PRINCIPES

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THE INTERNATIONAL PALM SOCIETY, INC.

THE INTERNATIONAL PALM SOCIETY

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PRINCIPES

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Contents for July

Front Cover

Copernicia ekmanii along the shores of the Caribbean Sea in northwestern Haiti. Photo: Joel C. Timyan. See pp. 140–145.

PRINCIPES

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Editorial

Four articles in our July issue feature aspects of palm-hunting. One of the most significant collectors of palms and other plants in New Guinea was the veteran plant collector Len Brass, after whom the genus *Brassiophoenix* is named. Brass collected over an extended period in many areas of New Guinea and his collections are of great importance for the study of palms in the region. Paul Forster of the Queensland Herbarium in Brisbane has provided an interesting brief account of Len Brass's life and a complete list of the palms named after him. His article also includes a formidable list of the palm names that are typified by Brass collections. The island of New Guinea continues to attract palm botanists. Bill Baker has recently spent a short expedition in Papua New Guinea, hunting for rattans and other palms. In his article he describes the rich and varied palm flora of the Mubi River. Of particular interest is *Heterospathe macgregorii* that grows on the banks of the river in the flood zone—in other words, it behaves as a rheophyte. This represents an addition to the very small number of rheophytic palms.

Joel Timyan, Chuck Hubbuch, and Suzanne Michal spent an exciting expedition in Haiti, hunting for the elusive *Copernicia ekmanii*, affectionately known as Mr. Straw Man, a strikingly handsome palm confined to karst limestone on the north coast of the island. Their account describes some of the difficulties and discomforts of palm-hunting. Undoubtedly *C. ekmanii* will continue to be much sought after as an ornamental.

Dypsis acaulis, previously known only from a single herbarium specimen, has been refound in that mecca for palm botanists, the Masoala Peninsula in northeastern Madagascar. This curious little palm is illustrated on the cover and in a short article by one of your editors, describing its rediscovery.

We provide some new information on one of the best known and most widely cultivated ornamental palms, *Chamaedorea elegans*. Cervantes Enriqueta González and associates write about the embryology of the parlor palm and how that relates to pollination.

Raphia is one of only two palm genera that is naturally represented on both sides of the Atlantic (the other is the genus *Elaeis*). The single New World species *R. taedigera* contrasts with the 20 or so species that have been recorded for Africa. There have been some suggestions that *R. taedigera* may have been introduced in South America. Whatever the case may be, *R. taedigera* is still one of the least well known and collected palms of the lower Amazon. In their article Judith Carney and Mario Hiraoka describe the distribution and ecology of *R. taedigera* in Amazonia, discuss its uses, and provide comments on its biogeography.

As usual in July, we run our regular feature Palm Research, compiled by Andrew Henderson with some assistance from Helen Sanderson. Here you will find a listing of the large number of books and articles on palms that have appeared in print over the last 12 months. There is also plenty of Chapter News to read and two fine palm portraits in the center of our issue.

JOHN DRANSFIELD
NATALIE UHL

Principes, 41(3), 1997, pp. 123–124

Note from the President

As I write this note to members, I myself am quite busy preparing for our Midterm Meeting in England. Many exciting things are happening in the International Palm Society. Foremost will be continuing the planning for our 1998 Biennial Meeting in Thailand. It will begin in Central Thailand and end in Southern Thailand. The actual dates for the 1998 IPS Biennial are Saturday 12 September through Saturday 19 September. The Post-Biennial Trip will be Sunday 20 September through Saturday 26 September and involves further travels in South Thailand. I recommend that all members arrive in Thailand one day before the Biennial on Friday 11 September with the chance to recuperate from jet

lag and relax before our activities begin. Specifics on the Biennial Meeting will be mailed to all Members in the future, but mark your calendars now for this most exciting meeting.

Another exciting item of news is the anticipated membership of several new chapters or affiliated groups to our society from various areas of the world. As we expand, it gives all of us the opportunity for more worldwide communication about palms. A future issue of *Principes* will give specific information on our expansion.

On another front, I hope all of you are having fun with your cultivation efforts on palms. We in Southern California are having great success with a lot of Madagascar palm species new to cultivation. I wish to thank John Dransfield and Henk Beentje for giving us names and descriptions of these exciting new species in their book, *The Palms of Madagascar.* This work has given all of us the ability to communicate about specific plants. Previously, they were called "*Chrysalidocarpus* species" with some sort of footnotes about localities. When I talked to others in different parts of the world, we never knew whether we were talking about the same species or not. Now we can all "talk the same language." I am proud that our Society helped with the publication of this work and other scientific reference books. The same can be said of the many contributions to *Principes.* They have linked the knowledge of palm specialists and scientists directly to all Members so we can all have more fun with palms. My many thanks to all those who help in this distribution of palm information.

Finally, I want to keep open the avenues of communication between myself, the Board of Directors, and all members. Please feel free to write to me about any subject that interests you. We love ideas on how to get new members. Previous surveys have demonstrated that the main reason our members don't renew is because they simply forget to send in their dues. I am sure that all of you are current on your dues, but a friend of yours might have forgotten to renew. Please remind them now so they won't miss anything the IPS has to offer. Thank you and my best to all of you.

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CHAPTER NEWS AND EVENTS

Phillipe Cremer

The International Palm Society would like to express condolences to family and friends of long-time Palm Society member, Philippe Cremer of South Africa, who was killed in a tragic accident on Friday, April 18th, of this year. Phillipe was a founding member of the South African Palm Society and a former director of the International Palm Society. We will all miss Phillipe and his many contributions to our society.

South African Palm Society News

The South African Palm Society held a slide show on 8 October, at the lecture room of the Durban Botanical Gardens about the palms of the Sir Seewoosagur Ramgoolam Botanic Gardens (formerly Pamplemousses) in Mauritius and Vallée de Mai in the Seychelles.

Also discussed was the SAPS 97 Congress to be held July 12–14, 1997 in the Durban area. SAPS also decided to proceed with a rare palm and cycad sale in conjunction with the cycad society. SAPS is negotiating with the parks department for a suitable location.

Work on the Palmetum is progressing well. For those not familiar with the SAPS Palmetum, it is a 7-hectare site located in the subtropical Transvaal Lowfeld near Hectorspruit. Groups of palms have been planted that were donated by members of the SAPS.

PETER WUNDERLIN
Vice President
South African Palm Society

(*Continued on p. 130*)

Principes, 41(3), 1997, pp. 125–130

Raphia taedigera in the Amazon Estuary

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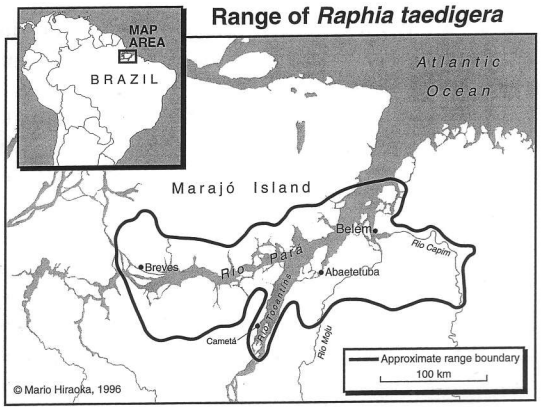
Of the 28 species of the genus *Raphia*, all are confined to Africa with the exception of *Raphia taedigera*, which occurs in tropical America (Uhl and Dransfield 1987). It occupies a disjunct distribution in inundated riverine habitats of Central America (Nicaragua, Costa Rica, Panama) as well as in the estuaries of the Atrato and Amazon rivers of Colombia and Brazil (Bailey 1935, Allen 1965a, Henderson 1995) (Fig. 1). Scientific research on *R. taedigera* has focused on three principal concerns: (1) the palm's biogeographic distribution in tropical America (Allen 1965b, Moore 1973, Uhl and Dransfield 1987); (2) ecological studies of *Raphia* in specific localities (Bailey 1935; Allen 1965a; Anderson and Mori 1967; Myers 1981, 1984; Devall and Kiester 1987); and (3) whether *R. taedigera* is indigenous to the Americas or an historically recent introduction (Otedoh 1977, Gentry 1993, Urquhart, in press). Yet, no research to date addresses the role of *Raphia* in wider cultural and socio-economic systems, despite growing scientific interest in this issue.

Amazonian palms are prominently featured in recent studies that point out the importance of their products for income generation among the rural poor as well as their potential for alternative and sustainable tropical land use systems (Hecht et al. 1988; Hiraoka 1992, 1995; Nepstad and Schwartzman 1992; Redford and Padoch 1992). Emphasis, however, remains on those palms with products directly consumed in local and regional markets, such as acaí (*Euterpe oleracea*), the peach palm (*Bactris gasipaes*), babassu (*Orbignya phalerata*), tucumã (*Astrocaryum aculeatum*), and buritĺ (*Mauritia flexuosa*). The research emphasis on marketable products, however, fails to bring into relief the important role of other Amazonian palms such as *R. taedigera*, whose products are not directly consumed, but figure prominently in household economic strategies.

The objective of this article, consequently, is to link botanical studies *R. taedigera* to its use among peasant farmers in the Amazon estuary, the region where the palm reaches its broadest extent in tropical America. Divided into two sections, the first provides an overview of the palm's biogeographic range and the ecological conditions that favor its establishment, while the second section discusses *Raphia*'s role in regional subsistence and livelihood strategies.

Distribution and Habitat

Scientific interest in the American *Raphia* dates to 1824 when the Prussian botanist, Martius, identified the species along the Amazon estuary (Bailey 1935:40). Naturalist Henry Bates, writing at midcentury, advanced understanding of the palm's biogeographic distribution and habitat, calling attention to its establishment along inundated floodplains to the west and south of Marajó Island (1975:104–117). Two features of the palm repeatedly drew the attention of botanists: its egg-sized fruit that strikingly resembles a pine cone, and the palm's long, sweeping fronds. *R. taedigera* is a sister species to the world's longest-leafed palm (*R. regalis*) and its pinnate leaves often reach 15–20 m (Correia 1928, Allen 1965b, Hallé 1977, Henderson 1995). The leaves rise from a central base of three to five trunks that arch to a height of 10–20 m (Bailey 1935, Anderson and Mori 1967). Each individual trunk typically yields five inflorescences, which flower and fruit throughout the year, the fruits weighing as much as 50 kg (Allen 1965a, Devall and Kiester 1987; exhibit at Museu Goeldi Herbarium in Belém) (Fig. 2). As the bare seeds do not float (Urquhart, in press), *Raphia* propagation relies upon either the fruits drying prior to flotation so they can be transported by water, or upon vegetative reproduction. The mature stems die after inflorescence formation, but the life of the plant is extended by suckers that spring from its base (Bailey 1935). The pollinators of *R. taedigera* are as yet unknown (Francis Kahn, personal communication).



1. Range of *Raphia taedigera*.

One of the least collected of Amazonian palms, *Raphia taedigera* is established on imperfectly drained soils along tidal river channels (furos), where currents constantly change direction and favor alluvial deposition (Richards 1952, Huber 1959). *Raphia* vegetation formations extend along the River Pará from Breves on the southwestern portion of Marajó Island to east of Belem along the River Capim and south of Cametá on the River Tocantins (Huber 1959) (Fig. 1). The palm occurs in dense stands on geologically recent alluvial deposits along low-lying tidal (várzea) floodplains and tolerates a degree of salinity (Bouillenne 1930, Allen 1965b, Moore 1973, Henderson 1995) (Fig. 3). Fieldwork indicates that the palm thrives along floodplains of black- and clear-water rivers characterized by slightly to strongly acid water (such as the Tocantins and Capim rivers) and when appropriate drainage conditions exist, in imperfectly drained inland swamps.

R. taedigera (jupatí) is frequently found in association with mangroves (*Rhizophora* and *Avicennia* spp.) as well as with other economically valuable palms, such as *Mauritia flexuosa* (buritĺ) and *Manicaria saccifera* (bussu). A recent study suggests that *Raphia taedigera* represents a climax rather than a pioneer plant community (Devall and Kiester 1987, viz Anderson and Mori 1967), a research question that proved important for examining Otedoh's (1977) hypothesis of the palm's introduction from Africa as food on slave ships. As Iltis and others subsequently argued, *Raphia*'s crucial role as a pioneer species on imperfectly drained soils would have facilitated within just a few hundred years the palm's establishment and distribution over the broad area it now occupies (quoted in Anderson and Mori 1967). The hypothesis for a recent introduction of *Raphia* to the Americas, however, is not supported by palynological data from eastern Nicaragua where Urquhart (in press) establishes the presence of *R. taedigera* in vegetation formations more than 2 000 years ago.

2. Fruits of *R. taedigera*.

Use of Jupatí in the Regional Economy

An account by a Jesuit priest, José Vieira, written in 1654, provides an early reference to uses

3. *R. taedigera* on várzea floodplain.

of *Raphia* in the Amazon region. Vieira describes the palm's petioles being split and woven into the cylindrical tube (tipití) used to express the juice from grated manioc tubers, an important step in rendering the bitter varieties safe for human consumption (Azevedo 1928 (i):373–74). In 1853 the importance of jupatí in regional livelihood systems drew the attention of the English botanist Alfred Russel Wallace. Noting the use of the *Raphia* petiole for house construction, window shutters, boxes, baskets, bird cages, and bottle stoppers, Wallace's expedition even found it admirably suited for lining insect boxes (Wallace 1971:44). A half century later Barbosa Rodrigues (1903: xxvi) mentioned two additional features of jupatí: the use of the palm's fronds for thatch and the fact that the fruits were not consumed. Based upon his botanical investigations earlier this century, Correia (1928) recorded the medicinal properties of jupatí fruit, the oil serving as a balm against rheumatism and paralysis. Even though he noted that West Africans prepared a fermented drink with *Raphia* fruit, Correia (1928 iv:573) did not observe similar uses of the fruit juice in the Amazon estuary. To the list of uses for the palm, Correia added the making of musical instruments from the petiole. Surprisingly, none of the uses of jupatí within the Amazon estuary today was identified by these authors.

Both the fruits and petiole of jupatí are used in the contemporary period. Women in the Breves region (Fig. 1) still extract cooking oil from the fruit pulp, the fruit is also fed to pigs, and the petiole is made into toys that are sold in Belém. However, the most widespread and economically important use of jupatí in the Amazon estuary today is to make shrimp traps and fishing weirs from the petiole (Figs. 4,5). Table 1 summarizes both past and present uses of *Raphia taedigera* within the region.

Next to acaí (*Euterpe oleracea*) extraction, shrimping provides the second-most important source of on-farm income to peasant families (ribeirinhos) dwelling along the rivers. Surveys within the *R. taedigera* zone indicate incomes from shrimping that annually average between US $250 and $300. *Raphia* petioles are split and then formed into a shrimp trap (matapí), a cylinder about 60 cm long and 30 cm across with conical ends (Fig. 6). A meal, made from rice bran, grated coconut or babassu (*Orbignya phalerata*), is wrapped in a perforated leaf (*Theobroma cacao, Ischnosiphon* spp., *Genipa americana,* or *Montrichardia* spp.) and placed inside the cylinder, the smell enticing the shrimp to enter the conical end from which there is no exit.

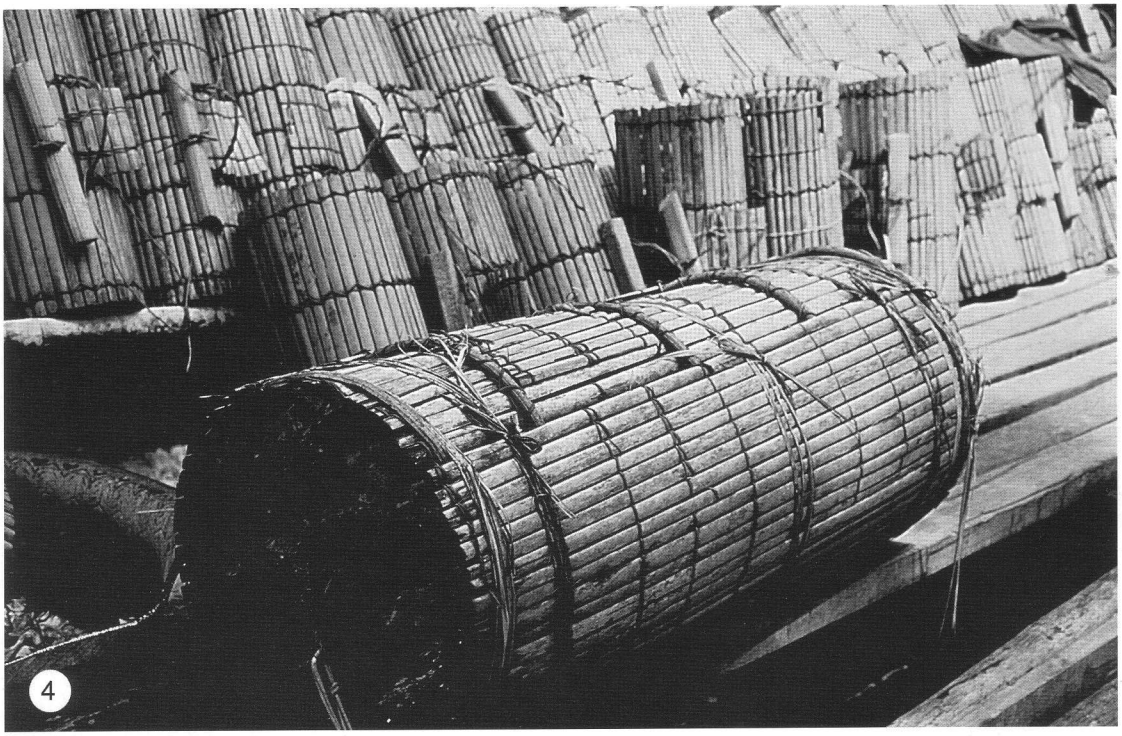
While households occasionally make the matapís for shrimping, more frequently they are purchased from individuals who specialize in supplying the regional market. In the estuary region, demand is such that some households may produce between 800 to 1 000 traps for sale per year (Hiraoka 1993:154).

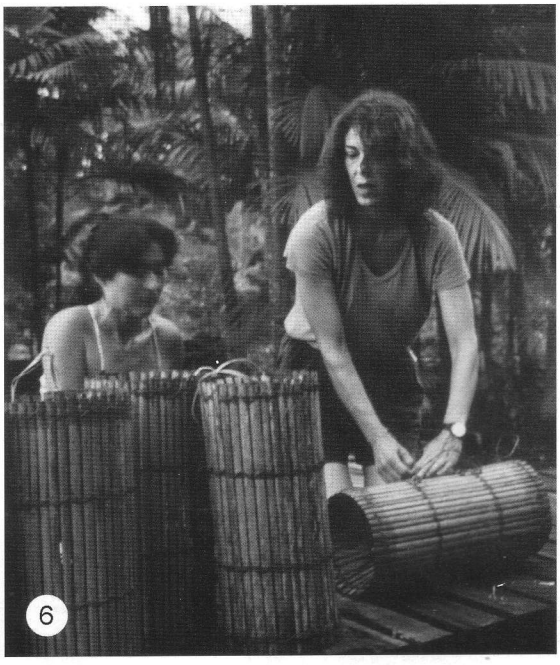
The matapí traps are set from canoes at sunset and attached to plants or poles along the river's edge. In the mornings the shrimp are retrieved and "corralled" in larger holding pens (viveiros), also fashioned from jupatí. The shrimp can thus be kept alive for two to three days after capture, time which enables peasant households to prepare them for sale either fresh, partially dried, or salted. Both men and women are involved in shrimping and marketing, the main harvest season occurring from March to June. While the customary common property resource system recognizes shrimping rights of individual ribeirinho households, the locations of the traps along the river are a carefully guarded secret due to fears of matapí theft from passers-by and the growing incursion of commercial fishermen in the lower Amazon as a response to rising urban demand for shrimp (McGrath et al. 1993).

Conclusion

Among the palms most utilized in contemporary peasant livelihood strategies within the Amazon estuary, *Raphia taedigera* ranks in importance with *Euterpe oleracea, Mauritia flexuosa,* and *Manicaria saccifera.* Yet despite its regional significance, *Raphia* has received little research attention. While this paper clarifies the palm's biogeographical range, crucial ecological features, such as its pollinators, remain unknown.

One additional issue raised in this study of *R. taedigera* also merits attention. The fact that the present uses of *Raphia* for shrimp traps and fishing weirs was not recorded by earlier observers is puzzling given the longstanding significance of aquatic resources in Amazonian livelihood systems. If these uses are indeed recent, it reveals the depth of local knowledge of the properties of specific palms, which facilitates their adjustment to changing markets and subsistence needs. But if *Raphia* has long been used for fishing practices, it indicates that research has largely concentrated





4. Fish trap (matapí).
5. Fishing weir.
6. Preparing the matapí meal for shrimping.

Table 1. Uses of Raphia taedigera *in the Amazon Estuary.*

Part of Palm	Use
Trunks	house construction
Leaves	thatch
Petiole	house construction, shrimp traps, fishing weirs, manioc processing, baskets, bird cages, window shades, musical instruments, toys
	inner soft tissue of petiole: bottle corks, wrapping material for ceramic/glass bottles
Fruit	cooking oil, medicine, pig feed

on directly marketed palm products. Given the increasing interest in the cultural and socio-economic role of palms in the Amazon (Schultes 1974, Balick 1988, Hecht et al. 1988), this study argues for additional research on the indirect role of palm products in providing trade items of value to local economies. These items include not only the fruits, oil, and hearts of palms that are traded but also the use of the petiole for making the traps and weirs for capturing marketed shrimp and fish.

Acknowledgments

The authors would like to acknowledge funding support from the Latin American Studies Center at UCLA, the Ministry of Education, Science, and Culture of Japan as well as the assistance of Dr. Norboru Hida (Department of Geography, Akita University, Japan) with fieldwork during July 1996. The authors are also grateful for valuable comments from Mario Jardim, Francis Kahn, and Andrew Henderson during the preparation of the manuscript.

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CHAPTER NEWS AND EVENTS (*Continued from p. 124*)

Southern California Chapter News

I've received nothing but praise about the new format and size of the *Palm Journal.* What a great job our editor is doing! Thanks to Don Tollefson for his suggesting the change.

We had a great meeting in Palm Desert on March 15. The Southern California Chapter board of directors met in the shade of a huge old native grove of *Washingtonia filifera* near 1000 Palms, and after touring the Coachella Preserve there, the 50 or so members who were in attendance drove a few miles to the garden of Don Nelson in Palm Desert where we were treated to a tour of his well-maintained garden. An interesting feature of Don's garden is that he has all his fan palms in the front yard, and all his feather palms in the back yard. After filling ourselves on his collection, we traveled only a few blocks to the garden of Allen Valley where we spent the rest of the afternoon. Allen has many wonderful palms growing in his garden, but three in particular took my breath away. He has the largest clump of *Serenoa repens* I've seen in California. It must be six feet (1.9 meters) tall and 12 feet (3.7 meters) across. He has the most beautiful *Livistona inermis* I've ever seen. Although his tree is only three or four feet (1–1.2 meters) tall, it is a sight to behold, with it full head of wispy leaflets (I heard more "oohs and aahs" over this plant than any other palm we saw this day). There was a fruiting *Hyphaene* in his front yard that must be over 12 feet (3.7 meters) tall (that makes it about the biggest one in California). He had many other unusual palms in his garden that love the desert heat, and everyone who came certainly enjoyed the fruits of his labor.

Our auction and raffle netted the chapter $676. Thanks to all the donors and those who bought the plants, and thanks to Don Nelson and Walt Frey for running the auction. And thanks to Sue Rowlands for arranging everything for this great meeting!

Our next meeting was at Quail Botanical Gardens in Encinitas on Saturday, May 31, featuring our first annual palm sale. Many growers arranged to bring some of their finest palms to the sale.

This issue of the *Palm Journal* was devoted to the genus *Trithrinax.* While there are only three currently accepted species of this genus, they are all very desirable palms and are well adapted for our Southern California Mediterranean-type climate.

The next issue of the *Palm Journal* will be devoted to the Australian genera with only one species each, such as *Carpentaria, Hedyscepe, Laccospadix, Lepidorrhachis, Normanbya, Oraniopsis,* and *Wodyetia.* Many of us are growing specimens of these palms in our gardens, so a wealth of information is expected.

GARY WOOD
email: palmnut@telis.org

News from the Sunshine Coast Branch, PACSOA

The first 1997 Annual General Meeting was held on February 3. After the close of the business section of the meeting, members were entertained by Peter Heibloem with a descriptive talk and fascinating slides of his recent trips to Saraburi and Takfar in Northern Thailand and Zaire, Uganda, Southern Sudan, Zambia, Tanzania, and Kenya where Peter photographed some of the little known Central African *Encephalartos* species.

(*Continued on p. 137*)

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Embryology of Chamaedorea elegans (Arecaceae): Microsporangium, Microsporogenesis, and Microgametogenesis

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ABSTRACT

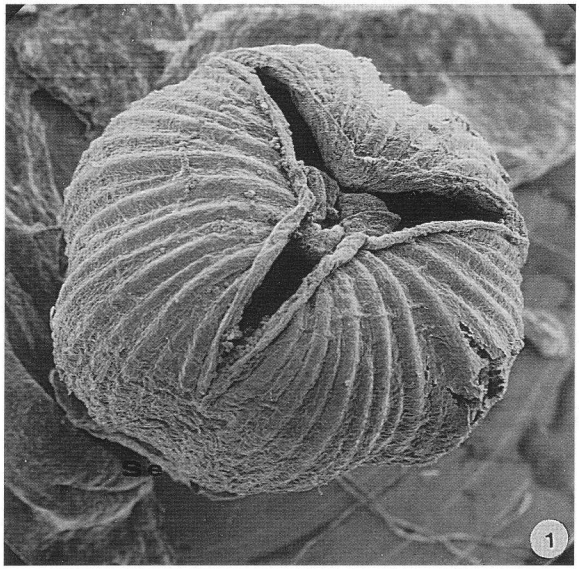
Chamaedorea elegans is a dioecious palm of great economic importance and is an endangered species. Annually, the male palm produces 2–3 inflorescences, each with a great number of tiny yellow flowers. During anthesis, flowers produce a drop of nectar that is observed over the apex of the pistillode that stands out from the triangular opening formed by the petals. The male flower has six stamens. The anther wall is formed by six cellular strata: an epidermis, a monostratified endothecium, a middle layer formed by three cellular strata, and the glandular tapetum. The microspore mother cells begin meiosis and form tetrads of tetrahedral and tetragonal microspores. The mature anther wall consists of an epidermis and an endothecium. Mature pollen grains are two-celled and monosulcate, semitectate-reticulate. *In vitro* germination of pollen grains shows their high viability. The form, color, and structure of the pollen grains and nectar drop of the flower during anthesis hint at an entomophilous pollination.

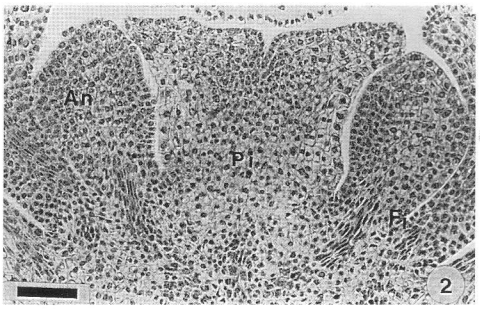
Chamaedorea is a neotropical dioecious genus, which ranges from Mexico to Brazil and Bolivia. The genus comprises 133 species of which 54 can be found in Mexico (Quero 1987, Hodel 1990a-d, 1991, Hodel and Castillo 1991, Barba and Romero 1993). *Chamaedorea elegans* is an element of vegetation of medium and high evergreen rainforest (Rzedowski 1978, Saldivia and Cherbonier 1982). At present plants of this palm species have great economic importance because of their use in interior decoration. Their leaves are widely used in floral arrangements. Because of overexploitation this palm is on the list of endangered species (Vosters 1975, Vovides 1981, INIREB 1986, IUCN 1988). Under natural conditions the reproduction of *Chamaedorea elegans* takes place only through seeding (Barba and Romero 1993). Regarding its reproductive biology some studies have been made on the pollen biology (Thanikaimoni 1970, Takhtajan 1980). Male flowers are yellow and 2 mm long; they have six stamens with short filaments and anthers which are scarcely visible under the pistillode (Hodel 1992). The only previous work about embryology of the genus *Chamaedorea* is from Mahabalé and Biradar (1968), where the investigations of Sussenguth (1921) and Schnarf (1931) are cited. The type of division of the microspore mother cells in different species is described.

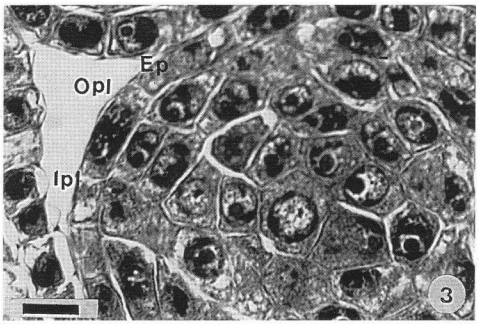
When the need for efficient reproduction of this species was brought to our attention, we decided to study the basic reproductive biology of *Chamaedorea.* The present study describes the development of the male flowers: anther development, microsporogenesis, microgametogenesis, and pollen grains. Some of the data have taxonomic value.

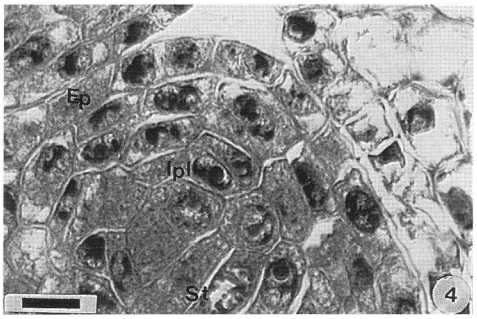
Materials and Methods

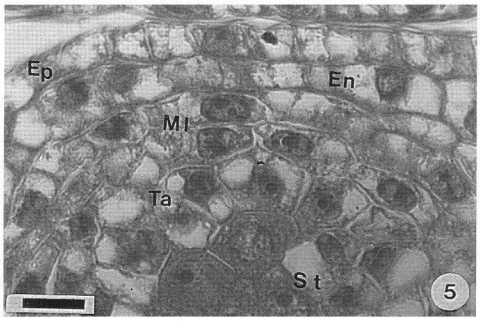
Flower buds and flowers at anthesis, from male inflorescences of *Chamaedorea elegans,* maintained under laboratory conditions at an average temperature of 25°C with a photoperiod of 16 hours of light and 8 hours of darkness, were periodically collected at different stages of development. The material was fixed in FAA (formaldehyde, 10 ml; 96% ethanol 50 ml; glacial acetic acid, 5 ml; distilled water, 35 ml). From paraffin-embedded material, sections (8–10 μm) were cut on a rotary microtome and stained with safranin-fast green (Johansen 1940). Sections (0.8–2.0 μm) obtained from JB4-embedded material cut on an ultramicrotome were stained with toluidine blue (Valley 1976). The photomicrographs, which show

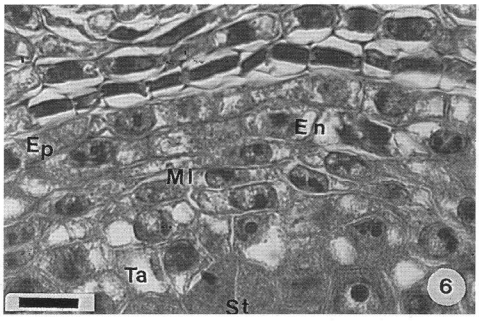




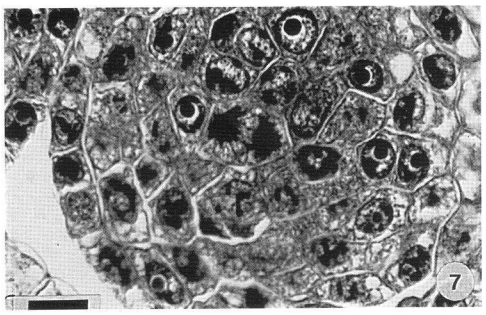


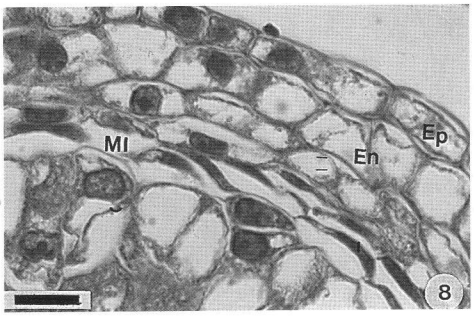


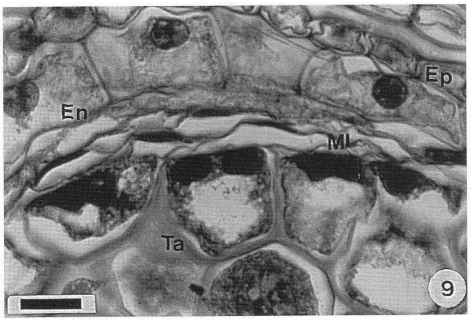


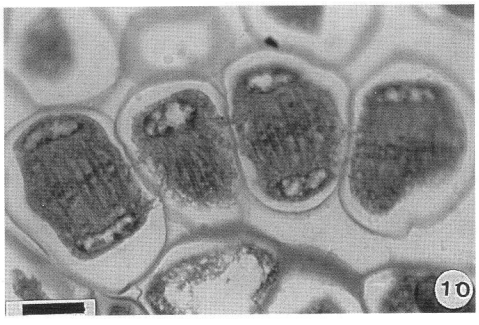


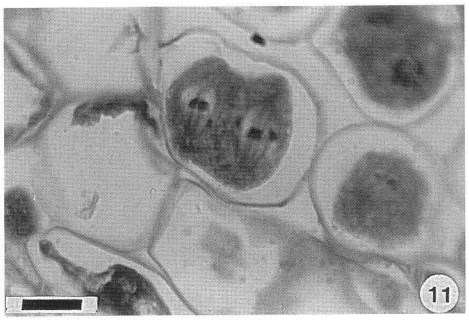
1. Male flower at anthesis with ribs caused by fiber packages arranged longitudinally in the petals. SEM 30×. 2. LS floral bud at early stage of development. Pistillode (Pi), anther (An), filaments (Fi), vascular bundle (Vb). Scale = 42.2 μm. 3. TS anther. Epidermis (EP), outer secondary parietal layer (Opl), inner secondary parietal layer (lpl), sporogenous tissue (St). Scale = 26.6 μm. 4. TS anther. Arrows show a periclinal division of the inner secondary parietal layer. Epidermis (Ep), inner secondary parietal layer (lpl), sporogenous tissue (St). Scale = 8.1 μm. 5. TS anther. Epidermis (Ep), endothecium (En), stratified middle layer (Ml), tapetum (Ta). Sporogenous tissue (St). Scale = 11.2 μm. 6. TS anther with complete number of layers. Epidermis (Ep), endothecium (En), middle layer with three strata (Ml), tapetum (Ta), sporogenous tissue (St). Scale = 10.9 μm.

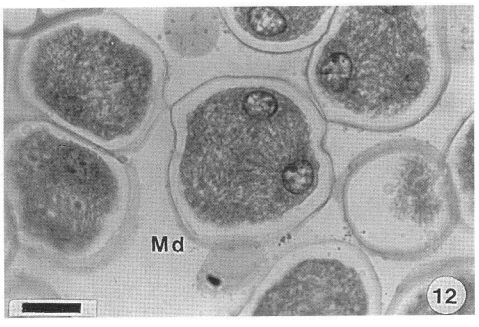


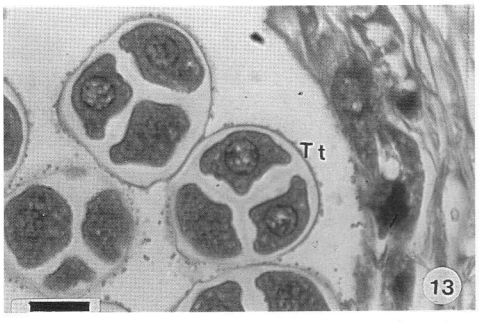


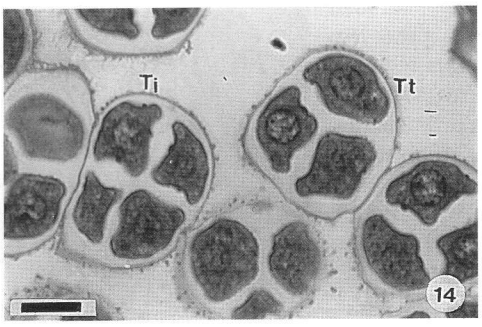












7. TS anther. Mitotic divisions of the sporogenous tissue. Scale = 10.5 μm. 8. TS anther wall with degeneration of the middle layer. Epidermis (Ep), endothecium (En), middle layer (Ml). Scale = 12.4 μm. 9. TS anther showing two-nucleate cells of the tapetum. Epidermis (Ep), middle layer (M1), tapetum (Ta). Scale = 10.5 μm. 10. First meiotic division of microspore mother cells. Scale = 10.7 μm. 11. Second meiotic division of microspore mother cells, which gives rise to tetrads with an isobilateral

different stages of development, were taken on a Zeiss photomicroscope.

Some flowers at anthesis and mature pollen grains were fixed in FAA, dehydrated through an ethanol series (30–100%), and finally in absolute acetone. The material was subjected to critical point drying with CO_2 in a pressure chamber (CPA II, Jeol JFC 1100) and coated with gold for observation under a scanning electron microscope (JEOL JMS-35).

Results

Under the laboratory conditions that were used to maintain the *Chamaedorea elegans* plants, inflorescences appeared throughout the year approximately every three months. Flowers mature on the same inflorescence at the same time, until they reach a size of 2.2–2.5 mm at anthesis.

At the apex of the pistillode, which emerges from the triangular opening formed by the petals, a nectar drop is observed 24 hours after anthesis, which remains for 2–3 days before the abscission of the flower. When the anthers dehisce, pollen grains emerge and cover the internal walls of the petals and the floral cavity. No pollen grains were observed outside the flower, or on the nectar drop.

Under the scanning electron microscope, multiple ribs arranged longitudinally were observed on the flower (Fig. 1). Transverse sections showed that these ribs are formed by fiber packages with thick walls.

Anther Wall Development

During the early developmental stages, in longitudinal sections of floral buds (0.8–1.0 mm long), sepals already cover the petals, pistillode, and stamen primordia (Fig. 2). The latter are formed by meristematic cells surrounded by a protodermis. The hypodermal cells divide periclinally, forming two layers. The outer layer, adjacent to the protodermis, is the primary parietal layer, which differentiates into the anther wall. The inner layer becomes the sporogenous tissue. Subsequently, the primary parietal layer divides periclinically forming two layers: adjacent to the protodermis is the secondary outer parietal layer and close to the sporogenous tissue is the secondary inner parietal layer (Fig. 3). The secondary inner parietal layer divides periclinally and forms subsequently the tapetum, which is adjacent to the sporogenous tissue (Fig. 4). This middle layer divides again periclinically to form another layer (Fig. 5). The secondary outer parietal layer divides periclinally to form the endothecium, adjacent to the protodermis, and another layer of the middle cells. The anther wall does not have any further periclinal divisions and remains as a single layer of protodermis, a single layer of endothecium, three cell layers of the middle region, and a single-layer tapetum (Fig. 6).

Microsporogenesis

As the anther wall develops, the sporogenous tissue divides frequently by mitosis (Fig. 7). The middle region begins to degenerate (Fig. 8). The tapetum cells increase in volume, vacuolize, and their nuclei divide (Fig. 9). The tapetum is of the secretory type and has binucleate cells. The microspore mother cells, which occupy the central region of each of the four microsporangia of the anther, are surrounded by a thick callose wall. Some microspores begin meiosis with successive cytokinesis (Figs. 10,11) and others with simultaneous cytokinesis (Fig. 12) forming tetrads of tetrahedral (Fig. 13) and tetragonal types (Fig. 14). Endothecial cells have bar wall thickenings (Fig. 15).

Pollen Grains

The callose wall loosens and dissolves, freeing the young pollen grains, which emerge with their walls already formed (Fig. 16). As a monad, the microspore divides, forming generative and vegetative cells (Fig. 17). Pollen grains contain starch in the cytoplasm of the vegetative cell. The tapetum cells break and their contents adhere to the pollen grain wall. At this stage the anthers lose the septum that separates each sporangium from the theca and open by longitudinal dehiscence, allowing the release of a large amount of morphologically well-formed pollen grains (Fig. 18).

Our observations indicate that pollen grains are

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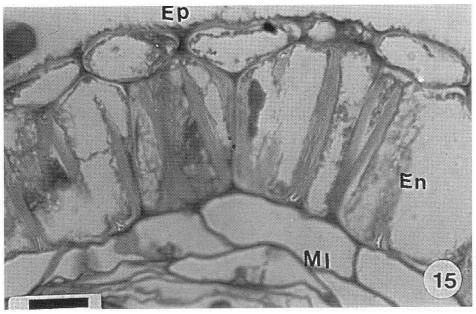
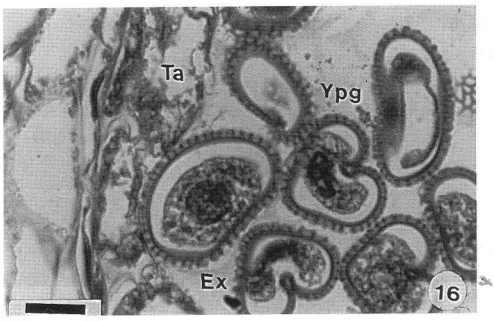
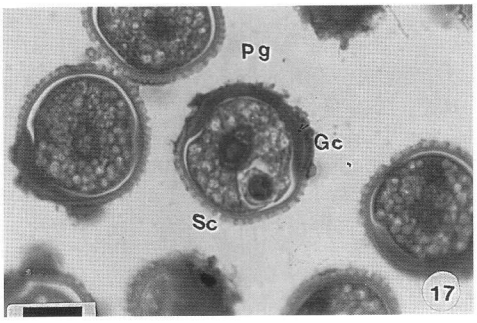
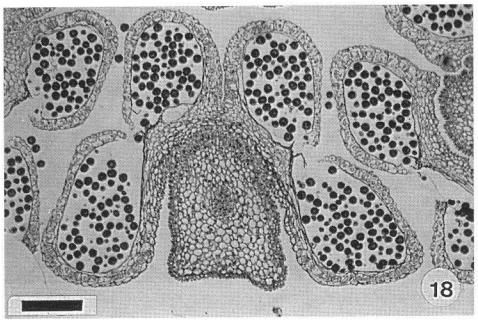
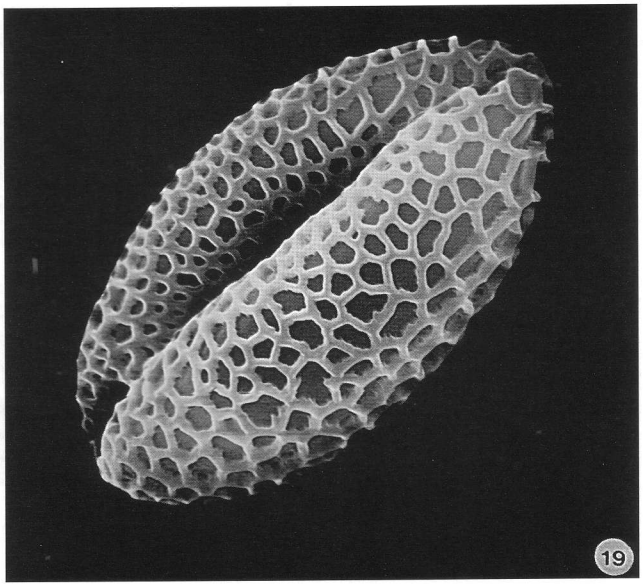
arrangement. Scale = 10.2 μm. 12. Second meiotic division of the microspore mother cells, which gives rise to tetrads with tetrahedral arrangement. Meiotic division (Md). Scale = 13.3 μm. 13. Microspore tetrads with tetrahedral arrangement (Tt). Scale = 10.9 μm. 14. Microspore tetrads with tetragonal (Ti) and tetrahedral (Tt) arrangement. Scale = 10.9 μm.











15. TS anther wall. Endothecium (En) with thickened walls. Middle layer remains (Ml). Scale = 10.7 μm. 16. Young pollen grains (Ypg). Exine (ex). Tapetum remains (ta). Scale = 10.0 μm. 17. Two-celled pollen grain (Pg), generative cell (Gc), spermatic cell (Sc). Scale = 11.4 μm. 18. TS mature dehiscent anther. Scale = 126.0 μm. 19. Mature pollen grain, monosulcate, semitectate-reticulate. SEM 2000×.

morphologically well formed and apparently capable of reproduction. Preliminary studies on the germination in vitro show a high viability of the pollen grains.

Pollen Morphology

In *Chamaedorea elegans* the pollen is monosulcate, heteropolar-bilateral. The exine is semitectate, and the reticulum presents muri of 1 μm wide and lumen ranging from 1 to 3 μm. The longest axis is 36.3 μm (34–38) and the shortest 27.2 μm (18–26).

Discussion

Male flowers of *Chamaedorea elegans* possess a pistillode, which is only present in some genera of the family Arecaceae (Essig 1973; Uhl 1976a,b, 1977, 1978a,b, 1980; Uhl and Dransfield 1987). The presence of the pistillode that produces nectar drops at anthesis suggests zoophilous pollination for this species.

The characters found during anther development in the microsporogenesis and microgametogeneis of *Chamaedorea elegans* agree with Davis (1966) who established these characters for the family.

Anther wall formation in *Chamaedorea elegans* is of a basic type, although for monocotyledons, in general, the formation of the walls almost always proceeds according to the monocotyledonous type (Davis 1966, Dahlgren et al. 1985). The type of anther wall development is not established in previous works on palm embryology (Biradar 1968, Biradar and Mahabalé 1968, Mahabalé and Biradar 1968, Kulkarni and Mahabelé 1974), only the number of cell layers were determined.

Dahlgren et al. (1985) reported the presence of a unique cellular stratum forming the middle layer in monocotyledons. Nevertheless, the number of strata is variable in different members of Arecaceae: *Phoenix sylvestris* has two, *P. pusilla* and *P. acaulis* one or two (Biradar 1968, Kulkarni and Mahabalé 1974). In *C. elegans* we found that three strata form the middle layer.

Regarding the tapetum, although the amoeboid or plasmodial type is described as the most common for monocotyledons (Dahlgren et al. 1985), in the family Arecaceae the secretory type is more frequent. The arrangement of microspore tetrads in palms is very variable (Davis 1966, Mahabalé and Biradar 1968, Dahlgren et al. 1985). Rao (1959) described the presence of more than one type of tetrad in a single sporangium of *Hyphaene indica* (=*H. dichotoma*), *Areca catechu*, and *Chrysalidocarpus lutescens*. In *Chamaedorea elegans* the tetrads are of both tetragonal and tetrahedral types.

The pollen grain types found in the palms are highly variable (Mahabalé 1967, Parthasarathy 1970, Uhl and Moore 1973, Takhtajan 1980, Ferguson et al. 1983, Dahlgren et al. 1985, Harley et al. 1991). Thanikaimoni (1970) described a monosulcate pollen type, reticulate-semitectate for the genus *Chamaedorea;* these characteristics agree with the results obtained.

Acknowledgments

We thank Ana Rivas and Verena Rubio for the manuscript translation and Biol. Yolanda Hornelas for the SEM photographs and Dr. Socorro Lozano and Dr. Beatriz Ludlow for pollen description.

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CHAPTER NEWS AND EVENTS (*Continued from p. 130*)

Mooreana Is No More

The journal *Mooreana*, named in honor of Dr. Harold E. Moore, Jr. and which has been published by the Townsville City Council in North Queensland, has printed its last issue. Its history was well summarized in John Dowe's editorial in the last issue:

"The journal had its beginnings in 1988 when Robert Tucker, then Botanic Collections Officer, began publishing News from The Palmetum shortly after the official opening of The Palmetum in September of that year. . . . With an increased interest in The Palmetum both locally and internationally in the early 1990s, accompanied by a significant rise in membership to The Friends of The Palmetum, it was perceived that there existed the need for a journal of improved quality and substance. *Mooreana* first appeared in June 1991 under the editorship of Robert Tucker. Following Robert's untimely death in early 1992, I [John Dowe] assumed editorship of *Mooreana* in April of that year as part of my duties as the incumbent Botanic Collections Officer."

Palm enthusiasts around the world will miss this quality publication. The International Palm Society would like to thank John Dowe for his dedicated and quality work in the past on *Mooreana*.

(*Continued on p. 162*)

Principes, 41(3), 1997, pp. 138–139

Dypsis acaulis

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It is always exciting to find living individuals of a palm species known previously only from its type herbarium specimen. Often the herbarium specimen may be very incomplete and give little idea of what the living palm looks like and a certain amount of detective work is required to match up the living with the dead. However, in the case of *Dypsis acaulis* J. Dransf., from Madagascar, the type specimen consists of a whole plant, so when I first described it, it was easy enough for me to imagine how the palm would appear in nature.

Dypsis acaulis is based on a collection made by Perrier de la Bâthie in 1912 at Marambo near Antalaha on the Masoala Peninsula, north-east Madagascar. I found the collection in the herbarium in Paris among the bundles of unnamed material in 1984. It seemed to be a very distinctive palm with an apparently creeping stem and entire bifid leaves about 30 cm long that are white on the undersurface. The inflorescence is spicate, with a dense spiral of overlapping bracts in the flower-bearing region, the whole thus appearing rather like the spicate inflorescence of a species of *Geonoma*. I was able to dissect open the very young flower buds and these showed that there are only three stamens. The material suggested a distinctive species of *Dypsis*, unlike any other described. In particular, the white undersurface of the leaves is unique in the genus, and a rare feature in other genera in Madagascar. It seemed most remarkable that this apparently very distinctive species should not have been described and named for the Flore de Madagascar (Jumelle & Perrier de la Bâthie, 1945), despite the material being more complete than that of many other species they described.

On my first trip to Masoala in 1986 and on subsequent trips I kept a keen eye out for this distinctive palm but saw no trace of it. By the time the manuscript of *Palms of Madagascar* was ready to go to the printer, we still had no further material of the palm, but, as it appeared to be so distinctive, I decided to describe and name it in any case.

In November 1996 I was back in Madagascar and had the chance to visit the Masoala Peninsula once again, but this time from the east rather than the west where all my previous trips have taken place. Within a few minutes of entering the forest on our first day, on the walk to our base camp I found a palm instantly recognizable as *Dypsis acaulis*, appearing just as I had imagined. It is one of the smallest species of the genus and altogether rather decorative. Photographs show the distinctive dark green bifid leaves that are white on the undersurface, the acaulescent habit, and the spicate inflorescence with the glistening cherry-red fruit. The photographs do not show the tiny male flowers with their three minute stamens.

Dypsis acaulis seems to be a rare palm in Masoala. Its distribution in the area I visited in 1996 is very patchy; it occurs in two valleys and associated lower slopes but is absent from a wide area of apparently suitable habitat that we walked through. It seems to be most abundant in valley bottoms on stream banks and lower hill slopes where it forms rather close colonies up to about 50 cm across.

Acknowledgments

I would like to thank the management and staff of Projet Masoala in Antalaha for arranging my visit to Masoala and making it so rewarding and enjoyable.

1. *Dypsis acaulis* growing beside a stream; the brilliant white undersurface of the leaves can be seen. 2. *Dypsis acaulis*: the short spike is about 10 cm long and bears brilliant red ripe fruit.

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Hunting for Mr. Straw Man

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The elusive straw man (*Copernicia ekmanii* Burret, Fr. *homme paille*, Cr. *jamm de pay*) is a hardy palm, growing on the crusty, dog-tooth limestone that juts out of the Caribbean Sea along the northern coast of Haiti. The tortuous coastline with the constant blowing of the northeasterly trade winds is a place that attracts buccaneers and explorers. The palm is poorly known to the world outside its native range; two expeditions were organized by Fairchild Tropical Garden to find out more about the current status of this magnificent survivor of a beautiful, but harsh, landscape (Fig. 1).

The first trip began as the three of us set out from Port-au-Prince on Monday afternoon, May 6, 1996. We had gone but 35 minutes from the capital before the swollen stem of an old *Pseudophoenix vinifera* caught our eye. Tucked away among thorn scrub of an abandoned sisal plantation, it stood solitary, a remnant of the original dry forest that had been cleared since colonial times (Fig. 2). Up and away from predators, an Hispaniolan woodpecker had pierced the stem for a nest site. Several other wine palms (Fr. *palmiste-à-vin*, Cr. *palmistaven*) could be seen, but scattered widely.

The road north took us through the rich Artibonite Plain, where the land is irrigated for rice production, and on to the desert town of Gonaïves. After a short stop, we were off for the "far west." The road north takes one along one of the most arid spots in Haiti, through a *Consolea* and *Lemaireocereus* cactus landscape. Oasis and fresh water courses typically have stands of *Copernicia berteroana* that are used as a source of thatch. By nightfall, we had left the coast and climbed to the low mountains in the center of the NW peninsula. As soon as one reaches about 300 m, the massive trunks of *Sabal domingensis* dominate the landscape, standing about as columns to the sky (Fig. 3). They are well-adapted to survive the annual fires set to clear the brush and prepare the fields. It is common to see the palms with only a spear and two leaves left, the other leaves cut for thatch. The thatch is dried and bundled as a cash crop, left stacked up by the side of the road for domestic use or sale to truck transporters out of the region.

We spent the night at a CARE guest house. Scanning Burret's description of *C. ekmanii*, we noticed that he collected only a short distance from where we slept. Early the next morning, we set off for an adventure. It was market day and everyone seemed to be walking in the same direction—donkeys loaded with all sorts of goods to be sold and bartered for weekly provisions. Along the route nobody seemed to know of the Straw Man. So then we began asking for any of the elderly who might know and this led us to a man sitting at an intersection in town. His toothless grin lit up when we stopped our 4-wheel drive vehicle for a chat. He hardly let us finish our description, when he interrupted with a gesture toward the ocean and confirmation that a large population existed and was well known by the locals who harvest for thatch. Later, we learned that this man was a local government official, traveling with a rubber stamp of authority, which he used on a slip of paper with his name—Monsieur Dugait Dégat. Hopping into the vehicle, he proceeded to lead us to a fishing village along the coast.

The weekly visit of the fish truck from Port-au-Prince was at hand when we parked near the village. Spiny rock lobster was selling for 90 gourdes (=$6.00) per pound. Ice was being hauled away from the truck by the fishermen for the next week's catch. We asked a local fisherman what it would cost to hire a boat and reach the site where the *C. ekmanii* were found. After some haggling, we got a round-trip in a rowboat worth 3.3 pounds of lobster and this included three Haitian friends accompanying us through all sorts of entangled shrubbery, cactus, and sharp rocks in bare feet and thongs.

Upon reaching across the bay, we proceeded to

climb up to a ridge that separated the mangroves from the open ocean. This ridge turned out to be a plateau on a peninsula, several kilometers wide. We spotted the palms off in the distance, across a savanna-type plant community comprising cacti, bunch grass, and thorn scrub. Walking to them was an exercise of patience; every step had to be carefully chosen to avoid injury. Here and there, quail doves were flushed from their ground-dwelling nests. One of the guides spotted a buff-colored bird egg, picked it up, and put it in his pocket.

The first individuals of *Copernicia ekmanii* appeared stunted, averaging a height of 1–2 m. These had been harvested for their thatch, undoubtedly impairing productivity. No seedlings were observed, causing one to wonder how this population regenerates under such harsh conditions. Remnants of harvested stumps of the thorny shrubs and scattered earthen kilns were witness to charcoal-making activities. Goats bleated here and there—open grazing was the norm. However, Mr. Straw Man seemed to tolerate all these activities and was holding its own in such rugged conditions.

We left the fishing cove and headed along the northern coast. Along the way, we took a break and climbed down an escarpment toward the sea. Led by a lady who knew of the palm, we came to a lone palm, about 3 m tall, hugging a rocky ledge near a ravine. The lady spoke of an extensive population of *Copernicia* farther along the coast. With this information, we continued on our journey. On both sides of the dirt trail, farmers were in their fields, harvesting a crop of peanuts in the shallow pocket soils of the limestone rock. A farmer returning from his field and carrying the stump of an agave plant for fuelwood kindly stopped to chat a while to answer our queries. He told us we could find a palm in town that might be in fruit. With hopeful anticipation, we hurried along and arrived in town just before dusk. When we finally located the palm, an entourage of folk had gathered around, entertained by these strangers who came looking for palms, not people. The palm we located, reaching about 4 m, was much larger than any we had sighted that day. It was probably cultivated and receiving the benefit of a fertile site and ample water supply. There were several fresh fruiting stalks that were in various stages of flowering. The shoreline was but 10 m from the palm. Talking with the fishermen, we confirmed the presence of the coastal population spoken of earlier and learned of another population nearby. When we asked where we might find the largest individuals and the possibility of harvesting seed, the new location seemed to be our best choice. We arranged for a sailboat the next day for our final excursion.

We boarded *Grace à l'Eternel,* a 5-m fishing boat with a two-man crew. With a brisk northeasterly wind, we reached the population within 30 minutes of sailing. From a distance, we could easily spot the stand of *C. ekmanii* towering over the beach cove. Beneath the palm grove were the thatched A-frame shelters of the fishing community (Fig. 4). These palms were the tallest and most beautiful specimens we had yet seen. The accumulation of old fronds were hanging in petticoat fashion along the trunks. Ashore, we were greeted by the matriarch of the village who led us along the coast to study the extent of the population. The sandy beach extended southward. Outside the confines of the small village, the palms were shorter and regularly harvested for thatch by people coming from the arid hinterland far away. Stem density was high and seedlings were common. Several seedlings were carefully dug up and bundled in a water-soaked shirt for distribution to *ex situ* sites at Fairchild and the Katherine Dunham Botanical Garden near Port-au-Prince. Fishermen were spear fishing and mending their nets. Children were telling us how they like to eat the sweet pulp of the fruit and play marbles with the spherical seed. Our captain and first mate quickly ate a meal of bean gruel and mentioned that we'd better get sailing for our return trip because the winds were picking up. It was about 11 AM and our destination was in the exact direction the wind was coming from.

The crew rowed for 20 minutes to a rocky cape, then set sail toward the northwest. The captain maneuvered well among the whitecaps, though

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1. *Copernicia ekmanii* along the shores of the Caribbean Sea in northwestern Haiti. 2. *Copernicia ekmanii* is restricted to harsh conditions along the coast.
3. A *Pseudophoenix vinifera* that survived the conversion of its dry forest habitat to a sisal plantation.
4. *Attalea crassipatha* of Haiti, the only member of the *Attaleinae* found in the Greater and Lesser Antilles.


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5. *Sabal domingensis*, the dominant species in the agricultural landscape of northwestern Haiti.
6. *C. ekmanii* provides shelter in this fishing village.

bailing became a constant task for the passengers. The gusty winds made sailing difficult, though the captain kept reminding us that this was nothing compared to sailing the Windward Passage to Cuba and that we were safely in the hold of *Grace à l'Eternel.* During the fourth tack, the 24-ounce drinking mug that we were bailing with slipped out of hand and into the sea. The captain, aghast as seeing such a prize possession leave the boat, decided to change sailing direction and return to fetch the mug. Upon doing so, our weight shifted dramatically and several waves breached the sides of the boat. Immediately, we were on the verge of capsizing, with thoughts that it was us, and not the *C. ekmanii,* that were in fact endangered. A frantic 20 minutes ensued in which nothing but getting water out of the boat was on our minds. The captain praised his boat's capacity to hold water. He suddenly dived out of the boat and swam to retrieve the floating mug. Back on board, he quickly cut a gallon jug in half and threw it to us for bailing. Eventually, the near calamity was under control and we resumed our course toward the port. The captain consoled us that we would be ashore within 30 minutes. He was accurate to within minutes. Safely on land, we were greeted by other fishermen who had witnessed our plight and assured us that they were prepared for a rescue.

The second trip took place in July when two-thirds of the straw man team got together again to look for *Copernicia* seeds. While Joel addressed pressing issues at home, Chuck returned to Port-au-Prince to meet Suzanne and begin the second part of our adventure. Suzanne had already made arrangements with CARE for accommodations in this remote section of the country. Familiar with the route this time, and equipped with life jackets, we set out immediately for the *Copernicia* populations.

The journey went as expected for the first few hours. A flat tire was changed and repaired at first opportunity. A second occurred shortly thereafter, and then a third. We ended our first day's journey with tire repairs. The next morning, we arose early, with two new inner tubes, and set out for our destination. Crossing a particularly hot and arid region on a rocky road, we experienced a rapid succession of flat tires; three in all. Here, the villages were so scattered and so small that we could not find even the shade-tree mechanics of small towns. We drove on, between villages, past *Copernicia berteroana* (Fig. 5), through the cactus scrub, on two flat tires with the third mounted on the back of our four-wheel drive vehicle. Two tires were almost shredded by the time we finally reached a village. Fortunately, a CARE truck stopped and offered assistance. Hearing that we were all bound for the same facility, these gentlemen delivered us to our planned accommodation for the night.

The next morning, CARE provided a truck and driver to take us to the palm populations. Wearing our life jackets, we had a pleasant, uneventful sail to the palms and back. We spoke to the people of the village about the importance of these palms and heard about the problems they face in protecting them. Everybody from small children to elderly women and men helped us collect the seeds. We then discussed with a village committee how much money was appropriate for the seeds we were taking. Since negotiation is the rule, reaching a mutually agreeable payment took some time. Visiting two nearby sites, we collected about 100 slightly immature seeds and quickly counted the palms. Each of these populations exceeded 500 individuals, easily making them the largest populations we had seen.

The following day, a CARE driver returned us to our vehicle and we watched as the new tires were mounted. Without the surprisingly generous assistance of CARE, our little adventure would have been a real trial. Our rented vehicle, however, had a little more mischief to offer.

Trying to maintain our tight schedule, we set out for Port-au-Prince that afternoon. We were already late because we had to purchase new tires, have them mounted, and return CARE's spares. We had three more flats on the return—discovering two at a restaurant when we stopped for dinner and one at a gas station. A grand total of nine flat tires in three days may not be an all-time record for Haiti, but it was a personal best for each of us. Then, two hours from Port-au-Prince, driving in the dark, our headlights flickered and went out. Unwilling to face Haiti's late night trucks, reputed to be manned by very dangerous drivers, and rough roads in total darkness, we ended another day. We drove a safe distance off the road and slept in the Spartan comfort of the utility vehicle's reclining bucket seats.

We awoke at first light and returned to Port-au-Prince just as the rental car company was opening. They kindly reimbursed us for our tire expenses and, to our surprise, rented us another vehicle for the continuation of our week's travels. The final

days proved relatively uneventful as we viewed numerous palm populations of six palm species, including *Pseudophoenix lediniana, Zombia antillarum,* and *Attalea crassispatha* (Fig. 6). We were also able to collect seeds of the *Attalea.* Most of the seeds were collected for conservation efforts in Haiti, with a few returning to Fairchild Tropical Garden with Chuck.

The hunt for Mr. Straw Man was an experience hard to forget. We saw several significant populations, each containing hundreds of mature palms. The species appears to be better off than other endemic palms in Haiti, primarily because the harsh site conditions are too risky for conversion to annual cropping activities. Rainfall is erratic and the soils, if any, are shallow. This does not mean that the native habitats are not endangered. Free grazing, charcoal-making activities, fires and harvesting for thatch are a menace to the natural conditions favoring regeneration and a sustainable population. However, conservation of the species can be managed. Suzanne and friends are establishing the Haitian Botanical Foundation, which will continue the palm work, as well as other environmental conservation. Suzanne and Joel are founding members and Chuck has been asked to serve on its board of directors. The three of us have taken different routes to Haiti, joining in our search for the Straw Man. We cannot know what lies ahead of us in Haiti. We have great hope that by continuing along this path, however, we will bring something of value to the people of this impoverished country.

Acknowledgments

The authors would like to extend their sincere appreciation to the CARE staff in Haiti for providing logistical support during the expedition. Many Haitians along the way graciously gave of their time in assisting the team to locate and reach the isolated *C. ekmanii* populations. Travel costs were funded in part by Fairchild Tropical Gardens.

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Left
Sabal pumos (Kunth) Burret

This species was first collected from Michoacan, Mexico in 1803 by the great botanical explorers Alexander von Humboldt and Aimé Bonpland. It was first placed in the genus *Corypha* by Kunth and later transferred to *Sabal* by Burret. For over 150 years, *Sabal pumos* was known only from that one, original collection until J. Rzedowski visited the type locality in the early 1960s and found thriving populations of this palm. "Pumos" is the name given locally to the fruits, which are edible and are to this day collected and sold in local markets. *Sabal pumos* is distinguished from its relatives by several features including its large fruits (to 2.8 cm in diameter) and its elevational range (600–1 300 m, the highest in the genus). It is locally abundant in the type locality of Michoacan, and scattered populations are found in adjacent states.—Scott Zona.

Right
Calamus hollrungii Becc.

Calamus hollrungii is the most common and widespread species of rattan in New Guinea (see pp. 148–157). This photograph, taken near the shores of Lake Kutubu in the Southern Highlands of Papua New Guinea, shows a juvenile individual establishing itself in the undergrowth; its appearance belies the brutish nature of the adult form. Fully grown specimens of *C. hollrungii* are extremely robust and can climb to great heights in the forest canopy with the help of leaf whips (cirri), which are armed with hundreds of recurved, grapnel-like spines. It is a confusingly variable species. For example, the sheaths of some forms are completely without spines, while those of other forms possess large numbers of stout, black spines. Further study is required to discover whether more than one taxon is concealed within this hitherto tolerated breadth of variation. To date, the rattan industry in Papua New Guinea is very underdeveloped. However, the country is fortunate that such a high-quality cane-producing *Calamus* species is also its commonest.—William J. Baker

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Rattans and Rheophytes—Palms of the Mubi River

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The island of New Guinea holds some of the greatest botanical mysteries left on earth. It is a place where vast tracts of rain forest still stand in an unexplored and impenetrable landscape, where Asia meets Australia in a melting pot of fantastic biological diversity. Although this uncharted paradise seems somewhat distant now, with the help of my field notes and, no doubt, a little imagination, I shall attempt to tell a few tales of my first field trip to collect palms in New Guinea.

As is the case for many plant groups in New Guinea, the palms of the island are very poorly known. This is a result of the severe lack of botanical collections from the region, principally due to the inaccessibility of most parts of the island, coupled with the old bugbear that general collectors do not like making specimens of bulky plants such as palms. Enough said! Although there have been several specialist palm collectors active in New Guinea, there is still a dearth of material in herbaria. Thankfully, a number of palm botanists are taking a strong interest in the palms of New Guinea and the situation should change. Recently, I was fortunate enough to be asked to spend two months studying rattan diversity in Papua New Guinea (PNG), the eastern half of the island, as part of a larger rattan project at the Royal Botanic Gardens, Kew funded by the European Union. Naturally, I was more than happy to oblige and consequently spent January and February 1996 indulging in some of the most exciting plant exploration that I have experienced so far.

I do not intend to give every detail of the trip, but rather an account of some particularly excellent collecting that I enjoyed while I was a guest of the Worldwide Fund for Nature (WWF) project in the Kikori basin. As part of the packed program very kindly organized for me by Tanya Leary of WWF, it was arranged that I should spend three days based at Kantobo in the Southern Highlands where I would collect around the Mubi river. Having already spent a week being flown around Mount Bosavi by helicopter, courtesy of WWF, I didn't think things could get any better, but I was wrong.

Accompanied by my field assistant, Lawrence Kage, I was driven by car from the WWF base at the Chevron oil camp at Moro along the road that follows the main pipeline from the oil wells around Lake Kutubu in the Southern Highlands to the coast in Gulf Province where the pipeline continues to a marine terminal outside the mouth of the Kikori river. Only an hour out of Moro, we were halted by a flood on the road and were just on the point of turning back when we made radio contact with our hosts in Kantobo who agreed to meet us on the other side of the flood. Having ferried our gear across the rather unappealing, tepid water, we were met by Pamero, a wizened old man with dreadlocks and a serious lust for life, who drove like a lunatic, although he could only just reach the steering wheel, along the limestone road to a point where a path led into the forest. There we met porters who helped us carry our gear down to a launch on the Mubi river. Pamero, being somewhat multitalented, took control of the boat and, having introduced us to the villagers at Kantobo, set off to take us some 15 minutes downstream to the lodge where accommodation had been arranged.

As I relaxed in the knowledge that we were *actually* going to reach our destination, I took more notice of my surroundings. Either side of the broad river, whose turbid waters flowed calmly, but swiftly, magnificent forest rose from the alluvial flats along the banks clothing the limestone hills behind. Along the river margins, some ubiquitous New Guinea tree palms, or *limbuns*, to use the PNG pidgin term, could be seen. *Metroxylon sagu*, the sago palm, grew gregariously in large

quantities, which is fortunate, as the local people are dedicated and enthusiastic sago eaters. Here and there, flowering specimens could be seen, spreading their massive candelabras of inflorescences high above the foliage. These individuals are quite useless to the local people as the energy required for this reproductive effort exhausts the edible starch, which is stored in the trunk of the palm before flowering. It is nevertheless an impressive sight. Groups of *Gulubia costata*, the most common of all the robust tree palms in New Guinea, were frequent. It is readily distinguished by its spherical crown of straight leaves with drooping leaflets, although this character is not reliable as it is shared by some species of *Gronophyllum*, *Rhopaloblaste*, and *Cyrtostachys*. The presence of a brush-like inflorescence narrows the options down to *Gulubia* and *Gronophyllum* and, although probability suggests that the palm in question is *Gulubia costata*, a closer look at the flowers is needed to be certain. Among the gulubias, a few individuals were spotted with large, spreading inflorescences which I tentatively identified as *Cyrtostachys peekeliana*. Striking among these typical pinnate palms was the bipinnate *Caryota rumphiana*, a robust member of the fishtail palm genus, which is common throughout the island.

Disembarking at a bend in the river, we were led along a board walk through the bush to the lodge. As we approached, I was distracted from rattan spotting when a hitherto distant rumbling noise became gradually louder, up to the point where it was difficult to communicate with anyone unless they were standing close by. Arriving at the lodge, I walked to the edge of the river bank to find myself on a cliff a hundred feet above the river, which was now hurling itself over a great precipice into a deep limestone gorge. Equally awe-inspiring was the forest, which towered above the gorge on the opposite side, presenting a fantastic view of the different layers of vegetation that appeared to be sewn together by rattans and lianas of various kinds. This was the dramatic beginning of Wassi Falls, possibly the most spectacular chain of waterfalls to be seen in New Guinea.

During that evening, we made plans for the next few days of fieldwork. Lawrence visited Kantobo village to gain permission from the landowners to collect in the area. Unlike most other countries, PNG has retained traditional land rights and it is vital to talk to the local landowners before doing anything on their property. The following day, two guides from the village joined us for our first day collecting around the falls and this proved to be extremely productive. I found six species of *Calamus*, including three that I had not come across before. Although this number may not be as high as that which one might find in, say, most sites in Borneo, it was certainly a good score for PNG. Unsurprisingly, the widespread *Calamus hollrungii* was present. I encountered this species in every locality that I visited and was very much bewildered by the variation that it displayed. For example, some individuals bristled with numerous black, triangular spines, which would penetrate my thick leather gloves as I tried to make a specimen, but others were totally unarmed on the sheath. An extensive study is needed before any meaningful taxonomic entities can be identified within this complex. Another particularly interesting rattan found in the area was *Calamus humboldtianus*. It had an altogether peculiar feel about it with its large leaflets, leathery and somewhat hooded, crowded on a disproportionately short rachis with a long petiole. The most remarkable feature was a structure known as an ocrea, which is an extension of the leaf sheath above the insertion of the petiole. Although ocreas occur in many rattan genera, they are a great speciality of New Guinea *Calamus* species. The ocrea of *C. humboldtianus* is one of the most spectacular, reaching a length of 80 cm or more. It is blackish purple in color with numerous collars of soft, fine spines.

Several small palms grew in the undergrowth. A slender *Areca* related to *A. novo-hibernica* was common, as was a species of *Calyptrocalyx*, which I had already found in abundance around Mt. Bosavi. The latter was a particularly ornamental palm. Its regularly pinnate leaf was an exquisite copper shade on emergence and bore elliptic leaflets whose apices were drawn into fine pendent drip tips. A very dwarf *Gronophyllum* of the type previously known as *Nengella* was also present,

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1. An unidentified *Gulubia* species growing in abundance on karst limestone along the Mubi river. 2. An as yet unidentified species of *Orania*. 3. *Caryota rumphiana*, the black palm, one of the most abundant palms in New Guinea. 4. *Heterospathe macgregorii* growing as a rheophyte on the banks of the Mubi river.


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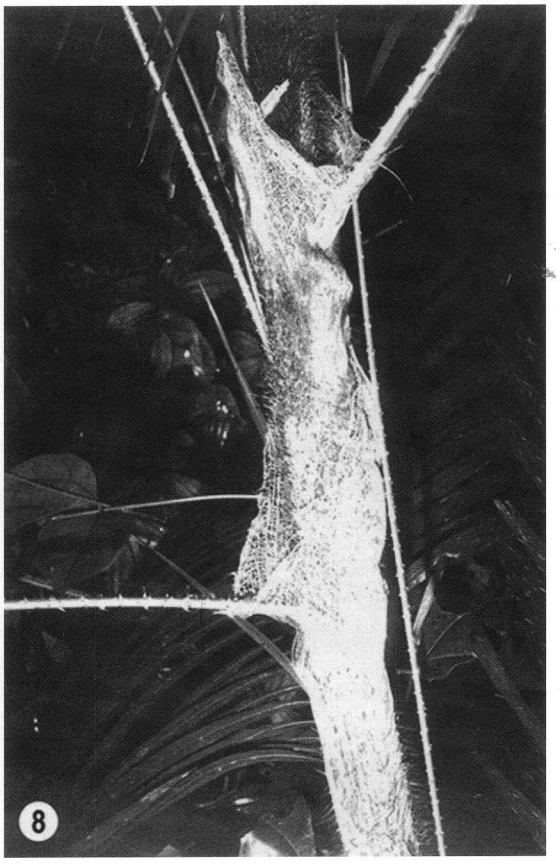
5. *Heterospathe macgregorii*: infructescence with ripe fruit. 6. The village of Kantobo.



7. *Calamus reticulatus*: habit. 8. Close-up view of the stem of *Calamus reticulatus* showing the netlike ocrea.

but scarce. It has been identified tentatively as *G. flabellatum* on account of its entire leaf, but a thorough revision of the group is required before we can be certain of the standing of this species.

After an unpleasantly close encounter with a death adder, we came to a point where the trail dropped over the edge of the gorge. I was told it led to a viewpoint from which the biggest of the falls could be seen. Reluctantly easing myself over the edge of the cliff, I staggered and slipped down the mudslide that called itself a path. A heavy mist thrown up by the furious water swirled around, providing ideal conditions for mosses and liverworts, which thrived in the sodden atmosphere. Eventually we reached a ledge where the vegetation cleared to reveal a waterfall of epic proportions, apparently known as Beaver Falls, an ample reward for the effort required to reach the spot. Although the river constantly belched up great clouds of mist that obscured the view, I could make out a large, but willowy tree palm with beautiful arching leaves clinging to a ledge on the side of the chasm, but there was no hope of making out enough detail to identify even the genus.

Having recovered from the exertions of the waterfall trail, I decided that the following day would be conducted in a more leisurely fashion. A local man named Benedict brought his dugout canoe to the lodge early in the morning and so we started a wonderful day of collecting along the banks of the Mubi river. We made our first stop only a few minutes after setting off as I had noticed clumps of a rattan that grew almost in the river itself. When I managed to get close to the rattan, I could see that it possessed an ocrea quite unlike anything I had come across in any *Calamus* species, and yet the presence of a flagellum, a climbing whip attached to the leaf sheath, indicated that it *had* to be a *Calamus*. Above the petiole, the sheath extended to form a loose fibrous tube around the next leaf sheath. As this vegetable stocking reached the top of the next leaf sheath,

it was stretched by the petiole and the flagellum to form a net funnel. This feature would have been remarkable on its own, but even more amazing was its similarity to the ocrea of the Bornean rattan, *Korthalsia jala,* to which *Calamus* is quite unrelated. This curious palm was readily identified from the literature as *C. reticulatus,* on account of this distinctive feature.

Benedict was extraordinarily proud of the palms that grew on his land and he was quite adamant that I should collect black palm, *Caryota rumphiana.* In his guide to palm-collecting techniques, Dransfield (1986) notes that "the unhurried careful collection of a majestic palm can be immensely satisfying." I take his point, but, frankly, I draw the line at the genus *Caryota,* a genus that not only creates difficulties by possessing massive and particularly complex leaves, but adds insult to injury by producing a vile irritant juice in its fruits in particular. Evidently, these sentiments have echoed down the decades of palm collecting in New Guinea as, despite being one of the commonest tree palms on the island, very few complete herbarium specimens have ever been made of the species. As I was plucking up courage to tell Benedict that I did not want to make a specimen of black palm, a fine fruiting specimen came into view from the boat. Feeling a sudden pang of guilt, I knew that I had to face up to my taxonomic responsibilities. However, there were bonuses for being so conscientious. A massive male specimen of *Calamus humboldtianus* was growing on a tree next to the fated *Caryota* and we made some marvelous specimens from it, complete with inflorescences. This rattan proved to be just as bizarre in reproductive form as it was in vegetative structure. The inflorescences were not quite mature, but were unusual in that the rather papery primary bracts were not tubular, but had split longitudinally, not unlike the genus *Daemonorops,* to reveal highly congested rachillae with the flowers arranged in a very disorderly fashion, not distichously as is more usual in male rachillae of *Calamus.* Nearby there was also a very accessible specimen of *Korthalsia* in bloom. One should never pass up the opportunity to make an easy collection of *Korthalsia.* In general, members of the genus flower high in the canopy where the stem may be branched. More often than not, the great effort required to disentangle the rattan and bring it to the forest floor results in the snapping of the stem. Two species are described from New Guinea, *K. brassii* and *K. zippelii,* but the distinction between the two is so unclear that we have been unable to identify with confidence any of the specimens that have come to Kew from New Guinea.

Having collected around the black palm, it was impossible to ignore the inevitable any longer. Although the gratuitous felling of a palm is deplorable, it was obvious that, in this case, it would be impossible to make good specimens of this very poorly known species without being destructive. Thankfully, *Caryota rumphiana* is so common that the loss of one individual would not affect the local population. Benedict brought out his axe, which, ironically, had a beautiful shiny handle made of black wood from the very palm that we were about to cut down. As he chopped through the trunk, I noticed that the black outer wood gave way to a white pith, which apparently can serve as an inferior source of sago. Eventually, the palm yielded and crashed to the forest floor. Once on the ground, the massive bipinnate leaves seemed even more enormous than they had when held high. We set to work, trying to generate a compact, yet informative specimen. Even with the help of four men, and a dose of their excellent sense of humor, the job took nearly two hours. Having completed the specimen, I must confess to feeling extraordinarily self-righteous and, yes, I admit that there was a tinge of the satisfaction that Dransfield mentioned. However, the palm got its own back later on as I extracted seed from some of the riper fruit. I managed quite successfully to cover myself with irritant juice, not realizing until it was far too late when the most intense and excruciating burning itch swept from my finger tips, over my hands, and onto my arms. Revenge was sweet for the black palm that day.

Returning to the canoe, we headed for one of the minor creeks that flowed into the Mubi river. Near the confluence, we stopped so that I could watch a villager making sago. Stepping ashore, we found a young teenager from Kantobo who turned out to be one of Benedict's cousins. The poor girl became intensely embarrassed as her heavy task turned into a spectator sport. I was led to the spot in the sago swamp where the girl had single-handedly felled a massive sago palm and split off the outer wood to reveal the starch-loaded pith inside. She demonstrated how she extracted the pith using a short axe with a relatively long cylindrical wooden head tipped with iron. She chopped furiously but accurately, shaving strips of pith from the trunk, reducing it to fine particles. Having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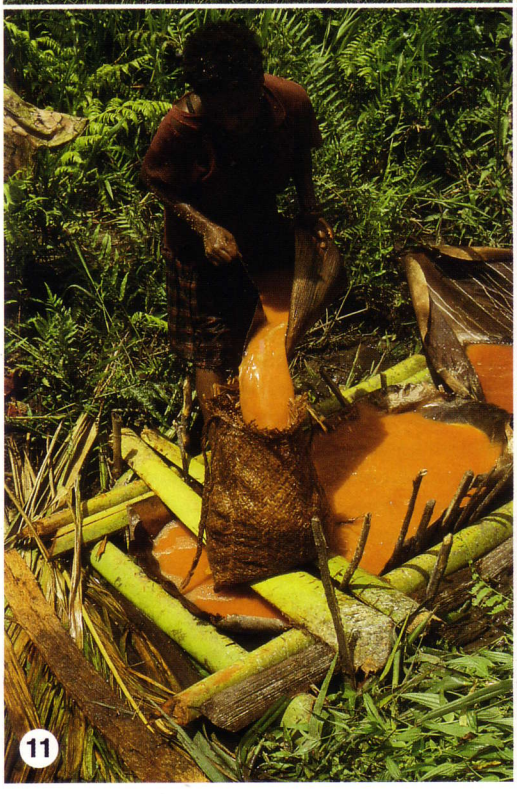
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placed the chippings into a large, woven fiber bag, the girl returned to the river bank where she had set up a contraption, which consisted primarily of a palm crownshaft, probably from *Gulubia costata*, and which had been cured over a fire and formed into a large basin shape. The basin was restrained by bamboo pegs so that it would keep its shape when filled with water and a small platform made from *Metroxylon* petioles was set up over it. She placed the bag on the platform and, using another crownshaft basin, poured a large volume of river water into the bag. As it drained out, she folded over the top of the bag and firmly squeezed out the remaining water with her feet, repeating the process a number of times, fetching more water from the river, then pouring and squeezing it through the sago pith. I could still see no sign of the sago itself, but before I had a chance to doubt the method, Benedict barked an order at the rather submissive young woman who crouched by the side of the crownshaft basin. She plunged her hands through the water, which had turned a curious orange color, and, lifting them, brought up a huge clod of congealed starch that had been washed out of the pith. This was raw sago, the staple diet of the vast majority of New Guinea's lowlanders. I was extremely impressed, but was sharply reminded by Benedict that this was woman's work and it in no way could compare to, say, house building, which was a distinctly male task and one which was considerably more strenuous, at least in Benedict's eyes. Although I begged to differ, I did not dare to voice an opinion as it was not my position to comment on the rights and wrongs of the social hierarchy in New Guinea. However, it is true that the rural communities that I experienced in PNG were very much male-dominated. Kantobo was particularly conservative, still maintaining the traditional village layout of a central long house for men only, which is surrounded by smaller houses for the women and children. It is considered to be very unwise for a man to have too much to do with women or young children as they are likely to cast a spell on him or cause him to fall ill. I was advised by some of my companions that the method of sago-making that had been demonstrated to me was a very bad one as the girl had stepped over the sago, which would almost certainly poison any man who ate it. It would be far better for her to squeeze the sago pith with her hands, I was told.

Leaving the now red-faced young woman to her arduous task, we paddled into a narrow creek, which led to a small patch of swamp forest. The mud was thick, but this did not deter the growth of a particularly aggressive, yet handsome species of *Calamus*. Its sheaths were a rusty orange shade and were armed with a dense mass of hairy spines. Most *Calamus* species possess a peculiar swelling below the petiole, the geniculus or knee, the function of which is unknown, but it has been suggested that it might contribute to the climbing habit. In this case, the knee was absurdly swollen and was fringed with more offensive spines. During the preparation of specimens, casualties were sustained and the forest echoed with the blue language of indignant palm collectors at work.

Near the base of a soaring limestone cliff, which inhibited any further progress, a slender *Calyptrocalyx* grew. Although it was no horticultural beauty, it was interesting to me as it possessed two spikes within a single prophyll, whereas all other species that I had encountered bore solitary spikes only. We have not attempted to name any of the *Calyptrocalyx* species that were collected. Although names undoubtedly exist for some of the species, as yet we understand little or nothing about the species boundaries and it seems that there are many taxa yet to be described. This wonderful genus is crying out for taxonomic attention.

As we returned to the forest, Benedict started to explain that when the river is high, especially in July, it is possible to canoe through the swamp forest. Suddenly, I realized that several of the palms that we had collected must be adapted to, and perhaps even are dependent on, seasonal flooding. Certainly the *Calamus* and the *Calyptrocalyx* that we had just collected must enjoy wallowing in mud, but whether or not they qualify as true rheophytes is questionable as they appear not to be adapted to tolerating flowing water. *Calamus reticulatus*, on the other hand, may be considered to be a true rheophyte. It grows only on the very margins of the river, according to my local informants, where it often forms thickets. The leaflets are narrow and are very flexible so would offer

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9. *Metroxylon sagu* grows abundantly in the valley of the Mubi river. 10. Chopping up the pith of a felled sago palm to make sago. 11. Washing out starch from the pith with water. 12. Removing sago from water.

little resistance to fast-flowing water, which might uproot a more resistant rattan.

On our third day of collecting on the Mubi river, we were to be picked up at the pipeline road after lunch, but there was enough time for Pamero to take us upstream towards Gobe village. I was told there would be places where *Calamus reticulatus* could be collected in flower, so that was our mission for the day. We headed straight for Gobe as we were venturing off Kantobo territory and would need permission from the local landowners. Beyond Kantobo, the landscape changed as the river narrowed and the limestone cliffs began to rise very close to the river bank. We often came across islands in the middle of the river whose margins were dense with *Calamus reticulatus* thickets. There were small groups of *Gulubia costata* growing in the increasingly narrow alluvial strip. Behind these, growing gregariously high on top of the limestone hills was another species of *Gulubia* (or possibly *Gronophyllum*), which I recognized as being the same as the tree palm that I had seen clinging on to the side of Beaver Falls. With its very long, wiry trunk and its arching leaves, it was an outstandingly elegant palm. Nearby, close to the river, grew a fabulous *Orania* with almost distichous, somewhat glaucous leaves. It was immensely tantalizing to see how much more could be done if I had more time, although I suspect that attempting an assault on the jagged karst to collect the *Gulubia* would have been an unpleasant and dangerous if not an impossible task.

We reached Gobe village and received permission from the residents who were typically bemused by my work. We headed back downstream and stopped at Mabogo island where *C. reticulatus* grew abundantly and a fertile collection was easily made. Before we left, I was told that I could see a local burial site on the island if I was interested. It all seemed a little macabre, but it was also the kind of cultural experience that one should not miss. The Gobe villagers took me to a nearby spot where the limestone rose vertically once again and there they showed me a row of skulls perched on a ledge under a cliff. These, I was told, were village commoners from Gobe, but on top of a higher ledge, a chief's burial could be seen. We scrambled up on top of a large boulder and there in the gloom was a pile of bones, which obviously included the remains of more than one person as there were three skulls. One belonged to the chief and the second to his wife who had died later. However, the third skull was that of the pig that had been part of the funeral feast that had taken place at Gobe to honor the chief. By placing the leftovers with the chief's body, his spirit would not feel excluded from the celebrations. I approved thoroughly of this tradition, although I doubted it would go down well at home. Among the bones were a variety of artifacts that the chief had cherished: kina, or shell money, and shell bangles, both highly prized commodities from the coast, wooden arrows, now rotting, but with wallaby bone heads persisting, and an iron axe head and a safety razor that had been gifts from missionaries.

Returning to the boat, our final task was to visit a nearby island where a slender tree palm had been spotted from the boat. Although the water flowed swiftly, we managed to land on the tiny island, which was barely big enough to accommodate us. The margin of the island was dominated by the elegant palm that grew to only two meters and bore somewhat recurving pale green leaves. Its moderate spreading inflorescences were weighed down with bright red fruit. Although this was a pretty enough palm, the really remarkable thing about it was that it grew on an island, which, even at this time of relatively low water, barely rose above the surface of the Mubi river. I was told that the water is often high enough to submerge the island and can be considerably higher at times of flood and yet here were mature, fruiting palms growing on apparently dry land. The only possible conclusion was that this palm was genuinely rheophytic and with its resilient trunks and its flexible leaves with narrow leaflets it was obviously well adapted to this niche. This palm has been identified as *Heterospathe macgregorii*. It is also known from collections further downstream on the Kikori river.

Sadly, our collecting trip on the Mubi river came to an end, albeit on an exciting note. It was frustrating to have been unable to collect all the wonderful palms that we saw, but perhaps this provides an excuse for a return visit. The difficulties we have experienced in identifying and understanding many of the specimens that I collected further emphasizes the need for critical evaluation of all aspects of New Guinea palms, including their taxonomy, ecology, conservation, and ethnobotany. An enticing prospect indeed!

Acknowledgments

I am grateful to the European Union for funding this fieldwork and to John Dransfield and the Royal Botanic Gardens, Kew for generous advice and support. Tanya Leary and the WWF Integrated Conservation and Development Project in the Kikori basin provided fantastic logistical support without which the entire exercise would have been unthinkable. Lawrence Kage was a stalwart and entertaining field assistant as were my other companions from Kantobo and Gobe. I am also very grateful to Tim Utteridge who made the early stages of the project so enjoyable; sadly, he was unable to join me on the Mubi river. Finally, many thanks to Max Kuduk, Geoff Stocker, and the staff of PNG Forest Research Institute at Lae.

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Principes, 41(3), 1997, p. 157

LETTER

Dear John and Natalie,

When we last met, I told you that my *Pigafetta* (!?) had bloomed. Talking to the "old timers" from the Palm Society, it seems that this blooming was the first time recorded in South Florida.

Five separate male inflorescences emerged in late August 1995 and within two weeks, two completely opened and flowered. The other three never fully developed. Larry Noblick came over to our garden one stormy afternoon and in the middle of a lightning storm, we took a complete voucher for the Herbarium at FTG (Noblick & Migliaccio #5074).

The plant flowered this summer (1996), again holding two inflorescences while several others never fully developed.

The palm was originally given to me in April 1989 by Howard Waddell of Miami, a fellow palm collector. The seeds had come from the IPS Seed Bank the previous year. I planted the palm that September in a deep pocket of marl on the NE side of my yard—the only available sunny and wind protected space at the time. It was three-feet tall overall when the December 1989 freeze hit, but protected by the sunny wall of the house and an eight-foot tall Surinam Cherry hedge. It showed little damage other than some minor leaf spotting.

In August 1992, that part of our house took the brunt of Hurricane Andrew and the "Pig" was blown over and blasted by 175 mph flying gravel from my neighbor's roof. The palm lay on the ground at a 45° angle for several weeks after the hurricane before I got around to removing it. Much to my surprise, it was pushing out several new leaves! With the assistance of the neighbors, we wrapped the still-spiny crown in some blankets and propped it up with a tripod of boards. The roots had reanchored the palm at a bit of an angle, so we were hesitant to damage them by propping the tree completely vertical. Since that time the trunk has grown vertically above the curve. I suspect that the weight of the crown, like a coconut, has had something to do with this less-than-desirable curving growth habit.

Many local growers have told me to be ready to lose the "Pig" in the next freeze and this past winter we had numerous cold and wet days with temperatures in the low 40's and one night of 33° in my shadehouse. However, the *Pigafetta* showed only tattered leaves. As a result of last winter, I lost a *Coccothrinax ekmanii* and my 15 foot tall *Gulubia costata* has only barely recovered. Therefore, I'm optimistic that "Pig" will be around long enough to contribute pollen to a flowering female somewhere in South Florida (albeit via "artificial insemination").

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Len Brass and His Contribution to Palm Discoveries in New Guinea and the Solomon Islands

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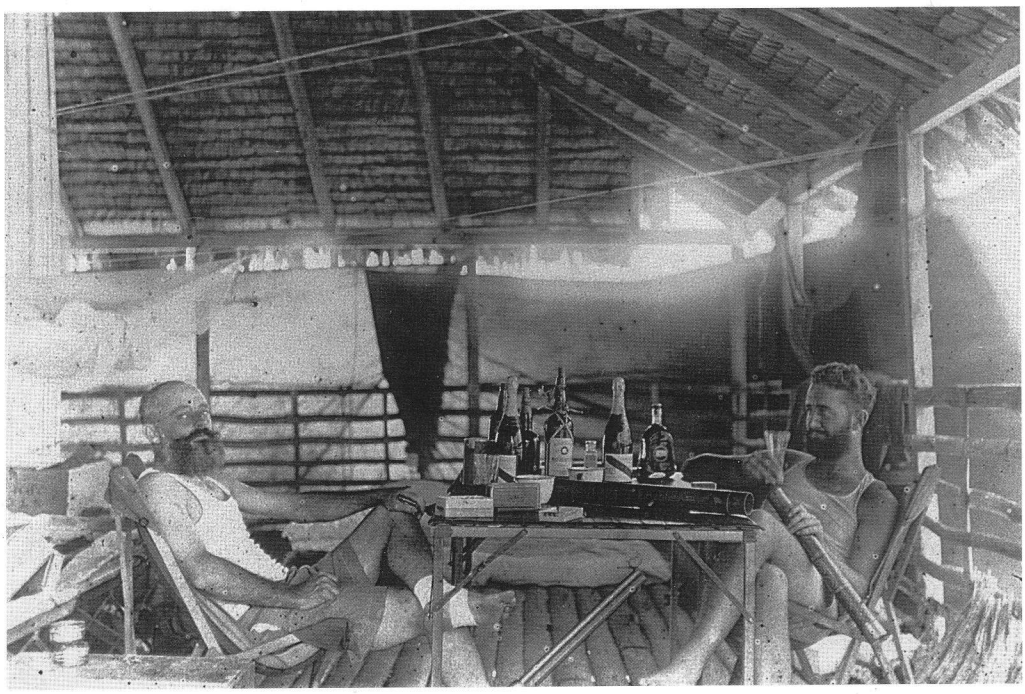
ABSTRACT

The contribution of L. J. (Len) Brass to the collection of New Guinea and Solomon Island palms is briefly reviewed. Names of 58 New Guinea and Solomon Island palms with type collections by Brass are listed with an indication of those 46 types held at the Queensland Herbarium (BRI).

Leonard J. Brass (Len) (1900–1971) was born in Toowoomba, Queensland, Australia and died at Cairns in the same state. Brass (Figs. 1–2) is undoubtedly the foremost Australian botanical collector of the 20th century and is well known for his many years working for the American Museum of Natural History where he was employed as botanist on the various Archbold Expeditions to Cape York Peninsula in Queensland and different parts of New Guinea (Archbold and Rand 1935; Archbold et al. 1942; Brass 1938, 1941, 1956, 1959, 1964,; Rand and Brass 1940).

Brass was employed to collect herbarium material of all vascular plants that he encountered, and in most instances his explorations took him to localities previously not botanized. As a consequence his discoveries of new taxa were numerous and his collections were extensively used as type specimens by botanists from the 1930s through to



1. Len Brass (left) together with Garnie Pike in Papua New Guinea in 1933.

2. Len Brass at Misima Island, Papua New Guinea in 1956.

the present. Brass's outstanding contribution to botanical exploration, particularly in New Guinea, has long been recognized (Perry 1971), and any botanist who has had the pleasure of working with his superbly presented specimens (nearly always fertile and with good label data) and reading his accounts of exploration (e.g., Brass 1938, 1941, 1953, 1956, 1959, 1964) will attest to his stature as a 20th century botanical icon. There are over 180 species and genera of vascular plants named for Len Brass (Forster, unpublished data), which is perhaps a record for any collector of this century.

This article focuses on Brass's contribution to the study of New Guinea and Solomon Island palms. The collection and preparation of herbarium specimens of palms are often avoided by plant collectors as they are bulky, difficult to process, and often unpleasantly spiny. Brass did not obviously avoid collecting palms, and although they do not comprise a major proportion of his collections (e.g., there are 149 palm specimens out of a total of 13 130 [or 1.13%] at the Queensland Herbarium), the collections that he made are significant as many were of new species. A total of 58 palm names from New Guinea and the Solomon Islands is based on type specimens collected by Brass (Table 1) and of these, one genus, *Brassiophoenix*, and nine species, *Cyrtostachys brassii*, *Gulubia brassii* (now a synonym of *G. longispatha* [Essig 1982]), *Gronophyllum brassii*, *Korthalsia brassii*, *Leptophoenix brassii* (now renamed as *Gronophyllum leonardii* [Essig and Young 1985]), *Livistona brassii*, *Orania brassii* (now a synonym of *O. lauterbachiana* [Essig 1980]), *Rhopaloblaste brassii* and *Strongylocaryum brassii* (now a synonym of *Ptychosperma salomonense* Burret [Essig 1978]) are named in his honor. The regard that these workers held for Brass can be noted in the text accompanying their description of taxa in his honor. Burret in describing *Brassiophoenix* stated "Herrn L. J. Brass, der deuch ausgezeichnete Sammlungen die Kenntnis der Flora von Neuguinea sehr gefördert, insbesondere aber auch durch verständnisvoll ausgewähltes Material die Kenntnis der Palmen sehr erwitert hat, sie die interessante neue Gattung gewidmet." Moore (1969), in describing new taxa of *Heterospathe*, noted: "Most of the following descriptions are taken from specimens collected by Leonard J. Brass whose interest in palms, as expressed in detailed notes, photographs and ample collections, has contributed greatly to our knowledge of the family in New Guinea."

The bulk of the taxonomic work on Brass's New Guinea and Solomon Island collections was undertaken by Max Burret (1883–1964) (Potztal 1958, 1965), who published a series of papers on New Guinea palms (Burret 1931, 1934, 1935, 1936, 1939) wherein 56 taxa were named based on Brass types. Burret did not explicitly state a herbarium where the holotype for each of these names was deposited, although it is likely that most of the specimens that he worked on were from the Arnold Arboretum in Harvard (A) as this is where most of the early Brass collections were identified and distributed from, apart from the numbers 3551–6077 that were distributed from the New York Botanical Garden (NY) (van Steenis-Kruseman 1950). Subsequent workers have usually indicated a holotype at A or have lectotypified names by specimens annotated by Burret at A or NY (e.g., Essig 1980, 1982). The extent of duplication of Brass palm collections is unknown, but based on other vascular plant groups, it is possible that duplicates could be represented in the herbaria A,

*Table 1. Names of New Guinea palm taxa with type collections by L. J. Brass. * indicates type specimen present at BRI. Isotypes, isolectotypes, and syntypes at BRI are also indicated. (Name in parentheses = currently used name).*

Name	Brass Collection Number
Actinophloeus linearis Burret (= *Ptychosperma lineare* (Burret) Burret)	1566
Actinophloeus macrospadix Burret (= *Ptychosperma microcarpum* (Burret) Burret	5628*
Actinophloeus microcarpus Burret (= *Ptychosperma microcarpum* (Burret) Burret	1659
Areca nanospadix Burret	921
Areca rostrata Burret	3971*
Brassiophoenix drymophloeoides Burret (= *B. schumannii* (Becc.) Essig)	5665*
Calamus altiscandens Burret	7327*
Calamus anomalus Burret	5298
Calamus brassii Burret	5009*
Calamus distentus Burret	7151*
Calamus eximius Burret	7216*
Calamus macrospadix Burret	5423*
Calamus multisetosus Burret	5422*
Calamus nannostachys Burret	1379
Calamus pseudozebrinus Burret	3923*
Calamus reticulatus Burret	6811*
Calamus stipitatus Burret	2719*
Calyptrocalyx albertisianus var. *minor* Burret	5790*
Calyptrocalyx archboldianus Burret	5290*
Cyrtostachys brassii Burret	5600*
Cyrtostachys microcarpa Burret (= *C. kisu* Becc.)	7162*
Gronophyllum brassii Burret	7093*
Gronophyllum leonardii Essig & Young	5631*
Gulubia brassii Burret (= *G. longispatha* Becc.)	5457*
Gulubia costata var. *gracilior* Burret (= *G. costata*)	5887*
Heterospathe annectens H.E. Moore	28409
Heterospathe minor Burret	3462*
Heterospathe pulchra H.E. Moore	27116
Heterospathe sphaerocarpa Burret	5413*
Hydriastele lepidota Burret	8701*
Korthalsia brassii Burret	6864*
Leptophoenix brassii Burret (= *Gronophyllum leonardii* Essig & Young)	5631*
Leptophoenix macrocarpa Burret (= *Gronophyllum pinangoides* (Becc.) Essig & Young)	5299*
Leptophoenix microcarpa Burret (= *Gronophyllum pinangoides* (Becc.) Essig & Young)	3998*
Licuala angustiloba Burret	7069*
Licuala concinna Burret	6894*
Licuala linearis Burret	3824*
Licuala magna Burret	7136*
Licuala pauciseta Burret	5637

BM, BO, BRI, CANB, K, L, LAE, and NY. The Queensland Herbarium (BRI) has 46 Brass type collections of palms (Table 1). If the specimens at A or NY are to be regarded as holotypes, then those at BRI should be considered isotypes, as indeed many have "Co-type" on the label. Some authors (e.g., Ferrero and Dowe 1996) have listed the specimens at A and BRI simply as types, and it will be necessary for future workers to designate lectotypes.

Table 1. Continued.

Name	Brass Collection Number
Licuala tanycola H.E. Moore	13010A
Livistona brassii Burret	5950*
Livistona crustacea Burret	7668*
Livistona melanocarpa Burret	6310*
Nengella gracilis Burret (= *Gronophyllum gracile* (Burret) Essig & Young)	7083
Nengella rhomboidea Burret (= *Gronophyllum pinangoides* (Becc.) Essig & Young)	7201*
Orania archboldiana Burret	8225
Orania brassii Burret	5489* (isolecto)
Orania distichia Burret	5599* (isolecto)
Paralinospadix amischus Burret	3826*
Paralinospadix merrillianus Burret	6815* (syntype)
Ptychandra montana Burret	4974*
Ptychococcus archboldianus Burret	7218*
Ptychococcus archboldianus var. *microchlamys* Burret	8166*
Rehderophoenix pachyclada Burret (= *Drymophloeus pachycladus* (Burret) H.E. Moore)	2720* (isotype)
Rhopaloblaste brassii H.E. Moore	13305
Strongylocaryum brassii Burret (= *Ptychosperma salomonense* (Burret)	3481* (isotype)
Strongylocaryum latius Burret (= *Ptychosperma salomonense* Burret)	3361* (isotype)
Strongylocaryum macranthum Burret (= *Ptychosperma salomonense* Burret)	2956* (isotype)

Brass's palm specimens invariably comprise several sheets of material. The specimens are generally fertile (flowers and/or fruit) and may comprise portions of the leaf, the bracts enclosing the inflorescence, parts of the inflorescence, and seed. The label data contain extra information as to the size of the palm and proportions of the leaves and inflorescence, as well as colors of the various parts. It is not immediately clear whether Burret had only the specimens available to him when he drew up the numerous descriptions, or whether Brass also supplied him with photographs of some collections. Certainly Moore (1969) had use of these photographs for his work on *Heterospathe*, and a Len Brass habitat picture of *Rhopaloblaste brassii* accompanies its description (Moore 1970). In the Brass archives at the Queensland Herbarium, there are numerous labelled photographs of plants that Brass collected, including palms. These archival photographs would be of great interest to workers on the palms of New Guinea as they could represent trees that were used in the preparation of the type specimens.

Acknowledgments

Thanks to Peter Bostock (BRI) for database manipulation of specimen information and for commenting on this article, and to Lyn Craven (CANB) for copies of several hard to obtain references. Photographs of Brass are from the Len Brass archives at BRI.

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CHAPTER NEWS AND EVENTS (*Continued from p. 137*)

New Hawaiian *Pritchardia* Garden Dedication

On March 6, at the University of Hawaii at Hilo, 150 people gathered for the dedication of the three-acre *loulu* (*Pritchardia*) garden. The *loulu* garden is one increment of a larger botanical garden at the university that will include a worldwide palm collection organized geographically. The garden is the brainchild of Hawaii Island Chapter member and Professor of Biology Dr. Don Hemmes. Dr. Hemmes and other volunteers have been planning the garden, clearing the site, and planting palms for one and one-half years. Assisting Don have been university students Lauren Wilson, Steve Zeiher, and Matt Cohen, and university employee Deborah Scott.

The *loulu* garden contains all 19 species of *Pritchardia* listed in *Manual of Flowering Plants of Hawai'i*, some of which are very rare. To discourage theft, the plants will be left unlabelled until they become too large to steal. Overall there are 60 specimens. After the dedication ceremony, the University Chancellor planted a *Pritchardia viscosa*.

Across campus, Don and his volunteers are preparing a worldwide palm garden that will extend approximately one-half mile on each side of Wailoa Stream, so that when the garden is complete, a total of about a linear mile of palms will line the river. An increment of African palms was recently completed, and planting of palms of the Philippines and New Caledonia began April 2. Awaiting their permanent places in the sun are specimens of approximately 200 palm species in 5-gallon containers, with more being added all the time. After the palms, Don plans a bamboo garden, an authentic recreation of a Hawaiian village, with ethnobotanical garden and a hibiscus garden.

KEN BANKS
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Louisiana Chapter News

The Louisiana Chapter of the IPS met on March 16 at the Audubon Zoo in New Orleans. Members were treated to a complimentary tour of the zoo following the meeting. Aside from a splendid display of exotic and native fauna, the flora at the zoo includes some interesting palm species. Thanks to Stephen Trans Asprodites, Director of Horticulture of The Audubon Institute for providing this fine meeting site.

The Louisiana Chapter plans an extensive "palm planting" exercise for the New Orleans area this spring and summer.

Northern California Chapter News

The Northern California Chapter of the IPS held their first meeting of 1997 on May 18th at Ian and Jane McDonald's garden in San Rafael.

DAN SEKELLA
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(*Continued on p. 166*)

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PALM RESEARCH IN 1996

ANDREW HENDERSON
New York Botanical Garden, Bronx, NY 10458

HELEN SANDERSON
Royal Botanic Gardens, Kew, Richmond, Surrey

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Change in Horticultural Correspondent

The new correspondent is:

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619-276-5295 (phone)

or send questions by email to Jim Cain (palm_dude@compuserve.com)

CHAPTER NEWS AND EVENTS (*Continued from p. 162*)

XII INTERNATIONAL CONFERENCE ON OIL PALM—Cartagena, Colombia September 3–5 1997

The XII International Conference on the oil palm, organized by the National Federation of Oil Palm Growers (FEDEPALMA) and the Oil Palm Research Center (CENIPALMA), will take place at the Conventions Center of the Cartagena Hilton Hotel in the city of Cartagena de Indias, Colombia from September 3 through 5, 1997.

The topic of this conference is: "Opportunities for Oil Palm" and the main purpose is to analyze the future of oil palm, as well as the technical developments in crop, yield, and palm oil extraction activities.

Today, palm oil occupies the first place in the global trade of oils and fats and the second place in world production of oil seeds. Colombia is the first Latin American producer in the market and the fourth producer worldwide.

The conferences will have participants and speakers from Malaysia, Indonesia, Nigeria, France, Costa Rica, Venezuela, Brazil, and Ecuador, among others, and there will be three modules:

1. Economic and Marketing Module, where the global forecasts of oil palm will be analyzed.
2. Agronomic Module, where issues such as soil and disease management, irrigation system, physiology and yield, and plantation management will be analyzed.
3. Module on Palm Oil Mills

On September 1 and 2, prior to the International Conference, the International Society of Oil Palm Agronomists, ISOPA, will carry out its annual meeting, where results will be presented on research conducted by experimental stations, plantations, and universities.

Both the ISOPA meeting and the International Conference will have simultaneous translation from English into Spanish and Spanish into English.

The above-mentioned academic events will be supplemented with a business exhibition of equipment, inputs and agro-industrial service suppliers.

Additionally, CENIPALMA has organized events prior to the conference where interested participants can visit plantations and palm oil mills in the Llanos Orientales (Eastern Plains) between August 24 and 30.

Information: FEDEPALMA
Fax 217 5347, Santafé de Bogotá D.C., Colombia
As of May 1997: Carrera 10A No. 69-89
Tel 3133623
Email: fedepalm@openway.com.co

Registration fees XII International Conference on Oil Palm are:
Before 15 July 1997=US$230.00, Until 15 August 1997=US$240.00, and after 16 August=US$250.00

News from the Sydney Branch Chapter

The Sydney Branch of P.A.C.S.O.A. met on March 18 at Maiden Theatre, Royal Botanic Gardens, Sydney. Horticulturist Brendan Lewis spoke on the subject of "Landscape Design." In addition, Don Morris of the Hunter Region Botanic Garden provided various *Livistona* seedlings for sale at the meeting.

The *Principes Minor* issue for March 1997 (No. 85) featured the genus *Livistona*, as promised, with numerous discussions on the culture and appearance of the members of this popular genus.

News from the Palm & Cycad Society of Mackay Branch (PACSOA)

The Mackay Branch of P.A.C.S.O.A. met in October 1996 at Pat Don's residence, with 15 members attending. The branch is investigating signs to be erected at the Farleigh Mill Palm Gardens—a very necessary adjunct to the gardens. The last meeting of the Branch for the year was held on November 24 at the Farleigh Mill Palm Gardens. This was followed by a raffle.

The first A. G. M. of 1997 was held at Shelly's in Walkerston.

News from Western Australia

The Palm & Cycad Society of Western Australia (PACSOWA) met at the Leederville Town Hall, Cambridge Street, Leederville on March 17, 1997. The meeting featured a talk by Ken Adcock on how to pollinate your cycads. In addition, George

Sevastos gave a short talk on *Oraniopsis appendiculata,* a very beautiful but slow-growing species native to Queensland.

An informal discussion on a species or genus of palm or cycad is now part of each monthly meeting, with members to bring along potted specimens for discussion. The bottle palm, *Hyophorbe lagenicaulis,* was discussed at the March 1997 meeting.

The February 23 Gascoyne Park workday was not held under the best of conditions. Despite an hour of steady rain, which seemed to be only falling on the Park, from 9:00 am, it was pleasing to see the number of members that turned up. Members that braved the weather were: Ken Lee, John Banasiewicz, Linda Therkelsen, Betty and Hayden Nichols, Shirley and Ray Fisher, Roy Atkinson and George. Neil the 'Bobcat man' spent four hours moving approximately 100 m^3 of good soil and landscaped it among the trees to start a new rain forest area. The new area has many shady gum trees so it will be ideal for a lot of shade-loving cycads.

The first garden visit of the year was to Coast Road Palms (Lot 52 Beechboro Road) on Sunday March 23. On Sunday April 20, there was another open garden afternoon, split between Cliff Britto's place (in Parkwood) and Barry Shelton's Place (in Lynwood).

The annual *Rhapis* Day was at Ken and Joy Lee's this year on Sunday May 18. Apart from displays of excellent *Rhapis* there was a discussion on potting mixes and Joy provided one of her famous afternoon teas.

News from the Hawaii Island Chapter

The Hawaii Island Palm Society met on February 7 at Wailoa Park for an Annual BBQ, rare palm auction, and elections. Again this year, there were free palms for members. Newly elected officers for the chapter are: President Karen Piercy (kaede@aloha.net), Vice President Bö-Goran Lundkvist, Secretary Helen Carlson, Treasurer Sue Simonsen, and Editor Ken Banks (kb@aloha.net).

The chapter also met on Friday, March 7, to hear a presentation by Norm Bezona on his adventures in the wilds of South America. Norm is retiring as county agent this year. He is contributing columnist to the Tribune-Herald, co-author of *Palms in Hawaiian Gardens* and founding member of the Hawaii Island Palm Society and the HI Chapter of the Bamboo Society. Norm has also served for many years on the Board of Directors of the International Palm Society.

News from the Palm Society of South Texas

The Palm Society of South Texas (PSST) IPS chapter held their second annual palm sale on April 19 at the Corpus Christi Botanical Gardens, located at 8510 S. Staples. Paul Thornton, Director of the gardens, has assisted greatly with show publicity as has Charles Vieh of San Benito. In addition to palms, there will be native Texas plants and a huge collection of orchids from those held by the Gardens.

The Chapter met at the home of Jeff Hensley in Corpus Christi on May 17 for basically a "social" theme and "potluck" lunch. Door prizes and seedlings were provided to attendees. Many also toured the palm plantings of the Texas A&M University campus in Corpus Christi.

The June 14 meeting will be held at Thad and Alice Magyar's home and gardens in Santa Rosa—for a tour of the famous Magyar Gardens and a hosted barbecue.

JIM CAIN
Palm_Dude@compuserve.com

News from Broward County, Florida

The Broward County Palm & Cycad Society (BCP&CS) met on March 27 at the Broward County Cooperative Extension Service Office in Davie. Dave Romney gave an enlightening talk on coconuts. Dave has been researching *Cocos nucifera* in Belize, Jamaica, and Tanzania since 1959 and has published over 70 scientific papers on coconuts. This lecture addressed many commonly asked questions concerning the coconut (origin, propagation, lethal yellowing, various cultivars, etc.).

For more information on the Broward County Palm & Cycad Society, contact:

CHARLENE GRALL
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News from the Gulf Coast Chapter

The Spring Meeting of the Gulf Coast Chapter was held at the Pensacola Seed and Garden Nursery on March 16, hosted by Larry Morris. Larry's sprawling nursery contains an abundance of palms

and cycads. A covered dish lunch was shared by all.

Frank Storli reports from Panama City that efforts are underway to transplant the unusual four-headed *Butia* to a safe location this spring.

For further information by email on the Gulf Coast Chapter, contact:

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Florida First Coast Chapter

Several members of the chapter joined the Central Florida Chapter for a tour of Fairchild Tropical Gardens, private gardens, and palm nurseries in the Miami area on March 1–2. Back home in Jacksonville, the chapter met together for a spring cleaning and maintenance of the palm and cycad garden at the Florida Community College, Jacksonville. The garden has 22 palm genera and five cycad genera that are running their tests for cold hardiness and providing a touch of the tropics for the campus. The chapter met on April 19 at the Kanapaha Botanical Gardens in Gainesville, Florida for a tour of their palm, cycad, and bamboo collection. The visit to the botanical garden was followed by a barbeque and plant sale at Kyle Brown's in Glen St. Mary.

On April 20, the group visited the Okefenokee Swamp. For further information on the Florida First Coast Chapter, contact:

JOEL TIMYAN
email: jctimyan@atlantic.net
TEL (352)-376-3027.

News from Far Northern Queensland

The International Palm Society would like to welcome to Far North Queensland Palm & Cycad Association (FNQPACA) as our most recent affiliate society. This action was ratified by the IPS Board of Directors at the May board meeting.

The FNQPACA now has a membership of over 100 members and an interesting A4 newsletter to spread the word and entertain their members. Officers of the association are: David Warmington, President; Tony Roberts, Secretary; Aaron Andreassen, Treasurer; Bill Beattie, Editor; Michael Ferrero, Events Coordinator; and Committee Members Terry Mead and Julie Rogers.

The January 1997 issue of the FNQPACA Newsletter featured an excellent article with photographs of *Sommieria elegans*, an attractive palm from the rainforests of Irian Jaya, Indonesia.

Pacific Northwest Chapter News

The Pacific Northwest Palm & Exotic Plant Society held a general meeting on May 26 at Van Dusen Gardens. Other meetings planned for 1997 include general meetings at Van Dusen Gardens on July 28, September 22, and November 24. In addition, there will be a society barbecue in August. The group will also have a booth at the Pacific National Exhibition in Vancouver, which runs from August 15 through September 1.

If you would like additional information on the Pacific Northwest Palm & Cycad Society, please contact:

RICHARD WOO
email: 72370.1466@compuserve.com

News from the Fous de Palmiers

Fous De Palmiers, the French Palm Society, invited the Directors of the International Palm Society to come do a tour of palms in France following the May board meeting at Royal Botanic Gardens Kew in England. While some of the directors were unable to take advantage of this marvelous offer, 18 IPS Directors and guests did make this fabulous journey.

The IPS Directors departed London for Nice on Thursday, May 22, where they were met by Fous President Alain Hervé, Vice-President Jacques Deleuze, and the Fous' IPS Chapter Correspondent Steve Swinscoe. On Friday morning, they visited Jardin Exotique de Monaco. Monaco has many little places with good plant design and there was sufficient free time for members to look around, see the Changing of the Guards, etc.

Saturday morning opened with a visit to "Les Cèdres," lunch in a restaurant on a nearby little beach (Plage du Passable), and a later afternoon visit to a large and interesting nursery in the suburb of Nice. Mrs. Marnier-Lapostolle graciously opened "Les Cèdres" on Saturday for our group, although the garden is generally closed on weekends. On Saturday evening Fous de Palmiers welcomed the IPS Directors with a typical genuine "Repas Niçois."

Sunday, May 25, was the day of the Fous general assembly in Menton and in Italy. Many of Directors participated in the Fous meeting opening, before departing for a visit of Hanbury garden

in Italy, returning to Menton where all enjoyed aperitifs and lunch, graciously hosted by Fous de Palmiers. The rest of the afternoon was devoted to visiting the numerous worthwhile gardens in town.

Some IPS Directors were also fortunate enough to see Jean-Pierre Sclavo's cycad collection. This is one of the best and generally considered the second most important in Europe after Naples. This was a fantastic visit!

On Sunday other IPS directors visited Domaine du Rayol, one of the most beautiful places near Toulon (150 km west of Nice) which is on the very rocky coast and devoted to South African plants.

Special thanks from the IPS Board to Jacques Deleuze who was extremely helpful in setting up and organizing this excellent tour!

News from the European Palm Society

India: Martin Gibbons led a tour of European Palm Society members to northeast India, including Calcutta, Kalimpong, Sikkim, and Shillong in Meghalaya. The 12-day tour began on April 14 with a flight from London's Heathrow airport to Calcutta, then a second flight to Bagdogra where the group was met and transported to Kalimpong by minibus. During our few days there, we saw many native palms, including *Phoenix rupicola, P. humilis, Plectocomia himalayana, Wallichia disticha, W. densiflora, Caryota* 'Himalaya', *Livistona jenkinsiana,* and perhaps most exciting of all, the new *Trachycarpus* 'sikkimensis'—both in habitat and in cultivation. We also saw the native cycad, *Cycas pectinata.* We took day trips to Darjeeling (lunch at the famous Windermere Hotel) and Gangtok, in Sikkim.

Then we flew from Bagdogra to Gauhati for the four-hour climb (by minibus) to the colonial town of Shillong, in Meghalaya Province. There we saw the fabulous *Trachycarpus martianus* and many other palms in cultivation. From there, a full day trip to Moosmai in the Khasia Hills and the Nohkalikai Falls (seventh highest in the world), the habitat of *T. martianus.* It is a stunning sight. We also saw *Caryota obtusa, Pinanga gracilis, Plectocomia khasiana, Calamus erectus* in the wild, and many other palm species.

The entire area visited is a rich one for plant enthusiasts, with many species seen that are not listed here. The weather was warm but not hot (except in Calcutta).

Cornwall, U.K.: Member Richard Darlow organized an excursion in late May to visit some of Britain's best "subtropical" exotic gardens and nurseries in southwest Cornwall. There are numerous palms established there and May is a particularly good time of year to see other exotics such as echiums, beschonerias, and mesembryanthemums in flower. To the best of our knowledge, this was a first time a helicopter was chartered as part of a palm society trip! Among the places visited were Lamorran House, Trebah, the "Lost Garden of Heligan," and Fox-Rosehill garden in Falmouth. The helicopter was to visit famous Tresco, on the Isles of Scilly.

Spain: The European Palm Society plans a summer meeting this year in the wonderful old town of Almuñécar, on Spain's southern coast. The event, which was kindly being arranged by the Spanish 'Association of the Friends of Palms', lasted four days, and involved a full and exciting program. Almuñécar (or at least, nearby Malaga) is easily accessible by air, with frequent and inexpensive charter flights—others drove.

News from Avepalmas

AVEPALMAS members meet according to the rules the first Wednesday of each month. In April members and special guests were invited to the nursery of Cesar Diaz who had prepared a special treat of fruit juice with liquor and peach palm croquettes. After a roundshow of seedlings, plantlets, and grown-up palms in his installation, a raffle was done with donated palms, e.g., a *Chambeyronia macrocarpa,* and some other valuable species, including zamias. We had the pleasure of having some new members to AVEPALMAS and also a visitor from abroad, IPS member Bill Skimia from California, who happened to pass through Caracas, searching for new material for his nursery.

AVEPALMAS' Honorary member, August Braun, has published several new books after the book that was presented in connection with the biennal three years ago, in June 1994, and I give you an updated list, e.g., *Las Palmas Cultivadas en ciudades elevadas de la parte andina de America del Sur, La selva nublada de Venezuela* (*The Venezuelan Cloud Forest*), *Adornar con Palmas, El Chaguaramo, sus afinidades, sus caracteristicas y su cultivo* (on *Roystonea* spp.), *Las Palmas de las sabanas de Venezuela, La Utilidad de las Palmas en Venezuela.*

As I reported in February, he is now in retirement, but is still keeping contact with the botan-

ical garden, where he feels comfortable among his friends: plants and people. An interesting article was published in one of the most important newspapers, titled "El Jardinero de Dios," August Braun.

AVEPALMAS is fortunate to have another very busy successful author, Jesus Hoyos, who is finishing a second edition of "Palmas Tropicales en Venezuela," which as usual will be published from La Salle. As soon as it is available to the public, AVEPALMAS will let you know.

For those who are interested we have a list of palm literature available. Books printed in Venezuela are mostly written in Spanish.

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News from the Palm Beach Chapter

The Palm Beach Chapter met on February 5 and featured an open panel discussion, with Paul Craft, Kurt Decker, Dale Holton, and Bill Jones serving on the panel. The panel answered questions from the group as well as discussing several prepared topics.

On March 5, the chapter met to hear Dr. Jeff Block speak on garden planning as it pertains to positioning, light, ventilation, nutrition, and microclimates. Jeff has 15 years experience in horticulture and landscape design.

The April meeting featured Dr. Scott Zona who talked on the Ptychospermatinae and the work he has been doing on this group of palms. Scott has been working especifically on the genera *Veitchia* and *Drymophloeus* and should have that work finished sometime next year. Look for some name changes that may surprise some people.

The Annual Spring Palm Sale was held at Morikami Park on April 12–13. For further information on the chapter, contact:

PAUL CRAFT
email: plamnut@icanect.net

News from Central Florida

The Central Florida Chapter started off the spring season with an excursion to Miami. The palm-filled weekend was organized by Rick Leitner of the South Florida chapter and our thanks go out to him for a great time. Tours began at Fairchild Tropical Gardens with Rick describing how these lush gardens had suffered because of Hurricane Andrew and the efforts underway to repair their damage. Later that day, the group visited Rick's home and the gardens of Paul Drummond and Michelle and Fernando Arca. Sunday brought the group to the gardens of DeArmand Hull and Carol Graff. Central Floridians were awed by the collections of their south Florida counterparts and we thank them for their exceptional hospitality.

April brought a month of fund-raising for the chapter. Vice President Dave Witt and President Tom Broome organized a plant sale for the weekend of the 5th at Harry P. Leu Gardens in Orlando and another on the 12th at the University of South Florida Botanical Garden. Both sales brought much-needed funds to our chapter's coffers.

The chapter is now looking ahead to our Fall meeting on October 5th at Harry P. Leu Gardens. We'll be getting our checkbooks out for this one because we will be having our annual plant auction (made an annual event after it was so tremendously successful at the last Fall meeting at Bob and Marita Bobick's home). We are especially looking forward to a visit from Larry Noblick of the Montgomery Foundation in Miami at this meeting. It should be an exciting, palm-filled day!

ELIZABETH STRYJEWSKI
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News from the Palm & Cycad Society of Southwest Florida

Some members of the Southwest Florida Chapter joined the Central Florida Chapter (CFP&CS) on March 2 for garden tours in Miami (see above).

Southwest Florida welcomed spring with a riverfront garden festival. Members of local plant societies as well as many vendors participated in the Cape Coral Garden Show held at Jaycee Park on March 22. David and Geri Prall represented the Palm & Cycad Society of Southwest Florida at this show. They gave a workshop on "Unusual Palms and their Culture." Also included was a talk on "Spring Care for Palms and Cycads" covering treating cold-damaged palms and fertilizing. They were also on hand to answer questions on palms, cycads, and local membership issues.

The chapter met again on April 26 at the home of Bob Read.

GERI PRALL

BOOKSTORE UPDATE

JULY 1997

A GUIDE TO PALMS AND CYCADS OF THE WORLD. (L. Stewart, 1994, 246 pp..full color, line drawings and maps for each genus..... **$35.00**

BETROCK'S GUIDE TO LANDSCAPE PALMS *(A.W. Meerow, 1992, 153 pp. - all color.)*..... ***$30.00***

☞ ***CHAMAEDOREA PALMS*** *(D. Hodel, 1992, 350 pp., 127 pp. of superb color) EXCELLENT!*..... ~~***$69.95***~~
LIMITED TIME (P.S. members)..... ***$29.95***

COCONUT RESEARCH INSTITUTE, MANADO (P. A. Davis, H. Sudasrip, and S. M. Darwis, 1985, 165 pp., 79 pp. color).... **$35.00**

CULTIVATED PALMS OF VENEZUELA (A. Braun, 1970, 94 pp. and 95 photographs.)..... **$8.00**

DESERT PALM OASIS (J. W. Cornett, 1989, 47 pp., 41 pp. color) **$9.00**

DISEASES AND DISORDERS OF ORNAMENTAL PALMS (A. R. Chase and T. K. Broschat, 1991, 56 pp., color on each page)... **$29.00**

☞ **EL CHAGUARAMO** (A. Braun, 1996, 32 pp., paperback, 21 pp. with color.) (In spanish)..... **$13.00**

☞ **EL CULTIVO DI LAS PALMAS EN EL TROPICO** (A. Braun, 1988, 23 pp. in color, 66 pp. all together) (In spanish)..... **$13.00**

EUADOREAN PALMS FOR AGROFORESTRY (H.B.. Pedersen and H. Balslev, 1990, 105pp.)..... **$15.00**

FIELD GUIDE TO THE PALMS OF THE AMERICAS (A. Henderson, G. Galeano and R.. Bernal, 1995. A guide to the 67 genera and 550 species of palms found in the Americas. 256 color photos, 42 line drawing, 553 maps.)..... **$75.00**

FLORA OF TROPICAL EAST AFRICA, PALMAE(J. Dransfield, 1986, 52 pp.)..... **$23.00**

FLORES DES MASCAREIGNES (La Reunion, Maurice Rodrigues, 1984, 31 pp.)..... **$8.00**

FLORIDA TREES AND PALMS (S. A. Rose, A. A. Will, Jr., T. B. Mack, 1984, 30 palm species, 120 pp.)..... **$10.00**

GENERA PALMARUM (Dransifield and Uhl, description/key to all genera of palms, 200 species with 200 b/w photos, 30 color photos. 600 pp., 8½ x 11 soft cover)..... **$49.95**

☞ **GROWING COCONUTS IN SOUTH FLORIDA** (Romney, 1997, 67pp., Spiralbound paperback) useful information..... **$15.00**

☞ **GROWING PALMS (THE DIAMOND LANE GUIDE)** (D. Tollefson, 1997, 151pp., 8 color photos, spiralbound, clear plastic cover, paperback, practical useful information..... **$30.00**

HANBOOK OF FLORIDA PALMS (B. McGeachy - 1955, introduction to the common varieties of palms, 63 pp., 53 b/w photos.)..... **$3.95**

☞ **IDENTIFYING PALMS** (M. Gibbons, 1993, 126 color photos, 80 pp., compact study guide and palm identifier.)..... **$9.00**

KEY GUIDE TO AUSTRALIAN PALMS (L. Cronin, 1989, 180 pp., 85 pp. color)..... **$22.00**

LAS PALMAS CULTIVADAS (A. Braun, 1994, 64 pp., color, Spanish, The cultivated palms of highland Andean cities in South America) **$13.00**

LAS PALMAS DE LAS SABANAS DE VENEZUELA (A. Braun, 1995, Spanish, 59 pp.)..... **$13.00**

LEXICON PALMARUM (J. Dransfield and H.. Beentje) - a glossary of botanical terms used in palm studies, in English, French, German, Spanish and Portuguese. 64 pp., 60 drawings..... **$16..00**

MAJOR TRENDS OF EVOLUTION IN PALMS (H. E. Morre, Jr., N. W. Uhl, 1982, 69 pp.)..... **$7.00**

OIL PALMS AND OTHER OILSEEDS OF THE AMAZON (C. Pesce, 1941, translated and edited by D. Johnson, 1985, 199 pp.) **$24.95**

☞ **PALMERAS DE BOLIVIA** (H. Balslev & M. Moraes, 1989, 99 pp., 18 b/w photos, paperback, in spanish)..... **$10.00**

PALEM INDONESIA (in Indonesian) (Sastraprdja, Mogea, Sangat, Afriastini, 1978, 52 illustrations, 120 pp. For English translation add $3.00)..... **$6.00**

PALMS AND CYCADS AROUND THE WORLD (J. Krempin, 1990, 267 pp., 267 pp. color) REVISED EDITION..... **$52.50**

PALMS IN AUSTRALIA (David Jones, 1984, 278 pp., over 200 color photographs)..... **$40.00**

☞ **PALMS OF SOUTH FLORIDA** (G. Stevenson, reprint 1996, 100 full page b/w line drawings, 251 pp., softbound, excellent information **$20.00**

☞ ***PALMS OF MADAGASCAR*** *(John Dransfield and Henk Beentje, 1995) EXCELLENT! (Dcc.. 95)*..... ***$83.00***

PALMS OF THE AMAZON (A. Henderson), 1995, 362pp. many line drawings)..... **$100.00**

PALMS OF THE NORTHERN TERRITORY (AUSTRALIA) (A. White, 1988, 41 pp., 21 photographs, some color)..... **$6.00**

PALMS OF THE WORLD (Formerly - **PALMS**, A. Blombery & T. Rodd, 1982, 192pp., 212 color photographs)..... **$35.00**

PALM SAGO (K. Ruddle, D. Johnson, P. K. Townsend, J. D. Rees, 1978, 190 pp.)..... **$10.00**

PALMS OF THE SOLOMON ISLANDS (Dowe, Dennis, McQueen, Birch, 55 pp., 39 pp. photos, 8 in color) Four excellent chapters. **$10.00**

PALMS OF THE SOUTH-WEST PACIFIC (J. L. Dowe, 1989, 198 pp., 33 pp. color)..... **$30.00**

PALMS OF SUBEQUATORIAL QUEENSLAND (Robert Tucker, 1988, 91 pp., 12 pp. color, many black and white photographs and maps)..... **$20.00**

PALMS THROUGHOUT THE WORLD (David Jones, 1995, 410 pp., over 200 color photographs)..... **$55.00**

SECRET OF THE ORIENT DWARF RHAPIS EXCELSA (L. McKamey, 1983, 51 pp.)..... **$9.00**

THE GENUS PTYCHOSPERMA LABILL (F. B. Essig, 1978, 61 pp.) **$6.50**

THE INDIGENOUS PALMS OF NEW CALEDONIA (H. E. Moore, Jr., N. W. Uhl, 1984, 88 pp.)..... **$12.00**

THE PALMS OF RIO'S JARDIM BOTANICO (1992, 15pp., some color)..... **$5.00**

THE STRUCTURAL BIOLOGY OF PALMS (P. B. Tomlinson, 1990, 477 pp.)..... **$120.00**

TROPICA (A. Graf, 7000 color photos, 1138 pp.)..... **$175.00**

TROPICAL RAINFOREST (A. Newman, 1990, 241 pp., World survey of endangered habitats, all color.)..... **$45.00**

☞ **VANUATU PALMS** (Aust. Systematic Botany) (J. Dowe, 1996, black/white photos, paperback, 59 pp. **$35.00**

PALM PAPERS (Postage Included)

A NEW PRITCHARDIA FROM KAUA'I, HAWAI'I (Reprint from Principes, R. W. Read, 1988, 4pp.)..... **$2.00**

HARDIEST PALMS AND FURTHER INFORMATION ON HARDY PALMS (J. Popenoe, 1973, 8 pp.)..... **$3.00**

NOTES ON PRITCHARDIA IN HAWAII (D. Hodel, 1980, 16 pp.) **$3.00**

RARE PALMS IN ARGENTINA (Reprint from Principes, E. J. Pingitore, 1982, 9 pp., 5 beautiful drawings)..... **$2.75**

☞ **PALMS FOR SOUTHERN CALIFORNIA** (Osborne and Reynoso, 1997, 25 pp.)..... **$5.00**

PALMS FOR TEXAS LANDSCAPES (R. Dewers & T. Keeter, 1972, 3 pp.)..... **$2.00**

PINANGA ISSUE OF PACSOA (#16, 1987, 17 pp.)..... **$3.00**

The palm books listed above may be ordered at the prices indicated plus $3..00 extra per book, overseas U.S. $3.50, to cover packaging and book-rate postage, (California residents please add 7.25% sales tax.) Foreign checks must be in U.S. dollars and payable on a USA bank. No credit cards. If insured by IPS, add 10% extra. Please include your International Palm Society membership number. ALL SALES FINAL. Send check payable to:

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Back Cover

Dypsis acaulis growing beside a stream in lowland rain forest in the Masoala Peninsula, Madagascar. Photo: J. Dransfield. See pp. 138–139.