PRINCIPES

Journal of The Palm Society

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THE PALM SOCIETY

A non-profit corporation primarily engaged in the study of the palm family in all its aspects throughout the world. Membership is open to all persons interested in the family. Dues are $10.00 per annum payable in May. Requests for information about membership or for general information about the Society should be addressed to the Secretary.

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JOURNAL OF THE PALM SOCIETY

An illustrated quarterly devoted to information about palms published in January, April, July, and October, and sent free to members of The Palm Society

EDITOR: Harold E. Moore, Jr.

EDITORIAL BOARD:
David Barry, Jr., Walter H. Hodge, Eugene D. Kitzke, Harold F. Loomis, Nixon Smiley, Dent Smith

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Cover Picture

Washingtonia filifera in Palm Canyon, California, appearing here much as it might be found in some remote and seldom visited desert canyon. Photograph by Peter Bisset, courtesy U. S. Department of Agriculture.

NEWS OF THE SOCIETY

DIRECTOR DIES

Paul H. Allen, famous plant scientist, died in New Orleans at the age of 52. He was on the board of directors of The Palm Society until his death. He was also ex-director of Fairchild Tropical Garden.

He had recently traveled extensively through the tropics, in search of banana varieties and their relatives, sponsored by the United Fruit Company. He was director of the Company's Lancetilla Experiment Station at Tela, Honduras. Although without formal botanical training, he became an important botanist and geneticist, having begun his career at the Missouri Botanical Garden, where his ability was soon noticed. While still in his twenties, he was sent to Panama to collect and study orchids, and soon became an authority on this plant family. The rest of his life was spent working with tropical plants, about which he wrote many articles and books.

Our sincere sympathy goes to his widow, Dorothy, of 3525 Belaire Place, St. Louis, Missouri.

* * *

Plans are going forward for the Society's biennial meeting in southern California on April 12th, followed by several days of tours and sight-seeing. Reservations are coming in, and we expect a good showing, especially of members in the western states, who have not been able to attend the meetings held in Florida. If you want to attend, please send your reservation, as we must make arrangements for you right away.

* * *

Several members were kind enough to send in reports on the freeze damage of last winter, followed by further reports on the at times surprising recovery of those which were not immediately disposed of. They, and others of us, will be interested in Dent Smith's exhaustive report on several hundred palms at his place in Daytona Beach. We thank all of you for sharing your experiences with us.

* * *

From San Diego, California, Mr. James P. Specht writes:

"The San Diego Zoo was the recipient of a fine collection of palms grown and collected over many years by Edwin W. Moore. The Zoo's fame is due in large part to its interesting and varied flora, which includes mature palm specimens representing eleven genera (Archontophoenix, Arecastrum, Butia, Chamaedorea, Chamaerops, Erythea, Howeia, Livistona, Phoenix, Sabal and Trachycarpus). Ed Moore's collection, representing thirty-five genera and seventy-five species should further enhance the Zoo in years to come.

"My interest in this donation brought me to Tim Aller, Supervisor of Horticulture at the San Diego Zoo. Tim asked for my help in placing the palms and I accepted eagerly. The near-ideal conditions afforded by the Zoo's grounds and climate, plus Tim Aller's cooperativeness spurred me on to procure additional plant specimens for the Zoo. In this endeavor Bill Seaborn, of the Del Dios Nursery, Escondido, California, was contacted and made a generous donation of palms and cycads.

"More than 250 plants representing thirty-nine genera and eighty-eight species were placed throughout the Zoo. The present total at the Zoo now stands at forty-five genera and one hundred species of palms. These additions to the Zoo are generally of small size; the future is not promising for some, but the end result in years to come will be a vastly enriched collection of mature palms.

"Anyone interested in donating plants

to the Zoo may contact Tim Aller at the San Diego Zoological Gardens."

* * *

One of the Society's members remarked not long ago that since the seed bank has proved to be a success, the next step should be a "seedling bank," where members with surplus young plants might exchange them for others which they want. It is easily demonstrated that there is a surplus—for example, at a recent meeting in San Diego, members donated seedlings of such rarity and desirability that in a few minutes $118.00 was raised, of which the local group was so kind as to send $50.00 to headquarters as a contribution toward the costs of publishing PRINCIPES.

This is an intriguing idea, and merits some thought. Probably if there were a seedling bank it would have to be divided into regional sections, to simplify transportation and handling. Other details would have to be worked out, also.

The chief need is for some of those "dedicated volunteers" who would want to take on this interesting chore. Are there any raised hands?

* * *

Mrs. M. S. H. Kneale, who has been treasurer of the Society since April, 1962, has resigned, due to pressure of other duties. We wish to express to her our sincere gratitude for the fine job she did in this exacting position.

Mr. and Mrs. T. R. Baumgartner have offered to take on the treasurer's work until election time in April. These dedicated palm enthusiasts are true friends and helpers of the Society.

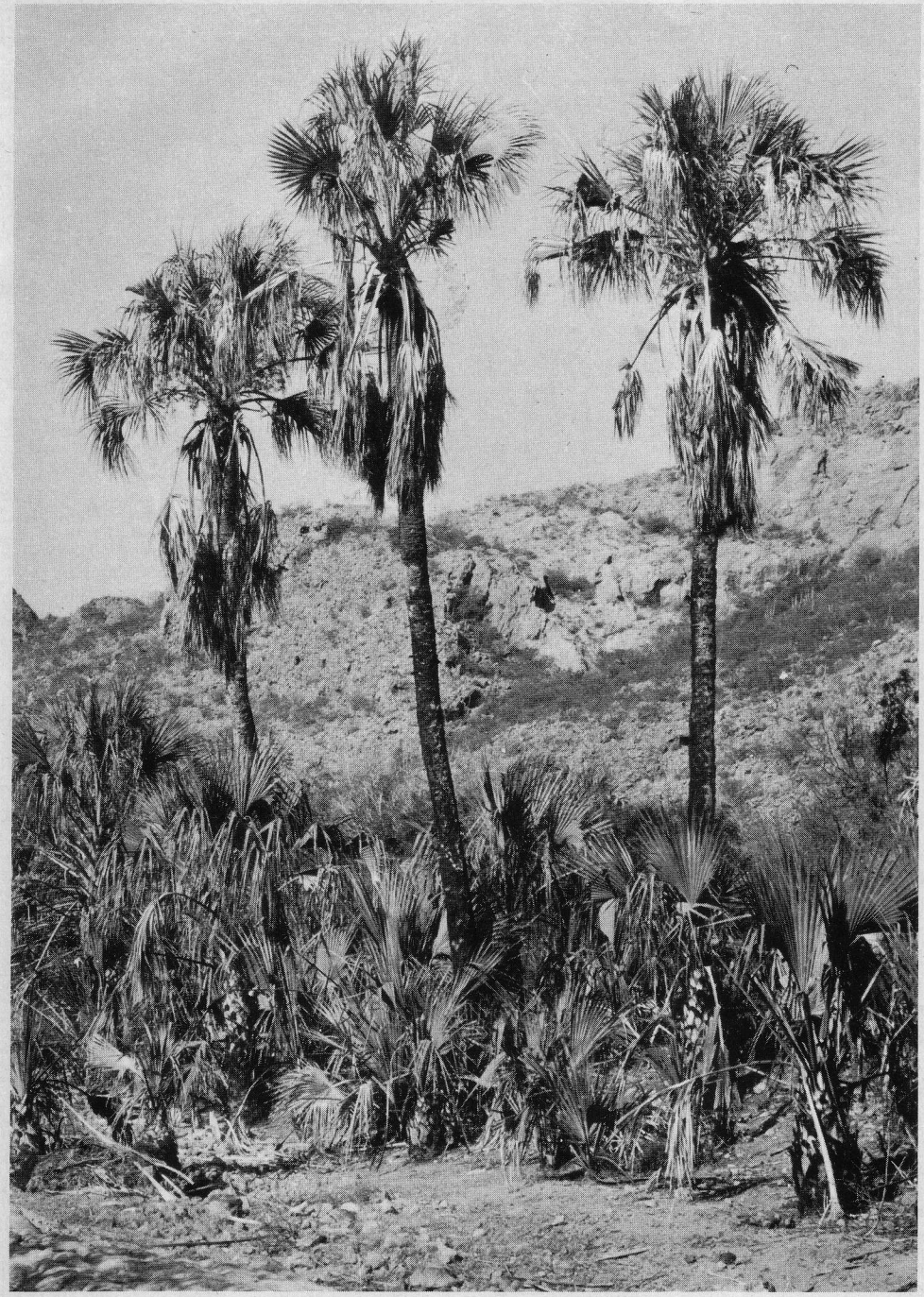
LUCITA H. WAIT

Palms along Mexico's West Coast Highway

ROBERT O. SCHNABEL
Photographs by the Author

When one crosses the Mexican border south of Yuma, Arizona, and heads southeastward along the highway from San Luis to Santa Ana, Sonora, one's thought is how anything could live in this burning desert. Only a few plants and animals have been able to adapt themselves to life on these seemingly endless mountains of buff colored sand and ragged lava flows. This is the Gran Desierto, a two hundred mile expanse of 120° F. summer temperatures, ending in the foothills of the Sierra Madre Occidental mountains where the traveler can see the first palms in the little towns of Caborca, Altar, Santa Ana, and Magdalena. These palms are seedling descendants of *Phoenix dactylifera* brought in from Spain and Africa by the Spanish settlers almost 400 years ago. Scattered among the *P. dactylifera* are numbers of *Washingtonia filifera*, native to the foothill canyons of the Sierra Madre, and also *W. robusta* that have been brought by humans across the Gulf of California and northward from its native area in southern Baja California.

The northernmost outliers of the Sonoran palmetto, *Sabal uresana*, reputedly exist in a remote canyon in the Babisso Range of the Sierra Madre about thirty miles southeast of Magdalena. But, it is not until you have turned due south at Santa Ana and crossed about seventy-five miles of arid plains that you can easily



1. *Sabal uresana* at San Carlos Bay, Sonora.

see the first *S. uresana*. These are in the Sonoran state capital city of Hermosillo.

Hermosillo, a modern prosperous commercial and agricultural center, is situated at Latitude 29° North, 75 miles inland from the Gulf of California and only 600 feet above sea-level. The area has a long hot summer season and a short warm winter. Climatically it is classified as humid, semi-arid, rain deficient at all seasons. Its less than six inches of rain falls from summer thunder storms and from occasional winter storms from the northwest. Water for irrigation comes from the mountains behind the city where up to 25 inches falls during the year and runs off to the sea by way of the Río Sonora and Río San Miguel water sheds. Some January nights become very cold but frosts are rare and separated by many years. Tropical vegetation such as royal poinciana, *Plumeria*, and papaya abound, and Hermosillo is probably the northernmost (and very marginal) range of *Cocos nucifera* on the west coast of North America. In the past ten years a few coconuts have been planted as ornamentals and one specimen near the pool of the Gandero Motel has two feet of trunk. The native *Sabal uresana* is used extensively to line streets in the modern residential areas, but *Phoenix* and *Washingtonia* are the predominant palms.

Moving southward along Mexico's Highway 15, no palms are encountered until the Gulf Coast is reached at Guaymas where *Cocos nucifera*, and *Roystonea regia* have frequently been planted along the beaches. Desert mountains meet the sea northwest of Guaymas and three species of palm can be seen growing wild along the intermittent streams in the canyons of these rocky cactus-studded ranges. The summer air temperatures at Guaymas are daily over the 100° F. mark and the water temperature of the Gulf ranges near 90° F. In winter, air maximums are in the 80's, minimums in the 50's, and water temperature in the 50's.

Sabal uresana can be seen readily at and near San Carlos Bay, reached by good gravel road 15 miles from Guaymas. This is a fine tree ranging to 25 feet in height with a self-cleaning trunk, and long petioles bearing large dark green fans with the typical *Sabal* costapalmate curve. The fans are covered with a glaucous material that gives a whitish cast to the fan and results in the local name, *palma blanca*, white palm. This is an excellent tree for the desert areas of Arizona as well as the desert valleys and other hot interior valleys of California.

Perhaps a dozen specimens of *Erythea armata* can be found mixed with the hundreds of *S. uresana* at San Carlos. The *E. armata* here are short and scrubby and resemble their cultured domestic California garden cousins only in the conspicuous glaucous blue coloring. A non-botanical description of *E. armata* would state that it is similar to the ubiquitous *W. filifera* except for its startling blue-grey coloring, and its long arching strands of creamy colored flowers. *E. armata* is popularly termed the great blue hesper palm or the Mexican blue fan palm.

On the tops and sides of the rocky cliffs and mountains surrounding San Carlos Bay may be found perhaps a dozen specimens of a green *Erythea* described by Dr. L. H. Bailey as *E. clara*. Some experts and palm fanciers feel that this palm is only a color variation of *E. armata* and should not be known as a true species. The reasoning comes from the fact that *E. armata* in the canyons of Baja California exhibits a green form at the higher elevations of its range, but does not take into account the fact that

2. *Erythea clara* at San Carlos Bay, Sonora.

Dr. Bailey did recognize certain botanical differences, although even he exhibits some doubts as to whether this is really a separate species. *E. clara* survives in the most austere of conditions, growing in cracks on rocky hillsides, under torrid desert skies with little rain during the year, and only the humidity of the Gulf to sustain it through the long dry spells.

About 70 miles southeast of Guaymas at the city of Navajoa a paved road branches into the foothills of the Sierra Madre 30 miles eastward to the town of Alamos, the former silver capital of western Mexico. From Alamos, primitive roads branch out into the mountains and canyons where *S. uresana* can be seen in great numbers. Here, also, in considerable number can be found *Erythea aculeata.* Both of these palms extend high into the mountains, almost to the pine forests, and are regularly subjected to freezing temperatures and an occasional snow storm. *E. aculeata,* whose Latin name means prickly, is a medium-sized palm rarely reaching twenty feet in height. Its trunk is slim, under one foot in diameter. Its fan is dark green and glaucous. This palm is thriving in California desert conditions and should be an excellent tree for the hotter palm growing areas of California and Arizona. In this area of southeastern Sonora, *S. uresana* and *E. aculeata* have been, in the past, so abundant that they enter the economy of the region in the form of roof thatch, building logs, and in the case of *S. uresana,* a succulent food. They are fast succumbing to the ravages of mankind, and the number of mature specimens is rapidly diminishing.

South of Navajoa, just past the Sonora-Sinaloa border, the terrain changes from desert to thorn forest, characterized by a humid, semi-arid climate, deficient in rainfall during the winter months, but amply supplied in the summer by tropical thunder storms from the south and by run-off water from the mountains to the east. Temperatures are hot in summer, warm in winter, and frost is virtually unknown. Here, on the wide fertile delta of the Fuerte River is the booming commercial city of Los Mochis, center of a vast cattle, mining, rice, and sugar growing area. At latitude 26° North and only a few hundred feet above sea level, Los Mochis at first glance looks like the other sweltering Mexican west coast cities; but it possesses one asset that should make it well known throughout the botanical world — Jardín Botánico "Las Palmas."

We should thank one man, Ing. Mario Zamora C. for his untiring efforts in bringing about the opening of this garden to the general public, and for bringing about its restoration from former neglect to its emerging status as one of the fine palm gardens of the world. Behind Jardín Botánico "Las Palmas" lies a story of pioneering, revolution, and persistence. Briefly, the story is this. At the turn of the century, a Mr. Johnson went to Los Mochis as the head of the then new sugar refinery. Once established in Los Mochis, he acquired twenty acres of land, built a home on the edge of the plot and sent to New York for landscape architects to lay out a formal English garden—with Mexican adaptations. One section he devoted to a collection of all the species of plant life growing along the west coast of Mexico, and the second section he reserved exclusively as a palm garden. He then proceeded to send to all parts of the world for seeds of palms which he germinated and placed in his garden.

During the 1920's and the era of the Mexican revolution Mr. Johnson faded from the scene and the garden, although well established at that time, was neglected and allowed to go wild. In the

3. A double colonnade of royal palms, *Roystonea regia*, at Jardín Botánico "Las Palmas," Los Mochis, Sinaloa.

decade of the 1950's the sugar mill and the adjacent Johnson properties were acquired by the Compañia Azucarera de Los Mochis, S. A. This company, in turn made the good decision to engage as its superintendent a young chemical engineer named Mario Zamora, and fortunately Señor Zamora happened to be a palm enthusiast who immediately recognized the worth of the gardens that had come under his control. Mario has now convinced the company that these gardens are a thing to be preserved for posterity and at present there is a crew of workers grubbing out the brush, trimming and readying the lawns, paving the streets, and generally making the gardens ready for the visitors that will surely stream to its gates. The gardens may now be visited by asking permission at the company offices.

At the Los Mochis gardens several mature examples of each of more than seventy species can be observed as well as thirty other species growing in the lath house. Included are such rare trees as *Pritchardia Gaudichaudii*, *Aiphanes caryotaefolia* and a spectacular unidentified *Sabal* distinguished by its lack of trunk and its plethora of long (up to 20′) arching petioles terminating in ten-foot fans. At the end of Royal Palm Road irrigation water regularly carries seeds of *Roystonea regia* into a shallow basin where literally thousands of seedlings are thriving. This is the source of most of the royal palms that are so fast coming into prominence along Mexico's west coast. A list of the palms in the Jardín Botánico "Las Palmas" de Los Mochis, as compiled by Mario Zamora appears at the end of this article.

While Los Mochis is very close to the tropics, and its winters are generally warm, light frost sometimes occurs in January. The coldest night known re-

4. *Sabal Rosei* near La Fortuna, Nayarit.

corded a low of 32° F. for a period of thirty minutes!

As one proceeds southward toward Culiacán the thorn-forest thins, giving way here and there to small grassy llanos where stands of *Sabal Rosei* may be observed. In Culiacán the traveler should not miss the dozen beautiful specimens of *Roystonea regia* surrounding the swimming pool of Los Tres Rios Motel. These twenty-year-old palms were transplanted from Los Mochis ten years ago. Along the Avenida Huyamo, a stylish riverside residential boulevard, a prominent specimen of *Caryota urens* is well worth visiting.

At Mazatlán, on the seacoast at Latitude 23° N., *Cocos nucifera* is the predominant palm, and from this area southward the coconut is grown extensively as a commercial crop. In the city itself *C. nucifera, Livistona chinensis, Chrysalidocarpus lutescens,* and *W. robusta* are most used as ornamentals. For the palm lover, however, no trip to Mazatlán would be complete without visiting the patio of the Belmar Hotel. Here may be seen many spectacular clumps of *Ptychosperma Macarthurii* reaching upwards to twenty and more feet. *Coccothrinax* and *Thrinax* species can be seen mixed with several ten-foot *Phoenix Roebelenii,* and a magnificent *Livistona rotundifolia* dominates one corner of the garden. However, the most outstanding plant in the garden is not a palm but an enormous cycad with a trunk diameter of at least six feet, branching and rebranching into a dozen separate crowns!

Upon departing Mazatlán toward the south the traveler notes that the cactus and acacias of the Sinaloan thorn-forest

5. Thatched hut made entirely from products of *Sabal Rosei* near Acaponeta, Nayarit.

are rapidly thinning out. Within fifty miles, in the state of Nayarit, the flora undergoes complete change for this is now a region geographically classified as "humid, tropical, deficient in rain only in winter." The highway follows the narrow coastal plain threading southward, skirting the swamps and lagoons to the west and paralleling the base of the foothills to the east.

Along this coastal plain and extending upward into the hills are hundreds of thousands of specimens of *Sabal Rosei* growing in clumps, thickets, forests, or as solitary specimens. *S. Rosei* occurs in the grasslands and also mixed with the broad leafed trees which are, in season, riotously colored by the flowers of vines and the flashing wings of macaws, parrots, and other brilliant hued birds. The agriculture of the region is mainly the production of corn, sugar, bananas and coconuts.

S. Rosei is a valuable economic commodity in the Nayarit lowlands where its bole is used for telephone poles, scaffolding, fence posts, bridge structures, corrals, stockades, and human dwelling places that also use its fans as thatch. The growing bud makes a succulent food, and the fruit is eaten by pigs and other animals.

In the Nayarit lowlands a strange relationship may be seen in which *S. Rosei* plays the role of "host" to another plant. Also growing in this region are many strangler figs *(Ficus* sp.); and birds, after eating the fruit of the fig, roost in the palms and drop the fig seeds into the leaf sheaths. The young fig appears as an epiphyte with roots descending to the ground. These eventually expand and

6. A trio of *Acrocomia mexicana* northwest of Tepic, Nayarit. The two on the left are being enveloped by strangler figs, the one on the right is covered with an epiphytic cactus.

coalesce. As the years pass the fig branches and broadens into a tree which slowly encases the entire trunk of the palm. The palm dies and only the fig remains. This ironic play of nature can be seen in its varying stages everywhere in the palm country of Nayarit with *S. Rosei* and sometimes *Acrocomia mexicana* playing the central role.

The heart of Nayarit's palmland is undoubtedly at the junction of the west-coast highway and the highway leading out to the sea at San Blas. In all directions the traveler may now see many specimens of *Acrocomia mexicana* growing in groves, in groups, or solitarily. In spite of its liberal coating of inch-long vicious black thorns on the trunk and petioles, *A. mexicana* is locally used as building material and thatch. The fruit is enjoyed by animals and humans alike, having a thin, mild-flavored, custard-like edible layer between skin and seed.

In this region several identified and unidentified species of *Chamedorea* can be found both in the wild and under cultivation in gardens.

A must for the tourist in this area is the ride out to San Blas through the wild forests of *Orbignya Guacuyule*, the coquito palm. The asphalt highway at places virtually tunnels through the enormous green fronds and rigid pale trunks of these magnificent sixty-foot palms. The fruit or nuts of *O. Guacuyule* have for years been harvested for their oil content and are consumed by both humans and farm animals as a nourishing food. San Blas is a small somnolent south-sea island type village scattered amid acres of *Cocos nucifera* along the warm Pacific beaches.

Back at the highway junction, a visit must be made to the establishment of Señor Heriberto Parra. Sr. Parra maintains a restaurant, a small zoo, and a large collection of exotic tropical plants, and on the side acts as a guide for tourists interested in hunting "tigers." *El tigre*, the jaguar, is plentiful in the surrounding hills and swamps. Heriberto not only will conduct you through his nursery showing his extensive collection of rare *Musa* species, breadfruit, travellers' trees, and the like but will furnish you a guide to take you out into the field for a look at the hard to find and spiny-trunked palm, *Cryosophila nana.*

From Señor Parra's nursery, the highway turns away from the coastal plain and slowly climbs the green outliers of the Sierra Madre. *Orbignya Guacuyule* is immediately left behind, *Sabal Rosei* abounds in countless numbers, and *Acrocomia mexicana* gradually thins out until finally at the city of Tepic, approximately two thousand feet in altitude, the palm land is left behind.

About fifty miles further inland and two thousand feet higher, near the state boundary line between Nayarit and Jalisco, the really alert traveler may observe a few specimens of *Brahea dulcis*. *B. dulcis*, the rock palm, grows on rocky ridges in poor soil, where the goat herders occupy their time and augment their incomes by weaving its fans into straw hats. This is the last native palm to be encountered growing wild along the Nogales to Mexico City highway.

Palms Growing in
Jardín Botánico "Las Palmas," Los Mochis, Sinaloa, Mexico
compiled by Ing. Mario Zamora C.

Aiphanes caryotaefolia
Archontophoenix Alexandrae
Archontophoenix Cunninghamiana
Arecastrum Romanzoffiianum
Arenga pinnata
Arenga tremula
Caryota mitis
Chamaedorea brachypoda
Chamaedorea elatior
Chamaedorea spp.
Chamaerops humilis
Chrysalidocarpus lutescens
Coccothrinax argentea
Cocos nucifera
Copernicia cerifera
Corypha Gebanga
Cryosophila sp.
Cryosophila Warscewiczii
Dictyosperma album
Elaeis guineensis
Erythea aculeata
Erythea armata
Erythea sp. *(E. armata* or *E. elegans)*
Howeia Forsteriana
Jubaea chilensis
Latania Loddigesii
Livistona australis
Livistona Saribus (L. cochinchinensis, L. Hoogendorpii)
Livistona Mariae
Livistona rotundifolia
Livistona spp.
Mascarena lagenicaulis
Mascarena Verschaffeltii
Paurotis Wrightii
Phoenix acaulis
Phoenix canariensis
Phoenix dactylifera
Phoenix reclinata
Phoenix reclinata (hybrid form)
Phoenix Roebelenii
Phoenix rupicola
Pritchardia Gaudichaudii
Pritchardia Thurstonii
Ptychosperma Macarthurii
Rhapis excelsa
Roystonea oleracea
Roystonea regia
Sabal Palmetto
Sabal Rosei
Sabal sp. *(S. mauritiaeformis* or *S. umbraculifera)*
Sabal sp. (probably *S. mexicana*, seed from Oaxaca)
Scheelea Liebmannii
Thrinax excelsa
Thrinax Morrisii
Thrinax spp.
Trachycarpus Fortunei
Trachycarpus Martianus
Veitchia Merrillii
Washingtonia filifera
Washington robusta (previously *W. sonorae)*
Several unidentified mature specimens

In the Lath House

Arenga sp.
Astrocaryum mexicanum
Chamaedorea erumpens
Chamaedorea sp.
Chamaedorea Seifrizii
Coccothrinax alta
Erythea Brandegeei
Latania lontaroides (L. Commersonii)
Licuala grandis
Livistona Benthamii
Pinanga Kuhlii
Pritchardia affinis
Pritchardia arecina
Pritchardia Hillebrandii
Pritchardia lanaiensis
Pritchardia Lowreyana
Pritchardia pacifica
Reinhardtia gracilis var. *gracilior*
Sabal bermudana
Serenoa repens
Thrinax parviflora
Trachycarpus Martianus
Trachycarpus Takil

Palm Hunter in the Wastelands

RANDALL HENDERSON

A chapter from the book On Desert Trails, *published by Westernlore Press, Los Angeles 41, California.* *Reprinted by kind permission of Mr. Henderson.*

Tattered troopers of General Stephen W. Kearney's Army of the West had been straggling across the southern Arizona and California deserts from waterhole to waterhole for weeks. Then on November 29, 1846, an advance detachment following the course of Vallecito Creek, which drains to the desert from California's Sierra Nevada, spied green foliage against the drab hillside in the distance.

Green trees on the desert could mean water, and when the soldiers turned aside to investigate, they found a spring surrounded by a group of trees which some of them were able to identify. Lieut. William H. Emory of the Topographic Engineers, accompanying the Army, records the incident in his diary, later published as *Notes of a Military Reconnaissance from Fort Leavenworth to San Diego.* Emory wrote:

"A few miles from a spring called Oro Grande... several scattered objects were seen projecting against cliffs, hailed by the Florida campaigners, some of whom were along, as old friends. They were cabbage trees, and marked the locale of a spring and small patch of grass."

Many Floridans still call them cabbage trees, or cabbage palmettos, but to Californians they are palms—the *Washingtonia filifera,* which grows wild on the Southern California desert and south into Baja California.

Lieut. Emory's reference was the first recorded observation of California's native palms by an Anglo-American. The palms seen by the Kearney troopers are in San Diego County, and are located at the desert entrance to a canyon in the Laguna Mountains. The oasis is known today as Mountain Palm Springs.

I visited this oasis in 1931, and on this and subsequent camping trips in the area counted 57 palms in the group mentioned by Lieut. Emory, and an additional 238 palmettos in four other groups in the immediate vicinity. The Mountain Palm Springs oasis probably has changed little since General Kearney and his weary army came this way 115 years ago. The "cabbage trees" are still there—"green foliage against a gray hillside" where thirsty travelers may come for clear, sweet water and shade.

My interest in the wild palms of the Southern California desert dates back to 1920 when on a visit to my old prospector friend, Gus Lederer at Corn Springs in the Chuckawalla Mountains, I spent two days loafing in the shade of the palm fronds which formed a canopy over his one-room cabin. That was my introduction to one of the most interesting botanical phenomena of the Great American Desert. I have never ceased to be amazed and delighted at the paradox of palms growing wild in the arid desert, for this tree must have abundant water at its shallow roots.

The quest for these isolated palm oases became a hobby which has occupied literally hundreds of my weekend jalopy—and later jeep—outings during the last forty years. So far I have logged and photographed 88 separate groups on the American side of the international boundary, and I am confident that the total will exceed 100. On the Mexican side of the border the palm canyons extend more or less intermittently the entire length of the Baja California peninsula.

There are few places where these palm

oases may be observed from paved highways. Generally they are in remote canyons and sometimes may be reached only after miles of hiking beyond the point where the terrain becomes impassable for a jeep. The clues to their whereabouts came to me from many sources: prospectors, hunters, cowhands and old maps. These trees thrive in both the Upper and Lower Sonoran botanical zones. At Dos Palmas spring, near the western end of Salton Sea, they are growing below sea level, and at another spring, also known as Dos Palmas, in the Santa Rosa Mountains, they are vigorous trees at the 3500-foot elevation. In my note book is reference to a report that a small group of the native palms are seen at 4200 feet in San Diego County—but that is a report yet to be confirmed.

On an old map accompanying the report of Col. J. W. Barlow of the U.S.-Mexican boundary survey of 1892-96, I saw a notation "palm spring" along a remote sector of the international border of Southern California. This region of ninety square miles is a blank white space on all published maps. During the next three years I made four trips into this area by jeep and on foot before I located them. There were 27 mature trees in the bottom of an obscure canyon in the Inkopah Mountains, watered by a trickle that flowed a few hundred feet from a spring, and then disappeared in the sand.

On the hunch that there might be more palms in this little-known corner of the Colorado Desert, Arles Adams and I explored the area on a backpack trip in March 1946. Arles is a mill superintendent in El Centro, California, with the hands of a mechanical genius and an artist's delight in the primitive freedom of the unexplored wilderness. He has been my companion on many excursions into the unmapped geography of the Southwest.

We travelled light. Our sleeping bags, food for two days, and a quart canteen of water each added up to twenty-pound packs. Leaving U.S. Highway 80 near Mountain Springs, during the first hour we passed one small group of palms, and before noon had arrived at another where the blackened ceiling of a cave and a huge boulder with nine mortar recesses in its top surface were mute evidence that the site had been the home of prehistoric tribesmen. Later in the day we passed another group of 17 palms huddled together in a lovely picture that will remain in my memory as one of the highlights of the trip.

To the hiker, the desert escarpment of the Inkopah range is just a succession of ups and downs. We found it necessary to make a tedious detour around a 30-foot dry waterfall. A half hour later we were descending a 500-foot precipice of gray and white marble. It was a beautiful formation, but we were too busy clinging to the rocks and trying to find hand and toe holds to think much about the coloring at the time. On an almost vertical descent a twenty-pound pack, swaying with each movement, calls for rather critical balancing at times.

During the morning we had been able to refill our canteens at springs along the way. But as the afternoon shadows began to lengthen, water supply became our chief concern. When darkness came we found a little sheltered cove where there was enough dead ironwood for warmth. We were thirsty, but not painfully so, and made dry camp for the night.

The next morning we continued down the canyon and within an hour came to a series of *tinajas*, still holding water from the last storm. I use the Spanish term because I like the Mexican pronun-

ciation of *Tená has* and it is a specific term whereas the English "natural tank" is neither exact nor accurately descriptive.

Now, for the first time since we had started our hike twelve miles to the north, I knew where we were. I had seen these *tinajas* on one of my previous trips into this region in quest of the palm springs. Unknowingly, we had crossed the international border and were in Mexico. The boundary monuments are far apart in this region.

We spent the day revisiting the palm spring and hiking back along the floor of the desert, at the toe of the range, to Coyote Well on Highway 80, where our car was to meet us. The two-day backpack trip had added three new groups to my roster of palm oases, and also the location of several prehistoric Indian sites, one of them identified by well-preserved petroglyphs on the rocks. We had seen no wildlife and few game trails, for this is indeed arid country, but all along the way we had been serenaded by the musical call of the canyon wren, which to me is the sweetest sound on the desert.

Owing to the sparsity of boundary markers in this remote area, I am not sure yet whether the little oasis to which I gave the name Boundary Palm Spring, to distinguish it from many other palm oases in Southern California, is in the United States or Mexico. However, on the map which I published in *Desert Magazine* at the time of the re-discovery of this little oasis, I gave Uncle Sam the benefit of the doubt. The other three groups are identified in my notes as Mortero Palm Spring, where we found the old grinding mortars, Juniper Palm Spring, and Mesquite Palm Spring.

On these palm-hunting excursions I always carry a mechanical counter to record the number of trees. While I have not yet completed the census, and the numbers change from year to year as scarred veterans topple before storm winds and new trees are constantly taking root, I estimate there are 11,000 native palms on the Southern California desert, and perhaps another 18,000 in Mexico within fifty miles of the international border.

There is one group of 57 Washingtonias on the Arizona side of the Colorado River in a precipitous canyon in the Kofa range. I learned about the Arizona palms from Albert Stitt of the U.S. Reclamation Bureau. He had seen them during a previous tour of duty with the U.S. Agricultural Station at Bard, near Yuma. He offered to serve as guide on a trip to the Kofa, and we arranged to go.

We crossed the Colorado River at Yuma, and then turned north over the suspension bridge which spans the Gila River. Just beyond this bridge a sign warns the motorist: "No water, no gas, no oil for 72 miles." The sign-maker might have added "no bridges." This is unimportant in dry weather, but the road crosses hundreds of arroyos between that point and the next service station at Quartzsite, and on those rare occasions when rain is falling these desert dips run full of water. I had once attempted this route after such a storm. At each arroyo I would wade out with a shovel to sound the depth of the torrent, while my companion drove the car. We navigated two of them, but at the third flood stream the handle of the shovel disappeared in the water. In this land of seldom-seen roads we had to make a 200-mile detour to reach our destination.

But we had fair weather for our trip to the Kofa, and camped that night at the base of the mountain which rises 2000 feet almost perpendicularly from the floor of the desert. The Kofa is

a strange mountain, virtually without water. During many trips over and around the mountain I have never found a spring big enough to fill a canteen. There are *tinajas* which hold water for a few weeks after a rain, but during long periods of drouth the Kofa massif is as dry as the Sahara. Yet despite this apparent lack of moisture, every tiny ledge and crevice has luxurious green vegetation the year 'round. Evidently the huge block of volcanic rock which comprises the bulk of the mountain is shattered and porous, and stores great quantities of storm water within its mass. Dr. L. H. Bailey, the eminent botanist at Cornell University, who had visited the palm canyon, referred to it as a "fantastic mountain."

The name Kofa is derived from the King of Arizona, a long-abandoned mining property near the southern base of the mountain. The old prospectors had another name for it—one that could hardly be used in polite society. They called it S. H. Mountain, and that name appears on some of the old maps. When one drives along the Yuma-Quartzsite road with the mountain outlined against the eastern sky, there is observed a conspicuous butte which suggested the descriptive term used by the old-timers.

The palms grow in a narrow slot of a tributary canyon, accessible only by hand and toe ascent. There must be water at their roots, otherwise the palms would not be there. But it would require the pick and drill of a hard rock miner to get a drink there. The scarcity of water probably explains the absence of potsherds, petroglyphs or other evidence of previous Indian habitation near the mountain.

The daddy of the palm oases in California is the widely-publicized Palm Canyon, near the resort city of Palm Springs. There are approximately 3000 trees in this group, extending along the floor of the canyon for several miles, and fed by a live stream of water. They are multiplying, as is true in nearly all the oases where there is running water. Palm Canyon is on the agenda of the National Park Service as a possible national monument, but little progress has been made toward the acquisition of the oasis for this purpose because most of the palms are on the reservation lands of the Cahuilla Indians. The Cahuilla Tribal Council derives considerable income from a nominal charge for entrance to the canyon.

One circumstance which confirms the conclusion that the wild palms are increasing in numbers is that the old-timers who were responsible for the original naming of many of the oases frequently referred to them by number. For instance, Twenty-nine Palms, near the town of that name and the headquarters for the National Park administration of the Joshua Tree National Monument, was given the name by Col. Henry Washington, chief of the survey party which established California's San Bernardino Base and Meridian in 1852. Today only fourteen of the original palms are still standing, their age evidenced by the deep fire scars and the stooped angle of their trunks. However, young trees have more than replaced the fallen veterans. Incidentally, this is the northernmost of the wild palm groups in California. A few miles away, within the Monument, is another group known as 49 Palms.

Prospectors, who tramped this desert nearly a century ago, probably were responsible for the original naming of 17 Palms in the Borrego Badlands sector of the Anza-Borrego State Park. The popularity of this historic waterhole is attested by the old foot-trails which approach it from every direction. The last time I visited this oasis only five of the

original trees were standing, but I counted 25 young trees ranging from 2 to 25 feet in height.

At Dos Palmas spring, on the desert slope of the Santa Rosa mountains, the original two palms have increased to five, with several additional trees downstream below the spring. At Dos Palmas, on the old Bradshaw freight route, there are now 27 trees.

The native palms of California are all of the fan type, the species *Washingtonia filifera*. The scientific name was given by a German horticulturist, Herman Wendland, in 1879. He saw young trees growing in a hothouse at Ghent, Belgium, from seed brought from the United States. The name was given to honor George Washington, leader of the American Revolution, and first president of the U. S. A.

In later years, other botanists added four other species to the genus *Washingtonia*. These were *W. gracilis*, *W. sonorae*, *W. robusta* and *W. arizonica*. The latter classification was given in 1923, by O. F. Cook of the U. S. Department of Agriculture, to the palms in Arizona's Kofa mountains. The other three species are natives of the states of Sonora and Baja California in Mexico.

In 1936, Dr. Bailey of Cornell published a monograph in which he sugested that the variations in *robusta*, *gracilis* and *sonorae* were so slight it would greatly simplify the identification of the three if they were all reclassified as *robusta*. He regarded *arizonica* as *filifera*. Thus, on the authority of the Cornell scientist, we now have but two species in the genus *Washingtonia*, *robusta* and *filifera*. The two are readily distinguished. *Robusta* is a tall slender tree sometimes reaching a height of 50 or 60 feet. It is widely planted as an ornamental tree in the Southwest. *Filifera* is a thick-trunked tree seldom growing higher than 35 or 40 feet.

Along the desert escarpment of the Sierra Juárez range, just south of the international boundary in Baja California, is another fan palm distinguished by the bluish cast of its fronds, and, when in fruit, by its seeds. It grows large clusters of marble-sized seeds compared to the pea-size of the Washingtonia genus.

During trips to the canyons of the Sierra Juárez many years ago I noted this strange palm growing in the same canyons with the Washingtonias. Later I brought out some of the seeds and sections of the frond stems and sent them to botanist friends for identification. Evidently they were passed along to Dr. Bailey for I received a letter from him asking for information as to the habitat. A year later, the scientist sent word that on his next trip West he would like to visit one of the canyons where the trees were growing. The trip was arranged, and it proved to be one of the most delightful experiences in my years of palm hunting. The eighty-year-old botanist revealed amazing stamina during the four-mile hike along the rocky trail into Taos Canyon. Along the way he entertained the members of our party with his experiences around the world in assembling the fine herbarium at the Cornell campus. When we reached the palms he immediately confirmed his previous conjecture that they were one of the blue palm species, the *Erythea armata*. This species is found within 25 miles of the American border, but I have never found a single tree north of the boundary.

Visitors to Palm Canyon, near Palm Springs, note there is considerable variation in the thickness of the trunks of mature trees, some of them approaching the graceful lines of the robusta species. Where the water supply is ample and the trees grow in a dense forest, as in the

7. *Washingtonia filifera* in Palm Canyon, where the palms grow in small and large groups, in dense groves and as stragglers. The canyon is only a fifteen-minute drive from Palm Springs, California. Photograph by Peter Bisset, courtesy U.S. Department of Agriculture.

natural park above Hermit's Bench in this canyon, the trunks tend to be more slender than where the growth is scattered or the water supply more limited.

As the tree grows and puts out new fronds at its crown, the lower fronds die, but do not pull loose from the trunk as do the leaves of most other trees. They hang close to the trunk, forming a thick skirt. These skirts are highly inflammable, and generally on the older trees have been burned away. Sometimes the fires have been started by campers, and at other times by lightning. Prehistoric Indians who camped at the palm oases are said to have burned the dead fronds because they believed the thatch was the hiding place of evil spirits.

I have slept on the ground beneath these wild palms many times, and I can understand the reasons for the Indian superstition. Bats, wrens, insects and even rodents sometimes find shelter among the dead fronds. More than once I have been awakened by a faint rustling in the dry skirts overhead.

During the late spring and early summer the mature trees throw out creamy plumes of blossoms among the living fronds. These develop into tiny seed berries and by October great clusters of the dark brown seeds dangle from the foliage. The berry consists of a hard seed covered by a thin sweet skin. The Indians crushed these seeds in crude mortars and made them into a porridge. In Guadalupe Canyon, in Baja California, I once came upon a hermit cutting the tender crown out of the young trees for food. I have never found evidence that the Indians did this. To them the tree was too valuable a source of food and shelter to be destroyed in this manner.

In seeking out the location of palm groups when I had no other clues for guidance, I learned a lesson from the prospectors. In their search for free gold they not only panned the sand of the arroyos, but they kept a sharp eye for float—for pieces of ore which may have broken loose and been washed downstream from a ledge higher up on the mountain. And so I learned to scan the creek beds of the lower canyons for palm float—a bit of frond, a seed stem, or perhaps a section of trunk washed down the canyon. Such evidence unfailingly led to living palm trees higher up.

Whence came these wild palms to the Southern California desert? No one can answer with certainty. It is not true—as some unknowing persons have suggested —that they were planted by the Spanish padres who first came to this region. Undoubtedly the Franciscan fathers, who first established missions in the Californias in the 18th century, planted seeds and grew palms in their settlements. But the palms were here many thousands of years before the white man came to this western hemisphere. Probably they were here before primitive man inhabited the earth. *The California Highway and Public Works* magazine reported in January, 1932: "Near Bridge Canyon north of Castaic school the fossilized imprint of a palm leaf was found embedded in limestone. The depth at which the fossil was found was estimated at from 25 to 30 feet below the present surface of the ground."

The Los Angeles Museum has a fossil imprint of a palm frond, presumably a fragment of Washingtonia, collected at Austin quarry, Calabasas, California, which scientists believe dates back to the Miocene period. Baja California's palm trees were mentioned by Father Juan Crespi, historian of the Portola expedition, as long ago as 1769, and Father Junípero Serra, who founded the California missions, recorded seeing them the same year.

There is good reason to believe the

trees date back to a period when the desert as we know it today was partially inundated, or threaded with swamps and bayous, for there is no escaping the fact that the palm is a water-loving tree. Its shallow root system bears out the conclusion that it has made no evolutionary progress in adapting to dry arid soil or deep water tables, as have the smoke tree and other desert shrubs with long tap roots. Its fronds thrive in the desert sun, and its trunk conserves moisture—but its roots must have a generous supply of water.

My study of the desert palms has convinced me that the original trees in this area survived along the fault lines which more or less parallel the Salton Sea on both sides. These fault lines, where water rises close to the surface of the ground, may accurately be followed from an airplane overhead by noting the extra growth of vegetation which marks them. These stringers of vegetation often include palm trees.

The palms in the canyons, where the greater numbers are found, are migrants from the floor of the desert. Their seeds from the parent trees along the fault lines were brought into the canyons by Indians and coyotes, and possibly, in the case of Kofa Palm Canyon, by birds. The Indians carried them, as they did mesquite beans and chia seed, for food. The coyotes eat the fruit as it falls to the ground, but digest only the sweet skins. Undigested palm seeds may be seen in coyote dung in nearly all the desert canyons where there is water. The coyote is despised as a chicken thief and camp robber—but I believe this wild dog of the desert must be credited, more than any other agent, for the fine stand of palmettos in Palm Canyon and the many other canyon oases where the Washingtonia thrives today.

Since a palm tree has no growth rings by which its age may be determined, I have sought the answer in other directions. There are canyons where I can identify three different generations—all of them fully mature. The separate generations may be determined by the fire scars on the trunk, for all the aged trees have been burned, and by the length of the dead frond skirts. It is not uncommon to find a fire-scarred veteran of perhaps 150 years growing close beside another tree which has a full skirt of dry fronds. Considering the inflammability of the dead fronds, it is obvious the older tree reached full maturity before the adjacent tree had sprouted.

Fortunately, the fire which strips the palm of its dry fronds seldom kills the tree. The outer surface of the trunk may be charred and the green fronds at the crown singed until they wilt and die, but within a few weeks a new growth of fronds emerges and the vitality of the tree appears in no way impaired by the flames. Actually, the burned tree almost invariably grows a heavier crop of seed the following season—as if Nature had stepped up its reproductive process to compensate for any destruction that may have been caused by its flaming enemy.

The effect of water supply on the growth of the Washingtonia has been demonstrated by trees I have grown domestically. Twelve years ago I transplanted some native seedlings given me by Paul Wilhelm of Thousand Palms Canyon. They were three years old and 2½ feet high. Part of them were planted where they received only a weekly irrigation. They now average less than six feet in height. Others were planted where for six months of the year they received daily irrigation of warm water, the waste from a refrigeration cooling system in a nearby building. These palms are now twenty feet high.

The root system of the tree consists

of hundreds of small rootlets, each no thicker than a lead pencil, which spread through the ground immediately below the surface. The sap flows from roots to crown in the porous heart of the tree. It is this characteristic of the tree that enables it to survive even when the bark —if the outer covering of the trunk may be called bark—is blackened with char.

Why does a person, presumably in his right mind, spend his weekends for many years hunting for palm trees? I can only answer that by suggesting other questions: Why do men and women climb mountains, or run the treacherous rapids of the Colorado River in wooden boats?

To active-minded human beings life would be meaningless without goals. They cannot all set out as did Christopher Columbus in quest of a new world, or Admiral Byrd in search for the South Pole. Most of us have to be content with more modest projects. But in nearly every member of the human species there is the built-in urge for conquest—for exploration. This is especially true of youth. And so we embark on whatever form of adventure our environment will suggest and our circumstances will permit.

Oh, I know, the psychologists have a more scientific — and incomprehensible — explanation for human impulses than I am suggesting. But the basic urges in human nature really are not as complicated as some of the minds in the ivory towers would have us believe. If parents and teachers and law-makers better understood the basic emotions which are the dynamo of human conduct I am sure there would be less alcoholism, fewer love triangles, and certainly less crime and juvenile delinquency than plague our society today.

I am sure no winner of the Indianapolis Sweepstakes or the Open Golf championship or the Kentucky Derby ever experienced a deeper sense of achievement or a more lasting satisfaction than came to me the day, after six fruitless weekends spent scaling the rocks and plodding up the sand canyons of the Inkopah Mountains of Southern California, I finally got my first glimpse of the pretty palm oasis near the fantastic rock formation known as Dos Cabezas.

Landscape Grouping of Palm Species*

H. F. Loomis

Palms have been used in landscaping for many years in countries fortunate enough to be able to grow them out-of-doors. Several methods have been followed, the most usual being the planting of a single specimen in an open space where it might be seen to the best advantage or placing it to lend a special accent adjacent to shrubs, trees, a doorway, corner of a building or to break an expanse of wall. Thus single plants of several or more species may be seen scattered in yards, gardens and parks or along streets, with little artistic relation to each other.

A somewhat more studied effect has been achieved by placing several individuals of the same species in loose or close group arrangement. This is more commonly done with single-trunked kinds than with those that form natural clumps and occasionally may be an attempt to simulate a clumping species without running the danger of having the group expand greatly, as with some multiple-trunked palms.

A third common landscape use of palms is the planting of many of the same kind, usually a single-trunked one, in a row at the side or front of a door-

yard, around a plaza, or along one or both sides of a pathway, drive or street.

Everyone has seen, or knows through pictures, magnificent avenues in the tropics or subtropics of such giant species as the Royal, Washingtonia, Canary Island Date, and Palmyra palm, to name a few, but intermediate and small species with one or many trunks also have been displayed extensively in row plantings. A somewhat more utilitarian row use has been made of certain suckering palms of such genera as *Phoenix, Bactris, Chamaedorea, Astrocaryum,* or *Rhapis* by close planting in hedges to provide screens or dividers along property lines or between areas, the spiny-trunked ones effectively barring passage.

Departures from the single-species row are seldom observed, but a delightful exception appeared several years ago when the streets in the business section of Coral Gables, Florida, were decorated with a combination of herbaceous plants and palms, the latter practically in a curbside or central parkway row of a half dozen species intermixed, one or two with multiple trunks, included among the other plants.

A rarely seen arrangement of palms, but one that deserves widespread exploitation by landscape architects and palm lovers in general may be termed "species grouping." In essence it can be described as the planting of several or many palm species in a compact clump or group to give a coordinated mass that will keep a pleasing shape for many years without pruning or special training.

Such a group is shown in the accompanying photograph, which illustrates remarkably well the several features involved in this type of planting. Obviously it is an old group, as attested by the size of the larger palms, with the royals near the center furnishing the principal highlight and surrounded by a very closely spaced mixture of species of decreasing size to the low-growing ones that fill segments of the outer margin. It can be seen that much thought went into the original selection and disposition of members of the group, which unquestionably has been a thing of beauty for many years with more remaining for it.

An interesting point shown by the photograph, exemplifying an often advantageous use of palms as contrasted with shrubs or trees in such a mass planting, is that the group still remains almost within its original bounds, nearly all the growth having been upward with hardly any outward expansion.

In planning a palm species group, the size and shape of the area and the approximate height and numbers of species and individuals to be used can be varied endlessly. For a group to be dramatically effective, however, the requirements and characteristics of the different species must be known to insure maintaining the proper relationship between its elements over a long period.

Much can be learned of the dimensions, general shape and appearance, rate of growth, and light requirements of various palm species by studying those in established collections. Fortunately, there are several current books devoted entirely to palms as well as the quarterly journal PRINCIPES and numerous botanical papers published by the Bailey Hortorium, Cornell University, which provide information on most aspects of the palm family. Also many plant nurseries in the palm-growing regions, of the United States at least, can supply greater numbers of species, with descriptive details and cultural suggestions, than ever before. Thus the stumbling blocks of getting information and of finding suitable palms for planting have been largely removed.

While the group in the photograph is

8. Large species-group of palms in Botanic Garden, Dominica, B. W. I. Easily recognized are *Roystonea oleracea*, *Pritchardia pacifica*, *Chrysalidocarpus madagascariensis*, *C. lutescens*, *Phoenix reclinata*, *Thrinax parviflora*, *Licuala spinosa* and *Rhapis excelsa*. Photograph by H. F. Loomis, courtesy U.S. Department of Agriculture.

too grandiose for any but large grounds, the principle of planting can be carried through smaller clumps to relatively tiny arrangements in patios, courtyards, or even indoor planter boxes where the smaller shade palms would be required. Undoubtedly the greatest use to be made of grouping is in the intermediate-size range, perhaps with no more than three or four species represented by a total of six to a dozen palms in such locations as mentioned for the first two landscape types of palm planting.

After having decided on the space a species-group will occupy, and the maximum height allowable, the general exposure will dictate whether shade-palms or sun-palms or both should be planted. In a group fully exposed to the sun, some shade-loving species of relatively small to medium size may be located on its north side if shade from the larger inner palms is fairly constant. Placing of shade-species in such a group can be deferred until the larger interior palms are of a size to provide the necessary protection from the sun; in fact, in any group all species, whatever their requirements, need not be set at the same time however desirable this may be. Still, in most cases, fewer complications will ensue if the tallest and intermediate ones are placed concurrently. Where suitable small species for the outer margin are not available, young specimens of some larger but slow-growing palms may be substituted with the intent of eventual replacement or of setting small species at their base when they become too large. Certain suckering palms of small to medium height are adapted to marginal planting if a few suckers are being continually produced to afford a low leaf-cover to hide the older inner stems. In this category, *Licuala spinosa, Rhapis excelsa* and *Zombia antillarum* are a few that may be mentioned.

A feature to be considered in any group, especially the larger ones, is the general appearance or texture that may be attained by judicious mixing of fan-leaf and feather-leaf palms with single or multiple trunks, to increase the interest and beauty of the planting. Another opportunity for diversification is in blending colors of foliage, as some palm species characteristically have dark-green leaves, others light-green to almost yellow ones, and a few species silvery-gray to distinctly bluish leaves.

In starting group plantings it is best to use palms that have begun to attain some size, so that a mass effect will be evident from the first. If small seedlings are used more time will be needed for them to grow and fill out the plantings into unified clumps.

Those in South Florida who wish to arrange a species-group may select from the following list of species, most of which are available in the area. Palms in the list are named in classes of descending heights at maturity but considerable over-lapping occurs between the adjacent classes.

VERY TALL SPECIES—*Washingtonia robusta, Roystonea elata, R. regia, Corypha umbraculifera, Cocos nucifera.*

TALL SPECIES — *Elaeis guineensis, Phoenix dactylifera, P. canariensis, Sabal Palmetto, Pritchardia pacifica, P. Thurstonii, Latania* (all species).

INTERMEDIATE HEIGHT SPECIES—*Dictyosperma album, D. aureum, Trachycarpus Fortunei, Thrinax microcarpa, T. parviflora, Coccothrinax* (most available species), *Ptychosperma elegans, P. Macarthurii, Chrysalidocarpus madagascariensis, C. lutescens.*

SMALL SPECIES—*Chamaerops humilis, Veitchia Merrillii, Thrinax Morrisii, T. Ekmanii, Phoenix Roebelenii, Licuala grandis, Chamaedorea erumpens, C. Seifrizii, C. concolor.*

VERY SMALL OR LOW SPECIES—*Sabal Etonia, S. minor, Phoenix pusilla, Rhapidophyllum hystrix, Chamaedorea elegans, C. tenella.*

Many more species are growing in this region and locating desirable specimens and including them in diversified group arrangements will be a pleasant experience for anyone, make a worthy contribution to knowledge of the use of palms, and enhance the variety and beauty of landscape plantings.

More about Cold Tolerance

Effects of a Hard Freeze upon Cultivated Palms during December, 1962, at Daytona Beach, Florida

DENT SMITH

Having already dealt in these pages with the cold tolerance of certain cultivated palms, the writer hardly had expected to return to that frigid subject in just five years. The hard freeze of December, 1962, gave rise to a different set of circumstances, however, and the effects upon the palms were different also. Hence it has seemed advisable to report anew.

Six years ago nearly everybody was convinced that the world was growing warmer. Most of the meteorologists subscribed to the notion and helped to give it wide credence. The ice was said to be melting and the glaciers receding. Certainly in the United States much of the eastern seaboard had been enjoying less rigorous winters for several years. But if the trend was in a warm direction, it was not confirmed by the weather in many states following the 1956-1957 winter, for the very next winter there were several hard freezes extending well down into Florida. Such severe cold, the Floridians thought, might not again invade their peninsula for decades. It would have been against reason to expect that much worse would come within a few years, but come it did in December, 1962.

The delay in publishing this report until January, 1964, thirteen months after the freeze occurred, is owing to valid reasons. The freeze effects upon the injured palms were not simultaneous with the occurrence of the freeze itself. On the contrary, these effects were in a state of constant change over more or less extended periods of time, with the outcome continuing to be in doubt for from one month to as many as ten months. In some instances it was still impossible to know, by late summer, which palms would survive among all those still ailing but alive at that time; and even somewhat later on, ten months after freeze injury, the issue remained doubtful in a few cases. Not until late November was it possible to tabulate all the facts and to prepare this account for publication in the next issue of PRINCIPES —the current one. Any earlier report would have been inevitably misleading because of inaccuracies. Many palms survived that for a time appeared dead or dying, others in extremely sorry condition with only the slenderest of holds on life managed in time fully to recover, and a number that appeared to be safely mending ultimately died from hidden injuries.

At the time of the freeze there were one thousand planted palms, slightly more or less, under the writer's care at 2514-2518 South Peninsula Drive, Daytona Beach, Florida. This number was substantially larger than in prior years,

but the number of genera and species had been reduced by losses from 94 genera and 242 species to 70 and 207 respectively. No attempt to grow coconut palms and some of the other tenderer kinds had been repeated since the large losses of the 1957-1958 winter.

Accompanied by high surface winds from the northwest, a mass of Arctic air descended on December 12, 1962, and blanketed most of Florida. The northern and central regions were subjected to much deeper cold than the southern, and generally the inland sections at any given latitude were colder than the immediate coasts. Marine influence was lessened, however, even on the littoral of the Atlantic Ocean, for the strong northwest winds off the land hardly permitted much warmth from the water to make headway landwards. Although the palm plantings reported on here are located a scant quarter-mile from the open sea, any benefit from the proximity was, if not negligible, quite small on this occasion.

There was less than one day's warning of a record-breaking freeze, making the time all too short to prepare for it. In the few hours of grace some six hundred small palms in pots and cans were placed in a heated shed and an unheated garage, as a consequence of which none was lost. Stakes were driven upright around some of the smallest planted palms and sheet blankets draped over them, so that the plants were enveloped without being touched by the fleecy cotton material. Shelters of windproof but translucent acetate mesh stapled to stakes were built around three sides of about thirty small palms, leaving the south side and top open to be covered with a sheet blanket in case of a threatened cold attack as in this instance (Fig. 9).

No heat was used outdoors for several reasons, the chief one being that not

9. Type of shelter for protection of small palms from cold northerly winds. Further protection, in case of a threatened freeze, may be effectively added by draping a sheet blanket or other material over the open top and side.

even two hundred "salamanders" or other grove heaters could give full protection to every palm needing it. Firing would have been of little value anyhow, for as it turned out the force of the icy winds would have dissipated most of the heat. A still more compelling reason for the lack of any heat at all was that the rush to buy grove heaters had exhausted the supply in central Florida at the first alarm and they were not to be had.

On that fatal day, December 12, the temperature fell to 32° F. at 8 p.m. and continued falling till it reached a minimum of 22° at 7 a.m. on the morning of the 13th. It gradually started to rise at 8:30 a.m., but did not reach 32° until 10 a.m., thus making a total of 14 hours below freezing. The maximum temperature during the daylight hours of the 13th was only 42°.

The damage to plants was apparent enough at first, but not nearly so appalling as a week later when it looked as if a fire had run through the grounds. Immediately, however, once the frozen veg-

etation had thawed out, a faintly sweet but sickly odor began to permeate the air, becoming more pronounced within the next few days and not unlike that of a battlefield strewn with dead.

On the 13th one could not hazard a good guess as to the number of palms killed or to the proportion of their total number. Perhaps three-quarters of them had suffered fatal injury, perhaps only one-third or just a quarter. Two more consecutive nights with freezing temperatures were to ensue: 11 hours from 9 p.m. on the 13th to 8 a.m. on the 14th, with a minimum of 26°; and 3 hours from 10 p.m. on the 14th to 1 a.m. on the 15th, with a minimum of 29°. New injury was caused by the two additional freezes, and the damage from the first freeze was extended.

With the lapse of a week dead fishes floated in the river shallows and others were cast up to rot on the bank, adding nothing pleasant to the pervading stench from decaying vegetation. It looked as if six or seven hundred palms had been lost, though a correct tally could not be made before fall. Hundreds of other tropical plants were either killed outright or frozen down to the ground—trees, vines, shrubs, foliage plants, bromeliads, tree ferns. Citrus was not vitally injured except the fruit and except lemon and lime trees; but many kinds of plants that no one had seen cold-damaged before, on the local peninsula, were either killed or converted into ghastly eyesores, as for example Brazilian pepper trees, Norfolk Island "pines" and the commonly planted melaleucas.

Fortunately a fair number of the writer's palms were of the hardiest kinds and sustained no injuries whatsoever, but too many others, including some of those that had always been considered absolutely cold-tolerant for the locality, suffered severe damage to the foliage or else lost all of it together with any unexpanded leaves. Some of these died, and some made a natural recovery; others had to be aided by human agency, as without it they were doomed. If, as time wore on, no new growth became visible within six weeks to three months, radical surgery was resorted to in an effort to save any palms that, though devoid of foliage, remained upright with the lower part of the stems (trunks) still sound up to within two feet of the top. Nothing was to be lost by it, for these palms appeared to be already dead or about to die, most of them rotting at the top of the stem which at that point was infested with maggots. However futile it seemed, the larvae-infested rotten tops of the stem or trunk were sawed off with a pruning saw. From only a few inches of a very small stem to as much as two feet of a large woody trunk had to be amputated, thus leaving in the latter instance only a gaunt pole with a flat top. These cutoffs were made many times at a point well below the base of the latest leaf to emerge, and certainly where no vestige of the sheathing leaves could be readily discerned. Nevertheless, about eighty of these shorn and sawed-off palms, out of approximately one hundred and fifty so treated, began to push up new leaf growth that was feeble, sickly and stunted at first, but becoming more promising with each succeeding leaf until, in some instances, the normal leaf crown was attained and in other instances a slow progress maintained (Fig. 10). Not miraculous, perhaps, but most amazing to this writer, who had been zealously attached to the belief that palms chopped in twain are finished for all eternity. And so they were in every case where a cut had to be made below the shoot apex. Regeneration could not take place when the removal of all unsound tissue resulted in a cut too far below the

10, (left). *Syagrus quinquefaria* recovering from a mere stump left by the saw. 10a, (right). Same palm as at left, showing where the very drastic crosscut was made.

crown, and this was the case with many of the palms cut back.

The word "bud," when used to signify an emerging leaf of a palm, is erroneously applied according to P. B. Tomlinson, Research Scientist at the Fairchild Tropical Garden, and therefore this popular usage is avoided in the preceding paragraph and in the rest of this article. When gardeners and growers refer to the "bud" of a palm they usually mean by that term *the latest unexpanded leaf to become visible in whole or in part.* Because the usage is erroneous, Dr. Tomlinson has suggested that "emerging leaf" will suffice to convey the intended meaning, and that suggestion is being followed in the writing of this article. The matter is brought to the fore here because "emerging leaf" often appears in the succeeding pages of the report. The term may seem somewhat awkward at first, but no one will be mystified by it; and perhaps it is better to be a little awkward than to continue in support of an error, which the writer readily admits has been his own in common with most of the other dirt-gardeners.

The emerging leaves, now converted to respectability from "buds," had to be lifted or pulled out of hundreds of the writer's palms, often leaving deep sockets which had to be drained of rainwater to prevent new rot. The innermost leaves extracted were of course dead, but not uniformly loose; a good deal of force had to be exerted for removal of some. No ordinary bulb-syringe proved long enough to reach the bottom of the largest sockets; a twenty-inch catheter had to be added to a battery filler to drain the deepest cavities created by extraction of emergent leaves. No wonder someone was prompted to remark that only a palm-nut of the first magnitude would lavish such care on the sorry snags and stumps then abounding. It was not love, however, that redeemed a few of the seemingly most hopeless palms, nor was it faith; it was unremitting attention and effort.

Not to be overlooked is the fact that the 1962-1963 winter as a whole was slightly warmer than normal for the

11. Tall specimen of *Phoenix Roebelenii*, S. Beach St., Daytona Beach, Fla., was over forty years old when freeze-killed in Dec., 1962. *News-Journal* photograph.

area. All the damage resulted from the one cold outbreak beginning the evening of December 12th and ending in early morning of the 15th. The temperature did not again fall to the freezing point during the remainder of the winter and frost did not recur, yet the severity of the one outbreak caused more damage than any other of the century. Witness Figs. 11 and 12, showing two palms nearly half a century old that were finally struck down by the 1962 freeze after having defied perhaps one hundred or more less violent freezes. Numerous palms and other plants in the writer's collections that had survived the long cold winter of 1957-1958, officially the coldest of record, were at last destroyed by the short but unprecedented cold outbreak of 1962.

By no means were all the survivors of the 1957-1958 winter damaged by the 1962 outbreak, much less killed. Moreover, the number of recoveries of severely injured palms exceeded by far any reasonable expectation. Certainly to judge by early appearances there were no grounds for optimism, and no one would have been rash enough to predict that, despite the heavy losses, there would be many survivors among the palms of strictly tropical habitat—which there were, especially notable in such genera as *Bismarckia, Licuala, Livistona, Sabal, Acrocomia, Syagrus* and *Orbignya,* to name a few.

The alphabetical summary below is as detailed as may be without extending the matter far beyond the available space. It is aimed at showing the effects of the 1962 freeze upon all the palms planted in the grounds here, and does not take any potted palms into account. The summary is comprised of whatever facts were available up to December 1, 1963. Heights given are over-all, expressed in feet (′). The palm names conform with the usage established by Harold E. Moore, Jr., in "An Annotated Checklist of Cultivated Palms," PRINCIPES 7:119-182, 1963.

ACOELORRHAPHE *(Paurotis).* 3 palms, 1 sp., 14 to 30 yrs. old, 9′ to 17′. *A. Wrightii* (3), unaffected.

ACROCOMIA. 17 palms, 6 spp., 5 to 16 yrs., 8′ to 32′. *A. aculeata* (2), both defoliated, rotten tops of trunks sawed off, but both recovered. *A. crispa* (1), young palm with much new and tender growth, killed outright. *A. mexicana* (1), defoliated, attacked by larvae, stem cut back one foot, fully recovered; this same palm had survived injury almost as severe in 1957-1958. *A. Totai* (6), virtually uninjured. 7 other individuals of 2 undet. spp., damaged in varying degree, all recovered.

AIPHANES. 9 palms, 3 spp., 4 to 9 yrs., 5′ to 8′. *A. acanthophylla* (6), *A. caryotaefolia* (1), *A. Lindeniana* (2), all killed, incl. one of the last-named that had survived the freezes of '57-'58.

ARCHONTOPHOENIX. 10 palms, 2 spp., 5 to 8 yrs., 10′ to 15′. *A. Alexandrae* (2), *A. Cunninghamiana* (8), all killed, though some life persisted in the latter for several months.

ARECA. 5 palms, 2 spp., 5 to 8 yrs., 7′ to 10′. *A. Aliceae* (1), killed. *A. triandra* (4), 2 killed; 2 frozen down to ground, both rising from the roots after March 1, for the 2nd time.

ARECASTRUM. 28 palms, 1 sp., 17 yrs., 9′ to 36′. *A. Romanzoffianum* (28), 3 killed; 11 others had severe damage to foliage; 6 others completely defoliated, developed "heart rot" and infested with larvae, trunks cut back 1′ or more, all recovered; 3 others, minor burn of foliage; 5 others, no slightest injury, but all of these were grown here from seed obtained in southern Brazil by Mr. David Barry. No queen palms here were in-

jured by the several freezes of '57-'58 when the minimum was 25°, though that was not true of the Daytona Beach mainland where lower minima were established in some places.

ARENGA. 15 palms, 5 spp., 5 to 14 yrs., 4′ to 13′. *A. Engleri* (8), moderate damage to foliage of 5, none to 3 (this sp. markedly more cold-resistant than most strains of *Phoenix reclinata* found in the trade). *A. pinnata* (4), all killed. *A. porphyrocarpa* (1), killed down to ground, now alive through new suckers. *A. Wightii* (1), killed. *A.* sp. (1), moderate injury, recovering.

ARIKURYROBA. 4 palms, 1 sp., 4 to 8 yrs., 3′ to 9′. *A. schizophylla* (4), 3 killed; 1 severe injury, cut back to merest stub, but recovered.

ASTROCARYUM. 1 palm, 1 sp., 6 yrs., 5′. *A. alatum* (1), killed.

ATTALEA. 2 palms of undet. spp., 7 yrs., 4′ to 5′, some foliage damage, not vitally injured.

BACTRIS. 3 palms, 3 spp., 5 to 10 yrs., 3′ to 5′. *B. Gasipaes (Giulielma Gasipaes)* 1, killed to ground for the 2nd time, again slowly rising from the roots. *B. major* (1), killed to ground, reviving through new stems. *B. Ottostapfeana* (1), killed to ground, re-establishing itself slowly from roots.

BISMARCKIA. 6 palms, 1 sp., 4 to 8 yrs., 3′ to 10′. *B. nobilis* (6), the smallest killed; very severe damage to the remaining 5, necessary with 2 to prune away 1′ from the top of stem, but all 5 have fully recovered.

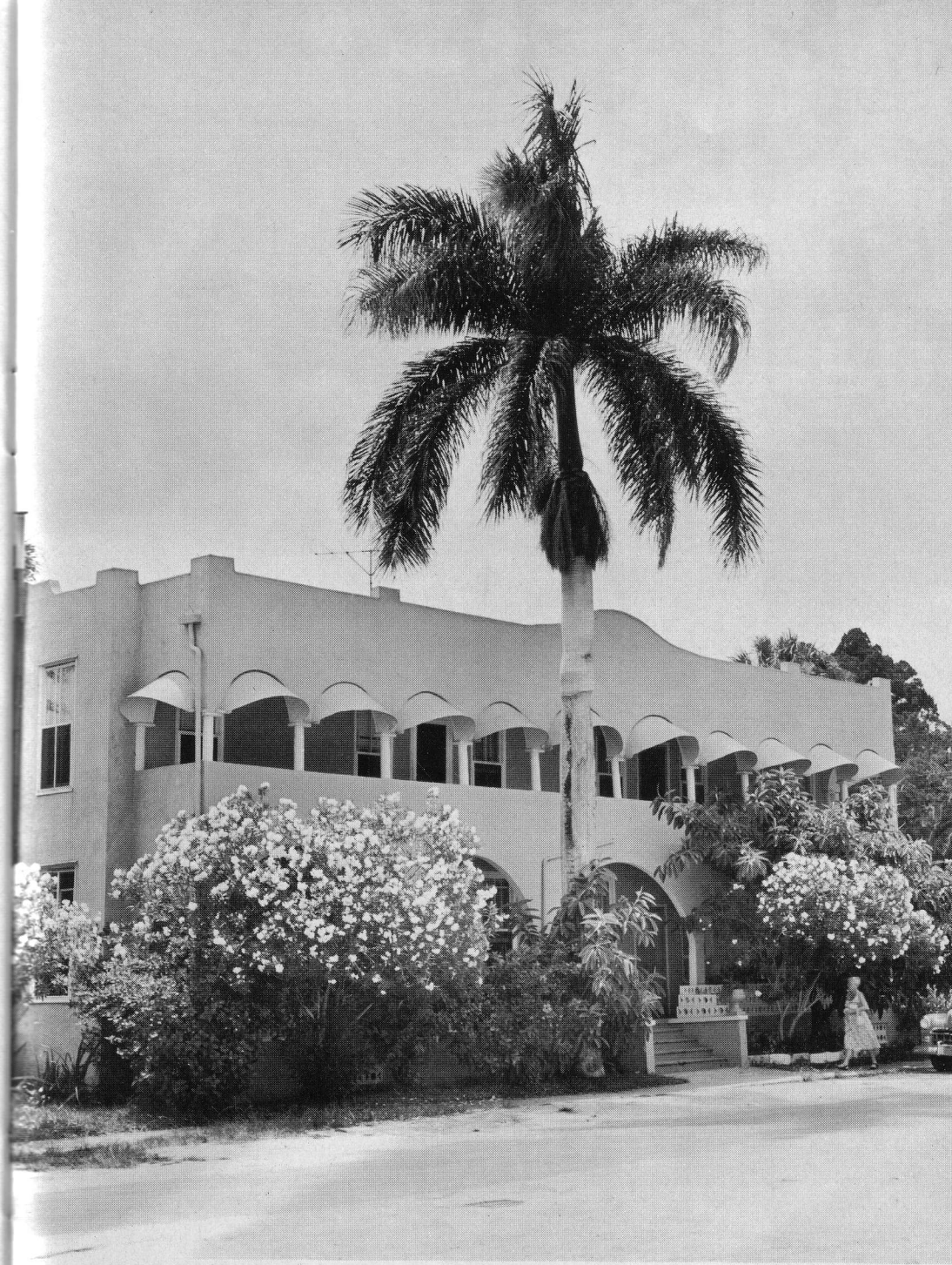
BUTIA. 6 palms, 2 spp., 6 to 20 yrs., 4′ to 14′. *B. capitata* (5), unaffected. *B. eriospatha* (1), unaffected.

BUTIA × ARECASTRUM. 4 of these natural crosses, 9 yrs., 12′ to 16′, unaffected. This hybrid handsome, fast-growing and said to have endured 14° with but little damage.

CALAMUS. 1 palm, 1 sp., 7 yrs., 3′. *C.* sp., a dwarf sort, killed.

CARYOTA. 7 palms, 4 spp., 4 to 15 yrs., 4′ to 22′. *C. Cumingii* (1), killed. *C. mitis* (4), all frozen to ground except few small stems; 2 of the 4 had been frozen down before, in '57-'58, one regaining height of 18′ in only 5 years, the other regaining 10′; all 4 again rising from stubble, one already reaching 7′. *C. ochlandra* (1), slowly died, in contrast to immediate destruction of following sp. *C. urens* (1), killed outright. Note that multiple-stem spp. may restore themselves, but single-stem spp. do not.

CHAMAEDOREA. 345 palms, 23 named spp. plus various undet. spp., 2 to 11 yrs., 1′ to 11′. *C. brachypoda* (2), considerable foliage damage, about half the stems lost, but this stoloniferous palm rapidly recovers by means of new offshoots, resulting in both patches being already larger than before freeze. *C. concolor* (2), killed. *C. costaricana* (2), killed to ground, slowly recovering from roots. *C. elatior* (2), killed. *C. elegans* (7), all killed though this sp. unscathed in '57-'58. *C. Ernesti-Augusti* (10), all killed. *C. erumpens* (16), average destruction about 90%, restoration by new stems ranging poor to good. *C. fragans* (1), killed. *C. geonomaeformis* (6), all killed. *C. glaucifolia* (4), all killed though undamaged by prior freezes. *C. Klotzschiana* (3), all killed, unhurt by prior freezes. *C. lepidota* (1), killed. *C. microspadix* (18), absolutely unharmed, undoubtedly the hardiest *C.* sp. ever cultivated here. *C. monostachys* (1), killed. *C. neurochlamys* (2), killed. *C. oblongata* (12), all killed. *C. pumila* (1), uninjured. *C. radicalis* (16), undamaged, apparently second only to *C. microspadix* in degree of cold tolerance. *C. Schiedeana* (52), all killed. *C. Seifrizii* (8), about 70% or more of each plant destroyed, though undamaged in prior freezes; several clusters have made good recovery. *C. Schippii* (2), killed. *C. tenella* (5), killed.



12. *Roystonea regia* on the mainland at Daytona Beach, Fla., said to have been 46 years old when destroyed by the freeze of December, 1962. It had seemed indestructible, for it had survived scores of freezes, total defoliation several times, and the loss of a fourth of its woody trunk when the first building before which it had stood burned to the ground—despite all of which it had always fully recovered and borne huge quantities of fruit. *News-Journal* photograph.

13, (left). *Coccothrinax Miraguama* trying to recover, and apparently succeeding, after loss of its foliage and amputation of uppermost part of stem. 13a, (right). Detail revealing the point at which stem of the palm at left was cut off and showing the plant in bloom even if only feebly.

C. Tepejilote (6), all killed. *C.* sp. from Chiapas (65), all killed. *C.* sp. from Michoacan (4), all killed. *C.* sp. from Nayarit (2), both killed. 5 or more other undet. spp. (95), all killed. During the summer scores of volunteer seedlings sprang up from seeds dropped just before or after the freeze, thus forming the nucleus of new plantings.

CHAMAEROPS. 4 palms, 1 sp., 7 to 13 yrs., 3′ to 8′. *C. humilis* (4), unaffected.

CHRYSALIDOCARPUS. 13 palms, 3 spp., 5 to 11 yrs., 4′ to 15′. *C. Cabadae* (2), all but a few inner stems destroyed, one plant making rapid new growth, the other languishing. *C. lutescens* (10), the 3 largest discarded because of vital injuries; the remaining 7 reduced to about one-third their bulk, but most of the crowded small stems still sound, should make handsome plants again in 2 yrs. barring freezes. *C. madagascariensis* (1), expanded foliage destroyed, emerging leaves pulled out, three larger stems lopped off because of rot, two smaller remained sound, new leaves rose from all five, now fully recovered.

COCCOTHRINAX. 49 palms, 11 spp., 5 to 30 yrs., 3′ to 22′. *C. acuminata* (1), killed. *C. argentata* (9), 4 killed; remaining 5 damaged in varying degree, but all recovered, flowered and fruited in season. *C. argentea* (1), killed. *C. crinita* (5), 2 killed; 1 minor damage; 2 required very drastic surgery, but recovered. This sp. withstood 25° min. of prior freezes. *C. Dussiana* (6), all killed, though at least 1 had withstood 25° in '57 without any damage. *C. Eggersiana* (12), 10 killed, 2 survived after removal of emerging leaves and drainage of socket provided. *C. fragrans* (1), killed. *C. Martii* (2), 1 killed; severe injury to the other, necessitating amputation of 1′ of stem to remove larvae and rotten tissue, whereafter it slowly grew a full new crown of

leaves. *C. Miraguama* (4), 3 quite small protected with covers and so uninjured; the unprotected one so badly frozen that, later on, the trunk had to be cut back 16″ to eliminate rot and maggots, after which it slowly added foliage and new stem, even flowering from 3 spathes in early fall. *C. Yuraguana* (1), killed. *C.* spp. (7), all killed.

COPERNICIA. 15 palms, 8 spp., 4 to 8 yrs., 2′ to 7′. *C. alba* (1), foliage temporarily shabby, no other damage; prob. the hardiest sp. of the genus. *C. Berteroana* (4), 1 killed; 3 heavy damage but recovering. *C. cerifera* (1), killed. *C. Curtissii* (1), minor damage though protected, now restored. *C. Ekmanii* (1), emerging leaf pulled out, expanded foliage lost, fully recovered. *C. glabrescens* (2), both lost emergent leaves, attacked by flies, larvae cut out, both recovering and developing suckers. *C. Torreana* (4), all but one protected, no considerable damage to any, all in good condition. *C. gigas* (1), partial protection but foliage badly burned, now restored.

CORYPHA. 3 palms, 2 spp., 5 to 6 yrs., 1′ to 2′. *C. elata* (1) and *C. umbraculifera* (2), all small enough to be shielded, and so undamaged.

CRYOSOPHILA. 1 palm, 1 sp., 8 yrs., 6′. *C. Warscewiczii* (1), killed though it survived 25° in '57.

DICTYOSPERMA. 1 palm, 1 sp., 8 yrs., 9′. *D. album* (1), killed.

DRYMOPHLOEUS. 2 palms, 1 sp., 5 yrs., 5′ to 6′. *D. Beguinii* (2), killed.

ELAEIS. 1 palm, 1 sp., 6 yrs., 9′. *E. guineensis* (1), killed. This specimen had survived 27°, but another failed to recover from 25° freeze of '57.

ERYTHEA. 9 palms, 4 spp., 3 to 9 yrs., 2′ to 6′. *E. aculeata* (1), minor damage. *E. Brandegeei* (2), slight damage to the smaller, none to the larger. *E. armata* (3), unaffected. *E. edulis* (3), some slight burn of leaf tips.

GEONOMA. 4 palms, 1 sp., 4 yrs., 3′. *G. binervia* (4), 3 killed; 1 survived with protection.

HOWEIA. 8 palms, 2 spp., 5 to 13 yrs., 3′ to 10′. *H. Belmoreana* (1), killed. *H. Forsteriana* (7), all killed. Other palms of the latter sp. were likewise killed by the 25° freeze of '57. Exceptionally tolerant of cool weather, the howeias are not at all tolerant of hard freezes of long duration.

HYDRIASTELE. 1 palm, 1 sp., 5 yrs., 8′. *H. Wendlandiana* (1), killed.

HYPHAENE. 6 palms, 4 spp., 4 to 5 yrs., 2′ to 4′. *H. crinita* (2), *H. Schatan* (2), *H. thebaica* (1), *H.* sp. (1), total loss of emergent leaves and expanded foliage; all ostensibly dead after 30 days, but elimination of rotting tissue and maggots by sawing off several inches from the tops of stems permitted resumption of growth, and by fall all 6 were restored to full vigor and normal appearance.

14. Young *Hyphaene thebaica*, while still ostensibly frozen to death, was beheaded by an axe, only to rise again from both stems as if nothing had happened.

JUBAEA. 1 palm, 1 sp., 7 yrs., 2′. *J. chilensis* (1), unaffected.

LATANIA. 1 palm, 1 sp., 8 yrs., 8′. *L. lontaroides* (1), killed.

15. *Syagrus flexuosa* recovering from defoliation following freeze and loss of the upper eighteen inches of its trunk to the pruning saw.

LICUALA. 19 palms, 6 spp., 4 to 6 yrs., 18″ to 4′. *L. grandis* (6), all saved by protection, but surely would have been lost otherwise. *L. paludosa* (4), all killed. *L. peltata* (2), 1 killed, other survived injury. *L. pumila* (1), severely injured, recovering. *L. Rumphii* (4), 2 killed; 2 others survived with but little injury. *L. spinosa* (2), 1 survived severe injuries; the other uninjured.

LINOSPADIX. 1 palm, 1 sp., 4 yrs., 3′. *L. monostachya* (1), survived with some leaf loss, lacking in vigor since freeze.

LIVISTONA. 34 palms, 10 spp., 4 to 40 yrs., 2′ to 36′. *L. australis* (3), unaffected. *L. chinensis* (14), mostly unaffected, several with tip burn of lower leaves. *L. decipiens* (1), unaffected. *L. humilis* (1), a 2′ juvenile, killed. *L. Jenkinsiana* (1), minor burn. *L. Mariae* (1), unaffected. *L. Merrillii* (1), unaffected. *L. rotundifolia* (3), 2 killed; 1 recovering, but only

16. Same palm as on facing page, showing detail of trunk where it was lopped off and the new growth rising from what was recently only a stump.

with help of drastic surgery. *L. Saribus* (8), unaffected. *L.* sp. (1), New Guinea palm with unarmed petioles, killed.

MASCARENA. 2 palms, 2 spp., 4′ to 9′, 5 to 11 yrs. *M. lagenicaulis* (1), *M. Verschaffeltii* (1), both killed.

MYRIALEPSIS. 1 palm, 1 sp., 8 yrs., 8′. *M. Scortechinii* (1), killed.

NANNORHOPS. 1 palm, 1 sp., 7 yrs., 3′. *N. Ritchieana* (1), unaffected.

NORMANBYA. 1 palm, 1 sp., 7 yrs., 10′. *N. Normanbyi* (1), killed.

ORBIGNYA. 7 palms, 3 spp., 8 to 9 yrs., 4′ to 9′. *O. Cohune* (1), killed. *O. spectabilis* (4), emerging leaves and tall foliage killed, all 4 recovered. *O. Guacuyule* (2), defoliated but recovered.

PAUROTIS. See *Acoelorrhaphe.*

PHOENIX. 105 palms, 9 spp. plus many hybrids, 5 to 30 yrs., 3′ to 26′. *P. abyssinica* (1), all foliage badly burned, otherwise unharmed. *P. canariensis* (10), un-

affected. *P. dactylifera* (7), unaffected. *P. Loureirii* (1), severe injury, recovery poor, outcome still doubtful. *P. paludosa* (1), an old palm with tall slender stems, no leaf burn or other damage. *P. reclinata* (39), 7 undamaged, the remaining 32 burned in varying degree, from minor to total loss of expanded foliage and emerging leaves, 15 of the 32 seemingly dead, but all fully recovered without artificial aid. *P. Roebelenii* (10), 2 minor damage, remaining 8 severe injury involving loss of all emerging and expanded leaves. Score: 5 died, 5 fully recovered. *P. rupicola* (2), defoliated except for leaves barely starting to emerge, full recovery of both. *P. sylvestris* (2), unaffected. *P. pusilla* × ? (8), *P. rupicola* × ? (9), *P. zeylanica* × ? (7), various other hybrids (8), all suffered destruction of most or all foliage, including emerging leaves, but all recovered in full.

PINANGA. 2 palms, 1 sp., 4 yrs., 4′. *P. Kuhlii* (2), both killed to ground, both rising from several new shoots apiece.

POLYANDROCOCOS. 2 palms, 1 sp., 5 yrs., 3′. *P. caudescens* (2), killed.

PRITCHARDIA. 5 palms, 5 sp., 4 to 10 yrs., 2′ to 8′. *P. affinis* (1), killed. *P. arecina* (1), killed. *P. lanaiensis* (1), killed. *P. Lowreyana* (1), survived with protection. *P. Thurstonii* (1), killed.

PSEUDOPHOENIX. 4 palms, 2 spp., 9 to 11 yrs., 4′ to 6′. *P. vinifera* (1), killed. *P. Sargentii* (3), 2 killed; the other alive though sawed off near base, poor condition.

PTYCHOSPERMA. 14 palms, 2 named spp., various undet. spp., 5 to 9 yrs., 4′ to 11′. *P. Macarthurii* (3), killed to ground, slowly rising from roots. *P. Nicolai* (1), small palm badly burned but none of 6 stems killed, condition good. Undet. spp. (10), all killed to ground, some recovery from roots.

RAPHIA. 3 palms, 1 sp., 4 to 9 yrs, 3′ to 9′. *R. farinifera* (3), 2 smaller killed; the other had badly burned foliage but did not lose emerging leaf, recovered fully.

RHAPIDOPHYLLUM. 2 palms, 1 sp., 6 to 9 yrs., 2′ to 5′. *R. hystrix* (2), unaffected.

RHAPIS. 14 palms, 2 spp., 4 to 12 yrs., 3′ to 9′. *R. excelsa* (13), 4 or 5 stems died among perhaps 150 undamaged. *R. humilis* (1), unaffected.

RHYTICOCOS. 1 palm, 10 yrs., 9′. *R. amara* (1), killed, though it had survived the hard freezes of 1957-1958 winter.

ROYSTONEA. 14 palms, 2 spp., 8 to 21 yrs., 12′ to 33′. *R. elata* (1), killed. *R. regia* (13), 12 killed outright, other lingered 'til Sept., a sad object with hardly a spark of life and had to be removed. The latter and one other had been defoliated by the freeze 5 yrs. earlier, but had fully recovered.

SABAL. 106 palms, 15 named spp. plus 3 or more undet. spp., 5 to 45 yrs., 2′ to 45′. The following in no way affected: *S. bermudana* (2), *S. causiarum* (3), *S. domingensis* (5), *S. Etonia* (8), *S. mexicana* (1), *S. minor* (8), *S. Palmetto* (62), *S. parviflora* (1), *S. Rosei* (1), *S. texana* (1), *S. Yapa* (1). Devastated, with loss of most or all foliage: *S. glaucescens* (1), *S. mauritiaeformis* (2), *S. mayarum* (1), *S. nematoclada* (1), *S.* sp. Veracruz and Tabasco (2), *S.* sp. Guatemala (1), *S.* sp. Br. Honduras (1), other undet. sabals (4). All severely damaged palms recovered—no losses in *Sabal*. Note wide cleavage, however, between hardier and tenderer species, without any intermediates.

SCHEELIA. 3 palms, 2 spp., 5 to 13 yrs., 3′ to 10′. *S. Liebmannii* (2), all foliage destroyed, incl. emergent leaves, both recovered. *S.* sp. (1), leaves to 15′ all destroyed, emerging leaf drawn out, larvae and advanced decay in upper trunk, cut back 1′, gradually recovering; this specimen had fully recovered from ex-

treme injury suffered in '57-'58.

SERENOA. 13 palms, 1 sp., 6 to 50 yrs., 1′ to 12′. *S. repens* (13), unaffected.

SYAGRUS. 7 palms, 6 spp., 7 to 10 yrs., 7′ to 10′. *S. comosa* (1), severe injury to leaf crown and upper stem, cut back 17″, recovering. *S. coronata* (1), killed, though it survived extreme injury in '57-'58. *S. campestris* (1), killed. *S. flexuosa* (1), injuries necessitated decapitation with pruning saw, severely cut back as illustrated in Figs. 15 and 16; recovering, as shown. *S. quinquefaria* (2), both lost emerging leaves and expanded foliage, attacked by rot and larvae, over 1′ of stem amputated from each, both recovering as shown in Figs. 10 and 10a. *S. sancona* (1), survivor of '57-'58 freezes, lost. *S. Weddelliana:* see *Microcoelum Weddellianum* out of alphabetical order, at end of this list.

THRINAX. 18 palms, 3 spp., 9 to 35 yrs., 5′ to 22′. *T. microcarpa* (4), all killed, though these palms had endured 27° in prior freeze without the least damage. *T. parviflora* (12), though cultivated under the name of this Jamaican sp., are quite possibly *T. floridana*, now ruled a valid name; 11 killed, including small young ones and old tall ones; 1 severely injured, stem pruned back 1′, has erected a few stunted leaves and ripened two reduced bunches of white fruits (Fig. 17). *T.* sp. (2), 1 killed; the other severely damaged but fully recovered.

TRACHYCARPUS. 7 palms, 2 spp., 5 to 12 yrs., 2′ to 7′. *T. Fortunei* (6), unaffected. *T. Martianus* (1), unaffected.

TRITHRINAX. 1 palm, 1 sp., 6 yrs., 3′. *T. acanthocoma* (1), unaffected.

17. *Thrinax parviflora* once 14 feet tall, but now much shrunken due to losing all its foliage to the freeze and the uppermost part of its trunk to the saw. Here it is making a valiant effort to restore itself, and despite its pathetic appearance has managed to ripen a hundred or so fruits containing viable seeds.

VEITCHIA. 6 palms, 3 spp., 4 to 8 yrs., 3′ to 10′. *V. Joannis* (3), *V. Merrillii* (2), *V. Winin* (1), all killed.

WALLICHIA. 3 palms, 1 sp., 4 yrs., 4′. *W. disticha* (3), all killed.

WASHINGTONIA. 10 palms, 2 spp., 5 to 17 yrs., 7′ to 24′. *W. filifera* (6), unaffected. *W. robusta* (4), unaffected.

ZOMBIA. 2 palms, 1 sp., 5 to 12 yrs., 1′ to 4′. *Z. antillarum* (2), 1 killed; the larger very little damaged, condition good.

ADD: MICROCOELUM. 3 palms, 1 sp., 6 to 14 yrs., 2′ to 5′. *M. Weddellianum* (3), all killed even though the oldest and tallest had never been cold-damaged during 10 yrs. here in the open ground.

THE EDITOR'S CORNER

It's a small corner this time. The editor, Dr. Moore, is not in it just now. He is in other corners of the planet, having left Ithaca, N. Y., on sabbatic leave September 30, 1963 for extended travel abroad in pursuit of his taxonomic work with the palms. At the year end he was in Singapore, following visits to Madagascar, Ceylon and India.

When he returns to Ithaca in early May, 1964, his travels will have taken him quite around the world. Lands yet to be visited on his itinerary are North Borneo, Australia, New Guinea, British Solomon Islands, New Caledonia and Fiji . . . The job of editing this issue of PRINCIPES and also the next has devolved upon me, alas. I say alas with feeling because the business is fraught with exactions and anxieties, and makes fearful inroads on one's time—which brings home with great force the fact that Dr. Moore has done an immense amount of work on PRINCIPES, now entering upon its eighth year, and has earned it a reputation for high standards. He is to be thanked for his arduous work, yes, but chiefly to be congratulated upon his achievement.

D. S.

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* * * *

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