PRINCIPES

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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 Executive Secretary.

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JOURNAL OF THE PALM SOCIETY

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

EDITOR: Harold E. Moore, Jr.

EDITORIAL BOARD:

Paul H. Allen, David Barry, Jr., Duncan Clement, Walter H. Hodge, Eugene D. Kitzke, Harold F. Loomis, Nixon Smiley, Dent Smith.

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Contents for April

Cover Picture

Neodypsis Decaryi in flower at the Fairchild Tropical Garden, Miami, Florida. Note the inner bract which, though usually deciduous, has persisted on this inflorescence. See also page 71. Photograph by Robert W. Read.

NEWS OF THE SOCIETY
Dues Policy Change

Dear Members:

As the President of your Society I have been studying, through the help of a Finance Committee headed by Dave Barry, certain serious financial problems. During the early life of our Society, it was simple to operate a dues system that notified each member of the need for renewal on the anniversary date of his having joined the Society. With growth of our Society this system has become almost unworkable and certainly inefficient in that the Executive Secretary and Treasurer have to be active in collecting dues twelve months around the year. In fact, it is so cumbersome and confusing that we may have even neglected to send out a notice to some of you resulting in loss of your support for one year.

Based upon the Finance Committee report and conferences with the Executive Staff with concurrence by the Board of Directors the following proposals have been acted upon:

1. Change dues due-date to a common anniversary date eliminating the present system of billing each member separately in keeping with the anniversary month of having joined the Society.
2. Establish a fixed amount for dues entitling membership and subscription.
3. Establish additional classes of membership to allow those members who so wish to make larger contributions to the Society.

The month of May has been selected as the most timely period for setting a uniform dues-date. You probably will be over your shock of taxes and Christmas expenses by this time. Fortunately, it also happens to be the beginning of our fiscal year and the anniversary date of the largest number of members.

Now there immediately develops the problem of how to be fair to those who may have submitted their annual dues just before the new system was announced. This problem also applies to recent new members. We feel that the dues schedule listed below holds part of the answer. There is no way that we can set the Society on a solid financial basis without at least a small sacrifice by every member during this awkward dues changeover period. However, it is proposed that each member consult his own situation and if he has made a recent donation and does not feel it fair to submit the $10 in dues on May 1st he should prorate the amount already paid in and pay the balance. One example might be as follows:

Dues paid in January	$10.00
Less portion for January thru April	3.33
Balance unused dues credit	$6.67
Therefore May 1st billing	$3.33

In such a case the payment of $3.33 on May 1st would satisfy this member's obligation through April 30, 1962. However, I trust many will avoid the arithmetic and make the small sacrifice of sending the entire $10.

The Society recognizes there are burdensome currency restrictions for some members outside the United States and their membership dues will be accepted and welcomed in amounts less than $10 as before.

It should be noted that the minimum dues class of $10 is less than current operating costs per member. However, we have had a number of members who through generous support have pro-

vided the balance needed to operate. We trust that no one will reduce his donation to the minimum amount and rather hope that everyone will donate over and above the $10 if he can. Although the Society is currently solvent, we have been approaching a hand to mouth economy and have had no contingency to fall back on.

The new dues structure is:

$10.00	Regular Member
15.00	Associate Member
20.00	Contributing Member
25.00	Sustaining Member
50.00	Fellow
100.00	Donor

Hereafter, each member will receive a reminder that dues are payable in May, with a contribution card enclosed for his convenience.

This change in handling dues has been long considered and perhaps too long delayed since the continuance of our Society depends upon enthusiastic support by the entire roster of members.

Respectfully,

E. D. KITZKE, *President*

Gift from S. C. Johnson & Son, Inc.

The Johnson's Wax Fund, which in 1958 presented the Society with a gift in the amount of $250, this year, in consideration of the fact that one of its employees, Eugene D. Kitzke, was elected President of The Palm Society has again made a generous contribution doubling the amount to $500.

This comes at a very opportune time, as the Society is in the throes of a reorganization and there will be a lag in members' contributions until the new arrangement goes into effect while expenses continue at the same rate.

Since the Johnson Company is a very large user of carnuba wax from the leaves of *Copernicia cerifera* and since Mr. Kitzke is in charge of the program of increasing the production of *Copernicia* wax by improved culture and by hybridization, the company is especially interested in our organization. All our members will, I am sure, join me in extending sincere thanks to the Johnson's Wax Fund and to the executives of the company for their generosity.

WALTER J. MURRAY, *Treasurer*

Meetings

In January your Executive Secretary went to West Palm Beach at the invitation of the local chapter of the Florida Nurserymen and Growers Association to present a talk on palms at their monthly meeting.

The auditorium at the County Agent's Building was filled with a very attentive and interested audience. Local members of The Palm Society had been invited also. After showing slides of palms useful in landscape work and a lively informal discussion during which members of the audience offered instances from their own experience, a number of persons indicated their interest in joining the society. From this number, several new members have been inscribed in our roster.

Mrs. Wait was royally entertained by Mr. and Mrs. D. K. Miller of Mai Kai Nursery, and by Mr. and Mrs. John B. Van Epp, members of the Society. Mr. Jim Griffin, executive secretary of the FNGA was present and told us of some interesting discoveries made while doing research on palms during his studies at the University of Florida.

* * *

Letters are received at Society headquarters from many members containing ideas, suggestions and questions. These

are all duly noted and replied to. In this way we are building up a fund of palm information which can become useful to all. We are glad to pass along information from member to member, and we urge all members to write, sending questions or items of interest from their own experience.

Valuable tips are received by word of mouth, also. In a recent visit to Dr. Lawrence M. Simonson at Lantana, Florida, we enjoyed seeing his truly remarkable collection of rare plants, including many fine palms. Dr. Simonson asked us to pass along a suggestion regarding spraying young palms. He said that he had lost two choice palms which still were in containers because the spray material was allowed to accumulate in the heart of the palm and stay there. He suggests that after a short time the container should be laid on its side and the liquid be allowed to drain away. Dr. Simonson invites Society members to come and see his plants after making advance arrangements for a convenient time.

Another member, Mrs. E. G. Piper, remarked that she frequently re-reads her back numbers of PRINCIPES, and as her experience with palms grows, so does the benefit she receives from the information old issues contain. This is something which many of us could do with profit.

Local Groups Elect Officers

The Southern California group held a meeting at the Los Angeles State and County Arboretum at Arcadia, on February 5th, for the election of officers and the planning of future activities. Edwin Moore, of San Diego, was elected Chairman; Mrs. Ben Roth, Tujunga, Secretary; Mrs. Perry Nollar, Whittier, Membership Chairman. Tentative plans were made for an excursion to the Palm Springs-Indio area, a meeting at the home of the new secretary with a program and plant exchange, a trip to Santa Barbara and a visit to the Huntington Botanical Garden.

The Greater Miami group held its monthly meeting at Simpson Garden Center on March 1st. Newly elected officers are: Col. E. G. Piper, Chairman, Wesley Wilson, Secretary-treasurer. Due to the efforts of the officers, a larger number of members than usual was present.

All members within driving distance are urged to attend these meetings. Members in both areas have been asked several times to indicate their desire to attend meetings or go on field trips by sending five self-addressed postcards to the secretary of the group in their area. We cannot expect our busy secretaries to send out over one hundred notices to all members in their areas each time. Some members do not seem to have understood this arrangement, so let us repeat once more:

Any member who wants to attend meetings or go on field trips is requested to send five postcards addressed to himself or herself to Mrs. Ben Roth, 10223 Haines Canyon, Tujunga, Calif.; or to Mr. Wesley P. Wilson, 1170 N. E. 134th St., North Miami, Fla. Those not doing so run the risk of not knowing about these affairs.

* * *

The Society's founder, Dent Smith of Daytona Beach, Fla., and Bob Nelson of San Ysidro, Calif., recently made an unusual trip down the peninsula of Baja California to its southern tip in a Jeep station wagon, camping out and digging their way through some rugged territory.

Then they crossed the Gulf of California from La Paz to the mainland and visited a number of places on their way back north. We hope that this trip will form the basis for another of Dent's interesting articles for PRINCIPES.

LUCITA H. WAIT

THE EDITOR'S CORNER

Society members in Florida and the West Indies who seek advice on garden problems in this region may now turn to a recently published book by one of the directors of The Palm Society and the Director of the Fairchild Tropical Garden, Nixon Smiley. *Tropical Planting and Gardening for South Florida and the West Indies* (University of Miami Press, Coral Gables, Florida, 1960) covers the problems of a special climate and attendant difficulties and advantages in gardening.

Palms are treated in a separate chapter which reviews the uses of palms in the tropical garden and lists on six pages the more common and some of the rare palms suitable for Florida. Other chapters consider trees, shrubs, vines, herbs, grasses, ground covers, and fruits. Based on long experience with gardening in South Florida, Mr. Smiley's book should be a boon to gardeners of the area.

New contributors this month are two. Brother Alain (Enrique E. Liogier Allut), successor to Brother León as Professor of Biology at Colegio de la Salle in Havana, is continuing the *Flora of Cuba* and has written on Cuban palms. Brother Alain was born in France but is now a Cuban citizen. He was a Fellow of the John Simon Guggenheim Memorial Foundation in 1951-52, 1954-55 and 1958-59. Mr. D. M. A. Jayaweera, who is currently studying at Harvard University on a Rockefeller Foundation grant, is Superintendent of the Royal Botanic Gardens at Peradeniya, Ceylon.

IN AND OUT OF THE PALM GARDEN

In recent years growers have been discovering that "stepping up" to egg cans or still larger containers has greatly increased the growth rate of palms and at the same time has eliminated the labor of frequent shifting to slightly larger containers. In the past the first rule with potted plants has consisted of a warning not to overpot, but it appears that heeding it has not been the fastest way to grow a palm to good marketable size. Stepping up palms into pots or other containers much larger than immediately needed for root room is a good practice, however, only if special attention is given to drainage, which should be perfect for all palms not suited to soggy soil. The overpotting fetish, now at last laid to rest, held sway unchallenged for many long years because of the likelihood of overwatering, thus to compact the soil, prevent aeration, sour the growing medium and rot the roots. The premise is correct, but takes no account of the fact that water can be used sparingly and the drainage may be controlled by proper measures. Unlike porous pots, the cans used to "grow on" the palms give up moisture only at the surface of the soil and through any holes in the steel sides and bottoms. If the soil is heavy and moisture-retentive, the drainage might be insufficient no matter how many slots, slits or other holes were made in the can, wherefore it is a good precautionary measure to line the bottom of the punched can with an inch of gravel or crushed rock topped with another inch of coarse sand. Drying out of the soil in cans in a poorly ventilated green-

house is apt to be excessively delayed unless the soil mixture is porous enough never to become sodden or gummy. In a word, stepping up small palms into containers entirely too large at the time is safe only if provision is made for thorough drying out of excess moisture.

* * *

Because there are no set rules for palm culture, and certainly no special instructions on how to grow all the palms that roam the earth, the gardener does well to fall back on whatever he knows or can find out about the conditions obtaining in the native range of each palm. The palms of arid climates, for example, may thrive on moisture at the root but are conditioned to dry air and hence when cultivated in a humid atmosphere the foliage should never be watered or syringed. This, if not a demonstrable fact, is at least the clue that nature itself provides, and it would apply to such palms as the dates, the erytheas, the desert washingtonias, etc. Young date palms are apt to develop leaf spot in Florida even without the aggravation of artificial rainfall, and not infrequently they sicken and die from repeated hosings. The relatively dry air of coastal California is not always dry enough to prevent fungus infection in *Washingtonia filifera.* The much more humid atmosphere in Florida is a constant threat to such palms as erytheas and is perhaps responsible for the fact that scarcely a half dozen have survived anywhere in the state.

* * *

Lacking complete knowledge of the 2700 habitats of 2700 palms, it seems safest, when planting exotics with unknown cultural requirements, to dig a hole big enough to accommodate without squeezing a small female adult Indian elephant and backfill the hole with the best soil and organic matter obtainable, with the little palm stuck right in the middle. With most kinds of palms that would be 95 per cent of the battle, and the odds are, with a ton or so of cow manure incorporated, there would be no need for additions of fertilizer before 2061 A.D. The rest, for rainforest palms, is water—200 inches or more annually, and that's a lot of water.

* * *

Better than books on palm culture, if there were any, is Nature's own book. Take a leaf from it to find out what kind of soil is required for any given palm, what its requirements of moisture, what other conditions make it prosper in its native range. The aim should be to simulate all the natural factors as nearly as may be, though facsimile reproduction of them seldom would be possible. An approximation would have to suffice, even granting that no close one could be attained in every case. If the biggest hurdle can be surmounted—that of climate — some knowledge of habitat should provide the best clues for solving any cultural problems. Manifestly all the facts concerning native environments would be worth more to the gardener than a shipload of encyclopedias on gardening.

* * *

It's easy to sit back in a comfortable chair and tell the other fellow how to grow palms. It's not quite so easy to grow your own, but if you are a private gardener retired from Connecticut or Pennsylvania to the joys of subtropical gardening, you have a big edge with your palms on the commercial grower. You can use that most excellent of all adages about when and how often to water your potted palms: if the soil feels dry to your finger, water; if not, refrain. This advice, while good enough in its way, is worthless to nurserymen. They never have time to dip their fingers into

several thousand pots, or in some cases a million, and that's their hard luck.

* * *

A dirt gardener, if his name is in the Social Register, has to spend a good part of each day trying to get his finger nails really clean, just to keep up with the quality. Actually, unless the fellow is only a part-time dirt gardener, his nails will never be more than superficially clean. It takes six years of no digging to get them in condition for presentation at the Court of St. James's. Full-time dirt gardeners are quite naturally always dirty, and if their hands show no circumstantial evidence, their claims to the status are obviously fraudulent. Gardeners who garden by proxy hire other people to do their digging, and these bully lads get the grime so thoroughly impacted under their nails that it cannot be excavated soon or ever.

* * *

If it so happens that you are a deep-down dirt gardener, like this writer, you explain away that permanent black gob under your thumbnail by casually remarking that you caught your thumb in the door jamb of your Rolls-Royce. Sometimes this explanation works.

* * *

An inquiry from California about the cold tolerance of *Euterpe edulis* in Florida brings to mind the startling circumstance that there are no planted euterpes in Florida, or else, if now there are any, it would come under the heading of news. In prior years *E. edulis* has failed to live when planted in south Florida, but it seems unlikely that the failure has been due to cold weather. "It grows," according to P. Raulino Reitz, "in Bahia (Martius), Minas Gerais, Goiaz (rare), Rio de Janeiro (Glaziou), São Paulo (Lindman), Santa Catarina and Rio Grande do Sul. In Santa Catarina I have observed it in all the municipalities of the Sierra and the lowlands, from north to south in the state." Santa Catarina is south of the tropics, and frost is not unknown, especially at higher elevations. The winter climate of the other subtropical state, Rio Grande do Sul, is still cooler because it is the southernmost Brazilian state. Seed obtained from the southern palms should produce plants with more cold tolerance than from the palms of such tropical regions as Bahia.

* * *

Many species of *Coccothrinax* are proving to be remarkably cold-tolerant when set out at only four or five years of age, at which time the plants are still very small. What makes this fact noteworthy is that most of the species are natively confined to the tropics, with the largest representation in Cuba. None of the many species planted at the Fairchild Garden has failed to make the grade there because of cooler winters, but only in recent years have they been tried in the more rigorous climate of the central east coast 250 miles to the north of Miami. There seven species have given a fair to good account of themselves during cold spells, enduring minima of 30° to 27°F. with only very minor burn in some cases and none at all in others. *Coccothrinax crinita*, noted for its bearded stem, is perhaps the most cold-tolerant, having emerged unscathed from a succession of hard freezes down to 25°. All the species seem to make excellent house plants when placed near a window admitting sunlight for some part of the day; and all are elegant and extremely handsome when well grown. They have the further virtue of not being so subject as other house palms to attack by mites and mealybugs. They may be grown indoors during winter and placed outdoors during the warm season for several years

and then, upon becoming rather large for the house, permanently set out in the garden. Few kinds are available at nurseries, but seed is not too hard to come by and any representative collection would have to be started in whole or in part from seed. The one other catch is that most of the species are extremely slow in growth during their early years, but that is exactly what might be sought in the ideal house palm.

* * *

Cold tolerance is a term that is not always made plain. Its significance is relative. It would not be misunderstood if applied just to one locality and to any others that nearly duplicate the kind of winter weather to be expected. The bearded lady referred to above could survive, probably, a typical San Francisco winter, but all of the *Coccothrinax* palms seem to demand high heat for at least seven or eight months of the year. Normal cold at San Francisco would not be necessarily fatal to all tropical palms, but the year-round continuity of cool weather would do them in without remorse. *Phoenix canariensis* is happy there and properly termed hardy, but by extension into climates ever colder the word loses its sense and the palm has to be classed as tender. Cold tolerance by itself is a deceptive term unless the degree of tolerance is specified. This can usually be determined by consulting published meteorological data of the place where the term has been applied to plants.

* * *

Now that *Euterpe edulis* was left in the lurch a paragraph or so back, we momentarily return to it. Reasoner Brothers, of Florida, were offering it in their catalogs as long ago as 1887. They were ahead of the times, for 75 years ago they had in stock various palms not now in the trade at all. One of these was *Catoblastus praemorsus!*

* * *

The Puzzle of the Month Club, in its latest release, wants to know if Cat-o'-Blastus is really a palm or only a blasted cat. This query gave rise to the resignation of seven club members, all of them cat-lovers who objected to having any kind of cat qualified by such an adjective as "blasted." But this was not all. Two other members, who were palm-lovers, jointly signed a letter bitterly protesting "this facetious attack on the generic name of a palm," and characterized it as so much fatuous goose-grease.

* * *

If all the postage stamps depicting palms were stuck on the inner walls of a house, there would be no need to buy wallpaper. This number would include all the stamps having palms or parts of palms somewhere in the design. Though the palms are sometimes the principal object, more often they are incidental to the main scene or focus of interest—so incidental, in some stamps, that they can only be detected with a magnifying glass. Coins too, both ancient and modern, depict palms, but cannot vie in numbers with the stamps. Coconut palms on postage stamps alone run into the hundreds, far outnumbering all others. Just now the new tropical nations are turning from palms, giraffes, apes, etc. to portraits of revolutionary nabobs and themes emblematic of their extreme nationalism, but when the fervor eventually subsides they will inevitably return to the glorification of their native fauna and flora, including that tried and true all-time long-distance glamor-getter, the palms. And why not? What else can bring the tropics so vividly alive on less than one square inch of paper?

Even the Russians like to strike a romantic note with palms on postage stamps, and they have issued about a dozen just to show how balmy and languorous life can be on the shores of the Black Sea. The United States, which has never been any great shakes with palm stamps, has barely matched Russia's dozen. This pittance seems extreme when compared with the lavish hundreds issued by the African nations, for the United States can boast of almost as many different palm species as may be found on the whole continent of Africa; and if there are any native species in Russia, this reviewer has not yet heard of them. Said reviewer has in mind to illustrate in later issues of PRINCIPES, if Heaven wills it and the editor falls for it, groups of palm stamps picturing men climbing palms, palms at waterfalls, dusky maidens not overclothed languishing beneath palms, etc., all for the edification of palmophiles. Another object would be to show that the whole world is palm-conscious, and very, whether aware of it or not.

Essays on the Morphology of Palms

P. M. TOMLINSON
Fairchild Tropical Garden, Miami 56, Florida

IV. THE LEAF

Adult palm leaves are amongst the largest developed by plants. There is, however, an enormous range in their size. The largest are probably those of some *Raphia* species and often exceed a length of 50 feet. The fan palm *Corypha umbraculifera* has leaf blades up to 12 feet in diameter. At the other end of the range are several species of *Chamaedorea* with leaves only two or three feet long. In addition to this great range in size there is also a considerable range of form. It is the purpose of this article not only to try and indicate this diversity, but also to show that it is less complex and more easily understood than a glance at a collection of living palms would first suggest. All palm leaves have a fundamentally similar structure which suggests that they have been derived from one basic type.

In the earlier essay on seedling leaves (Tomlinson, 1961) it was indicated that the palm leaf could be regarded as being made up in the same way as many monocotyledonous leaves. The blade or lamina is supported by a long slender axis. The axis consists of three distinct regions; a basal leaf sheath extending above into a long or short naked petiole which is continued into the rachis. It is convenient to distinguish the rachis from the petiole as that part of the leaf axis on which the blade is inserted. In many monocotyledons a scale-like organ, the ligule, is present at the mouth of the sheath but this is rarely present in palms. Sometimes it is only visible in immature leaves as in *Bactris*.

Although the palm leaf is an organic whole it is convenient to describe its various parts separately.

Leaf Sheath

In some palms, as in most members of the arecoid groups, the leaf sheath is an obvious closed tube. Otherwise, as in the larger fan palms, it is a short, less well defined region at the base of the petiole and clasps the stem. The

former tubular type of leaf sheath is long and particularly conspicuous in the climbing palms of the lepidocaryoid group because adjacent sheaths are persistent and overlap only slightly. The exposed part of the sheath in these palms is commonly armed with sharp prickles, the arrangement of which is constant and fairly diagnostic for each species. Also the mouth of each sheath is often prolonged beyond the insertion of the petiole as a tubular projection. This organ corresponds to the ligule of other monocotyledons. In several species of *Korthalsia* this projection is swollen and normally occupied by ants.

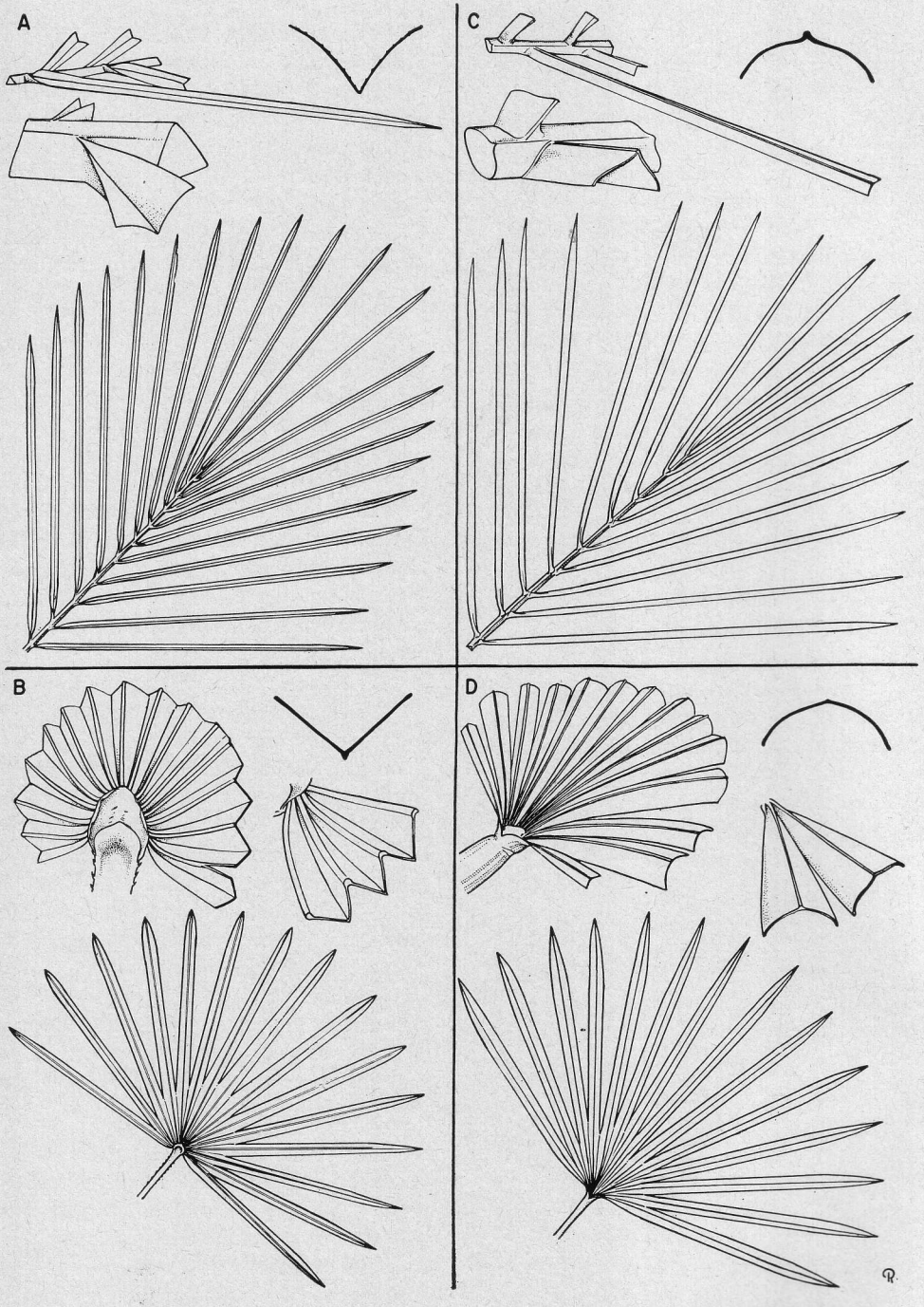
In the larger palms belonging to the arecoid, chamaedoroid, and iriartoid alliances the tubular leaf sheath is smooth and green, that of the oldest leaf being conspicuous below the terminal crown of leaves as the outside of a structure to which L. H. Bailey gave the name of crownshaft. The crownshaft of the royal palm serves as a familiar example. In these palms the leaves fall as a single unit, each abscissing cleanly at the node. Consequently the stem below the crownshaft is always smooth and may be described as self-cleaning. In other palms the leaves persist, wholly or partly, in various ways, and the stem is often obscured by their remains. In the larger fan palms in which the leaf base is not tubular, the woody leaf sheath splits vertically down its back, largely as a result of expansion of the stem within. These split leaf bases form a very regular criss-cross pattern and persist for many years, as in *Corypha* and *Sabal*. In other palms the leaf base may have a different appearance as it dries out. In *Copernicia* for example, the leaf bases persist as woody stumps. In *Cocos* and *Livistona* part of the persistent leaf base has the consistency and appearance of coarse sacking. Commonly the leaf base shreds into its constituent fibres which may persist as a shaggy coat throughout the life of the palm, as in *Arenga* and especially in *Trachycarpus*. In *Zombia* the fibrous remains form sharp protective spines. The "skirts" of whole persistent dried leaves which clothe the stems of mature *Washingtonias* are a familiar sight to Californians.

The Petiole

This region is defined as that part of the leaf axis above the leaf sheath which carries no leaflets. Usually it is very long and conspicuous as in the larger fan palms and in *Raphia*. In some climbing palms and in some of the cocoid alliance, however, it is virtually absent since the first leaflets are inserted on the leaf axis immediately above the leaf sheath. *Copernicia Torreana* is a fan palm which always attracts attention in cultivation because the leaves closely encircle the stem, each leaf having only a very short petiole. The petiole is usually grooved above and rounded below, but in many fan palms the groove disappears distally so that in cross-section the petiole just below the insertion of the leaf blade is almost diamond-shaped. In *Nypa* the petiole is almost round in cross-section throughout much of its length. The petiole margin in some fan palms is beset with numerous teeth, thus does the saw-palmetto *(Serenoa repens)* get its name. Other palms may have prickles scattered over the petiole surface.

The Rachis

This is distinguished from the petiole merely as the region of the leaf axis on which the leaf blade is inserted. In the feather palms it is rounded below but above it bears conspicuous lateral grooves on either side of a central ridge, the leaflets being inserted in the



20. Leaves of palms showing tips of pinnate leaves, blades of palmate leaves, attachment and diagrammatic cross sections of pinnae. Induplicate: A, *Phoenix Roebelenii*; B, *Serenoa repens*. Reduplicate: C, *Butia capitata*; D, *Mauritia flexuosa* (young leaf).

grooves. A true fan leaf has no rachis since the leaflets are inserted together at the end of the petiole but as is indicated below, the fan leaf can be regarded as a feather leaf with a condensed rachis.

The Blade

It has been convenient throughout this series of articles to refer to fan leaves and feather leaves as objects familiar to the non-specialist since they are self-explanatory descriptive terms. In some botanical writings they are accorded considerable prominence, it being suggested that palms can be divided into two groups according to whether they have leaves which are fan-shaped (palmate, Fig. 20, B, D.) or feather-shaped (pinnate, Fig. 20, A, C.). Although this subdivision is a useful one, it is not a natural one.

On the other hand, a more fundamental basis for subdivision depends on the way in which the leaflets or leaf segments are folded. This basic subdivision has been clearly described by Moore (1960) in his article on the Caryotoideae and I reproduce with Dr. Moore's permission the illustrations which clearly indicate these features (Fig. 20). If the leaflets of a palm leaf are examined carefully they will be found to be, in transverse section, either V-shaped, i.e. induplicate or folded upwards (Fig. 20 A, B) or A-shaped i.e. reduplicate or folded downwards (Fig. 20 C, D). This feature is often difficult to establish in flattened leaflets, but it can always be elucidated by examining the insertion of the leaflets. We can now, therefore, distinguish two major groups of palms—the induplicate-leaved palms and the reduplicate-leaved palms. The former group includes most of the fan-leaved genera and a few feather-leaved genera. The latter group is almost entirely feather-leaved except for three fan-leaved genera.

Induplicate (V-folded) Palm Leaves

Phoenix has feather leaves which are a good example of this type (Fig. 20 A). The leaflets are sharply folded and each ends in a stiff spine whilst the basal leaflets are reduced to spines. It is noticeable that there is always an odd terminal leaflet, i.e. the leaf is imparipinnate (see Tomlinson, 1961) and this is a fundamental property of such leaves. Moore (1960) has shown that the caryotoid palms, which are the other feather-leaved members of this group, also have fundamentally imparipinnate leaves, but this can usually be established with certainty only in juvenile leaves. *Caryota* itself is specialized and unique because its leaves are not once—but twice-pinnate.

The remaining induplicate-leaved palms all have fan leaves (Fig. 20 B) and comprise the sabaloid and borassoid groups. These have palmate leaves, i.e. the leaf blade segments are arranged like the fingers of a hand. In some species of *Licuala* and in *Teysmannia* the blade is virtually unsegmented but the ribs have the typical palmate arrangement. Otherwise distinct segments or "fingers" are visible extending out of the "palm" of the blade. Rarely the splits between the segments extend to the base of the blade and there is no "palm". Usually the segmentation is very regular, as in *Serenoa* (Fig. 20 B), but it may be quite irregular, as in *Rhapis* and species of *Licuala*. At first sight there does not seem to be much in common between the feather leaf of *Phoenix* and the typical sabaloid fan leaf (Fig. 20 A and B) but Eames (1953) has recently shown that a fan leaf is equivalent to a feather leaf in which the rachis is so condensed that the

leaf segments are inserted at much the same level on the end of the petiole. The chief evidence for this conclusion is that in many palms of the borassoid and sabaloid groups leaves intermediate between true palmate and true pinnate leaves occur. L. H. Bailey termed these leaves costapalmate since they superficially resemble palmate leaves but have a conspicuous rachis. *Sabal* is a good example and its leaves are well illustrated on the cover of PRINCIPES, Vol. 4, No. 3. Having emphasized previously the correlation between the type of pinnation and folding of the leaflets it may be asked if a solitary terminal leaflet can ever be recognized in fan palms. Because of congestion of the rachis the terminal leaflet seems always to be displaced and it is never obvious except occasionally in some juvenile leaves. One other characteristic structure of fan leaves deserves mention. This is the hastula which is visible as a scale-like organ at the apex of the petiole (Fig. 20 B). A hastula may be present on the upper and sometimes also the lower surface of the petiole of a typical palmate leaf.

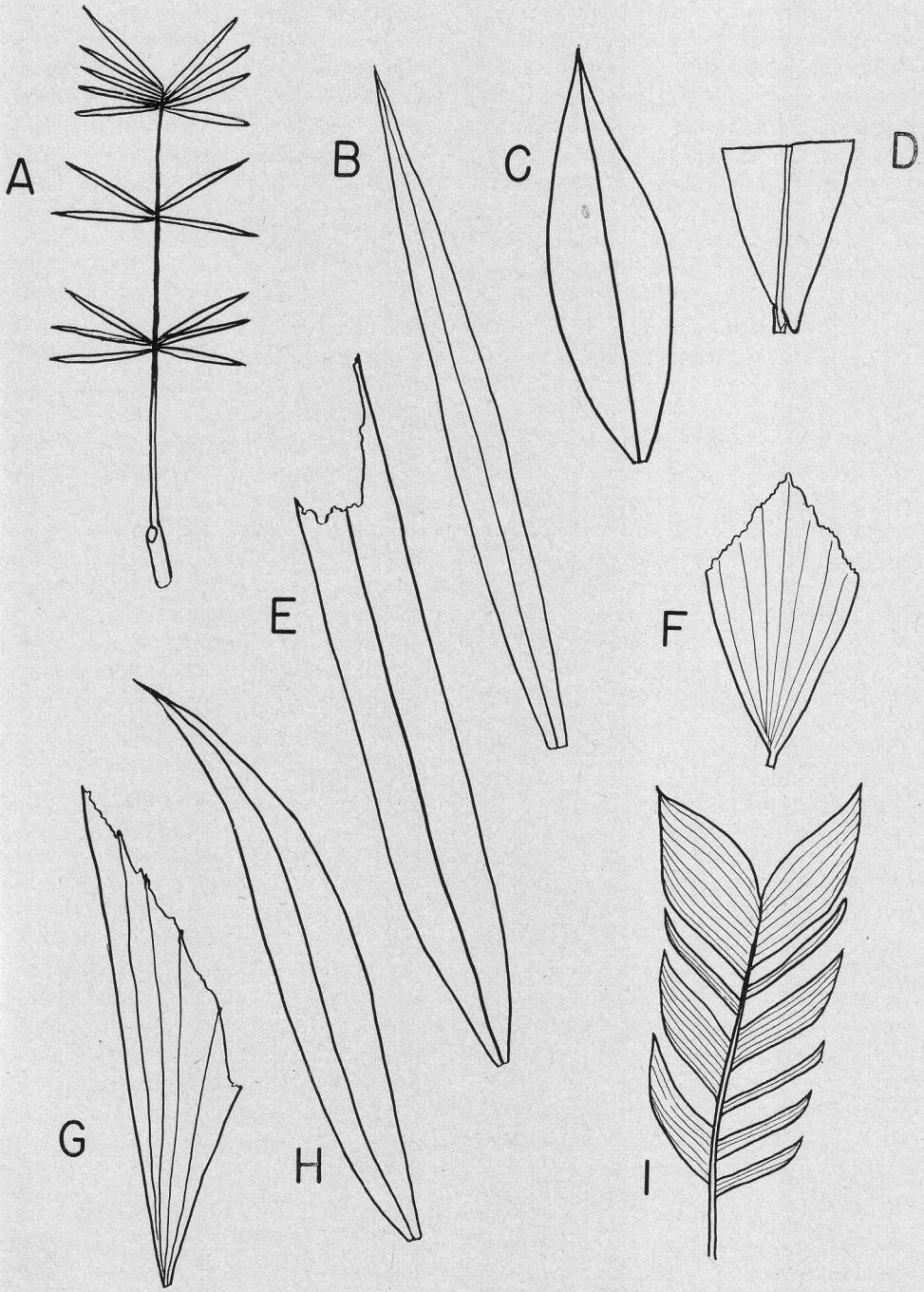
Reduplicate (Λ-folded) Palm Leaves

Most members of this group have feather leaves which are paripinnate, i.e. they have an equal pair of terminal leaflets (Fig. 20 C). This feature is usually fairly obvious in adult leaves of members of the arecoid, chamaedoroid and iriartoid groups, as well as in seedling leaves. In many of the lepidocaryoid palms and especially in the cocoid palms there is usually an irregular arrangement of veins at the leaf apex resulting in an inconstant arrangement of apical leaflets so that the paripinnate nature of the leaf is not evident. Three genera of reduplicate-leaved palms, *Lepidocaryum*, *Mauritia* and *Mauritiella* have developed fan leaves. They show no hastula (Fig. 20 D).

Elsewhere I have dealt in greater detail with the fundamental morphology of the palm leaf and tried to explain some of its peculiarities on an evolutionary basis (Tomlinson, 1960).

The above brief outline indicates the fundamental construction of palm leaves but conveys little of their diversity. The most regular and symmetrical of palm leaves, exemplified by those of the coconut, have equal pinnae which are lanceolate (lance-shaped, Fig. 21 B), distributed regularly along the rachis and all equally pendulous. More usually, however, they show varying degrees of irregularity in their spacing. The most striking irregularity is that in which the leaflets are borne in clusters, separated by long naked portions of the rachis (Fig. 21 A). This arrangement occurs in species of *Calamus* and in a less striking fashion in many palms. Often the leaflets do not all extend in the same plane but project sideways at varying angles, as is common in *Phoenix*. Leaflet shape also varies considerably from its typical lanceolate form. The outline may be ovate (Fig. 21 C) rhombohedral (Fig. 21 F) or even slightly sigmoid (Fig. 21 H). Certain groups of palms are characterized by leaflets with irregularity torn apices (Fig. 21 E). These include the ptychospermate palms, the iriartoid palms and, most strikingly many caryotoid palms. The common

21. Leaf and leaflet morphology in palms. A, leaf of *Calamus poensis* with clustered leaflets. B-H, leaflets. B, *Bactris Gasipaes* (lanceolate); C, *Desmoncus* sp. (ovate); D, *Arenga Ambong* (leaflet base, auriculate); E. *Ptychosperma Macarthurii* (leaflet apex praemorse); F, *Korthalsia scaphigera* (rhombohedral); G, *Caryota mitis* (triangular); *H*, *Chamaedorea* sp. (sigmoid). I, leaf of *Geonoma* sp. with unequal segments.


A
B
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name, fishtail palms from the irregular flabellate outline of the leaflets, is a particularly appropriate name for the genus *Caryota* (Fig. 21 G). *Caryota* itself is outstanding amongst all palms in having bipinnate leaves, the primary leaflets themselves being split into secondary segments. The insertion of the leaflets on the rachis is usually broad but it is constricted in *Korthalsia* (Fig. 21 F), while in *Arenga* and a few other palms the leaflets often have an auriculate base, i.e. the base extends backwards beyond the level of insertion, as a small ear (Fig. 21 D). Commonly also, the leaflets are not of uniform width on each side of the leaf. This is characteristic of many species of *Astrocaryum* and *Geonoma* in which the wider leaflets have many prominent ribs, while narrow leaflets on the same leaf may have only one rib (Fig. 21 I).

The above notes on the palm leaf do not indicate its most peculiar feature. Since, however, this feature is shown by the leaf only in its early development it is not striking or easily observed. The initial stages of leaf development corresponds to those in other monocotyledons but when the leaf primordium is only a few millimetres high the individual leaf segments are produced in a unique manner. This process has been well-described recently by Eames (1953) and since it would be inappropriate to go into its details, the reader is referred to Professor Eames' article for exact information. The essential mechanism is that within the solid marginal tissue which ultimately produces the whole of the blade, minute splits appear, at first unconnected with the exterior of the leaf but later breaking through to the leaf surface. These splits separate the strips of tissue which ultimately become the leaflets. The subsequent growth and enormous expansion of the leaf is merely concerned with the extension of these primordial splits. When almost mature the leaf blade protrudes as a lance-like structure from the apex of the leafy crown, the leaflets being tightly folded together. As the leaf unfolds evidence that the leaflets were originally united is found in the presence of a narrow band of tissue (the reins or lorae) which connects their apices. This is torn apart as the leaflets expand and usually shrivels but sometimes it is remarkably persistent as a green band hanging from the lowest leaflets. The reins are conspicuous in such palms as *Corypha, Dictyosperma, Dypsis* and *Neodypsis*. This method of leaf development in which the parts of a compound leaf are cut out of an originally solid tissue is not found in other plants. The usual course of development of compound leaves involves the formation of a separate primordium for each segment. An obvious example is provided by the cycads in which the leaflets can be seen to be distinct at all stages of development.

The above account of morphological variation has been written without comment on the biological advantages of each modification. If there is an advantage in a particular leaf form it is not usually obvious, but the climbing palms (rattans) make a striking exception. In such liane-like palms the rachis of each adult leaf is prolonged into a long whip-like organ called a cirrus. This is armed either with numerous backwardly directed claws, as in *Daemonorops* and allied genera, or with distant pairs of leaflets modified as backwardly directed spines, as in *Desmoncus*, a few *Chamaedorea* species and in most of the African rattans. These cirri, because of their hooks, are little more than grapnels which catch in the foliage and limbs of

tall forest trees and so anchor the rattan as it hauls its slender stems into the forest canopy. No doubt other structural modifications have their direct usefulness but no example is more obvious than this.

The purpose of this essay has been merely to serve as a brief outline which will guide the beginner in understanding the complexity of the palm leaf. In spite of this complexity and of the great diversity in size and form, I have tried to show that palm leaves are fundamentally all alike. There is much that remains untold. If a short essay introducing the subject can reach the length of this present article, then a proper survey would produce a whole volume.

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Palms in the Royal Botanic Gardens, Peradeniya, Ceylon

D. M. A. JAYAWEERA

The Royal Botanic Gardens at Peradeniya, Ceylon, were founded in 1821 at the request of Sir Edward Barnes, the Lieutenant-Governor of Ceylon at the time, by his desire to see the cultivation of coffee in the colony. The site was earlier inspected and reported on favourably by Mr. Alexander Moon who was Superintendent of Calutara Garden near Colombo.

The Gardens occupy a horseshoe-shaped peninsula round which flows the chief river of Ceylon, the Mahaweli. The Gardens are situated 68 miles from Colombo, the chief port of Ceylon, along the Colombo-Kandy road; and 4 miles from Kandy, famous for its Temple of the Tooth wherein a tooth relic of Buddha is housed. The total area is 147 acres of beautifully undulating grounds 1550 feet above sea-level. The climate is hot, moist, and very equable. The mean temperature is about 76° F., and the rainfall averages 90 inches per year spread over about 170 days. January to April is the driest season of the year. The mornings are cool (the temperature in the early mornings in January and February is sometimes as low as 56°-58° F.). April is the hottest month though the mornings are fairly cool.

Mr. Alexander Moon was appointed the first Superintendent of Botanic Gardens in 1821, and he was responsible for moving the plants from the Calutara Garden to the present site. The first official plan of the Gardens appears to

Ed. Note. Additional photographs of palms at Peradeniya are to be seen in "Cultivated Palms," in *The American Horticultural Magazine* 40: pp. 52 (*Borassus flabellifer*), 69 (*Corypha umbraculifera*), 76 (*Hyphaene thebaica*), 83, 84 (*Lodoicea maldivica*), 108 (*Roystonea oleracea*).

22. An avenue of *Roystonea regia*, the royal palm, planted in 1950. Royal Botanic Gardens, Peradeniya, Ceylon. Photograph by D. M. A. Jayaweera.

have been made in 1843 and was subsequently developed to its present condition by the successive Directors and Superintendents. Moon compiled a catalogue of Ceylon plants (1824). Other Directors of note were G. H. K. Thwaites F.R.S. (from 1857 to 1880) the author of *Enumeratio Plantarum Zeylanicae* (1864); H. Trimen F. R. S. (1880-1896) author of *Handbook of the Flora of Ceylon and Hortus Zeylanicus;* J. C. Willis F. R. S. (1896-1912) who published a revision of the Podostemonaceae of India and Ceylon and dealt with problems of evolution and "Age and Area" theory; T. Petch (1913-1925) an authority on the Fungi of Ceylon and responsible for several publications dealing with this subject; and H. F. Macmillan (1912-1925), the author of *Tropical Planting and Gardening* (1949).

Visitors to the Gardens are struck particularly by the beautiful undulating lawns, the envy of all botanical gardens, and by the shadow effects of large trees on these lawns in the early hours of the sunny mornings and late evenings.

The living collection of plants in these Gardens includes over 3000 species of which the palms and bamboos are most impressive. The palms occupy the southern section of the Gardens covering an area of about three and three-quarter acres. One hundred and forty-three species of palms are represented in this collection and there are five avenues of palms in various parts of the Gardens. These avenues are planted with talipot palms *(Corypha umbraculifera)*, royal palms *(Roystonea regia)*, cabbage palms *(Roystonea oleracea)*, double-coconut palms *(Lodoicea maldivica)*, and palmyra palms *(Borassus flabellifer)*.

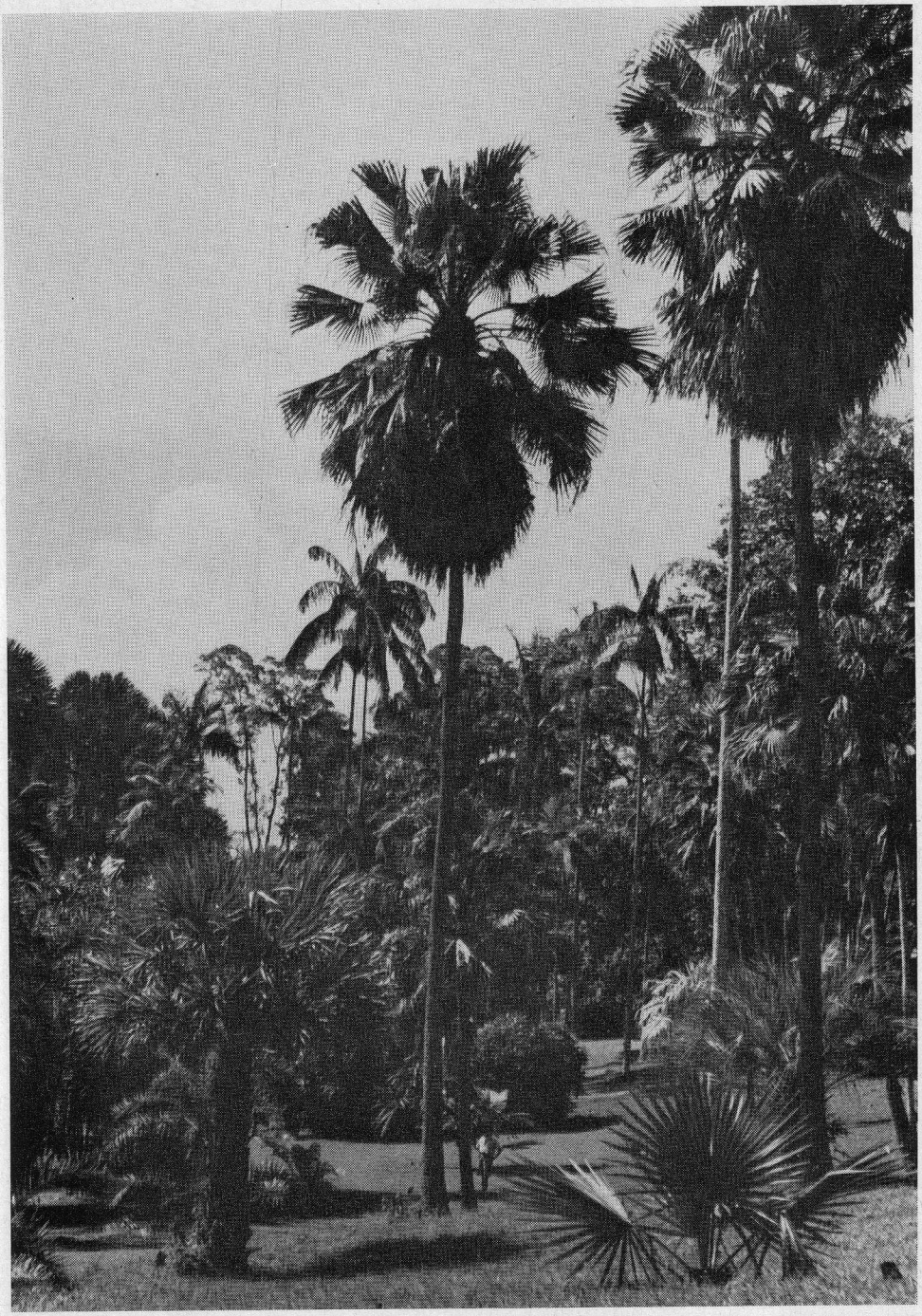
23. A view of the palmetum at Peradeniya. Left, *Raphia pedunculata;* center, *Calamus scipionum;* right, *Metroxylon Sagu.* Photograph by D. M. A. Jayaweera.

The talipot palm *(Corypha umbraculifera)* of Ceylon and South India, the chieftain of the palm tribe, is the largest of the palms and most majestic. It grows to a height of 60-80 feet with a straight cylindrical trunk 3-4 feet in diameter with a crown of immense fanlike leaves which are used for umbrellas, sunshades, etc. At the age of 30 to 40 years it produces an enormous pyramidal creamy white inflorescence 15-25 feet in height upon the summit of the stem above the crown of leaves. Each palm produces over 1,000,000 fruits of which about 50 per cent are viable. These fruits are dispersed by frugivorous bats. When the fruits are ripe the plant dies.

The double-coconut or coco-de-mer *(Lodoicea maldivica)* of the Seychelles Islands is a most remarkable palm especially for its longevity and its morphological peculiarities. A fine male specimen of over 100 years of age and a fruit-bearing female specimen 55 years old in addition to many younger ones are represented in the Avenue. The royal and cabbage palms grow into splendid specimens in these Gardens. The cabbage palms in the avenue average over 100 feet in height and are 53 years old while the royal palms have been recently planted and are still quite young.

The palmyra palm, *(Borassus flabellifer)*, a native of India and Ceylon, grows remarkably well towards the drier parts of the island. It attains a height of 45-60 feet. The male and female trees cannot be distinguished until they begin to flower when they are about 15 years old. The female inflorescence is tapped for sweet toddy from which jaggery, vinegar, and spirits are manufactured. The fruit is eaten when young and from the juicy mesocarp of

24. A large specimen of *Orbignya Cohune*. To the left is *Arikuryroba schizophylla*. Royal Botanic Gardens, Peradeniya, Ceylon. Photograph by D. M. A. Jayaweera.



25. A general view of a section of the palmetum of the Royal Botanic Gardens, Peradeniya, Ceylon. Photograph by D. M. A. Jayaweera.

the older ripe fruits an article of food called *punatoo* is prepared. After the extraction of *punatoo* the seeds are germinated and young 2-3-month-old seedlings are boiled and eaten or dried and stored for future use. The leaves are used for thatching houses and the timber for building purposes. The fresh toddy-juice of the plant is used medicinally as a stimulant and anti-phlegmatic. It is very useful for persons suffering from habitual constipation and is supposed to be a specific for amoebiasis. The tender terminal bud is a diuretic.

Other palms of economic and medicinal value that grow abundantly in Ceylon are *Cocos nucifera*, *Areca Catechu*, *Phoenix zeylanica*, *Caryota urens*, and *Nypa fruticans*. The economic value of coconut is well known. The fresh nut is much used for all culinary purposes and the older and dried nuts are converted into oil and cattle food. The young flower is tapped for coconut toddy from which jaggery, vinegar, and alcohol are prepared. The leaves are used for thatching houses; the husk of the drupe for making ropes, mats, baskets, brushes, etc.; the timber for building purposes and the activated charcoal from the endocarp of the fruit for gas masks. Medicinally the flowers are used in the treatment of diabetes, dysentery, leprosy and urinary diseases. The roots are astringent and diuretic and often employed along with other drugs for treating persons suffering from dysentery and other intestinal complaints. The young coconut water is a good substitute for saline and it contains traces of vitamins A, B and C.

Areca Catechu, the betel-nut palm, is a thin tall cylindrical palm bearing a crown of leaves at the summit of the stem and is much cultivated in village gardens. The nut is used as a masticatory. The dried young nut is a stimulant, astringent, and taeniafuge. The young shoot is an abortifacient in early pregnancy. The expressed juice of the pericarp is applied to the bites of tarantulas. The value of the nut as an anthelmintic is due to the presence of the alkaloid arecoline which occurs along with tannin and gallic acid.

The wild date of Ceylon, *Phoenix zeylanica*, is found abundantly on the southern coast and in the dry zone districts of Ceylon. The leaves are used for weaving mats and the cabbage is supposed to be an antidote against rat-bite poisoning.

The kitul palm, *Caryota urens*, grows naturally in the moist districts. It is much used as elephant food. The inflorescence is tapped for toddy as in the coconut, the fibre used for making ropes, brushes, etc., and the timber for building purposes. The pith of the mature trees yield starch which is used as a substitute for sago.

The water coconut, *Nypa fruticans*, grows along the mouths of rivers on southwest coast of Ceylon. The palm is not much used by the inhabitants. The juice of the young shoot is used medicinally for treatment of herpes.

There are only 21 species of palms in all growing wild in Ceylon. Of this number 12 are endemic species out of which 8 are in the genus *Calamus*. The *Calamus* species are all confined to the moist low country below 1000 feet elevation. Of these *C. radiatus* and *C. zeylanicus* are common, while *C. rivalis*, *C. delicatulus*, *C. pachystemonus*, *C. Thwaitesii*, *C. digitatus*, and *C. ovoideus* are rare. *Areca concinna* is also rare, being confined to the forests in the moist low country, while *Loxococcus rupicola* and *Oncosperma fasciculatum* are rather common and are found in moist forest regions below 5000 feet elevation.

Phoenix zeylanica is very common in the low country.

Native palms to be seen in the Garden include the above as well as the talipot and palmyra palms (already mentioned), coconut, betel-nut *(Areca Catechu)*, wild date *(Phoenix zeylanica)*, kitul palm *(Caryota urens)*, and water coconut *(Nypa fruticans)*.

Besides the palms mentioned above, there are a number of other notable species of interest growing in the Botanic Garden: African oil palm, *Elaeis guineensis;* ivory nut palm, *Phytelephas macrocarpa,* from Colombia; doum palm, *Hyphaene thebaica,* from the Sudan; carnauba wax palm, *Copernicia cerifera,* from Brazil; macaw palm, *Acrocomia sclerocarpa,* from tropical America; cohune palm, *Orbignya Cohune,* from Honduras; sealing wax palm, *Crytostachys Renda,* from Sumatra; sago palm, *Metroxylon Rumphii* from New Guinea and *Metroxylon Sagu* from Malaya. There are also several species of the following genera; *Aiphanes, Arenga, Attalea, Calamus, Latania, Licuala, Livistona, Phoenix, Ptychosperma, Sabal,* and *Thrinax.*

PALMS OF CUBA

BROTHER ALAIN
Herbario De La Salle, Vedado, Habana

It is always exciting and charming for the visitor in Cuba to contemplate the palm groves that may be seen in every part of the country. The first thing you notice as you travel along the central highway are the slim trunks of the royal palms, their heads high above the sugar cane plantations or mixed with other trees in the woody hills. You may see long rows of them along the roads and between fields in the *guardarrayas* separating one sugar cane field from another. This royal palm is well named as it may be considered the "King of the Palms," and even of the whole world of plants.

But as you drive out from Havana, you may reach places where even from your car you can observe different kinds of palms. There are more than 75 different species of palms in the island, and most of them are not to be found elsewhere. Some are quite rare while the ubiquitous royal palm is everywhere. This is quite unusual for a small area like Cuba to have such a large number of species of palms, and it offers an opportunity for the botanist and nature lover to study the different forms and adaptations of these remarkable plants.

The systematic study of the palms in Cuba began only some 30 years ago when the leading Cuban botanist of this century, Brother León (1871-1955), began collecting herbarium specimens in order to know each species and study them in his laboratory. From this long and difficult study came some 37 new species. To collect samples of palms for the herbarium is not so easy as for other plants. For example, if you want the leaves you have to find somebody to climb the tree, and this is not easy sometimes even if you want to pay for the services. The botanist does not want to cut down the palms, but he needs some parts that cannot be obtained unless you kill the plant. The material you have to take home is always bulky, and if you travel by the public means of transportation, somewhat embarrassing to take with you. For all these reasons, the palms of Cuba were little known, and the 38

26. *Roystonea regia*, the royal palm, planted in the Botanical Garden of Havana University, Cuba. Photograph by C. Lauvalle.

27. *Copernicia Torreana*, Las Villas Province, Cuba. Photograph by W. H. Hodge.

species reported from the island were not completely understood. Thanks to Brother León's efforts we have now a fair knowledge of this family; his collections are kept in his own herbarium in Havana City, and may be consulted by the botanists interested in this study. There are duplicates in Harvard University Herbarium, and in Washington at the Smithsonian Institution, and also in the New York Botanical Garden Herbarium. Living collections may be found at the Harvard Tropical Gardens, at Soledad, Cuba, and also some of them have been planted at the Fairchild Tropical Gardens in Florida.

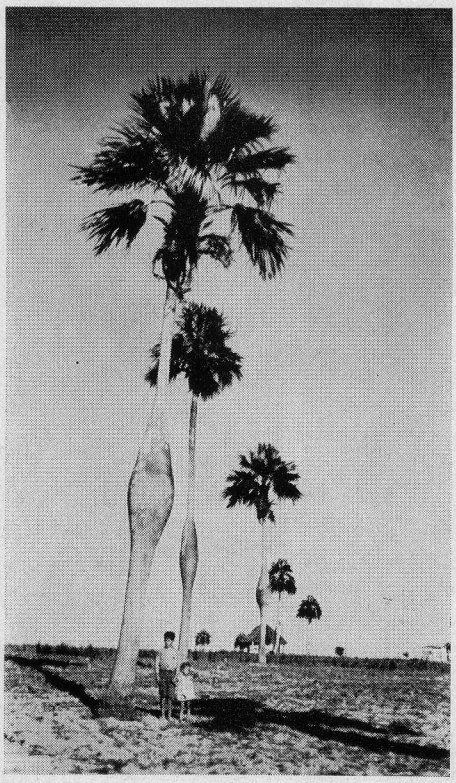
Of course, we shall begin our study with the royal palm, *Roystonea regia*. As the most abundant palm it is well known, and it is in cultivation in tropical gardens in many parts of the world. In the primitive state of the island, when most of its land was covered with dense tropical woods, there were fewer royal palms than at present. This handsome palm likes open places in rich soil, and

28. *Sabal florida* near Batabano, Havana Province, Cuba. Photograph by Brother León.

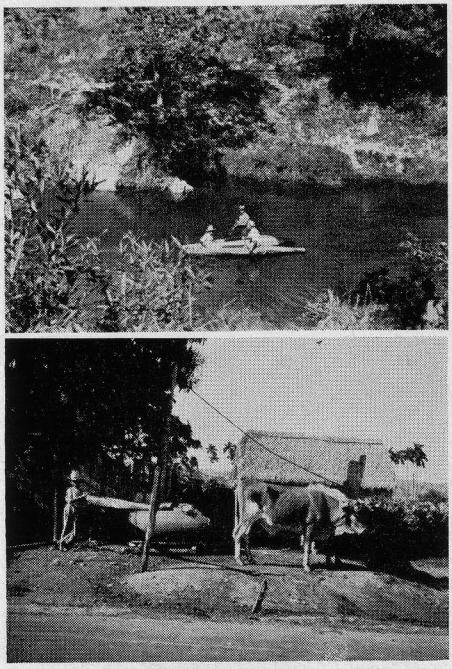
in thick woods we only find isolated individuals. As civilization came to Cuba and the woods were cut down to give place to the cultivation of sugar cane, the royal palms found more and more ground for growing without interference of big trees; at the same time, man himself helped the propagation, as the palm was very useful to him for raising pigs, for thatching his house, or even for building his home. Birds propagated the palm rapidly, and where there was open ground there developed palm groves called *palmares*. If a single palm is delightful to the sight, for the grace of its trunk and foliage and the finely cut leaves that move at the slightest breeze, when we contemplate hundreds of them together we admire the beauty of many white trunks standing together and the thousands of leaves alive with the whispers of the evening breeze. There is a scene that always arouses admiration, the time of sunset, with the royal palms standing erect and dark against the red- and orange-colored light of the dying sunlight.

Royal palms like fertile soil and humidity, though they do not grow well in swampy places. Their favorite place is the plains where sugar cane is being planted. Sometimes we can find them along the streams and the rivers, or on hillsides, or crowded in a valley. They have been planted on the farms where hogs are raised and along the roads; we also find them in gardens where their elegant shape and high crown of leaves give an air of greatness to the surroundings.

This tree is one of the most useful in Cuba to the countryman *(guajiro)*. There has developed between a man and a tree an association quite difficult to match. The *guajiro* lives in a very simple house, his *bohío*, thatched with palm



29. *Colpothrinax Wrightii*, the barrel palm, savannas of Pinar del Río, Cuba. Photograph by Brother León.



30. *Colpothrinax Wrightii.* Above, a boat made from two trunks tied together; below, carrying water in a barrel made from the palm. Photographs by Brother León.

leaves. The poorest of them also use palm planks, or even the sheaths of the leaves, to make the walls of their houses. The fruit, *palmiche,* is eaten by the hogs and its oil makes them fat for the Christmas feasts, as there is no Cuban house where they do not eat *lechón asado* on Christmas Eve, or *Nochebuena.* The sheath of the leaves is also useful to make small baskets to pack fruits and take them to market, and if the rain comes while you are out in the fields just put one of these sheaths *(yagua)* over your head and you may get home quite dry. So is the life of the Cuban *guajiro* linked to this wonderful palm. Even the housewife will use a broom made with the dry inflorescence of the palm. For the Cuban countryman, food and shelter come from the royal palm.

In order to get the leaves and the fruits, the *guajiros* have to climb up the branchless trunk, for 30 to 40 feet; the man in charge is called *desmochador,* and he is remarkably skillful in this operation; there is at least one of them for a village, and he is called when there are enough palms with ripe fruits in the estate or *finca,* or when there is need of palm leaves for repairing the roof of the house. He uses a small rope making two loops around the trunk; there are also two small loops hanging from the rope —one is for a knee, the other for a foot. He proceeds to move up one loop at a time, about one foot or two up the tree, and little by little, he climbs up to the leaves and begins to cut them down with his machete. The fruits, or *palmiche* cannot be dropped from the height of the palm without getting loose from the inflorescence; for this reason, he ties a rope to the higher point of the trunk, and another man below takes the loose

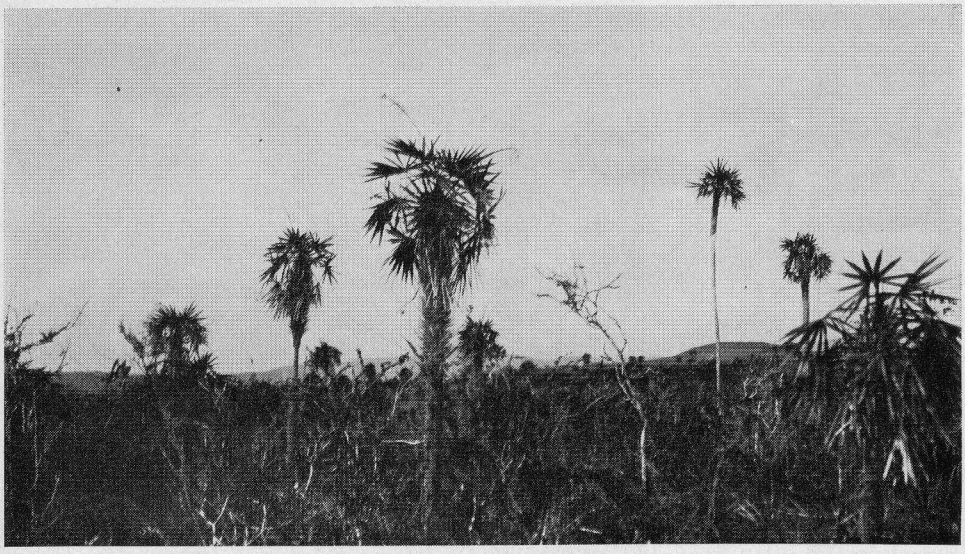
31. *Acrocomia armentalis,* Guatao, Havana Province, Cuba. Photograph by Brother León.

32. *Coccothrinax miraguama* var. *orientalis*, pinelands of Sierra de Nipe, Oriente, Cuba. Photograph by Brother León.

end of the rope and goes some 40 or 50 feet from the base of the palm and ties the rope to another tree, making a low grade slope; the *palmiche* will now come down by the rope without gathering too much speed, and arrive without damage. The *desmochador* charges about $1 for each palm.

Until quite recently, there was only one known species of royal palm in Cuba, *Roystonea regia*. The famous Cuban botanist, Brother León described three more species found only near the eastern tip of the island in the region of Baracoa and Maisi, making thus four species in all. There are also several other species in the other Antilles, and each island of the Greater Antilles appears to have its own species. The Cuban ones are: *Roystonea regia, (palma real)*, *R. lenis (palma de seda)*, *R. stellata* and *R. violacea (palma morada)*. But without doubt, the most beautiful and the most abundant is the first species, the one you cannot miss when you set foot on the island.

When a visitor goes from Havana City to the interior of the island, he will soon see another palm, not so beautiful but still very attractive; it is named in Cuba *palma cana*, and belongs to the genus *Sabal*, the same as the palmetto of southern United States. But these sabals are big palms, sometimes up to 40 or 50 feet high; they are nearly always found in savannas and their round heads of palmate leaves crowning a very cylindric trunk stand high above the grassy plain. They always are a sign of poor soil, and they stand the drought much better than

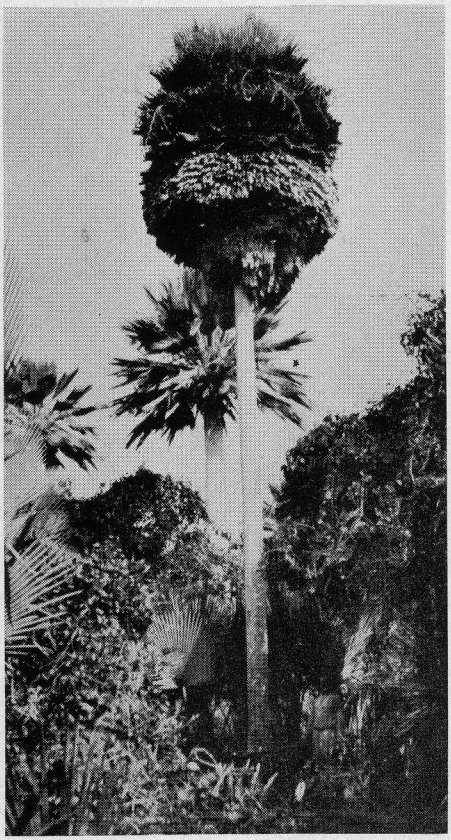


33. *Coccothrinax pseudorigida*, savannas of Camagüey, Cuba. Photograph by Brother León.

the royal palm. Their fruits, though quite abundant, are not used as food for animals, but their leaves are the best thatching material; a house covered with the leaves of *cana* is likely to last from 10 to 12 years, against two or three years for the leaves of royal palm. For this reason, we are likely to see many *canas* with their leaves cut down, leaving only the newest ones at the top of the trees.

Again, we have 4 species of *cana*, two of them are quite widespread while the other two are restricted to smaller areas. *Sabal florida* is to be found in all the Provinces, sometimes in large numbers, sometimes scattered in the dry savannas; they are a sign of poor agricultural conditions and they are likely to be seen in places where cattle are pastured. We also find another quite abundant *cana*, *Sabal parviflora*. This is smaller than the preceding, and grows in swamps in the southern part of Cuba from Pinar del Río to Camagüey. Also in swamps and with bigger trunks and leaves, we can find *Sabal Japa* near Batabanó in Havana Province. This species grows only in the western Provinces of Cuba. The fourth species, *Sabal mayarum*, grows only in the savannas of western Pinar del Río and it is also in Yucatán.

The visitor that goes to Pinar del Río will see when he gets to Consolación del Sur a few miles before reaching the capital city of the province, some remarkable individuals of the *palma barrigona*, the barrel palm, or literally the belly palm. The trunk of this tree is ridiculously swollen at the middle, tapering above and below to a slender cylinder. Your attention is immediately drawn to this unusual shape for a tree, and you wonder, as many botanists have done before, what would be the reason for such a belly. This *barrigona*, *Colpothrinax Wrightii*, grows only in the sandy savannas on Pinar del Río and on the Isle of Pines. It is well represented and sometimes hundreds of them grow together near the tobacco plantations or mixed with the pines that gave their names both to the province of Pinar del Río and to the Isle of Pines.



34. *Copernicia vespertilionum*, foreground; *C. gigas*, background. Southern Las Villas Province, Cuba. Photograph by Brother León.

The *palma barrigona* is much used by the Cubans in the region from Sumidero to Guane and in the savannas of southern Pinar del Río. They may cut the trunk, and after taking out the much softer inner part close the ends of the barrel with cement or clay and use it as a container for water; it is used to

carry water from the river to the house transported on the fork of a tree, cut for this purpose, and pulled by oxen. Some have used the trunk to hold drinking water for their cattle, and we may see some beehives kept in a trunk of *barrigona*. You may also enter a home and sit down in a chair made from a hollowed trunk like an armchair. It has also served as a canoe, but since the trunk is round and cannot be made flat because of its soft inside, two trunks are tied together and two men can ride in the river in this twin canoe.

I shall also mention the *corojo* palm, small groups of which can be seen along the roads in Las Villas, Camagüey and Oriente provinces; it is also quite common in some savannas in Pinar del Río. Its trunk is swollen in the middle, though less abruptly than in the barrel palm. Even the royal palm has a tendency to this swelling that must take place during the years of full growth when there is abundant food for the plant, and it seems to store some of the excess food in this swelling. It may also be a question of balance in the weight of the plant and of resistance to the winds and storms. But again, why the swelling of the *barrigona*, the *corojo* and the royal palm, and not of the *cana?* The *corojo* palms belong to the genus *Acrocomia* and are always found in savannas growing in small groups called *corojal*. The leaves are pinnate, like those of the royal palm; the fruit is about one inch in diameter; children like to break the hard shell to extract the fleshy edible nut. As the palm is not too abundant, no other use is made of it, though the leaves make good cover for the *bohíos* and the outer wood makes strong planks.

The most common species of the *corojo* palm is *Acrocomia armentalis* which is quite widespread in all the Provinces. It belongs to the savannas,

35. *Copernicia glabrescens*, savannas, Pinar del Río, Cuba. Photograph by Brother León.

chiefly on serpentine. The pinnate leaves make a crown two to three feet in diameter above and about one foot at the base. Its trunk is covered with very sharp spines about two or three inches long. *Acrocomia subinermis* is known only from one or two trees near Havana City, and *Acrocomia pilosa* has been described from the Guantánamo region in Oriente. *Acrocomia aculeata* is cultivated under the name *corojo de Jamaica*.

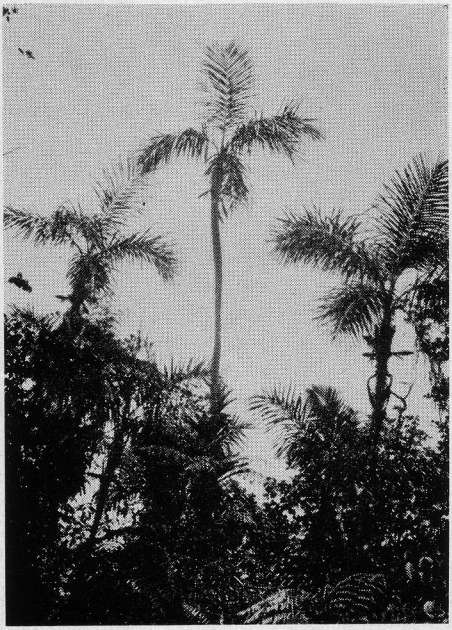
Cuban savannas offer a great variety of palms that are classified chiefly in two genera, *Coccothrinax* and *Copernicia*.

The genus *Coccothrinax* is chiefly West Indian; these are among the smallest of the Cuban palms and may be cultivated for ornamental purposes as they are graceful and not too bulky. They do very well in pots as indoor plants, and Cuban gardens are beginning to display their nice fanlike leaves. They are called

in Cuba *miraguano*. Of these, we count some 21 different species, quite alike in general shape the main differences being technical details of the flowers and leaves. The most common is *Coccothrinax Miraguama*, inhabitant of savannas and serpentine barrens of the six provinces and the Isle of Pines. It gets up to 15 to 20 feet, though younger specimens of 5 to 10 feet high are more common. Its fruits are small and of no use to the *guajiros*. For this reason, many thousands of them have been cut down to make place for pastures or rice plantations. Another cause of its destruction is that it is used as fence posts, its wood being very hard and durable.

There are several species of *miraguano* that may attract the sight of the botanist. One of them, *Coccothrinax crinita*, has the trunk heavily covered with dense hairs, the leaf sheath being so thick as to look like hair, the fibers interwoven like a sort of fabric. They are used for pillows and also this hairlike material is placed at the mouth of charcoal bags to close them. Another of its uses is to make brooms from the quite resistant fibers. It is called *palma petate* and is found in the northern part of Pinar del Río Province near Las Pozas and also in the Trinidad Mountains in Las Villas Province. Several of these *Coccothrinax* palms have a very long and slender trunk, and grow in open places, like the edge of cliffs, between Jauco and Maisi in eastern Oriente. There we can find *Coccothrinax Alexandrii*. On the hills near Santiago can be observed *Coccothrinax fragrans*, a nice palm 5 to 10 feet high with fragrant flowers. All these *miraguanos* are very hardy and usually grow in dry savannas or on rocks and cliffs.

Now we come to the genus *Copernicia*. There are in Cuba some 24 species, and we have to go to South America to find more species of these handsome palms, though there are one or two species in the Antilles outside Cuba. The Cubans separate them into two different groups, the *jatas* and the *yareyes*. The *jatas* hold the old dried leaves making a very large head where all kinds of animals may live while the *yareyes* drop the dead leaves early. The most common is the *jata de Guanabacoa, Copernicia Torreana*, named after the famous Cuban naturalist, Don Carlos de la Torre, by Brother León; it is found on serpentine barrens near the ancient town of Guanabacoa east of Havana City. Another location for it is just east of Madruga in the Province of Havana near the border with Matanzas Province. Its height is commonly 10 to 15 feet, and its large leaves 4 to 5 feet in diameter keep on piling one above another. One of the most beautiful Cuban palms is *Copernicia vespertilionum, jata de los murciélagos;* it grows in the savannas of



36. *Bactris cubensis*, mountains of Baracoa, Oriente, Cuba. Photograph by Brother León.

37. *Thrinax parviflora* near Havana, Cuba. Oriente, Cuba. Photograph by Brother León.

southern Las Villas and Camagüey and is a tall palm about 40 to 50 feet high. Bats like to nest between the dead leaves, hence its names, both vernacular and scientific.

I shall also mention the *jata guatacuda, Copernicia rigida,* a very nice palm growing in the wet savannas in northern Oriente. The leaves are among the largest of the Cuban palms, nearly 10 feet long, and are very straight, the plant taking the shape of a giant funnel as the leaves point to the sky.

Among the *yareyes,* the most common is *yarey hembra, Copernicia Baileyana,* named by Brother León after Liberty H. Bailey, one of the botanists who knew most about palms. It is found in great quantities in the savannas near Bayamo and Las Tunas in Oriente Province, and it is present also in nearly all the Provinces (it has not been reported from Matanzas). Its leaves have strong fibers and are used for making baskets, hats and even slippers. It is also useful for the wax covering of its leaves, and it can be used like the wax palm of Brazil, the carnauba palm, though the industry has not been developed in Cuba so far. Several species of *yareyes* are growing in very restricted areas, and are not to be found very easily by the visitor as their whereabouts are quite far away from the main roads. The differences between them are also quite small and you have to get the flowers or the fruits to tell them apart. *Copernicia Yarey* would be the easiest to observe; it grows in some parts of northern Oriente. That and *Copernicia gigas,* a tall tree more than 60 feet high, found from southern Las Villas to the Cauto valley in Oriente, are among the most remarkable. Also in the savannas of Isle of Pines in the vicinity of Nueva Gerona, you cannot miss *Copernicia Curtissii,* one of our smallest *Copernicias.*

Another nice genus is *Thrinax.* Of the three species found in Cuba, one, *Thrinax parviflora (T. Wendlandiana)* grows in coastal thickets and on cliffs above the sea all over Cuba. It is named *guano de costa* by the Cubans. The leaves may be used for thatching houses, though they are rather small for this purpose. It is also planted in gardens near the beaches as it resists very well the spray from salt water. The two other species are found inland on limestone cliffs in the western provinces. The best place to observe the small palm *Thrinax microcarpa, guanito de sierra,* is at Viñales in Pinar del Río; it is very abundant on the sides of the *mogotes* or limestone hills of this unique region. It likes the steep rocks that form the walls of the *ensenadas* or hidden valleys between *mogotes.* The third species, *Thrinax Drudei,* is

quite rare and has been collected only on the steep limestone hills north of Santa Cruz de los Pinos in Pinar del Río.

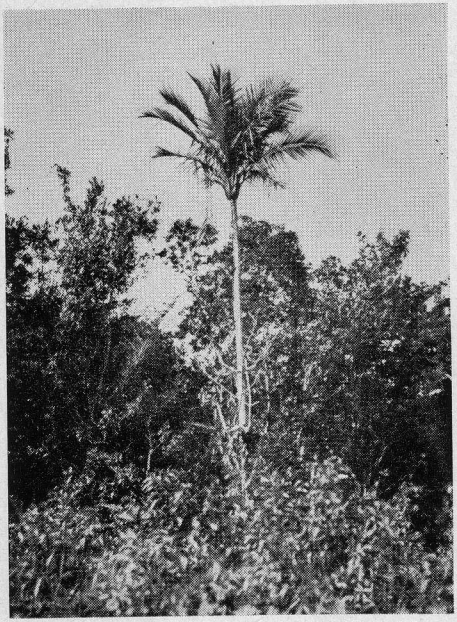
As we were speaking of Viñales, there is another palm growing only on the *mogotes;* this is *palma de sierra, Gaussia princeps,* a tall slim palm resembling the royal palm. The *guajiros* have no special use for this, as it is nearly always out of reach on the ledge of the cliffs.

If by any chance you happen to be visiting the enchanting Isle of Pines and driving through the savannas south of Nueva Gerona you are likely to observe a rather small palm along the clear streams; this is the *palma manaca, Calyptrogyne dulcis.** Its leaves are pinnate, like those of the royal palm, but have no sheath; the compact inflorescence has abundant white flowers that can be eaten and have a sweet flavor, hence the specific name *dulcis.* The tender young leaves also can be eaten as a salad. This palm is said to point to good water; as an old Cuban author said, "Where *manaca* grows there is abundant and good water." There are in Cuba four species of *manacas.* The most common is *Calyptrogyne dulcis* growing in savannas always near the streams or "arroyos." In the Sierra de los Organos in Pinar del Río we find *Calyptrogyne intermedia;* in the Trinidad Mountains, in Las Villas we have *Calyptrogyne microcarpa,* and in the Sierras of Oriente grows *Calyptrogyne Clementis,* named after Brother Clemente, a botanist who collected for more than 30 years in Oriente.

In Sierra Maestra, Oriente, above 2000 feet altitude, we find the *palma justa, Euterpe globosa,* one of the few Cuban palms found in all the Antilles except Jamaica. It is tall and beautiful and likes the damp and rich soil formed by the decaying leaves of the tropical forest. It replaces the royal palm in the higher mountains. In his classification of the vegetation of the higher Sierras in Cuba, Brother León includes two ecological formations with a palm as altitude indicator: the *manacales,* from 1500 to 2400 feet altitude with the *manaca Calyptrogyne Clementis* as a dominant; the

[*Some botanists, including the late L. H. Bailey, consider that the West Indian species of *Calyptrogyne* belong in a separate genus, *Calyptronoma.* Ed.]

38. *Gaussia princeps* on limestone hills, Pinar del Río, Cuba. Photograph by Brother León.



39. *Calyptrogyne microcarpa,* Trinidad Mountains, Cuba. Photograph by Brother León.

40. *Euterpe globosa*, mountains of Oriente, Cuba. Photograph by Brother León.

fangales, from 2400 to about 3500 feet, with *palma justa*, *Euterpe globosa* among the trees though not a dominant.

I shall also mention the horrible *palma pajúa* or *palmilla*, *Bactris cubensis*, found in the pinelands of Oriente. Of medium size, it has the trunk, leaves and inflorescence covered with very long and sharp black spines sometimes two or three inches long, and for this reason it is not used by the Cubans. Its fruit are of a bright orange-red color.

There are, besides four species of *Hemithrinax*. Two of these species grow on limestone cliffs, the other two being restricted to the pinelands of northern Oriente around Moa. These are *H. Ekmaniana* near Sagua la Grande in Las Villas, *H. compacta* on the hills south of Sierra de Nipe in Oriente; the two of the Moa region are *H. rivularis* and *H. savannarum*.

The *palma de Guinea*, *Pseudophoenix Sargentii*, grows near the coast in northern Oriente and Camagüey and is also found in Hispaniola, Florida, the Bahamas Islands, Mexico and British Honduras.

The swamps of Cuba from Havana Province to the west and in the Isle of Pines have the very interesting *guano*

41. *Paurotis Wrightii* forms a fairy ring in savannas of southern Pinar del Río, Cuba. Photograph by Brother León

prieto, *Paurotis (Acoelorraphe) Wrightii*. It is nearly always found in circular groups like fairy rings or witch's rings. It propagates both by seeds and by its rootstocks, always radiating outwards from the center of the ring. The first plants to die are the ones in the center and the ring widens a little every year, the bigger and older plants being the nearest to the center of the circle. The leaves of the palm have a spiny petiole and the trunk is used for fencing. This particular palm is suited to resist the fires that every year burn the grass of the dried swamps and savannah during the dry season. The bases of the leaves remain attached to the trunk; when the fire comes, they burn only at their tips but the vital parts of the plant are not touched, unless the fire becomes too prolonged because of the presence of shrubs which keep the fire going long enough to damage the plant.

And, of course, we can see everywhere the coconut tree, *cocotero*, and have a treat of coconut juice, or ask at any country grocery store for *dulce de coco*, a sweet made with the pulp of the coconut mixed with raw sugar.

So if you go to Cuba, don't miss the palms that are so beautiful, and make this island "the most beautiful land man has ever seen."

Madagascar's Three-sided Palm – Neodypsis Decaryi

ROBERT W. READ
Fairchild Tropical Garden, Miami 56, Florida

One of the most interesting palms in the Montgomery Palmetum of the Fairchild Tropical Garden near Miami, Florida, is a palm from an island famous for its unusual plants. The island is Madagascar, home of the lace plant, the royal poinciana, the traveler's tree, and many other unusual plants. The palm is *Neodypsis Decaryi* unusual for its pronounced triangular shape caused by the three-sided arrangement of the leaves. This three-sided arrangement is present also in related genera such as *Chrysalidocarpus* and *Dypsis* where there are fewer leaves per crown or where the stems are clustered and crowded so that it is not as noticeable or perfectly arranged as it is in *N. Decaryi.*

The genus *Neodypsis* is composed of fourteen species all of which are restricted to the island of Madagascar. An illustrated account of the different species with a key and descriptions in French may be found in the *Flore de Madagascar et des Comores, 30th Famille-Palmiers,* by H. Jumelle published posthumously in 1945. *Neodypsis Decaryi,* the one species of this genus presently found in cultivation in the Western Hemisphere, can be found only at the Fairchild Tropical Garden where visitors may see several mature specimens of this most beautiful and interesting palm.

Neodypsis Decaryi was named for the French botanists Decary who collected specimens of the palm near Fort Dauphin, in the southeastern region of Madagascar sometime before 1933. The species was described by Jumelle in 1933 in the *Annales du Musée Colonial de Marseille,* series 5; volume 1 (1) : 15 and was illustrated in figure 1 on page 11 of the third fascicle of the same volume. The seeds from which the plants at Fairchild Tropical Garden were raised were received from Madagascar in July of 1947 through the interest of Professor H. Humbert of the Museum d'Histoire Naturelle, Paris. In the first ten years the plants prospered, acquiring a very ornamental character during the first few years and becoming increasingly interesting with maturity.

The most interesting aspect of *N. Decaryi* is the peculiar arrangement of the large graceful leaves. If one could view the palm from directly above one would see that the leaves radiate in only three directions giving the appearance of a three-bladed propeller. The leaves lie directly one above the other in each of three distinct vertical rows. From the side, only two rows of leaves are visible, these forming a large fan or peacock's tail with the 12-15-foot rigid feathery leaves gracefully curved at their tips. The leaf bases overlap, forming a triangular pattern, and are covered with a rusty brown fuzz. This rusty fuzz or tomentum persists on the leaf bases, the petioles, the bracts of the inflorescence and on the larger branches of the inflorescence. Viewed from any angle this palm is distinctive and I believe it is to become one of the more popular ornamentals in subtropical regions.

Neodypsis Decaryi always has a solitary trunk, often up to 20 inches in diameter. The dark brown rind is rough from numerous fissures and narrow leaf scars. The petiole and rachis are rounded

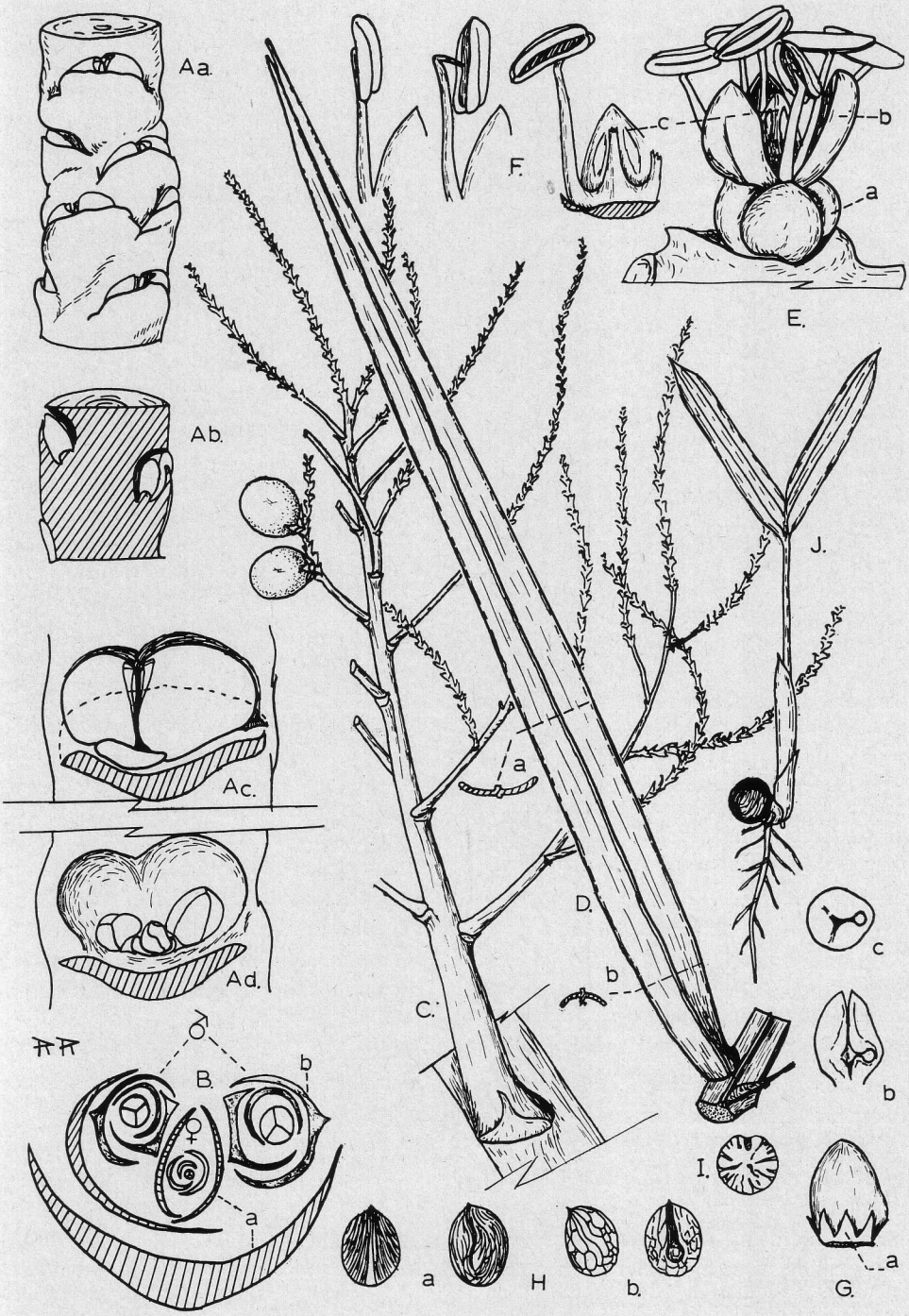
below and concave above. The narrow rigid pinnae are reduplicate and arranged regularly in a single row within a groove along the upper half of the rachis. Toward the middle of each pinna the margins are turned upward giving the pinna the appearance of being induplicate. The tip of each pinna bends in a graceful curve toward the apex of the leaf. The lowermost pinna frequently has a long unpleated rein hanging below the crown. Rusty-brown scales occur on the mid-vein within the slightly folded base of each pinna. These scales darken with age and diminish in size or are brushed off leaving a dark raised scar or callous. New leaves appear singly throughout the year and before unfolding resemble sharply pointed spears.

Inflorescences appear throughout the year in Florida but primarily during the spring months. They arise from among the leaves and rest on the next lower petiole (although Jumelle stated that they arise below the leaves). Each inflorescence is subtended by two large enclosing bracts. The first or outer bract is barely exposed from among the leaf sheaths, and is bicarinate (like a two-bladed sword) and persistent. The second bract, which emerges through the lower side of the first, attains twice the length of the first and looks much like a pointed club. It dries and falls soon after the inflorescence emerges through the split lower side. Pressure from the leaf bases may rarely hold the second bract in place. The inflorescence is branched three times, each branch being subtended by a short abruptly pointed bract. The bracts of the ultimate branches are very small and rounded.

The flowers, both male and female on the same inflorescence, are sunk in pits beneath modified bracts along the ultimate branchlets. Two male flowers with a single female between them in each pit is the usual arrangement; however the female does not develop in the majority of the groups. The male flowers have three imbricated (overlapping) sepals and three valvate (non-overlapping) petals, six stamens with the anthers on hinge-type filaments which are inflexed in bud and a large pistillode two-thirds the length of the petals. The female flowers, when present, are subtended by two small bracts; the sepals are imbricated and the petals are imbricated with valvate tips. The pistil is encircled at its base by six small staminodes. The young pistil is slightly swollen on one side, indicating the position of the fertile locule with its single ovule. Two other locules are reduced and apparently bear no ovules.

Mature fruits are oval, glaucous olive-green and may have one or two partially developed carpels as lobes at the base. The mesocarp consists of a very thin yellow-green flesh over a rather fibrous inner layer. The seed is ovoid with a depression on the upper surface below which lies the tiny embryo embedded in deeply ruminate (mottled) endosperm. The mode of germination is adjacent ligular as defined in the *Ameri-*

42. *Neodypsis Decaryi*. Aa, portion of an ultimate rachilla showing groups of buds x 5; Ab, rachilla in vertical section showing pits x 5; Ac, group of buds with bract cut away exposing two staminate buds x 10; Ad, same group of buds with sepals removed from staminate buds to expose pistillate bud in center x 10; B, diagrammatic arrangement of bracts (a) and sepals (b); C, primary branch of inflorescence x ¼; D, pinna from middle portion of leaf with cross sections at a and b x ¼; E, staminate flower with sepals (a), petals (b), pistillode (c) x 5; F, development of stamens during anthesis; Ga, pistil of pistillate flower with staminodes x 5; Gb, Gc, longitudinal and horizontal sections of pistil with solitary ovule x 5; Ha, fruit with exocarp removed to show mesocarp fibers x ½; Hb, seed x ½; I, seed in cross section showing rumination x ½; J, seedling with bifid eophyll x ¼.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43. *Neodypsis Decaryi* cultivated at the Fairchild Tropical Garden. Photograph by R. Read.

can Horticultural Magazine 40: 17. 1961. Two tubular sheaths precede the single deeply bifid eophyll or first seedling leaf-blade; subsequent leaves are pinnate with many pinnae.

Culture

Jumelle stated that *N. Decaryi* is found in mesophytic forests at about 100 meters elevation between Mandrare and Fort Dauphin. It is interesting to note that the native region for this species is at the same latitude south (25° S.) as Miami is north (25° N.). The plants at Fairchild Tropical Garden are growing near sea level on porous oolitic limestone. There has been little or no nutritional or disease problem. An attack by ambrosia beetles was halted by injection of Dieldrin into the borings before the beetles had a chance to continue their damage. Plants grown in full sun mature earlier, fruiting almost two years before shade-grown plants. Plants growing in the shade of a large live-oak, although later in maturing and having a more slender habit, are no less beautiful than those in full sun. Any well drained soil should satisfy the requirements of this species. Once established supplemental water seems unnecessary as plants seem to enjoy a medium dry climate. The plants at Fairchild Tropical Garden were subjected to temperatures as low as 28° F. for several hours a night for two nights during the winter of 1957-58 without any sign of injury.

LETTERS

1211 SOUTH ZERO STREET
FORT SMITH, ARKANSAS
March 16, 1961

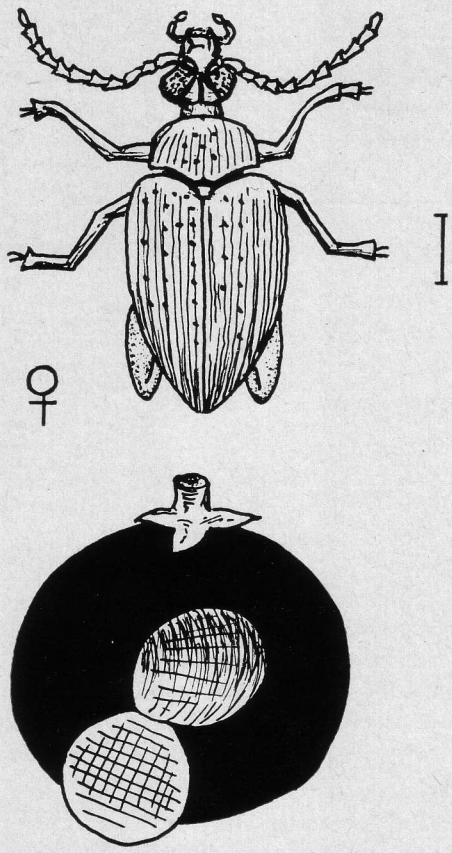
Since I am the only member of The Palm Society in Arkansas, you may remember that a photo of my palms appeared in PRINCIPES, April, 1959. The same year, when talking with Dr. Milton W. Sanderson (State Natural History Survey, Natural Resources Building, Section of Faunistic Surveys and Insect Identification, Urbana, Illinois) I mentioned finding weevils in seeds of *Sabal minor*. He was very interested in having enough material to work with, since the few he had were collected in Miller County, Arkansas. I told him I expected to be in either Mississippi or Louisiana the coming November-December. As it happened, I was sent to Louisiana where I collected ample material in Sabine Parish, Louisiana. Besides the container of seeds I sent him, I opened 150 of the same batch and found a ratio of one in seven inhabited, so I sent him some larvae and pupae preserved in alcohol. Then I noticed some tiny pupae in some of them that were parasitic on the bruchids. I told him I suspected they were Hymenoptera, which he later informed me they were. I sent him some of these also. The beetle is *Caryobruchus gleditsiae* L. which he tells me was identified by Bottimer in 1956 from his Arkansas material. And the parasitic wasps are *Eupelmus cyaniceps* Ashm. identified by Dr. B. D. Burks (National Museum) in 1960 from my Louisiana material.

Later, nearly all the rest of the 150 seeds produced bruchids which shows a high infestation of these "weevils," and not enough wasps.

In his letter of April 14, 1960, Dr. Sanderson states: "In the event that you or some of your friends in The Palm Society should find bruchids in seeds other than *Sabal minor*, I would be interested in examining them. Thus far we know of but one *Caryobruchus* species in the United States but who knows if there are others until we compare reared material from a variety of palm seeds?"

The parasitic wasp also parasitizes other Bruchidae. Also another species of the same genus parasitizes katydid eggs. Most all of the Bruchidae develop within the seeds of legumes. Only a few develop in the seeds of palms.

I am including a drawing of this beetle (female) if you can use it, which



44. Female weevil and fruit of *Sabal minor* redrawn and enlarged (scale x 1 2/7).

I drew from looking at the beetle. None of my material on bruchids has an illustration of this genus or species. The line to the right shows its natural size. The figure below represents the palmetto fruit showing hole and "cap" where an adult beetle has emerged. The beetles have curious hind legs, apparently for jumping. Males are slightly smaller.

Yours truly,
DILLWYN W. PAXSON

LAKELAND, FLA.
March 10th, 1961

In the October PRINCIPES I found an article: "The Ecuadorean Relative of the Chilean Wine Palm", by David Barry, Jr. In his quotations of temperature ranges of Quito taken from a pamphlet published by Pan American Airways, there are some errors in his conversion figures are Fahrenheit to Centigrade temperatures.

I wrote a letter to Mr. Barry and called his attention to the errors in his centigrade quotations and the importance of giving correct conversion figures, since our foreign members are not familiar with Fahrenheit degrees which therefore have no meaning for them.

I expected the corrections which I have sent him to be published in the January issue of PRINCIPES; however, not finding them there and still thinking they ought to be published, I am listing the temperatures and their equivalent centigrade degrees below and beg you to have them published in the next issue if possible.

44°F - 47°F : 6.7° - 8.3°C.
69° - 72°F : 20.6° - 22.8°C
55°F : 12.8°C
56°F : 13.3°C

Thanking you in advance for your kind attention to this matter, I am,

Sincerely,
MORTEN K. BEYER