Palms

Journal of The International Palm Society Vol 45(1) 2001

THE INTERNATIONAL PALM SOCIETY, INC.

The International Palm Society

Founder: Dent Smith

The International Palm Society is a nonprofit corporation engaged in the study of palms. The society is international in scope with worldwide membership, and the formation of regional or local chapters affiliated with the international society is encouraged. Please address all inquiries regarding membership or information about the society to The International Palm Society Inc., P.O. Box 1897, Lawrence, Kansas 66044-8897, USA.

FRONT COVER

The receptive pistillate (female) flowers of *Astrocaryum urostachys* look more like sea anenomes or exotic mushrooms than palm flowers! These flowers were photographed in Ecudorian Amazonia by F. Kahn.

Palms (formerly PRINCIPES)

Journal of The International Palm Society

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BACK COVER

Heterospathe macgregori, grows in great abundance along the banks of the Kikori River near Kikori in Gulf Province, Papua New Guinea. A strict rheophyte, this palm occurs only on the river margins, forming dense clumps of 20 or more flexible stems. The bright red fruits are especially striking. See C. Migliaccio's article, p. 15. Photo by W.J. Baker.

Features

In the next issue of PALMS...
Martin Gibbons will report on his search for *Trithrinax* in the wilds of Argentina!

An inflorescence of *Astrocaryum scopatum* Kahn & Millán in the Upper Maraon River valley, Peru. See related articles by F. Kahn, pages 29 and 42 of this issue. Photo by F. Kahn.

News from the World of Palms

President Horace Hobbs visited IPS strongholds in California and Florida to meet with members, discuss topics of common concern and enjoy the local palms. In Huntington Beach, he attended the Palm Society of Southern California annual banquet in January. In Miami, his March visit coincided with the South Florida Chapter's Spring Palm Show and Sale at Fairchild Tropical Garden. Horace plans to visit other local chapters throughout his term, so look for him at your next event.

In November 2000, one of us (JD) was in Madagascar, leading an eco-tour for the Friends of Kew. As usual, we drove south from Antananarivo through the plateau, heading for Ranomafana. This road passes through the only known remaining population of *Dypsis ambositrae*. This year, only one mature individual was visible from the road. The population has certainly decreased. Fortunately there are plans to target this species for conservation in a new project aimed at renewing the living palm collection of Tsimbazaza, the national botanic garden of Madagascar.

Ha Long Bay not far from Hanoi in Vietnam is famous for its karst limestone islands, scattered as fantastic crags and towers in the waters of the bay. Such limestone is always interesting for plants. Recent fieldwork by Vietnamese botanists collaborating with Singapore Botanic Gardens staff has revealed a wonderful new species of *Livistona*. Named *L. halongensis* T.H. Nguyen & R. Kiew and described in Gardens Bulletin Singapore 52: 198 (2000), this remarkable species occurs on the slopes of the islands and is immediately distinguishable from other species by the immensely long inflorescences that are held above the crown. The palm is also illustrated in an attractive field guide – "The Wild Plants of Ha Long Bay."

Many members of the IPS will be aware of the attractive little book, "Palm Trees of the Amazon and their Uses" by Alfred Russel Wallace, published in 1853, and reprinted in facsimile in 1971 by the Coronado Press. This was the first book in English on the palms of the Amazon and also the first popular account; it describes almost 50 different species and their uses. Some botanists of the period, such as Richard Spruce, were critical of the book, singling out for particular mention the drawings. Unfortunately the illustrations in Wallace's book are indeed rather crude and were not particularly well printed. Sandy Knapp, at the Natural History Museum in London, has unearthed Wallace's original sketches in the library of The Linnean Society in London. These sketches made in pencil in the field, are exquisite and form an interesting comparison with those in the published book. Clearly, poor Wallace was not served well by his engraver and printer. Sandy Knapp reproduces these and other of Wallace's drawings in a nice new book "Footsteps in the Forest – Alfred Russel Wallace in the Amazon," published by the Natural History Museum.

Prof. J. C. Voltolini is conducting a study of the interactions of palms with mammalian seed dispersers and predators in the Brazilian Atlantic Forest. He will be working in the Parque Estadual da Serra do Mar on the southeastern Brazilian coast with genera such as *Syagrus*, *Attalea*, *Geonoma*, *Astrocaryum*, and *Bactris*. He would like to contact people interested in palm ecology, including seed dispersal and predation. Prof. J.C. Voltolini, Grupo de Estudos em Ecologia de Mamíferos (ECOMAM), Universidade de Taubaté - Departamento de Ciências Biológicas, Praça Marcelino Monteiro 63, Taubaté, SP, BRASIL 12030-010. tel.: 0-12-2254165. e-mail: <jcvoltol@infocad.com.br>.

THE EDITORS

Dent Smith's Palm Trees and Palm Logs

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1. Dent Smith in his garden with an *Acrocomia* sp.

The first issue of Principes that I received as a new member of the IPS was Volume 30, Number 1, the Dent Smith Memorial Issue; it made quite an impression on me. Those who wish to learn more about the life of this extraordinary man and his passion for palms and the Palm Society should obtain a copy of this issue, which contains biographical sketches and remembrances of his close associates as well as Dent's best observations on the cold hardiness of nearly 80 genera of palms.

Perhaps every member of the International Palm Society has heard of Dent Smith (Fig. 1), the founder of the Palm Society. Many long-time members knew him personally and even newer members have seen his name at the top of the masthead of PALMS listed as "Founder." Although I never had a chance to meet Dent, I have read, I believe, all of his published writings on the subject of palms and much unpublished material in the form of correspondence and especially his hand-written "Palm Logs."

This article focuses on Dent Smith's early experiences as a palm grower or collector. Like many of us, growing specimens for his personal collection was the reason Dent began to learn about palms in the first place. He had collected conifers and other trees at previous homes in the northeastern United States and so had already displayed a penchant for collecting large plants. As you read about some of his experiences in learning how to grow palms, I think many of you will recognize that, in many cases, his experiences were the same as yours and that Dent Smith was not only the Palm Society's founder but also, perhaps, the prototypical member. It is important to keep in mind that while my main source of material for this article, Dent Smith's "Palm Logs," ended in February of 1965, Dent went on to plant, grow and learn about palms for another twenty years.

The Palm Logs

The Logs consist of three volumes, nearly 500 hand-written, legal size 21 x 35 cm pages covering a span just short of 13 years, with the first entry dated March 16, 1952. Although these logs were intended for his own use, Dent wrote legibly, correctly and often included humorous observations. When recording new plantings, Dent printed their scientific names in red ink in the margin of the page for easy reference. Like many of us whose occupations center around horticulture Dent paid a lot of attention to the weather, and the bulk of the log entries are rather dry recordings of temperature and rainfall. The chief obstacles that Dent had to overcome to grow successfully the palms he so admired were weather related: freeze and drought. He also liked to record the local weatherman's forecast for the next day, and with years of experience came to rely more on his own "meteorological premonitions" than those of "the boys at the weather bureau."

The Land

The land Dent used for his palm collection actually consists of two properties totalling four acres (1.6 ha), half of which belonged to Dent's long-time secretary, Margueriete Martin; Dent referred to Miss Martin's property as Dudie's land, using an affectionate nickname. The land is in the shape of a long narrow strip, running east to west, less than one-half mile (0.8 km) inland from the Atlantic Ocean and bounded on the west by the salt water Halifax River. The city of Daytona Beach lies just to the north. For a location 260 miles (418 km) north of Miami, in north-central Florida, Dent at least chose a spot remarkable both for its natural beauty and its protection from winter cold.

2. An old but still quite small *Brahea armata* at the eastern end of the garden.

3. June 2, 1953. A truckload of large palms arrives from Reasoner's Tropical Nurseries.

The long narrow shape of the property allows for a diversity of terrain and soil types from a high very sandy soil at the eastern end to a more substantial and moister soil at the western end near the Halifax River. The native forest, which was in place when Dent purchased the property, consisted largely of sand pine, *Pinus clausa*, at the eastern end, sand live oak, *Quercus geminata*, in the central portion of the property and live oak, *Quercus virginiana*, at the lower western end. Numerous *Sabal palmetto* and *Serenoa repens* were scattered around the property and many of these were retained along with the best specimens of both oak species; only the sand pines were removed entirely.

The presence of sand pines is an indication of the poorest kind of sandy soil to be found in central Florida. It is often referred to as "sugar sand" because of its similarity in color and texture to the granulated sweetener. My own garden consists of this soil type, and I can say from experience that some palm species simply refuse to become established in it and remain in a permanent juvenile growth phase regardless of fertilizing and watering practices (see Fig. 2, *Brahea armata*). As he began to try to establish young palms in the sugar sand, Dent wondered "that anything can grow here without artificial watering, and in fact very little can." We shall see later how Dent sought to overcome the considerable obstacle of such poor soil in a major portion of his garden.

Getting Started

Dent began planting trees and plants on the two properties in 1950, two years before he began recording his activities in the Palm Log. In fact the first volume is titled "A Journal of Plants and Gardening" and was retitled "Palm Log" at a later date. It begins with a list of plantings made prior to March 1952; these include around 30 trees many of which are very common central Florida fruit trees and flowering trees. Some of the trees were a bit daring for his climate such as royal poinciana, *Delonix regia*, and avocado, *Persea americana*. Also planted by that time were a number of flowering vines that received a great deal of attention, and a few of which are very evident on the property today. In this initial list of plantings only two palms are mentioned; a coconut seedling, and a queen palm, *Syagrus romanzoffiana*. Clearly palms had not yet captured Dent's interest. At the end of this first entry, however, he notes that he had recently received 200 seeds, "many of them palms of sorts, mostly unknown," from the United States Plant Introduction Station, in Coconut Grove, Florida. These seeds, the first of many received from the U.S.P.I. Station were to become the germ of Dent's palm collection and also, perhaps, his deep interest in the palm family.

Initially Dent found plenty to dislike about palms, especially the slow growth of some species. He

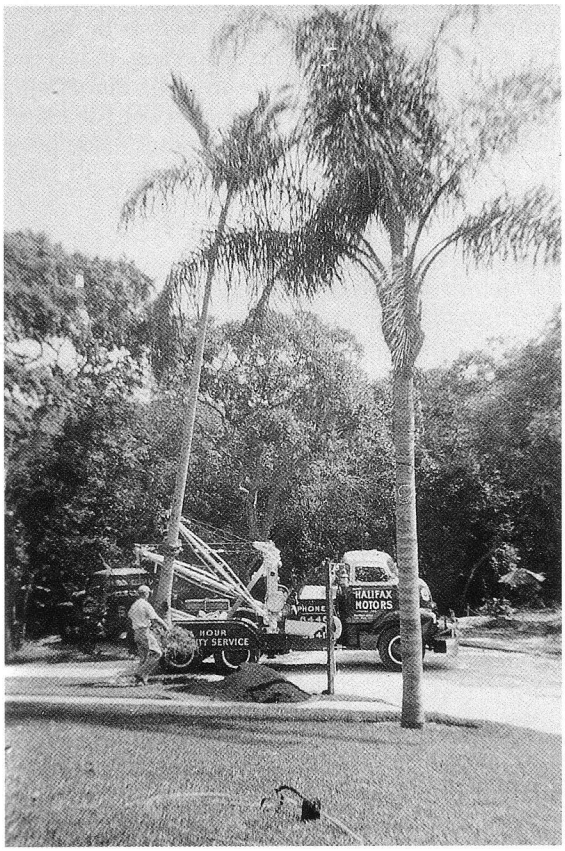
was already middle-aged when he began planting palms; in August of 1953 he wrote in the log, "The more I see of palms, the more I stand aghast at their slow growth. Case of watched pot, I suppose, in part anyhow." By this time he already had 36 species planted. He was particularly disappointed with the slow growth rate of *Pseudophoenix*, *Thrinax* spp. and especially *Coccothrinax* spp., of which he had many kinds: "No one without a lifetime ahead of him should attempt to raise [them] from seed.... Sometimes I'm tempted to throw them away." Within a few years though, *Coccothrinax* became one of Dent's favorite genera, he learned that they begin to develop more quickly once planted in the ground, were adaptable to his sandy soils and possessed a certain amount of cold hardiness.

Seeds and Plants

Like most palm enthusiasts, Dent obtained seeds and young palms where and when he could find them. His pursuit of new and untried species for his collection led to the friendships that later would help to form the beginnings of The Palm Society. Harold Loomis of the United States Plant Introduction Station in Coconut Grove, Florida, Bob Wilson of Fantastic Gardens in Miami, David Barry of California Jungle Gardens in Los Angeles and Stanley Kiem of Fairchild Tropical Garden in Miami were just a few of the many palm growers, professional and amateur, that Dent met in his quest for palms and palm knowledge. In pursuit of the latter Dent carried on a very lively personal correspondence with many fellow "palm-nuts" from the very beginnings of his interest in palms until his death.

A point was reached in late spring of 1953 when Dent began to commit more time and resources to his palm collection. Palms began to arrive from various nurseries around Florida including some large specimens from Reasoner's Tropical Nurseries across the state in Bradenton (Figs 3 and 4). Dent worried that some of these large specimens had been poorly handled during digging and transport, and indeed they failed to thrive. Thereafter he became an expert in the transplanting of large specimen palms and took a personal interest in the handling of any that were destined for his garden. He also realized that eventually the best specimens in his garden would be the ones that he raised

4 (left). June 2, 1953. An extremely tall *Archontophoenix alexandrae* is planted by the front driveway. 5 (right). A neighbor poses near a young *Archontophoenix alexandrae*. Also seen are species of *Coccothrinax*, *Hyphaene*, *Butia* and *Sabal*.



himself from seed or small plants, not large transplanted specimens.

Dent germinated many of his seeds, palms and otherwise, in a seedbed, which is a plot of ground set aside solely for the germination of seeds. Once the seeds had sprouted they were then transplanted into small individual pots. A seedbed has some advantages over, say, germinating seeds in community pots; the soil in a seedbed remains at a warmer, more constant temperature during central Florida's long cool season than the soil in a community pot would. Many difficult to germinate palm seeds, especially cocoids like *Acrocomia*, *Attalea* and some species of *Syagrus* that fail to sprout in pots will germinate reliably, if slowly, in a seedbed. One drawback of using a seedbed is the difficulty of sterilizing the soil to prevent pests and diseases from killing the young seedlings. Also in a seedbed labels are easily lost, especially in cases of slow or sporadic germination of a species over a period of months or even years. Like many of us, Dent accrued a small collection of "mystery palms" that defied identification; such specimens are often a source of conversation and debate at Palm Society meetings and thus have a value of their own.

Planting Techniques

Dent Smith was a strong believer in the preparation, or even replacement, of soil in a hole prior to planting a new palm. In a column in Principes 5: 43, he described the size of the hole as "big enough to accommodate without squeezing a small female adult Indian elephant." He paid special attention to soil preparation when planting in the porous sugar sand at the eastern end of his property; sometimes the hole was lined with clay-like marl and then filled with ingredients such as topsoil, leaves, seaweed, peat and chicken manure. These elaborate preparations were done several months in advance and often the recipient of such treatment was a small palm only one or two years old. Dent reasoned that preparation in advance of planting would eliminate or reduce the need for fertilization later in the palm's life. If the palm died or failed to become established for any reason he simply planted a new one in the same prepared site.

The practice of preparing large planting sites for palms, or other trees for that matter, is not recommended nowadays. In most cases the preferred technique is to backfill around the newly planted palm with the same soil that was dug from the hole. Dent's soil preparation techniques were similar to those recommended in "Native and Exotic Palms of Florida" by Dickey et al., and published by the University of Florida's Institute of Food and Agricultural Science in 1962. This book, like the earlier edition of it, which Dent owned, was probably based on observation and experience rather than research and influenced his fertilizing practices and use of a seedbed for germination of his palm seeds.

Competition from the roots of nearby trees and damage to the roots of young palms by moles and other burrowing animals were problems that were addressed by placing the young plant in its planting hole without removing the five gallon metal "egg can" that it was growing in. The bottom of the can was cut away but the cylinder was left to rust away or sometimes was removed later. Some larger specimens were planted in the same manner using bottomless 20 gallon (75 l) trash cans.

Fertilizing

In several of his articles and columns in Principes, Dent suggested that palms, if "planted properly," did not need fertilizer. When he first began his palm collection, however, Dent did apply fertilizer on a regular basis, but he used some products and

6. Dewey Watson and one of central Florida's first *Bismarckia nobilis*.

practices that nowadays we know are not appropriate and which in some cases led to damage to his palms, perhaps influencing his thinking about the need for fertilizers.

In an attempt to "harden off" some tropical species in the autumn of 1952, Dent applied potash to many; several, including his largest *Roystonea regia* and an *Aiphanes* sp., suffered significant damage. He was perplexed that a *Dictyosperma album* treated in the same manner was unaffected. I, for one, have made exactly this same mistake. For a number of years in the early stages of his collection, Dent, following the advice given in "Native and Exotic Palms of Florida," used commercially packaged sewage sludge to fertilize all of his palms, which may well have caused some of the persistent micronutrient deficiencies that affected some his palms. Granular fertilizers with analyses of 4-7-5 and 6-6-6 were also used extensively at various times, presumably in each case the results were observed and found to be less than satisfactory, and another product or method was tried. Reading about Dent's early experiences and problems with fertilizers makes me especially appreciative of the more recent and ongoing research and findings of the palm horticulture scientists at the University of Florida's Institute of Food and Agricultural Science. Despite the fact that he entered a number of complaints and concerns about fertilizers in the Palm Log, there is no doubt that Dent's garden was, and is, beautiful and healthy (Fig. 5).

Dent prided himself in being a "dirt gardener" and he really preferred his own method of fertilization which he referred to as "enlarging the feeding area" of a particular palm. This rather laborious procedure required digging a circular trench several feet out from the base of the young palm and circling it completely. Any tree roots encountered while digging the trench were eliminated and the trench was then filled with "black dirt, bone meal and manure" or sometimes other organic matter. This procedure could be repeated several times during the establishment phase of a palm's development using a larger diameter trench each time. Such tasks as well as the many other chores to be done on four very intensively cultivated acres were done mostly by Dent himself and his horticultural assistant of more than 25 years, Dewey Watson (Fig. 6). From time to time he also employed professional landscaping crews, notably "Big John and his boys....hard workers."

The Palm Society

The November 18, 1955 entry in the Palm Log contains, in addition to the usual recording of temperature and a brief description of a short trip to the Bahamas, the statement: "I have started the Palm Society." In the same entry Dent went on to list the members that he had already recruited: "H. Bertram Smith, James E. Smith, Mrs. L. H. Wait, Mr. Stanley Kiem, Harold Loomis, Mrs. David Fairchild, Mrs. Robert H. Montgomery, and Mr. and Mrs. Langlois." Three weeks later he noted that membership was already up to twenty, it continued to grow rapidly over the next few months as Dent and the others spread the word. There were no dues, only voluntary contributions.

Dent took on the greatest portion of the work of organizing the new Palm Society and in producing its earliest publications. Beginning in January 1956 he edited a monthly bulletin titled simply: The Palm Society. There were six issues of this informative little precursor to Principes, and some were even illustrated. Volume 1, number 1 of Principes came in October of 1956. In less than a year the Palm Society was founded, grew to around 200 members and began to publish a high quality journal. Most of the impetus and a great deal of the hard work necessary for such an auspicious beginning was provided by Dent Smith.

As much as he was devoted to the success of the Palm Society, from the beginning Dent also frequently lamented in the Palm Log that it took most of his time and kept him from making the observations and doing the dirt gardening that he truly loved. As a result entries in the Palm Log decreased during the first years of the Palm Society's existence.

Cold

Many of us who attempt to grow tropical palms in central Florida are fond of saying that we have the perfect climate for it, except for one or two days each year when a heavy frost or even temperatures below the freezing mark may occur. The uniformly hot summer days and warm summer nights of central Florida allow for excellent growth of many tropical palm species as well as the more familiar subtropical palms. Our long growing season usually permits palms to gain enough growth momentum and strength to carry them through the winter. Dent Smith began his palm collection at a good time, for the first five or six winters there were no serious freezes; by late 1957 he had already planted several hundred individual palms of "135 species belonging to 64 genera," including such unlikely central Florida residents as: *Acanthophoenix rubra, Bactris gasipaes, Drymophloeus litigiosus, Mauritia flexuosa, Phytelephas macrocarpa, Salacca zalacca* and many more. Dent felt a small measure of security in his

choice of plants and location; once lost, that security would never return.

The winter of 1957–1958, taken as a whole, is surely one of the worst ever recorded in the Sunshine State. The lowest temperature of the winter, 25°F [-4°C], was recorded by Dent on December 12, 1957. It was followed by a low temperature the next day of 27°F [-3°C]. Although Dent recognized this freeze as a calamity for his unprotected palms, he tried to remain optimistic for the next few weeks. But he recognized that a freeze at such an early date, before the end of autumn, can be especially destructive since the damaged palms would have to wait for many months for weather hot enough to allow for their recovery, and the log entries gradually became somewhat gloomy as each day the damage to his palms, many of which he had raised from seed, became more apparent. By the end of December he estimated that two-thirds of his collection was lost.

On January 9, 1958 Dent reached the low point of this, his first hard winter in central Florida; another freeze of 27°F occurred along with high winds that tattered the brown foliage that once was his lush tropical landscape. He wrote in the Palm Log, "I am rapidly becoming most unphilosophical about the losses and future prospects here." A week later things looked even worse: "Even if one is philosophically inclined, it is a fearful tax on patience. It even begins to seem that discouragement and common sense are equivalent." Anyone who has watched his years of patient seed collecting and nurturing of young palms die in such a disastrous series of freezes would no doubt have similar thoughts. Dent Smith experienced real tragedy in his life: he lost both his children, one to war, the other to cancer, and his first wife Marta suffered from a very long and fatal illness. The loss of some plants would not affect him for long and would, in fact, be turned into an opportunity to learn and share what was learned with others.

Even as he counted his losses from the winter of 1957–1958, Dent was making plans to replant. Although he had done little to provide protection for the palms that were planted in the ground, he had filled his garage and "every nook and cranny in the living room, kitchen and both bedrooms" with hundreds of potted seedlings and larger palms, enough to make a good start on replanting. More cold was yet to come; February 13–21, 1958 brought an unheard of stretch of nine straight days of low temperatures below or near the freezing mark with five straight days of freezing weather with temperatures as low as 26°F [-3.5°C], many palms which Dent felt would have recovered from the earlier freezes were finished off by this extended cold spell. Dent was not at home for this last cruel period of cold, however; he was on an extended palm buying trip in South Florida. Over the next few years he bought and planted palms at a very quick pace both to replace freeze losses and to try new species. Truckloads of palms arrived from many sources including, even, a few large specimens dug from the Bailey Palm Glade at Fairchild Tropical Garden in Miami.

Dent did learn a lot from his observations made following the freezes. Some species, such as *Livistona saribus, Bismarckia nobilis* and *Coccothrinax crinita,* proved to be surprisingly hardy; others, such as *Archontophoenix cunninghamiana* and *Rhopalostylis baueri,* were disappointments. He noticed that a number of palms had apparently survived the freezes only to be killed by insect larvae some months later, this despite the fact that he had treated them with strong insecticides. Had he known that the real problem with these palms was probably bacterial bud rot and that the proper treatment would have been to drench their buds with copper fungicide/bactericide and perhaps, insecticide as well, he may have been able to save more of his damaged plants. Unfortunately in 1958 there simply was not as much information on palm cold hardiness and the treatment of cold damaged palms as there is today.

Fortunately for us Dent published his observations on the effects of the 1957–1958 freezes as well as later ones; his articles on the cold hardiness of palms, which appeared in Principes (see references), are still the best and most complete. Aside from founding the Palm Society, Dent's observations on the effects of freezing temperatures on hundreds of palm species are his most valuable contribution to palm horticulture.

Palms You Love and Palms You Love to Hate

Within a few years of the freeze Dent's palm collection was bigger and better than ever. At one point he noted in the Palm Log, with a bit of amusement at the depth of his addiction to palms: "There are here more different kinds of planted palms than anywhere else in Florida between the North Pole and Miami, in any one place." Many of these were species of *Coccothrinax* and *Chamaedorea.* The latter was perhaps his favorite genus; their small size, availability and variety of leaf forms and growth habits made them excellent subjects for the lightly shaded areas beneath the

oaks in his garden. After observing that of his many species of *Chamaedorea*, only *C. tepejilote* was affected by a freeze of 27°F [-3°C], Dent wrote, "In some ways they are the most satisfactory and rewarding plants suitable for this climate." Later he elaborated that for someone who, like himself, began to grow palms late in life their quick development and early maturity were desirable characteristics.

Areca triandra was one of Dent's most tender favorites. He believed it to be the toughest and most adaptable member of its genus, and although he lost many to freezes, he continued to replant this species and one survives today in his collection. *Zombia antillarum* was another that was lost and replanted many times. Dent was well aware that tropical palm species that produce suckers or clustering trunks might be able to regrow after having their existing trunks and foliage killed by freezes, and this belief has proven to be true in a number of cases in his collection. *Archontophoenix alexandrae* was another favorite, and many were planted, not because of hardiness, but because of their rapid growth, good appearance in the cool months and availability.

Perhaps we all have a species of palm that we have regretted planting, or even having heard of in the first place; a nemesis, a palm we love to hate. Our nemesis might be one of those very common species that we planted when we first became interested in palms, or that *Phoenix reclinata* that suckers too profusely, and whose spines have wounded us often. Dent's nemesis was the African oil palm, *Elaeis guineensis*. He first acquired an

Tab. 1. A list of the palm species and numbers of individuals currently in the Dent Smith garden at Daytona Beach, Florida

Acoelorraphe wrightii	2	*Livistona saribus*	1
Areca triandra[1]	1	*Livistona* hybrids	2
Arenga engleri[3]	3	*Phoenix canariensis*	1
Attalea sp. (possibly *A. butyracea*)[3]	3	*Phoenix reclinata*	1
Attalea sp. (possibly A. *cohune*)[3]	3	*Phoenix sylvestris*	1
Brahea armata[2]	1	*Ptychosperma macarthurii*[3]	1
Brahea spp.	3	*Rhapidophyllum hystrix*	1
Butia capitata	2	*Rhapis excelsa*[3]	many
x *Butyagrus nabonnandii*	2	*Rhapis subtilis*[3]	1
Caryota mitis[3]	3	*Roystonea regia*[4]	1
Chamadorea microspadix	2	*Sabal causiarum*	1
Chamaerops humilis	3	*Sabal domingensis*	2
Coccothrinax argentata	1	*Sabal minor*	1
Dypsis lutescens[3]	1	*Sabal mexicana*	1
Dypsis madagascariensis[1]	1	*Sabal palmetto*	many
Hyphaene spp.	4	*Sabal yapa*	1
Livistona chinensis	5	*Serenoa repens*	3
Livistona decipiens	3	*Washingtonia robusta*	2
Livistona mariae	1	*Zombia antillarum*	1

[1]A small plant or sucker that has regrown from the root system of a formerly large plant that was killed to the ground by cold.

[2]A plant that is struggling for reasons other than cold damage.

[3]A vigorous plant that has regrown after being killed to the ground by cold.

[4]Recently planted.

7 (left). Doris Smith with an unidentified *Brahea* in the garden. 8 (right). A large *Attalea*, thought to be *A. cohune*.

African oil palm in the spring of 1953 as a two-year old plant. Initially he was so pleased with its dark green color and rapid development that he used a photo of it in the very first issue of Principes 1:8. In the Palm Log at about the same time he wrote that while all of the *Acrocomia* have been good growers here "African oil palm takes the prize." *Elaeis guineensis* is a perfect example of a palm which thrives in central Florida's uniformly hot summer weather, its high humidity and, usually, ample rainfall. The winters at Dent's garden were another matter though. His African oil palms grew well during the early fifties when winters were mild, but after the winter of 1957–1958, freezes came on a more regular basis, and the Palm Log frequently mentioned the distressed condition of these palms. After the December 12, 1957 freeze he wrote, "Of all this terrible devastation I regret mostly the wrecking of the two *Elaeis* palms." By the following year, they were partly recovered but were again severely damaged, this time by a short freeze of 27°F [-3°C]. One palm lost its bud and all of its foliage. Some weeks later, after reassessing its condition Dent wrote, "I have no patience to see if it will again recover, and I am going to grub it out and burn it. To find a hardy palm, of good size, that still is not a common one is no easy task, and here impossible." The following year the remaining *Elaeis* was again injured. and by April showed no sign of life. By early June, Dent gave up hope for it.

Dent Smith's Palms Today

Doris Smith, Dent's widow, is doing a superb job of maintaining the many fine specimens that remain in Dent's collection (Fig. 7). The decade of the 1980's saw a number of very harsh freezes which killed many palms. Diseases, notably *Ganoderma zonatum*, have taken a few also. Nevertheless the scene that greets one when entering the property on its long driveway is one of lush tropical beauty. Many of Dent's favorites are now gone. The many individuals and species of *Coccothrinax* are represented by one small but apparently very tough *C. argentata*; of the many *Chamaedorea*, only one very large *C. microspadix* remains. It is likely that the survival and very fine condition of this last *Chamaedorea* is due to its resistance to the nematodes that are so prevalent in Florida's sandy soils as much as to its cold hardiness.

Some of the most surprising and beautiful palms currently in the collection are four large *Hyphaene* spp. They are surprising because although the natural range of the genus *Hyphaene* extends to about the same latitude as Daytona Beach, they have probably lived through much lower temperatures there than they experience in their native range. There seems to be more than one species represented in the collection. Dent began to acquire *Hyphaene* spp. in 1955. Many that he obtained were not identified as to species, but he did record *H. thebaica*, *H. guineensis* and *H. crinita*. The existing individuals of *Hyphaene* are growing at both the eastern and western ends of the properties and display a variety of leaf colors from green to blue-silver as in *Bismarckia*. Some individuals have branched dichotomously, others have only suckered at the base. The lone female does produce viable seed regularly. Their existence in Daytona Beach proves that given enough summertime heat at least some *Hyphaene* spp. can be successful in the subtropics.

Another surprising group of long term survivors in Dent's garden are four *Attalea*, three of these are *Attalea* sp., and the other is possibly *Attalea cohune* (Fig. 8). Dent planted many of these "South American oil palms." Many were unidentified as to species, and their planting locations on the property were only given in vague terms in the Palm Log. As with *Hyphaene*, the *Attalea* have been defoliated by cold or even frozen to the ground on a number of occasions, but their appearance in January 2000, after 10 years without a serious freeze, is most impressive. When and if these giant palms form an above ground trunk they may become more susceptible to death from severe freezing temperatures.

The exact number of species currently in Dent's collection is difficult to determine. There are some genera, such as *Sabal*, *Hyphaene* and *Livistona,* that are represented by a number of species that have not been identified by a competent authority, and a number of hybrids may also be present in these genera. There are probably around fifty species currently in the collection.

The palms that we plant in the ground are at best temporary, even if, as many of Dent's palms have, they outlive the one who planted them. Dent Smith's most successful planting was the idea of the Palm Society, which over the years with the help of its editors, officers and members has taken root and grown in parts of the world where palms themselves are rarely seen.

Acknowledgments

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LITERATURE CITED

DICKEY, R.D., E. WEST AND H. MOWRY. 1962. Native and Exotic Palms of Florida. Institute of Food and Agricultural Science, University of Florida, Gainesville, Florida, USA.

KNAPP, D. 1961. Fertilization requirements. The American Horticultural Magazine 40: 138–141

SMITH, D. 1952–1965. Palm Logs, vols. 1–3. Unpublished.

SMITH, D. 1956. African oil palm, photograph and caption. Principes 1: 8

SMITH, D. 1958. Cold tolerance of the cultivated palms. Principes 2: 116–126.

SMITH, D. 1961. In and out of the palm garden. Principes 5: 42–46.

SMITH, D. 1964. More about cold tolerance. Principes 8: 26–39.

SMITH, D. 1986. U.S.D.A. hardiness zones as applied to cultivated palms, and other horticultural comments. Principes 30: 26–31.

The Genus *Heterospathe* in Cultivation

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1. *Heterospathe elata* is cultivated throught the tropical world.

Horticuturists have long grown a handful of *Heterospathe* species. Now that more species are entering the trade, it is important to re-examine this attractive genus for its horticutural potential. This article lists all the described species and reviews what is known about the eighteen species in cultivation.

The genus *Heterospathe* is represented by approximately forty species of primarily rainforest palms from the Western Pacific – the Philippines, Micronesia, eastern Indonesia, New Guinea, the Solomon Islands and east to Vanuatu and Fiji (Uhl & Dransfield 1987). While most species are found in the understory, a few are canopy palms. The New Guinea *Heterospathe* (ca. 17 spp.) tend to be small arborescent or acaulescent and clustering; whereas species from the Philippines (ca. 11) tend to be small and frequently clustering, and those from the eastern part of the range of the genus (ca. 4 spp.) tend to be solitary and moderately tall palms.

2. *Heterospathe salomonensis* with unripe fruit. In cultivation at Fairchild Tropical Garden, Miami, Florida.

There are 41 validly published species in the genus but for many years, only a handful have ever been cultivated outside their native countries. Presently, about 18 taxa are known to be grown primarily by palm enthusiasts (Tab. 1). Warm and humid regions of Australia and Hawaii are well-suited for growing this genus. South Florida would probably support the species that are tolerant of alkaline soils and occasional cold weather as long as the requisites of long-term container culture, amended soils and cold, dry wind protection are met. Southern California does not support any of the *Heterospathe* currently in cultivation (R. Rodolf & G. Stein, pers. comm.) because of its long and cool winters. Some of the higher altitude species (*H. delicatula* and *H. humilis*) perhaps could be grown there but these have not been available in sufficient quantity for trials.

For many years, *Heterospathe elata* (Fig. 1) has been the only widely cultivated species of this genus, particularly in South Florida. Occasional specimens of *H. sibuyanensis*, *H. woodfordiana*, *H. elmeri*, *H. salomonensis* (Fig. 2) and *H. negrosensis* (Fig. 3) have been sold at Fairchild Tropical Garden or South Florida Chapter of the IPS palm sales. However, very few of the other species have appeared in cultivation until recently. In the last few years, small but commercial quantities of seeds and nursery-grown seedlings of *H. "brassii"* (a *nomem nudum* with no botanical standing), *H. brevicaulis*, *H. cagayanensis*, *H. deliculata*, *H. glauca*, *H. intermedia* (Fig. 4), *H. micrantha*, *H. minor* (Fig. 5), *H. negrosensis*, *H. phillipsii*, *H. philippinensis*, *H. sibuyanensis* and *H. woodfordiana* have become readily 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.

A complete taxonomic review of *Heterospathe* would be particularly welcome in light of the current collecting activity in New Guinea and the Solomon Islands (Fig. 6) that is expected to result in description of new species and clarification of the taxonomy of existing species.

Species in Cultivation

The best known species in the genus is *H. elata*, the Sagisi Palm, which has been widely grown as

3. *Heterospathe negrosensis*, a 20-year old specimen still without a trunk, Fairchild Tropical Garden, Miami, Florida.

a landscape palm throughout the warmer subtropics and tropics. It produces prodigious numbers of seed that germinate on the ground under the parent or are carried away by birds and small mammals (Migliaccio, pers. obs.). In Guam, it is considered a weedy species and is crowding out native species in ravines (Jones 1995). Seeds germinate readily but take many years to develop a trunk, after which growth is rapid, particularly in full sun.

Heterospathe "brassii" presents an intriguing case. Despite the fact that seeds of this taxon have been distributed by the Palm Society as early as 1988 (as 88-PS-562), and that seedlings with this name are presently available from Hawaiian growers, the species name *"brassii"* has no valid taxonomic standing. That is, no species of *Heterospathe* has ever been formally described with this name so that its true identity is unknown. This name first appears in print in an article written by the late Geoff Dennis in *Palms of the Solomon Islands* (Dowe 1989) without any descriptive information. Accordingly, collectors should be wary of any plants identified as *H. "brassii."* While germinating readily, seedlings of this taxon have been prone to fungal infection during cool South Florida winters and the few individuals planted in shady, protected locations in the alkaline soils at Fairchild Tropical Garden have languished. This palm is reportedly native to the Solomon Islands.

4. *Heterospathe intermedia*, 16-years old, in cultivation in Luzon, Philippines (Photo by Carl Lewis).

5. *Heterospathe minor*, growing in the author's garden, has a colorful new leaf.

Heterospathe cagayanensis is a variable species with acaulescent as well as 6 m tall, solitary trunked individuals. It has tiny seeds that germinate readily but are prone to damping off due to fungal infection. Montgomery Botanical Center in Miami, Florida has used weekly sprays of the systemic fungicide Phyton 29™ (Copper sulfate pentahydrate with 21.36% active ingredients) to prevent damp-off in *Heterospathe*. Treatment ends once seedlings are established (Judd, pers. comm). In Hawaii, this species has been shown to tolerate drought well once established (Singeo, pers. comm.).

The dwarf species, *H. deliculata* , with its colorful inflorescence, has outstanding horticultural potential as a small container palm (Essig, pers. comm.). In South Florida, it grows faster as a juvenile than *H. elata* and without any special cultural conditions (Searl, pers. comm.).

Heterospathe salomonensis (Fig. 2.) from the Solomon Islands and the Philippine species, *H.*

Tab. 1. *Heterospathe* species in cultivation.

Heterospathe species	Native to	Characteristics
"brassii" (name not validly published)	Papua New Guinea; Solomon Islands	small palm with solitary trunk and pink new leaf.
brevicaulis Fernando	Luzon, Philippines in lowland forests	solitary to 2.5 m overall with stem to 50 cm tall; small fruit and persistent leaf bases.
cagayanesis Becc.	Luzon, Philippines	acaulescent or solitary to 6 m tall; leaves to 2 m; juvenile leaf reddish.
deliculata H.E. Moore	SE Papua New Guinea at low to mid-elevations (1100 m) in oak forests	acaulescent and prostrate; leaves to 1.8 m tall; inflorescence with purplish axis and flowers.
elata Scheff.	widespread in Philippines; Moluccas, Micronesia	solitary slender trunk to 15 m tall; newest juvenile leaf pink-bronze.
elmeri Becc.	Camaquin, Philippines	solitary; trunk; to 7 m overall height.
glauca (Scheff.) H. E. Moore	Moluccas	solitary trunk to 4 m; leaflets pendant.
humilis Becc.	widespread in Papua New Guinea; 900–1600m	dwarf; acaulescent; prostrate or clustering with thin stems; leaves simple or divided, to 1.5 m on long petiole.
intermedia (Becc.) Fernando	endemic to eastern Philippines	solitary trunk to 12 m tall; glossy yellow-green petiole and rachis.
micrantha (Becc.) H. E. Moore	Papua New Guinea	solitary or sparsely clustering trunk 3–4 cm wide by 5–6 m tall; new leaf orange-red.
minor Burret	Solomon Islands	solitary slender brown trunk to 5 m; shiny leaflets; new leaf orange-red.
negrosensis Becc.	endemic but widespread in Philippines	robust solitary trunk to 2–3 m tall and >3 cm diam.
phillipsii Fuller & Dowe	Fiji; proposed as Threatened	solitary trunk to 12 m and to 18 cm diam.; pinnae broad and lax.
philippinensis Becc.	Philippines in lowland forests, 300–1400 m elev.	clustering or solitary trunk to 3 m and 2–3 cm diam.; narrow, widely spaced pinnae; newest leaf pink-bronze.
salomonensis Becc.	Solomon Islands	solitary trunk to 5 m; newest leaf on juvenile is reddish.
scitula Fernando	Luzon, Philippines understory of lowland forests	clustering, slender trunks 1.5 cm diam.; 2 m overall height; young leaves reddish-brown.
sibuyanensis Becc.	endemic to Sibuyan, Philippines; known only from the type specimen	solitary trunk to 10 m tall and 12 cm diam.; leaflets scaly on underside; similar to *H. elata*.
woodfordiana Becc.	Solomon Islands	solitary slender, brown trunk to 4 m tall and 8 cm diam.; approx. 10 leaves; leaf sheaths blotchy brown/black; new leaf deep red

6. An unidentified acaulescent *Heterospathe* on Kolombangara, Solomon Islands (Photo by S. Zona).

elmeri and *H. negrosensis,* have been cultivated sporadically in South Florida for many years, but individuals of these species are rare in gardens, perhaps because of their slow growth rate, lack of reliable seed source and unremarkable appearance. While trouble free, they have not become popular, except with serious palm collectors.

On the other hand *H. glauca,* with its pendant leaflets, is an exceptionally attractive palm worthy of a prominent place in the garden. However, its cold-hardiness and tolerance of South Florida's alkaline conditions are unknown.

Heterospathe humilis (Fig. 7), a small clustering species may be good for cool, subtropical coastal conditions found in California or SE Australia (Essig, pers. comm.). It has been grown successfully as a pot plant in South Florida but usually dies after planting out.

When seedlings of *H. micrantha* first appeared in South Florida several years ago, collectors were awed by its brilliant orange-red petiole and new leaf. Plants grow well in pots and have already been planted out. Once in the ground in shaded, humid locations, their growth rate increases but the plants tend to be less colorful (Searle, pers. comm.). Once again, cold-hardiness and long-term tolerance of South Florida's high soil and water pH are unknown. However, the small overall size and slow rate of growth makes this collectors' species best-suited to long term container culture.

Heterospathe minor (Fig. 5) is another species that has been around a long time in cultivation but in small quantities. Its orange-red new leaf and small size makes it another candidate for long term container culture. It has been grown successfully in the ground in Hawaii but most plants die after planting out in South Florida.

Heterospathe philippinensis is a very variable small species with both clustering and solitary forms. The clustering form would be very attractive as a container palm in a shaded, humid setting.

The recently described *H. phillipsii* (Fig. 8), an emergent palm named for the late Dick Phillips of Fiji, is one of the larger species in the genus. Its attractive seedlings require lots of moisture and shade but appear to be faster growing than most *Heterospathe.* However, with its lax pinnae, it may be a bit straggly in the garden (Stone, pers.

7. *Heterospathe* cf. *humilis* in cultivation in the author's garden.

comm.). Unfortunately, it is restricted to one population of 400–500 adults on the island of Vitu Levu in an area selectively logged for its hardwoods. Accordingly, it has been proposed as a Threatened Species – the only member of the genus considered for a special conservation consideration (Fuller & Doyle 1997). Fortunately, seeds of this palm are cultivated in a few private gardens in Suva, Fiji and have been distributed widely to botanical gardens and collectors in Hawaii, Australia and Florida.

Heterospathe scitula is an exceptionally attractive clustering species similar to *H. philippinensis* but with fewer leaflets of variable width. Young leaves are reddish-brown and trunks are slender – making this species also well-suited to container culture. However, many seedlings succumbed to fungal infections during the cool winter (two nights of 4°C minimum temperature) in South Florida

Interestingly, despite the fact that *H. sibuyanensis* has been occasionally cultivated for many years in Australia, Hawaii and Florida, specimens have not been collected in the wild since the original description in 1919 (Fernando 1990). Recent searches on the island of Sibuyan, Philippines have not turned up any individuals of this species, so collectors should be wary of seeds or plants with this name, particularly because this species closely resembles *H. elata*.

Heterospathe woodfordiana, with its rich red new leaves, is another species worthy of wider use in the landscape. It has been more widely used in Australia and Hawaii as an accent palm but with some care, should also be able to be grown successfully in South Florida. Despite its beauty, its slow rate of growth and the lack of any regular seed source reduces its chances of wider landscape use.

The newly introduced *H. brevicaulis* and *H. intermedia* are now being cultivated in Australia, Hawaii, and South Florida but little is known about their growing requirements or ultimate horticultural potential.

Cultivating *Heterospathe*

Because most species are found in primary rainforests, conditions of high humidity and acidic soils (or potting media) will promote the best growth. If it is difficult to provide these conditions in the landscape, long term container culture may be a viable option. Growers in subtropical regions will also need to provide cold protection, especially from dry winds. Based on what is known now, this genus prefers filtered light in protected locations. The only exception is *H. elata* which flourishes in full sun. Regular applications of a balanced palm fertilizer and micronutrient sprays will also promote growth and strengthen plants against conditions of low humidity and temperature. Patience is also a requirement for growing palms in this genus as most are slow-growing.

Many species have new leaves ranging in color from pink-bronze, to deep red to orange-red, so that even as juveniles in pots, they provide a welcome splash of color in the nursery.

Many Questions Remain

Despite recent collecting activity in the Southwest Pacific, the following species remain poorly known or unknown in cultivation: *H. annectens*, a medium-sized solitary understory species with hairy leaf sheaths from Papua New Guinea; *H. arfakiana* from Irian Jaya, *H. clemensiae*, a 6 m tall solitary species found at 1800m elevation in northeastern New Guinea; *H. dransfieldii*, a clustering, slender-trunked dwarf species endemic to the island of Palawan, Philippines; *H. glabra*, a solitary palm from 1800 m elevation in New Guinea; *H. kajewskii*, a 15 m tall solitary species with 2.5m long fronds found at 1000m elevation on the island of Bougainville, Solomon Islands; *H. ledermanniana* from New Guinea; *H. lepidota*, a solitary palm to 6 m tall from lowland slopes in Papua New Guinea; *H. macgregori*, a rheophyte from Papua New Guinea (see Back Cover); *H. mullerana*, a large-fruited species from the Eastern Highlands of Papua New Guinea at 1600–2000 m), *H. obriensis*, also from the Eastern Highlands of Papua New Guinea; the attractive *H. parviflora* from the tropical New Britain Islands of Papua New Guinea, *H. pilosa* from the Cyclops Mountains of New Guinea, *H. pulchra* from Papua New Guinea and called "exceptional" by Moore; *H. ramulosa* with a 6 cm stem from Bougainville in the Solomon Islands; *H. sensisi*, a 15–20 m solitary species from the Solomon Islands; *H. sphaerocarpa*, an acaulescent species with 4.5 m long fronds from 1200m elevation in the Central Division, Papua New Guinea; *H. trispatha*, a slender understory palm endemic to lowland dipterocarp forests on the island of Luzon, Philippines; *H. uniformis*, a 7 m solitary species endemic to lowland forests on West Ambrym, Vanuatu; and *H. versteegiana* from New Guinea.

Summary

As more species of *Heterospathe* are cultivated, it is hoped that commercial growers and collectors will share their experiences so that these attractive palms will find greater use in landscapes and that *ex situ* conservation efforts for taxa such as *H. phillipsii* can continue to buffer the effects of widespread deforestation in the Southwest Pacific.

8. *Heterospathe phillipsii* in habitat in Navua District, Viti Levu, Fiji (Photo by S. Zona).

Additionally, consistent practice of sustainable collection techniques and appropriate horticultural methods can also ensure the survival of *Heterospathe* spp. 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 out. It is particularly important to obtain as much knowledge as possible of the ecology of these palms in the wild as this will help determine their suitability for cultivation.

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Literature Cited

Cropper, H., N.W. Uhl and J. Dransfield. 1997. Index to Principes, Volumes 1–40. International Palm Society, Lawrence, Kansas, USA.

Dowe,J. (ed). 1989. Palms of the Solomon Islands. The Palm and Cycad Societies of Australia.

Essig, F. 1982. A new species of *Heterospathe* (Palmae) from New Britain. Principes 26: 4–6.

Fernando, E. 1990. The genus *Heterospathe* (Palmae: Arecoideae) in the Philippines. Kew Bulletin 45: 219–234.

Fuller, D., J. Dowe and M.A. Doyle. 1997. New species of *Heterospathe* from Fiji. Principes 41: 65–69.

Jones, D. 1995. Palms Throughout the World. Smithsonian Institution Press. USA.

Moore, H.E. 1969. New palms from the Pacific, III. Principes 13: 99–108.

Uhl, N.W. and J. Dransfield. 1987. Genera Palmarum. A classification of palms based on the work of H. E. Moore, Jr. L. H. Bailey Hortorium and the International Palm Society, Lawrence, Kansas.

Livistona carinensis in Miami, Florida, USA

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1. *Livistona carinensis* grows vigorously in the author's palmetum. Here it is flowering in March, 2000. (Photo by S. Zona)

Despite being from arid areas of the Arabian Peninsula and the Horn of Africa, *Livistona carinensis* needs an abundant supply of water.

I obtained my *Livistona carinensis* from Fairchild Tropical Garden, which had received the wild-collected seeds from Djibouti in 1976. I received the plant at a Plant Distribution at the Garden in 1978, at which time it was probably about 50 cm (15–20 in.) tall. I moved from my home on a man-made island in Biscayne Bay in 1980, and I brought the potted plant with me. It was probably planted out in July 1980 or the following spring. Unfortunately, I did not keep good records, and

2. The creamy white flowers of *Livistona carinensis*. (Photo by S. Zona)

those that I had disappeared in large part due to the effects of Hurricane Andrew in August, 1992.

I moved to a retirement community halfway between the city of Miami and Homestead where the weather is colder during the occasional winter cold spells than on the island, which was kept warmer by the water surrounding it.

The new location is at the end of the ridge of rock on which the early settlers built, since it was drier than the surrounding Everglades and had more breezes. The *Wissmannia carinensis*, as it was known at that time, was placed in the Palmetum (Fig. 1). I had started by having 100 holes augured in what is known as coral rock (oolite) with a very thin layer of soil over it. In fact on some spots there is no soil at all. My *Wissmannia* grew very well, as did most of the small palms brought from my old garden. I had set up a watering system under my control and could turn it on when I deemed the plants needed it. Unfortunately after Hurricane Andrew in August of 1992, a new automated system was installed over which I have no control.

In 1995 the *Wissmannia* looked like a huge pineapple with its fat trunk, to which remains of the old leaves added size, and its head of strong dark green leaves. It had not been harmed by Hurricane Andrew, except that one lower leaf had been twisted and caught on the large dark hooks of several other petioles. It took almost two years until we were able to cut off the offending frond. In May 1997 I discovered that the top of the tree was bending over as though it were wilting. A path was cut up the trunk so that a ladder could be placed and someone could investigate the top to check for fungus. There was no sign of anything unusual except that a complete circle of inflorescences, about six inches high, were emerging. In time, the top began to straighten out, and the inflorescences grew upwards at first. As they elongated they began to bend down, although they did seem to stay outside of the leaves. When about 2 m (7 ft.) long, they bore numerous tiny pale creamy yellow flowers (Fig. 2). There seemed to be many thousands of flowers but, to my dismay, no signs of fruits.

The following year the same series of events took place, although the wilting was more pronounced. I had, meanwhile, discovered that this palm grows where there is fresh water on the surface of the ground. Scott Zona had given me a copy of an article by Monod (1955), who found the palm in Somalia near an oasis called Karin (or Carin) and that the trees were growing where fresh water was above ground, coming from springs around which people had planted date palms. Later Scott provided another article by Bazara'a et al. (1990),

who described the site in Yemen where the German Botanist Wissmann had first found the palms. They too said that it grew only where there was water on or very near the surface, although some of those areas had water that was slightly saline. Given this information, I thought that perhaps my tree had not had enough water, as late spring had been very dry. A hose was laid at the base of the palm and turned on for four to five hours daily. Soon the wilted look disappeared, and the inflorescences grew and bloomed. This time tiny lumps appeared but seemed to grow larger very slowly. It appears the wilting problem was caused by planting the palm at the outer limits of the sprinkler, and possibly because I could not control the time the sprinkler was on. Now I am providing extra water by means of an irrigation system that works on demand.

The fruits that formed were dark brown to black when ripe and about 7.0 mm (0.25 in) in diameter, only slightly larger than black peppercorns! There were some eight to ten inflorescences. I cut off the first inflorescence to ripen and recovered handfuls of seeds which I took to our South Florida Chapter meeting and distributed to all who wanted some. Steve Trollip, visiting IPS Board member from the Republic of South Africa, took the remaining cupful to distribute in his country. About a week later South Florida Board member, Murray Corman, cut off the remaining inflorescences, many of which were still green. He wrapped them all in a large tarpaulin and placed the bundle in the shade at his house. The copious rain kept inflorescences from drying out while the fruits ripened. From these fruits, Murray and I obtained thousands of viable seeds. Seedlings from these seeds are growing vigorously.

In its native habitat the tree can grow to 30 m (100 ft), a fact that indicates that it is very well anchored in the soil and able to withstand the tremendous winds of the area. The palm was first described by Chiovenda as a species of *Hyphaene* (which it very obviously is not). Burret recognized that it could not be a species of *Hyphaene* and described the new genus *Wissmannia*, comparing the palm with *Maxburretia* (or *Symphyogyne* as it was then called) rather than *Livistona*, which it so obviously resembles. When Dr. H. E. Moore made the first really complete botanical specimens of the palm (as opposed to the incomplete scraps of previous collections), he recognised the many similarities with *Livistona* (Moore 1971); however, the palm was so far from the other species of the genus, which occur in Australia and on several Pacific islands, that he continued to recognize it as a separate genus. During research towards *Genera Palmarum*, Dransfield and Uhl felt that it was not distinct from *Livistona*, and placed *Wissmannia* in synonomy. Now that fresh fruits and vigorous seedlings are known, perhaps it should be reassessed.

My experience with this palm shows that knowledge of natural habitats is vital if we wish to succeed with palms in artificial habitats (our gardens).

Literature Cited

Bazara'a, M., L. Guarino, A. Miller, and N. Obadi. 1990. Observations on an endangered fan palm in Arabia. Edinburgh Jour. Bot. 47: 375–379.

Monod, T. 1955. Remarques sur un palmier peu connu: *Wissmannia carinensis* (Chiov.) Burret. Bull. Inst. Français d'Afrique Noire Sér. A 17: 338–358.

Moore, H. E. 1971. Wednesdays in Africa. Principes 15: 111–119.

The Indochinese Rattan *Calamus acanthophyllus* – a Fire-Loving Palm

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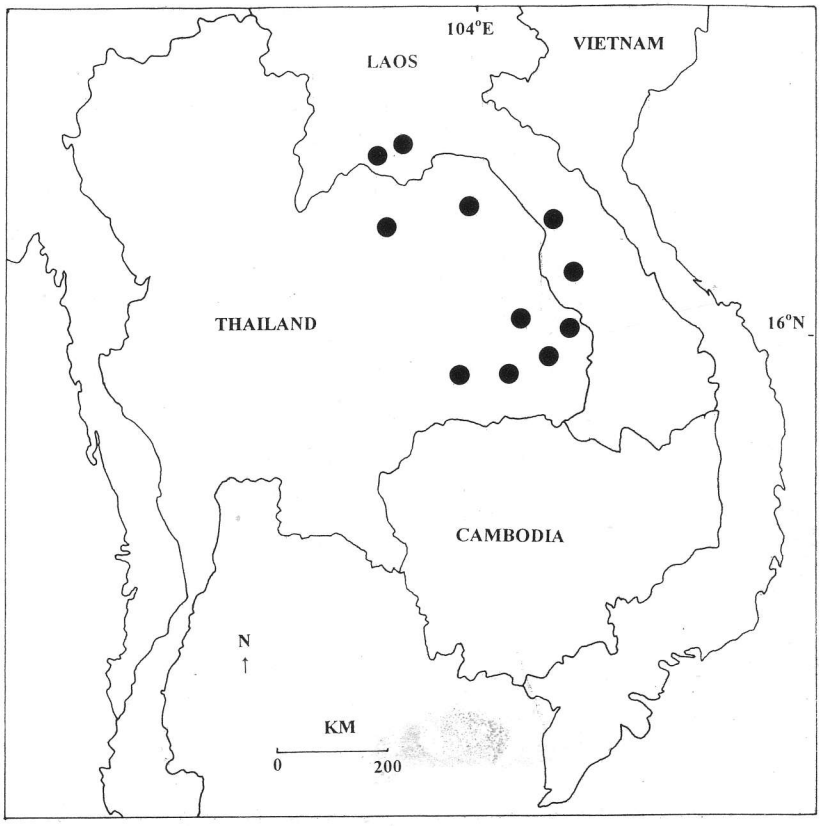

1. Distribution of *C. acanthophyllus*. Some dots cover more than one record.

The taxonomy of Indochinese rattans is poorly known, and the ecology of individual species is even less well-studied. During a project to catalogue the rattan flora of Laos, we have had the opportunity to observe several of these little-known species. Among them is *Calamus acanthophyllus*, whose appearance and peculiarities are outlined in this note.

2. *Calamus acanthophyllus* in April: one plant opening a new leaf (center right) and another with open leaves and a young inflorescence (center left). Specimen *Khamphone 141*.

The vast majority of rattans occupies moist evergreen forests where they seldom, if ever, risk being burnt, but *C. acanthophyllus* lives in dry, lightly wooded habitats which may be burnt every year. Its range is shown in Figure 1, and known records are listed at the end of the text. It has been recorded below 250 m at scattered sites in the lowlands of Laos and east and north-east Thailand. It can perhaps be expected to occur in Cambodia and southern Vietnam since similar habitats are common there.

Records where the habitat was noted all come from deciduous habitats, including dry deciduous dipterocarp forest and village margins. It may be quite scarce and patchily distributed as it has been found quite rarely during recent fieldwork in Laos (pers. obs.) and whilst Vidal (1956–60) found it commonly in one area of dry deciduous dipterocarp forest in Vientiane Municipality he did not record it from 14 other areas of this habitat from Vientiane south to the Cambodian border. All Lao sites lie in Climate Region I of Vidal (1956–60), characterised by an average temperature greater than 20°C year-round, average annual rainfall ranging from 1400 to 2600 mm and a very long dry season (at least five months). Rainfall in the dry deciduous dipterocarp forests of north-eastern Thailand is typically 1000–1500 mm (Stott 1991).

Open deciduous forests are widespread in the lowlands of Laos and north-east Thailand. Huge areas of them are burnt annually. These fires may start naturally but more often are set by people. Some spread accidentally during slash-and-burn farming, some are set for fun whilst others serve to stimulate fresh grass growth for livestock or make walking and hunting easier. Fires occur in the driest part of the dry season when few understorey plants are actively growing. In many areas they pass quite rapidly, consuming fallen leaves, grass and herbs but leaving shrubs, saplings and trees little affected (Stott 1988). Understorey plants which adapt to this regime are often annuals with fire-resistant seeds or perennials which can regrow after fire from underground organs (Stott 1984). The latter is the strategy which seems to be used by *C. acanthophyllus*. It is one of the few acaulescent rattans, producing its leaves from a stout, almost bulb-like base which is partly underground. It is this bulb-like part which survives the fire and later puts out new leaves (Fig. 2). The bases of the leaves are remarkably thick and leathery. They form a multi-layered sheath (Fig. 3) which appears to protect the single, highly vulnerable apical meristem, the pad of actively dividing cells which is essential for new growth.

Calamus acanthophyllus shares this difficult habitat with another adventurous, often stemless palm, *Phoenix loureiri* var. *loureiri* (*sensu* Barrow 1997) which seems to solve the problem of fire in a similar way (Stott 1984, 1988). *Phoenix loureiri* (often called *P. acaulis*, although the two species are distinct) is a widespread species and may have evolved elsewhere, but *C. acanthophyllus* seems to have a much more restricted range. It presumably evolved somewhere in mainland South-East Asia

3. The bulbous base of *Calamus acanthophyllus* cut away to show the thick, leathery, overlapping leaf bases. Specimen *Khamphone 141*.

in the restricted patches of naturally occurring deciduous vegetation, long before the arrival of humans and the resulting expansion of fire-climax deciduous forests.

Calamus acanthophyllus is quite an easy plant to recognise, even when sterile, although it might be confused with seedlings of *Calamus viminalis* Willd. The swollen base of *C. acanthophyllus* produces leaves which can reach 1.5 m long (including a petiole of about 90 cm) but lack any kind of climbing organ and have non-tubular bases. The leaflets are narrow linear, up to 25 x 1 cm but usually shorter, plumosely arranged, more-or-less grouped, with a tight, digitate terminal group of 5–8. The leaflet margins and some or all of the veins are usually armed with the stiff, golden erect spines which give the plant its specific name, but these may be absent. When sterile this less spiny form can be confused with seedlings of *C. viminalis*, but that is a larger plant with thinner, tubular leaf bases, stouter petioles with straight spines often 3–4 cm long, shorter, broader leaflets, and a conspicuous white indumentum on freshly emerged parts.

The inflorescences of *C. acanthophyllus* are quite simple for a rattan and similar between the sexes: an erect central axis around 50 cm long rising amongst the leaves and bearing a few alternate spikes of flowers near the tip. The flowers are numerous but small and inconspicuous, being dull yellow and green. The fruits are ovoid and dull ivory in colour with fine dark scale margins (Fig. 4). Kerr recorded the Khmer language name 'padao kui' in Surin, Thailand, whilst in Laos, local names include 'wai tia' (dwarf rattan) and 'wai kok' (rattan of dry, open forest). We have also heard *Phoenix loureiri* being referred to as 'wai kok' by people selling the fruits in Salavan Province. Vidal (1963) records Lao people eating the fruits and using the roots in traditional medicine but it has no particular economic significance.

In the list below, FRCL is used for the herbarium of the Forest Research Centre, Lao PDR.

SPECIMENS EXAMINED. LAOS: Savannakhet Province, km 65 on the road from Savannakhet to

4. *Calamus acanthophyllus* fruit, April. Specimen *Khamphone 141*.

Quangtri, fr., *Poilane 11509* (P); no locality, fr., *Massie s.n.* (P); Than Ngeun [untraced locality], fr., *M. P. Tixier s.n.* (P); Khammouane Province, Gnommalat District, Ban Kabood, 160 m, ster., *Khamphone 43* (K, FRCL); Vientiane Municipality, Thoulakhom District, near Ban Hatkiang, 200 m, stam. and fr., *Khamphone 141* and *142* (K, FRCL). THAILAND: Ubon Ratchanthani Province, Ubon (some sheets) or Rivière d'Ubon, stam. and fr., *Thorel s.n.* (P, types and isotypes of male and female, K, female isotype); Ubon Ratchathani Province, Khemarat, Pho Sai, Na Kham, 160 m, stam., 2/11/97, *Soejatmi Dransfield SD1454* (K); Yasotawn Province, ster., 4/5/24, *SN 246538* (BK); Udon Thani Province, Nong Bun Lam Phu, 230 m, *C. Phengklai 1254* (BKF); Sakhon Nakhon Province, Phu Phan, Ti Lataven, *PS 1939* (BKF); Sakon Nakhon Province, Ban Tan, fr., 5/12/62, *Adisdi 201* (BK); Surin Province, Prasat District, Taseng Prue, Ban Jan Gual, *D.P. Hurlburt 21* (BKF); Surin Province, 130 m, *C. Phengklai* et al. *3629* (BKF); Surin Province, 100 m, stam. and fr., 9/1/24, *Kerr 8233* (K, BK); Sisaket Province, Kanthalak, stam., 25/1/65, *C. Phengklai 947* (K, BKF).

OTHER RECORDS. LAOS: Vientiane Municipality, common around km 18 on the Vientiane-Thangon road (Vidal 1956–60); Vientiane Municipality, Naxaithong District, Ban Nongkhankhou, 200 m (personal observation, 1999).

Acknowledgements

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LITERATURE CITED

BARROW, S. C. 1997. A monograph of *Phoenix* L. (*Palmae*: *Coryphoideae*). Kew Bulletin 53: 513–575.

STOTT, P. 1984. The savanna forests of mainland South East Asia: an ecological survey. Progress in Physical Geography 8: 315–335.

STOTT, P. 1988. Savanna forests and seasonal fire in South East Asia. Plants Today November-December 1988: 196–200.

STOTT, P. 1991. Stability and stress in the savanna forests of mainland South-East Asia. pp 29–39 in Werner, P. A. (ed.) Savanna Ecology and Management. Australian Perspectives and Intercontinental Comparisons. Blackwell Scientific Publications, London.

VIDAL, J. E. 1956–60. La végétation du Laos, I. Conditions ecologiques. II. Groupements végétaux et flore. Travaux Laboratoire Forestier de Toulouse 5: 1–582

VIDAL, J. E. 1963. Les plantes utiles du Laos. (Cryptogames, Gymnospermes, Monocotylédones). Journal d'Agriculture tropicale et de la Botanique appliquée. 1ère Série (I–VI bis).

Two Amazonian Palm Species Revalidated: *Astrocaryum farinosum* and *A. sociale*

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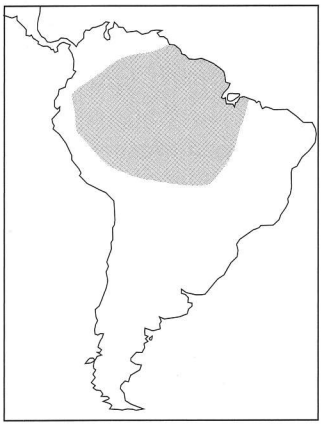
***Astrocaryum farinosum* and *A. sociale*, two species described by J. Barbosa Rodrigues, were treated as synonyms of *A. sciophilum*. Data from new material of these palms show that differences in vegetative and reproductive characters are significant enough to treat them as species.**

Astrocaryum farinosum and *A. sociale* were described and commented on by Barbosa Rodrigues (1875, 1879, 1888, 1891, 1902, 1903) whose collections have disappeared, probably in a domestic fire (Glassman 1972). These taxa have been put into synonymy with *A. sciophilum* (Miquel) Pulle by Wessels Boer (1965). Only two vouchers of *A. farinosum* were collected in Guyana (*Smith 2583*, 21–26 Nov. 1937, this with three photographs; and *Black & Ledoux 50-10779*, 12 Nov. 1950). Kahn and Millán (1992) treated the three taxa as species. They justified their position with knowledge of *A. sciophilum* and *A. sociale* in the field as well as from herbarium vouchers, and by considering the similarity between Barbosa Rodrigues'(1903) drawing of *A. farinosum* and Smith's photographs; both illustrate the remarkably long and very slender inflorescence which characterizes this species. However, Kahn and Millán had not seen *A. farinosum* in the field at this time, and Smith's herbarium voucher includes only leaf parts and fruit. Henderson (1995) followed Wessels Boer (1965)'s assessment with only one species, *A. sciophilum*.

Smith collected *Astrocaryum farinosum* in Guyana along the Equissebo tributary of the Kuyuwini river about 150 miles from its mouth, i.e. about 120 km air-distance from the Brazilian locality. The palm was recollected along Kuyuwini river by *Jansen-Jacob et al. 2390*, 5 Feb. 1991. In 1993 and 1994, *A. farinosum* was revisited in the Upper Jatapú River valley (north Brazil) where Barbosa Rodrigues collected it in 1873; the palm forms dense stands in the understory of terra firme forest on uneven relief near the border with Guyana. Ripe fruit and flowers at anthesis were collected (*Kahn and Moussa 3526–3531, 3533–3535, 3536–3539, 3563–3568*). It was recently found in central Brazilian Amazonia near Balbina about 400 km air-distance from the Upper Jatapú (*Rabelo 50*), and at Km 145 from Manaus on highway BR 174 (*Kahn 3636*). The characters of *A. farinosum* – slender infructescence, large fruit, epicarp with short spines – are remarkably constant in spite of the fairly large distance between the populations.

Astrocaryum farinosum extends from southern Guyana to about 120 km north of Manaus.

1: Distribution areas of *Astrocaryum farinosum*, *A. sciophilum* and *A. sociale* in the Amazon basin.

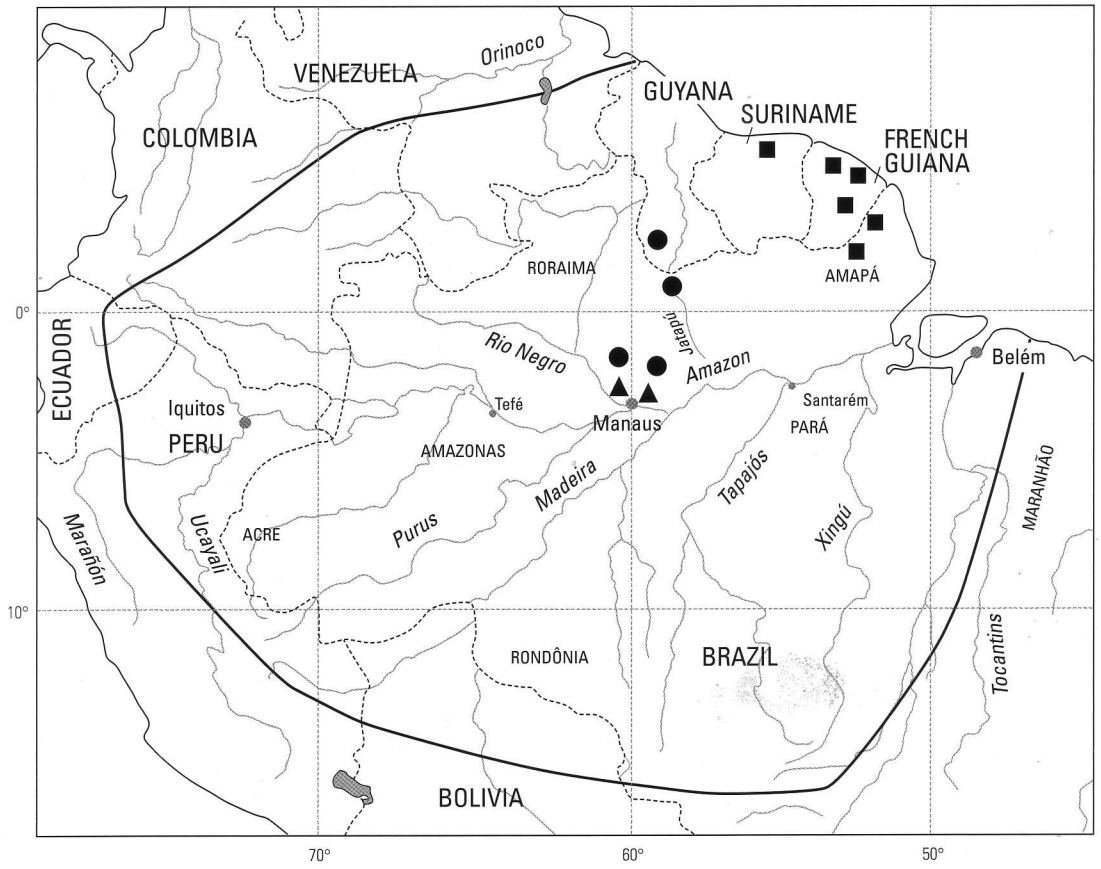


Astrocaryum sciophilum occurs in French Guiana, Suriname, and in Brazil at the border with French Guiana in the state of Amapá. *Astrocaryum sociale* is limited to central Amazonia in the immediate northern region of Manaus (Fig. 1).

Distinctive characters among *Astrocaryum farinosum*, *A. sciophilum* and *A. sociale*

The measures of vegetative and reproductive parts of the three species are given in Table 1.

Vegetative parts. *Astrocaryum farinosum* has the same habit, and almost the same physionomy as that of *A. sciophilum*, being most often subacaulescent (Fig. 2, 3). Both species have oblique rows of spines on the petiole and may develop a trunk, which is usually 3–4 m in height, exceptionally up to 10 m. The trunk of *A. sciophilum* keeps the sheaths of the dead leaves only under the crown, while that of *A. farinosum* usually remains covered with the sheaths throughout its whole length. *Astrocaryum sociale* develops a subterranean trunk



● *Astrocaryum farinosum* Barbosa Rodrigues
■ *Astrocaryum sciophilum* (Miquel) Pulle
▲ *Astrocaryum sociale* Barbosa Rodrigues

Table 1. Vegetative and reproductive characters of the three species. (Data from [1]Kahn's vouchers cited in text; [2]*Henderson 1047, 1070, Kahn 569, 587, 3223, 3229, sn;* [3]*Granville 3257, 11074, Oldeman 1088).*

	A. farinosum[1]	*A. sociale*[2]	*A. sciophilum*[3]
Trunk	aerial	subterranean	aerial
Leaf length (cm)	491–681	410–466	595–700
Rachis length (cm)	352–520	280–370	441–446
N pinnae/side	57–81	51–70	64–82
Median pinna			
length (cm)	85–118	76–88	100–105
width (cm)	3.6–4.2	2.9–3.7	4.2–4.8
Inflorescence length (cm)			
Peduncle	139–180	35–50	up to 100
Rachis	6.5–20	7–11	10–25
Rachilla length (cm)			
basal part (without stam. fl.)	1.1–2.6	0.8–3.0	1.9–2.9
distal part (bearing stam. fl.)	8.0–20.5	3.9–7.5	5.5–11.3
Staminate flower (mm)			
Sepal length	0.7–1.3	0.4–0.8	0.3–0.5
Petal length	2.4–4.0	1.9–2.9	2.0–2.4
Filament length	0.8–1.3	0.6–0.9	0.4–0.9
Anther length	0.9–1.6	0.8–1.1	0.7–0.9
Pistillode length	0.1–0.8	absent	?
Pistillate flower (mm)			
length	12.5–19.2	8.8–13.1	13.3–18.8
width	9.4–11.9	5.8–8.0	7.5–8.4
Calyx length	8.3–14.4	4.9–9.4	9.4–12.5
Corolla length	6.3–11.7	4.0–7.2	6.3–9.4
Staminodial ring height	1.4–3.8	0.9–1.6	0.8–1.7
Gynoecium			
length	7.0–13.3	5.0–6.9	7.8–10.9
diam.	4.2–9.1	3.9–5.6	4.2–5.0
Stigma			
length	6.6–11.3	5.3–9.4	7.5–10.5
width	6.3–9.7	5.5–9.4	5.2–7.2
Fruit (mm)			
length	48–76	39–58	70
width	32–47	24–39	30–40
Perianth (mm)			
Calyx length	9–14	8–13	14
Corolla length	18–30	17–27	28
Staminodial ring height	11–22	10–14	14
Spines on epicarp	short	short	long

which cannot be observed without excavation (Fig. 4, 5). Its leaves are significantly shorter than those of both former species.

Reproductive parts. The inflorescence of *A. farinosum* is very slender, up to 2 m long, and erect (Fig. 6); that of *A. sociale* is short, no more than 0.6 m long (Fig. 7); and that of *A. sciophilum* is intermediate in size, initially erect when flowering and more or less pendent at fruit maturity (Fig. 8). The rachis of *A. farinosum* and *A. sociale* is short, that of *A. sciophilum* is longer. The distal part of the rachilla, which is covered with staminate flowers, is clearly shorter in *A. sociale* than in the other species. Rachilla indumentum consists of obclavate hairs in *A. sciophilum* and of thread-like hairs in *A. farinosum* and *A. sociale.*

The staminate flower is larger in *A. farinosum* with very minute pistillodes which are not observed in the other species. A small bract, usually present at the base of the flower in the three species, is more developed in *A. farinosum.*

The pistillate flower is significantly smaller in *A. sociale.* The staminodial ring is usually higher in *A. farinosum* than in *A. sciophilum* (both species with flowers of same size). However, the main differences concern the morphology of the flower parts which makes these species easily to identify (Fig. 9):

Astrocaryum sciophilum – calyx 3-dentate, oblong-urceolate, narrowed at top, encompassing the style up to the base of the stigmas; corolla 3-denticulate, oblong-urceolate.

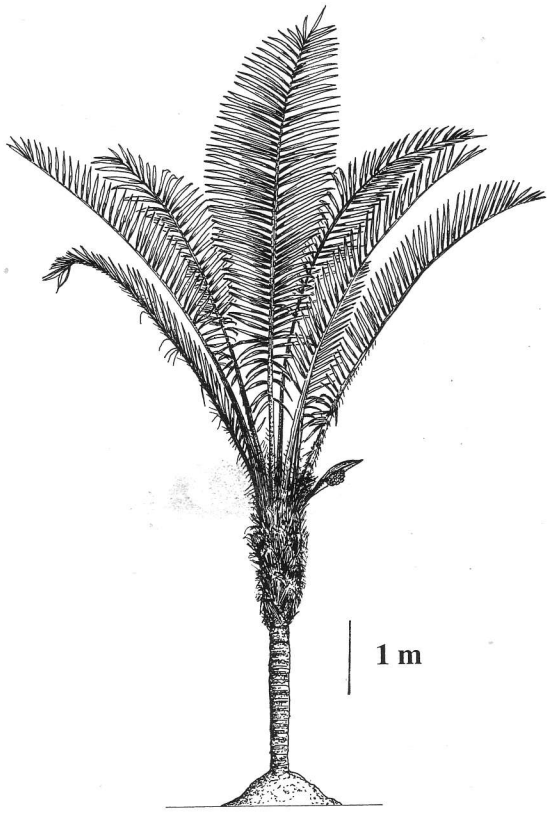
Astrocaryum farinosum – calyx strongly 3-dentate, urceolate, not narrowing in the upper part; corolla 3-denticulate, subglobose to slightly urceolate.

Astrocaryum sociale – calyx 3-dentate, subglobose, not narrowing in the upper part; corolla 3-dentate, globose.

The fruit is strongly or sightly turbinate to globose; the epicarp is covered with hard spines in *A. sciophilum,* with small spines in *A. sociale* and *A. farinosum* (Fig. 10). This last species develops the biggest fruits with a massive rostrum. There is no significant difference in the perianth, except for the staminodial ring being usually higher in *A. farinosum.*

2. *Astrocaryum farinosum* (after Barbosa Rodrigues' drawing, 1903, and Smith's photographs, yr 1937)

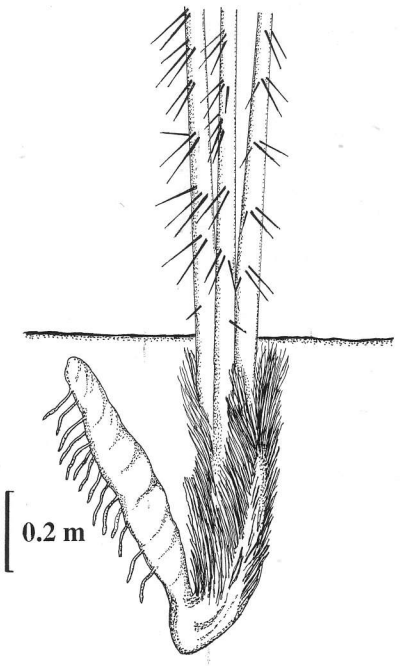
3. *Astrocaryum sciophilum* (by J.-J. de Granville).



Discussion and Conclusion

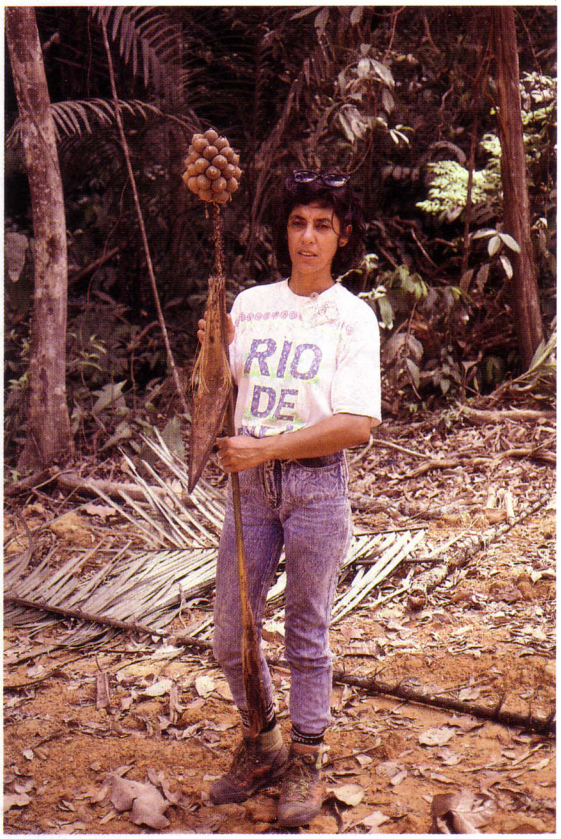
Wessels Boer (1965) considered *Astrocaryum farinosum* and *A. sociale* as synonyms of *A. sciophilum*. He based his argument on the variability of vegetative parts of these spiny palms and on the controversial additional small bracts – inserted on the peduncle and on the base of the rachis – which were emphasized by Burret (1934). Only *A. sciophilum* had such bracts according to Burret, which distinguish it from the other species. It is true that Barbosa Rodrigues did not refer to such structures in his descriptions and did not illustrate them in his drawings. Wessels Boer did not observe them in *A. sciophilum*, and he concluded on Burret's discussion of this character "I fail to understand what he meant." And this was his main argument to consider *A. farinosum* and *A. sociale* as synonyms of *A. sciophilum*. In fact, the three species possess small chartaceous, brown bracts, highly variable in shape, number and size and therefore not significant taxonomically. On the other hand, Wessels Boer could not have considered differences in flowers because only those of *A. sciophilum* were then available in the herbaria.

Henderson (1995) treated them again as synonyms of *A. sciophilum*. He considered *A. sociale* and *A. farinosum* as short-trunked palms, and by the way, introduced a confusion: It may be true for *A. farinosum*, most often subacaulescent, but it is not the case with *A. sociale* which has a subterranean trunk growing downwards. Henderson interpreted both species as short-stemmed populations of *A. sciophilum* and explained this morphological difference as the probable result of rainfall which is higher in the Guianas than in central Amazonia. Higher rainfall would then favor the development of a trunk. There is a difficulty, however: his large species *A. paramaca* presents trunked individuals in central Amazonian while it develops acaulescent (subterranean-trunked) palms in the



5. *Astrocaryum sociale* – subterranean trunk (by F. Kahn).

4. *Astrocaryum sociale* (by F. Kahn).



6. *Astrocaryum farinosum* – infructescence (by F. Kahn).

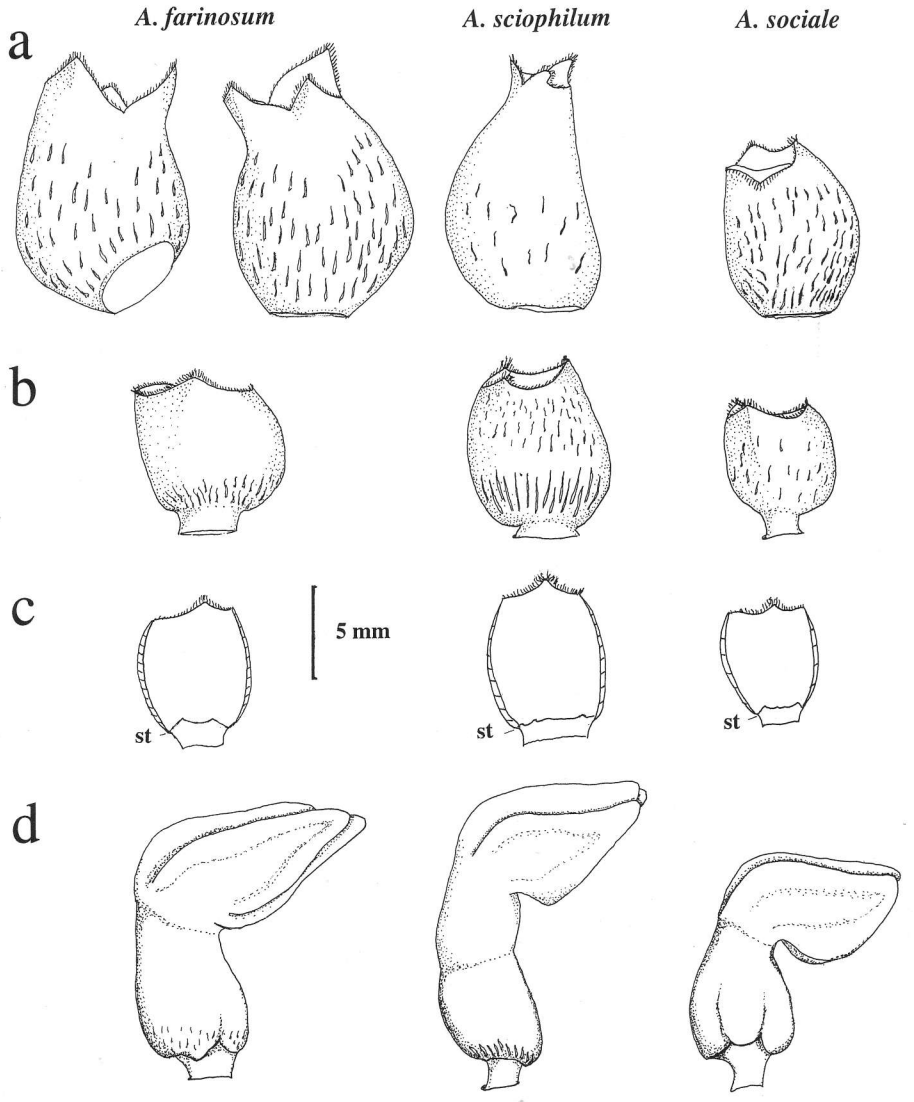
7. *Astrocaryum sociale* – infructescence (by A. de Castro).

8. *Astrocaryum sciophilum* – infructescence (by J.-J. de Granville).

Guianas (under higher rainfall). Could higher rainfall in the Guianas favour the trunk development in one species (*A. sciophilum*) and limit it in another species (*A. paramaca*), both species growing in the same Guianan locality inside the same forest? Moreover, trunked individuals of *A. farinosum* (*Kahn 3636*) have been found in central Amazonia within 60 km of the most important population of the subterranean-trunked *A. sociale* (Fig. 1), both species growing under the same climatic conditions.

Wessels Boer and Henderson's positions are far from convincing. 1) Wessels Boer had seen neither *A. farinosum* nor *A. sociale* in the field, and discussed variability of vegetative parts from *A. sciophilum* only. The few collections available in 1965 were very incomplete. We can assume that Wessels Boer did not observe specimens of *A. sociale* and knew *A. farinosum* only from Smith's voucher, which was then identified as *A. sciophilum* by Burret. 2) Henderson's position is ecologically inconsistent and is not based on new information about these species.

Data from new material of *A. farinosum* and *A. sociale* show that differences in vegetative and reproductive characters are so significant that they should not be called "evidently homogeneous" as concluded by Henderson (1995).



9. Pistillate flowers of the three species. a – calyx; b – corolla; c – staminodial ring (st) adnate in corolla; d – gynoecium (by F. Kahn).

This group of very close species belongs to subgenus *Monogynanthus*, section *Ayri* (Burret 1934). Cladistic and phenetic analyses of morphological characters as well as DNA phenetic analysis – genomic AFLP – show that the three species are as distant from section *Munbaca* (the second section of subgenus *Monogynanthus*) as from the other species of section *Ayri* (Kahn & Second 1999, Pintaud et al. in press).

These results as well as the distributions of the three species which extend in northern Amazonia – from the central region to the Guianas with *A. sociale* and *A. sciophilum* at the south and northeast, respectively, and with *A. farinosum* between these poles – offer a relevant biogeographical scheme to study evolutionary processes in the genus.

Acknowledgments

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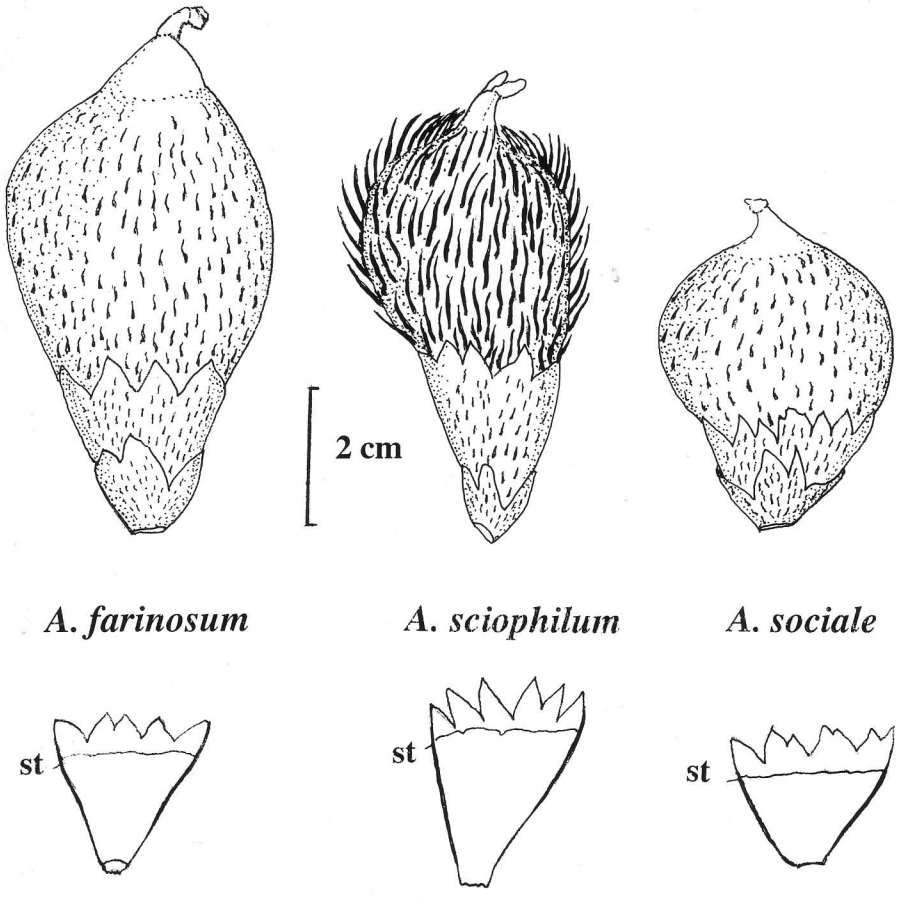
LITERATURE CITED

BARBOSA RODRIGUES, J. 1875. Enumeratio Palmarum Novarum quas Valle Fluminis Amazonum, Rio de Janeiro.

BARBOSA RODRIGUES, J. 1879. Prostesto-Appendice ao Enumeratio Palmarum Novarum, Rio de Janeiro.

BARBOSA RODRIGUES, J. 1888. Palmae Amazonenses Novae. Vellosia 1: 33–56.



10. Fruits of the three species; below: perianth with staminodial ring inside (by F. Kahn).

BARBOSA RODRIGUES, J. 1891. Palmae Amazonenses Novae. Vellosia 2: 91–112.

BARBOSA RODRIGUES, J. 1902. Palmae-Amylocarpus. Contr. Jard. Bot. Rio de Janeiro, 3: 69–88.

BARBOSA RODRIGUES, J. 1903. Sertum Palmarum Brasiliensium, ou relation des palmiers nouveaux du Brésil, découverts, décrits et dessinés d'après nature. Imprimerie Monnom, Bruxelles, 2 vol.

BURRET, M. 1934. Die Palmengattung *Astrocaryum* G. F. W. Meyer. Repert. Spec. Nov. Regni Veg. 35: 114–158.

GLASSMAN, S.F. 1972. A Revision of B. E. Dahlgren's Index of American Palms. Phanerogamarum Monographiae Tomus VI, Verlag Von J. Cramer, Lehre.

HENDERSON, A. 1995. The palms of the Amazon. Oxford University Press, New York.

KAHN, F. AND B. MILLÁN, 1992. *Astrocaryum* (Palmae) in Amazonia. A preliminary treatment. Bull. Inst. fr. Et. andines 21: 459–531.

KAHN, F. AND G. SECOND, 1999. The genus *Astrocaryum* in Amazonia: Classical taxonomy and DNA analysis. Mem. New York Bot. Gard., 83: 179–184.

PINTAUD, J.-C., G. SECOND AND F. KAHN. Phylogeny of the Amazonian species of *Astrocaryum* (Palmae) inferred from cladistic and phenetic analyses of morphological and DNA (AFLP) characters. Amer. Jour. Bot., in press.

WESSELS BOER, J.G. (1965). The indigenous palms of Suriname. E.J. Brill, Leiden.

Len Brass' Photographs of Palms in New Guinea

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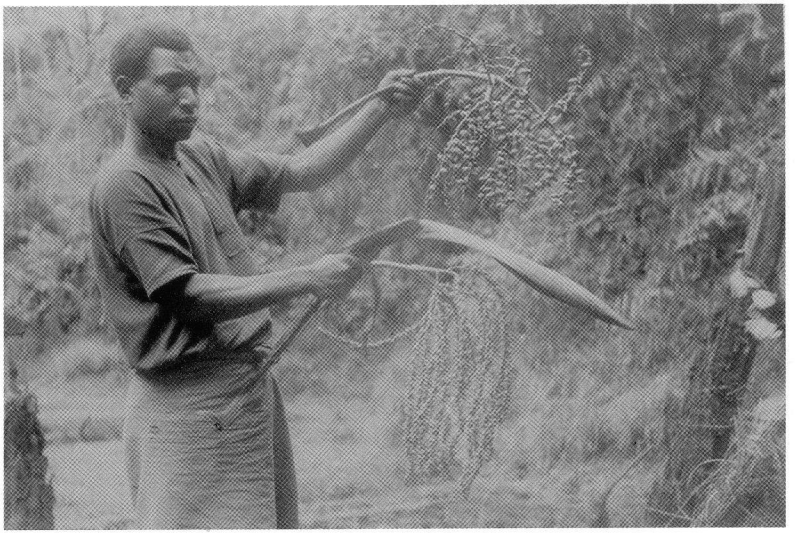
Toowong QLD 4066 Australia



1. Brass' photograph of *Heterospathe obriensis*, *Brass 4974*.

Even almost thirty years after his death, Leonard J. Brass remains one of the most important collectors of palms in New Guinea.

Leonard Brass' contribution to palm science has already been accounted for earlier in this journal (Forster 1997). Several things make Brass' collections so important. First of all, he went to remote places and collected an unusually high number of new species in relation to the rather few collections of palms he made overall (149). Secondly, most of the collections are very complete with flowers and/or fruits included, as well as informative notes. Thirdly, he provided additional documentation with black and white photographs that were distributed with the specimens. A large collection of negatives and prints are kept in the photographic archives at the Queensland Herbarium in Brisbane, Australia. Table 1 gives a list of the species photographed. Because the negatives are large the resolution is generally very good; however, film technology and light measurement do not live up to modern standards. The photographs of palm individuals from which type collections were prepared are particular valuable since they facilitate accurate reconstruction of the identity of the palm in question.

Table 1. List of the Brass photographs available on CD-ROM. Asterisk indicates that a type specimen was prepared from the individual photographed.

Name on photograph (synonym of)	Brass coll. no.	Part photographed
Actinorhytis calapparia (Blume) H. Wendl. & Drude ex Scheff.	5672	Habit
Actinorhytis calapparia (Blume) H. Wendl. & Drude ex Scheff. (2 photos)	2827	Habit, leaf and infructescence
Areca macrocalyx Zipp. ex Blume	2655	Leaf and infructescence
Arenga microcarpa Becc.	5625	Infructescence
Brassiophoenix drymophloeoides Burret	5665*	Crown and upper stem ('severed top')
Caryota rumphiana Mart.	5440	Habit
Caryota rumphiana Mart. (2 photos)	2651	Habit, infructescence and inflorescence
Cyrtostachys brassii Burret (3 photos)	5600*	Crown, infructescence, palm on ground
Gulubia brassii Burret (syn. of *G. longispatha* Becc) (2 photos)	5457*	Habit, crown and upper part of stem
Gulubia costata Becc. (2 photos)	7245	Habit and infructescence
Heterospathe minor Burret	3462*	Habit
Hydriastele beccariana Burret	8333	Crown and upper stem, in flower and fruit
Licuala lauterbachii Damm. & K. Schum.	2819	Habit
Livistona crustacea Burret (4 photos)	7668*	Habit, crown, leaf and infructescence
Livistona woodfordii Ridley	3517	Habit
Metroxylon rumphii Mart.	8111	Infructescence
Metroxylon sp.		Flowering tree
Orania disticha Burret (2 photos)	5599*	Habit and inflorescence
Orania lauterbachiana Becc.	6610	Leaf and inflorescence
Ptychandra montana Burret (syn. of *Heterospathe obriensis* (Becc) H. E. Moore) (4 photos) (Fig. 1)	4974*	Leaf base, leaf, inflorescence and infructescence
Ptychococcus sp. (2 photos)	7120	Palm on ground, inflorescence bud and infructescence
Rhopaloblaste ledermanniana Becc.	7135	Crown and upper stem ("severed top")

A CD-ROM with the Brass photographs scanned at high resolution (5-7 MB TIF files) is available from Paul Forster, Queensland Herbarium at a charge of Aus $20. Only checks and international money orders payable to Queensland Herbarium are accepted.

LITERATURE CITED

FORSTER, P. I. 1997. Len Brass and his contribution to palm discoveries in New Guinea and the Solomon Islands. Principes 41: 158–162.

The Use of *Pigafetta elata* for Making Furniture in Indonesia

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Pigafetta elata **is a majestic palm endemic to the island of Sulawesi, Indonesia (Dransfield 1998). Its distinctive characteristics include lines of shiny golden-brown spines along the base of its leaves, and a dark-green trunk with light grey rings where the leaves have fallen off (Whitten 1987). According to Uhl and Dransfield (1987), this pioneer palm occurs at an elevation between 300 and 1500 m above sea level on river banks, landslips, very steep-sided ridgetops and disturbed forest. Given its habitat preferences, *Pigafetta* plays an important role in the forest ecosystem by decreasing rates of soil erosion and even landslides (pers. obs.).**

In North Sulawesi, the most beneficial feature of *Pigafetta* is its stem. The strong mature trunks of *Pigafetta* have proved to provide long-lasting timber. The trunk of *Pigafetta* is commonly used in the development of bridges and water conduits in paddy fields. Historically, it has also been used for over decades as a construction material for traditional houses, especially for interior walls and floors. Prior to the development of wooden house industry, many traditional houses in Minahasa, North Sulawesi, were made from the trunk of this palm. Currently, *Pigafetta* is found only in older houses, where it is used in the construction of interior walls and floors. In certain rural areas, the stem of *Pigafetta* is also used by villagers to build huts in the forest. Interestingly, these huts are also used in processing brown jaggery or palm sugar (*gula aren*) and local mild wine (*saguer*) made from the sugar palm, *Arenga pinnata*.

Recently *Pigafetta* has become economically important for local people in the Nooangan area of North Sulawesi as an important component in the small-scale home furniture industry. According to local people, the timber's overall quality is much better than that of the coconut, which is also commercially used for furniture making in North Sulawesi. *Pigafetta* offers an excellent alternative to coconut in regards to furniture-making. This is due to its great abundance and ease of harvest, as opposed to the coconut tree which is grown mainly for coconut harvest.

When harvested, the mature stem, which is large in diameter (the bigger the better), is cut into

1. Trunks of *Pigafetta elata*, hollowed out, dried and ready for the furniture-maker

2. A finished set of furniture, made from *Pigafetta elata* trunks.

sections or manageable lengths. A half-portion of a *Pigafetta* palm is used to make a set of furniture, commonly comprising one small table and five chairs. The pithy core of the trunk, which is soft, is scooped out. Then the tube-shaped pieces of trunk are left to dry in the sun for at least a month (Fig. 1). It takes about one to two weeks to produce a set of furniture. The price depends on the furniture items. For example, the price of a set of furniture (Fig. 2), consisting of one small table and five chairs, ranges from US$75 to $100, which is quite expensive by Indonesian standards.

According to local craftsmen, *Pigafetta* is harvested in secondary forest, owned by local people. Since this is a new furniture making industry in North Sulawesi, few palms appear to have been cut down by the craftsmen from the forest so far. Indeed, *Pigafetta* is still abundant in this particular area. Local people said further that if the demand for the furniture increases, they will begin to cultivate the palm commercially (it takes about ten years for a palm to reach harvestable size). The marketing of this small-scale home industry is carried out by the craftsmen themselves through promoting the product on a door-to-door basis. Based on personal observations and interviews with local craftsmen, it is apparent that most of the furniture was only sold to the villagers in surrounding areas. One obstacle faced by this small-scale industry is that of obtaining financial resources required to run the business. Currently, craftsmen make only the furniture that has been ordered since they lack the money to make excess products. This is also why they find it difficult to promote the products in other regions. Even though this is not a very intensive labour industry, it makes a significant contribution to the local economy.

Acknowledgements

First and foremost, I thank Dr. J. Dransfield, for without his support and encouragement this manuscript would not have been written. Discussions with Dr. Johanis Mogea are gratefully acknowledged. I extend a special thanks to my advisors Ted Spence, Paul Wilkinson Paul Treitz for a great deal of assistance and support. Special recognition needs to be given to Tim Babcock for his encouragement and help. Financial support for this work was generously provided by the University Consortium on the Environment, a component of the Collaborative Environmental Project in Indonesia (CEPI) Project (funded by CIDA).

Literature Cited

Dransfield, J. 1998. *Pigafetta*. Principes 42: 34–40.

Uhl, N. W. and J. Dransfield. 1987. Genera Palmarum. A classification of palms based on the work of Harold E. Moore, Jr. L.H. Bailey Hortorium and the International Palm Society, Allen Press. Kansas.

Whitten, A. J., Mustafa, M. and G. S. Henderson, 1987. The Ecology of Sulawesi. Gadjah Mada University Press, Yogyakarta.

ERRATA

On page 175 of PALMS 44(4), the legend to Figure 1 reads "Map of the islands on which *Siphokentia* is known to occur." *Siphokentia* is, in fact, not known from Yapen or Num, nor does it occur on mainland New Guinea as was implied unintentionally by the legend. The presence of *Siphokentia dransfieldii* on Supiori and Numfoor was reported to one of the authors by Biak islanders and has not been verified, although there is no reason to doubt the accuracy of their information. – W. J. Baker

In the review of D.R. Hodel (ed.) *Palms and Cycads of Thailand*, in PALMS 44(3): 99, John Dransfield mentioned that J.F. Maxwell had recently collected *Calamus harmandii* in Thailand, and, if the specimen proved to be correctly identified, this would represent a new record, not in Hodel's book. The specimen has recently been received at Kew and is not *C. harmandii* but *C. erectus*, itself a new record for Thailand. – J. Dransfield

Astrocaryum yauaperyense: A Synonym of *Astrocaryum murumuru*

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Astrocaryum yauaperyense **Barbosa Rodrigues was tentatively treated as a synonym of *A. murumuru* Martius from the similarity of the pistillate flowers (Kahn and Millán 1992). However, there is a contradiction in Barbosa Rodrigues (1903): the text discusses that he had no time to collect flowers, yet the illustrations include drawings of pistillate flowers. New collections of Barbosa Rodrigues' palm corroborate Kahn and Millán's position.**

Astrocaryum yauaperyense was collected in the Yauaperi River valley in 1884 by Barbosa Rodrigues who described it as a new species some years later (1888, 1891, 1902, 1903). The author did not collect flowers, as he wrote in his famous book, Sertum Palmarum Brasiliensum (Vol. 2, p. 80): "Tout mon temps étant occupé par la pacification des sauvages Krichanás de la rivière Yauaperi, je n'ai pas eu le loisir de rechercher les fleurs de cette espèce; c'est pourquoi la description n'est pas plus complète. Néanmoins, par le faciès et par les caractères que je décris, cette espèce s'éloigne de toutes celles connues." ("Because of pacifying Krichanás savages of Yauapery River all the time, I could not search for flowers of this species; this is the reason why my description is not complete as it should be. Nevertheless, from the facies and characters I describe, this species is well-distinct from the others"). Barbosa Rodrigues (1903) described the vegetative parts in particular (trunk, pinnae, peduncular bract) and, very succintly, the fruit "*drupa turbinata, fusca, aculeata*" (i.e. "drupe with a reversed cone shape, sombre brown, spiny").

There is no reference to a type or to any vouchers collected. A plate (Tabl. 80A) includes illustrations of vegetative parts (part of leaf, rachis, apex of peduncular bract) and of a fruit, but also of an entire rachilla and of a pistillate flower with details of calyx, corolla, staminodial ring and gynoecium. The obvious contradiction between Barbosa Rodrigues' text (no time to collect flowers) and the drawing of a pistillate flower in Plate 80A makes it impossible to know the origin of this flower. All the vegetative and reproductive parts drawn are from one (or more) species which undoubtedly belong(s) to section *Ayri* of subgenus *Monogynanthus*. The fruit seems to be unripe and is uninformative for identification at the specific level, but the pistillate flower is very similar to that of *A. murumuru*. Consequently Kahn and Millán (1992) considered *A. yauaperyense* a synonym of *A. murumuru;* however, reproductive material from this palm had to be collected and studied in order to support this position.

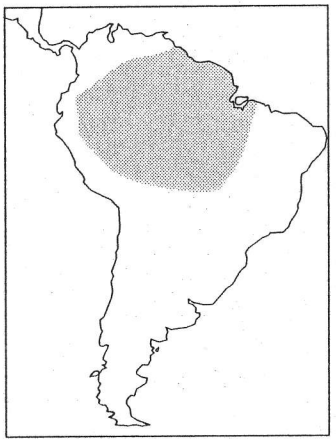
Astrocaryum yauaperyense Rediscovered

The Jauaperi River (spelled Yauaperi on old maps) is a tributary of the Rio Negro. I visited the middle Jauaperi valley in July-August 1993 where it is crossed by highway BR 174 (Manaus-Venezuela). The species was there; I found it near Caracaraí in

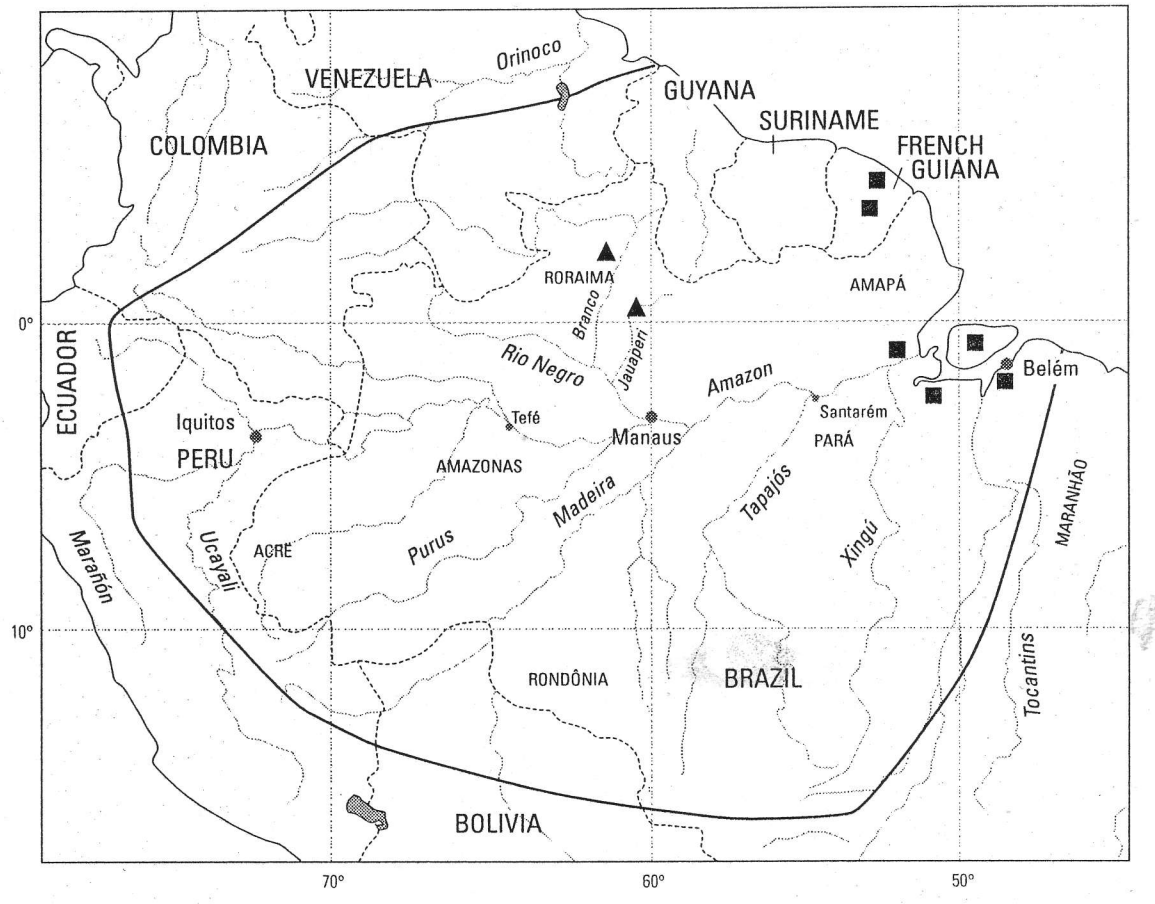
the Rio Branco River valley as well (Fig. 1). This palm usually forms dense stands in seasonal swamp forests. It also grows in pastures which have been increasing for the last 30 years with the opening of highway BR 174 and the resulting development of cattle ranching on vast areas.

The following vouchers were collected: *Kahn 3512* (fl., fr.) CEN, 31 Jul 1993, Roraima, BR 174, 35 km north of Equatorial line, 20 km before Jauaperi River. *Kahn 3515* (fr.), *3516*, *3517* (seedling) CEN, 1 Aug 1993, Roraima, Municipio Caracaraí, 10 km before the town via BR 174, on northern margin of Rio Branco River. *Kahn 3540* (fl.) CEN, 28 Oct 1993, 20 km north of Caracaraí.

Astrocaryum yauaperyense is a medium-sized, multistemmed palm with large pinnate leaves (Fig. 2). All the morphological characters of the vegetative parts fit the description of *A. murumuru*



1. *Astrocaryum yauaperyense* Barbosa Rodrigues (=*A. murumuru* Martius) in the Amazon basin.



■ *Astrocaryum murumuru* Martius

▲ Astrocaryum yauaperyense Barbosa Rodrigues

2. The palm in the field, near Caracaraí.

fairly well. However, the great similarity of vegetative parts in this group of palm species (section *Ayri*, subgenus *Monogynanthus*) led Kahn and Millán (1992) to define the species using reproductive characters, mainly (not exclusively) from those of the pistillate flower at anthesis and fruit at maturity.

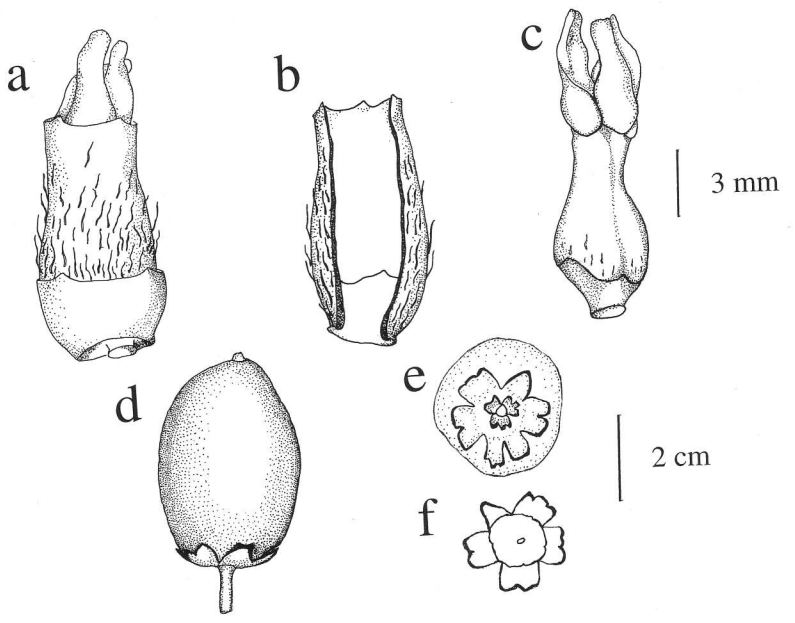
The pistillate flower of *Astrocaryum yauaperyense* (Fig. 3 a–c) – calyx glabrous, clearly shorter than corolla, cupular to shortly tubular, 3-denticulate; corolla spiny, slightly campanulate to tubular; staminodial ring adnate, 1/3–1/2 as long as corolla – presents the morphological pattern which characterizes group IV within section *Ayri* (Kahn and Millán 1992). This group includes three species: *A. murumuru* Martius; *A. chonta* Martius – distinct by the staminodial ring low, often reduced to 6 teeth; and *A. ulei* Burret – easy to identify from the calyx cupular, very short, usually less than 1/4 as long as corolla, this oblong to cask-shaped. The pistillate flower of *A. yauaperyense* is very similar to that of *A. murumuru* and differs in the same way from flowers of *A. chonta* and *A. ulei*.

The fruit of *A. yauaperyense* (Fig. 3 d–f) is usually ellipsoid to ovoid, 5.7 x 3.5 cm, with a short pedicel, to 1.6 cm long, an epicarp slightly or not pilose at maturity, and a mesocarp remarkably fleshy. It differs in shape from that of *A. murumuru* which is most frequently turbinate. However, such a difference may depend on a higher reproductive rate and on a higher density of fruits on the rachis which develop mutually compressed into a turbinate shape. Fruits of *A. chonta* and *A. ulei* differ from those of both former taxa in smaller size, in an epicarp usually densely pilose, a mesocarp less fleshy, and in characters of perianth – a corolla slightly folded at margin in *A. chonta*, a calyx remarkably short in *A. ulei*.

Moreover, these two species are single-stemmed palms which grow on periodically flooded alluvial soils and on clay soils, respectively. *Astrocaryum yauaperyense* and *A. murumuru* are multistemmed palms, mainly found in seasonal swamp forests.

Conclusion

The new material collected in the Jauaperi River valley, as well as data on palm habits and ecology, provide convincing arguments in favor of treating *Astrocaryum yauaperyense* as a synonym of *Astrocaryum murumuru sensu* Martius (not of Henderson's concept of *A. murumuru*). In fact, Henderson (1995) transformed *Astrocaryum murumuru* into a broadly defined species and treated the related taxa as varieties or as synonyms of these. In particular, he considered *Astrocaryum yauaperyense* a synonym of his variety *murumuru* which also includes *A. chonta* and *A. ulei*, two very close species, as seen above. At this point, the ranking at infraspecific level would be consistent. The problem which makes his treatment impossible to apply is that he also treated *Astrocaryum gratum* Kahn et Millán as a synonym of. var. *murumuru*. *Astrocaryum gratum* clearly differs from the former taxa in the morphological pattern of its pistillate flower as well as in other



3. *Astrocaryum yauaperyense* Barbosa Rodrigues (=*A. murumuru* Martius), from *Kahn 3512* (CEN) – a) pistillate flower; b) staminodial ring adnate inside corolla; c) gynoecium; d) ripe fruit with short pedicel; e) perianth in fruit (outside); f) perianth in fruit with staminodial ring (inside).

reproductive and vegetative characters. This species is very close to *Astrocaryum macrocalyx* Burret, *A. perangustatum* Kahn et Millán and *A. urostachys* Burret – the four species forming group III in section *Ayri* (see Kahn and Millán 1992). Henderson treated these three latter species as three varieties, each distinct from var. *murumuru,* but he did not discuss his position about *A. gratum* – included in var. *murumuru* – although it would have been coherent to consider it as a different variety as well.

We shall never be sure of the origin of the pistillate flowers drawn by Barbosa Rodrigues (1903) in Plate 80A; but at least we can say that they correspond very well to a pistillate flower of *A. murumuru* and of *A. yauaperyense* as rediscovered. Because of this doubt about the origin of the flower, Plate 80A cannot be a lectotype as it was referred to by Glassman (1972). I propose the voucher *Kahn 3512* (CEN) as a neotype for the name *Astrocaryum yauaperyense* Barbosa Rodrigues.

This note brings me to the following conclusion: Taxonomists must argue from complete data before deciding whether a taxon is a new one. If knowledge is incomplete or data confused – e.g., the contradiction between drawings and text by Barbosa Rodrigues, and lack of herbarium collections – the status quo is best maintained or the taxon should be considered as uncertain. Kahn and Millán's decision (1992) in considering *A. yauaperyense* as a synonym of *A. murumuru* was somewhat premature, but this position has now proved to be consistent with new material of the palm.

Acknowledgments

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Literature Cited

Barbosa Rodrigues, J. 1888. Palmae Amazonenses Novae. Vellosia 1: 33–56.

Barbosa Rodrigues, J. 1891. Palmae Amazonenses Novae. Vellosia 2: 91–112.

Barbosa Rodrigues, J. 1902. Palmae-Amylocarpus. Contr. Jard. Bot. Rio de Janeiro, 3: 69–88.

Barbosa Rodrigues, J. 1903. Sertum Palmarum Brasiliensium, ou relation des palmiers nouveaux du Brésil, découverts, décrits et dessinés d'après nature. Imprimerie Monnom, Bruxelles, 2 vol.

Glassman, S. F. 1972. A Revision of B. E. Dahlgren's Index of American Palms. Phanerogamarum Monographiae Tomus VI, Verlag Von J. Cramer, Lehre.

Henderson, A. 1995. The palms of the Amazon. Oxford University Press, New York.

Kahn, F. and B. Millán, 1992. *Astrocaryum* (Palmae) in Amazonia. A preliminary treatment. Bull. Inst. fr. Et. andines 21: 459–531.

Palm Internet Resources I: Palm Society Websites

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The past few years have witnessed a virtual explosion of palm-related information on the Internet.

Palm enthusiasts can now subscribe to free e-mail lists, participate in online discussion forums and bulletin boards, and visit informative websites around the world. Many of the newer 'palm' websites, in particular, have come about as a result of local societies wishing to spread the word about palms to the widest possible audience. If the number of palm-related websites is any indication, interest in palms world-wide is at an all-time high.

When I was approached by the editors of *PALMS* to write an article on palm Internet resources, they initially wanted a two-page list of the 'best' websites focusing on palms. Given the overwhelming number of palm-related websites presently online, even a list of the best sites would not fit in the space provided in this issue. Therefore, the editors and I agreed that it would be best to separate the list into categories and publish four short articles as an occasional series.

This first article lists and briefly summarizes websites maintained by palm societies throughout the world. The second article will focus on general, regional and cold-hardy palm-related information, and on horticulture and economic uses of palms. The third article will address palm-related e-mail lists, online newsletters, bulletin boards and webrings. The fourth and final article will focus on sites in languages other than English and on sites from public and private palm gardens. Commercial websites (i.e., palm nurseries and seed vendors) will not be treated in these articles; however, an Internet search would provide many such sites.

One caveat I should make at the start is that, due to the dynamic and ephemeral nature of the Internet, this list is admittedly incomplete and parts of it may even be inaccurate by the time this article is printed. With that said, let's begin.

Palm Society Websites

International Palm Society <http://www.palms. org>. Official website of the IPS; includes society-related information, a free discussion forum and information on Chapters that do not have their own websites (see below); also provides an opportunity to purchase back issues of *Principes* and *PALMS*.

South African Palm Society <http://www.sapalm.co.za>. South African Chapter of the IPS; includes information on their society, their publication, *Palm Enthusiast*, and the best palms for South Africa.

European Palm Society <http://www.palmsociety.org>. European Chapter of the IPS; newly renovated site that contains information on the EPS and their publication, *Chamaerops*; site is mirrored at <http://www.chamaerops.net>.

Fous de Palmiers <http://www.chez.com/palmiers/>. French Chapter of the IPS (site is in French); contains information on their society and their publication, *Le Palmier*; also includes palm photos and a bibliography of palm resources in numerous languages.

Palm and Cycad Societies of Australia <http://www.pacsoa.org.au>. Australian Chapter of the IPS; includes information on their society and their journal, *Palms and Cycads*, as well as technical and non-technical articles and lots of photos; also provides information pages for several local chapters of PACSOA (see below).

Sydney Branch of PACSOA <http://www.pacsoa.org.au/branches/sy.html>. An affiliated chapter of the IPS in Sydney; includes information on their society and their journal, *Principes Minor*.

Northern Territory Palm and Cycad Society <http://www.pacsoa.org.au/branches/nt.html>. A chapter of the IPS formed in June 1983, primarily to conserve and protect the endangered latrum palm, *Ptychosperma bleeseri*; includes information on their society and a list of palms native to the Northern Territories.

Palm Society of Southern California <http://www.palms.org/socal/>. Southern California Chapter of the IPS; includes information on their society and their journal, *The Palm Journal*.

Palm Society of South Texas <http://www.raingardens.com/psst.htm>. South Texas Chapter of the IPS; contains an events listing for the society.

Houston, Texas Chapter of the International Palm Society <http://www.palms.org/houston/>. Houston, Texas Chapter of IPS; contains general chapter information.

Pacific Northwest Palm & Exotic Plant Society <http://www.palms.org/pacific/>. A chapter of the IPS in northwestern USA; contains information on the cultivation of palms and other exotic plants outdoors in British Columbia, Washington and Oregon.

Southeastern Palm & Exotic Plant Society <http://www.speps.net>. An affiliated chapter of the IPS in southeastern USA; contains information about their society and their publication, *Rhapidophyllum*; also includes information on growing palms in the southeastern USA.

Palm & Cycad Societies of Florida <http://www.plantapalm.com>. Recently affiliated chapter of the IPS – officially recognized in June 2000; includes the *Virtual Palm Encyclopedia*, which contains over 50 articles on palm biology, evolution, horticulture and virtual tours of gardens and natural areas world-wide, as well as over 1200 photos of over 500 palm species.

Central Florida Palm & Cycad Society <http://www.plantapalm.com/centralfl/>. Central Florida Chapter of the IPS; contains general information on the chapter and their newsletter, *The Palmeteer*.

Palm & Cycad Society of Southwest Florida <http://www.plantapalm.com/southwestfl/>. Southwest Florida Chapter of the IPS; contains general chapter information.

Palm Beach Palm & Cycad Society <http://www.plantapalm.com/palmbeach/>. Palm Beach County, Florida Chapter of the IPS; contains general information on the chapter and their newsletter, *Palm and Cycad Times*.

South Florida Chapter, International Palm Society <http://www.plantapalm.com/southfl/>. South Florida Chapter of the IPS; contains general chapter information.

IPS Chapters without Websites

As a courtesy, contact information for chapters of the International Palm Society that do not have their own websites is provided on the IPS website. Information on the societies in Australia is provided on the PACSOA site.

International Chapters – IPS website <http://www.palms.org/chapters/chapters1.htm/>. South China Palm Association; Association Chambeyronia [New Caledonia]; Palm Society of New Zealand; La Asociación Española de Amigos de las Palmas [Spain]; AVEPALMAS [Venezuela].

North American Chapters <http://www.palms.org/chapters/north.htm/>. Arizona Chapter; Northern California Chapter; Florida First Coast Chapter [northeastern Florida area]; Island of Hawaii; Gulf [of Mexico] Coast Chapter; Louisiana Chapter.

Australian Chapters – PACSOA Website <http://www.pacsoa.org.au/branches/>. South Queensland Group; Sunshine Coast Branch; North Queensland Palm Society; Palm & Cycad Society of Mackay; Rockhampton Palm & Cycad Society; Palm & Cycad Society of South Australia; Palm & Cycad Society of Western Australia.

Horticulture Column

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Q. I wonder if you could shed some light on cold tolerance. I live in Port Elizabeth, South Africa (about 34°S latitude). At the time of this writing it is late May, and winter will begin in a few more weeks. Our temperatures sometimes go as low as 4°C (39°F), but we never have freezing temperatures, and frost never forms. Some of the palms in my collection are still in pots, but many more have been planted in the ground for about a year. Now that our cool season has begun, I have noticed some spotting of the foliage of a few palms, especially *Ptychosperma elegans*. My *Pritchardia pacifica* shows no ill effects at all. Since our night time low temperatures will be in the 4–6°C range for several months, will these plants survive? Our daytime highs in winter are in the low 20s°C (70s°F). The funny thing is that all my palms are still growing, although not as fast as they did three months ago. Dennis Lutge, R.S.A.

A. I think you have a very good climate for growing palms, especially those from cool subtropical areas or even mountainous parts of the tropics. There are, perhaps more than a hundred species of subtropical palms that would be very much at home in your climate. In fact, since you do not experience freezing temperatures, many palm growers would say that you are asking about "cool tolerance" rather than cold tolerance. With some persistence, and perhaps a few setbacks, you will be able to grow successfully even tropical species such as the *Ptychosperma elegans* that you mentioned.

For those of us who grow palms outside of the tropics, we find that that our palms look their best at the end of the growing season. Over the summer they build up a kind of growth momentum and are growing their fastest as the cool weather begins to approach. This momentum keeps them growing in cool weather for a while, and finally, depending on the species and barring any freezing weather, their growth slows considerably. In spring when the weather begins to get warmer growth accelerates slowly, and it may be well past midsummer before growth resumes at a normal pace. When a tropical palm species such as *P. elegans* is grown in a climate with a pronounced winter season, it can suffer not only from freezing temperatures and frost but also from the lack of heat. Such a tropical palm simply does not function well when temperatures stay too low for extended periods, and the younger the palm the more difficult it will be to keep it healthy. In cool weather, tropical palms may suffer nutrient deficiencies such as manganese deficiency or potassium deficiency, so it is important to fertilize your palms well during the growing season. Palms that have a nutrient deficiency when winter starts may not be around for spring. Plants in containers will be even more likely to develop nutrient deficiencies in cool weather since their roots will be colder than those of plants in the ground and less able to function well. I recommend that you continue fertilizing all of your palms right through the winter. Young tropical palms, especially, can be more susceptible to foliar fungus diseases during cool weather, possibly the cause of the spots on the leaves of your *Ptychosperma*. An occasional spraying with fungicide may help prevent such infections. Any wear and tear on the palm's foliage will, of course, be replaced much more slowly during the winter. Damage from wind, frost and disease will accumulate on the foliage to such an extent that by spring it might look quite different from the lush tropical plant that it was at the end of summer.

The good news is that your tropical species will become somewhat better able to endure the long cool winters where you live as they get larger. Each species is different, of course, and part of the fun in growing palms is trying to determine which ones have a chance to grow in your climate.

Q. My foxtail palm, *Wodyetia bifurcata*, has an unopened inflorescence, one still enclosed by the peduncular bract. It has been visible since a dead leaf fell several weeks ago. The inflorescence looks like it is just sitting there; it is not expanding or growing. As the cold weather will soon arrive in central Florida, I was wondering if the flowers will emerge normally, and if so, how long will it take for the fruits to ripen? Bob Mertens, Florida.

A. You should not be too disappointed if this, the first inflorescence on your foxtail palm, fails to

develop further. Failure of the first flowering efforts of many species of arecoid palms is very common. In the future, your foxtail palm should be able to produce normal inflorescences, followed by healthy fruits and seeds.

The process of flowering and fruit development in *Wodyetia bifurcata* is rather lengthy. I am advised by an Australian grower who maintains more than 1000 foxtail palms for the purpose of seed production, that 15 months are required from the time the bracts become visible to the time when fruits are ripe. Keep in mind that the 15-month time frame is for palms growing in tropical Queensland, Australia. In a cooler climate, or one with more seasonal variation, a longer time will be required for fruit production, perhaps as much as two years. In tropical conditions you could expect to wait three months or longer for the inflorescence to emerge from the peduncular bract once it is first exposed. After a further six-month period, if all goes well, fruits will have been set, and in another six months they will be ripe. The good news is that isolated individuals of *Wodyetia bifurcata* have been observed to produce fruits, so it is possible to have seeds with only a single tree.

Thanks to Paul Craft, Rolf Kyburz and Neville Burman for assistance with this question.

Q. Six years ago I had three queen palms, *Syagrus romanzoffiana*, planted in my front yard by professional landscape installers. At the time of installation they were around 12 ft(4 m) tall, and their trunks were still covered by leaf bases. These palms have grown faster than I expected, and they look beautiful, but one of them seems to have a ring of damaged bark or skin around its trunk several feet above the soil line (Fig. 1). A few cracks extend downward from the deepest portion of the damage. This damage was first noticed when the leaf bases from that portion of the trunk were shed. I was told that this damage was caused by a freeze, but in the six years that I have lived here in central Florida, there has not been any weather cold enough to damage these palms. Is it possible to determine if this palm already had suffered this freeze damage before it was planted in my yard, will it get worse and what, if anything, can be done about it? Rosalin Walters, Florida

A. It is possible for a palm to show the effects of freeze damage to its trunk a year or two after the freeze has occurred, and this injury may be seen as a ring of damage that encircles the trunk entirely or partially. Since you are located not far from where I live, I was able to see your queen palm firsthand. The damage on your palm was not caused by cold weather. It was caused by lifting the palm during planting by means of a chain wrapped around its trunk. The impressions of the chain links can be clearly seen to the right in Fig. 1. The deeper hole on the left may have been caused by the chain's grab hook "taking a bite" on the trunk, or perhaps it was caused by some other part of the equipment used to lift the tree. Chains and steel cables should never be wrapped around the trunk of a palm or any other tree in order to lift it. The presence of leaf bases is often thought of as a protection against chain damage when handling palms, but your situation proves that leaf bases are not always adequate protection for tender trunks.

Large palms with smooth trunks can be difficult to handle using the straps and slings that are intended for the purpose; they tend to slip along the trunk's surface. Sometimes the strap can be positioned at a balance point so that the tree is carried horizontally to its planting hole. More elaborate techniques that may include lifting the tree from beneath the root ball are sometimes employed. It is probably worth any extra cost to have large palms planted by well-equipped and experienced installers.

1. Queen palm trunk damaged by chain. Note the oval shaped marks on the right, which were caused by the links of the chain, and the deeper gouge on the left.

Unfortunately the damage to the trunk of your queen palm is permanent; palms have no ability to "heal" or compartmentalize damage the way that, say, an oak, pine or eucalyptus can. The deepest areas of damage have the potential to provide an entry point for palm butt rot disease, *Ganoderma zonatum*, which is fatal to palms. At this time, however, your palm's trunk appears solid. There does not seem to be any decay in progress, but you should make sure that your irrigation system does not spray water on the trunk. Do not paint or attempt to fill cavities of damaged palm trunks, or those of other trees for that matter.

Q. Can you tell me where, when and why the practice of painting the lower trunks of palms began? Is it done for purely aesthetic reasons or was some substance, perhaps white lime, originally used to discourage insects? I ask because recently the practice seems to be getting out of control on the island of Tobago, West Indies, where I live. Nearly every tree in our botanic garden was painted, even non-palms, sometimes as much as 3 or 4 meters up from the ground. Is it possible that someone thinks that this makes the palms look better? Steve Hayton, Tobago, West Indies.

A. I think that most of us who have traveled a bit in the tropics have seen painted palm trunks and wondered about the purpose of this rather unsightly practice (Figs. 2–4). Even here in Florida, it is not too unusual to see painted palms, and the color almost always seems to be white. I have heard conflicting reasons for palm painting, and perhaps there is more than one reason. I asked Hugh Harries for some help in answering this question. Hugh has spent many years in various tropical locales working with coconut palms and coconut palm farmers and has been kind enough to supply me with the following information. It seems that the painting of tree trunks is a tradition which is thought to serve a practical agricultural purpose, to be a safety precaution or to be aesthetically pleasing.

The whitewashing or painting of palm trunks is believed to be a deterrent against ants crawling up and down the trunk. Any experienced grower knows that ants traveling about on his plants are up to no good. They feed upon the secretions of various sucking insects and protect these pests from predators, which would otherwise provide a natural control for them. Is there scientific proof that the paint is really effective against ants? Perhaps not, but as Hugh explains:

> Many agricultural scientists might laugh and say that unless the white paint has the right insecticide mixed in it, it can have no controlling effect over ants. They would relegate it to what used to be known as "old wives' tales" along with hammering nails into the coconut trunk to stop button nut shedding or using salt as a fertilizer. We know these must be nonsense except that nails might provide trace elements to palms growing on severely alkaline soils and that the chloride content of salt, rather than the sodium content, has been shown to be beneficial to coconut palms.

Hugh explains the painting of palm trunks for safety reasons:

> On a dark, moonless night it is very easy to walk into an unpainted palm trunk. Painting it white to chest or head height makes it visible. Remember, the palm crown can be high overhead so that there may be no warning in the form of a denser patch of shade or low-hanging leaves. The original need to paint trunks must have [arisen] long before electricity, but it is still very common in many tropical countries, even when they have the benefit of good street lighting.

The last of the possible reasons for painting trunks white is the one that I suspect is behind most of the palm decorating: some folks really do think it looks good! From Hugh:

> A street that has been swept and has had the curbs and trees trunks painted white looks clean and tidy. Not least, it is an unskilled job and can be used to "make work" for people who need spending money at Christmas and other festivals.

A final anecdote on palm trunk painting from Hugh:

> In Sri Lanka and India, growers paint a likeness of a snake on the palm trunk to discourage rats from climbing into the crown and damaging the tender (drinking) nuts. Although the snake is depicted circling the stem in spiral fashion, snakes can actually climb almost vertically up a palm stem to get into the crown where they give any climbers – rats or humans – a distinct surprise. And I can speak from experience!

Figs. 2–4 (facing page) Painted palm trunks. Photos by S. Zona.

2 (top). *Roystonea regia*, Miami, Florida.

3 (lower left). Coconut, Acapulco, Mexico.

4 (lower right). *Roystonea regia*, Malang, Java, Indonesia.