

Palms

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The International Palm Society

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FRONT COVER

A portion of the *Coccothrinax* collection at Fairchild Tropical Botanic Garden. See related article by C. Migliaccio and A. Reyes, p. 57. (Photo by C. Migliaccio)

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BACK COVER

A bird's-eye view of part of Fairchild Tropical Botanic Garden's *Coccothrinax* collection. For related story see C. Migliaccio and A. Reyes, p. 57. (Photo by Scott Zona)

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Ripening fruits of *Coccothrinax crinita*. Photo by Chris Migliaccio.



NEWS FROM THE WORLD OF PALMS

The IPS Board of Directors met in Miami, Florida in April. The meeting was hosted in the elegant grounds of the Montgomery Botanical Center, but MBC's fabulous palm collection did not distract the Board from carrying out the Society's business. IPS President Paul Craft presided over the day-long meeting, which was attended by 22 Board members from Spain, Australia, Dominican Republic, England and throughout the US. The Board also reviewed proposals submitted to the IPS Endowment Fund, the results of which will be announced in the next issue of PALMS.

A second newsworthy event was the official retirement of Co-Editor John Dransfield from salaried work at the Royal Botanic Gardens Kew, as the head of Kew's palm research program. John's retirement was marked by two major events in the fortnight leading up to his official departure on 18 April 2005. We thank Dr. Bill Baker for his account of the activities from which we summarize: On 6–8 April, a conference was held in John's honor at the Linnean Society and at Kew. "The Palms – An International Symposium on the Biology of the Palm Family" was attended by well over 100 delegates from 22 countries. Thanks to support from Kew, the Linnean Society, the Annals of Botany and the Systematics Association, ten bursaries were awarded to participants from overseas countries, including Nigeria, Bolivia, Brazil, Colombia and the Philippines. The standard of science, reported in the 22 talks and 40 posters, was exceptional, ranging from new advances in palm evolution and classification through to state-of-the-art ecological findings and encouraging developments in palm conservation. It was not all work and no play, however. On day two at Kew, after a morning of workshops, Dave Cooke and Emma Fox ran a series of

tours aimed at highlighting the splendors of the Palm and Temperate Houses and the remarkable collections that they contain. After a quick spin in the Kew Explorer tram, delegates were delivered to a glorious reception in the Palm House, complete with a surprise planting by John himself of a palm whose new genus name will honor John. The event was sneakily captured by a BBC team, who is currently filming a second season of *A Year at Kew* to be shown on British television. The day was rounded off with a dinner among a forest of handsome specimen palms. Both before and after the conference, the Palm Section in the Herbarium was crowded with more than 20 visitors, effectively distracting John from the mixed emotions of impending retirement. A week after the conference, Soejatmi Dransfield, along with many of John's friends and colleagues, laid on a spectacular spread for John's retirement party, including the legendary Three Palm Pudding (see a recipe in *Principes* 21(1): 21. 1977, co-authored by John and Soejatmi before they were married). After a touching speech from Henk Beentje and tall tales from colleagues, the 150 party-goers cleared the groaning table faster than you could say "*Johannesteijsmannia*."

John and Soejatmi will be back in Kew on a regular basis as Honorary Research Fellows. John's ambitious research plans include producing a second edition of *Genera Palmarum*. This edition will include additional co-authors, including Connie Asmussen, Bill Baker, Madeline Harley and Carl Lewis. John will also be working on the Palms of New Guinea project coordinated by Bill Baker, as well as keeping up other interests in Southeast Asia and Madagascar.

THE EDITORS

The Genus *Coccothrinax* in Cultivation

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1. A portion
of the
extensive
collection of
Coccothrinax
at Fairchild
Tropical
Botanic
Garden.



For many years, only a handful of *Coccothrinax* species have ever been cultivated outside of the Caribbean basin. In the last five years, over two dozen additional species have become available to collectors. Although little is known about the needs of these species in cultivation, some of these palms are very beautiful and deserve wider use.

Palms of the genus *Coccothrinax* are species from coastal scrub and open forest from the Caribbean islands and bordering lands (Uhl & Dransfield 1987). While most forest species are found in the mid-canopy, a few are emergent palms. All are solitary, with the exception of *C. pseudorigida* and *C. fagildei*, which cluster.

Currently, there are 50 accepted species in the genus. Considerable taxonomic confusion exists because many pockets of endemism occur in eastern Cuba, perhaps due to the rich assemblages of soil types and microclimates,

and most species seem to possess limited distribution ranges, making finding the palms, much less collecting ripe seeds, difficult.

When Henderson, Galeano and Bernal published the *Field Guide to the Palms of the Americas* in 1995, they reduced the number of species to 14 and indicated that the genus was in dire need of revision. However, Moya and Leiva's checklist (2000) enumerated 38 species for Cuba alone. When the second largest center of distribution, Hispaniola, is considered, the number of accepted species

2. *Coccothrinax crinita*, a species known for its long fibers covering the trunk.



may be even greater. It is easy to see that this genus does indeed need a great deal of work to sort out the species. Complicating matters further is the fact that anecdotal evidence strongly suggests that a significant amount of hybridization has occurred among the species cultivated in South Florida, a situation making taxonomic work based upon these individuals challenging, to say the least. A complete taxonomic review of *Coccothrinax* would clarify the taxonomy of existing species and would be particularly welcome in the light of the current collecting activity in Cuba and the Dominican Republic that may very well result in the discovery of new species.

This article focuses on the cultivation of some of the attractive, but little known, taxa that have recently come into South Florida. Because of the confusion regarding names, the taxonomy of the genus cannot be ignored completely. This paper thus relies more closely on the work of Cuban botanists most familiar with the species in the wild than on other published accounts.

For many years, only a handful of *Coccothrinax* species have ever been cultivated. In this paper, we define “cultivation” to mean species found in the landscape trade or in private collections (botanic gardens and individual collectors).



3. *Coccothrinax miraguama* is appreciated for its attractive, persistent leaf base fibers.



4. The trunk of *Coccothrinax spissa* is swollen.

Interestingly, a few species are widely grown, while the many more species are practically unknown outside their countries of origin. Some of these species deserve wider use because of their beauty.

Presently, only about eight taxa are known to be grown for the commercial landscape market; a handful are being tried in the Canary Islands, but another 30 have gradually begun to be grown in South Florida. Proximity to wild seed sources, however irregular and limited in quantity, and similar climate and soil type, make South Florida well suited for cultivating and studying the genus. Their slow growth rate makes them challenging

candidates for long term study, and for the same reason, few of the newly available species are likely to be embraced by the landscape trade. Several species that have moderately fast growth rates hold some promise. Warm and dry regions of Australia and Hawaii could also be well suited for growing this genus, but low soil pH in both locations limits *Coccothrinax* cultivation. Few species grow well in either location. Likewise, southern California does not seem to be a good habitat for most species because of its long and cool winters.

For many years, *Coccothrinax argentata*, *C. barbadensis*, *C. crinita* (Fig. 2), *C. miraguama* (Fig. 3) and *C. spissa* (Fig. 3) were the only



5. A suspected hybrid between *Coccothrinax* and *Zombia*.

species widely found in cultivation, although a handful of names (*C. argentea*, *C. martii*, *C. alta*) were indiscriminately applied to plants available at local palm sales. Occasionally plants identified as *C. boschiana*, *C. clarensis*, *C. cupularis*, *C. gracilis*, *C. fragrans*, *C. inaguensis*, *C. jamaicensis*, *C. readii* and *C. yuruguana* have been sold at Fairchild Tropical Botanic Garden or South Florida Palm Society sales. However, very few other species have appeared in cultivation until the past three years when collectors from around the Caribbean basin began palm prospecting in Cuba and the Dominican Republic. As a result, seeds and seedlings of numerous taxa have begun to

appear at local palm sales and offered on the Internet by commercial seed and plant vendors. However, because the taxonomy is in disarray and there are no mature specimens of these new "immigrants" in South Florida, it is important to acknowledge that identification of these newly offered species is tentative at best. In a few cases, quantities of "fresh seeds" have been offered from locations where the palms simply do not exist and/or many months after the plants finished their annual fruiting.

Collections of seeds from palms in the type localities and extensive photo collections have

Table 1. Species of *Coccothrinax* in cultivation.

<i>Coccothrinax</i> species	Native to	Characteristics
<i>argentata</i>	Pine rocklands of South Florida including Florida Keys; coastal hammocks of southern Florida Keys; Bahamas; Yucatan.	Lax leaves dark green above and silver below; high drought and salt tolerance; slow growing.
<i>barbadensis</i>	Coastal scrub from Lesser Antilles south to Trinidad and Margarita Island, Venezuela.	Large green leaves, may be slightly silver below; fastest growing of genus (seed to 6 m [20 ft.] in ten years).
<i>borhidiana</i>	Scrub forest on karst near coast, Matanzas, Cuba.	Exceptionally stiff leaves with short petioles; leaves retained for years – superficially resembling a miniature <i>Copernicia macroglossa</i> ; erect inflorescences; South Florida specimens are finally producing large purple fruit after about 18 years of cultivation from seed; salt and drought tolerant.
<i>crinita</i>	Low serpentine hill soils in central and western Cuba; critically endangered.	Large green leaves; long arching inflorescences above the crown with large burgundy fruit; persistent leaf sheaths form thick layer of fibers on trunk; critically endangered in the wild (<100 plants in habitat) but arguably the most easily recognized and widely grown species of the genus in the world; easy to grow in alkaline soils despite being native to serpentine habitat; requires more water than others in genus.
<i>miraguama</i>	Pine forests and sandy scrub in western Cuba.	Probably several different subspecies; all share rigid green pinwheel leaves and coarse fibers; trunks favorable as hosts for small epiphytic orchids and bromeliads.
<i>proctori</i>	Cayman Islands.	Fast growing, salt tolerant, tall palm with close affinities to <i>C. argentata</i> and perhaps <i>C. barbadensis</i> .
<i>scoparia</i>	Widespread in pine forests in the Dominican Republic (and Haiti?)	Similar to <i>C. miraguama</i> with stiff, deeply divided leaves and wide, coarse leaf sheath fibers; trunk more slender.
<i>spissa</i>	Scrublands and open pasture in southern Dominican Republic and Haiti.	Stoutest trunk in genus (up to 70 cm [27.5 in.] in diameter in cultivated specimens); usually swollen midstem.



6. Community pot of seedlings of *Coccothrinax argentata* making vigorous growth.

been made to help identify the plants using the older *Coccothrinax* literature. Buyers should realize that all identifications should be considered tentative until more extensive field work is done and the genus is formally revised. In the meantime, growers should keep accurate records of seed sources and their own cultivation experiences to contribute to a growing body of information on this genus of attractive palms.

In the last few years, small quantities of seeds and nursery-grown seedlings labeled as *C. alexandri*, *C. argentea*, *C. camagueyana*, *C. fragrans*, *C. ekmanii*, *C. garciana*, *C. gundlachii*, *C. hiorami*, *C. macroglossa*, *C. moaensis*, *C. montana*, *C. munizii*, *C. borhidana*, *C. nipensis*, *C. pauciramosa*, *C. pseudorigida*, *C. salvatoris* and *C. saxicola*, have become available to growers. Because these species are "new to the trade" little is known about their cultural

requirements. This paper, therefore, presents what is known at this time and identifies what may be some horticulturally valuable species worthy of greater use in the subtropical and tropical landscapes.

Species in Cultivation

Because Florida is close to the center of distribution of the genus and has the wet/dry season and alkaline soil preferred by most members of the genus, more *Coccothrinax* (ca. 40 taxa) are cultivated here than anywhere else. The majority of species are recent arrivals, and few fruiting specimens exist. Anecdotal evidence suggests that what have been recognized as *Coccothrinax* species (particularly those in the *C. argentata* – *C. readii* – *C. inaguensis* – *C. litoralis* and *C. barbadensis* – *C. alta* – *C. readii* – *C. proctorii* – *C. jamaicensis* groups outside of Cuba) can form fertile hybrids. This evidence suggests that each

group may be one species that displays a wide range of characteristics across its range rather than a guild of multiple species. Additionally, an intergeneric and sterile *Coccothrinax* × *Zombia* hybrid has flourished at Fairchild Tropical Botanic Garden in Miami for decades (Fig 5). Obviously the application of DNA analysis to all *Coccothrinax* could help clarify the picture.

Table 1 presents the species that have been grown for the longest time in South Florida, as well as in Hawaii, Australia, the Canary Islands and elsewhere. Palms known as *C. alta* and *C. argentea* are also in cultivation, but all the mature plants the authors have seen have horticultural origins and resemble either *C. argentata* or *C. barbadensis*, or share a mixture

of characteristics that make identification challenging.

Cultivating *Coccothrinax*

Coccothrinax are best grown from freshly collected ripe seeds. After removing the pulp, soak the seeds 1–3 days and discard any “floaters.” Dried seeds may be soaked for over a week to rehydrate them. Sow the seeds shallowly in a 10–15 cm deep community pot of well drained medium kept in a warm, sunny space. Fresh seeds germinate best, but seeds can take up to a year to germinate. Be patient and do not throw the seeds out until they rot. If the soil mix breaks down, remove the ungerminated seeds, replace the mix and resow.



7. The root mass of *Coccothrinax hiorami* is large and benefits from a large, roomy pot.

8. *Coccothrinax boschiana* is slow-growing but attractive, even as a young plant.



Community pots may be divided when seedlings are at the two-leaf stage. Seedlings should be placed in pots deep enough to accommodate the long roots (Fig. 6) *Coccothrinax* germinates remotely, so be sure to plant the seedling so the roots are below the soil and the bud of the seedling is above ground. Once again, a well-drained medium is best and may be amended with crushed limestone rock or dolomite for drainage and to maintain an alkaline root zone.

Coccothrinax benefits from over-potting – that is, planting in larger pots than most palms, because of their proportionately greater root mass (Fig. 7). Growth rates can be increased by moving seedlings and juvenile plants into pots one size greater than the usual sequence. Keep potted *Coccothrinax* off the ground on benches to ensure good air circulation around the plants. Most species (except *C. crinita*, *C. montana* and *C. yunquensis*) will tolerate full sun even as seedlings. Growers in subtropical



9. *Coccothrinax borhidiana* is a handsome palm for gardens.

regions will also need to provide cold protection for these small potted palms, especially from dry winds and cold rain that encourage fatal fungal infections. Regular applications of a balanced time release palm fertilizer and micronutrient sprays will also promote growth and strengthen plants against conditions of low humidity and cool winter temperature. Patience is also a requirement for growing palms in this genus as most are slow-growing, particularly for the first 3–5 years.

Because most species are found in sunny, seasonally dry climates and in well drained alkaline soils, similar landscape conditions will promote the best growth when the palms are ready to be planted. Dig a large hole to accommodate future root growth and then water and mulch the newly planted palms to mimic their habitat. Planting at the beginning of the rainy season will help young plants get established. Keep mulch away from the trunk to avoid fungal infection and fertilize lightly



10. *Coccothrinax camagueyana* has silvery leaves with bluish cast.

for the first six months with a palm fertilizer with N-P-K ratio of 2-1-3 and micronutrients. Liquid fertilizers may be used for plants in the ground or in pots but are unlikely to have much effect on slow-growing palms such as these.

Many of the very attractive Cuban species are found in serpentine soils rich in nickel and/or other heavy metals such as iron, chromium, cobalt and manganese. These soils also feature high magnesium/calcium ratios with

correspondingly low levels of calcium, potassium and phosphorus. In fact, calcium levels in serpentine soils are virtually zero. Serpentine soils can be either acidic or alkaline with older serpentine areas tending to be more acidic and newer ones slightly more alkaline. For the serpentine species (*C. sp. "azul"*, *C. camagueyana*, *C. clarensis*, *C. garciana*, *C. moaensis*, *C. pseudorigida* and *C. yuruguana*) long-term container culture may be the only viable option unless local soils are serpentine

as well. Alternatively, using an iron and magnesium amendment once a month seems beneficial.

Species worthy of wider cultivation

The following species are worthy of wider cultivation because of the characteristics listed and their prospective adaptability to subtropical or tropical conditions on well drained alkaline soils.

C. alexandri – 13–20 m, robust, Cuban, coastal palm with large crown of stiff leaves with silver undersides.

C. boschiana (Fig. 8) – slender, Dominican Republic, coastal species with leaves golden green above and silver below; heavy, coarse fiber; slow-growing.

C. brevicrinis – Cuban palm with short trunk, short, coarse fibers and dense crown intermediate in “hairiness” between *C. borhidiana* (Fig. 9) and *C. crinita* (Fig. 2); from a different part of Cuba with different soil (*C. crinita* comes from serpentine area, *C. brevicrinis* from alkaline calcareous soils).

C. camagueyana (Fig. 10) – drought tolerant, serpentine species good for pot culture, moderate growth rate, stiff leaves with silver-

blue cast on upper surface; similar to plants known as *C. “azul”* (Fig. 11).

C. fragrans – Dominican Republic and Cuban species with stout trunk; close affinity to *C. spissa*.

C. garciana – serpentine species from Cuba with spiny red leaf fibers to 2 cm wide, rigid round leaves on short petioles; exceptionally slow growth rate and soil requirements may limit this to long-term pot culture.

C. gundlachii – robust, Cuban species with large, stiff leaves, erect inflorescence and heavy, coarse fiber.

C. litoralis – coastal Cuban species found in sandy, wet, littoral scrub; high salt tolerance and moderate growth rate.

C. macroglossa (Fig. 12) – robust, Cuban palm with large black fruit, stiff leaves that are silver underneath, coarse fibers.

C. montana – an understory palm from the moist mountains of the central Dominican Republic; dark green leaves deeply divided; fast-growing; white fruit.

11. The species known to growers as *Coccothrinax “azul”* is one of the bluest species.





12. *Coccothrinax macroglossa* has stiff leaves that are silvery underneath.

C. munizii (Fig. 13) – a thin-stemmed, Cuban species with small, wedge-shaped leaves; tiny fruit; a good planting companion with cactus.

C. pauciramosa – medium-sized, coastal, Cuban species with erect inflorescence and heavy, coarse fiber; easy to cultivate.

C. salvatoris – Cuban brackish forest species with a compact crown, wide leaf segments, heavy fiber and starburst-like leaves.

Many questions remain

A handful of other species (*C. clarensis*, *C. cupularis* (Fig. 14), *C. ekmanii*, *C. guantanamensis*, *C. hiorami*, *C. inaguensis*, *C. jamaicensis*, *C. pseudorigida*, *C. readii*, *C. saxicola*, *C. yunquensis*, and *C. yuraguana*) are so poorly represented in cultivation that identification of some of the plants may be questionable, particularly if the plants were grown from seeds collected in botanic gardens. Furthermore, the following taxa remain poorly known altogether or unknown in cultivation outside their country of origin (Cuba, unless

otherwise noted): *C. acunana*, *C. baracoensis*, *C. bermudezii*, *C. concolor* (Haiti, extinct?), *C. elegans*, *C. fagildei* (clustering with up to 100 heads!), *C. leonis*, *C. microphylla*, *C. moaensis*, *C. muricata*, *C. nipensis*, *C. orientalis*, *C. pumila*, *C. rigida*, *C. savannarum*, *C. trinitensis*, and *C. victorini*) that their horticultural potential cannot be evaluated at this time.

A further comment

As we worked on this article, we realized that cultivating *Coccothrinax* serves as a metaphor of life itself and offers many meaningful lessons – patience is an important virtue, actions often take a long time to bear fruit and no matter how much we would like to see things happen, Nature moves according to its own timetable. *Coccothrinax* seedlings need the right nutrients, just the right amount of water and sunlight and a healthy environment. They can tolerate a fair amount of pests, including overprotective “parents.” Whenever our conversation turns to which species just produced its first divided leaf after years of growth, we are reminded of these lessons.



13. *Coccothrinax munizii* is a slender palm with stiff leaves from the driest part of southeastern Cuba.

Summary

As more species of *Coccothrinax* are cultivated, we hope that commercial growers and collectors will share their experiences in palm forums and in the literature so that these attractive palms will find greater use in landscapes. We hope to see more *in situ* and *ex situ* conservation efforts, particularly for the Cuban species with limited distributions, in order to buffer the effects of human activity, particularly coastal tourism, in Cuba and the Dominican Republic. Additionally, consistent practice of sustainable collection techniques and appropriate horticultural methods can also ensure the survival of *Coccothrinax* in the wild and in cultivation. These practices include

collecting a few seeds from many individuals rather than all the seeds of a few specimens, harvesting only ripe seeds and processing them promptly, matching the cultural conditions to the plant's own habitat as closely as possible, as well as carefully monitoring these palms from sowing to planting in the landscape. It is particularly important to obtain as much knowledge as possible of the ecology of these palms in the wild, as this information will help us determine each species' suitability for cultivation and techniques of conservation.

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The authors thank Dr. Scott Zona, Palm Biologist at Fairchild Tropical Botanic Garden



14. *Coccothrinax cupularis* is still uncommon outside botanical gardens. This specimen grows at Fairchild Tropical Botanic Garden, Miami, Florida.

and Paul Craft, President of IPS for their ongoing encouragement of this project, assistance with translations of original descriptions and their editorial suggestions. Many collectors and horticulturalists kindly shared their experiences; notable among them were Mike Harris, Loxahatchee, Florida, USA; Dale Holton, Lake Worth, Florida, USA; Marcel Moreno, Miami, Florida, USA; Ken Neugent and Mike Davenport, Fairchild Tropical Botanic Garden, Miami, Florida, USA; Carlo

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PALM LITERATURE

PALM TREES: A STORY IN PHOTOGRAPHS. David Leaser. Westwood Pacific Publishing, Los Angeles, California, USA. 2005. ISBN: 1-59588-010-0. US \$39.95, cloth hardcover bound with platinum foil debossed title, color dust jacket. Pp 144.

David Leaser's new book, *Palm Trees: A Story in Photographs*, is brilliant in concept: Show the diversity, beauty and importance of palms through a large-format picture book, let the photographs do the talking and keep the text clean and simple. The book succeeds admirably and resoundingly! This is not a gardening book, nor is it a compendium of exotic, little-known palm species. It is a large-format "coffee table book" devoted to palms. It is the sort of book one can dip into at random or read cover to cover. Either way, the book is a treat.

Leaser's book begins with an introduction and two chapters examining the historical significance of palms and the cultural importance of the coconut. The bulk of the book comprises four chapters illustrating palms by geographic area: the Americas, Africa and the Indian Ocean, Europe and the Middle East, and Asia and Australia. The book ends with an excellent listing of public gardens where readers can see good palm collections in the USA, Australia and England. I noted that several important palm collections outside of these areas were omitted.

Some of the photos show palms in public spaces, others show palms in private gardens and still others show palms in the wild. Frequent visitors to Fairchild Tropical Botanic Garden will recognize many of our palms in Leaser's book. Palms from the Huntington Library and Botanical Gardens in southern California and from several botanical gardens in Hawaii also make frequent appearances. I very much enjoyed thumbing through the book and seeing palms I know through the viewfinder of a professional photographer. Some of those palms have never looked so good!

Each chapter includes some text, which is clear, accurate and well written, but as the title

says, the story is told in the photographs. The "story" is not so much a narrative as it is a collection of brief anecdotes. The selection of palms in the book reflects Leaser's personal interests and travels. This is not a book in which to see exotic, never-before-illustrated rarities. In fact, most of the palms in the pages of this book are commonly cultivated species, but Leaser brings out the beauty in even the most common palms. At last, we have definitive photographs on pages 46 and 47 of coconut palms on a beach at sunset, of a bottle palm (*Hyophorbe lagenicaulis*) (p. 91), of *Phoenix canariensis* in Southern California (pp. 96 and 97) and of *Caryota* leaves aglow with back-lighting (p. 112). These subjects have been so well photographed in Leaser's book that any further attempt to portray them would be just plain futile.

Panoramic photos spread across two pages, interspersed with close-ups, portraits and vast expanses of white space, make each page a visual feast, but if I have any real criticism of this book, it is that many of the photos in this book are a bit too rich. The photos are just a bit too colorful, the skies are too blue and the lawns are too green. I am indebted to Don Hodel (pers. com.) for pointing out that some of the photos have been altered in more significant ways. For example, Don noted that the clouds in the dust jacket photo of Fairchild Tropical Botanic Garden are the exact same clouds seen in the photo on pp. 132 and 133 of Hoomaluhia Botanic Garden in Hawaii. Purists might cry foul at Florida clouds transported to Hawaii, but I must admit, the resulting composite photo is pleasing. The technical wizardry and digital artistry sometimes overshadow the subjects of the photos, but the art of story telling allows for this sort of embellishment. No real harm is done by these artistic liberties.

Leaser's *Palm Trees: A Story in Photographs* is an attractive introduction to this photogenic family. No other book better illustrates the beauty of palms and their place in our gardens and in our hearts.

SCOTT ZONA
Fairchild Tropical Botanic Garden

Behind the Date Palm in New Caledonia

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1. The cemetery of the patron saint Sidi Moulay on the road from Nessadiou to Bourail (Photo: M. Ouenoughi, Jan. 2000).



The presence of date palms in New Caledonia reflects the sad history of men.

2. Great grandson climbing the date palm of his great-grandfather, the deportee Mamâar of the Ouled Zekri tribe (Photo: M. Ouennoughi, Feb. 2003).



To understand the origin of the date palms that are found in several areas of New Caledonia, we have to go back in history, to the origin of the Arab-Berber community; beyond the tree and its edible fruits, a whole culture is revealed to us, which has been preserved, indeed recreated, by the will of uprooted men who found in it the strength to survive.

The French colonization in Algeria was marked by a series of insurrections, harshly repressed – those of southern Oran in 1864, the territory occupied at that time by two large, related Algerian and Moroccan Berber tribes, those of Kabylia in 1871, of El Amri in 1876 and of Aurès in 1879. New revolts took place in 1881–1882 and spread into southern Tunisia. The insurgents were sentenced to deportation. Between 1873 and 1878, 1200 Algerians and

several Tunisians were deported in this way to New Caledonia; other convoys arrived there up to 1894 with new prisoners from the Maghreb.

The French prisoners (political – mainly the “Communards” – and common law prisoners) sentenced for more than seven years were condemned to perpetual exile. The most deserving were freed on good behavior and obtained tracts of land on the penitentiary area. They were able to cultivate the land and found families; they became colonists. The right to the acquisition of land was granted only afterwards to Algerian prisoners. As Collinet (1978) emphasized, they would have to wait until 1885 for Algerians to become provisional landowners. They had to cultivate their land and in this way prove to the penitentiary administration that they could ensure their subsistence.



3. Date palms planted by the deportee Ben Toumi (Photo: L. Delozanne, Feb. 2003).

The region of Bourail (163°09'44"E; 21°33'41"S) was selected for the establishment of an agricultural penitentiary that was founded in 1867. The first concessions were ceded in 1870. In 1877, there were 197; in 1885, there were 337. The freed men became more numerous and a decree in 1884 extended the penitentiary area to 17,363 hectares, including parts of Gouaro, Nessadiou, Néra, Boghen, Téné, Pouhéo and Ny valleys. The freed Algerians settled mainly in the fertile valleys of Nessiadou and Boghen. This region is semi-arid (Nicomède 1886) with a climate characterized by a hot season with an average temperature of 26°C from November to May, and a dry temperate season for the rest of the year with much fog and an average temperature of 22°C.

Bourail became a little bit of Algeria. In 1895, 500 Algerians were censused there. Today, a crescent moon on the coat of arms of the municipality recalls the many Algerians who contributed to its foundation. The old Algerians came there to die, surrounded by their community, which explains the concentration in the cemetery of 218 graves of Muslims who died between 1871 and 1979. The deportee Miloud Ben Abdallah donated a piece of land, in homage to the patron saint Sidi Moulay, for the creation of the cemetery of Nessadiou.

At the same time, as a part of a colonial policy of land occupation, women sentenced in metropolitan France could escape prison by accepting deportation to New Caledonia to found a family there. Arriving in Bourail, they married freed deportees, French and Algerian,

4. Mr. Ben Toumi, descendant of the Patriarch Ben Toumi, picking out shoots in the Voh valley (Photo: M. Ouennoughi, Feb. 2003).



who had obtained a tract of land. Couples, in spite of their mixed Algerian and French origin, reconstituted a community around traditional practices. The descendants of the second generation explain that the deportees transmitted their know-how to their French wives who took care of the vegetable gardens and cooked traditional dishes. Hard wheat was used to make unleavened cake (*kesra*) or bread (*khobz*). They also prepared cakes with pounded dates. Today, there exists a large group of descendants of Berber-Caledonian origin. They refer to the deportees as “Old Arabs,” which signifies the deep regard in which they held them. The association of “Arabs and Friends of Arabs” was created on the death of the last deportee, Rouiana Ali Ben Salah (1869–1979), who was a farmer born in

Douar Hammania in Constantine Province, Algeria. The mission of this association is to keep Arab-Berber culture alive in New Caledonia. It constitutes a sort of village assembly or council along the principles of the *djemâa* of the Maghreb peoples; in particular it is responsible for the renovation of the cemetery of Nessadiou.

The date palm in daily life

The Old Arabs said that the date palms should not be destroyed because they marked their passing. They practiced their religion and gathered around places of worship, marked by the presence of date palms. The cemetery was one of them (Fig. 1). The palm tree is still present in the life of the inhabitants of Bourail even though its economic importance is hardly

significant. Today, there are no weddings without palm leaves; these are used to decorate the places where the ceremonies are celebrated. The names given to girls are related to the date palm. Thus, the first names *Nakhlà* and *Tamara* are frequently heard in the valley of Nessadiou. *Nakhlà*, of Arab origin, is the name given to the female palm tree before the production of ripe dates. The word *tamar*, of Hebrew origin (Munier 1975), is also found in the oases of South-east Algeria and in Kabylia in the form of *tmar* and refers to the ripe date. Both first names recall the origins of the deportees in the oases; both symbolized abundance, prosperity and fecundity.

If the younger generation has lost all knowledge of the date palm and its traditional culture, the older still remembers. Their stories transmit precious information on the know-how of the Old Arabs. They tell us that the old ones planted the date pits according to the lunar month in relation to the period of Ramadan; this cycle announced the rains. This practice derives from the custom found in certain Saharan oases. Thus, in the oases in Ziban, for example, the fast ends with a date, and the pit was planted immediately. In both cases, the planting of the pits is accompanied by invocations.

According to their descendants, the Old Arabs also built traditional Saharan-type wells that made it possible to supplement a dry spell by irrigation. Traces of subterranean galleries to draw water from the water table can be still found, along with clay channels (*seggia*). The well belonging to Ben Yamina family was equipped with a similar type of seesaw pump found in the Maghreb (*chadouf*); the seesaw was made of the trunk of the date palm. The oldest members of the family saw how their fathers – who were originally farmers and also often blacksmiths and traders – applied their knowledge brought directly from the Sahara. At the forge, they re-created the traditional tools for date palm cultivation, as those illustrated by Brac de la Perrière (1995) for North Africa – the *mendjels* (saw-toothed sickle), the *meshas* (short-handled hoes) and *djebbar* pliers to separate the shoots of the mother-plant. These tools originating from rural homes have been assembled in the Museum of Bourail.

The cultivation of the date palm did not spread in those regions of New Caledonia as might have been expected. In effect, it required a good deal of labor from the men of the households. However, men were mobilized in

1918 by the nickel mines at Thio, and there was also much loss of life during the world wars.

The varieties of dates found in New Caledonia and their origins

What do the varieties of dates in New Caledonia teach us? To what extent can they contribute to re-creating the history of plant introduction? In the 19th century, dates constituted the staple food for many inhabitants of the Maghreb. Many varieties can be found there, most of which were important only locally but some of them had become and still are known nationally (*khars*, *tafezouine*, *takerboucht*) or internationally (*deglet nour*, *medjool*). Dried varieties such as the *mech degla* of Ziban or the *degla beida* of Oued Rhir kept very well and provided nomadic peoples, in particular, with a food resource rich in calories and mineral salts. The pits were fed to animals as well (Dubost 1989). Saharans today consider that an annual stock of 50 kilograms of dates is required per person. It is not surprising then, one way or another, that the convicts kept stores of these fruits all around them during their long exile. A survey conducted in an oasis (El Ghraous) in Ziban among the old men of the Bouazyd families revealed that small bags of *deglet noor* dates had been given by their relatives to those sentenced to ensure their survival.

These facts have remained alive in the collective memory of the Arabo-Berber community of New Caledonia that resulted from the deportation. It is thought that the patriarchs planted the pits they brought from North Africa to mark their clan or their tribal affiliation. In Pouembout region, which neighbors Bourail, oral tradition named a variety *zekri* in memory of the political deportation of Mamâar of the Ouled Zekri who belonged to an insurgent tribe in Ziban (Fig. 2). In the same way, several varieties of dates, common among the people of Nessadiou, Boghen and Voh, refer to the deportee Ben Toumi – an important person of Ibadite origin from the North African region of Mزاب – who had employed Algerian farmers from Nessadiou and Boghen to develop crops associated with date palms (Figs. 3 & 4). One variety is closely related to that known as *okhet degla* from its red, short oval dates. *Okhet degla* is reported from southern Tunisia in Degache Oasis, where the date farmers kept it as a heritage. Other varieties found in New Caledonia such as the variety *loulou* are considered to be of Berber origin.

The historical procedure developed by Ouennoughi (2004) revealed the relationships between the varieties of dates found in New Caledonia and their origins in the Maghreb and the Sahara. It offers a pertinent framework to be explored with molecular markers in order to improve our knowledge of palm fruit transport in the recent history.

Guardian of memories

The North Africans deported to New Caledonia recreated a social fabric that reflects the memory of their Berber and Kabylia origins. They imported date pits, to which they attached the cultural values of the oases. They planted them in respect for their traditions. In this way, the cultivation of the date palm was introduced according to the traditional methods of multiplication of shoots and of irrigation. This know-how was progressively lost with the passing of time. If only traces remain in the accounts of the first and second generations, in the tools conserved in the museums, in the headstones in the cemeteries, the memory is still alive, there, behind the date palms.

Acknowledgments

We thank Mr. Guy Moulin, Mayor of Bourail, and the members of the municipality council

who supported the project. We are indebted to Mrs. Ghislaine Salem, responsible for Bourail historical patrimony, and to the inhabitants of Boghen, Nessadiou, Pouembout and Voh valleys for their helpful assistance during the investigation. Mrs. Debora Taylor translated the French version into English.

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Ethnobotanical Notes on *Caryota ophiopellis* in Vanuatu

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1. *Caryota ophiopellis*,
Tanna, Vanuatu.

Caryota ophiopellis Dowe is endemic to two islands of the Vanuatu archipelago, where it is used as a source of starch during famines. It is threatened by expanding human settlements.

The Vanuatu archipelago, made up of some 80 islands, is situated between Fiji and New Caledonia in the southwest Pacific. The climate is generally tropical, becoming more temperate towards the south and with increasing altitude. The islands are mainly of volcanic origin, and the relief is often abrupt. The highest point of Vanuatu, Tabwemasana on the island of Espiritu Santo, reaches an altitude of 1879 meters. The geographical complexity explains the diversity of the ecosystems found in the region, ranging from mangroves to lowland rainforest to high altitude montane forests.

One of the most distinctive palms of Vanuatu is *Caryota ophiopellis* (Fig. 1). This palm has a single stem 7–9 m in height and 30–40 cm in

diameter (at 1.5 m from the ground), but the diameter is slightly reduced at the base. The stem is marked with conspicuous nodes, and the internode length is 20–30 cm. The bipinnate leaves are characteristic of the genus *Caryota* (Fig. 2). The petioles, 60–70 cm long, have the texture and appearance of snakeskin, and for this reason, the palm is commonly known among the islanders as the “snake-skin palm.”

This palm is hapaxanthic and, because it is single-stemmed, it is also monocarpic, meaning that the individual dies after completing its flowering and fruiting cycle. The inflorescences carry both male and female flowers, but some of the uppermost



2. *Caryota ophiopellis*,
Anatom, Vanuatu.



3. Ripe fruits of *Caryota ophiopellis* are red; occasionally two-seeded fruits are found.

inflorescences have only female flowers. Each inflorescence is pendulous and can measure up to one meter in length. Fully matured fruits are red containing a little white gelatinous pulp and one seed, but we have also observed occasional two-seeded fruits (Fig. 3). The seeds, measuring 0.9–1 cm in length, are black and slightly rounded.

Caryota ophiopellis is found at an altitude of between 10 and 400 m (Dowe & Cabalion 1996), where it flourishes mainly in virgin forest, if one can consider that “virgin” forests still exist on these islands, as well as in secondary forests, with little undergrowth and a permanently humid soil. It does not colonize open spaces such as gardens and cultivated land, nor have we observed any young plants on fallow land or coppices. This leads us to believe that populations of *Caryota ophiopellis* are highly sensitive to modifications in their ecosystem and encounter difficulties in colonizing new territories.

The seeds of *Caryota ophiopellis* germinate in great numbers close to the parent palms, but seedlings also find their way under the crowns of large trees where pigeons and giant bats, great consumers of the fruit of *Caryota*, like to perch. It is worth noting here that the fruit

pulp does not seem to be an irritant to man or beast, unlike that of *Caryota urens*.

Caryota ophiopellis is found exclusively on the islands of Tanna (mainly the western part) and Anatom, to the south of the archipelago. It is found in abundance in other localities near Lenakel, Isangel, Loanatom and Green Point, on Tanna. Schmid (1970) collected one specimen on northern Tanna, but we have not as yet visited this part of the island to examine this population. Our correspondents tell us that the species is not found in the interior of Tanna (Middle Bush), because of low temperatures, nor to the east, which is prone to deposits of ash from the volcano Yasur. On Anatom, we observed small populations in the center of the island growing alongside arborescent ferns of the genus *Cyathea* and other species that appreciate humid conditions.

According to Dowe and Cabalion (1996) the species is native to the islands of Tanna and Anatom. Walter and Lebot (2003), on the other hand, suggested that it may have been introduced to the archipelago during the 19th century or later, but they provided no justification for their comment.

Etymology and local names

Caryota comes from the Greek *Karyota* meaning nut-bearing. The Latin terms *ophio* (snake) and *pellis* (skin) are reference to the color and texture of the petioles, which are similar to snakeskin. Of course, among the villages in Vanuatu, the scientific name has no meaning. Instead, common names are used.

Some 110 languages are still spoken in Vanuatu (Bonnemaison 1986). Eight different languages are used in Tanna and one language in Anatom. One single species can have many different names depending on the locality. We have found the following names locally given to *Caryota ophiopellis*: *Nip* near Lenakel (Tanna), *Nipitari* near "Green Point" (Tanna) and *Irejei* in Anatom. This list is certainly incomplete, as not all of the linguistic zones have been visited.

The legend of the Nip

During our visit to the village of Lowanatom (west coast of Tanna) the following story was related to us:

All the plants came from the sea, but the first was the *Nalien* the Magician (*Tradescantia* sp.). The *Nalien* summoned all the new arrivals in order to attribute a place where each could grow. In this manner the coconut palms and the yams found their place on the coast, and the arums were confined to the mountains. Two plants, the banana and the *Nip* declined the summons on the grounds that they would not take orders from a creeping plant. As punishment, *Nalien* condemned them never to see their children grow up, and ever since the banana and the *Nip* die immediately after bearing their first fruits.

Traditional usage

The *Nip* has many nutritional and cultural uses. As with many *Caryota* originating in southeast Asia and Papua New Guinea, the *Nip* is a kind of sago palm. Starch, stored within the stem, can be extracted and used as food. According to the tribal chiefs we interviewed the consumption of sago by the islanders is an extremely ancient practice. Sago is traditionally mixed with grated coconut and cooked in a stone oven. Thus prepared, sago "bread" is highly calorific. We have learned of two different methods of sago extraction.

The first method was recounted to us by an elder of the village of White Sand (eastern Tanna). The palm is cut down whilst in flower, because at this period the quantity of starch

within the pith is at its greatest. The stem is then split lengthways, and the pith is separated from the bark and reduced to powder with wooden pestles before being placed in a receptacle. Water is then added and mixed well with the pulverized pith. The milky liquid thus obtained is transferred to a second receptacle by way of a channel of bamboo which helps to trap any fibrous debris. A white starch settles in the bottom of the second receptacle. This sago starch is collected and used as food. We were able to witness a similar means of preparation in a village in the Lenakel region in western Tanna.

The second method of preparing *Caryota* sago was described to us by Chief Sam Kuke of the village of Lenatam (western Tanna). The method is similar in many respects to the first, but here the work is done at the river bank. Water from the river is drawn through a narrow channel into a deep hole lined with leaves to make it partially watertight. The pith is again pounded and placed at the top of the channel where water from the river flows over it and takes the starch into the hole. The starch clings to the leaves and can be easily collected after the water has drained away.

Today, sago is used as food in Tanna only during periods of famine. When plantations are devastated by cyclones or drought, the people turn once more to the forest in general and the *Nip* in particular for survival. Certain inhabitants of very remote villages affirm that they regularly consume sago, and on Tanna and on Anatom, the pith is used to feed domestic pigs.

On Anatom, the terminal buds of *Caryota ophiopellis* are a source of food, but the use of sago seems to have been either forgotten or ignored. Another indigenous palm, *Metroxylon warburgii*, is still known for its sago by the elders. The stem is also used as construction "wood" for flooring, walls and supports. The leaves, together with those of arborescent ferns and coconut palms, are used to make screens around the *Nakamal*, a place of initiation where young boys are circumcised and kept out of the sight of women for three months. *Caryota ophiopellis* also has medicinal uses. Decoctions of roots and the bark of the stem are a part of traditional remedies.

Conclusion

The most senior of our correspondents told us that *Caryota ophiopellis* was once abundant in all of the forests to the west of Tanna. The

development of agriculture and to a lesser extent the expansion of villages means that the palms are now found only in the valleys and other uncultivated lands and in regions farther from the villages. Although *Caryota ophiopellis* is occasionally grown as an ornamental tree, it is a species in real danger, except perhaps in Anatom where the human pressure is less severe. The danger is all the more real as this highly attractive palm is very rarely cultivated by collectors or botanical gardens.

Acknowledgments

We thank the Ministry of Agriculture and the Forestry department of Vanuatu, the herbarium in Port-Vila and its manager Sam Chanel, with whom this study was made. We thank also all the inhabitants of Tanna and Anatom, forest rangers, anthropologists and tribal custom chiefs for their help and support.

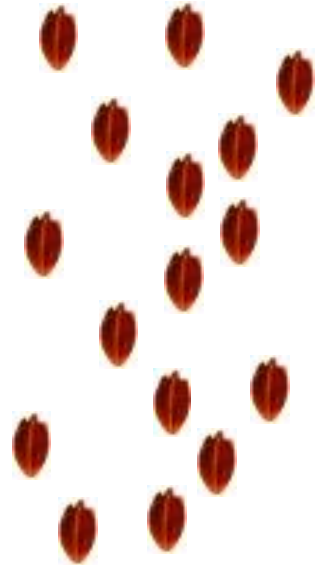
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PALM LITERATURE

PALMEIRAS BRASILEIRAS E EXÓTICAS CULTIVADAS (NATIVE AND CULTIVATED PALMS OF BRAZIL). H. Lorenzi, H.M. de Souza, J.T. de Medeiros Costa, L.S.C. de Cerqueira & E. Ferreira. Instituto Plantarum, Nova Odessa, São Paulo, Brazil. 2004. ISBN: 85 86714 20 8. 22 x 30 cm, hard pictorial cover, color throughout, in Portuguese. Pp 432.

Brazil's prominence as the tropical country with the best studied palm flora is carried forward another step with this new edition of the book *Palmeiras no Brasil*, published in 1996. Like the first edition, each taxon is described on a single page. The text provides common names and synonyms and describes the palm, its habitat, utility and propagation; accompanied by outstanding color photographs of the tree, the inflorescence and the fruit. The size of the book has been enlarged by about 80 percent; the number of native and introduced taxa featured are increased to 208 and 185, respectively; a key to the native palms is now provided and small distribution maps added to each entry. More than 90 percent of the native palm taxa of Brazil are described, including two natural *Syagrus* hybrids, the intergeneric hybrid *X Maximbignya dahlgreniana* and five undescribed species. The section on exotic palms covers nearly all of the common tropical ornamentals. A glossary is provided of botanical terms used in the book, along with

indexes of scientific names and common names and a bibliography.

My only criticism of this otherwise excellent book is that it does not appear to take into account revisions of *Aiphanes* (Borchsenius & Bernal 1996), *Allagoptera* (Moraes 1996), *Bactris* (Henderson 2000) and *Euterpe* and *Prestoea* (Henderson & Galeano 1996) published since the first edition.

I strongly recommend this book to those who grow or have an interest in Brazilian palms. The book has a sturdy binding, the printing on glossy paper is of the highest quality and the reproduction of color photographs is excellent. The IPS Bookstore stocks this title.

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A Journey Along the Rio Napo

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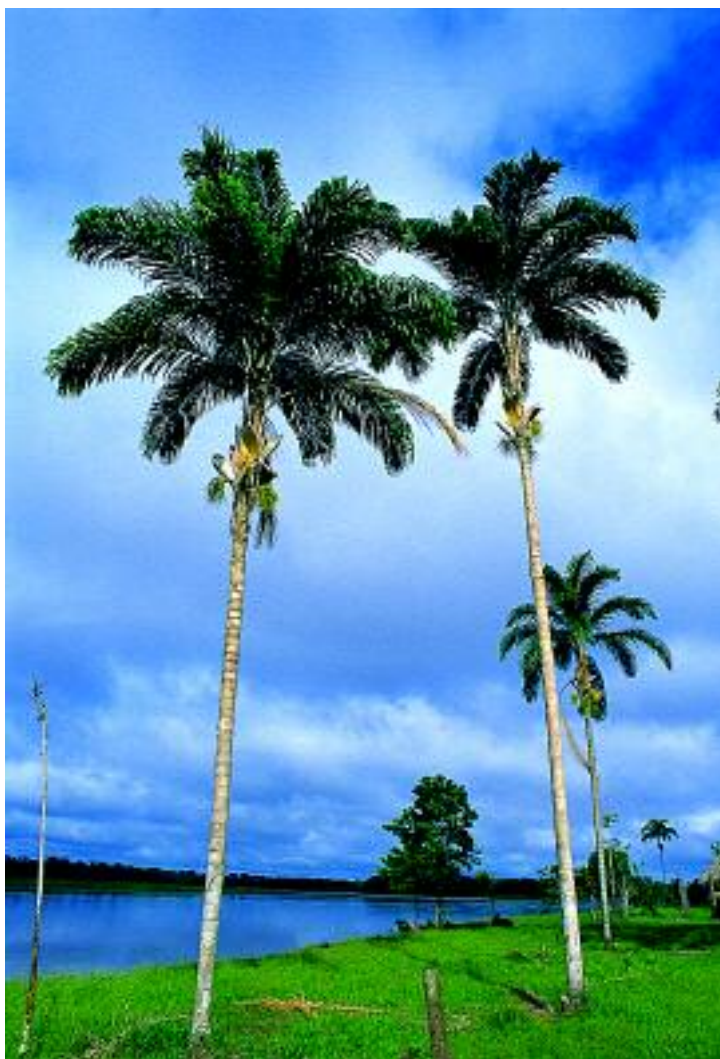
IRD

Whimper 442 y Coruña

A.P. 17.12.857

Quito, Ecuador

1. *Bactris gasipaes* in a pasture on alluvial terrace of Rio Napo. This species has been domesticated by Amerindians and is still widely cultivated in the Amazon, especially for its edible fruits.



An expedition along the Rio Napo, a tributary of the Amazon that flows through Peru and Ecuador, revealed some of the area's palms, their specific habitats and their importance in the lives of the local people.

In October–November 2004, IRD (Institut de Recherche pour le Développement, France) organized an international, multidisciplinary expedition on Rio Napo, a major tributary of the Upper Amazon River. Rio Napo originates from the northern Andes in Ecuador. In its upper valley, located some 25 km to the SE of volcano Cotopaxi (5897 m) it is no more than a tumultuous stream. It quickly enlarges and become navigable from Puerto Napo, some 70 km to the east of its source. In its lower course, in Peru, it reaches nearly 5 km wide in some points, and finally merges with the Amazon, 75 km downstream from Iquitos. The expedition included more than 20 scientists from five nationalities, with research programs in hydrology, geology, palaeontology and botany. Many new discoveries were made, including spectacular macrofossils such as the teeth of a 15 m long crocodile. A complete topography of the river as well as a continuous stratigraphic sequence of the past 20 million years was achieved.

I happily participated in the Peruvian part of the expedition, although joining it in the middle of the trip was not so easy. I was supposed to come with a small plane taking three passengers from Quito to Tiputini in the far eastern Ecuadorean Amazon, and meet there with a TV team who had to make aerial views of the expedition and landscape.

Everything began well; we took off from Quito airport and soon had magnificent views of the Andes, including the deep blue Mojanda Lake above Otavalo and various ice-capped volcanoes. Most spectacular was Cayambe (5790 m), of which we had a very close view. Then, as we descended toward the Amazon plain, the sky became more and more cloudy and when we reached the lowlands, we could hardly see more than tall yellow flames emerging from scattered oil fields, and the meanders of Rio Napo, in the middle of the mist and rain.

Approaching Tiputini, the rain became so heavy that water entered the plane from everywhere, and the only thing we could see was the lightning illuminating briefly the dense clouds all around the plane. It wasn't safe enough to spend more time in this area, and we had to go back to Coca airport, further up the Rio Napo. We waited desperately for several hours for better weather conditions, which never appeared on this unfortunate day. Since the plane had to go back to its base, I took my wet equipment and began to search for transportation to go down the Rio Napo and meet the expedition at Nuevo Rocafuerte, the last village before entering Peru. Unfortunately, it was a Saturday and there is little activity during the weekend in Coca. The next boat to Nuevo Rocafuerte was on Monday

2. A traditional house made of palm material at Campo Serio, Rio Napo.





3. A swamp forest dominated by tall *Attalea butyracea*, also with *Euterpe precatoria* and *Astrocaryum urostachys*.

and takes 12 hours to reach this village. By that time, the expedition would have been too far away downstream in Peru to be met. The only remaining option was to rent for myself alone a 20-seat powerful boat, which is normally contracted by oil companies. After having loaded nearly half a ton of fuel in tanks on the back seats, we departed late in the afternoon (me, my backpack and the three crew members) for a race down the river. We passed Pompeya after 34 minutes, while regular transport takes three hours to get there. As the day finished, it was more and more difficult to see the obstacles in the river, and after some slaloming among dead trunks at 70 km/h, the pilot decided it was safer to stay at night in the small village of Bañacocha. There we met a military hydrologist (unmistakable with his orange uniform) who was coming back from the Ecuadorean part of the expedition. He informed us that some members of the expedition were still in Nuevo Rocafuerte and that I was still in time to meet them early the next morning. We thus decided to depart as soon as daylight appeared.

We woke up at 4:45 a.m. and looked outside at the weather conditions. There was no longer rain but a fog so dense that we could hardly see anything 5 m away. By 6:00 a.m. the pilot decided it was possible to go on, although the

fog persisted. It took us two hours to reach Nuevo Rocafuerte without major difficulty, despite the low visibility. There, an annex of the Peruvian boat on which the expedition embarked was waiting for me, and after a half-hour trip, I finally met the expedition in Pantoja, on the Peruvian side, and at last I could begin thinking about palms!

The main focus of the palm work was to understand where and how changes in palm species composition between Ecuador and Peru occurred. The palm flora is significantly different in northeastern Ecuador and in the region of Iquitos, while the distance between the two areas is not so great on the scale of the Amazon basin (500 km). For example, the most abundant palm species in the Iquitos-Pebas region of Peru, *Lepidocaryum tenue* (Vormisto et al. 2004) is totally absent (or at least unrecorded) from Ecuador (Borchsenius et al. 1998). Two other genera fairly abundant in the Iquitos region, *Iriartella* and *Wendlandiella*, are also absent from Ecuador, as well as a number of other interesting species such as *Chelyocarpus repens*, *Attalea ferruginea*, *Bactris halmoorei* and *Bactris killipii*. An especially interesting distribution pattern to study was that of *Astrocaryum urostachys*, which has been considered as endemic to Ecuador (Borchsenius et al. 1998) and *A. macrocalyx*, known only



Opposite page:

4. *Attalea butyracea* and *Euterpe precatoria* at sunset.

from the area of Iquitos (Kahn & Millán, 1992). The two species arose from a common ancestor (Pintaud & Kahn 2002) and are immediately distinguished by their habit. *Astrocaryum urostachys* is densely clustering while *A. macrocalyx* is always solitary. As these species occur in abundance in alluvial terraces, their distribution would be easy to trace during our trip. Are they meeting and mixing in some part or are their ranges totally separated? What, in fact, promoted their morphological differentiation? These were some of the questions I was eager to answer.

The Peruvian course of the Napo is still a very isolated region. It is mostly inhabited by Indian communities who cultivate a few crops for their subsistence, including the Peach palm, *Bactris gasipaes* (Fig. 1). Their houses are made entirely of palm material (Fig. 2). Walls are made with species of *Iriarteeae* (*pona*), mainly *Iriartea deltoidea* or *Wettinia maynensis*, depending on local availability, and roofs are thatched preferentially with *Lepidocaryum tenue* and *Attalea butyracea*.

Natural vegetation along Rio Napo is mostly composed of forests on Quaternary alluvial

soils, the structure and floral composition of which depends on the frequency of flooding and quality of drainage. Palm composition is highly characteristic of each habitat type. In areas almost constantly inundated on river shores, only *Bactris riparia* is found. In slightly higher terraces, frequently flooded forests are rich in spiny palms (Bactridinae), the most characteristic of them being *Astrocaryum jauari*, associated with *Bactris concinna*, *B. bidentula*, *B. brongniartii*, *B. bifida* and the climbing species *Desmoncus orthacanthos*, which forms dense thickets. Higher terraces, seldom reached by the water, are the typical habitat of *Astrocaryum urostachys*, associated with *Attalea butyracea*, *Geonoma deversa* and *G. brongniartii*.

On the second day of our descent from Pantoja, in the vicinity of Campo Serio, we encountered vast areas of swamp dominated by *Attalea butyracea*, a kind of vegetation I had never previously seen in such extensive stands (Fig. 3). I decided to investigate the forest, accompanied by Emerson, a crew member who was to help me with most of the field work I made during the trip. The forest floor was damp and muddy, but many trails crossed the forest, paved with *Attalea* leaves. A surprising fact of the Peruvian Amazon is that there is human presence everywhere. Even in places such as these swamps, not very appealing nor

5. *Astrocarym jauari* in periodically flooded forest along lower Curaray River.



close to any settlement, people come and gather some products of the forest. Extractivism is indeed a very important aspect of Amazon life, and palms in particular provide many products, including palm-hearts, fruits, seeds, building material, fibers etc. I noticed an *Astrocaryum* off the trail and tried to approach it, but it was impossible to walk in the deep mud. Following the example of local people, we cut and put large *Attalea* leaves on the ground in order to reach the palm and make a herbarium collection. It proved to be *Astrocaryum urostachys*. This species was abundant in the swamp, but it had a somewhat different morphology from the populations I knew from Ecuador, with slender stems and narrow leaflets, probably because of the unusual habitat in which it was growing. Other common palms were *Socratea exorrhiza*, with its prominent stilt roots, *Euterpe precatoria* and *Geonoma brongniartii*, a set of species generally abundant in swamps. *Mauritia flexuosa*, the most typical swamp palm in the Amazon, was on the other hand scarce and basically replaced by *Attalea butyracea*, which reached unusual densities in this place. When we went back to the river, we discovered a breathtaking scenery – there was a sunset and moonrise at the same time. The palms were glowing in the orange light of the sun and the moon appeared behind them (Fig. 4). This was really an unforgettable sight.

The third day I explored a hill above the lower Aushiri river, a tributary of Rio Napo. Many emerging crowns of *Astrocaryum chambira* and *Iriarteia deltoidea* caught my attention, but the understory proved to be very poor in palms, with only *Hyospathe elegans*, *Chamaedorea pauciflora* and a couple of *Geonoma* and *Bactris*.

The fourth day we awoke at the mouth of Rio Curaray, the largest tributary of Rio Napo. Again the light was very special, and we decided to explore the lower course of the Curaray in the morning, taking many photographs. *Astrocaryum jauari* was abundant along the river, on the lower terraces (Fig. 5). In some places, the shores were lined with clumps of *Bactris riparia*, which was also a spectacular sight (Fig. 6). *Astrocaryum urostachys* was still abundant in these forests, now far from the Ecuadorean border (200 km). Just 5 km downstream of its confluence with Rio Curaray, Rio Napo makes a curve at 90° to the east as it follows the northeastern limit of a major hill system, the Iquitos arch. Since *Astrocaryum macrocalyx* is known from other sectors of the arch, it was important to

document what species grew in these hills. We stopped at the small settlement of Copal Urco, a toponym meaning “hill of the copal tree” (copal is a name applied to various resiniferous Burseraceae species). There we looked for someone who could guide us in the forested hills. Local people in the Amazon are always happy to help visitors. We just asked if someone could show us some *huicungos* (the vernacular name of *Astrocaryum* species with leaflets arranged in one plane) and a man immediately volunteered to accompany us. We soon found the palms, which turned out to be *Astrocaryum macrocalyx*. We asked our guide if these palms were always solitary, and he confirmed this important point. So the boundary between the two *Astrocaryum* species was clear. *Astrocaryum urostachys* grows in the alluvial plain and *A. macrocalyx* in the hills of the Iquitos arch. Where these geomorphological structures meet, as here near the mouth of Rio Curaray, there is a contact between the two species. There is thus a sharp boundary between a species previously known from Ecuador and another described from Iquitos, exactly what we were looking for.

But what happened with the other species having a similar distribution pattern? So far we had not seen any of them. Interestingly however, the house of our guide had a roof thatched with *Lepidocaryum tenue* leaves, one of the species abundant in the Iquitos arch. We asked the man where he gathered these leaves and he said the palm grew rather far away from the river, three hours walk from Copal Urco. Then we realized that the areas we were visiting in the immediate vicinity of Rio Napo did not represent all the diversity of habitats found in the region and that we were missing some important palm communities. Unfortunately, there was no time to conduct field study away from the river and we had not the opportunity to document other species limits during that trip. It took three more days to reach Iquitos. All along the lower Napo, we saw *Astrocaryum macrocalyx* abundantly on alluvial terraces, just as *A. urostachys* grew in the upper Napo, but we no longer saw the latter. This gave us further information: there is no ecological differentiation between the two species, and the contact encountered at the base of Iquitos arch may represent the point where the colonization fronts of the two species meet.

This expedition was therefore very informative, as it contributed towards bridging the gap in our knowledge between areas of



6. *Bactris riparia* on the banks of a small tributary of Rio Curaray.

palm inventories showing different species composition. However, much more remains to be learned before we can fully understand the distribution patterns of palms in the western Amazon.

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Rhopalostylis baueri on Norfolk Island

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1. A group of *Rhopalostylis baueri* along Mount Pitt track. The spreading and arcuate leaves distinguish the species from *R. sapida*, which has a tight and erect crown.



Rhopalostylis baueri occurs on tiny Norfolk Island where its survival is threatened by introduced weed species.

Norfolk Island, in the Southwest Pacific (29°04'S, 167°56'E), covers an area of only 34 km² (7.5 × 8.5 km) and its summit, Mount Pitt, is just 316 m high. The island is a midpoint on the Norfolk Ridge, a large mountain range of Gondwanan origin, now submerged except at its northern and southern ends, New Caledonia and a part of North Island of New Zealand, respectively. Norfolk Island is not a high, emergent peak of the ridge, but the result of a recent (3 million years

old) volcanic epiphenomenon. As the island is entirely basaltic, it erodes rapidly, forming high cliffs along most of its 32 km long coastline (Green 1994).

When I was based in New Caledonia a few years ago, there was a direct, week-end flight from Nouméa to Norfolk Island, which is just 650 km to the South. I took this opportunity to make various trips to Norfolk Island, especially in summer, to escape the hot and humid New Caledonian weather and refresh in



2. Cylindrical crownshaft and prominently pedunculate inflorescences also characterize *Rhopalostylis baueri*.

the cool climate of the small island. The contrast between two islands is indeed surprising. With its extensive green pastures, quiet cows and coniferous forests, Norfolk Island looks more like a European countryside than a subtropical island. Even more surprising is that the cloud forest begins at only 250 m elevation, making the modest hills of the center of the Island look like the summit of

Mont Panié (1618 m), the highest mountain of New Caledonia, with a scenery of tree ferns, araucarias and palms.

Despite its tiny size, Norfolk Island gained a worldwide notoriety since its discovery by Captain Cook on his second circumnavigation in 1774. It immediately appeared strategic for sailing ships as an abundant supply of materials for repairing ships, with its forests of

tall *Araucarias* – an ideal provision of masts – and native flax (*Phormium tenax*) from which fibers can be extracted. Then Norfolk Island as a penal settlement became notorious for the inhuman treatment of the prisoners. As the penal settlement closed in 1856, the island remained free to receive the descendents of the Bounty mutineers, led by Fletcher Christian, who initially settled in the remote and even smaller Eastern Pacific island of Pitcairn in 1789. Nowadays, almost half of the ca. 2000 inhabitants of Norfolk Island are descendants of the Pitcairn community. Their

colorful language, mixing 18th century English and Polynesian, is still spoken on both islands. When I first landed on Norfolk Island and asked for Mrs. Christian, working for the National Park, I was answered “Well, there are hundreds of Christians here.” I nevertheless found her quickly, and we soon became good friends.

Norfolk Island is also well known to plant growers as some endemic species, especially *Araucaria heterophylla*, are widespread in cultivation. Another sought-after plant from



3. A dense, monospecific stand of *Rhopalostylis baueri*, showing good regeneration. The numerous scars, almost without internodes on the larger trees, suggest a very slow growth rate.



4. A pristine upland forest with numerous crowns of *Rhopalostylis baueri* and tree ferns emerging from the species-rich canopy.



5. After invasion by *Psidium cattleianum*, most of the original vegetation has been eliminated and only a few crowns of tree ferns and *Rhopalostylis* are still visible.

the island is its only palm, *Rhopalostylis baueri*. The Norfolk Island population is of special taxonomic interest, because it is the type of the species (which also includes a variety in Raoul Island in the Kermadec Archipelago), and also the type of the genus *Rhopalostylis* (Wendland & Drude 1875). *Rhopalostylis baueri* is a beautiful palm, adaptable in warm temperate and humid subtropical climates, just as its New Zealand relative, *R. sapida*. The two species are actually very similar. Vegetatively, *Rhopalostylis baueri* is distinguished by its cylindrical crownshaft (prominently bulging in *R. sapida*) and its spreading, distinctly recurved leaves, as opposed to the "feather duster" crown of erect leaves in *R. sapida* (Figs. 1 & 2).

Ecology of *Rhopalostylis baueri*

The species is found throughout the island. At low elevations, it is mostly found in shaded and humid gullies, where it grows among tree ferns. Further up in the hills, it becomes a dominant component of the forest (Dowe 1989). Locally it even forms pure stands, as do many other Pacific islands palms. However, contrary to other species such as *Kentiopsis oliviformis* and *Satakentia liukuensis* (Pintaud & Hodel 1998, Pintaud & Setoguchi 1999), *Rhopalostylis baueri* does reproduce well within the stands, as individuals of all sizes can be seen (Fig. 3). It is likely that the smaller size of *R. baueri* reduces the impact of leaf fall on

seedlings and the survival of juveniles. Another noteworthy feature is the very high number of rings on the trunks of adult palms, without evident internodes, which indicates a very slow growth, as reported for *R. sapida* in natural stands in New Zealand (Enright 1985).

Conservation in the wild

Conversion of most of the lowland areas into pastures has severely restricted the range of the species. It is now almost confined within the National Park, above 200 m elevation (Dowe 1989). Outside the park, only a few isolated plants survive in some gullies. However, even within the remaining upland forests, the future of the palm is not secure, due to the invasion of the strawberry guava tree (*Psidium cattleianum*), a small tree introduced in most tropical countries, with disastrous effects on many small islands. The plant aggressively invades the understory of primary forest and eventually replaces all existing vegetation, forming dense thickets. The staff of the National Park manually removes the plants in the protected forests, but it is still hard to control the invasion. The major problem is a conflict of interest with the islanders who cultivate guavas (*P. cattleianum* and *P. guajava*, the latter less invasive) to make jam, which is advertised as an island speciality and sold in tourist shops. It is therefore impossible to eradicate *Psidium* from the island, and birds eating the fruits continuously

disperse seeds within the National Park, promoting the invasion (Figs. 4 & 5). In conclusion, *Rhopalostylis baueri* can be considered to be Vulnerable on Norfolk island.

Acknowledgments

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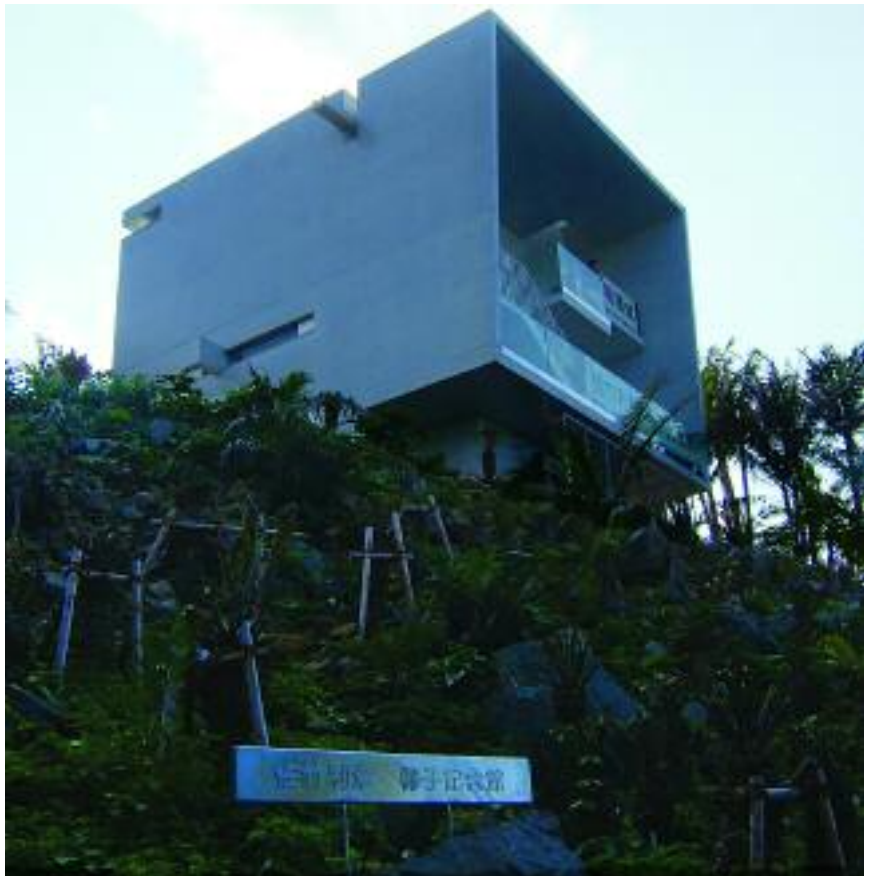
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The Toshihiko Satake Memorial Palm Museum, Ishigaki Island, Okinawa, Japan

THE SATAKE CORPORATION
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(Editors Note: the following is an edited version of the official press release announcing the opening of the Toshihiko Satake Memorial Palm Museum).

The new museum sits among new planting of *Satakentia likiensis*.



A new palm museum (Fig. 1) dedicated to Dr. Toshihiko Satake has opened in Japan.

The name Toshihiko Satake is commemorated in the generic name of one of the most elegant palms of the western Pacific, *Satakentia likiuensis*, native to the Ryukyu Islands at the south of the Japanese archipelago. Dr. Satake (Fig. 2), a leading industrialist in Japan and second President of the Satake Corporation, had a passionate and deep interest in palms and was a frequent correspondent of Professor Harold E. Moore. It was Hal Moore who recognized that the palm described as *Gulubia likiuensis* by Hatusima, did not belong to *Gulubia* but represented a distinct genus. In naming it *Satakentia*, Hal Moore paid homage to a great student of the palm family.

When Dr. Satake was 23 years old, he was given a young specimen of *Livistona* by a friend. He was attracted by the appearance of the palm and thus began his life-long interest in the family. At the time, no one in Japanese academia was studying palms, and he was astonished at how little literature was available. The open field encouraged him to study further.



2 (above). A bronze bust of Dr. Toshihiko Satake. 3 (below). The main room of the Satake Museum has educational exhibits of palm artifacts, palm literature and palm ethnobotanical collections. The museum focuses on *Satakentia likiuensis* but includes information on the entire palm family.





4 (top) and 5 (bottom). The museum has exhibits of palm fruits and seeds.



4 (top) and 5 (bottom). Different views of the palm exhibits.



8. The glass case contains a rare original edition of Martius' *Historia Naturalis Palmarum*.

After World War II, he formed a friendship with Professor Moore. At the age of 52 in 1962, Dr. Satake announced a new classification of the palms, with 11 subfamilies, 29 tribes, 253 genera and 3,333 species. Dr. Satake received honorary doctorates from Tokyo University of Agriculture in 1993 and from Hiroshima University in 1995. His collections include 78 species, 230 plants of palms and cycads, seed samples from approximately 500 different palm species and valuable literature.

On 27 January 2005, the Satake Technical Foundation (Chairperson: Dr. Toshiko Satake) established the Toshihiko Satake Memorial Palm Museum on Ishigaki Island, Okinawa Prefecture in Japan, the very site of *Satakentia liukuensis*, and held an opening ceremony. The Foundation was established with a donation of 30 million Japanese Yen on 6 March 1984 with the aim of promoting and supporting research and development activities, to encourage human resource development and to support botanical research in Japan. At present, the Foundation is supporting university laboratories in Japan and grants scholarships for overseas students at Hiroshima University and other universities in Japan.

The museum, one of the very few to be devoted to the palm family, was established to contribute to regional promotion and the development of botanical research, in memory of the late Dr. Toshihiko Satake (1910–1998). Dr. Satake was a leading authority in palm research and was instrumental in recognizing the distinctness of the palm *Ryukyu Yaeyamayashi*, later to be named *Satakentia liukuensis* by Professor Moore.

The museum is a two-storied, reinforced concrete building with a total floor area of nearly 190 square meters. The exhibition room on the second floor comprises eight zones (Figs. 3–8): 1) Introduction to Dr. Satake, 2) Ecological distribution of palms in the world and over 100 kinds of palm seeds (Figs. 4 & 5), 3) Exhibition of *Satakentia liukuensis*, 4) Exhibition of various products made from palms (Figs. 6 & 7), 5) Introduction of the Imperial Palm (*Roystonea oleracea*) from Joinville, Brazil, similar in appearance to *Satakentia liukuensis*, 6) Introduction to other palm museums in Japan, 7) Video display on a 50 inch plasma television screen, and 8) In the center of the exhibition room, a display of rare and valuable palm literature such as the incomparable *Historia Naturalis Palmarum* of



9. The rooftop offers a vista of *Satakentia likiuensis* in the wild.

Martius (Fig. 8). The cases also include valuable items such as coconut pearls, palm fossils and palm postage stamps that Dr. Satake collected from a variety of international sources in his lifetime.

On the rooftop of the museum, visitors can enjoy wonderful panoramic views of the East

China Sea and the natural habitat of *Satakentia likiuensis* (Fig. 9).

The museum opens every day except Tuesday. Admission is 300 Japanese Yen per visitor (free for children younger than elementary school age). The museum expects to receive approximately 30,000 visitors in 2005.

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