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 Secretary.

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PRINCIPES

JOURNAL OF THE PALM SOCIETY

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

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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 July

Cover Picture

Liberbaileya gracilis grows on limestone cliffs of Pulau Duyan-Bunting, Malaya. Photo by Benjamin C. Stone. See also page 98.

Mailed at Miami, Florida
November 15, 1967

NEWS OF THE SOCIETY

Activity has continued at a rapid pace in your Secretary's office during the first half of 1967. There is always plenty of routine work, keeping the membership file in up-to-date order, sending out dues notices, receiving the dues checks and sending receipts for them, preparing the envelopes for mailing PRINCIPES, going to the post office one or more times a day with packages, etc., to mail and to sign for registered letters, keeping records on the more than one hundred botanical and educational institutions which subscribe to PRINCIPES, and so on.

The interesting part begins when the postman arrives. Every day he brings letters from members and others, with bits of news, questions, requests for information about many matters, reports about success or failure with certain palms, and conjectures regarding what to do about them. Reading and answering these letters is the fascinating part of my job. I am always sorry when other, pressing matters come up to interfere with correspondence.

The first year of the current biennium ended on May 1st with the Society solvent, but by a very narrow margin. Total receipts, from dues, sale of publications (subscriptions and back numbers), and seeds were $6436.08. Expenditures totaled $6162.04, of which one half was the cost of printing PRINCIPES. Balance at the end of the year was $274.04, and the treasurer was very pleased indeed at the prompt and generous way in which the members responded to the dues notices sent out in May. A good many of you don't wait for the renewal notice, but send your dues checks ahead of time. This is a real help, also. We try hard to hold down expenses, but it isn't easy.

Seed Bank correspondence has been animated. A surprising number of members and friends have sent donations of seeds to the Bank, and these have been portioned out to those who have requested them. We are always glad to have reports from Seed Bank members about the seeds they have received, and happy to repeat orders if the first lot was not successful. Several members have sent in really impressive lists of the palms now in their collections.

Dr. Robert N. Smith, Jr., of Harlingen, Texas, has had a novel idea. As a friendly gesture, he wrote a note to each member whose name appears in the roster and its supplement, enclosing one or more small pieces of petrified palm material, beautifully polished. By using a magnifying glass, or even without one, it is possible to see the structure of the palm trunk or roots, so different from those of deciduous trees. It was a fortunate coincidence that Dr. Smith had this inspiration just before Dr. Tuta's article on palm fossils appeared in PRINCIPES. We are grateful that Dr. Tomlinson and Dr. Zimmerman have explained the anatomy of palms to us in recent issues of PRINCIPES.

Mr. Billings McArthur, of Winter Park, Fla., has been making, for several years, a large collection of color slides of palms, as well as of many other tropical plants. He has worked up some very interesting talks, which he presents at meetings of civic, university, garden and other clubs, always making a point of mentioning The Palm Society. He has been generous in giving copies of his slides to the Society, and plans eventually to tape-record his talk so that chapters in various places may borrow the package for programs. Meanwhile he has spent a lot of time going over the Society's slide collection, arranging it alphabetically and placing slides in a stout metal slide file, his gift to the Society. Any member or chapter may borrow the slides by depositing a check

for $10.00 with the main office; the deposit will be returned when the slide collection comes back via registered mail

Among new members is Dr. Jerome P. Keuper, President of Florida Institute of Technology, at Melbourne, Fla. Dr. Keuper's ambition is to create on his campus an outstanding landscape featuring palms. With energy and enthusiasm, and with advice and help from Mr. Dent Smith, The Palm Society's founder and first president, he already has planted a large number of young palms. Along a stream flowing through a hardwood "hammock" on the campus, Dr. Keuper is designing the "Dent Smith Trail". In time, this should become a mecca for palm lovers.

Mr. Kenneth Foster of Orange, Calif., besides publishing NEWSLETTER for the Western Chapter, often surprises us with clever new gadgets, such as his Seed Germination Log, colorful bumper sticker announcing: LANDSCAPE WITH PALMS, or a circular sticker to be used on correspondence, with the legend: Member, The Palm Society, surrounding our emblem (the royal palm designed for the Society by the talented botanical artist, Marion R. Sheehan). Mr. Foster does not sell any of his creations, but if you wish a sample of any of them, please write to The Palm Society, 7229 S. W. 54th Ave., Miami, Fla. 33143.

From time to time someone who is doing research on some phase of the study of palms applies to the Society for financial help. This might be an experiment in seed germination, or the discovery and identification of the palms native to some remote region, or the publication of a book on palms. Considering our precarious financial condition, it is impossible for the Society to sponsor any such work. But perhaps some of our members might decide to make some tax-deductible gifts to the Society to be used for such purposes. One such study which would be of great practical value to the Seed Bank in particular would be an experiment in the viability of palm seeds. How long will palm seeds remain live when stored? What media, what temperature and moisture conditions give best results? Etc., etc. Now if we can just find someone who is interested in making such a study, and, if necessary, the funds for it!

LUCITA H. WAIT

THE EDITOR'S CORNER

It is a long time since this heading appeared in PRINCIPES as one of the "Regular Features" which became less and less regular as demands on the Editor's time increased. Warren Dolby, who has so kindly agreed to serve as Assistant Editor, suggests additions to the former series, two of which are instituted here as "Palm Briefs" and "Photo Gallery."

The first of these is intended for the publication of short notes from members or other contributors; the second may serve as a focus for the publication of photographs, not necessarily related, which may be aesthetically interesting, valuable from the point of view of landscaping, or just new views of "old friends" to paraphrase Mr. Dolby. Contributors are invited to send material for these sections to Mr. Warren Dolby, Department of Geography, Contra Costa College, San Pablo, California 94806. Additional innovations are to be expected in future issues.

Hopefully, with a pair of editors, delays in publication may not be so great as they sometimes have been in the past. Hopefully, also, a better balance may be achieved so that we truly can provide "something for everyone."

More Chromosome Counts by Mail

ROBERT W. READ and HAROLD E. MOORE, JR.
Department of Botany, University of the West Indies, Mona, Kingston, Jamaica and L. H. Bailey Hortorium, Cornell University, Ithaca, New York.

A previous report of chromosome counts for Pacific palms obtained from pollen sent by airmail appeared in *Principes* 9: 4-10, 1965, and summaries of chromosome numbers for palms have appeared in *Cytologia* 30: 385-391, 1965 and *Principes* 10: 55-61, 1966. Pollen of American palms collected by the junior author* was forwarded by air to Jamaica in February and March, 1967. Study of this pollen, using techniques described in *Stain Technology* 39: 99-106, 1964, has resulted in additional counts which are listed below. The occurrence of n = 18 for the arecoid genera *Euterpe* and *Prestoea* is of especial interest, for previously *Neonicholsonia* and *Roystonea* were the only Arecoideae known to have this number. Pollen of other species of *Euterpe* and of species of *Iriartea, Maximiliana, Morenia, Orbignya, Socratea,* and *Wettinia* was also obtained but attempts to determine chromosome numbers were unsuccessful due chiefly to poor or no germination.

Subfamily	Haploid number	Place of origin	Voucher
Arecoideae			
Euterpe oleracea	n = 18	Brazil	*Moore 9547*
Pelagodoxa Henryana	n = 16	Cultivated, Summit Gardens, Panama Canal Zone	*Moore 9400*
Prestoea decurrens	n = 18	Costa Rica	*Moore & Parthasarathy 9407*
Prestoea longepetiolata	n = 18	Costa Rica	*Moore & Parthasarathy 9426*
Cocoideae			
Attalea Allenii	n = 16	Colombia	*Moore & Parthasarathy 9468*
Coryphoideae			
Chelyocarpus sp.**	n = 18***	Peru	*Moore et al. 9494*

*From work relating to National Science Foundation grant GB-3528. Voucher specimens are deposited in the L. H. Bailey Hortorium, Cornell University, Ithaca, N. Y.

**This is the species which Burret described as *Tessmanniophoenix longibracteata* (*Notizblatt Berlin* 10: 398. 1928) but later noted to be a species of *Chelyocarpus* (*Notizblatt Berlin* 15: 337. 1941). He did not make a formal transfer of the epithet nor do we because the relationship of this species to *Chelyocarpus Ulei* and *C. Wallisii* is not yet clear.

***In addition to the 18 chromosomes, a satellite was noted in preparations of this species.

A Lectotype for Polyandrococos

The palm genus *Polyandrococos* Barbosa Rodrigues included three species when originally described in 1901 — *P. caudescens, P. pectinata,* and *P. Torallyi.* One of these must be designated as lectotype of the genus. Since Barbosa Rodrigues united his own *P. pectinata* with the earlier *P. caudescens* in *Sertum Palmarum* 1: 122, 1903, and since *P. Torallyi* was removed by Burret to the genus *Parajubaea* in *Notizblatt Berlin* 11: 50, 1930, *Polyandrococos caudescens* becomes the residual type. There being no reason to reject this species as type, it is accordingly designated formally as lectotype.

HAROLD E. MOORE, JR.

Experience with Hardy Palms in Georgia

WILLIAM D. MANLEY

For the past thirty-five years I have had the joy and satisfaction of raising the hardier palms. It is my hope that some of my experience in raising and observing these palms in the Atlanta area will prove of value to the many palm lovers who live in the same or similar climatic zones and that they too may derive some of the same pleasure I have known.

My experience with palms began in the year 1924 when I, as a boy of seventeen, arrived in Wilmington, North Carolina after having pedaled a bicycle 465 miles from Atlanta, Georgia. There I saw my first palm — a *Sabal Palmetto*. To me it looked exotic and I wondered, even at that age, how a palm could grow so far north as the Carolinas. I had always associated palms with far away South Pacific islands, white sand beaches, warm sunshine and romance. But it was here that *my* romance with the palms was begun.

Some few years later on my first visit to Savannah, Georgia, a friend helped me dig up a saw palmetto (*Serenoa repens*) which I brought back to Atlanta. Of course the shock of transplanting was too great and it did not survive. Still interested in palms, I later visited Miami, Florida. There I quickly discovered there was more than one species of palm!

In 1927 I married and moved back to Atlanta where my education with the hardier palms was to commence. Knowing of my love for palms, my father-in-law shipped me two good-sized coconut palms (*Cocos nucifera*). These were planted in my yard and there is no need to explain what happened to them in the first frost. It was at this point that I began to become aware of the varying degrees of hardiness in palms and embarked upon a close association with four of them — the needle palm (*Rhapidophyllum hystrix*), the windmill palm (*Trachycarpus Fortunei*), the bush palmetto (*Sabal minor*), and the European fan palm (*Chamaerops humilis*).

The needle palm is the hardiest — probably the hardiest palm in the world. I acquired my first specimen from a local nursery in 1930 at a cost of $3.50 and carried it home in a burlap bag. I have seen the needle palm growing in its natural swampy places, even in water about half the time, and many times I have had to wear rubber boots in order to get in and dig one out. The needle palm is very easy to transplant. I remember on one occasion a helper's dropping a small needle palm at the edge of a swamp. Almost bare-rooted it lay for two weeks. On my return I found it, took it home and today it is a nice healthy specimen.

All of the needle palms I have found in swamps have long stems or petioles, due to their growing in almost total shade. Many also have yellowed fronds. I have come to the conclusion that this leaf condition is due to lack of soil nutrients, because when the palms have been transplanted into my yard, fertilized and cared for, they grow into a deep green.

I found one needle palm growing in Rome, Georgia, which is in Plant Hardiness Zone 7-B. In January 1963 the temperature fell to 10° below zero (Fahrenheit) and there was no damage to this palm. I have had several letters from a palm enthusiast in Sitka, Alaska, wanting needle palm seeds, and I believe that this palm would live there. Although the mention of Alaska usually stirs thoughts of ice and snow, Sitka is

1. Entrance to Mai-Kai with unprotected needle palm, *Rhapidophyllum hystrix.*

close by Zone 8-A due to the moderating influence of the Japanese Current.

None of my needle palms had ever fruited nor borne seed until this last year when I had a bumper crop. The seeds are very peculiar: they grow right down close among the long and sharp needles, looking much like a large cluster of grapes, remaining slightly greenish until the first cold weather when they turn a light brown and develop a furry exterior. By about Christmas a faint odor can be detected when walking close to the palm. When the seeds are ripe the odor grows very pungent, similar to rotten cheese. I suppose the seeds grow down deep in the needles so that small animals cannot easily get to them. The odor should keep them off; however, I did find some of mine chewed on, possibly by a field mouse.

I have seen many beautiful specimens of needle palms and I always stop to get the history of all I see. One thing they all have in common: all were transplanted from their natural habitat, none was purchased from a nursery. Only just recently have I learned of a few for sale by nurseries; heretofore, I had never seen any offered for sale. There now seems to be an awakening to the value of the needle palm in landscaping.

2. Needle palm on north side of Manley house.

Sabal minor, sometimes called the bush palmetto or blue palmetto, grows near us here. There is a natural stand about thirty-five miles south of me, and it is seen in many places below Macon, Georgia, extending on to the coast. Dent Smith told me that in some places in East Texas they grow so prolifically

they are considered a nuisance. They are always seen in swamps, low places and sometimes in pastures. Actually thousands of these neat, squatty palms grow where they are covered much of their life by about three to four inches of water above ground.

They never grow very large in swamps — only to a height of about three feet with about four to six fronds. Taken out of their natural surroundings and moved to a place in the sun, fertilized and cared for, they become a handsome and very neat, clean palm. The main drawback to anyone raising this palm is the long wait, as they are really slow growers. Even after getting established with a good root system, they grow only about two fronds per year. These fronds are stiff and erect, deep green on top and powdery blue underneath.

The flower-stalk or seed-stem grows high above the fronds and when the fruit begins to form it bends over, sometimes almost touching the ground. Last year I collected a market-basketful of seeds from two large *Sabal minor* growing in a garden in Madison, Georgia.

I have tried fertilizing the *Sabal minor* in the fall, applying heavy layers of chicken manure to one and not fertilizing one nearby. Last January three below zero temperature revealed no difference in hardiness — neither palm was damaged.

The *Sabal minor* is hard to dig, having a different root system from the *Trachycarpus* or the needle palm. These palms have an underground stem resembling a large pod, similar to a giant peanut, with a small number of roots extending out from this pod. I am always careful not to injure this pod when transplanting. I dig the palms with a good-sized ball of earth, but I have also just washed off the earth and either method seems to be allright. Actually, I have never lost a *Sabal minor* or needle palm in a transplant.

The windmill palm (*Trachycarpus Fortunei*) was really my introduction to the hardier palms. About 1930 I went on a trip eastward from Atlanta and on passing through Madison, Georgia, I noticed a tall palm. I stopped to inquire about it and was told that it was several years old, but the owner did not know the name of the palm; however, she did know the name of the nursery in Augusta where it had been purchased. I wrote the nursery and in due time received their catalog. There it was — pictured and called CHUSAN'S FORTUNE PALM. I immediately sent the $1.75 they were asking and soon had my own palm which was planted about five feet from the house. This of course was the Chinese windmill palm (*Trachycarpus Fortunei*).

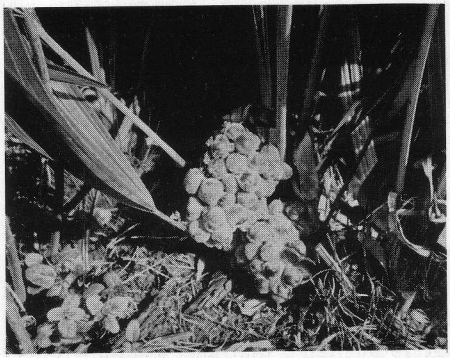
This *Trachycarpus* and the needle palm I subsequently acquired both just about exploded out of the ground. They were never fertilized, but many years later I came to the conclusion that the fast growth was directly due to the filled earth which had been pushed into this area along with rich black soil, leaves and red clay. I now prefer to plant all my palms in a large hole filled with rich woods-dirt, mixed with well-rotted cow manure and old leaves.

By 1950 the needle palm had grown to an enormous and beautiful clump and the windmill was about fifteen feet in height and had a beautiful crown of fronds. This was the year of what we called the "Big Freeze" The thermometer fell to two degrees (Fahrenheit) with a high, cold, dry wind blowing from the northwest. I thought this marked the end of my palm ventures, but found later that the windmill only suffered tip burn on the lower fronds.

3. Needle palm on patio.

There was no damage to the needle palm.

In 1958 this home was sold and we moved to another location in Atlanta. The two palms were moved too — my first experience in moving an object this large and heavy. The palms did not seem to suffer at all from the move, and I am sure this was due to the extra large ball of earth I took up with them.



4. Fruits of *Rhapidophyllum hystrix.*

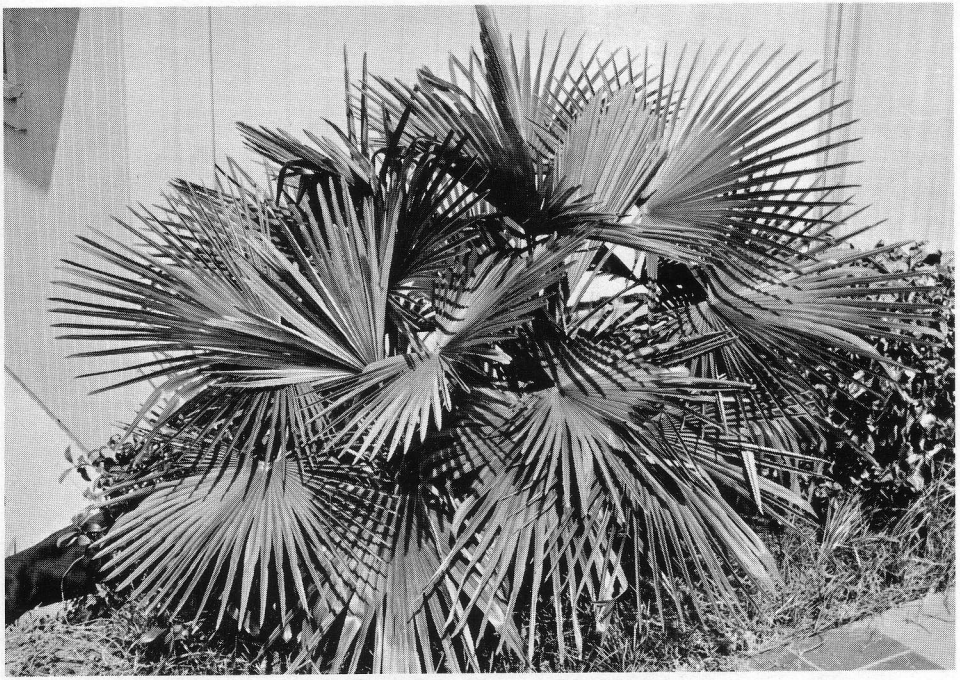
No fronds were removed, but I found out later that many dried up and had to be removed, especially on the *Trachycarpus.*

After living here for two years, we sold again and built a home on Peachtree Creek. The two palms were moved once more to the new location. But this was not their last move. Three years later we decided to move to the country thirty miles south of Atlanta, and of course the palms went too, along with hundreds of others acquired during the intervening five years.

In December 1962 the temperature fell to three degrees below zero (Fahrenheit). This was the coldest I had ever seen in the Atlanta area. I lost several small *Trachycarpus,* but no damage was recorded to the needle palms or *Sabal minor.* Then just one month later the temperature fell even lower — down to six below zero. Still no damage to the needle palm and only slight frond tip

5. *Trachycarpus Fortunei* recovering from three below zero freeze.

burn to the *Sabal minor*. All the *Trachycarpus* had completely defoliated anyway in the December low of three below. I dug up many of the *Trachycarpus* thinking they were dead, when in reality they possibly would have come back had I left them alone. The first winter at our present place (which we call "Mai-Kai") we had another of those three below zero nights. All the *Trachy-*



6. *Trachycarpus* one year after three below zero and complete defoliation, south or protected side of house.

carpus and *Chamaerops humilis* completely defoliated and looked dead; however, this time I did not take any of them up. In the spring, about April, they began to show life and today they have completely recovered with full crowns.

I have found that when the *Trachycarpus* has been growing for several years and long enough to develop a good root system, that those standing in well-drained soil will withstand lower temperatures. This palm just does not do well in hard-packed clay, sand or poor drainage. *Sabal minor* and the needle palm, on the other hand, seem to do well in any planting except sand, even hard-packed clay, or standing water.

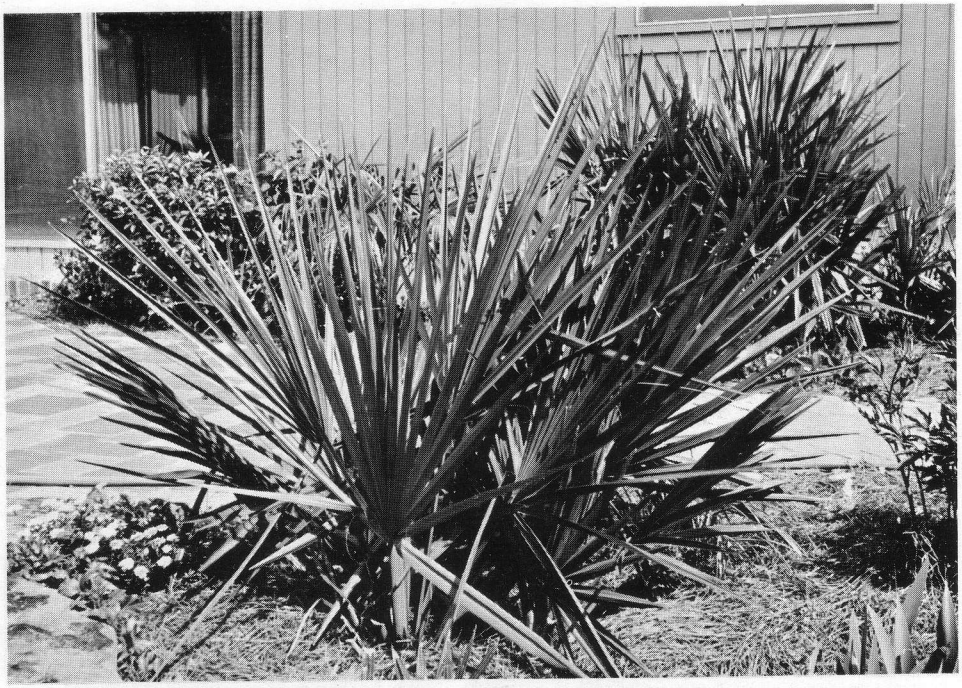
Many strange things happen in the observance of the hardy palms, especially watching several *Trachycarpus* all the same age: many survived zero weather while others within five feet succumbed. In Decatur, Georgia, a suburb of Atlanta, where twenty-five tall *Trachycarpus* lined the sidewalk, only twelve remain after the disastrous six below zero of January 1963. I have noticed that the ones which survived have very stiff, erect fronds which did not droop down at the tip. I have made it my business to collect seed from these apparently hardier specimens and at this writing have here at Mai-Kai several trees ready to put out an inflorescence.

I have grown many *Trachycarpus*, planting seed in pans, directly in the ground, and in all sizes of cans. I think the most prolific planting I have ever had was in 1960 when I had a bountiful supply of seeds and simply scattered them on the ground. In about two months I had a *Trachycarpus* lawn. *Trachycarpus*, I have found, can be

7. *Trachycarpus* in patio fully recovered from freeze.

forced to grow about two feet a year by severe pruning in the late spring of each year.

In thinking of the cold tolerance of the hardy palms, there are many factors to take into consideration. These include location or position of the palm in reference to a large body of water,



8. *Sabal minor* on patio, needle palm in background.

its site in relation to a high fence or house, or whether or not it receives protection under a canopy of trees such as pines or magnolias. Here at Mai-Kai a thermometer is installed on all four sides of the house and I have observed that temperatures may vary as much as twenty degrees.

I have seen many peculiar situations as to the weather and the growing of palms. Snow on many palms, even the Washingtonias, does no damage; actually it is a nice warm blanket. We had a three-inch snow this February. I did not arrive home until late, and all the needle palms were weighed down to the ground as well as the *Chamaerops* and *Sabal minor*. A good lick to the undersides of the fronds knocked the snow off. The tall *Trachycarpus* only needed to have the trunk jarred several times to dislodge their snow. I have found that more damage will occur from those exceedingly dry and cold winds from the northwest. When transpiration occurs at a higher rate than a palm can replace its moisture, there will be frond burn. Usually this will show up in the lower fronds.

I have tried 0-14-14 fertilizer on my palms, but have come to the conclusion that this procedure, which may be fine for woody plants in hardening them up for a frost, is downright detrimental to palms. I have used just about all the recommended fertilizers for my palms, but have concluded that organic fertilizer is the best for the hardy palms.

Today at Mai-Kai Acres we are enjoying living with all our beautiful palms. I used to try to get all the fringe area palms to grow here such as *Washingtonia robusta, Sabal Palmetto,* and *Butia capitata,* but finally gave up and have now only the four — the needle palm, *Sabal minor, Trachycarpus* and *Chamaerops humilis.*

Nematode Pests and Associates of Five Species of Chamaedorea

R. P. Esser*

A number of *Chamaedorea* species are grown commercially in Florida nurseries for both local and out-of-state markets. Many regulatory examinations have been made of the palms for nematodes by Division of Plant Industry nematologists in addition to a number of examinations of palms with severe growth problems.

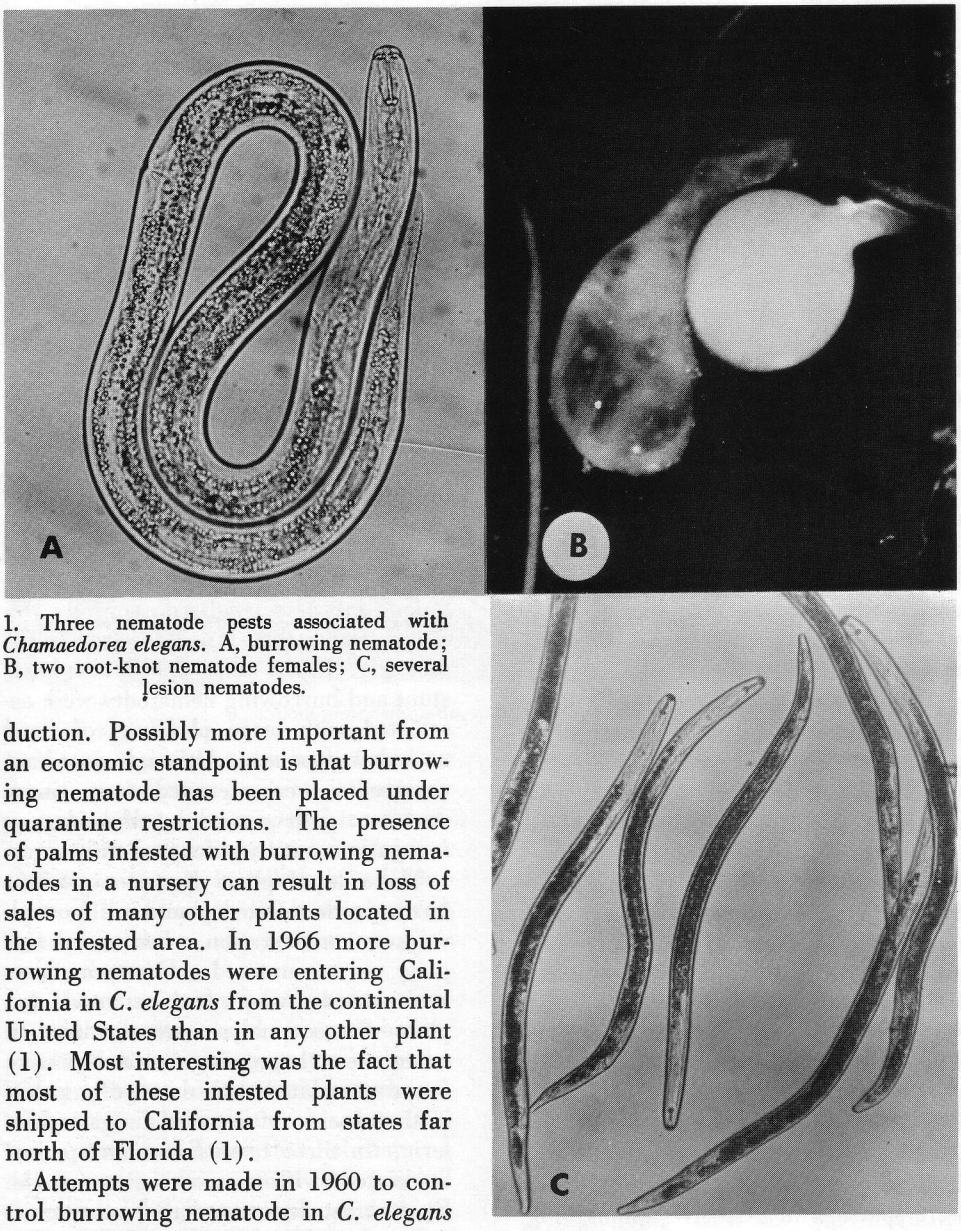
A single female burrowing nematode (*Radopholus similis*) was found in August, 1955 on *Chamaedorea elegans* Mart. (*Neanthe bella* Cook), at Homestead Florida. Since that time 76 nematode examinations have been made of five species of *Chamaedorea*, results of which are summarized in Table 1.

Table 1 lists 13 genera and five species of plant-parasitic nematodes not previously reported as associates of *Chamaedorea*. Burrowing (Fig. 1-A), root-knot (Fig. 1-B), stubby-root and spiral nematodes were most commonly found associated with the palms. *Meloidogyne incognita* has been reported on *C. elegans* in Canada (2). Burrowing and lesion nematodes were reported on the same species in Florida in 1960 (5). Van Weerdt et al (4) cited two cases where several thousand of these palms grown under shade were heavily infested with burrowing nematode. Infected palms were stunted, spindly and had yellowed fronds (Fig. 2). Roots were sparse with extensive lesions (Fig. 3). Root symptoms observed on *C. elegans* infected by burrowing nematode in subsequent problem cases included disintegration, rot, and growth retardation. Stem symptoms included red, brown or black lesions on or in the basal stem. In some plants lesions extended into the stem ¼ to ½ inch above the soil line. Frond symptoms included wilt, burn, browning, and yellowing. In one palm observed, fronds developed from pale green to yellow to ash grey. Similar injury occurred in *C. elegans* infected with large numbers of lesion nematodes (Fig. 1-C). Two instances were noted where severe injury resulted in the presence of four genera of plant-parasitic nematodes. In one, spiral, lesion, root-knot, and burrowing nematodes were associated with severely yellowed plants that failed to grow satisfactorily. In the other, spiral, root-knot, stunt and burrowing nematodes were associated with large plantings of dead and dying palms. Although root-knot nematodes were detected four times, root-knot galls caused by *Meloidogyne incognita acrita* were noted only once.

The role of plant disease organisms in nematode-infested plants is almost always a consideration when severe injury is encountered. Fourteen cases were recorded where both nematode and plant disease analyses were made. In seven cases, burrowing nematodes were found associated with damage to palms in the absence of detected fungi or bacteria. In three cases *Fusarium* sp. was associated with burrowing nematode. By contrast, lesion and root-knot nematodes were found associated with *Fusarium* sp. in each case where dual analyses were made.

Palms infected with burrowing nematode present two economic ramifications. Primarily, burrowing nematode is a severe pest of the palms and is capable of preventing commercial pro-

*Nematologist, Division of Plant Industry, Florida Department of Agriculture, Gainesville, Florida.



1. Three nematode pests associated with *Chamaedorea elegans*. A, burrowing nematode; B, two root-knot nematode females; C, several lesion nematodes.

duction. Possibly more important from an economic standpoint is that burrowing nematode has been placed under quarantine restrictions. The presence of palms infested with burrowing nematodes in a nursery can result in loss of sales of many other plants located in the infested area. In 1966 more burrowing nematodes were entering California in *C. elegans* from the continental United States than in any other plant (1). Most interesting was the fact that most of these infested plants were shipped to California from states far north of Florida (1).

Attempts were made in 1960 to control burrowing nematode in *C. elegans* using DBCP (Dibromochloropropane) at a rate of 4 gallons of the active ingredient per acre (5). A severe stunting of the treated palms resulted from the treatment.

In January 1965, Miller and Perry (3) eliminated burrowing nematodes from *C. elegans* by dipping bare-rooted palms for 30 minutes in a 600-800 ppm water solution of either Zinophos or Dasanit (Bayer 25141). (In one test, lesion and root-knot nematodes survived the treatment in the bulbous crown of the palm, indicating failure of the nematicides to penetrate the enlarged stem

2. *Chamaedorea elegans* seedlings. Left, stunted unthrifty plants grown in soil infested with burrowing nematode; right, a healthy young plant.

bases.) Mass-dip treatments using Zinophos or Dasanit can be made using plastic-lined soil trenches or plastic-lined cattle-watering tanks (Tanks used for such a purpose should not be used to water stock). The former method has the advantage of easy disposal of the used nematicide into the soil by removal of the plastic following treatment.

A 600 ppm dipping solution can be made as follows: Zinophos (4 lb/gal), 1.8 oz to 10 gallons of water or ⅔ pint to 60 gallons of water. Dasanit (6 lb/gal), 1⅓ oz. to 10 gallons of water or ½ pint to 60 gallons of water.

Nematodes on *C. elegans* in ground beds of a plant nursery may be controlled by drenching with Zinophos 4-E at rates of ¾ to 1½ pints per 1,000 square feet or Dasanit at rates of 1¼ or 2½ pints per 1,000 square feet in adequate water for uniform coverage (4). Either should be applied as a

3. *Chamaedorea elegans* seedlings cut longitudinally to show the severe internal lesions caused by burrowing nematode.

drenching spray under low pressure. Immediately after treatment the treated area should be sprinkle-irrigated with one acre-inch of water. The purpose of the latter is to wash the chemical from the foliage and to drive it into the soil. Both chemicals are available in granular form. Zinophos in a 10% granular formulation should be applied at a rate of 3 lbs., 10 oz. to 7 lbs., 4 oz. per 1,000 square feet; or Dasanit in a 10% granular form at 10 or 20 lbs. per 1,000 square feet. The granular material is spread evenly over the area to be treated and washed into the soil with one inch of water. BOTH ZINOPHOS AND DASANIT ARE VERY TOXIC (HIGHLY DANGEROUS TO HUMANS) AND ALL PRECAUTIONARY MEASURES LISTED ON THE LABEL SHOULD BE RIGIDLY FOLLOWED.

Anyone applying or working with these materials should use every precaution to prevent breathing, ingesting or spilling either material on skin. Rubber gloves, boots, aprons, and a mask and respirator should be worn. Rub-

Table 1. Nematodes Associated with *Chamaedorea* spp. Expressed in Occurrence per 76 Examinations

	Chamaedorea costaricana	*C. elegans*	*C. erumpens*	*C. seifrizii*	*C. metallica***	*C.* sp.	Total occurrence
Examination	1	44	16	3	1	11	
Criconema sp. (Spine nematode)	-	2	4	-	-	-	6
Criconemoides sp. (Ring nematode)	-	3	4	1	-	3	11
Dolichodorus sp. (Awl nematode)	-	2	-	-	-	-	2
Helicotylenchus sp. (Spiral nematode)	1	9	8	-	-	4	22
Helicotylenchus nannus (Spiral nematode)	-	-	1	-	-	1	2
Hemicriconemoides sp. (Sheathoid nematode)	-	-	1	-	-	-	1
Hemicriconemoides chitwoodi (Sheathoid nematode)	-	-	1	2	-	-	3
Hoplolaimus sp. (Lance nematode)	-	-	1	-	-	-	1
Meloidogyne sp. (Root-knot nematode)	-	7	8	3	-	9	27
Meloidogyne incognita incognita (Root-knot nematode)	-	2	-	-	1	-	3
Meloidogyne incognita acrita (Root-knot nematode)	-	1	-	-	-	-	1
Paratylenchus sp. (Pin nematode)	-	-	1	-	-	-	1
Peltamigratus sp. (Spiral nematode)	1	-	-	-	-	-	1
Pratylenchus sp. (Lesion nematode)	1	6	2	-	-	3	12
Pratylenchus brachyurus (Lesion nematode)	-	1	-	-	-	-	1
Pratylenchus coffeae (Lesion nematode)	-	-	-	2	-	-	2
Radopholus similis (Burrowing nematode)	-	27	1	-	-	1	29
Rotylenchulus sp. (Reniform nematode)	-	1	-	-	-	-	1
Scutellonema sp. (Spiral nematode)	-	-	1	-	-	-	1
Trichodorus sp. (Stubby-root nematode)	-	3	4	1	-	19	27
Tylenchorhynchus sp. (Stunt nematode)	-	1	2	-	-	2	5
Xiphinema sp. (Dagger nematode)	-	2	2	2	-	2	8

**Misidentified in the trade as *C. tenella* Wendl. but recently described as a new species.

ber gloves should be used when handling treated plants within 2 days following treatment. Rubber gloves and boots should be used if contacting treated soil up to 10 days after treatment.

Preventing nematode problems by using plant sanitation procedures is usually easier and more economical than chemically treating a severe nematode problem. Clean seed planted in soil that has been sterilized by dry heat, steam, or chemical treament is the basis for producing nematode free plants. Such plants should be grown when possible in clean containers out of contact with untreated soil.

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The Gold-Plated Imitation Date Tree

EVELYN CHING

A palm tree recently made newspaper headlines in Orange County, California. While the publicity was not all favorable, it at least focused attention on palms as landscaping specimens of great value — monetarily as well as aesthetically. And plain folks who had thought of palms as "the tall skinny ones" (*Washingtonia robusta*) or "pineapple palms" (*Phoenix canariensis*) now speak knowingly of "reclinatas."

It all came about with the completion of the Angel Baseball Stadium in Anaheim. The stadium is beautifully built, well planned, but became of necessity in deference to the automobile a huge concrete structure surrounded by acres of asphalt parking area. And because people here have become very "landscaping conscious," the Anaheim city fathers knew that something had to be done over and above a few well-placed olive trees and some minimum-maintenance greenery at the entrances.

A fountain was suggested. But a fountain in scale with the stadium would have cost at least $50,000 plus daily maintenance by two men. (It seems people throw lots of things into fountains besides coins.) At this point Dick Kamphefner and Paul Saito of the Anaheim City Park Department stepped into the picture. They had seen large palm groups used effectively in conjunction with major structures and at far less cost than the proposed fountain. Armed with pictures and prices of the *Phoenix reclinata* groups planted at the Los Angeles International Airport, of an enormous *Chamaerops humilis* at Long Beach, and of another *Chamaerops* at Glendale Federal Savings and Loan

1. The "Gold-Plated Imitation Date Tree" (*Phoenix reclinata*) recently planted at Anaheim Stadium. Photo by Ken Foster.

Branch, they convinced the City Council that a large group, while not inexpensive, would be most economical both for initial cost and subsequent upkeep. Pride and a competitive attitude toward Los Angeles probably also contributed to their choice.

Through George Miyasako, who makes a business of supplying very large specimens, a suitable group was located. It was a *Phoenix reclinata* which was on the original Cecil B. DeMille estate near Ferndale Park and the Greek Theater in Los Angeles. The palm was estimated to be over 100 years old, although no one could be found

who actually knew anything about its origin or history.

The specimen stands forty-five feet tall and has ten major trunks. Mr. Miyasako reports that there were ten other trunks that have been cut off for at least twenty-nine years, and that they were as large in diameter as those now standing. Around the cut-off trunks are many pups, and in one instance a seed apparently has dropped in the center of a stump and is growing. It looks as though the original stump were sprouting from the middle.

On June 17, 1966, the tree was boxed at the site and the next day tied and braced. The inside measurements of the box were nine feet square by seven feet deep, and the whole thing weighed twenty-two tons. A 40-ton crane came in to move it, but the uphill nature of the site, the narrow access and the height of the palm group broke this crane so that a 100-ton crane had to be brought in. The palm was finally lifted, loaded, slanted back, and trucked some twenty-five miles to the stadium. The route, using surface streets, necessitated layout and permit by the California State Highway officials. The actual moving time took only two hours, but it cost $3,200.

Meanwhile, back in Anaheim the large concrete planter had been prepared with sand, nitrolized redwood shavings and chicken manure. Then on June 18th, with palm in place, all concerned stood back to admire their achievement. For $7,600 they had a unique, historic and unusual ornament at the stadium entrance. It was guaranteed by Mr. Miyasako for one year and valued at $15,000.

Reporters for the local papers were there, too, with notebooks and cameras to report what the City Council had wrought. Their pictures, descriptions and statistics were duly published. One

2. View of the multiple trunks and crowns of the Anaheim *Phoenix reclinata.* Photo by Ken Foster.

fact, however, had been overlooked: the sensitivity of the taxpayer's wallet when it comes to anything as ephemeral as beauty. Editorials flayed the City Council, lampooned the Park Department, and had some acid things to say about who sold the city what at the taxpayers' expense. Letters to the editor were even more critical: "a gold-plated imitation date tree . . ." and "the thorns are for the taxpayer who is really stuck." A few wrote to praise, but the nay-sayers write more letters and were in the majority.

Of course by now the shouting has died down and like all controversial beautification the whole matter has assumed its proper proportions. Because of the original publicity, however, ordinary tourists and visiting firemen alike wanted to have their pictures taken with the $15,000 palm tree. To discourage not only children but also adults who were climbing into the tree for pictures, several *P. reclinata* in fifteen-gallon containers had to be planted around the base of the original group. (As a barrier they work!)

It is a credit to the resilience of the Council and the Park Department that Anaheim's new tax-supported Convention Center will also have a palm as the center of attraction — an old and very beautiful *Chamaerops humilis.*

PALM BRIEFS

Palms in South Texas

Nine miles southeast of Brownsville, near the coast, there is still a wild jungle of native palms, the *Sabal texana.* These sabals once grew wild all along the banks of the Rio Grande River before man ever set foot in this area, and are mentioned by some of the Spaniards who explored this country in the sixteenth century.

The lower Rio Grande Valley of Texas is actually a delta about one hundred miles long and forty miles wide, extending from Rio Grande City to Brownsville on the Gulf of Mexico. There the Rio Grande River forms the boundary line between the United States and Mexico. Sixty years ago this valley was a clearing in a thorny wilderness. Today it is a lush paradise of palms, citrus and tropical growth.

The U. S. Government records the center of the valley at latitude 26° 12′ north and at longitude 97° 42′ west with a ground level of thirty-seven feet above sea level. The mean daily maximum temperature is 85.1° F. and the mean daily low temperature is 63.4° F. From 1931 to 1965 the record low temperatures were 21°F. in 1951 and 14°F. in 1962. The below-freezing temperatures of these two years, 1951 and 1962, killed most of the citrus trees along with most of the other imported tropical plants and trees.

The valley also has fluctuations in rainfall. The yearly average is 26.07 inches, but with extremes of 11.39 inches in 1956 and 45.99 inches in 1941. The western end of the valley — the interior — is much less humid than the eastern end. The soil also varies greatly, from sand on the coast along the Gulf of Mexico to sandy loam and even hard clay in other parts.

It is this valley that our neighbors from the north refer to as the "Valley of the Palms." Most of the highways, country roads, citrus orchards and vegetable farms mark their boundaries with lines of palms — *Washingtonia robusta, W. filifera, Phoenix canariensis,* and *Sabal texana.*

In spite of occasional severe damage from the "big freeze" palms continue to be enthusiastically planted. The *Arecastrum Romanzoffianum* or "Cocos plumosa", as it is usually called here, is represented by at least two sub-species. By many it is thought to be the most handsome and graceful of all the palms in the Valley. It is a fast grower, and although most of the plants were killed by the big freeze of 1962, they have been replanted by the tens of thousands, especially in business and residential districts, and these new palms are thriving. Among the other feather palms used here the *Phoenix dactylifera* and *P. sylvestris* grow very well, but the most common is *P. canariensis.*

With the help of The Palm Society this part of the country is now becoming acquainted with additional species of palms, the majority of which have been introduced within the past fifteen years. The most popular ones seem to be *Chamaerops humilis,* locally called Mediterranean fan palm, *Livistona chinensis, Phoenix Roebelenii, Rhapis excelsa* and *R. humilis* or lady palm, and *Butia capitata* or "jelly palm." There are also a few *Erythea armata* and *Trachycarpus fortunei,* but none of these have been here long enough to be tall.

In protected areas one can also find *Caryota mitis* and *C. urens, Chamaedorea erumpens, C. seifrizii, C. radicalis,* as well as an occasional *Chrysalidocarpus lutescens* — the yellow butterfly palm.

Many of us have young specimens of a wide range of cold-hardy palms and, much to the distress of our bank accounts, *cold-sensitive* palms as well. We

1. *Sabal texana* in "Wild Palm Tree Grove" east of Brownsville, Texas, on Rio Grande River.

keep trying them out, however and perhaps will come up with some palms new to this area that may even like it down here.

Your South Texas Palmateers would welcome any advice The Palm Society members have to offer regarding the cultivation, on a large scale, of other

2. Native *Sabal texana* used as a street tree in lower Rio Grande Valley of Texas, *Washingtonia robusta* in background, *Phoenix canariensis* back right. Ronnie Luster photo.

varieties of palms.

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Acoelorrhaphe in Florida

The handsome Madeira or paurotis palm, known botanically as *Acoelorrhaphe Wrightii*, is increasingly well known and appreciated by aficionados of this fabled family in all parts of the world.

Its native range extends from the southern part of the Florida peninsula (primarily within the Everglades Na-

tional Park) to a number of the islands comprising the Bahamas. It also occurs extensively in Cuba, notably in the provinces of Pinar del Rio and Las Villas, and according to H. E. Moore, Jr., the plant found from Mexico to Honduras is the same thing.

In South Florida, *Acoelorrhaphe* — also known as silver-saw palm — is found on the banks of generally vaguely saline streams and canals, or deep within the hardwood hammocks which dot the grassy glades of this fascinating region.

Unlike most palms, this splendid species will thrive in soils in which a considerable amount of salt exists. In fact, it often seems to do a bit better under such conditions than in less saline situations. It thrives in full sun (and, for that matter, in semi-shade), and definitely benefits by copious water at the roots.

Our late great palm authority, Liberty Hyde Bailey, discussing this palm in *Gentes Herbarum* 4: 364-365, 1940, wrote:

"The silver-saw palm is gregarious. It grows in clumps from one root, although in some cases only a single trunk may persist to maturity but in old native stands there may be a hundred trunks like bamboo poles. As a planted palm it makes its best effect as a cluster of slender boles, fan-shaped silver-bottomed leaves, saw-edged petioles, and out-thrusting arms of flowers and fruits at the top. Upper surface of leaves is light green and sometimes silvery, until they begin to die. It may grow 30 to 40 feet tall. Very dense clumps are sometimes seen, the trunks or stems being hidden by the mass of foliage; this foliage canopy should be encouraged in plantings, and the stand given plenty of room. Young masses of the silvery foliage are particularly attractive when the area is not too dry."

1. *Acoelorrhaphe Wrightii*, the showy Madeira or paurotis palm, under cultivation in its native South Florida.

Acoelorrhaphe Wrightii can well be utilized as a highly ornamental background planting or as a solitary specimen cluster. During a recent lecture tour throughout Florida, I was very interested to find extensive use of this fan-palm in landscaping even above Orlando and St. Petersburg — though often the clumps exhibited the results of neglect from the owners of the hotels, restaurants, and the like which they graced.

In our area, superb wild examples of the Madeira palm can be found in the Everglades National Park — notably in the marvelous Mahogany Hammock (where several kinds of tillandsias and the pretty native orchid *Epidendrum tampense* occur as epiphytes on the roughened stems). And exceptionally fine cultivated clumps are on display

1. *Liberbaileya gracilis* on the cliffs of Pulau Dayan-Bunting, Malaya, with Inche Mahmud bin Sidek for scale. Photo by Benjamin C. Stone.

at Fairchild Tropical Gardens.

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Liberbaileya gracilis

Liberbaileya gracilis is one of those palms that is not as yet fully understood botanically. During my field work in

Malaysia in 1963, plans to reach the Langkawi Islands off the west coast of Malaya, where this palm grows, did not materialize. Thus it was an exciting day when Dr. Benjamin Stone of the University of Malaya in Kuala Lampur forwarded photographs of the rare species.

Dr. Stone writes as follows: "These photos, which I took on May 10, 1967, on the north-central limestone face of Pulau (Island) Dayan-Bunting, in the Pulau Langkawi group, off the west coast of Perlis, Malaya, show some of these palms in their native haunts. They are often on very steep slopes or cliffs and mostly quite inaccessible . . . In one photo you will see the figure of Inche Mahmud bin Sidek, our herbarium technician, who did the collecting proper and gives a convenient "scale" to the photo. Incidentally, I used Tri-X film exposed at ASA 400, a Pentax camera with a 35 mm. f. 3.5 Takumar lens, and exposed for 1/125 at f. 11.

"Some of the palms reached a height of perhaps 25-30 ft.; the stems in these were somewhat arched, by no means straight or erect. On very steep exposed cliff-faces some trunks formed a U-shaped figure, that is, bending downward from the rooted base, then upcurved to the crown and apex. The leaves are a medium green, not especially dark and not glaucous."

An inhabitant of limestone areas, *Liberbaileya gracilis* would seem to have potential as a plant for cultivation in southern Florida as might its equally problematical relative *Maxburretia rupicola* from limestone hills near Kuala Lumpur.

There is an interesting story connected with the name for this species, for it was independently treated by two botanists during the year 1940 when war had disrupted communication. Dr. Max Burret in Berlin described the genus *Symphyogyne* to include two species, *S. gracilis* Burret and *S. rupicola* (Ridley) Burret. Five months later, Dr. C. X. Furtado placed the same two species in separate genera as *Liberbaileya lankawiensis* Furtado and *Maxburretia rupicola* (Ridley) Furtado.

Symphyogyne proved to duplicate an earlier name for a genus of liverworts so cannot be used, as Burret and Potztal showed in 1956 (*Willdenowia* 1: 530). These botanists accepted Furtado's two genera. Thus *Liberbaileya* is a legitimate name even though published later but its species must be called *Liberbaileya gracilis*, using the earlier published epithet, not *L lankawiensis*.

LIBERBAILEYA Furtado, Gardens' Bulletin, Singapore 11: 238. 30 Aug. 1940.
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HAROLD E. MOORE, JR.

Some Palms of Nicaragua

ALEX D. HAWKES

On several occasions in recent years, I have visited the marvelous and truly amazing country of Nicaragua, principally in continuing pursuit of my stud-

ies of orchids. My botanical interests also take in the palms, and during orchidological explorations, I have quite naturally paid some attention to these princes of the vegetable kingdom.

The flora of Nicaragua is as yet very incompletely known. Though this is the largest of the Central American countries, scientific investigation has been remarkably scanty through the years. An indication of the wealth of plants to be located in Nicaragua is seen in the results of my work with orchids there, in close collaboration with A. H. Heller, of Monte Fresco, near Managua. When our study of the Nicaraguan Orchidaceae was commenced in 1956, a total of 139 species and variants was recorded from the republic. At the end of 1966, a total of authenticated indigenous representatives of the Orchid Family of 552 was arrived at, and additional records are being added with extraordinary frequency.

The only published roster of Nicaraguan palms known to me is that afforded by B. E. Dahlgren, in his valuable *Index of American Palms*, published by the Field Museum of Natural History in 1936. This consists of fifteen species, as follows, using Dahlgren's names, in alphabetical sequence.

Acrocomia vinifera Oerst.
Asterogyne Martiana Wendl.
Bactris dianeura Burret
Bactris horrida Oerst
Calyptrogyne glauca (Oerst.) Wendl.
Chamaedorea graminifolia Wendl.
Chamaedorea membranacea Oerst.
Chamaedorea sphaerocarpa Burret
Cryosophila Warscewiczii (Wendl.) Bartl.
Euterpe macrospadix Oerst.
Geonoma microspadix Wendl. ex Spruce
Pyrenoglyphis minor (Jacq.) Karst.
Pyrenoglyphis ovata (Oerst.) Karst.
Reinhardtia simplex (Wendl.) Burret
Socratea durissima (Oerst.) Wendl.

Nicaragua is an extremely diversified land physically. The western quarter or so, where by far the bulk of the population exists, is characterized by a longitudinal line of volcanic mountains, several of which are persistently active, with fertile hilly lowlands extending to the Pacific. A distinct and protracted dry season occurs here. In the west-central quarter, northward towards the border of Honduras, we find the highest mountains of the country, these carpeted with dense hardwood forests, with scattered stands of pines (*Pinus oocarpa*), and some excellent and spectacular examples of "cloud forests" on the tallest peaks.

The eastern half of Nicaragua is a complex array of mountain ranges, draining toward the Caribbean, and tremendous expanses of lowland rain forests which are very sparsely inhabited, essentially impenetrable by car, and to a large extent unexplored. The dry season in this immense region is very short, often virtually non-existent.

Palms are naturally most common, both in numbers and in kinds, in the areas of high annual rainfall. In the lowlands extending from around the two huge lakes, Managua and Nicaragua, to the Pacific, about the only native species the casual visitor is likely to encounter is *Acrocomia vinifera*, the country's most widespread palm. Handsome stands of it can be seen on the grassy hillocks along the highway between Managua and the picturesque old city of León, and scattered specimens still exist in some of the suburban districts of the capital city itself. Dahlgren notes that this *Acrocomia* is called *palma de vino* and *corozo* in Nicaragua, but I have found *coyol* to be a far better known vernacular in the countryside.

In the attractive hills southward from

Managua, on the Inter-American Highway, especially near Casa Colorado, and on towards the often active twin craters of Volcán Masaya - Santiago, a very pretty cluster-forming *Chamaedorea* is rather frequent in moist ravines, growing with a splendid big spreading tree-fern (genus *Cyathea*). And along the road extending from this Highway to Granada, a lovely and famous old town on the shores of Lake Nicaragua, around the base of towering Volcán Mombacho, I have found isolated specimens of a huge palm which appears to be *Orbignya Cohune*, and which is common in the central and eastern departments.

Nearer Granada, one sees tattered tight clusters of a viciously thorny small *Bactris*, growing fully exposed in pastures, with towering buttressed ceibas their only arborescent companions. This same species (*Bactris minor*, probably) is also found along streams along the road between Managua and Tipitapa, growing almost hidden by great ranks of heliconias.

Mombacho volcano is no longer active—its entire upper third was blown out in cataclysmic eruptions ages ago—and despite the difficulties of scaling its wet, precipitous slopes, it offers fascinating botanizing. A cloud cap customarily covers the shattered summit, and here we find marvelous formations of small, gnarled trees so heavily laden with orchids, bromeliads, and other epiphytes that large branches often break off under their weight. A small caespitose *Chamaedorea* occurs sporadically somewhat lower down on the mountain, in an oddly restricted belt extending horizontally around the slopes. It grows with a glorious big tree-fern, one with viciously ebony-thorned frond-bases, and a robust *Dieffenbachia* frequently as tall as a man.

On the side of Mombacho facing northeastward, toward Granada, yet another *Chamaedorea* occurs on the margins of clearings, often in company with a splendid big *Begonia* with erect inflorescences four and more feet in height. This palm is a solitary one, of considerable charm. Near here, too, I found three specimens of a spectacular palm which is highly reminiscent of *Welfia Georgii*, known from Costa Rica and Panama.

Travelling along the Inter-American Highway from Managua eastward and northward toward Honduras, the clump-forming *Bactris* noted previously can be seen near Tipitapa, a quaint town with some famous hot springs. In the same district, in open grassy fields among deciduous trees such as the calabash (*Crescentia Cujete*), several kinds of bull-horn acacias, and the very handsome orange - yellow - flowered *coyote* (*Platymiscium pinnatum*), there is a stocky *Sabal* in small numbers. This same palm is also to be found near the town of Ciudad Darío, further northward along the Highway.

In the northwestern mountains (reached by taking the road to Matagalpa and Jinotega), near the charming rustic hotel at Santa Maria de Ostuma, fabulous montane forests are found. Here some of our most interesting orchids have been discovered, and it is a botanical showplace which every visitor to Nicaragua should not neglect. Indigenous palms are infrequent, consisting of two or three apparently different chamaedoreas, one solitary, the others forming rather open clusters, and an odd dwarf pinnate palm which is much like a *Synechanthus*, this growing in limited numbers near the rim of the impressive Guasgualí Valley.

Returning southward towards Managua once again, we come to the new road being constructed to the river port of Rama, far away into the immense

reaches of Zelaya Department, which occupies almost as much territory as all of the rest of Nicaragua combined. Called the Roosevelt Highway, and built with U. S. assistance, this is by far the most rewarding trip the palm enthusiast can make in the country. This provided he does not object to camping out, since hotel accommodations are, at best, primitive.

Leaving the Inter-American Highway at El Empalme, one travels through generally sere hills with thickets of thorny xerophytic vegetaion — uncomfortable botanizing on foot, with agressive ants, wingless wasps, and the like adding to one's distress. A few of the sabals noted near Tipitapa are to be found along the way, but otherwise scurfy epiphytic bromeliads and some showy flowering trees (mostly *Tabebuia pentaphylla*) are the principal horticultural sights.

Further along, near Juigalpa, appear occasional rather sad specimens of the cultivated peach palm or *pejibaye*, long known as *Guilielma Gasipaes*, but presently called *Bactris Gasipaes*. A side trip from the Rama Road to the old gold-mining towns of La Libertad and Santo Domingo takes one into some fascinating country, even though most of the original forests near the habitations were destroyed long ago. Sharp hilltops and valleys, though, still retain intriguing stands of trees, underset with marvelous big marantads and gingers, and occasionally, a giant *Heliconia* with pendulous inflorescences some four feet in length. Orchids, bromeliads, aroids, ferns, peperomias, and other epiphytes abound, of course—and in La Libertad such things even occur on the aged tile roofs of the houses!

Bactris Gasipaes is here, and is much relished for its edible fruit, these eaten boiled and often served with roast pork with happy culinary results. Our old friend, the *coyol* (*Acrocomia vinifera*), stands in solitary spinose splendor on some of the exposed hump-shaped hillocks—the palm is just too painfully difficult to cut down and remove, say the inhabitants of the area. And, too, their pigs delight in the abundant big fruit when these fall to the ground.

April and May are reasonably "dry" months in this district. But even during this season, rain falls almost daily, so that walking about usually involves mud up to the knees in many spots on the trails. The most conspicuous palm around La Libertad is a graceful species which I suspect is *Euterpe macrospadix*. Its sleek, slender trunks attain heights upwards of forty feet, and are topped by a dense crown of splendid feathery foliage. Like many palms found in such constantly wet forests, its roots are exposed to some degree above the level of the ground. In this species, these roots—as thick as a man's thumb—are of an amazing vivid orange-red color.

A few terribly spiny climbing *Desmoncus* were encountered and given a wide berth, since these neotropical "rattans" can cause nasty wounds if approached incautiously. *Asterogyne Martiana* forms rather extensive colonies hereabouts. This is one of my favorite palms, and I can only hope that the little seedlings which we now have coming along from Nicaraguan seed here in Coconut Grove will thrive under our conditions. Its short stems in the wild are often set with delicate ferns and such charming little orchids as the pendant, flattened dichaeas, with their chocolate-scented diminutive blossoms. I find the dull dark-green leaves of the palm, normally split only at their tips, notably neat, and the red branches of the rachis, set with lustrous blue-black fruits are a perfect accompaniment to this unique plant.

Some giant trees had been cut down near the mucky trail, and as I searched

the fallen branches for orchids, I found my first *Reinhardtia*, right at my feet! This was an exciting discovery for me, and upon wandering further around the area, *R. gracilis* var. *gracilis* proved to be frequent. As we travelled a bit further on, literally thousands of these delightful dwarf palms appeared in small clumps, growing consistently in heavy yet humusy soil in the deepest of shade, often under the broad paddle-leaves of multi-colored marantads.

Returning to the Roosevelt Highway (the Rama Road on many maps), and continuing towards the east, through the spectacular scenery of Chontales Department, the *pejibaye* (*Bactris Gasipaes*) increases in numbers. Its tight stem-clumps and glossy dark-green leaf-crowns are highly attractive until one discovers how wickedly spiny are almost all parts of this palm. *Acrocomia vinifera* forms stately groups on the hills near Villa Somoza, and hereabouts once again we encounter the big pinnate palm previously seen near Granada, which is probably *Orbignya Cohune*.

The oil palm, *Corozo oleifera*, is also seen around habitations, especially near rivers, though the natives seldom seem to make use of the oil expressed from its massive fruit-clusters. This species is far more common further eastward towards the Caribbean, in the swampy lowlands of the Rio Mico and Rio Escondido basins of Zelaya.

A splendid group of flowering trees of *Andira inermis* prompted a stop—the vivid lavender-purple flowers in huge pyramids are marvelously attractive! Growing around the bases of the stately trees were dense clumps of a showy *Bactris*, with graceful almost golden-yellow trunks set with rings of ebony, elongate spines, and very feathery fronds. One of the physical problems of collecting in Nicaragua here again presented itself, when all of us bumped into bushes and reedy grasses on which crouched walnut-sized masses of tiny ticks. These diminutive *garrapatos* can move with the speed of a racing car, and for days thereafter we were infested with these nasty little insects. During previous treks in Central America, I have developed a severe fever from the attacks of the pin-head-sized beasts, whose danger is far more immediate than snakes or such well-publicized (but rarely seen) species.

Once down into the humid lowlands of the Rio Mico drainage basin, palms increased rapidly both in numbers and variety. Endless expanses of showy heliconias (of some five species) occupied the wet gulleys and often extended in solid phalanx up hillsides. Several kinds of marantads with handsome powder-white undersides to the huge entire leaves were scattered amongst them, as were some lovely orange-coned gingers. An unusual pinnate palm grows here in abundance, seldom more than ten feet in overall height, with glaucous lower surfaces to the foliage. It is very attractive, and perhaps our Editor can offer some idea of its identity.

The impressive *guarumos* (*Cecropia spp.*) abound in such regions, with their huge, long-stalked, hand-shaped leaves —white or glaucous underneath—and typically hollow, ant-infested jointed trunks. Near Muelle de los Bueyes, where an *Episcia* carpeted wet slopes above a cascading crystalline stream, *Asterogyne Martiana* again appeared with a very pretty slim-trunked *Geonoma* fifteen feet or so tall which seems much like the Costa Rican *G. congesta*. Both of these, along with the glaucous pinnate palm noted above, continued to increase in abundance as we approched the temporary end of the road, over the Rio Siquia, where we set up our camp surrounded by palms, *guaru-*

mos, and balsa trees (*Ochroma lagopus*).

Bactris Gasipaes is frequent hereabouts, and some of the tallest specimens of this palm I have ever seen were scattered along the larger streams. Coconuts naturally abound in settlements, and *Corozo oleifera* is often found near swampy areas. Huge clumps of the poorly-named Panama hat palm, *Carludovica palmata* (which is a member of the *Cyclanthus* Family, not a palm, of course) form spectacular arrays on wet hillsides, but reach their most impressive development in boggy gulleys, where the palmate leaves on very elongate petioles often attain heights of fifteen feet.

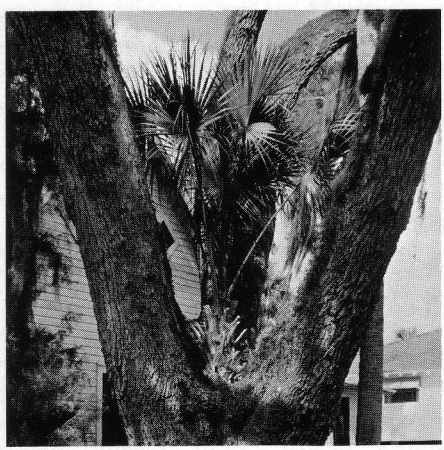
A walk along a muddy trail towards one of the larger tributaries of the Rio Siquia brought us to a veritable botanical wonderland! Immense tangled masses of *Vanilla Pompona* vines (an orchid) hung over carefully "landscaped" ranks of *Asterogyne* and the sleek, tall *Geonoma*. Some splendid big ferns with coppery juvenile fronds vied with tall gingers and marantads for space in wet spots, and showy parrots and over-sized hummingbirds flew about on every side. I inadvertently walked into one of the long whip-like leaf-extensions of a clambering *Desmoncus* palm, and while attempting to extricate myself, fell into a clump of the huge terrestrial bromeliad, *Aechmea Magdalenae*. Though this plant—much like an overdone pineapple in vegetative appearance—is prized by the natives for its edible fruit and excellent leaf-fibers, its marginal thorns are vicious, turning both forwards and backwards, and easily ripping clothes and flesh.

Torn and tattered, I progressed, to catch up with my companions, and despite the discomfort, I delighted at every step in the plants on all sides. A little brook, soggy-banked and set with trees on which perched proportionately huge anthuriums, gave me an excuse to pause for a rest. And here about a dozen beautiful specimens of *Socratea durissima*, their astounding stilt-roots far taller than my head, and their crowns almost hidden in the umbrage overhead.

And nearby, with showy masses of shrubby *Warscewiczia coccinea* — its incredible waxen paired orange bracts surrounding the tiny flowers and Chinese blue fruits—was a group of stemless pinnate palms whose glorious big fronds reached some twenty feet upward and outward in graceful array. None of these palms gave any evidence of flowering or fruiting, but they are apparently of the *Scheelea* alliance.

The Roosevelt Highway now continues beyond this river, towards its eventual destination at Rama, and when I next visit Nicaragua, I look forward to travelling onward into this amazing eastern section of the country, with its glorious palms and other plants.

PHOTO GALLERY



Sabal Palmetto growing in the crotch of a live oak tree in New Smyrna Beach, Florida. The palm has no connection with the ground, but according to local residents has been growing in the tree for twenty years. Photo by Dent Smith.

PALM LITERATURE

Natural History

Corner, E. J. H. 1966. The Natural History of Palms. 393 pages, 133 figures, 24 plates. University of California Press, Berkeley, Calif. $12.95.

Professor Corner has had much experience in the tropics and has an enthusiasm for palms obvious in this book about them. The volume is well printed, copiously illustrated with line drawings, some excellent, some sketchy, and 24 halftone plates. The text is presented in 15 chapters accompanied by two appendices, a glossary, chapter references, bibliography and index. The first two chapters introduce palms and early students of them. Then follow chapters on the palm crown, trunk, root and spine, inflorescence, flower, fruit, seed and seedling, on rattans, on palm geography, on palm evolution and three on genera. Palm classification closes the list. Appendices are (A) keys to commoner palms and (B) an alphabetical index of genera with distribution, number of species, and chromosome numbers.

When I first thumbed through the book, I was elated with the thought that the palms had been treated completely and authoritatively, so far as their general characteristics are concerned. There is much information in the volume, some of it new and based on Professor Corner's observations in the tropics. The diversity of form, structure and function in the palms is brought out, and whether or not one agrees with Corner's interpretations and his thoughts on evolution in the family, it is good to have them on the record.

The pity is that this book, potentially so useful, is marred by lack of attention to detail, factual errors, and broad generalizations later contradicted, so that one soon loses confidence in the information presented. The writing tends to be florid, at times less than clear (as in the description of the ovary of *Phytelephas*, p. 151), and sometimes disconcertingly suggests that the palms have the power of thought (". . . the key to understanding what is going on in their heads" p. 7) or of independent action ("They dismiss the primitive apical growth . . . and they develop the blade basally . . .", p. 217). The reviewer is faced with the alternatives of noting the book uncritically, of providing a detailed critique which would require more space and time than is available, or of suggesting what the reader must be wary of by means of selected examples. At the risk of seeming a captious critic, I have selected the latter course for PRINCIPES.

Attention to detail suggests care in all matters, and though names of plants may seem inconsequential, the incorrect use of them when a guide to correct names is cited (p. 383, Moore 1963c) does not instill confidence. Thus *Nypa*, though correctly used on p. 11, is elsewhere consistently misspelled *Nipa*; *Guilielma* misspelled *Gulielma; Arikuryroba* misspelled *Aricuriroba.* The correct name for the Chilean honey or wine palm is *Jubaea chilensis* not *J. spectabilis* as used by Corner, for the raffia palm *Raphia farinifera* not *R. Ruffia,* for the American oil palm *Elaeis* (or *Corozo*) *oleifera* not *E. melanococca* (which is a synonym for the African oil palm, *E. guineensis*). *Oncosperma* and *Eugeissona* are names neuter in gender and the correct name for *Oncosperma filamentosa* (used by Corner) is *O. tigillarium. Metroxylon sagus* and *M. bougainvillei* (p. 316) should be *M. Sagu* and *M. bougainvillense* respectively.

Though Corner devotes a chapter to geography, the information in Appendix B is not always correct: *Catoblastus* and *Wettinia* are listed as "Costa Rica

to Bolivia" but neither is yet reported north of Colombia; *Chelyocarpus*, listed as "Andean, Central America," is a palm of low elevations in the Amazon drainage of Peru and Brazil; the genus *Socratea* occurs from Costa Rica to the Amazon basin, the type-species having been described from South America, but is listed simply as "Panama." In the text, *Zombia*, a genus of Hispaniola, is credited to Cuba (p. 62); *Ptychosperma Macarthurii*, a native of New Guinea, to Australia (p. 44).

Among outright errors of fact are the attributing of a fossil fan-palm to the geological period known as the Triassic on pages 1 and 250 when R. W. Brown, who described the fossil, called it only "palmlike" or "regarded tentatively but creditably as a primitive palm" but not a fan-palm. On page 21, Jacquin is credited with having ". . . first discovered as an *Areca* the well-known *Euterpe oleracea* of South America" and as having published *Elaeis* later. Both *Areca oleracea* and *Elaeis* were described in the same book (1763) and *Areca oleracea* is now known as *Roystonea oleracea* (Jacquin) O. F. Cook, quite a different palm from *Euterpe oleracea Martius*. Most botanists will be surprised to find *Curculigo* placed in the Commelinaceae (p. 273). Burret's "Arabian journey" (p. 324). apparently derives from an incomplete reading of an article by Burret in which he described palms collected in Arabia by Wissmann.

Persons who are familiar with *Attalea, Maximiliana, Orbignya, and Scheelea* in the Cocoideae and *Wettinia* in the Arecoideae will wonder why they are characterized on p. 135 as dioecious (having male and female flowers borne on different plants). I am not aware of any cocoid palm that is normally dioecious and so keen a worker as Sir Joseph Hooker characterized the genera correctly in Bentham and Hooker's *Genera Plantarum* (1883). The cocoid palms are basically similar to the bulk of arecoid palms in having flowers in triads when the female flower is developed — a pair of male flowers, albeit sometimes reduced in size and probably sterile, is usually to be found in association with the female. The differences illustrated in Fig. 70B and 70C are not real, nor is 70A (male) well drawn compared with Fig. 68 adapted from Baillon in which the short floral axis of *Borassus* is shown. It is perhaps worth noting that *Pseudophoenix*, an arecoid palm, may be added to the list of pinnate palms having bisexual flowers on p. 132. To characterize the sepals and petals of palm flowers as "short, thick, rounded structures like bud scales" on p. 143 seems odd in view of the diverse shapes illustrated, often sketchily, in Figs. 73, 74, 75, 78. Strange also is the contradiction between Table 4 on p. 279 and the species of *Areca* listed by Furtado in which the larger number of stamens is associated with smaller habit (easily determined by reference to published descriptions), not the contrary as Corner suggests on p. 148; or the contradiction between the incorrect statement on p. 236 that two genera of borassoid palms (*Hyphaene* and *Medemia*) have free carpels and the correct characterization "ovary syncarpous" for the Borassoideae on p. 347.

Admittedly, the generic limits in the Cocoideae are not universally agreed upon. *Cocos* is generally considered to consist of the single species *Cocos nucifera* and is so accepted by Corner in Appendix B. Yet elsewhere in the text (pp. 86, 88, 91, 129, 141, 161, 244, 290, 291) the reader must attempt to determine whether Corner writes of *Cocos* in a restricted sense or in a broad sense and how broad a sense (can the prickly *Acanthococos* truly be accom-

modated in even a broad circumscription of *Cocos* as on p. 91 but not in Fig. 45?). Corner's ideas would have been more readily understood had he taken some stand on the genus and stuck to it.

The twice-pinnate leaf of *Caryota* is much stressed by Corner as possibly primitive (pp. 80-81, 209, 263) and is described (p. 62) and illustrated (Fig. 36, p. 77) as terminating in a single leaflet. This may be the exceptional situation but normally the main axis of the mature leaf terminates in paired leaflets like the seedling leaf. There is no need for Corner to wonder ". . . that *Caryota* should not begin with the terminal leaflet that its adult leaves have" (p. 198). The lateral axes are equivalent to single pinnae as seen in the succession from once-pinnate juvenile to twice-pinnate mature leaves on a single plant and they do terminate in a single pinnule as might be expected. Given this succession, it is difficult for me to consider the leaf of *Caryota* as anything but highly advanced using the same criteria of evolutionary recapitulation expressed by Corner on p. 198.

Corner also stresses Beccari's ideas that *Eugeissona* is intermediate between the cocoid and lepidocaryoid palms (pp. 40-41, 138, 180-181, 233) but I fear he relies on superficial resemblances in the thick but not 3-pored endocarp (characteristic also of *Ptychococcus* in the Arecoideae) and a misunderstanding of the ovary which is trilocular, triovulate. One or rarely more seeds develop and these are much dissected (see Fig. 84D, E) perhaps being the basis for Corner's statement (p. 180-181) "The ovary has indications of a primitive multilocular state with six or twelve incomplete partitions, though their development seems mainly to occur after pollination." Some first-hand investigation of this genus (weedy in parts of Malaya) might have altered Corner's views. Anatomical evidence not earlier available also clearly shows *Eugeissona* to be a perfectly reputable though odd lepidocaryoid palm.

Professor Corner often uses generalizations without noting exceptions until later. This I personally find unsettling and wonder whether the device serves the reader. Thus on page four, we read "The floral parts of the monocotyledon are arranged in threes, not in fours, fives, or some higher number as in dicotyledons." Almost immediately the exceptions begin to appear for the palms alone, to say nothing of such families as Araceae or Cyclanthaceae (see Fig. 119, p. 268). Or on p. 157 "Palm fruits . . . do not dehisce," while on p. 257 ". . . the only vestige of dehiscence seems to be that of *Astrocaryum*." But the fruits of some species of *Astrocaryum* dehisce completely to expose sometimes brilliantly colored mesocarp. *Lytocaryum* and *Microcoelum* also have dehiscent fruits and from personal observation I would add some species of *Socratea* to the list. Multistaminate flowers are attributed on p. 147 to all subfamilies ". . . except that of *Phoenix*, the Coryphoid palms, and *Nipa* [sic]" but on p. 149 we read "the exceptional subfamilies without multistaminate flowers are those of *Nipa*, *Phoenix*, and the Coryphoid palms; yet the Coryphoid *Thrinax* is said to have six to twelve stamens." Indeed *Thrinax* and some of its close relatives do have more than six stamens. Again, on p. 115, "The passage from palm trunk to inflorescence is abrupt. There are no intermediate structures between leaf and spathe . . .", yet on p. 117 the terminal inflorescences of some palms ". . . may have reduced leaves at the base and they may show how the vegetative leaf is transformed into a spathe" (and see also reference 112 to Chapter 5).

Three chapters entitled "Generic Notes" contain random observations on

selected genera. Chapter 15 on palm classification contains an outline of classification but the brief descriptions of subfamilies are not always accurate nor the keys entirely useful — *Arenga* and *Wallichia*, for example, cannot always be separated on stamen-number.

It is unfortunate but true that the majority of palms, like most other plants, can only be identified definitively by recourse to characteristics of inflorescence, flowers, and fruit. Keys to the commoner palms (no criteria for "commoner" being provided) such as Corner gives in Appendix A will certainly not be of much service to the palm grower who has *Chamaedorea elatior* in his garden, for it will key to *Desmoncus*, or to the traveller in South America who will find the widespread *Euterpe precatoria* keying to *Rhopaloblaste* of the Old World, or to the motorist in California who will often see roadside plantings of *Washingtonia* species deprived of their "skirt" by cutting or burning, the trunk thus not "covered with persistent dead leaves." To differentiate genera on the basis of "tropical" (subtropical *Acoelorrhaphe*) versus "temperate" (*Chamaerops, Trachycarpus*) should offend not only the taxonomist but any sensible reader.

Despite such shortcomings, the book does contain stimulating and controversial ideas, and readers fortunate enough to live or travel in warmer regions may be led by it to examine more closely the palms they grow or pass, or those in the north to marvel at the richness of the tropics as exemplified by the palms.

Oil Palm

Zeven, A. C. 1967. The semi-wild oil palm and its industry in Africa (Ph.D. thesis). 178 pages, 13 plates, 11 figures, 31 tables. Centrum voor Landbouwpublikaties en Landbouwdocumentatie, Wageningen, Netherlands. Also to be published as Agricultural Research Reports No. 689.

Dr. Zeven has published an account of the African oil palm, *Elaeis guineensis*, which is broad in its coverage and based on several years of work in West Africa. Twelve chapters and a summary deal with the design and execution of his studies, centers of variation, natural habitats and present geographical distribution in Africa, domestication and selection, origin and classification of the groves studied, yield, exploitation, diseases and pests, and economic factors as they relate chiefly to Nigeria, together with 12 pages of references to other studies concerned with the oil palm.

The book is paperbound, well printed and illustrated. Though the primary emphasis is on economic aspects of the palm, the more general chapters bring together much useful information about the botany and geography of the species.

HAROLD E. MOORE, JR.

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