

PRINCIPES

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Cover Picture

A grove of mature *Sabal palmetto* in the central Florida highlands near Fort McCoy. From color transparency by Kyle E. Brown. See page 3.

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JOURNAL OF THE PALM SOCIETY

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Ecological Studies of the Cabbage Palm, Sabal palmetto*

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From its center of distribution in central and southern Florida, *Sabal palmetto* (Walt.) Lodd. ex J. A. & J. H. Schult., exhibits two far-reaching, narrow range extensions along the Atlantic and Gulf coasts. It was this distribution pattern, especially along the Atlantic coast, and the desire to explain it, which led to this study.

The usual tool for such a study is the ecological life history (Pelton, 1951, 1953) which provides information basic to understanding how a species, in all stages of its life history, is adapted to survive in nature.

Realizing the longevity of *S. palmetto*, the major emphasis of the study was concentrated on the stages from flowering to seedling establishment. Thus, the objectives of the study were to determine the strategy of reproduction in *S. palmetto* and with this information attempt to explain the distribution of the species in nature.

I. Floral Biology

Information on pollination mechanisms in the palm family is quite sparse. Although entomophily was recognized, anemophily was considered to be the primary mode of pollination in the palms by early workers (Schmid, 1970). More recently, Schmid (1970) found that *Asterogyne martiana* (H. Wendl.) H. Wendl. ex Hemsl., a small Costa Rican palm, was pollinated by syrphid flies (Diptera), and Essig (1971) found that two other Costa Rican palms, *Bactris guineensis* (L.) H. E. Moore and *B. major* Jacq. were pollinated by beetles.

Sabal palmetto has several features characteristic of anemophilous species: production of enormous numbers of small, visually inconspicuous flowers; exserted anthers; and few ovules per flower (Faegri and van der Pijl, 1966; also see Fig. 1). On the other hand, preliminary observations revealed that *S. palmetto* has several distinctive features of an entomophilous syndrome: production of nectar; production of strong odor; anthesis and attractant production synchronized with potential pollinator activity; production of sticky pollen; and visitation by many species of insects, some in large numbers.

To determine the precise nature of the pollination mechanism in *S. palmetto*, field studies were conducted throughout the natural range of the species during the flowering seasons of 1971 and 1972. Preliminary observations of floral morphology and phenology as well as insect collections were made at Smith Island, N.C., Hunting Island, S.C., Tomoka State Park and Apalachicola, Fla., during May through August, 1971. Detailed observations of the daily floral sequence and insect behavior were made at Ft. George and Longboat Key, Fla., in July and August, 1971 and 1972 (see Fig. 2 for locations). Trees were tagged and observed between 0430 and midnight EST. Periodic visits were made for several days at both sites. An 18-hour vigil

* This is the first in a series of articles taken from earlier work by the author (Brown, 1973).

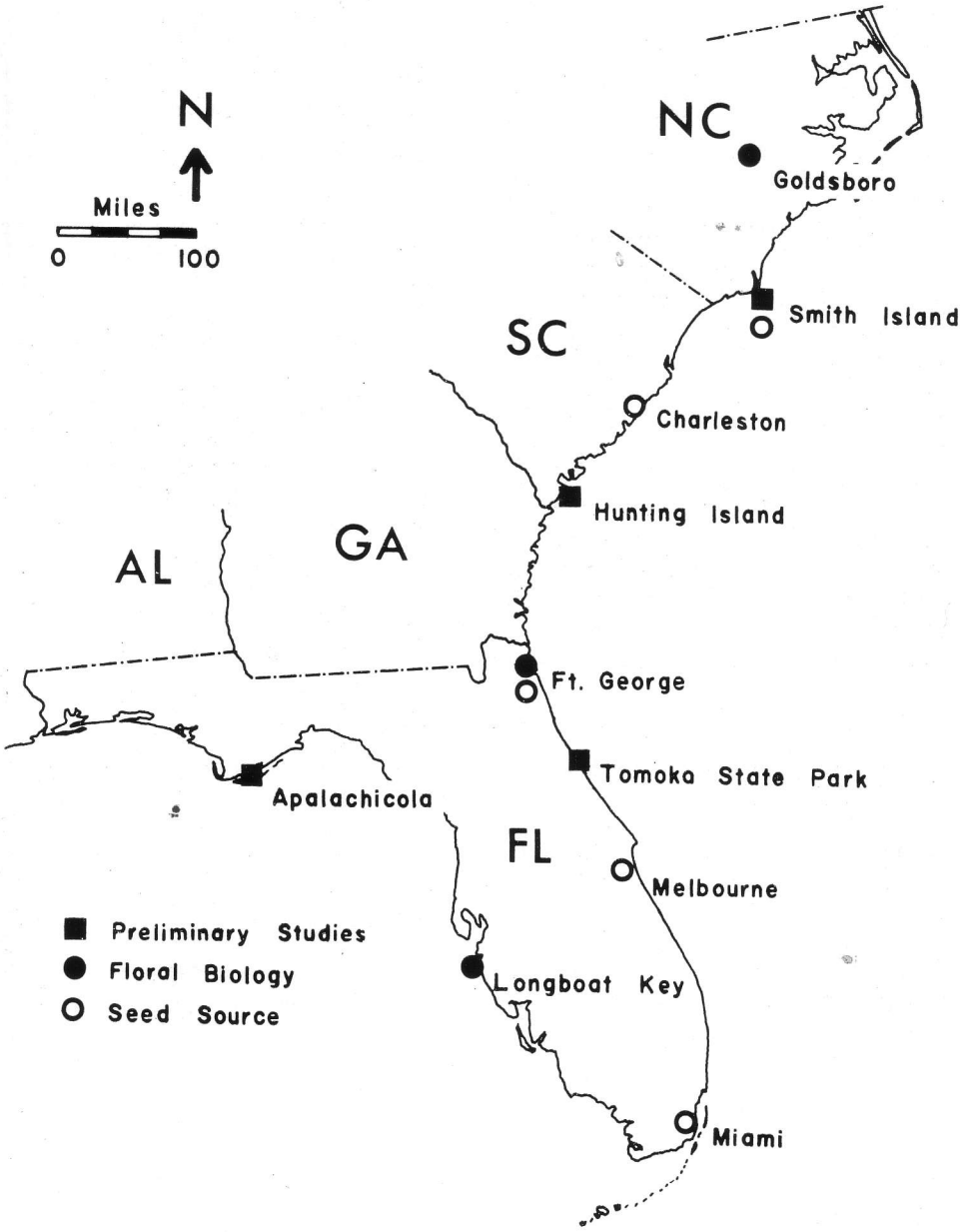


1. The inflorescence of *Sabal palmetto*. A, trees in full bloom; B, a single inflorescence; C, close-up of flowers; D, the flowers and their most common insect visitor, *Apis mellifera*.

on July 28, 1971, at Longboat Key, provided much information. Presence or absence of nectar and pollen on flowers was determined visually. Insect behavior was observed visually and recorded in detail. Insects were mounted for later examination and identification. Slides were made in the field of both anther-pollen and insect-pollen loads for later microscopic examination.

Floral Morphology

Detailed floral morphology is described by Bailey (1944). Individual flowers are 4–5 mm. long, sessile and bisexual. Septal nectaries which occur near the base of the ovary are assumed to be responsible for producing the pungent odor and nectar associated with open flowers. Pollen grains are sphe-



2. Location of field study sites and seed sources.

roidal to ellipsoid and average 36.6 microns long and 30.8 microns wide. Pollen viability, assumed of fully formed grains mounted in methyl-green glycerine jelly, is 98.4%. Pollen is obligately carried by insects, for glycerine jelly slides left exposed near flowers for 24 hours collected no wind-borne pollen.

Seasonal Phenology

Reproductive events exhibit seasonal periodicity. The exact mechanism of floral initiation is unknown but latitudinal differences in both time of first flowering and duration of flowering period exist. Southern populations around Miami may begin flowering as early as April and normally continue until at least August. Initial flowering activity proceeds up the coast reaching Ft. George (approximately mid-range) about July 1, and finally Smith Island in the second to third week of July. The period of flowering is condensed with increasing latitude such that at Smith Island it lasts only four to six weeks.

Even though growth of the inflorescense is basal, flower opening occurs randomly on individual panicles over a one- to two-week period after elongation of the panicle is complete.

Daily Events

The following description of daily phenology is a composite of observations from the two intensive study sites. All times are Eastern Standard equivalents for July 28 or Julian Day 209 and average time for each event.

The daily flowering cycle begins in darkness (0430) with production of a strong fragrant odor. Flower buds begin expanding such that by 0500 the first flowers are at anthesis. The stigmas, which at this time are white, glistening, and slightly sticky, are assumed to be receptive. Nectar is pooled at the base of the ovary and visible to the naked eye. Between 0530 and 0540, when a flashlight is no longer needed for observation, the first bees and flies begin exploiting the flowers for nectar and the majority of expanding flowers are open.

Anthers are visibly swollen by 0630, and by 0730 the first anther dehiscence occurs. These first-dehiscing anthers are, significantly, in the sun. Shortly after dehiscence the first pollen loads on bees start accumulating. By 0810 all anthers exposed to the sun are dehisced. Those on shaded flowers complete dehiscence by 0910.

The delayed dehiscence of anthers results in a functional dichogamy of at least two and one-half hours in the first flowers of the day. The few flowers opening later in the morning have only a brief anther delay or practically none at all. Protogyny was reported in *Sabal minor* (Jacq.) Pers. by Müller (1863). In the case of *S. palmetto*, it appears that the degree of protogyny is determined by anther moisture balance which controls anther dehiscence. Anthers on whole flowers from shaded locations began dehiscing within five minutes when secondary branchlets were excised. Dehiscence was even more rapid when branchlets were excised and placed in full sun.

By 0910 some stigmas lose their sheen and turn brownish. These are assumed to be pollinated. All new flowers for the day are open by 1100, but nectar and odor production continue through the day. By 1630 most anthers are stripped clean of pollen. At sunset a change in insect visitors from Hymenoptera/Diptera to nocturnal Lepidoptera/Coleoptera occurs. At 2300 odor is no longer detectable and the nonessential flower parts are withered and brown.

Before the beginning of the next flowering cycle all flowers from the previous day are spent. Individual flowers thus have a life span of less than 18 hours, probably 12 hours at most, if those opening at 1100 are the same ones ceasing to emit odor at 2300. The spent flowers dehisce tardily, but they cause no further response from insects.

The events just described apply to dry weather. Rainfall interrupts the normal

Table 1. Daily floral phenology. Based on observations at Longboat Key and Ft. George, Fla., during July and August, 1971 and 1972. Times are average for events and adjusted to Eastern Standard equivalents for July 28.

Time	Events
0430	Production of odor begins
0500	First flowers at anthesis; stigmas receptive
0530	First bees arrive
0730	First anther dehiscence
0910	Anthers in shade finish dehiscence
1100	All new flowers are open
1630	Anthers stripped clean of pollen
2300	Odor no longer detectable; flowers withered and brown

sequence whenever it occurs, for it will delay anther dehiscence in the forenoon, and it will terminate insect visitations at any time. The termination by rain is a function of the shape and size of the flowers which is such that water droplets encapsulate the reproductive organs. One rain which occurred at 1500 resulted in a cessation of visitation by insects for the remainder of the day. Flowers were still covered with water at sunset, over four hours after the rain had stopped. A summary of daily floral phenology is presented in Table 1.

Insect Visitation and Behavior

With a few sporadic exceptions, herbivory was not an important activity of attracted insects. The only directly observed herbivory was on unopened buds by an unidentified orthopteran (Tethigonidae) and several unidentified lepidopteran larvae. During the preliminary observations at several locations, a stripping of early inflorescences in bud stage suggests possible herbivory of a seasonal but devastating nature.

A complete list of visiting insect species may be found in Brown (1973). Although of interest for other reasons, many of these species did not behave in a manner likely to affect pollination. Some passively collected pollen on their bodies in small amounts, but these species never occurred in numbers sufficient to be considered important pollinators. This group also included spiders of entomophagus families.

A summary of the more active insect visitors by orders, including pollen loads and behavioral observations follows. Descriptions are for adults unless specified.

Coleoptera—Five families and seven species were represented. Pollen was found in sparse amounts on all. All were feeding either on nectar or pollen. Only two species were found at all locations in numbers sufficient to be pollinators. *Caryobruchus gleditsiae* (L.) (Bruchidae) is nocturnal and never contacted freshly opened flowers. The other, *Notolomus basalis* Le Conte (Curculionidae), is small and in seeking nectar rarely ever contacts the stigmas.

Diptera—Six families and six species were represented. Pollen was found in sparse amounts on all. Visiting was sporadic and limited to nectar-gathering, usually from a hovering position.

Hemiptera—Three families and three species were collected at only two locations. Pollen was not found on any. One was the predatory assassin bug, *Zelus bilobus* Say (Reduviidae).

Homoptera—One species, a tree hopper (Membracidae), was collected on unopened flowers at Longboat Key. Sparse amounts of pollen were found but numbers and behavior preclude this species as a pollinator.

Lepidoptera—Two families and two species were found at Longboat Key.

Small amounts of pollen were present but nocturnal habits eliminate these species as pollinators.

Orthoptera—Two families and three species were found at Longboat Key. Two crickets (Gryllidae) had no pollen and were nocturnal. The grasshopper (Tethigonidae) has been mentioned earlier as an herbivore on unopened buds. None are pollinators.

Thysanoptera—One species was found at all locations. This is a perplexing group due to their extremely small size. *Frankliniella tritici* (Fitch), Thripidae, was at times found in large numbers in and among open flowers. J. W. Hardin (personal communication) considers that thrips may pollinate unopened flowers of chokeberry, *Aronia* spp. However, in *S. palmetto* I found thrips only on open flowers, never in closed flower buds. Most of their activity was below the exserted stamens although they occasionally came in contact with pollen on the anthers. I am assuming, with reservations, that thrips play an unimportant role in pollination.

Hymenoptera—Thirteen families and 45 species were collected. The bodies of every species had pollen present, ranging from scattered individual grains, to visible clumps, to the heavy corbicular and abdominal loads of bees.

Seven families of wasps were represented by adults which were feeding on nectar. Sparse amounts of pollen were found on all 16 species. Most families were represented at all locations. Three families included entomophagus members, especially bee predators. Visits by wasps were always solitary and represent little total time on flowers.

Three species of ants (Formicidae) were collected. At least one species was found at all locations. Pollen was sparsely present. Activities were varied, including feverish activity around unopened buds associated in one case with the tree hopper, *Idioderma virescens* Van Duzea (Membracidae). Ants were less common on open flowers where they appeared to be feeding on nectar.

The suborder of true bees (Apocrita) was represented by five families and 24 species. Of all species observed and collected this group was the most ubiquitous. All species collected were active pollen gatherers and all were equally capable of behavior which could result in pollination. The presence of large numbers of bees, especially honey bees, discouraged activity of wasps. This pattern is the reverse of that reported by Shoudt and Mitchell (1967) in which wasps fended off other insects, including honey bees, on coconut palm.

Two families, Megachilidae (leaf-cutting bees) and Xylocopidae (carpenter bees) are solitary bees. The nine species in these two families, while efficient pollen gatherers, lacked the numbers and time on flowers to be considered important. Of the three other families, the Apidae and Bombidae are social, the Halictidae solitary to primitively social.

Apis mellifera L. (Apidae), the honey bee, was found at all locations except Smith Island. Its pollen- and nectar-gathering activities were obvious. Individuals were at flowers from early morning until sunset and often in large numbers, certainly in greater numbers than any other species of insect.

Bombus species (Bombidae), bumble bees, were observed at all locations except Longboat Key. They were equally efficient at pollen-gathering as *Apis*, and had even larger pollen loads, but like the leaf-cutting and carpenter bees their numbers were few.

The mining bees (Halictidae) were represented by five genera and 11 species. These small bees were ubiquitous and possess all the characteristics of

effective pollinators. Their small size was compensated for by large numbers and persistence at the flowers.

Microscopic studies of all bees revealed that in addition to corbicular and abdominal loads, abundant pollen was also present on the mouth parts, legs and ventral surface of the body. Most frequently, pollen occured in clumps rather than in individual grains. Observations on first bee visitors of the morning revealed that all species were carrying some pollen over on their bodies from previous days. All bees except the *Bombus* species were carrying loads of pure *S. palmetto* pollen. Contamination in *Bombus* loads was slight. This fidelity of pollen loads is not surprising since the communication system of social bees normally leads to the exploitation of pollen and nectar sources (Percival, 1965). It was also noted that during peak flowering activity of *S. palmetto* few other native plants were in full flower. It appears that *S. palmetto*, in its phenology and sheer numbers of flowers, provides the various bee species with a major source of food.

Anemophily is discounted in *S. palmetto* due to negative glycerine jelly slide tests and presence of an entomophilous syndrome. This species is rather obviously mellitophilous (bee-pollinated), although other insects, especially wasps, may be of importance locally and at particular times. The bee most effective in pollen transfer is *Apis mellifera.*

The honey bee has not always been the pollinator for *S. palmetto* since it is an introduced species (Borror and DeLong, 1971). The absence of this bee from the Smith Island collection allows speculation as to the native pollinator before the arrival of *A. mellifera.* Of the other bees, several halictids offer the best combination of behavior and frequency to be evoked as the primary native pollen vector for *S. palmetto.* These are *Augochlora pura pura* (Say), *Agapostemon splendens* (Lep.) and *Dialictus* spp. All are present throughout the range of *S. palmetto*, with the green *Augochlora pura pura* replaced by the blue *A. pura masieri* Cockerell in southern Florida.

Sexual System

To clarify the sexual system and determine the pattern of intraspecific fertilization, artificial pollination experiments were conducted. Preparation of flowers was accomplished in the late afternoon followed by appropriate manipulations the next morning. Bagging of flowers was with styrofoam cups, with windows cut out, covered with nylon stocking. Development of fruit was considered evidence of fertilization. Experiments were conducted on several trees at Ft. George and a single tree at Goldsboro (Brown, 1973). The results of these experiments are summarized below.

No evidence of incompatibility mechanisms which would preclude autogamy or allogamy (geitonogamy or xenogamy) were found and all, at least theoretically, can occur with the aid of insect vectors. No evidence of apomixis was found. The results suggest that protogyny is effective, especially on early flowers. It appears that not only is there an initial temporal separation of maturation of female and male parts in early flowers but also that the stigma may in fact be nonreceptive by the time pollen in the same flower is presented. The pollination of early flowers must be accomplished by pollen brought from: 1) exposed flowers on the same tree or different trees; or 2) flowers open on the previous day.

Protogyny facilitates the adaptively favorable event of allogamy, especially xenogamy. Any pollen contacting a protogynous stigma will be allogamous and in all probability effect fertilization

(Faegri and van der Pijl, 1966). Allogamy may be further facilitated in this species by the carry over of pollen from one day to the next on vector insects.

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FOOTNOTES ON PALMS

Have you ever inhaled the fragrance from the bloom of our native cabbage palm? Now who would ever believe that this dowdy old gal would use such sexy perfume? However, with her high laced-up boots she may be more modern than we suspect. In my opinion, this palm is fine in the wild but somewhat unsatisfactory as a landscape palm because of her lack of fastidiousness. Perhaps I am biased because the birds, who love the fruit of the cabbage palm, drop the seeds in my flower beds and I am always having to pull the seedlings out.

Now do not think that I do not like palms, in fact, I consider palms one of the joys of living in Florida. I will never forget my first visit to Florida when I first viewed the magnificent planting of royal palms along McGregor Blvd. in Fort Myers; I could hardly believe that they were living plants!

Palms are of special interest to many people because of religious interest; the people of Jerusalem, when they heard that Christ was on his way to the city, "went forth to meet Him carrying Palm branches." The Bible also states: "the righteous shall flourish like the Palm."

In India, the coconut palm is called "the Tree of Heaven." In Tahiti, the local government has an ordinance that states: "No building in Tahiti shall be higher than two-thirds of a coconut tree."

When Captain William Bligh was cast adrift in a small boat by the mutineers of the Bounty, the fruit of the coconut tree helped save him and his companions from starvation. In his journal he mentions coconuts several times (he spelled it cocoa-nuts). On Wednesday, April 29, the day after the mutiny, his small boat was off the northwestern part of the island of Tofoa, the northernmost of the misnamed Friendly Islands. His journal relates: "We weighed anchor and rowed along shore to see if anything could be got; and at last discovered some cocoa-nut trees; but they were on top of high precipices, and the surf made landing dangerous; both one and the other, we however got the better of it. Some of the people, with much difficulty, climbed the cliffs, and got about twenty cocoa-nuts, and the others slung them on ropes, by

(*Continued on page 23*)

In Quest of the Big Seed (With Observations Along The Way)

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The more Phyllis Sneed and I learn about the palms the more we love them. Our appetite for additional species seems almost insatiable. But there comes a time when one sits back in contemplation about some of the really "hard to get ones."

Thanks to the Seed Bank, all members of The Palm Society have the privilege of acquiring not only readily available species but many rare ones, too. More recently, thanks especially to Lucita Wait and DeArmand Hull and to others who have made contributions and expeditions, a number of exotic species have been acquired from far places and distributed. But, as a practical matter, the Seed Bank can't be expected to furnish some species, especially those having fruits too large for collection on a scale for distribution.

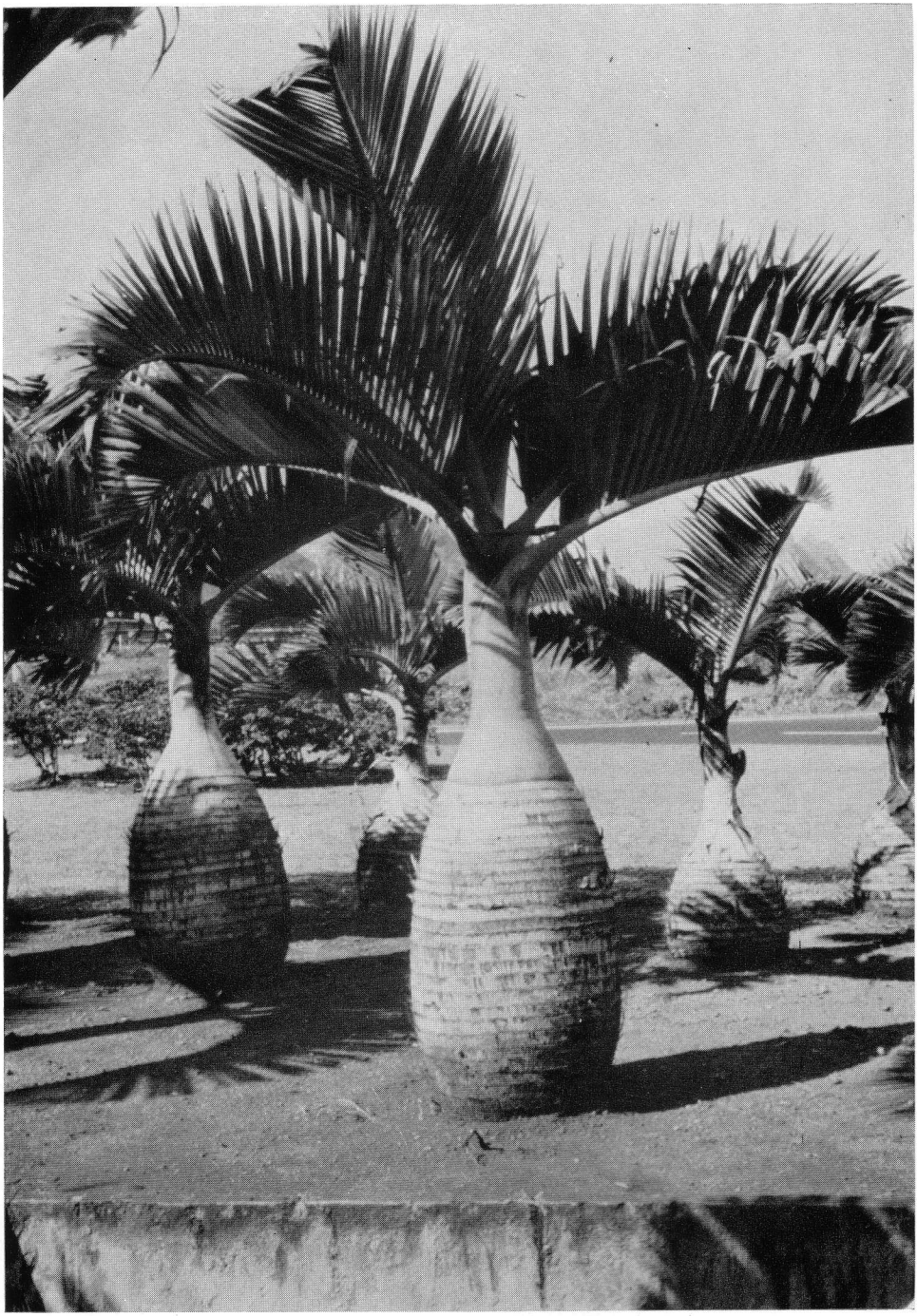
Having said that, we get to the point of going after the largest seed in the plant kingdom, that of *Lodoicea maldivica* (coco-de-mer). On our way we will interlace the account with some up-to-date and, we hope, informative observations.

We left Montego Bay 28 September, 1974, nonstop to London, arriving early the 29th. We had ample time in London to visit the magnificent Palm House and other attractions at Kew Gardens before leaving, late evening, nonstop to Nairobi, then on to Mauritius.

The "big seed," of course, is indigenous to those delightful little wisps of granite islands, the Seychelles, situated in the Indian Ocean midway between Africa and India. Going that far, we couldn't pass up a chance to visit Mauritius, although it was perhaps some 3,000 miles out of our most direct way to the Seychelles. Mauritius is about 1,900 air miles southeast of Nairobi and some 500 miles east of Madagascar in the Indian Ocean.



1. *Mascarena lagenicaulis* planting on highway near University of Mauritius.



2. Near-perfect bottle specimen of *Mascarena lagenicaulis* in the planting shown in Fig. 1.



3. Avenue of relatively young *Verschaffeltia splendida* in the Royal Botanic Gardens at Pamplemousses, Mauritius.

We flew over Madagascar with something like a heavy heart. One doesn't enjoy being that close to a huge tropical island, the indigenous source of so much of the world's finest tropical flora, without stopping. But Madagascar has had, and still has, apparently, a reputation for being somewhat inhospitable to "foreigners." We found Mauritius most friendly and enjoyed meeting the people there.

Thanks to our Editor, Dr. Moore, and Stanley Kiem of the Fairchild Tropical Garden in Miami, we had corresponded with several persons in Mauritius. Dr. H. R. Julien, Curator of the Herbarium, Sugar Industry Research Institute at Reduit, busy as he is, was extremely helpful, as was his father, Mr. H. Julien, M.B.E., in acquiring seeds for the Seed Bank. Without their help we couldn't have assembled a sufficient quantity for Seed Bank purposes. It should be noted that Dr. Julien's father, for many years the Director of the Royal Botanic Gardens at Pamplemousses, went out of his way to introduce us to the Gardens. Not only that, but he has created much beauty in Mauritius with his landscaping for the government and others. This seemed important to us in an island where the indigenous vegetation to a very large extent has given way to the production of sugar cane. A new superhighway between Port Louis (the capital) and Curepipe (largest city) has been landscaped beautifully by Mr. Julien. Palms are not the only motif, but see the group of *Mascarena lagenicaulis*, the bottle palm, in Fig. 1. Phyllis and I were thrilled with this sight, which is located in a "round-about" on the new highway, only a short distance from Reduit and the University of Mauritius. Figure 2



4. Dr. R. E. Vaughan and Phyllis Sneed in the garden at his home in Phoenix, Mauritius.

shows a closer view of this magnificent small palm which is indigenous to the Mascarene Islands.

We liked the garden at Pamplemousses, which has a large collection of palms including those indigenous to the Mascarenes. As we look back, I think we were most fascinated with an avenue of relatively young *Verschaffeltia splendida* (Fig. 3), which is indigeneous to the Seychelles, not Mauritius. Later in the Seychelles we saw many mature specimens of *Verschaffeltia splendida*, but never out in the sun, lined up in a row for a picture.

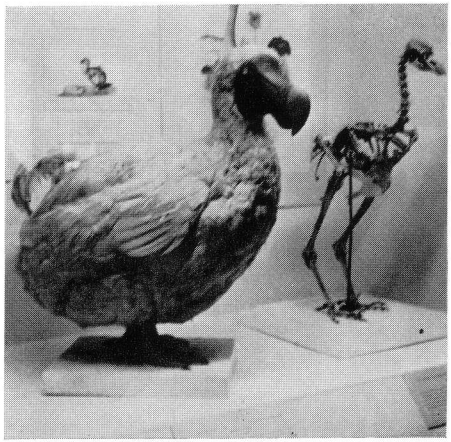
Pamplemousses has *Mascarena lagenicaulis*, too, but in our judgment the stands there were not as attractive as the more recent plantings down south on the superhighway. This garden deserves much more attention than we can give it here, except to say that, unfortunately, no catalog of the garden's plants is available to the visitor, although the garden itself certainly is diverse enough to justify one.

While in Mauritius we were delighted with the opportunity to meet Dr. R. E. Vaughan, botanist. At one time he helped Stanley Kiem in the collection of seeds for Fairchild Tropical Garden, and through Stanley's introduction we met Dr. Vaughan. We certainly appreciated his attention to us in Mauritius and his courtesy in showing us around the delightful garden at his home in Phoenix, a suburb of Curepipe. The picture in Fig. 4 does not do Dr. Vaughan justice but it was taken because he and Phyllis were "caught" in front of a palm that has borne his name.

While in Curepipe we visited the interesting botanic garden there. It's small, compared with Pamplemousses, but has some fine species of palms including one that exists nowhere else! Helping us at the garden in Curepipe was Mr. T. A. M. Gardner, M. A., of the Forestry Service, shown here with *Acanthophoenix crinita* (Fig. 5). Not only did he take time to help us around the Garden and in acquiring seeds, but he cares about palms and is a current member of The Palm Society. Later when we went to work packaging seeds to mail back to the Seed Bank we were extremely grateful to Mr. Joseph Gueho of the S.I.R.I., who also has accompanied Dr. Moore on expeditions in the Mascarenes.



5. *Acanthophoenix crinita* and Mr. T. A. M. Gardner of the Forestery, Service, Curepipe,



6. Restoration of the dodo in museum, Port Louis, Mauritius.

In the few days we were there we explored much of Mauritius in a rented car which took a few wrong turns, but the roads are excellent and the people most helpful all over the island. English is generally understood and we had no serious communication problems. There are several good, modern hotels. We enjoyed downtown Port Louis with its avenue of royal palms and the interesting museum where one can see a restoration of that famed, albeit extinct, indigene of Mauritius, the dodo bird. Frankly, our preference for indigenous things there is *Mascarena lagenicaulis*, with *Hyophorbe verschaffeltii*, *Acanthophoenix crinita*, and the species of *Latania* in close competition. Nevertheless, as one contemplates the bird (see Fig. 6), imagination takes over and one can wonder about a number of things, such as a fantasy of the flora that might have surrounded the living bird.

Leaving Mauritius on October 5, we arrived at the new airport on Mahe, Seychelles after a three-hour flight. The next day we called Mr. Guy Lionnet, with whom we had corresponded at Dr. Moore's suggestion. He had come to the Seychelles from Mauritius some 30 years ago and was the Director of the Seychelles Department of Agriculture for 10 years. It is not possible to thank Guy Lionnet enough for the splendid things he did to make our visit to the Seychelles so pleasant and so productive in the way of seed collection. Before we left the islands we not only had the "big seed" in the mail but also a great many fresh seeds of the other Seychelles palms—*Deckenia nobilis*, *Nephrosperma vanhoutteanum*, *Phoenicophorium borsigianum*, and *Verschaffeltia splendida*—on their way to the Seed Bank. Only *Roscheria melanochaetes* had eluded us. More about that later. First, a few notes.

Until completion of the Seychelles International Airport in 1971, it wasn't a quick and easy trip to these islands. Over the years, the literature is laced with travelers' stories about the fabulous coco-de-mer nut (e.g., see the notes on "Traveling Members" in *Principes* 15: 141, 1971). The Seychelles remain remote but they can be reached by air comfortably within relatively few hours from any international airport in the world. Moreover, hotel accommodations, particularly in Mahe and now, Praslin, are quite modern.

The islands have been covered in the literature (see especially the delightful book by Guy Lionnet, *The Seychelles*, 1972, published in the United States by Stackpole Books, Harrisburg, Pa., and in Great Britain by David Charles Publishers Ltd.) as has the Vallée de Mai on Praslin Island and the coco-de-mer (see *Principes* 7: 44–54, 1963 and *Principes* 9: 134–138, 1965; also Guy Lionnet's *Coco-de-Mer, the Romance of a Palm*, 1973 ed. Imprimerie Saint Fidèle, Seychelles). Accordingly, the observations here are intended to supplement and update rather than duplicate.

Guy Lionnet oriented us in Victoria, the colorful capital of the islands, then

took us through its small (15-acre) but very attractive botanical garden situated on a hillside, to which we returned before leaving the islands. Though not much above sea level, the garden has all six endemic palms of the Seychelles and a collection of others, most notably *Cyrtostachys renda*, *Corypha umbraculifera*, *Dictyosperma*, and *Mascarena lagenicaulis*. There is also a good collection of flowering ornamentals, together with *Araucaria heterophylla* and the magnificent *Pandanus hornei* (Vacoa parasol) which flourishes in the Vallée de Mai along with the coco-de-mer. Several clusters of *Cyrtostachys renda* were most impressive, and we were intrigued by a young cultivated coco-de-mer in a cage. But we had seen these palms and it was the garden's lone specimen of *Roscheria melanochaetes* that excited us the most. Although this delightfully attractive small palm prefers a higher elevation than the Victoria garden affords, it was accessible to admire and photograph there (Fig. 7). Unfortunately it wasn't in fruit and, as we soon were to learn, viable seeds of *Roscheria* are elusive and difficult to obtain.

After a meeting with the Seychelles' most cordial and able Director of Agriculture, Mr. S. M. Savy, arranged for us by Guy Lionnet, we were not only permitted to collect seeds for the Seed Bank but given every encouragement to do so. Armed with this, our enthusiasm grew, and we drove the few miles up into the central highlands of Mahe to meet Willy André, Forest Officer in the Morne Preserve area. This is beautiful country and the region where *Roscheria* occurs on Mahe. We went through the bush in two sections of the mountain slopes and saw stands of *Roscheria* (see Fig. 8) but no seeds! Willy André certainly did his best to help us find them but it wasn't the right time. *Roscheria* seeds



7. *Roscheria melanochaetes*, Botanical Garden at Victoria, Mahe, Seychelles.

are extremely small, easily blown away by wind, and readily lost if they fall in undergrowth on the ground. Not only that but the viability of fresh seeds apparently is short, so it seems likely that this palm will remain rare in cultivation.

After three most enjoyable days on Mahe we were ready to go on to the source of the big seeds. Praslin Island lies 24 miles northeast of Mahe. Though small, about 14 square miles, what it lacks in size is far more than compensated for by its beauty and the presence of the incredible Vallée de Mai, itself an area of only 46 acres. To get there from Mahe one can go daily by ferry, a three hour trip, or by regularly scheduled flight in small aircraft in 15 minutes. We flew.

From the Praslin air strip we were bused to our lodging in the newly



8. Willy André and Phyllis search for seeds of *Roscheria* in an indigenous area on Mahe, Seychelles.

opened Paradise Hotel, a very pleasant cottage-type facility on a good white sand beach at Cote d'Or. There we were able to rent a Mini Moke and set out immediately to locate Mr. Philippe de Lafontaine, Senior Forest Ranger on Praslin. One really can't get too lost on Praslin but we managed to drive past the station and had to backtrack to find Philippe. He was most cordial, and after discussing and lining up our seed-collecting mission we drove the short distance to the Vallée de Mai entrance and proceeded on an orientation walk through the Vallée. Philippe has a mastery of the flora there and the introduction he gave us was exceedingly helpful as a prelude to several return excursions we made later. Not only that but he has mastered the call of the rare Praslin black parrot which inhabits the Vallée. Although we didn't decoy them close enough to photograph, we did see two on the wing in the distance and heard them frequently.

It would be inappropriately presumptuous of us to pretend that we can describe the Vallée de Mai. Words are inadequate, and we have yet to see pictures that capture what it is really like.



9. Young coco-de-mer, Philippe de Lafontaine, and Phyllis on pathway in Vallée de Mai, Praslin, Seychelles.



10. *Verschaffeltia* vies with *Lodoicea* in the Vallée de Mai.

The best we can do is to say that, to us, it was awesome and primeval. It has to be a botanical wonder of the world. Certainly nothing else like it exists on earth, and it should be a "must" for traveling palm enthusiasts.

One can walk the main circular path in the Vallée in perhaps an hour, which is what many of the Seychelles tourists do, going to Praslin from Mahe and returning the same day. The palm devotee can spend many hours in the Vallée marveling at its grandeur and antiquity. The dirt paths are only three to four feet wide following the contours (see Fig. 9) with the slope on the descending side plunging steeply to a stream at the bottom of the Vallée. The path itself descends to the bottom and across the small stream to continue up on the other side. The paths are kept swept clean but very little else is disturbed. Every effort is made to keep the Vallée natural, so palm and other debris accumulates on the ground throughout the area. This poses a fire hazard so smoking is discouraged and fire breaks have been constructed.

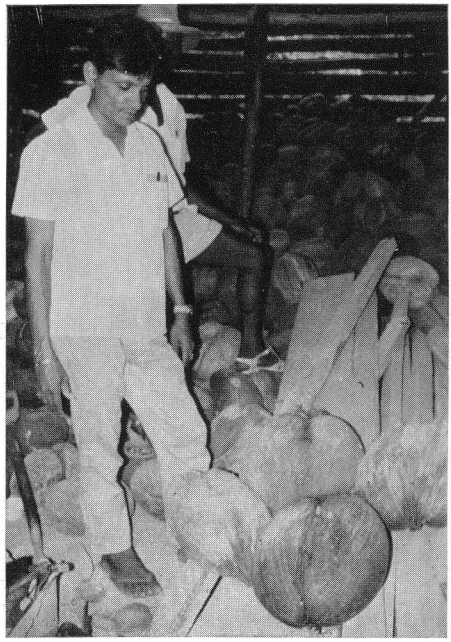
The Vallée has all the palms endemic to the Seychelles and some that were introduced, including *Cyrtostachys renda*. But *Lodoicea maldivica* completely overwhelms everything else. There are at least 4,000 of them in the Vallée—from seedlings on up to the 800-year-old giants that tower above the others at more than 100 feet. Although difficult to photograph because of the density of other growth, magnificent old specimens of *Deckenia nobilis* and *Verschaffeltia splendida* assert themselves through the maze of *Lodoicea* (Figs. 10, 11). *Phoenicophorium* also is much in evidence, with many young trees noticeable along the upper slopes from the pathways. At one juncture, a side path diverges from the main trail down to the floor of the Vallée. This leads past a stand of very old *Verschaffeltia splendida*, rising up out of the natural debris. The stilt roots of these trees seemed almost as tall as the entire height of the row of much younger *Verschaffeltia* we had photographed earlier in Mauritius.

Sandwiched in with our dallying along the paths through the Vallée we enjoyed the beach at Cote d'Or, explored Praslin in the Mini Moke and of necessity discovered the one petrol source with its quaint glass-bottle-pump dispenser. Meanwhile, seeds of *Nephrosperma*, *Deckenia*, *Phoenicophorium*, and *Verschaffeltia* had been collected and readied for packaging. Again, *Roscheria* was elusive. It remained to get the "big seed."

Fortunately, to get *Lodoicea maldivica* one does not probe the bush, shake any trees hoping seeds will fall, or shinny up them to hack off an inflorescence. How could you handle seeds each weighing 20 to 40 pounds, or more, which have taken up to seven years on the tree to mature, and some



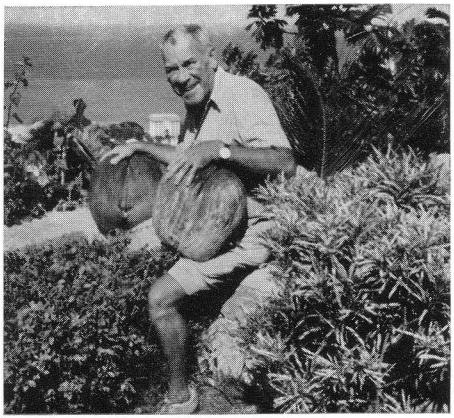
11. *Deckenia* emerges above younger *Lodoicea* in the Vallée de Mai.



12. *Lodoicea* seeds assembled after collection in the Vallée de Mai. Philippe de Lafontaine and assistant view the four seeds selected for mailing to Jamaica and Florida.

that are contained in two- or three-seeded fruits weighing much more?

Through its Forestry Department under the Director of Agriculture, the Seychelles government collects the available seeds in the Vallée de Mai and assembles them centrally. Some 2,000 or more mature nuts are brought in annually. They are sold, as a source of revenue, to souvenir and seed collectors as well as furnished to local craft industries for manufacture of curios. In addition, up to perhaps 1,000 nuts each year are consumed green by visitors to the islands and others who wish to taste the "forbidden fruit," which in the immature nut is a jellylike substance. No loss to the Vallée de Mai accrues as a result of this deflection of seeds. Indeed it is difficult to see how the Vallée could support much further proliferation of



13. *Lodoicea* seeds (average weight 33 lbs.) and the author back in Jamaica.

Lodoicea, notwithstanding the palm's slow growth.

We joined Philippe de Lafontaine and some of his assistants at what we dubbed the big-seed crib, which was reminiscent of an early Missouri corn crib. Though ignorant of the characteristics of a viable *Lodoicea* seed, we wanted two of them, a male and female, hopefully, if we are to propagate the species back in Jamaica. We had a request from Dr. U. A. Young, currently President of The Palm Society, to get one seed for him, and we wanted a fourth to send back to the Seed Bank for Lucita Wait to dispose of. We depended upon Philippe to select the seeds, all four of which are shown on the board in the crib in Fig. 12. He did his best to select viable seeds, and at the same time determine their sex. We will always be grateful for his decision, whatever the ultimate result may be.

Not content with merely acquiring the "big seed," we wanted to know how it tasted. Was it what the early potentates thought it was? After considerable hacking and prying into a green nut the "jelly" was extracted. Satisfied with a liberal sampling, we returned to our hotel with a large plastic bag of this

unique and delicately textured jelly which we turned over to the chef with the suggestion that other guests might share it as a dessert.

In October, 1974, the government charge for *Lodoicea* nuts in Praslin was 30 Seychelles rupees (approximately U.S. $6). Subsequently the rate has been increased to 100 rupees (about U.S. $20). Then, of course, one has to get them back to Mahe for forwarding to whatever destination.

After three of the most enjoyable and seed-rewarding days in our short collecting experience, we almost overwhelmed the Mini Moke on the drive to the air strip with our luggage, the four coveted "big seeds," and miscellaneous and containers of seeds of the other Seychelles palms. Thanks to the consideration and understanding of Air Mahe we were not charged overweight on the return trip from Praslin to Mahe. The four big seeds alone averaged over 33 pounds each.

Back on Mahe, Guy Lionnet put us in touch with a forwarding agent who arranged to package the "big seeds" for air freighting—two seeds to Jamaica, two to Florida. When we returned to Jamaica late in October, having gone on to Ceylon (Sri Lanka) from the Seychelles, the big seeds were waiting at the airport. After some delay because of missing clearance papers, we retrieved them from their airport captors and the author couldn't resist posing with them (Fig. 13).

The seeds have been half-buried and caged in our Gully (not Vallée!) and we shall be full of anticipation for some time to come.

(*Continued from page 10*)

which we hauled them through the surf into the boat. That was all that could be done here; and as I found no place so safe as the one we had left, to spend the night at, I returned to the cove, and having served a cocoa-nut to each person, we went to rest in the boat."

Friday, May 1, "At night, I served a quarter of a bread-fruit and a cocoa-nut to each person for supper." Saturday, May 2, "I served a cocoa-nut and a bread-fruit to each person for dinner."

They were later to obtain a few more coconuts from the natives of this island, but the natives became more unfriendly and attacked the boat and one of the men was killed. All the others who accompanied Bligh arrived at Timor after 44 days at sea and traveling 3600 miles in a small boat. It is irony of some sort that one of the things that set off the mutiny was due to Bligh accusing some of the crew of the Bounty of stealing his *cocoanuts*!

CLAIRE C. COONS

WHAT'S IN A NAME?

Attalea (at ta lée a) was taken from the name of Attalus III Philometor, King of Pergamum in Asia Minor from 138–133 B.C. In his later life, Attalus was interested in medicinal plants.

Cornera (cór ner a) honors Edred John Henry Corner (1906–), formerly professor of tropical botany at Cambridge University and author of *The Natural History of Palms* (1966).

Cuatrecasea (quat reh cáh see a) is based on the name of Dr. José Cuatrecasas (1903–) of the Smithsonian Institution, Washington, D.C., who has collected many palms in Colombia.

Jubaea (jew bée a) honors Juba II (about 50 B.C. to 24 A.D.), King of Numidia from 29 to 25 B.C. and subsequently King of Mauretania (both in North Africa). Juba married the daughter of Mark Antony and Cleopatra, was a Roman citizen, and wrote on many subjects, including plants and geography.

The Palm Heart as a New Commercial Crop from Tropical America

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A stately species of the genus *Euterpe* is found throughout the once vast rain forests of Costa Rica. This palm, when mature, reaches the upper limits of the forest canopy, some 70 feet or more in the air. Its slender trunk, while only six to eight inches thick, supports a splendid crown of fronds, directly under which are produced clusters of small, single-seeded fruits (Fig. 1). Unfortunately, these palms contain a sweet tender heart, and before they reach a seed-producing size they are often felled to acquire this relatively small amount of edible "heart of palm." In fact, in areas of forest much traveled, as soon as these palms reach one inch in diameter, they become desirable in the eyes of the local inhabi-



1. Two sources of heart of palm, *Euterpe* to the left, *Bactris gasipaes* at the right.



2. *Bactris gasipaes* planted close together for harvesting.



3. Cutting to the heart.



4. The heart removed. More must be peeled to get to the part used for food.

tants as a source of food. The campesinos (rural peasant farmers) decapitate even these small palms to get at the slender heart, which at this stage provides hardly more than a mouthful of food.

With the increasing population stress on Costa Rica's dwindling rain forests, there is doubt as to this palm's ability to survive these depredations, as each new seedling, upon discovery, is usually soon destroyed. Palm hearts are continually collected for commercial canning and for export, thereby continuing to reduce further the already low populations.

Where does the solution lie? Should conservationists press for a prohibition on the importation of this "delicacy," or is there another answer?

Las Cruces Tropical Botanical Garden and Field Station, a unit of the Organization for Tropical Studies, Inc. near San Vito de Java in the mountains of western Costa Rica, is attempting the experimental cropping of a substitute palm heart, the *pejibaye* or peach palm (*Bactris gasipaes*). Several rows of this species were planted in an attempt to demonstrate that this palm could serve as a domesticated substitute for the *Euterpe*, thereby reducing the traditional damage to the forest ecology. These palms become large enough to cut for their hearts in two and one-half to four years from seed, depending on the climate and location, and they yield up to three pounds of edible heart, substantially more than the *Euterpe* palm (Figs. 2–4). One additional commercial advantage to using the *pejibaye* palm heart is that it will not discolor after being cut, as does the wild product. The quality of the heart is excellent, having a crisp, nutty flavor. The peach palm is well known in Costa Rica as an impor-

tant food, the fruits being appetizing and nutritious. The trunk contains a sweet sugarcanelike material which has a potential for use in the manfacture of alcoholic beverages. Cattle enjoy grazing on the leaves, disregarding the spines in their gusto.

For cropping, the plants can be spaced quite close to each other in order to give maximum yield. At Las Cruces the trees were spaced .75 by 2.0 meters, while in large-scale plantings at the Turrialba Tropical Agricultural Research and Training Center, 2,200 trees were planted per hectare (2.47 acres), and spaced 3 by 1.5 meters (*Activities at Turrialba* 1(3) : 4, April–June 1973, Turrialba, Costa Rica). Conclusions drawn from the Las Cruces experiment indicate that a little further spacing than was given is needed for optimum yield. The peach palm will produce up to 12 offshoots, usually averaging five. These can be used for propagation or left to mature into a second crop or ratoon. One objection sometimes raised to harvesting this palm is its spiny trunk, which can be a challenge to the handler. However, spineless strains of this palm are being propagated, which should remove this difficulty.

As experimental cropping and the first few commercial operations have proved worthwhile, what is now needed is a large-scale growing program promoted by the government and with the cooperation of commercial packaging companies. Heart of palm has the potential for being an important agricultural crop in tropical America.

LETTERS



The freak behavior of the palm depicted in the accompanying photograph would not make the subject a candidate for a beauty prize. It does, however, carry a hopeful message to those of us who have watched an otherwise fine specimen palm apparently succumb to shock or disease when transplanted. The *Phoenix sylvestris* illustrated was planted three years ago in prime condition at the Polynesian Hotel, Walt Disney World. After a period of some months, signs of trouble were perceived in the older leaves. They had gradually deteriorated into the forlorn terminal at a right angle to the trunk. A new bud, to our surprise, had in the meantime pushed out alongside the original and gives promise of ultimately assuming a normal aspect.

If nothing else, the message may be not to be too hasty in consigning to the graveyard the apparent transplant casualty.

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Terminal Flowering in Daemonorops

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Terminal (hapaxanthic) flowering is well known in the lepidocaryoid palms; all species of *Korthalsia*, *Plectocomia*, *Plectocomiopsis*, *Myrialepis*, *Ancistrophyllum*, *Oncocalamus*, *Eleiodoxa*, and *Eugeissona*, and apparently all species of *Raphia*, have this particular method of flowering in which axes develop through a vegetative phase and then pass into a flowering phase which terminates the growth of those axes. In *Metroxylon* all species but one flower hapaxanthically; *M. amicarum* (H. Wendl.) Becc., the exception, has pleonanthic flowering, the inflorescences being produced in the axils of the leaves until the axis dies of injury or old age. That the two effectively and markedly different methods of flowering can occur in the same genus has stimulated much speculation as to which flowering process is primitive and which advanced. Holttum (1955), Corner (1966), Hallé and Oldeman (1970), and Dransfield (1970) favour the idea that hapaxanthic flowering is basic whereas Moore (1969), at least in *Metroxylon*, and Moore and Uhl (1973), regard it as derived. Tomlinson and Moore (1968) regard the whole argument concerning which is primitive, hapaxanthy or pleonanthy, as being redundant. Like many evolutionary problems there are good arguments difficult to prove in favour of both views. Whatever the real answer may be, the situation is certainly an interesting one and it may be of importance to record the occurrence of hapaxanthy in a genus hitherto thought to be entirely pleonanthic.

Of the 115 species of *Daemonorops*, at least one species appears to have hapaxanthic flowering. This is *Daemonorops calicarpa* (Griff.) Mart., an acaulescent forest undergrowth palm highly characteristic of forest bordering rivulets in nonswampy lowland and hill dipterocarp forest in the Malay Peninsula; in such a habitat it forms thickets, often in association with *Calamus castaneus* Griff. It also grows in North Sumatra in a small area of forest in the Langkat Nature Reserve which is remarkable for the large number of plants of Malayan distribution apparently not found elsewhere in Sumatra (e.g. *Calamus castaneus*, *C. insignis* Griff., and *Johannesteijsmannia altifrons* (Reichb. f. et Zoll.) H. E. Moore).

Daemonorops calicarpa produces sympodially suckering axes which are scarcely more than 30 cm. tall and bear large leaves often 3–5 m. tall with rusty brown sheaths having conspicuous oblique combs of pale brown spines. The pinnae are regular, fine, and densely crowded, and sometimes the leaf ends in a short vestigial cirrus. A clump will contain six or more axes of varying age. An axis of *D. calicarpa* in flower has a marvellous appearance; a large knobkerry of flowers is found almost at ground level among the leaf bases. The flowering axis consists of very crowded internodes with short leaves ending in vestigal cirri and undulate, partially developed leaflets. These leaves become smaller and smaller distally. In the axis of them are the inflorescences which likewise decrease in size distally until the most distal ones are minute and contain no flowers. In all, about 25 inflorescences are produced from one axis, not apparently reaching anthesis



1. *Daemonorops calicarpa.* Flowering shoot showing the crowded mass of reduced leaves with short cirri and undulate leaflets and the mass of inflorescences. Note on the right a young sucker developing from the base of the terminated axis. (*J. Dransfield 1831.* Ulu Besitang, Langkat, N. Sumatra, August 1971.)

at the same time, but still produced over a very short period. In the staminate plant, these inflorescences open in an acropetal sequence and finally die and rot on the plant; suckering from the base of the flowered axis perpetuates the life of the plant. In the pistillate plant the inflorescence sequence is similar, but if pollination and fertilization take place, the inflorescences are much longer lived and produce a great bunch of infructescences. In either sex the individual clump will contain many old rotted inflorescences at the stem apices showing that growth does not continue after flowering and confirming the hapaxanthic behaviour of the palm.

Daemonorops tabacina Becc. in the same section (*Cymbospatha*) of the genus as *D. calicarpa* has possibly a similar method of flowering. One population from West Sumatra (represented in the Bogor Herbarium by *Dransfield 4161*) is probably referable to this species. It consisted of conspicuous rosettes with suckers very similar in armature to those of *Daemonorops calicarpa* but also producing an aerial axis about 4 m. in length, weakly climbing, terminating in reduced leaves and inflorescences decreasing in size distally. Though only one fresh specimen in flower was found, the abundance of dead stems in each clump seemed to suggest that flowering was as in *D. calicarpa*.

Cirri and flagella, the climbing organs of Asiatic rattans, are associated in rattans with the climbing phase. Most rattans pass through a rosette stage during their development from seeds and this rosette stage is usually without climbing organs; cirri develop gradually at the ends of successive leaves as an aerial stem is produced. Similarly, flagella appear from the leaf sheaths of certain *Calamus* species usually only when an aerial stem has been built up. The presence of cirri in the acaulescent *Daemonorops calicarpa* may suggest that this species is either an intermediate in the evolution of the climbing habit from the acaulescent or else that it represents a reduction from the rattan habit. It is, however, much more reasonable to suggest that the cirri in the flowering system of *Daemonorops calicarpa* represent a vestigial state as they can have no adaptive significance for climbing. This very much suggests that the acaulescent habit in *Daemonorops calicarpa* is derived rather than primitive and also suggests by association that hapaxanthy in *Daemonorops* is derived. This is further suggested by the fact that the cymbospathe inflorescence of *D. calicarpa* represents a highly differentiated inflorescence when compared with the simple inflorescences of *D. longispatha* Becc. and its relatives where there is a gradual succession of bracts and branches of decreasing size.

This, however, is not to suggest that the acaulescent habit in rattan genera is always derived. In *Calamus*, the "acaulescent" *Calamus castaneus* with stocky short trunk, no sign of climbing organs, and very simple inflorescences with a gradual and decreasing succession of bracts could be regarded as basal in the genus *Calamus* whereas the acaulescent *Calamus lobbianus* Becc. with short vestigial flagella and highly condensed divaricating inflorescences may be regarded as derived from a climbing ancestor.

If indeed hapaxanthy in *Daemonorops calicarpa* is derived, it is possible that it may be an adaptation of some ecological significance, but what that may be is not known.

However convincing the arguments of Holttum, Corner, and Hallé and Oldeman may be for the primitive status of hapaxanthy, here is one example where

it is much more likely to represent a derivation from pleonanthy.

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NEWS OF THE SOCIETY

As of this writing there are 1,015 members in The Palm Society. It has taken just 20½ years to achieve this goal, one that our founder, Dent Smith, said he felt would put the society on a sound financial basis. Our finances are sound and our members are enthusiastic, what more can we ask? So, congratulations to one and all, and many thanks to those of you who have worked so hard to help us grow—your efforts have paid off.

* * *

The mighty state of Texas is bestirring itself and soon we will have one or several chapters of the society there too. Mrs. Virginia Masse called together a few members in Dallas—Gordon Hintz, Rosie Graham, Fred Meyer, and Lenny Goldstein—to spend a couple of hours getting acquainted and swapping information. Lenny continues: "A couple of things are fairly certain even for a small group, our interests are wide-ranging. Some of us have concentrated on the more exotic species, while others, notably Mr. Hintz, have devoted their efforts to cultivation of hardy species. In this context, we should all be able to contribute and learn a lot. Secondly, it appears that Palm Society members in Texas are more likely to organize on a regional, rather than a statewide, basis. Distances—240 miles between Dallas and Houston, and over 500 miles between Dallas and the Valley—and climatic differences account for this observation. One statewide meeting a year is possible. I believe from talking to Jimmy Cain (in Houston) that this is also the sentiment of the Houston group. At any rate, the Dallas group is enthusiastic and we decided to meet again October 25 at Mr. Hintz's home. (As you know, he has had good success sowing seed directly into the ground in order to get them accustomed quickly to the cold spells and alkaline soils of Dallas.)"

The second meeting of the North Texas Chapter of The Palm Society was held in October at the home of Mr. Gordon Hintz. Members were able to view the 26 species of palms being grown out of doors in Dallas by Mr. Hintz. A viewing of slides provided by The Palm Society was held. Plans were made to exhibit palms at the North Dallas Garden Forum Show in November, the display to consist of potted palms and a photographic display of large outdoor palms growing in Dallas.

It is sincerely hoped that the exhibit will draw in new members for the society.

Good luck to the Texans, we'll be eager to hear your news.

* * *

The Florida members had the great good fortune to have a visit from member Watana Sumawong of Bangkok, Thailand. A meeting was held for the Central Florida members, on September 7, at the magnificently palm-landscaped home of our President Young. Almost 90 members and their families attended the morning plant sale. Over $800 was raised; most of the plants had been donated by our host and many of them were very rare. Members had been asked to bring a picnic lunch and a chair so a pleasant interlude was spent among the palms. Afterwards Mr. Sumawong showed some wonderful slides of plants, not only palms, in his collection. It was difficult to see the colored slides in the daylight, but enough was seen to bring exclamations of astonishment from those who were unfamiliar with the large assortment of curcumas, globbas and other exotics grown by this avid plant collector. Thursday evening, September 11, the Palm Beach members had a chance to see the slides at the Mounts Agricultural Center Building, and Saturday, the 13th, those in the Miami area met at Fairchild Tropical Garden, also in the evening. All were enthusiastic about the fascinating plants shown. In honor of our guest, the Garden had exhibited an almost 4-foot tall plant of the Thailand *Rhapis*, the species of which our speaker has collected so many thousands of seeds. He has really introduced this delightful plant into cultivation. It should prove to be a favorite as it seems to adapt well to pot culture and is most decorative in its various forms, some wide and short-leafed, others with narrow segments and larger leaves. This is the plant discussed in PRINCIPES, Volume 17 no. 1 by another of our members, Mr. David Barry. Mention must be made here of the time and effort expended by De Hull acting as guide to Commander Sumawong in his travels about Florida.

From Randy Fuller in Naples, Florida comes an interesting report. "Regarding the four *Lodoicea* seeds June Misner brought back in the summer of 1971 (from the Seychelles): all four germinated, to the extent that they put down radicles in 20-gallon plastic garbage cans filled with coarse sand. (These were put indoors at room temperature during the winter of 1971–72.) Three never developed an aboveground leaf. One did. Incidentally, first comes up a *hard*, pointed appendage about 6″ high. This, I guess, is a device to make way for the first leaf. Then, after 19 months, appeared the first leaf. At this point I dragged (and I mean dragged) the 20 gallons of damp sand to the planting hole, carefully slit the plastic sides (the can was full of roots) and lowered it in. This was May, 1973. In May, 1974, the first leaf quit enlarging at 3′, and the second leaf emerged. This quit enlarging at 7′, and now the third leaf is about 12′ high, and I hope will become 9′–10′ high. We are not going to test the cold-hardiness of this palm, ever. If we get one of our rare (in the beach area of Naples) cold spells, on goes the heat. We'll send a picture for PRINCIPES when the third leaf is full-grown." We regret to bring you the sad news that June Bremerman Misner passed away on October 2, 1975 after open-heart surgery. She will be remembered as a devoted member and palm lover.

District VI of the Florida Federation of Garden Clubs and the Brevard County Cooperative Extension Service co-sponsored a horticulture seminar at Florida Institute of Technology in Melbourne on October 2, 1975.

Dr. Jerome P. Keuper, President of F.I.T. and past president of The Palm Society, headlined the program which included his talk and slide presentation on palms and their preservation. Garden clubs from Volusia, Flagler and Brevard Counties were in attendance.

Following the seminar in the F.I.T. Auditorium, the group was escorted on a tour of the tropical gardens located on the university campus in which there are some 2,000 palms representing 200 species.

* * *

"The September 13, 1975 Southern California Chapter meeting was held in Balboa Park. We discussed the success of The Palm Society's exhibit at the 1975 Exotic Plant and Fern Show at the Pomona Fairgrounds. We gained eight new members as well as an increase of $100 from a sale of palm seedlings. Next year we expect to do much better.

"Ed Moore, one of the early members of The Palm Society, was a most informative host as he escorted us around the grounds and pointed out future sites for palmetum developments.

"The garden tours of Jim Wright's and Ed Moore's were really great. Both members have truly fine collections, especially when you consider the fact that neither has a greenhouse. Most outstanding in the Wright garden were his *Rhopalostylis sapida* and *Neodypsis decaryi*. The latter carries many leaves. This palm, planted further north does not seem to do quite as well. It would seem that in California the San Diego climate would be indeed hard to beat.

"Particularly outstanding in the Moore Garden, which we visited on October 1, 1975, is the large clump of *Chrysalidocarpus lutescens*, some 25 years old. Also outstanding are the double-headed *Livistona chinensis*, *Pritchardia beccariana*, and *Parajubea cocoides* as well as a large array of great-looking howeias, chamaedoreas and erytheas. Ed has donated countless palms to Balboa Park. He has been a long and steady supporter of palms and we in California owe him much.

"We have just finished our exhibit at the Los Angeles County Fair. A sign was on display and I have received a number of calls and letters requesting information and applications. Future plans call for exhibits in the Orange County Fair and possibly in San Diego County Fair. That one depends on whether we can get enough members to help inasmuch as it lines up with our 1976 Biennial Palm Society Convention in June/July.

"Starting with the next newsletter, we will be offering an opportunity to place an advertisement to either buy, trade, or sell palms, cycads or rare plants. The size of the space will be 1½ × 3½" and the cost is $2.50 per issue. The income from the ads will be used to help defray the costs of printing and mailing the newsletter. If interested, please contact Ralph Velez, 15461 Devonshire Circle, Westminster, CA 92683."

On November 2, 1975 55 members of the Southern California Chapter met at the home of Mr. and Mrs. John Magnuson, on what turned out to be a beautiful day on the desert to which some had to drive five hours. It was amazing to see all the different palms growing in containers on the patio since it gets to 110° F in the summertime. Of course, there is protection from the sun in the lath house and the plants are watered daily. Member K. C. Moore auctioned off the plants brought by members and netted $265, a goodly sum. The potluck luncheon brought by members and the wide variety of palms to be seen—*Wallichia caryotoides*, *Brahea bella*, *Jubaea*, *Ptychosperma*, *Chrysalidocarpus*, *Howea*, *Roystonea*, *Chamaedorea*,

Phoenix, Livistona, Serenoa, Pritchardia, Erythea plus 26 species of cycads all helped make the day a memorable one.

Congratulations to the Southern California members, they really are doing things and have gotten many members for the society.

The Northern California Chapter held its annual garden meeting in September in Warren Dolby's garden in Oakland. It was a beautiful day and almost fifty 'palm people' showed up, our most successful meeting to date. Some came from as far away as Auburn and Santa Cruz. They spent the afternoon wandering in the garden, chatting with friends about palms and bidding for the beautiful array of rare plants that were presented for auction.

* * *

From member John Avery in Salisbury, Rhodesia, comes the following notice: "Would you kindly have this property registered on your roster as JABULA PALM GARDEN? I have been very busy lately planting out hundreds of palms. Having put so much effort into this place, I would like to see it sold to an enthusiast one day. . . Meanwhile, if you have an expert coming out here in palm identification, I would like my sabals sorted out. In return, I'll fly him to see our palm communities in remote areas." Isn't there some member able to take up this offer?

* * *

Member Robert Tucker in North Queensland, Australia writes such interesting letters, I wish all could read them. Some excerpts from his latest are quoted below.

I hold *Pinanga kuhlii* in the highest esteem, it is a spectacular plant, much admired by visitors. One specimen in the Cairns Botanical Gardens is magnificent, has a half dozen trunks, the tallest about 6 feet now and 3 inches wide. The leaves are about 7 feet long, gracefully oriented, the crownshafts a pale golden color. I have two different forms, one has the pale golden crownshaft and faint variegation, another has green crownshafts but more intense variegation and the new leaves are more of a light brown than pink. I think pinangas are far more beautiful than chamaedoreas and they seem to be slightly faster growing and hardier, if not more robust.

I have just returned from a weekend with friends at Cape Tribulation. We collected a quantity of *Licuala muelleri* and *Normanbya* seed. The fruits were so abundant and so large, it has been an exceptional year for these palms; generally *Normanbya* has a few seed but *Licuala* is very elusive, in fact in three years searching I have never seen anything like the fruits we have just seen. I have not heard of *L. muelleri* being cultivated in the USA and hope it is known over there. It grows quite tall and has a passion for shade and wind shelter. It requires a moist to wet soil all year around, copious humus and can withstand minor cold. Friends have it growing out of doors in places like Sydney which would be similar but wetter than southern California and also in Brisbane which would be similar to most of southern Florida. In both cases the plants are doing nicely although they slow down in Sydney. It grows to 60 feet so needs much vertical room, has a crown spread of up to 20 feet.

Are growers over there still having trouble with *Normanbya*? I fail to see why it should be difficult to raise—Brisbane people have no trouble. I have not found heat to be of any aid in germination and sun stunts the seedlings although the plants should get at least half sun when growing in the ground. In the wild areas where they grow they

attain their greatest dimensions in heavy clay where copious moisture is available and where more sun than usual penetrates the canopy. Their beautiful fruits are unpleasant to clean, the fibres around the seed are very loose and have sharp ends and pierce one's skin with ease. . . . Anyway I hope the seeds (sent to the Seed Bank) provide some growers with some nice palms; who knows, *Licuala muelleri* and *Normanbya normanbyi* might exist in gardens only in a few year's time. The area there is very exciting . . . it is a wonderful place, unfortunately doomed to be cleared, ploughed and burnt. . . . It says that Fauna and Flora are protected, but . . . if the present trend continues they will have to change the signs to "Sanctuary, Land Speculators, Real Estate Agents and Cane Farmers are Protected."

TEDDIE BUHLER

Miss Margueriete Martin

Word has been received of the death of Miss Margueriete Martin on November 16, 1975, in Daytona Beach, Florida. Miss Martin served as the first treasurer of The Palm Society and she will be remembered by members whose acquaintance with the society dates back to its early days.

Notice

Back issues of PRINCIPES, starting with Vol. 3 no. 3 through current issue, Vol. 20, no. 1, are available at a cost of $1.50 each, which includes postage and handling. The 11 earlier issues (Vol. 1 has five issues) are being reprinted and will cost $2.50 each issue, or a total of $27.50 for the set. These issues should be ready shortly after appearance of this issue. All can be ordered through office of The Palm Society, 1320 S. Venetian Way, Miami, FL 33139, U.S.A. Also available are two reprints about hardy palms for 75¢ together, including postage and handling. Those interested in books about palms or other horticultural subjects, can contact Fairchild Tropical Garden, 10901 Old Cutler Road, Miami, FL 33156, U.S.A., or Edwin A. Menninger, D.Sc., Horticultural Books, Inc., 219 Martin Avenue, Stuart, Florida 33494, U.S.A. Note: purchasers of all 11 reprints at one time may deduct 10% from the cost, paying $24.75 instead of $27.50.

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I certify that the above statements made by me are correct and complete. Signed, Mrs. Theodore C. Buhler, Executive Secretary.