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THE PALM SOCIETY

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Caryota urens flowering at the San Diego Zoological Gardens, courtesy San Diego Zoological Society. See page 125.

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Notes on the Palms of Northwestern Cape York Peninsula

ROBERT TUCKER
P.O. Box 528, Rocky Point, Weipa, Queensland, Australia 4874

In a recent article by Covacevich and Covacevich (*Principes* 22: 88–93, 1978), mention was made of a general lack of published information regarding the palms of northern Cape York Peninsula. The following notes, based on ten months residence in Weipa and regular trips into various parts of the northwestern Cape York Peninsula, should help fill the void. Further travels will add to the present understanding in time.

Northwestern Cape York Peninsula (herein called the area) has three unnatural and one natural boundary but contains a fairly uniform vegetation and climate. The southern limit is represented by a line drawn from the coast just south of Weipa eastwards toward Iron Range. The boundary then turns north at about the geographical center of the peninsula, continuing to the Jardine River, then turns west until the coast is reached. The western boundary is the coast between Weipa and the Jardine. The small region north of the Jardine is somewhat distinct, having a higher rainfall, more hilly terrain, and has greater floristic links with the Torres Strait and the east coast.

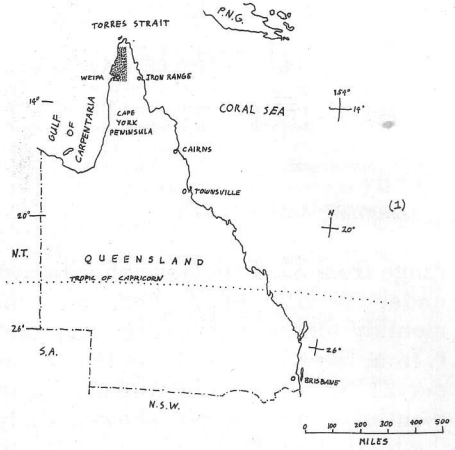
Climate

The rainfall inside the area is fairly uniform throughout, averaging 1700 mm per annum. Over 90 percent of this falls in the summer months between December and April. Temperatures are high and show little fluctuation. Maximum monthly temperatures range from 35° C in November to just under 30° C in July, while minimum monthly temperatures range from 25° C from December to March to just under 21° C in July and August. Mean monthly temperatures show a daily fluctuation of 8–10° C from day to night throughout the year (Specht 1977). Tropical cyclones are a fairly regular climatic feature but apparently have little long-term effect.

Topography and Vegetation

Cape York Peninsula as a whole is relatively flat and the terrain inside the area is quite so, having no mountains or hills of any importance. The main watercourse system is the Wenlock River, which has its beginnings on the eastern side of the peninsula on the western slopes of the Great Dividing Range. The Mission and Embley/Hey rivers, on the confluence of which Weipa is situated, are large tidal estuaries with no major fresh water flow.

The vegetation of the area is predominantly open woodland consisting of *Eucalyptus tetradonta*, *E. nesophylla*, *E. confertiflora*, *Erythrophleum chlorostachys*, numerous species of *Acacia* and *Melaleuca*, with many deciduous elements. Broad-leaved gallery forests occur along all major seasonal watercourses and mangroves are widespread on the coast and in river estuaries. Soils have been dealt with in detail (Isbell, Webb, and Murtha 1968) and need not be mentioned here.

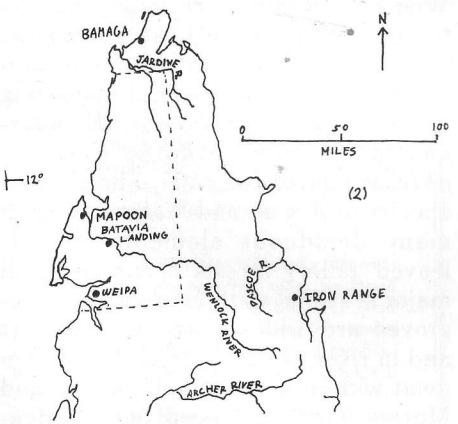


1. Queensland, showing area of northwestern Cape York Peninsula.

The Main Habitats

The monotony of the open woodlands is broken by numerous low areas where sedges and species of *Melaleuca* dominate. Such places are completely flooded during the rainy season, and although dry by the start of the next rains, retain sufficient ground moisture to maintain their semiaquatic communities. There is a high canopy in low moist areas near springs; these places support true rain forest elements and in some locations appear very lush. Vine scrubs also occur on slopes and sandy coastal formations are dominated by deciduous monsoon forest trees such as *Bombax ceiba* var. *leiocarpum*, *Ficus virens*, *Terminalia sericocarpa*, and *Pongamia* species. The interesting native mangosteens, *Garcinia warrenii* and *G.* sp., although usually rain forest trees, occur in the dry vine scrubs. Giant lianes of *Entada phaseoloides* are a common feature and the drought-resistant epiphytic fern *Drynaria quercifolia* is abundant.

Vine scrubs occasionally border mangroves or freshwater rivers and form tall gallery forests with a high species composition. Ground moisture and humidity are often high in such places and many undershrubs and epiphytes not common in the area are present.



2. Northern Cape York Peninsula (detail).



3. *Licuala ramsayi* on mangrove margin along Wenlock River.



4. *Livistona muelleri* near Stone Crossing, Wenlock River.

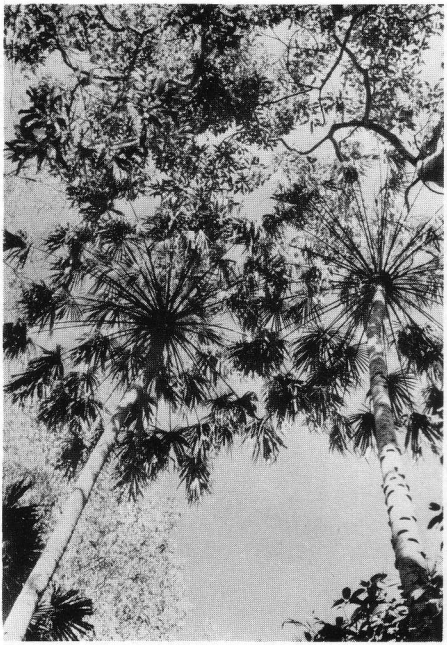
Coastal sands can be flat or undulating. The latter situation obviously is caused by built up beaches deposited by a receding coastline and can be seen plainly from the air. The successful establishment of broad-leaved communities on such formations is apparently quite slow. Frequent fires halt the process completely. Lagoons in sand country are not rare and some become semiclosed with tall species of *Melaleuca*. These places can be seen from the air easily because of the crowns of *Livistona benthami* or occasionally *Licuala ramsayi* with their unmistakable foliage and generally yellowish color.

The Species and Their Habitats

Corypha elata Roxb. Although common in south-central Cape York Peninsula, it is apparently rare in the area, occurring only in the extreme southeastern corner. Here it grows along seasonal watercourses in deciduous low vine thickets.

Livistona muelleri F. M. Bailey. Probably the most widespread and abundant palm in the area, occurring apparently throughout. It favors moist, open situations, either bordering creeks or swamps, and may occur locally in shady dry vine scrubs. Thousands of this palm are to be seen east of Weipa in open swamp forest and semiclosed gallery forest. It exhibits some noticeable variation within the population.

Livistona benthamii F. M. Bailey. Apparently confined to lagoon margins, moist gallery forests, and moister vine scrubs. It colonizes the mangrove-vine scrub ecotone with much



5. *Livistona benthamii* at Batavia Landing.



6. *Hydriastele wendlandiana* at Batavia Landing.

success and attains pure stand populations in several places. It extends inland where conditions permit.

Licuala ramsayi (Mueller) Domin. Widespread on the western part of the area favoring semiclosed to closed gallery forests and lagoon margins wherever ground water is available. Such habitats are not common, but the palm seems to establish itself in large numbers if it can survive at all.

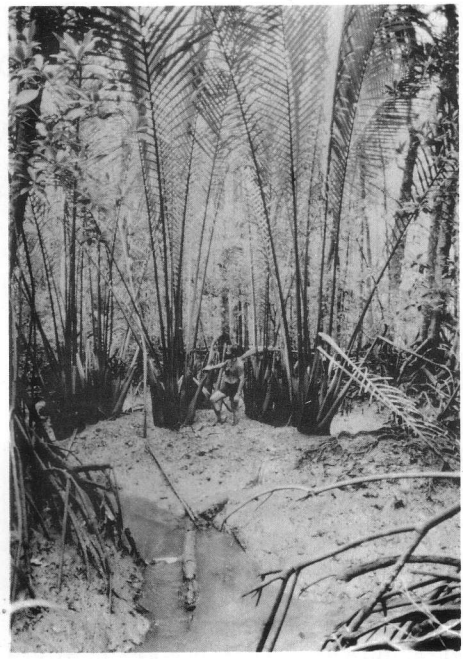
Ptychosperma macarthurii (H. Wendland ex Veitch) H. Wendland ex J. D. Hooker. Very rare and restricted to moist gallery forests bordering mangroves. Only five adults and as many juveniles have been seen by the author; possibly larger numbers occur in unexplored vine scrubs.

Hydriastele wendlandiana (Mueller) H. Wendland and Drude. A very widespread species successfully exploiting any permanently moist situation. It can occur in open swamps with *Nepenthes* and sedges but is more often found in vine scrubs or gallery forests with moist soils. In the open it appears to be fairly resistant to fire and if well shaded is unusually resistant to drought.

Nypa fruticans Wurmb. Very restricted on the west coast of the Peninsula but locally abundant along the Wenlock River. It grows as a clumping undershrub under tall *Rhizophora*, *Bruguiera*, *Avicennia*, and *Ceriops* species and rarely dominates. The fern *Acrostichum speciosum* is common among *Nypa* and the amaryllid *Crinum pedunculatum* is an occasional associate. Where sufficient fresh water flows into the *Nypa*, the vigorous climbing fern *Stenochlaena palustris* sometimes covers the older leaves,



7. Naturalized *Cocos nucifera* at Batavia Landing.



8. *Nypa fruticans* at Batavia Landing.

which attain lengths in excess of 10 meters.

Cocos nucifera L. The coconut has a brief history of cultivation in the area. Main plantations were established at Mapoon on Port Musgrave, the large sheltered estuary of the Wenlock River. Very few trees survive today and only one other coconut garden worth mentioning still exists at Small Batavia just upstream from Mapoon. At Small Batavia (also called Tungu by Islanders and Fungu by Aborigines) and Batavia landing, also on the Wenlock, the coconut has naturalized and small wild populations are to be found. Occasional coconuts occur along the shore of the Gulf of Carpentaria between Weipa and the Jardine River, but it is nowhere common and in most places is not reproducing adequately and may disappear altogether.

The most important single palm habitat in the area seems to be near Batavia Landing on the Wenlock River, where all the species mentioned can be found. An interesting fact is the lack of species that should grow quite successfully there—*Calamus* species, *Ptychosperma elegans*, and *Gulubia costata*. Whether the Wenlock palms are relictual or introduced by natural means remains to be seen.

All of the native palms in the area are better represented on the east coast, especially at Iron Range; some extend further south and others into the Northern Territory. *Licuala ramsayi*, *Livistona muelleri*, *Hydriastele wendlandiana*, and *Nypa fruticans* extend south to the north coast region between Cairns and Townsville; *Livistona muelleri* does not grow south of the Mulgrave River, while the others

extend at least as far south as the Herbert River. *Corypha elata* and *Livistona benthamii* have wide ranges over southern and central Cape York Peninsula and occur in the Northern Territory Top End, where *Hydriastele* may also occur.

Conservation

The palms of northwestern Cape York Peninsula are all well represented outside the area and the species are in no immediate danger of extinction. However, the small and isolated populations within the area are very delicate, and with the exception of the two *Livistona* species (which are robust and abundant) are suffering from an increasing menace. This is the feral pig. Because of the generally dry and open nature of the forests in the area, feral pigs (a recent introduction) are seeking moister places to dig and wallow during the dry season. A small group of pigs can cause extensive damage to large areas, rooting through the soft soil in search of edible roots and the like. Once-grassy *Melaleuca* swamps are turned into desolate bogs, the dominant trees often dying. The damage done to the broad-leaved communities in moist soil is just as drastic. Adult palms of the smaller species can be undermined, juveniles rooted out, and seed eaten. Such soil disturbance can lead to gross erosion during the rainy season.

Burning off the bush during the dry season has some detrimental effects. Mostly the palms are immune to fire either through being physically resistant, as are *Livistona* and *Corypha*, or by growing in places that escape fires. However, regular burns do much to reduce potential broad-leaved communities to sclerophyll communities and can occasionally enter vine scrubs, often causing much damage.

Open-cut bauxite mining here at Weipa has claimed a few *Livistona muelleri* and more will disappear in the future. However, mining (supposedly) is not carried out in wetlands or close to watercourses so the bulk of the population is safe. Generally the area is relatively untouched and if managed properly can remain so as part of Australia's last wilderness.

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Postscript

Since the above was written, the author has found a large population of *Corypha* along the Ducie River, a large tidal tributary of the Wenlock River, and he has observed *Livistona muelleri* occurring naturally near Cowley Beach, a location much further south than that previously indicated.

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The Temiche Cap

JOHANNES WILBERT
Department of Anthropology, University of California, Los Angeles, CA 90024

Toward the end of the eighteenth century the German botanist Joseph Gaertner (1791: 468, *pl. 2*) obtained the spathe, spadix, rachillae, and flowers of a palm known in Neotropica as *temiche* (*timiche*, *timití*), *truli*, and *ubussú* (*bussu*). Characteristically, the entire inflorescence and large pendant infructescence of this palm is contained in a pouchlike cover, a feature Gaertner's chosen name, *Manicaria saccifera*, takes fittingly into account for both the genus and the species of the plant.[1] The *temiche* palm has since become known from Central America, the littoral of Colombia, the Orinoco Delta, the Guianas, Trinidad, and the lower Amazon (Moore 1973: 92, *pl. 56*). It is predominantly a palm of the tidal swamp but grows also along the marshy banks of the lower Amazon as far inland as the Río Negro and the Purus River.[2]

I have elsewhere given a comprehensive account of *Manicaria saccifera* and its cultural significance for the Warao Indians of the Orinoco Delta (Wilbert 1976). Here I shall concentrate on the spathe of the palm and the uses Indians make of it.

Writes Wallace (1853: 70), to whom we owe the first detailed description of the *temiche*, "The spathe . . . is much valued by Indians, furnishing them with an excellent and durable cloth." It is fusiform and brown in color and provides a good-sized piece of fine, closely woven, seamless material. "When cut open longitudinally and pressed flat," continues Wallace, "it is used to preserve [the Indians'] delicate feather ornaments and gala dresses, which are kept in a chest of plaited palm leaves between layers of smooth 'bussu' cloth." Braun (1968: 111) also reports that the fibrous spathe of *temiche* is used as wrapping material and for loincloths. Oftentimes an entire spathe is employed as a carrying bag, and its lower half can be converted into a hoodlike cap.

Temiche caps are worn by Indians, Creoles, and tourists. They are sometimes referred to as "monkey caps," likening their wearers to East Indian bonnet macaques. However, the circumstance that outsiders sport *temiche* caps in jest or label them with gauche appellations should not detract from the fact that, in native context, the cap used to play the more serious role of a protective head covering. Since the *temiche* cap in its latter significance has not been adequately described, the present essay is presented to illustrate its rustic form and function.

Traditionally Warao Indians spend much time collecting food on open interfluvial savannas, producing stem starch from *moriche* palm (*Mauritia flexuosa*) in more or less open *morichales*, and navigating the wide distributaries of their sun-drenched

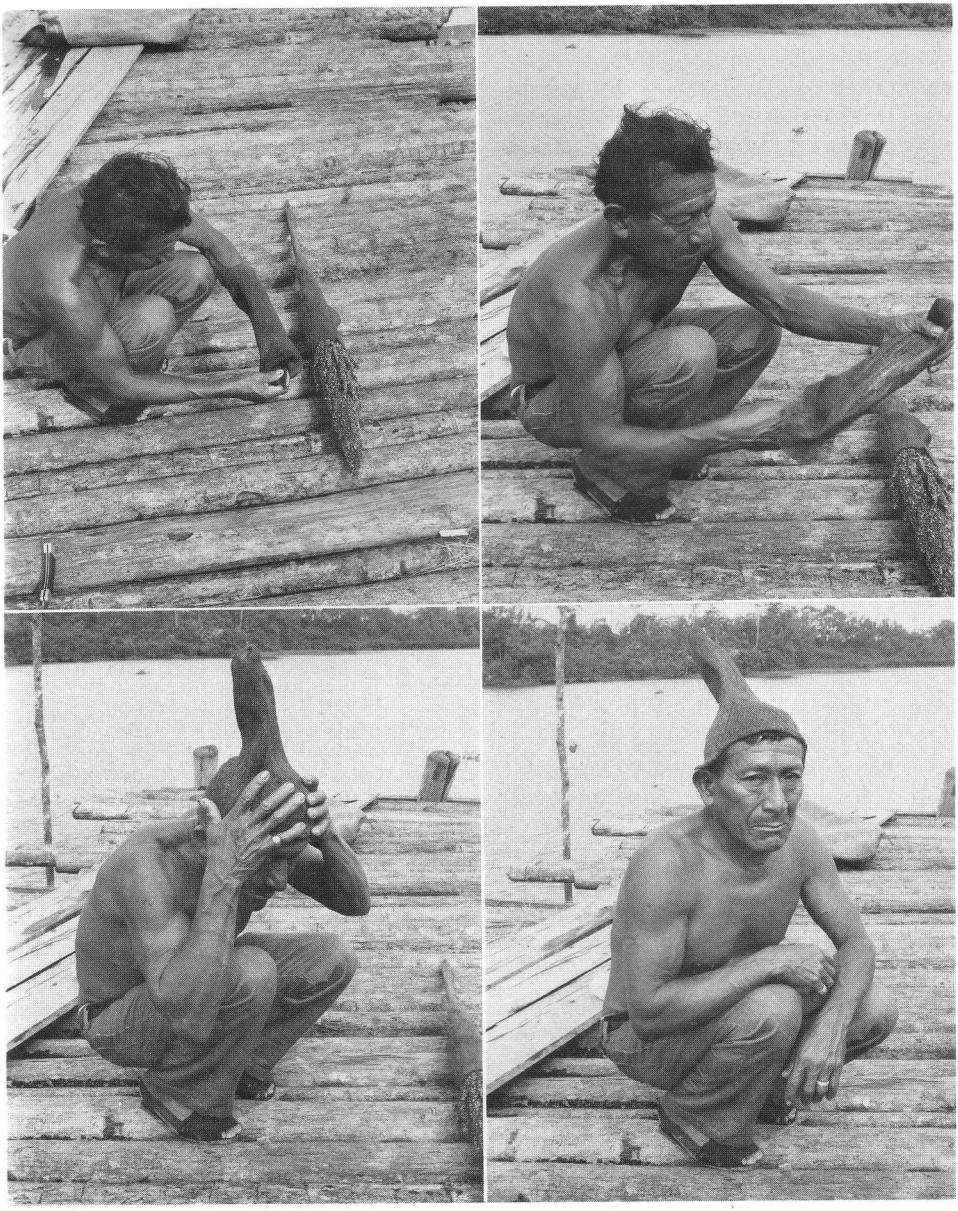
[1] Derived from Lat. *manica*, "sleeve" and *saccifera*, "sack-bearing."

[2] Bailey 1943: 392–393; Standley and Steyermark 1958: 271–273 (Central America); Wessels Boer 1965*a*, *b* (Colombia, Guianas); Wilbert 1976 (Orinoco Delta); Bailey 1933: 405–413 (Trinidad); Burret 1928: 389 (Mouth of the Amazon); Wallace 1853: 70 (Río Negro, Amazon).



1. In making a *temiche* cap, an inflorescence of *Manicaria saccifera* with unruptured spathe is removed from the palm, the spathe is cut, and the top pulled off.

domain. Modern Warao spend also long hours clearing garden plots and tending shadeless rice fields. Whenever the sun bears down on them with merciless intensity the Indians say, *hokohi ahera*, "the sun hurts." At outdoor work sites they implant a single *temiche* leaf or an entire row of them



2. The spathe is then turned inside out, shaped to the head with the fingers, and worn to give protection from the sun.

into the soft ground to protect themselves from the stinging rays and the weather. When traveling along the path or as idle passengers in a motor-driven canoe they can be seen protecting their heads with *temiche* leaf segments, referred to as *aroko a kuasimara*, "leaf cape." But when the

Indians move about and need two free hands, they fashion a *temiche* cap which they call *yasi nona*, "an article worn for the sun."[3] Since *temiche* palms grow closely scattered in tidal swamp forest or else in solid stands, called *temichales*, the Indian is never far away from this useful plant, and the manufacture of a sun shade, cape, or cap takes but a few moments of his time.

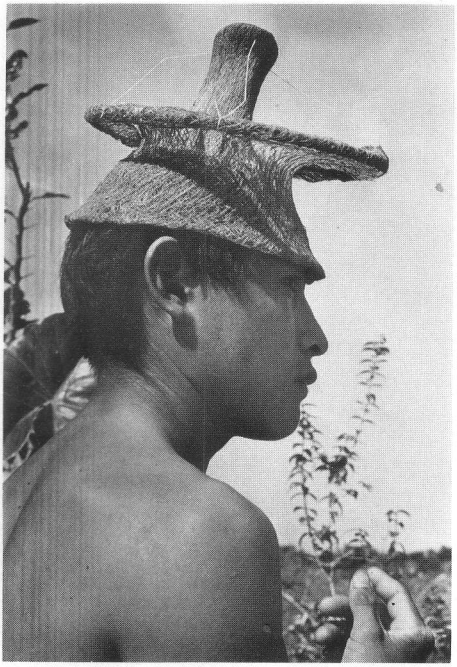
In addition to being ubiquitous in the tidal zone, *Manicaria saccifera* also seems to have no annual flowering period, so that the Indian can approach a palm almost anytime and with good chances of finding an untorn spadix in the flowering stage.

To produce a *temiche* cap, the Warao place the inflorescence on a firm support. If the cap is intended for an adult, he cuts the fibrous spathe with a sharp knife around the middle of the spadix. For a child the cut is made closer to the tapered lower end, where the circumference is narrower and more adequate for the smaller head size.

Upon completion of the circumcision the Indian slips off the severed half of the spathe, exposing thereby the flower bunch it used to sheathe.

Next the separated part of the spathe is turned inside out and the rim is folded up inwardly to the width of one inch. This strengthens the edge and gives the cap a finished look.

Growing among the leaves of the palm, flowering *temiche* spadices are usually moist and flexible. However, should the specimen selected for the cap dry out in the manufacturing process, the Indian will wet it before he slowly slides it over his head. To accomplish the latter he uses both hands, fingers spread, gently pushing



3. A Warao Indian of the younger generation in Venezuela wears a cap made from *Manicaria saccifera* but given a fancier shape than the usual model. Photograph by Peter T. Furst.

the hood downward while simultaneously stretching and pressing it against his head to give it the desired fit. In its finished form the *temiche* cap provides its bearer with effective protection against the sun. While wearing it, the Warao like to moisten the cap from time to time to make it more resistant and also to refresh themselves.

The Indian depicted in the manufacturing sequence of photographs is Antonio Lorenzano, a village headman of the Winikina subtribe. Besides being an astute political leader he is also a shaman. I have been studying with him since 1954 and respect his knowledge and ability to interpret Warao lore. Lorenzano has assured me that the *temiche* cap was a commonplace garment of the Warao before the recent introduction of West-

[3] From *ya*, "sun," (*i*)*si*(*a*), "for," and *nona*, "artifact."

ern hats of straw and felt. It was practical, cheap, and always in stock and style. In fact, the old Indian can become nostalgic over the *temiche* cap which is suggestive of a bygone *warao witu*, a "true Warao" way of life. Like the *bonnet phrygien*, a similar cap of the European historical past, the *temiche* cap has become emblematic to the old of Waraodom free of Western encumbrance.

I must admit though that the younger generation as I saw it grow up over the past 25 years, does find it awkward to wear *temiche* caps. The morning they arrive in a garden plot or rice field, for instance, men, women, and children may scramble to don their *temiche* bonnets. But once they see themselves all walk around in their new hoods, they find it hilarious, and the women start throwing theirs away. The younger men make their caps more acceptable to themselves by giving them all sorts of fancy shapes, some of which may even reflect long forgotten ritualistic content. Only in one particular instance is vanity cast aside by both men and women, i.e., when the Indians gather the honey of stingless bees (*Trigona* sp.). These tiny black monsters are in the bad habit of attacking the heads of their aggressors by biting their scalps and tearing their hair. Worse still, they crawl into their ears and eyes and noses and torture the honey seekers with scores of painful bites. To protect themselves from this airborne scourge, everybody—men, women, and children—will make sure not to approach a hive of stingless bees without wearing a *temiche* cap, no matter how awkward it may make them feel otherwise. In any case, however, many of the men, especially those who lack Western hats and who will have to exert themselves in the blazing sunshine, keep their bonnets on their heads, grateful for the comfort, protection, and esprit they derive from wearing a *temiche* cap, even today.

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Crown Relationships in Two Samoan Palms

PAUL ALAN COX
Department of Biology, Harvard University, Cambridge, Massachusetts 02138

Abstract

Dissection of crowns in *Balaka* aff. *rechingerana* and *Clinostigma onchorhynchum* in Western Samoa reveal that Corner's postulate of equal numbers of exposed and unexposed leaves in palms holds for the *Balaka* but not for the *Clinostigma* in which there are more than twice as many developing as exposed leaves.

In his book *The Natural History of Palms*, Corner makes the interesting conjecture that "the palm crown should have as many developing leaves as it has open leaves" (1966), a suggestion that has been repeated in more recent texts (Hallé et al. 1978). This statement appears to be related to his postulation of equal rates of leaf initiation and abscission in a steady-state crown. He uses both assumptions to derive formulas of an essentially demographic nature that can be used to determine the age of individual leaves. Corner provides evidence of a somewhat anecdotal nature for his assumption by describing the results of complete dissections of the crowns of six species of palms. For two specimens of *Cocos nucifera*, one specimen of *Elaeis guineensis* (in which "the bud snapped in dissection and damaged the soft apex"), and an unspecified number of specimens of *Ptychosperma macarthurii*, *Pinanga simplicifrons*, *Pinanga furfuracea*, and *Pinanga kuhlii*, Corner found essentially equal numbers of open and developing leaves.

I became interested in Corner's conjecture and decided to test it on two Samoan species of palm, *Balaka* aff. *rechingerana* Burret and *Clinostigma onchorhynchum* Beccari.

Materials and Methods

In July and August, 1979, ten specimens of *Balaka* aff. *rechingerana* (*maniuniu* in Samoan) were collected from an area soon to be cleared for agricultural purposes near Falemauga, on the island of Upolu, Western Samoa. Five specimens of *Clinostigma onchorhynchum* (*niu vao* in Samoan) were collected on land to be cleared for agricultural purposes near Tiavi on the island of Upolu. Each specimen was completely dissected after recording the stem length and diameter immediately beneath the crown. The number of developing (unexposed) and the number of exposed leaves were counted. A chi-square test was made on the number of unexposed and exposed leaves in each crown. Measurements of sheath, petiole, and lamina lengths were recorded for each leaf in all of the crowns. Voucher specimens for each species (*Cox 221* for *Balaka* aff. *rechingerana*, and *Cox 162* for *Clinostigma onchorhynchum*) were made and deposited with the Gray Herbarium.

Illustrations of the natural logarithms

Results

Balaka aff. *rechingerana*

Specimen	Stem length	Diameter	No. unexposed leaves	No. exposed leaves	χ^2	p
1	74 cm	2 cm	7	5	0.3	NS
2	257	3	8	7	0.7	NS
3	251	4	7	7	0	NS
4	177	3	8	7	0.7	NS
5	87	2	8	6	0.3	NS
6	285	4	8	6	0.3	NS
7	217	5	7	7	0	NS
8	179	3	8	7	0.7	NS
9	148	3	8	8	0	NS
10	61	3	7	7	0	NS

Clinostigma onchorhynchum

Specimen	Stem length	Diameter	No. unexposed leaves	No. exposed leaves	χ^2	p
1	342 cm	11 cm	22	10	4.5	0.05
2	795	18	27	13	4.9	0.05
3	394	14	21	9	4.8	0.05
4	270	14	21	8	5.8	0.025
5	*	*	32	12	9.0	0.001

* not recorded

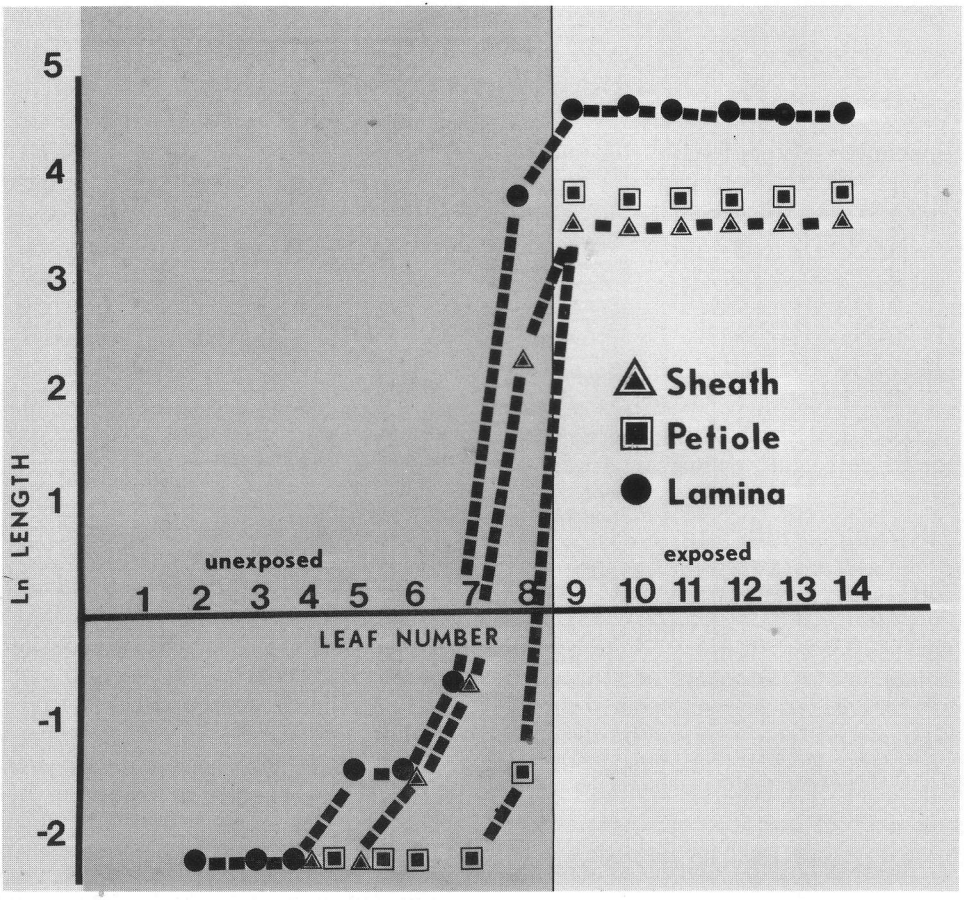
of the leaf lengths plotted against the leaf order are shown for a typical crown of *Balaka* aff. *rechingerana* and a crown of *Clinostigma onchorhynchum* in Figures 1 and 2.[1]

Discussion

The crowns of *Balaka* aff. *rechingerana* seem to have roughly the same number of expanded and unexpanded leaves and therefore fit Corner's hypothesis well. Although there were slight differences between the numbers of expanded and unexpanded leaves in the sample of ten crowns, none of these differences were statistically significant.

The crowns of *Clinostigma onchorhynchum*, however, do not fit Corner's hypothesis. All of the crowns in the sample had more than twice as many unexpanded as expanded leaves, and all of the differences between numbers of developing and exposed leaves were statistically significant. The great deviation of the crowns of *C. onchorhynchum* from Corner's hypothesis raises questions concerning the cause of this deviation and its effect upon the validity of the demographic formulas derived by Corner.

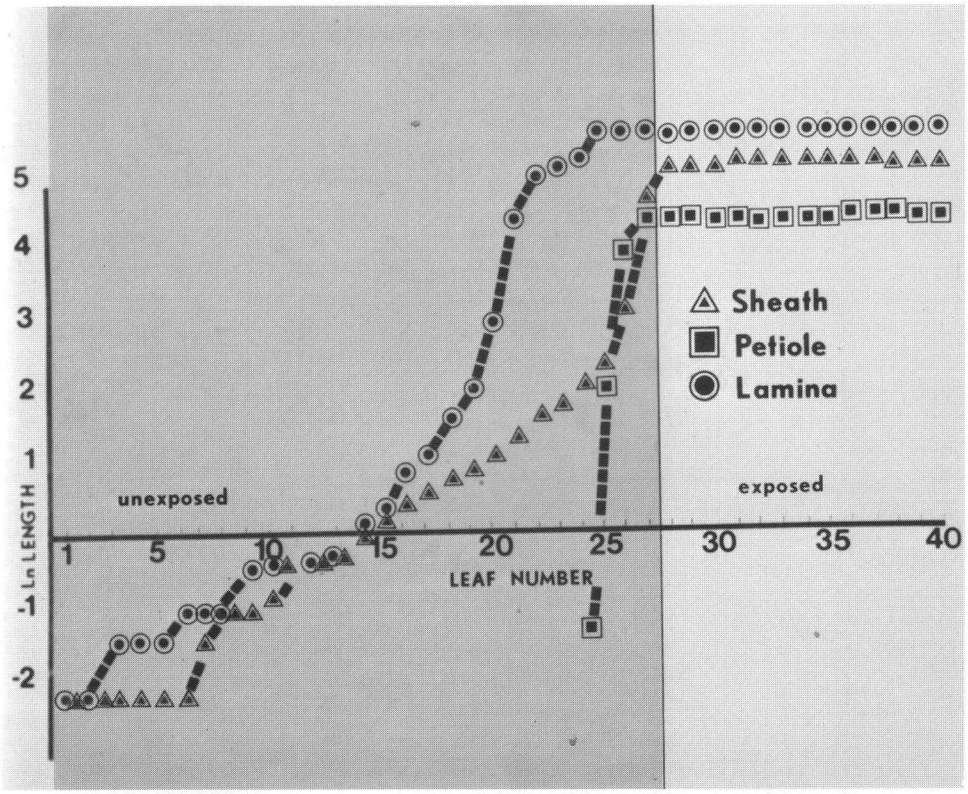
[1] Figure 1 shows the plot for specimen #6 of *B.* aff. *rechingerana*; Figure 2 gives the graph for specimen #1 of *C. onchorhynchum*. The data for the other specimens are available on request.



1. Leaf number (a rough determination of leaf age) plotted against the natural logarithms of leaf sheath, petiole, and lamina lengths for an individual of *Balaka* aff. *rechingerana*. The shaded area indicates leaves that are unexposed; i.e. those that are still developing and have not yet opened.

The significance of the first question can be discussed at two levels. At a more general level, Corner's initial generalization was based on observations of only six species of arecoid and cocosoid palms; three of the species were in the same genus. The two species here (both arecoid) show that further studies are needed to determine the strength of Corner's generalization. It might be that the relationship found in the crown of *Clinostigma onchorhynchum*, where the numbers of developing and exposed leaves are very different, occurs in many different species; conversely, this relationship might prove to be very rare among the palms. Only further observations of palm crowns of different species can resolve this question.

At a more specific level, we may ask why the crown of *Clinostigma onchorhynchum* should be different in the number of expanded and unexpanded leaves than the crown of *Balaka* aff. *rechingerana*. There are several possible explanations, but since so little is known about these species and palm



2. Same as for Figure 1 for an individual of *Clinostigma onchorhynchum*.

crowns in general, it would be premature to assign any more than a speculative status to these alternatives. First of all, there may be a historical explanation in that some external trauma, such as a large wind, disturbed the crowns of *Clinostigma onchorhynchum* in Samoa, removing part of the crown, but did not affect the crowns of *Balaka* aff. *rechingerana*. Although this is a possibility because *C. onchorhynchum* is a tall palm, which often exceeds the canopy of the surrounding forest, while *B.* aff. *rechingerana* is a small understory palm, I consider this to be highly unlikely because Samoa has not experienced any large hurricanes or other large physical traumas since 1966. Also, if this explanation were true, one would expect to find a relationship with height so that tall individuals would have more of their crown missing than small individuals. This, as shown by the data, is not the case.

Secondly, there may be an evolutionary explanation in that there has been natural selection for equivalent numbers of exposed and unexposed leaves in *B.* aff. *rechingerana* and against equivalent numbers of exposed and unexposed leaves in *C. onchorhynchum*. Greatly different selective forces operating on the two species, however, are difficult to imagine as both species have similar habi-



3. An individual of *Clinostigma onchorhynchum* near Tiavi, Upolu, W. Samoa.

tats and similar ecologies. The species are sympatric in several areas; they grow together on the slopes of Mt. Fia Moe, Upolu, although *C. onchorhynchum* seems to occur more frequently in open habitats such as the edges of clearings or on the edges of gorges while *B.* aff. *rechingerana* appears to



4. An individual of *Balaka* aff. *rechingerana* near Falemauga, Upolu.

be mostly confined to the interiors of undisturbed rainforest. Mature individuals of *C. onchorhynchum* (Fig. 3) are much larger than mature individuals of *B.* aff. *rechingerana* (Fig. 4), the former often reaching into the canopy of the mature forest, while the latter is strictly a small understory palm.

It is possible, then, that a selective force involved with different positions and light environments could play a role; in this regard it is of interest that the genera *Pinanga* and *Ptychosperma* which Corner studied tend to consist of understory palms (McCurrach 1960, Essig 1978).

Thirdly, the different number of open and developing leaves in *C. onchorhynchum* might be a product of allometry in the sense that selection has not favored different numbers of open and developing leaves directly, but rather has favored some other trait, which of necessity, has involved the relative proportion of open and developing leaves. For example, the massive leaf sheaths of the entire Clinostigma alliance may function to protect developing inflorescences (Uhl and Moore 1973), and selection might have favored numerous layers in the crown shaft to increase this protective function. The inflorescence in *C. onchorhynchum* is very fleshy and succulent at the time the first flowers open, in contrast to the more "woody" inflorescence of *B.* aff. *rechingerana*; possibly the inflorescence of *C. onchorhynchum* needs additional protection from physical and biological hazards. In both species, however, the leaf sheaths serve to push the leaves up into the crown as shown by their exponential growth in older developing leaves (see Figs. 1, 2).

The demographic formulas developed by Corner for determining the ages of individual leaves merely by counting their order in the crown and by knowing the rate of abscission might be applicable in *B.* aff. *rechingerana* if Corner's postulate of uniform and equal rates of initiation and abscission of leaves in palm crowns is correct, but will yield incorrect determinations if applied to *C. onchorhynchum*, and any other palm in which the number of developing leaves is not equal to the number of exposed leaves. Corner states that if the number of days between successive leaf yellowings is p days and the number of leaves in the crown is n, that the "working life" of the leaf will be np days, its period of development will be also np days, and that the total age of the leaf will be 2np days. If we assumed equal rates of abscission and initiation, and that these rates were uniform through time, np days would be a good estimate of the number of days a leaf is exposed in the crown, but would be a great underestimate of its period of development. The total age of the leaf derived from 2np would also be a gross underestimate of the total age of the leaf. Similarly, deriving the age of the palm by adding 2np to the trunk age, as Corner suggests, would also lead to a great underestimation of the age. Unfortunately, since there is no strict ratio between number of exposed and unexposed leaves in crowns of *C. onchorhynchum*, any attempt to accurately estimate the number of developing leaves within the crown by using only rate of abscission and the total number of exposed leaves as parameters will fail.

It is clear that more studies are needed to develop a comprehensive theory of crown relationships and their possible functions. Since such studies are of necessity destructive, it is hoped that any work done in crown dissection will be confined to cultivated material, or wild material from "doomed" sites such as areas of road construction or agricultural expansion.

Acknowledgments

I thank P. B. Tomlinson, H. E. Moore, Jr., T. Givnish, P. Stevens, and T. Kana for comments on an earlier draft of this manuscript: B. Cox,

A. Siilata, and Maleko of Si'usega assisted in collecting the data. This work was supported by funds from a Danforth Graduate Fellowship, an NSF Graduate Fellowship, the Atkins Fund, and the Fernald Fund, the latter two of Harvard University.

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PALM QUESTIONS AND ANSWERS

Q. What are the quarantines concerning lethal yellowing?

A. I am listing the following regulations:

Quarantine Area—entire counties of Broward, Dade, Hendry, Martin, and Palm Beach; and that portion of Monroe County not considered to be mainland.

Suppressive Area—Collier County. This county has been engaged in an intensive injection and tree removal project on all hosts exhibiting lethal yellowing symptoms for the purpose of achieving complete eradication. Therefore, all host material moving into Collier County from the Quarantine Area must be accompanied by a special permit.

Florida Requirements—a special permit is required for movement of all hosts outside both the Quarantine and Suppressive areas. If anyone is interested in obtaining a permit, contact your local Division of Plant Industry Agricultural Products Specialist.

California Requirements—California will not accept any host material originating in the lethal yellowing regulated areas. Any such material arriving there from these areas will be destroyed or returned to the shipper.

Hawaii Requirements—all host plants and parts thereof, including seeds, from Florida are prohibited; all palms of any species, parts and seeds, from the regulated area are also prohibited. Phytosanitary export certificates showing origin must accompany certifiable shipments of plants.

Louisiana Requirements—all palm trees which originate in a lethal-yellowing infested county or 25 miles from a known infection (whichever is the farthest) are refused entry. Non-host palms may be moved from a non-infested county but must be accompanied by a certificate of origin stating the palms originated in an area free of lethal yellowing.

Mississippi Requirements—host plants from regulated areas prohibited entry. Host plants from outside of regulated areas prohibited unless accompanied by a Florida certificate stating the origin of the shipment.

Puerto Rico Requirements—the introduction of all varieties of palms, products of palm, and palm seeds into the Commonwealth of Puerto Rico, from any place outside thereof, is prohibited.

Texas Requirements—all host plants listed above, *Arecastrum romanzoffianum* and *Phoenix roebelenii* are refused entry into Texas if plants originated in the regulated area of Florida.

DEARMAND HULL
18710 SW 288 St.
Homestead, Florida

Principes, 24(3), 1980, pp. 118–124

Coccothrinax readii, A New Species From the Peninsula of Yucatan, Mexico

HERMILO J. QUERO[1]

Jardín Botánico, Instituto de Biología,
Universidad Nacional Autónoma de México

The Mexican portion of the Peninsula of Yucatan comprises the states of Campeche, Yucatan, and Quintana Roo. In its geological and physiographic features, this region is clearly different from the rest of Mexico; it is a great plain formed by a vast sheet of Tertiary and Recent porous and friable limestone having several low hills not more than 400 m high. The climate is warm and humid. The soils are rendzinas, gley, and sand.

For botanists, this region is very interesting because it has some endemic species, it is the northern boundary of some Central American species, the southern boundary of some North American species, and it has a great affinity with the Antillean flora. There are five Antillean genera of palms present: *Coccothrinax*, *Thrinax*, *Pseudophoenix*, *Acoelorrhaphe*, and *Roystonea*, each represented by one species.

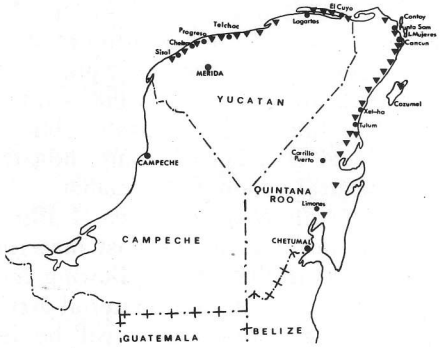
A new species of *Coccothrinax* described herein has a very wide distribution in the Peninsula of Yucatan along the coastal regions of Quintana Roo and Yucatan; it had been collected only a few times (*Schott 721*, in Progreso; *Kiem 331*, in Chixchulub, near Progreso, both in Yucatan, and *Kiem 403*, at Puerto Juarez, Quintana Roo). The author collected this palm for the first time in 1971 (*Quero 464*), but it was not until 1976, when he began to work on "The Palms of the Peninsula of Yucatan," that he made intensive field studies of the palm. With the assistance of Dr. R. W. Read, who traveled with the author to that region, it has been determined as a new species.[2]

Coccothrinax readii Quero **sp. nov.**

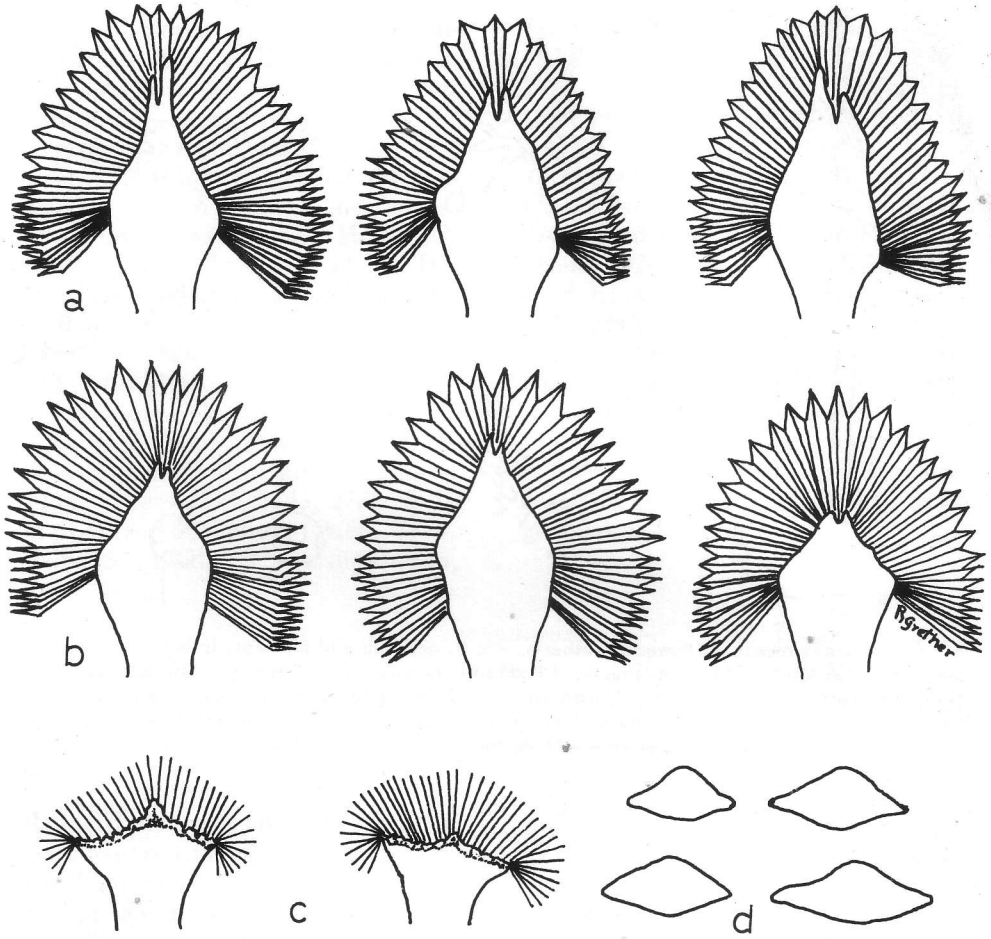
Truncus simplex, caule gracili usque ad 4 m alto, plerumque minus

[1] This species is named in honor of Dr. Robert W. Read of the Department of Botany, Smithsonian Institution; I wish to express my appreciation to him for his assistance and for critically reviewing the manuscript, and to Biol. Rosaura Grether of the Department of Biology, Universidad Autónoma Metropolitana, for her assistance with the field work and the drawings. Dr. W. J. Dress of the L. H. Bailey Hortorium, Cornell University, assisted with the Latin description.

[2] The seeds collected by Dr. R. W. Read and distributed to the members of The Palm Society in June (*Coccothrinax* sp. from Mexico) were, in fact, of this species.



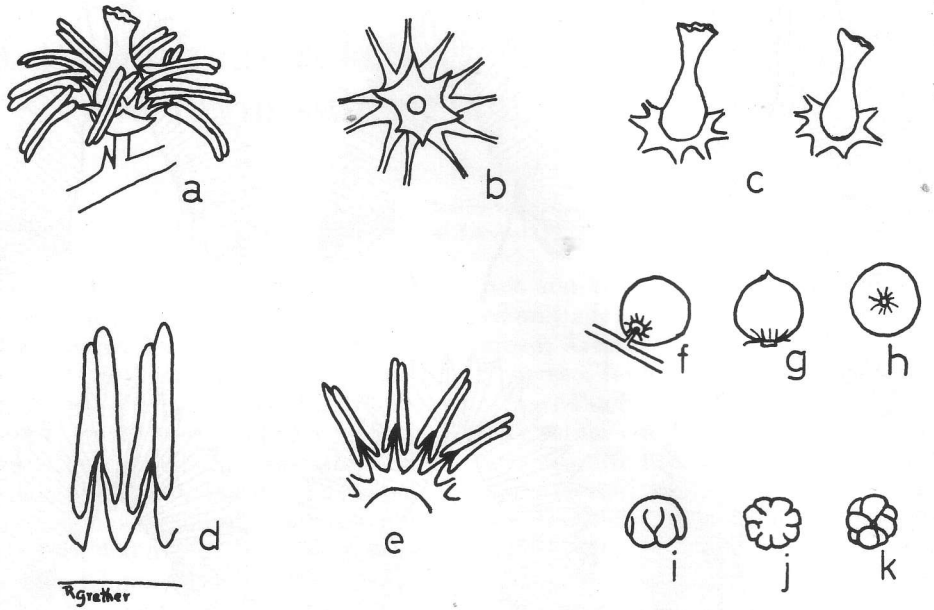
1. Map showing the distribution of *Coccothrinax readii* in the Peninsula of Yucatan.



2. *Coccothrinax readii*. **a**, variation of adaxial hastulas from palms growing on sand dunes of Punta Sam, ×1; **b**, variation of adaxial hastulas from palms growing in forest near Cancun, ×1; **c**, abaxial hastulas, ×1; **d**, petioles in cross section at the slenderest portion, ×2.

quam 5 cm lato; folia palmata ambitu orbicularia, pagina supra atroviridi infra argentea et non punctulata, lamina in 39–54 segmenta divisa, segmentis centralibus usque ad 65 cm longis apice bifurcatis, ad 3.8 cm latis supra sinus, hastula apiculata bifida 0.9–2.5 cm longa, vagina linguiformi, parte libera usque ad 6.8 cm longa; inflorescentie non elongatae 4–7 (–9)-partitae plerumque 5, floribus eburneis, fragrantibus, pedicellis 1.5–4 mm longis, perianthio 5–6-partito, segmentis subulatis, staminibus 9–13, antheris 2–3.7 mm longis, basi in forma sagittis; inflorescentiae fructificantes arcuatae, fructibus subglobosis purpureo-nigris, 5–12.5 mm diam., pedicellis fructiferis 2–6.5 mm longis, semine 3.5–10 mm diam.

Coccothrinax readii is a small, solitary palm 1–4 m high, with a very slender, brownish or grayish trunk 3–5 (–



3. *Coccothrinax readii*. **a**, flower at anthesis, ×5; **b**, perianth and filaments in bottom view, ×5; **c**, pistil shape with infundibuliform stigma, ×5; **d**, anthers with unequal thecae, ×10; **e**, stamens with filaments fused at their bases, ×5; **f**, fruit attached at the rachilla, ×1; **g**, fruit in side view, ×1; h, fruit in bottom view with remaining perianth and filaments, ×1; **i**, seed in side view ×1; **j**, seed in upper view, ×1; **k**, seed in bottom view ×1.

5.5) cm in diam. bearing a small open crown of 9–16 palmate leaves. Leaf blades are 40–110 cm in diam., dark green above and silvery on the abaxial surface, with 39–54 segments connate in a palman 13–30 cm long, the free portion triangular, generally tapering to a bifid apex to 3 cm deep, sometimes abruptly constricted in the middle of the free portion, middle segments 40–65 (–71) cm long from hastula to apex, the widest point always over the sinus, 2–3.8 cm wide; petioles 25–110 cm long, 6–11 mm wide at the most slender point and 8–15 mm wide at the union with the sheath, biconvex to narrowly rhombic in cross section and flattened adaxially toward the base; sheath linguiform, free portion 3–6.8 (–9.5) cm long from the union with the petiole, woven of fine fibers and forming a looser net with age; hastula narrowly triangular, sometimes only slightly retuse apically, but mostly very deeply bifid to 7.5 mm, free portion 9–25 mm long, sometimes tubular; abaxial hastula 1.7–4 mm long. Inflorescence interfoliar, arcuate in fruit, (37–) 40–84 cm long, bearing 4–7 (–9), usually 5, primary branches, the lowermost branch 9–25 cm long with 6–20 (–25) rachillae (3–) 4.5–11 cm long. Flowers fragrant, creamy-white; perianth in a single series with (4–) 5–6 unequal, subulate lobes; stamens (8–) 9–11 (–13) longer than pistil, filaments connate at the base in a ring around the base of the ovary, anthers retuse to bifid at the apex, sagittate at the base, longer than filaments, thecae unequal 2–3.7 mm long; pedicels 1.5–4 mm long. Fruit subglobose, purple-black and juicy-fleshed at maturity, 5–12.5 mm in

diam. with persistent perianth and filaments; fruiting pedicels 2–6.5 mm long; seed brownish, subglobose, cerebriform, 3.5–10 mm in diam.

Vernacular name: *knacás*.

Uses: the trunks are used in the construction of rustic houses and fences.

Specimens examined: MEXICO. QUINTANA ROO: ½ km N of Xel-Ha, *Quero 2755* (holotype, MEXU; isotypes BH, US, NY, F, GH; topotype, *Quero 2747*); 5 km S of Cancun, *Quero 2318, 2494, 2495, 2661, 2742, 2743, 2744*; Cancun, *Quero 464*; 1.5 km SW of Xel-Ha, *Quero 2647, 2723, 2746, López-Franco 1137*; 1 km S Ruins of Tulum, *Quero 2395, 2645, 2722*; 5–10 km S Town of Tulum, *Quero 2370, 2396, 2754*; 17 km NE Carrillo Puerto, *Quero 2642*; 6 km E Limones, *Quero 2536*; Punta Sam, *Quero 2320, 2397, 2496, 2497, 2745, 2756, Grether 451*; Cozumel Island, *Quero 2489, 2490*; Puerto Morelos, *Quero 2435*. YUCATAN: road from El Cuyo to Lagartos, *Quero 2405, 2668, 2738, 2739, 2740, 2741*; road from Telchac to Progreso, *Quero 2410, 2748, 2749, 2751, 2752*; road from Progreso to Sisal, *Quero 2474, 2682, 2753*.

In addition numerous measurements were made from random plants in each population.

Coccothrinax readii appears most closely related to *Coccothrinax jamaicensis* Read; however, it can be distinguished as follows:[3]

	C. jamaicensis	*C. readii*
Trunk length	6–8 m	to 4 m
Trunk diameter	(5–) 6.4–20 cm	3–5 (–5.5) cm
No. of leaf segments	35–38	39–54
Hastula:		
a) Apex	not bifid	bifid
b) General outline	broadly rounded acute	narrowly triangular
Petiole width:		
a) slenderest point	1.3–2 cm	0.6–1.1 cm
b) at the union with the sheath	to 2.5 cm	to 1.5 cm
Sheath length (free apex)	2–4 cm	3–6.8 (–9.5) cm
No. rachillae of the lowermost primary branch	14–40	6–20 (–25)
Rachillae length of the lowermost primary branch	8–16 cm	4.5–11 cm

Distribution and Ecology

The species is endemic to the Peninsula of Yucatan, from the southern region of the state of Quintana Roo to near Sisal on the northwestern coast of the state of Yucatan.

Coccothrinax readii is a very abundant palm where it grows, occurring in Median or Low Tropical Rain Forests near the coast and in Sandy Coastal Dunes.

[3] The laminar anatomy, using samples that were randomly collected throughout the range of distribution and variability of this species, tends to support a uniform and distinct taxon in Mexico. Pers. comm. R. W. Read.



4. Dr. Robert W. Read and the author with *C. readii* in a Median Forest near Xel-Ha.



5. *Coccothrinax readii* growing in a Median Forest near Cancun. Note the slender trunk and the long and thin petioles.



6. *Knacás* on sand dunes south of Tulum; at right, *Thrinax radiata*.

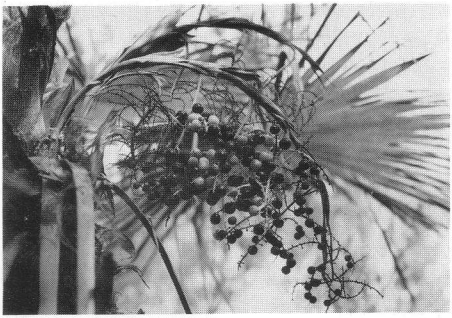


7. R. Grether with a very small palm growing on sands at Punta Sam.



8. A depauperate individual of *C. readii* at the limit of distribution near Chelem. Notice the small leaves and petioles and the orchid *Schomburgkia* growing on the trunk.

In the Median Forest, this palm is an important element of the physiognomy. It is very abundant in the median stratum under the shade of species such as *Manilkara zapota*, *Metopium brownei*, *Caesalpinia gaumeri*, etc. It grows under conditions of high humidity and on shallow soils with abundant humus not more than 10 to 15 cm deep where it reaches its best development. It is common to find it with brownish trunks usually tall (4 m), but very slender, not more than 4 cm in diameter. Leaves are large, 80–110 cm in diameter, with petioles 70–110 cm long. The hastula can be slightly bifid and is frequently tubular on account of the expansion of the blade. This kind of forest with *knacás* is exclusively found in Quintana Roo, from the south to the environs of Cancun: it is in the southern region that *C. readii* grows farthest inland (30 km), while it is never found more than 2 km inland in the environs of Cancun.



10. Close-up of the short fruiting inflorescence.



9. Close-up of the short inflorescence.



11. Rustic houses built with trunks of *C. readii* thatched with leaves of *Sabal yapa*.

The Low Forest where this palm is found is in the transition zone between the Median Forest and the Sandy Dunes. These forests grow in the middle region of Quintana Roo (environs of Tulum) near the coast where the humidity is also high but soils are poorer and very rocky, with coralline limestone outcrops. The habit of *C. readii* is similar to that of specimens of Median Forest, but it is generally smaller, the mean height being 2.5 m. The palm is associated with *Metopium brownei*, *Thevetia thevetioides*, *Acacia gaumeri*, *Pithecellobium platylobum*, *Beaucarnea pliabilis*, and *Pseudophoenix sargentii*.

This species grows on Sandy Dunes from the coast of Tulum in Quintana Roo to Sisal in Yucatan, where it is exposed to the sun and sea breezes, and it is here that *C. readii* presents its widest variations. It is generally smaller, but trunks are wider and grayish, the hastula is deeply bifid, the inflorescences are shorter and frequently the terminal primary branches are not well developed.

In the dunes of Tulum, humidity is high: this zone is exposed to frequent rainfall, as well as to the strong sea breezes. Here, *C. readii* is very vigorous, more than 2 m high with trunks 5 cm in diameter, and leaves are large, to 110 cm in diameter, with segments to 3.8 cm wide and petioles 1 m long. Other species growing in these dunes are *Thrinax radiata*, *Chrysobalanus icaco*, *Metopium brownei*, *Coccoloba uvifera*, *Cordia* sp., etc.

In the dunes of Punta Sam, this palm grows 2 m high, although it is generally smaller, the width of trunks reaches 5.5 cm, the leaves are smaller—40–70 cm in diameter, petioles 25–50 cm long, hastula to 2.5 cm long and deeply bifid (to 7 mm)—and the inflorescence is 30–50 cm long. Associates are *Pithecellobium keyense*, *Chrysobalanus icaco*, *Sophora tomentosa*, *Coccoloba uvifera*, and *Thrinax radiata*.

The region of El Cuyo on the northern coast of Yucatan limits a coastal lagoon, therefore the humidity is high. *Coccothrinax readii* is found here growing 2 m high, the leaves are larger than those of Punta Sam, to 90 cm in diameter, the petioles are to 60 cm long, and the inflorescences to 50 cm long. Other associated species are *Pseudophoenix sargentii*, *Thrinax radiata*, *Metopium brownei*, *Agave* sp., and several species of cactus.

The environs of Chelem, on the northwestern coast of Yucatan, near Sisal, are one of the driest regions of the Peninsula and they are the limit of distribution of the species. This palm is there represented by depauperate individuals 1–1.5 m high, with slender trunks to 4 cm in diameter, leaves 40–50 cm diameter, petioles to 40 cm long. The inflorescences are very short and the branches are not well developed. The species grows with *Thrinax radiata*, *Metopium brownei*, *Gossypium hirsutum*, *Malvaviscus arboreus*, and different kinds of cactus.

There are three islands near the northeastern coast of the Peninsula: Cozumel, Isla Mujeres, and Contoy. It is interesting to emphasize that scattered individuals of this species are found only in Cozumel, none on the other islands.

PALM PORTRAIT

The "Fish-Tail" Palms*

The increasing interest in the exotic in plants is causing palms to be more used in gardens and in homes, for few plants invoke the atmosphere of the tropics as do palms. The Huntington gardens have an outstanding collection which is unsurpassed in the United States west of Florida. Some hundred kinds from subtropical regions survive, and usually thrive, in our ordinarily benign clime.

To the uninitiated, the three thousand or so kinds of palms seem very much alike, and many people probably think there are only two species, one with feather-shaped leaves and one with fan- or hand-shaped leaves. Notable exceptions are the "fish-tail" palms, so-called because the leaf segments resemble the triangular caudal fin of a fish. Small forest palms called chamaedoreas have such leaves but the name is more commonly applied to *Caryota*, a genus from southeast Asia of some thirteen species. These imposing trees cannot be confused with other palms because of their finely dissected fronds (a term popularly applied to the leaves of both ferns and palms) with their fin-like divisions.

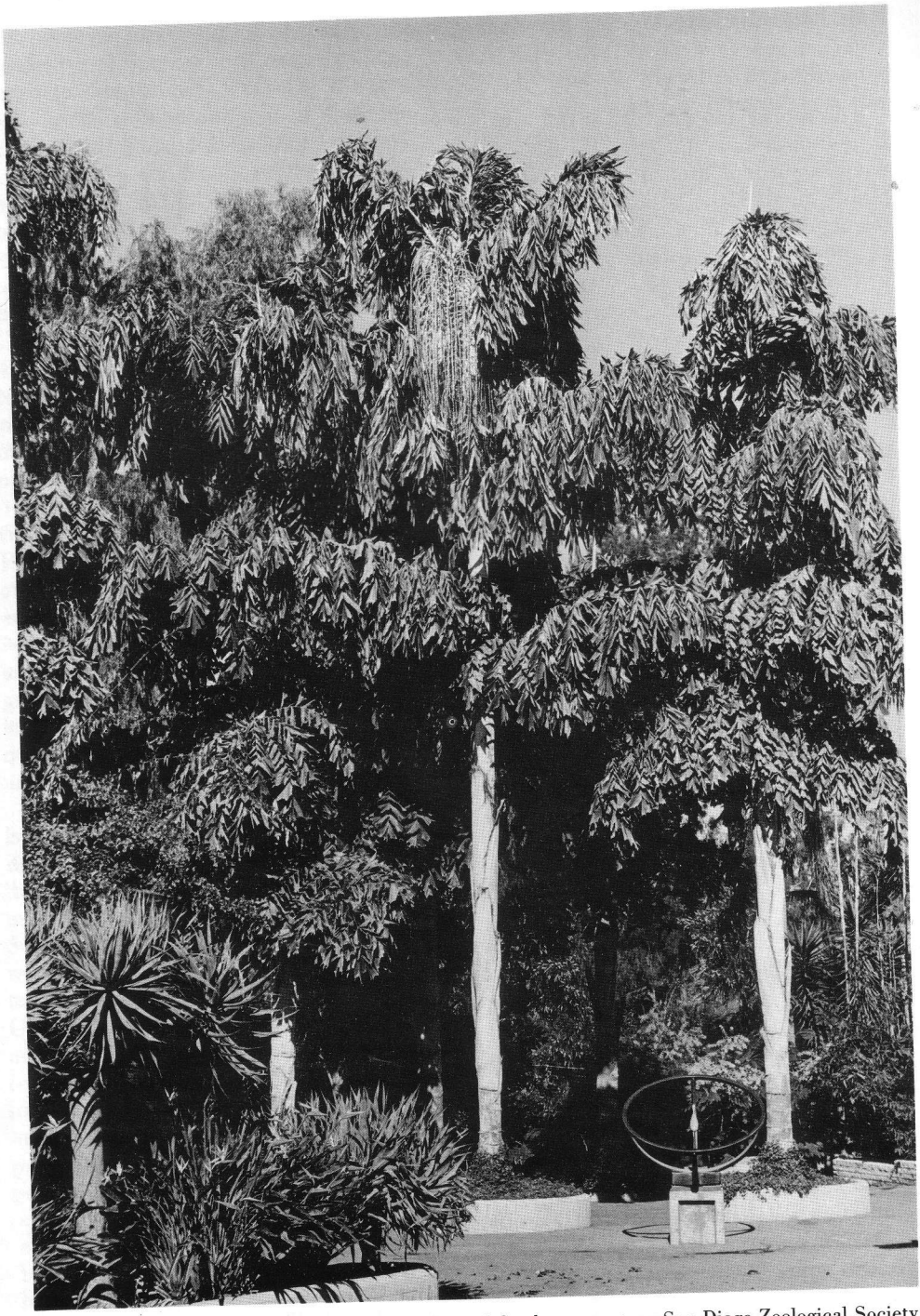
In southern California, two species of *Caryota* have recently become popular and are well represented at the Huntington. *C. ochlandra*, from southern China, was introduced by the late David Barry, Jr., at his California Jungle Gardens in the 1940s after he obtained seeds from Hong Kong and Canton. Our several specimens are located near the east end of the sidewalk that runs through our Jungle Garden; just uphill, under an old oak, is our oldest, some twenty feet high. Despite its height, it is only sixteen years old, for caryotas are among the fastest growing of palms. Each node, or ring, on their trunks marks the former location of a single leaf, and these rings are over a foot apart.

As if to compensate for such a growth rate, Nature imposes a severe penalty on *Caryota*: the fastest-growing palms they may be, but they are also the shortest-lived. The average life span of a single-trunked "fish-tail" is only some twenty years. During this time, the plants do not flower, unlike other palms, which flower yearly once they are old enough to do so. After growing for ten to fifteen years, *C. ochlandra* produces its first flower stalks near the tip of the trunk; these hang downward, with strange, beetle-shaped flowers in clusters. Each year, for four or five years, another inflorescence is produced farther down the trunk. Soon after the last flower stalk appears the palm dies. Like the agave, or "century plant," which also has an amazingly fast-growing flower stalk, the plant, in a final and mighty effort, reproduces itself and then perishes.

Unfortunately, in *Caryota* the male and female flowers mature at different times on the same plant so that seed rarely forms on California plants. The original sources of seeds in China have vanished and only one of the many plants in the United States that has flowered has actually set seed. *C. ochlandra* therefore is becoming increasingly rare as the remaining plants flower without young ones to replace them.

Plants of this species have been known to survive 24° F. without damage so that, once a seed source is established, this handsome species should become common. One of its distinctive features is the clustering of the small leaf segments at the base of each frond. This makes a perfect platform for a bird nest, a fact that has not

* Reprinted with permission from *Huntington* July–August 1979.



1. *Caryota urens* flowering at San Diego Zoological Gardens, courtesy San Diego Zoological Society.

gone unnoticed by local birds, so one can find a nest on nearly every leaf base. The leaves, with their fine divisions, somewhat resemble those of bamboo and, in fact, this species is named after *Ochlandra*, a bamboo genus.

An even handsomer species in our collection is *Caryota urens*, from India, Burma, and Sri Lanka. It is by far the most common species in tropical lands. It had never been cultivated to any extent in California until 1962, when David Barry, Jr., who had introduced *C. ochlandra*, collected seeds from plants at the relatively high altitude of 4800 feet in Sikkim. Coming from a high altitude, these plants presumably are more frost hardy than lowland forms. It is even faster growing than *C. ochlandra* and the first plants, some forty feet high, are now flowering in southern California. We hope seed will be regularly available from California plants. Flowering in this species is spread over some seven years but is just as fatal to the plant. *C. urens* is a much-utilized plant in its native countries. The leaf-base fiber is used for rope, which is so strong that it was used to tie wild elephants. Toddy, a palm wine, is fermented from the sap and the toddy can be further distilled into the stronger *arrack* or boiled down into sugar.

The name "urens" means "burning" and refers to a notorious character of the caryotas. The fruits are red and conspicuous and they are impregnated with crystals of calcium oxalate which is very irritating to the tongue and skin; it is said that even the bark of the trunk, if wetted, will irritate the skin. Deaths have even occurred from the effects of the juice.

Caryota urens is a magnificent plant, with broad segments that form a large arching frond. Our largest specimen, some fifteen years old, can be found facing the North Vista by the north door of the Art Gallery, where it has nearly exceeded the height of the roof. It dominates the landscape and attracts much attention from visitors. Unfortunately, it will probably soon flower—let us appreciate it while we may.

MYRON KIMNACH

PALM BRIEFS

Coconuts in the Celebes

Dr. Antony Davis is the coconut expert at the Indonesian Government Institute of Industrial Crop Research in North Sulawesi. He was a younger colleague of my brother, Professor J. B. S. Haldane, one of the bright young Indians enmeshed in the scientific seniority system which so often hampers Indian research. By now he is an old friend and has started a Haldane Research Institute in his own state, Kerala, where he started working on coconuts more than twenty years ago. He was sent out to Indonesia by FAO to help them with their problems. When I was there in 1977 he was in his second year and deeply involved in the reorganization of one of the most important crops of Indonesia. This Institute also deals with cloves, nutmegs, and other spices and indeed there are fellow institutes in other parts of Indonesia dealing with other important crops.

North Sulawesi is beautiful country; there is still a vast amount of deep forest but pressure of population has put a great deal of it under cultivation, mostly with coconut palms, dwarfing the wooden houses of the cultivators. The main buildings of the Institute where Mr. Sudasrip, the Director, and his staff live are on the outskirts of Manado. But the main plantations are only a short drive away and growing. It seems likely that in the future this

Institute will be working almost entirely on coconuts. The amount of local use is unusual. In North Sulawesi there is an average consumption of two hundred coconuts per head every year as against forty in other parts of Indonesia. These coconuts, picked young, are used mainly for their delicious milk, the best possible hot weather drink and the rest may be thrown away or a little of the soft nut scooped out. At the airport they sell paper bags of brown palm sugar, scrunchy with bits of fresh nut; I couldn't stop eating it! Nobody in this part makes any use of coir. However, most of the coconut plantations regularly replanted by the Dutch in their day, have not been renewed by the present plantation owners, including the government. The yield is falling.

This is a situation that involves not only scientific problems but also the economics of all the crops and the efficient organization of production. Dr. Davis is coping with the scientific side. Some of this means waiting for fairly long-term results but also he and his colleagues have to consider the best ways to replant so that the coconut grower will not suffer a disastrous drop in his income and so that the illiterate can be taught and helped. Of course Dr. Davis has the job of training his Indonesian successors; I thought they were a bright lot but somewhat handicapped by finding English a difficult language so that reading a paper in a scientific journal is a struggle. The transmission of information from one language to another is something that UNESCO should be thinking about very seriously. English taught as a university arts subject is not really much help and there are endless possibilities of small scientific misunderstandings.

The interesting thing is that the basic work of the Institute is all done on the spot with the main equipment being an ability to keep accurate data in whatever language. For instance, here in Indonesia coconuts are planted on their sides in an east-west direction, never north and south. But in the experimental plot they are planted both ways: will there be a difference? If so, why? Some however have been planted vertically as in India; it is harder for the developing embryo to get out but this burial may make it tougher. Again it is local custom, especially when space is limited, to hang the nuts on poles to germinate; it appears that the embryo can stay in a dormant state until planting is done when they rush ahead. All this is a matter of watching over several seasons and not interpreting data to suit a theory. Antony Davis himself, if anything an over-enthusiast, is careful to tell this to his Indonesian successors. His early work on coconut spirals showed that in India much higher yield always came from plants with a leftward spiral. Here it appears to be 50-50. Now there seems to be increasing evidence of a difference in spiral ratios not only in coconuts but in twining creepers, pine kernels, and so on between the northern and southern hemispheres. If this is so the even ratio at the Equator might perhaps be expected. But it will be some years before the results will be definite and meanwhile yields will be carefully watched.

There are many odd things in their experimental plantations, including two palm trees which, instead of producing nuts, produce bulbils, that is to say small plants which look, when they are taken down, about four years old. This must be a mutation that occurs from time to time for I remember, some ten years back, driving south through Kerala when Antony suddenly saw a tree with exactly this habit and we rushed over to look at it. Did he

actually shin up the tree? I wouldn't put it past him. Now this means that these bulbils develop quickly into healthy plants that can be detached, potted up and replanted. If they develop into bulbil-bearing palms, they are useless for a crop but, as they are clones, they are very useful for experimental work and it may be possible to get up to 250 a year from one tree. It is also possible that some or all of them may bear nuts but at present it's a case of wait and see.

In another garden a hybridization program is going on, the genetics of which are in charge of Dr. Kiyanagi of the same Institute. There is a dwarf coconut palm that matured some two and a half years earlier but has only a low yield of comparatively poor nuts. Here there is a huge experimental acreage with the soft blue of one of the great Indonesian mountains rising dramatically behind it; it is planted with one row of tall palms and four rows of dwarfs. The male flowers of the tall palms fertilize the dwarfs, which have had their male flowers removed. The resulting hybrid seedlings are likely, on the evidence of trials elsewhere, to do better than either parent and it is hoped that all new plantations or renewals of older ones in Indonesia will be entirely from these hybrids supplied by the government. This project has been given financial help from the UN. Actually, a private French firm has produced similar hybrids from one African and one Malayan palm species and is selling the nuts. But each nut for growing is far too expensive for Indonesia, so the country has had to start its own program. So far, there has been no time to breed and evaluate the F_2 generation. That, surely, means looking another twenty years ahead; we cannot indefinitely hurry the processes of nature.

There are also fertilizer trials going on. Interestingly, it is possible by fairly heavy doses of fertilizer, much of which is produced in Indonesia, to revitalize old trees for a few years at least. During these critical years a new planting of hybrids will have time to grow.

With all this program, the Institute is bound to specialize in coconuts. Spices will be dealt with in the future in another Institute: the cloves, the nutmeg, and mace, the balm which grows wild and smells of cough cures, the peppers, and cinnamon. The Manado Institute has a banana expert, a very pretty one: many girls go through university nowadays and there are several on the staff. Bananas are a common intercrop with coconuts and so, for example, is maize; all crops must have their place in practical research.

I get the feeling that the Indonesians are very nice people to work with and for. At one plantation office, we were entertained with a charming xylophone concert and everywhere we visited a couple of tender coconuts would be picked and offered to us. Ever since, I have been trying to think of an English work which describes the fairytale taste or the texture of the slippery delicious kernel. I am sure the Indonesians have the exact word for it!

NAOMI MITCHISON
Carradale House
Carradale, Campbeltown, Argyll

Notes on Palm Uses in a Spanish Treasure

The thousand-mile-long desertic peninsula of Mexico's Baja California would seem to be an unlikely habitat for palms, yet that land is the home of several interesting taxa that may be seen growing wild, especially in the rocky canyon bottoms. One of these is the San José hesper palm, *Brahea brandegeei*, which is often planted as

an ornamental in southern California. Indeed, the late William Hertrich considered it the finest ornamental fan palm for the area.

This Mexican species became known to botanists for the first time when specimens were collected in October 1900 by T. S. Brandegee and Kate Sessions near San José del Cabo at the southernmost tip of Baja California (Fig. 1). In 1903, Carl Purpus formally described the palm as *Erythea brandegeei*. To Kate Olivia Sessions (1856–1940), one of California's first great plantswomen, can be given the credit for introducing the species into horticulture, for from her nursery in San Diego came dozens of interesting ornamentals that now grace the California scene.

Only recently have we learned that the San José hesper palm had been known by early Spanish missionaries some 200 years before the Brandegee and Sessions expedition. San José del Cabo, which gave the palm its English name, was the site of one of a number of Jesuit missions established throughout the peninsula during the period 1697–1768. The Jesuit Miguel del Barco (1706–1790) has given us the first informal records, principally concerning uses, about this palm under its then-used colloquial name of "palma colorada," literally "red palm."

Padre Barco lived for 30 years in Baja California but later in life was forced into exile in Italy where, during the 1770's, Barco prepared a manuscript chronicling the natural history as well as the general history of the Baja California he had come to know so well. However, for over two centuries the priest's manuscript remained essentially unknown. Fortunately, it was carefully preserved at the National Vittorio Emmanuele Library in Rome. In 1973, thanks to the scholarly editing of Dr. Miguel Leon Portilla (Director of the Institute of Historical Research of the National Autonomous University of Mexico) Barco's work . . . a modern Spanish Treasure, was finally published (Barco 1973).

The Barco chronicle is instructive reading for anyone interested in the history or natural history of Baja California during the 18th century. The historical and biological areas occupy about equal parts in the volume but five of eleven chapters on natural history are concerned with the local plants. Of primary interest to palm enthusiasts are the several descriptive paragraphs (a page and a half, principally in chapter 4, entitled "De los Arboles de Naturaleza Regular") about *Brahea* but discussed under the subtitle "Las palmas coloradas," as they were then known. Since Barco's com-



1. *Brahea brandegeei* at San José del Cabo, Baja California. Mexico. Photograph by Kate Sessions in 1900 courtesy L. H. Bailey Hortorium.

ments may be of interest to readers of PRINCIPES, I am giving a free translation from the Spanish of the account about *Brahea* together with editorial comment [in brackets]:

"The red palms of the south are well known in California [i.e. Baja California]. They are very tall [to 125 ft, according to Bailey, 1937], and when cut one notes that the wood is red even though the outer stem surface has a normal palm color, namely gray. The wood of this palm is very strong and durable and hence it is used for beams, but only in its natural form [as a whole trunk], being cut only to the length required. Nor would it be wise to finish them otherwise, for then the trunks would lose much of their strength which lies principally in the outer part. Because of this they leave the more slender specimens, cutting only those with a diameter of 18 dedos [approximately 1.3 ft]. Although the wood of the [native] poplars [*Populus* sp.] and pines [*Pinus cembroides*] is very lustrous and better, the latter occur in large ravines in the interior mountains hence are very difficult to obtain. They make little use of those trees, but they value all the palms for roofing, especially that of churches. Besides the red palm, there is another kind [*Washingtonia robusta*] that closely resembles it superficially but which, when cut down, is seen to be different, for it has a white wood that is less solid and less durable than the wood of the red palm.

"When the southern [southern Baja California] Jesuit missions were founded [between 1720 and 1733], there were many stands of palms in the region because none of the local Indians [the Cochimi Indians] made use of these large palms. During the revolt of 1734, people from the province of Sinaloa [in mainland Mexico] came to southern Baja California to pacify it. These immigrants started to cut and eat the hearts of the palms, called palmito, and it was from them and others at that time or a little before that the Californians [Cochimi] learned to eat the palmito that they had previously not known to be edible. They liked it so much that in a short time a large number of beautiful palm stands were destroyed, because once the heart was cut out the palm died without sprouting from another part as in other trees. To cut the palmito, they climb to the top of the palm armed with a small but heavy belt knife and there cut the heart. Or else they sever the trunk with an axe from below, felling the whole palm and then cutting out the palmito in safety and without fear. Those who climb to the crown for palmito have to take care not to fall because the trunks are very tall, straight, and slim in comparison to their height. They have no leaves except near the tip or bud and there are no branches so, aside from the difficulty and danger of climbing so high on a trunk without any rope, cutting the palmito while the palm is bending and vibrating to one side and the other is frightening even to an observer from the ground. Apart from the weight of its large and heavy leaves at the top, the trunk bears also the weight of the man, and this combination causes the top to vibrate, even more if there is wind.

"The Mission Indians, not generally having axes with which to cut the palms at the base, climb in the manner described, and in four or five years the great palm groves of their territory stand dead without a leaf, like a crowd of large snuffed-out candles. Rainwater penetrates the center of the trunk, which is not so solid, and the palms decay easily, a situation that does not occur when the whole palm is felled because then water cannot enter the

pithy pulp. Formerly, many palm stands existed in the land, then desert, up to the midpoint between Santiago and La Paz [or about 100 miles north of San José del Cabo]. Having commenced to work mines, the operators and timber cutters of those establishments started to cut the palms with axes in order to eat the palmito, besides the many that were cut for construction which, so the story goes, were carried to the sea by water from great rains and consequent floods in the arroyos. Certainly palmito is delicious and esteemed for salads, and in places where it exists the Spaniards eat it as a delicacy . . . ."

Barco's paragraphs describe uses of *Brahea brandegeei* which until now have been unrecorded. Of special interest is his description of the use of palmito or palm cabbage. Curiously, this is the earliest reference I know of the use of this delicacy in the New World. Much older references are found for the Old World. Yet one must assume that Amerindians have been eating palm cabbage for many centuries. Strangely, Barco's Baja Californian Cochimi appear to have learned about the edibility of palm cabbage as a result of the spread of Jesuit Missions from mainland Mexico.

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Note: An English translation of the Barco work is to be published by Dawson's Book Shop in Los Angeles, California. There will be some corrections and additions to footnotes relating to plant names in the original publications. These have been made by Dr. Annetta Carter, student of the Baja California flora, who states that the palma colorada "is most abundant in the Cape Region but extends north almost to latitude 26°N. In the vicinity of Loreto, it is called 'palma de taco' or 'palma de tlaco.' The leaves are valued for thatching." Dr. Carter further states that a "palma blanca," incidentally mentioned by Barco in two different places in his chronicle (pages 56 and 62) probably represents *Washingtonia robusta*, which is "common in the northern part of the Sierra de la Giganta."—W.H.H.

W. H. HODGE
Trumansburg, N.Y. 14886

Palms in Utah

24 April 1979

Residents of St. George, Utah, are calling the windmill palm, *Trachycarpus fortunei*, the "snow palm" after the bitterly cold winter of 1978–1979.

White-dusted windmills were a common sight in the normally sunny desert resort, which received a total of 24.5 inches of snow in January and February.

A late-winter inspection tour showed that a week with low temperatures under 10 degrees Fahrenheit, the lowest being three above zero, did not visibly damage any of the hairy-trunked fellows.

St. George sits at an elevation of 2760 feet 120 miles northeast of Las Vegas, in the U.S. Department of Agriculture's plant hardiness Zone 6, and *Trachycarpus fortunei* usually fruits every year.

This past winter's intense cold may not have tilted any windmills in Utah's "Dixie," as it's called by locals, but it may have claimed the lives of many California fan palms.

Washingtonia filifera was planted in front of numerous motels and residences in St. George, but it seemed obvious from drooping brown fronds that few individuals survived. Many specimens were quite tall.

25 July 1979

I have just returned from a four-day stay in St. George. Frankly, I was

shocked—but delighted—to discover that about 50 percent of the palms I thought were dead or dying in February made it through the winter alive.

I suspected a few would still be around, since the intense cold was of short duration, but the number of *Washingtonia filifera* that recovered was truly amazing.

The tallest and/or oldest individuals in town, as one would expect, appeared to be in the best shape. They range in trunk height from 10 to 30 feet. Most are in sheltered spots, but some are very exposed.

It should be noted that the motels and hotels in St. George, like those in Las Vegas, bring in large specimens to landscape their facilities so size is not always an indicator of local growth.

I noticed a number of California fan palms that were defoliated last winter putting out new fronds, but there are "headless" trees in every neighborhood in town that show no signs of recovering.

Many of the palms that went entirely brown in the winter have been removed by their owners, but other people are waiting patiently for their trees to spring forth in the warm desert sun.

This is not the first time *Washingtonia filifera* has taken a beating in St. George. I understand that in 1972, another bad winter, many of them were killed while others came through okay.

The town's leading nurseryman told me in February that he expects most locals who like palms will probably only plant *Trachycarpus fortunei* in the future because of its proven hardiness in the area.

One would think that *Chamaerops humilis*, the European fan palm, would be a better choice in the St. George area than *Washingtonia filif-*



1. *Trachycarpus fortunei* in St. George, Utah.



2. Young *Washingtonia filifera* after the winter of 1978–1979 in St. George, Utah.

era, but I have been unable to locate a single specimen anywhere.

Incidentally, I am experimenting with both *Trachycarpus fortunei* and *Chamaerops humilis* here in Ogden. I lost two large greenhouse-grown windmills and one small one in an exposed northern location last winter.

This time, I have two windmills and one European fan palm in a more protected location on the east side of my home. Our winter storms usually come in from the west, but we sometimes get east canyon arctic winds.

I wrapped the three windmills with strips of green burlap last winter, which proved inadequate protection, so this year I'm thinking of covering them with plastic bags with a few holes for air circulation.

We seldom get to 0 degrees Fahrenheit in Ogden, since the Great Salt Lake never freezes and moderates winter temperatures, but last winter was our second worst in history and we slid below 0 several times.

I read in PRINCIPES that windmills have survived −6 in Georgia and −8 in Maryland, so I'm hopeful that they'll make it here if I can give them enough protection while they're young.

RICK HASSETT
2911 W. 2900 S.
Ogden, UT 84401

NOTES ON CULTURE

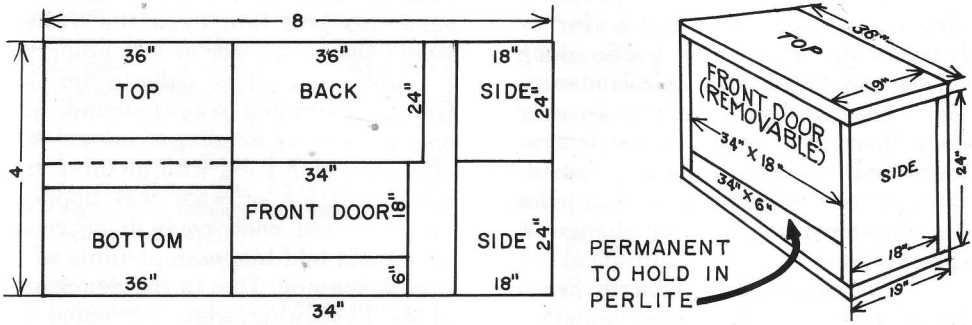
A New Seed Germinating Chamber

Much has been written in the past about methods of germinating seed, and I have tried a number of them. A couple of years ago I got an idea from Jim Benzie of Laguna Beach, California about yet another way. He had been using an old refrigerator with a small light bulb as a source of heat. I couldn't locate a refrigerator, so, instead, I decided to build a box made of rigid insulating foam. As it turned out, I couldn't have been happier. I've tried heating cables, but they were troublesome and burned out. At this

time, they are relatively expensive when hooked up with a separate thermostat. A sheet of insulating rigid foam 4′ × 8′ × 1″ is under six dollars. The light bulb holder, cement, and wires (electrical), would probably bring the total cost to a little over ten dollars. One of the advantages of a box of this size—36″ wide, 26″ high and 19″ deep—is that, in addition to germinating seed, the white walls are so reflective that there is enough light and heat from even a 40- or 60-watt household light bulb that one can grow plants inside it. It works quite well as a hospital. I use the smaller 40-watt bulb in the summer and the 60-watt in the winter. Temperatures are generally maintained between 70° and 90°F even though the box is kept outdoors here in Southern California about seven miles from the ocean. Winter lows are generally in the 40° to 50°F range. The heat inside the rigid foam box can be regulated by experimenting with light bulbs of different wattage. Holes were burned into the bottom section for drainage. A soldering iron works very well for this. A 2″ layer of perlite maintains high humidity and can also be used for cuttings if so desired. When the light bulb burns out, it is quite noticeable and is easily replaced. At one time, I had the bulb on a timer so that I could duplicate the day/night cycle, but I found the night temperatures in the winter would drop more than desired. The 24 hours of continous light did not seem to be detrimental to any of the plants I may have had inside the box anyway. I would leave a light bulb on all the time, especially if just germinating seed.

Construction of the box is relatively easy. The sections are cut from a 4′ × 8′ sheet with a hacksaw blade and glued together with any type of cement that bonds styrofoam. I use 2″ nails to hold the walls while the cement dries. A porcelain light bulb holder is attached to the inside center of the top of the box with nuts and bolts. Where the wire emerges from the top, it is caulked. The front door fits snug enough so hinges are not necessary. See diagram below for dimensions.

RALPH VELEZ



LETTERS

I have long been interested in palms and am attempting to contact others who have my interest. Although New Orleans is located at a rather northerly latitude (30°N), the protection afforded by Lake Ponchartrain allows us to grow many cold-hardy ornamental palms.

The following are the palms that I have seen in the city during 1979–80 with an indication of their relative abundance: *Washington robusta*,

abundant, *W. filifera*, rare; *Trachycarpus fortunei*, abundant; *Acoelorrhaphe wrightii*, rare; *Chamaerops humilis*, abundant; *Rhapis excelsa*, common; *Livistona chinensis*, common; *Bismarkia nobilis*, rare; *Sabal palmetto* and *S. minor*, abundant; *Phoenix canariensis*, abundant, *P. reclinata*, rare, *P. roebelenii*, rare, *P. dactylifera*, rare; *Butia capitata*, abundant; *Arecastrum romanzoffianum*, abundant.

GARY IRISH
7019 Crowder Blvd., #142
New Orleans, LA 70127

Dear Editor:

I am enclosing an official document that is the outcome of THE PALM WAR here in San Diego that was waged between myself, Theresa Yianilos, and a group of citizens against the Port District, which is a state agency, and various landscape architects and the San Diego Gas and Electric Company.

During 1977 and 1978, San Diego lost hundreds of mature *Phoenix canariensis*, many of them over 100 years old. One group of 60 lined Harbor Drive, a major artery of traffic along the Ocean Front. During relandscaping, The Port District cut down over 60 of these trees upon the recommendation of several landscape consultants whose influence and anti-palm bias have caused a major change in this city away from the subtropical image to that of a northern climate. Since the Port District is run on an autocratic basis which does not have to answer to the electorate, their reaction to criticism of their landscaping policies of not planting palm trees and cutting down healthy mature specimens resulted in citizens, led by Theresa Yianilos and Environmentalist Photographer Eva Ewing, to filing complaints with the State Coastal Commission in California which protects the coastline. The Port District was found to be in violation of the Coastal Act of 1976 and the matter was settled out of court. They are planting 15 *Phoenix reclinata* with 4 trunks apiece for 40 trees they took out. The ignorance of the Attorney General's office of the inequity of this settlement is a direct reflection of the general ignorance on the part of the officials about palms in general. I also hold the landscape architect, Joseph Yamada, to be responsible for the inequity of this solution. His recommendations reflect his total preference for pine trees and his prejudice against palm trees. We now have double rows of pines on Harbor Drive as well as Torrey Pines Road at our University. He continued to recommend the removal of palm trees on other jobs in the city as was observed at our University of California. It was clear that we needed a city ordinance or policy. Meanwhile, there was the San Diego Gas and Electric Company which admitted to cutting down over 200 palms a year because they were a nuisance in the lines. Often mature hundred-year-old trees were cut down because some resident (not even the owner) would object to a tree on city property.

Letters and phone calls to the Gas Company resulted in a runaround. The only answer lay in going to our elected officials which I did with pictures and documentation of what was happening. I visited each councilman separately and told him with pictures what was happening. Due to the generosity of Ms. Eva Ewing, who contributed the labor and cost of the pictures, we were able to tell our message effectively to the Coastal Commissions and to the elected officials.

I have been named the Palm Lady of San Diego because of my fervent attack upon those who would denude this city of palm trees because of their short-sighted wish to follow the latest

fads in landscaping. I wear my title proudly. Because I make good newspaper copy, and the story was pertinent and brought many palm lovers out of the woodwork, including officials and landscape architects alike, as well as ordinary citizens, there has been an article in the news about palms almost weekly. This city is now aware of its tropical image and look. I feel that "The Palm Lady" has done her part.

THERESA YIANILOS
7727 Lookout Drive
La Jolla, California 92037

NO. 1013

PARK AND RECREATION BOARD POLICY

SUBJECT: Palm Tree Preservation and Planting.

BACKGROUND: In the past, large numbers of palm trees have been planted in San Diego on public street rights-of-way, the grounds of public facilities and parks, and in private developments. These plantings have contributed to the semi-tropical image of the City. Currently, redevelopment activity, old age and disease have caused the loss of a significant number of mature palm trees. This loss does not appear to have been offset by new palm plantings.

PURPOSE: The purpose of this policy is to encourage a balanced landscape, which includes palm trees, to assist in the retention of the City's semi-tropical image.

POLICY: It shall be the policy of the Park and Recreation Board to encourage the retention and planting of palm trees as follows:

1. *Street Rights-of-Way:* Existing palm plantings will be retained and protected to the extent feasible.

   It is recognized that trees growing into power lines are dangerous, and effective remedies must be initiated to correct the hazardous condition. If a palm tree cannot be trimmed or the power line re-routed at a reasonable cost to avoid conflict, the palm tree may be removed under City permit which will require replacement with a suitable palm where feasible.

   Due to the maintenance frequency required for palms planted in the street right-of-way, new plantings of palms as street trees will be limited to low maintenance palm species.

2. *Public Facilities and Parks:* The planting of a balanced landscape will be required in public facilities and parks. Consultants shall consider palm trees, if appropriate. The approved design standards for Mission Bay Park will govern in that facility.
3. *Other agencies and the private sector* are encouraged to include palms in their landscaping projects where appropriate.

RESPONSIBILITY: The responsibility for implementation of this policy is placed in the Park and Recreation Department.

SUBSTANTIATION: Council Resolution No. 223288, April 17, 1979. Park and Recreation Board Minutes of July 17, 1979.

NEWS OF THE SOCIETY

News from Australia

Meetings of the newly formed New South Wales Chapter are held once every two months at the Education Centre in the Royal Botanic Gardens, Sydney. In our first five meetings, we have had talks followed by discussion on Australia's *Livistona* species, seed and storage and germination techniques, and travel slides of palms in Australia, Indonesia, and Malaysia.

Specimen plants are brought along for exhibition and seeds and seedlings donated by members to the Chapter are available for sale at the meetings.

Attendance has averaged about 20. However, it is felt that the smaller number has facilitated the free exchange of ideas, both in the more formal part of the meetings and afterwards over refreshments. The small committee comprises a Convenor (or President), Nicholas Heath, Treasurer, Tony Rodd, and Secretary, Brian Preston.

Two of our members, Richard Budd and John Gatenby, recently visited Indonesia and Malaysia. They were helped in their search for palms outside Kuala Lumpur by Eric Taylor, a resident member of The Palm Society. It just shows what a great idea the membership roster is.

BRIAN PRESTON

News from California

Everyone was suprised and delighted at the setting for the Southern California Chapter's November meeting held at Ellis Farms in the Anza-Borrego Desert. Upon turning in the drive, we were greeted by acres of palms and welcomed to the beautiful patio by hosts Joe Ellis and Tom Roydon. About 90 people made the long trek to the meeting which was conducted by Co-chairman Al Bredeson.

Following lunch of hamburgers donated by Ellis Farms, an Anza-Borrego State Park Ranger spoke on the history and locations of *Washingtonia filifera* in California. Tom Roydon also spoke on how Ellis Farms was started and how the palms are raised.

A plant raffle, which Lois Rossten won, was followed by Tom Roydon and crew demonstrating how a ten-foot *Washingtonia robusta* is dug, burlaped, fronds trimmed, and tied for shipment.

Following the meeting, many members headed for the State Park and a hike to Palm Canyon.

The Chapter ushered in the new year with its annual banquet held at Sam's Seafood Restaurant in Huntington Beach. Ninety-two people attended the Luau-theme dinner. Afterwards, a contest was held for the best costume. The winner, Ray Fuller, received a beautiful picture donated by Doug Hughes. In addition, many guests received palms that were awarded by raffle.

The highlight of the evening, however, was a slide show conducted by Ken Foster covering his collecting trip to New Caledonia and the South Pacific. Many members were afforded their first look at an array of rare and beautiful palms.

Perfect weather made it an enjoyable trip to Ventura for our March meeting. About 60 people made the journey and met at Ventura College. John Tallman, Assistant Dean for the college and a Palm Society Member, escorted us on a tour of the grounds to show us the many palm plantings.

Following lunch by the pool and a short business meeting, a slide show was given by Lance Birk covering one of his trips to Borneo. A plant sale concluded the meeting.

FRANK KETCHUM

News from Texas

The Houston Area Chapter of The Palm Society, currently with 18 paid memberships, has met in July and November, 1979, January and March, 1980, at the homes of Bob and Jean Maurice, Linda E. Livesay, Eric and Deanne Erdmann, and Jim and Clarice Cain with 12–14 members attending.

A Palm Show and Sale was held at the Houston Arboretum on September 15–16. Slide shows and lectures accompanied the sale, which showed a profit of $238.39. Another show is planned for May 3, 1980. A chapter library has been formed with Deanne Erdmann as librarian. Back issues of PRINCIPES have been purchased and other books ordered.

The Houston Chamber of Commerce has formed a Citizens Committee for the Beautification of Houston which plans to plant 1,000 palms a month in and around the city for 10 months. A large planting of palms is planned for Houston International Airport.

Speakers have included Jim Cain narrating a show of Linda Livesay's slides of palms of Houston and speaking on *Rhapidophyllum hystrix*, and Dennis Johnson, Professor of Geog-

raphy at the University of Houston, who presented a slide show of "Palms of the World" represented in his study of palms used for food and food products.

At each meeting a seedling of the month is discussed. These have included *Thrinax parviflora* [probably *T. radiata*], *Phoenix roebelenii*, *Licuala grandis*, and *Acoelorrhaphe wrightii* (*Paurotis wrightii*).

BONNY RUHLAND

PALM LITERATURE

DRANSFIELD, J. 1979. A monograph of *Ceratolobus* (Palmae). Kew Bull. 34: 1–33.

Six species, one of them new to science, are described in detail.

——. 1980. *Retispatha*, a new Bornean genus (Palmae: Lepidocaryoideae). Kew Bull. 34: 529–536.

Retispatha dumosa of the *Calamus* alliance is described and illustrated.

ESSIG, F. B. 1980. The genus *Orania* Zipp. (Arecaceae) in New Guinea. Lyonia 1: 211–233.

Orania is surveyed and detailed descriptions provided for the nine species in New Guinea, including four described as new.

—— AND B. E. YOUNG. 1979. A systematic histological study of palm fruits. II. The *Areca* alliance. Syst. Bot. 4: 16–28.

Genera in the *Areca* alliance fall into two groups based on fruit histology.

FISHER, J. B. AND J. DRANSFIELD. 1979. Development of axillary and leaf-opposed buds in rattan palms. Ann. Bot. (London), ser. 2, 44: 57–66.

Normal and displaced axillary vegetative buds as well as other forms of buds are described for diverse rattans.

JOHNSON, M. A. T. 1979. The Chromosomes of *Ceratolobus* (Palmae). Kew Bull. 34: 35–36.

The chromosome number of $2n = 26$ is demonstrated for the three species of *Ceratolobus* based on study of root tips.

MOGEA, J. P. 1980. The flabellate-leaved species of *Salacca* (Palmae). Reinwardtia 9: 461–479.

Four species of Malaya and Borneo, three of them new, are considered.

MOORE, H. E., JR. 1980. New genera and species of Palmae from New Caledonia, II. Gentes Herb. 12: 17–24.

Actinokentia huerlimannii, a second species in the genus, and *Moratia cerifera*, a new monotypic genus, are described.

——. 1980. Two new species of *Geonoma* (Palmae). Gentes Herb. 12: 25–29.

Geonoma divisa from Colombia and *G. epetiolata* from Panama are new.

——. 1980. Four new species of Palmae from South America. Gentes Herb. 12: 30–38.

Chamaedorea leonis from Bolivia, *Prestoea asplundii* from Ecuador, and *P. cuatrecasasii* and *P. pubens* from Colombia are added.

—— AND L. J. GUÉHO. 1980. *Acanthophoenix* and *dictyosperma* (Palmae) in the Mascarene Islands. Gentes Herb. 12: 1–16.

Two genera are each considered to consist of a single species: *A. rubra* (*A. crinita*) variable but not subdivided; *D. album* with three varieties.

TOMLINSON, P. B. 1979. Systematics and ecology of the Palmae. Ann. Rev. Ecol. Syst. 10: 85–107.

A review of the current state of knowledge about palms and thoughts for future directions of research. Anyone who has had to identify palms, except in smaller genera, will argue Tomlinson's point that the palms are well known taxonomically, but advances in other aspects of the family are succinctly summarized.

TORRES, A. M. AND B. TISSERAT. 1980. Leaf isozymes as genetic markers in date palms. Amer. J. Bot. 67: 162–167.

Leaf chemistry proves useful in identifying date cultivars.

H. E. MOORE, JR.

BOOKSTORE

INDEX TO PRINCIPES (Vols. 1–20, 1965–1976, H. E. Moore, Jr., 68 pp.)	$ 3.00
CULTIVATED PALMS OF VENEZUELA (A. Braun, 1970, 94 pp. and 95 photographs)	4.50
THE INDIGENOUS PALMS OF SURINAME (J. G. W. Boer, 1965, Part of Flora, 172 pp.)	21.00
PALMS (D. Muirhead, 1961, 140 pp.)	2.50
PALMS OF SOUTH FLORIDA (G. B. Stevenson, 1974, 251 pp.)	6.00
PALMS OF THE WORLD (J. C. McCurrach, 1960, 290 pp.)	19.00
THE MAJOR GROUPS OF PALMS AND THEIR DISTRIBUTION (H. E. Moore, Jr., 1973, 115 pp.)	4.50
THE GENUS PTYCHOSPERMA LABILL. (F. B. Essig, 1978, 61 pp.)	5.50
PALM SAGO (K. Ruddle, D. Johnson, P. K. Townsend, J. D. Rees, 1978, 190 pp.)	7.50
HARVEST OF THE PALM (J. J. Fox, 1977, 244 pp.)	15.00
THE DATE PALM (H. Simon, 1978, 155 pp.)	8.95

Palm Papers (Postage Included)

THE HARDIEST PALMS (J. Popenoe, 1973, 4 pp.	1.00
FURTHER INFORMATION ON HARDY PALMS (J. Popenoe, 1973, 4 pp.)	1.00
FRUITS OF THE PTYCHOSPERMA ALLIANCE (F. B. Essig, 1977, 16 pp.)	1.00
PALMS—ANCESTRY AND RELATIONS (B. Ciesla, 1979, a chart)	4.00

Prepaid mail orders now are invited for the palm books listed above and should include the indicated price plus $1.00 extra per book to cover packaging and postage to any address in the world. (California residents please add 6% sales tax.) Send check in US currency payable to The Palm Society, together with specific indication of book (or books) desired, and with clearly legible return address, to Pauleen Sullivan, 3616 Mound Avenue, Ventura, California 93003, USA. We also buy and resell old palm books.

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