PRINCIPES

Journal of The Palm Society

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THE PALM SOCIETY

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

EDITOR: Harold E. Moore, Jr.

EDITORIAL BOARD:

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

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Contents for January

Cover Picture

Part of the palm collection, Bogor Botanic Garden, Indonesia. Photograph by W. H. Hodge.

Mailed at Miami, Florida, Jan. 10, 1962

NEWS OF THE SOCIETY

Biennial Meeting

The third Biennial Meeting of The Palm Society will take place at Fairchild Tropical Garden, Miami, Florida, on April 14, 1962. It is hoped that there will be a large attendance, since these, our official conventions, are held only every second year. The officers and directors are planning a program which they hope will be of interest to all the membership. Further details will be found in the literature enclosed in this issue of PRINCIPES.

The President has appointed Dr. Duncan Clement as chairman of the nominating committee, Mrs. L. H. Wait as chairman of planning the meeting, and Mr. Dent Smith as chairman of special events. All other members are invited to attend and take part in the meeting, and are urged to show their interest by offering their help and suggestions.

The chairman of the nominating committee will entertain nominations by mail until February 15th. These may be sent to the Executive Secretary, to be forwarded to him. Nominations from the floor at the business meeting on April 14th also will be accepted.

Californians Meet at Huntington Gardens

On November 12th the California group met at the Huntington Botanical Gardens, San Marino, where Mr. William Hertrich, grand old man of California palms, was their host. More than forty persons were guided on a tour of the palm collection. Mr. Hertrich pointed out two palms of particular interest because he believes they are the only known specimens in Southern California: *Sabal causiarum* and *Sabal viatoris*. A specimen of *Sabal neglecta* [S. *umbraculifera*] attracted considerable attention, as its leaves are larger than those of other fan palms growing there.

Palm enthusiasts often are interested in cycads also. Notable in the cycad collection were: a matched pair of *Encephalartos latifrons*, and two magnificent pairs of *E. Altensteinii*.

Following the tour, members enjoyed coffee and home-made cookies, as well as some good palm conversation. Mr. Otto Martens was responsible for organizing this enjoyable afternoon.

David Barry, Jr., Visits Florida

The Society's Vice-President, (who also is President of The Bromeliad Society), David Barry, Jr., recently spent a week in Florida, visiting Palm and Bromeliad Society members and touring nurseries. He was a guest of Mr. and Mrs. Mulford B. Foster at Orlando, Mr. and Mrs. Dent Smith at Daytona Beach, Mr. and Mrs. James C. McCurrach at Palm Beach, and of the Fairchild Tropical Garden at Miami.

On Tuesday evening, November 21st, he spoke before a combined group of both societies in the Greater Miami area, telling incidents from his travels in many parts of the world and illustrating them with color slides. About sixty persons listened avidly to his descriptions of places and plants he has seen.

Beginning December 1st, Mr. and Mrs. Barry will spend four months visiting islands of the Pacific region, beginning with New Caledonia, where he expects to collect specimens and perhaps seeds of palms native to the island which are not as yet in cultivation.

Dr. Hodge Moves

A former president of The Palm Society, Dr. Walter H. Hodge, has left his former position as head of the educational department of Longwood Gardens, Kennett Square, Pa., to accept a post as

consultant in tropical biology with the Division of Biology and Medicine of the National Science Foundation, in Washington, D. C.

The primary purpose of this move is to permit him to better utilize his scientific background in the field of tropical botany and biology.

His new home address is: 5413 Center St., Chevy Chase 15, Maryland, U.S.A.

We extend our best wishes to Dr. Hodge in his new work.

The Treasurer Thanks You

Since announcement was made of the change in our fiscal policy by setting a definite dues date and a schedule of annual dues, about one third of the Society's members have expressed their approval by sending additional contributions, over and above their earlier payments. These amounts, added to the very generous gift of $1000.00 from the Johnson's Wax Fund, have enabled the Society to continue in a solvent condition during the period of change, and will carry it through until the next dues date, May 1, 1962. The Treasurer, Mr. Walter J. Murray, wishes to express his gratitude to those who so generously have helped out during this difficult time.

Palms Withstand Hurricane's Force

Reports from the Texas area so badly damaged by hurricane Carla state that most of the palms continued to stand throughout the high-velocity winds. Mr. E. R. Cantwell writes from Corpus Christi:

"Our local damage was not severe. We all came through in fair shape. Palms, as usual, stood the buffeting better than other trees. Very little palm damage considering the intensity of the winds. I don't think a single healthy palm was damaged mortally. Some old diseased palms broke off, of course. Winds in Port O'Connor got up to 175 miles per hour, but palms were left standing."

Also from Corpus Christi, Mr. Ben F. Vaughn reports:

"Very few palm trees were blown over, although other types of vegetation suffered. I have a house at Port Aransas on Mustang Island, and it was considerably damaged. However, the palm trees around it are still standing. I also have the Palm Grove Plantation at Brownsville where I have a native grove consisting of about forty acres of native sabal palms. We had some high winds there but suffered no real damage."

LUCITA H. WAIT

PALM LITERATURE

Tomlinson, P. B. *Anatomy of the Monocotyledons II. Palmae.* pp. xiii, 345, with 18 text and 45 end figures, plates I-IX. Oxford University Press, London. 1961. $10.10.

The internal structure of palm roots, stems, and leaves is the principal subject of this technical book, second in a series devoted to anatomy of the monocots, volume I having dealt with the grasses. Dr. Tomlinson has made a major contribution to his own and allied fields in botany by drawing together information from previous studies and adding a very considerable amount of new information of his own in a form which is most useful.

The first 73 pages and 18 text figures are devoted to a general account of the morphology and anatomy of the vegetative parts of palms together with a summary of schemes of classification and exposition of materials and methods used. Readers of PRINCIPES will already be familiar with some of this text from the series of more popular articles appearing in the journal.

Remaining pages give detailed anatomical accounts of leaf, stem, and root for 128 genera arranged, except for a few genera of uncertain position, in major groups largely corresponding with recognized subfamilies or homogeneous tribes. The bactroid palms are separated from the main body of Cocoideae as are the chamaedoroid and iriartoid palms and *Ceroxylon*, *Leopoldinia*, *Orania*, *Pelagodoxa*, *Pseudophoenix* and *Sclerosperma* from the arecoid palms. Here anatomy points to several already recognized problems in disposition of genera within the present Arecoideae and suggests a critical evaluation of the relationship between the bactroid palms and the Cocoideae.

An appendix (pp. 325-338) listing the distribution of the more important diagnostic characters in palm genera and a key to major groups based chiefly on leaf anatomy (pp. 71-73) should be especially useful in the identification or verification of sterile material to group or genus. Figures and plates are bound together at the back rather than with the various chapters.

If criticism can be levelled, it is that, of necessity, only about one-tenth the species and fewer than half the genera have been examined and that anatomy of the inflorescence, flower, and fruit has been omitted. The author, however, clearly states that " . . . it has . . . been my object to indicate some of the major deficiencies in our knowledge of the construction of palms rather than to produce an encyclopedia of assured facts." Further, that if the volume "will provide the stimulus for more intensive and accurate studies, then its production will have been worthwhile." It is already an invaluable reference book for students of palms. It is to be hoped that it will indeed stimulate further studies in anatomy as it surely will in the systematics of palms.

* * *

Dahlgren, B. E. & S. F. Glassman. A Revision of the Genus Copernicia. 1, South American Species. *Gentes Herbarum* 9: 1-40. 1961.

The first part of a long-awaited study of *Copernicia* has appeared and manuscript for a concluding part is complete. The portion published deals with the South American species *C. alba* (*C. australis*, *C. rubra*), *C. cerifera*, and *C. tectorum* (*C. sanctae-martae*). The authors conclude that only one species, for which the correct name is *C. alba*, is present in Argentina, Bolivia and Paraguay.

H. E. Moore, Jr.

Some Palms Of Northwestern Mexico

Robert O. Schnabel
Palm Springs, California

Around the California and Arizona deserts many a story tells of interesting but unlikely happenings to the wandering prospectors who have been addled by the searing summer temperatures. One such scorched prospector, rounding a turn in a steep narrow canyon, beheld to his astonishment a cool oasis with sparkling running water and hundreds of sheltering palms. This in itself is not surprising to one acquainted with the distribution of *Washingtonia filifera;* but, this prospector's disbelief stemmed from his unlikely encounter with hundreds of palms that were not green, — they were snowy white! Not only were the palms white, but all the other vegetation shimmered in unwordly whiteness.

No one knows who that prospector was or where his white canyon exists, but the story persists. Is it fact or fantasy?

Shreve's "Vegetation of the Sonoran Desert" (1951) gives references to wild palms growing in the Mexican state of Sonora, just south of Arizona, and known there as *palma blanca*, or "white palm." Immediately it might be concluded that here is the basis for fact in the old prospector's story.

Palma blanca is listed in Dr. Bailey's *Gentes Herbarum* article on *Sabal* (1944) as *Sabal uresana*, the Sonoran palmetto. Its type localities are near Hermosillo and Ures and at San Carlos Bay, San Pedro Bay, and Nacapule Canyon, all northwest of Guaymas. Shreve lists them as occurring in the watered river valleys and at altitudes up to 4000 ft. on the pine and oak clad hills of Sonora to the east of Alamos and Ciudad Obregon.

In December 1960 an attempt was made by the writer to visit the region to the east of Alamos, but this attempt was frustrated because of the primitive roads. San Carlos Bay about fifteen miles northwest of Guaymas was easily accessible and three groves of palms were found in this area. On approaching San Carlos Bay the first group of perhaps a dozen mature *Sabal uresana* is found on flat land within a few yards of the road and about fifty yards from San Francisco Beach on the Gulf of California. At San Carlos Bay there is a secluded rocky and brushy side canyon containing half a dozen palms, most of which are sabals.

The narrow flat canyon floor behind San Carlos Bay is watered by an intermittent stream and contains hundreds of *Sabal uresana* in all stages of development. This large grove fits the popular idea of a desert oasis as the surrounding area contains barren ragged mountains which are in turn flanked by sandy plains supporting only saguaro, pitahaya, and other kinds of cactus and xerophytic desert growth. The region has two seasons: winter which is warm and frostless and summer which is long and extremely hot.

Sabal uresana, as it appears at San Carlos Bay, reaches a height of about twenty feet. The tall mature specimens have a clean trunk with a diameter not greater than that of *Washingtonia robusta*. Smaller trees maintain their leaf bases giving a massive effect to the trunk. The cross-hatch design of the petioles is pronounced. As in all sabals the costapalmate form is present and this curving tendency in the fan of *S. uresana* is very marked. In December the trees drop fresh dark brown seeds. The large leathery textured leaves are colored dark green, not white, but there is a definite blue-white cast to both sides of the leaves that lends a strong suggestion of white. When the wind rustles the leaves into action this blue-white is strikingly apparent.

Gentry (1942) has recorded *S. uresana's* Indian name as *tachu'* and describes the tree as follows: "Tachu' is a frequent and picturesque palm throughout the foothill country, at times with a very small crown of leaves spread on a tall (15 m.) slender column. Old plants are usually well spaced and scattered; the young often grow in thick colonies, especially along streams. The Guajary region is said to have nurtured a great population of these plants in earlier years. The natives attribute the present comparative paucity to a diminution of rainfall during the past twenty years (1920-1940).

1. *Sabal uresana*, San Carlos Bay, Sonora, from Kodachrome by R. Schnabel.

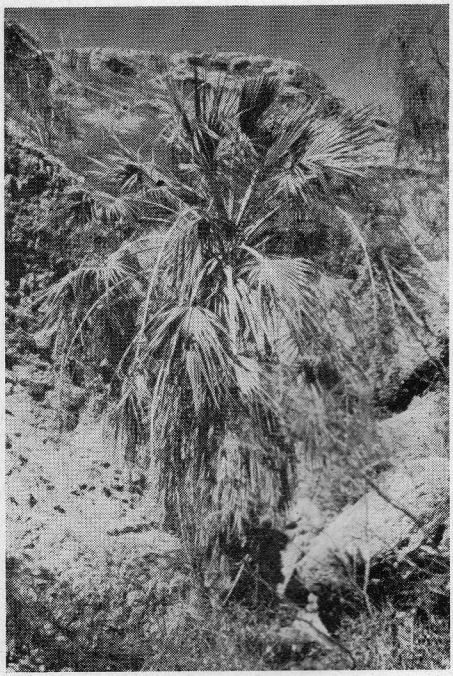
"Both Mexicans and Indians use the leaves in thatching roofs. The Warihios collect the terminal leaf buds and strip out the tender young leaves for basket-making. The soft, white vascular tissue of the heart is eaten raw or roasted in coal. The species is losing ground rapidly owing to onslaughts of human kind and rigors of drought cycle. A species of beetle is a persistent pest, destroying the seeds."

On the high ridges surrounding this San Carlos oasis are several specimens of *Erythea clara*. These were clinging to cracks in the rocky surfaces one tree separated from another by fifty yards to one-half mile. Two *E. clara* were growing with *Sabal uresana* in the side canyon mentioned above and standing on the edge of a *tanque*—a pothole, or hollowed out small rock basin filled with stagnant water.

Three specimens of *E. clara* were growing together on a ridge perhaps five hundred feet above San Carlos Bay in a crack about six feet long and one foot wide. Even the cactus were stunted on these inhospitable ridges, but *E. clara* seemed to be thriving as all the trees were loaded with hundreds of pounds of juicy unripe fruit. These *E. clara* varied from six to twelve feet in height, the trunks all self-cleaning about a foot and a half in diameter. The fans are a brilliant light green with a slight glaucous blue on the under side. The fruit hangs from great arching stems almost to the ground.

In his first *Gentes Herbarum* article on *Erythea and Brahea*, Bailey (1937) describes *E. Roezlii* (corrected to *E. clara* in 1943) and its differences from *E. armata*. The most obvious difference is in color, as *E. armata* is ashen grey on both surfaces while *E. clara* is unmistakably green. There appears to be no popular name for *E. clara*, but in Guaymas where one garden specimen reaches thirty feet, it is called *palma verde*, "green palm." So in the same locality we have a "green palm" and a "white palm" and since both are basically green, the local name is probably the popular means of distinguishing one from the other rather than a description of true basic color. If this supposition is true, the old prospector's white canyon does not exist in Sonora!

Deep among the sabals at San Carlos were found, however, three small white palms! These three palms were about five feet tall bearing a sparse crown of small armed silver-white fans twelve to eighteen inches across. The trunks were stout, about one foot in diameter and they retained to the ground level the shag of the old leaves. There were no seeds, fruit, or seedlings of this palm, nor were there old seed stems present. Bailey lists *E. armata* as native to both Sonora and Baja California and while these may have been small *E. armata* they probably were *Erythea elegans*, a small palm (Francheschi palm) Bailey lists as reputedly native to Sonora but whose type locality is unknown. *E. armata*, across the Gulf in Baja California and growing under circumstances similar to those at San Carlos Bay, was observed in late 1959 and found loaded with fruit, and as a much larger tree than supposed *E. elegans*. The small trees of *E. armata* have a definite darker blue color while the *E. elegans* of equivalent size are silver white, and the fans of the Sonoran palm are much smaller than those of the Baja California palm. It would be most interesting for someone with the correct botanical background to positively identify these small erytheas at San Carlos as either *E. elegans* or *E. armata*.



2. *Erythea clara* at San Carlos Bay from Kodachrome by R. Schnabel.

To one unfamiliar with palms, *Erythea armata* could pass easily for a "white" *Washingtonia filifera*. In the canyons of Baja California *E. armata* does not attain the stature of *W. filifera*, and its glaucous coloring is more blue than white. However, in Indio, California, there are two splendid specimens of *E. armata*, much larger than their wild brothers, growing under ideal conditions on the edge of a well cared for commercial acreage of *Phoenix dactylifera*. Under such ideal conditions the fans of *E. armata* have become almost pure white.

Since there are desert shrubs that show this same white-grey-blue quality (*Encelia*, desert holly) it is quite possible that somewhere in Baja California there is a well-watered ideally located canyon filled with *E. armata* and other "white" shrubs. When this canyon is located, the old prospector's white palm canyon will be known.

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The Botanic Garden at Bogor

A. DILMY

Director, Herbarium Bogoriense, Kebun Raya Indonesia

The Bogor Botanic Garden (*Kebun Raya Indonesia*—"Great Garden of Indonesia") is located at Bogor, formerly Buitenzorg, West Java, forty miles from Djakarta, the Indonesian capital. It was founded in 1817 as a scientific institution. Almost a century and a half have since elapsed and during this time the institution has grown into an organization of international importance. An illustrated article on the Garden in its present form appeared in *The National Horticultural Magazine* in July 1958.

The Bogor Garden, now covering two hundred and fifty acres, is predominantly an arboretum, although herbaceous plants also are cultivated on a large scale. [The arboretum is also devoted to native Indonesian plants.] Palms have received a great deal of attention; in fact, the palms are one group of plants in which the Bogor Garden takes particular pride.

Beautiful avenues and well arranged groups of palms mark the entrance of the garden. The ornamental qualities of these plants were the leading principle for the lay-out of the palm sections. *Roystonea* and various species of *Livistona* are used for rows along the border lines, The American *Orbignya*, *Scheelea*, and *Attalea*, the African *Raphia* and *Lodoicea*, the high Malaysian *Pholidocarpus*, and the very decorative rows of *Phoenix Roebelenii*, are the most conspicuous palms near the entrance of the Garden. The Lodoicea palm is a female plant. According to Mr. Douglas, former Superintendent of the Garden, who had this plant under continuous observation, every year it forms abortive fruits without fertilization; these fall before they become ripe. Attempts to get male plants have not been successful nor has it been possible to obtain pollen for artificial pollination. Along the forest garden the climbing rattan palms form a kind of tropical jungle. A huge group of the spiny Indonesian *nibung* palm, *Oncosperma horridum*, is located near the Director's office. In front of the garden office we find among various American palms a highly attractive group of terminal flowering *Eugeissona* sp. from Borneo. Here, also is a non-stooling species of *Oncosperma* from Northern Sumatra which is still undescribed.

Small groups of palms are planted near the nursery along the famous old Canarium Avenue. *Actinorhytis Calapparia*, a common palm in Sumatran kampongs, and the highly ornamental Sumatran *Cyrtostachys Renda* with red leaf sheaths, are very attractive. Proceeding along the arboreous legumes and the *Pandanus* groups we reach the pond gardens occupying a kind of valley whose slope is planted with a great variety of palms. Some of them are *Corypha*, various *Livistona*, *Phytelephas* from Peru with male and female plants, the latter producing vegetable ivory, and *Orania macrocladus*, a palm which grows wild in West Java near Depok and in the lowlands near Djasinga. *Nypa fruticans*, usually associated with mangroves, grows very well along the pond where it flowers and fruits.

Along the Tjiliwung river is a special part of the Garden devoted to some species of *Metroxylon*, the sago palms, which furnish the staple food for eastern Indonesia. The taxonomy of these palms is still not completely known. Against the slope of the river valley is another section of the Garden totally devoted to palms. *Cocos nucifera*, the most common and most important cultivated palm of Indonesia, grows here in various varieties. Highly ornamental is the slender gregarious *Oncosperma tigillaria*, a palm which in Sumatra and Borneo forms strips of palm forest on sandy banks behind the mangrove. Another pride of Indonesian palms is *Pigafetta filaris* from Celebes. Some species of *Caryota* and *Pinanga* are also very attractive. Near the bridge grows the great symbol of the economic importance of this garden for the welfare of Indonesia —*Elaeis guineensis*. In 1848 it was introduced from Africa into Indonesia and since 1854 it has been the forefather of

3. Part of the palm section of the Bogor Botanic Garden, Photograph by W. Meijer.

4. *Livistona rotundifolia* planted in a row at Bogor. Photograph by W. Meijer.

the highly valuable oil palm plantations of North Sumatra. Nearby along the Tjiliwung river is the famous *Borassus* probably *B. sundaica*, from eastern Indonesia.

One hundred and ninety-five genera of palms comprising at least three hundred and forty-three species are cultivated in the Garden, not counting five unidentified species. Some of the genera are represented by a large number of species: *Arenga* 14, *Bactris* 8, *Calamus* 43, *Caryota* 10, *Daemonorops* 28, *Licuala* 12, *Livistona* 14, *Phoenix* 19, *Pinanga* 10, *Sabal* 6, *Salacca* 7. These figures, taken from the 1957 catalogue of the plant species in cultivation at the Bogor Garden, apply only to the Garden at Bogor and not to the palms cultivated at our other branch botanic gardens in Indonesia.

These other gardens, which all come under the administration of the Bogor Garden, are: the Mountain Garden at Tjibodas in West Java, established in 1867 and located on the slope of Mount Gedeh, 40 miles inland from Bogor, at an elevation of 4,200 feet, contains 200 acres with 3000 acres of forest reserve; Sibolangit, 30 miles west of Medan in

5. Female flowers of *Lodoicea maldivica* producing abortive fruits. Photograph by A. Dilmy.

eastern Sumatra, established in 1914, consists of 60 acres with a forest reserve of 250 acres; Purwodadi in eastern Java with 210 acres, founded in 1941; Setia Mulia Institute for Natural Sciences, established in 1955 at Padang in western Sumatra consists of 150 acres of garden and 7500 acres of forest reserve; and Bedugul in Bali. The aggregate area for the Bogor garden and its several subsidiaries consists of 885 acres of garden and 10,750 acres of forest reserve, a total probably not surpassed by that of any other botanical garden in the tropics.

A country of the size of Indonesia does not have of course, a uniform climate. Bogor is very wet; Tjibodas still wetter; Purwodadi has a protracted dry season; Sibolangit and Padang are situated at low elevations, and Bedugul is in the hills. Consequently we are in a position to cultivate the palms in the habitat that suits them best.

We have no illusion about the correctness of the names by which we designate our plants. We presume that part of the nomenclature we use is obsolete.

Many of our palms are old. In one respect this is an advantage. For in identifying plants it is often difficult to define a species, and this is especially

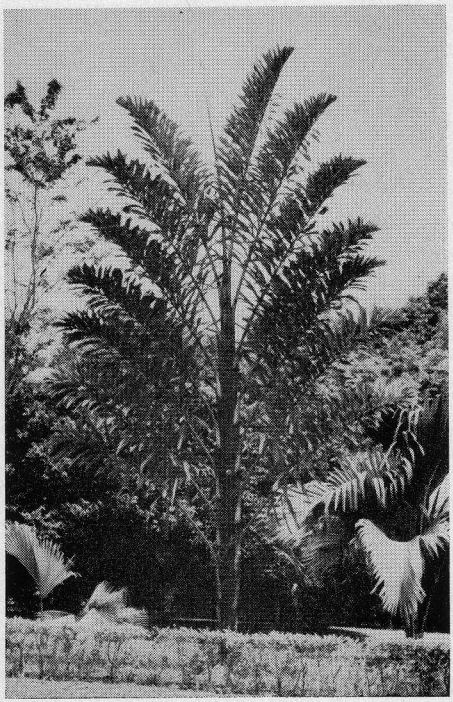
troublesome in palms because several of them do not flower until they have reached a great age, and the fruits are needed for determining the species.

Seed can be distributed to foreign botanic gardens when available, which is not often.

The palm collection of the garden though rich in species may still be further enriched. Many species of Malaysian *Licuala, Pinanga,* various species of *Arenga,* the curious giant-leaved but short-stemmed *Johannesteijsmannia altifrons,* are still lacking in the garden. The palm flora of Indonesia is very fascinating and the living collection of the Botanic Gardens will prove to be valuable for a future monographic treatment of these tropical trophies of the Plant Kingdom. Palms should be studied in the field and in the garden. The great classical example of a study of this type

6. *Wallichia densiflora* in flower at Bogor. Photograph by J. Douglas.

7. *Wallichia densiflora (W. oblongifolia)* growing at the Bogor Botanic Garden. Photograph by W. Meijer.



8. *Wallichia disticha* with its two-ranked leaves at Bogor. Photograph by Sudidjan.

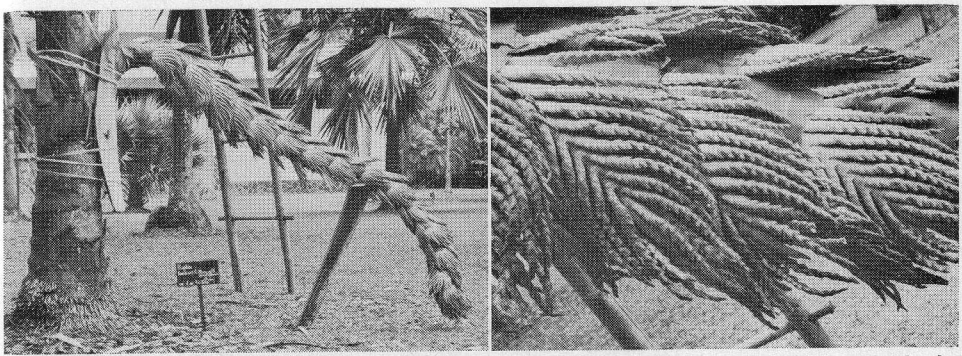
was by the famous Italian botanist, O. Beccari (1843-1920) who stayed three years in the wild forests of Borneo and afterwards made journeys in Sumatra and eastern Indonesia and Australia. Further studies of Malaysian palms were made by Burrett, Furtado, and Pichi-Sermolli. In April, 1957, R. C. Bakhuizen van der Brink, Jr., published a survey of native and many cultivated palms dealing with 78 species of which about 40 are indigenous (Part 16 of C. A. Backer's *Beknopte Flora van Java.* Emergency edition in Dutch, 74 pages). Some investigators have recently studied the flower biology and cytology of palms in the Bogor Botanic Garden. The flowering of *Corypha umbraculifera* and *C. elata* in the garden during 1955-56 brought about extensive study of their taxonomy and cytology.

These and other publications dealing with palms are to be found in the large library (Bibliotheca Bogoriensis), that for several generations has been part of the treasures of the Bogor Garden. This library was started in 1842 and today it comprises 150,000 books and subscribes to 1,400 periodicals. It is said to be the largest library of its kind in southeastern Asia. The Bogor Garden has issued a number of publications, most of them technical, dealing with palms. The first was in 1873 and the latest in 1958. An index to the palms in the Garden's collection was first published in 1899, and was revised in 1901, 1909 and 1914.

Also to be mentioned is the Herbarium Bogoriense, where dried and "in vitro" material of palms and other plants may be consulted. The herbarium was started in 1817 and today a half a million species are represented by dried material and material preserved in alcohol. The Herbarium occupies four large buildings and a few smaller ones.

Also to be mentioned is another section of the *Kebun Raya Indonesia*, namely the *Flora Malesiana*, an ambitious project to compile a flora of the entire vegetation of the area comprising Malaya, Indonesia, the Philippines, and New Guinea. At least 50 botanists of all countries are contributing to this project. Several parts have already appeared, and it is hoped that the day is not far when the monograph of Malaysian palms will be published.

Anyone who feels inclined to come to Bogor to inspect our living plant collection or to use our Herbarium, our Library or our Laboratory, will be cordially welcome and will receive full assistance. The Bogor Botanic Garden, one of the largest and oldest institutions of its kind in the tropics, endeavours to forge ahead whilst per-



9. *Raphia Hookeri* at the Bogor Botanic Garden, inflorescence left, closeup right. Photographs by J. Douglas.

petuating its traditions, but we need the help of experts from all over the world.

Assistance given by Dr. E. J. H. Corner of Cambridge University (England) and by the Staff of the Herbarium Bogoriense and Bibliotheca Bogoriensis is gratefully acknowledged.

Palms of Indonesia

W. MEIJER

Forest Department, Sandakan, North Borneo

No botanist is at present able to deal adequately with the palms of the Indonesian Archipelago — a part of the great Malaysian Islands. Although the palm family amounts only to about one-twentieth of the whole flora, it is represented by about 60 genera and at least 800 species. A discussion of all these palms would be out of the scope of this article. Furthermore, it would take more than a life time to master this subject. Therefore, I will deal only with some of the more common Indonesian palms and my experiences with them. But first let us review briefly previous work done with Indonesian palms.

The German-Dutch botanist, Rumphius (?1628-1702), who lived on the Island Ambon in the Moluccas, was the first to study Indonesian palms. His book *Herbarium Amboinense* was issued with text in both Latin and Dutch in six volumes from 1741 to 1755 long after his death. He was very much impressed by the striking form, habits, structure, and life history of palms. He described them and many other plants of the Moluccas and adjacent areas. His book starts with the coconut palm of the Malayan tropics. Other cultivated palms he described were areca nut palm *(Areca Catechu)*, the sugar palm *(Arenga pinnata)*, the sago palm *(Metroxylon Sagu)*, and the rattans. Rumphius' work appeared before Linnaeus' *Species Plantarum* (1753) which started the binomial system of nomenclature and therefore Rumphius' names have no standing in botany. But many Latin names given by Linnaeus and later authors refer back to plants originally described by Rumphius.

An early work dealing with palms of Indonesia according to the Linnaean system was that of C. L. Blume (1796-1862) in the second volume of his *Rumphia* (1839-1843). Blume studied the native flora of West Java. He described for the first time a number of

genera, such as *Oncosperma, Orania, Cyrtostachys, Iguanura, Ceratolobus, Daemonorops,* and *Korthalsia.* His work was well illustrated. During this same period appeared Von Martius' *Historia Naturalis Palmarum,* the genera and species of palms (1823-1850); the part dealing with Indonesian palms dates from 1849.

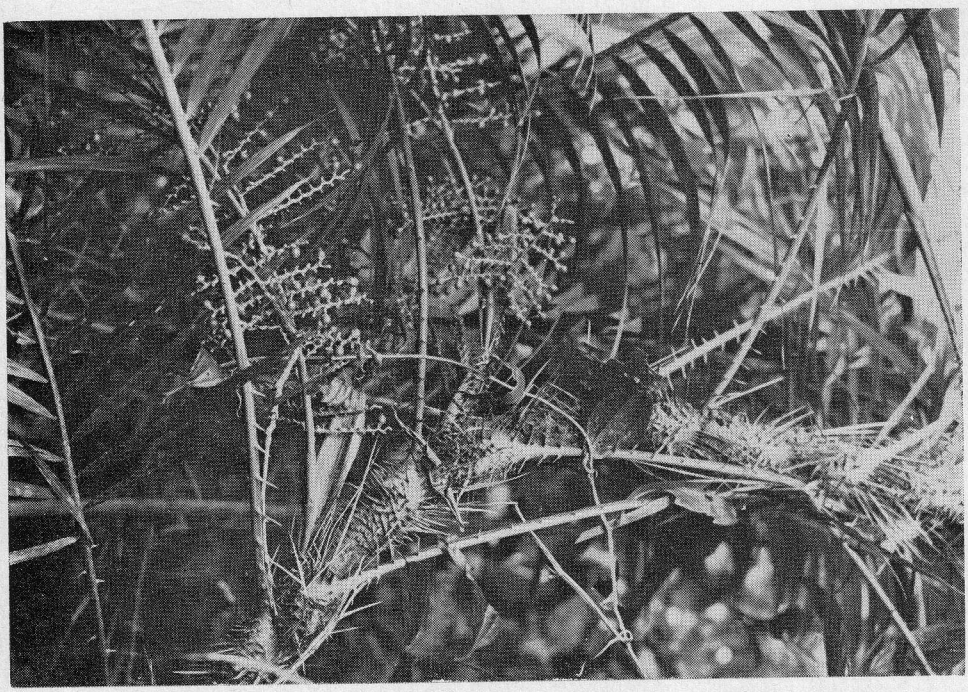
The study of palms of Malaysia was continued at the end of the last and the beginning of the present century by Odoardo Beccari (1843-1920), an Italian botanist who traveled in most parts of the Indonesian archipelago, staying a long time in certain areas, and thus, like Rumphius, collecting first hand knowledge of palms growing in their native habitat. His palm studies appeared in the three volumes of *Malesia* (1877-1890), and in the *Annals of the Botanical Gardens of Calcutta* (Vols. 11-13, 1908-1931). He laid a solid foundation for further monographic studies of Malaysian palms. Beccari was the first botanist who tackled the taxonomy of the genera of climbing palms, the rattans, highly valued for their economic uses but most despised by botanists and other people entering tropical jungles because they are so prickly and have to be handled with gloves or by people with thick skin.

Two leading palm specialists at the present time are Dr. C. X. Furtado at Singapore whose specialty are the palms of Malaya and British Borneo, and Dr. Max Burrett of Berlin, who in 1939 made a journey to Indonesia and who recently published in *Willdenowia* (1953 and 1956) a very valuable key and check list of all the palms of the world. From these studies of the above mentioned botanists and more like those of Miquel and Scheffer, in the last century, we become aware of the richness of the palm flora of Indonesia. As parts of Sumatra, New Guinea, Borneo, and some parts of Celebes and the Moluccas, become further explored for palms, it is possible that about 100 or more new species, especially of rattans and *Pinanga,* may be described.

Before describing the palms of Indonesia, I would like first to mention the different groups of palms and something on their distribution. The large group called *Lepidocaryoideae,* which is characterized by plants possessing scaly fruit and pinnate leaves, comprises about 500 species of rattans in three large genera — *Calamus, Daemonorops,* and *Korthalsia* — and some smaller ones. The center of development of this group is in the western part of Malaysian archipelago (Sumatra, Borneo, and to a lesser extent Celebes). The sago palm, *Metroxylon Sagu,* of eastern Indonesia also belongs to this group. A second large group of palms — the *Coryphoideae*—amounts to over 300 species. Leading in the number of species, especially in Borneo and Sumatra, is *Licuala,* fan-leaved dwarf palms of the undergrowth, especially in lowland forests on poor sandy soils. Also in this group are the giant plants of *Corypha,* palms which die after flowering, and the highly ornamental species of *Livistona.* Less known are the species of *Pholidocarpus* with larger fruit than *Livistona.* They are more or less restricted to marsh forests, while *Livistona* and *Corypha* may grow in dryer more open habitats especially along the coasts. The most interesting genus of this group is *Johannesteijsmannia (Teysmannia),* occurring in Malaya, Sumatra, and Borneo; it is a short stemmed plant but with giant leaves.

The remaining genera are usually included in the *Arecoideae.* The species are many and difficult to discern. *Areca,* with its species *A. Catechu,* is the very common betel nut palm or Indonesian kampongs (village orchards). But the leading genus in this group is the so called *pinang hutan, Pinanga,* represented with about 50 species in Malaya. The species are difficult to tell apart.

10. A fruiting plant of *Nypa fruticans* with old male inflorescences, Bogor Botanic Garden. Photograph by W. Meijer.



11. *Daemonorops* sp. in fruit, West Sumatra. Photograph by W. Meijer.

These palms will perhaps sometime become favorite palms in tropical shade gardens. They grow best at the border and in the undergrowth. They do not like open sun. Other members of this group are the decorative *pinang sinawar*, *Actinorrhytis Calapparia*, taller and more aristocratic looking and with more drooping leaves than *Areca;* it is also common in Malaysian kampongs and is probably native in eastern Indonesia; *Oncosperma*, with magnificent drooping inflorescences and spiny stems—one of the most attractive species is *O. tigillaria*, growing along the sandy coast inland of the muddy mangrove forests; another is *O. horridum*, growing inland in the forest of Sumatra and Borneo. Much rarer is *Orania* known from Malaya peninsula, Sumatra, west Java, and eastern Malaysia. Other genera in this group are *Rhopaloblaste*, *Calyptrocalyx*, and *Heterospathe*. Finally, there are the two subgroups, *Kentieae* and *Ptychospermeae*, which center in east Malaysia with many genera which are totally lacking in the western part.

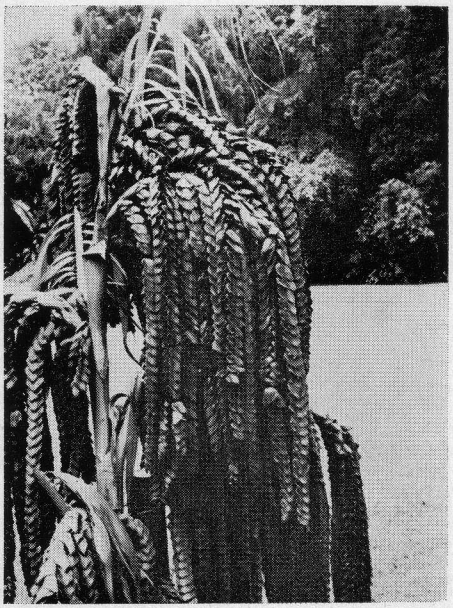
If a palm specialist were dropped somewhere on an island in Indonesia, he would be able to tell you from the palm flora where he is. A rich flora of rattans, of the dwarf fan palm *Licuala*, of *Pinanga*, and some scattered *Oncosperma horridum* and *Eugeissona* along riverbanks and on ridges, of *Pholidocarpus* in marsh forests and *Oncosperma tigillaria* along the coast—would tell him that he might be somewhere in Borneo (Kalimantan). *Pigafetta* and *Calyptrocalyx* combined with still a fairly large amount of rattans would mean the Celebes. A large number of *Kentia* and related genera without the rattan genera *Korthalsia and Daemonorops* would indicate that he is in the jungles of New Guinea (Irian). Some

genera would tell him nothing at all, because they occur in the whole Indian Malaysian region—*Corypha, Borassus, Orania,* and *Nypa.* The latter is a very common coastal palm forming extensive monotonous vegetation on the mudbanks at the estuaries of rivers and along the mangroves.

Hunting Palms in Western Indonesia

Palms play only a secondary role in the physiognomy of the Malaysian forests. Rattans may be the most abundant of the woody lianas, but other palms occur scattered in the forest; often they are found only in the lowest understory. In some areas that are less favorable habitats for trees, certain palms may be abundant: fresh water swamps are rich in *Pholidocarpus,* coastal pioneer vegetation; former mangrove forests or secondary vegetation may be rich in *Livistona;* sandy ridges behind the mangrove may bear a kind of forest composed of *Oncosperma tigillaria;* steep rock cliffs may be favorite sites for *Livistona* and related genera. I have already referred to the extensive *Nypa* swamps along the coasts, especially where rivers form new mudbanks.

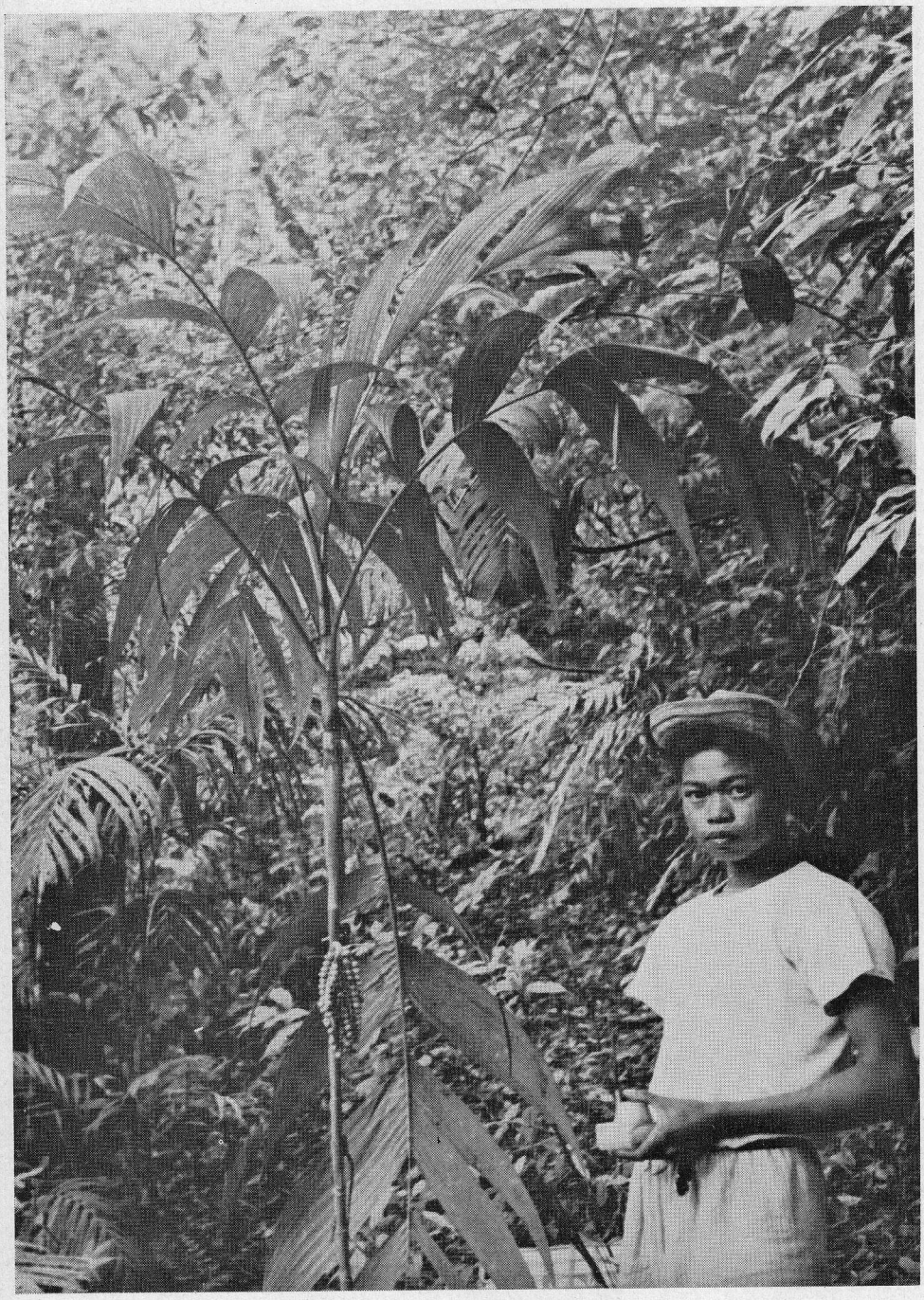
We may obtain a more intimate knowledge of palms if we start to hunt for them in these various localities. On a palm hunting trip in West Sumatra we may start along the coast south of Padang where the road intersects small patches of mangrove and *Nypa* swamps. It is very easy there to study *Nypa fruticans* without walking far on the mudbanks. After some search we may see a flowering *Nypa* with its upright branched inflorescence, long heads of very small male flowers surrounded by bracts and the female flowers in the center. Older inflorescences have withered drooping male branches and young



12. Inflorescence of *Plectocomia elongata,* a climbing rattan cultivated at Bogor. Photograph by J .Douglas.

fruits which grow into large heads, a kind of inflorescence which is unique among palms. The seeds are edible and the inflorescences may be cut off after the sap which contains sugar has been collected in bamboo containers. In small primitive houses along the road we see how the young leaves of *Nypa* are used for manufacture of cigarette paper. Older leaves are gathered and woven into mats which are used for roof thatching called *atap* by Malaysian peoples. If you get rattans from the forests you do not need any nails for binding this together into cheap and good houses.

Along the mangrove our attention is attracted by groups of slender *Oncosperma tigillaria.* The long drooping inflorescences of *nibung* are very decorative. They are spiny palms with strong stems. The inflorescences have double spathes, large enveloping bracts, and the ripe fruits are bluish colored. I saw extensive areas of this palm along the



13. A species of *Pinanga* in forested ravine, Mt. Sago, 3000 feet, West Sumatra. Photograph by by W. Meijer.

14. One of the climbing palms, *Plectocomia* sp. in flower, West Sumatra. Photograph by W. Meijer.

coast of the islands Nunukan and Tarakan (East Borneo). At the latter island I once visited the house of a Dutchman which was completely built of *nibung* piles, floors of split *nibung* stems, and thatch of *Nypa*. Proceeding inland on our Sumatran trip we might visit the ravines and forests on the so called Bukit Barisan range, especially the Anei gorge. Here we see scattered groups of the inland *nibung*, *Oncosperma horridum*. The leaves are less drooping but the stems are also spiny. We hunted this palm in Borneo with the Dyak people who rated it highly for the edible cabbage of the young shoots.

Along the river in the Anei gorge grow beautiful groups of a species of *Pinanga*. Inside the forests on the slope of the ravine we may hunt for rattans, thin stemmed ones good for binding purposes, or heavy spiny ones like *Calamus ornatus* used for making sticks and called *rottan semabu* (bamboo-like rattan). The most decorative rattans are the species of *Plectocomia* which have apical inflorescences, the drooping branches of which are densely covered with small brownish bracts. Two other species in West Sumatra are the greenish *Plectocomia elongata* and the yellowish-brown *P. sumatrana*. These rattans are monocarpic — the stems die after flowering. The genus *Korthalsia* has the same feature but *Calamus* and *Daemonorops* have lateral inflorescences. Species of *Calamus* often have spines on the inflorescence branches, those of *Daemonorops* do not. Rattans are widely used for sticks and binding materials and for baskets. Forest people know that some species have edible nuts, and species of *Daemonorops* from Sumatra and Borneo furnish a special kind of lacquer, the so-called "Drake-blood."

In the forests on these mountain ridges are species of *Arenga* and the related *Caryota*, the latter with twice compound leaves and wedge-shaped leaflets. Two species, *Arenga pinnata* and *Caryota Rumphiana*, are cultivated in the Minangkabau kampongs. They both produce palm sugar and fibers from the leaf bases, called *idjuk*, are used for thatching the old style houses. It is a pity that so many houses are thatched now with corrugated iron instead of the black *idjuk* which readily becomes overgrown by mosses and ferns. In the Minangkabau kampongs coconut palms are widely planted. If you are thirsty you may ask for young fruits with their refreshing milk. *Cocos nucifera—kelappa*—grows in all the fertile cultivated valleys and coastal plains and mountains from sea level to about 2600 feet. Along the coast the coconut grows abundantly and the nuts are collected for the manufacture of the fat-containing copra, which is the dried endosperm.

Near the native houses we will always find some trees of *Areca Catechu*, the betel palm. The so-called nuts are one of the ingredients of betel—a mixture of betel nut, lime, gambir, and leaves of *Piper betle*. The fashion of betel chewing is widespread among the peoples of southern Asia and Indonesia and known from times immemorial. From a medical point of view it is better to chew betel nut than chewing gum because the areca seeds contain tannins which are good for intestinal disorders, and they also contain a vermicide alkaloid arecoline. Some varieties contain more alkaloid than others.

In the undergrowth of the kampongs occur spiny stemless palms, *Salacca edulis* which have delicious tasting but rather acid fruits. This palm is very commonly cultivated especially in east Java and we find the fruit on the markets.

15. *Corypha Gebanga* in North Celebes, at left a flowering plant with dying leaves. Photograph by W. Meijer.

In the kampongs we may observe how palm sugar is made. The sugar palm is a native plant in Indonesia. Its stems often covered with epiphytes such as ferns, mosses, and orchids in the axils of the old leaf bases. Primitive bamboo ladders are used to reach the inflorescences, the male flower cluster being the one usually used to obtain sugar. It is first beaten to stimulate the flow of juice and then it is cut off. Bamboo containers are hung below the cut surface and twice a day a boy collects the juice. The juice is boiled above a fire in a large iron pan. The fluid sugar is made in *Cocos* "cups." There is no better sugar than palm sugar from *Arenga*. Indonesian doctors prescribe it in cases of jaundice.

The fruits of *Arenga* must be handled with care. Their skins contain crystals of calcium oxalate. However, the seeds are edible. They are much liked by civet cats which roam during the night in the kampongs and distribute the palms in grass fields far from the kampong. Palms are probably an older source of sugar than sugar cane which spread with barter from New Guinea to India before the dawn of Indonesian history.

The most famous source of starch and a staple food plant of people in the Moluccas (east Indonesia) is *Metroxylon Sagu*, a swamp palm. It is planted in western Indonesia. Minangkabau people call it *rumbia* and plant it in former coastal swamps. You must look well for flowering stems and to avoid confusing it with *Nypa*. *Metroxylon* dies after flowering. Besides the common non-spiny form occurs a spiny one

which is often considered to be only a variety of the same species.

After we have observed the palms of the native villages, the kampongs, we go back to the forests hunting for palms. On a trip to the high volcanos of Central Sumatra we note how the palm flora diminishes as we climb higher. On Mt. Tandikat and Mt. Sago we observe some special kinds of *Arenga*, and on the latter we find at least four species of *Pinanga* and two of *Caryota*, at a height of about 2600 feet above sea level. Only a few species of rattans are met with at an elevation of 5000 feet. On Mt. Korinchi a species of *Pinanga* grows at 6600 feet.

To see the rich palm flora of central Sumatra we might make an expedition into the dipterocarp-agathis forest in the sandstone region about 1600 feet altitude. It is similar to the forests at the same level and of the same geological formation in Borneo. In the undergrowth of this forest we note a wide variation in the species of *Pinanga*, some rather short stemmed, others larger; inflorescences upright or hanging; fruits yellowish or reddish in color; leaves coarsely or finely dissected. Some of these may be new to science.

Mixed with *Pinanga* are the small fan palms of the genus *Licuala*. The leafstalks are often spiny. The plants are low, almost stemless. The leaves are very useful for thatching material for small shelters. Rattans also occur scattered in such forests. They are most abundant in marshy places. Especially those species of *Calamus* and *Daemonorops* which have dense collars of "horsehair" which are interesting to observe but difficult to handle.

Marshy and peat forests in central Sumatra and east Borneo are the favorite locality of the huge fan palms, species of *Pholidocarpus*. It is not so

16. The crown of *Oncosperma horridum*, Mt. Tandikat, 2000 feet, West Sumatra. Photograph by W. Meijer.

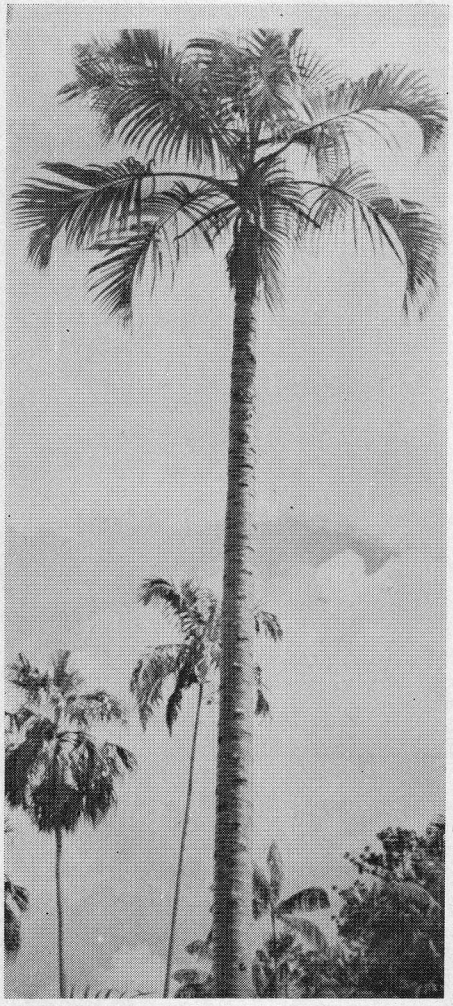
easy to collect these. The leaves are easy to study while the palms are young and short-stemmed, but they are quite out of reach when the palms become older and stretch their crown of leaves and inflorescences above the marsh forests. Axes may be broken on the hard stems. The fruits are as large as lemons. The genus is related to *Livistona*. Several species of the latter are commonly cultivated as ornamental plants in towns in the lowlands of Sumatra and Java. Once I visited a locality where *L. rotundifolia* was growing wild on steep sandstone rocks near Kuliki, north of Pajakumbuh. About 60 palms were growing there on the rocks in a region where ninety percent of the forests had been cut away and the hills had changed into grasslands that burned annually. I managed to collect some fallen leaves, old inflorescences, and some fallen blue-coated fruits, and to make a series of photographs. This documentation was enough to identify the plants, though the fruits were lost afterwards during my sudden departure from west Sumatra.

Almost nothing is known about wild

species of *Livistona* as they occur in Sumatra. From the airplane on the route Padang-Bengkulu-Djakarta you may see big palms growing on the inner side of the mangrove. I am still not sure whether these belong to *Pholidocarpus* or to *Livistona*. On the south coast of west Java, *Livistona rotundifolia* is observed at such habitats.

If we fly over to Java we may see there some other interesting palms of rather impressive growth. One is the so-called gebang palm, a species of *Corypha*. Superficially it resembles *Livistona* but the inflorescence is quite different. *Corypha* species have terminal upright branched inflorescences. Flowering means thus the end of the life of the plant. The taxonomy of *Corypha* is another problem in Malaysian botany. In the Botanical Gardens at Bogor one can see the differences between *Corypha elata* from the Philippines and *C. umbraculifera* from India, but the exact taxonomic position of *C. Gebanga* from Java has not yet been determined. Detailed studies of the flowers and fruits are necessary to settle this point.

The rarest palm in Java is *Orania macrocladus;* it is known from only two localities. The species also occurs in Sumatra and in the Malay Peninsula. Other species of this genus are known from east Indonesia. The plants resemble superficially the coconut palm, but the inflorescences are very different and the leaves are more upright. *Orania* is a member of Arecoideae and more or less related to the American royal palms, *Roystonea*. During our trip in Java we will certainly meet somewhere near Djakarta or in central or eastern Java the famous *lontar* palm, *Borassus*. Formerly all *Borassus* from Ceylon, India, Siam, Malay Peninsula, Sumatra, Java, and east as far as Timor were considered as belonging to one species—*B. flabellifer*. But Beccari called the Indonesian species *B. sundaica*. The matter should be investigated further. *Borassus* prefers regions with a rather long dry season. That is why it is seen more in the dryer central and east Java than in the wet western part. This palm plays an important role in Hindu-Javanese history. The Sanskrit name is *tola*. The leaves are called *ron tal* and were used to write on; rectangular slips were cut



17. *Pigafetta filaris* from the Celebes as it grows at the Bogor Botanic Garden. Photograph by W. Meijer.

from the leaves, punched in the middle, and threaded into books. It is assumed that the name lontar comes from *ron tal*. On Bali the name seems still to be *tala*. It is possible that formerly leaves of *Corypha* were also used for writing material. Every place were *Borassus* occurs abundantly, it is used as a source of sugar, for its edible fruits, the leaves for roof thatch, and the plants usually end their life on this earth at an age of about 50 to 60 years as building material.

Much more could be told about the palms of Indonesia from my own experience and from the rich literature on this subject. At least ten years of study in the field and another in the herbaria and libraries, besides a lot of skill and perseverance, will be necessary before a rather complete taxonomic survey of this marvellous fascinating family can be given in the great new *Flora Malesiana*, edited by professor van Steenis.

Palms of Brazil

THOMAS MOSES
São Luiz, Maranhão, Brazil

Brazil's greatest lyric poet, Conçalves Dias, when in exile, wrote of his native land as "The Land where Palm Trees Grow." No title could be more fitting. Brazil has always been recognized as the greatest country in the world for palm trees. In pre-Colonial days, the aborigines called this land *Pindorama*, which means "land of palms."

Surely no area of the earth's surface can be compared to Brazil for palms, for no other country has so many species or so many specimens. The species run to over 500 and the specimens to many billions. From the humid equatorial jungle of the extreme north to the plains and swamps of the extreme south, palms abound in almost uninterrupted sequence and in many areas there are dense palm forests which extend for hundreds of miles.

In my 30 years of incessant travel in Brazil I have had unending pleasure among the palms. Day after day, for weeks and months on end, I have traveled up and down the rivers by launch, canoe and raft, and penetrated the forests on horseback or afoot, admiring, studying, counting and collecting. There's a world of interest in a princely palm, whether it be a solitary palm or one in a grove. First, one admires the beauty — elegant and exotic. Then one thinks of it as a member of a family and looks for characteristics and character. Closer observation will reveal something of evolution, environment and enemies. There is no end to the investigation. To the casual observer, however, a palm is a pleasure to the eye. He sees its feather-like fronds like plumes in a lady's headgear. A lone palm in the midst of exogens is a symbol of survival or an ornament to enhance the surrounding verdure, like lace in a female's mantle. And even in the arid areas, a little group of palms is an oasis in the desert, to cheer the heart and renew the body.

In Brazil, palms are the life of the people. Everything for simple people in primitive surroundings is taken from the palms. To them, the palm is the "Tree of Life." In their folklore they tell of a flood and an old chief, Tamandaré, who alone escaped by climbing a palm, ate the fruit to keep alive, and, when the waters subsided, disgorged the seeds to

18. *Orbignya speciosa*, the *babassú palm*. Photograph by Thomas Moses.

repeople the earth. This affection for and dependence on the palms continues. On the lower Amazon, the people chant:

Who comes to Pará, comes here to stay;
Who drinks Assai goes never away.

And south of the Amazon, in the State of Maranhão, where hundreds of thousands of natives squat on the ground breaking the nuts of the *babassu* palm, the people sing:

Babassú, babassú,
Babassú, the wonder tree;
Were it not for babassú
All the world would naked be.

Further south, in the *carnaúba* country, the people recite the poet's version of the palm *(Copernicia cerifera)* which gives them food, drink, raiment and remedies.

This is also reflected in the names they give to their palms, names such as monkey nut, deer nut, dog nut, gipsy nut, vinegar nut, cow saliva nut, devil nut, devil's arrow palm, etc. Some palms are named according to their appearances and in this they have a wide range of terms to choose from, for there are palms of every conceivable kind of characteristic—palms of stout stem, palms of slender stem, bifurcated palms, pot-bellied palms, ground-trailing palms, aerial-rooted palms, climbing palms. And everywhere there are palms in profusion.

Brazil covers an area of, approximately, 3,289,440 square miles, or nearly half (47.3%) of South America. Most of the country is in the tropic zone and much of it is undeveloped, uninhabited and untouched by the hand of man.

This, then, is an ideal country for palm propagation. In the extreme north, the equatorial forests are a paradise for exotic endogens. In the extreme south, the swamps of the Gran Chaco have a considerable quota of species. And in the arid areas of the central plateau there are palms in abundance.

It is said there are over 500 species

of palms in Brazil. I have seen many of them, from the raffia-like climbing palm *(Desmoncus aereus)* to the towering *miriti (Mauritia flexuosa)*, but I know I'll never need to weep like Alexander the Great, for I'll never fully conquer this great world of palms in Brazil.

Brazil has furnished a number of palms that are among the most popular palms cultivated throughout the world. A few of these are *Arecastrum Romanzoffianum, Arikuryoba schizophylla, Acrocomia sclerocarpa, A. Totai, Butia capitata, Syagrus Weddelliana.*

PALM PRODUCTS IN COMMERCE AND INDUSTRY

Palm trees provide many articles of necessity for the people who live far from civilization. The native uses the trunks of slender palms for the walls of his house and the leaves of palms to cover it. Leaves from palms are used to make doors, windows and mats. If the floor has to be raised because the ground is water-logged, he splits the trunks of palms to make the floor-boards. For illumination and cooking, he uses the oil he extracts from the kernels of certain palms nuts by crushing and boiling. Palm nut-pulp, palm heart and mesocarp meal from certain palm nuts are his food and from the fruits of certain palms he can make a substitute for coffee. Palm sap is good wine, fermented or unfermented. Unfolded palm leaves are woven into hammocks, fishing nets, hats and other articles. Old leaves make good brooms. Spathes make fine basins, flower pots and other utensils. Spines from palms are used for nails and needles. Roots are boiled and strained to give a medicine to cure his ills. Nuts are used as cups. Flowers are the finest of decorations. And even the maggots in the trunks and fruits are useful; they make excellent bait when fishing and are delicious when fried.

When a native needs some ready cash, he can collect some nuts and extract the kernels or beat the wax out of certain palm leaves and sell his products at the nearest trading post. These are the palm products of commerce and industry. They are important in the overall economic picture, not only as items of export but also as raw materials for the domestic industrial machine to supply the population with edible oils and fats, soaps, shampoos and shaving creams, waxes, fibers and by-products such as glycerine, etc. An idea of the importance of these palm products may be gained by considering the present annual production.

Palm Kernels	
Coconuts	150,000 tons
Babassú	80,000 "
Tucum	6,000 "
Murúmurú	2,000 "
Licuri	1,000 "
Palm Wax	
Carnaúba	7,000 tons
Licuri wax	2,000 "
Palm Fiber	
Piassava	6,000 tons

The above figures are only rough estimates, taken from official sources, intended to give a general idea to the casual reader. They do not take into account local consumption, variation of crop totals and methods of compiling statistics, etc. More accurate figures, covering production, consumption and industrial uses can be given by the author.

PALMS IN ABUNDANCE

In some regions of Brazil, certain species are found in dense stands. Some of these stands extend for hundreds of miles and the number of individual

19. Brazilians breaking *babassú* nuts which are a little larger than duck eggs with exceedingly hard endocarps. Photograph by Thomas Moses.

palms runs into millions and billions. The outstanding are the following:

Babassú *(Orbignya speciosa)*

There are several very dense stands of this palm, the greatest being in the State of Maranhão and part of the State of Piauí, covering an area of about 150,000 square miles. The density, of course, is not continuous; there are clearings here and "pockets" there, but some of the "pockets" must have a number nigh to the 7-figure total. As to the total of *babassú* palms in the two states, there has been a lot of wild speculation. Some Brazilians say, quite candidly, "About 10 billion!". This is misinformed exaggeration. Nevertheless, I would say there are about 1 billion. And surely this is something to cause admiration. But I ought to add that many of these stands are too dense to be of economic value. Counts have been made which showed 3,000 palms to a hectare, whereas the maximum should be about 250.

The *babassú* palm is not the most beautiful of the Principes but it is one of the most important in economic value. It attains a height of about 50 to 60 feet, with leaves 15 to 25 feet in length. The fruit is a hard nut, averaging 4 inches long and hanging in bunches of 100 to 400. This fruit has a fibrous epicarp, a mealy mesocarp and an extremely hard endocarp. Embedded in this endocarp are the kernels which contain about 63 percent high lauric acid oil. To extract these kernels, natives squat on the ground, place the nuts on the upturned blade of an axe and beat them with a piece of hardwood. An average day's production is about 18 pounds per person, though much of this work is done by children who manage to extract anything up to 8 pounds per day. The number of natives breaking

babassú in the states of Maranhão and Piauí, at least on a part-time basis, must be near to a quarter of a million.

Another very large stand of *babassú* is reported in the State of Mato Grosso, near the Bolivian border. This stand is said to extend for 180 miles and is very dense.

Murúmurú
(Astrocaryum Murúmurú)

The lower Amazon is noted for its innumerable islands. A few of these are large, like Ilha Marajó, which is about the size of Switzerland; the vast majority are very small and uninhabited. On these islands, however, as well as on both banks of the Amazon and its tributaries, there is dense vegetation. Prominent in this forest growth is the *murúmurú* palm.

Years ago, I spent several months among these islands on a survey of the *murúmurú* palm. I had a motor launch and visited hundreds of the islands, counting and calculating the probable production of *murúmurú* nuts. Later on, I had to go to Manaus (1,000 miles up-river) and beyond, and could have gone right on to Peru and Equador, following the *murúmurú*. I did, however, go to French Guiana, for up there, on the frontier with Brazil, there is *murúmurú* in great density.

The *murúmurú* palm has a short, slim stem, about 6 to 18 feet high and 8 to 12 inches in diameter, covered with long, black spines. It grows in groups and is difficult of access. The fruits, which hang in compact clusters, are like little pears, covered with a reddish pulp. Animals eat the pulp and the natives collect the nuts, for the endocarps contain kernels which have commercial value. From island to island, the natives irregularly ply in canoes and sailboats in the collecting and trading of *murúmurú* nuts. These are piled at the trading posts and eventually taken to the crushing mills at Manaus or Belem for oil extraction and soap-making.

20. Fruiting specimen of *Orbignya speciosa*. Photograph by Klare Markley.

Tucum and Tucumá
(Astrocaryum vulgare and A. Tucuma)

These palms are found all over north Brazil. In the Amazon Valley they are known as *tucumá* and *tucumá-açú* and are found wherever *murumuru* is found, but several degrees south of the equator, they mingle with *babassu*. North of the equator they are abundant on the river Oiapoc, the river which separates Brazil from French Guiana. Other species of *Astrocaryum* are *A. manaoense*, which is tall and majestic; *A. Jauari (jauari)* which does not grow to any considerable height. The most common type, *A. vulgare*, the *tucum*, grows up to 30 feet.

All the species of *Astrocaryum* are noted for their long strong spines which grow in rings at regular intervals on the trunks, leaves and bracts. The fruits grow in small clusters, each fruit about the size of a pigeon's egg and covered with a yellow-orange pulp when ripe. Animals are fond of this fruit. On Marajó Island it is fed to cattle. Wild pigs and rodents feed on it in the forest.

I have also seen certain fish *(tambaqui)* devour it. More valuable, however, is the kernel within the endocarp. This yields an oil which resembles commercial palm oil and can be used for the same purposes. In fact, I have bought thousands of tons of these kernels for factories in the United States for use in the preparation of cooking oil, salad oil, shortening and other purposes. Here in Brazil, it is used for making soaps and shampoos. The leaves of the *tucum* palm are used by the natives for making hammocks and fish nets.

Piassava *(Attalea funifera)*

Various types of *piassava* are found in Brazil, from Bahia to the north of the State of Amazonas, on the borders of British Guiana. The most important area is in the coastal strip of South Bahia, where there are stands of considerable density. Stands of lesser importance are in the states of Alagoas and Maranhão.

The *piassava* palm, when full grown, rises to a height of 20 to 30 feet, with a stem of 10 to 15 inches in diameter. The leaves are usually about the length of the stem. The fruits are hard drupes of about 4 inches in length and 2 inches in diameter. Mature leaves are used for the extraction of fiber, which is an item of considerable commercial value in the State of Bahia. This fiber is exported to many parts of the world. It is said that the streets of many cities in the U.S.A. and Europe are swept with the brooms and brushes made from the leaves of the *piassava* palms of Bahia.

In the "*babassú* belt" of Marahão and Paiuí, there is a palm, known to the natives as, "*piassava do norte*", which produces a nut similar to that of *babassú* but easier to crack. The kernels are so like those of *babassú* that the two are mixed and no buyer ever seems to know or notice the difference.

21. *Astrocaryum vulgare*, the *tucum* palm of Brazil. Photograph by Klare Markley.

Buriti *(Mauritia vinifera)*

There are several species of *Mauritia* in north Brazil. The best known is *buriti*. It flourishes in abundance in many parts of the Amazon and in the states of Maranhão, Piauí, Goiás and Mato Grosso, On the lower Amazon, *miriti (Mauritia flexuosa)* fringes the river for many miles but is not found elsewhere. These two palms look almost identical at a distance. Closer inspection shows that the *miriti* is taller, the fruits are bigger and of a lighter color. There is a third *Mauritia*, known to the natives as *buritirana*, which is quite abundant on the river Tocantins. The seeds of all three species are used to make a refreshing drink.

The *buriti* palm is a sight worth seeing. Its stout, smooth trunk rises to a considerable height and is topped with a large crown. Long leaf-stalks, with blades at the extremities, spread out in all directions. Enormous bunches of dull-red fruits hang in profusion. These berries, about the size of a hen's egg, have an epicarp covering which resembles small fish-scales, and the mesocarp is a thin covering of pulp which is used to make the greatly appreciated drink

and also a kind of jam. *Miriti* leaves are used for making rope and hammocks but the leaf-stalks of the *buriti* have the widest application of any palm product. They are used for fences, furniture and rafts.

Assai *(Euterpe oleracea)*

There is a variety of *Euterpe* species in many parts of Brazil. The most popular is the *assai*, which is found in density on the Amazon, particularly the lower Amazon. In and around the city of Belem almost every house has *assai* in the backyard. On the rivers and in the forest *assai* is found in great numbers. South of the Amazon, in the states of Mahanhão, Goiás and Mato Grosso, another species *(E. edulis)*, known as *jussara*, is plentiful and popular.

The *assai* palm is an excellent example of elegance. Its slender, smooth and even stem rises to a height of up to 100 feet and is generally found in clusters of 6 to 12. The leaves are few and short. High up, at the base of the soft stem, clusters of fruit jut out in ornamental fashion. The fruits, of a crimson hue, about the size and shape of cherries, have a pulp between the thin skin and the hard kernel which the natives mix with water to make a popular beverage. Everybody drinks *assai*. It is a staple diet of Amazonia.

Macaúba *(Acrocomia sclerocarpa)*

This splendid specimen of the Principes is found all over Brazil. I saw it on the borders of the extreme north and in many parts of the Amazon. In the extreme south, on the Paraguayan frontier, it is very abundant. Large stands of more than 1 million are found in the valleys of the Rio das Velhas and Rio Grande in the State of Minas Gerais.

Acrocomia sclerocarpa is well known in the Guianas and other parts of South America. In the Gran Chaco it is known as the Paraguay palm. It is a robust species of about 30 to 40 feet high, has a column-like trunk with rings of strong spines at regular intervals, leaves of medium length and bunches of fruit which are round and somewhat larger than tennis balls. The fruits are covered with a yellow-red pulp which smells like fresh bread. Hogs fatten quickly when they eat this pulp. Beneath the pulp is a large endocarp with kernels which contain an edible oil. This oil is used for soap-making in the State of Minas Gerais.

Caiaué *(Corozo oleifera)*

This is the Brazilian version of the African oil palm *(Elaeis guineensis)*. It is found all over the central and upper Amazon, from around Itaceatiara to the Peruvian border, but how far north of the Amazon has not yet been ascertained. I found the greatest concentration on the south bank of the Madeira river and east of this river to the river Camuná there is a stand of several million. To pinpoint the general area I chose the little town of Borba.

This American relative of the African oil palm differs from the African species in that it is smaller, almost a dwarf, with a very short stem. The fruit bunches are small and the oil content in each fruit is less, although the oil is somewhat similar. The tree, though it has the appearance of having been chopped, is quite beautiful and ornamental, since it grows in light, sandy soil where the surrounding vegetation is almost akin to scrub.

Inajá *(Maximiliana Martiana)*

From the borders of French Guiana right down to the State of Mato Grosso this palm is found in greater or lesser degree, usually in abandoned plantations. The greatest concentration, however, is on the Ilha Bananal, the longest inland island in the world, measuring

about 80 miles long. The *inajá* flourishes there by the million.

This is indeed a portly palm. It rises to about 40 feet. The trunk base is wide, usually about 20 inches in diameter. Then it tapers off to about 14 inches in the middle trunk. The upper trunk widens out again to support the crown of long spreading leaves and the very heavy bunches of fruit which are backed by an immense spathe. The kernels contain from 50 to 60 percent of a white solid fat and the kernel oil is similar to that of coconut oil. The leaves can be used for making hats and mats.

Carnaúba *(Copernicia cerifera)*

In northeastern Brazil one finds the *carnaúba* palm, mostly in the wild state. The straight, roughened stem rises to a height of about 45 feet and is topped with a spreading crown of palmate leaves. These leaves must be among the most valuable in the vegetable kingdom, for they contain wax which the world uses to polish floors, furniture and cars.

The *carandá (Copernicia alba)* is of the same genus as *carnaúba* but is not much used to produce wax as it is found in humid, swampy forestland, stretching from the Amazon down through Mato Grosso to the borders of Paraguay and Argentina.

The more valuable stands of *Copernicia cerifera* are found in the central plateau of Brazil, particularly in the states of Ceará and Piauí, areas afflicted with periodical, prolonged droughts. But the greater the drought the greater the production of wax. Wax production, per palm per annum, is about 130 grams.

The *carnaúba* wax palm is one of the very few palms planted and cultivated in Brazil. Extensive plantations are found in the states of Ceará and Piauí. The Johnson Wax Company has, for years, maintained an experimental station and promoted planting and production.

Coconut *(Cocos nucifera)*

This palm is not a native of Brazil. I mention it because many people are of the opinion that it is. The history books tell us that it came to Brazil from Africa in the slave ships. Here it found favorable soil and other conditions and now it is found from Bahia to the borders of the northern Territories. No palm is so widely spread as the coconut. It is found in the furthest interior. But, as it was first landed and planted in what is now the State of Bahia, the people everywhere call it *coco da Bahia.* And it so happens that, from Bahia north through the states of Sergipe, Alagoas and part of Pernambuco, there is what we may call a "coconut belt." In this belt, a coastal strip, there must be many millions of *Cocos nucifera.* Official figures give production at 300 million nuts per year.

Twice I made a survey of this "coconut belt" in (1946 and 1950) and I had many surprises. It surprised me to see how many coconuts were produced and how few were crushed for oil extraction. This is because of the export of unripe nuts to Rio, São Paulo and other big cities for the consumption of the "milk." The extraction of endosperm from ripe coconuts for culinary purposes was also a surprise. This is a prime by-product in all of the six or eight small dessicating mills. And the intensive and extensive planting of dwarf coconuts was no less a surprise.

The coconut palm needs no description. However, the dwarf species is not so well known and it may surprise many Americans to hear of a coconut palm which has very little trunk, produces from 100 to 400 nuts a year and has bunches of coconuts so low that supports

have to be put under them to keep them off the ground. Furthermore, these dwarf coconut palms produce within 2 to 3 years after planting.

The Royal Palm
(Roystonea oleracea)

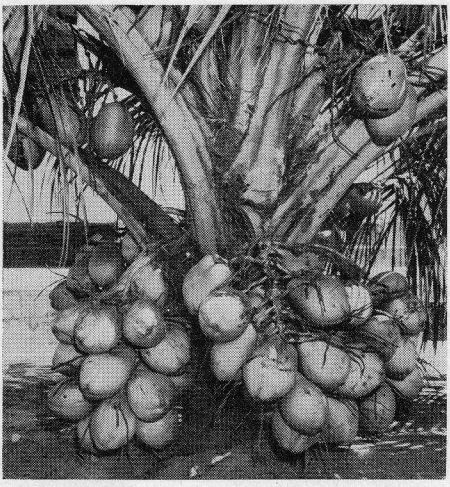
Like the coconut palm, the royal palm is not a native of Brazil. This point is of no importance, since *Roystonea oleracea* is beloved by all Brazilians as no other palm is beloved. It is found in almost every public square throughout the country. It adorns the entrance to many important buildings. It is an ornament in many a private garden. The avenue of royal palms in the Botanical Gardens of Rio de Janeiro is an unforgettable sight and probably the world's most inspiring display of palms in all their grandeur and glory.

SOME PALM HISTORIES

The Story of the Royal Palm

The pride of Brazil is the royal palm. Few people in the country, however, know that it is not native to Brazil. Nor do they know how it came to Brazil. The story is interesting.

In 1808, during the Napoleonic War, a Portuguese frigate, the "Princeza do Brasil", foundered off the coast of Gôa. The French captured the crew and took them, as prisoners of war, to the Island of Mauritius. The skipper of the captured crew, Luiz de Abreu, negotiated with his captors the ransom price for himself and his men. But before leaving Mauritius, he collected the seeds of some local plants and these he smuggled out with him. These seeds were presented to the Prince Regent of Brazil, D. João VI, who planted them in the Royal Gardens in Rio de Janeiro. One type of seed was a palm—a palm more beautiful than any hitherto seen in Brazil.



22. Heavy clusters of fruit are borne close to the ground on the dwarf coconut in Brazil. Photograph by Thomas Moses.

The curator of the Royal Gardens, Serpa Brandão, was very jealous of this unique species of palm. He had the seed collected brought to him and what he did not require for planting was destroyed in his presence. Thus, he thought, the Royal Gardens had the monopoly of the royal palm. But to his amazement, and that of D. João VI, many private gardens in Rio de Janeiro had specimens of the palm. An enquiry was set up and it was discovered that servants and slaves in the Royal Gardens had stolen the seeds and sold them in the city.

Today, the royal palm flourishes all over Brazil. Hardly a city of any size is without some specimens. The original, planted by D. João, VI, is still alive, though not flourishing any more.

The Story of the Dwarf Coconut Palm

In 1925, a Commission from the Ministry of Agriculture, visited Ceylon. When returning to Brazil, they were given some seedlings of king coconut *(niyor garding)*. These were dwarf

palms from the Andaman Islands, and were regarded more as curiosity than plants of economic value. They were distributed to some botanic gardens and agricultural institutions. Soon they were forgotten and the seedlings allowed to die. Fifteen years later, however, a good friend of mine, Dr. Samuel Hardman, Director of Agriculture in the State of Pernambuco, remembered the dwarf palms and hunted around until he found two survivors. He made nursery beds and set up a propaganda campaign for dwarf palm planting. Soon there was a wild demand for dwarf palm seeds and seedlings. The wonders of the dwarf palm had been discovered: it produces in 2 to 3 years, gives 100 to 400 nuts a year (as against 30 to 40 of the common coconut), has a trunk so low that the bunches need props to keep them off the ground. Everybody was extolling the dwarf palm; its rapid growth, its productivity, the sweetness of its fruit, etc. So the dwarf palm spread from Pernambuco to the furthermost limits of the land. Today, it is estimated, there are more than 10 million dwarf palms in Brazil—all this from two lone specimens found, or refound, in 1940.

The Story of the Carnaúba Wax Palm

The story is told that the Greek Orthodox Church priests in Russia had a problem. It was that the faithful, during the winter season, were stealing the candles from the altars because of the animal fat they were made of. One day a priest heard of a Brazilian palm which produced wax from which candles could be made which people would not steal to eat. The Church authorities made enquiries and these led to a contact with an English businessman in Brazil. He was James Frederick Clark, head of a firm in Parnaíba, Piauí. Mr. Clark's firm obliged by shipping *carnaúba* wax to Russia and this, more than anything else, helped develop the *carnaúba* wax trade, a trade which is, today, one of Brazil's greatest exportable assets. A few years ago, the people of Parnaíba, to mark the centenary of James Frederick Clark, erected a monument in the shape of a *carnaúba* palm in granite with a bust of Mr. Clark atop. No church thieves ever did a greater service.

The Story of Babassú

Babassú nuts are noted for the hardness of their endocarps. In this hard shell, about the size of a duck or goose egg, are kernels which contain oil of a high lauric acid type. The problem of cracking these nuts and extracting the kernels has occupied many mechanical minds and some of the stories are worth the telling.

Towards the end of last century, a shipment of palm nuts arrived at the English port of Liverpool. They were labelled "cohune nuts." Actually, they were *babassú* nuts. The receivers soon set to work to open them. They used hammers, chisels and other kinds of gadgets but the results were negligible. Finally, they cast the nuts into the sea.

At about the beginning of World War I, another English firm interested in *babassú*, sent out to Brazil a number of machines which, they claimed, would break *babassú*. They were hailed as the certain solution to the problem. Lots of leaflets were distributed, premiums were offered to the native with the highest production and, finally, the machines were sent into the interior. A little later, the enthusiasm died down. The natives couldn't handle the strange device. It was too complicated. In a short time the machines were all broken. They called them "machines for *babassú* to break." And broken they certainly were, with-

23. Cutting leaves of the wild Brazilian wax palms *(Copernicia cerifera)*, a source of carnauba wax. Photograph courtesy S. C. Johnson & Son, Inc.

out having produced a pound of kernels. Some years ago, I found one of them abandoned in the forest.

In more recent years, many attempts have been made to make a machine which will break *babassú* efficiently and economically. Individuals, organized firms, and even Government Commissions have tried to solve the problem. Many millions of dollars have been spent and many machines have appeared, from little portable contraptions to huge, high-powered mechanical constructions complete with brinefloats and dust absorbers. All have gone through the motions, often at extraordinary expense, but none has been put into permanent operation.

Meanwhile, as it was in the beginning, the natives squat beneath the palms,

place the nuts on an up-turned axehead and beat them into splinters with a piece of hardwood. Thus they remove the kernels, 80,000 tons of them a year.

Another story worth telling is that of the furor caused during Franklin D. Roosevelt's second presidential campaign. The subject was *babassú*. Roosevelt, in his Good Neighbor Policy, had signed an agreement with Brazil (in 1935) to allow certain vegetable oil-seeds, like *babassu*, to enter the U.S.A. free of the three-cents tax levied on copra. This brought a storm of protest from the Middle West. Governor Landon, the Republican candidate and Roosevelt's opponent, made the most of the situation and Republican newspapers published, with big headlines, articles with captions such as "What is babassu?" So *babassú* played a part in U.S. politics, even in a presidential election.

Allagoptera And Diplothemium

HAROLD E. MOORE, JR.

The small palm genus *Diplothemium* (about five species) occurs in Brazil and Paraguay. It was described by Martius in 1824 and was elaborated by him in 1826 to include four species, one of which, *D. caudescens*, has since been separated as *Polyandrococos caudescens* (Martius) Barbosa Rodrigues. Still later, in 1845, Martius described a fifth species (since variously placed in *Jubaea*, *Polyandrococos* and *Parajubaea*) and equated *Diplothemium* with *Allagoptera* which had been described in 1821.

Although the priority of *Allagoptera* was thus made clear over a century ago, the name *Diplothemium* has been used by most students of palms to the present. Some may argue that long usage would suggest attempting to conserve the name *Diplothemium* despite its few species and relative unimportance. But even if *Diplothemium* were conserved, an earlier epithet is required for one of the two better known species. Thus adherence to the rule of priority and the use of *Allagoptera* seems the better solution, especially in view of the need for careful study of the relationship between the genus and *Syagrus*. Since at least one species appears to have some into cultivation outside botanical gardens recently, it may be helpful to point out the correct names to be used at present under the *International Code of Botanical Nomenclature* (1956) and to comment briefly on these names.

Allagoptera was described by C. G. Nees in a list of corrections and additions following the appendix to the second volume of Prince Maximilian of Wied-Neuwied's *Reise nach Brasilien*, an account of the Prince's travels in Brasil during 1815, 1816, and 1817. According to *Isis von Oken* 1821: 578, 1821, this volume appeared at Easter, 1821 [April 22, 1821]. Essentially the same description appeared shortly thereafter in the botanical periodical *Flora* for May 21, 1821. The genus and its sole species, *Allagoptera pumila* Nees, were based on specimens of a small palm found by Prince Maximilian either behind the sand dunes on the coast between Sagoarema [Saquarema] and the *fazenda* of Pitanga on the way from Rio de Janeiro to Cabo Frio, or in a similar situation farther north between Vitoria and Rio Doçe. This little palm was known locally as *cocos de guriri* or *pissandó* at the first place mentioned,

and as such it was briefly described without formal naming on page 67 of the first volume of the *Reise*. It seems less likely that specimens were actually obtained at the second place mentioned (*Reise* 1: 201) between the *quartel* of Riacho and Rio Doçe.

Martius referred the *cocos de guriri* or *pissandó* mentioned by Prince Maximilian in volume one of his *Reise* to *Diplothemium campestre*, a species generally of inland and more elevated regions, with six to ten stamens (according to Martius) and also known as *guriri*. From his comments, it seems likely that Martius had not seen actual specimens of Maximilian's *guriri* when he wrote though he was personally familiar with *D. campestre*, for he mentioned only that the Prince had observed the *guriri* and he erred slightly in the locality.

Nees, however, noted that *Allagoptera pumila* had 14 stamens in the male flowers and we know that the species was a coastal one from near Rio de Janeiro. The locality and number of stamens identify *Allagoptera pumila* with *Cocos arenaria* (also known as *coqueiro de guriri*) described by Gomes in 1812 as a palm from Rio de Janeiro with 10-19 stamens. This last species was cited by name as a synonym of Martius' *Diplothemium littorale* which was, in turn, united by H. Wendland and by O. Drude with *Diplothemium maritimum*, a species originally known to Martius only from fruiting material.

It seems evident that Martius, presumably acquainted only with the informal description of *guriri* in volume 1 of Maximilian's *Reise* and not with specimens nor with the formal description of *Allagoptera pumila*, erred in 1826 when he referred the palm to his *Diplothemium campestre* as also he erred, by today's rules of nomenclature, in not accepting Gomes earlier epithet *arenaria* in place of *littorale*.

Essential synonymy is listed below for the species of *Allagoptera*. One variety *(Glaziovii)* described under *Diplothemium campestre*, is not transferred as it seems possibly no more than a variant of the typical variety. Two species described by Barbosa Rodrigues in *Diplothemium* are transferred to complete the listing. The most recent summary of species is that of Barbosa Rodrigues (as *Diplothemium*) in his *Sertum Palmarum Brasiliensium* 1: 116-120, 1903. *Allagoptera arenaria* and *A. campestris*, the two species most likely to be encountered in cultivation, are distinguished as follows:

Stamens in male flowers 10-16: fruit covered with brown woolly scales except for the nude tip. *A. arenaria*

Stamens in male flowers 6-9 (according to Drude); fruit lacking a prominent cover of scales. *A. campestris*

ALLAGOPTERA C. G. Ness in Wied-Neuwied, *Reise nach Brasilien* 2: 335. Apr. 1821; et in *Flora* 4: 296. 21 Mai 1821.

Diplothemium Martius, *Palmarum Familia* 20. Apr. 1824; et *Historia Naturalis Palmarum* 2: 107. 1826; 3: 293. 1845.

A. Anisitsii (Barbosa Rodrigues) H. E. Moore, tr. nov.

Diplothemium Anisitsii Barbosa Rodrigues, *Palmae Novae Paraguayenses* 16. 1899 ('Anizitzii') corrected in *Sertum Palmarum Brasiliensium* 1: 119-120. 1903.

A. arenaria (Gomes) O. Kuntze, *Revisio Generum Plantarum* 2: 726. 1891.

Cocos arenaria Gomes, in *Memorias da Academia Real das Sciencias de Lisboa* 3(1): Memorias dos

Correspondendentes, 61. 1812 *('arenarius')*.

Diplothemium arenarium (Gomes Vasconcellos & Franco, in *Portugaliae Acta Biologica*, ser. B, 2: 412. 1948.

Allagoptera pumila C. G. Nees in Wied-Neuwied, *Reise nach Brasilien* 2: 335. Apr. 1821; et in *Flora* 4: 296. 21 Mai 1821.

Diplothemium littorale Martius, *Historia Naturalis Palmarum* 2: 110. 1826.

Diplothemium maritimum Martius, *Historia Naturalis Palmarum* 2: 108. 1826.

A. campestris (Martius) O. Kuntze, *Revisio Generum Plantarum* 2: 726. 1891.

var. campestris

Diplothemium campestre Martius, *Historia Naturalis Palmarum* 2: 109. 1826.

Diplothemium campestre var. *genuinum* Drude in Martius, *Flora Brasiliensis* 3(2): 432. 1881.

Diplothemium campestre var. *Glaziovii* Dammer, in *Botanische Jahrbücher* 31, beiblatt 70: 23. 1902.

var. Orbignyi (Drude) O. Kuntze, *Revisio Generum Plantarum* 3(3): 322 & 546. 1898.

Diplothemium campestre var. *Orbignyi* Drude in Martius, *Flora Brasiliensis* 3(2): 432. 1881.

A. Hassleriana (Barbosa Rodrigues) H. E. Moore, tr. nov.

Diplothemium Hasslerianum Barbosa Rodrigues, *Palmae Hasslerianae Novae* 10. 1900.

A. leucocalyx (Drude) O. Kuntze, *Revisio Generum Plantarum* 2: 726. 1891.

Diplothemium leucocalyx Drude in Martius, *Flora Brasiliensis* 3(2): 431. 1881.

Diplothemium jangadense S. Moore, in *Transactions of the Linnaean Society* (London), ser. 2, 4: 499. 1895.

A NOTE OF CORRECTION

I would like to think of it as a deliberate mistake, designed to catch our readers of PRINCIPES, but the error is quite inadvertent and should be corrected. This is in the "Essay on the Morphology of Palms. V. The Habit of Palms" published in PRINCIPES 5: 83-89. In the illustration of growth habits in palms, Fig. 45, No. 7 is labelled as *Sabal Etonia* whereas it manifestly is wrong. It much better represents *Serenoa repens*, which was the original intention. This was quickly pointed out to me by Dr. L. M. Simonson of Lantana, Florida, for which I am very grateful. I can only plead a mild brainstorm over this mistake, because, as a newcomer to Florida I had earlier this year the pleasure of digging up *Sabal Etonia* and *S. minor* in the company of Dent Smith in Daytona Beach, and observing the peculiar growth habit of these plants. Also I described the unique growth form of *Sabal* in an earlier essay (*Principes* 4: 140-143). May I apologize publicly for this error. I have attached Dr. Simonson's letter.

P. B. TOMLINSON

* * *

LANTANA, FLORIDA

DEAR DR. TOMLINSON:

"Your article in the last number of PRINCIPES on "The Habit of Palms" is very interesting. However, I wish I could show you the growth habit of *Sabal Etonia* of which I have very many native here on my place — there were literally thousands growing on my land when I acquired it. Many have been

eliminated in clearing my land but there are still plenty to demonstrate that the stems do *not* creep but develop straight down. Your diagram is right for *Serenoa* repens where it creeps and branches but *Sabal Etonia* never does either. I am not a botanist but have raised plants for a good many years and *Sabal Etonia* and *S. Palmetto* both develop a pronounced knuckle or sharp elbow at the base of the plant undergrown and deeper and deeper, a new growth from which new roots grow. It is in this way that the plant anchors itself. A large stemless *S. Etonia* may be three or four feet underground and almost impossible to dig out but little ones show what I mean.

The stem is entirely underground and of course would not show in an herbarium specimen. I don't know whether or not Bailey mentions this peculiarity in *Gentes Herbarum*—I do not have access to that work—and I do not know whether other palms have a similar habit but it is a very curious fact that I have never seen mentioned. [Dr. Bailey does mention and illustrate the underground trunk of *S. Etonia* in *Gentes Herbarum* 6: 393, 398, 1944 Ed.]

My soil here is deep sand and I wonder how these sabals could develop on hard stony soil—I only have about four *Sabal Palmetto* but *S. Etonia* is common and very difficult to dig out when large. The way I do if I want to eliminate a specimen where I need the room is to pour a small quantity of kerosene in the bud and leave the stump to rot in time.

Sincerely,

LAWRENCE M. SIMONSON

Classified Section

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Errata in volume 5:

p. 114, col. 2, bottom line *for* 1 October 1961 *read* 30 September 1961

p. 141 *sub* Fig. 76, line 5 *for* 150 feet *read* 160 feet.

p. 142 *sub* Fig. 77, line 6 *delete* Photograph by A. Dugand.

p. 144 *for* Acrocomia aculeata 66, 139 *read*
Acrocomia 139
aculeata 66

p. 144 *sub* Aiphanes *read* caryotaefolia 20, 140

p. 145 *for* Ceroxylon alpinum 12, 101, 139, 140 *read* Ceroxylon 139, 140
alpinum 12, 101

p. 145 *sub* Chamaedorea costaricana *for* 103 *read* 106.

p. 146 *for* Hyospathe elegans 135, 139 *read* Hyospathe 139
elegans 135

p. 146 *for* Jessenia Bataua 139, 140, 142 *read* Jessenia 139
Bataua 140, 142