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THE INTERNATIONAL PALM SOCIETY

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PRINCIPES

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Front Cover

Phoenix theophrasti growing on calcareous cliffs at Finike Bay, Turkey. See pp. 117–122.

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Principes, 39(3), 1995, p. 115

Editorial

July 1995 contains a rich variety of recent discoveries about palms and we also introduce a new feature. IPS Horticultural correspondent Kyle Brown has been answering many different questions. Some of the questions and his replies provide all kinds of information on growing and should interest many of our members. We'd appreciate your comments.

Sasha Barrow continues to make interesting discoveries about *Phoenix*; in this issue she collaborates with Professor Melih Boydak of the University of Istanbul to discuss the *Phoenix* of a new locality in Turkey.

The Bismarck Archipelago is home to a fascinating group of genera, eight of them with endemic species. Fred Essig has given us a very readable and informative account of the palms found on the islands.

Chuck Hubbuch and Paul Craft have been exploring in Panama. Their well illustrated write-up accentuates the loss of the rain forest in the Darien and the vicissitudes of hunting palms in the tropics.

Three other articles deal with New World palms. Scott Zona has done a splendid job in monographing *Calyptronoma*, a genus which has a checkered taxonomic history and is restricted to the Greater Antilles. Don Hodel, in collaboration with colleagues from Guatemala and Honduras, has rediscovered *Chamaedorea donnell-smithii*, and in so doing learned several interesting things about the much grown *C. seifrizii*. Francisco Guanchez and Gustavo Romero discuss *Leopoldinia*, a genus most important for fiber production, and provide new insights on its inflorescences and flowers.

Andrew Henderson has listed the publications on palms for 1994, a feature we now plan for July issues. And our talented president has as always summarized the many activities of the chapters for us.

We end this editorial on a sad note. During past months the IPS has lost two very special members: Lucita Wait and Mel Sneed. We are planning articles about them for January 1996 and would like to invite their friends to please send us reminiscences by September 1995.

NATALIE W. UHL
JOHN DRANSFIELD

Principes, 39(3), 1995, pp. 115–116

From the President

I have received quite a few letters advising that members approve of the new format and the additional color added to *Principes*. Some members have offered further suggestions as to how we might improve our services. If you have any ideas or comments, pro or con, please post them to me—I do want your input.

It's getting quite close to the deadline for nominating potential new members to the IPS Board of Directors for the 1996 to 1998 term. It was pointed out at the June 1994 IPS board meeting that members were dissatisfied with the 1994–96 directors' ballot, as no choice of candidates was given to the members. Our members indicated that they wanted a choice of candidates. That's all well and good, but we need the help of the membership to do this. If the Nominating Committee Chairman (Lennie Goldstein of Florida) doesn't receive sufficient nominations, then this isn't possible. Surely, many of you know someone you would like to see on the IPS Board of Directors. Write a letter of nomination on his or her behalf and send it to Lennie Goldstein, Lynn McKamey, or me today! Under our election procedures, a notice requesting nominations is published in *Principes* allowing members to make suggestions for director nominees [this notice was posted in the January 1995 issue]. The Nominating Committee will then prepare the final slate of nominees based on regional membership distribution and nominees suggested [this is currently underway]. If there are few suggested nominees then there may not be more nominees than open director positions. It's up to you!

Since my request, I have received numerous Email addresses from IPS members and some other palm enthusiasts not yet members of our society. I would like to hear from any member who has not contacted me on the INTERNET (which includes GEnie, Compuserve, AmericaOnLine, Prodigy, and other member services). You will receive a personal reply. If you want a copy of my working INTERNET address list, post me a request. We now have InterNet contacts in Canada, Chile, Italy, Sweden, Finland, U.K., USA (many states), and Venezuela. Are there any InterNet users out there from Asia, Australia, Africa, or the Indian subcontinent? Let us know how to contact you.

There has been consternation by some members that the IPS has selected a commercial service (GEnie) on which to offer the IPS Palm Round Table (with Bulletin Board and Library), rather than set up an InterNet home page with access for all. We view GEnie as a "beginning" and are now investigating the possibility of an InterNet home page as an additional service the IPS may be able to provide. I am of the opinion that the organized Round Table on GEnie will be of great benefit in the exchange of information on palms and on the society. It can also serve as our "electronic headquarters" with easy access by members, directors, and officers. Hopefully, you will join us there. If anyone would like to volunteer to help set up and run the "direct access InterNet connection", please contact us.

With this issue, *Principes* should be back essentially on time. Thank you again for your patience during our "catch up" period.

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Please mark your calendars now for the
Biennial Meeting of the IPS
to be held at the Hyatt Newporter Hotel
in Newport Beach, CA in August 1996.

Official events will be held on August 3–8, with other related events before and after.
Post-biennial trips to be announced later.

Palm Symposium

World Palm Symposium at Fairchild Tropical Garden, October 20–21, 1995. For information contact: PAUL CRAFT, Palm Beach and Cycad Society, 16652 Velazquez Blvd., Loxahatchee, FL 33470, USA. Phone: 407-793-9029; FAX: 407-790-0174.

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Principes, 39(3), 1995, pp. 117–122

A New Locality for Phoenix in Turkey: Gölköy-Bödrum

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ABSTRACT

Until recently, the two native stands of palms in Turkey were known to be of *P. theophrasti* Greuter in the Datça Peninsula, and Kumluca-Karaöz in Finike Bay. A new locality for *Phoenix* in Turkey is now reported at Gölköy, north of Bodrum. In certain of its characteristics this new population differs from *P. theophrasti*. In this article the identity of Gölköy palm and its conservation status are discussed.

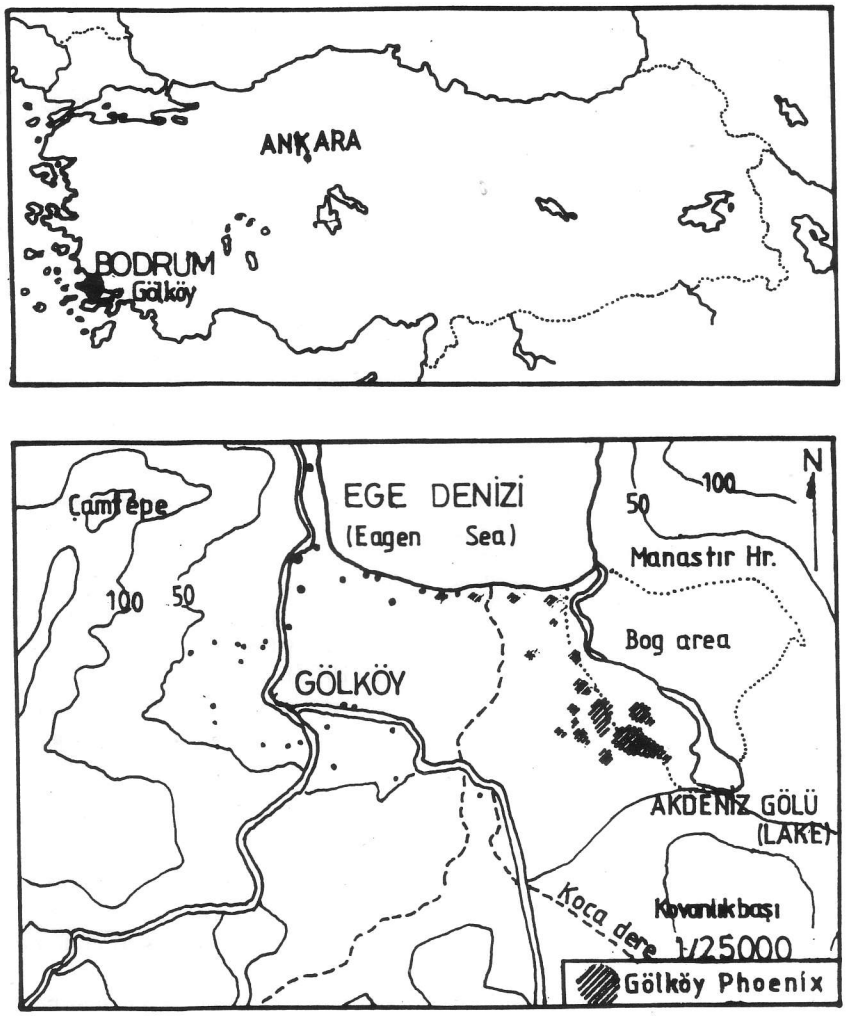
Natural stands of *Phoenix theophrasti* Greuter were first discovered in Turkey in 1982 (Boydak 1983, Boydak and Yaka 1983, Boydak 1985), in the south-west of the country in the Datça Peninsula. Boydak predicted that further populations of *Phoenix* would be found in Turkey, and sure enough three years later a second locality was recorded, a long way from Datça, at Kumluca-Karaöz in Finike Bay (Boydak 1986, 1987). A third Turkish population of *Phoenix* has recently been found at the village of Gölköy, north of Bodrum.

The *Phoenix* population has been known to the inhabitants of Gölköy for hundreds of years. In 1989 A. Bayraktar and I. Aslanboga (Professors of Landscape Architecture) visited the Gölköy palm population and considered it to be representative of *P. theophrasti*. In the early summer of 1990 one of the authors, M. Boydak, made the first of several trips to Gölköy and immediately noticed several distinct differences between the Gölköy palms, *P. theophrasti* and *P. dactylifera*. Samples were sent to the Royal Botanic Garden, Edinburgh (December 1990) and Royal Botanic Gardens, Kew (July 1993). In April 1994 both authors visited the Gölköy population and the two native stands of *P. theophrasti* in Datça and Kumluca-Karaöz in Finike Bay and collected further herbarium material.

Phoenix theophrasti was described by Greuter in 1967, from the famous grove at Vai in Crete. It is now known from nine coastal localities on that island (Turland et al. 1993), where it can be found growing along moist valley floors, stream banks, by springs, on coastal rocks and cliffs, in all cases by the sea, from 0–230 m altitude. Greuter (1967) noted that the "Cretan Date Palm" had been known since Classical times, when it was recorded in the writings of Theophratus. Further records were made of the palm by travellers to the region in later times (e.g. Leake 1835, Kirchner 1875). Many considered it to be an escaped cultivar of the Date Palm, *P. dactylifera* L. (Langeron 1927). However, Greuter (1967) considered the Cretan palm to be a distinct species, and he named it *P. theophrasti* in honor of the Greek botanist-philosopher.

Greuter's formal taxonomic description of *P. theophrasti* did not end the confusion between this species and the cultivated Date Palm. The two species certainly can appear similar, especially when *P. dactylifera* has been left untended, and when there are no flowers or fruit present. This confusion probably accounts for reports of *P. theophrasti* on other Aegean Islands, such as Kalimnos, Nisiros and Simi. These palms are likely to be *P. dactylifera*.

P. theophrasti is distinguished from *P. dactylifera* by its upright fruit clusters, and small inedible fruits (Greuter 1967, Anon. 1983). Turland et al. (1993) note *P. theophrasti* to have leaves which are smaller, shorter and sharper than those of *P. dactylifera*. The *Phoenix* populations of Datça and Kumlaca-Karaöz match the description of *P. theophrasti* of Crete, and so they are included under that name. Certain morphological characteristics of the Gölköy palm make it less



1. A map to show the locality of the palm grove at Gölköy, near Bodrum, Turkey.

easy to name than the other Turkish palm populations. This new population of *Phoenix* is found growing on boggy ground on the boundaries of the fast-growing village of Gölköy, between patches of *Pinus brutia* Ten. and the sea. Several palms are now included within the gardens of newly-built houses. The main stand of palms covers an area of approximately one hectare bordering the village. However, palms can be found in smaller outlying groups or individual clumps over an area roughly six times this size, from the village across the flat land to the sea (700–800 m away).

On first seeing the population, so close to the village, one cannot help but ask if it is natural, as opposed to being the remnants of a cultivated palm grove. There are reasons to believe that it could be native. Firstly, the palms yield small fruit that are slightly sweet, but scarcely fleshy, and it seems very unlikely that they were planted as a fruit crop. Alternatively, it might have been the leaf or leaf-base fiber that was the desired crop, but no local records support this. Secondly, the population is well established and is regenerating successfully by both suckers and seedlings.

The Identity of the Gölköy Palm

The Gölköy palm differs from *P. theophrasti* in terms of its fruiting stalk length, fruit size and seed shape. Gölköy fruit stalks are 0.6–2 m long,

2. A view of the Gölköy *Phoenix* palm population growing amongst piles of bricks: evidence of the expanding tourist village close by. 3. A cluster of scorched palm trunks at Gölköy. The suckers at the trunk base are an indication that the palms are recovering well from the fire of 1993.

4. *P. theophrasti* growing along remote beaches and in rocky gullies of the Datça peninsula, Turkey. 5. *P. theophrasti* in full staminate flower, Datça peninsula, Turkey.

whereas those of *P. theophrasti* rarely exceed 0.3 m, and they hold fruit that is marginally larger. Although the Gölköy palms grow on a fertile plain site, their height, at 4–8 m, is generally shorter than that of *P. theophrasti* of Datça and Kumlaca-Karaöz where some palms up to 17 m can be seen. The scanty flesh of the fruits of the Gölköy palm have a slightly sweet taste, reminiscent of the cultivated date. It seems then that there are differences between the Gölköy palm and *P. theophrasti*, the issue to be determined now relates to how we should interpret and acknowledge these differences. Do they indicate that the Gölköy palm is a new species, or a variety of *P. theophrasti* or *P. dactylifera*, or is there some other explanation?

The characterization of the various species of *Phoenix* is difficult at the best of times, due to the distinct lack of obvious differentiating characters, and the ready hybridization with each other. Throughout the natural range of *Phoenix* and its range of cultivation, intermediates between the species can be found. It is often a difficult, and perhaps impossible, task to discover their parentage. It cannot be ruled out that hybridization has played a role in the origin of the Gölköy palm. If it is of hybrid stock, then what are the possible parents? *P. theophrasti* is a sure contender for one parent, since it shares the characters of a clustering habit and upright fruit clusters with the Gölköy palm. The sweetness of the Gölköy fruits could point to *P. dactylifera*, which has been cultivated in the Aegean region for many years, as the second parent.

A preliminary anatomical study of the leaflets of the two Turkish populations of *P. theophrasti*, the Gölköy palm and samples of non-Turkish *P. dactylifera* have provided some useful and interesting results. All three palms are grouped together by the presence of large bundles of non-vascular fibers in the mesophyll layer of the leaflets. Very small groups of fibers are occasionally found in the leaf mesophyll of other species in the genus, but they are never so abundant or in large bundles. Anatomical data clearly indicates a close relationship between *P. dactylifera*, *P. theophrasti* and the Gölköy palm, though further sampling is required before the exact nature of their relationships can be understood.

At present therefore, there is no answer to the Gölköy problem, but further study of the morphology, anatomy and DNA of *P. dactylifera*, *P. theophrasti* and the Gölköy palm is included within a three year study of the whole genus by S. Barrow at the Royal Botanic Gardens, Kew. It is hoped that the study of the chloroplast DNA will help to provide answers to the many questions about relationships within the genus. However, even if differences are discovered between the DNA of the three Turkish *Phoenix* populations, there is still the problem of how to interpret them. It is important that they are interpreted against the background of variation in *Phoenix* as a whole. New species or varieties of *Phoenix* cannot be described without reference to the rest of the genus, and therefore the Gölköy grove cannot be formally named until all *Phoenix* species have been studied to the same level. For example, *P. reclinata* in Africa shows wide morphological variation and yet is currently held under a single name on account of its pointed male flowers. If the Gölköy grove is described as a new variety, and the DNA variation between the various forms of *P. reclinata* is found to be as great or greater than that between the Gölköy grove and *P. theophrasti*, there would be strong grounds supporting the description of several new varieties of African *Phoenix*. Now we are entering the shaky ground of determining the concept of a species in *Phoenix*, a subject perhaps best left for another day!

Whatever decisions are made about the history, nature and name of the Gölköy *Phoenix*, there is no doubt that the population is of great importance as a natural palm grove in Turkey, and therefore it is imperative that positive action is taken to ensure its conservation.

Conservation of the Gölköy Grove

There is considerable local interest, and a certain amount of pride, in the Gölköy palms, but unfortunately this may not be enough to protect them against the two major threats of water drainage and fire. Tourism has become an important source of income for the local people, and there is growing pressure to expand the village with new summer housing and tourist facilities (Fig. 2). The Gölköy palm grove occurs within a nature conservation area and therefore any activities that might alter the natural balance of the ecosystem are forbidden. Despite this, plans are afoot to drain the bog area, in which the palms grow to accommodate the inevitable golf course. A drainage trench surrounding the whole area is now in place. Before its construction, the boggy ground was completely flooded for several months each year.

Since the construction of the drainage trench certain parts of the palm grove are inundated with water for only 2–3 months annually. The water-relations of *Phoenix* are little understood, but it is clear that many of the species require an environment that is either permanently or seasonally flooded, and therefore the drying out of the bog could be disastrous for the Gölköy grove.

Gölköy, meaning "lake village," is named after the lake that borders the palm grove and village. Thankfully, several abundant springs feed the lake, and therefore it should be impossible for the drainage ditch to dry out the bog completely. However, the sinking of the water-table will have an adverse impact on the local ecosystem and this, in turn, could affect the well-being of the palm grove.

As to the other threat, in June 1993, Turkish T.V. reported that a fire, purpose-lit to clear land for development, got out of control and spread to a part of the Gölköy palm grove (Fig. 3). Initially, it was suggested that many palms had been destroyed, and certainly many blackened stumps can be found amongst the surviving palms. Fortunately, our recent observations show the grove to have recovered well, and perhaps even to have benefited, from the fire. All palms in the main stand have charred, scorched trunks, but most show a healthy abundance of suckers sprouting at the base. Many of the palms were flowering during our visit, and throughout the grove, seedlings can be found, evidence of successful fertilization of the female flowers over the last few years. *Phoenix* is obviously living up to its namesake: rising from the fire!

If fire was the only threat facing the palms, then the grove might be considered relatively safe. However, the combined threats of fire and drainage of the bog convey an increasingly vulnerable conservation status upon the grove, since there is little real control over the rate of expansion and development of the village. Certain outlying parts of the *P. theophrasti* population at Finike Bay (Kumluca-Karaöz) is similarly threatened by the growing tourist village nearby, though fortunately the bulk of this population, growing on top of steep, calcareous cliffs, and down their sides to the sea, occurs in areas unsuitable for housing development. The various stands of the species in the Datça Peninsula are, at present, also safe due to their occurrence in either steep, rocky gullies, or along remote, uninhabited beaches.

It is our opinion that conservation action must be focused soon upon the Gölköy *Phoenix* grove, not only because it represents one of only three native palm stands in Turkey, but also because the identity of the palm is not yet clear. Therefore, in 1993 M. Boydak applied to local and city governors requesting effective protection measures for the Gölköy grove, including a ban on the water drainage scheme and expansion of the village into the palm population. Unfortunately, the necessary measures have not yet been implemented, but the attempt to realize positive action to ensure the conservation of the Gölköy grove continues.

Acknowledgments

We are grateful to Professor Dr. F. Yaltirik, Mr. I. J. Hedge and Miss J. Lammond, and Dr. J. Dransfield for their assistance in the attempt to identify the Gölköy palm. To Professors Dr. A. Bayraktar and Dr. I. Aslandoga for the contribution of initial information on the palm grove. Sincere thanks also go to the Turkish Forest Service—Regional Directorate of Mugla, especially Mr. Behig Guyen and Mr. Osman Ceylan and Forest Service Officials of Bodrum Forest Conservancy, and Gölköy's Muktar, Mr. Fetan Özbek, and Mr. Fevzi Ertugrul who contributed to the various expeditions.

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Principes, 39(3), 1995, pp. 123–129

A Checklist and Analysis of the Palms of the Bismarck Archipelago

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This analysis of the palm flora of the Bismarck Archipelago, although certainly incomplete, is intended both as a practical guide to the palms, and as a small contribution to the phytogeography of the region. The Bismarck Archipelago is a substantial chain of islands off the north-east coast of New Guinea, and is part of the independent nation of Papua New Guinea. The chain itself is bent into a "U," lying on its side just south of the equator. The two large islands of New Britain and New Ireland form the bulk of the archipelago, but both sides of the U-shaped chain extend westward in strings of small islands. The chain terminates on the north side with Manus Island (the Admiralty Islands), and on the south side with a series of small volcanic islands lying closely along the north coast of New Guinea (Fig. 1).

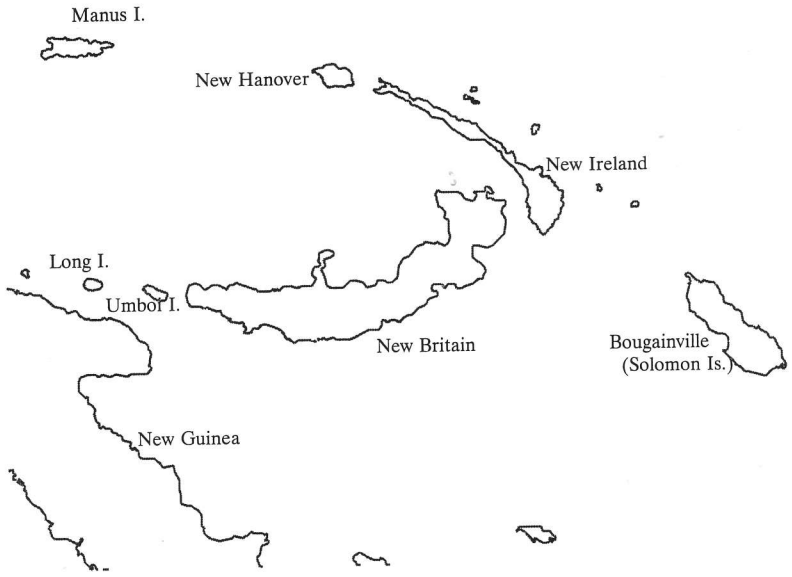
The largest of the islands, New Britain, is rugged and mountainous, consisting of over 36,000 square kilometers, with peaks up to 2,250 meters in elevation. The geology is complex, large areas of raised limestone alternating with extensive areas of volcanic rock and a number of active volcanos. New Ireland is much smaller and for the most part quite narrow, but the southeastern end is broad and mountainous, with peaks over 1,800 meters high. The higher elevations on both islands sustain montane forest and some of the unique elements of the palm flora.

Moore (1969b) considered the palm flora of the Solomon Islands to be primarily an extension of that of New Guinea, with some contribution (*Clinostigma*, *Physokentia*) from the ancient Pacific flora that survives primarily in New Caledonia. As one would expect, the palms of the Bismarck Archipelago show an intermediate character between those of New Guinea and those of the Solomon Islands. New Britain is separated from New Guinea by only 83 kilometers, the volcanic Umboi Island serving as a stepping stone between them. However, surprisingly few New Guinea palms have crossed the small gap. The Solomon Islands begin officially with Bougainville, some 120 miles east of New Ireland, with only a few very small islands lying between the two archipelagos. A number of palms have apparently migrated from the Solomons to the Bismarck Archipelago.

Most palm fruits in the western Pacific region are fleshy and rather heavy, and are presumably dispersed only short distances by animals (*Nypa* and *Cocos* are obvious exceptions). Some genera with large fruits, such as *Orania*, are absent from the Bismarck Archipelago, although abundant and diverse on New Guinea and some of the islands to the southeast. Even genera with smaller fruits (e.g., *Calamus*, *Gulubia*, *Gronophyllum*, *Hydriastele*, *Calyptrocalyx*, *Heterospathe*, and *Cyrtostachys*) are each represented by only one or two species in the islands. On the other hand, some genera with large fruits (*Ptychococcus*, *Actinorhytis*) are found in the Bismarck chain and in the Solomons.

Genera with endemic species in the Bismarck Archipelago are *Ptychosperma*, *Gronophyllum*, *Heterospathe*, *Hydriastele*, *Calyptrocalyx*, *Cyrtostachys*, *Physokentia* and *Clinostigma*. The first six genera are widely distributed in New Guinea. The last two are distributed through the Solomon Islands and down to but not in New Caledonia. The remaining genera found in the region are represented by common, widespread species.

Genera found on New Guinea but lacking in the Bismarck Archipelago are: *Borassus*, *Brassiophoenix*, *Corypha*, *Daemonorops*, *Korthalsia*, *Linospadix*, *Pinanga*, *Sommieria*, and *Pigafetta*. Most of these genera are fairly restricted in their distribution, even in New Guinea, and not suitably positioned for migration eastward. *Korthalsia*, however, is widespread and common in



1. Map of the Bismarck Archipelago.

New Guinea, and its fruits are small. It would not be surprising eventually to find it somewhere in the Bismarck Archipelago.

Rhopaloblaste and *Livistona* are found in both New Guinea and the Solomon Islands, but seem to be lacking from the Bismarck Archipelago. Moore's (1969b) indication that *Livistona* occurs here appears to have been in error, although one would certainly expect it. Several species of this genus occur in New Guinea, including *L. woodfordii* Ridley, which also occurs in the Solomon Islands (Tulagi, Esa'ala). To date, however, I have seen no collections from this region.

One genus that has diversified among the islands is *Ptychosperma*, a large genus centered in New Guinea, and represented by two endemic species in the Bismarck Archipelago, and at least one more in the Solomon Islands. None of these seems to have any close relatives in New Guinea, however, with *P. hentyi* being an unusual endemic in New Britain, and *P. gracile* appearing to be most closely related to Solomon Island and Australian species. *Ptychosperma* subgenus *Actinophloeus*, on the other hand, is lacking altogether from the islands, although it is widespread in New Guinea.

When I first encountered specimens of *Ptychosperma hentyi*, I assigned them to *Drymophloeus* based on the elongate peduncles of the inflorescence, the broadly cuneate, apically convex leaflets, and the apparently globose seeds. My annotations (as well as some by Moore), and my mention of them in my Palm Flora of New Guinea (Essig 1977), regrettably may have lead to erroneous reports of the occurrence of *Drymophloeus* in the Bismarck Archipelago (as in Moore 1969b, Hay 1984). *Drymophloeus* is found only in westernmost West Irian, skips over the remainder of New Guinea, and reappears in the Solomon Islands, assuming one accepts the inclusion of Burret's genus *Rehderophoenix* in *Drymophloeus* (Moore 1969a). The tremendous geographic separation of these two parts of the genus, and the fact that the characters by which *Drymophloeus* is distinguished from the other genera of the Ptychospermatinae are primitive for the alliance as a whole, suggest that the issue should be further examined.

One final observation—These islands were settled by seafaring peoples many centuries ago, and there has undoubtedly been much interaction among the peoples of the islands and New Guinea since then. We must take into consideration, therefore, the possibility of human introduction and cultivation of some of the palms. *Ptychococcus* and *Caryota*, for example, have very hard "wood" used by the local people throughout the region for bows, spearheads and a variety of other purposes (pers. obs.). It is quite possible that early settlers or traders brought seeds of these species with them. In both genera mentioned, the single

species present in the Bismarck Archipelago appears to be indistinguishable from species distributed broadly through New Guinea and into the Solomon Islands. Similar interpretations can be argued for *Cocos nucifera*, *Metroxylon sagu*, *Areca catechu*, and *Areca macrocalyx*, as all are of economic importance.

Synopsis of the Palms of the Bismarck Archipelago

The only previous work on the plant life of the Bismarck Archipelago was that of Peekel (1984), a German Catholic priest who resided on New Ireland for many years. A truly enlightened individual, Peekel studied not only the botany of New Ireland, but also the language and culture of the people there. We are indebted to Peekel for the indigenous names from New Ireland and much of the ethnobotanical notes included in the following list.

Key to the Species

1a. Leaves palmate; small, solitary palms of the forest undergrowth ..... *Licuala lauterbachii*
1b. Leaves pinnate or bipinnate; habits various 2
2a. Leaves bipinnate; large solitary palms producing inflorescences from the top downward ..... *Caryota rumphiana*
2b. Leaves once pinnate 3
3a. Fruit in a dense, globose head; trunkless palms forming extensive colonies in brackish water of estuaries ..... *Nypa fruticans*
3b. Fruit loosely arranged or in dense, elongate heads; palms with distinct trunks and growing in more terrestrial habitats 4
4a. Stems weak, climbing by means of spiny leaves, or by spiny whiplike extensions from the leaves or leaf axils 5
4b. Stems erect, not climbing, and mostly not spiny .. 6
5a. Leaves with irregularly placed, broadly lanceolate leaflets, and extended into an elongate, spiny cirrus .. .. *Calamus hollrungii*
5b. Leaves with regularly placed, narrowly lanceolate leaflets, with whiplike flagella attached to the leaf sheaths ..... *Calamus ralumensis*
6a. Pinnae irregularly multi-ribbed 7
6b. Pinnae regularly arranged, each with a single prominent rib 9
7a. Palms stilt-rooted; pistillate flowers and fruit distributed along most of the length of the rachillae; fruit red ..... *Areca guppyana*
7b. Palms not stilt-rooted; pistillate flowers and fruit on the lower parts of the rachillae only; fruit yellow-green 8
8a. Fruit in a dense spike; small palms of the forest understory ..... *Areca macrocalyx*
8b. Fruit in a panicle; robust palms cultivated near villages and disturbed sites ..... *Areca catechu*
9a. Palms with stilt roots 10
9b. Palms without stilt roots 11
10a. Fruits dark purple; seed sharply angled; montane forest, New Britain ..... *Physokentia avia*
10b. Fruits red; seeds terete in cross-section; montane forest, New Ireland ..... *Clinostigma collegarum*
11a. Palms massive, clumping, producing a massive inflorescence at the apex of the trunk; leaf bases with sinuous spiny ridges ..... *Metroxylon sagu*
11b. Palms of moderate dimensions, or with solitary trunks, producing inflorescences in sequence from the axils of the leaves; leaf bases smooth 12
12a. Pinnae conspicuously toothed or ragged at the tips 13
12b. Pinnae acute or briefly notched at the tips 13
13a. Pinnae induplicate; clustering palms with coarse fibrous leafbases; crownshaft lacking ... *Arenga microcarpa*
13b. Pinnae reduplicate; solitary or clustering palms with non-fibrous leaf bases; crownshaft present 18
14a. Staminate flowers soft, with long, pointed, loosely closed petals, mature when first exposed; fruit terete in cross-section 15
14b. Staminate flowers hard, bullet-shaped, maturing slowly after exposure of the inflorescence; seed 5-lobed in cross-section, at least when immature 16
15a. Small, clustering palms ..... *Hydriastele kasesa*
15b. Tall, solitary palms; restricted to Manus I. ..... *Gronophyllum manusii*
16a. Pinnae broad, wedge-shaped, apically convex; seed subterete in cross-section ..... *Ptychosperma hentyi*
16b. Pinnae lanceolate, apically oblique to concave; seed clearly 5-lobed in cross-section 17
17a. Fruits less than 2.5 cm long, with thin, fibrous endocarp ..... *Ptychosperma gracile*
17b. Fruits more than 2.5 cm long, with thick, elaborate, bony endocarp ..... *Ptychococcus kraemerianus*
18a. Inflorescence appearing as several elongate unbranched spikes emanating from a single leaf axil ..... *Calyptrocalyx* sp.
18b. Inflorescence branched, not as above 19
19a. Fruit massive, more than 15 cm long. Widely cultivated, and growing wild along coasts . *Cocos nucifera*
19b. Fruit less than 10 cm long 20
20a. Fruit black; flowers and fruit crowded, slightly sunken in the thick rachillae ..... *Cyrtostachys peekelii*
20b. Fruit and flowers not as above 21
21a. Fruit grayish with conspicuous lighter ribs; pinnae pendulous ..... *Gulubia costata*
21b. Fruit orange to red 22
22a. Fruit small, spherical ..... *Heterospathe parviflora*
22b. Fruit the size and shape of a chicken egg ..... *Actinorhytis calapparia*

Actinorhytis calapparia H. Wendl. & Drude—New Ireland.

This species was reported from the Namatanai region of New Ireland by Peekel, but not seen elsewhere, despite being found in both New Guinea and the Solomon Islands. Moore (1969b) reports that this species is widely cultivated as far west as Malaya, so cultivation may be a factor in the palm's distribution. Indigenous names (New Ire-

land)—Kuanua: *vekaveke*; Pala: *Hakaheke, kakahiaka*; Lamekot: *kafa*.

Areca catechu L.—Universally cultivated in the region.

This is the widely used betel nut, and was most certainly spread to the Bismarck Archipelago as a cultivated plant. Indigenous names (New Ireland)—Kuanua: *buai*; Pala: *buei*; Lamekot: *vua* note these names all appear to be slight variations on the widespread Pidgin English name (*buai*) for betel nut, suggesting relatively recent introduction of the palm to New Ireland.

Areca macrocalyx Zipp. (as *A. jobiensis* in Peekel)—New Britain, New Ireland.

This species has spike-like infructescences derived from inflorescences in which the pistillate flowers are confined to the very base of each rachilla. The species serves as a substitute for the commercial betel nut. Indigenous names (New Ireland)—Kuanua: *Kumul*; Pala: *kumulo*; Lamekot: *makega, kega*.

Areca guppyana Becc. (as *A. novo-hibernica* in Peekel)—New Britain, New Ireland.

This is a slender, stilt-rooted species common in low-lying coastal areas, with noncongested fruits similar to *A. catechu*. It is found only in the Bismarck Archipelago and the Solomon Islands, nothing like it being found in New Guinea. It has not been reported by Peekel as used for betel nut. Indigenous names (New Ireland)—Pala: *misle, butno*; Ugana: *vapbua, bua*.

Calamus hollrungii Becc.—New Britain, New Ireland, Manus.

The two rattans known from this region are quite different from one another, but each appears to belong to very widespread species. *C. hollrungii* Warb. has leaves with widely spaced, irregularly arranged, broadly lanceolate leaflets, and a terminal flagellum, while *C. ralumensis* has closely spaced, narrowly lanceolate leaflets and a cirrhus arising from the leaf sheath rather than a flagellum from the leaf tip. *C. hollrungii* is common throughout New Guinea, the Bismarck Archipelago and the Solomon Islands. Indigenous names (New Ireland)—Kuanua: *magu*; Pala: *kalaua, kalawa*; Lamekot: *ni*.

Calamus ralumensis Warb.—New Britain.

This species is quite abundant in the lowland forest of New Britain. It is probably on New Ireland as well, but has not been collected from there. It resembles the widespread *C. vestitus* Burr. of New Guinea, which Moore also identified from the Solomon Islands. It is likely that the two are one and the same species. Indigenous names (New Ireland)—Kuanua: *kada*; Pala: *siribe, buso*; Lamekot: *iogel*.

Calyptrocalyx sp.—New Britain.

This one rather robust species resembles one collected in the Central Province of Papua New Guinea, but neither has been identified. The genus is particularly in need of revision.

Caryota rumphiana Mart.—New Britain, New Ireland, Manus, Long I. (Fig. 2).

This species is both widespread and common, occurring from Indonesia (Ternate) to the Philippines, New Guinea, northeastern Australia, the Bismarck Archipelago, and the Solomon Islands (Gudalcanal). Varieties have been described for geographical variants in some parts of the species range, including variety *papuana* Becc. from West Irian. There is too little information available to determine the usefulness of such varietal names. As its wood is valued for construction purposes (pers. obs.), its spread may have been aided by human migration or trade. Indigenous names (New Ireland)—Kuanua: *gelep, kuraga*; Pala: *galah*; Lamekot: *gelat*; (Manus)—Kali: *Sahun*.

Clinostigma collegarum J. Dransf.—New Ireland.

Clinostigma is widespread in the Pacific, from the Bonin and Caroline Islands in the north to Fiji and Samoa in the east. This species was found in New Ireland in 1975, growing on ridges in montane forest at elevations of about 1,350 m. It resembles *Gulubia costata* in general aspect, but is distinguished most readily by its fruit with lateral stigmatic residue. The species is also notable for the mass of distinctive stilt roots at the base of the trunk.

Cocos nucifera L.—New Britain, New Ireland, Manus, Long I.

The widespread coconut palm is cultivated throughout the Bismarck Archipelago. Indigenous

2. Villagers from Matafuma Village on Long Island drive spikes of *Caryota rumphiana* "wood" into a log, during construction of a makeshift outrigger canoe. 3. The bright red fruits of *Heterospathe parviflora* are widely spaced on the branches of the inflorescence. This palm is known only from New Britain. 4. A villager from Sampantobil in the Nakanai Mountains of New Britain holds a leaf and inflorescences of *Ptychosperma hentyi*, a unique and beautiful species found only on this island.

names (New Ireland)—Kuanua: *lamamas*; Pala: *lamas*; Lamekot: *ni*.

Cyrtostachys peekeliana Becc.—New Ireland.

Cyrtostachys extends from Thailand to the Solomon Islands, with the greatest number of species in New Guinea. Only the one species is found in the Bismarck Archipelago, and so far only on New Ireland. One species has been found eastward, on Bougainville (*C. Kisu* Beccari). Peekel reports that the hard outer wood is used for planks. Indigenous names (New Ireland)—Kuanua: *a-ia*; Pala: *a-ihul*; Lamekot: *lifur*; Ugana: *varivan, ivin*.

Gronophyllum manusii Essig—Manus.

Found on Manus Island, but similar appearing palms have been noted from a distance on Long Island.

Gulubia costata (Becc.) Becc.—New Britain.

This widespread species of New Guinea has so far been found in only a few spots in the Hoskins area, West New Britain.

Heterospathe parviflora Essig—New Britain (Fig. 3).

Heterospathe is a widespread genus with many locally endemic species in both New Guinea and the Solomon Islands. This is the only species known from the Bismarck Archipelago. The genus has not been found in New Ireland and was unknown to Peekel.

Hydriastele kasesa (Lauterb.) Burr.—New Ireland, New Britain.

This species resembles *H. microspadix* (Becc.) Burr. from northeastern New Guinea, but dimensions overall are smaller. Widespread in lowland forests. Indigenous names (New Ireland)—Pala: *kasesa*; Lamekot: *kasi*; Ugana: *vakase, kase*.

Licuala lauterbachii Damm. & K. Schum. (*Licuala peekelii* Lauterb.)—New Britain, Bagabag I., New Ireland.

This is the only species of this widespread and diverse genus to be found in the Bismarck Archipelago. It is common in eastern New Guinea and is found also throughout the Solomon Islands. In New Britain it is the most common palm in the understory of lowland forests. Indigenous names (New Ireland)—Kuanua: *luga, uban*; Pala: *salaho*; Lamekot: *fi*.

Metroxylon sagu Rottb. (*M. laeve* Mart., *M. rumphii* (Willd.) Mart.)—New Britain, New Ireland, Manus.

This is the common sago palm found from Malaya and the Philippines to New Guinea and beyond. It is found in swampy areas throughout the larger islands of the Bismarck Archipelago, and on Guadalcanal as well, while *M. salomonense* is found also on Guadalcanal and elsewhere in the Solomons. Another species, *C. bougainvillensis* has been described from Bougainville. As it is an important economic plant throughout its range, *Metroxylon sagu* may also have been spread by humans. According to Moore (1969b) the genus is Melanesian in origin, rather than Asian or New Guinean. Indigenous names (New Ireland)—Pala: *bia* (spiny form called *bia-gargarat*); Lamekot: *sasak*.

Nypa fruticans Wurmb.—New Britain, New Ireland.

Nypa is found in brackish estuaries from Sri Lanka and eastern India to the Solomon Islands, Ryukyu Islands, and Australia. Peekel reports that *Nypa* fronds provide excellent material for atap matting, and is commonly called "wild sago palm" or "*sak-sak*." Indigenous names—Kuanua: *manimua*; Pala: *bia-to, bia-ta*; Lamekot: *ulagai*.

Physokentia avia H. E. Moore—New Britain.

Physokentia avia is related to species in the Solomons and beyond, and is found at relatively high elevations.

Ptychococcus kraemerianus (Becc.) Burr.—New Britain, New Ireland.

This species was described from New Ireland, but the type consists of only a few large fruits with deeply grooved and heavily armored endocarps, and seeds with homogeneous endosperm. Recent collections from New Ireland and New Britain, with matching fruits, are indistinguishable from *P. elatus* Becc., a species abundant in northeastern New Guinea. Furthermore, the species from the Solomon Islands also closely resemble this one. *Ptychococcus* is valued by the indigenous people for its hard wood, which is used for bows and spear heads. It may have also been spread among the islands by humans, and in fact, dispersal of its large fruits by any other means seems unlikely. Thus it appears that there is but one widespread species of *Ptychococcus* in lowland

eastern New Guinea, the Bismarck Archipelago, and the Solomon Islands. The name *P. kraemerianus* has nomenclatural priority.

Ptychosperma gracile Labill.—New Britain, New Ireland, Long I.

This species has elongate leaflets and ruminate, weakly grooved seeds, and is similar to *P. elegans* of Australia, and *P. salomonense* of the Solomon Islands. The group of solitary medium-tall palms with red fruit and ruminate endosperm has no obvious close relatives in New Guinea, and thus could be considered part of the "extra-New Guinea" element of the palm flora.

Ptychosperma hentyi Essig—New Britain (Fig. 4).

This species is widespread and abundant on New Britain, but has not been found elsewhere. It has unusual broadly cuneate leaflets with convex tips, that gradually decrease in size toward the end of the strongly arched leaves. Its seeds are nearly terete at maturity (although clearly 5-lobed when immature) with ruminate endosperm.

ADDENDUM

Elaeis guineensis Jacq., the African Oil Palm, has recently become widely cultivated on New Britain. There is no indication, however that it has escaped and become part of the flora.

Ptychosperma novo-hibernica Becc. in Lauterb., Beiträge zur Flora von Papuasien. IV. Engl. Bot. Jahrb. 52:29. 1914. (Holotype: *Kraemer s.n.*, 1909, New Ireland (B)).

This species was described from New Ireland from incomplete material. The leaves are clearly of *Ptychosperma*, possibly *P. gracile*. The inflorescence fragment is unusual, however, as it has what appears to be an elongate main axis and numerous short rachillae. It resembles more a *Heterospathe*, leading me to suspect that the type collection was mixed. Flowers and fruit were lacking, and the specimen at Berlin was probably destroyed, so it is not likely that this specimen will be further identified.

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Searching for Palms in Eastern Panama

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In many ways, Panama is a crossroads, in terms of travel, biogeography, and culture. For oceanic navigation, the Panama Canal offers a crucial link between the Atlantic Ocean with the Pacific. The United States has maintained a strong political and military presence in Panama for many years because of the importance of the Canal to the U.S. It is also the primary reason for the present activity and wealth of the cosmopolitan cities of Panama City and Colon.

On land, Panama is the southern-most portion of the Central American bridge between North and South America, the crossroads of the Americas. Here the plant and animal life of two continents has blended and diversified in an incredible display. In *The Botany and Natural History of Panama* (1985), D'Arcy and Correa estimate as many as 10,000 species of plants and 900 species of birds in Panama. They do not take the opportunity to estimate the number of insect species but do note a study that reported over 700 species of beetle trapped at a single site. In travel publications, journalists gush over the lush wilderness of the Darien Gap in eastern Panama, the only break in the Pan American Highway.

Culturally, Panama struggles to bridge another gap, one between a modern technological community and the Amerindians who have a traditional tie to nature. Native populations in parts of western Panama live in poverty unable to make a smooth transition to a modern world while slowly losing their traditions. However, others seem to hold onto many of their traditions while exploiting opportunities in the cities. Kuna Indians from the San Blas Territory and the Darien Province can easily be found in Panama City, men working in a variety of situations or women selling colorful molas (a native sewing craft) at tourist destinations. Yet the Kuna seem to maintain many old traditions and are credited with conserving the forests of the San Blas Territory where many Kuna live.

To the casual visitor, Panama offers luxurious hotels, drinkable tap water, a good road system, and a wide array of local crafts as souvenirs. Ecotours are available from a number of local tour companies for the adventurous. Just a few miles outside of Panama City in the forests of Soberania National Park, one can see parrots, toucans, and monkeys. Nearby, Summit Park offers a small zoo of native animals and a display of tropical plants, many of which were brought to Panama by David Fairchild and other plant explorers in the early part of this century.

Recently, five members of the International Palm Society (IPS) visited Panama to offer assistance to Summit Garden and to spend a little time in the tropical wilderness. Paul Craft, of the Palm Beach Chapter of the IPS, organized the details of airline, hotel, and automobile reservations. Chuck Hubbuch, of the Dade Chapter of IPS and of Fairchild Tropical Graden, provided travel experience based on a previous trip and attempted to renew contacts at Summit Garden. Unfortunately, all efforts to reach previous contacts at Summit proved fruitless. When Paul and Chuck met Palm Beach Chapter members Dale Holton, Larry Dietrich, and Chris Wheeler at the airport in Miami on the long-awaited day of departure, we still did not know what to expect at Summit, but had high expectations of the planned expedition into the Darlen Province. Larry proved to be the most adept at Spanish, by far, and was appointed our official translator.

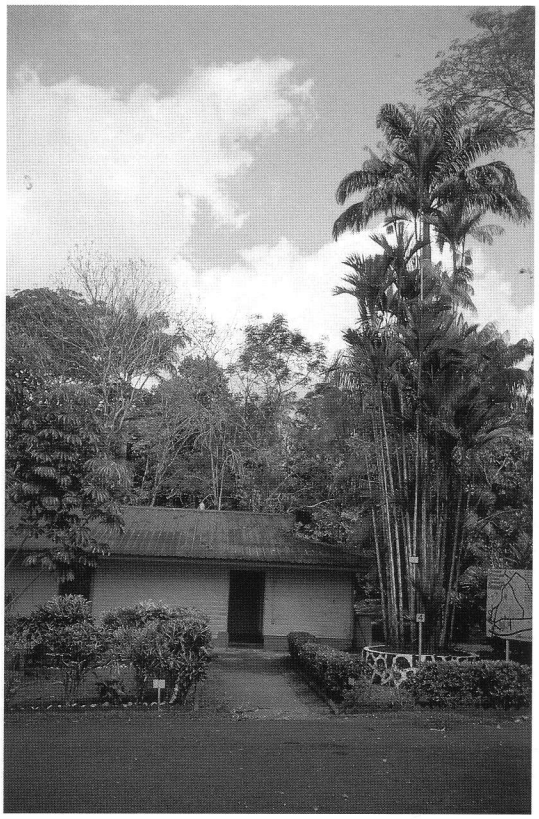
On the morning after arrival in Panama City, the five of us headed for Summit Garden in a subcompact car. This was our first little travel glitch. The four-wheel drive vehicle we reserved from a major international car rental company would be promised to us repeatedly over the next four days but would never arrive. The next problem was actually finding Summit Garden using the rental company's simplistic map of the city. We toured the worst parts of the city, searched for non-existent road signs, and tried to adapt to the heavy traffic. For Paul, it was reminiscent of Los

Angeles without the freeways. One of the highlights of the grand tour was seeing a large number of *Bentinckia nicobarica* used as street trees. The one road to Summit that Chuck knew was blocked by construction. We finally learned that we could get into the road to Summit only by making a U-turn on a busy four-lane highway or by driving across the Canal via the Bridge of the Americas and back again. We never did find an easier route.

The new director at Summit Park, Carlos Sucre Graell, was very cordial and walked with us through part of the Garden asking many questions about the plants. When we asked about the botanical garden manager, we learned that a new person was also in that position, a young biologist named Claudia Rumi Shibuta. Apparently, this is why earlier correspondence remained unanswered. At this time, Claudia and Chuck have continued correspondence, investigating ways for their institutions to work together.

The director gave us passes for the Garden, showed us a short orientation film about Summit Park, and told us to do anything we could to help the plant collection. Over the next few days, we explored the grounds and Chuck discussed future cooperative projects between Summit and Fairchild with Claudia. Currently, Summit has few plant records and functions more as a park than as a botanical garden. Its main focus seems to be providing the public with the opportunity to see the native animals of Panama, including monkeys, birds, and large cats. Large groups of school children toured the Garden every day. There are also playgrounds and open areas where families get together for picnics and baseball. A small nursery produces plants from the Garden's seeds to sell to the public. While this is all valuable to the people of Panama, it seems to leave the plants in the background, particularly the native plants.

We spent one and a half days photographing, identifying, labelling, and mapping the unlabelled or incorrectly identified palms. An interesting palm collection across the street is not considered part of Summit Garden. Some Palm Society members may know this area across the road where the *Pelagadoxa henryana* grows. Particularly impressive displays at the Garden were a large *Cyrtostachys renda*, the red sealing wax palm, at the entrance (Fig. 1) and a *Corypha umbraculifera*, the talipot palm, in full bloom near the entrance (Fig. 2). In all, we identified approximately forty cultivated palm species. Certainly, the climate is such that many palms that do not grow well in Florida could thrive here.



1. Administration Building at Summit, note the tall *Cyrtostachys renda* on the right.

In addition to the cultivated palms in the collection, we observed plants of *Areca triandra*, *Bentinckia nicobarica*, *Licuala spinosa*, and *Livistona saribus* which volunteered in adjacent forests. Also, we saw native *Astrocaryum standleyanum*, *Elaeis oleifera*, a *Desmoncus* species, and *Oenocarpus mapora* in the forest.

The palms and other plants are well maintained in Summit Park. We hope that continuing support by Fairchild Tropical Garden and the Palm Society will lead to a brighter future for Summit as a scientific palm collection. We agreed that Summit has a tremendous potential to showcase the diversity of plants native to Panama, to teach the public to appreciate the importance of conserving their natural habitats, and to serve as a center for conservation and research.

On our last day at Summit, we ran into Gary Outenreath of Moody Gardens in Galveston, Texas

2. a and b. A large *Corypha umbraculifera* flowering just inside the entrance of Summit Garden.

and a small group of his colleagues. They had taken a boat to a remote area of the Darien and were still nearly breathless with excitement over the diversity of plants and animals, especially birds. We began to get excited about our upcoming trip.

During our final few days in Panama, after Chris returned to Florida, four of us finally located a four-wheel drive vehicle and headed eastward toward South America on the Pan-American Highway (Fig. 3). We had high expectations. People who had visited Panama ten or twelve years ago had warned Paul to be careful in the Darien because it was a wild and dangerous area with miles of dense forest. We were told by locals that we would see great forests once we reached the Darien Province. So, as we drove along the highway, eagerly anticipating signs of the forest.

When the Pan-American Highway pavement ended, we continued along over and around ruts, pot holes, and washed out bridges. We saw *Sabal mauritiiformis* (Fig. 5) and *Scheelea rostrata* standing in pastures behind barbed wire fences. *Bactris* formed colonies along streambanks. Giant soft-wooded, baobob-like quipo trees, *Cavanillesia platanifolia*, were silhouetted against the sky, standing alone where there were once tall forests. Fires had burned off forest remnants or scrub vegetation in the effort to produce and improve pastures and croplands. By this time, the only vehicles we passed were the occasional bus and tractor trailer rigs that were weighed down by two or three massive logs, the largest that any of us had ever seen.

Just before reaching the Darien, we stopped to photograph a billboard shaped and painted like a giant Stihl chainsaw (Fig. 4). It stood on a hillside blackened by a recent first and lumber was stacked on the road below. Little did we realize how prophetic this sight would be.

We found a hotel in the town of Meteti and stopped for the night. It offered thin mattresses, cold showers, robust roaches, and a simple, but nice, restaurant. These would have been high quality accommodations in a remote, rain forest set-

3. A typical landscape along the Pan-American Highway in eastern Panama Province.

ting. Unfortunately, there was still no rain forest, only farmland, and we soon lost our tolerance for the simple offerings of the hotel. The hotel proprietor told us that we would soon run into rain forest on the Highway and suggested a nearby side road as a quick afternoon trip. We found little of interest at the end of this site. It was a highly disturbed section of saltwater estuary with some secondary forest and many lianas. We returned to the hotel and sat in the restaurant beside the cock fighting ring, where we were offered chicken. Paul (Fig. 6) wondered aloud if it was the loser of the last bout.

The next day, we were woken early by the hotel's raucous pet blue-and-gold macaws. Shortly thereafter, we began our drive toward the town of Yaviza at the end of the Pan-American Highway hoping to find rain forest. Three hours later, in the middle of Yaviza, about forty miles from the Colombia border, we arrived at the end of the highway. Frustrated and disappointed, we found only a few patches of disturbed forest along dirt logging roads that wandered off the highway. While we saw few animals, we did find a respectable variety of plant life, *Socratea*, *Oenocarpus*, *Bactris*, and *Welfia* were relatively common palms here, along with a scattering of heliconias, aroids, ferns, and a variety of vines and trees. We also found a few cycads in the understory. These plants, which superficially resemble palms, are becoming quite rare throughout the Americas as a result of deforestation.

Seedlings of some plants grew in large numbers immediately below their parent's crown indicating that the animals that naturally disperse the seeds were already gone. We expect that these last small patches of trees will be burned as soon as the useful timber is removed. Soon, these interesting plants and the few remaining animals will be gone. Some may be the last of their kind. We had learned the hard way that the lush forests of the Darien Gap are now inaccessible by road. Later, we were told that 180,000 acres of rain forest are being cleared in Panama each year. To see healthy forests in the Darien, one must leave the Highway and take a boat down the Pacific coast or fly to a remote site in the heart of the Darien.

It was too late to arrange for a plane or boat excursion. But, being incorrigible plant enthusiasts, we stopped to examine whatever trees we could find growing in fence rows or front yards as we drove back toward Panama City. *Cecropia*,

4. Eight foot tall chainsaw advertisement on a scorched hillside along the Pan-American Highway.

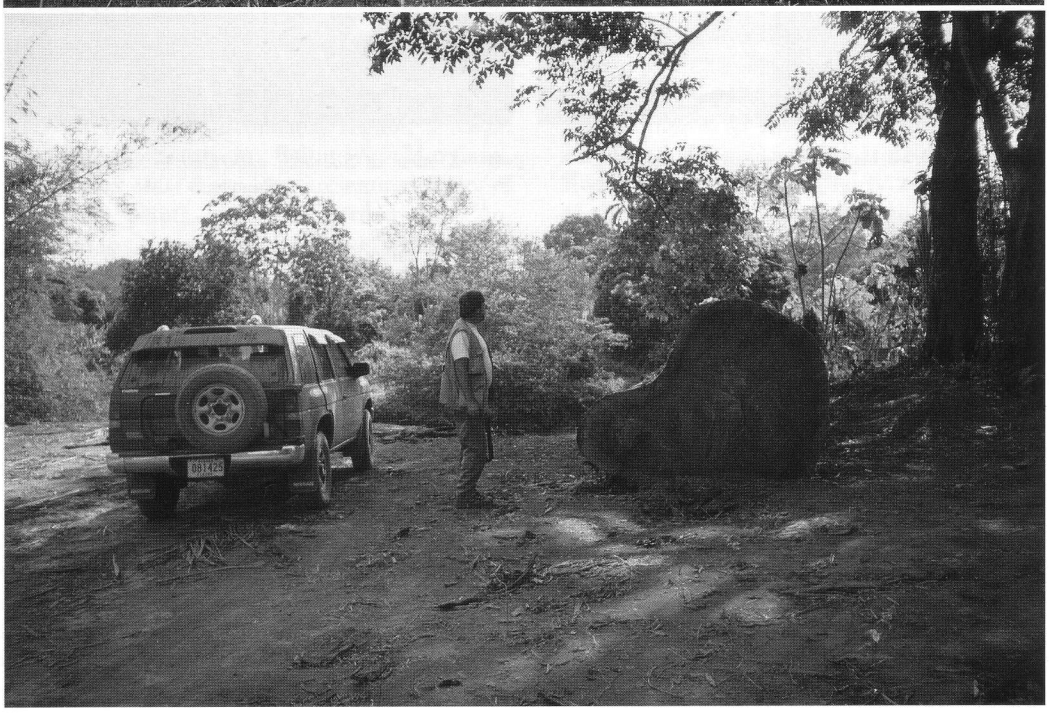
Tabebuia, *Pseudobombax*, *Erythrina*, *Triplaris*, *Muntingia*, *Bauhinia*, and *Cassia* were among the tree genera that caught our attention. Since we made good time on the return drive, we turned up a road toward Carti Suitupo that Chuck knew from a previous trip. Here we finally were able to immerse ourselves in the lush, living green of a rain forest.

Once in the San Blas Territory (Fig. 7), we could simply walk off the road edge, down the ravine slope, and into the humid forest where we found *Asterogyne martiana*, *Astrocaryum confertum*, *Astrocaryum standleyanum*, *Attalea allenii*, *Bactris coloniata*, *Socratea exorrhiza* (Fig. 8), *Synechanthus warscewiczianus*, *Welfia georgii*, *Wettinia hirsuta*, and assorted *Geonoma* and *Chamaedorea* species. Heliconia plants grew to twenty feet in height and hung massive red inflorescences over our heads. Epiphytic mosses, liverworts, aroids, orchids, and bromeliads grew everywhere on tree trunks, branches, and even on large leaves. Massive lianas hung from the trees. Birds sang, insects called, and hummingbirds buzzed around us. It was exactly how some members of our group had imagined the rain forest. For Chuck, it was a relief, like returning home after a hectic day. Each step we took offered exciting new discoveries. It is difficult to explain the excitement that a plant enthusiast feels in an almost overwhelming setting such as this. The diverse, luxuriant vegetation was the perfect therapy for the depression that had befallen each of us earlier in the week in the dusty Darien.

In his book, *The Cloudforest*, Peter Matthiessen writes, "One also learns quickly not to lay one's hand or lean casually on tree limbs, which are often spined and sometimes ant-ridden." Although Matthiessen was writing about Brazil, it was certainly true that this "Garden of Eden" also contained a few hazards. Thorny tree ferns pointedly reminded us to pay attention to our surroundings. But the most memorable event was when we ran into the hollow-thorned acacia tree which housed a colony of stinging ants. We all quickly discovered that these ants are quite aggressive and venomous. For Chuck, their stings were much worse than a related ant that he previously experienced in dry forests of southern Mexico. We later read in Dan Janzen's *The Natural History of Costa Rica* that these rain forest ants are particularly notorious for their ferocity. For those who are concerned about such matters, we did not see a single snake.

Leaving the most beautiful and interesting site of our trip, we returned to Panama City in preparation to fly home again. As expected by all, it had been a very interesting trip. Just as it is more exciting to see an unusual animal in the wild than in a cage, we found it very exciting to see palms and other plants in their natural environment. We gained new insights about their growth and cultural needs. We saw them in beautiful settings unmatched by any man-made landscape. But, our overwhelming feeling was a sense of loss as we experienced first-hand the deforestation about which we have read so much.

Returning to that earlier metaphor, these are not problems for the future, we are at the crossroads right now. Panama's human population, like that of the rest of the world, is growing in numbers and sophistication. They require room to grow and demand a better standard of living. Unfortunately, the deforestation which follows the population growth results in losses of valuable natural



5. *Sabal mauritiiformis* were left standing when this area was cleared for pasture in eastern Panama Province. 6. Paul Craft standing next to a large log on the banks of the Rio Tuira in the Darien Province.

7. Lush vegetation of the San Blas Territory.

8. A stand of *Socratea exorrhiza* in San Blas Territory, Panama.

resources, cultural traditions, and biological diversity, in Panama just as it has in the United States and elsewhere. It seems to us that the answers lie in education and finding economic alternatives to deforestation. Of course, suggesting such general answers can be much easier than achieving solutions.

These two botanical gardens, Fairchild Tropical Garden and the Garden of Summit Park, hope to develop solutions. Maybe together, and with institutions such as the International Palm Society, we can work to insure that Panamanians and their visitors will see wild palms in their natural habitats in the coming decades.

The palm collection at Summit Gardens includes:

Aiphanes aculeata
Areca triandra
Astrocaryum sp. (probably the native *A. standleyanum*)
Bactris gasipaes
Bentinckia nicobarica
Borassus aethiopum
Borassus flabellifer
Caryota mitis
Cocos nucifera
Corypha umbraculifera
Cyrtostachys renda
Drymophloeus beguinii
Elaeis oleifera (native)
Euterpe oleracea
Heterospathe sp. (probably *H. elata*)
Hyphaene sp.
Latania loddigesii
Latania sp.
Licuala grandis
Licuala spinosa
Livistona chinensis
Livistona decipiens
Livistona saribus
Livistona rotundifolia
Oenocarpus mapora (native)
Pigafetta filaris
Pinanga coronata
Ptychosperma elegans
Ptychosperma macarthurii
Roystonea oleracea
Sabal causiarum
Sabal minor
Scheelea sp. (probably the native *S. rostrata*)
Syagrus romanzoffiana
Thrinax radiata
Veitchia merrillii

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The Rediscovery of Chamaedorea donnell-smithii (C. seifrizii)

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In 1888, Dr. Karl Thieme, a German naturalist and professor of medicine, collected a small species of *Chamaedorea* among rocks along the Río Chamelecon near the border of the departments of Cortés and Santa Bárbara in northern Honduras. Thieme, a resident of San Pedro Sula, Honduras, sent the *Chamaedorea*, along with numerous other important collections of plants he had made from 1887–1893 in the surrounding region, to Capt. John Donnell Smith in Baltimore, Maryland, U.S.A., who was compiling an enumeration of Guatemalan plants. Smith forwarded the *Chamaedorea* to German professor Udo Dammer, one of the leading palm students of the time and associate of the great German palm specialist Hermann Wendland.

Dammer (1903) honored the Baltimore captain by listing the name *Chamaedorea donnell-smithii* for the new palm but he provided no description or other information about the species. Two years later, Dammer (1905) gave a rather scant description of the new species, thus validating the name although the information was hardly diagnostic. Dammer's brief description simply stated that *C. donnell-smithii* was among the smallest species of palms and had 2-4 pinnae on each side of the rachis. One can readily see that Dammer obtained nearly all his information from Thieme's original, meager collection, a specimen consisting of one leaf and a detached, partially disintegrated inflorescence with a few decomposed flowers.

Thieme's original material, the holotype of *C. donnell-smithii* at US, and Dammer's brief description tell us virtually nothing about this species; both are inadequate for proper identification and placement of the species, probably explaining why the name disappeared from use and has remained a mystery for nearly 100 years. Hodel (1992) gave the most recent and complete account of *C. donnell-smithii* although he, too, was unable to make an adaquate diagnosis and listed the species as imperfectly known.

Our interest in resolving the mystery of *Chamaedorea donnell-smithii* arose in 1993 when Hodel examined several fairly recent collections of an unidentified *Chamaedorea* from seasonally dry, rocky areas along rivers or streams in the interior of Honduras. Although somewhat resembling the mysterious and elusive *C. donnell-smithii*, these more complete collections bore a stronger affinity, especially in leaf and inflorescence, to *C. seifrizii*, a well known and commonly cultivated (see Hodel 1992) species of cespitose or clustering habit from the seasonally dry forests of the Yucatán Peninsula in México, Belize, and Guatemala, and the Islas de la Bahía off the north coast of Honduras.

Fortunately for our interest, label data of these more recent and complete collections of the unidentified *Chamaedorea* did not note whether their habit was solitary or cespitose, thus failing to eliminate or confirm their identity as *C. seifrizii*. Indeed, if the label data noted the habit of these palms as cespitose, we would have considered them simply to be *C. seifrizii*, and we may have dropped the matter right then, leaving unresolved the mystery of *C. donnell-smithii*. However, the lack of information about their habit stimulated our inter-

1. *Chamaedorea seifrizii* at or near the type locality of *C. donnell-smithii*, on a steep, rocky slope along the Río Chamelecon, Honduras.

est and left open the possibility that the recent collections represented *C. donnell-smithii*.

Adding to the suspense was the riverside habitat of the recent collections from the interior of Honduras, the same, interestingly, that Thieme had noted for *C. donnell-smithii*. Furthermore, this riverside habitat does not correspond to that of *C. seifrizii*, known from the virtually riverless Yucatán Peninsula. Could the recent, unidentified collections be the mysterious and long-lost *C. donnell-smithii* of which so little was known? Or did they, perhaps, represent a species new to science? Or were they simply *C. seifrizii*? Still another, albeit uncomfortable, possibility lurked in our minds, one that could have tremendous nomenclatural impact: were the virtually unknown *C. donnell-smithii* and the widely known and cultivated *C. seifrizii* one and the same? If so, the name *C. donnell-smithii* would have priority, on purely technical nomenclatural grounds, since it was published 33 years before that of *C. seifrizii*. So intriguing were these thoughts that in February 1994, hoping to solve this puzzle, we visited the sites of the recent collections of the unidentified *Chamaedorea* and the type locality of *C. donnell-smithii* in Honduras.

We began to unravel the mystery of *Chamaedorea donnell-smithii* when we visited two sites in Francisco Morazán in central Honduras where the unidentified *Chamaedorea* had been recently collected. Both sites were in seasonally dry forest on steep rocky slopes above watercourses. At both sites we found a *Chamaedorea* of cespitose habit, short-pinnate leaves, and short-peduncled inflorescences emerging below the leaves by erupting through old, persistent, dry leaf sheaths. We examined flowers at anthesis of both sexes. Without a doubt we had found what we knew as *C. seifrizii*. This discovery increased the uncomfortable possibility that *C. seifrizii* and *C. donnell-smithii* were identical.

Several days later, this possibility was confirmed when we found the same cespitose palm on steep, rocky slopes in seasonally dry forest at or near the type locality of *C. donnell-smithii* along the Río Chamelecon near the border of Cortés and Santa Bárbara departments (Fig. 1). One might contend that we have not eliminated the possibility that a second, distinct *Chamaedorea* could be growing nearby that is, in fact, *C. donnell-smithii*. However, this dry, rocky habitat is so unusual for palms and especially *Chamaedorea* that the existence of a distinct, second species seems highly unlikely. In fact, we observed no other species of palms at any of the sites; the habitat is simply too inhospitable.

Rather than saddling ourselves with the unenviable and onerous task of reducing the name of the widely known and cultivated *Chamaedorea seifrizii* to a synonym of the virtually unknown *C. donnell-smithii*, we have opted to propose conservation of the epithet *seifrizii* over *donnell-smithii*. It is more practical and logical to avoid displacing well established names for purely nomenclatural reasons. To that end, we have submitted a proposal to *Taxon*, the journal of the International Association for Plant Taxonomy, arguing this conservatory position. In the meantime, pending approval of our proposal, we urge botanists, horticulturists, growers, hobbyists, and others to continue to use the epithet *seifrizii* for this species. Overall, our experience with this matter serves to remind us of the intricacies, com-

plexities, and pitfalls awaiting those who venture into the perilous waters of plant taxonomy.

See Hodel (1992) for an extensive, illustrated botanical and horticultural account of *Chamaedorea seifrizzi*.

Chamaedorea seifrizii occurs in open or dense, moist or seasonally dry woodland or forest on flat land in the Yucatán Peninsula of Mexico, Guatemala, and Belize, and on steep, rocky slopes along watercourses in the interior of Honduras. It ranges in elevation from 0–500 meters. It is often found on limestone rocks or soils.

As noted earlier, the habitat of *Chamaedorea seifrizii* in the interior of Honduras is quite different from that where it occurs on the Yucatán Peninsula in Belize, Guatemala, and México. This difference in habitats was partly responsible for the mystery surrounding *C. donnell-smithii* and *C. seifrizii*. In the Yucatán Peninsula, *C. seifrizii* occurs on rocky but relatively flat land with an absence of rivers or other watercourses. The forest is generally a moderately dense woodland with only a poorly developed canopy and few, if any, large trees. A pronounced dry season occurs from January through June. In Petén, Guatemala, toward the southern end of the range of *C. seifrizii* on the Yucatán Peninsula, the forest has a better developed and denser canopy with large trees. There, *C. seifrizii* often grows in low, poorly drained areas which become boggy during the rainy season.

In the interior of Honduras, however, *Chamaedorea seifrizii* has only been found in relatively open, seasonally dry forest on very steep, rocky slopes along rivers or streams. A pronounced dry season occurs there, also, and many of the smaller watercourses by which it is found lack water for an extended period. One has to wonder whether this pattern of distribution in the interior of Honduras is wholly natural or is partly influenced by human activities. The patches of vegetation in which *C. seifrizii* grows are but remnants of a once more extensive forest that also covered the surrounding flatter areas. However, eons of human activity, such as burning, cultivation, and animal grazing, have reduced and restricted this dryland forest to the largely inaccessible, steep, rocky slopes carved by rivers and streams. It is reasonable to conclude *C. seifrizii* was one more widely distributed in the interior of Honduras and probably occurred in dryland forest in flat areas prior to the advent of destructive human activities.

Whether in the Yucatán Peninsula or the interior of Honduras, though, it is clear *C. seifrizii* inhabits one of the driest and most demanding ecosystems for the genus. The dry season is particularly pronounced and lengthy and the substrate porous and well drained; it is common to find companion vegetation actually wilting from the lack of water although the palms do not seem to be suffering. Another indicator of the dry nature of this forest is the thorny, deciduous, and/or succulent aspects of many of the companion species.

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Do You Have Questions About Palms?

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A Revision of Calyptronoma (Arecaceae)

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Although uncommon in cultivation and restricted to habitats that are not always readily accessible, *Calyptronoma* palms nevertheless are of great interest. *Calyptronoma* is clearly a member of the tribe Geonomeae of the subfamily Arecoideae, and like all members of that tribe it has triads of flowers borne in pits in the rachillae. Although its tribal placement is without controversy, the disposition of the genus and the enumeration of its species have endured shifting botanical tides for over a century. The taxonomic and nomenclatural confusion surrounding these palms has obscured two important points: *Calyptronoma* is a genus of palms confined entirely to the Greater Antilles, and one of its species is threatened in Puerto Rico.

Because of the intrinsic interest of this group of palms and because of my own long-standing interest in Caribbean plants, I welcomed the opportunity to collect and study the genus while in the Greater Antilles. Particular effort was made to find reliable characters by which the species can be distinguished and to establish with confidence the distribution of the species. The results of this study are presented here.

Taxonomic History

The history of the genus *Calyptronoma* is brief but tortuous. Species now included in *Calyptronoma* began their nomenclatural life in genera as diverse a *Geonoma* and *Elaeis*, and over the years, *Calyptronoma* itself has suffered what de Nevers and Henderson (1988) politely called a "checkered taxonomic history."

Grisebach (1863) published, without description, the name *Geonoma (Calyptronoma) swartzii* Griseb. & H. Wendl., citing the place of publication as his Flora of the British West Indies (1859-1864), where the genus and description were published in 1864 as *Calyptronoma swartzii* Griseb. It appears that Grisebach (1863) inadvertently anticipated the publication of the new genus and its sole species, *C. swartzii*. The 1863 publication was intended to be a nomenclatural transfer of *Calyptronoma* into *Geonoma*, although it was invalid because the basionym had not yet been published. In effect, Grisebach changed his mind on *Calyptronoma* even before the had published the genus as new. Subsequently, Grisebach (1866) validated the combination in *Geonoma*, although is not clear whether or not he intended for *Calyptronoma* to have subgeneric status.

After such an inauspicious and uncertain beginning, *Calyptronoma* continued to endure the ignominy of changing opinions. Wendland (in Kerchove 1878) recognized *Calyptronoma*. Hooker (in Bentham and Hooker 1883) transferred *Calyptronoma* to *Calyptrogyne* H. Wendl., an opinion echoed by Gomez Maza (1889). Drude (1889) reinstated *Calyptronoma*, but Beccari (1912) and Burret (1930) sank the species into *Calyptrogyne*. Bailey (1938) revived *Calyptronoma*, but six years later, it was again sunk into *Calyptrogyne* by León (1944). It was resurrected by Hawkes (1949) and Moore (1966), but sunk by Wessels Boer (1968), only to be reinstated again by Moore (1973).

The genus *Cocops* O. F. Cook, was proposed by Cook (1901) to accommodate vegetative specimens of a Puerto Rican palm, but once fertile material was known, *Cocops* was merged with *Calyptronoma*.

Current authorities (Uhl and Dransfield 1987) recognize *Geonoma*, *Calyptronoma*, and *Calyptrogyne* as distinct, and the characters given by Moore (1966) and Uhl and Dransfield (1987) seem adequate for recognizing these taxa at the generic level. Clearly, *Calyptronoma* is a monophyletic group; morhpological and anatomical characters distinguish it from *Calyptrogyne*. Whether the distinctive *Calyptronoma* clade is embedded within the genus *Calyptrogyne* is a question that must await further studies on generic relationships within the Geonomeae.

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The meaning of the name *Calyptronoma* was not given by Grisebach. Its roots are in the Greek *kalyptra*, a cap or lid (in reference to the corolla which falls off as a cap), and *nomos*, district or custom. More likely, it is a combined form of *kalyptra* and *Geonoma* ("colonist"), a genus with which it has obvious affinities. *Calyptronoma* is "the capped *Geonoma*."

The initial confusion regarding *Calyptronoma* species from the islands of the Greater Antilles is understandable, given fragmentary collections and incomplete floristic knowledge of the time. Grisebach (1864) initially believed that all the Antillean species of *Calyptronoma* were conspecific, as did Beccari (1912) and Burret (1930). Subsequently, nine taxa, variously treated as *Calyptronoma* or *Calyptrogyne*, were recognized by Wendland (in Kerchove 1878), Gomez Maza (1889), Cook (1901), Bailey (1938), León (1944), and Muñiz and Borhidi (1982). The most recent participant to wade into the fray was Lourteig (1989), who proposed a nomenclatural change to accommodate a name from *Geonoma* long regarded as confused and uncertain as to its application.

In the last revisionary treatment of the species (as *Calyptrogyne* subgenus *Calyptronoma*), Wessels Boer (1968) recognized three species, but in his key, he noted that "the material available was insufficient to reach any definite conclusions." He ended his discussion of these species by saying that "further study is needed in this subgenus."

Materials and Methods

The following treatment is based on herbarium holdings, plants in cultivation at Fairchild Tropical Garden, and observations made during the course of field work in the Greater Antilles.

For scanning electron microscopy (SEM), pollen was removed from herbarium specimens, sputter-coated with gold-palladium, and observed using an ISI Super IIIA SEM. Pollen terminology follows Harley (1990). Leaf material for SEM was fixed in FAA in the field and later transferred to glycerin-alcohol (Martens and Uhl 1980), dehydrated in ethanol, infiltrated with Hemo-De (Fisher Scientific, Pittsburg, PA), and air-dried. Samples were sputter-coated and observed as above.

Morphology

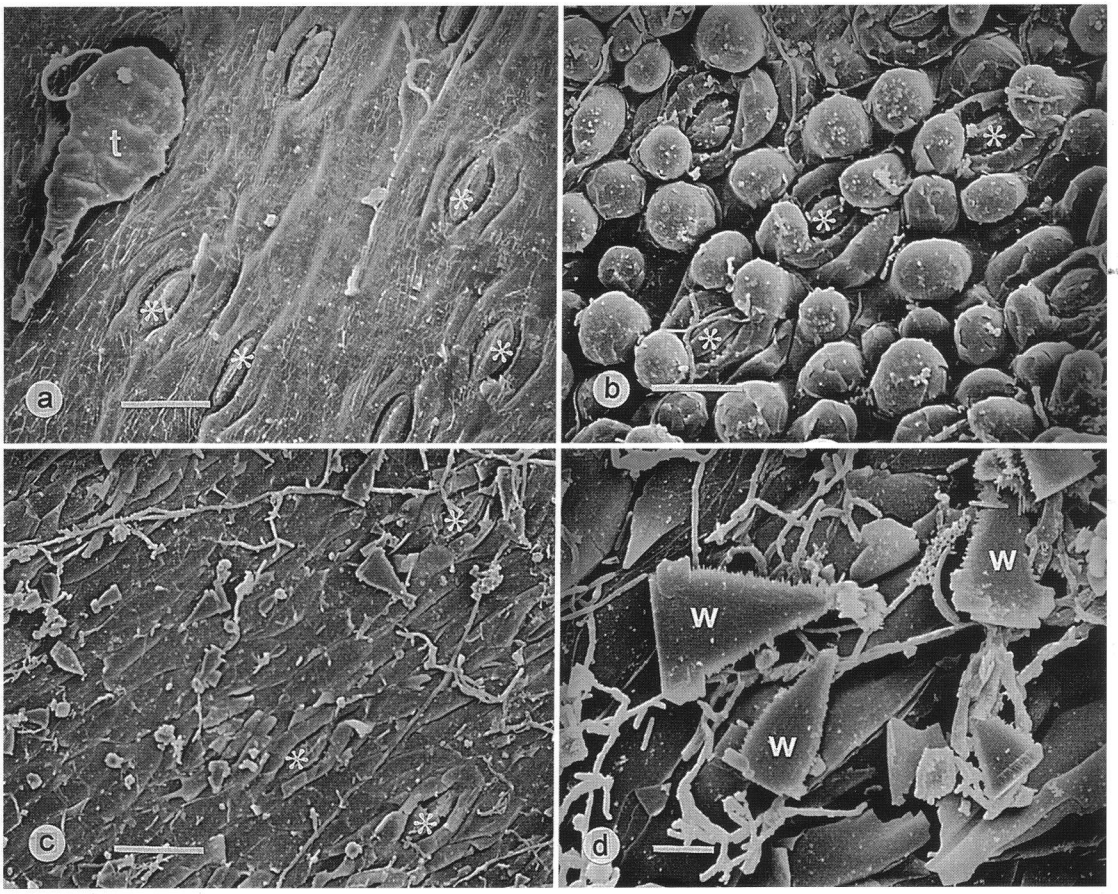
Stems and Leaves. Unlike most Geonomeae, which are understory palms (with the notable exception of *Welfia*), *Calyptronoma* is a genus of tall, robust, emergent species. The trunk is solitary, 15–30 cm in diameter. The original description of *Geonoma plumeriana* Mart. (=*C. plumeriana*) mentioned multiple trunks, but Lourteig (1989) attributed this error to seedlings growing at the base of a parent tree. The trunk bears prominent leaf scars and vertical fissures.

Leaf bases are not persistent, and no crownshaft is present. The leaf base is fibrous at its margins, and a short petiole is present. Leaves are uniformly divided into similarly-sized segments. The leaf segments of *Calyptronoma* are linear-lanceolate, with a single primary vein and several secondary veins. The larger veins bear chaffy scales on the abaxial side to varying degrees.

Because dried leaf segments often split and/or curl lengthwise, working with them is both challenging and frustrating. The splitting of leaf segments has led to the erroneous observation that some species have entire segment apices and others have bifid apices (León 1944, Muñiz and Borhidi 1982). The apices of all species are entire and acute.

The fine structure of the abaxial surface of the lamina exhibits variation that is taxonomically useful. The outer walls of the abaxial epidermal cells are strongly convex in *C. rivalis* (Fig. 1b), but in other species, they are flat (Fig. 1a,c). This characteristic is best observed in fresh material, under high magnification with obliquely incident light, or with an SEM, although with some practice, one can observe this characteristic even with only a hand lens. Multicellular trichomes are common on intercostal areas of the undersides of the leaf segments of *C. occidentalis*. They have also been observed in some specimens (juveniles?) of *C. plumeriana* (e.g., *Baker and Dimmock 4822*) but not in *C. rivalis*. These trichomes are scattered, sunken into the surface, relatively flat, and tapered on one side (Fig. 1a). They are very difficult to observe with the dissecting microscope and are often obscured by epiphyllous organisms and dust. Platy wax deposits were observed on *C. plumeriana* (Fig. 1c,d); however, the micromorphology of the deposits as observed (Fig. 1d) may be an artifact of the specimen preparation. Surface waxes, when recrystalized by solvents, may not assume their *in vivo* configuration (Jeffree et al. 1976).

Populations of *Calyptronoma* exhibit some variability in the color of their leaves, peduncular bract interior, and sepals. In some populations,



1. Scanning electron micrographs of abaxial surfaces of leaf segments of *Calyptronoma* (stomata are marked by asterisks). a. *C. occidentalis* (*Zona & Salzman 455*). Note multicellular trichome (t) in upper right. Scale = 25 μm. b. *C. rivalis* (*Salzman 253*). Scale = 25 μm. c. *C. plumeriana* (*Zona & Salzman 478*), note platy wax deposits. Scale = 25 μm. d. Platy wax deposits (w). Scale = 5 μm. Filamentous structures in c and d are fungal hyphae.

these structures are coppery red or even dark purplish red, rather than green or brown. The color is most obvious in the leaf rachis and petiole (Fig. 2). In the Dominican Republic, where *Calyptronoma* is known as "manaca," palms with reddish coloring are known as "manaca colorada." These color variants, however, do not warrant taxonomic tank. All species exhibit this coloration, and the variation is continuous.

Inflorescences. Inflorescences are borne singly in the axial of each leaf. They have three (very rarely, four) orders of branching. A prophyll is present, and a single peduncular bract attached to the base of the peduncle. The peduncular bract is enclosed by the prophyll at its base, but distally, it is free and expanded.

The axes of the inflorescence are covered with arachnoid pubescence when young but are glabrescent at maturity. Rachillae are borne in clusters on the proximal part of the rachis, but are borne singly in the distal portion. Proximal (basal) rachillae are longer than distal (terminal) rachillae. The number of rachillae borne in the lowermost clusters was believed to be taxonomically significant (Wessels Boer 1968); however, there is broad overlap among the species. In *C. occidentalis*, the tips of the rachillae may be sterile for a few centimeters; however, this character is not constant.

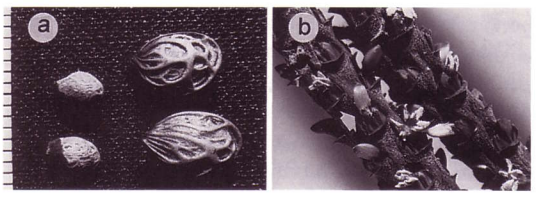
As with all Geonomeae, the flowers are borne in pits. Each pit is enclosed by a pit bract. The morphology of the pit bract is variable in *Calyptronoma*. In *C. occidentalis*, the pit bract is

2. Variation in leaf color (green morph not illustrated). a. *Calyptronoma plumeriana* (grown as *C. microcarpa*) dark purplish red form, at the Jardín Botánico Nacional, Cuba. b. *C. plumeriana*, coppery red form (*Zona & Salzman 478*).

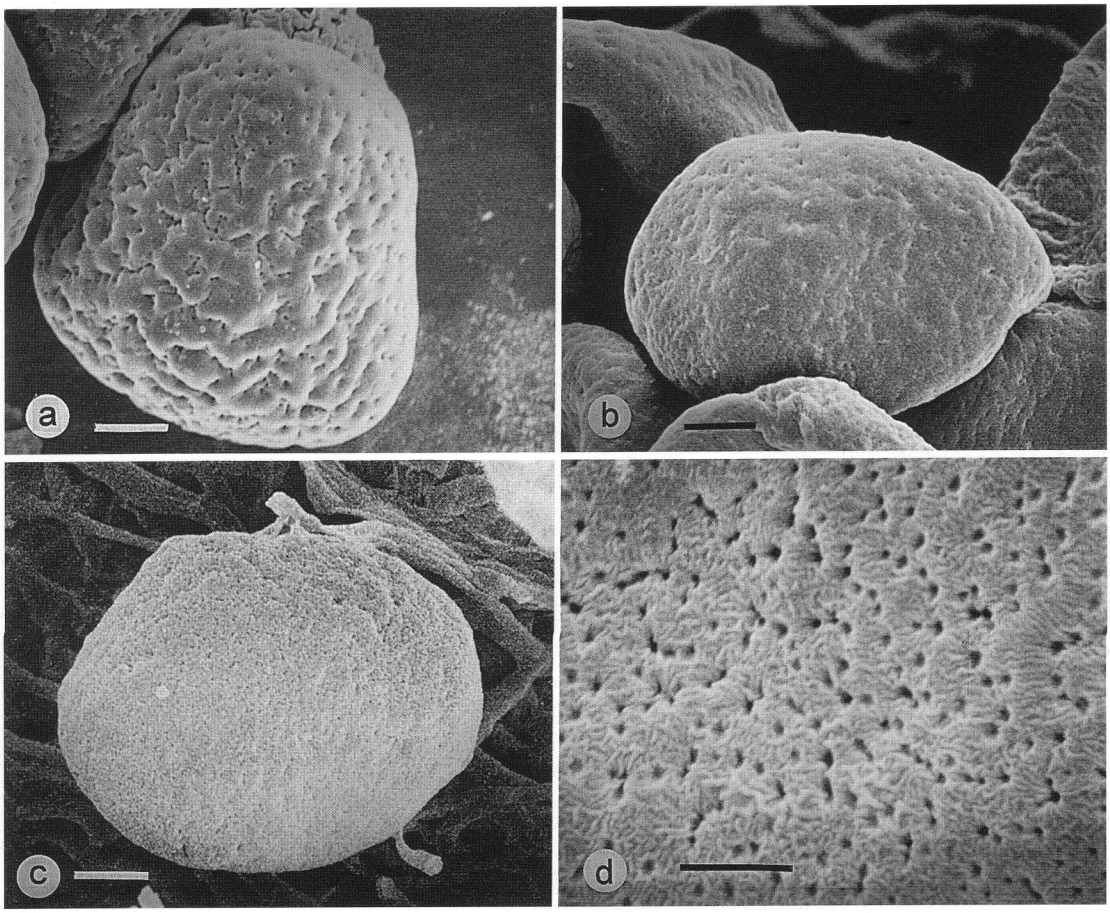
strongly reflexed, becoming perpendicular to the rachilla axis, in dried specimens. In contrast, the pit bracts of *C. plumeriana* and *C. rivalis* are recurved, often rolling back in dried specimens.

Flowers and Fruits. Flowers are arranged in triads of one pistillate flower flanked by two staminate flowers. Staminate flowers have three free sepals, each with a dark, pigmented keel. The dorsal sepal is generally smaller and narrower than the other two. There are three petals, which are partially connate and open by valvate lobes in *C. occidentalis* and *C. plumeriana*. In *C. rivalis* (Fig. 3b), they are completely connate and fall away as a cap by means of a circumscissile zone of dehiscence (e.g., *Henderson and Aubry 1185*). Calyptrate corollas in staminate flowers are not known anywhere else in the palm family. The stamens are six, connate into a fleshy, funnelform tube, with short free filaments at its apex. The androecium is exserted beyond the perianth, and the filaments are reflexed at anthesis. The anthers are sagittate and dorsifixed near the base but not versatile. The connective is pigmented. The pistillode is minute.

Pollen of the geonomoid palms was examined using light microscopy by Punt and Wessels Boer (1966), who found that the pollen of *C. occidentalis* differed from the pollen of *C. clementis* (=*C.*



3. a. Endocarps of *Calyptronoma plumeriana* (*Jack 7849*), right, and *C. rivalis* (*Sanders et al. 1711* p.p.), left. Scale divisions = 1 mm. b. Staminate flowers of *Calyptronoma rivalis* (*Henderson & Aubry 1185*) showing calyptrate corolla (arrow). Scale as in a.



4. Scanning electron micrographs of *Calyptronoma* pollen. a. *C. occidentalis* (*Salzman & Zona 152*). Scale = 5 μm. b. *C. rivalis* (*Liogier 28727*). Scale = 5 μm. c. *C. plumeriana* (*León 13169*). Scale = 5 μm. d. *C. plumeriana* (*León et al. 10066*). Scale = 2.5 μm.

plumeriana) and *C. intermedia* (=*C. plumeriana*). Pollen grains are monosulcate (rarely trichotomosulcate), tectate (Harley 1990) and elliptical in outline. Examination by SEM revealed consistent differences in the tectum surface patterning. The tectum surface of *C. occidentalis* is perforate-insulate (Fig. 4a); while that of *C. rivalis* is densely and finely perforate (Fig. 4b) and *C. plumeriana* is densely and finely perforate (Fig. 4c) with micro-striations (Fig. 4d). These differences are taxonomically significant.

Pistillate flowers have sepals that are essentially identical to those of the staminate flowers. The petals are united throughout their length and open by means of a circumscissile zone of dehiscence. The staminode is tubular and bears six minute lobes. At anthesis, the distal portion of the staminode is inflated and extends beyond the perianth. In older flowers, the distal portion of the staminode is absent, and only the basal tubular portion remains. It appears as if the staminode also possesses a circumscissile zone of dehiscence. The gynoecium is composed of three fused carpels, with a long, slender style and a three-lobed stigma. One carpel is conspicuously smaller than the other two and contains a smaller, probably sterile, ovule.

The fruit of *Calyptronoma* is a drupe, with clearly differentiated epicarp, mesocarp, and endocarp. Fruits are obovoid, somewhat dorsiventrally compressed, with basal stigmatic remains. The epicarp is smooth, changing from green to red to purple-black as the fruit ripens. The mesocarp is juicy. The endocarp is fragile, free from the seed, and net-like in *C. occidentalis* and *C.*

plumeriana (Fig. 3a, right). In *C. rivalis*, it is obscurely net-like and strongly adherent to the seed (Fig. 3a, left).

The seed is spheroid to ellipsoid, somewhat dorsiventrally compressed, with a smooth, brown-black testa and an encircling unbranched raphe and small basal hilum. The embryo is more or less basal, and the endosperm is homogeneous. There is no taxonomic significance to slight variation in embryo position, as was believed by Muñiz and Borhidi (1982). Germination is adjacent-ligular, and the eophyll is bifid.

Taxonomic Treatment

CALYPTRONOMA Grisebach, Fl. Brit. West Ind. Isl. 518. 1864. *Calyptrogyne* H. Wendl. subgen. *Calyptronoma* (Griseb.) Wessels Boer, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Reeks 58: 63. 1968. Type: *Calyptronoma swartzii* Griseb. [=*C. occidentalis* (Sw.) H. E. Moore].

Cocops O. F. Cook, Bull. Torrey Bot. Club 28: 568. 1901. Type: *Cocops rivalis* O. F. Cook [=*Calyptronoma rivalis* (O. F. Cook) L. H. Bailey].

Solitary, unarmed, pleonanthic, monoecious palms. Stem smooth, gray-brown, fissured, with prominent leaf scars. Leaves spirally arranged, pinnately divided; leafbase clasping, its margins fibrous; crownshaft absent; petiole less than 50 cm long; segments linear-lanceolate, reduplicately plicate, borne in 1 plane; apex acute; chaffy scales borne on the abaxial surface of major veins. Inflorescence interfoliar, solitary in the axil of each leaf, with 3 (rarely, 4) orders of branching; prophyll bicarinate, obscured by subtending leaf base; peduncular bract erect, coriaceous, splitting longitudinally on the abaxial side, attached near the base of the peduncle; peduncle elliptical in cross-section, bearing several vestigial bracts; rachillae borne in clusters on short stalks basally, solitary distally, each subtended by a short bract and bearing arachnoid tomentum when young, becoming glabrescent when mature. Flowers borne in triads, sunken into pits closed by pit bracts. Staminate flower sessile; sepals 3, unequal, imbricate, linear-elliptical and with a conspicuous, pigmented keel; margins denticulate, hyaline; petals 3, basally adnate to the staminal tube and connate for ca. ¼–½ their length or entirely connate, distally valvate or calyptrate, thin and membranous, white drying brown; staminal tube funnelform, fleshy, white, bearing 6 short, narrowly triangular filaments at its apex; anthers 6, sagittate, with darkly pigmented connective, dehiscence introrse; pistillode minute. Pistillate flower sessile; sepals 3, imbricate, linear-elliptical with a conspicuous, pigmented keel; margins denticulate, hyaline; petals 3, membranous, connate, opening by a circumscissile zone of dehiscence; staminode membranous, tubular-cupulate, with distal end inflated and 6, minute marginal lobes; gynoecium composed of 3 fused carpels, superior; stigmatic lobes 3; style slender, apically attached to the 3-lobed ovary; ovules anatropous. Fruit a drupe, spheroid to obovoid, somewhat dorsiventrally compressed, with a smooth epicarp, fleshy mesocarp, and a crustaceous endocarp bearing a raised branched vascular trace. Seed spheroid, somewhat dorsiventrally compressed, brown, shiny, bearing a conspicuous, encircling, unbranched raphe and an obscure hilum; embryo basal to suprabasal, minute; endosperm homogeneous. Eophyll bifid.

Key to the Species of Calyptronoma

1. Longest rachillae usually greater than 25 cm long; pit bracts reflexed and divaricating in dried specimens; tectum perforate-insulate (Jamaica) .... 1. *C. occidentalis*.
1. Longest rachillae usually 25 cm or less long; pit bracts recurved or rolled back in dried specimens; tectum finely perforate 2
   2. Outer cell walls of the abaxial leaf epidermis smooth; petals of staminate flowers partially connate, opening by valvate lobes; endocarp mostly free from the seed; endocarp fibers distinct and net-like (Cuba, Hispaniola) .....2. *C. plumeriana*.
   2. Outer cell walls of the abaxial leaf epidermis convex; petals of staminate flower entirely connate, opening by circumscissile zone of dehiscence; endocarp adherent to the seed; endocarp fibers indistinct (Hispaniola, Puerto Rico) ..... 3. *C. rivalis*.

1. Calyptronoma occidentalis (Sw.) H. E. Moore, Gentes Herb. 9: 252. 1963. *Elaeis occidentalis* Swartz, Fl. India Occ. 1: 619. 1979. *Calyptrogyne occidentalis* (Sw.) Gomez Maza, Noc. Bot. Sist. 50: 1893. *Calyptronoma swartzii* Gribseb. & H. Wendl. ex Griseb., Flora Brit. W. Ind. 518. 1864. (as *C. schwartzii* in H. Wendl., Kerch. Palm. 238. 1878.) *Geonoma (Calyptronoma) swartzii* (Griseb.) Griseb. & H. Wendl. in Griseb., Cat. pl. Cub. 222. 1866. *Calyptrogyne swartzii* (Griseb.) Becc., Pomona Coll. J. Econ. Bot. 2: 356. 1912. Neotype: Jamaica, St. Ann, vicinity

of Hollymount, Mt. Diablo, 750 m, *Maxon 2327* (neotype, designated here, US!)

Calyptrogyne victorinii León, Contrib. Ocas. Museo Hist. Nat. Col. "La Salle" 3: 4. 1944. Type: Jamaica, from the mountains of the interior, May 1941, *León & Marie Victorín 20067* (holotype: HAC!; isotypes: GH!, NY!)

Stem to 15 m tall, 8.8–30 cm in diam. Leaf 2.8–4.3 m long, with ca. 60 segments; segments 52–95 cm long, 2.1–4.5 cm wide, bearing inconspicuous multicellular trichomes on the abaxial intercostal surface. Prophyll 35.5–63 cm long, 5–8(–13) cm wide. Peduncle 39–98.5 cm long and 1–2.8 cm wide; rachillae (21–)26–35.5 cm long, 4.3–6.8 mm in diam, with (6–)7(–8) rows of pits; proximal rachillae borne in clusters of up to 3–4(–6) on stalks 0.7–4.1 cm long, 0.5–0.9 cm wide, clustered rachillae borne for ca. ½ the length of the rachis; pits 1.7–4.1 mm long, 1.8–3.6 mm wide, longitudinal distance between pits (lip to lip) 4.2–9.8 mm. Staminate flowers 5–5.9 mm long; sepals 3.3–4.4 mm long, 0.9–1.1 mm wide; petals 3.5–5.7 mm long, 1.1–2.2 mm wide; staminal tube 3–5.2 m, anthers 1.1–1.6 mm long. Pistallate flowers 4.9–6.5 mm long; sepals 3.4–4 mm long, 1–1.3 mm wide; corolla not seen; staminode not seen; gynoecium ca. 6.7 mm long, style ca. 5.1 mm long; ovary 1–1.2 mm long. Fruit 9.8–15.8 mm long, 5.9–8.5 mm in diam.; endocarp free from seed, strongly net-like; seed (5.1–)5.8–8.6 mm long, (3.9–)4.4–5.8 mm diam.

The type of *C. swartzii* was given by Grisebach (1864, 1866) as *Wright 1466*; however, Swartz's *Elaeis occidentalis* of specifically cited as a synonym. In the 1864 publication of the genus name, Grisebach wrote that this genus was "constructed upon the *Elaeis occidentalis* Sw." Thus, the name *C. swartzii* is nomenclaturally superfluous, and the type of *C. swartzii* must be the type of *E. occidentalis*. No Swartz collections of *E. occidentalis* have been found at BM, G, LD, S, S-Linn, or SBT (T. Zanoni, pers. comm.), hence, a neotype is designated here.

Although three collections were cited by León (1944) in the publication of *Calyptrogyne victorinii*, I consider the specimen annotated by León to be the holotype.

This species is characterized by having the longest rachillae in the genus. When dry, the pit bracts are divaricating. The pollen is also distinctive. This species is tolerant of a broad range of environmental conditions. In its native Jamaica, it grows in swamps near sea level, in upland marshes (Mason River Field Station), and along mountain streams at more than 700 m above sea level. It is also the species most amenable to cultivation in southern Florida.

Distribution: Endemic to wet habitats in Jamaica (Fig. 5).

Local Name and Uses: Long thatch. Leaves are used for thatch, and stems are used for construction.

Phenology: This species flowers in June through December; fruits have been collected throughout the year, with a peak in early spring.

Additional Specimens Examined: **JAMAICA:** CLARENDON. Chapelton to Bull Head, below summit of Bull Head, *Underwood 3415* (NY); Mason River Field Station, 720 m, near Kellits, *Gentry & Kapos 28308* (MO), 650 m, *Zona & Salzman 452* (FLAS). PORTLAND. Upper Swift River, near Mossman's Peak, Blue Mountains, 850 m, *Bretting J-255* (NY); Stoney River base camp, 380 m, *Morley & Whitefoord 693* (BM, MO, US); Nanny Town site, 640 m, *Morley & Whitefoord 775* (A, BM, MO, US); 0.8 km SSW of Lancaster House, 975–1000 m, *Proctor 34636* (MO). ST. ANN. Hollymount, *Bailey 712* (BH); Albion, road to Alexandra, 450 m, *Read 1673* (BH, BM, US). ST. ELIZABETH. Morass near Middle Quarters, *Bailey 15049* (BH), *Bailey 213* (BH), *Britton 1631* (NY); 7 km E of Black River along road to Santa Cruz, 10 m, *Zona & Salzman 455* (FLAS, RSA); near Black River, *Harris 9842* (BM, NY, US). WESTMORLAND. Between Newmarket and Darlston, *Britton 1462* (NY); vicinity of Negril, *Britton & Hollick 2110* (NY, HAC), *Salzman & Zona 152* (FLAS). ST. THOMAS. Corn Puss Gap trail, 460 m, *Read 1693* (S, US); Cuna Cuna Pass, *Fredholm 3254* (NY, US), 610–820 m, *Maxon 1759* (US). TRELAWNY. Tyre, *Britton 537* (NY, US).

2. Calyptronoma plumeriana (Martius) Lourteig, Phytologia 65: 484. 1989. *Geonoma? plumeriana* Martius, Palm. Orbig. 34. 1843. Type: Plumier's Catal. Gen. Tab. 1 habit excl. details and MSS 7, icones 7, 8, 9, 10.

Calyptronoma dulcis (Wright ex Griseb.) L. H. Bailey, Gentes Herb. 4: 168. 1938. *Geonoma dulcis* Wright ex Griseb., Cat. Pl. Cub. 222. 1866. *Calyptrogyne dulcis* (Wright ex Griseb.) Gomez Maza, Dicc. Bot. 72. 1889. Type: Cuba,

1865, *Wright 265* (holotype: GOET!; isotypes: GH!).

Calyptronoma intermedia (Griseb. & H. Wendl.) H. Wendl. in Kerch. Palm. 238. 1878. *Geonoma intermedia* Griseb. & H. Wendl., Sauville Fl. Cub. 153. 1873. *Calyptrogyne intermedia* (Griseb. & H. Wendl.) Gomez Maza, Noc. Bot. Sist. 50. 1893. Type: Cuba, Pinar del Río, banks of Taco Taco River, *Wright 3972* (holotype: GOET!; isotypes: A!, GA!, NY!, US!)

Calyptronoma clementis (León) A. D. Hawkes ssp. *clementis*, Phytologia 3: 145. 1949. *Calyptrogyne clementis* León, Conrib. Ocasion. Mus. Hist. Nat. Col. "de la Salle" 3: 11. 1944. Type: Cuba, Oriente [Guantánamo], Loma San Juan de Buena Vista, S of Hongolosongo, Sierra Maestra, 900 m alt., Nov. 1940, *León 17964* (holotype: HAC!; isotype: GH!)

Calyptronoma microcarpa (León) A. D. Hawkes, Phytologia 3: 145. 1949. *Calyptrogyne microcarpa* León, Contrib. Ocasion. Mus. Hist. Nat. Col. "de la Salle" 3: 10. 1944. Type: Cuba, Las Villas [Sanctis Spiritus], Topes de Collantes, Trinidad Mts., 800 m, Nov. 1938, *León 18574* (lectotype: HAC!; isolectotypes: GH!, HAC!).

Calyptronoma clementis ssp. *orientensis* Muñiz & Borhidi, Acta Bot. Acad. Sci. Hung. 28: 342. 1982. Type: Cuba, Oriente [Holguín?], Monte Centeno, Moa, 12 Nov 1945, *Acuña 13019* (holotype: HAC!).

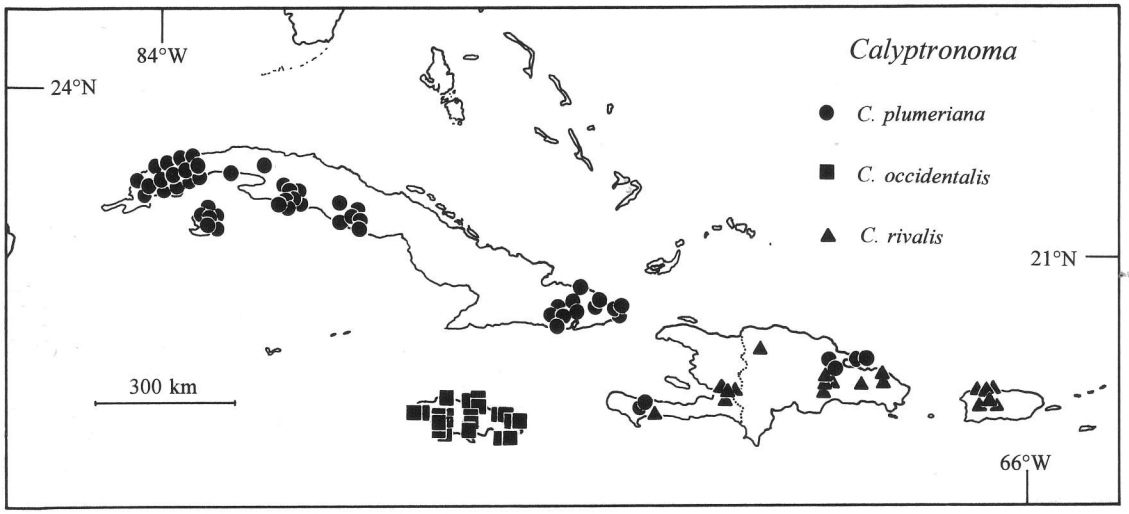
Stem 10 m or more tall, 15–20.3 cm in diam. Leaf 1.9–4.6 m long, with 100–160 segments; segments 44.5–92 cm long, 2.2–6.8 cm wide, sometimes bearing inconspicuous multicellular trichomes on the abaxial intercostal surface. Prophyll 27.5–41 cm long, 6–9.5 cm wide. Peduncle 44–78 cm long and 1.1–2.6 cm wide; rachillae 12.5–24(–26) cm long, 3–6.7 mm in diam., with (5–)6(–7) rows of pits; proximal rachillae borne in clusters of up to 4–7(–10) on stalks 0.9–5 cm long, 0.4–1.2 cm wide, clustered rachillae borne for ⅔ or more the length of the rachis; pits 2.4–4.7 mm long, 1.8–3.3 mm wide, longitudinal distance between pits (lip to lip) 5.4–12 mm. Staminate flowers 5.1–8.5 mm long; sepals (3.6–4.7 mm long, 0.8–1.7 mm wide; petals 4.7–6.2 mm long, 1.2–1.6 mm wide; staminal tube 3.4–7 mm long, 1.3–1.7 mm wide; filaments 1.1–1.5 mm long; anthers 1–2.3 mm long. Pistillate flowers 3.4–6.7 mm long; sepals 3.2–4.9 mm long, 0.7–1.5 mm wide; petals 3.2–5.4 mm long, ca. 1.2 mm wide; staminode 7.5–7.7 mm long, 3.1–3.4 mm wide; gynoecium 4.8–5.1 mm long, style ca. 5.3 mm long; ovary 0.7–0.8 mm long. Fruit 6.8–12.2 mm long, 4.8–7.8 mm in diam.; endocarp free from seed, strongly net-like; seed 3.8–6 mm long, 2.8–4.8 mm diam.

Although I take no pleasure from synonymizing the well known name *C. dulcis*, the change is necessary in light of Lourtieg's lectotypification and circumscription of *Geonoma plumeriana*. According to Lourteig, *G. plumeriana* can be referred to a species of *Calyptronoma* from Hispaniola, but it is now clear that two taxa on *Calyptronoma* are present on that island. The question then becomes: To which taxon does *G. plumeriana* apply?

The two Hispaniolan taxa are readily distinguished by fruit and seed size. The original description of *G. plumeriana* noted that its fruits were "the size of cherries" ("baccis cerasi magnitudine"). This characterization, although vague and inexact, more likely refers to the taxon long known as *C. dulcis* (fruits 4.8–7.8 mm in diameter). The Hispaniolan taxon with smaller fruit (3.6–4.6 mm in diameter) is *C. rivalis*.

When Grisebach described *G. dulcis*, the type was designated as "Wr. a. 1865." Subsequently, "Wright no. 1865" was designated as a type (Bailey 1938; Glassman 1972), but this is in error. As pointed out by León (1944), "1865" is the date of the collection not the collection number. The specimen corresponding to the year 1865 is *Wright 265*, and this is taken to be the type. The material at GOET, presumably seen by Grisebach, is the holotype. In the original description of *Calyptrogyne microcarpa*, León designated two syntypes: *León 18574* with fruits and *León 18449* with flowers. As the epithet describes the fruit size, I have selected *León 18574* as the lectotype.

In the original description of *C. clementis*, León cited a previously published name, *Calyptrogyne swartzii*, as used by Beccari (1912) and Grisebach (1866), excluding the synonyms cited by those authors and implicitly excluding the type of *C. swartzii* (see Art. 63.1 and 2 of the ICBN). León clearly gave these citations as misapplications of the name *C. swartzii*, which he knew to be a synonym of *Calyptrogyne occidentalis* (León 1944, p. 3). He in no way proposed *C. clementis* as a new name for the palm that was called *C. swartzii*. *Calyptrogyne clementis* is therefore interpreted as a new species (as León intended), not as a nomenclatural synonym of *C. occidentalis*.



5. Distribution of *Calyptronoma* in the Greater Antilles.

A useful character for distinguishing the two taxa of *Calyptronoma* in Hispaniola is the shape of the outer walls of the cells of the abaxial epidermis of the leaf. The outer walls of the abaxial epidermal cells of *C. rivalis* are strongly convex; while those of *C. plumeriana* (and *C. occidentalis* of Jamaica) are smooth (Fig. 1). This character is extremely valuable for identifying sterile, mature specimens; however, its usefulness with seedlings has not be tested.

Distribution: Native to stream banks and arroyos in the hills and mountains of Cuba and Hispaniola (Fig. 5).

Local Names and Uses: Flor de confite, manaca, manaca colorada, manacla, palma de arroyo, palma manaca (Cuba, Dominican Republic); palm a vin (Haiti). "Palma justa," the local name for *Prestoea montana* (Graham) Nicholson in Cuba, has been misapplied (León 1944). Leaves are used for thatch. The flowers and fruits are said to have a sweet flavor, and the terminal bud ("cabbage") is edible (Roig y Mesa 1928; Alain 1961).

Phenology: Records indicate that this species flowers from April to November in Cuba. Fruits have been collected throughout the year in Cuba. Available data from Hispaniola suggest that this species flowers in July and fruits in December.

Additional Specimens Examined: **CUBA.** CIENFUEGOS. Sierra de San Juan, SE of Cumanayagua, 300–400 m, *Hodge & Howard 4506* (A); San Blas, *Bailey 12395* (BH), 180–240 m, *Jack 6973* (A, US), 240 m, *Rehder 1243* (A), *Jack 7084* (A, US); La Sierra, 150–240 m, *Jack 7580* (A, S, US), *Jack 7849* (A, BH, NY, S, US), 180–240 m, *Rowe 7585* (A, BH). GUANTANAMO. Monte Verde, N of Guantánamo, *Wright 1466* (FI, GH, GOET, MO, NY); Baracoa, *Horn 3050* (FI, NY, US); Yateras, La Prenda, *Hioram 4754* (GH, HAC); Yateras, 500 m, *Maxon 4464* (US). HOLGUIN. Sierra de Cristal, Mayarí, banks of Río Lebisa, *Alain et al. 5720* (GH, HAC); Sierra de Nipe, La Plancha, *León & Alain 17999* (GH, HAC, NY, US); Sierra de Nipe, Río Piloto, *Ekman 9682* (S), *Ekman 2109* (S), Monte Centeno, Moa, *Acuña 13019* (HAC). ISLA DE LA JUVENTUD (ISLA DE PINOS). Vicinity of Santa Barbara, *Britton et al. 14761* (GH, NY, US); near Nueva Gerona, *Curtiss 485* (A, GH, HAC, NO, NY, US), *León 17463* (GH, HAC), *León & Marie Victorín 18785* (GH, HAC); San Francisco de las Piedras, *León (& Seifriz) 17531* (GH, NAC, US); near San Juan, *León & Marie Victorín 18891* (GH, HAC, US); Arroyo del Hatillo, *León 17899* (HAC). LA HABANA. Batabanó, *León 13619* (HAC). MATANZAS. Zarabanda, *León & Marie Victorín 19549* (GH, HAC, US). PINAR DEL RIO. Consolación del Sur, *Bailey 324* (BH), *León & Alain 19379* (GH, HAD, US); 4 km W of Consolación del Sur, *Dahlgren 22823* (HAC); vicinity of Herradura, *Britton 6482* (NY), *van Herman 875* (FI, HAC), *van Herman 745* (HAC); Sierra de Cabra, *Britton et al. 9818* (NY); Taco Taco River valley, *León 16531* (BH); Santa Cruz de los Pinos, *León 16630* (BH, GH, HAC, US); Pan de Azúcar, Viñales, *León 17900* (GH, HAC), *León 19538* (GH, HAC, US); Viñales, *León 19298*

(GH, HAC, US); N of San Diego de los Baños, *León 4379* (BH, HAC, NY), *Palmer & Riley 529* (US); N of Pinar del Río, *Shafer 317* (GH, HAC, MO, NY); Paso Real, *van Herman 767* (NY); San Luis, *Roig 3580* (HAC), *Roig 2462* (HAC); El Roble, mpio. Bahia Honda, *Zona et al. 631* (FTG, HAJB); near Mameyal, *Zona et al. 624* (FTG, HAJB); between San Andres and La Palma, near Loma del Americano, *Zona et al. 630* (FTG, HAJB). SANCTI SPIRITUS. Trinidad Mountains, Topes de Collantes, 800 m, *León 18574* (GH, NY, US), *León 18449* (HAC), *León 19072* (HAC); Buenos Aires, Trinidad Mountains, 762–1,066 m, *Jack 7018* (AS, US); Banao Mountains, *León 19380* (GH, HAC, US), *León & Roca 7869* (NY). SANTIAGO DE CUBA. SE of Paso Estancia, *Shafer 1748* (A, NY); Piedra Gorda to Río Seboruco, *Shafer 3654* (NY); near Santiago, 550 m, *Taylor 412* (NY); vicinity of Loma del Gato, Cobre Range, *León et al. 10066* (NY). VILLA CLARA. Trinidad Mountains, Herradura, 320 m, *Britton & Britton 5018* (NY, US).

DOMINICAN REPUBLIC. DUARTE. S side of Quito Espuela above Los Brasitos, Arroyo Guaconejo, 410 m, *Zona & Salzman 478* (FLAS, JBSD). EL SEIBO. Sabana de la Mar, El Limpio, ca. 300 m, *Ekman H15685* (S, US). SAMANA. Vicinity of Laguna, Pilón de Azúcar, 100-500 m, *Abbott 406* (US). SAN CRISTOBAL. Monte Plata, *Jiménez s.n.* (BH).

HAITI. GRAND 'ANSE. Massif de la Hotte, along road between Jérémie and Les Cayes, 4.5 km S of Riviere Glace, 810 m, *Judd & Skean 8669* (FLAS). SUD. Road from Camp Perrin to Beaumont, at Tete Morne Gefferd, *Henderson & Aubry 1179* (NY).

3. Calyptronoma rivalis (O. F. Cook) L. H. Bailey, Gentes Herb. 4: 171. 1938. *Cocops rivalis* O. F. Cook, Bull. Torrey Bot. Club 28: 568. 1901. *Calyptrogyne rivalis* (O. F. Cook) León, Contrib. Ocasion. Mus. Hist. Nat. Col. "de la Salle" 3: 12. 1944. Type: Puerto Rico, road from Lares to San Sebastian, 18 Jun 1901, *Underwood & Griggs 89* (lectotype: US!).

Calyptronoma quisqueyana L. H. Bailey, Gentes Herb. 4: 169. 1938. *Calyptrogyne quisqueyana* (Bailey) León, Contrib. Ocasion. Mus. Hist. Nat. Col. "de la Salle" 3: 12. 1944. Type: Haiti, Ouest, Morne Saut d'Eau, Chaine des Matheux, beyond and above Ville Bonheur, 29 Mar 1937, *Bailey 229* (lectotype: BH!).

Stem to 15 m tall. Leaf 3.1–5 m long; segments 54–107 cm long, 3–6 cm wide, glabrous on the abaxial intercostal surface. Prophyll 35–61 cm long, 6–10 cm wide; penduncular bract 66–77 cm long, ca. 8.5 cm wide. Peduncle 39–77 cm long and 1.3–3 cm wide; rachillae 17–23(–26) cm long, 3.7–5.4 mm in diam., with 6(–7) rows of pits; proximal rachillae borne in clusters of up to 3–5(–7) on stalks 1.4–5.2 cm long, 0.6–0.9 cm wide, clustered rachillae borne for ½–⅔ the length of the rachis; pits 2.4–3.5 mm long, 1.7–2.9 mm wide, longitudinal distance between pits (lip to lip) 5.3–10.5 mm. Staminate flowers 4.8–5.1 mm long; sepals 3–3.6 mm long, 1.1–1.2 mm wide; petals completely connate; staminal tube 4.1–4.5 mm long, 1.5–1.6 mm wide; filaments 0.8–1.2 mm long; anthers 1.6–1.7 mm long. Pistillate flowers not seen. Fruit 4.6–7 mm long, 3.6–4.6 mm in diam.; endocarp adherent from seed, obscurely net-like; seed 3.8–4.9 mm long, 2.9–3.5 mm diam.

Cook designated no type for his *Cocops rivalis*, but the specimen at US collected by Underwood and Griggs the same year in which the name was published is annotated as the type by R. Read. I concur with his choice of lectotype. The type named by Wessels Boer (1968), *Cook s.n.*, does not exist.

Bailey designated two syntypes in his original description of *C. quisqueyana*. *Bailey 229* is a fertile collection from a mature palm; whereas, *Bailey 229a* is a vegetative collection from a nearby palm that was specifically collected to supplement *229* ("Collected to show leaf tip"). The more complete collection, *Bailey 229*, is therefore taken as the lectotype.

The existence of *C. rivalis* outside of Puerto Rico has some bearing on its conservation status. It has been listed as Threatened by the U.S. Fish and Wildlike Service since February, 1990. In Puerto Rico, this palm is confined to a small area, the type locality, between Lares and San Sebastián. Additional populations are said to exist in nearby watersheds (e.g., the Tanama River gorge [Little and Woodbury 1980]), but I have seen no specimens. Its continued protection in Puerto Rico is recommended. In Hispaniola, this species is found over a wide area from Haiti to eastern Dominican Republic. It does not appear threatened in Hispaniola.

On Hispaniola, where this species co-occurs with *C. plumeriana*, the two species do not appear to flower at the same time. Data from herbarium specimens indicate that Hispaniolan populations are reproductively isolated.

The calyptrate corollas of the staminate flowers, small fruits with adherent endocarps, and convex outer walls of the abaxial epidermal cells (see above under *C. plumeriana*) distinguish *C. rivalis* from all other species.

Distribution: Native to stream banks and arroyos in the hills and mountains of Hispaniola and western Puerto Rico (Fig. 5).

Local Names and Uses: Manaca, manacla, palma manaca, palmilla (Puerto Rico, Dominican Republic); palm a vin (Haiti). Leaves are used for thatch.

Phenology: Data from Puerto Rico are scarce but indicate that this species flowers in April. Fruit collections are known from May and August. In Hispaniola, flowers have been collected in October, December through February, and April. Fruits have been encountered in April, August, and November.

Additional Specimens Examined: **DOMINICAN REPUBLIC.** EL SEIBO. Guamira, between Hato Mayor and Sabana de la Mar, *Jiménez 4111* (US); 15 klm al N de Hato Mayor, 400 m, *Liogier & Liogier 27738* (NY, UPR); 1.8 km S of El Valle on road to Hato Mayor, Arroyo Manacla, 135 m, *Zona & Salzman 479* (FLAS, JBSD, RSA). SAN CRISTOBAL. 15–18 km NE of Bayaguana along Río Comatillo, 50-100 m, *Sanders et al. 1711* (pro parte) (BH, FTG); 8.5 km from Comatillo on road to Cruce de Pilacón at Arroyo Pilacón, 160 m, *Zanoni & Mejía 16410* (JBSD, MO); along Río Comatillo, Bayaguana, 150 m, *Liogier & Liogier 21256* (NY); *Liogier et al. 27564* (NY). SANTIAGO RODRIGUEZ. Monción, Cordillera Central, al sur de La Meseta, arroyo Manguanita, 485 m, *García et al. 2630* (NY).

HAITI. OUEST. Near Saut d'Eau, ca. 300 m below waterfall, *Henderson & Aubry 1185* (NY); Masif des Matheux, Mirebalais, Morne Saut d'Eau, ca. 400 m, *Ekman H5498* (NY, S, US); Morne Saut d'Eau, above Ville Bonheur, *Bailey 229a* (BH). SUD. Morne de la Hotte, *Ekman H167* (S).

PUERTO RICO. Between San Sebastián and Lares, *Bailey 45* (BH, MO), *Britton & Hess* (FI, GH, MO, NY, US), *Liogier & Vivaldi 28727* (NY, UPR, US); valley about 4 km E of San Sebastián, *Horn s.n.* (BH); near Camuy, *Sintenis 6061* (US).

CULTIVATED. PUERTO RICO. Río Piedras, University of Puerto Rico Botanic Garden, *Salzman 253* (spirit collection) (FTG).

Doubtful and Excluded Names

Calyptronoma kalbreyeri (Burret) L. H. Bailey, Gentes Herb. 4: 166. 1938. =*Pholidostachys synanthera* (Mart.) H. E. Moore.

Calyptronoma robusta Trail, J. Bot. 14: 330. 1876.=*Pholidostachys synanthera* (Mart.) H. E. Moore.

Calyptronoma synanthera (Mart.) L. H. Bailey, Gentes Herb. 4: 166. 1938. =*Pholidostachys synanthera* (Mart.) H. E. Moore.

Calyptronoma weberbaueri (Burret) L. H. Bailey, Gentes Herb. 4: 166. 1938. =*Pholidostachys synanthera* (Mart.) H. E. Moore.

Geonoma (Calyptronoma) swartzii Griseb. & H. Wendl. in Griseb., Mem. Amer. Acad. ser. 8(2): 531. 1863. nomen nudum, but later validated in Grisebach (1866).

Palma pinao Aublet, Hist. Plant. Guiane Franç. 2: 974. 1775. Lourteig (1989) cited this name as a synonym for *Calyptronoma plumeriana*, because Aublet cited Plumier's Catalog. It must be noted however, that Aublet's taxon, "Palma pinao dactylifera, palustris," is a polynomial given under the genus heading of *Phoenix*. It also predates the name for which Lourteig said it was a synonym. Fortunately, Aublet's polynomial is invalid under the code and need not be given further consideration.

Acknowledgments

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The Flowers and Unusual Inflorescences of Leopoldinia

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Carl F. P. von Martius described the genus *Leopoldinia* in 1824 based on material collected during his travels in Brazil in 1817–1820. Martius dedicated it to Josefa Carolina Leopoldina, archduchess of Austria and wife of Don Pedro I, then Emperor of Brazil. The genus belongs to the subfamily Arecoideae, tribe Areceae, and is the sole member of subtribe Leopoldiniinae (Dransfield and Uhl 1986). It is restricted to the Rio Negro and upper Orinoco region. The genus is interesting because its phytogeography and phylogeny are poorly understood (Henderson 1995), and evolutionarily important because of its triovulate, apparently not specialized gynoecium (Uhl, personal communication 1995).

The species of *Leopoldinia* are medium-sized palms, with pinnate leaves, small flowers, and more or less laterally compressed drupaceous fruits. Their most distinctive and conspicuous features are, however, "the netted fibers which spring from the margins of the sheathing petioles, and cover the stem half-way down or sometimes even to its base" (Wallace 1853).

Martius described two species in his 1824 publication, *Leopoldinia insignis* and *L. pulchra*. Moore (1963) designated *L. pulchra* as the lectotype of the genus, arguing that Martius had described it in greater detail than *L. insignis*, including line drawings of staminate and pistillate flowers. Martius, however, illustrated flowers that were not fully opened, and he provided no information on the color and arrangement of perianth parts in fully developed flowers.

Wallace later described two additional species, *Leopoldinia major* and *L. piassaba* (Wallace 1853). Wallace's descriptions included only information on the distribution and ethnobotany of these two species, perhaps because he lost his botanical collections on his return trip to England (Stafleu and Cowan 1988: 33). His illustrations lack any floral detail, showing only a rough drawing of the whole plant, a dry inflorescence of *L. piassaba*, and the infrutescences of *L. major* and *L. pulchra*. For his description of the genus, Wallace basically paraphrased Martius.

Leopoldinia piassaba is the economically most important species in the genus. The species is not currently in cultivation but has great potential in agroforestry. The foliar sheaths terminate in long (0.5–1.5 m), pendulous fibers. The fibers at first appear as light brown ribbon-like strips, 2–10 cm wide, that later split into dark brown to grayish brown individual fibers (Spruce 1860; personal observation). These fibers persist and hang, "entirely concealing the stem, and giving the tree a most curious and unique appearance" (Wallace 1853). Spruce (1860) states: "the long beard of the petioles . . . give to the piassaba an aspect *sui generis*, and render it one of the most striking and handsome of the noble family of the palms . . . Nothing that I have seen in Amazonian forest dwells more strongly and pleasantly in my memory than my walk among these strange bearded columns, from whose apex sprang the green interlacing arches which shaded me overhead".

The fibers of *Leopoldinia piassaba* were a common article of commerce where the species grows. They resist rotting, even after long periods of immersion in water; the Brazilians used them to make cables to navigate the Amazon. They are also used for making rope, brooms, brushes and baskets (Putz 1979). The leaves are equally resistant to rot and make a very resistant thatch, and they are therefore the most sought after of the local palms. The fruits, when ripe, are eaten raw or prepared as a refreshing drink.

Spruce (1860) reports that large quantities of piassaba were exported from Pará, Brazil, to Europe and North America; in England the fibers

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were used to make brooms and brushes for house cleaning and street sweeping (Wallace 1853). Incidentally, *Attalea funifera* Mart. was long confused with *Leopoldinia piassaba* as the source of piassaba fibers (e.g., Schomburgk 1841, 1931). *Attalea funifera* does produce a similar fiber, commercially exploited since the 1500's, but the species is endemic to the state of Bahia, Brazil (Voeks 1988). Wallace (1853) Spruce (1860) and Burret (1930) cleared up the confusion.

The foliar sheaths also persist in the other species of *Leopoldinia*, forming a reticulate covering on the stem and "giving out from their margins an abundance of flat fibrous processes which are curiously netted and interlaced together" (Wallace, 1853), but never bearing long fibers like *L. piassaba*. The fruits of *L. major* are collected in large numbers and by burning and washing the Indians extract a salt substitute, a scarce staple in the area (Wallace 1853).

Several descriptions of *Leopoldinia* and its species have been published since Martius (1824) and Wallace (1853). Drude (1882), however, was the first botanist to monograph the genus. Spruce (1860) offered for the first time descriptions of the leaves, inflorescence, and flowers of *Leopoldinia piassaba*. Only Drude (1882), Dahlgren and Noe (1959) and Uhl and Dransfield (1987), however, included illustrations of the inflorescence. Drude (1882) showed a floral bud and a floral dissection of *L. insignis*. Dahlgren and Noe (1959) showed photographs of herbarium sheets of *L. pulchra* and *L. insignis* without further details. Uhl and Dransfield (1987) presented a detailed drawing of *Leopoldinia pulchra* based on staminate and pistillate flower buds and showing for the first time details of a rachilla. Flowers and inflorescences of the other species have never been illustrated.

The purpose of this report is to illustrate for the first time mature flowers of *Leopoldinia pulchra* and *L. piassaba*, as well as to present new information on the architecture of the inflorescences of these two species. The data presented are part of a continuing comprehensive biological study of *Leopoldinia* (Guánchez, Ph.D. dissertation, in prep.).

Materials and Methods

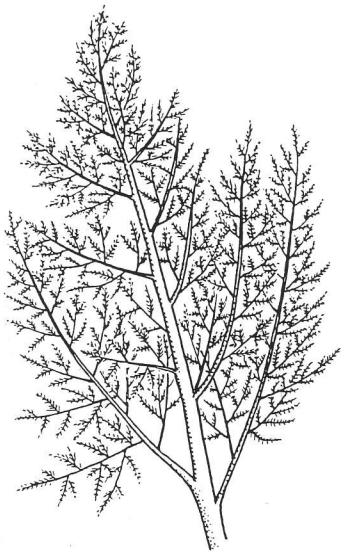
Martius described *Leopoldinia insignis*, albeit somewhat doubtful of its validity ("*Pauca de hac specie addere valemus*"; 1824); it has not been found by later collectors. Henderson (1995), without further discussion, placed it in the synonymy of *L. pulchra*. We visited localities cited by Spruce (1871), Jhan (1908) and Wessels Boer (1988) where *Leopoldinia major* reportedly grows, but we never encountered plants referable to this species; its status is currently under revision. For these reasons, in the present work we only present information about *L. piassaba* and *L. pulchra*.

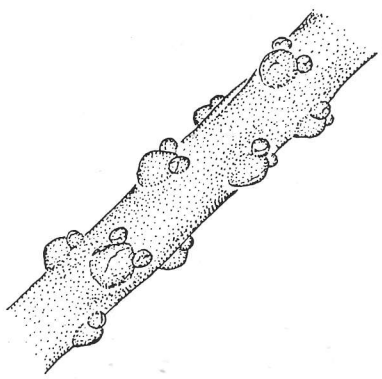
Materials were collected near San Juan de Ucata, the uppermost permanent Indian village along Caño Ucata, a black-water river tributary of the Orinoco river (Departamento Atures, Amazonas state, Venezuela). This site is located in the northernmost limit of the distribution of the genus (Uhl and Dransfield 1987). The samples were taken in and around a permanent plot established to study population structure and gender dynamics in *Leopoldinia piassaba*.

We examined a total of 64 specimens collected during the course of the study as well as specimens collected by the senior author along the Brazo Casiquiare (the waterway that connects the Amazon and the Orinoco river basins). Herbarium specimens were collected particularly during the months of October and November; photographs were taken within four hours of the samples being collected. A complete set of these collections is at TFAV; some duplicates are at VEN and BH. We also examined other *Leopoldinia* herbarium collections in BH, GH, K, MER, MO, NY, TFAV, US and VEN.

Results and Discussion

Martius described *Leopoldinia* as a monoecious genus, bearing staminate and pistillate flowers in the same inflorescence. The most recent account of the genus (Henderson 1995), states that *L. piassaba* "may be dioecious (Wessels Boer 1988), or monoecius and have unisexual inflorescences". The plants of *Leopoldinia piassaba* we encountered bore dimorphic, either staminate or pistillate inflorescences. The species flowers once a year (October–November). During the annual flowering period, each plant commonly has only one type of inflorescence which can be different from year to year. The staminate inflorescence is usually longer than the pistillate (Wessels Boer 1988), but the outstanding difference is in the branching. Staminate inflorescences (Fig. 1) have rachillae branching to the fourth order; these are short, thin and numerous (Fig. 4), 1–2 cm long × 1–





2 mm diam., and bear only staminate flowers (*Guánchez and Romero 4858*). Pistillate inflorescences (Fig. 2) are shorter but have longer and thicker rachillae (Fig. 5), 10–20 cm long × 4.0 mm diam., branched only to three orders and usually bearing only pistillate flowers. However, occasionally triads are present, with a central pistillate flower and two lateral staminate buds (Fig. 3), but then the staminate flowers abort before anthesis.

Intermediate forms also occur. We collected an unusual specimen (*Guanchez & Piñate 4956*) with one inflorescence branched to four orders (staminate form) and another inflorescence branched to three orders (pistillate form). The first one had only staminate flowers and the second one bore triads. We also collected one inflorescence in the study site near San Juan de Ucata (*Guánchez et al. 4915*), that had third order branching (the pistillate form) in most of the basal branches and then fourth order branching (staminate form) in the other branches. Similar branching patterns were found only in one additional herbarium specimen from Brazil (*Luetzelburg 22350*, BH). In the last two specimens some rachillae in the transition parts between the two different branching patterns were intermediate in length and thickness and varied in the relative number and the placement of pistillate and staminate flowers. In both cases the staminate flowers tended to be borne toward the apex and the pistillate toward the base of the rachillae. Two different branching patterns in the same inflorescence have not previously been reported in Arecaceae (Uhl, pers. comm.). These mixed inflorescence architectures are of special interest for the study of the origin and development of the two branching patterns.

Leopoldinia pulchra (see Back Cover) is typically monoecious, flowering several times during the year, as shown by the rather frequent occurrence of individuals bearing two or more inflorescences and/or infructescences of different shapes

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1. *Leopoldinia piassaba*. Primary branch from a staminate inflorescence (drawing by B. Manara from *Guánchez et al. 4894*). 2. *Leopoldinia piassaba*. Primary branch from a pistillate inflorescence (drawing by B. Manara from *Guánchez et al. 4897*). 3. *Leopoldinia piassaba*. Close-up of part of a rachilla showing triads with abortive staminate buds (drawing by B. Manara from *Guánchez et al. 5033*).

4. *Leopoldinia piassaba* (upper photo). Rachilla with staminate flowers (photograph by G. A. Romero from *Guánchez et al. 4894*). 5. *Leopoldinia piassaba* (lower) . Pistillate rachillae (photograph by G. A. Romero from *Guánchez et al. 4897*).

6. *Leopoldinia pulchra* (upper photo). Plant showing two different shaped inflorescences (photograph by F. Guánchez. Voucher was not made). 7. *Leopoldinia pulchra* (lower). Typical triads with one opened staminate flower (photograph by G. A. Romero from *Guánchez et al. 5095*).

at different states of development (*Guánchez et al. 4098, 4909, 4911, 5077 and 5095*). Most commonly the same plant bears two differently branched inflorescences at the same time (Fig. 6). Often these inflorescences bear a few flowers of the opposite sex, alone, in pairs or in triads (Fig. 7). In comparison to *L. piassaba*, inflorescences of *L. pulchra* show a wider range of variation in the relative number of staminate and pistillate flowers and in their arrangement on the rachillae. Furthermore, the staminate flowers tend always to be borne toward the apex and the pistillate toward the base of the rachillae. Flowers in triads are common (*Moore et al. 9525*, BH; *Guánchez et al. 4909*, TFAV).

Leopoldinia has small 3-parted unisexual flowers. The staminate flower is usually smaller than the pistillate. The staminate flowers of *L. piassaba* (Fig. 4) have three suborbiculate, fimbriate sepals, 1.1 × 1.0 mm, green at the base and reddish yellow and dry at the apex; three petals 1.4 × 1.0 mm, yellow at the base, becoming green at the apex; six stamens with filaments white, transparent, subterete, and with suborbicular versatile anthers, and a rudimentary pistillode (*Guánchez 4896*). The pistillate flowers (Fig. 5) have three reniform, fimbriate sepals, with attenuate margins, yellow at the base and reddish green at the apex, 1.5 × 2.5 mm; three ovate-triangular petals, 2.5 × 1.8 mm, yellow basally and green at the apex; six subulate staminodes 1.0 mm long, and an ovary with three, sessile, recurved stigmas which become eccentric in the development of the fruit (*Guánchez 4893*).

The staminate flowers of *Leopoldinia pulchra* (Fig. 7) have three suborbicular sepals 0.8 × 1.0 mm (*Moore et al. 9525*), pale green in color; three ovate petals 1.0 × 0.8 mm, reddish inside at the base and pale green toward the apex; six stamens, with flat erect filaments that are reddish and transparent with erect ovate-reniform and bilobed anthers and a rudimentary pistillode the same color as the filaments. The pistillate flowers (*Moore et al. 9525*) have pale green reniform sepals 0.8 × 1.3 mm; petals 1.0 × 0.8 mm and green; and small staminodes; the ovary is top-shaped.

As mentioned above, plants of *Leopoldinia piassaba* flower once a year, bearing dimorphic, staminate or pistillate inflorescences; each plant commonly produces one type of inflorescence which may be different from year to year. This flowering pattern appears to fit the model of gender diphasy, where ". . . individuals belong to a single genetic class but choose their sexual mode in any season according to circumstances" (Lloyd and Bawa 1984 and Schlessman 1988). Patterns of gender dynamics have been documented in *L. piassaba* (F. Guanchez, in prep.), but the factors controlling gender changes from season to season remain unknown.

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PALM RESEARCH IN 1994

ANDREW HENDERSON
New York Botanical Garden, Bronx, NY 10458

Books

Rattans of Sri Lanka. An Illustrated Field Guide. By N. de Zoysa & K. Vivekanandan. Sri Lanka Forest Department, Battaramulla, Sri Lanka. ISBN 955-9153-03-X. 1994. 82 pages. Price unknown.

Illustrations of the Family Palmae in Taiwan. By Jih-Ching Liao. National Taiwan University, Taipei, Taiwan. 1994. 120 Pages. Price unknown.

Pindorama. By Mercedes Benz do Brasil, S. A. Cámara Brasiliera do Livro, São Paulo. 1993. 143 pages. Price unknown.

First International Symposium on Ornamental Palms. By M. Dewmatte (editor). Acta Horticulturae 360. ISBN 90-6605-156-6. 1994. 250 pages. Price unknown.

Cuatro Congreso Internacional sobre Biología, Agronomía e Industrialización del Pijuayo. By J. Mora Urpí, L. Szott, M. Murillo & V. Patiño. Editorial de la Universidad de Costa Rica, San José, Costa Rica. ISBN 9977-67-243-1. 1993. 492 Pages. Price unknown.

A Guide to Palms and Cycads of the World. By Lynette Stewart. Angus and Robertson, Sydney, Australia. ISBN 0-20717643-4. 1994. 246 Pages. Price unknown.

Las Palmeras del Perú. By Francis Kahn and Farana Moussa. Instituto Francés de Estudios Andinos, Lima, Peru. ISBN 84-89302-16-2. 1994. Pages 180. Price unknown.

Palms and Cycads around the World. Revised Edition. By John Krempin. Krempin Books, Broadbeach Waters, Queensland. ISBN 0-646-14252-6. 1993. Pages 276. $54.00.

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Journals

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General Interest Articles

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Questions and Answers

KYLE BROWN

Chair, IPS Horticultural Correspondence Committee
Rt. 1, Box 2700, Glen St. Mary, FL 32040 USA

From: Enrique Voulminot
Rambla Gandhi 685, Apt 901
Montevideo, Uruguay

Thanks for your time. I am planning to plant Washingtonia robusta *on a vast area over white, non-salty sand dunes in my home country, Uruguay. The climate is similar to yours in Georgia.*

*I will use palm trees of about 15 cm (6 ins) tall cultivated in plastic pots of about 2 ins * 2 ins * 10 ins which I will plant randomly in the dunes for landscaping purposes. The palms will not be irrigated and I will try to fertilize them twice a year over the next two years. Our summers are often dry and winters get to −3.C.*

1. *Will* W. robusta *grow well in the white sand dunes?*
2. *Which is the best time to plant in the nursery? Do I plant the seedlings in early spring, autumn, summer?*
3. *Which is the best time for planting the palm trees? This year I tried late spring and the drought effects were terrible. I am afraid of planting in the winter.*
4. *If I am to transplant a grown-up palm tree from the sand, how would it behave? Would it be like bare-root transplanting?*

If you have any books that you may suggest on this subject, please let me know.

In regard to your plans to use *Washingtonia robusta*, you must understand that this palm responds with good growth to the following conditions: warm to hot temperatures (60 to 70° F at night and 85 to 95° F daytime); high fertility soils; abundant water in the root zone.

I cannot recommend this species for the conditions which you described in your letter. As a matter of fact I cannot think of any palm that can be started in such conditions without irrigation.

It sounds to me like you have closer to California climate type than Georgia. Perhaps that is why you suspected *Washingtonia* would be a good choice. It is true that the species does grow well in California and is of course native in Mexico under similar climatic conditions. The critical thing to remember is that the plants grow around desert springs where their roots are in almost constant contact with water.

In response to your last question, if you ever were to grow a palm to maturity on pure sand transplanting would in all likelihood be "bareroot."

I am sorry to be so negative in my answers, but I do not want to see you spend a lot of time and money just to lose it all for lack of proper facilities. You must consider some sort of irrigation and I would recommend a low volume, low pressure drip system. If you will do this and fertilize them once a month during the warm season, I believe you can have success in your sand dunes.

From: Ms. Toni Santoni
31900 N. Marginal Rd., #125
Willowick, OH 44095

Can you please send me any information you may have on how to care for the 10" majesty palm tree. I bought this indoor plant approximately one month ago; I have researched everywhere and cannot find any information about this plant or how to care for it. I certainly would appreciate your help.

Your Majesty palm (*Ravenea rivularis*) should prove to be a good interior plant. No special treatment is required; however, a few things should be kept in mind. Give this plant as much light as possible, especially during the winter, even if it means supplemental artificial lighting (a combination of cool white fluorescent and incandescent is best). As for fertilizing you should use a good soluble product such as Peter's or Miracle Grow preferably with minor or trace elements. Use no more than once a month and dilute to one fourth the recommend rate. Water the plant thoroughly with the fertilizer solution. Additional watering should be done only if soil feels dry to the touch. Over watering kills more house plants than any other cause. Occasional soakings are much preferred to constant wetness. This palm is somewhat drought tolerant so don't worry if it dries out on occasion. Just be sure to rewet very thoroughly by soaking it overnight in a bucket of water. One other important item is to not "over pot" your plant by transplanting into a larger pot. Palms can tolerate having their roots pot bound with no ill effects. As a matter of fact it is a desirable condition because it tends to eliminate the possibility of over watering and will tend to slow down growth so the plant doesn't out grow its location too quickly. It is best to grow the plant in a container with drainage and a saucer but whatever the case don't allow it to stand in water.

I hope this information is helpful and I hope you have success in growing your palm.

From: Mark Cox

My name is Mark Cox and I live in northern Florida. I became aware of the International Palm Society from reading a palm book. I am in need of some information that I hope you can provide.

I purchased two Ravenea rivularis *(Majesty Palms) to plant outside. Will they tolerate the climate here in the Jacksonville, Florida area? In the winter we usually get a few nights when the temperature drops to the upper 20sF for a couple of hours. Once in a while it will go down to the lower 20's.*

Do Syagrus romanzoffiana *(Queen palms) tolerate colder temperatures than the majesty palm?*

I also have nine Washingtonia robusta. *Will Epsom salts be good for fertilizing them? What type of fertilizer would be the best for palm trees?*

Thank you very much for any information that you can send to me.

We do not have a track record on how the Majesty palm will do outside in northeast Florida. No one that I know of has had the nerve to try. However, several people in the First Coast Chapter of IPS have said they are going to try it. You could be among the pioneers! I would recommend placing it in the most protected spot that you possibly can. From reports I have received, it appears that the queen palm is a little bit hardier than the Majesty palm but not by more than a few degrees.

Washingtonias do not normally require Epsom salts in north Florida. A better fertilizer for them would be a Palm Special available at most complete line garden centers.

From: Nikolaus von Behr
P. O. Box 08-762
70.312-970 Brasilia DF
Fone/Fax (061) 273 9195

1—Is it true that when some seeds of a bunch are mature, all the other seeds are too?

2—Is it true that you cannot dry palm seeds? Conserving them with the mesocarp keeps its fertility? How can you extend the fertility of a palm seed using cheap methods?

3—Which pesticides do you recommend to avoid pests in the seeds you store? Does it influence in germination? Low toxicity, please.

4—I want to know more about stocking palm seeds. Is there any article specifically about that in Principes? Can you send me a photocopy of this article.

5—Maybe you can send me a copy of other

answers sent to other palm growers like me, with simple questions about palm cultivation and seed storage?

Thank you very much for your kind attention. And congratulations for this wonderful service provided to IPS members. It makes me proud of being a member of IPS.

In the future you could publish a book with the most common questions sent by IPS members. This booklet could be a great success!

1. It is not universally true that all seeds in a bunch mature together. For most species of palms it probably is true. There are noteworthy exceptions, however, such as your native *Butia capitata* and the North American native *Rhapidophyllum hystrix*. Each species of interest must be researched to determine seed maturity and viability.

2. It is true that you cannot dry palm seeds. This is the quickest and surest way to destroy viability. Seeds of some palm species can be kept viable for a few months by keeping them cool and moist. Again, this varies with each species. The best approach always is to collect seeds as soon as they are ripe and plant them as soon as possible. For additional information on seed storage, shipping and viability I suggest you contact the following individuals with specific questions on specific palm species:

Lynn Muir, IPS Seedbank Chairman
33802 Valencia Pl.
Dana Point, CA 92629
USA

Seed Service
Inge Hoffman
695 Joaquin Ave.
San Leandro, CA 94577
USA

3 & 4. These same individuals can answer questions about pesticides and stocking of palm seeds.

5. I will investigate the possibility of coming up with a compilation of commonly asked questions about palm cultivation and seed handling.

From: Ronald Frick
3195 Moss Pointe Dr.
St. Charles, MO 63303

I have a variety of house palms and always fight spider mites. Can you please recommend the best way to control them?

I am very interested in purchasing a book or so through the "Bookstore." Can you recommend one or two from the list for houseplant palms identification, care, watering, soil mixture, etc.?

Your help is greatly appreciated.

To control spider mites on your palms try an insecticidal soap such as Safer's. If that proves ineffective then try Mavrik Insecticide/Miticide. Both should be available at complete line garden centers in your area.

As for the best books on "housepalms" I suggest you contact the "Bookstore Lady" herself, Mrs. Pauleen Sullivan at the following address:

3616 Mound Ave.
Ventura, CA 93003

Nobody knows the Bookstore like Pauleen! And good luck growing your palms indoors.

From: Richard Kennedy
2517 Danny Pk.
Metairie, LA 70001

I have a couple of questions related to palm culture that I hope you can answer for me. I am neither a professional horticulturist, nor a botanist. I have belonged to the IPS for two years and to the Louisiana Chapter for three years. I am primarily interested in cold hardy palms suited for outdoor culture in Louisiana. I try to grow palms that are not commonly planted in here.

First, I have not had much luck germinating or raising Jubaea chilensis *seeds. I have tried scarifying, soaking them in water, dipping them in sulfuric acid, treating them with gibberellic acid and stratifying them. Out of fifty seeds received in September of 1992, four germinated within six months, another seven germinated since then. Out of thirty seeds received in September of 1993, two have germinated, one of those has succumbed to disease. One of the seeds planted in September of 1992, sprouted in February of 1994 in a pot that was outdoors all winter. Temperatures had been as low as 30° F, daytime temperatures averaged in the 60's.*

Seeds usually become available in September, and I want to try another batch this year. Can you recommend a method for planting the Jubaea seeds for maximum germination? I have facilities for keeping a limited number of planted seeds warm overwinter, but from my experience, I wonder if perhaps I should just plant them in pots, and leave the pots out of doors overwinter, protecting them only from severe frost?

I have seven surviving Jubaea *at this time. I suspect they do not like heat, high humidity and being wet so can you recommend a fungicide and soil mix for growing* Jubaea.

Next, I have many seedlings of various species of palm trees I have grown from seeds that I want to set out in a field. I have ten acres, more or less, to plant on. I want to get the most trees per acre without placing the trees so close together that they will not obtain full size at maturity. Is there a rule of thumb to go by for spacing seedlings? I was considering 1.5 times the diameter of the crown of a mature tree, or perhaps twice the diameter. Would there be a difference in size and age to maturity, for trees planted according to the targeted spacing, if cultural practices were intense, average or minimal? In other words, I want to get the maximum number of fine specimens out of the least amount of space. How far apart should I plant the trees?

I sympathize with you on your attempts to grow *Jubaea* in Louisiana. My advice to you is to obtain as large a specimen as your budget will allow to be shipped from California. I am serious about this, based on our own attempts and those of several very good palm growing friends here in north Florida. We have all tried various soil mixes and all of the good fungicides, such as Truban, Banrot, and even Benlate before the crisis. We have all been able to germinate the seeds but the seedlings soon go into a decline which is irreversible. I am certain this is due to the climate we have on the Gulf Coast. I am sorry but there are some things that are not possible to overcome even with the best of normal effort.

As to your second inquiry, I recommend that you place your trees no more than the anticipated mature diameter apart. In most commercial growing fields they are placed much closer than that; however, "harvesting" is begun before trees reach maturity leaving space for those trees that are left to mature. Do not hesitate to use intense cultural practices as the unit diameter spacing. Good luck in your venture.

From: Wayne Ward
Begonia 200, Col. Montealegre
Tampico, Tam. 89210 Mexico

I live on my ranch in northeastern Mexico, about 30 miles NW of Tampico, Tamaulipas.

I'm having a lot of trouble with Rhinoceros beetles. These are a shiny purplish black color. I think they are Oryctes rhinoceros, *but I'm not sure. I can't find any literature on them.*

I've always had a slight problem with them in my maguey plants that I have scattered around, but now they're getting into my good palms, as well as native palms and bougainvillea.

I think they're worse now because we had a totally unexpected 12" of rain in January, normally a dry month. Our rainy season is usually from the 10th–20th of June thru September, with an average rainfall of 40".

I would appreciate it if you would send me your recommendations for control of this beetle because they are becoming BAD.

I've been trying to control them by digging them out, but it's very difficult to catch them. I've dug out about 150 so far.

I know that palms are sensitive to a variety of insecticides, so I'm afraid to try a shotgun approach.

There is no way that I can rely on sanitation and cultural practices. I live in a clearing of about 2 hectares completely surrounded by jungle full of decomposing plant material. I've dug thru piles of leaves and limbs, but I've been unable to find any larvae.

I would prefer to use something which I can pour around the trunks that would repeal them.

And also, of course, something to pour in the holes to kill the ones already there.

They've killed a beautiful 3 meter + Chrysalidocarpus cabadae, *and a 2 meter tall* Latania loddigesii. *I'm getting desperate! Hence my cry for help!*

Hoping to hear from you real soon . . .

Your rhino beetles should succumb to any of several common insecticides, but I must warn you the adult beetles will be more resistant than the larvae. Malathion is the least toxic chemical I can think of, however, Dursban, Diazinon, and Cygon

would also be effective. All of these have proved to be safe on palms but keep in mind that Cygon is systemic so don't use it on any palm you would harvest any parts of for human or animal consumption. All of these can be applied as a soil drench or sprayed directly into tunnels or bore holes.

I hope you get relief soon.

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CHAPTER NEWS AND EVENTS

PACSOA News

Palms & Cycads, the journal of the Palm and Cycad Societies of Australia (PACSOA), recently announced the PACSOA Directors to serve for 1995–1997. They are Leo Gamble, Tom Turner, Ted van Ginneken, Cheryl Basic, Jeanne Price, and Lou Randall (all returning from 1993–1995 period). They join the 1994–1996 Directors: David Tanswell, Greg Cuffe, Stan Walkley, Paul Anderson, John Dowe, Will Kraa, and Rolf Kyburz. PACSOA held their Annual General Meeting on May 29, 1995, at the Bread House, Gregory Terrace, Brisbane.

PACSOA at the end of 1994 has almost 1,300 members. *Palms & Cycads* is a 28–40 page A5-sized journal with color covers and additional color interspersed throughout. In addition to news items and meeting announcements, the October–December 1994 *Palms & Cycads* issue featured articles on *Guihaia argyrata*, *Polyandrococos pectinata*, Loren Whitelock's "Around the World in Search of Cycads" and "Palms and Cycads on Postage Stamps" by Dennis Johnson, each lavishly illustrated in color.

PACSOA now accepts Visa and MasterCard as forms of payment for memberships/subscriptions, PACSOA Bookstore orders, and PACSOA Seed Bank orders. This makes it very easy for non-Australian members to participate in these services. For additional information, contact PACSOA, P.O. Box 1134, Milton 4064, Queensland, Australia or fax 61-7-298-5088 from outside Australia.

News from Sydney Branch, PACSOA, Chapter

The Sydney Branch of PACSOA (and affiliated chapter of the IPS) met on May 16 at the Royal Botanic Gardens in Sydney. Simon Leake, an agricultural scientist, founder and director of the Sydney Environmental Soil Laboratory, spoke on potting mixes. The Laboratory also offers soil testing services.

News from Gold Coast–Tweed (Australia)

The Gold Coast–Tweed Palm & Cycad Society of P.A.C.S.O.A. held their Annual General Meeting on April 9 to tour the nursery of Rolf Kyburz at K-Palms. Rolf is one of Australia's leading importers of palm seeds. He also travels extensively in search of palms—having made several trips to Madagascar and a recent trip to Venezuela and Cuba.

The June meeting was held on Sunday June 11 at the property of the new local society president, Phil Thomas, in Mrwillumbah.

News from North Queensland

The North Queensland Palm Society (NQPS) met on March 13 at Tumbetin Lodge, The Palmetum. Guest speaker was Tony Huntington, who gave a presentation on his recent trip to Hawaii. Videos were shown of the Alii Gardens of Hana, Lyon Arboretum, Waimea Falls Park and the Foster Botanic Garden. The beautiful scenery and beaches were reminiscent of tropical North Queensland. After dinner, Lorraine Tooth gave an enlightening address on a selection of cycads brought to the meeting from her collection. John Dowe then held the group's attention while he described a number of rare palm species brought in by members. These included *Licuala elegans* and *L. cordata* from Chris Gray's collection. John also described the different leaf form of cultivated *Ptychosperma macarthurii* as compared with those growing in their natural habitat.

Chris Gray, local society President, recently

announced closure of the former NQPS Seed Bank. Thanks were expressed to Terry and Dorelle Hart for the fantastic effort they have put into the Seed Bank over many years. With the rising costs of seeds, postage, etc., the Seed Bank was simply no longer viable in its existing form. Seeds will no longer be posted to out of town members. A Local Seed Bank will, however, make seeds available to members at local meetings and garden tours.

The first 1995 Garden Tour for the NQPS was held on April 8 at the residence of Jeff Jones, 94 Hammond Way. The group then proceeded to Lorraine Tooth's for morning tea, and then to Chris Gray's.

The Friends of the Palmetum also heard a presentation by Jane Allen of Kew Gardens. Ms. Allen is a Botanical Horticulturalist, responsible for the Living Cycad Collection maintained in the Royal Botanic Gardens Kew. Her talk featured The Palm House, the plants in it, and a look at its recent restoration. An introduction to the soon-to-be-opened "Evolution House," which features cycads, was also given. A supper followed the talk.

Future meetings for 1995 are scheduled for July 10, September 11, and November 13, all at Tumbetin Lodge, Townsville, beginning at 7:30 p.m. The NQPS hosted visiting groups from the neighboring Rockhampton and Mackay Palm Societies on June 10–12. Garden tours will be held on August 12 and October 7. Contact the NQPS for additional information.

Sunshine Coast (Australia) News

The Palm & Cycad Society, Sunshine Coast Group of Queensland, Australia met on April 3 at the Nambour Band Hall. Mark Ormond spoke on the "Palms of New Caledonia." A display of these beautiful palms was provided at the meeting, with a discussion on their use as ornamentals in the gardens on the Sunshine Coast. A short slide show on the Palm House of Kew Gardens was also given by Leo Gamble. The raffle prize was a large *Pinanga cummingii* plant.

A video on Cycad Reproduction, produced by Knut Norstog, was shown. This was a "hands-on" display of how to fertilize cycads. As an additional bonus, Peter Heibloem gave a talk on his recent trips into Mexico, Uganda, and Zaire. The raffle prize was a *Chamaedorea radicalis* about 2 meters (6.5 feet) tall, in seed.

The Palm & Cycad Society of Mackay (Queensland, Australia)

The Palm and Cycad Society of Mackay met on February 26 at the home of Henning and Misse Madsen in Sarina. Regular meetings were also held on March 26 at the home of Lois McGregor in Slade Point and on April 23 at the home of Gwen Shailer in Sarina.

The annual Fete was held at the Farleigh Mill Palm Gardens on Sunday, May 7.

The Garden Expo at the Mackay Showgrounds is scheduled for July 8 & 9. Percy Simonsen will coordinate the display, with cooperation and assistance from other members.

News from Western Australia

The Palm & Cycad Society of Western Australia outing to Ken Adcock's place on Sunday, February 26, drew 25 plus members to kick off 1995 weekend activities.

The Society met on March 20 at the Leederville Town Hall. The meeting was an open discussion about palms, with members bringing a rare, unusual or uncommon palm to the meeting to discuss. Plants brought to the meeting and discussed included palms *Syagrus sancona*, *Latania lontaroides*, *Neodypsis lastelliana*, *Vershaffeltia splendida*, and the palm-lookalike *Cardoluvica palmata* from Central America. It was also noted that Allan Lane donated a fine specimen of *Beccariophoenix madagascariensis* for the February meeting. Read all about this fine Madagascar palm in the coming "Palms of Madagascar" book.

This IPS affiliate society also met on April 17. Darryl Hardie put together a palm and cycad quiz and a good time was had by all.

Much work has been going on in Gascoyne Park erecting the Tim Erceg Gazebo, in memory of the late member who was so active in the Gascoyne Park project. Additional recent plantings include six *Ravenea* sp. and four *Phoenix dactylifera*.

The Society is going to put up a 20-meter-square display in the Dianella Plaza Shopping Centre on September 28–30, 1995. Palms and cycads will be sold as well as shown. Editor of the Western Australia society newsletter for 1995 is Belinda Riley, with supplemental contributions by Ken Adcock, Adam Peterson, and Barry Shelton.

News from New Zealand

The Palm & Cycad Society of New Zealand met on May 2, 1995, with the evening devoted to *Chamaedorea* palms. Members brought along slides and palm plants to create a lively discussion.

The June 6 meeting featured Scott Zona, who spoke on the palms of Fairchild Tropical Garden in Florida.

The 1995 Annual General Meeting is scheduled for July 4 at the regular venue in Auckland.

Pacific Northwest Chapter News

The Pacific Northwest Palm & Exotic Plant Society (PNWP&EPS) met on March 27, 1995 at the Van Dusen Gardens in Vancouver with 39 members in attendance. Gerard Pury presented a slide show featuring the exotic gardens of the Swiss Lake Country. Other highlights of the meeting included guest speaker Peter Anson of Gibsons, B.C., who has begun rescuing and importing endangered fern species from New Zealand.

The group toured the Piroche Plant Nursery in Pitt Meadows on April 29. Pierre Piroche imports exotic and rare plants from China.

Another big public relations event this spring was the planting of nine *Trachycarpus fortunei* palms by the Vancouver Parks Department along Beach Avenue in Vancouver, a fashionable seaside boulevard with trendy restaurants and stores at the foot of Denman. These palms will join 24 others planted there through the efforts of the PNWP&EPS and private finance.

The PNWP&EPS now has members in ten countries and its journal, *Hardy Palm International* has grown to near 40 pages per issue and features color as well as black and white photographs.

A further move to increase local membership will be focused in Washington and Oregon, with Edie Baer from Portland (Oregon) and Michael Svardh of Hansville (Washington) spearheading the local efforts.

Meetings are scheduled for July 24, September 18, and November 27, 1995. All are to be held at Van Dusen Gardens, Vancouver and all will start at 7:30 p.m. A summer barbeque will be held in August. The PNWP&EPS will also have a booth at the Pacific National Exhibit in Vancouver from August 19 through September 4, 1995.

Fous de Palmiers of France Holds Exposition

The French Chapter of the IPS, Fous de Palmiers, held an exposition "Palmiers, Princes des Tropiques" at the Institut de Botanique, 163, rue A. Broussonet, Montpellier, on April 29–30. The exposition was open from 9 am until 7 pm both days. In addition, presentations were given in the afternoons. On Saturday, Steve Swinscoe spoke about the recent Fous trip to see the palms of California and P. Albano discussed "Ornamental Palms—Which Species to Plant?" On Sunday, J. Deleuze presented "The Palms of New Caledonia," F. Hallé discussed "Les Palmiers: famille de records," and Y. Duval spoke on "In Vitro Culture for Propagation and Preservation of Palms."

There was an excellent write-up in the recent *Chamaerops*, journal of the European Palm Society, about the joint fall 1994 meeting of the French and European Palm Societies in the south of France. This meeting was hosted by the Fous de Palmiers and brought attendees from around Europe and from the USA.

South Africa Palm Society News

The 1995 Annual Congress was held from April 29 through May 1, 1995 at Trichardtsdal in Eastern Transvaal. The venue has been arranged by Ernest and Sandra Helm, long time benefactors of the South African Palm Society. The venue was near the *Borassus aethiopum* grove and Carpe Diem Nursery.

Local society president, Mark Bradshaw, pointed out that the 1994 southern hemisphere winter was the coldest in at least 30 years, with confirming reports from Brazil, New Zealand, and Australia, as well as from South Africa. Some palms were lost in South Africa to the cold but some unusual positive surprizes were also noted. James Warrington's *Salacca* in Nelspruit came through unmarked. Seedlings of *Cyphophoenix elegans* and *Chambeyronia macrocarpa*, both from New Caledonia, survived the cold in Pretoria. *Livistona decipiens* survived −7° C in Boksburg.

European Palm Society Growth

The European Palm Society recently announced that their current membership is over 400 mem-

bers. The largest contingent is from the United Kingdom, followed by Germany, then France. Despite the name, it is nonetheless a widespread bunch, with members also hailing from Japan, Thailand, India, Hong Kong, Malaysia, Sri Lanka, South Africa, Indonesia, Australia, New Zealand, USA, Canada, and every European country and a few bordering the African side of the Mediterranean.

1994 Summary from the Northern California Chapter

The Spring meeting on May 15, 1994, was held at the home and garden of Scott and Joanne LaFramenta of Sonoma, a community north of San Francisco, noted for its oak-covered hills and fine wines. Scott has been planting palms on his hillside property for over 15 years. Nature, especially the great freeze of December 1990, has been weeding out those palm species not suited for the climate of the Sonoma County foothills. The garden is not located in one of northern California's "subtropical" microclimates. No *Howea* or *Archontophoenix* species here. Nonetheless, the LaFramenta garden is a lush temperate zone palm garden. The dominant palm genera are *Sabal*, *Brahea*, *Trachycarpus*, *Butia*, *Washingtonia*, and *Trithrinax*. Intermixed with the palms are several varieties of *Eucalyptus* and native California oaks. All of the above mentioned palms survived three straight nights of 12° F in December, 1990. Scott lost 15 large Queen Palms (*Syagrus romanzoffiana*) of the 16 planted on the property. Slowly we are beginning to recognize the palm species with real survival potential here in Northern California. The palm auction at the meeting raised $357 for the local chapter treasury.

The summer meeting was held at the opposite end of the Bay Area at the Los Gatos garden of John and Gina Wagner on July 24. The Wagner garden is a young palm garden, with many of the palms moved across the Santa Cruz mountains from Soquel where John began his initial palm plantings. At this meeting, we had a sale of many rare palms not usually available in Northern California: *Parajubaea cocoides*, *Guihaia argyrata*, *Ceroxylon quindiuense*, *Archontophoenix cunninghamiana* "Illawara," plus many more. In addition to the palm sale, a short auction added another $115 to the treasury.

The late summer meeting was held at Dale and Cindy Motiska's Neon Palm Nursery in Santa Rosa on September 18. Over the past 3 years, we have watched the Motiska's "Palm Demonstration Garden" take shape. Dale has planted approximately tow acres of his property with palms. He has also been rescuing old palms from ranches and gardens around Northern California and planting them in his garden. The latest arrivals are two ancient *Brahea armata* with 60-foot trunks and a giant *Jubaea chilensis*. After a short business meeting and a delicious buffet prepared by Cindy, the auction raised $376.

In the 15 years since its establishment, the Lakeside Palmetum in Oakland has matured to the point that we have to use extension ladders to reach the dead fronds on the *Parajubaea*, *Syagrus*, *Trachycarpus*, and *Caryota*. The garden has been well maintained throughout the years by a small group of dedicated members led by Darold Petty, the Palmetum director. At least one Saturday morning per month is spent weeding, pruning, planting and general maintenance. Last November, Darold, Bob Fowler, and Tim Cooke rebuilt the pathways with 2,200 feet of new bender board and 32 cubic yards of gravel. Approximately 120 hours of labor went into that project alone.

Many thanks to our members who contributed their time, labor and money to the Chapter over the past year.

DAN SEKELLA
President, Northern California Chapter

News from the Central Florida Chapter

On May 6, the Central Florida Palm Society met at the home and gardens of Hersh and Jackie Womble. Their palm and cycad collection includes both mature and juvenile specimens—over 60 strong (over 20 species of cycads).

Late last year the carrotwood trees along Coffee Pot Bayou between 20th and 30th Avenues in St Petersburg were all replaced with 52 Medjool date palms (*Phoenix dactylifera* "Medjool"), each about 16–18 feet tall. The effort was spearheaded by the North Shore neighborhood association of the city. Removal of the carrotwood trees cost $2,900 and the preparation of the ground and replacement date trees, warranty and delivery included, was about $98,000. Medjool dates can

also be seen around the Florida International Museum in the city.

Also in St. Petersburg, the Gizella Kopsick Arboretum has announced expansion plans. More about this to come in future issues.

The chapter will host the 1995 International Palm Society Board of Directors meeting in Sarasota in October (see related write-up in this issue, pp. 170).

News from the South Florida Chapter

The South Florida Chapter of the IPS met on April 19 to hear a "Palm Sex" lecture. The June 21 meeting featured a panel discussion on palms for beginners. April 2 was a work day at the Metro Zoo. On May 20, a field trip to Fairchild Tropical Garden was held for a "name learning experience."

The group plans a "program for experts" for their August 16 meeting. No program has been set for the October 18 general meeting. Note that the chapter meetings are changing to the 4th Tuesday of every even month.

A field trip to the Bahamas is tentatively scheduled for September 1–4, 1995, and the chapter's fall sale will be held November 4–5 at Fairchild Tropical Garden.

News from the Palm Beach (Florida) Chapter

The spring sale of the Palm Beach Palm & Cycad Society, held on April 8 and 9, 1995, was the largest spring sale for the group ever. Over $23,400 worth of palms and cycads were sold. Totals sales, including books, T-shirts and fertilizer, brought the gross receipts to $27,828. Special thanks to Dale Holton who, as always, coordinated everything and made sure the sale ran smoothly.

On May 3, the chapter met at Mounts Botanical Garden to hear Willie Tang, president of the International Cycad Society, speak about the cycads of Thailand, which he recently visited.

A field trip was held to Western Florida on May 20–21 to visit Selby Botanical Gardens, the gardens of Libby Besse, Michael Perry, and U. A. Young. The group saw many of the gardens to be seen by the IPS Board of Directors at their planned meeting in Sarasota in October, 1995.

June 17 was a workday at the Norton Sculpture Garden at the corner of Barcelona and Flagler in downtown West Palm Beach. Lunch was provided.

The Palm Beach Palm and Cycad Society, in conjunction with Fairchild Tropical Garden, is putting on a World Palm Symposium 1995—two days of talks from some of the leading palm researchers in the world. This will take place on October 20 and 21, the week preceeding the IPS Board Meeting. The World Palm Symposium will feature 13 of the top palm researchers in the world lecturing on their recent research on various palm genera, conservation, tissue culture and other palm studies. The speakers include Dr. Leng Guan Saw of the Forest Research Institute of Malaysia, Dr. Fin Borschsenius of Aarhus University, Denmark, Mr. John Dowe of the Townsville Palmetum in Australia, and Dr. Andrew Henderson of the New York Botanical Garden. For additional information, please write to World Palm Symposium, % Paul Craft, 16652 Velazquez Blvd., Loxahatchee, FL 33470.

News from Broward County, Florida

On March 23, 1995, the Broward County Palm & Cycad Society (BCP&CS) met at the Broward County Cooperative Extension Service Office in Davie.

The group met on May 26 to hear Dr. Fred Essig, Director of the Botanical Garden and a faculty member of the University of South Florida, speak on "Palm Collecting in Papua New Guinea, 1971–1989". He discussed many species of palms in their native habitats, including *Ptychosperma*, *Orania*, *Gronophyllum*, *Gulubia*, *Calyptrocalyx*, and many others.

News from the Hawaii Island Chapter

The Hawaii Island Chapter of the IPS announced a meeting on June 30, with Jeff Marcus speaking on his recent trip to Fiji and the Philippines.

A chapter workday was held at the Panaewa Zoo to plant some palms on May 27. More than 35 palms had been made ready for the planting.

A Barbecue and Members' Palm Auction is scheduled for July 21 at Wailoa State Park.

News from the Louisiana Chapter

The Louisiana Chapter of the IPS met on March 12 at the Audubon Institute in New Orleans. Tran Asprodites of the Institute gave a brief description of the new exhibit "Butterflies in Flight", then described the planned exhibit on "Mesoamerica", asking the chapters assistance in determining which palms were appropriate for landscaping in that exhibit.

Tran also announced that much work had been done on Palm Point in the part of Audubon Park closest to St. Charles Avenue. The society agreed to assist in planting more palms there. President Danny Braud then discussed the possibility of growing *Bismarckia nobilis* in the New Orleans area, as it has reportedly survived temperatures as low as 22° F in the Tampa area of Florida. A slide show was then presented on the Singapore Botanical Gardens by Chapter Secretary Gary Fleming, who recently returned from there.

The group also met on May 28 at the splendid estate of Mal and Mich Mele, #1 River Road in Covington known as "The Property." The meeting began with lunch shortly after noon. Simon Leake, an agricultural scientist, founder and director of the Sydney Environmental Soil Laboratory, spoke on potting mixes. The Laboratory also offers soil testing services.

A meeting was planned for June 18 at the home of Eddie Assmann on the Tchefuncte River at 69099 River Bend Drive in Covington. Planned activities included a cruise on the Tchefuncte River, possibly with water skiing.

News from the Texas Chapter

The Texas Chapter of the IPS met in San Antonio on May 6 and 7, 1995, providing the first opportunity for members in that area to easily attend a chapter meeting. The group stayed at the Howard Johnson Riverwalk. The weekend kicked off with a morning barge tour of the Riverwalk with Richard Heard from the City of San Antonio, followed by lunch on the Riverwalk. This was followed by a tour of the San Antonio Botanical Garden with Paul Cox, Director. There were no activities scheduled for Saturday night. Sunday featured a brunch at member George Street's Rainforest.

Don't Miss the October 1995 IPS Board Meeting in Sarasota, Florida

The Central Florida Palm Society (CFPS) will host the fall 1995 meeting of the Board of Directors of the International Palm Society. The meeting will convene on October 26 at the Sarasota Hyatt.

On Thursday evening, the group will tour the Besse's palm and cycad collection and then go to dinner at the Field House on Sarasota Bay.

Most of Friday will be consumed in board meetings. However, the group will tour Selby Botanical Gardens in the late afternoon, followed by a cocktail party and a catered dinner at Selby. CFPS and other IPS members are invited to attend the Selby event for the cost of the dinner. Scott Zona will be the featured after-dinner speaker, with a lecture and slide presentation on his recent work with *Roystonea* palms.

On Saturday, the group will head for St. Petersburg and Tampa to join the CFPS in its fall meeting. After a brief tour of the Gisella Kopsick Arboretum, the group will head to Ben and U. A. Young's residence. They will help conduct a plant auction and enjoy the excellent plant collection with the CFPS members.

Registration information should have been received by all IPS Directors and Committee members and you should have all made your hotel reservations. If not, do so now! Non-directors are welcome to attend, but emphasis will be on the Society's business. Make your plans now. If you wish to attend, it is imperative that you let the Ed Hall or Libby Besse know in advance. Contact Ed or Libby if you have any questions.

JIM CAIN

Back Cover

Leopoldinia pulchra reflected in the black water of Cano Ucata in Amazonas State, Venezuela. See pp. 152–158.

BOOKSTORE UPDATE

☞ *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**

A GUIDE TO THE MONOCOTYLEDONS OF PAPUA NEW GUINEA, PART 3, PALMAE (R.J. Johns and A.J.M. Hay, Eds., 1984, 124 pp.) **$8.00**

BETROCK'S GUIDE TO LANDSCAPE PALMS *(A.W. Meerow, 1992, 153 pp. - all color.)* ***$29.00***

BRAZILIAN PALMS, Notes on their uses and Vernacular names (C. Pinheiro and M. Balick, 1987, 63 pp.) **$9.25**

☞ ***CHAMAEDOREA PALMS*** *(D. Hodel, 1992, 350 pp., 127 pp. of superb color) EXCELLENT!* ..... ~~*$59.95*~~
LIMITED TIME ***$49.95***

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.) **$7.95**

CYCADS OF THE WORLD (D. Jones (1993) 312 pp., 250 color photos **$45.00**

DESERT PALM OASIS (J. W. Cornett, 1989, 47 pp., 41 pp. color) **$8.95**

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

ECUADORIAN PALMS FOR AGROFORESTRY (H. B. Pedersen and H. Balslev, 1990, 105 pp.) **$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 NEOTROPICA INTRODUCTION AND THE IRIARTEINAE (A. Henderson, 1990, 100 pp.)..... **$23.00**

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 PALMS, Handbook of (B. McGeachy, 1955, 62 pp.) **$3.95**

FLORIDA TREES AND PALMS (S. A. Rose, A. A. Will, Jr., T. B. Mack, 1984, 30 palm species, 120 pp.) **$6.00**

GENERA PALMARUM (N. W. Uhl and J. Dransfield, 1987, 610 pp.) **$79.00**

HARVEST OF THE PALM (J. J. Fox, 1977, 244 pp.)..... **$30.00**

INDEX TO PRINCIPES (Vols. 1 - 20, 1956-1976, H. E. Moore, Jr., 68 pp.) **$4.00**

KEY GUIDE TO AUSTRALIAN PALMS (L. Cronin, 1989, 180 pp., 85 pp. color) **$21.95**

☞ **LAS PALMAS CULTIVADAS** (A. Braun, 1994, 64 pp., color, Spanish. The cultivated palms of highland Andean cities in South America) **$10.00**

MAJOR TRENDS OF EVOLUTION IN PALMS (H. E. Morre, Jr., N. W. Uhl, 1982, 69 pp.) **$6.00**

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

PALEM INDONESIA (in Indonesian) (Sastraprdja, Mogea, Sangat, Afriastini, 1978, 52 illustrations, 120 pp. For English translation add $3.00) **$5.50**

PALMAS DEL DEPARTMENTO DE ANTIOQUIA (Palms of Colombia, in Spanish; G. Galearno and R. Bernal, 1987, 207 pp.) **$18.95**

PALMS (M. Gibbons, 1993, 80 pp. Identifying 120 species in color, description, habits & cultivation.) **$10.95**

PALMS AND CYCADS AROUND THE WORLD (J. Krempin, 1990, 267 pp., 267 pp. color) REVISED EDITION **$50.00**

PALMS AND CYCADS BEYOND THE TROPICS *(Keith Boyer, 1992, 160 pp. 120 color photos.)* ***$20.00***

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

PALMS IN COLOUR (David Jones, 1985, 93 pp.) **$14.95**

☞ **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) **$5.95**

PALMS OF THE WORLD (Formerly - **PALMS**, A. Blombery & T. Rodd, 1982, 192pp., 212 color photographs **$34.95**

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. **$9.95**

PALMS OF THE SOUTH-WEST PACIFIC (J. L. Dowe, 1989, 198 pp., 33 pp. color) **$29.95**

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

SECRET OF THE ORIENT DWARF RHAPIS EXCELSA (L. McKamey, 1983, 51 pp.) **$5.95**

☞ **SOWING OF PALM SEEDS IN THE TROPIC AND GERMINATION RESULTS** (A. Braun, 1994, 53 pp.)..... **$10.00**

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

TROPICA (A. Graf, 7000 color photos, 1138 pp.) **$165.00**

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

☞ **VENEZUELAN CLOUD FOREST** (A. Braun), 1994, 54 pp., 16 pp. color, English & Spanish **$11.00**

PALM PAPERS (Postage Included)

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

HARDIEST PALMS or FURTHER INFORMATION ON HARDY PALMS (J. Popenoe, 1973, 4 pp.) ..... each **$2.00**

NOTES ON PRITCHARDIA IN HAWAII (D. Hodel, 1980, 16 pp.) **$2.50**

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

PALMS FOR SOUTHERN CALIFORNIA (Trish Reynoso, 1990, 11 pp.) **$3.00**

PALMS FOR TEXAS LANDSCAPES (R. Dewers & T. Keeter, 1972, 3 pp.) **$1.25**

PINANGA ISSUE OF PACSOA (#16, 1987, 17 pp.) **$2.50**

RHAPIS PALMS - CULTIVATED SPECIES AND VARIETIES CULTURE AND CARE OF THE LADIES(Lynn McKamey, 1989, 10pp.) **$2.00**

The palm books listed above may be ordered at the prices indicated plus $2.50 extra per book 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 add 10% extra. Please include your International Palm Society membership number. ALL SALES FINAL. Send check payable to:

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