940–2006)

Robert Lee Riffle (Fig. 1) described himself as a "horticultural writer" but loved being called "an award-winning author." Winning the American Horticulture Society's "Garden Book of the Year" award for both *The Tropical Look: An Encyclopedia of Dramatic Landscape Plants* and *An Encyclopedia of Cultivated Palms* (co-authored with Paul Craft) gave him great pleasure. Riffle's third book, *A Pocket Guide to Palms*, will be published by Timber Press in 2007. Robert Lee Riffle died suddenly of cardiac arrest on Friday evening, August 11, 2006, at home in Fort Pierce, Florida.

1. Robert Lee Riffle. Photo by Mike Burnett.

From childhood, Bob was interested in plants and flowers and seed germination. Some of his earliest gardening experiments were in growing plants from outside his zone – dahlias which suffered in the humidity of the South and tulips not meant for the heat. It was the beginning of over 55 years' study of botany, taxonomy and horticulture and a passion for palms and tropical-looking plants. His partner, Rany McIntyre, said he thought Bob had spent his entire life preparing to write the books he published.

In 1980, Bob started a lush tropical garden behind his house in the Montrose District of Houston. Friends said the humidity of Houston combined with the humidity from the swimming pool and the Plexiglas cover over the entire back yard made for very wet visits. Shovels pushed into the soil were vine covered in days. When the palms grew and the cover went, he searched for more planting space. The pool was emptied, and holes were jack hammered into the bottom to allow for drainage. The shell was filled with soil and then palms, thus becoming one of the biggest plant pots in the city of Houston. Many photos of that garden are in *The Tropical Look*.

The Internet was a goldmine for Bob, and he downloaded more than 10,000 photos of palms and other tropical plants for his own reference. In kind, he would ultimately spend the last 20 years of his life generously answering questions and touching the lives of thousands of people who found him online in the gardening, palms and tropicals forums. His last Internet home was as the moderator of the IPS message board at www.palmtalk.org – he was proud of the community there and considered the participants good friends.

In 2001, Bob left Houston for the warmer zones of Florida where he finished *An Encyclopedia of Cultivated Palms*. As he wrote in *The Tropical Look*, "The lure of the beauty of tropical landscapes…is undeniable…has an almost irresistible appeal for people who don't live in such places...It is the stuff dreams are made of."

In addition to his longtime companion, Rany McIntyre, he is survived by his sister, Nancy, his daughter Donna, two granddaughters and hundreds of friends around the world. More about Robert Riffle's life including photos of him, his travels and Florida palm garden can be found in a special section of the IPS web site, the www.palmtalk.org message board in a forum under his name. – *Diane S. Laird, Kirkland, Washington, USA*

The Grassy *Butia*: Two New Species and a New Combination

LARRY R. NOBLICK
Montgomery Botanical Center
11901 Old Cutler Road
Miami, Florida 33156
USA
noblick@fiu.edu

1. *Butia exospadix* with its grass-like habit.

Two palms that imitate grass have been discovered in the natural grasslands on the border of Paraguay and Brazil. These new, illusive, grass-like species, *Butia exospadix* and *B. marmorii*, show distinctive similarities to the rarely collected *Syagrus leptospatha*, which is transferred to the same complex of *Butia* species.

Butia contains nine species (Govaerts & Dransfield 2005) occurring in Brazil, Paraguay, Uruguay and Argentina. Some of the members of the genus that are found in Paraguay and Brazil are among the smallest of palms. I refer to these smaller members as the grassy *Butia* because they blend in so perfectly with the grasses of the savanna (cerrado) that they are rarely noticed (Fig. 1). Species in this group have leaf petiole margins lined with fine fibers rather than the typical petiole spines found in most *Butia* species.

Some of these smaller *Butia* species have been mistakenly placed in the genus *Syagrus*. Recently, *Butia campicola* was transferred from *Syagrus* (Noblick 2004).

In this paper, I transfer *Syagrus leptospatha* Burret to *Butia* and also describe two new species, *Butia exospadix* Noblick and *Butia marmorii* Noblick. Several of these species roughly follow a curious distribution beginning in the north in the center of Brazil's Mato Grosso do Sul in the Serra de Maracaju (*B. leptospatha*), extending south following the Paraguayan-Brazilian border along the Sierra de Amambay (*B. leptospatha*, *B. exospadix*) and finally turning east into the Sierra de Mbaracayú (*B. campicola*). Many are within the drainage of the Rio Parana (*B. exospadix*, *B. marmorii*, *B. microspadix*) (Fig. 2).

Key to the Grassy *Butia*

1. Inflorescence branched, rarely spicate . . . 2.

1. Inflorescence spicate, rarely branched . . . 3.

2. Inflorescence usually with 1–8 branches, peduncular bract opaque papery to thicker and glabrous to lepidote . . . . . *B. marmorii*

2. Inflorescence usually with 12–17 branches, peduncular bract much thicker, covered with a thick wooly tomentum . . . . *B. microspadix*

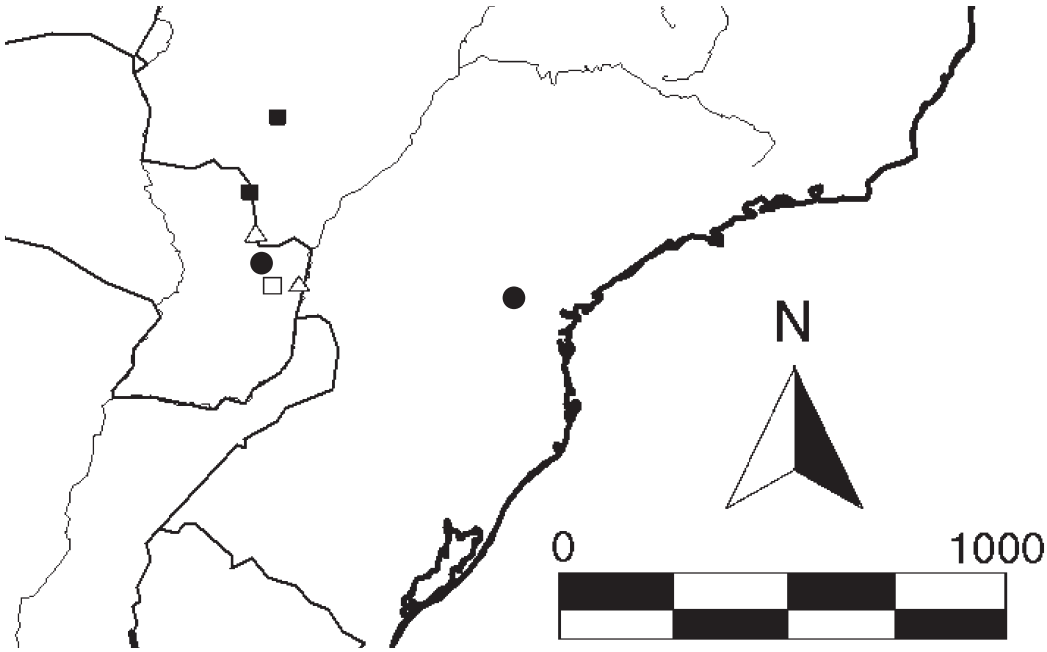
3. Leaf rachis less than 12 cm long (as measured between the basal and apical leaflet insertions, ca. 3–10 cm long), leaflets crowded together on the rachis, pistillate flowers less than 4 mm long (ca. 3.0–3.5) . . . . . *B. exospadix*

3. Leaf rachis greater than 18 cm long, ca. 18–77 cm, leaflets regularly spaced with up to 1–3 cm between the leaflets, pistillate flowers greater than 4.5 mm long (4.5–7.0 mm) long . . . . . 4.

4. Peduncular bract 9–15 cm long, extremely thin, papery, like translucent onion skin, spike only to 4 cm long . . . . . *B. leptospatha*

4. Peduncular bract 40–73 cm long, thicker, coriaceous, opaque, spike greater than 10 cm long (12–21 cm) . . . . . *B. campicola*

2. Map of Paraguay and Southern Brazil showing the distribution of *Butia leptospatha* (square), *Butia exospadix* (open triangle), *Butia campicola* (circle), *Butia marmorii* (open square) and *Butia microspadix* (pentagon). Scale is kilometers.



Butia leptospatha (Burret) Noblick **comb. nov.** Fig. 3.

Syagrus leptospatha Burret, Notizbl. Bot. Gart. Berlin Dahlem 15:105. 1940. Type: Brazil, Mato Grosso, Boliche Seco, Campo Grande, *Archer & Gehrt 3915* (Holotype: SP-36429, isotype: US).

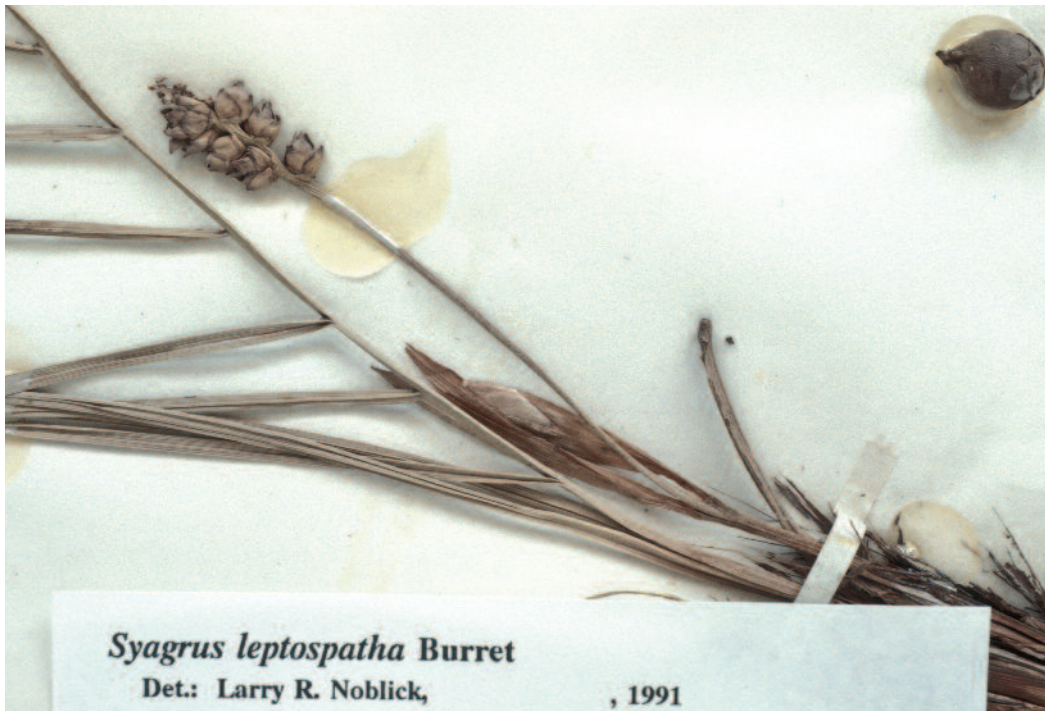
Syagrus leptospatha was discovered in 1936, described by Burret (1940) and not recollected again until 58 years later in 1994 (Pedro Juan Caballero, Paraguay). Glassman (1987) wrote that it was "probably extinct." Today, its former habitat is dominated and threatened by soybean cultivation. Phylogenetic character analyses of the Attaleinae show that *Syagrus leptospatha* aligns closely with *Butia* species (Noblick unpublished), rather than with other *Syagrus*. *Butia leptospatha* (Fig. 2) differs from *Syagrus* by having no noticeable deep grooves in its onion skin-like, paper-thin bracts. Its leaf anatomy as illustrated in Glassman (1987) shows vascular bundles on both the adaxial and abaxial surface as in other *Butia* (*Syagrus* species have vascular bundles only on the abaxial surface). *Butia leptospatha*, *B. campicola* (Barb. Rodr.) Noblick and *B. exospadix* have dark purple fruit, are acaulescent, have spicate inflorescences, have long peduncles that (usually) project the inflorescence in fruit above the peduncular bract (sometimes substantially so) and have the narrow grass-like leaflets. Based on its smooth peduncular bracts, its leaf anatomy, the phylogenetic analyses and its similarity to two other *Butia* species, I am here in transferring *Syagrus leptospatha* to *Butia*.

Guillermo Marmori has discovered two new species of *Butia* in Paraguay. The first was collected in 1980, and the site is now under water. The second was discovered in 1993 from a region just west of the Itaipu reservoir. The 1980 discovery is *Butia exospadix,* and the 1993 discovery is *Butia marmorii*.

Butia exospadix Noblick **sp. nov.**, palma graminiformis, solitaria trunco acaule et subterreano; folium reduplicato-pinnatum foliolis 6–10, congestis, rhachide foliorum 3–10 cm longa; spica super spatham exerta. Typus: Paraguay, Canindeyú, Itanana, *L.R. Noblick & T. Rios Otero 5305* (Holotypus: PY; isotypi: FCQ, FTG, K, NY). Fig 4.

Stem solitary, acaulescent, subterranean 10–20 cm in diam. Leaves 2–7 in the crown, spirally arranged and spreading; leaf sheath plus petiole ca. 6–11 cm long, adaxially channeled and abaxially rounded, and glabrous; petiole without the leaf sheath 0–3 cm long and 0.3–0.5 cm wide and 0.2 cm thick at the base

3. Herbarium specimen of *Butia leptospatha* showing its spicate inflorescence and its very short, onion-skin thin peduncular bract (*Archer & Gehrt 3915*).



of the leaf blade; leaf rachis 3–10 cm long with 6–10 pairs of leaflets distributed evenly along the rachis closely crowded together in a congested manner; basal leaflets ca. 32–42 cm long × 0.1–0.2 cm wide, middle leaflets ca. 30–48 cm long × 0.3–0.4 cm wide, apical leaflets ca. 32–45 cm long × 0.1–0.2 cm wide. Inflorescence interfoliar, unbranched, 4.5–12 cm long with peduncle glabrous, 36–67 cm long × 0.15–0.2 cm diam.; peduncular bract 33–46 cm long with no apparent beak and the expanded or inflated part of the bract 5.5–16 cm long × 0.5–1 cm in width and with a 1.2–2.3 cm perimeter and a 0.5–1 mm thickness, tightly enveloping the peduncle; rachilla 1, ca. 4.5–12 cm long; pistillate (triad) flowering portion 1.5–2.5 cm long, number of pistillate flowers 9–17 and the staminate flowering portion measuring 4–6 cm long. Flowers pale yellow to purple tinged, staminate flowers near the base of the inflorescence 3.5–4.0 mm long, sessile; sepals 3, distinct, linear, imbricate but briefly connate at base, acute to mucronate, membranous, glabrous; petals 3 distinct, unequal, obovate, valvate, fleshy, glabrous, with inconspicuous venation, ca. 3.5–4.0 × 2 mm, acute tips; stamens 6, pale yellow, distinct, 2.2–2.8 mm long, with filaments 1–2 mm long; pistillode trifid, not reflexed, less than 0.5 mm long. Pistillate flowers, globose to ovoid, sessile 3.5–4.0 × 2.5–3.5 mm; sepals, glabrous, without visible venation 3–3.5 × 2.5–3.2 mm, coriaceous, imbricate, sepals subequal, acute, keeled to faintly keeled at tip; petals 3, distinct, imbricate at base, valvate at apex, triangular, faintly nerved, especially near the base, glabrous, 2.5–3.5 × 2–3 mm, valvate portion 0.5–1.5 mm long, acute; gynoecium 2–2.7 × 1.5 mm. glabrous, stigma 0.5–0.8 mm long, and staminodes 0.6–0.7 mm long, 3– 6 dentate to smooth and truncate. Fruits purple when mature, 1.2–2.0 × 1.2–1.5 cm, ovoid; cupule (persistent perianth) reddish brown, 0.8–1.0 cm in diam. × ca. 0.3–0.4 cm high; petals longer than sepals, staminodial ring truncate, 1 mm high × 3–4 mm diam.; epicarp, dark purple when mature, smooth and glabrous; mesocarp pale yellowish, fleshy, non-fibrous ca. 1–2 mm thick; endocarp nearly spherical, ca. 1.0–1.6 × 1.0–1.3 cm, 1 mm or less thick, hard, bony, dark brown to nearly black, apex with no distinctive protuberance or beak, interior smooth, monovittate, round in cross-section, outer surface nearly smooth, pores 3 nearly even with surface and subequatorial, sutures visible especially at apex; seed 1, spherical to ellipsoidal, ca. 0.8–1.2 × ca. 1 cm, endosperm white, homogeneous. Germination remote tubular, eophyll simple, narrowly lanceolate.

Common name: *jataí poñy*.

Habitat and conservation: Open grasslands and savannas (cerrados); flat terrain with deep sandy soils and with few, and sparsely distributed shrubs and trees, frequently associated with *Allagoptera campestris*. The plants are restricted to the open short grasses rather than in the adjacent low weedy scrub.

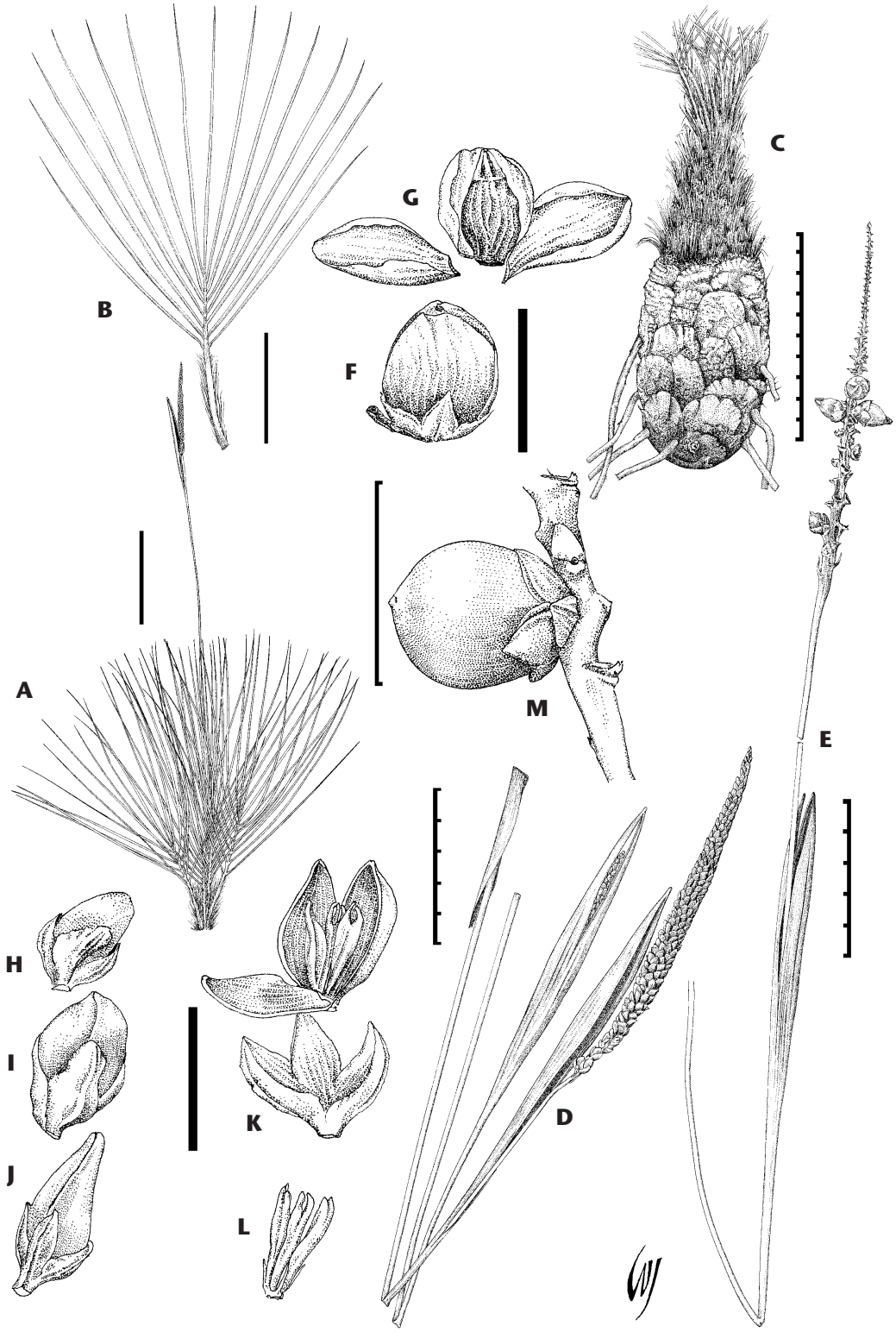
Etymology: The specific epithet is from *exo-* meaning "outside" and *spadix* referring to an "inflorescence (of palm)." Together they are translated as "outside inflorescence" or "projecting inflorescence," referring to the elongated peduncle (in fruit) that projects the inflorescence far above and "outside" of the peduncular bract. It is not the only *Butia* to do this, but it is the one that does it in the most exaggerated manner.

Distribution: Known from the Paraguay–Brazil border in Canindeyú, Paraguay between Ypé Jhu (Paranhos, Brazil) and Capitán Bado (Colonel Sapucala, Brazil) just north of Itanana, and also from Alto Parana, an area now flooded by the Itaipu Reservoir.

Phenology: Most of palms had flowers or developing immature fruit with only one with mature fruit in February.

Specimens Examined: PARAGUAY: Canindeyú, Itanana, 19 km N of Itanara on Ypé Jhu/Capitán Bado Road, ca. 422 m, 23° 37.958'S, 55° 32.210'W, 8 Dec 2002, *L.R. Noblick & T. Rios Otero 5305* (Holotype PY; isotypes FCQ, FTG, K, NY); 26–27 km N of Itanara on Ypé Jhu /Capitán Bado Road, ca. 420 m, 23° 34.411'S, 55° 31.875'W, 8 Dec 2002, *L.R. Noblick & T. Rios Otero 5307* (FCQ, FTG, K, US); 20 km circa ante Capitan Bado ex Ype-Jhu, 12 Jan 1979, *L.Bernardi 19568* (NY); Alto Parana, Agricola Itabo, 70 km NE de Hernandarias, inundado por lago de Itaipu, zona del Rio Itabó, 12 Apr 1980, *G. Marmori 687* (CTES); San Pedro, Yaguareté Forest (Sustainable Forest Systems site), around Aserradera. 23° 47' 46"S 56° 12' 41"W, 21 May 1997, *E. Zardini & S. Zavala 46879* (FTG, MO).

Discussion: *Butia exospadix* is easily separated from *B. leptospatha* by its shorter leaf rachis (3–10 cm vs. 35–37 cm), longer peduncular bract (48–73 cm vs. 9–13 cm), smaller pistillate flowers (less than 4 mm vs. 7–8 mm) and longer spike (12–21 cm vs. 3–4 cm). *Butia*



4. *Butia exospadix*. **A** Habit; **B** Leaf, showing the short rachis; **C** Underground stem; **D** Inflorescence; **E** Infructescence; **F–G** Pistillate (female) flower; **H–L** Staminate (male) flowers and one open male flower with sepals and three stamens removed; **M** Fruit. Habit, stem and fruit drawn from photographs; leaf, flowers, inflorescences and infructescences drawn from *Noblick & Rios 5305*. Thin line scale is 10 cm (A–B), thick line scale on flowers is 5 mm (F–G and H–L). All other scales are in cm as marked. Drawn by Wes Jergens.

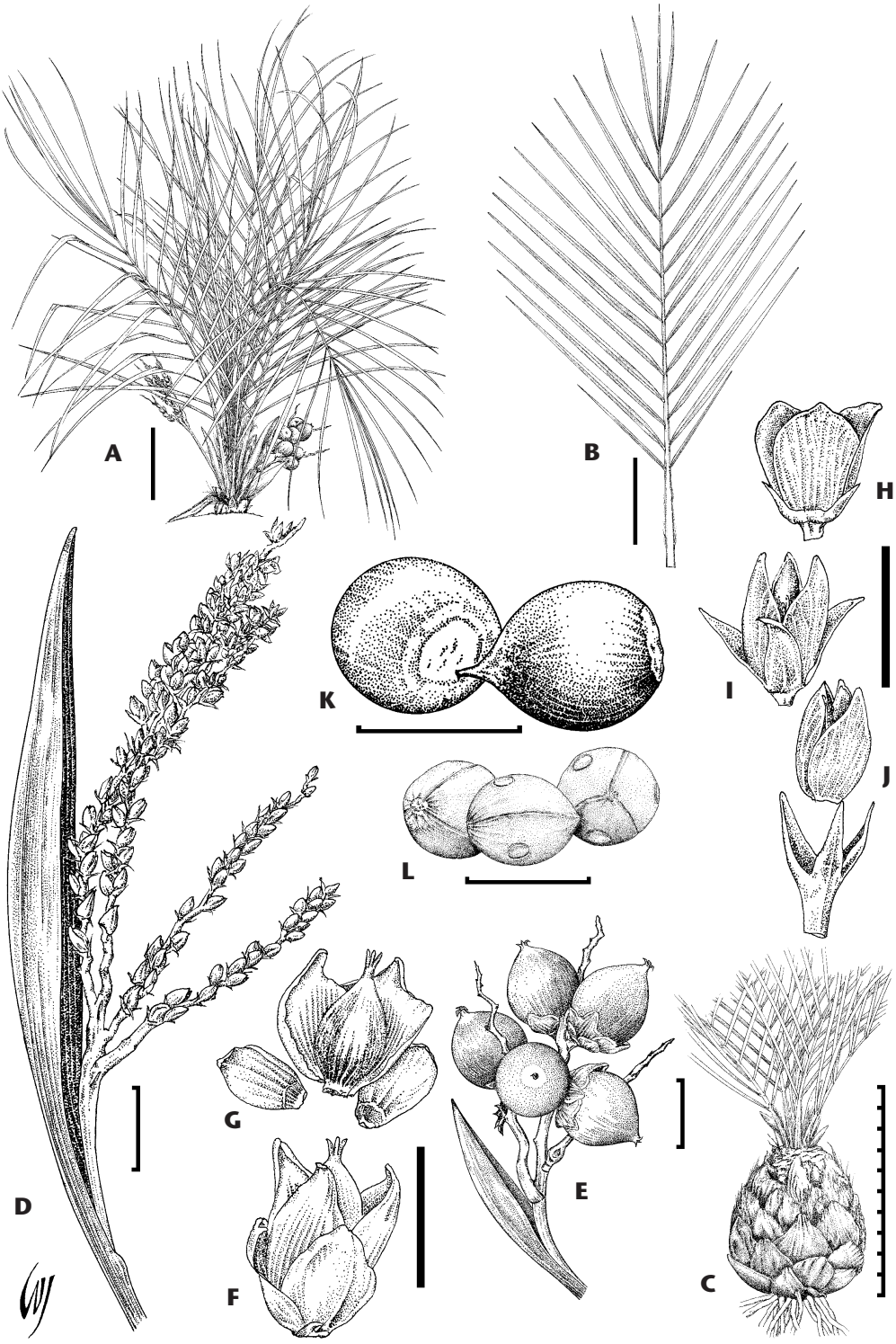
5 (upper left). *Butia exospadix* inflorescence with small crowded flowers (*Noblick 5305*). 6 (upper right). *Butia campicola* inflorescence with larger and fewer flowers (*Noblick 5299*). 7 (lower left). *Butia exospadix* infructescence with a mature, beakless, purple fruit (*Noblick 5307*). 8 (lower right). *Butia campicola* infructescence with immature, beaked fruit (*Noblick 5299*).

9. *Butia exospadix* leaf rachis showing congested leaflets on a short rachis (*Noblick 5305*).

exospadix is separated from *B. campicola* by its smaller inflorescence (6.0–7.5 cm vs. 12–21 cm), smaller and more crowded flowers (Figs. 5 & 6) and by the smaller, usually non-beaked fruit (Figs. 7 & 8). *Butia exospadix* is vegetatively separated by its congested leaf rachis (Fig. 9).

Butia marmorii Noblick **sp. nov.**, palma solitaria trunco acaulis et subterreano. Folium reduplicato-pinnatum foliolis 9–18, regulariter dispositis. Inflorescentia ad 7–17 cm longa, rachillis (1) 2–4, floribus femineis ca. 5.0–6.5 × 2.5–3.0 mm. Typus: Paraguay, Alto Parana, Cia. Laguna. *L.R. Noblick et al. 5122* (Holotypus PY; isotypes FTG, K, NY) Figs. 10 & 11.

Stem solitary acaulescent, subterranean 10–20 cm in diam. with persistent leaf bases (Fig. 12). Leaves 3–5 in the crown, spirally arranged and spreading; leaf sheath plus petiole ca. 2–15 cm long, adaxially channeled and abaxially rounded, and glabrous; petiole not including the leaf sheath less than 1 cm (0.4–0.5) cm long and 0.5–0.7 wide and 0.1–0.2 cm thick at the base of the leaf blade; leaf rachis 23–51 cm long with ca. 9–18 pairs of leaflets distributed evenly along the rachis; basal leaflets ca. 11–31 cm long × 0.1–0.3 cm wide, middle leaflets ca. 24–44 cm long × 0.4–0.7 cm wide, apical leaflets ca. 17–31 cm long × 0.1–0.3 cm wide. Inflorescence interfoliar, unbranched or branched to 1 order, peduncle 4.5–9.0 cm long × 0.3–0.5 cm wide × 0.1–0.5 cm thick; peduncular bract with a total length of ca. 8–19(–40) cm with no apparent beak and the expanded or inflated part of the bract measuring ca. 4.0–12.5(–18) cm long × 0.3–1.1



10. *Butia marmorii*. **A** Habit; **B** Leaf; C Underground stem; **D** Inflorescence; **E** Infructescence; **F & G** Pistillate (female) flower; **H–J** Staminate (male) showing various male flower shapes and one male flower with sepals removed; **K** Fruit; **L** Endocarp. Habit and fruits drawn from colored photos, stem drawn from prints of *Marmori 3138*; leaf, flowers, inflorescences and infructescences drawn from *Noblick et al. 5122*. Thin line scale is 10 cm (A & B), thick line scale on flowers is 5 mm (F & G and H–J). All other scales are in cm as marked. Drawn by Wes Jergens.

11 (top). *Butia marmorii* plant in habitat among grasses. 12 (bottom). *Butia marmorii* plant dug up by road construction crews exposing the grapefruit-sized underground stem.

(–2.5) cm in width and with a 1.2–3.0 cm perimeter and a 0.5 mm thickness, very thin or thicker, but not as thin as onion skin and never translucent; rachis 0–1 cm long; rachillae 1–8, apical ones ca. 2.8–7.0 cm long and basal ones ca. 3–7 cm. Flowers dark purple to pale yellow with purplish tinge; staminate flowers near the base ca. 4.5–5.5 mm long × 2 mm

wide, sessile, basal ones frequently short pedicellate with pseudopedicels ca. 1–1.5 mm long; sepals 3, distinct, linear triangular, connate at base forming a pseudo-pedicel, acute, sclerenchymous at the base but membranous near the tip, glabrous; petals 3 distinct, unequal, obovate, valvate, membranous, glabrous, with distinct venation, ca. 3.5–3.8 × 2.0–2.5 mm, acute; stamens 6, pale yellow, distinct, 2.5 mm long, with filaments 1.5 mm long, pistillode trifid, less than 0.5 mm long. Pistillate flowers, conical, sessile; sepals, glabrous, with no visible venation except at the margins and tip, sclerenchymous, imbricate, ca. 5.0–6.5 × 2.5–3.0 mm, unequal, acute, faintly keeled at tip; petals 3, distinct, imbricate at base, valvate at apex, triangular, obscurely nerved, glabrous, 3.2–5.5 × ca. 2.3–3.0 mm, acute; gynoecium 2.5–3.0 mm long × 1.0 mm wide, glabrous. Fruits purple when mature, 1.2–2 cm long × 1.2–1.5 cm in diam., ovoid; cupule (persistent perianth) greenish brown, ca. 0.6–0.8 cm in diam. × ca. 0.4 cm high; petals slightly longer that sepals, staminodial ring truncate, 0.5 mm high × 2.5 mm diam.; epicarp dark purple when mature (Fig. 13), smooth and glabrous; mesocarp pale yellow, fleshy, non-fibrous ca. 1–2 mm thick; endocarp nearly spherical to elliptical, ca. 1.0–1.8 × ca. 1.0–1.3 cm., ca. 1 mm or less thick (ca. 0.5 mm thick), hard, bony, dark brown to nearly black, apex with no distinctive protuberance or beak, interior smooth, monovittate, round in cross-section, outer surface nearly smooth, pores subequatorial, 3 nearly even with surface, sutures visible; seed 1, spherical to elliptical, 8–9 mm long × 5–6 mm diam., endosperm white, homogeneous. Germination remote tubular, eophyll simple, narrowly lanceolate.

Common name: *yatay poñy*.

Habitat and conservation: Cerrado scrub, in open grassy areas between the taller cerrado plants, restricted to the medium to tall grasses rather than in the adjacent low weedy scrub. Plants in full sun were more productive than those in shade. The terrain is nearly flat with gentle slopes and with a red sandy, lateritic soil. The site has been excavated for road work and threatened by pasture land. By 2004 soybean fields were encroaching on the site; the area is not expected to survive. Luckily, Marmori discovered another site within 2 km of Cia Laguna, but none of the areas is legally protected, and the palms remain threatened.

Etymology: The specific epithet honors its discoverer, Itaipu botanist, Guillermo Caballero Marmori.

Distribution: Known from a small area in Alto Parana, Paraguay in the vicinity of the village

13. *Butia marmorii* infructescence showing the purple fruit and thicker bract.

14. *Butia marmorii* inflorescence with purplish flowers and smooth, opaque, peduncular bract (*Noblick 5332*).

of Cia Laguna. A collection from Instituto de Botánica Darwinion (SI) confirms a population of more robust plants as far south as San Ignacio, Misiones, Argentina and digital images taken in the field corroborate its presence as far north as Três Lagoas, Mato Grosso do Sul, Brazil (Emerson Salviani, pers. comm.).

Phenology: Palms had developing and mature fruit in February, and several were continuing to flower.

Specimens Examined: ARGENTINA: Misiones, San Ignacio, near the house of H. Qulroga, 27° 16'S 55° 33'W, 270 m, 9 Dec 1997, *M.E. Múlgura de Romero et al. 1657* (SI); PARAGUAY: Alto Parana, before Cia Laguna and Itaquyry, ca. 69–70 km N of Hernandarias, ca. 10 km after the turn off for Itaquyry, 25° 2' 3"S 54° 59' 41.8"W, 180 m, 15 Feb 1996, *L.R. Noblick, H. Cropper, T. Rios Otero, M. Quintana, & G. Marmori 5122* (Holotype PY, isotypes FCQ, FTG, NY); Laguna, 70 km N de Hernandarias, 27 Mar 1993, *G. Cabellero Marmori 3138* (Herbarium at Itaipu, CTES, FCQ, MBM); Cñia Laguna, approx 55°W, 25°S camino a Itakiri, ca. 64 km NE de Hernandarias, 28 Mar 1993, *A. Schinini, R. Vanni & S. Cáceres 28229* (CTES); 10 km NW de ruta Ciudad del E-Salto de Guairá, camino a Itaquyry, 25° 01'S 54° 59'W, 28 Oct 1994, *A. Krapovickas, R M. Harley, C.L. Cristobal, & A. Schinini 46129* (CTES, K); Cia Laguna, about 1–2 km E of Laguna along a dirt side road, ca. 276 m, 25° 0.075'S 55° 2.516'W, 26 Nov 2002, L.*R. Noblick, T. Rios Otero & G. Marmori 5281* (PY, FCQ, K, NY).

Discussion: *Butia marmorii* is distinct from *B. leptospatha* in having branched vs. spicate inflorescences, thicker opaque bracts vs. translucent onion skin-like bracts, smaller pistillate flowers (4.5–6.0 mm vs. 7–8 mm long) and shorter peduncles (4.5–9.0 cm vs. 8.5–24 cm long). *Butia marmorii* is easily separated from *B. microspadix* by its glabrous to lepidote vs. tomentose bracts and 2–4(–8) vs. 12–17 inflorescence branches (Figs. 14 & 15).

Acknowledgments

I thank the staff at Museo Nacional de Historia Natural del Paraguay (PY), especially Teresa Florentin Peña (Techi) and Marissa Quintana;

15. *Butia microspadix* inflorescence from the state of Parana, Brazil with characteristic densely, hairy peduncular bract (*Noblick 4881*).

a very special thanks to Tomas Rios (Pilu), my driver, collecting colleague and friend. Rios was helpful on my 1996, 2002 and 2004 trips. I also thank the staff at the Universidad de Asuncion (FCQ), especially the director, Dr. Maria Fatima Mereles, for allowing use of their plant dryers. Sincere thanks go to my friend Guillermo Caballero Marmori and his wife and family for supporting our collecting activities. Finally thanks are due to the staff at Fairchild Tropical Botanic Garden, where I am an Associate Researcher. Financial support for these collecting trips was provided by the Montgomery Botanical Center (1996, 2002) and the International Palm Society (2004). The impetus and financial support to finish up this work was provided by the National Science Foundation Grant #0212779.

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Two Palms with Surprising Qualities

JEAN-MICHEL DUPUYOO
Jardin d'Oiseaux Tropicaux
Conservatoire Biologique Tropical
83250 La Londe-les-Maures
France
jmdupuyoo@yahoo.fr

1. *Heterospathe uniformis* growing with *Cocos nucifera* in the background (Magam, North of Ambrym).

The Vanuatu archipelago, situated in the southwest Pacific Ocean, is composed of some 80 islands. It benefits from a tropical, humid climate, with certain variations according to latitude and altitude. Of the 21 indigenous palm species, 14 are endemic (Dowe & Cabalion 1996). This article concentrates on two species: *Heterospathe uniformis* and *Neoveitchia brunnea*.

Heterospathe uniformis and *Neoveitchia brunnea* are both endemic in Vanuatu, more precisely to one or a small group of islands in the archipelago. They are therefore rare in the wild, and information about them is equally scarce.

The genus *Heterospathe* contains 38 species found in an area from the Philippines to the islands of the western Pacific (Govaerts & Dransfield 2005). *Heterospathe uniformis* is the only species present on Vanuatu. Dowe and Cabalion (1996) considered it to be endemic in the west of Ambrym. *Heterospathe uniformis* is of medium height, the trunk reaching 7 m tall, with a diameter at breast height of 15 cm (Figs. 1 & 2). The leaves are pinnate and measure 140 cm in length. The inflorescence is interfoliar. The fruits are elliptic 2.2 long and 1 cm in diameter (Fig. 3). The color changes from green to orange and finally red at full maturity. The seeds are pointed at the apex and rounded at the opposite (calyx) end (Dowe & Cabalion 1996).

Neoveitchia is a genus of two species (Govaerts & Dransfield 2005). *Neoveitchia storckii* is found exclusively on Vitu Levu, Fiji (Watling 2005). The species which concerns us here, *N. brunnea,* is endemic to a single island in the center of the Vanuatu archipelago, Pentecost Island (Dowe & Cabalion 1996). *Neoveitchia brunnea* is also a medium tall palm. The trunk can reach 10 m in height and a diameter of 30 cm at breast height (Figs. 4). The base is noticeably wider, even in young trees less than 1 m tall (Fig. 6). The pinnate leaves can be up

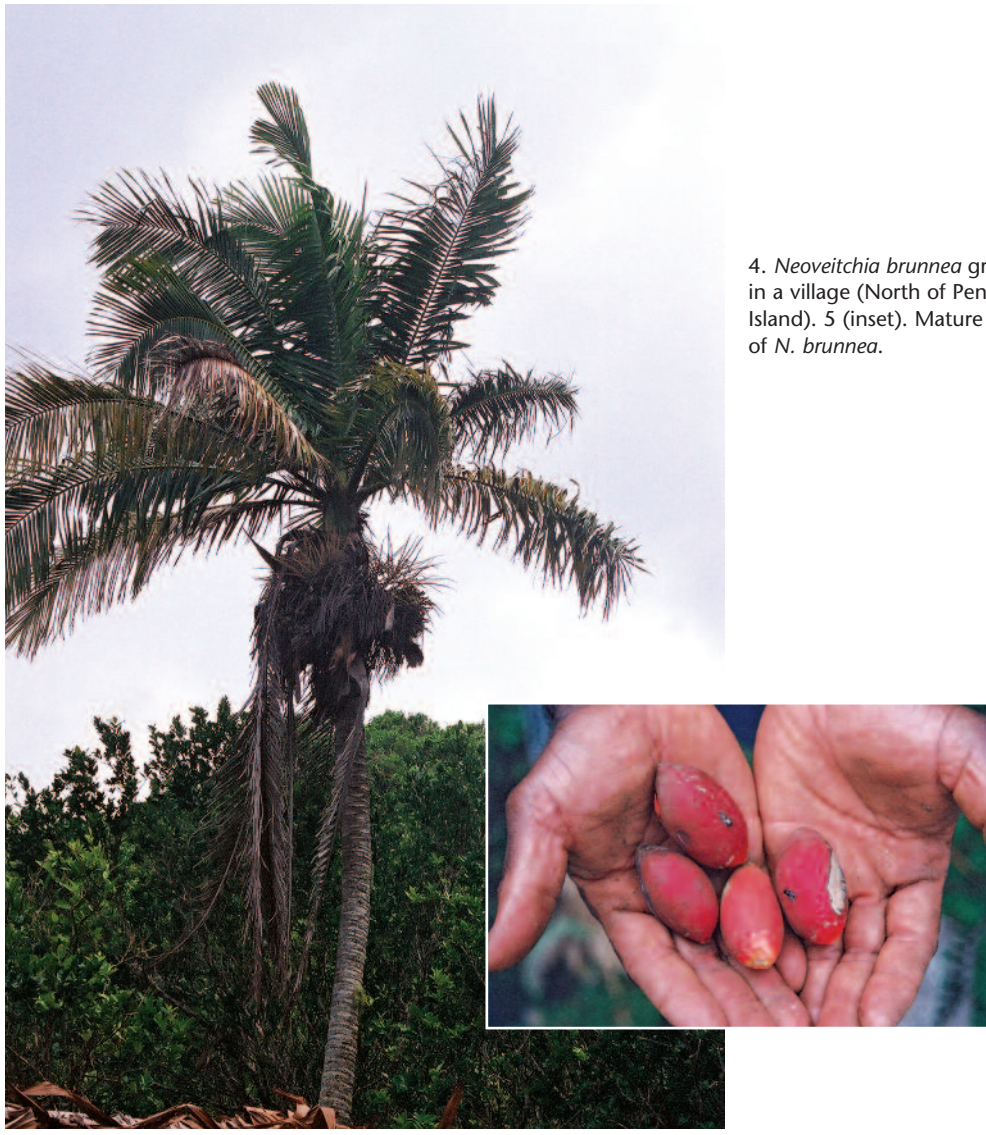
2. *Heterospathe uniformis* is protected by people from destruction (Liro, Paama). 3 (inset). Mature fruits of *H. uniformis*.

to 5 m in length (Fig. 7). The inflorescence is infrafoliar; the fruits are oval and 7 cm in length. They change from green to dark red at maturity (Fig. 5). The seeds are oval and 3.5 cm in length (Dowe & Cabalion 1996).

Observations from the field

My first encounter with *Heterospathe uniformis* was on the island of Paama, where this species is known locally as *Fakul*. The palms in Paama, the island with the highest population density of the archipelago, grow in the undergrowth of coconut groves and orchards. It is uncommon for a "useless" species to survive on these islands where the vegetation is controlled to a very great extent, but *H. uniformis* is far from being useless. The *Fakul* is renowned for its qualities against sexual impotence. The fruit is used for this purpose, mainly by older men. I also learned that a similar remedy could be obtained from the bark. These palms are therefore conserved and seedlings protected.

In September 2003 at the tribal festival in Paama, I met some inhabitants of northern Epi who confirmed that *Heterospathe uniformis* was present on the island and known also for its stimulant powers. The tree also appears to be spontaneous on the totally deserted volcanic island of Lopevi. In the north of Ambrym, *H. uniformis,* or *Lioleniere,* is likewise known for its qualities as a sexual stimulant. There the bark is consumed mixed with grated coconut. This mixture can be given to children



4. *Neoveitchia brunnea* growing in a village (North of Pentecost Island). 5 (inset). Mature fruits of *N. brunnea*.

5 (left). The base of *Neoveitchia brunnea* is noticeably wider, even in young trees (North of Pentecost Island).
6 (right) The ornamental pinnate leaves of *Neoveitchia brunnea* (North of Pentecost Island).

to give strength and ensure growth. The bark is also used as a fertilizer. In gardens of yams sprinkled with pulverized palm bark, the yams at harvest are much bigger than usual. Finally the stem is sometimes used to make walking sticks for the elderly.

Neoveitchia brunnea seems unfortunately to be considerably rarer, confined to the north of Pentecost Island and is little known by local people apart from the most aged. It is sometimes called *Niu Niu Tatu,* which means "fruit which rolls to the ground." It is also known as the *Devil Palm*, as its fruit were thought to be eaten by demons, giving the tree a very bad reputation. At one time, children were forbidden to touch it, as it was thought that simple contact would provoke a serious illness of the stomach. According to the elders, the sap could be used to concoct a dangerous poison capable of killing men or rendering women sterile. Other less fearsome stories are known among the local people, that the first man came out of the trunk of *Neoveitchia brunnea* for example. I was unable to discover many details about the folklore associated with this palm, because traditional knowledge is rapidly eroding and new generations have generally very little interest in these matters.

I did not have sufficient time to carry out a full and detailed study of the populations *Neoveitchia brunnea*. In fact the trees that we saw were mainly close to inhabited areas, in coconut or other orchards. I found very few young specimens and no seedlings. I did not find specimens elsewhere in the archipelago. It does not benefit from any conservation measures. It is regrettable that unlike another rare palm, *Carpoxylon macrospermum*, it has not been introduced to the gardens of the capital Port-Vila or Luganville.

Epilogue

These two rare palms are among those most admired by palm enthusiasts. Both grow naturally at low altitudes and should be relatively easy to cultivate in tropical, humid climates. If the survival of *Heterospathe uniformis* seems to be assured, the same cannot be said for *Neoveitchia brunnea*. Its utilization as an ornamental palm is one great hope for this attractive tree, and a program of

cultivation should be organized as soon as possible.

Acknowledgments

I thank the Forestry Department and the Ministry for Agriculture of Vanuatu for allowing me to carry out this study, as well as the inhabitants of Vanuatu for their help and hospitality.

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Nomenclatural Note – Correcting Errors in *Palms of Madagascar*

JOHN DRANSFIELD,
HENK BEENTJE
AND
RAFAËL GOVAERTS
Herbarium
Royal Botanic Gardens, Kew
Richmond, Surrey
TW9 3AE, UK

During the subsuming of the genera *Neophloga*, *Chrysalidocarpus*, *Neodypsis*, *Phloga*, *Vonitra* and *Antongilia* into *Dypsis*, which was published in *Palms of Madagascar* (Dransfield & Beentje 1995), a large number of nomenclatural changes were made. In some instances the same species epithet had been used in more than one genus, resulting in the need for the publication of new names. In two instances we made errors affecting four species in all, in the transfers of species epithets resulting in the need to correct names used illegitimately in *Palms of Madagascar*. We make these changes here. In summary, *Dypsis linearis* as described and illustrated in *Palms of Madagascar* should be named *D. procumbens*, *D. anovensis* should be *D. linearis*, *D. zahamenae* should be *D. humbertii* and *D. humbertii* requires a new name, *D. henrici*.

Dypsis linearis Jum., Ann. Inst. Bot.-Géol. Colon. Marseille, III, 6(1): 35 (1918). Type: Madagascar, R. Anove, *Perrier 12066* (Holotype P).

Dypsis anovensis J. Dransf. in J. Dransfield & H. Beentje, Palms Madagascar: 380 (1995), nom. illeg.

Dypsis procumbens (Jum. & H. Perrier) J.Dransf., Beentje & Govaerts, **comb. nov**.

Neophloga procumbens Jum. & H. Perrier, Ann. Inst. Bot.-Géol. Colon. Marseille, III, 1: 27 (1913). Type: Madagascar, Andringitra, *Perrier 11977* (Holotype P).

Neophloga mananjarensis Jum. & H. Perrier, Ann. Inst. Bot.-Géol. Colon. Marseille, III, 1: 26 (1913). *Chrysalidocarpus ambolo* Jum., Ann. Inst. Bot.-Géol. Colon. Marseille, IV, 6(3): 8 (1928 publ. 1929). Type: Madagascar, Vatovavy, *Perrier 12071* (Holotype P).

Neophloga linearis Becc, Bot. Jahrb. Syst. 38. Beibl. 87: 26 (1906). Lectotype: Madagascar, Ambohimitombo, *Forsyth Major* 606 (Holotype K).

Dypsis linearis (Becc.) Beentje & J. Dransf. in J. Dransfield & H. Beentje, Palms Madagascar: 249 (1995), nom. illeg.

Dypsis humbertii H. Perrier, Notul. Syst. (Paris) 8: 46 (1939). Type: Madagascar, Andrangavolo, *Humbert 17776* (Holotype P).

Dypsis zahamenae J. Dransf. in J. Dransfield & H. Beentje, Palms Madagascar: 336 (1995), nom. illeg.

Dypsis henrici J. Dransf., Beentje & Govaerts, **nom. nov.**

Neophloga humbertii Jum., Ann. Inst. Bot.-Géol. Colon. Marseille, V, 1(1): 20 (1933). Type, Manantantely, *Humbert 5817* (Holotype P).

Dypsis humbertii (Jum.) Beentje & J. Dransf., Palms Madagascar: 239 (1995), nom. illeg.

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Beccari's "Grande Nouveauté": the Discovery, Taxonomic History and Typification of *Pelagodoxa henryana*

JOHN LESLIE DOWE
Australian Centre for Tropical Freshwater Research
James Cook University
Townsville
Qld 4811 Australia

AND

MELANY H. CHAPIN
Bernice P. Bishop Museum
Research Associate
Hawaii, USA

***Pelagodoxa henryana*, one of the palm family's most distinctive and highly threatened species, was first collected from the Marquesas in 1916 by Charles Henry. The following year, Odoardo Beccari established the genus and named the type species after the collector. The relationship of *Pelagodoxa* to other palms has puzzled botanists, but by applying advanced research techniques along with precise morphological examination, a clearer understanding of its position within the family has been made possible. A search of relevant herbaria indicated that the materials on which *P. henryana* was described were not extant, and therefore *P. henryana* is lectotypified here with illustrations that accompanied the protologue.**

Pelagodoxa and its type species *P. henryana* were established and described by Beccari (Bois 1917), based on a collection made by Charles Henry in 1916 from Nuku Hiva, Marquesas Islands in the Pacific Ocean. Specimens of fruits and a set of photographs were originally sent by Henry to the horticultural botanist Désiré Bois then editor-in-chief of *Revue Horticole*, at the Muséum d'histoire naturelle in Paris. Bois passed them on to Beccari, described as "*le savant palmographe de Florence*." Beccari's new genus and species were included as a

footnote in Bois' (1917) paper '*Palm nouveau des Iles Marquises*' in *Revue Horticole*. Beccari included with his protologue two illustrations of fruit, one by an unknown artist (Fig. 1) and the other by his own distinctive hand (Fig. 2). In an accompanying letter sent with the protologue and quoted by Bois, Beccari noted a similarity with *Teysmannia altifrons* [= *Johannesteijsmannia altifrons*] and *Manicaria saccifera*, but he could not ascertain the systematic position of this "*grande nouveauté.*"

Subsequently, Henry (1918) made a brief reference to *P. henryana* in a paper about the flora of the Marquesas, describing "*une autre sorte de Palmier, peut-être inconnue, a feuilles entières et argentées du plus bel aspect*" [another kind of palm tree, perhaps unknown, with entire leaves and with a silver coloration giving it a beautiful appearance] and including a footnote, apparently included by the editor, about its recent formal description. The following year Bois (1919) provided a summary and partial quote of Beccari's protologue of *P. henryana* and emphasized the uniqueness of the species.

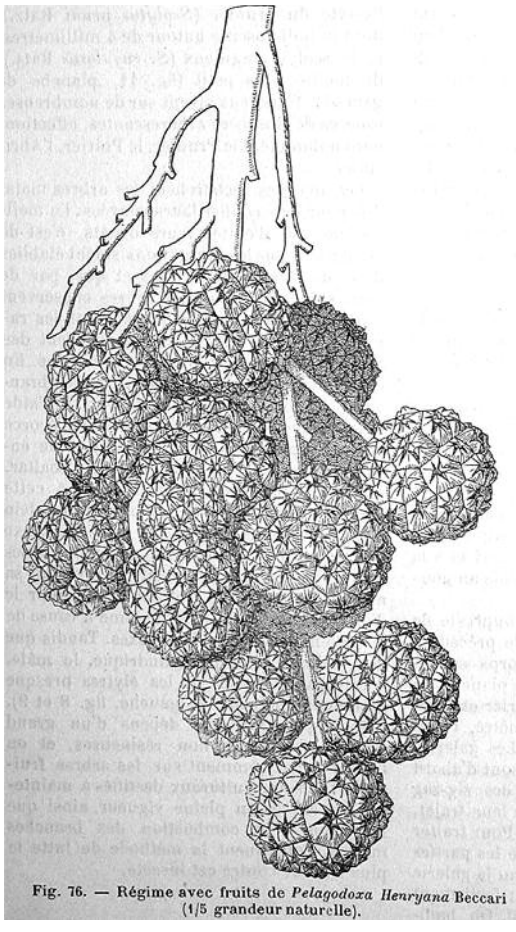
Although Beccari did not specifically explain his choice of name for the new genus, derivation of the generic name comes from the Greek *pelagos*, meaning the sea or flowing water, and *doxa*, meaning praise or glory, and can be construed as 'glory of the oceans.' According to Bois (1917), Henry described the habitat as being at low altitude, in very shady places near pools on slopes under a canopy of *Hibiscus tiliaceus* L. Henry was active in plant collecting in the Marquesas from 1916 to 1922 and was the author of at least two papers on the flora of the archipelago (Henry 1918, 1920). Biographical information on Henry has been elusive. He was the Director of the French Society of the Marquesas around this time, and his few collections, mainly deposited in Paris Herbarium, are mostly cultivated species that occurred in gardens or in agriculturally disturbed sites. This suggests that Henry may have been involved with, or had an interest in agriculture or crop plants.

In 1920 and 1921, Charles Henry sent seeds from the Marquesas to the horticulture department of the Muséum d'histoire Naturelle in Paris. Unfortunately these either arrived in a desiccated condition or perished soon after germination (Bois 1924). The young seedlings had what was identified as a fungal problem, which was called "*Penicillium incarnatum.*" This may have been *Gliocladium vermoeseni* (Biourge) Thom, a pathogen that afflicts many palms today. It caused the young seedlings of *Pelagodoxa* to damp off and perish. The difficulty of growing *P. henryana* in a cool climate was soon recognized, and cultivation was recommended in either heated greenhouses or in gardens within tropical locations.

A second species of *Pelagodoxa*, *P. mesocarpa* Burret, was described by Burret (1928), based on a collection made by the botanist Hugh Cuming, labeled as collected in New Caledonia. However, Cuming never visited New Caledonia, so the origin of the type material of that taxon remains in doubt. The Cuming specimen is extant in Berlin Herbarium (B) (J. Dransfield pers. comm.). Burret described *P. mesocarpa* with somewhat smaller fruits than *P. henryana,* but this was the only character used to distinguish the two species (Fig. 3).

Beccari (in Boise 1917) was unable to provide a complete description of *P. henryana* in the

1. Part of the lectotype of *Pelagodoxa henryana*, in D. Bois, Revue Horticole 15: 302, fig. 76 (1917).



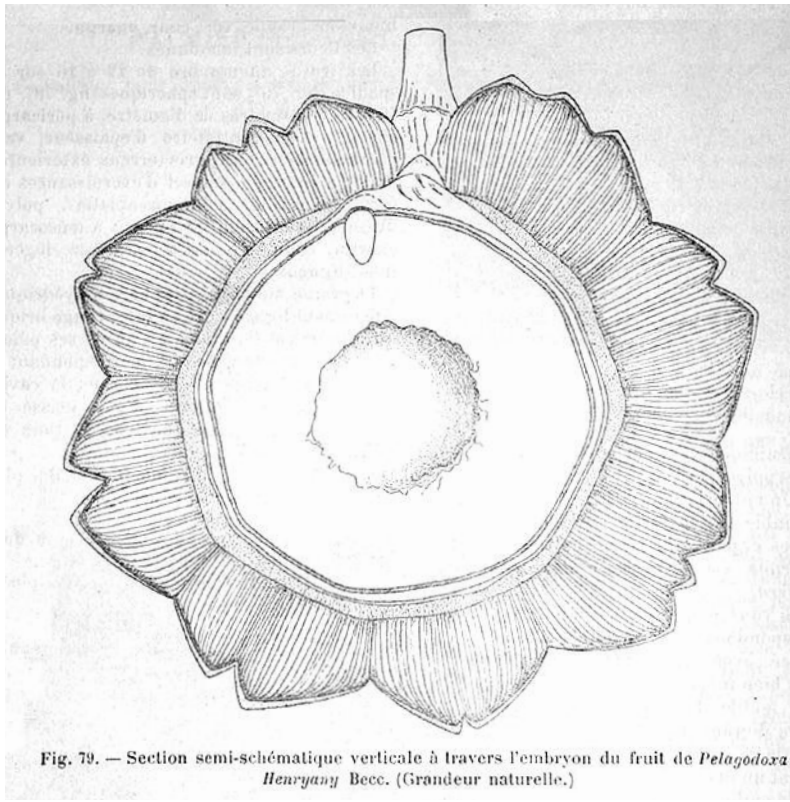


Fig. 79. — Section semi-schématique verticale à travers l'embryon du fruit de *Pelagodoxa Henryana* Becc. (Grandeur naturelle.)

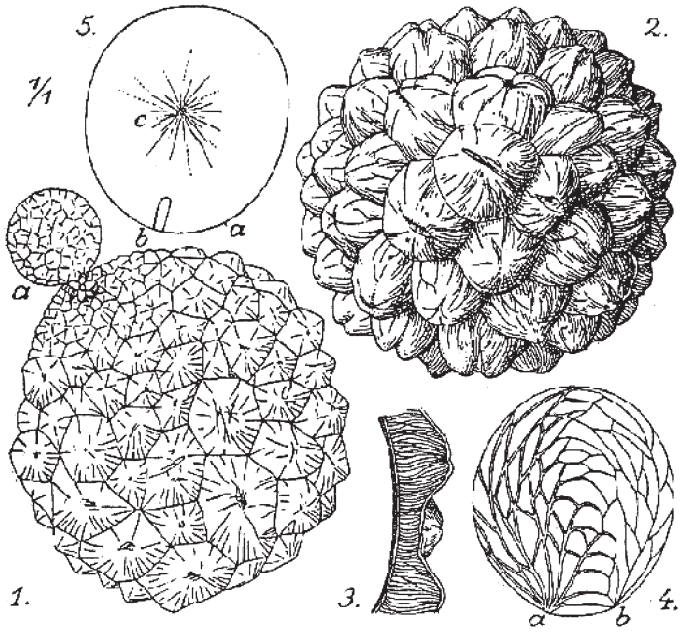
2. Part of the lectotype of *Pelagodoxa henryana*, in D. Bois, Revue Horticole 15: 304, fig. 79 (1917).

protologue because of lack of material. It was Martelli (1932) who presented the first thorough description. Martelli had additional collections at his disposal and had also corresponded directly with the collector, Charles Henry, who was by then residing in Paris, as well as Father Simeone Delmas, a missionary who had spent 40 years in the Marquesas. The description did not include female flowers, but otherwise Martelli suggested that there was a close relationship between *Pelagodoxa* and *Orania*. Martelli (1935), while confirming the identity and status of the genus and *P. henryana* in his work on the synonymy of palm genera in the tribe Areceae, appears to have overlooked Burret's *P. mesocarpa*.

In a posthumous treatment of the Arecoideae based on Beccari's unpublished notes, *Pelagodoxa* was placed as a "*Genus incertae sedis*" [unable to be placed genus] (Beccari & Pichi-Sermolli 1955). In that work, the close relationship of *Pelagodoxa* to *Sommieria* was clearly outlined, and the placement of the genus in the Iguanurinae was proposed. The second species, *P. mesocarpa*, was maintained, although no comments as to its validity as a distinct species were provided.

The inclusion of *P. mesocarpa* as a second species was accepted by Moore (1957), but it was subsequently placed in synonymy under *P. henryana* in Moore's treatment of Fiji palms (Moore 1979). Current accounts consider *Pelagodoxa* to be a monotypic genus (Uhl & Dransfield 1987, Govaerts & Dransfield 2005).

Pelagodoxa has always been of considerable interest and perplexity to palm botanists because of its unusual set of characters, its undetermined relationship to other genera, and its difficulty in systematic placement. Beccari, when establishing the genus, suggested there were gross similarities to *Johannesteijsmannia* and *Manicaria*, based on leaf size and form, and the appearance of the large fruit (Bois 1917). He otherwise could not ascertain with any confidence the systematic position of the genus without examining the "intimate structures" of the flowers and fruit. Burret (1928) recognized a relationship with *Sommieria*, among other genera. Martelli (1932) placed it in his '*Orania* group,' then later in the tribe Areceae (Martelli 1935), and Beccari and Pichi-Sermolli (1955) tentatively placed it within the Iguanurinae. Tomlinson (1961) found leaf morphology very distinct, in that *P. henryana* had a unique arrangement of cells around the stomata, but otherwise could not



3. Illustration of *Pelagodoxa mesocarpa* in M. Burret, Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem 10: 287, fig. 3 (1928).

relate it to other genera. In a novel arrangement of the palm family, Satake (1962) placed *Pelagodoxa* in the Phytelephantoideae along with *Phytelephas*, *Sommieria* and *Manicaria*.

Moore (1973) organized the Arecaceae according to the evolution of palms as it was understood at that time. Of the 27 genera that Moore included in his '*Clinostigma* alliance,' he placed *Pelagodoxa* closest to *Neoveitchia*, *Sommieria* and *Iguanura*. Subsequently, Dransfield and Uhl (1986) included it formally within the Iguanurinae and later suggested a possible relationship to *Heterospathe* but otherwise noted "it does remain very isolated" (Uhl & Dransfield 1987, p. 420).

Essig et al. (1999), in a histological study of fruits in the Iguanurinae, concluded that there was nothing in the pericarp structure of *Pelagodoxa* that could be used to infer generic relationships. However, the lack of an operculum in *Pelagodoxa* [the presence of an operculum is a defining character of genera in the Iguanurinae] indicated that the genus was misplaced in the Iguanurinae (Chapin et al. 2001), and that its systematic position should be reconsidered. Chapin and Dowe (2005) concluded that three distinct fruit size cohorts exist in the known population of *P. henryana*, and that selection and distribution by humans has played some part in that situation. However, variation in fruit size *per se* should not necessarily indicate that the taxonomy of the species should be reconsidered, as fruit size variation is apparent in many palm species.

Once molecular work began refining the phylogenetic placement of Arecaceae, it became apparent that some genera in the tribe Areceae were indeed "misplaced." When samples included members of the Iguanurinae, they indicated this subtribe to be paraphyletic. As more molecular studies were conducted they too began to suggest the paraphyly of the Iguanurinae (Hahn 2002a, 2002b, Lewis & Doyle 2002). DNA sequence data consistently placed *Pelagodoxa* and *Sommieria* in a strongly supported sister relationship isolated from other genera (Lewis & Doyle 2002). Additional molecular work using low-copy nuclear DNA and mapping of morphological data of the Indo-Pacific Arecoid palm genera also supported *Pelagodoxa* and *Sommieria* as immediate relatives, thus concurring with Lewis and Doyle's placement (Norup et al. 2006). Floral studies further supported a close relationship of these two genera and reinforced the isolation of them from other palms (Stauffer et al. 2004). In consideration of their uniqueness and isolation, *Pelagodoxa* and *Sommieria* have recently been placed in their own tribe, the Pelagodoxeae (Dransfield et al. 2005).

Typification

Beccari's protologue of *P. henryana* (Bois 1917) was based on a collection of fruits and a photograph of a plant in habitat, all of which

4. Undated specimen of *Pelagodoxa henryana* in Florence Herbarium (FI) of fruits/seeds suspected to be failed germinants sent by Bois to Beccari after 1917.

were provided by Charles Henry from a collection he made in the Marquesas in 1916. To determine whether or not any of the original plant material was extant, we attempted to locate the collections made by Henry in both the Florence (FI) and Paris (P) herbaria. The search at Florence was based on the historical precedent that Beccari very often placed material there of species that he described. Sometimes he kept only a fragment of a collection if it was to be returned to another herbarium. After Bois received the original materials of 1916 from Henry, they were then sent to Beccari from Paris. It likely follows that once Beccari had finished with the materials they were returned to Bois, except for possible fragments that Beccari retained. The focus of the search of Paris was based on the fact that that was where the Henry materials were dispatched from, and would likely have been returned to. Secondly, Moore (1979) in his treatment of *P. henryana*, noted that a specimen that he reservedly proposed as the type, was extant in Paris.

The collection managers, other staff at FI and P, and colleague Dr. Fred Stauffer were contacted with the request to locate any material that may be relevant to the typification of *P. henryana*, as well as any other associated specimens collected and deposited in those herbaria. Images of all materials of *P. henryana* were examined by the authors. The search of Florence resulted in the location of a number of specimens, none of which could be considered as type material. The earliest collection located in FI was dated 1916, and this was of a portion of inflorescence and flowers only, and not relevant to the protologue. Another collection, dated October 1919 was similarly of a portion of inflorescence and flowers. The only fruit specimens located had had their epicarps removed and consisted of partially decayed seeds and remnant mesocarp. These specimens were undated and accompanied by a note stating that they had been sent by Bois. Bois (1924) discussed the germination attempts of *P. henryana*, and that certain batches of fruit, sent from the Marquesas on separate occasions, had either arrived in a desiccated condition in Paris, or otherwise failed to germinate. It is suspected that all the fruit specimens in Florence are failed germinants sent by Bois to Beccari, after 1917 (Fig. 4).

The search of Paris revealed a group of four sheets consisting of leaves or portions of leaves, annotated as being collected by Henry in August 1920. There were also two apparently separate collections of fruit in the carpological collection; one fruit collection was in a box with two labels, one label stated that it was a collection by Henry in 1917, and the other label lacked a reference to a collector or date. The second collection, in a plastic bag, was designated as collected by Henry but undated. The specimen cited by Moore in 1979 was amongst the group of leaf specimens, and annotated by him as a questionable "isotype?" during a visit to Paris in 1977 (Fig. 5). Neither this specimen, nor any of the others in Paris, can be accepted as a type of *P. henryana,* as the collection date of these specimens postdates

publication of the name and lacks the material upon which Beccari based his protologue or are otherwise undated. From our herbarium searches, we concluded that Henry's original 1916 collection of fruits was not extant, or if indeed was extant and was one of the undated collections in the carpological section, was otherwise unable to be positively identified. Therefore, in the absence of specimens unequivocally related to the protologue, choosing a new type specimen for the species was required.

The procedure for assigning a new type for a name for which the holotype material has been lost or destroyed is outlined in Articles 9.2, 9.9, 9.10 and 9.11 in the *International Code of Botanical Nomenclature* (Greuter et al. 2000). A new type can be chosen either from materials that were inextricably associated with the protologue, in the absence of an isotype, syntype or paratype, and would be a lectotype, or other materials that may or may not be directly related to the protologue, and would be designated as a neotype. In the case of *P. henryana*, the only materials used by Beccari in the protologue were an infructescence, fruit, and a photo of the species in habitat. The illustrations of fruit published along with the protologue were more than likely drawn from the Henry specimens, and as the illustrations are materials associated with the protologue, they can therefore be chosen as the lectotype of *P. henryana*. The use of illustrations as types has many examples in palm taxonomy. The updated taxonomy and typification of *P. henryana* is as follows:

Pelagodoxa henryana Becc. in Bois, Rev. Hort. n.s. 15: 302. 1917. Type: Lectotype (here designated). Illustrations in D. Bois, Rev. Hort. n.s. 15: 302–304, figs. 76 & 79 1917 (herein reproduced in Figs. 1 & 2).

Pelagodoxa mesocarpa Burret, Notizblat. Bot. Gart. Berlin-Dahlem 10: 288. 1928. Type: New Caledonia, *H. Cuming s.n.* (holotype: B).

5. Specimen of *Pelagodoxa henryana* collected by Charles Henry and dated 21 August 1920 in Paris Herbarium (P) labelled as 'isotype?' by H.E. Moore Jr. This specimen cannot be the type of *P. henryana* as the collection date postdates publication date of the protologue (1917).

Specimens located in Florence and Paris: "Enui," Marquises, 17 July 1916, *C. Henry s.n.* (FI); Iles Marquises, Nuku Hiva, October 1919, *C. Henry s.n.* (FI); Is Marquesas [from Bois], undated, *anon.* (FI, carpological collection); Is Marquesas, undated, *Delmas s.n.* (FI, carpological collection); Iles Marquises, 21 August 1920, *C. Henry s.n.* (P); Iles Marquises, 1917, *Henry s.n.* (P, carpological collection in a box); Iles Marquises, undated, *Henry s.n.* (P, carpological collection in a plastic bag).

Conclusion

The circuitous route of discovery and documentation of *Pelagodoxa* and the meandering process of investigating its phylogenetic position are as unique as its morphology and anatomy suggests. Beccari's assessment of *Pelagodoxa* being a '*grande nouveauté*' is still valid, as it remains one of the greatest novelties in the palm family, both morphologically and historically.

Acknowledgments

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The Dent Smith Collection at Fairchild Tropical Botanic Garden

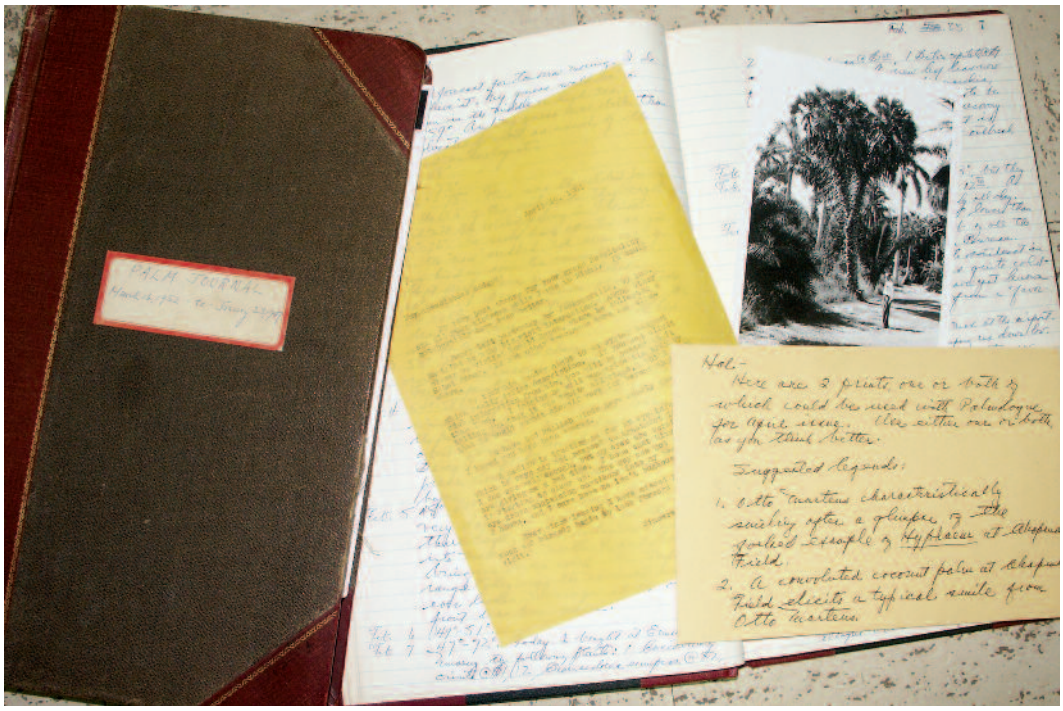
NANCY KORBER
Fairchild Tropical Botanic Garden
11935 Old Cutler Road
Coral Gables, Miami, Florida
33156
USA
nkorber@fairchildgarden.org

The International Palm Society exists today primarily due to the perseverance and dedication of one man, Dent Smith, an indefatigable palm enthusiast and keen observer of his own palm garden in Florida.

Dent Smith was born in 1897 in Staunton, Virginia; he lived what even he called "an itinerant life." In his youth, he sought very little formal education, job stability or financial reward, but while itinerating somewhere in Mexico, he decided it was time to grow up. As with everything else he did in life, he attacked his new plan with enthusiasm and persistence and no small amount of sharp intelligence. Eventually, he made enough money as a bond trader on Wall Street to retire comfortably while still in his early 50s. He moved to Daytona Beach, Florida, and started growing palms. Overcome by the palm bug and self-described as a palm fanatic, he decided to start a society devoted to the love of palms.

Smith noted on March 18, 1955, "I have started the Palm Society" [Palm Log, March 18, 1955] and listed among the first recruited members: H. Bertram Smith, James E. Smith, Mrs. L. H. Wait, Mr. Stanley Kiem, Harold Loomis, Mrs. David Fairchild, Mrs. Robert H. Montgomery and Mr. & Mrs. Arthur C. Langlois. After 10 months of hard work and persistent recruiting, the Palm Society boasted 200 members. The first issue of *Principes* was published almost within a year, with Smith the principal editor and writer.

As a palm enthusiast, it was quite natural that Smith developed a relationship with Fairchild Tropical Garden (now Fairchild Tropical Botanic Garden, FTBG). In fact, the first official meeting of the Palm Society was held at FTBG on April 17, 1956. Because of the long-term and very congenial friendship with FTBG, Smith felt this would be an excellent place to house the bits of history encompassed in his correspondence and writings. As a result, Smith



1. These items represent a small portion of the Dent Smith Collection, housed in the archive of Fairchild Tropical Botanic Garden.

gave his papers to FTBG and his correspondence from 1955 to 1986 is now housed in FTBG's archive.

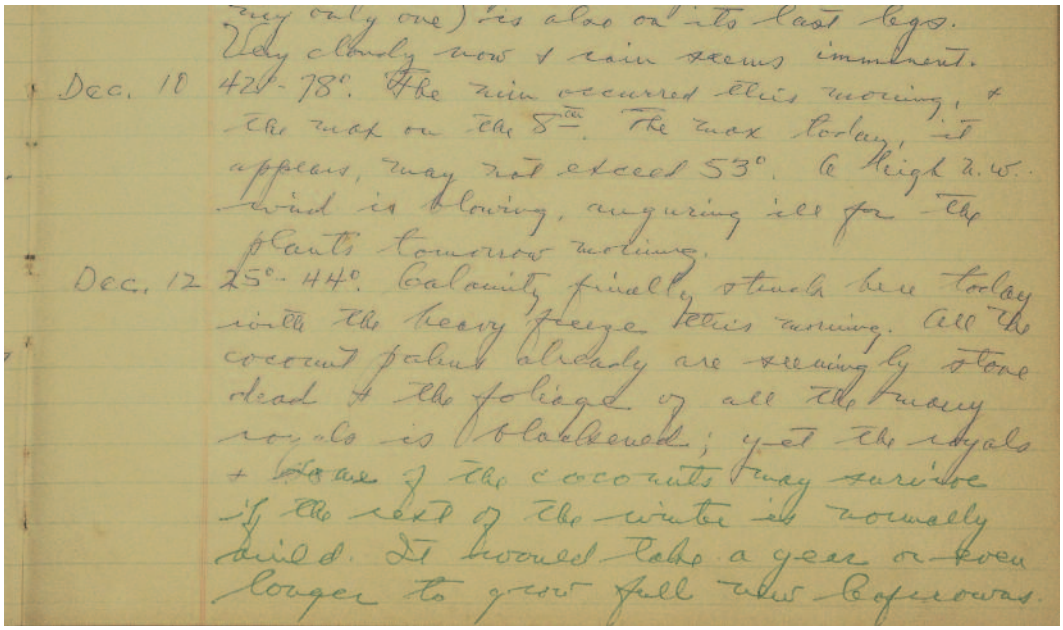
To recognize the 50th anniversary of the IPS, FTBG recently organized and cataloged the collection of notes, letters, manuscripts and photographs (Fig. 1). The Dent Smith Collection contains over 4600 letters from over 200 internationally prominent palm botanists and horticulturists, mostly from 1956–1975. The list of correspondents represents most of the people responsible for the formation of the Palm Society, now the International Palm Society, including Palm Society officers and board members David Barry, Jr., Walter H. Hodge, Jerome P. Keuper, Otto Martens, Kenneth C. Foster, Lucita Wait, Nixon Smiley, Harold R. Loomis, Margaret and Arthur Langlois and Harold E. Moore, Jr.

Fortunately for us, Smith was diligent about making copies of his own letters. As a result, one can, in some cases, follow both sides of the written conversations through many years. The letters at times read almost like a story. Many of the roughly 300 correspondents' files include only a few letters; but Smith's correspondence with others was lengthy and lasted for many years. For example, there are about 600 letters in each of the files from David Barry, Jr., Harold E. Moore, Jr., and Lucita Wait. Each of these people holds a special role in the formation of the Society: Harold Moore, Jr. was the first editor of *Principes* (now *PALMS*); Lucita Wait served for many years as the secretary and behind-the-scenes 'spark,' and David Barry served as President, Director and driving force behind the International Palm Seed Exchange Service.

As expected, the topic of most of the correspondence is the formation and nurturing of the Society. Smith's discussions of even the mundane details are often witty, humorous and entertaining. Although the impetus behind the hundreds of letters may have been the administration of the society, the topics often turned to other matters, most notably palms themselves and his trials growing palms at a time when horticultural information was scarce.

Dent Smith on Meteorologists

Smith had little faith in professional meteorologists. Of course, trying to grow tropical palms in Daytona Beach naturally required very close attention to weather. The health and survival of his palms depended on accurate forecasts. As he recorded in his palm logs, a forecast for frost triggered hours of


my only one) is also on its last legs.
Very cloudy now & rain seems imminent.
Dec. 11 42°-78°. The rain occurred this morning, &
the max on the 8th. The max today, it
appears, may not exceed 53°. A slight N.W.
wind is blowing, augering ill for the
plants tomorrow morning.
Dec. 12 25°-44°. Calamity finally struck here today
with the heavy freeze this morning. All the
coconut palms already are seemingly stone
dead & the foliage of all the many
royals is blackened; yet the royals
& bases of the coconuts may survive
if the rest of the winter is normally
mild. It would take a year or even
longer to grow full new Copernicias.

2. "Calamity finally struck here today with the heavy freeze this morning." In his Palm Log, December 12, 1957, Smith recorded his observations on the palms in his garden as they succumbed to a lethal freeze.

preparation and considerable anxiety. Unfortunately, forecasting weather was not an exact science, and as a result, Smith often vented his frustration on the local meteorologists. He dubbed the forecasts as "sorry and incompetent guesses." One devastating February low was actually "10 degrees lower than forecast by the biggest boob of all the boobs in the local Weather bureau." [Palm Log, February 10, 1963]

On Being a Palm Fanatic

Smith was well and truly bitten by the palm fanatic bug. Reading his correspondence and notes, one can see that he loved his palms. He suffered when they did, as in the winter of 1957–58 when frost killed a substantial number of his palms (Fig. 2). Undaunted, he kept planting, and by November 1960 he discovered while making a list that he had 771 palms in the ground, 161 species in 62 genera. This impressive tally was recorded only two months after the devastation of hurricane Donna. Nothing kept him from planting and nurturing and making observations and notes about his palms.

Again, in December 1962, Daytona Beach received a period of very severe cold. According to Smith, it was "worse than the winter of '57–'58. It now appears that more than one half of all my palms are dead or dying, and in fact the number may run even to two-thirds or more." [Palm Log, December 13, 1962] Just one day later, he noted in his Palm Log the delivery and planting of more palms. He never gave up. He later noted that he did lose more than 600 palms in that one hard winter.

Hurricane Observations

Smith made careful observations about specific plants and their reactions to hurricanes. He noted that the palms fared much better than other plants. His oaks were totally destroyed in Hurricane Donna, leaving the palms that weathered the storm dangerously exposed to bright sunlight. Overall damage to the palms from the extreme winds looked remarkably like damage from severe cold, except that the wind damage was immediately observable while the cold damage sometimes took a few days to appear.

A full description of the holdings of the Dent Smith Collection is available on FTBG's website <http://www.fairchildgarden.org/research/SmithCollection.html>, along with information for scholars wishing to examine the materials. The Dent Smith Collection preserves the history, both entertaining and mundane, of the formation and early years of the Palm Society, as well as the history of Smith's palm collection and enduring fascination with that most remarkable family of plants.

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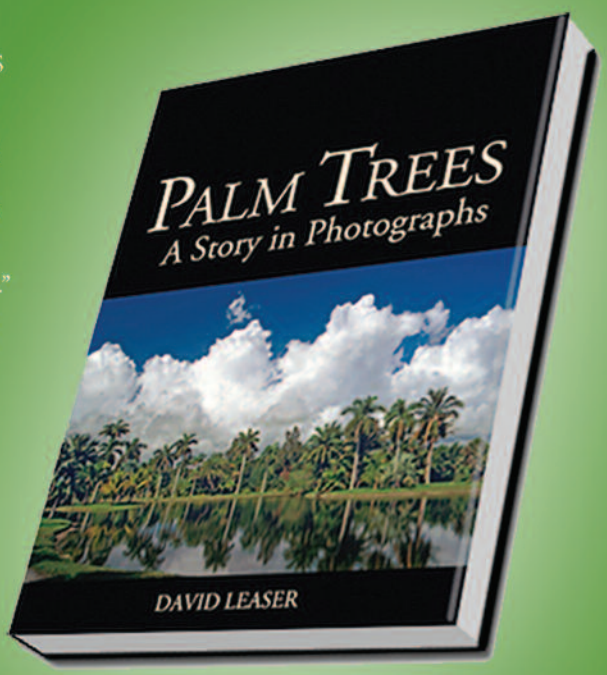

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Madagascar Diary 2005

JEFF SEARLE
6640 SW 172 Ave.
Ft. Lauderdale, Florida
33331
USA

AND

PETER BALASKY
6220 Melaleuca Rd.
Ft. Lauderdale, Florida
33330
USA

1. Marojejy National Park is home to some of Madagascar's most exciting palms.

Madagascar is one of the world's most exotic places. A renowned hot spot of biodiversity, the island is home to more than 160 species of palms, most of which are endemic to the island. In April, 2005, we joined Bill Beattie (North Queensland, Australia) to visit some of the premier palm destinations on the island.

There are many areas of palm importance scattered over the island, but travel is time consuming and difficult. So we chose to visit areas that have a reputation for a good selection of palm species. One of the areas that was most inviting was Marojejy National Park situated in the northeast part of the island. Marojejy has large areas of undisturbed forest

and has not been very thoroughly explored by palm researchers.

It was in the first week of April that we visited Marojejy National Park (Fig. 1). Marojejy National Park contains 60,000 hectares and was only opened to the general public in 1998. It contains a large range of elevations starting at 75 m with lowland rainforest and extends to montane heath thicket at the 2132 m summit of Mt. Marojejy (Fig. 2). The terrain is steep and irregular, approaching 45º on the northern slope of the massif. Because of the rapid rise in elevation, there are extreme changes in the climate in a very short distance. This gives rise to an extraordinary number of microclimates and has resulted in evolution of large numbers of species of both flora and fauna. For example, there are over 300 species of ferns identified on Mt. Marojejy. In addition, there are 150 species of amphibians and reptiles, 125 species of birds, 12 species of lemurs, and more than 30 species of palms. Many of these palm species that we saw in habitat were simply extraordinary. The culture of this region has been unchanged for centuries. Many local traditions, as well as superstitions, are still alive today as they were long ago.

From the captial of Antananarivo, we took a short flight to the coastal town of Sambava. From there, we packed ourselves into a very small taxi. It was fully loaded with gear, then we set out for the Marojejy Mountains. This long drive was an adventure of its own. It starts with buying supplies. The challenge was purchasing rice, beans, sardines, bread, oil, soft drinks, water and chocolate for all of us as well as the porters, guides and the cook for the five days. With the help of our good friend Guy Rafamantanantsoa, who is an experienced botanist and who has accompanied Dr. John Dransfield and Henk Beentje, we purchased the supplies and were off to the park. The park office provided the five porters, the guide and the cook, and away we went through perhaps the most spectacular area of Madagascar.

The first segment of the hike was through degraded lowland forest, bamboo thickets and areas of cultivation. Palms were not numerous but we observed *Dypsis catatiana*, *D. spicata*, *D. mirabilis*, *D. pinnatifrons*, *D. fasciculata* and the non-endemic *Raphia farinifera*. During the hike it is likely we passed other species, but our vision was severely limited by the density of the vegetation. The hike to the park boundary takes about two hours and then another three hours to Camp I (Mantella Camp, named after the local forest tree frog).

Camp I provided large tents, a jungle shower, comfortable cots and hungry bed bugs. The cook prepared large bowls of rice and beans for every meal. This was sometimes supplemented

2. The Marojejy mountains, home to some of Madagascar's most beautiful palms.

3. *Dypsis thiryana* was found with bright red fruits.

4. The attractive crownshaft of D*ypsis baronii*.

5. *Dyspsis marojejyi.*

with fried meat, or we opened our tuna or sardines and added it to the rice. We left on the first morning for Camp II with serious palm hunting in mind. The trail is moderately steep but slippery from the frequent rain. We encountered populations of *Dypsis pinnatifrons* (pink form), *D. heterophylla*, *D. thiryana* (Fig. 3), *D. baronii* (Fig. 4), *D. perrieri* and the Madagascar foxtail, *D. marojejyi* (Fig. 5). *Ravenea* species were *R. robustior* and *R. sambiranensis*. *Marojejya insignis* was a wonderful find (Fig. 6). There were also a few unidentified species.

Lunch was eaten at Camp II: bread, sardines, fruit and chocolate. Camp II is a very picturesque place, and a photo appears in *The Palms of Madagascar* with *Dypsis baronii* on page 199. The pause in the spectacular area of Camp II gave us time to ponder why more people do not make the effort to visit this part of the world. For anyone interested in botany this is Nirvana. There are untold species of orchids and more than 30 species of palms on this one trail. At the conclusion of day two, we returned to Camp I to spend the night.

The hike on day three was from Camp I all the way to Camp III (Simpona – named after a species of lemur). It is a five hour hike that is steep, slippery and full of botanical surprises. This section of the trail was steeper than any other part. To stay on the trail, we had to grab roots, branches, anything we could to make the climb. As we hiked higher, the canopy height deminished. In the lowland rainforest, the canopy is around 35 m in height. Here at 800–1400 m elevation, the canopy height is 15–25 m. The views are spectacular. The orchids, mosses and ferns change rapidly as the elevation increases. *Dypsis cookei* with its metallic sheen is in scattered groups in a rather narrow elevation range. *Dypsis andrianatonga* (Fig. 7) is much more common and occupies

6 (top). Jeff Searle at the base of *Marojejya insignis*. 7 (bottom). *Dypsis andrianatonga.*

a broader elevation range than *D. cookei*. *Dypsis oreophila* is scattered, and as usual, there are some palms that escape our identification. One of the palms that was in full fruit appeared to be *D. oreophila* or something similar. We found it difficult to stop and spend time at unidentifiable palms because of the pressure to reach Camp III before darkness. The urge to

discover the next surprise had to wait until morning.

The next morning, the beginning of day four, we began the next stage of the hike. For this section of the trail, we traveled halfway to the summit. The climate was montane, and consisted of heavy thicket mostly less than 2m tall. There were fewer palms the higher we went. We came across the ultra-rare *Dypsis coursii*. Afterwards, we walked back to Camp III to enjoy the remainder of the day. On a previous day of the hike, Bill decided to remain behind at Camp I. To our surprise, Bill had made the huge climb from Camp I to Camp III during that day. He found the determination and energy to make the incredible climb that few others had acheived. The one palm we hoped to find at the summit, *Dypsis pumila*, eluded us.

The final stage of the hike took us through montane thicket mostly less than 2 m tall. There were fewer palms, and they were mostly unfamiliar. We came across *Dypsis coursii* and *D. pumilia*.

After four days of exhiarating hiking up the mountain, we headed back down to Camp I. The trail down is physically easier but more dangerous because of the risk of a fall. This fact makes it difficult to watch for things we missed on the way up. In spite of our slow progress, we made some wonderful sightings and took time to enjoy the spectacular vistas.

Marojejy is one of the ultimate destinations for palm or nature lovers. The challenges of the hike make the adventure more rewarding. Here is a place visited by only a handful of the world's palm lovers, and that, in itself, makes it a special place. Observing the palms on Marojejy and elsewhere in Madagascar increases our understanding of why some palms just will not grow in the environments that we provide in our gardens. Species that evolved high up in the Marojejy Mountains, or in lower, mid-level elevations, may be a challenge to grow in South Florida. Certain species may not tolerate the higher temperatures, and the sea-level conditions of this region.

We rested for one day in a nice cottage on the Indian Ocean beach and got ready for the next segment of our Madagascar adventure. Our next destination is the Masoala – the "motherlode" for palms. But that is another story that we hope we can share in the future.

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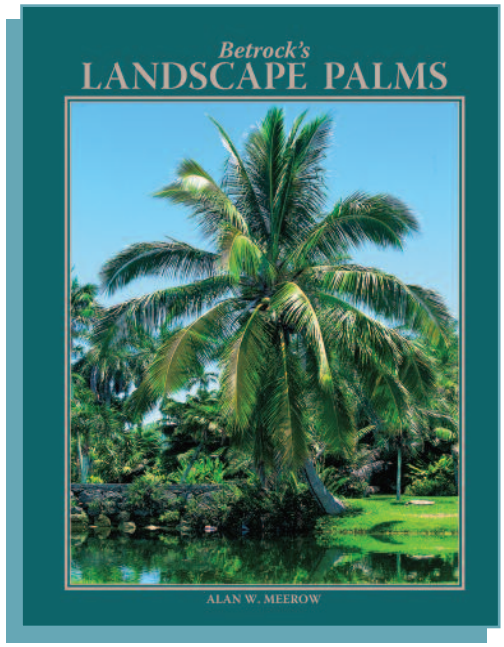

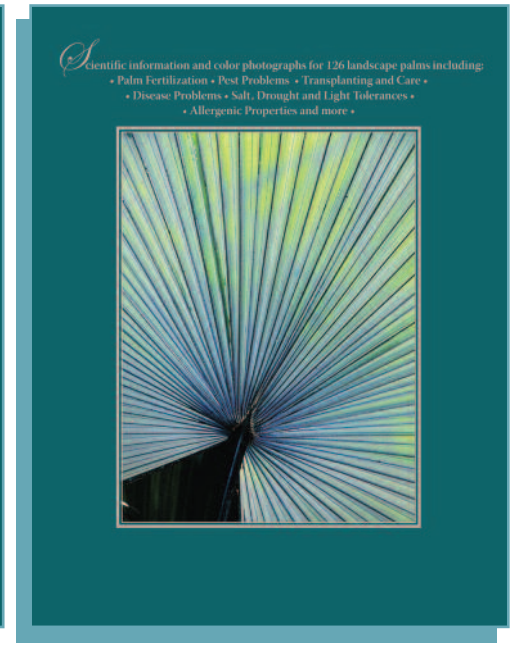

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