

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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PRINCIPES

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.

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Cover Picture

Part of the pendulous inflorescence of *Cryosophila Guagara* P. H. Allen, a palm of the rain forest of Golfo Dulce. Photograph by Paul H. Allen.

Mailed at Miami, Florida
June 4, 1965

NEWS OF THE SOCIETY

We Lose Two Members

The Society has been saddened by the loss of two of its valued members.

Mr. Otto John Priebe died on January 21st, at his home in Clermont, Florida. A member of the Society since 1956, he was a landscape architect, grove owner and enthusiastic collector of palms and cycads. He owned one of the most complete private collections of cycads in the United States, including almost all the species described from Australia, as well as many from Africa, the South Pacific and Mexico. His untimely death put an end to plans he and Mrs. Priebe had made for an extended collecting trip to Africa.

Mr. Alvin B. Cutler, owner of Cutler Nursery, 7675 S. W. 128th St., Miami, Florida, died on March 8th. He also had been a member of the Society since 1956. In recent years he had built up the palm section of the nursery to a very large extent, and had one of the most complete inventories of palms in the Greater Miami area. He also specialized in platyceriums, having a very large and varied collection.

Both of these members will be very much missed. Our sympathy goes out to the widows and other relatives.

Successful California Meeting

On December 6th, 1964, the California group met at the Floral Association Building, Balboa Park, San Diego. Hosts were the group's chairman, James P. Specht and his charming wife, Alice, who served a Hawaiian-style buffet lunch to more than sixty members and their families. A tour of the Park grounds followed, then a discussion on palm culture, and finally slides taken by Mr. Specht on his recent visit to Florida. The group, under Mr. Specht's leadership, is compiling a list of palms

growing in California, graded as to cold tolerance, which should prove a valuable guide to beginning growers.

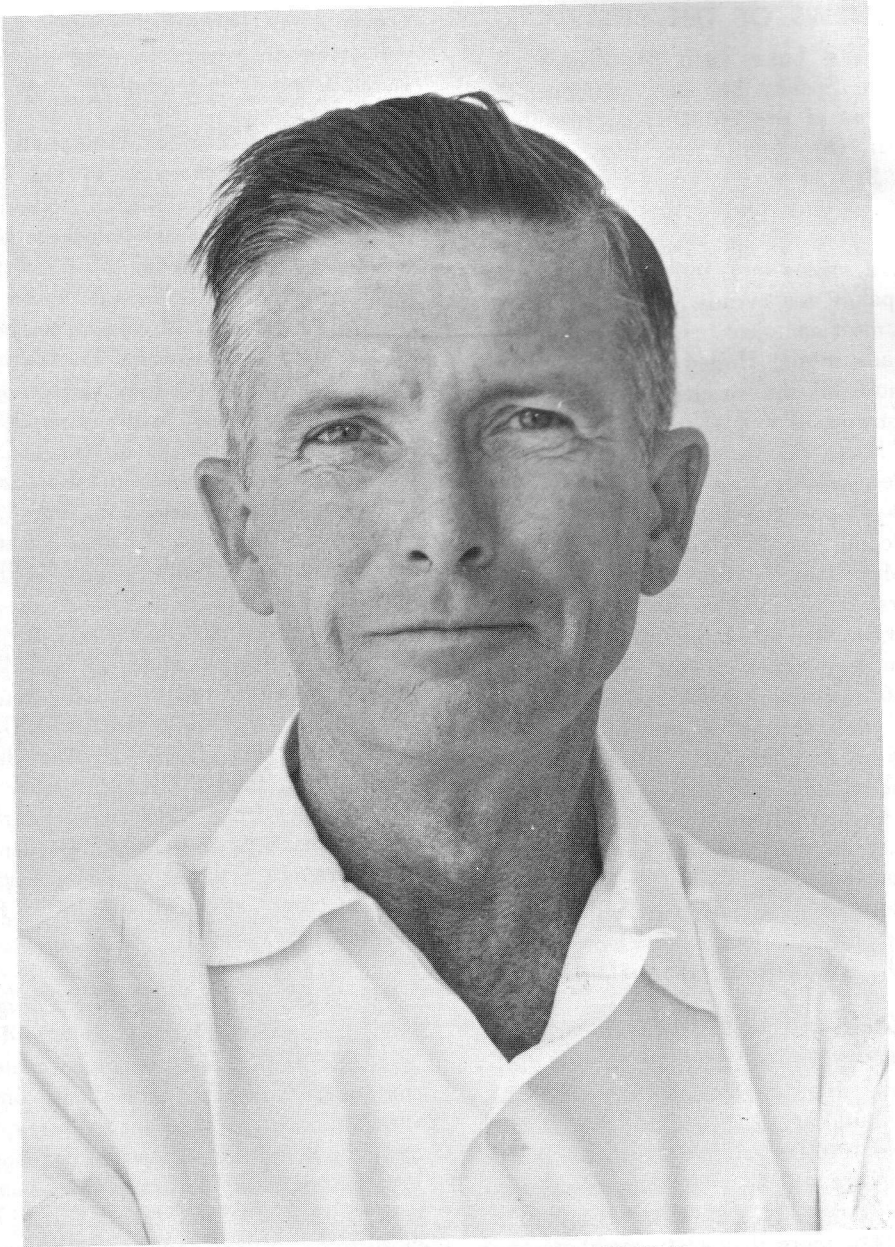
Society Member Honored

At the annual meeting of Fairchild Tropical Garden, on March 26th, Mr. Stanley C. Kiem was awarded the Garden's Founder's Medal, "for distinguished achievement in the world of palms and cycads." Mr. Kiem has been on the staff of the Garden for fourteen years, and at present is Superintendent there. He has made many expeditions to countries and islands in North, Central and South America and the Caribbean, collecting plants and seeds for introduction into the United States. Among many valuable palms he has brought back and made available is the recently described *Chrysalidocarpus Cabadae*, which is achieving deserved popularity in this country. He found it growing and fruiting at the Atkins Garden of Harvard University, Soledad, Cuba, and gathered a large number of seeds, plants from which were distributed to members of Fairchild Garden a few years ago. This palm is now beginning to bloom and fruit in Florida for the first time.

* * *

The April number of *Sunset Magazine*, the popular house and garden magazine of the western United States, contains a nine-page article on palms, with a number of excellent photographs and about 60 identification drawings. Prepared carefully by the efficient members of the magazine's staff, it should be most useful to palm growers in the western area. Palm Society members who took part in its preparation are: William C. Aplin, *Sunset Magazine* staff photographer, David Barry, Jr., Morgan Evans, Frederick M. Lang and Otto Martens.

LUCITA H. WAIT



31. Paul Allen, June, 1962. Photograph by W. H. Hodge.

PAUL HAMILTON ALLEN, 1911-1963

"For distinguished achievement in the world of palms and cycads" reads the inscription on the Founder's Medal of the Fairchild Tropical Garden award-

ed posthumously to Paul Hamilton Allen on March 26, 1965. It is a fitting phrase to use in dedicating this issue of PRINCIPES to a man whose name must ever be associated with palms in

Central America and Colombia, who served as Director and member of the Editorial Board of *The Palm Society* from 1956 until his death, and whose unpublished and reprinted writings on palms form the bulk of this issue devoted to palms of the Central American region he studied so long and well. Unpublished articles and notes have been made available through the kindness of Mrs. Dorothy Allen and all have been assembled under the guest-editorship of his long-time friend, Dr. Walter H. Hodge, to both of whom the editor acknowledges his indebtedness.

H. E. M.

POSTHUMOUS AWARD TO PAUL ALLEN

Paul Allen, well-known botanist and specialist in tropical plants, was awarded the Founder's Medal at the Annual Meeting of Fairchild Tropical Garden on the afternoon of March 26th. His widow, Dorothy, flew down from St. Louis to accept the medal. The citation which follows was written and read by Dr. Walter H. Hodge.

PAUL HAMILTON ALLEN

It would be hard to say when the late Paul Allen saw his first living palm. It is doubtful that it was in his native Oklahoma. More likely it was as a student at the Missouri Botanical Garden whose conservatories in the thirties were at their horticultural zenith. Soon he was to see palms in their native haunts in Panama. The Garden was initiating a modern flora of that botanically important isthmian country and, as an impressionable young man, Paul Allen had the great good fortune to be included in a plant collecting trip to that land. As any good botanist could have predicted he was thrilled and excited by the great green world of the tropics. In 1936 he returned for good with a new wife, Dorothy Osdieck of



32. Founder's Medal, Fairchild Tropical Garden.



33. Mrs. Allen accepts medal from Dr. Hodge.

Kirkwood, Missouri, who was to love the tropics with as much zest as her young husband. Except for a brief respite in 1953, when Paul served as Director of the Fairchild Tropical Garden, the Allens lived their married life within the tropics.

His first job was to manage the Missouri Botanical Garden Tropical Station based in the Canal Zone. Palm collecting was part and parcel of the over-all task of assembling the herbarium collections and associated data on which the Panama Flora was to be based. Paul Allen's success is demonstrated in the account of the palms prepared for this flora by Liberty Hyde Bailey in 1943. Prior to 1936 only 37 species of palms were known from Panama. Paul's field efforts more than doubled this number and in so doing thirteen new Panamanian palms were discovered, five of which very appropriately honor the name of this superb and discriminating plantsman.

In subsequent years Paul Allen developed a special affection for the palms along with his other major plant love — the orchids. Under the kindly aegis of a new employer, the United Fruit Company, he studied the flora — including the palms — of Costa Rica, Honduras and El Salvador. During this time several new palms were named by him — primarily in the genera *Roystonea* and *Cryosophila*. In the fifties a new young Society devoted to these *Principes* of plants was formed. Paul Allen served The Palm Society as charter member, Director, and member of its Editorial Board.

For all those things and more, it is especially appropriate that this Garden

— devoted as it is to palms and to tropical plants in general — should elect to honor one who epitomized in his own life's work what the Fairchild Tropical Garden itself attempts so successfully to do. In awarding the Robert H. Montgomery Palm Medal posthumously to Paul Hamilton Allen it is particularly fitting that his wife Dorothy — his loyal and able helpmate, and talented botanical artist as well — has found it possible to come here from St. Louis to receive it. I hope that this belated presentation will demonstrate in a small way the sincere appreciation and affection many of us have had for Paul Allen and for the outstanding contribution that he made during his lifetime to botany and to horticulture.

Paul Allen — Palm Collector and Student

HAROLD E. MOORE, JR.

Few groups of plants are less amenable to usual collecting techniques or frustrate the plant collector more than do the palms. Thus most early, and some late, explorers were usually content to collect fragments of leaves with a few flowers and fruits, and to ignore such important parts as leaf-sheaths, inflorescence bracts and inflorescences themselves. Not so Paul Allen, whose long correspondence with Dr. L. H. Bailey and native admiration for and understanding of palms gave him a splendid background for collecting and studying palms. As a consequence, his specimens, augmented by notes and photographs, approach the ideal, and his persistence in collecting as many stages of flower and fruit for individual species over a wide area provided the means for understanding Central American and Colombian palms much better than they had previously been understood.

I do not have a complete listing of all

the palms collected by Paul Allen, but as Dr. Hodge has pointed out elsewhere (p. 41), his collections enriched the number of palms known for Panama and Costa Rica by a large percentage. Though Paul wrote only two formal articles on palms, his major contribution was through extensive correspondence and detailed information provided for the use of L. H. Bailey and the writer. From his collections have come the first representatives of six species which bear his name—*Attalea Allenii* H. E. Moore, *Bactris Alleniana* L. H. Bailey, *Chamaedorea Allenii* L. H. Bailey, *Geonoma Allenii* L. H. Bailey, *Prestoea Allenii* H. E. Moore, *Sabal Allenii* L. H. Bailey. In addition to those named in his honor, his specimens have brought the following species to scientific attention for the first time: *Aiphanes fuscopubens* L. H. Bailey, *Acrocomia panamensis* L. H. Bailey, *Bactris aureodrupa* L. H. Bailey, *B. Baileyana* H. E. Moore, *B. devia* H. E.

Moore, *B. divisi cupula* L. H. Bailey, *B. duplex* H. E. Moore, *B. fuscospina* L. H. Bailey, *B. militaris* H. E. Moore, *B. oraria* L. H. Bailey, *B. paula* L. H. Bailey, *Chamaedorea coclensis* L. H. Bailey, *C. falcaria* L. H. Bailey*, *C. lucidifrons* L. H. Bailey, *C. Woodsoniana* L. H. Bailey, *Hyospathe concinna* H. E. Moore, and *Synechanthus panamensis* H. E. Moore.

Paul's detailed consideration of palms in the rain forests of the Golfo Dulce, reprinted in this issue, speaks for his familiarity with the group as do several paragraphs from a letter to Bailey published in an appreciation by Wilson Popence in *Ceiba* 10: 1-14, 1964. His other writings show an equal grasp of palms.

Distribution and variation in *Roystonea*, *Ceiba* 3: 1-18, 1952, in which *Roystonea Dunlapiana* P. H. Allen and *R. regia* var. *hondurensis* P. H. Allen were described.

Two new fan palms from Central America, *Ceiba* 3: 173-178, 1953, with *Cryosophila Guagara* P. H. Allen and *C. Williamsii* P. H. Allen described as new, together with a key to species.

My own association with Paul stemmed from identification of collections with attendant correspondence, and further developed during a period of joint field study in 1953 at Palmar, Costa Rica, while he was working on his book, *The Rain Forests of the Golfo Dulce*. There I had my first experience with such rain forest genera as *Iriartea*, *Socratea*, *Welfia*, and the undergrowth palms peculiar to that region under the tutelage of a master observer and collector.

**Chamaedorea falcaria* has since proved to have been assigned to the wrong genus and is a species of *Hyospathe*; *Geonoma Allenii* must now be assigned to *Calyptrogyne*, probably as a synonym of *C. brachystachys*.

I well recall one day which characterizes Paul's devotion and concentration. Crossing the river to Palmar Norte on the morning of March 12th, we headed for the high mountain slopes on the trail to El Cedral and Maiz, on which grow some perplexing palms. The day was hot, though once in the forest proper above the second-growth of the lower slopes, the force of the sun was greatly lessened. Nonetheless, it was the sort of day I attempt to describe to friends and colleagues (and income tax collectors!) of temperate regions who jocularly or seriously comment on the "vacations" field botanists enjoy; for climbing from near sea level to 3,000 feet with pack, plant presses, axes and photographic equipment, even when shared with assistants, tends at length to make routine university work seem vacation indeed. On this particular day it was two very weary botanists who returned to collapse *into* the river after having reached *Hyospathe Lehmannii* and as yet unidentified *Chamaedorea*. It was also on this day that the photograph of *Geonoma congesta* reproduced as fig. 39 was made. The full drama of the photo is not apparent, however. Paul was an excellent photographer and shot not "from the hip" but from a tripod on well prepared positions. The clump photographed was in a reasonably open spot by the trail, but to get the whole meant clearing well off the trail to set up the tripod. While an assistant and I cleared about the palm, Paul cut a path to an appropriate distance, selected a site for the camera, and squatted to cut undergrowth as close to the ground as possible with low sweeping strokes of his machete. Suddenly the peace was broken by a shout, a crash of brush, a final whack of the machete and silence while Paul wiped his face and recovered from the realization that he had been

stooping by and "fanning" with his blade a well concealed *terciopelo* (*Bothrops atrox*, also known as *barba amarilla* or *fer-de-lance*), one of the most dreaded snakes of the Americas.

This and other days of collecting from Palmar, the joy of late afternoon tea with Paul and Dorothy, spiced by

their interest in and conversation about all things pertaining to their adopted countries, have left an indelible impression so that even today, studying palm specimens collected by Paul H. Allen brings home the realization that we are deprived of much more than a talented palm collector and student.



34. *Erythea salvadorensis*. Photo P. Allen.



35. *Cryosophila Williamsii* at Lake Yojoa
Photo P. Allen.

Palms in Middle America

PAUL H. ALLEN

Palms form a characteristic and sometimes conspicuous element in the vegetation of most tropical countries. This is certainly true of Mexico and Central America, wherever clearings and cultivation, or lack of rainfall have not eliminated them from the scene. Genera and species increase in number and complexity as one travels southward in the Americas, reflecting the more favorable environment of the rain forest habitat and the physical approach to the

great Amazonian *hylaea* that serves as a distributional center for the family, in the Western Hemisphere.

Middle American lands show an infinite variety, holding within themselves all the vast range of climatic zones and plant associations of a continent. Northern and eastern slopes of the central cordillera are, with minor exceptions, relatively rich and fertile, with great tracts of nearly unbroken forest crisscrossed by short, but often precipitous



36. *Acoelorrhaphes Wrightii*, Macantaca Creek, Nicaragua. Photo P. Allen.

rivers that are constantly fed by the torrential rains that characterize this coast. On the Pacific, hot, breathless valleys, dominated by stark and dramatic massifs, alternate with areas of open savanna, where the lush green during the rains is replaced by clouds of dust, and the soft pastels and golden autumnal tones of the dry season. Areas of intermediate elevation, such as the famed Meseta Central of Costa Rica have delightful, Spring-like climates throughout the year. An ascent from the coasts to the icy sphagnum bogs of the Cordillera de Talamanca, in Costa Rica, or to the eternal snows of Popocatepetl, in Mexico, will provide a lesson in vertical plant distribution more forceful than a series of lectures on the relation of living things to elevation and humidity. Depending upon location, the landscape varies from the dark forests of conifers and oaks on the upper flanks of the great, wild mountains of Mexico, Guatemala and Honduras to the tropical rain forests of Nicaragua, Costa Rica and Panama, with rolling plains, swamps,

and patches of deciduous woodland thrown in for good measure.

Only an approximate comparison can be made of the palm populations found in the individual countries, due to the imperfect state of our knowledge regarding the group, and this in turn has been true because palms are such hard things to collect in any sort of recognizable condition. Anyone who has tried to preserve the essential character of giants like *Orbignya*, *Scheelea* or *Roystonea* between 11 x 16 inch herbarium sheets will know what I am talking about. When faced by such a patent impossibility, the average botanical collector takes fragments, and it has been the varied interpretations placed on these tantalizing scraps that have given rise to many of our taxonomic difficulties. Most palms can only be studied as living entities rather than from museum fragments.

One need only consult Dahlgren's classic *Index of American Palms* to find that some 485 species and varieties are credited to Brazil, as compared with 15



37. *Manicaria saccifera*, swamps near Fort Sherman, Panama. Photo P. Allen.

species for the continental United States, yet the objective inquirer must note that the smaller number from North America has spawned 93 synonyms, that cluster about the mother species like puppies, while the Amazonian list has scarcely any synonyms at all. One would need a faith equal to belief in the annual liquification of the blood of St. Januarius to be convinced that the Brazilian palm names will not eventually be subjected to equal scrutiny and reductions to synonymy. This is not to imply, by any means, that name lists move only in the direction of condensation and simplification. There can be no question that most, if not all tropical countries harbor species, or even genera, that are as yet unknown, or unrecorded. Striking evidence of this basic fact might be presented in the 43 species of palms listed in 1936 for Guatemala, that have been increased to 76 in recent years, through the efforts of Standley and Steyermark. Panama, in 1936 was credited with 37

species, yet at least 73 are known today. Much of the same can be expected from the other tropical American countries, as roads penetrate new areas, or airfields are put into service, so that it would seem safe to predict that new discoveries may tend to keep pace with reductions to synonymy for a good many years to come.

In round numbers, we may say that approximately 350 species of palms are at present known to occur as wild plants in Mexico, Central America and Panama, where they form a much more conspicuous element in the flora than do the palms in the Orient, if a reasonable allowance be made for duplications within the individual lists. The genera involved include the following in Central America (Guatemala to Panama, inclusive), an area with which I am best acquainted through fairly extended periods of residence: *Acoelorrhaphe* (*Paurotis*); *Acrocomia*; *Aiphanes*; *Asterogyne*; *Astrocaryum* (including *Hexope-*



38. *Corozo oleifera*. Photo P. Allen.

tion); *Bactris* (inclusive of *Guilielma*, *Pyrenoglyphis*); *Calyptrogyne*; *Chamaedorea* (inclusive of *Collinia*, *Dasystachys*); *Coccothrinax* (? *Nicaragua*); *Cocos* (introduced and naturalized); *Corozo*; *Cryosophila*; *Desmoncus*; *Erythea*; *Euterpe*; *Geonoma*; *Hyospathe*; *Iriartea*; *Manicaria*; *Neonicholsonia*; *Oenocarpus*; *Opsiandra*; *Orbignya*; *Pholidostachys*; *Phytelephas*; *Prestoea*; *Raphia*; *Reinhardtia* (including *Malortiea*); *Roystonea*; *Sabal*; *Scheelea*; *Socratea*; *Synechanthus*; *Thrinax*; *Welfia*.

A great number of Middle American palms contribute greatly to the rural and primitive economies of their respective countries, where the leaves are used for thatch, hats, baskets, brooms or fire fans; the trunks for house posts, walls, floors, water conduits or banana prop poles; and the inflorescences or fruits for everyday utensils, toys and as food for humans or domestic animals in an infinite number of forms. The fermented sap of at least two, fills the flowing bowl in the form of palm wine; and the tender terminal bud, or "cabbage," of many makes a delicious vegetable, either raw or cooked, that would rank

as a delicacy in any land. When we have said this much, we have, however, about exhausted the subject insofar as utility is concerned, since few of the species from Middle America have been able to compete with imported or synthetic products on the open market, due probably to their infrequency—as compared with cultivated crops—their relatively slow rate of growth and the fact that their exploitation does not lend itself to the use of mechanized equipment. Isolated exceptions may be cited in the cases of the coconut, which is probably not native to the area, though introduced in very early, and even probably pre-Columbian times; in the shells and kernels of *Orbignya Cohune*, which yield a high-grade charcoal and an edible oil; and in the well-known ivory nuts (*Phytelephas*) that supply material for miniature carvings and buttons to world trade. The most important source of palm oil in Middle America today is *Elaeis guineensis*, the African oil palm, which has reached our shores through the agency of man in the form of high-yielding, selected strains, by way of Sumatra, in the East Indies.

Many Middle American palms that are too small or rare to be of even local importance—such as some kinds of *Chamaedorea* and *Reinhardtia*, for example—make handsome indoor or tropical garden subjects, and it may be said in general that the future of most tropical American palms seems to lie more nearly in that direction than in any prospect of wholesale utilization by industry. As a matter of interest the most popular house palm in the United States

today is *Chamaedorea elegans* (usually passing in the trade incorrectly as *Neanthe bella*), a Mexican and Central American species. Less than 50 species can be called at all common, and some of these occur in sufficiently isolated localities to escape the attention of all but the most determined traveller, prepared to endure not a little discomfort for the pleasure of seeing some of Nature's masterpieces in the wild.

Rain Forest Palms of Golfo Dulce

PAUL H. ALLEN

[Editorial Note: One of Paul Allen's major publications is his illustrated volume, *The Rain Forests of Golfo Dulce*, published in 1956 by the University of Florida Press. This book describes intimately the prominent arboreal species of a Costa Rican rain forest near which the Allens lived during five years residence at Palmar, on the Golfo Dulce. All the conspicuous palms of the forest are treated in this book. They are not separated out but rather appear in appropriate alphabetical position among the other genera of trees. It seems proper to excerpt the various scattered paragraphs on the rain forest palms and to bring them together as a single coherent account for students of this group. For this purpose the original key to the palms is included as well as all the accounts of the palms, which follow the key in alphabetical sequence. Thanks are due Lewis F. Haines, Director of the University of Florida Press, for permission to reproduce these paragraphs as well as the descriptive phrases of Archie Carr, who provided the jacket commentary for the original publication. Dr. Carr has this to say about the tropical rain forest, which serves as the habitat for so many palms—W.H.H.]

"Ask a naturalist to name the world's most varied and productive and colorful and generally exciting environment and he is almost sure to come up with the tropical rain forest. He might waver a bit between the rain forest and the coral reef; but make him stick to the land and it will be the rain forest every time.

"The pull of the tropics for cold-zone folk is a curious and complicated thing. It is a sort of romantic aura, distilled from all sorts of associations and dreams; but back of the hankering you always come to the jungle, the broad-leaved evergreen forest. It was the jungle that stirred the old boys—Darwin, Wallace, Humboldt, Bates—who first told the world the real story of the tropics; and if you go down and find a piece of undisturbed jungle and walk around in it, this will be the thing that stands out in *your* mind when you go home.

"If you go to the rain forest after just the feel of it, you will not be disappointed. But if you go as a botanist anxious to know the plants that build it, and determined to behave as you behave on field trips back home, the jungle will drive you crazy. It is hard to find the rain forest in the botany manuals. It is hard to put it into a plant press. It can be done, but it takes years.



39. *Geonoma congesta* and *Asterogyne Martiana* (foreground) in forest at Esquinas, Costa Rica.
Photo P. Allen.

"Paul Allen offers a clever and original and effective plan for softening the face of the jungle—for getting acquainted with it in the short time that the usual visitor has at his disposal.

"As a representative sample of the unspoiled tropics, Mr. Allen chose the wonderful forests of Golfo Dulce. Golfo Dulce is a bay of the Pacific, let into the southernmost tip of Costa Rica, alongside the Panama frontier. Peculiar local conditions give the area about the bay some 200 inches of rain a year, which is three or four times the average for the rest of the Pacific side. Some of the best bananas in the world grow there, and there are some patches of rain forest that rival any in Central America.

"But the Golfo Dulce rain forests are no mere local oddity. They are a superb expression of a widespread phenomenon—the great broad-leaved evergreen forest that rims the whole wet side of tropical America and reaches spectacular culmination in the ocean of trees that fills the basin of the Amazon. It is a phase of this marvel that Allen's book is about—an outlier that somehow stole across to the Pacific side, into the warm wet Golfo Dulce country, and burgeoned there to form a forest of almost unsurpassed richness.

"Up to now, botanizing in the American rain forest has frustrated the casual visitor because he is used to identifying plants by their flowers and fruits. In the rain forest he wanders about among the towering columns with all the identifiable structures out of reach and all the familiar procedures denied him. The flowers are too high, or they come out at another season, or only during unusual weather—or they last only a few days, or even only a few hours. Any of these things may be true of the fruits too, and besides that the monkeys eat them as fast as they ripen. The botanist either goes home in a pet or hires a gang of Indians and starts cutting down trees to get their flowers.

"Well, Paul Allen shows you how to know the forest without cutting down the trees. Refusing to be hog-tied by the rules of traditional botany, he shows how much you can learn from such features as the stature of a tree, or the conformation of the trunk and base, or the kind of bark or sap, or the kind of place it is growing in—or even whether it does such odd things as shelter ants in hollow twigs or thorns. By making the most of every clue available, as the Indian woodmen do, Paul Allen gives you a way to keep your layman's wonder at the rain forest and still come away feeling that you know something about its structure."

Key to the Palms of Golfo Dulce

1. Plants armed with spines.
2. Leaves fan-shaped *Cryosophila Guagara*
2. Leaves pinnate, or entire.
3. Individual leaflets conspicuously wedge-shaped, broadest at the apex. Lower trunk with conspicuous prickly stilt roots.
4. Stilt roots in mature specimens as high as a man. Stamens more than 50. Seeds with an apical embryo *Socratea durissima*
4. Stilt roots in mature specimens about 2-3 ft. high. Stamens about 14. Seeds with a lateral embryo *Iriartea gigantea*
3. Individual leaflets never wedge-shaped or broadest at the apex.
4. Trunks solitary.
5. Trunks very short and massive, often reclining. Spines confined to the margins of the base of the frond *Corozo oleifera*
5. Trunks of varying diameter but never short, massive, or reclining. Spines abundant on the trunk and other parts.
6. Trunks more than 8" in diameter. Fruits globose, greenish yellow. *Acrocomia vinifera*
6. Trunks about 6" or less in diameter. Fruits not globose or greenish yellow

7. Fruits intensely spiny, in short compact clusters. Pinnae often in broad, confluent blocks *Astrocaryum alatum*
7. Fruits never spiny, in long pendulous clusters. Pinnae never in broad confluent blocks *Astrocaryum Standleyanum*
4. Trunks multiple.
5. Fronds entire, with a bifid apex.
6. Fronds more than 6 ft long. Common palms of swampy forests at sea level *Bactris militaris*
6. Fronds less than 3 ft. long. Rare palms of forested ridges at 1,500-2,000 ft. *Bactris* sp. — Allen 6765
5. Fronds pinnatisect.
6. Spines conspicuously pale tan in color, winged or flattened throughout most of their length *Bactris diviscupula*
6. Spines not pale tan or conspicuously flattened.
7. Fruits about $\frac{1}{2}$ " in diameter, red in color at maturity. Spathes densely woolly but not armed with spines on the expanded portion *Bactris Baileyana*
7. Fruits about 1" in diameter, deep purple at maturity. Spathes intensely spiny on the expanded portion *Bactris balanoidea*
1. Plants not armed with spines.
2. Fronds entire, bifid at the apex *Asterogyne Martiana*
2. Fronds pinnatisect.
3. Individual leaflets wedge-shaped, broadest at the apex. Lower trunk with stilt roots.
4. Stilt roots in mature specimens usually more than 6 ft. in height. Stamens more than 50. Seeds with an apical embryo *Socratea durissima*
4. Stilt roots in mature specimens about 2-3 ft. high, often absent in young plants. Stamens about 14. Seeds with a lateral embryo *Iriartea gigantea*
3. Individual leaflets never wedge-shaped or broadest at the apex.
4. Trunks multiple.
5. Fruits covered with overlapping scales. A species usually found in nearly pure stands in coastal swamps. *Raphia taedigera*
5. Fruits not scaly. Plants not found in swamps nor in pure stands.
6. Staminate and pistillate flowers produced on separate scapes *Chamaedorea Woodsoniana*
6. Staminate and pistillate flowers produced on the same scape.
7. Spadix broomlike, the slender, rodlike basal part much longer than the terminal cluster of flowering or fruiting strands *Synechanthus angustifolius*
7. Spadix not broomlike, the basal part much shorter than the flowering or fruiting strands.
8. Flowers produced in deep pits in the rachis.
9. Canes about 2" in diameter. Fruits about $\frac{1}{2}$ " in diameter *Geonoma congesta*
9. Canes less than $\frac{1}{2}$ " in diameter. Fruits about $\frac{1}{4}$ " in diameter *Geonoma* sp. — Allen 6750
8. Flowers not immersed in pits in the rachis.
9. Trunks 4-6" in diameter. Scapes large with many pendulous strands 1 ft. or more in length *Oenocarpus panamanus*
9. Trunks less than 2" in diameter. Scapes small, the strands less than 1 ft. long *Hyospathe Lehmannii*
4. Trunks solitary
5. Trunks very short and massive, often reclining. Fruits produced in large, very compact clusters which are deeply seated in the axils of the fronds *Corozo oleifera*
5. Trunks not massive or reclining. Fruits not in compact clusters in the frond axils.
6. Plants large, usually 30-65 ft. or more in height.
7. Fruits usually more than 6" in diameter. Cultivated or naturalized on sea beaches *Cocos nucifera*
7. Fruits less than 2" in diameter.
8. Strands of the rachis about 1" in diameter and octagonal in cross section. Flowers produced in deep pits. Fruits almond-shaped *Welfia Georgii*
8. Strands of the rachis much less than 1" in diameter and never octagonal in cross section. Fruits not almond-shaped.
9. Trunks slender, usually less than 6" in diameter. Fruits globose, about $\frac{1}{2}$ " in diameter *Euterpe panamanus*
9. Trunks massive, to about 12-18" in diameter. Fruits ellipsoidal, conspicuously beaked at the apex *Scheelea rostrata*
6. Plants usually less than 20 ft. in height.

7. Plants dwarf, to about 8 ft. to the tips of the fronds, the trunk usually less than 1 ft. in height.
8. Spadix spicate, undivided. Staminate and pistillate flowers both present on the scape *Neonicholsonia Watsonii*
8. Spadix branched. Staminate and pistillate flowers produced on separate scapes. *Chamaedorea* sp. — Allen 6742
7. Plants with trunks more than 3 ft. in height.
8. Staminate and pistillate flowers produced on separate scapes.
9. Scapes erect. Plants found in wet forests at sea level *Chamaedorea* sp. — Allen 6262
9. Scapes pendulous. Plants found on forested ridges at 1,800-2,000 ft.
10. Fruits obovoid, less than $\frac{1}{2}$ " long *Chamaedorea* sp. — Moore 6527
10. Fruits oblong, more than $\frac{5}{8}$ " long *Chamaedorea Wendlandiana*
8. Staminate and pistillate flowers produced on the same scape.
9. Flowers borne in pits on the rachis. Fruits dark purple or black *Geonoma binervia*
9. Flowers not borne in pits. Fruits yellow, orange, or red *Synechanthus angustifolius*



40. *Asterogyne Martiana*, Esquinas forest Costa Rica. Photo P. Allen.



41. *Astrocaryum Standleyanum*, Palmar Norte, Costa Rica. Photo P. Allen.

ACROCOMIA VINIFERA Oerst.—*Coyol* (Local and general).

Single-trunked, rather stout, intensely spiny palms, with drooping, pinnate fronds, the spiny bases of which are usually long persistent. The large panicles of flowers, as yellow as ripening wheat, appear late in the dry season and are followed by elongate clusters of dark yellowish-green, smooth, globose fruits which average a little more than 1" in diameter. The inner kernel has the flavor of coconut and is often eaten in Honduras. A refreshing cider-like wine is often made by fermenting the whitish sap obtained from deep rectangular incisions in the crown of the felled trunks. The trees are often left standing in pastures and the fruits are much relished by cattle. Locally common in dry, open situations, sometimes forming nearly pure stands near Rey Curre and Potrero Grande.

ASTEROGYNE MARTIANA Wendl.

Single-trunked, unarmed palms which average about 6-8 ft. in height and about 2" in trunk diameter, the lower 2-4 ft. of the stem usually more or less repent. The

attractive fronds are completely undivided and bifid at the apex, and are sometimes used locally for thatch. The fragrant white flowers are produced on clusters of 3-6 simple spikes which radiate from the end of a slender arching scape. They normally appear in late January or early February, and are followed in March by small fruits which are at first red, but become dark purple or black at maturity. Frequent in climax forests throughout the area. A handsome species, well worthy of cultivation for ornament.—Esquinas Forest, 200 ft., *Allen 5596, 5826, & 6752* & *H. E. Moore 6535*—Forested hills near Palmar Norte, 1,500 ft., *Moore 6530 & Allen 6744*.

ASTROCARYUM — KEY

1. Fruits orange, unarmed, in conspicuous pendulous clusters *Astrocaryum Standleyanum*
 1. Fruits not orange, densely armed with spines *Astrocaryum alatum*

ASTROCARYUM ALATUM Loomis — *Coquillo* (Panama).

Small, intensely spiny, single-trunked palms which average 12-25 ft. in height. On close examination the slender trunk is found to be without spines, but is usually more or less covered by the spiny persistent bases of the fronds. The leaves are pinnate, with many of the pinnae fused together in broad confluent blocks, the midribs and bases being covered with a truly formidable armature of long, flattened lustrous-brown spines. The compact clusters of spiny, beaked fruits are erect or pendulous, and are protected by a spiny spathe. They are usually in fruit in our area from October until late March. The prominently ringed trunks of mature specimens are unbelievably hard, and the black wood might be used for canes, fishing rods, or archery bows. A very common species, usually found in wet lowland forests, particularly near Tinoco and Jalaca.—Tinoco station, sea level, *Allen 6612*.

ASTROCARYUM STANDLEYANUM L. H. Bailey—*Pejibaye* (Local)—*Black palm* (Canal Zone, Chiriquí, and Bocas del Toro)—*Chunga* or *Chonta* (Panama).

Tall, handsome palms, common to areas of climax forest, the individual specimens varying from about 40-65 ft. in height. The solitary black trunks are usually about 6-8" in diameter, and are armed with broad bands of long, flat spines which are highly flammable. The fronds are pinnate and spinose, particularly near the base. The terminal bud, or "palmito," can be eaten. The fruits are produced from March to about June in long, pendulous, bright-orange, attractive clusters. Individual fruits are unarmed, and the rather scanty pulp surrounding the large seed is sweet and edible. The hard black wood is used for canes, fishing rods, ornamental boxes, inlaying, archery bows, and other similar purposes, and might be suitable for golf clubs.—Hills near Palmar Norte, 200-600 ft., *Allen 6662 & 6771*.

BACTRIS—KEY

1. Fronds undivided, bifid at the apex.
 2. Fronds more than 6 ft. in length. Plants confined to swampy forest at sea level. *Bactris militaris*
 2. Fronds about 2 ft. long. Plants confined to forested ridges at 1,500-2,000 ft.
 *Bactris* sp.—*Allen 6765*
1. Fronds pinnate, never bifid at the apex.
 2. Spathe conspicuously armed with needle-like spines.
 3. Spines conspicuously flattened, pale yellow in color, usually tipped with brown
 *Bactris divisicipula*
 3. Spines not conspicuously flattened, dark brown or black in color *Bactris balanoidea*
 2. Spathe densely woolly, but never armed with spines *Bactris Baileyana*
 BACTRIS BAILEYANA H. E. Moore—*Hoja de duende* or *Huiscoyol* (Local).

Common spiny palms, with pinnate fronds and multiple trunks about 15 ft. in height. The short, broad spathes have a pale-brown, woolly covering, unique in our area in being unmixed with spines. The small, nearly globose fruits are red at

maturity, and are usually found in October. A widespread and characteristic species of the forested ridges, to about 2,000 ft. in elevation.—Esquinas Forest, 200 ft., *Moore 6556 & Allen 6606*.

BACTRIS BALANOIDEA (Oerst.) Wendl.—*Huiscoyol* (Local).

Slender, intensely spiny palms, with multiple trunks and pinnate fronds, which form open colonies 10 to about 30 ft. in diameter, the interval between the canes being about 1-3 ft., depending upon the situation. The relatively large, dark-purple or brownish-purple fruits mature during March and April. They are frequently eaten locally, and have a pleasant, acidulous taste.—Palmar Norte, 100 ft., *Allen 6739*—Hills near Palmar, 200 ft., *Moore 6543 & Allen 6756*.

BACTRIS DIVISICUPULA Bailey.

Slender palms, with 3 or 4 canes 12-18 ft. in height, terminating in 6-8 mature pinnate fronds, all parts of the plant conspicuously armed with white or pale-yellow, usually brown-tipped and flattened spines. Spathes tawny brown in color, also with many short, flat spines. Fruits about $\frac{1}{2}$ " in diameter, the apex abruptly beaked; dark purple at maturity.—Forested hills above Palmar Norte, 1,200-1,500 ft., *Moore 6531 & Allen 6746*.

BACTRIS MILITARIS H. E. Moore

A very striking, multiple-stemmed species, mature specimens of which average about 15 ft. in height. The large, arching fronds are completely undivided, a very unusual condition in this genus. The canes are slender, and armed with very long, black, needle-like spines. The small white flowers are produced from late April until early July and the attractive red fruits mature from about mid-August until November.—Very common in wet, lowland forests near Tinoco Station and Sierpe, *Allen 5276, 6264 & 6296*.

BACTRIS sp.

Spiny, stoloniferous palms, with 3-6 slender canes 6-10 ft. in height and about $\frac{1}{2}$ " in diameter, each with about 4-5 live, bifid, undivided fronds which may be either spiny or unarmed on the same plant.—Frequent in forested hills above Palmar Norte at 2,000-2,500 ft., *Allen 6765*.

CHAMAEDOREA—KEY

1. Plants dwarf, the trunks usually less than 1 ft. in height *Chamaedorea* sp. — *Allen 6742*
1. Plants of varying size, but with trunks at least 3 ft. in height
2. Trunks multiple, to about 35 ft. *Chamaedorea Woodsoniana*
2. Trunks solitary.
3. Scapes erect. Wet forests at sea level *Chamaedorea* sp. *Allen 6262*
3. Scapes, pendulous. Forested ridges at 1,800-2,000 ft.
4. Fruits obovoid, less than $\frac{1}{2}$ " long *Chamaedorea* sp. — *Moore 6527*
4. Fruits oblong, more than $\frac{1}{2}$ " long *Chamaedorea Wendlandiana*

CHAMAEDOREA WENDLANDIANA (Oerst) Hemsl.

Single-trunked, pinnate-leaved palms 10-20 ft. in height, with green, conspicuously ringed, unarmed canes, the lower portion often somewhat repent, with many adventitious roots. Inflorescences branching, pendulous, with a rather fleshy green rachis.—Forested hills above Palmar Norte, 2,000-2,500 ft., *Moore 6547 & Allen 6761*.

CHAMAEDOREA WOODSONIANA Bailey.

Slender, unarmed, pinnate-leaved palms with multiple trunks, 15-35 ft. in height. Scapes elongate, pendulous and branching, with a bright-orange rachis and black, globose fruits about $\frac{3}{8}$ " in diameter.—Forested hills above Palmar Norte, 2,000-2,500 ft., *Moore 6549 & Allen 6762*.



42. *Bactris militaris*, Tinoco station, Costa Rica. Photo P. Allen.



43. *Cryosophila Guagara*. Photo P. Allen.

CHAMAEDOREA sp.

Dwarf, single-stemmed palms, 6-7 ft. in height, the trunk usually about 1 ft. or less in height, with 8-10 pinnate fronds. The plants bear a considerable superficial resemblance to those of *Neonicholsonia*, but may be immediately separated by the branching rather than spicate inflorescence.—Locally common on steep forested ridges above Palmar Norte at about 1,800 ft., *Moore 6525 & Allen 6742*.

CHAMAEDOREA sp.

Single-trunked palms, to about 8 ft. in height and 1" in trunk diameter, the stem erect, green and ringed, bearing 5-6 spreading, pinnate fronds which typically have about 11 pairs of caudate-acuminate pinnae. Inflorescences about 3, either inter- or infra-foliaceous, the erect spadix having spreading, light-green rachillae and yellowish flowers.—Forest near Tinoco, sea level, *Moore 6533 & Allen 6262*.

CHAMAEDOREA sp.

Slender, single-stemmed palms, to about 12 ft. in height, with a few dark-green, pinnate fronds. The spadix in young fruit is pendulous, with orange rachillae and green, obovoid fruits about $\frac{2}{5}$ " long and $\frac{1}{3}$ " in diameter.—Rather infrequent in the forested hills above Palmar Norte at about 1,800 ft. elevation, *Moore 6527*.

COCOS NUCIFERA L.—*Coco, Cocotero, Coconut, or Pipa* (Local and general).

Coconut palms are the dominant element along sandy beaches in the entire Golfo Dulce region, forming small picturesque groves or, particularly from the delta of the Río Coto to Banco Point, stretching out in a thin line for miles in front of the darker, broad-leaved vegetation. The trees have every appearance of being wild and are universally believed to be so by the local inhabitants, since they regenerate spontaneously without the aid of man, often far from any present habitation. In view of the recent revival of controversy as to the origin of the coconut it is perhaps of some interest that Burica Point was particularly mentioned by Oviedo as early as 1526 as having large and thriving stands, evidently much resembling those which are found today.

COROZO OLEIFERA (HBK) L. H. Bailey—*Corozo* (Local and general)—*Tuskra* (?) (Boruca)—*Coquito* or *Palmiche* (Nicoya)—*Corozo colorado* or *Corocito* (Panama).

Common palms, with massive, often more or less prostrate trunks and very large pinnate fronds, the basal portions of which are armed with short, stout spines which represent modified pinnae. The yellow or reddish-orange fruits average about 1" in length, and are very densely crowded on the large, sessile, axillary panicles. The fleshy pericarp is utilized in some places, notably in the Perlas Islands of Panama Bay, for the extraction of an edible oil. The species is related to the African Oil Palm, and is superficially similar to it in appearance. Frequent in wet pastures and swampy forest throughout the area.—Pastures near Palmar, *Allen 6768*.

CRYOSOPHILA GUAGARA Allen—*Guagara* (Local).

Slender, single-trunked, fan-leaved palms, 12-20 ft. in height, the trunks armed throughout with extensive branching root spines. Mature plants with 12-15 live fronds, the flabellate blades averaging about 5 ft. in diameter, the dark, glossy-green upper surface contrasting strongly with the silvery-white lower side. The fronds are strongly bifid, with a deep central cleft which divides the blade to within about 1" of the short, broadly triangular hastula. The inflorescences are elongate and pendulous, and are covered throughout their length with 25 to about 40 broad, papery, yellowish bracts. The flowers are produced on short, branching panicles, which are spirally arranged on the main axis of the inflorescence. Fruiting clusters are commonly seen without bracts, which tend to fall before the globose, waxy fruits mature. A very striking species, immediately separable from all others in the genus by the elongate pendulous inflorescences which are covered to the apex by the conspicuous bracts. Common in the lowland forests throughout the area, the fanlike fronds being much used for thatch.—Forests near the Tinoco Station, sea level, *Allen 6602*.

EUTERPE PANAMENSIS Burret.

Slender, unarmed, single-trunked palms 30-65 ft. in height, with attractive crowns of pinnate fronds. Common on the crests of forested hills between Palmar and Boruca at 2,500-4,000 ft. The inflorescences are borne directly below the crownshaft, the deep-purple or black, globose fruits averaging about $\frac{3}{8}$ " in diameter.—Hills above Palmar Norte, 2,500 ft. *Moore 6553 & Allen 6766*.

GEONOMA — KEY

- | | |
|--|--|
| 1. Trunks solitary | <i>Geonoma binervia</i> |
| 1. Trunks multiple. | |
| 2. Fruits about $\frac{1}{2}$ " in diameter. Canes more than 1" thick | <i>Geonoma congesta</i> |
| 2. Fruits about $\frac{1}{8}$ " in diameter. Canes less than $\frac{1}{2}$ " thick | <i>Geonoma</i> sp. — <i>Allen 6750</i> |

GEONOMA BINERVIA Oerst. — *Surtuba* (Costa Rica).

Slender, single-trunked palms, to about 15 ft. in height, with relatively large, irregularly pinnatisect fronds and twice-branched, pendulous, reddish or reddish-brown inflorescences.—Occasional in the forested hills above Palmar Norte, mostly at 1,500-2,500 ft., *Moore 6523, 6542 & 6546 & Allen 6758*.

GEONOMA CONGESTA Wendl. ex Spruce—*Caña de danta* (Local).

Handsome, erect, unarmed palms, with up to about 12-15 canes which average $2\frac{1}{2}$ " in diameter, each bearing at its apex 10-12 pinnate, bifid fronds, the lateral pinnae usually fused into a few broad, confluent blocks, but sometimes much narrower. There are commonly 3-5 branching scapes borne just below the leafy crown, the small black fruits maturing in late March. The canes are sometimes used for

house walls, and the fronds for thatch, which may be expected to last for approximately two years, according to report. A very common species of the clay hillsides in the Esquinas Forest at low elevations.—*Allen 6039, 6748, & 6753.*

GEONOMA sp.

Slender, stoloniferous palms with 3-5 canes about 6-10 ft. in height and $\frac{3}{8}$ " in diameter, each with 6-7 bifid, pinnate fronds, usually composed of 3 pairs of very broad pinnae. Inflorescences 1 or 2 branching scapes about 7" long, borne below the crown of leaves. The black, nearly globose fruits are about $\frac{1}{8}$ " in diameter.—*Esquinas Forest, 200 ft., Moore 6538 & Allen 6750.*

HYOSPATHE LEHMANNII Burret.

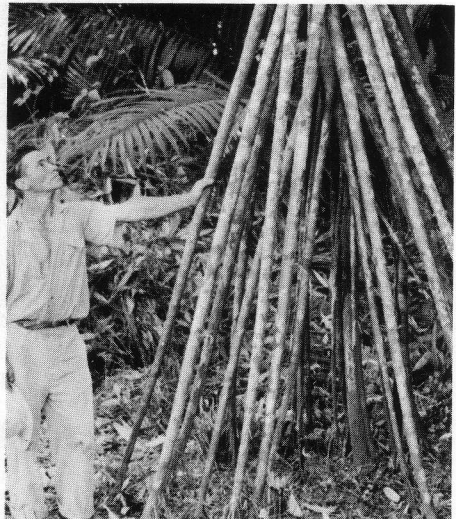
Unarmed, strongly stoloniferous, pinnate-leaved palms, with up to 20-25 slender green canes 1-2" in diameter and 9-15 ft. in height. Spathes 2, the flowers pinkish in bud. Fruiting spadices borne below the crown of leaves, with seeds about $\frac{3}{8}$ " long and $\frac{3}{16}$ " wide.—Locally common in the forested hills above Palmar Norte at about 2,500 ft. in elevation. *Moore 6544 & Allen 6764.*

IRIARTEA GIGANTEA Wendl. ex Burret—*Stilt palm* (Local and general)—*Chonta negra* (Boruca).

Strikingly handsome, single-trunked, unarmed palms, 30-90 ft. in height, with low, compact clusters of stilt roots which seldom exceed 3-4 ft. in height and which may be completely lacking in juvenile specimens. Individual pinnae strongly wedge-shaped and broadest near the apex, those of juvenile fronds being all on one plane, while in mature plants they are produced in 2 ranks which are at about a 30° angle with one another on the rachis, giving the fronds a tousled appearance. The slender, pendulous, unopened spathes are hornlike in appearance and are borne on the trunk just below the crownshaft. The pale-yellow flowers are produced on elongate strands, those of the staminate form with about 14 stamens. The fruits are globose, about 1" in diameter, with a lateral embryo. The wood in old specimens is black and exceedingly hard, like that of *Astrocaryum Standleyanum*. The trees occur as isolated speci-



44. Stilt roots of *Iriartea gigantea* (*Allen 6763*). Photo P. Allen.



45. Stilt roots of *Socratea durissima*. Photo P. Allen.



46. *Iriartea gigantea* (Allen 6763) in Costa Rica. Photo P. Allen.

mens or in magnificent groves along the forest trail from Palmar Norte to Buenos Aires at about 2,500 ft. elevation.—Moore 6524 & 6555 Allen 6745 & 6763.



47. *Oenocarpus panamanus*, hills near Palmar, Costa Rica (Allen 6680). Photo P. Allen.

NEONICHOLSONIA WATSONII Dammer.

Dwarf, single-stemmed, unarmed palms with about 8 pinnate fronds, the plants averaging about 8-9 ft. in height to the tips of the terminal leaflets. The erect or arching undivided spicate inflorescences about equal the fronds in length. Very common in climax forests throughout the area.—Coto Junction, 50 ft., Allen 6659.

OENOCARPUS PANAMANUS Bailey—*Maquenque* (Local and Panama).

Handsome, multiple-trunked, unarmed palms, 20-65 ft. in height, with 8-10 arch-

ing pinnate fronds, the well-developed, often somewhat bulging crownshaft dark blackish purple in color. The smooth, almost bamboo-like individual canes are conspicuously ringed and average 4-6" in diameter. The 2-4 inflorescences are borne well below the crownshaft and are at first covered by 2 cylindric spathes which are deciduous. The short, woody, nearly horizontal spadix has a great number of slender, pendulous, wine-red strands which bear the small white flowers and hard black or dark-purple, plumlike fruits. Frequent in hillside forests throughout the area.—Hills near Palmar, 100 ft., *Moore 6541 & Allen 6680*.

RAPHIA TAEDIGERA MARTIUS — *Yolillo* or *Palma real* (Local — *Holillo* or *Jolillo* (Bluefields, Nicaragua)).

Robust palms, typically with 3-5 trunks, which may vary in height from about 30 to 65 ft., and covered by the overlapping bases of the 8-10 enormous pinnate fronds, which may be up to 40 ft. in length. Each side of the stout rachis bears some 95 pinnae, whose midribs and margins are armed with short, sharp spines. The small flowers are produced in 3-5 very large, arching, or commonly pendulous inflorescences which originate in the axils of the upper fronds. These scapes may vary in length from 8 to about 16 ft., and lack a true spathe, but are enveloped throughout in a great number of persistent, spirally fused, papery bracts, each inverted cone enclosing a miniature cleft spathe and a distichous panicle of flowers. The handsome fruits are oblong or ellipsoidal, about 2-2½" in length, with a short, sharp terminal beak, the whole entirely covered with closely overlapping brownish-orange glossy scales. Individual plants apparently flower and fruit throughout the year, the mature canes dying after they have exhausted their inflorescences, being replaced by basal suckers. The species forms vast unbroken stands thousands of acres in extent back of Jalaca Farm and near the Laguna de Sierpe, this however being the only known occurrence of the genus on the Pacific coast of Central America. These tremendous stands would undoubtedly be exploited in the Asiatic tropics for sugar by tapping the immature inflorescences, but nothing of the sort has ever been attempted in our hemisphere. The stout frond rachises have been used for banana prop poles in the Limón Division of the United Fruit Company. — Swamps near Jalaca, sea level, *Allen 6276*.

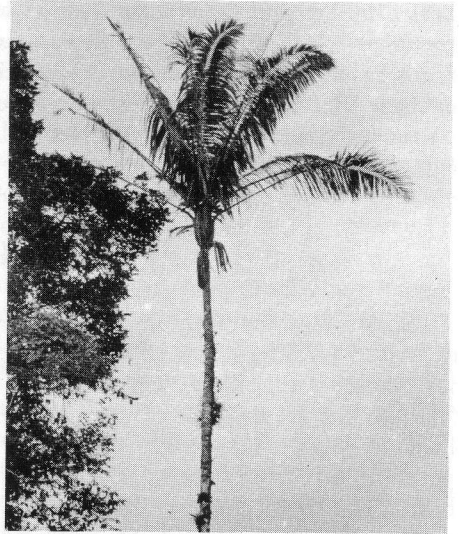
SCHEELEA ROSTRATA (Oerst.) Burret — *Palma real* or *Manaca* (Local and Panama).

Slender or robust, single trunked palms, 30-75 ft. in height, with very large, arching, pinnate fronds. The species is frequent in forests throughout the area, ascending the hills between Palmar and Boruca to about 2,500 ft., but sometimes forms groves of considerable extent in open pastures, particularly near Puerto Cortés. The large pendulous inflorescences are protected by a broad, corrugated boat-shaped spathe, and may bear (1) all staminate flowers, (2) all pistillate flowers, or (3) both, in which case the larger pistillate flowers are at the base of the individual strands, the terminal $\frac{3}{4}$ of which bear the crowded smaller staminate form. The yellow, ellipsoidal fruits have a prominent beak at the apex, and are indistinguishable from those of the *Scheelea* palms of Panama, so that it seems probable that *S. zonensis* may be referable here. The fronds of this species are used to a considerable extent locally for thatch. — Pastures near Palmar Norte, 50 ft., *Allen 6661* — Pastures near Puerto Cortés, 25 ft., *Moore 6540 & Allen 6754*.

SOCRATEA DURISSIMA (Oerst.) Wendl. — *Palmito* (Local) — *Stilt palm* (Local



48. *Scheelea rostrata*, Costa Rica. Photo P. Allen.



49. *Welfia Georgii*, Costa Rica. Photo P. Allen.

and general) — *Chonta* or *Palmilera* (Boruca) — *Maquenque* or *Palmito* (Costa Rica) — *Jira* (Panama).

Slender, single-trunked palms, 40-60 ft. in height, with very prominently developed prickly stilt roots which reach 6-8 ft. in height in mature specimens. Trunk unarmed, bearing 6-8 pinnate fronds, and with a cylindrical, somewhat glaucous crownshaft about 4½ ft. long. Individual leaflets narrowly wedge-shaped, broadest near the apex, usually split longitudinally in 3 or 4 segments, the leaflets borne at an ascending angle with the rachis. Inflorescences usually 1 or 2, produced from the trunk below the crownshaft. Spathes apparently 6. Flowers white, with more than 50 pale yellow stamens. Seeds ellipsoidal, with an apical embryo. The palm cabbage from this species is edible, but somewhat bitter and considered inferior to that obtained from *Welfia Georgii*. Very common and widely distributed throughout the area. — Esquinas Forest, 200 ft., Allen 6611 & 6715 — Tinoco Station, 50 ft. Moore, 6532 & Allen 6747.

SYNECHANTHUS ANGUSTIFOLIUS Wendl.

Slender, unarmed palms, with solitary or rarely multiple trunks to about 8-12 feet in height, the canes with about 5 pinnate fronds. The elongate, erect or arching, broomlike spadices are produced either from among or from below the fronds, and bear globose or ellipsoidal fruits which are orange or red at maturity. — Locally common in the Esquinas Forest, 200 ft., Moore 6537 & Allen 6677 & 6751 — Forested hills above Palmar Norte, 2,000 ft. Allen 6760.

WELFIA GEORGII Wendl. ex Burret — *Palmito*, *Palma conga*, or *Palma real* (Local) — *Palma conga* or *Palma real* (Panama).

Single-trunked, unarmed palms, 50-65 ft. in height, with large, pinnate fronds, the newest member in the center of the crown a rich, conspicuous reddish brown, contrasting very handsomely with the dark-green older foliage. Inflorescences are usually 1 or 2 relatively short pendulous spathes and spadices which are produced

below the bases of the fronds. The white flowers are borne in deep pits in the thick rachillae, which are octagonal in cross section, and are followed by the almond-like fruits, which are dark purple at maturity. The crown yields a sweet, edible palm cabbage, but each utilized means a specimen destroyed. Common in climax forest, particularly in the Esquinas District. — Esquinas Forest, 250 ft., *Allen 6346 & 6770 & H. E. Moore 6557.*

Oviedo, on "Cocos"

[Editorial Note: Gonzalo Fernandez de Oviedo y Valdes (1478-1557), Oviedo for short, was official chronicler of "The Indies" at the time of the Columbian voyages. He spent thirty-four years in different parts of the Caribbean. The first volume of his comprehensive "Historia General y Natural de las Indias" appeared in 1535. In it are descriptions of the West Indian (including Middle America) fauna and flora, illustrated by his own sketches. Several pages in volume 1 (pages 335-337 of an Oviedo edition, published in Madrid in 1851) describe a palm "called cocos," which is the basis of some of the controversy regarding the original nativity of the coconut palm (see *Principes* 7:54-69. 1963). Dr. E. D. Merrill, late Director of the Arnold Arboretum and an authority on the origins of cultivated plants, was much interested in this subject and knowing of Paul Allen's intimate knowledge of Central America and its native palms, asked him to comment on the Oviedo account. Allen responded in a letter dated December 27, 1952. Oviedo's description and the pertinent parts of Paul Allen's letter are of sufficient interest to be published here. The translation of Oviedo from the sixteenth century Spanish has been kindly made by Gil Cuatrecasas, whose notes as a translator are bracketed within the text. W.H.H.]

"There are other palm trees whose

fruit are called cocos, this being a genus of large palm trees, and whose leaf is of the same kind as that of the date palms, except that they differ in the base of the leaves [*lacinia*], for the leaves [*lacinia*] of coco trees originate in the rachis in the same way as the fingers of both hands when they are intertwined and in a like manner the leaves [*lacinia*] are spread further. These palm or coco trees are tall, and there are many of them in the coast of the South seas, in the province of the chieftain Chiman, and many more in what they call Borica, and many more than in both these places in an island of the southern gulf which is a hundred or more leagues off the coast of Peru: this island, according to what I learned from the pilot Corso, who has been there, is two hundred and thirty leagues from Panama and a hundred and thirty leagues from the port of Possession of Nicaragua. These trees or palm trees put forth a fruit which is called coco, which is like this (Plate 3.¹, fig. 15.²). Altogether, such as it is on the tree, it has a much greater bulk than a man's head; and from the outside of the bark to the middle part, which is the fruit, it is surrounded and covered by many skins which are like that burlap with which the palmitos [*Chamaerops humilis*] of land of Andalucia (I say of land that are not palmitos of tall palm trees) are covered; and from such burlap and skins in the Orient the Indians

make cloths and very good rigging, and the cloths are made in three or four ways, whether for the sails of ships or for clothing, as well as for thin cords as for thicker cords, and even cables and ropes and all sorts of ship's riggings. But there in these our Indies the Indians do not trouble to cure these cords and cloths which can be made from the wool or burlap of these cocos, such as in the Levant, for here there is much cotton and hemp and cabuya to supply such necessity for cords.

"This fruit which is within that burlap, is the coco, as big as the fist of a closed hand, and some as big as two fists, and more or less, it is a sort of round nut, and some are elongated. The crust is hard, and as thick as the width of the inscription [title] on a Castillian silver "real." Inside, attached to the crust of that nut or coco, is a meaty part in width like half the thickness of the small finger of the hand, or as thick as a writing quill of the kind common to geese. This is the fruit proper of the coco and what is edible, and it is as white as a cleaned almond and better tasting than almonds, and of smooth taste to the palate. It is eaten the same way peeled almonds might be eaten, and after this fruit is chewed some bagasse forms such as is the case with the almond; but if swallowing is desired it is not unpleasant, although if when the juice has gone down the throat, before this bagasse is swallowed, the chewed part seems somewhat rough, but not much nor enough to reject [spit out]. When the coco is fresh and recently picked off the tree or just fallen off which is better yet (and a sign that it is ripe), this meaty part or fruit, not having been eaten but instead pounded much in an almirez [brass mortar, for kitchen use] or mortar, and after straining the milk in a clean linen cloth, that

milk turns out much better and smoother than that of cows or sheep or other animals, and it is very nourishing and sustaining; said milk Christians put in the "mazamoras" [sort of *pap*, made of the flour of Indian corn, honey, and sugar; much used in Peru] which they make from corn or bread, like "puches" or "poleadas" [sort of *pap*. V. Gachas]; and due to this milk from cocos these mazamoras are excellent dishes, and without burdening the stomach they give such pleasure to taste and such satisfaction to hunger as if many and very good dishes had been eaten. By way of pith or marrow of this fruit which is in its middle, in the interior part surrounded by the already mentioned meaty part, is a place taking up the remaining part or entire quantity of the coco, full of a most clear and excellent water, and as much as would fill the shell of the egg of a hen, and more or less, in proportion to the bigness or size of the coco; when drinking said water, besides its being very clear, it is very substantial [nutritious] and precious, all of it that can be appraised or appreciated; and the moment in which it is drunk, as it passes the palate (*de planta pedis usque ad verticem*) it seems like no part or thing in man is left without feeling consolation and marvelous contentment.

"This fruit certainly seems like the one of most excellence and utility of all those that can be appreciated on earth, so much so that I am unable to say or explain it. The vessel of this fruit, after the water and the already mentioned food has been removed, is very smooth, and they clean and shine it subtly [thoroughly], and thus it comes out with a very good shine on the outside which leans towards a black color and of a very nice surface inside. Those who accustom to drink from these ves-

sels, and who suffer from colic, say they feel known cure against said sickness, and that the stone breaks in those that have it, and is forced to come out through the urine. I wrote all these things according to what I had reached and understood and in part seen of these cocos, when I wrote that report which was printed in Toledo the year fifteen hundred and twenty-six. The name coco was given to this fruit because the place by which it hangs, when the coco is born, has a round pit or hole, and above this one hole two other natural holes, and all three together make like the face of a little monkey who appears to grimace [inf. *cocar*]; and for this reason it is called coco. But in truth, as it has been said before, this tree is a species [kind of ?] of the palm tree. And since it has been said the way in which the negroes make oil and wine from palm trees, especially of that genus of them that I have already mentioned, I wish to bring to the memory of the reader what in this case writes that famous researcher of natural history who says the following sentence: 'To make wine from palm trees, which is used by the indianos [American? Hindu?] and the parthos [?] and the whole Orient of the maritime regions, which are called Cicles, they take a "modio" [Roman dry measure] and soak it in three "congios" [Ancient Roman liquid measure: gallon] of water (the "congio" is a certain measure), and then they press it.' That the coco could be useful for colic trouble, for it is a palm tree, should be believed, for I have seen made for such sickness a remedy from date kernels, and I say this here, for it is to the point and a proven thing, and because someone might derive benefit and great remedy for such pains after reading this. The kernels of the dates which

have that point or navel in the middle of the line made by the kernel below and above one side must be chosen; and a quantity of them burned much in a fire-shovel or something clean, in such a way that no other ash or coal or anything else might mix in with them, and afterwards pounded much in a clean mortar until they become powder, and once pounded, sifted on a strainer and stored; and when the pain would come or is expected, taking in the morning before eating with a "real" [coin] all the powder that can be taken with the "real" from the pile and put in a very thin glass of wine, in which there are three or four draughts of wine, and this drunk up; and if this is done two or three mornings, besides taking away the pain, the stone breaks and is purged through the urine, and many times it happens that the pain disappears immediately by drinking the powder. This I have seen myself and has been proven, and this is the reason why cocos are useful with such a disease.

Notwithstanding what has been said in praise of this fruit, I say that if taken continuously it comes to be hated, for it is strong and with a porringer of mazamorra with the milk of cocos, even though in a day a man does not eat anything else, he is as full as if he had eaten a sheep or many other foods and it gives rise to disgust and even indigestion.

"After I wrote the report I have mentioned, I was in the province and headland of Borica, and I ate some of these cocos and carried many ahead with me to Nicaragua, and came to loath them, and others did as I did and said the same thing as well. Finally, it is food for men who work and who are very strong [rugged?], but for the rest a little of this fruit is enough, for if eaten

continually, as it was done there, it is not for all stomachs. If the milk of the coco is put in a bowl in the open air two or three hours in the morning, and is drunk thus in fasting, it purges up to four or five stools."

Oviedo, Hist. Nat. Ind. 1:335-337
Madrid ed 1851 (orig. ed. 1535).

ESQUINAS EXPERIMENT STATION
CIA. BANANERA de COSTA RICA
GOLFITO DIVISION

Palmar

December 27, 1952

Dr. E. D. Merrill

Arnold Arboretum of

Harvard University

Jamaica Plain, Mass.

Dear Dr. Merrill:

Louis Williams has sent me your request for comments on Oviedo's description of *Cocos nucifera* in the Americas prior to 1526. A good many people considerably more erudite than I have barked their shins on this problem, and I consider it unlikely that a completely satisfactory answer will ever be forthcoming. O. F. Cook has pointed out that all of the close relatives of the coconut are American, and has urged an American origin for the species. The nearest living relative of the coconut would seem to be *Orbignya Cuatrecasana* Dugand of the Chocó in Colombia. The fact that about 97 per cent of the present cultivated stands are to be found in the south Pacific or the Old World tropics should not be an unsurmountable obstacle, since about an equal percentage of all bananas are grown in our hemisphere, and without any contention that they originated with us.

Judged purely on the basis of the transcript of Oviedo's account, which you have so kindly provided, I should be inclined to agree that he had seen and used coconuts in the Americas,

though he will never be given a Pulitzer prize for accurate reporting. His description of the size of the nut, the almond-like meat, its culinary and medicinal uses, and the cups made from the shell can refer only to *Cocos*. However, his illustration is of some species of *Bactris*, and much of his account is either equally applicable to other things, or obviously in error. There is of course a considerable "family" resemblance in most of the genera of the Coccoideae notably in the three pores at the end of the seed, the hard, usually black shell, the presence of clear, sweet liquid in the immature fruits, and in the more or less edible, coconut-like character of the flesh, at least during some of the stages of development.

One rather interesting aspect of the thing is that there are, so far as I can remember, only two pinnate-leaved palms that are usually found on or near the beaches of the Pacific coast of Central America. They are *Cocos nucifera* and various kinds of *Bactris*. Groves of coconuts exist today at all of the localities cited by Oviedo, the one near Burica point being fairly extensive and exploited commercially. As has been noted by Cook, coconuts are true cultigens, and cannot persist indefinitely in any location without the aid of man, since the young plants will not develop properly in shade. Whether the present stands of *Cocos* have existed on their present sites since Oviedo's time is however open to considerable question. Wafer reported extensive stands of coconuts on Cocos Island, but apparently many of these were felled by members of his party at the climax of a spree, and when Pittier visited the place in the 1890's there were relatively few left. This would seem to have been Oviedo's island, which he indicated had the most plentiful stands in his time, but this is

simply the first record of the general confusion of the tall and superficially similar *Rooseveltia Frankliniana* [*Euterpe macrospadix* — H.E.M.] which covers the hillsides and which looks like the less frequent coconuts of the beaches when viewed from the sea. The fact that Oviedo illustrated a *Bactris* would seem to me to indicate that he may have regarded them (and probably *Astrocaryum* as well) as being simply somewhat aberrant and inferior coconuts. His description of the quantity of liquid contained in a fruit being enough to fill the shell of an egg, more or less, depending on the size of the nut, would certainly seem to indicate this. Immature fruits of *Astrocaryum alatum* for example, have almost precisely this quantity of liquid, which is sweet and good, and the meaty part tastes much like coconut. It is difficult to under-

stand how he could have ignored the formidable spines of *Bactris*, particularly since he illustrates the typically aculeate rachis, but it is to be presumed that what we have is a compilation of unrelated things done in Spain after his return. The presence of the mango seed would seem to bear this out. We must, I think, remember his own statement: "Todas estas cosas escribi yo, segun lo que tenia alcancado y entendido y en parte visto destes cocos." He does say however that he took a load of them aboard at Burica for the trip to Nicaragua, and that he got pretty tired of them after a few days. If they were *Bactris* fruits, this would be all the more understandable.

So much for Oviedo & Cocos. . . .

Sincerely yours,
PAUL H. ALLEN

Miscellaneous Notes

Coyol Wine

Acrocomia vinifera, a Middle American palm commonly called *coyol*, has long been utilized as a source of wine. This use is alluded to in the specific name *vinifera*, meaning "wine-bearing." Production in Danli, Honduras is managed by felling *coyol* trees in the late dry season, after which they are hauled by oxen to a central yard in town. As many as 40-60 trunks are often assembled side-by-side, usually in lines of pairs. The large leaves are removed in the field in order to facilitate handling. A trough is opened in the crown of each trunk to a depth of 6-8 inches and a cut made on the lower side each day in the form of a thin shaving which opens the pores so that the cavity fills with liquid. The tapping cut is covered with a mat of Spanish moss (*Tillandsia usneoides*)

and held down with a broad woody frond base, the slender part shaved down to form a handle. Cuts are made in the morning and the liquid is collected each afternoon. Each tree generally yields a quantity of one or two pints. This is then fermented for about two days and then used as wine. Each trunk can be tapped and will produce for about a month. The wine will spoil if it is not used within two or three days, but about one-half pound per gallon of sugar can be added and with this the wine will last for about eight days. *Coyol* wine is somewhat milky, rather cidery in taste, and refreshing, but of relatively low alcoholic content.

P.H.A.

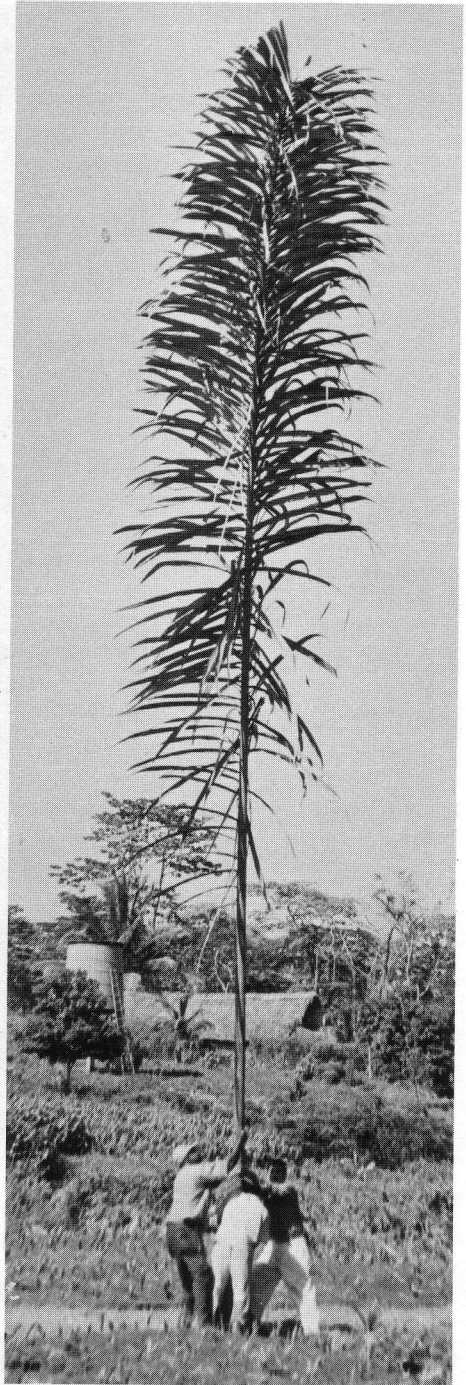
Raphia in the Western World

I am struck by the statement of L. H. Bailey that "there are suspicions that

the occidental *Raphias* are naturalized from Africa." Separately, in the *Gentes Herbarum* series, "Quaedam Palmae Panamenses" (Vol. III, Fasc. II, March, 1933), he cites Beccari's monograph of 1910 as the origin of the idea that Oersted's *Raphia nicaraguensis* might have been taken from a cultivated specimen, in Nicaragua, of the African *Raphia farinifera* (*Raphia Ruffia*).

This palm was believed by Oersted to be limited to Nicaragua, and to be distinguished principally by the lack of thorns on the margins of the leaves and its smaller size. That the former statement is not strictly true is apparent from examination of a photograph of the type, which shows the characteristic spines to be present, but largely confined to the lower margins of the pinnae. Dahlgren (in his *Index of American Palms*, page 240) reduces this concept to *R. taedigera*, but with a "?".

I have personally seen *Raphia taedigera* in the Mojinga swamp near the mouth of the Chagres River in Panama, visited by Bailey, and in the regions of Limon and Golfo Dulce in Costa Rica, and again on the Atlantic seaboard of Nicaragua from the lower reaches of the Rio Grande de Matagalpa, near Karawala, through the Pearl Lagoon estuaries, Cukra Hill, and the Rio Escondido to the mouth of the Rio Punta Gorda, below Monkey Point. Antonio Molina, Honduran botanist, has seen the species in the Rio San Juan on the border between Nicaragua and Costa Rica, and Alexander Skutch describes great tracts near Almirante, in Bocas del Toro Province, Panama. Isolated, unconfirmed reports also place it as far north as the Caratasca Lagoon, in Mosquitia. Stands in many of these places, particularly near Limon, Costa Rica and Almirante, Panama, as well



50. Leaf of *Raphia taedigera* (Allen 6489) Cukra Hill, Nicaragua. Photo P. Allen.



51. *Raphia taedigera* (Allen 6276). Photo P. Allen.

as the unique tracts on the Pacific coast of Central America between Golfito and Palmar in the Golfo Dulce region, are extremely extensive, often as pure concentrations hundreds or even thousands of acres in extent. To say that most of them have had little contact, either now or in former times, with introduction-

minded outsiders would be almost the understatement of the year. There cannot be the slightest doubt, in the mind of anyone who has seen these stands, that we are dealing with an exclusively American plant.

There is, however, a considerable degree of variation in individual speci-



52. *Raphia taedigera* inflorescence (Allen 6519), Photo P. Allen.

mens from place to place, in regard to number of trunks, maximum length of frond, degree of development of armature on the margins of the pinnae, length and number of inflorescences and size of fruit.

The Rio Escondido, in eastern Nica-

ragua, is lined for miles with this stately species, and provides the interested observer with a very good cross section of the total range of variation. Where soil is poor, and/or salinity high, the plants have a yellowish appearance, and seldom exceed 25 feet in height, count-

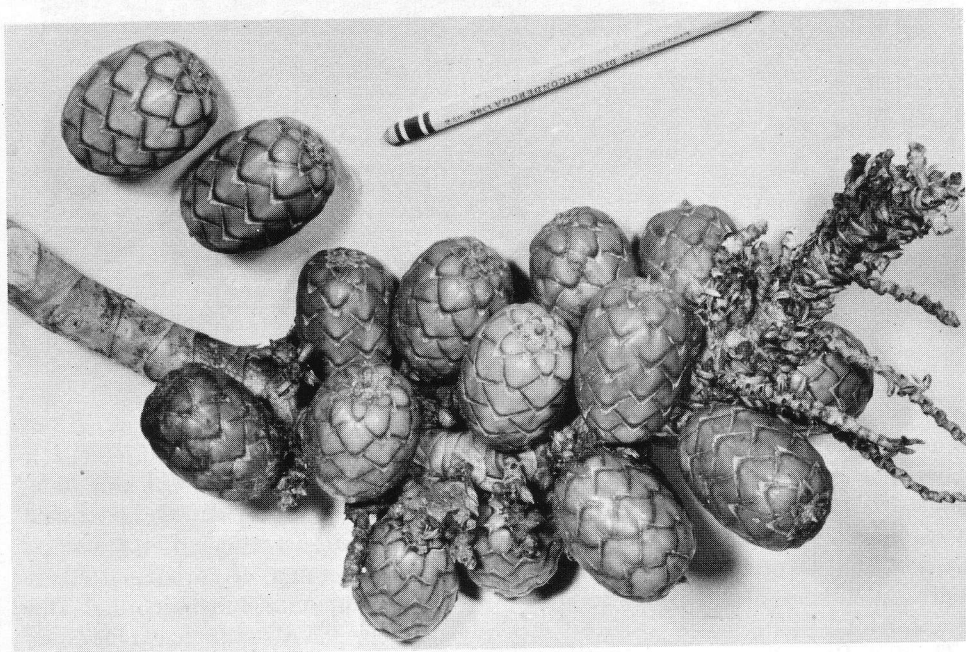
ing to the tips of the ultimate fronds. This upper level rises in a gradual curve, and the color varies to a deeper green wherever local growing conditions are more favorable. Maximum size seems to be reached on deep soils on the margins of land-locked ponds, where salinity must be at a minimum. Actual specimens collected and photographed in such a situation near Cukra Hill, north of Bluefields, in eastern Nicaragua, had individual fronds which measured 56 feet in length.

As would be expected, in the case of any plant having a considerable geographic range, and particularly in the instance of species whose sheer bulk discourages frequent collection, chance variants will unavoidably take their place in the literature as good species until adequate observation makes their true nature apparent. Comparison of the many specimens seen in Nicaragua, Costa Rica and Panama would make it

seem obvious that *Raphia nicaraguensis* may safely be relegated to the ranks of synonymy. P.H.A.

Palms of Quebrada Lopez

The Quebrada Lopez is one of the small streams heading on Santa Rita mountain, in the area north of Colon, Panama, on the line of the trans-isthmian highway. It is an area of heavy rainfall, and much virgin timber of the finest sort. Palms abound, the most conspicuous species being *Scheelea zonensis*, *Corozo oleifera*, *Astrocaryum Standleyanum*, *Astrocaryum alatum* (very common), *Oenocarpus panamanus*, *Iriartea exorrhiza?* (very common), [this perhaps *Socratea durissima*—Ed.] *Euterpe macrospadix* (infrequent), *Bactris* sp., *Geonoma* (probably *binervia*), *Welfia Georgii* (a common, handsome species), and *Phytelephas Seemannii*. The last named species occurs sparingly as seedling trees throughout the area, but the larger fruiting specimens, much



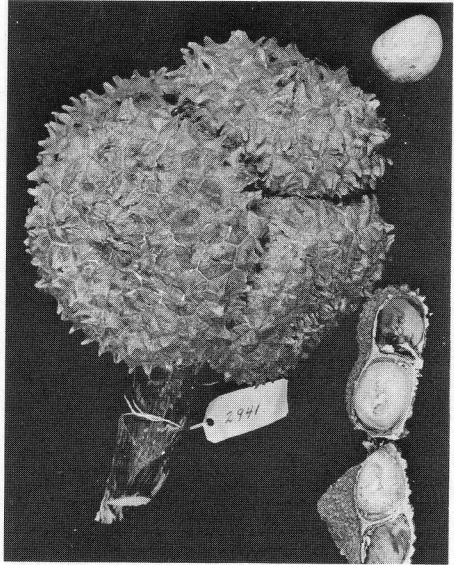
53. *Raphia taedigera* fruits (Allen 6276). Photo P. Allen.

resembling *Corozo* in superficial appearance, are limited to small groups of a few individuals, aptly termed "Islas" by the natives. Mature trees bear about twenty live leaves, of about the dimensions of a *Corozo* frond. Fruiting trees have short, massive trunks, covered by the persistent leaf bases, the axils of which bear an ample accumulation of dirt and trash. Among these decayed bases the fruit clusters mature, two to four in number in the specimens seen, of a most curious nature, being composed of from three to five flattened, armour-plated discs, attached to a short stout peduncle. These curious structures, whose surface much resembles alligator hide, contain from three to five seeds, which are the "Ivory Nuts" of commerce. So much do these fruits differ from those of most palm species, that they were long placed in a separate family together with *Nypa frutescens*, another aberrant species native to the Asiatic tropics.

P.H.A.

Some Musings on Old- and New World Palms

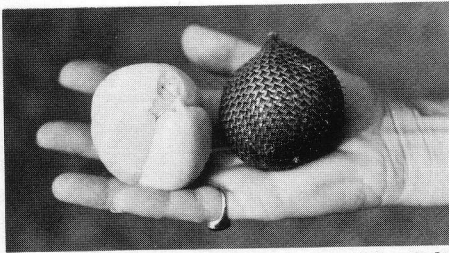
After some twenty years residence in the neotropics, an extended field trip to the paleotropics has brought on these brief musings about the palms of these separate regions. Both areas have extremely aberrant genera as exemplified by *Phytelephas* (American) and *Nypa* (Asiatic). Spiny *Bactris* in the New World (NW) occupies habitat niches similar to spiny *Daemonorops* and *Calamus* in the Old World (OW). *Cryosophila* (NW) and *Livistona* (OW) might be similarly compared. *Eugeissona* (OW) is the nearest approach to fantastic stilt-rooted *Iriartea* and *Socratea* (NW),—whose habit is assumed by *Pandanus*, the Old World screwpine. *Acrocomia* spp. and *Bactris Gasipaes*



54. *Phytelephas Seemannii* fruits. Photo P. Allen.

(NW) and *Arenga* spp. and *Cocos nucifera* (OW) are palms spread by man; and in the peach palm (*Bactris*) and coconut each area has a palm not positively known in the wild state. Actually there are more differences than similarities in the palms of these two great tropical areas.

Nothing in the Americas is comparable in usefulness to *Metroxylon* or the rattans; nothing is quite like the talipot palm (*Corypha*) for visual impact—except perhaps the wax palms (*Ceroxylon*) of the northern Andes and *Mauritia* and various Cuban fan palms. Nothing resembles *Calamus* in the understory of neotropical forests, with the local exception of *Desmoncus*, which is mostly upper Amazonian. On the other hand there is nothing quite like *Chamaedorea* and *Geonoma* in the Orient. Nor, in the Orient, is there anything that quite corresponds to the dense stands of *Orbignya* in northern Honduras, eastern Guatemala and British Honduras, or to the nearly pure stands of *Acoelorrhaphe*,



55. Fruit and contents, *Salacca edulis*, Bali. Photo P. Allen.

Corozo, *Raphia* and *Manicaria* of the coastal swamps; nor on the other hand is there in America anything quite like the great stands of *Nypa* of the Far East.

P.H.A.

Balinese Salak

Miguel Covarrubias in his fascinating book, *Island of Bali*, has this to say of *salak* (*Salacca edulis*). "*Salak*—a pear-shaped fruit that grows on a palm, tastes like pineapple, and is covered by the most perfect imitation snakeskin." I disagree with him on the taste, as did Paul. The texture and taste are more like that of an unripe but edible pear—hard, crisp, juicy and very refreshing. There are three unequal segments—the largest one contains the only seed. The covering of the fruit is snake-skin-like though not smooth like that of a snake. As can be seen in the accompanying illustrations the tip of each scale protrudes and the feel is prickly. According to my Bali diary, we drove along the east coast road of Bali as far as Karangasem then turned inland and be-



56. *Salacca edulis* fruit cluster, Bali. Photo P. Allen.

gan the ascent of the lower slopes of the volcano Gunung Agung. Looking up the side of the mountain, ahead of us, we could see extensive pure stands of this palm. About 1500 feet elevation we began entering plantations of *salak*. This is a straggly, terribly spiny, silvery palm with no trunk. After a while we stopped along a small, very steep dirt road in a sea of *salak* palms and the little old toothless owner of the planting reluctantly agreed to pose for us with his fruits, even though most of his neighbors looked on and giggled. We saw these palms the last day we were in Bali but strangely enough, in spite of our covering the Island, highlands and lowlands looking for bananas, this was the only place we saw *salaks* growing. The palms may be grown in other countries but we had not seen any of these fruits in the markets until Bali. Our native Bali hotel always served a plate of fresh *salaks* with every meal.

DOROTHY O. ALLEN

Prestoea Allenii —

A New Palm from Panama

HAROLD E. MOORE, JR.

The distinctions between *Euterpe* and *Prestoea* have recently been clarified by the writer (*Gentes Herbarum* 9: 256-262, 1963) and it seems particularly ap-

propriate, now that the proper genus has been determined, to describe a species of *Prestoea* collected in 1946 by Paul H. Allen and to provide for the species an

epithet honoring him. The notes accompanying the specimens are exemplary and although two other species from Panama—*P. roseospadix** and *P. sejuncta* L. H. Bailey—are still incompletely described they clearly belong in *Prestoea* and can be distinguished from *P. Allenii* by combinations of characteristics.

PRESTOEA ALLENII H. E. Moore, sp. nov.

Caules solitarii vel caespitosi ad 12 m. alti. Folia breviter peltolata, vaginis elongatis non scissis, pinnis utrinque ca. 50. Inflorescentiae magnae dense scabridulae, floribus masculis roseis 4-5 mm. longis, fructibus globosis 10-12 mm. diam.

Trunks rarely solitary to usually clustered with 6-10 stems averaging 10-12 m. high, 15 cm. in diam., these ringed, green when young, turning gray in age. Leaves 6-8, tending to twist and become arcuate apically at nearly a 90° angle with the base (Fig. 57), the sheaths forming a very prominently developed purple-black crownshaft; sheath ca. 1.1 m. long, glabrous except scattered brown appressed subentire to fimbriate-margined peltate membranous scales; petiole ca. 27 cm. long, glabrous, rounded below, concave above; rachis ca. 3.4 m. long with ca. 50 pinnae on each side, glabrous basally where rounded below, concave above, becoming flattened and elevated on the upper side and at length nearly deltoid in section at the apex where sparsely brown lepidote or punctulate; pinnae with scattered minute scales on surface and nerves below when young or becoming punctulate, the midnerve prominently keeled above and often clothed above with scattered small appressed brown membranous scales, below occasionally

with few scurfy ferrugineous scales, with 3-4 secondary and numerous tertiary nerves on each side, the marginal nerves somewhat thickened, apices acute or sometimes irregularly divided especially toward the tip of the leaf, the basal pinnae ca. 53 cm. long, 1 cm. wide, lower pinnae ca. 77 cm. long, 2.5 cm. wide, median pinnae ca. 1.18 m. long, 6 cm. wide, apical pinnae ca. 36 cm. long, 2.8 cm. wide. Inflorescences 2-4, infrafoliar, ca. 1.05 m. long; lower bract ancipitous, relatively thin, ca. 42 cm. long, 10.5 cm. wide, glabrous except for pale or brown appressed ceraceous scales marginally, upper bract inserted 8 cm. above the lower, ca. 1.1 m. long, terete in bud, 5 mm. thick, rostrate, more or less densely ferruginous lepidote-tomentose, an incomplete third bract ca. 25 cm. long, 4 cm. wide present at apex of peduncle; peduncle ca. 20 cm. long, 1.8 cm. in diam. at apex; rachis ca. 8.5 dm. long with more than



57. *Prestoea Allenii* (Allen 3531) from Kodachrome by Paul Allen.

**PRESTOEA ROSEOPADIX* (L. H. Bailey) H. E. Moore, tr. nov.

Euterpe roseospadix L. H. Bailey, *Gentes Herbarum* 6: 201. 1943

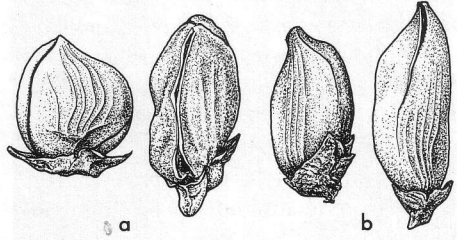
100 white to pinkish pendant rachillae to ca. 73 cm. long, 4 mm. in diam. at anthesis except the thickened base and more slender apex, the rachillae subtended by acute bracts up to 7 cm. long at base of rachis or the bracts only low and crescent-shaped toward the apex of the rachis, both rachis and rachillae more or less densely scabridulous with very short pale shining conic stiff hairs. Flowers in triads nearly to the apex of the rachillae, subtended by very low explanate bracteoles; staminate flowers 4-5 mm. long, pink, the sepals acute, ca. 2 mm. high, thickened basally, petals 4-5 mm. long, 2-2.5 mm. wide, stamens 6, about as high as petals, filaments inflexed at the apex, pistillode ca. 1 mm. high, trifid: pistillate buds ca. 3 mm. high. Fruit globose, black, 10-11 mm. in diam., 11-12 mm. high when dry the stigmatic residue in the upper third, mesocarp thin with a layer of thin flat pale fibers over very thin endocarp adherent to the globose seed, this 8-9 mm. in diam., raphe branches loosely anastomosed; endosperm ruminant; embryo basal.

PANAMA. Prov. de Chiriquí: vicinity of Cerro Punta, 2,000 meters altitude, May 24, 1946, *Paul H. Allen 3531* (BH, holotype; MO, isotype).

Vernacular name: *Maquenque*.

The collector noted that *P. Allenii* is a common palm ranging from 1,500-3,000 meters altitude in heavy rain forest, first found as single-trunked individuals or weakly clustered at about 1,500 meters and attaining maximum development at 2,500-3,000 meters altitude where 6-10 trunks develop from a common base.

In addition to other Panamanian species, there are three or four in Costa Rica and Nicaragua of which only *P. decurrens* (H. Wendland ex Burret) H.



58. Staminate flowers of *Prestoea Allenii* (a) and *P. roseospadix* (b) x 5.

E. Moore seems related to *P. Allenii*. The densely pilosulous inflorescence axes, white flowers with short hairs on at least the center of the sepals and on the tips of staminate petals, as well as smaller stature, long-petiolate leaves, and fruit amply distinguish *P. decurrens* from *P. Allenii*, *P. sejuncta* and *P. roseospadix*.

To supplement the treatment of palms in Woodson and Schery, *Flora of Panama* 2: 373-375, 1943, it may be useful to provide a key to distinguish, so far as material permits, the three species of *Prestoea* in Panama.

1. Inflorescence glabrous, the rachillae slender, 1-2 mm. in diam. at anthesis, 2-4 mm. in diam. at fruit when dry; staminate flowers 5-6.5 mm. long, attenuate, often subsymmetric, the petals about 3 times as long as broad, the sepals scarcely thickened basally; fruit 9-10 mm. in diam.; pinnae with a continuous or almost continuous line of prominent membranous brown-and-white scales on the mid-nerve below; crownshaft not described. *P. roseospadix*
1. Inflorescence densely scabridulous at anthesis (not known at anthesis in *P. sejuncta* but apparently with a residue of scabridulous hairs in fruit), the rachillae 4-6 mm. in diam. at the middle in anthesis and fruit; staminate flowers (unknown in *P. sejuncta*) 5 mm. long or less, abrupt-

ly acute, often markedly asymmetric, the petals scarcely twice as long as broad, sepals thickened basally; fruit 10-12 mm. in diam.; pinnae lacking prominent membranous scales on the midnerve below but sometimes with ferruginous scurfy scales near the base; crownshaft developed or not.

2. Crownshaft not developed; trunk solitary (always?); petiole elongate, 7.5-9 dm. long; pinnae 35-40 per side.

P. sejuncta

2. Crownshaft prominently developed; trunks usually clustered; petiole short, ca. 2.7 dm. long; pinnae ca. 50 per side.

P. Allenii

It is unfortunate that complete comparisons cannot be given owing to lack of information on the crownshaft of *P. roseospadix* and flowers of *P. sejuncta*. The presence or absence of a crownshaft has been used as one of the

criteria to separate *Euterpe* and *Prestoea* and has, in general, been considered a constant generic characteristic. In *Prestoea*, as also in *Pinanga*, the leaf-sheaths may either be closed, forming a crownshaft, or split and not forming a crownshaft, depending on the species, but at the specific level the type of sheath does appear to be constant at maturity. Thus I do not hesitate to separate *Prestoea Allenii* and *P. sejuncta* on this basis despite the lack of flowers of the latter. A very similar palm which I have seen only in sterile condition, grows also in Costa Rica above Finca La Florita some 85 kilometers from San José on the road from Cartago to El General at an altitude of 2,450 meters. From the verbal description, Paul Allen thought that the palms from Costa Rica and Chiriquí might be the same but only an adequate collection of the Costa Rican palm will provide an answer.

Palms at Lancetilla

W. H. HODGE*

To Central American woodsmen, the name *lancetilla*, meaning "little lance," refers to a small slender palm, *Astrocaryum mexicanum*, which is abundant in the wet hillside forests of the north coast of Honduras and Guatemala. The colloquial name is well given for the trunks, and indeed most parts of this species, are covered with a dense armature of sharp blackish spines. These two-edged "little lances," which easily penetrate the flesh, are a constant menace to anyone tramping woodland trails where this palm abounds. To botanists and horticulturists familiar with Central America the name "Lancetilla" means

something else. It brings to mind an outstanding tropical garden located in a small valley of the same name on the northern Honduras coast. Garden and valley share the same name which derives from the abundant *lancetilla* palms to be found on the surrounding hills.

For two reasons it is especially fitting to devote a few pages of this memorial issue of *PRINCIPES* to the Lancetilla Valley and its garden. First of all it was Paul Allen's last base of operations. He was Director of this garden at the time of his passing. Secondly, the garden has (besides its outstanding collection of other economic plants) a notable collection of palms. These, together with the numerous native species—which inhabit the neighboring forests,

*The writer wishes to thank the United Fruit Company and especially those of its officials without whose aid, numerous courtesies and hospitality this article could not have been written.

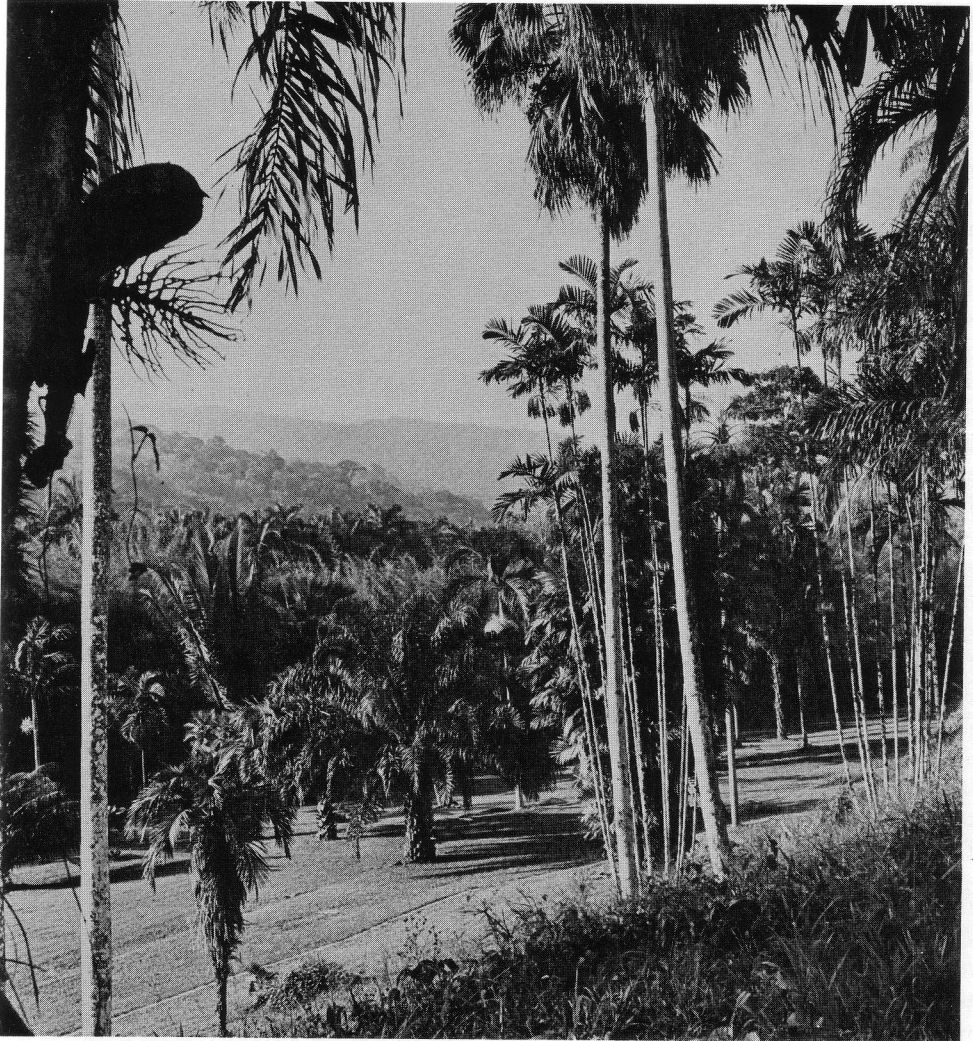


59. Aerial view of Lancetilla Experiment Station in the Lancetilla Valley. Photograph is looking north to Caribbean Sea (top) with Tela in distance. The Lancetilla Garden plantings occupy the flatter land in center foreground. The royal palm allee may be seen in center foreground while above it is guest house with lawns and employee housing and propagation area to right. Photo courtesy United Fruit Company.

savannahs and swamps—make this spot an alluring one for all those interested in these wonderful plants. For at Lancetilla one can combine the pleasure of seeing and studying mature cultivated specimens of some of the outstanding palm genera of the tropics with the pleasure of tramping trails in permanently protected rain forests where palms occur ranging from the giant *cohune* or *manaca* (*Orbignya Cohune*), described as “the finest and most imposing of all Central American palms,” to insignificant though highly ornamental species of the shaded forest floor.

The Lancetilla Valley and its garden lie just south of the port of Tela, one of the main Honduras bases of the

United Fruit Company. Tela is a town whose inhabitants, like many others in this part of Honduras, depend mainly on the production and shipment of bananas for their livelihood. From the port various spurs of the Tela Railroad, the local operating subsidiary of the Fruit Company, radiate out into the flatter coastal plain. Running due south from the town is the Tela River, a small stream whose clear headwaters serve as the source of the local water supply. A spur of the railroad winds three miles through mature test plantings of exotic tropical trees to the Lancetilla Experimental Station, which has been since 1925 the main base for plant introduc-



60. General view of palm collection with rain-forested hills beyond. Photo W. H. Hodge.

tion and associated testing activities of the United Fruit Company.

The Lancetilla Garden, as it is more familiarly known, is neither a show or display garden nor a true botanical garden, but rather a living germplasm collection of economically important tropical plants, including ornamentals. It is safe to say that during its lifetime Lancetilla has been the major source of foreign plant introductions not only for

Honduras but for most of the adjacent Central American republics as well.

It was in 1925 that the Garden was first established. The prevalence of the destructive Panama disease among the Gros Michel bananas, then widely planted in the lowlands, forced officials of the Fruit Company to consider the possibility of growing other economic crops on either a rotation or replacement basis on the abandoned banana lands. Before

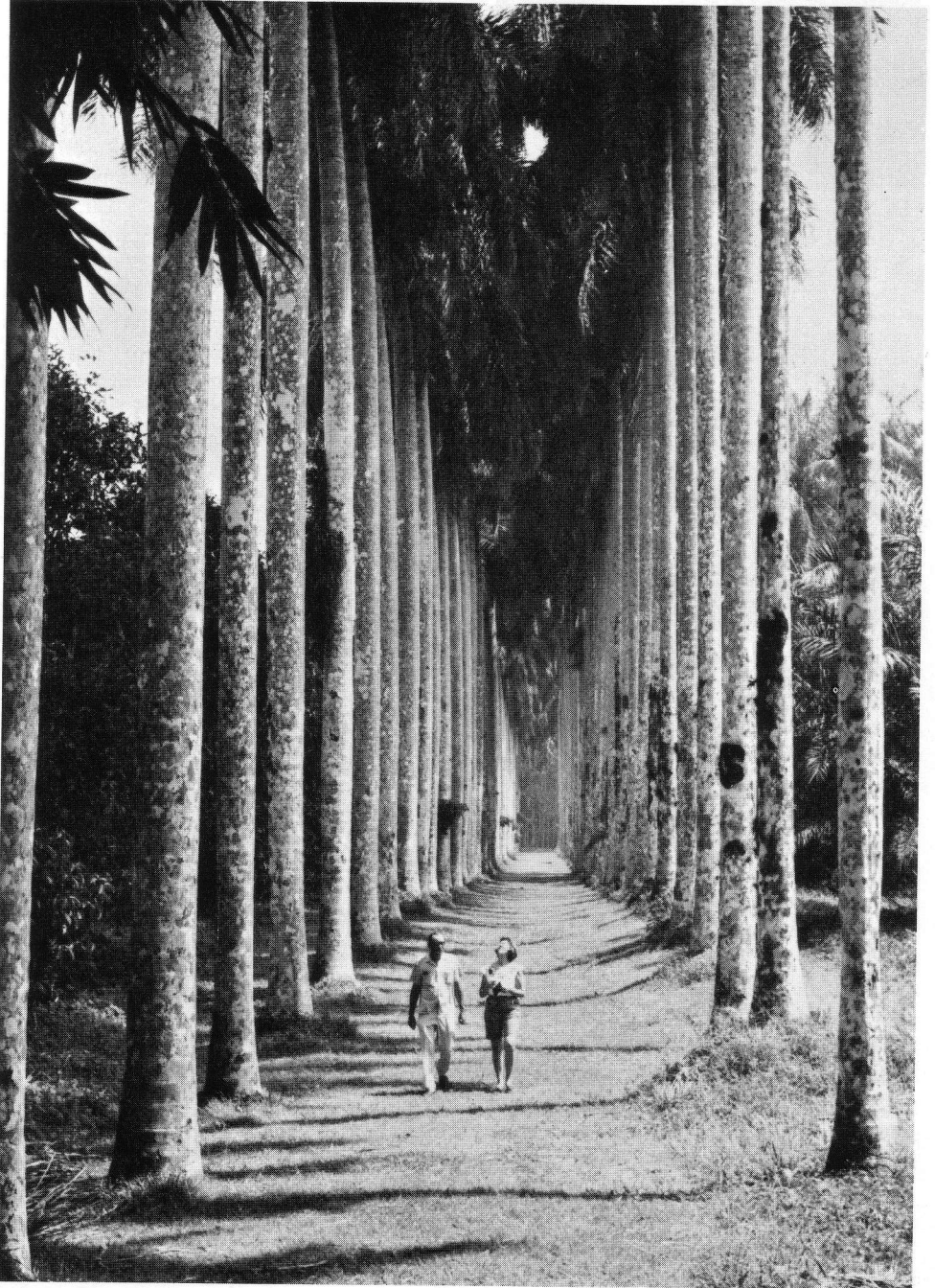
any large scale investment in a potential new crop can be made, it is necessary to determine the crop's suitability in a new area by initial test plantings. These new crops have to find the rather uniform local climate a congenial one, which in terms of the Lancetilla Valley means a heavy but haphazard annual rainfall (126-172 inches), uniformly high relative humidity (seldom less than 80 per cent), and a mean temperature running between 70° and 80°F. Thus was Lancetilla born—for the cultivation, observation, and study of a wide variety of tropical economic species that might have potential local agricultural use. These include edible fruits, timber trees, oil producing plants, and the like.

The United Fruit Company was fortunate in finding for Lancetilla a plantsman with outstanding experience in the field of plant introduction. This first director of the Garden was Wilson Popenoe, who was brought to Honduras as a skilled agricultural explorer from the United States Government's foreign plant introduction unit, then headed by David Fairchild. During the first five years of his stewardship the Lancetilla Garden came into being, complete with nurseries, an arboretum, young orchards, forest plots, ornamentals, and test plantings of dozens of potentially useful species. Initially several hundred different tropical plants were assembled from all over the world. During the forty odd years that have passed since those first plantings in the late twenties, the arboreal species have developed into outstanding specimen plants. Indeed, in this respect, this garden is a mature one and as such is the finest in Central America and one of the best in the New World. Moreover, the variety of species grown has steadily increased so that the 1964 Garden inventory lists some 373 species (including horticultural varieties

or clones), in 406 genera, and representing nearly 100 different families of plants. Of this total one group of plants is dominant. This is the palm family, representatives of which comprise about a tenth of all the species grown at Lancetilla. All in all there are presently 101 species and varieties of the *Palmae* to be found in that section of the garden devoted to these plants. At least twenty additional native palms may be found close by, mainly in adjacent undisturbed watershed forests.

Scientists or visitors who are garden *aficionados* are always welcome at Lancetilla. However, one must make prior arrangements with United Fruit Company officials at Tela for a visit, because there is no road up the valley to the garden. Instead there is a three-mile-long rail spur served by one of the numerous auto ferrils, serviceable open-sided hybrid cars with automobile engine and flanged railroad wheels. These are the normal means of transport for Company personnel using the Tela Railroad system. The ten-minute rail ride carries one somewhat noisily but enjoyably along the small Tela River. One passes first through mature plantings of tropical timber trees which, except for their well lined up rows, gives one the feeling of being within lowland rainforest. Towards the end of the line the car suddenly plunges into a green tunnel, a hundred yards long, of the giant spiny bamboo (*Bambusa arundinacea*) and as suddenly is ejected into the main portion of the Garden with its rolling green lawns and park-like atmosphere. Almost immediately the rail line ends. The car is swung around with a turntable and you are at Lancetilla. It is at this very point that the palm collection begins.

Except for a few special plantings, Lancetilla's palms are limited to several



61. The fine allee of Cuban royal palms at Lancetilla, inspired doubtlessly by a similar allee of Caribee royals to be seen in the Botanic Garden at Rio de Janeiro which was known to Wilson Popenoe. The trunks of this series of palms are mottled with colorful lichens, some bright orange in hue. Photo W. H. Hodge.



62. The Lancetilla Garden palm collection as seen from the end of the narrow gauge rail line which runs from Tela. An autoferril is being turned on the turntable. Photo W. H. Hodge.

acres of mostly flat land lying on the valley bottom just south of the terminus of the rail line. The best over-all view of the collection is from an old river terrace which lies above the collection to the west. On the same terrace, a hundred yards distant, is situated the Garden's guest house, and a spacious lawn runs from it southeasterly towards the palms. The cool of the morning, when the sun angles low through the boles—across the green palm glade—is the best time to enjoy these plants. The only better moments are during moonlight when all is quiet save for the occasional rustling of giant leaves and the exotic animal noises of the tropical night.

The palms are mostly planted as specimen plants in botanic garden style. Their presence here is to demonstrate their growth potential in the Lancetilla Valley environment. Although most of the palms are ornamental—even the economic species—these cannot be

called ornamental plantings. The connoisseur of palms, especially if he is from the north, will be attracted to those species native to the deep tropics. These normally do not thrive in strictly sub-tropical gardens. He will know from the appended list which palms to seek out—on the edge of the old river terrace the handsome cane-like clumps of the slender cluster palm, *Ptychosperma Macarthurii*; the heavier spiny clumps of the utilitarian peach palm, *Bactris Gasipaes*; the stemless ivory-nut palm or *tagua*, *Phytelephas macrocarpa* with its curious elephant-trunk-like inflorescences and heavily armored fruits; several interesting oncospermas; the East Indian sealing wax palm, *Cyrtostachys Renda* with its unbelievable red leaf sheaths; and many more.

One outstanding ornamental planting of palms does exist in the Garden though it is somewhat apart from the main collection. This is a mature *allée* of Cuban royal palms (*Roystonea regia*), planted in the late twenties along the east side of the orchard of mangosteens. The impressive 800-foot-long, grassy avenue—which roughly parallels the north-south valley axis—contains upwards of 110 palms, each planted about 15 feet apart. These are presently about 75 feet tall.

Apart from the ornamental palms, many of which have entered Central American gardens by way of propagations from Lancetilla, the most important economic palm to have “graduated” from the Garden's ranks is *Elaeis guineensis*, the African oil palm. Some two dozen clones—mostly Javanese and Sumatran selections—of this highly important seed-oil producer are maintained as a reservoir of germplasm for breeding purposes at the garden. Here also is the oldest stand of oil palms in tropical America, the grandparents, you might call them, of thriving and pro-

ductive plantations in Central America. The discovery of agricultural "pay offs" of this type, to be grown on former banana lands abandoned because of disease problems, was (the reader will recall) one of Lancetilla's original reasons for being. When one sees the thousands of profitable acres of oil palms and the Fruit Company's modern oil extraction plant at nearby San Alejo, one can be happy that the palms have paid their part, as it were, for the operation of Lancetilla.

Any description of Lancetilla's palms would be incomplete without brief mention of the wild species inhabiting the nearby forests. Few gardens anywhere can boast of a site which lies, like this one, adjacent to protected natural rain-forest. Yet for the Garden's 1050 acres there are 4000 protected acres of forested watershed, largely untainted by man. Luckily the valley flora has been rather carefully studied and is probably better known than any like tract elsewhere in tropical America. Thanks are due that Nestor of Central American botanists, the late Paul C. Standley, whose *Flora of the Lancetilla Valley, Honduras* is still the Bible for the botany of the area and essential to all scientific activity dealing with the natural history of this part of the Honduras coast. Wilson Popenoe encouraged Standley to use the new garden during the winter of 1927-28 as a base for botanical activity in the valley. The flora was published in 1931 and, because of Standley's fine descriptive style, is recommended reading (especially the introduction) for any visitor interested in either the local flora or the garden.

Speaking of the palms, Standley writes, "Palms are abundant in the Lancetilla region as to both species and individuals, and there are represented



63. Main palm collection with *Ptychosperma Macarthurii* in foreground. Photo W. H. Hodge.

here most of the groups which grow in Central America. The number of species is, of course, not so great as might be found in an area of similar size farther southward." He then goes on to describe in detail the following species, only one of which, the coconut, is an exotic cultigen: *Acrocomia mexicana*, *Astrocaryum Cohune* [= *A. mexicanum*]*, *Attalea Cohune* [= *Orbignya Cohune*], *Bactris hondurensis*, *Bactris major*, *Bactris* sp., *Chamaedorea Arenbergiana?*, *Chamaedorea geonomaeformis*, *Chamaedorea graminifolia*, *Chamaedorea Pacaya*, *Cocos nucifera*, *Desmoncus polyacanthos*, [*Desmoncus* sp.], *Geonoma binervia*, *Geonoma glauca* [*Calyptrogyne glauca*], *Geonoma trifurcata* [*Asterogyne Martiana*], *Guilielma utilis* [*Bactris Gasipaes*], *Iriartea dur-*

*Some of the names used by Standley are now incorrect in which instance they have been followed by the correct name in brackets. Ed.

issima? [*Socratea durissima*], *Malortia gracilis* [*Reinhardtia gracilis* var. *gracilis*], *Oreodoxa oleracea* [*Roystonea Dunlapiana*]. Additional wild species are doubtless now known from the area.

Inasmuch as Standley has written as well as any about the local upland forests and their palms, it seems fitting to close this account of the palms of Lancetilla with some brief excerpts from his volume:

"The hills rise to a maximum elevation of 600 meters (2,000 ft.), and . . . are covered with heavy primeval forest. Their slopes are very steep, and the vegetation so dense and tangled that progress over them is difficult except where trails have been opened. The forest usually is dripping wet, and the atmosphere beneath it is much like that of a northern hothouse.

"Leaving the office at Lancetilla, one goes southward across some of the plantings and in five minutes comes to the Tela River, a shallow stream ten yards wide, flowing over a bed of rounded white stones and coarse gravel, across which one may hop from stone to stone if the water is low . . .

"Across the river one walks for a few minutes through some abandoned bananas . . . In a moment one passes . . . to the open trail and the deep shade of the tall forest . . . One notices immediately the stillness. Great blue butterflies float silently across the path.

"The customary silence of this great forest and the dimness of the light give it a dreary and foreboding atmosphere much the same as that pervading the deep Douglas fir forests of our own Rocky Mountains. The trees are exceedingly tall, rising to 100 feet or more, their tops so far above

one's head that the leaves are indistinguishable . . .

"Looking about in this dense forest, we note that there are two principal levels of foliage: the tops of the tall trees, and also a very considerable understory at a comparatively low level. This understory consists of smaller trees that seem to delight in the darkness. Many of them are species of such a nature that apparently they cannot exist in full sunlight.

"The understory is composed very largely of palms, and of these the most abundant and conspicuous is the cohune or corozo (*Attalea cohune* [*Orbignya Cohune*]), which here attains its best development. There are cohunes also in the lowlands, even in rather swampy ground, but they are most plentiful on the lower hill slopes. When this forest is viewed from a distance, the cohunes are not at all or scarcely visible, their foliage being concealed by the taller trees under which they grow. On the slopes they stand closely together and very successfully shut out what light filters through the trees above. Their huge leaves, frequently thirty feet long, wither after they fall to the ground and make a thick mulch over it. The nuts germinate freely and form vigorous beds of seedlings.

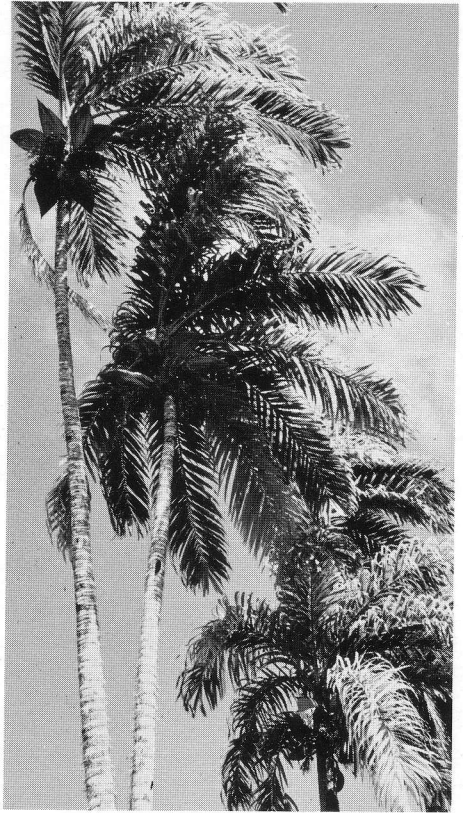
"Other palms, but lower ones, grow with the cohune. The most noticeable is the lancetilla (*Astrocaryum cohune*) [*Astrocaryum mexicanum*], with its offensively armed stems, which has given the name to the valley. There are also *Bactris* species, two handsome *Geonomas*, and several graceful species of *Chamaedorea*. One of the neatest of the palms found in such situations is *Malortia gracilis* [*Reinhardtia gracilis*]. It is cer-

tain to attract attention because of its airy habit and especially on account of its cross-shaped leaves with rows of perforations or 'windows' close to the midrib. A palm of less admirable characteristics is the bal-
aire (*Desmoncus*). It is a clambering vine, and possesses pinnate leaves whose midrib is prolonged and whip-like and provided with abruptly refracted spines. These tips grope blindly in all directions, and grip any passing object, ripping it mercilessly . . .

"The forest of these hills has every evidence of being perfectly primeval. There are all the marks that are supposed to furnish reliable criteria upon this subject — giant forest trees in great variety, an abundance of corozos and other tall palms, and a great profusion of the more significant small palm species, tree ferns, and many other plants that never are known to exist in second growth forest."

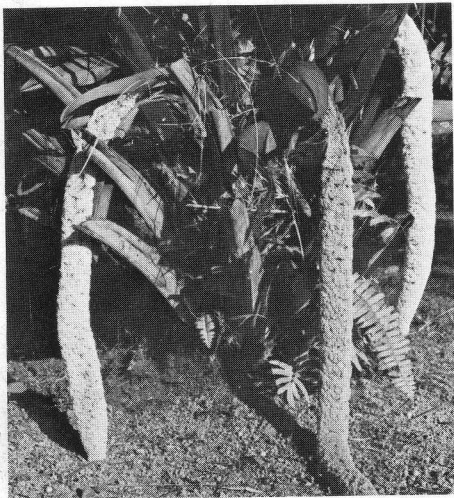
Palms Growing at Lancetilla

Acoelorrhaphe Wrightii
Acrocomia Totai
Aiphanes caryotaefolia
Archontophoenix Alexandrae
Areca Aliciae
Areca Catechu
Areca triandra
Arecastrum Romanzoffianum
Arenga pinnata
Arenga Wrightii
Arikuryroba schizophylla
Astrocarym alatum
Astrocaryum mexicanum
Astrocaryum Standleyanum
Attalea sp.
Bactris Gasipaes
Bentinckia nicobarica
Borassus aethiopum
Borassus flabelliformis



64. Pejibaye palms (*Bactris Gasipaes*) in the collection at Lancetilla. Photo W. H. Hodge.

Caryota Cumingii
Caryota mitis
Caryota urens
Cocos nucifera
Corozo oleifera
Corypha umbraculifera
Cryosophila albida
Cryosophila Warscewiczii
Cyrtostachys Renda
Chamaedorea elegans
Chamaedorea sp.
Chrysalidocarpus lutescens
Chrysalidocarpus madagascariensis
Daemonorops fissus
Dictyosperma aureum
Drymophloeus sp.
Elaeis guineensis
Euterpe edulis



65. A male plant of *Phytelphas macarocarpa* in flower at Lancetilla. Photo W. H. Hodge.

Euterpe oleracea
Heterospathe elata
Latania lontaroides
Licuala grandis
Licuala peltata
Livistona rotundifolia
Livistona Saribus

Livistona sp.
Manicaria sp.
Mauritia setigera
Metroxylon sp.
Nephrosperma Vanhoutteanum
Oenocarpus panamanus
Oncosperma tigillarum
Orbignya Cohune
Phoenix canariensis
Phoenix Roebelenii
Phytelphas macrocarpa
Pritchardia pacifica
Ptychoraphis augusta
Ptychosperma Macarthurii
Ptychosperma sp.
Raphia vinifera
Roystonea Dunlapiana
Roystonea regia
Roystonea sp.
Sabal texana
Salacca edulis
Syagrus orinocensis
Veitchia Joannis
Veitchia Merrillii
Veitchia Winin
Welfia Georgii

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