

PRINCIPES

Journal of The Palm Society

January, 1970
Vol. 14, No. 1

THE PALM SOCIETY

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

PRESIDENT: Dr. John Popenoe, 10901 Old Cutler Road, Miami, Fla. 33156.

VICE PRESIDENT: Dr. Jerome P. Keuper, Florida Institute of Technology, Melbourne, Fla.

SECRETARY: Mrs. Lucita H. Wait, 7229 S.W. 54th Avenue, Miami, Florida 33143.

TREASURER: Wallace E. Manis, 13601 Old Cutler Road, Miami, Florida 33158.

DIRECTORS: 1966–70, Dr. Walter H. Hodge, Japan; Mr. E. D. Kitzke, Wisconsin; Mr. Harold Loomis, Florida; Mr. W. E. Manis, Florida; Dr. Harold E. Moore, Jr., New York; Mrs. L. H. Wait, Florida; Madame Ganna Walska, California. 1968–72: Mr. Otto Martens, California; Mr. David Barry, Jr., California; Mr. Walter J. Murray, Florida; Mr. Dent Smith, Florida; Mr. Harrison G. Yocum, Arizona; Dr. Robert N. Smith, Texas; Dr. U. A. Young, Florida.

PRINCIPES

JOURNAL OF THE PALM SOCIETY

EDITOR: Harold E. Moore, Jr., 467 Mann Library, Ithaca, N.Y. 14850

ASSISTANT EDITOR: Warren J. Dolby, 5331 Golden Gate Avenue, Oakland, California 94618

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

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

Contents for January

Notes on the Reproductive Biology of *Asterogyne Martiana* (Palmae). I. Inflorescence and Floral Morphology; Phenology
Rudolf Schmid 3

Epiphytes That Strangulate Palms
T. A. Davis 10

A Study of Germination and Use in Twelve Palms of Northeastern Peru
Charles B. Jordan 26

Regular Features
News of the Society 33
Classified Section 36
What's in a Name? 36

Cover Picture

1. Tropical wet forest, Finca La Selva, Costa Rica, a palm lovers' paradise with *Asterogyne Martiana* in the foreground and probably a *Geonoma* in the background. Among other palms at Finca La Selva are *Astrocaryum alatum*, *A. Standleyanum*, *Bactris* spp., *Calyptrogyne sarapiquensis*, *Chamaedorea* sp., *Cryosophila* sp., *Euterpe macrospadix*, *Iriartea gigantea*, *Pholidostachys pulchra*, *Prestoea decurrens*, *Socratea durissima*, and *Welfia Georgii*. See pages 3–9 for other figures.

PRINCIPES

JOURNAL OF THE PALM SOCIETY

An illustrated quarterly devoted to information about palms and published in January, April, July and October by The Palm Society, Inc.

Subscription price is $6.00 per year to libraries and institutions. Membership dues of $10.00 per year include a subscription to the Journal. Single copies are $1.50 each. The business office is located at **7229 S.W. 54th Avenue, Miami, Florida 33143.** Changes of address, undeliverable copies, orders for subscriptions, and membership dues are to be sent to the business office.

Application to mail at second class postage rates is pending at Miami, Florida 33143 and at Lawrence, Kansas 66044.

Mailed at Lawrence, Kansas
March 5, 1970

Notes on the Reproductive Biology of Asterogyne Martiana (Palmae).

I. Inflorescence and Floral Morphology; Phenology

RUDOLF SCHMID

Department of Botany, The University of Michigan, Ann Arbor 48104.

As a participant in the Organization for Tropical Studies' (OTS) Advanced Botany Course "Reproductive Biology in Tropical Plant Ecology" held in July–August, 1968, I had the opportunity to make detailed observations on the reproductive biology of *Asterogyne Martiana* (H. Wendl.) H. Wendl. ex Hemsley* (subfamily Arecoideae, tribe Geonomeae), a small showy palm native to Costa Rica and much of Central America.

Asterogyne, a genus of one to three species, depending upon taxonomic concepts, ranges from British Honduras to western Colombia (and perhaps also to northern Venezuela—see Wessels Boer, 1968). The most widely distributed species of the genus, *A. Martiana*, is a common undergrowth component of wet lowland forests (up to 500 m. elevation) (Fig. 1, see cover) of the Atlantic and Pacific coasts, ranging from British Honduras and Guatemala to western Colombia.

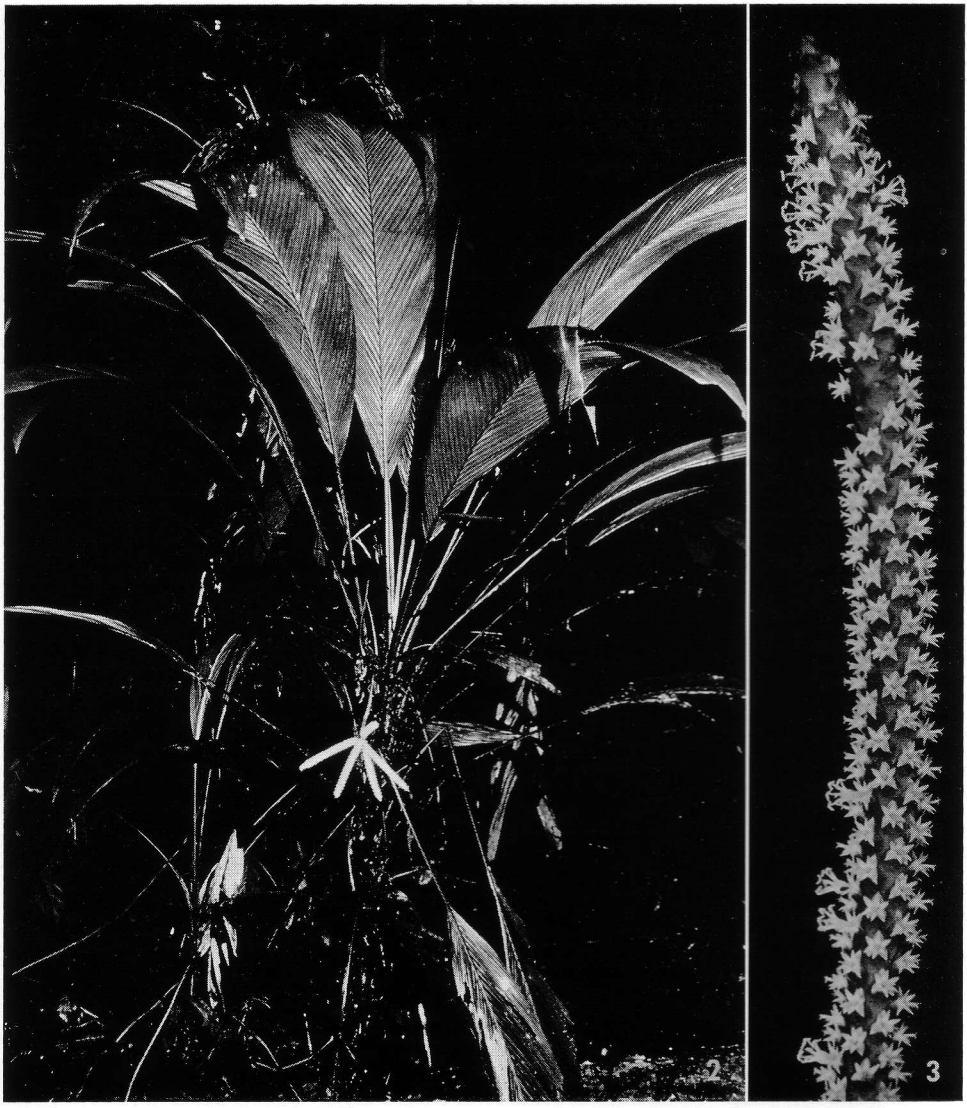
A dwarf palm, *Asterogyne Martiana* (Fig. 2) sometimes reaches 2 m. or more in height, and the unbranched, unarmed trunk becomes 3 to 5 cm. thick. The showy deep green leaves, up to 1.3 m. long and 25 cm. wide, are usually entire, though deeply bifid at the apex; they frequently become frayed with age. White, fragrant, unisexual flowers are produced on axillary inflorescences typically of 2 to 7 dull pale red rachillae (Fig. 3), 10 to 25 cm. long, which radiate from the end of an elongate, slender arching peduncle. The one-seeded, fleshy, smooth, ellipsoid-ovoid fruits are at first red but become purplish black at maturity.

* Synonyms include *Geonoma Martiana* H. Wendl., *G. trifurcata* Oerst., and *Asterogyne minor* Burret.

METHODS

Asterogyne Martiana was studied at two different sites in Costa Rica. Preliminary observations were made on July 21, 1968, in an alluvial plain tropical wet forest near the Pacific road, about 12 km. (by road) southwest of the town of Rincón de Osa (8° 42′ N, 83° 29′ W), Osa Peninsula, Puntarenas Province. Detailed observations of the palm were made from August 1–6, 1968, in the tropical wet forest on Finca La Selva (Fig. 1), about 5 km. (by river) south of Puerto Viejo (10° 26′ N, 83° 59′ W), Herédia Province.

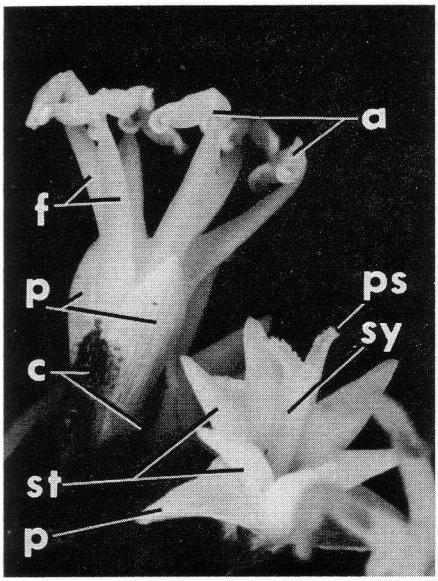
Using a census technique, I wandered in the forest, taking notes on the palms in flower and on their insect visitors. Plants were labelled and their sequence of flowering (phenology) was traced over a period of several days. Observations were generally possible only between 4:00 and 11:00 A.M. due to the torrential afternoon rains characteristic of the wet season. The most complete observations were made between 6:00 and 10:00 A.M. Flowers were examined in the field with a hand lens or dissecting



2–3. *Asterogyne Martiana.* Fig. 2, habit. Fig. 3, inflorescence branch with 7 clockwise spiraling rows of female (and male) flowers, 12:02 P.M., ×0.9.

microscope, and throughout the morning were checked for nectar production, either visually or with a Bellingham and Standley Pocket Refractometer (distributed by Epic, Inc., 150 Nassau St., New York, N. Y. 10038). Insect collections and floral material preserved in FAA were also examined.

The photographs were originally taken on Kodak Kodachrome II Film; the close-ups of the insects and flowers were taken at initial magnifications of ×0.2 to ×1.65 with a Micro-Nikkor Auto 55mm. f/3.5 lens on a Nikon F Photomic TN camera. Illumination was by electronic flash ringlight (Honeywell



4. Male and female flower of *Asterogyne Martiana*, 12:07 P.M. ×8.9. Abbreviations: a, anthers; c, sepals; f, filaments, basally connate; p, petals; ps, papillate stigma; st, staminodes; sy, style.

Prox-O-Lite) operating off a Honeywell Strobonar P65C power pack. The accompanying black-and-white photographs were produced from Ansco (GAF) Versapan Negative Film or Kodak Plus-X Pan Film copy negatives (Schmid, 1969) of the Kodachrome II originals.

I cannot overemphasize the value of an adequate photographic record. Examination of the Kodachromes under a 25– and 50-power dissecting microscope not only substantiated many of my field observations, but also revealed much additional information.

INFLORESCENCE AND FLORAL MORPHOLOGY

The following description of the reproductive structures of *Asterogyne Martiana* will supplement previously published accounts (see Wessels Boer, 1968, and references therein). In general, *Asterogyne* resembles *Aristeyera* (Moore, 1966, 1967; Uhl, 1966), which Wessels Boer (1968) recently transferred to *Asterogyne*.

A sexually mature plant of *Asterogyne Martiana* may bear 1 to 6 inflorescences (average of 2.4 for 110 plants sampled) concurrently, each inflorescence consisting of 2 to 8 branches (average of 4.6 for 36 plants sampled). Inflorescences may also be spicate (Wessels Boer, 1968). Pits containing the flowers are arranged on the inflorescence branches (rachillae) in close-set, vertical, clockwise (Fig. 3) or counterclockwise spiraling rows. Most inflorescences (over 60%) bear floral pits in 7 longitudinal rows (Fig. 3). Less common are inflorescences with floral pits either 6-ranked or 8-ranked. Occasionally, the same inflorescence may bear rachillae with 6- and 7-ranked pits, 7- and 8-ranked pits, or 6- and 8-ranked pits; a comparable situation exists in *Aristeyera* (or *Asterogyne*) *ramosa* (Moore, 1967, p. 146).

Both male and female flowers are whitish, fragrant, and nectariferous. Flowers occur deeply sunken in pits in the fleshy inflorescence branches. As is typical for many palms, three flowers occur at a pit site, each triad consisting of an inner central female flower and two outer lateral male flowers. The pits at the tips of the inflorescence axes usually bear only male flowers. A fleshy, sunken pit-closing bract completely covers each floral pit, and a small bractlet subtends each flower. The male flowers of my Costa Rican material were 7.5 to 9 mm. in length, the female flowers 6.5 to 8 mm.

The male flowers (Figs. 4, 5, 7) have 3 distinct sepals, 3 basally connate petals, 6 stamens with the filaments basally united into a short tube that is weakly adnate to the petals, and a small, tripartite rudimentary pistil (or pistillode)

about 2 mm. long. Initially slender, the bifid connectives of the inflexed anthers become greatly enlarged (to about twice their former diameter) shortly after the flowers open; this causes the separate pollen sacs to dehisce introrsely, become erect, and coil back upon themselves (Figs. 4, 5, 7). The large, ellipsoidal, monocolpate pollen (see Punt and Wessels Boer, 1966) is whitish and smooth-surfaced. It is rather sticky and is shed from the anthers in small clumps, which are frequently found on the ventral surfaces of insects and also on the inflorescence axes, littered among the flowers.

The female flowers (Figs. 4, 6, 7) have 3 distinct sepals, 3 basally united petals, 6 very prominent staminodes, basally connate and strongly adnate to the petals, and a short, trilocular, triovulate ovary surmounted by 3 fused, elongate styles with 3 papillate stigmas that are recurved at anthesis. The lower halves of the styles display a warty, glandular appearance suggestive of the structure of nectaries. Both these translucent stylar protuberances and the fleshy staminodes readily exude fluid when slightly damaged; the fluid gave a reading of 22% in a pocket refractometer, a reading identical to that obtained for nectar concentration.

PHENOLOGY: FLORAL EVENTS OCCURRING OVER SEVERAL DAYS

Asterogyne Martiana is monoecious and markedly protandrous. The pit-closing bracts recurve and roll back (see Uhl, 1966) just before the flowers emerge. The flowers of an inflorescence then open in gradual daily succession, emerging one by one from each floral pit: first the two male flowers, then the female flower.

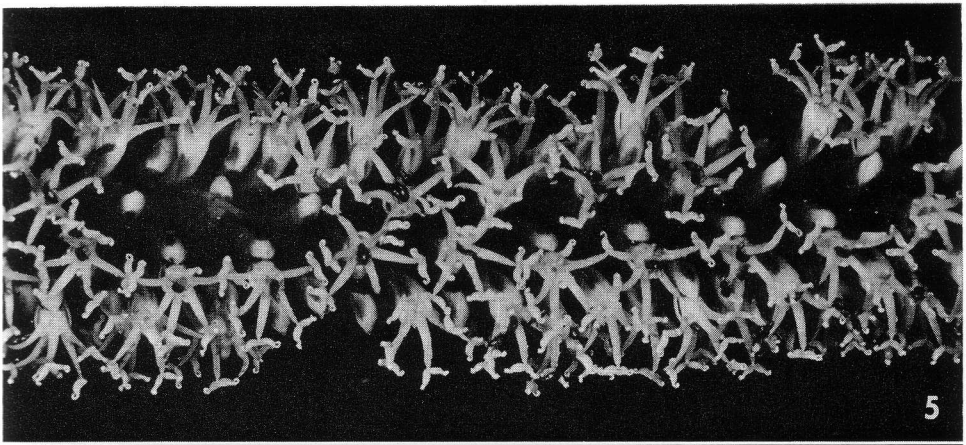
Often the entire inflorescence is covered with flowers (Fig. 2), two flushes of male flowers preceding a flush of female flowers. In other cases flowers emerge basipetally on the spikes, so that on the first day only the tips of the spikes have male flowers, on the second day the middle parts of the spikes are in flower, on the third day the bottom portions of the spikes are in flower, and on the fourth or fifth day the second set of male flowers or the set of female flowers may emerge, either in small groups or as a flush. Wendland (1856) reported that the female flowers of an inflorescence appear four to six days after the male flowers, but at La Selva the former generally appeared within a day or two of the latter. Thus, although it is possible for all the buds of an inflorescence to open completely within three days, five or more days are usually required.

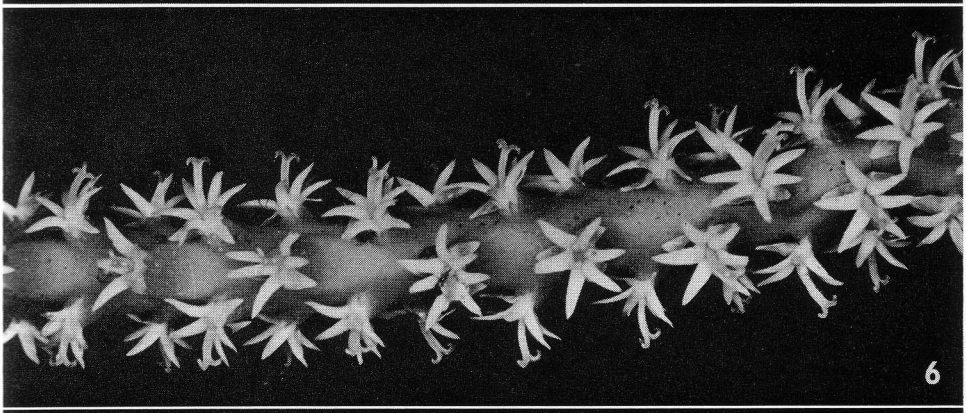
Two flowers generally do not occur at one pit at the same time. Occasionally two male flowers may occur together at a pit site, but more commonly a male flower and an emerging bud occur side by side at one pit. Only very rarely do a male and female flower occur together at the same pit site (Figs. 3, 4, 7) or even at different sites on the same inflorescence. In addition, only one inflorescence of a plant is usually in flower at any one time, other inflorescences on the plant bearing only buds or fruits. Of

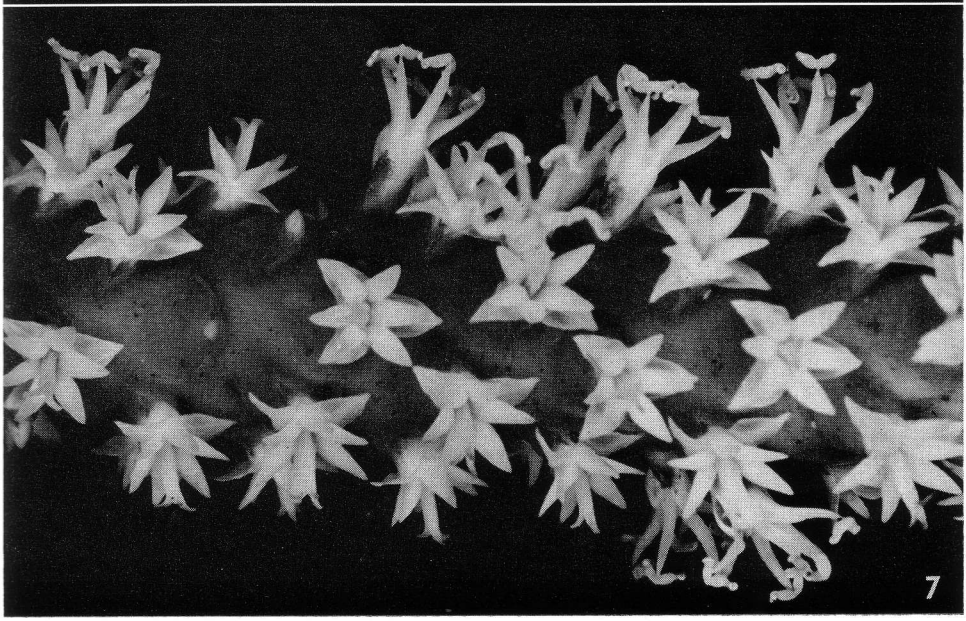
---

→

5–7. Portions of inflorescence branches of *Asterogyne Martiana*. Fig. 5, male flowers, 7:57 A.M. × 2.0. Fig. 6, female flowers, 8:15 A.M., × 2.0. Fig. 7, enlargement of Fig. 3, an atypical situation with both male and female flowers occurring together at the same pit sites, 12:10 P.M., × 3.9.


5


6


7

some 50 plants observed in flower, only one bore two flowering inflorescences concurrently: on the first day both inflorescences bore only male flowers, on the second day one inflorescence had male and the other female flowers, and on the third day both inflorescences bore only female flowers.

Thus, allogamy (cross-pollination) is the rule, usually consisting of xenogamy (pollen transfer between flowers of different plants). Geitonogamy (pollen transfer between two flowers on the *same* plant) is extremely unlikely; only rarely do male and female flowers occur *at the same time* on the same inflorescence or on different inflorescences on the same plant. The unisexual nature of the flowers, of course, prevents autogamy (self-pollination).

According to Allen (1956), in Costa Rica flowers of *Asterogyne* normally appear in late January or early February, followed in March by the small fruits. At Osa in late July and at La Selva in early August all reproductive stages were present, from newly emergent inflorescences with flower buds to old inflorescences bearing mature fruits. It would be interesting to determine if there is greater flowering in the dry season (see Janzen, 1967). I suspect, however, that flowering is more or less continuous throughout the year.

Since each plant produces twice as many male as female flowers, each lasting one day, one might expect a census of plants in flower to reveal this ratio, especially if the census were taken over an extended period of time. However, a census of plants in flower at La Selva on August 1–6 yielded 61 plants bearing male flowers and 20 plants bearing female flowers. Presumably this variance from the expected 2:1 ratio is because it takes two to six days or longer for *all* the male flowers of an inflorescence to emerge from the floral pits, whereas the female flowers of the inflorescence require only one day, at most two, to emerge. That is, flowering in the male condition is prolonged, accentuating the protandry and thus ensuring a longer period of time in which pollen will be available for transport to the female flowers.

PHENOLOGY: FLORAL EVENTS OCCURRING IN ONE DAY

Most male and female flower buds start opening around dawn (5:00 A.M.). Some buds open as early as 4:40 A.M. (but never before 4:30), whereas a few open only by 5:30 or later. Initially both male and female flowers are closely appressed against the spikes, but within an hour or so of anthesis the flowers reflex abaxially about 60° so that their exserted axes are nearly perpendicular to the spike axes (Figs. 3–7).

By 6:00 A.M. most anthers have completely dehisced, in the manner described above. Stingless bees (Apidae: *Trigona* spp.) were observed collecting pollen as early as 5:20 A.M. Pollen is copiously produced. Gravity and the action of insects scatter much pollen onto the spike axes, around the male flowers. By 9:15 A.M. most anthers have lost nearly all their pollen.

The flowers of both sexes have a strong, sweetish fragrance reminiscent of honeysuckle or gardenia. The scent is noticeable from dawn on, although its strength is somewhat variable throughout the morning.

Nectar production in the male flowers seemed to begin about 7:30 A.M. Nectar is abundantly produced from 8:00 to 9:00 A.M., so much, in fact, that it frequently fills the staminal tube. Traces of nectar were evident in flowers collected as late as 9:30 A.M.

Nectar production in the female flowers begins somewhat earlier and is less abundant than in the male flowers.

Traces of nectar were evident in flowers examined as early as 6:45 and as late as 9:25 A.M. Nectar from both male and female flowers gave a reading of 22% in a pocket refractometer.

Pollen was first observed on stigmas of flowers collected at 7:36 A.M. Fewer than five pollen grains of the palm were generally present on the stigmas of a flower, but this small quantity is more than adequate to effect fertilization since only one of the three ovules in an ovary develops.

Insect damage to the flowers increases as the day progresses. By 9:30 A.M. damage from chewing insects (mainly Coleoptera) was often considerable. The petals and stamens of the male flowers and the fleshy staminodes of the female flowers are especially susceptible to insect mutilation.

Both male and female flowers last one day. Male flowers, unfertilized female flowers, or the upper withered portions of fertilized female flowers (see Burret, 1930, p. 141) begin to fall from the inflorescences by noon; some male flowers were dropping from the spikes as early as 11:05 A.M. By 4:30 P.M. the spikes had lost most of their flowers. After flowering is completed, the pit-closing bracts reflex adaxially to reseal the floral pits, later rolling back to allow the exsertion of the enlarging fruits. Spent flowers which may happen to remain on the spikes the following day evoke almost no attention from insects, and then only from Coleoptera. Afternoon wind and rain probably accelerate the shedding of the flowers from the inflorescences.

Literature Cited

Allen, P. H. 1956. The rain forests of Golfo Dulce. University of Florida Press, Gainesville, Florida. xi, 417 pp.

Burret, M. 1930. Geonomeae Americanae. Botanische Jahrbücher 63(2):123–270.

Janzen, D. H. 1967. Synchronization of sexual reproduction of trees within the dry season in Central America. Evolution 21(3):620–637.

Moore, H. E., Jr. 1966. *Aristeyera*, a new genus of geonomoid palms. Journal of the Arnold Arboretum 47(1):1–8.

———. 1967. Two new American palms. Journal of the Arnold Arboretum 48(2):143–151.

Punt, W., & J. G. Wessels Boer. 1966. A palynological study in geonomoid palms. Acta Botanica Neerlandica 15(2):266–275.

Schmid, R. 1969. [Low-contrast] Copy negatives from color. Industrial Photography 18(5):32–33, 80–82, 84–86.

Uhl, N. W. 1966. Morphology and anatomy of the inflorescence axis and flowers of a new palm, *Aristeyera spicata*. Journal of the Arnold Arboretum 47(1):9–22.

Wendland, H. 1856. Einige neue Palmen Amerika's. Linnaea 28:333–352.

Wessels Boer, J. G. 1968. The geonomoid palms. Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde, Tweede Reeks, 58(1):1–202.

Epiphytes That Strangulate Palms

T. A. Davis

Indian Statistical Institute, Calcutta, India

Especially in the evergreen tropical forests with heavy rainfall, the various plant communities strikingly demonstrate their struggle for existence by competing with each other. As the primary problem of the plants under such environments is receiving adequate sunlight, different species undergo various modifications in their habits in order to win over their neighbours. A sturdy-stemmed tall tree, for instance, is surpassed by a slender-stemmed, fast-growing liana which twines over and expands its leafy surface over the foliage canopy of the former.

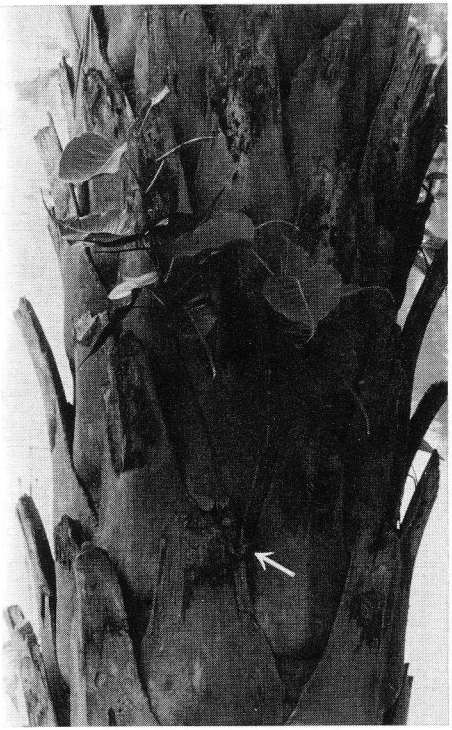
In mixed plant communities, some plants may cooperate with each other for their mutual benefit, both existing as active partners. This phenomenon is referred to as symbiosis, and the participants are known as symbionts. In lichens for example, the algae and the fungi live in mutual partnership. Some plants, on the other hand, are parasitic and depend on their host plants completely or partially for their nourishment. *Cassytha, Cuscuta, Orobanche* and *Rafflesia* may be examples of complete or holoparasites. *Loranthus, Viscum,* and *Santalum* are examples of partial or hemiparasites.

A third category of plants which is relevant to the present study is the epiphytes which grow on other plants, but never derive food from them. They usually absorb moisture from the atmosphere by means of special aerial roots. But the roots of a few other epiphytes as the ones illustrated in this article reach the soil in course of time and absorb from it moisture as well as minerals. The epiphytes that abound the tropical rain forests are mostly from the families Orchidaeae, Piperaceae, Bromeliaceae, Araceae and a few genera of Urticaceae, Loranthaceae and Cactaceae. Among the non-flowering plants, the most important ones are the lichens, and the illustration by Hodge (1956) of lichens on the trunk of a palm is particularly impressive. Various algae, mosses and ferns are also often found to be epiphytic on other plants.

Palms, being primarily tropical dwellers, are not spared by epiphytes, although fortunately they are not hospitable to major plant parasites. In India, two species of *Ficus, F. religiosa* and *F. bengalensis* are the most common epiphytes among the angiosperms. They start as epiphytes on the palm trunks, but eventually when their roots reach the soil they grow into massive trees. These fast-growing epiphytes very soon envelop the palms, cast shadow on their crown and eventually kill them by strangulation. In the course of time, it is hard to find any trace of the original palm as the territory is fully occupied by the *Ficus.* In the following pages a few examples of *Ficus* species strangulating palms as well as three members of Araceae epiphytic on palm trunks are reported.

Ficus religiosa

As its name suggests, *Ficus religiosa* is a sacred tree to most Indians and Southeast Asians. It was while meditating under one such tree that Lord

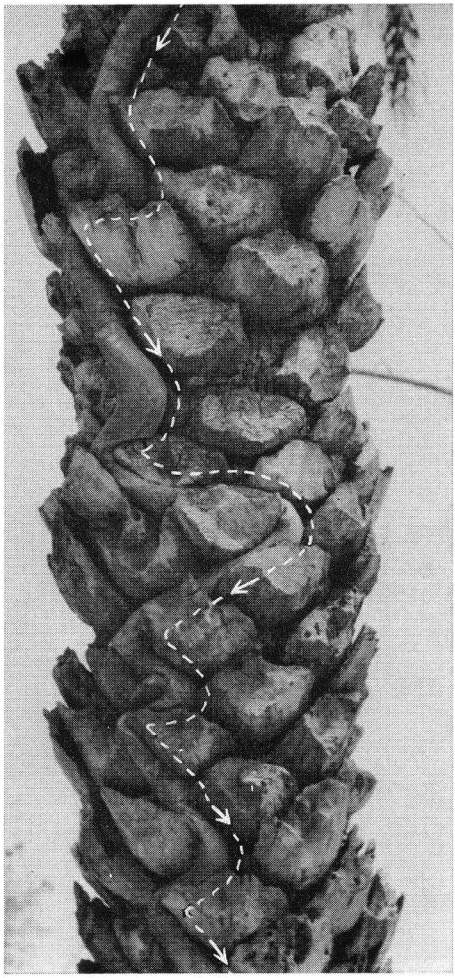


1. A young *Ficus religiosa* seedling springing from a leaf axil of *Phoenix sylvestris*. The arrow indicates the foot of the *Ficus*.

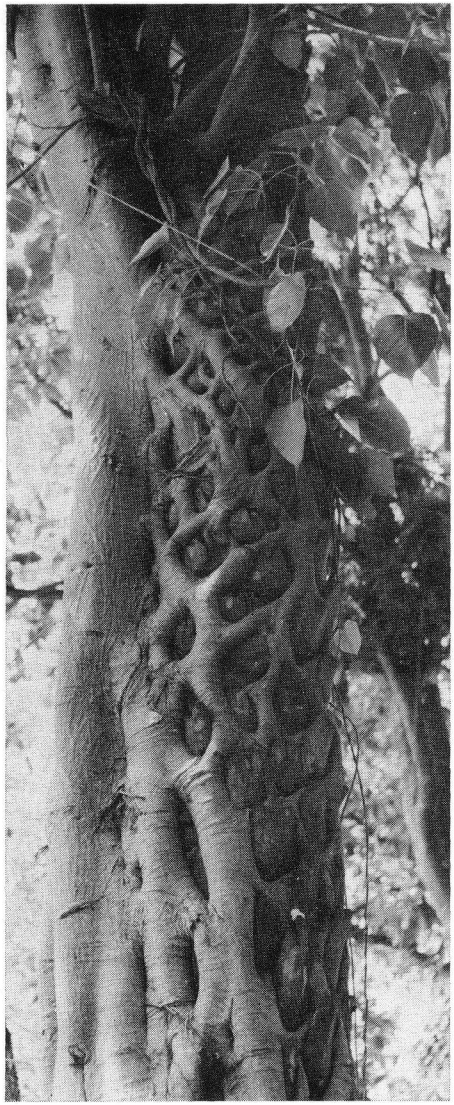
Buddha attained Divine Wisdom, and the tree in many Indian languages is known as the Tree of Wisdom. It is a tremendous task for the devout Buddhists to preserve the original tree under which Lord Buddha meditated a little less than twenty-five centuries ago. The Hindus also consider this tree very sacred, and in practically every temple there is a *F. religiosa* tree. The religious sentiment is so powerful in India that this tree provides dwelling places to many on public road-sides. Devotees plant a tree on a public road-side and erect a small stone image under it and offer prayers to it. As the tree expands, the area of the place of worship also widens sufficient for a family to live in. Gradually a small tea shop or the like may spring on one side of the temple, a source of income for the inmates of the house. No one dares to disturb such houses. Though this tree is a great nuisance and even a potent danger to houses, Hindus and Buddhists do not venture to fell them or even lop their shoots. But when it is unavoidable, the pious people call in Muslim laborers to do the job. Mostly on account of this attitude many palms are allowed to be killed by the *Ficus*.

In Fig. 1 is seen the trunk of a *Phoenix sylvestris* having numerous persistent leaf bases. From the axil of a leaf base, a young *F. religiosa* seedling springs up. *Ficus religiosa* and a number of other *Ficus* species thrive excellently in Bengal, fruiting during the warmer months. The ripe fleshy fruits are enjoyed by many species of birds, especially the common crows and mynas feasting on them. The numerous small hard seeds swallowed by the birds pass out unharmed along with the droppings. There is good chance of these seeds getting deposited within the leaf axils of palms as the birds often prefer to perch on palms. Monsoon immediately follows the fruiting season and the seeds start germinating. The decaying leaf bases as well as the dust and humus materials deposited at these leaf axils by wind form an excellent medium for the seedlings to get established. The closely packed leaf bases function as efficient insulation material against desiccation, and so the *Ficus* seedlings get sufficient moisture even when none of their roots reached the soil.

After getting established thus, the *Ficus* seedling in its attempt to expand itself quickly sends downwards one or two primary roots so as to reach the soil for extra nourishment. The problem of descent over the rugged surface of the stem is not an easy job which may amount to getting out of a complicated

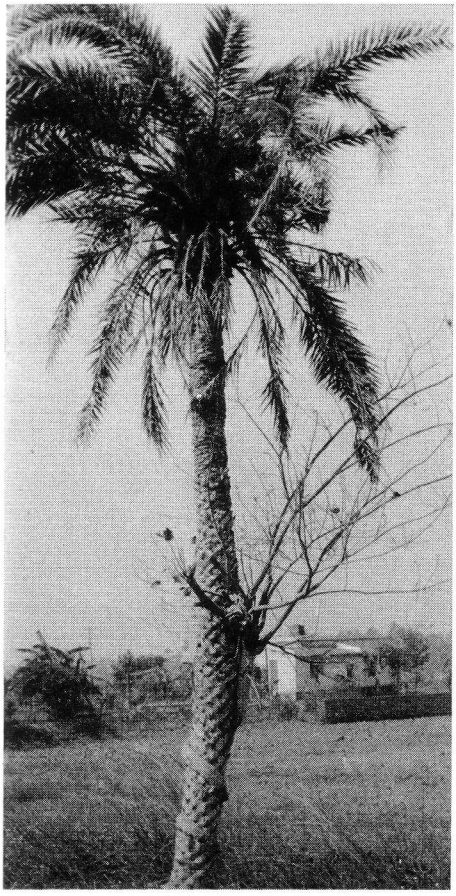


2. The descent of a *Ficus* root between the leaf bases of *Phoenix sylvestris*.

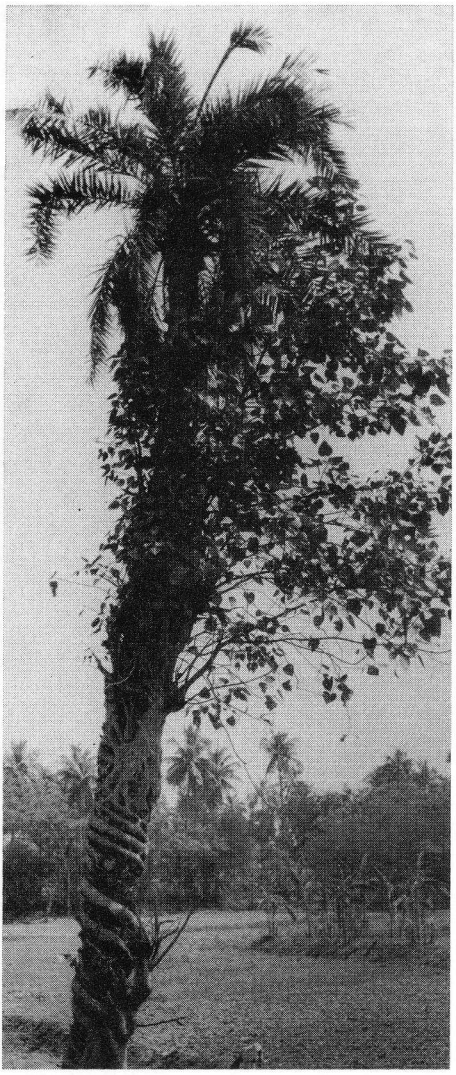


3. The main "root-stem" of *Ficus religiosa* showing a network.

maze. The root being slender and delicate to begin with, in its attempt to protect itself from desiccation and damage from insect pests, descends through the narrow spaces available between successive leaf bases. The leaves of *Phoenix sylvestris* are arranged spirally on the trunk, and so the leaf bases do not provide a vertical passage. Thus, the roots struggle, and prompted by the gravitational attraction, they make zig-zag movements between leaf bases and eventually reach the soil after producing long but essential root-lengths. A closer view of one such root on a palm trunk is seen in Fig. 2. The dotted white line indicates the direction of the root's descent.



4. A three-year-old *Ficus religiosa* epiphytic on a *Phoenix*.

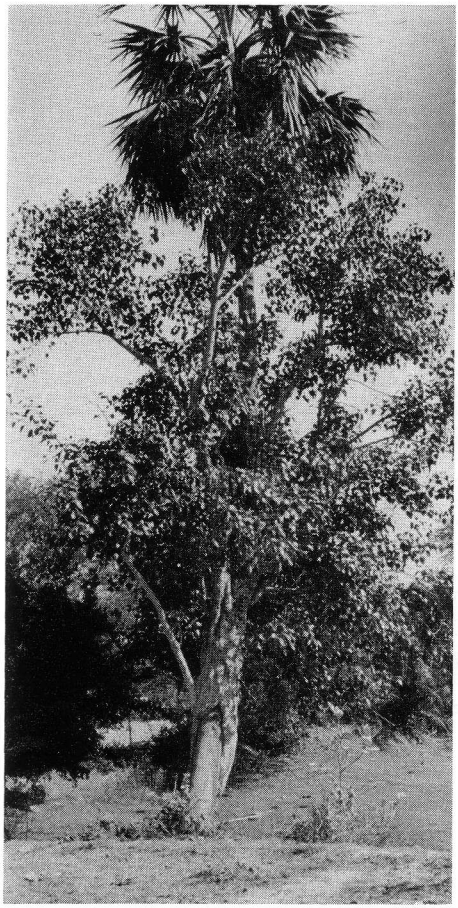


5. Main roots of a *Ficus* descending around a *Phoenix* stem in counter-clockwise fashion.

The next course of action of the *Ficus* is depicted in Fig. 3. One or more roots penetrate the soil while their aerial portions rapidly increase in girth eccentrically, expanding towards the periphery, the only direction available for expansion. Thus they bulge outside the crevices of leaf bases. Very soon, more or less a vertical "root-stem" is formed as is clear from Fig. 3. At this stage, several lateral roots are produced slantingly at all heights which in turn produce further orders of rootlets slantingly forming rectangular islands between them. This pattern is inevitable because of the peculiar arrangement of the leaves. The tips of leaf bases enclosed within the cells await their turn to be completely covered by the rapidly expanding root-mat of the epiphyte. Co-



6. A single root of a *Ficus* descending a *Phoenix* trunk in clockwise fashion.



7. A massive *Ficus religiosa* enveloping a *Borassus flabellifer.*

alescing of rootlets or fusion of parts of rootlets at intervals are peculiar with *Ficus* sp. The rootlets get firmly sealed to each other in a criss-cross pattern and finally coalesce into a single hollow cylinder around the palm. Usually the seeds of *Ficus* get deposited in leaf axils at fairly high levels, and so the newly formed tubular stem of the epiphyte covers a great height of the palm trunk. As the "stem" gets thus fortified, the shoot of the epiphyte enlarges speedily and progressively annihilates the host. Figures 4 and 5 demonstrate this phenomenon. The epiphyte in Fig. 4 is about three years old and had shed its leaves at the time of photographing it. The *Ficus* in Fig. 5 is about eight years old and has firmly established itself, many of its roots having penetrated the soil. Its leafy shoots have grown sufficient to reach the level of the palm's crown. Within a couple of years the *Ficus* is bound to overpower the *Phoenix.*

In Fig. 6 what appears like an anaconda stifling a helpless victim is nothing but a *Ficus religiosa* in the process of finessing and strangulating a *Phoenix sylvestris* palm. The development of a single but prominent root of *Ficus* is very striking as it grips the stem in clockwise direction. The taproot or the primary aerial root starting from the base of the epiphyte descends left-handedly. At some level before reaching the ground, this root changed its direction, but very soon got back to the original course before reaching the ground. The leaves on a trunk are arranged in clockwise or counterclockwise fashion. As the leaf spirals provide distinct and continuous spiralling channels between them, following this course is much less of an obstacle for the roots. The expansion of the root takes place vertically and after some time the entire root envelops the stem. In some palms, the epiphytes emit more than one main root, each following the channel between two leaf spirals as seen in Fig. 5. Here coalescing of roots can take place quickly unlike the case in the specimen of Fig. 6. Another difference noticed between the roots of these two plants is the opposing directions they chose to grow downwards.

Three instances of *Ficus religiosa* epiphytic on *Borassus flabellifer* are described below. *Ficus* thrives more on *Phoenix sylvestris* than on *Borassus flabellifer.* In the latter species, the stem is more or less devoid of persistent

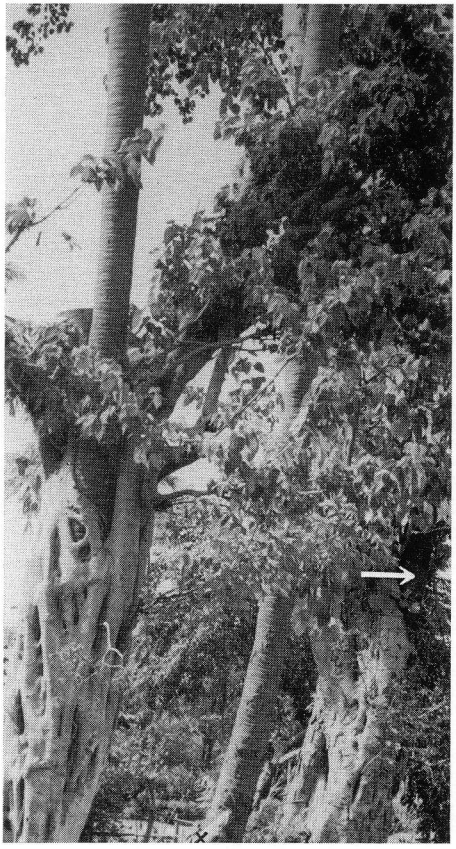


8. A closer view of "windowed" sheathing roots of *Ficus religiosa.*

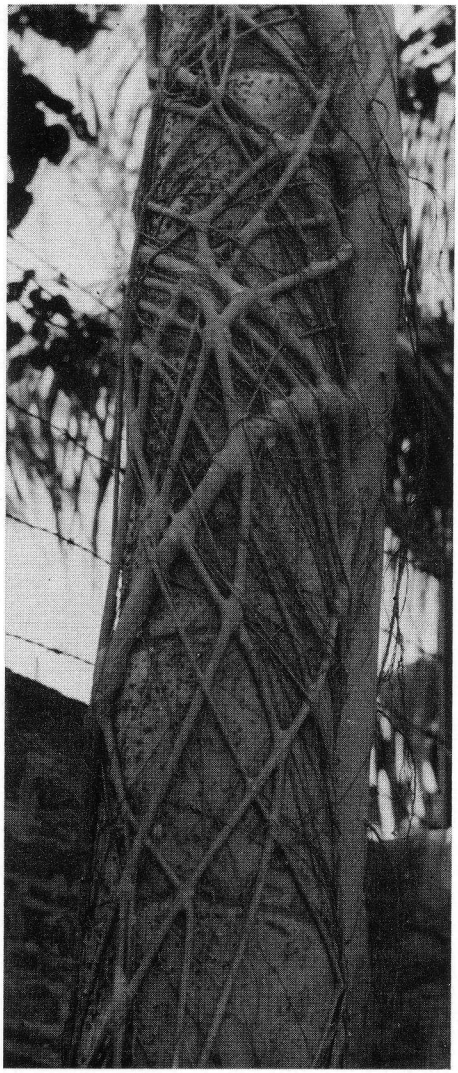
leaf bases as compared to that of *Phoenix*. So there are fewer chances of the epiphyte getting established on these trunks. Moreover, the root system of *Borassus* is much harder and closely-set than that of *Phoenix,* and it could be a tough struggle for the *Ficus* roots to penetrate the hard root-matting of *Borassus*. In addition, the trunk as well as the crown of *Borassus* are much sturdier than those of *Phoenix*.

The massive epiphyte, *Ficus religiosa* in Fig. 7 has surrounded the *Borassus* trunk all around excepting at the base where the stem is partially visible. The palm seems to be little affected by the epiphyte as it continues to produce a good number of fruits each year. Also the trunk has not diminished in girth. Figure 8 is a closer view of the base of another *Borassus* gripped firmly by *F. religiosa*. As the roots expand rapidly, the "windows" through which the palm trunk is visible will be soon covered up. This *Borassus* is also not seriously harmed by a massive epiphyte.

In Fig. 9, there are three *Borassus* palms infested by *F. religiosa.* The trunk of the palm at the right end which is not clearly visible is indicated by the arrow. These palms are growing on a roadside near the Calcutta airport. The lower trunk of the palm on the left has been completely covered by the roots of the *Ficus*. However, the shoot has not expanded as much as it could because of its being pruned periodically to avoid obstructing the telegraph and power lines. The palm at the extreme right is also fully engulfed by the epiphyte. However, the middle palm is covered only by a stump (marked X) of the *Ficus* as



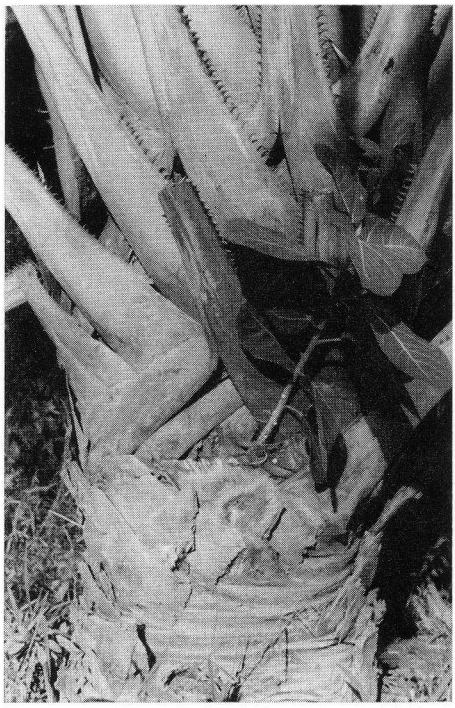
9. Three *Borassus* stems partially covered by *Ficus religiosa.*



10. A reticulate root-matting of *Ficus religiosa* on the trunk of *Caryota urens.*

most of the original plant was destroyed by a serious attack of the lac insect (*Laciferus lacca*).

In Fig. 10 is seen the lower part of the trunk of *Caryota urens* that was growing at the premises of the Indian Statistical Institute, Calcutta. Since the stem of *Caryota* is smooth, having no persistent leaf base, the epiphyte should have had its access to the palm through the axil of a living or drying leaf. Soon a few roots must have twined around the stem and supported the shoot even when the supporting palm leaf had fallen. I noticed this tree only at a very late stage when the epiphyte struck many roots into the soil and the palm was about to be fatally damaged. The epiphyte's enormous foliage engulfed the entire palm crown. Though the *Caryota* was growing very close to an open farmyard manure pit with plentiful nutrients avail-



11. A seedling of *Ficus bengalensis* growing from a *Corypha elata* leaf axil.

able, the palm was not allowed by the epiphyte to produce even the first terminal spadix. The root-matting of the epiphyte has an impressive look (Fig. 10). The fusion at junctions of rootlets moving one across the other resembles welding together of thin and thick metallic rods in a tubular mantle. The *Ficus* has established itself into a large tree after the palm died.

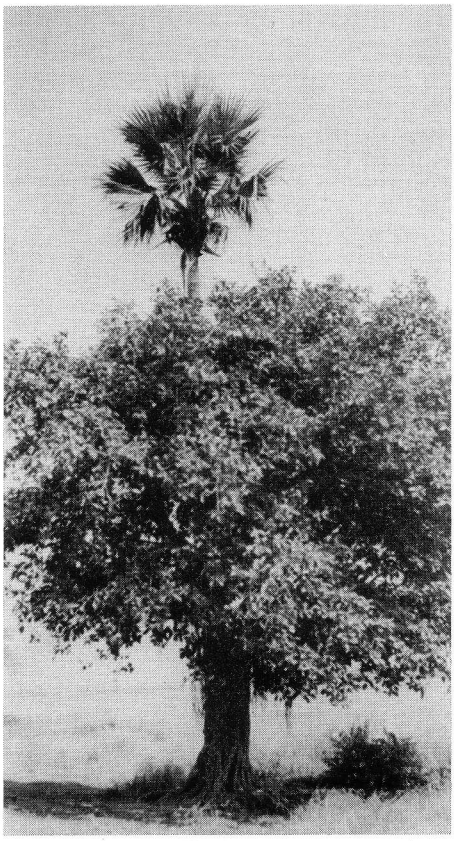
Ficus bengalensis

Being a native tree, *Ficus bengalensis* (the common banyan) thrives luxuriently in Bengal (Northeastern India). The great banyan tree growing at the Indian Botanic Garden, Calcutta, with its 1100 or more proproots that function as "stems" and straggling to about 1500 feet along the circumference is perhaps



12. *Ficus bengalensis* "embracing" a *Phoenix sylvestris*.

the largest living *F. bengalensis*. This tree is honoured especially in literature as a benevolent protecter of all who go under its shade, and adopted as the Emblem of Madhya Pradesh, a state in central India as well as the State Bank of India. It is worth mentioning that it is

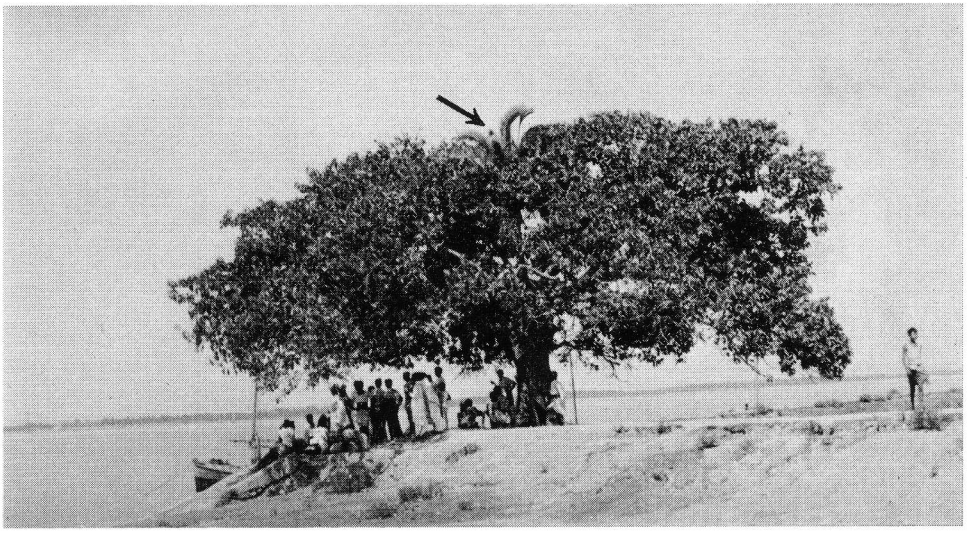


also the emblem of our Indian Statistical Institute. However, to many species of trees including palms, the banyan is not a good neighbor. In Bengal and to a lesser degree in other parts of India, this tree starts its development as an epiphyte, the way *F. religiosa* generally grows, on other trees. In addition to many species of dicotyledonous trees that are strangulated, the banyan also causes death to some palms, though not as often as *F. religiosa.*

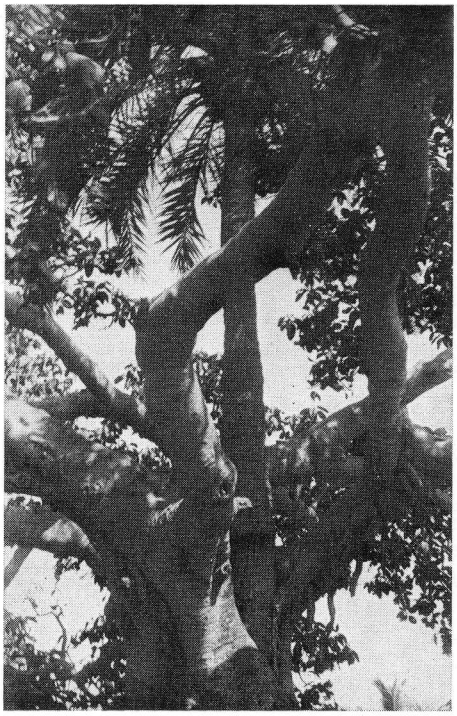
A young banyan seedling which survives exclusively as an epiphyte in the crown of a young *Corypha elata* palm is seen in Fig. 11. *Corypha* retains persistent leaf bases for a considerably long time after the withering away of the lamina. This tree is not inhabited by many epiphytes. Though the species is rare in India there are over a hundred individuals of this species growing at the Indian Botanic Garden, and practically

←

13. An epiphytic banyan that has developed into a large tree.



14. The arrow points to the distal crown of a *Phoenix* which is about to be exterminated by a massive banyan.



15. Inner view of the host-epiphyte contact of the trees in Fig. 14.

all of them are free from such large epiphytes.

In Fig. 12, a middle-aged *Phoenix sylvestris* is covered with a banyan up to the base of the crown. Obviously the root tips have reached the soil and their aerial portions are in the process of spreading over the entire surface of the palm trunk. This palm is standing on the bank of river Hooghly (south of Calcutta) and the moisture has induced the several hanging roots visible in the illustration. The *F. bengalensis* enveloping the stem of *Borasus flabellifer* in Fig. 13 has developed into a full-grown tree. Yet its shoots are unable to suppress the palm crown. There is no trace of the palm trunk visible up to about fifteen feet from the ground as the *Ficus* has developed a tubular "stem" around it. It looks as though the *Ficus* will not be able to win the race by overgrowing the *Borassus*. On the other hand it expands laterally.

An impressive view of how a *Ficus bengalensis*, starting as an epiphyte on a *Phoenix sylvestris*, encroaches on the latter leading to a stage of acute strangulation is seen in Fig. 14. This *Ficus* is capable of giving shelter to a hundred people and stands at a ferry point on the Hooghly river, 30 miles south of Calcutta. In Tamil literature, the banyan is eulogised as the tree growing out of a seed the size of an egg of a small fish, but spreading to such vast dimensions as to give shelter to a king and his huge army. The tree in Fig. 14 also started as an epiphyte on a *P. sylvestris* and the host tree just survives, its distal leaves being pointed to by the arrow mark. Considering its present height, the epiphyte must first have been established at the crown of the host when the latter was about half its height. The portion of the trunk below this has been completely encompassed by the banyan whose shoots at the beginning obviously concentrated on lateral development. Since the locality adjoins a wide river, there are strong winds, thereby height can be a decided disadvantage. The banyan has eventually spread out around the palm allowing a part of its crown to just peep out through its dense foliage as seen in Fig. 14. A view of the upper portion of the palm as visible from underneath the banyan showing some portion of its trunk is seen in Fig. 15. The palm is likely to be stifled to death in a couple of years. To support the above presumption, I present the photograph (Fig. 16) of a banyan which has killed its original host. The lower part of the stem of the host, *Phoenix sylvestris* which is clearly visible is not fully enveloped by the expanding roots of the foe. Within a radius of 50 miles from Calcutta I have



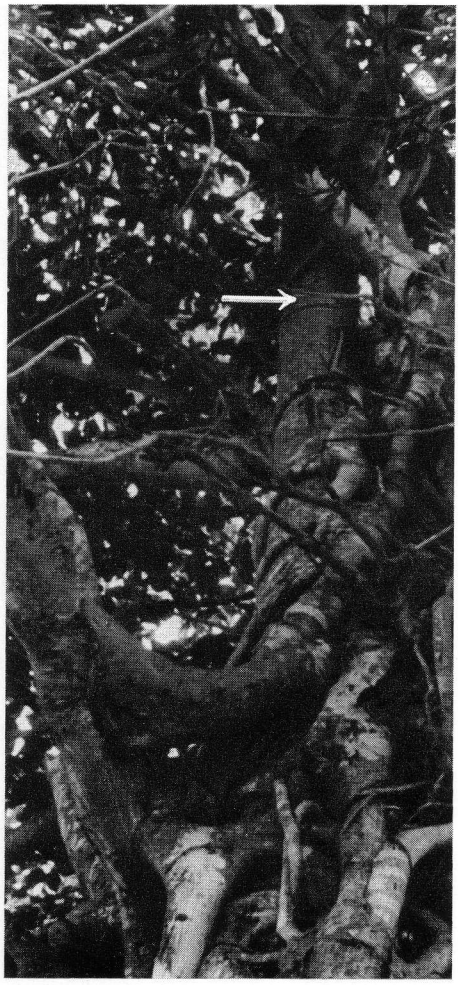
16. The epiphytic banyan stifled its host *Phoenix sylvestris.*

examined several huge *Ficus religiosa* and less frequently *F. bengalensis* trees showing some remnants of *P. sylvestris* trunk or a gap which would indicate the former position of the palm trunk within their "stems."

Another instance of *F. bengalensis* sapping a palm is seen in Fig. 17 where the victim is a delicate but elegant ornamental palm, *Livistona chinensis*, photographed at the premises of the Drug Research Institute, Lucknow (India). There



17. A *Livistona chinensis* under a banyan tree.



18. *Livistona rotundifolia* trunk entangled by the aerial roots of a banyan.

were many *L. chinensis* planted at this Institute along with several other flowering and shade trees, one being *F. bengalensis*. The latter has spread out its shoots and surpassed the expectation of the horticulturists. So much so that the banyan has shadowed and dwarfed many neighbouring trees. The several proproots hanging from the heavy banyan shoots are a great menace to other plants, one of the victims being a *Livistona chinensis* (Fig. 17) which has no chance of escape from these "octopus tentacles." Not only have the aerial roots entangled the trunk, but also the crown has come entirely under the canopy of the banyan. In the present case, the killer of *L. chinensis* did not commence as an epiphyte, but as a neighbour with just the right to live as the other neighbours. In Fig. 18 is seen the lower portion of the trunk of a *Livistona rotundifolia*



19. *Philodendron* sp. climbing on a stem of *Caryota mitis*.

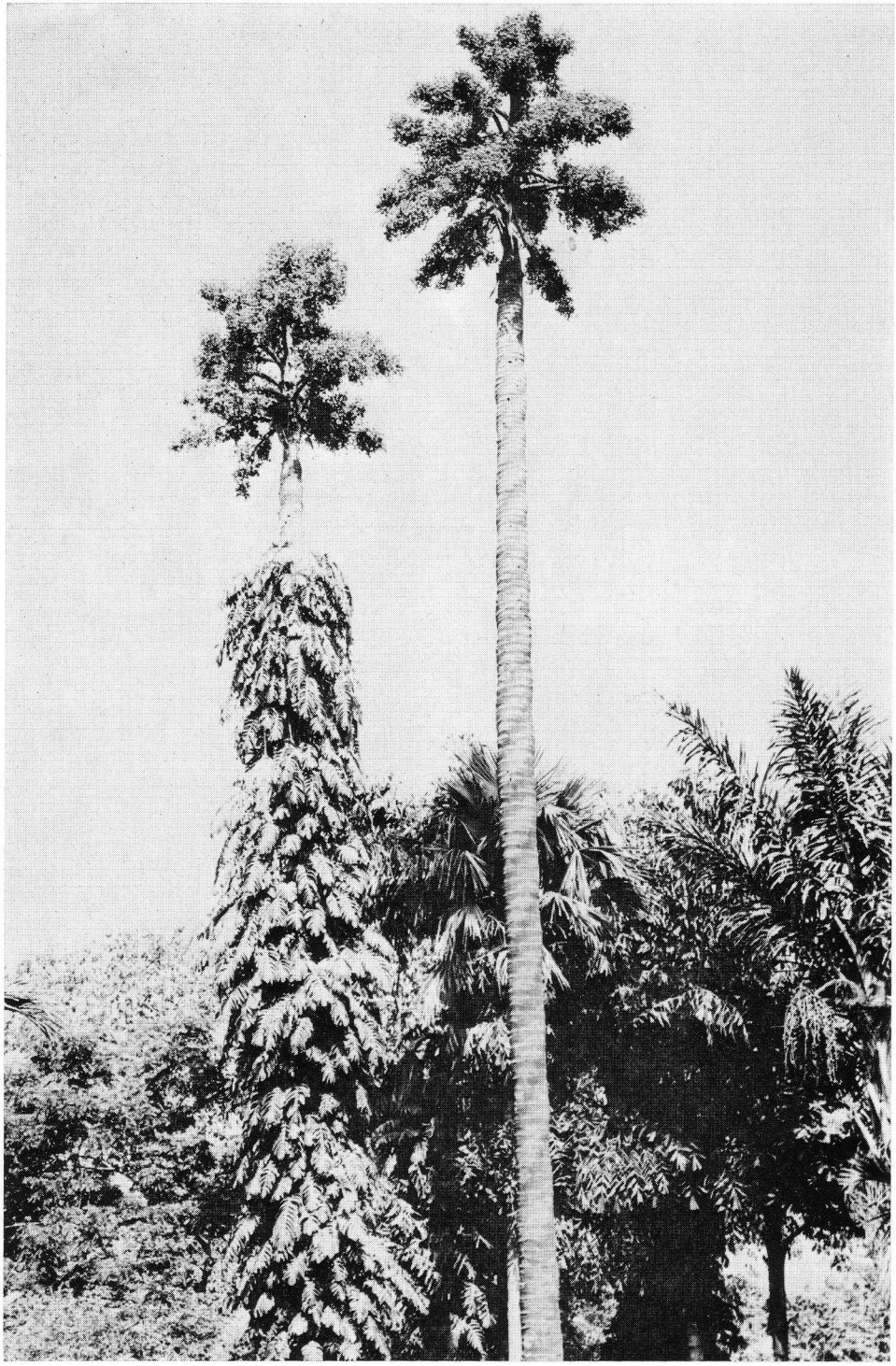
being completely overgrown by the aerial roots of *F. bengalensis* at the same Drug Research Institute. The redeeming feature in the present case is that the crown of the palm is well above the canopy of the banyan and looks as if it can never be overcome by the banyan.

Ficus aurea

Smith (1956) described with striking illustrations a *Sabal palmetto* being strangled by *Ficus aurea* which he observed at N. Wild Olive Avenue, Daytona Beach, U.S.A. which region is not the usual habitat of the killer *Ficus*. According to Smith, "birds deposit the fig seeds in the high boots of the palmettoes or on the branches of other trees, whence aerial roots descend to the ground and forms stems which gradually surround the host trunks and merge there. In time the host dies of strangulation, the trunk slowly decays and crumbles, and the woody fig enormously expands its own trunk to fill the vacated space, so that eventually no evidence of the murder remains."

Philodendron

Palms have several other epiphytes, man being responsible for some of them since palm trunks serve as ideal supports for ornamental creepers such as *Philodendron, Scindapsis, Pothos, Raphidophora* and the several species of orchids and cacti. Hodge (1959) published two most captivating pictures of palm trunks beset with ornamental plants. A species of *Echeveria*, which by nature is not epiphytic, planted on the trunk of a robust young *Phoenix* sp. growing in Mexico has a distinctive appearance. The other picture of Hodge shows orchids and ferns growing wild as epiphytes on the smooth trunk of a cultivated *Caryota* sp. There are several oil palms (*Elaeis guineensis*) in Malaysia bearing on their trunks several species of orchids and ferns as well as seedlings of the palms themselves. Though epiphytes usually stick to the trunks having persisting leaf bases or similar rough surfaces, in parts of Kerala State (India) even the smooth-stemmed coconut offers support to several species of orchids and other epiphytes.



20. *Raphidophora* sp. epiphytic on *Corypha elata.*

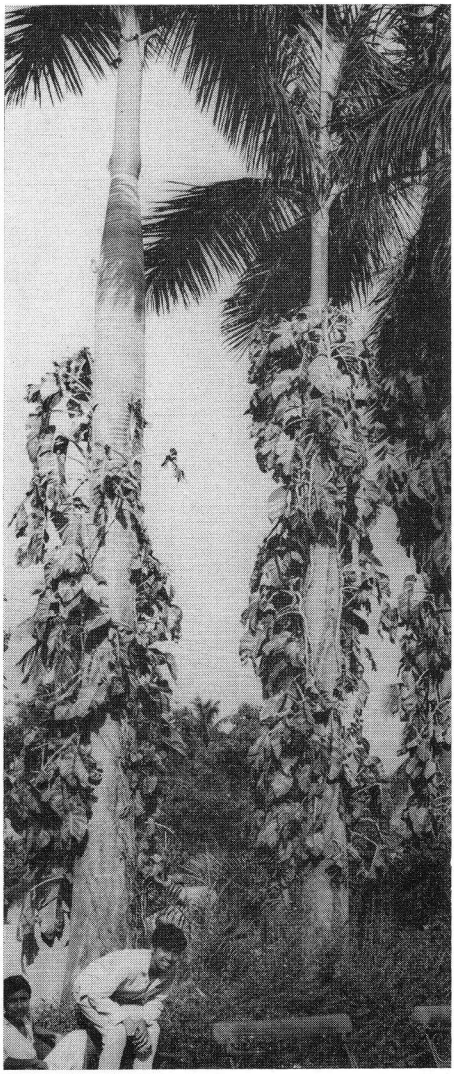
Caryota mitis is a smooth-stemmed clustering palm. Several such clumps are grown inside the Large Palm House of the Indian Botanic Garden, Calcutta. To enhance the beauty and to utilise the space more effectively, some of these palms are used as supports for the araceous epiphyte, *Philodendron* sp. as the one seen in Fig. 19. The several uniform roots that move downwards and cover the stem do not expand as those of *Ficus*. The leaves with deeply lobed lamina grow elegantly often obstructing the growth of the *Caryota* itself.

Raphidophora

Raphidophora sp. of the Araceae with its large, incised, dense leaves makes a good ornamental climber. Palm trunk forms ideal support for this species. At the Indian Botanic Garden, one will be able to see the view shown in Fig. 20 till about the end of 1970. The epiphyte has covered practically the entire trunk of one of the two stately *Corypha elata* palms with young fruits and shed leaves. The chances of *Raphidophora* choking the crown of *Corypha* is no longer possible as the palm is completing its normal life unhampered by the epiphyte.

Scindapsus officinalis

Growing money plant (*Scindapsus officinalis*) indoors or on garden trees is very common throughout India. The several small climbing roots produced at the nodal as well as internodal regions of the weak stem enable the ornamental plant to be an efficient epiphyte. It can get attached to even steep walls or even on smooth surfaces. In Bengal, where *Roystonea regia* adorns practically every park, *Scindapsus* with its large variegated leaves enhances their beauty by spreading on the trunks of these royal palms. The view seen in Fig. 21 is taken in a Calcutta suburb.



21. *Scindapsus officinalis* creeping on the trunks of *Roystonea regia*.

The photographs for Figures 4–6 were taken by Mr. S. K. De of the Crop Science Unit of the Indian Statistical Institute.

LITERATURE CITED

HODGE, W. H. 1959. Palm trunks as living planters. Principes 3:77, 93–95.
SMITH, D. 1956. Principes 1:1, 3.

A Study of Germination and Use in Twelve Palms of Northeastern Peru

CHARLES B. JORDAN

Escuela Nacional de Ciencias Forestales, Apt. Postal #2, Siguatepeque, Depto. Comayagua, Honduras, C. A.

While working in the Peruvian Amazon in 1966–67 as a member of the United States Peace Corps, I had an opportunity to conduct some experiments on the germination of seeds of 12 species of palms that are common to this region, and in addition to note some of their local uses. The collection of seeds and information for this experiment took place within a 20-mile radius of the town of Iquitos, last seaport on the Amazon River. The actual germination of the seeds and care for the seedlings was conducted in an area called Puerto Almendras which is located nine miles to the west of Iquitos on the Nanay River. Some of the seedlings produced by this study have now been planted in this area and it is hoped that continued observation will provide information on growth-rates and age for the species involved, information that is not available today. The facilities and man hours used in this study were donated by the Escuela de Peritos Forestales and the United States Peace Corps. The forestry school mentioned is jointly operated by the United Nations (FAO) and La Universidad National de la Amazonia Peruviana and is located in Iquitos.

Germination

The methods of collection and germination of the palm seeds used in this study were the same for all species involved. The seeds were harvested at the time that they had begun to fall from the trees to insure full development and best possible germination results. Immediately after collection, the seeds were stripped of their fruit coats, washed in water, and allowed to dry in the sun for two hours. This was done to prevent fungal growth that might have hampered germination. After washing, one and sometimes two groups of 100 seeds were sown for each species. The seeds were placed in boxes of sand at a depth of approximately one-half inch. The boxes were then transferred underneath a sideless, 10-foot-high structure which was roofed with green translucent corrugated plastic. To provide drainage and to aid in control of fungal growth, the boxes were elevated to a height of three feet. All groups of seeds were then watered twice a day until such time as it was noted that no more seeds in the group were capable of germinating. The watering times varied from as much as 250 days for *chambira* (*Astrocaryum Chambira*) to as little as 65 days for *cashapona* (*Socratea Orbigniana*). (See Table 1.) Representations of the seeds and their seedlings are shown in the drawings included in this report as Figs. 1–12. These sketches were done by Jim Garcia of Iquitos under the supervision of the author. Note that the ages given for the seedlings represented are only the total days after emergence and do not include the days that development took place under the surface of the sand medium.

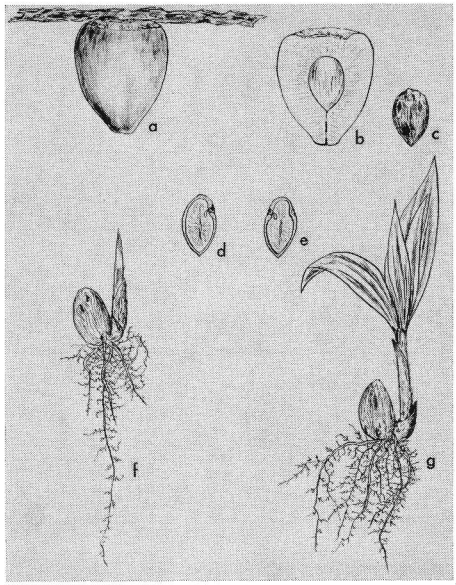
Table 1 names the palms used in this experiment, shows the percent germina-

TABLE 1. *The weights, percent germination, and time required for germination of 12 Peruvian palm species.*

Name	Germination in percentage of 100 seeds	Days allowed to germinate	Weight of 100 cleaned seeds in kilograms
Bactris Gasipaes	76	78	.330
Bactris Gasipaes	99	80	.285
Oenocarpus multicaulis	97	67	.294
Oenocarpus multicaulis	88	74	.290
Mauritia vinifera	7	100	1.750
Mauritia vinifera	8	125	2.370
Mauritiella sp.	4	94	.635
Mauritiella sp.	10	105	.632
Euterpe precatoria	93	89	.167
Euterpe precatoria	95	83	.250
Jessenia polycarpa	99	83	.910
Jessenia polycarpa	80	79	.886
Iriartea ventricosa	79	154	.340
Iriartea ventricosa	18	144	.363
Socratea Orbigniana	79	70	.268
Socratea Orbigniana	79	65	.240
Maximiliana stenocarpa	80	150	.620
Maximiliana stenocarpa	82	148	.660
Astrocaryum Chambira	3	250	4.400
Phytelephas macrocarpa	12	240	4.540
Scheelea sp.	61	146	4.060

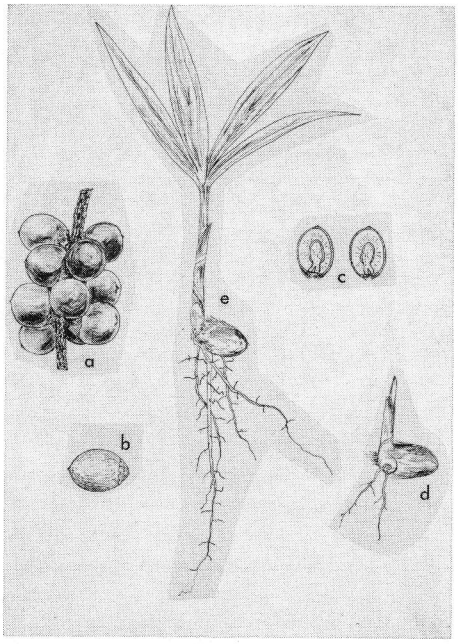
tion for these species based on 100 seeds, gives the number of days required for the germination success noted, and records the weight per 100 cleaned seeds. It is evident from a study of this table that to procure good germination from palms such as *Mauritia vinifera*, *Mauritiella* sp., *Astrocaryum Chambira*, and *Phytelephas macrocarpa*, another method of sowing must be found.

Three basic patterns of germination are known for palms (See Tomlinson,

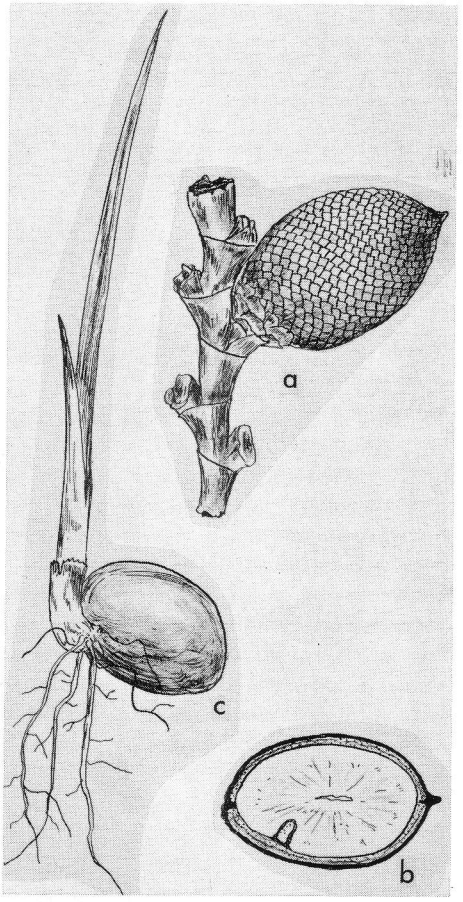


→

1. *Bactris Gasipaes* (*pijuayo*). a, fruit; b, fruit in vertical section to show endocarp; c, endocarp; d, e, endocarp in vertical section; f, seedling when visible leaves were two days old; g, seedling when visible leaves were 31 days old. All × ⅔.



2. *Oenocarpus multicaulis* (*sinami, sinamillo*). a, fruits on rachilla; b, fruit; c, fruit in vertical section; d, seedling when visible leaves were six days old; e, seedling when visible leaves were 63 days old. All ×5/7.



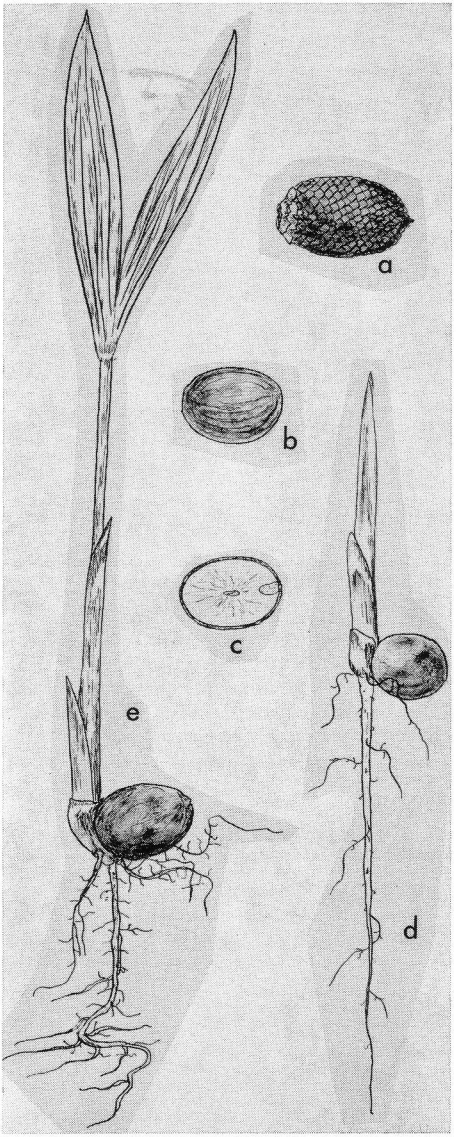
3. *Mauritia vinifera* (*aguaje*). a, fruit on rachilla; b, fruit in vertical section; c, seedling when visible leaves were 43 days old. All ×1/2.

Principes 4:58–59. 1960). The germination type of several of these Peruvian species studied appears not to have been noted previously. All but three have the type of germination characteristic of *Archontophoenix* and many arecoid palms. *Maximiliana* and *Scheelea*, however, appear to germinate like *Phoenix*, while *Phytelephas* germinates like *Washingtonia*. In one fruit of *Maximiliana* all three seeds germinated (Fig. 9).

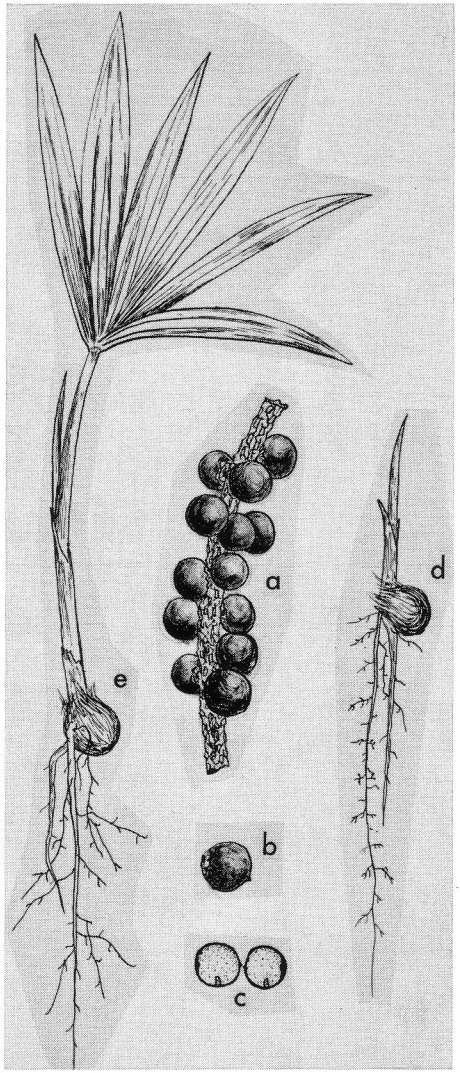
Local Uses

The fruit of *pijuayo* (*Bactris Gasipaes*) is illustrated in Fig. 1. It is boiled and eaten by the native populace. When covered with butter and sprinkled with salt, this dish also becomes a favorite of many tourists. The tree is also useful for its trunk which, when dry, can be split, flattened, and made into flooring, walls, etc. *Pijuayo* can be found with or without spines protruding from its trunk. The native population seems to seek out the spineless variety because of the ease with which they can climb it to harvest the fruit and for the smooth flooring which can be made from it.

Oenocarpus multicaulis (Fig. 2) has two common names in the Iquitos region, *sinami* and *sinamillo*. Although this palm can be split and used for flooring as *pijuayo*, it is seldom sought because it does not reach a sufficient diameter



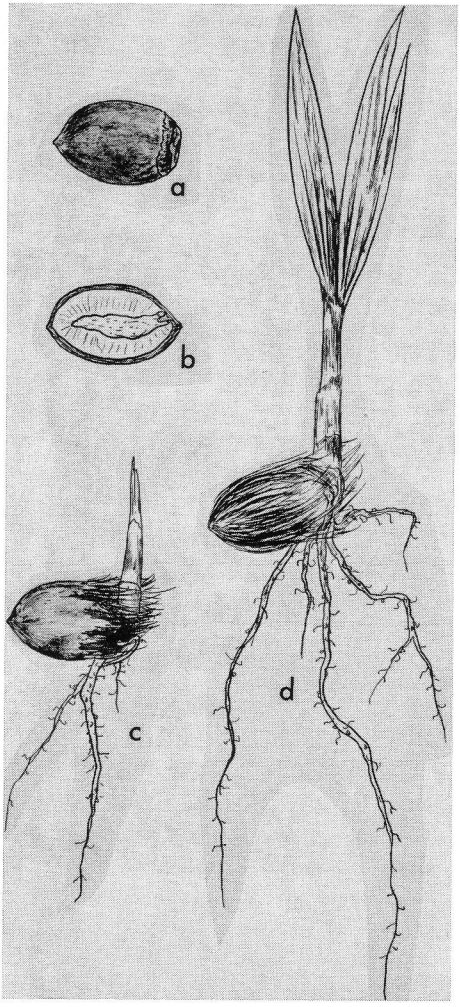
4. *Mauritiella* sp. (*aguajillo*). a, fruit; b, seed; c, seed in vertical section; d, seedling when visible leaves were 10 days old; e, seedling when visible leaves were 35 days old. All × ½.



5. *Euterpe precatoria* (*huasaí*). a, fruits on rachilla; b, fruit; c, seed in vertical section; d, seedling when visible leaves were eight days old; e, seedling when visible leaves were 30 days old. All × ½.

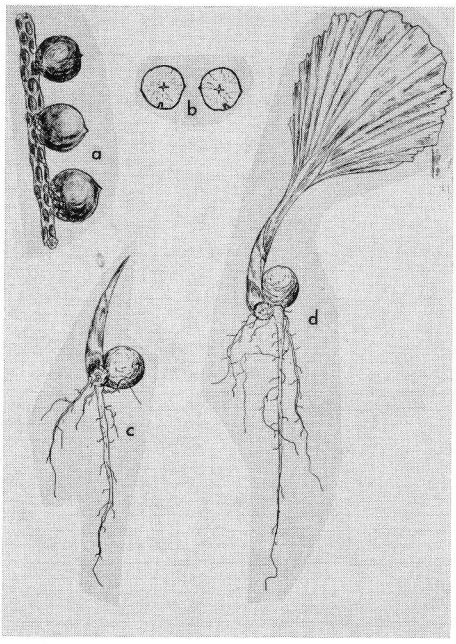
to make flooring of adequate width. The thin fruit coating around the seed can be dissolved in water to make a pleasant tasting drink.

Mauritia vinifera or *aguaje* is probably the most important palm economically that Peru has to offer. The thick layer underneath the scalelike outer covering of the fruit is very tasty and is used as a flavoring or eaten as is. Each fruit

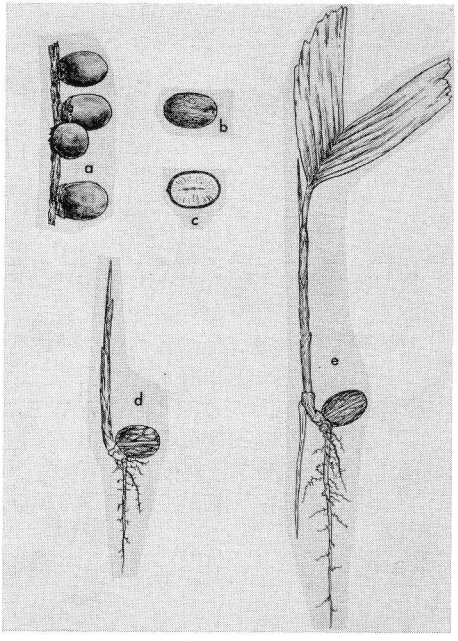


6. *Jessenia polycarpa* (*ungurahui*). a, fruit; b, fruit in vertical section; c, seedling when visible leaves were six days old; d, seedling when visible leaves were 70 days old. All × ½.

(Fig. 3) usually will sell for one to two cents in Iquitos' open air market. The overall sales of this fruit possibly exceed those of bananas in the region.

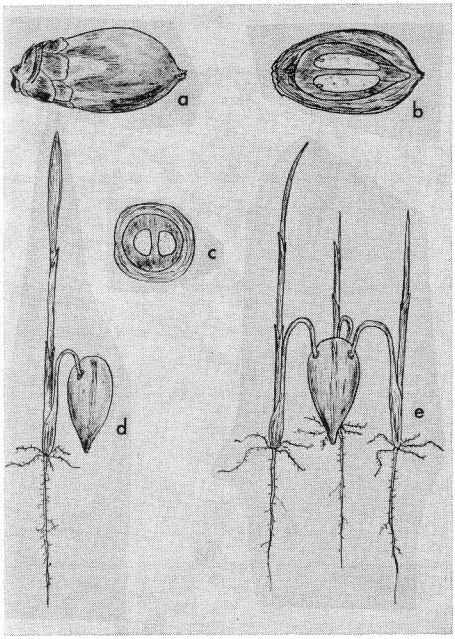


7. *Iriartea ventricosa* (*huacrapona*). a, fruits on rachilla; b, seed in vertical section; c, seedling when visible leaves were eight days old; d, seedling when visible leaves were 123 days old. All × 5/7.

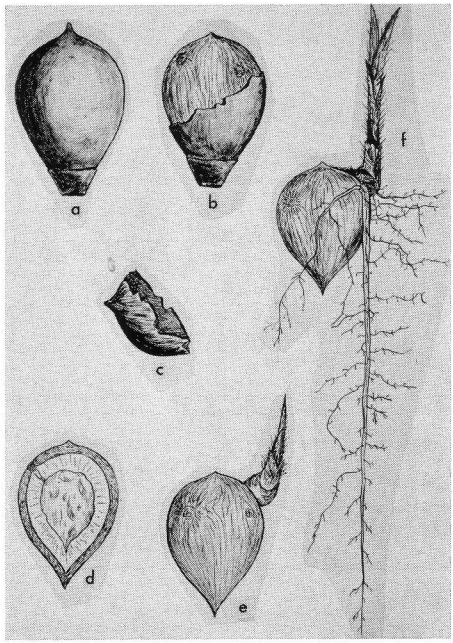


→

8. *Socratea Orbigniana* (*cashapona*). a, fruits on rachilla; b, seed; c, seed in vertical section; d, seedling when visible leaves were six days old; e, seedling when visible leaves were 67 days old. All × 5/8.



9. *Maximiliana stenocarpa* (*inayuca*). a, fruit; b, fruit in vertical section; c, fruit in cross-section; d, e, seedlings when visible leaves were 30 days old, note germination of three seeds from a single fruit in e. All × 4/5.



10. *Astrocaryum Chambira* (*chambira*). a, fruit; b, fruit with portion of pericarp removed; c, portion of pericarp; d, endocarp in vertical section; e, seedling when visible leaves were 35 days old; f, seedling when visible leaves were 68 days old. All × 2/3.

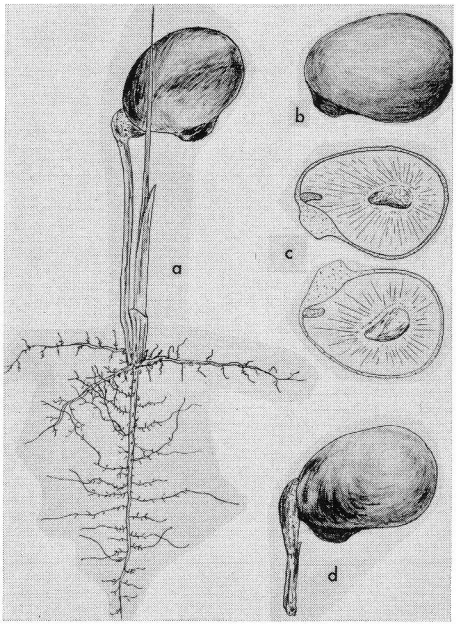
Mauritiella sp. or *aguajillo* (Fig. 4) is similar to *aguaje* but is smaller and has clustered trunks. Very little use is made of either its fruit or trunk by the native population.

Huasaí or *Euterpe precatoria* (Fig. 5) is a slender and beautiful palm and people are beginning to use it for beautifying roadways in the Iquitos region. The cabbage or palm hearts are extracted and eaten by the natives at Easter time. These hearts are also sold in the market place and are a favorite salad of tourists. Although the palm hearts can be taken from most of the palms mentioned in this study, they remain in short supply because the best and the easiest harvested are those that are taken from the not-too-plentiful *huasaí*.

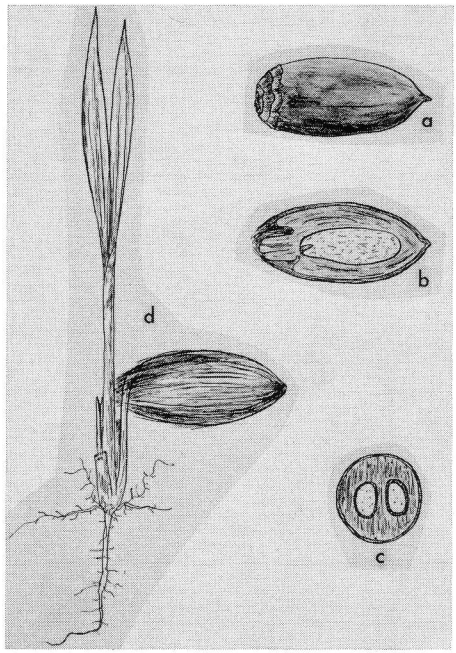
Ungurahui (*Jessenia polycarpa*) is much sought after by the native population because, like *sinami*, the thin fruit coating around the seed (Fig. 6) can be dissolved in water to make a refreshing drink. The water solution of this palm is usually mixed with dry granulated *yuca* to make a drink that is both tasty and filling.

Huacrapona or *Iriartea ventricosa* (Fig. 7) is a tall and robust palm that is an excellent source of flooring. It can be split easily and folded out into boards that are often three feet in width. It is so sought after in the Iquitos region that very few of the larger palms are left around populous centers.

Cashapona (*Socratea Orbigniana*), see Fig. 8, is used in much the same way as *huacrapona*. However, this palm is much smaller and, therefore, is less sought after by the natives.



11. *Phytelephas macrocarpa* (*yarina*). a, seedling when visible leaves were 10 days old; b, endocarp; c, endocarp and seed in vertical section showing equal halves; d, endocarp with seed beginning to germinate. All × 5/7.



12. *Scheelea* sp. (*shapajilla*). a, fruit; b, fruit in vertical section; c, fruit in cross-section; d, seedling when visible leaves were 38 days old. All × 4/5.

Inayuca or *Maximiliana stenocarpa* (Fig. 9) is used very little by the native population. It has been known, however, to be used by the Indians of the Amazon region to make darts for blow guns and wadding for shotguns. The darts are made by splintering the wood near the base of the tree, and the wadding is formed by shavings from this same area.

Chambira (*Astrocaryum Chambira*). This palm is used by the natives for its edible fruits (Fig. 10) and for the fibers that it produces. The fruits are like small coconuts and can be eaten when still green. The fibers are extracted from the new leaves and are used for making twine that is woven into many useful items.

Yarina (*Phytelephas macrocarpa*) was formerly an important palm economically. The green seed has a gelatinous center which is eaten by some natives. When the seed is ripe, the gelatinous center is hard (Fig. 11) and can be carved into buttons, needles, and many useful household tools.

Shapajilla or *Scheelea* sp. (Fig. 12) is fairly common around the Iquitos region, but the native population has developed no uses for it.

NEWS OF THE SOCIETY

Biennial Meeting

The Society's next convention will be held at Melbourne, Fla., from July 31 to August 2nd. Dr. Jerome Keuper, the Society's Vice-President, has invited Society members and their families to use the dormitories and cafeteria of Florida Institute of Technology, of which he is president. At the time of the meeting the students will be on vacation, and the facilities will be available. As you have seen from the flyer he has sent out, rates for room and meals will be extremely reasonable.

You will be interested to see the "Dent Smith Trail"—an acreage of forest under which the shade-loving palms grow, as they do in their native lands. Dr. Keuper also has an extensive collection of palms growing on other parts of the campus.

We are planning an interesting program and several expeditions. After the meeting there may be one or more trips outside of the United States. Nassau, Venezuela and Panama are possibilities.

Plan to attend this meeting. We think you will have a good time.

* * *

Items

Mr. E. R. Knobloch, Braithwaite, Louisiana, reports: "I have found that *Chamaedorea microspadix* is the hardiest to cold of all the chamaedoreas I have tried outdoors. It survived a dip to 17 degrees F., with perhaps 10 hours of below freezing weather."

Durban Botanical Gardens has an interesting slogan on their air-mail envelopes: two coconuts on a small island, and the words "Get With It—Plant a Palm or Two."

Two Palm Society members, Mr. Walter Haught and Mr. Richard Douglas, visited Australia in September, 1969. They met several of our Australian members, and reported that they were extremely well treated. They sent a postcard of the railway station at Kuranda, N. Queensland; the platform under the cantilevered roof is landscaped with palms and ferns in large pottery containers, and many hanging baskets. A flourishing palm flanks each side of the building. Why can't we have more pretty railway stations?

* * *

Seed Bank News

The Seed Bank has done a flourishing business during the past year. Due largely to the absence of hurricanes and freezes in southern Florida for about two years, the palms have had time to develop large numbers of fruits, so it has been possible to collect and ship many packets of seeds to our members. Several days of unusually cold weather, (the coldest here since 1962), have caused many palms to drop immature fruits, so the next few months may be rather barren ones for the Seed Bank's customers, and easier ones for your secretary.

Members both in and out of southern Florida have been most generous in sending seeds. Among them are: Alix Landscape Decor, Mr. C. L. Barnes, Mr. James Benzie, Mr. David I. Carroll, Mr. Howard F. Cooper, Mr. John Criswick, Dr. Ian C. Daly, Dr. M. E. Darian, Mr. Lucien De Clercq, Mr. Jerome Goodloe, the Instituto Agronomico (Brasil), Mr. Robert Kost, Mr. and Mrs. A. C. Langlois, Mrs. A. C. Margraff, Dr. H. E. Moore, Jr., Peradeniya Gardens (Ceylon), Mr. D. A. Pritchard, Dr. Robert W. Read, Mr. Dent Smith, Mr. Ura Snidvongs, Mr. R. G. Wilson, Mr. Motohide Yamakawa. Many thanks to all these kind people.

Our chief source of supply is still Fairchild Tropical Garden. We tender special thanks to the officers and staff, and especially to a volunteer FTG member, Mrs. Toni Martin, who has patiently added the Seed Bank to her other collecting chores. We also wish to thank Mr. and Mrs. A. R. Jennings and the U.S.D.A. Plant Introduction Station for their generous gifts of seeds.

The Seed Bank is very pleased to receive U.S. postage stamps instead of coins, in payment for seeds. This should be a convenience to the members as well as to me, as I have to buy postage in any case.

* * *

Jessenia and Maximiliana in Guyana

Mr. John Criswick, Arcadia, East Bank Demerara, Guyana (formerly British Guiana), contributed some seeds of *Jessenia* and *Maximiliana* to the Seed Bank. He commented:

"I must confess to being in some doubt as to whether these are *Jessenia bataua* or *J. polycarpa*. You will see from the illustrations on pages 98 and 99 of Braun's article (Cultivated Palms of Venezuela, *Principes* 12:39–103, 111–136, 1968—Ed.) that the seeds of both are very similar. I have suggested *bataua* because of what Braun says about the drink made from them and the asthma-curative properties ties in with what the Amerindians here tell me. It is difficult to examine an adult specimen as they are so tall and grow densely in forest swamps. In fact, I picked these seeds up this afternoon outside an Amerindian's hut after they had been thrown there by his wife who had steeped them in hot water to make 'tea,' a kind of fatty, chocolatey drink. This in no way impairs their germinating qualities, as is evidenced by the sprouting clumps outside all Amerindian huts, like those on page 99 of Braun. The Amerindian told me he had very recently gathered these seeds, so they are fresh.

"The Maximiliana seeds have simply been chewed and sucked and spat out, without the hot water treatment."

* * *

Seed Exchange

Mr. D. A. Pritchard, P.O. Box 4, Stratford via Cairns, Qld., Australia, is willing to exchange seeds with other members. Please write to him direct.

* * *

New Botanical Garden

Mr. Harrison G. Yocum, an enthusiastic Palm Society member, has been hard at work in Tucson, Arizona, helping to establish the Tucson Botanical Garden.

Mr. Yocum received his master's degree in horticulture from Rutgers University. After a period of teaching in Tennessee, he moved to Tucson about ten years ago, taking along a large number of prized plants, including cacti and palms. They formed the nucleus of his dream, a botanical garden in Tucson. When the plantings on his own grounds began to attract local attention, he promoted the Tucson Botanical Gardens, Inc., a non-profit organization. More than 100 men and women now belong to the organization, and it soon became necessary to move to larger quarters.

Under the aegis of Dr. Leland Burkhart, professor of botany at the University of Arizona, president, Mr. Gene Reid, superintendent of the City Parks and Recreation, and Mr. Yocum, thousands of plants have been donated, many from Mr. Yocum's private collection. While the plants are now in temporary quarters, it is hoped that soon a permanent Botanical Display Center, Tropical Growing Unit and Cool Environment Facility will be ready to receive them.

Something to Dream About

Lindblad Travel, Inc., New York, announces that in the spring of 1970 they will inaugurate a three-week motorship cruise to the "Forgotten Islands of the Indian Ocean"—the Seychelles, Amirantes, Farquhar, Aldabra and Comoros islands. The 250-foot long ship will sail from Mombasa, East Africa. The three weeks include enough time to reach Mombasa from New York, but the quoted rates are for the ship cruise only. They range from $960.00 per person for a three-bedded room, to $1510.00 for a single room. To the palm-lover, such a trip would be a dream come true.

* * *

Hyphaene in Kenya

In September, 1969, your secretary went on a three-week "safari" to East Africa. Insofar as animals and birds were concerned, this was a marvelous trip, but the palms were rather a disappointment, although we knew that we would not see many species. Many large clumps of *Phoenix reclinata* and a few plants of a *Raphia* species grew in swampy ground in Uganda, where we also saw large, handsome specimens of *Borassus* with ripening clusters of fruits the size of grapefruit and the color of oranges. Usually these palms were growing alone on the hillsides, but between Masindi and Kampala (Uganda's capital) there was an area where hundreds of them grew fairly close together.



In Kenya, palms were almost nonexistent until we arrived at the Marsabit National Reserve. On the grounds of Samburu Lodge, and for some miles in its vicinity, were plants of a very large, branching *Hyphaene*, quite awe-inspiring. We got a color slide, and picked up some fruit on the Lodge grounds. Specimens were sent to Dr. C. X. Furtado at the Singapore Botanical Gardens, where he is doing some work on *Hyphaene*. He writes: "You may name it as *H. semiplena* var. aff *subglobosa*."

* * *

News from St. Croix

Mrs. Hubert Hilder, St. Croix, U.S. Virgin Islands, is doing her best to make the island palm-conscious. She sent a photograph of an unusually fine young specimen of *Neodypsis Decaryi*, the triangle palm growing at Whim Greathouse Museum, one of the old plantation greathouses which has been preserved by the historical society. Mrs. Orville Chase, president of the St. Croix Garden Club, stands beside the palm.



Mrs. Hilder writes: "I excavated three holes and planted three palms in April, 1967, but this center one is doing best and despite our erratic rains it is impressive with a minimum of care. Occasionally I go by and put iron chelate, magnesium sulphate or palm-ixora food on the weeded area around them. . . . Last spring I gave a talk about *Veitchia Merrillii* for the isle and sold one hundred seedlings from a station wagon and the reports are good on all who bought and planted them. . . . 1969 was an historic year of 75 inches of rain here [the average yearly rainfall on St. Croix is 30 inches—Ed.] so all palms we had ventured to try are thriving. Some day we may even have a tropical-looking isle!"

L. H. WAIT

* * *

WHAT'S IN A NAME?

Barbosa (bar bó sa) was named by Beccari in honor of João Barbosa Rodrigues (1842–1909), a Brazilian botanist who wrote extensively on palms and who published the handsomely illustrated *Sertum Palmarum Brasiliensium* in 1903.

Barcella (bar séll a) was not elaborated by Trail when he gave the name to a subgenus of *Elaeis*. A possible explanation may be that it is derived from the Latin *barca* (little boat) plus the diminutive suffix *ella*, perhaps in reference to the canoes which surely must have been his means of transport to reach the location on the banks of the Padauiri River in Brazil where *Barcella* occurs.

Basselinia (bass ell ín ee a) was named in honor of the French fuller and poet Olivier Basselin (ca. 1400–ca. 1450) who was reputedly the author of the drinking songs of Normandy that came to be called *Vaux-de-Vire*. The English word vaudeville is derived from the French name for these songs.

Butia (bú tee a) comes, according to Barbosa Rodrigues in *Sertum Palmarum Brasiliensium* 1:81, 1903, from a Portuguese corruption of *mbotiá* (from *mbo*, to make, and *tiá*, tooth incurved) or those who have teeth incurved in allusion to the teeth that are borne laterally on the petioles of *Butia*.

Erythea (eh rith ée a) was one of the Hesperides, the daughters of the evening or the west, who lived on an island in the ocean at the western end of the world and watched over the golden apples in a garden. The name presumably was used because *Erythea edulis* occurs on Guadalupe Island off the coast of Baja California, Mexico.

Gulubia (goo lóo bee a) was modified by Beccari from the vernacular name *gulubi* used for *Gulubia moluccana* on the island of Ternate.

CLASSIFIED SECTION

CULTIVATED PALMS OF VENEZUELA. Reprint of August Braun's articles in PRINCIPES, Vol. 12. Now bound as an attractive separate booklet. Members are buying this as a convenience in having all the text in one volume. $2.00 postpaid.

* * *

BACK NUMBERS OF PRINCIPES. Complete volumes from Vol. 4 to Vol. 13. A few separate copies from vols. 1, 2 and 3. See ad, vol. 12, no. 2–3, page 108.