PRINCIPES

Journal of The Palm Society

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THE PALM SOCIETY

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

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JOURNAL OF THE PALM SOCIETY

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

EDITOR: Harold E. Moore, Jr.

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

Manuscript for PRINCIPES, including legends for figures and photographs, must be typed double-spaced on one side of 8½ x 11 bond paper and addressed to the Editor at Bailey Hortorium, Mann Library, Cornell University, Ithaca, New York, for receipt not later than 45 days before date of publication. Authors of one page or more of print will receive six copies of the issue in which their article appears. Additional copies or reprints can be furnished only at cost and by advance arrangement.

Contents for January

Cover Picture

Pinanga furfuracea at the Botanic Garden, Singapore. Photograph by G. Addison, November, 1958.

NEWS OF THE SOCIETY

The outstanding event of 1963, as far as the Society is concerned, may well be Dr. P. B. Tomlinson's proposal for an International Palm Year. chiefly concerned with the study of growth rates in palms, but possibly branching out to encompass other areas in which information is sadly lacking and much needed. You will read more about this farther along in this number of PRINCIPES.

* * *

The Society continues to receive inquiries about membership, and many of the inquirers become members. Since the new roster was published on September 1st, 21 more palm enthusiasts have joined. Our president, David Barry, Jr., has kindled enthusiasm among various Hawaiians, whom we are happy to welcome. Let's all follow his lead and encourage those whom we know are interested in palms to join.

California members, about 60 strong, were treated to a delightful outing at the home and nursery of Bill Seaborn, Escondido, Calif., on October 21st, 1962. The secretary of the group reports that it was one of the most enjoyable get-togethers they have had. "All that week had been cloudy and cold, but come that Sunday, the sun came out warm and wonderful and the countryside was beautiful. We sat out in the patio under a huge live oak and had coffee before we made a tour of his nursery. Every nook and cranny of his ¾ acre is crammed with palms. The temperature in his area varies from 80 degrees to 16 and his palms thrive beautifully." A luscious buffet supper was served, after which Mr. Robert Morris of San Marcos showed his collection of slides made during his world travels during the past five years. "They are quite stunning, and it was a thrill to see how the various palms grow in their native lands."

* * *

Some seed bank members are becoming lax in reimbursing the costs of sending seeds. I have all I can do to mail the seeds and keep the records, besides my other Society work, so please don't make me have to send reminders. The bargain was that seeds would continue to be sent as long as prompt payment was received

LUCITA H. WAIT

MARIAN BELL FAIRCHILD— AN APPRECIATION

MARJORY STONEMAN DOUGLAS

When Marian Bell Fairchild died recently it marked the end of an era in south Florida, but not the end of our appreciation of what she was and stood for, or of her influence on all of us.

She was the daughter of Alexander Graham Bell, and wife and widow of David Fairchild, the brilliant first head of the Bureau of Plant Introduction of the U. S. Department of Agriculture. But in her own handsome and radiant presence she was much more than that to everyone who had ever known her.

As her father's secretary her advice decided a committee of the Smithsonian Institution to accept the gift of a great art collection for the National Museum. As wife to David Fairchild and mother of his three children she was not only the constant and constantly enthusiastic companion of his world-wide travels. It was her knowledge of his material and her editing ability which helped so much to make his books the readable classics of plant collecting which they have proved to be.

In Washington, she made his home a centre for an increasing group of friends with all sorts of scientific knowledges and skills. Since 1927, when he came

to south Florida to establish the first U. S. Plant Introduction Garden in Miami and they became permanent residents of Coconut Grove, it was her taste and hospitality which made their wonderful estate "The Kampong" among his fine grove of tropic trees overlooking the Bay a focus of hospitality to distinguished plantsmen and botanists from all over the world. And a place of stimulus and inspiration to every person hoping to perpetuate the beauty of tropic growth and living in this changing world.

The Fairchild Tropical Garden, to which Dr. Fairchild contributed so much and which was established to honor him, was also a result of her own deep feeling for nature and her warm and outgoing spirit. With the magnetism of her great father and the total integration of her enthusiasms with those of her husband, her delight in nature and in life itself, with her unfailing kindness and warm understanding of people, she will remain with us still, a living and abiding presence.

A Special Message to Members of The Palm Society

In this issue Dr. P. B. Tomlinson, Research Scientist, of the Fairchild Tropical Garden, asks help in his important project of the study of the rate of growth of palms. If he should receive substantial support from our membership, the Society plans to signalize our joining of hands in this study by proclaiming an INTERNATIONAL PALM YEAR.

During this significant period several activities would be launched. Among those under consideration are:

1. The initiation of a fund to finance a competent collector to secure palm material from little explored places, such as New Guinea, Madagascar, and the Solomon Islands.

2. An intensification of the world-wide distribution of palm seeds. This project would be assisted by a new seed bank distribution list to include the offerings of newly established sources, and would be international in scope.

3. A special issue of PRINCIPES. A special and expanded issue of PRINCIPES would be published and devoted entirely to the horticultural aspects of palm culture. This issue would have especial value to the many members of our Society who are nurserymen or private growers. Certain qualified members would be asked for subjects for this issue.

4. The measurement of the growth rate of palms might be extended to a study of the periodical phenomena of flowering and fruiting in palms throughout the world.

Sincerely,
DAVID BARRY, JR. *President*

A Proposed International Palm Year

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

International co-operation is a familiar procedure to all scientists. By its means information from diverse and widely-scattered sources can be assembled far more easily than by a single individual or organization. The International Geophysical Year is a familiar, recent and well-publicized example. Similar ventures are frequently being put into operation since science knows no

geographical frontiers and scientists are necessarily unbiased observers.

Recently I have been considering how members of The Palm Society individually might provide information which, when collected together, would be of fundamental value to both science and horticulture. Many members of The Palm Society either grow palms in their own gardens and have them under constant observation, or may make frequent and regular visits to regions in which native palms grow. Altogether, these closely scrutinized palms must survive in a great variety of situations, both natural and artificial, in many parts of the world, either within their normal range, or far outside it as exotic ornamentals. Members of The Palm Society must be watching palms grow under all sorts of circumstances. They are in a favourable position to look at growing palms over long periods of time and so to watch the rate at which they grow. In just this way records are being kept of the rate of growth of selected palms at Fairchild Garden.

But the information that a single individual or organization can supply is very small compared with that which needs to be assembled before any sound generalizations can be made about growth rates in palms.

Therefore it would seem a reasonable proposal to enlist the aid of members of The Palm Society. They could supply a great deal of information, simply and with little effort, over a suitable period of time, such as a year. This project might be an attractive proposition to other individuals and organizations not members of the Society. The project might then be referred to as an "International Palm Year." This may sound rather ambitious or even pretentious, but the actual procedure would be very simple. Before going any further with the proposal, it will be necessary first to consider why there is lack of information and what benefits might be derived from a large scale increase in factual knowledge which such a cooperative scheme might produce.

Growth increases in many living organisms may be easy to measure. Thus it may be necessary only to determine the increase in overall length or the gain in weight. In hardwood trees the increase in girth of the trunk is a measure of the addition of successive new layers of tissue. Palms, however, do not grow like hardwood trees and the way in which their growth rate could be measured is not obvious. Apart from this difficulty, scientists who might make the proper observations are mainly centered in temperate countries and do not have unlimited access to large numbers of palms. In proposing the International Palm Year I would like to point out how these, and other, obstacles could be surmounted.

It might be thought that an accurate measure of the age of a palm would be given by its overall height. But this would be true only if all palms grew at exactly the same rate and maintained this rate constantly throughout their lives. In his accompanying article, however, Dent Smith shows that this is not true. We know only in very general terms that the palm initially grows very rapidly without increase in overall height and that subsequently it grows in height but at a decreasing or variable rate. This then would be one of the first benefits of an accurate knowledge of growth rates in palms — to give information about changes in the rate of growth of palms with age. Subsequently it might be possible to make a reasonable estimate of the age of a palm from its height. We are quite certain, as Dent Smith also points out, that all palms do

not grow at the same rate. Thus a short palm which grows slowly may be much older than a tall palm which grows rapidly. Some palms never produce an aerial stem. Precise measurements to show these differences in different species of palm are quite lacking. We shall see a little later, however, that there are precise criteria for estimating growth rates in palms. We could be in a position to say a great deal about the age and history of a particular palm if we had information about growth rates of its species from a large enough number of examples.

These observations on growth rates will be of great value to horticulturists and agriculturists. If one can estimate the size which a palm might achieve after a given period and in a given climate and soil it would be a useful guide to planting and landscaping. At present many nurserymen must be aware of our inability to do this. The guide to palm planting which Dent Smith mentions as being so desirable will only come from a much more thorough and detailed knowledge of rates of growth of palms. The value to the plantation owner is quite obvious, since his livelihood results from a knowledge of whether his crop is growing well or not. For this economic reason there is a good deal of information already available on the growth rates of crop or plantation palms like the oil-, date-, and coconut-palm. It is largely to extend these observations to palms of less immediate commercial value that international co-operation is called for.

From our knowledge of the mechanism of growth of the palm (itself only understood in a very superficial way) it seems that the rate of leaf production can be used to estimate growth rates in palms. Thus the number of leaves matured by a single stem over a given period gives an estimate of the pace of growth of that palm. This is a relatively easy standard to adopt since each palm stem bears a single crown of leaves and produces only one leaf at a time. All that is necessary to measure this leaf productivity is to mark a young leaf and observe by how many new leaves it is followed in a given period. In a future note in PRINCIPES simple methods will be described for marking such a leaf and recording the observations. These methods are not time-consuming and do not require specialized knowledge or apparatus. They do not harm the growing palm in any way. They do, however, provide fundamental information.

The tentative scheme therefore proposes that members of The Palm Society, together with other interested individuals or organizations such as Botanic Gardens or Research Institutes, should keep simple records of growth rates in as great a variety of palms as is possible for a period of not less than a year. These results would be analyzed by me, together with as much information as is already available in print, and ultimately published.

First, however, it must be known that there is sufficient interest in the project to make it worthwhile. For members of The Palm Society this can be done simply by indicating on a postcard their willingness to participate. These will be acknowledged collectively in a future issue of PRINCIPES. In addition the proposed scheme will be drawn to the attention of individuals and organizations who are not members of The Palm Society, but who may wish to participate. Botanical Gardens, particularly those in the tropics with large palm collections, would be in a good position to provide facilities for these simple observations.

If interest is sufficiently great the In-

ternational Palm Year would be brought into being. A tentative date for the initiation of this project would be July 1st, 1963. More details would appear in the next issue of PRINCIPES (April). These would consist largely of detailed descriptions of the simple procedures to be employed in making measurements, together with examples of how additional information which will be needed (largely facts about the age and the condition of the palms under observation) is to be recorded, as well as the observations on leaf production in the palms themselves.

Mr. R. W. Read, Botanist at Fairchild Garden, has been kind enough to offer his services as taxonomic consultant in instances where the identity of a palm under observation is in doubt.

I began by emphasizing how scientific theory is frequently based on masses of facts gained by international co-operative efforts involving many individuals. In the physical sciences these people are usually trained scientists and need quite elaborate apparatus. But it is not so in biology. In the history and development of biological science the keen, intelligent amateur is a prominent and important figure. In keeping with this tradition the untrained but enthusiastic and careful observer participating in an International Palm Year can assemble valuable information without the need of special equipment. These facts about growth rates in palms are a fundamental necessity and cannot be assembled in any other way.

The directors of The Palm Society have cast their blessing on my proposal. It is to be hoped that enthusiastic individuals will now be forthcoming in sufficient numbers that this idea of an International Palm Year will become a reality. It would offer a chance which so rarely presents itself in this era of elaborate and costly technology, a chance for the non-specialist to make a significant contribution to scientic research.

Growth Rates of Certain Palms

DENT SMITH

In this article the observations on the growth rate of a few palms, largely supported by photographic illustrations, are of course quite distinct from the scientific studies planned by Dr. P. B. Tomlinson for the proposed International Palm Year. His studies would be based at least in part, nevertheless, on the records and observations of non-technicians, who are any of us engaged in growing palms for pleasure or profit. This article, though but fragmentary, would conform with the objective if it proves to contain even a very minor fraction of the collective information to be sought.

Studies leading to fuller knowledge of the growth rate of palms must be of some importance to botanical science, as otherwise it is unlikely that Dr. Tomlinson would undertake them. How important they would be to gardening more nearly concerns all of us who garden, and most of us do. Greater knowledge of the growth rate of palms would be of the very first importance to anyone attempting to grow them. This may be readily seen from the fact that the placement of them is so often wrong in the sense that the misplaced plant shoots up years sooner than expected or the reverse, remaining almost stationary though rapid growth had been envisioned. Frightful mistakes in planting palms are not due only to lack of feeling for landscape design; they are

1. *Coccothrinax crinita.* (left), a specimen about nine years old which has grown much faster than usual for the species under cultivation; 1a (right), another plant of same age which has grown at the slow rate generally considered normal for the species.

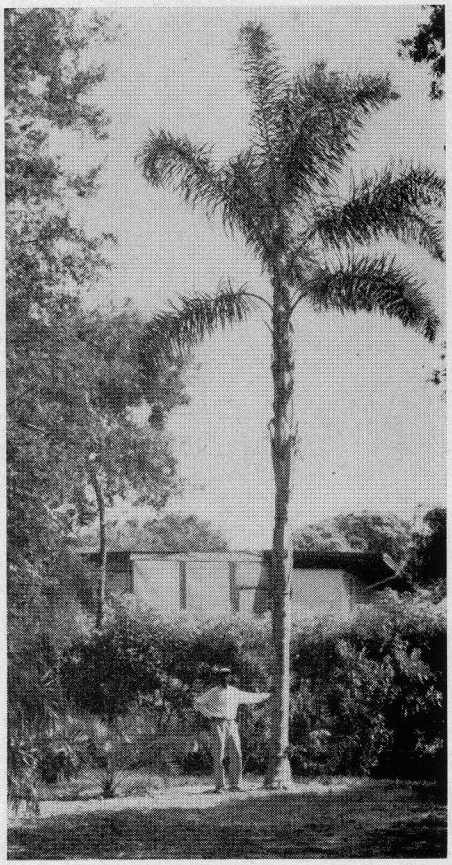
often due to ignorance of the growth to be expected, resulting in monstrosities up in the power lines and ridiculous little palmets pastured out where the monsters should have been.

One dimension a given palm may ultimately reach is probably known more often than not, for at least that one — height — usually is included in published descriptions. But palms grow in three dimensions, not just one, and both above and below ground; new roots, and any enlargement of the root system and of subterranean trunks, as in *Sabal minor* and *S. Etonia,* also must be included in the term "growth." Because of space limitations, attention here will be chiefly focused on the vertical or upward growth rate of the few palms to be mentioned.

Except for the more commonly cultivated kinds, seldom do we know how long it takes a palm to reach maturity and at what rate it grows at various stages between birth and death. For a palm does not have a growth rate, but rates. Certain species make their most rapid growth in the next few years after passing the seedling stage, while any increase in the size of others during this same period is barely perceptible from month to month, and in some cases even from year to year. Generally the growth rate is much reduced as maturity is approached, which may be readily seen by the narrower interspaces between the leaf scars, or in scarless stems by the congested appearance of the sheaths at the top of the shaft.

The relative terms "fast" and "slow" are inexact and sometimes misleading, for what one man calls fast another might call slow. Two rapid growers while young are the *Arecastrum Romanzoffianum* and the *Livistona decipiens,* but the former might easily make double the upward growth of the latter in the same length of time. Studies of growth rates should help to determine how fast is fast and how slow is slow. Perhaps one result would be a table of measurements showing annual average gains in height, or failing that, an averaged number of new leaves *per annum* for each species under surveillance.

A rapid succession of new leaves



2. *Arecastrum Romanzoffianum*, started from seed in 1952, has grown at the rate of about three feet a year.

manifestly indicates rapid growth, but in some palms this growth may be more in the bulk of the stem and foliage than in height gained, as for example in the *Phoenix canariensis*. While still quite young the king palms (*Archontophoenix* spp.) normally will add six inches or more of stem for each leaf produced, but the species of *Phoenix* must produce many leaves to gain an equivalent elongation of the stem.

Adulthood in palms materially differs from maturity. A palm is adult when able to reproduce itself from seed, even if only three years old, as in some species of *Chamaedorea;* but it is not mature until it reaches its fullest development, at which time, if it were a spruce or a fir, it should be harvested. Like timber trees, palms deteriorate from full maturity onward, notwithstanding that life may persist for a great many years. Even before maturity the expanse of the leaf crown is commonly much reduced, trunks develop cavities and fissures due to fungous attack or other causes, and a seeming shrinkage may be noted in the trunks (actually a wearing away of the perimeter) of ancient palmettoes. This peripheral erosion is the natural effect of heat, cold, wind, humidity and the heavy rainfall of countless storms perhaps throughout a century, perhaps three or four. The monocarpic palms and many others escape such extensive ravages because they are relatively short-lived.

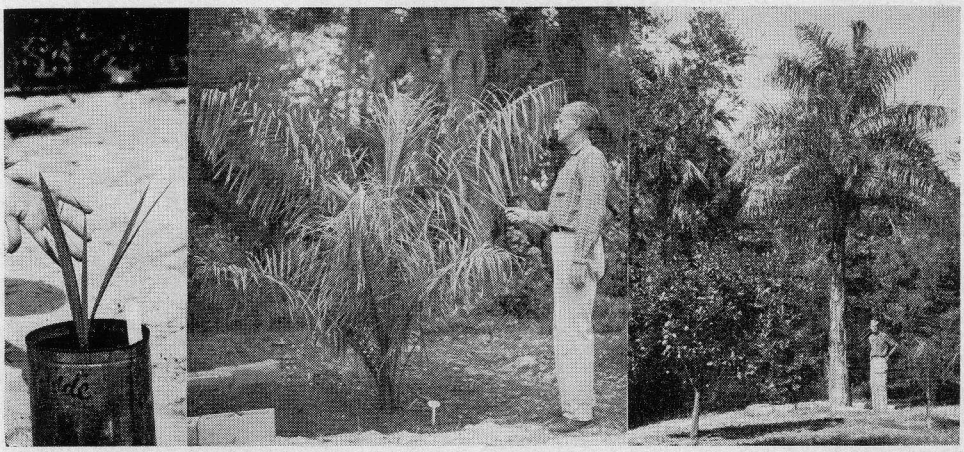
Granted that the growth rate or rates of a palm throughout its lifetime would be of more than passing interest to the gardener, his major concern would be the rate during its early years. Unless the garden is an old one, he works mostly with young plants. Usually his palm gardening begins with plants in pots or cans, and he wishes to know how rapidly each one grows so that he can intelligently choose a planting site. Human nature being what it is, his real interest lies in what is to happen over the nearer term rather than in the next century. Certain palms reach great heights in one hundred years, but planting for posterity is a project that stirs no enthusiasm outside of botanic gardens and arboreta, and very likely in those quarters altruism instead of enthusiasm supplies the motive. Thus anyone reaching the age when the actuarial calculations begin to look glum might do well to consider planting only those

3. *Archontophoenix Cunninghamiana.* (left), centered is a plant two years old photographed August, 1959; 3a (right), same palm in center but three years older in August, 1962.

palms that should give a good account of themselves over the earlier years, for surely the best rewards in gardening come from seeing the plants grow and develop into objects of wonder and inspiration. This is so patently true that also the youngest of gardeners, when it comes to planting palms, in all likelihood would prefer to plant those that promise not to delay good growth for a decade. The suggestion is not being made here that the notoriously slow starters, such as *Coccothrinax crinita*, are undesirable and should never be planted. The reverse is true, but one should know what one is getting into; which by itself is ample reason for trying to learn about growth rates.

Palms of the precise same age and species, even when planted at the same time, may or may not grow at the same rate. This may be graphically seen in

4. *Archontophoenix Cunninghamiana.* (left), a plant two years old in August, 1959; 4a (right), same specimen in August, 1962.



5. *Acrocomia Totai.* (left), one year old, November, 1953; 5b (center), same at three and a half years in February, 1957; 5c (right), same at seven years in November, 1960. In August, 1962, this palm had flowered and fruited in each of the latest three years.

Figs. 1 and 1a, showing two plants of *Coccothrinax crinita* of the same age and procedence, once nearly identical in size and appearance, the smaller now fulfilling its reputation for extremely slow growth and the larger violating the established speed limit.

Twelve years ago the writer began planting palms in Daytona Beach and has not yet called a recess, with the result that about one thousand individuals comprised of 71 genera and 182 species are now set out on the grounds. These are the figures after large losses due to freezing or other causes. Of almost 400 species tried here at one time or another, more than half proved to be unsuitable for the location. Some of the established palms were trucked here as large specimens, but most have been grown from seedlings and small potted plants, or else were started here from seed. The tallest palm grown here from seed is a rather spindly arecastrum now about thirty feet tall (Fig. 2); the seed was sown in the spring of 1952 and germinated in mid-summer of that year, thus making the palm ten years old as these words are being written (August, 1962) and giving it an average annual growth rate of three feet. Half a dozen other arecastrums from the same lot of seed have grown well, but at a slower and more usual rate.

Of the palms cultivated here the two species of *Archontophoenix* make the most rapid growth, being about equal to each other in that respect (Figs. 3, 3a, 4 and 4a); they grow faster than the fabulous willow of northern climes and faster than the European larch, that champion sprinter among the conifers. Several species of *Acrocomia* are very close contenders, but fall into second place (Figs. 5-5b, 6-6c and 12). Next in rapidity of growth at this locality are the royal palms (*Roystonea* species) despite occasional severe damage to the foliage by incursions of Arctic air (Figs. 7 and 7a). It would border on impossibility to rank the other rapid growers, of which there are many, in exact numerical order, for the differences in growth rate are not so apparent as in the three genera mentioned above. Even if hard and fast lines could be drawn, they would apply with full force to this locality only.

6. *Acrocomia* sp. belonging to section *Sentocomia*, evidently of low-latitudes because tender to cold. (top left), plant seven years old. May, 1953; 6a (top right), same in February, 1957, with adherent petiole bases; 6b (bottom left), same in October, 1957, with self-cleaning bole now bare; 6c (bottom right), same sixteen years old in August, 1962, despite total defoliation by freezes of 1957-58 winter.

Certain of the veitchias are said to grow faster than other palms in the Miami area, but that is not true at Daytona Beach, perhaps because the colder winters retard their growth. In any case the *Veitchia* species, especially *V. Merrillii*, are at best marginal in Daytona Beach. The *Archontophoenix* species, on the other hand, seem to maintain their winter pace quite as well as in a warmer climate.

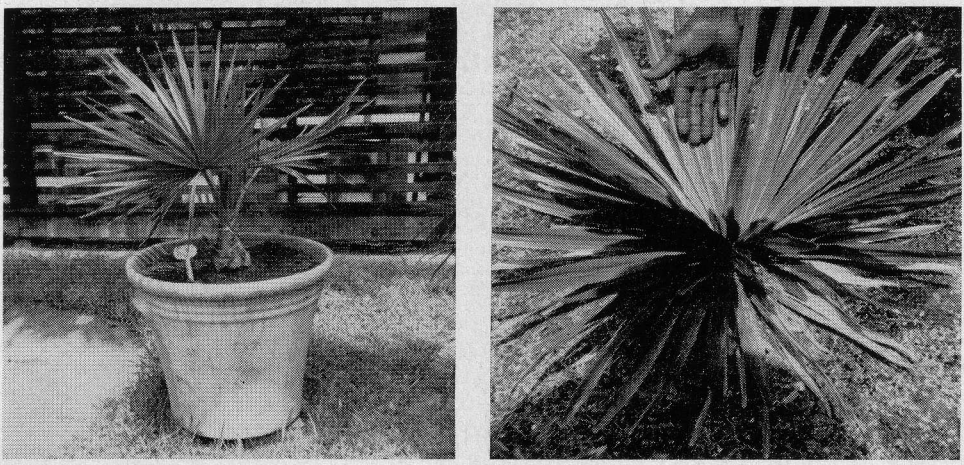
If a great many of the palms grow rapidly — and they do — many others grow with exasperating slowness. Then there are the medium growers, half way between fastest and slowest, and also the moderately fast, the moderately slow and yet others representing every shade of difference to be expected in so large a family. The notably slow growers may be arbitrarily divided into two general kinds: those that grow slowly through-

7. *Roystonea regia* (left), four years old, August, 1959, but greatly retarded by severe injury in heavy freeze of December, 1957; 7a (right), the same three years later in August, 1962.

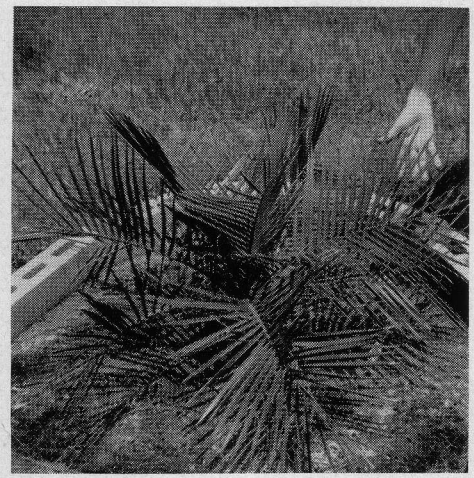
out their life span, as *Thrinax microcarpa, Rhapidophyllum hystrix, Pritchardia Hillebrandii, Serenoa repens;* and those that are laggards for all or a good part of their first decade, after which they make either good or fairly rapid growth, as species of *Corypha, Borassus, Copernica, Orbignya* (Figs. 8-10).

Here follow a few observations more or less at random on some of the palms in the writer's plantings:

The *Pseudophoenix* species are the slowest growing of all, which is true of them in this location during the long warm season as well as during the winter; the young plants, from four to ten years old, seldom make more than



8. (left). *Borassus flabellifer.* One of the "slow starters" already six years old in August, 1962. 9 (right). *Copernicia Torreana.* An extremely slow grower over the first decade. Seed from which this example sprang was sown nine years ago, in early 1953. Photographed August, 1962.



10 (left). *Orbignya speciosa* in center foreground at nine years from seed. A slow but most pertinacious palm photographed August, 1962.
11 (right). *Jubaea chilensis*, another laggard under Florida cultivation, eight years old, August, 1962.

two leaves in a year, and sometimes only one.

Here the *Jubaea chilensis* is one of the very "slow starters" (Figs. 11 and 20a). Whether it will one day begin to grow fast remains to be seen. The fact that this palm is nearly non-existent in Florida leads one to be somewhat skeptical of wider success with its culture in the state, though certainly any evidence is too meager to be conclusive.

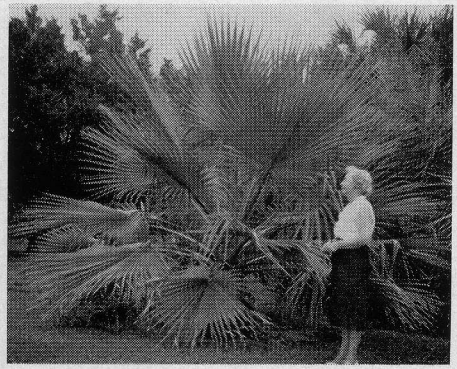
The *Sabal nematoclada*, native in British Honduras, is definitely the slowest-growing of eighteen *Sabal* species established here, and the *S. mauritiaeformis*, Colombian, is but a hair ahead of it. The *S. parviflora*, endemic in Cuba, is here the fastest grower in the genus. These superlatives are not intended to imply that the growth rates would or

12. *Acrocomia crispa.* (left), plant at six years and nine months of age, August, 1962; 12a (right), detail of sudden growth of specimen in August, 1962.

13. *Phoenix dactylifera* 'Deglet Noor' with five small offshoots, grown from seed in eight years. August, 1962.

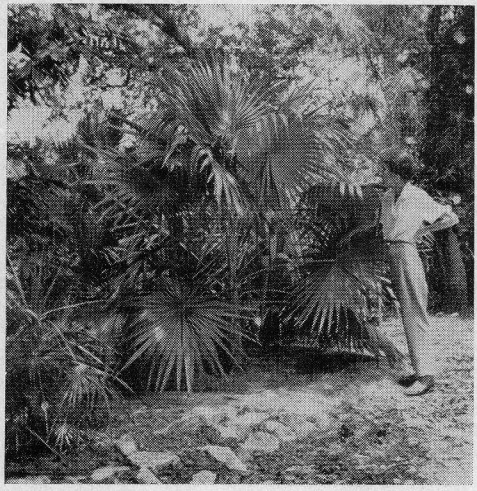
should be the same elsewhere, but perhaps valid inferences may be drawn to suit different conditions.

The *Sabal Palmetto* is extremely variable in growth rate and also in the proportions it attains. On these grounds it is usually a rapid grower, becoming in about ten years a massive tree already bearing fruit, with a root system extending outward from its base, in some directions at least, thirty to forty feet.

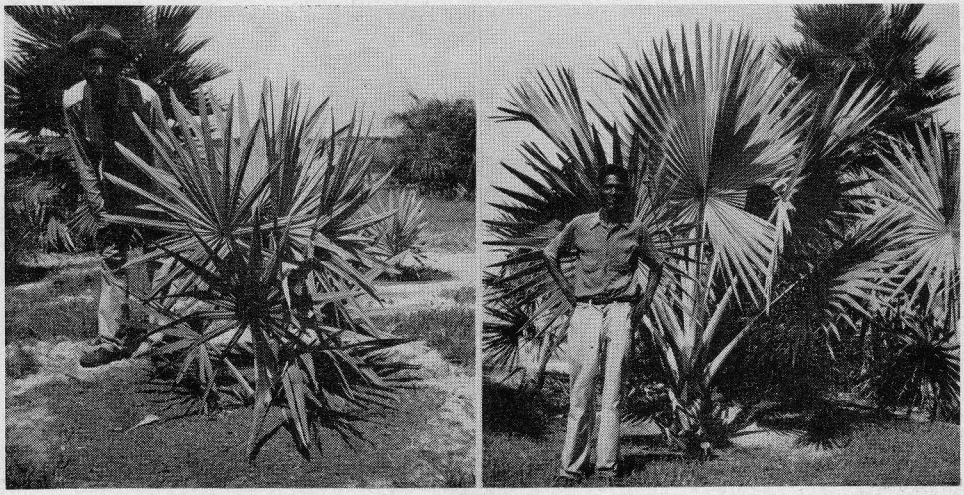


14. *Washingtonia filifera*, August, 1962, four years and seven months after germination of seed.

During their first seven or eight years the *Scheelea* species uniformly grow faster than the *Attalea*, and the *Attalea* faster than the *Orbignya*. The difference is quite marked, and long ago Nehrling correctly observed that the *Orbignya* palms are "hard to get started." He could have added with equal truth that they are hard to stop. Patience and enough time are the chief requisites for success with these palms, for they are extremely tenacious of life and withstand adversities that would destroy many others.

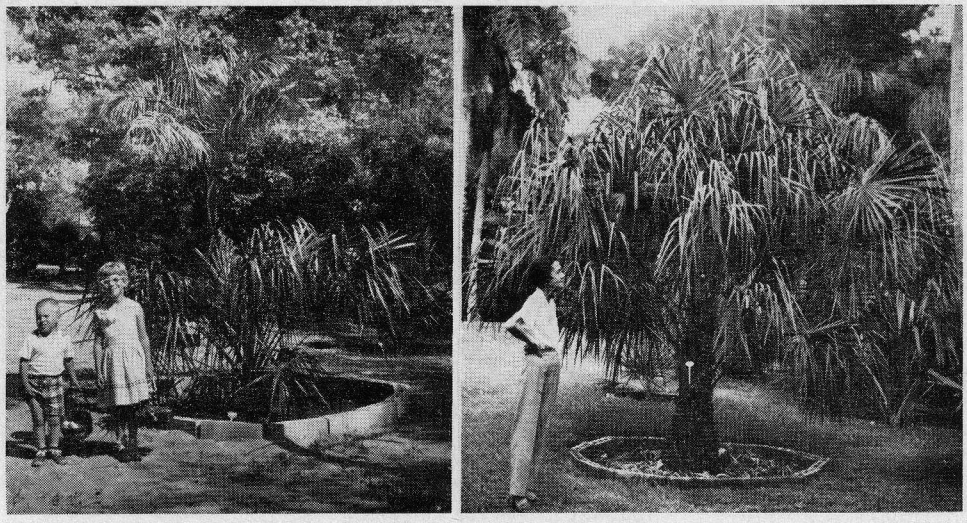


15 (left). *Phoenix canariensis* slightly over ten years old in August, 1962, from seed collected in February 1952. 16 (right). *Coccothrinax Dussiana*, August, 1962, from seed collected in October, 1953.



17. *Bismarckia nobilis.* (left), photographed in August, 1959, when four years old; 17a (right), the same plant, now seven years old, in August, 1962.

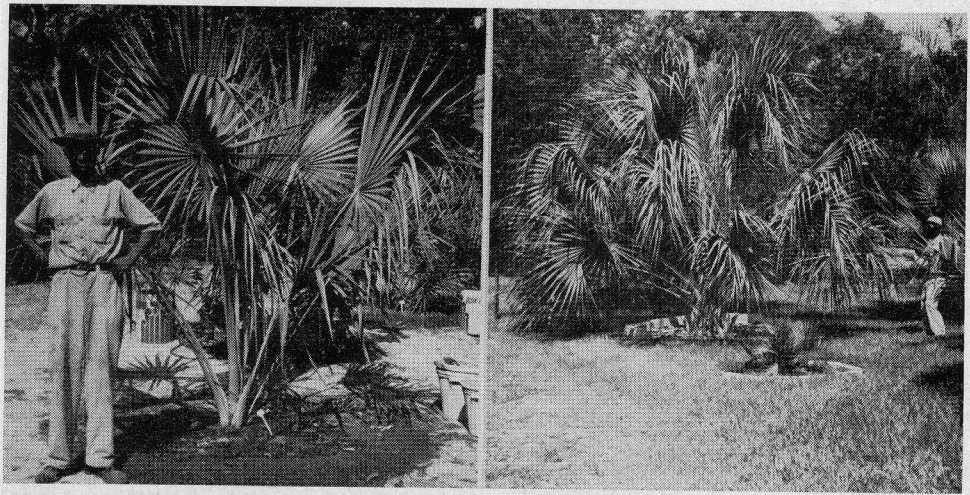
One more palm, the Cuban *Acrocomia crispa*, merits brief comment because of a remarkable development not observed by the writer in any other species of the genus. Although mention was made earlier of the very rapid growth of the acrocomias, a young specimen here of *A. crispa* had deviated from all the other observed species by not matching during adolescence the steady upward growth of the others; instead it had formed a broad crown of low foliage, but after six years and eight months had made no visible stem and hence no upward growth comparable to that of its congeners over the same short youthful span. It had not, that is, until late June, 1962, when suddenly a stem



18. *Livistona Saribus (L. cochinchinensis).* (left), seven years after germination of seed, April, 1960; 18a (right), same in July, 1962, at nine years of age.

19. *Washingtonia robusta.* (left), September, 1957, five years old; 19a (right), same in August, 1962, ten years old.

began to shoot upward by a startling vegetative process and within six weeks was something over six feet tall. Whether this belated but dramatic growth is habitual in young plants of *A. crispa,* the writer does not know though tending to suspect that it is; moreover it may be unique among palms, which again is a supposition and therefore far from certain. The sudden upward growth of the stem was not accompanied by a corresponding rapid increase in its diameter; on the contrary, at the end of the six week it was a very slender shaft appearing to be herbaceous growth and gave no sign it would expand into a woody bole, which of course in due time it would. The fleet transition from a squat



20. *Sabal causiarum.* (left), six years old in May, 1960; 20a (right), the same specimen in August, 1962, now eight years old. Steel tape held taut from stake at left to man's hand at right shows width of foliage to be 20 feet and 2 inches. Miniature palm in foreground is *Jubaea chilensis,* also eight years old.

shrub was attended by the formation of several short ascending leaves held closely parallel to the stem for half their length, clearly showing that the plant was spending most of its vigor on the erection of new stem at the expense of the foliar growth. The photographs in Figs. 12 and 12a were taken just as this account is being concluded, so that as yet there is no sequel. It is to be surmised, nevertheless, that the reduced foliage will soon be succeeded by a normal leaf crown, with some of the leaves arching or extending outward horizontally to five or six feet.

Coccothrinax Crinita

Nat De Leon

The genus *Coccothrinax* as it is presently understood consists of about 30 species. Geographically they range from South Florida through the West Indies, reaching their greatest development in Cuba where some 21 species are recorded.

At present there are a dozen species under cultivation in South Florida, but these are still poorly understood, for much work still remains to be done in the genus. One of the species, however, is so distinct that it could never be confused with others. Imagine, if you will, a palm whose trunk is completely covered with long strands of fiber that give the appearance of hair and you have *Coccothrinax crinita.*

This species, found only in Cuba, was first discovered by Charles Wright, but was not described until some 40 years later by Beccari. The original description was very fragmentary and it was not until some years later that better collections were to fill in the missing details. Specimens have only been collected in two widely separated mountainous areas in Santa Clara and Pinar del Rio, Cuba.

Coccothrinax crinita is a palm to 30 feet tall. Its large, palmate circular leaves are deeply divided into many segments, dark glossy green above, grey-green beneath. From the bases of the petioles are produced long strands of fiber that completely cover the trunk. If one inspects the trunk closely, he will find that the old leaf bases persist from ground level up, therefore, the long hairy mass also persists. A much branched inflorescence is produced from among the leaves, at first nearly upright, later almost hanging under the great weight of its fruit. The fruits, to one inch in diameter, are light purple at maturity and very fleshy; the furrowed seeds to half an inch.

Credit for the introduction of this interesting palm must go to our Society's president, Mr. David Barry Jr., plant introducer extraordinary. The record shows that in 1939 he sent young seedlings to the U. S. Plant Introduction Station, Coconut Grove, Florida. From these, three mature specimens can be seen today, one growing very close to the station's main office. These are the only mature palms growing in Florida. Also in cultivation are two mature trees growing at Atkins Gardens in Cuba, but their origin is unknown to me.

It is interesting to note that *Coccothrinax crinita* is without a doubt the hardiest species of the genus in cultivation today. During the very severe winter of 1957-1958, Mr. Dent Smith of Daytona Beach, Florida, recorded that two plants only several years old were unaffected by cold. Further proof was noted when I visted the Cowgill Nursery

in Tampa, Florida, during the spring of 1958 and saw a young seedling with no signs of cold damage. It may perhaps be theorized that the fiber produced, even when the palm is very young, helps protect the bud from cold damage.

21. *Coccothrinax crinita* fruiting at Chapman Field, Florida. Photograph by R. W. Read.

Coccothrinax crinita is not a difficult palm to grow. The seeds germinate readily. After the first few leaves have been produced, a full sun situation is preferred, although the palm will tolerate shade at any stage of growth. While it shows no soil preference, a loose, well drained medium suits it best. Although slow growing, the species is well worth planting as a unique palm.

New Caledonia For Palms

David Barry, Jr.

When Captain Cook discovered New Caledonia in 1774 he was evidently more impressed with the native pines than with the palms. He named the island New Caledonia because the pines reminded him of Scotland. Probably Captain Cook saw only the coconut palms and not the beautiful palms that lured me there, as these grow deep in the forests where they are not visible from the sea.

In January of 1962 I spent ten days in New Caledonia in a quest for palms. For several reasons they seemed to promise more to a palm collector from Southern California than would the palms from other places in the tropics. The islands south of New Caledonia had already been a source of palms for Southern California. From Lord Howe Island had come the howeias. From Norfolk Island and from New Zealand had come their respective species of *Rhopalostylis*. These palms have done well in the coastal belt of Southern California since their introduction a half century ago. It seemed reasonable to hope that New Caledonia palms from the mountain regions, some of which exceed 5000 feet in elevation, would be able to withstand the frosts of Southern California.

Except for being French and in the South Pacific New Caledonia is not like Tahiti. Languorous, glamorous Tahiti is verdure-covered in many shades of green. Its natives are light-skinned Polynesians. Papeete, the capital, is a small town. Tahiti is a well-advertised tourist attraction with accent on a life of ease. On the other hand, the green of New Caledonia is concentrated only in its dark forests and eastern coastal areas which contrast sharply with rolling areas of niauoli or of low brush. Its natives are dark-skinned Melanesians with thick, woolly hair that is often dyed a reddish brown. Nouméa is a small city of 20,000 population. Accent is on a life of industry. Mining is the principal activity, with important nickel, chrome and cobalt deposits. Until recently few tourists, except New Zealanders, visited New Caledonia.

Life in Nouméa is pleasant, and is as French as that in France. There are a number of excellent restaurants and a splendid beach for swimming. Long loaves of French bread are delivered like newspapers.

New Caledonia does not have the intensely tropical climate of lands that are near the equator. Except for somewhat more humidity its climate is much like that of the Hawaiian Islands. New Caledonia lies in the South Pacific in latitudes from 20° 8′ to 22° 25′, about the same distance below the equator that the Hawaiian Islands are above it in the North Pacific. Not counting New Zealand, New Caledonia is the largest island in the South Pacific. It is 250 miles long with an average width of 30 miles. A *chaine centrale* forms its back-

22. The jeep on a good road through shrub growth in nitrogen-deficient laterite soil.

bone and separates a wet east coast from the relatively dry west coast.

The distinctive flora of New Caledonia has been an attraction to botanists for the last century. Their interest, however, was mainly taxonomic, and they paid scant attention to collecting and sending away live plants or seeds. As an illustration, in the palm collection of the Botanic Garden in Sydney, the nearest port of call to Nouméa, there is only one species of a New Caledonian palm, *Chambeyronia macrocarpa*.

New Caledonia is rich in palms, with fifteen genera embracing about twenty-five species none of which is found elsewere. Only three or four species have so far been introduced to other countries, in a few instances, and mostly to European conservatories during the last century.

The flora of New Caledonia is unique and largely endemic. It is rich in green plants of ornamental foliage, such as ferns, araliads (more than 100 species), araucarias, and palms. Most of these plants grow in the forests that cover many parts of the island. Outside of the forests much of New Caledonia presents a barren aspect with a low shrub-like growth. The most characteristic plant is the *niauoli*, a paperbark relative of the eucalyptus, a much-branched tree that grows by the millions over large areas. Other extensive parts of the island have an impoverished laterite soil on which strange-looking brush-like plants manage to exist. These are worthless to a plant collector, as they would not survive away from their peculiar native environment.

Fortunately, for the success of my trip, I had become acquainted, through a correspondence of several years, with Lucien Lavoix, a prominent merchant of Nouméa, and an ardent plantsman. He is the owner of a remarkable property in a mountain forest on Mt. Koghi

23. Palms with half-ripe fruit in a mountain ravine. The rosette of leaves at the right is the crown of an araliad.

that rises back of the city. Without his enthusiastic help my efforts to see the palms of New Caledonia would not have amounted to much because I arrived unprepared for rough forays into the dense forest or the bush, or *brousse.*

Lucien Lavoix has cut five miles of roads through his three hundred acres of mountain forest, and has built a delightful resort home from which one may look down upon great expanses of the island and the Coral Sea. The terrain is very rough, steep, and covered with trees, palms, and ferns — a paradise for lovers of green foliage plants. Except for the many introduced exotics that have been planted along the edge of the roads, there are no bright flowering plants. Some large Kauri pines were taken out for timber years ago. Otherwise, the forest is virgin. Access to the plants would be most difficult without the new roads. The forest is so lush that photography of single specimens is difficult. For example, the giant angiopteris ferns that grow in colonies interweave their twenty foot long fronds to create a criss-cross maze.

I made in all four trips out of Nouméa to collect palms, going north, east, and south to forests with such fascinating names as La Forêt des Eléc-

triques, de la Riviére Bleue, du Plein de Lac, du Mois de Mai, du Col'd'amieu, de la Table Unio, et des Sources. On two trips Lucien Lavoix was my chauffeur and guide; on the other two Luc Chevalier, director of the Musée de la Nouvelle Calédonie. The jeep we used was a two-seated war surplus vehicle, formerly used by an American general. It ran well, but the roads were either rough, or we were going fast, and I always had to hold on to the windshield with one hand and a pipe rail at the edge of the seat with the other to keep from being thrown out. There were no doors, and the roof leaked.

We usually visited two or three forests on a single trip. On certain areas in the island the forests run together for great distances. On the south section of the island the forests were of about two or three hundred acres, extending up from the plain on the sheltered slope of a mountain. We would drive to the edge, enter the forest, and explore for species of palms that we had not already found in other forests. If the palms and flora in general seemed the same as we had seen, we would leave and go to another forest.

There are no snakes in New Caledonia, making it possible to walk boldly through waist-high grass when occasionally it formed the forest floor.

This exploration took place in the middle of January, which was the middle of summer there. I had planned the trip with the expectation of finding ripe seeds at this season. I should have gone in March, because the seeds of the palms and the beautiful araliads were only half-ripe. I would recommend March to a seed-collector; November for the taxonomist seeking fresh flowers. At best, such exploration is tiring and difficult. I heard later that shortly after I left, Nouméa had steady, unseasonably heavy rains which lasted for two months, and by mid-September all seeds had disappeared.

Identification of the palms that we found was not easy as the keys that I had were based mostly on mature seeds. These keys are in the *Journal d'Agriculture Tropicale et de Botanique Appliquée* 8: 57-64, 1961, as part of a valuable article on Les Palmiers de la Nouvelle-Calédonie, by A. Guillaumin of Le Jardin des Plantes of Paris.

The commonest palm is *Kentiopsis olivaeformis*, a slender, graceful palm with a green trunk about three inches in diameter. We saw hundreds of them, mostly growing in sheltered ravines. The ones in fruit were the tall ones, twenty to thirty feet in height. The lower ones, with fully developed trunks and crowns of leaves had no fruit. They were the trees that we could reach. I finally figured out that the lower specimens were more sheltered, and received insufficient light to induce them to flower. The tall trees in full sun alone received the light required to develop flowers.

I collected and shipped out quantities of half-ripe seeds, as I had found that good germination can sometimes be had with palm seeds that are allowed to harden somewhat by drying before they are sown. Except in a few instances, however, no success in germination was had by the recipients of these seeds.

We saw the two palms in which the new leaves are crimson, *Chambeyronia Hookeri* Becc. and *Actinokentia divaricata* Dammer. My host, Lavoix, assured me that the crimson color is a beautiful and striking contrast to the green of the palms and the surrounding forest. I had to take his word for it, as in no specimen did I see a young leaf unfolding. In *Chambeyronia* the leaves and petioles have a faint brownish cast that

24. *Chambeyronia Hookeri* in New Caledonia.

suggests a red that has faded to green. Mrs. Arthur Langlois of Nassau wrote recently that the young leaves of plants of *Chambeyronia macrocarpa* that she saw growing in the Jardim Botánico in Rio de Janeiro were beautifully red.

We saw three species of *Basselinia* of which ten endemic species have been described. These palms have trunks about two inches in diameter. One species that produces multiple trunks should be of great horticultural merit. It has an attractive silhouette, with a crown-shaft that is orange-brown flecked with short dark stripes. The foliage is of a clean-cut, hard texture. This leathery hardness of the leaves and petioles indicates that the palm may be slow-growing, and perhaps more tolerant to frost than palms of the other genera.

I probably saw other species of palms besides those that I have named, but I could not identify them. There is a general similarity in many of the species of pinnate palms seen a short distance away. Some of the species are found in sections of the island that I did not visit. To see some would require organizing a small expedition to spend two or three nights on the trail.

All of the palms of New Caledonia are pinnate with the exception of the enigmatic *Pritchardiopsis Jennencyi* Becc. According to Guillaumin's article, this palm was introduced to the conservatories of Europe by Sander in 1898. Guillaumin has not been able to find it in Europe, which is not surprising, nor was he able to find it when botanizing in New Caledonia.

Our editor, Dr. Harold E. Moore, Jr., had especially charged me with the task of finding this palm, and I did what I could for him. The palm was reported to have been found at the Bay of Prony by Jeanneney in 1892. With Luc Che-

valier as my guide, we headed southeast from Nouméa for the Bay of Prony. We drove a hundred miles or so into a remote and unfrequented country. There is a road between Nouméa and Prony, but there is no vehicular intercourse between the two places. Perhaps one car a month goes into the area back of Prony — that of a man to visit hydrographic stations. In case of a breakdown one would have to walk out. The road was very bad. The way was eerie in the region of the strange shrubs struggling for life in the red laterite soil.

We carefully searched two forests back of Prony for the fan palm. A heavy rain storm caught us and we were drenched for hours. The roof of the jeep was a sieve. Finally, we ignored the wet, and went trudging through the wet grass of the forest floors. Fortunately the rain was warm, except on the return journey to Nouméa, when we felt the wind.

We found no trace of a fan palm. Chevalier conjectured that it might be in one place, if at all, and that is at an elevation of about 1500 feet between two small peaks at the top of a small mountain that arises from the Bay of Prony. To go there would require arrangements to camp out and we were not prepared to do so. Chevalier did assure me that he and Lucien Lavoix would search this area subsequently in an effort to determine whether or not this palm exists. In September I met Lucien Lavoix in Honolulu. We spent several days together during which we had the opportunity to discuss this palm in more detail. He is of the opinion that there is no species of fan palm endemic to New Caledonia. His contention is based on the following:

The settlement of Prony began before Nouméa, in 1850. There is a good harbor and water, and there was timber.

25. *Basselinia Pancheri* in a forest of New Caledonia.

Approximately between 1880 and 1900 Prony was a prison for French convicts, both criminal and political. Today Prony exists only as a port from which to ship iron ore to a smelter in Australia. Contact with the outside world is by sea. Many years ago, in all probability, a fan palm and other plants, may have been introduced to the settlement of Prony. In 1892 Jeanneney found a fan palm there and assumed that the species was native and described it as a *Licuala.* (Beccari later called it *Pritchardiopsis.*) This plant, or plants, in the ensuing seventy years may have disappeared. On the other hand, it may be living in another part of the world where it is native and where it may be known by another name.

A case in point is *Cycas neocaledonica* found only in the settlement of Prony or its environs. It was first thought to be an endemic species of Cycas. It is now considered to be *Cycas circinalis,*

26. *Basselinia Pancheri*, detail of crown.

a species introduced many years ago.

Incidentally, the French seed firm of Vilmorin-Andrieux et Cie., of Paris, sent me seeds of *Cycas neocaledonica* about twenty-five years ago. The mature plants that I grew from these seed closely resemble *Cycas Thouarsii* from Madagascar.

In Guillaumin's article are listed as valid genera the following palms of which ten species are in *Basselinia;* two each in *Chambeyronia* and *Cyphokentia*, the others being "monospécifique", and all endemic except *Cocos: Pritchardiopsis, Cocos, Veitchia, Rhynchocarpa* [correct name: *Burretiokentia*], *Actinokentia, Chambeyronia, Kentiopsis, Cyphophoenix, Campecarpus, Cyphosperma, Cyphokentia, Basselinia, Dolichokentia, Brongniartikentia, Clinosperma.*

Other species may eventually be found in the mountainous regions in the north section of the island.

In spite of having timed my visit to New Caledonia about two months too early for seed-harvesting, and having largely failed to get any seeds, my good friends there have assured me that a never-ending supply of palm seed, as well as pictures of the native palms, will be forthcoming, now that they know how eagerly their palms are sought by palm lovers.

Germination of Palm Seeds Using A Method Developed For The Oil Palm

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There is still a grave shortage of information on techniques which have proved successful for germinating palm seeds, despite excellent general advice by Loomis (1958) and Yocum (1961) and specific information for some, usually economically important, species, for example Kitzke (1958) and Rees (1959, 1962b).

Although, as Loomis pointed out, palm seeds germinate under a variety of conditions in nature, it is often possible to apply a method worked out for one species to many others, as has been done with Kitzke's method developed for *Copernicia*.

Work on the germination of oil palm seed over the past ten years or so has resulted in the development of a technique which produces 90-100 per cent germination within 100 days, and a further refinement ensures that all seeds germinate within 20 days — a factor very important for the production of uniform nurseries for establishing plantations — although this involves a further 20 days before germination is completed. The method is described below, but the refinement (a dry heat-treatment) is omitted as it has been used only for oil palm seed.

Procedure

The seeds are first soaked with a daily change of water. After seven days the seeds are surface-dried with an absorbent cloth and placed in either a polythene bag of fairly heavy gauge (0.005 in., 500 gauge) or in a suitable glass jar with a polythene cover held on by an elastic band. It will be necessary to examine the seeds every two or three days to ensure that the seed moisture content is maintained at this level which is best defined by "as wet as possible with no superficial moisture." This may be checked from the appearance of the seed which is usually dark but without the shine which results from a water film on the seed surface. If there is any doubt about moisture content, the seed may be soaked (or overwatered) and left for a few days and re-dried as described above.

The above treatment would probably apply to all palm seed as it is an improvement on the normally used moist but well-drained soil. With regard to temperature for germination there is some diversity of opinion as to what is a general optimum. For the oil palm, critical experiments have indicated an effective range of 38-42°C. (100-108°F.), and advice on supplying at least some heat is given for a number of palm seeds. Johnston (quoted by Loomis, 1958) recommends heat treatment for a number of species and a simple incubator was recently described by Yocum, 1961. About half of the seed shown in the tables were germinated at 35°C. (95°F.), somewhat lower than the recommended level for oil palm seed to avoid possible lethal effects in any temperature-sensitive species, the remainder (Code numbers M 59 onwards) were kept at 39.5°C. (103°F.). After 80 days at high temperature, the oil palm seed is normally removed to ambient temperature (about 27°C., 81°F.). This procedure is successful with some, but not all, palm seed. No harm results from

the cooling, and if unsuccessful, heating can be resumed.

Results

Application of this method to the seed of a number of palm species has given the results shown in the accompanying tables. A list of "failures" is included; these may or may not be due to the method — in some cases seed was certainly of low viability.

A comparison of these results with other reported successes is difficult, because in the only comprehensive list (that of Loomis) the figures given are for "days to start of germination" with no indication of percentage germination finally achieved or of mean time to germinate. It is more useful to quote percentage germination and an indication of speed of germination such as the one used here — "days to 50 per cent of final germination", although it is frequently difficult to decide when germination is complete. For oil palm seed the criterion selected is 10 consecutive days with no germination following cooling.

Seeds of *Copernicia cerifera* germinated at about half the rate quoted by Kitzke, and fairly rapid germination was obtained with *Thrinax argentea*, *Pinanga Kuhlii* and *Phoenix acaulis* which are known to germinate readily (McCurrach, 1960). Particularly successful results were obtained with *Borassus flabellifer* (described by McCurrach as a species which does not germinate very well) which gave 65 per cent with half the seed germinating within 35 days. Seeds of *Allagoptera arenaria* germinated more rapidly than quoted by Loomis (73 days to start of germination) and achieved the very reasonable figure of 80 per cent, whilst *Caryota mitis* did better than expected from McCurrach's expectation of three to four months before germination starts. Reasonably high percentages without too long a wait were obtained with *Aiphanes erosa* and *Areca* sp. but no comparative data are available for estimating the efficiency of the method in these cases.

The lowest rate of germination was obtained with *Elaeis "madagascariensis"*, particularly the M4 material for which over 300 days were required to produce 2 per cent germination, under conditions which would have given approximately 95 per cent in 100 days with the closely allied oil palm, *Elaeis guineensis*.

Little can be said about the list of failures except that it is not necessarily the method which is at fault, especially in the case of seeds which normally germinate readily but here were found to be dead after comparatively short periods.

It is probably worth recording recent experiences on the preparation and storage of oil palm seeds which might apply to other palm seed. Oil palm seed stores best after very little very careful drying under ambient temperatures, or, better still, no drying at all, and storage at a somewhat reduced temperature (22°C., 72°F.) to prevent germination during storage. Germination of 98 per cent has been obtained after 15 months storage under these conditions, compared with a loss of viability of 1.2 per cent per week with methods in use until very recently. (Rees, 1962a). This is considerably better than suggested by De Leon (1958) who estimated two to three months as the maximum viability period for *Elaeis*.

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TABLE 1. List of species germinated successfully, with percentages obtained and speed of germination

Code	Material	Quantity	No. Germinated	%	Speed[4]
M4	*Elaeis "madagascariensis"* 36 x 17	350	13	4	305
M5	„ „ 43 x 17	350	95	27	96
M8	*Thrinax argentea*	30	19	63	30[5]
M14	*Copernicia cerifera*	9	7	78	28
M31	*Aiphanes erosa*[1]	55	37	67	4
M40	*Caryota mitis*	46	21	46	28
M59	*Allagoptera arenaria*[2]	10	8	80	31[6]
M60	*Pinanga Kuhlii*	197	159	81	13[5]
M62	*Areca* sp.	162	47	29	22
M64	*Phoenix acaulis*	158	58	37	59[5]
M65	*Arenga Wightii*	12	1	8	3
M66	*Chrysalidocarpus lutescens*	195	17	9	20
M69	*Arenga pinnata*[3]	23	1	4	27[5]
M96	*Borassus flabellifer*	20	13	65	35[7]

[1] Synonym under which material received: *Martinezia erosa*
[2] Received as *Diplothemium maritimum*
[3] Received as *Arenga saccharifera*
[4] Defined as days to 50% of final germination
[5] Said to germinate readily (Mc Currach, 1960)
[6] Germination starts in 73 days (Loomis)
[7] Said not to germinate readily (Mc Currach)

TABLE 2. List of species which failed to germinate

Code	Material	Quantity	Time kept
M7	*Areca triandra*	1	3 months[6]
M9	*Roystonea oleracea*[1]	30	3 months
M10	*Arecastrum Romanzoffianum*[2]	8	3 months[5]
M11	*Ptychoraphis augusta*	10	3 months[5]
M12	*Areca madagascariensis*	10	3 months
M13	*Arecastrum Romanzoffianum*[3]	6	3 months[5]
M24	*Acrocomia aculeata*	6	2.5 months[4,7]
M61	*Phoenix sylvestris*	10	22 days[4,5]
M63	*Acrocomia aculeata*	4	9 months[7]
M67	*Livistona* sp.	86	9 months[5]
M68	*Livistona chinensis*	13	9 months[5]

[1] Received as *Oreodoxa oleracea*
[2] Received as *Cocos Romanzoffianum*
[3] Received as *Cocos plumosa*
[4] All seed found dead after this period
[5] Germinate easily (Mc Currach)
[6] Seed loses viability rapidly
[7] Difficult to germinate (Mc Currach)

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A Note on Spines in the Oil Palm

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Tomlinson (1962) has recently described the types of spines found in palms, which has prompted closer observations on the oil palm. Although the oil palm is not regarded as a spiny palm in the same way as, say, *Aiphanes* or some scandent palms, it does possess three quite distinct types of spines, described below and illustrated by Figure 27.

Inflorescence spines

The tips of the branches of the female inflorescences are prolonged into spines, which persist in the fruit bunch. The growth of the fruit bunch causes the spines to separate and produce an effective armour. The inflorescence axis itself does not have a terminal spine, but is blunt-ended.

Fiber spines

As stated by Tomlinson, many cocoid palms, including *Elaeis*, have petioles armed with marginal teeth formed from the base of the fibers of the leaf sheath. In *Elaeis*, these are fairly regular, Fig. 27D, and their origin is interesting. The leaf sheath encloses two sets of fibers (with a more poorly developed third set, of no consequence here) each set comprising parallel strands of fibers, with the strands in the separate sets running roughly at right angles. When the softer tissues rot away, it is seen that the adaxial fiber layer is attached a short distance away from the abaxial. The bases of the abaxial fibers form the spines which are comparatively blunt-ended. No spines are formed at the adaxial fiber insertions. The point at which the fibers break off from the spines is well-demarcated (Fig. 27D) so that the spines are nearly all of the same length. The regular spacing of the fibers also ensures that the spines are uniformly distributed along the length of the 'petiole.'

These fiber spines occur along the basal part of the leaf up to about a fifth of the length of the leaf, and terminate at the level at which the leaflets occur.

Midrib spines

The lowermost leaflets on the oil palm leaf are poorly developed, although they still have the large basal swellings similar to those of the fully developed leaflets and from which arise the leaflet midribs. The 'lamina' of the lowermost leaflets frequently becomes broken away leaving a spine some 2 cm. long which was originally the leaflet midrib.

As the leaflets of the oil palm are arranged irregularly along the rachis in groups of one to five or more, and not all in the same plane, these spines appear (unlike the "fiber" spines) most irregular.

There is little doubt that these three types of spines in the oil palm form a very efficient means of protecting both the apex and the fruit bunches from predators. In West Africa, the original

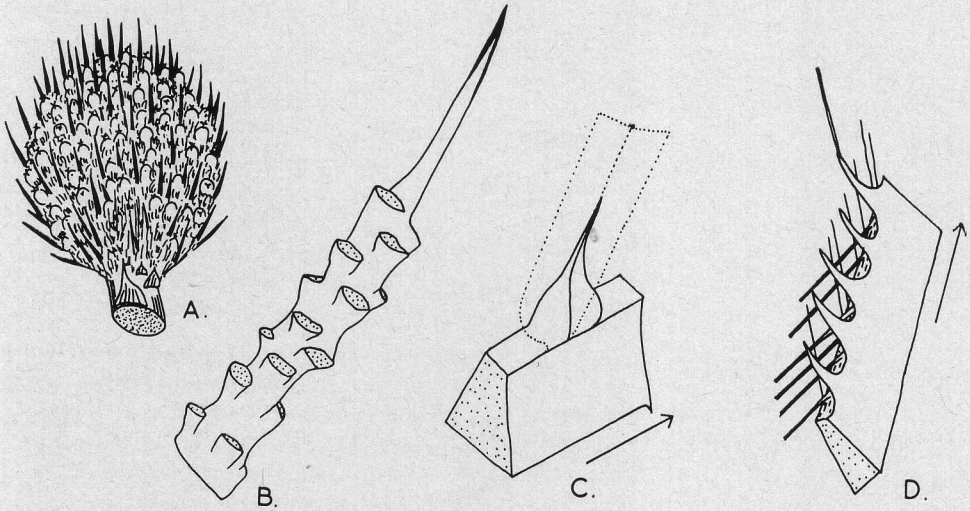


Fig. 27. Spines in the oil palm. Diagrams of A, fruit bunch with spiny branch tips; B, single branch of inflorescence with fruit removed; C, midrib spine, leaflet shown by dotted outline; D, fiber spines viewed from abaxial side. The arrows in C and D points to the leaf tip.

home of the oil palm, the only large animal which successfully attacks the plant is the elephant, as described, for example, by Onyioha (1962) for an estate in Eastern Nigeria. The crowns of young palms are trampled to expose the cabbage which is then eaten. Small rodents, squirrels and monkeys are not deterred by the spines from eating the fruit, and aid in disseminating the seeds. The spines on the basal parts of the petioles are put to other defensive uses; in Onitsha Province it is frequently observed that the mud walls surrounding the family compound in rural areas are topped with two to three foot lengths of petiole laid across at right angles to the length of the wall to deter unwanted human intruders who might climb into the compound.

Tomlinson (personal communication) wonders why the young oil palms are not more efficiently protected, as these are attacked and killed by rodents, particularly the quaintly named "cutting-grass" *Thryonomys swinderianus* and the giant rat *Cricetomys gambianus*. Monkeys are also known to damage palms planted in the field; they systematically uproot plants row by row. When establishing a plantation it is standard practice to fence in the nursery area to exclude rodents, and on planting out into the field to enclose each palm with a wire-netting 'collar.'

Literature Cited

Onyioha, K.O.K. 1962. ENDC (Eastern Nigeria Development Corporation) Declares War on Elephants. Development, ENDC Journal 6: 53-60.

Tomlinson, P.B., 1962. Essays on the Morphology of Palms. VII A Digression about Spines. Principes 6: 44-52.

MALAYAN ORNAMENTAL PALMS

C. X. Furtado

Botanic Gardens, Singapore

If a nurseryman in Malaya were asked to name the ornamental palms of Malayan origin he would shake his head in confusion. The reason is that palms are generally bulky for small Malayan gardens, or so untidy as to provide

shelter for insects and other pests, or they require shade or other conditions which are not easily produced about homes in the well developed lowlands of Malaya.

Such an economic palm as the dwarf coconut is a thing of beauty which could be grown in small compounds in Singapore and elsewhere, but since it attracts the cupidity of wandering street urchins, a superstition has grown around it that it brings misfortunes and miseries on the person who cultivates it.

The result has been that the palms commonly found in Malayan gardens are from India, Siam, Indochina, New Guinea, Java, Borneo and other places, except the widely cultivated *Areca Catechu* which provides the astringent material for the chewing of betel.

However, in the mild Mediterranean climates of the Italian Riviera, Monaco, or even of Portugal, I have seen several Malayan palms grown for indoor decoration, among them species of *Calamus, Daemonorops, Nenga, Caryota.* The temperate climate permits the growing of these plants but prevents their exuberant development, enabling the growers to use them in their dining rooms, on stages, and in other places of an extremely limited space. This suggests that perhaps in a warmer climate the Malayan species of *Areca, Nenga, Pinanga, Licuala, Iguanura, Ptychoraphis, Actinorhytis, Caryota* and *Phoenix* could easily be grown in gardens in the open where many would flower and seed. The beautiful palm *Johannesteijsmannia altifrons* (*Teysmannia altifrons*) from Malaya and Borneo requires shade, a reason why it has not become popular in Malaya, though it is admirably suited for pots. *Orania sylvicola* (*O. Macrocladus*), which has a tall solitary stem would produce a bottle-shaped stem if kept dwarf by growing in pots — but in Malaya the American *Roystonea* is more popular because the leaves are more attractive and the seeds are easily obtained. *Cyrtostachys Lakka,* which produces very beautiful scarlet leaf sheaths hence its common name "sealing wax palm," unfortunately grows very slowly and requires a couple of years or more before it can produce a stem of sufficient size to command admiration.

Another reason why Malayan palms are not found in the local gardens is that the availability of good ornamental palms from other parts of the world has discouraged local growers from acclimatizing and "training" local palms for the garden. Recently, botanical institutions and nurserymen in America, Japan, Australia and other places have shown interest in growing palms from Malaya, but they have experienced considerable difficulty in obtaining seeds, for even in the government gardens, sufficiently large varieties of Malayan palms are not available, and due to the restricted space in the Botanic Gardens, Singapore, there have been difficulties in maintaining the palm collection that was made by the previous directors of the gardens. In view of this, I suggest that foreign institutions interested in Malayan palms (as well as from regions in Sumatra and Borneo) should keep in contact with institutions which organize expeditions to collect herbarium material (e.g. Forest Departments and botanic institutions) so that they might collect seeds to meet the needs. When grown for some generations in semi-temperate regions, the Malayan palms may be "domesticated" and become suitable to the needs of the Malayan home. The cultivation of Malayan palms outside Malaya may also help to save some species from extermination owing to the ever expanding encroachment on the forests of Malaya.

28. *Daemonorops calicarpus* in the Singapore Botanic Garden.

THE EDITOR'S CORNER

Yes, it's February despite the cover! The story of this issue may make an apology unnecessary.

Manuscripts for January PRINCIPES went to Florida, where it is printed, about on schedule but lacking some of the photographs accompanying Dent Smith's article — photographs which had to be enlarged to match others for mounting in pairs of equal size. The mounted pairs were ready and were sent to Miami by registered mail on December 18th. Meanwhile, on the 14th, the galleys and earlier photographs were mailed from Miami and arrived safely in Ithaca.

Christmas came and went, the New Year began and still no proofs of the pictures sent on the 18th arrived in Ithaca. At last, on January 13th, the Editor telephoned Miami to find out why they had not been sent. Mr. Hollis at the Miami Post Publishing Company had never received them and, thinking the Editor both literally and figuratively snowed in, had been waiting for galley to be returned. A tracer on the missing photos was initiated through the Ithaca postoffice on the 14th. On the 15th, the remains of the photographs arrived from Washington, They had been burned in a railroad storage car fire in Fredericksburg, Virginia on December 20th; a letter had been written about them in Washington on January 7th, and had been mailed from Washington on the 14th.

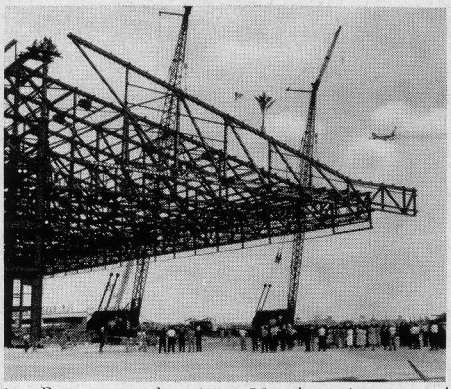
A telephone call to Dent Smith got immediate attention and replacements for the photos recently enlarged were sent promptly but then, through a series of ludicrous misunderstandings, the matching photos did not reach Ithaca until February 1st and through a final

delay did not arrive in the proper office until the 2nd.

The weekend has been filled with figuring sizes, mounting once again the now precious photographs and planning the arrangement of the current issue.

Your Editor will now figuratively "hold his breath" until word is received from Miami that the final and complete copy has been received.

This incident sets the stage for an impassioned plea for copy, copy, copy. If copy were at hand for one issue in advance, the job of producing the magazine would be much easier. Since the Editor will be on sabbatic leave from October, 1963, through April, 1964, Dent Smith has agreed to edit PRINCIPES for January and April, 1964. The present Editor would be happy to be able to hand over copy for the two issues if he gets enough in advance.



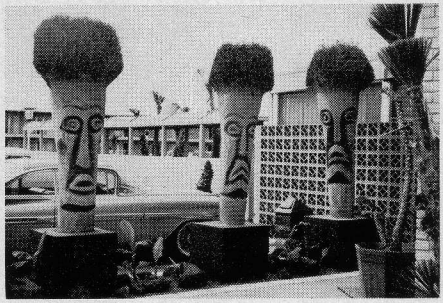
29. *Roystonea elata* in a 55-gallon drum, used as a topping-off tree on completion of the steelwork for a hangar at Eastern Airlines, Miami, Florida.

LETTERS

AUSTIN, TEXAS
July 26, 1962

Enclosed is a photograph of faces carved out of trunks of *Washingtonia robusta*. This is one use for dead palm trees which some society members might like to try, especially those hit by hard freezes this past winter. These are used ornamentally at the Las Vegas Motor Hotel in Houston, Texas.

KEITH CHUNN, JR.



30. Carved trunks of *Washington robusta.*

Randolph Fuller, Naples, Fla., writes: "The *Copernicia hospita* seeds which you sent last month I germinated in *four to seven days*, using the water soaking method. Here was a case of how useful back issues of PRINCIPES can be, as I remembered an article on germination of *Copernicia* seeds, and read it carefully when the seeds came. I have eight other species of *Copernicia* and find them slow as molasses in January when small, but fairly quick-growing when a few years old. The Society's seeds distribution program is highly appreciated, as I now have over 250 species and it is getting harder and harder to add to my collection."

WHAT'S IN A NAME

Nephrosperma (nef roe spér ma), a compound made up of the Greek words *nephros* (kidney) and *sperma* (seed), was created by Balfour in allusion to the kidney-shaped seed of the *N. Van-Houtteanum*, the sole species constituting the genus as currently understood. This solitary pinnate palm is native to the Seychelles Islands in the Indian Ocean. Confusion as to the gender of those technical names terminating in -sperma is rather widespread. Modern generic compounds assume the gender of their last component word, and -sperma is cor-

rectly a New Latin neuter singular form. Within the Palmae we have such properly constructed binomials as: *Dictyosperma album, Oncosperma fasciculatum, Didymosperma nanum,* etc.

* * *

Hyophorbe (high oh fór beh) is a genus erected by Joseph Gaertner who combined the Greek words *hys, hyos* (pig, sow) and *phorbe* (food, fodder) in reference to the fruits which are foraged by the swine introduced by European settlers on Mauritius, one of the Mascarene Islands where the palms are native. The so-called pignut palms embrace but two species as now understood, the *H. indica* and the *H. Vaughnii,* neither of which is well known in cultivation. The former *H. amaricaulis* and *H. Verschaffeltii* have been transferred to the genus *Mascarena* and are now known respectively as *Mascarena lagenicaulis* (bottle palm) and *Mascarena Verschaffeltii* (spindle palm).

* * *

Thrinax (thry nacks), a genus of approximately 10 species, is the Greek word designating a trident or 3-pronged fork, famed as the symbol of authority of Poseidon and Neptune, the Greek and Roman gods of the sea respectively. The error that *thrinax* means "fan" in Greek is well on the way to perpetuation, and the fact that the plants in our genus are indeed "fan" palms does not help matters. (Yes, the Greeks had a word for it; it was *liknon.*) The leaf segments of these palms terminate in pointed tips which, in turn, are again slightly divided. Since the tines of tridents and 3-pronged forks invariably come to a sharp point —impaling wayward subjects was a sport of the sea gods—the allusion is hardly an abstruse one. Only recently Dr. Richard A. Howard of Harvard's Arnold Arboretum pointed out that the genus *Thrinax* was first established in 1788 by the Swedish botanist Olof Swartz on a Jamaican species, *T. parviflora,* the first species described. (See *Principes,* October, 1960, p. 133.) The term was previously believed to have been the creation of the younger Linnaeus in 1791.

31. *Coccothrinax crinita* in Lima, Peru. The lower leaves have been removed to give a better view of the hairy trunk. Photograph by Gatteri.