PRINCIPES

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THE PALM SOCIETY

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

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JOURNAL OF THE PALM SOCIETY

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

EDITOR: Harold E. Moore, Jr.

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

Contents for July

Cover Picture

Linospadix monostachya in Botanic Garden, Sydney, Australia. Photograph by W. H. Hodge. See article on page 89.

NEWS OF THE SOCIETY

For twenty years the American Forestry Association has been receiving and recording data about the largest living specimens of the various species of native American trees. The prime purposes of this campaign are to stimulate greater appreciation of trees, to establish a national library of reference material and, through the co-operation of the owners, to protect and preserve these monarchs to the end of their natural lives.

The list now comprises 355 National Champions, located in forty-two states and the District of Columbia. One lone palm represents the Palmae: a royal palm, *Roystonea elata,* situated in Collier Seminole State Park, near Naples, Florida. Its circumference at 4½ feet is 4′9″, its height 100′, its spread 12′.

Among our members in the United States there may be some who would enjoy looking for the largest specimens of other *native* palms and submitting their measurements to the Forestry Association. Surely we don't want our favorites to be so poorly represented. Anyone who thinks this would be an interesting hobby may write to the American Forestry Association, 919-17th St., N.W., Washington 6, D. C. They will send you a mimeographed sheet of instructions, "How to Measure a Tree for AFA's Big Tree Contest."

* * *

Letters from members in various parts of the world tell about their activities in planting palms. Mr. Roland C. Smith, Perth, Australia, is engaged in planting palms along the shores of Rottnest Island, a resort situated twelve miles from the coast of western Australia. He reports that several species have been planted already, and more are planned for. Mr. Jenbei Tachibana, director of Tanaka Jungle Garden, near Osaka, Japan, has a plan to build a "Palm Beach" on Erabu Island, about 500 miles south of Osaka. On a recent trip there he discovered adult coconut trees, one bearing, one adult royal palm and one *Mascarena Verschaffeltii.* Growing in the small jungles are plants of the native *Arenga Engleri,* and *Livistona chinensis* is planted by the islanders as an ornamental tree. Mr. Tachibana is planting thousands of royals, dwarf coconuts, nypas, etc., to be used in landscaping an extensive coral sand beach in the next few years. He sent pictures of the palms already growing there, as well as of *Cycas revoluta,* which he says is planted by the residents each New Year's Day (Feb. 15th), as a source of emergency food. Erabu Island has for many years exported Easter lily bulbs to America.

* * *

Several California members had an interesting outing recently, going to Palm Springs to see the desert washingtonias. Mrs. Gunter Herman writes: "We visited several oases to see amazing natural stands of *Washingtonia* in the midst of the barren sands, with one interesting drive along the face of some mountains whose undulations hid many canyons full of palms which could not be seen except when we were exactly in front of the openings. Very eerie effect. We [also] drove through the date palm groves . . ."

The Greater Miami group enjoyed a delightful Sunday afternoon at the home of its chairman, Col. E. G. Piper, and Mrs. Piper. One member brought an unusual palm, inviting members to name it, the one giving the correct identification to receive a prize of another palm (carefully wrapped as a surprise). Since no one came up with the name, the "prize" was raffled off for the benefit of the Society.

Two members, Mr. Stanley Kiem and Mr. Gerard Pitt, spent six weeks in Trinidad and Brazil, collecting plants for Fairchild Tropical Garden. Some new palms were among the seeds they sent in; let us hope they will thrive in their new home.

* * *

Please note the new system for sending in your advertisements, (Classified Section). This arrangement will be much simpler for all of us, we believe.

LUCITA H. WAIT

Dr. R. Bruce Ledin Honored Posthumously*

The awarding of the Founders Medal at the annual membership meeting to Dr. R. Bruce Ledin, who died in 1959, was the only time that anyone has been so honored posthumously by the Fairchild Garden.

Despite the ill health he suffered throughout his short life following an attack of rheumatic fever during his early 'teens, Dr. Ledin found enough energy to obtain his doctor's degree. And he continued to work and to make contributions to botany and to horticulture until his death.

The following citation was prepared by Mrs. Julia Morton of the Morton Collectanea at the University of Miami. Dr. Ledin had collaborated with her in the writing of a book, *400 Plants of South Florida.*

"Dr. Robert Bruce Ledin's devotion to plants began in Minnesota at the age of 13 when flower-gardening aided his convalescence after a year's confinement with rheumatic fever. Thenceforth his comprehensive interest in and love for vegetation shaped his course and filled his life. While majoring in Botany at the University of Minnesota, he served for three years in the herbarium, collecting and taxonomizing, and spent two summers making checklists of the Compositae and Orchidaceae of that state. For his studies of the floral anatomy of *Thunbergia* species, he was honored by and elected to Sigma Xi. Graduating in 1939, he explored the genetics and growth of maize for a year at Minnesota and three years at Indiana University. From 1943 to 1946, he served on a Columbia University Dermatology Department War Research Project at Fort Benning, Georgia, combatting those microscopic plants, fungi and bacteria, and co-authored several resulting papers on dermatophytosis. In 1946, Bruce started teaching Botany at the University of Miami, and avidly studying and making notes on native flora. In 1950, he won his doctorate at Indiana University. His 156-page *Compositae of South Florida* received a Florida Academy of Sciences award as the 'finest contribution to science published in the Journal during 1951.' Joining the University of Florida's Sub-tropical Experiment Station as Assistant Horticulturist in July, 1951, he rapidly assimilated knowledge of tropical fruits and other cultivated plants. In 1952, he collaborated with Julia Morton on the book, *400 Plants of South Florida*; thereafter authored and co-authored various bulletins and horticultural papers; and participated actively and held offices in a number of plant organizations. As early as 1949, he was deeply absorbed in the lore of *Pseudophoenix* palms, his research leading to co-authorship of *Pseudophoenix in Florida* (published in *Principes*, Journal of The Palm Society, in

*Reprinted from *Fairchild Tropical Garden Bulletin* 16(2) :42-43, 1961.

January, 1959). He poured his final energies into the assembly and editing of materials for the handbook, *Cultivated Palms,* until two days before his death on July 9, 1959. In recognition of this scholarly and courageous labor, the Fairchild Tropical Garden is honored to present the Founder's Medal posthumously to Dr. Robert Bruce Ledin."

THE EDITOR'S CORNER

Mrs. Wait has written: "There are several types of members in The Palm Society: the serious botanist or taxonomist who is studying the classification and nomenclature of the palms; the nurseryman who is interested in producing and selling newer and better palms correctly labeled; the amateur or lover of palms, who wants to learn about them and grow them for his own enjoyment.

"In an effort to make contact with the other amateur palm growers for the purpose of exchanging experiences and information about the culture of the palms, their soil requirements, watering, etc., Mr. Dale W. Young, 645 Ross Street, Costa Mesa, California, has written an open letter (see Notes on Culture on this page), telling about the palms that he and his friend Mr. Fred W. Martin have grown in their small but charming garden. He hopes that others will be prompted to tell of their adventures in palm growing for the benefit of all."

Continuing the publication of articles not incorporated in "Cultivated Palms" (see *Principes* 5:6.1961), we read in this issue of palms from European, Australian, Hawaiian, and Puerto Rican gardens. Accumulated letters also appear, among them one from Benjamin Stone with interesting observations on the dispersal of the coconut in the Hawaiian Islands (page 110).

NOTES ON CULTURE

Dear Fellow-members:

Perhaps if we tell you about some of the things we have learned in growing palms here near the Pacific coast, we can help you solve some of your problems, then you will tell us how you have succeeded or failed in your own localities. Here is a list of the palms we have now:

Archontophoenix Cunninghamiana—8; *H. Alexandrae*—1; *Arecastrum Romanzoffianum*—4; **Arenga sp.*—1; **Arikuryroba schizophylla*—1; *Butia capitata*—1; *Caryota mitis*—2; *C. ochlandra*—1; *Chamaedorea cataractarum*—1; *C. costaricana*—2; *C. elegans (Neanthe bella)*—several; *C. erumpens*—1; *C. glaucifolia*—2; *C. humilis*—1; *C. microspadix*—2; *C. oblongata*—1; *C. radicalis*—1; *C. Schippii* (?)—4; *C. sp.* (Gresham)—1; *C. "spiralis"*—1; *C. Tepejilote*—6; *Chamaerops humilis*—1; *Chrysalidocarpus lutescens*—3; **Coccothrinax Dussiana*—1; **Dictyosperma album* var. *rubrum*—1; *Erythea armata*—2; *E. edulis*—1; *Howeia Forsteriana*—6; **Latania borbonica (L. Commersonii)*—1; *Livistona chinensis*—1; *Mascarena Verschaffeltii* (2 rotted away from overwatering this summer); *Paurotis Wrightii*—1; *Phoenix reclinata*—1; *P. Roebelenii*—6; **Pritchardia pacifica*—1; **P. Thurstonii*—1; **Ptychosperma Macarthurii (Actinophloeus Macarthurii)*—4; *Rhapis excelsa*—2; *Rhopalostylis sapida*—1; *Sabal Rosei*—1; *Trachycarpus Fortunei*—3; *Trithrinax acanthocoma*—1; **Veitchia Merrillii*—1, (identification doubtful); *Washingtonia robusta*—2; Unidentified spp.—2; Cycads: *Ceratozamia mexicana*—1; *Cycas circinalis*—1; *C. revoluta*—1; *Dion edule*—1 (watered sparingly); *Macrozamia spiralis*—1.

The palms marked with an asterisk are moved into a greenhouse during winter until large enough to try outside; however, these as well as all the others have been found to thrive outdoors in the coastal section of Southern California in summer at Costa Mesa (1½ miles inland) and midway between Los Angeles and San Diego. During the dry season from May until December the palms are watered three times a week. During rare heat waves they are watered daily and in winter, between rains, every ten days. Winter rainfall averages about nine inches, with a maximum of fifteen. Many winter days are in the 70's, with an average night temperature between 40 and 55 degrees F.

The palms are fed every eight weeks from May until December with a liquid 16-10-8 commercial fertilizer with one drop per gallon of Superthrive or Vitamin B-1 in the water. Feedings are alternated with two tablespoons of blood meal per gallon of water applied to the soil only. Last season we found foliar feeding with a gadget called Hoz-On to be beneficial. There seems to be adequate humidity and fog in the coastal areas to the mountains about 15 miles inland to make overhead watering unnecessary except during the periods when hot dry winds blow in from the desert. These winds, known as "Santa Anas", blowing in from the Santa Ana Canyon, usually last from twenty-four hours to three days; at these times we water overhead twice a day. These windy periods rarely occur more than three or four times a year. Water-soluble iron sulfate or liquid acidate are applied to the soil three times yearly to overcome the alkalinity of the water supply from the Colorado River. *Chamaedorea erumpens* and *C. microspadix* seemed to resent regular feedings by developing small brown spots on the foliage. We have reduced feedings on these to once yearly.

All palms except those which were brought into the greenhouse during the winter survived the severe winter of 1959 with the several freezes which invade our area every decade. As an experiment, one of the tender *Ptychosperma Macarthurii (Actinophloeus Macarthurii)* palms had been planted in the ground in a south sunny location under an eave overhang. We protected it, and the smaller *Archontophoenix Cunninghamiana* and *A. Alexandrae* palms with inverted peat-moss bags and brought them safely through the winter.

Many palm experts will discourage planting of the more tropical species in California, but they have failed to stress the fact that their experiments were tried many miles inland in colder areas such as San Marino, Arcadia, San Bernardino, etc. It is this writer's opinion that many of the more tender species can be grown and enjoyed out of doors in the coastal zone between Santa Barbara and San Diego, particularly in warmer frost-free areas, or those relatively so and when planted near buildings or under eave overhangs, in tubs on covered patios or in a lath house or under trees. Although they were protected from cold when young, one sees *A. Cunninghamiana,* howeias and *Chrysalidocarpus lutescens* reaching maturity, growing out in the open in colder areas fifteen or more miles inland. Surely experiments with tropical palms when given proper culture, cold protection, and above all enough water are worth trying near the coast.

An interesting experiment is going on with some coconut palms in front of the Hotel Royal Tahitian at nearby Laguna Beach. We understand that heat cables have been installed underground, and it would seem doubtful that they

would succeed without them. They were planted a year ago, just before the cold winter but survived and are sending up new leaves. It is too soon to judge whether they will thrive, but a report on these palms will be submitted at a later date.

One final bit of advice to palm enthusiasts in California. Most of our palms suffer from lack of water, as may be readily observed among the arecastrums *(Cocos plumosa)*. To help keep them moist be sure to build large saucers around them, encircled with six-inch mounds of clay to hold the irrigations. Then top the saucers with three inches of steer manure twice each season, and every other month add one-quarter inch of chicken manure, but do not work it into the soil. Just spread the well-rotted mulches on top of the soil and they will not burn.

Most palms seem to like a well-drained soil. All of ours, either tubbed or in the ground, seem to thrive in the following mix: one part clay, one part well rotted steer manure, one part leaf mold, one part sand, one part sponge rock. Our soil is rich but unfortunately heavy gummy adobe, so we prepare very large holes when using the above formula in planting.

When the old leaf bases of *Archontophoenix Cunninghamiana (Seaforthia)* become deciduous we have noticed the pinkish powder known as *Penicillium* fungus on two small plants. We are told that the force of rains can cause the fungus spores to jump several feet into the air and be carried to other palms by the wind. We cured one and will continue to spray the other with Phaltan every ten days until the fungus is no longer noticed. As a preventive we are adding a sticker-spreader liquid to the spray and spraying all other nearby palms.

This writer would like to read about the results of the experiments of many others in growing any kind of palm. The description of various climatic conditions, soils and amount of rainfall would be especially interesting. Hoping that our experiment may be a bit helpful, how about letting us hear about YOURS?

DALE W. YOUNG
645 Ross St.
Costa Mesa, Calif.

Essays on the Morphology of Palms

P. B. TOMLINSON

V. THE HABIT OF PALMS

The habit of a plant describes its general form and method of growth. Palms, with their terminal cluster of large leaves enclosing the single bud at the end of a slender unbranched stem, have such a distinctive habit that it is common to refer to unrelated plants with a similar appearance as "palm-like." This emphasizes the difficulty of including palms in the common subdivision of plants which admits of only herbs, shrubs and trees. Palms may be small but they are never truly herbaceous and they show various peculiarities in their mode of growth which makes it difficult to classify them as shrubs, trees or herbs. Palms, therefore, are best considered as a group of plants with a unique growth habit. However, this habit itself does vary considerably within the family as a whole. Thus the shape by which even a non-specialist recog-

nizes a palm may be exemplified by that of the coconut, royal palm or oil palm, but this only represents one of the growth forms which exist in the palms as a whole. It is the purpose of this article to indicate some of this diversity and also to show ways in which these forms are comparable.

Palms vary enormously in stature. The smallest palms resemble herbs. They possess slender stems of pencil thickness and only a few feet high. They are best exemplified by species of *Chamaedorea* (Fig. 45C) and *Reinhardtia*. The beginner could well be excused for not recognizing these diminutive plants as palms. On the other hand, palms like *Corypha*, *Jessenia*, *Jubaea*, and *Roystonea* have massive trunks which may exceed 100 feet in height. *Ceroxylon* is said to reach a height of 200 feet.

The general appearance of a palm depends to a large extent on the thickness and height of the stem, together with the way in which the stem branches, if at all. Each stem can be regarded as being made up of a number of discs or segments. Each segment is delimited by nodes, which represent the places of insertion of leaves, and consists of a single internode, which represents the distance between two successive nodes. Perhaps it is not too artificial a concept to regard the palm stem in this way, because the growth of each leaf is undoubtedly dependent upon the development of the internode immediately below and the overall growth of the stem can, in some ways, be regarded as a result of continual superposition of successive internodes with their associated leaves, one upon the other, although not in the disarticulate manner which this scheme might suggest. The leaves eventually fall or decay, but the stem segments persist.

The surface of the stem owes a great deal of its appearance to the degree of persistence, or otherwise, of the leaves, as I have indicated in the previous essay (Tomlinson, 1961). Thus, in many palms of the arecoid group, for which *Roystonea* serves as a familiar example, the leaf abscisses cleanly at the node below the crownshaft so that the stem is always smooth, with obvious internodes separated by ring-shaped leaf scars marking the nodes. In other palms, such as in *Phoenix*, the leaf base persists as a woody stump, the internodes are very short and the leaf scars are congested and overlap. The stem thus has a very irregular surface. There is much scope for simple but fundamental observation on the biology and structure of the leaf base in palms.

The distribution of leaves along the stem is one feature which may considerably influence the general appearance of a palm. This distribution is described by botanists as the phyllotaxy of a plant. The phyllotaxy in palms is usually spiral. In *Neodypsis* and *Chrysalidocarpus* the spiral is represented numerically as 1/3, because there are only 3 vertical series of leaves. This, however, is unusual and the spiral is usually much tighter, including many series of leaves. Occasionally the successive leaves are inserted, not along a spiral, but distichously, the leaves being arranged alternately in two opposite ranks along the stem. This produces a very striking appearance as in *Wallichia disticha*, *Oenocarpus distichus* and in some scandant palms.

The general habit of a palm depends, however, not so much on the distribution of leaves on the stem as on the overall length which the stem may attain, together with its method of branch-

ing. On this basis a few very distinct habit-forms can be recognized.

Stems Solitary

The stem is erect, columnar and always unbranched at the base. It represents the habit recognized by the layman as "palm-like." In larger palms of this type the stem may be several feet in circumference, cylindrical and very imposing, as in *Jubaea*, *Roystonea* (Fig. 45A) or *Phoenix canariensis*. It often rests on a wide dilated base which appears early in the development of the palm and serves mechanically as a solid foundation, useful if such palms are to achieve a great stature (Tomlinson, 1960). Many other palms have the same habit, but the stems are more slender and not usually so tall and there is a gradual transition from such forms as *Cocos*, by way of *Dictyosperma*, *Ptychosperma* and *Veitchia* to small palms such as *Geonoma*, *Hyospathe* and *Pinanga* down to the single-stemmed species of *Chamaedorea*.

Palms of this type of habit do not necessarily grow vertically upwards. Coconut palms commonly have curved trunks whilst *Opsiandra* may have reclining stems in certain situations.

The stilt palms are a group which essentially have solitary stems, but afford a distinctive habit (Tomlinson, 1960). Palms of this group are unusual in that they grow rapidly in length during the seedling stage and the early internodes are narrow. This unstable axis is supported by thick, buttressing stilt roots (Fig. 45F).

Single-stemmed palms may branch abnormally, as when the terminal bud is damaged mechanically or by disease. *Hyphaene*, however, does possess a unique habit, because in several of its species the stem bifurcates, or dichotomizes, at regular intervals in a very striking and characteristic way (Fig. 45B).

Stems Numerous

Some palms have the ability to increase the number of their stems by means of suckers arising in the axils of the basal leaves. Palms of this habit are variously described as tufted or clustered and botanists may use the word caespitose or soboliferous. Normally the suckers grow out close to the base of the parent stem so that the palm is truly tufted, as in *Ptychosperma Macarthurii* or in *Phoenix reclinata* (Fig. 45D). However this leads to competition between different shoots from the same individual. In some palms this is avoided because the sucker grows horizontally away from the parent stem before developing an erect shoot. This occurs, for example, in species of *Bactris*, *Chamaedorea* and *Metroxylon*. *Rhapis* will adopt this spreading habit in loose sand, but tends to be more tufted when pot-grown. Since these palms are capable of spreading over a wide area by purely vegetative means, they may be said to be colonial (Fig. 45H).

It should be noted that, except in abnormal circumstances, buds in tufted palms are always restricted to the base of the aerial stems. The aerial stems themselves are always unbranched and otherwise resemble the trunks of single-stemmed palms without, however, reaching the same height. *Euterpe* and *Oncosperma* are rather exceptional because the individual stems may be quite tall.

The type of stem, whether clustered or solitary, is almost invariably constant for each species of palm. On the other hand both the single-stemmed and caespitose conditions may occur within a single genus, as in *Areca*, *Arenga*, *Caryota*, *Euterpe*, *Ptychosperma*, *Phoenix*

and *Raphia*. This may be because single-stemmed species have evolved from caespitose types by the loss of the basal suckers, as has been suggested by Holttum (1955), the process having occurred independently in many genera. The mechanism by which suckers are produced is not understood, but to be able to control suckering in a palm would have enormous practical benefit. Palms which sucker are easily propagated. Single-stemmed palms have to be grown from seed and, apart from the time this involves, this makes it difficult to maintain selected varieties. There are many more varieties of date palm, which is propagated by suckers, than there are of either coconut or oil-palm, both of which are propagated by seed.

Stems Subterranean

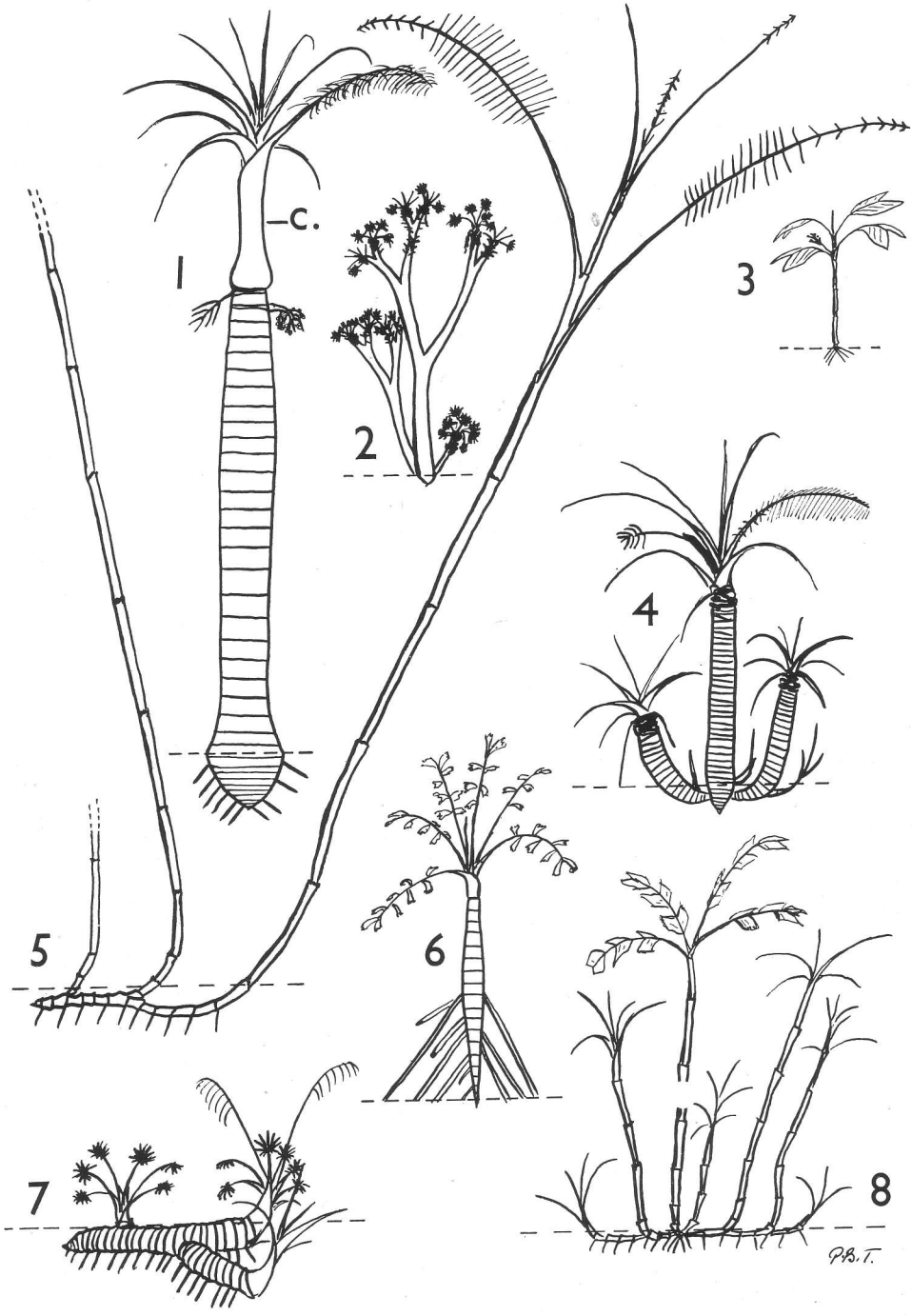
Although we recognize a palm by its distinctive aerial stem, a number are known in which the trunk remains wholly underground since it grows horizontally and not erect (Fig. 45G). Such palms are sometimes described as stemless or "acaulescent" (e.g. *Phoenix acaulis*), although the stem is not absent, but merely invisible. The best example of this habit is shown by *Nypa*, the stem creeping in estuarine mud so that only the leaves, erected by unequal growth at the leaf base, become visible. In *Nypa* the stem is branched. Other palms may be similar as in *Salacca*, but *Phytelephas* and *Sclerosperma* have underground stems which are unbranched. These latter also tend to grow more or less erect, but so slowly as to remain almost wholly buried. Several genera which are familiar as tall growing species also include one or more species which are depauperate relatives with underground stems. Familiar examples are *Sabal Etonia* and *S. minor*, *Phoenix acaulis* and *Syagrus flexuosa*. Other small palms may be less obligate in their growth form. Thus *Serenoa repens* in burned-over pinelands has a creeping stem, but sometimes if disturbed or grown in favourable situations it will produce a tall erect stem. *Chamaerops humilis* in cultivation often belies its specific name and develops erect stems like a typical tufted palm.

Stems Climbing

The rattans or climbing palms of the Eastern tropics are familiar to travellers in the Malay Archipelago. However, such scandent palms can be seen in all parts of the tropics and the habit seems to have evolved independently in at least five groups. Features which diagnose this growth habit are the long slender aerial stems, the narrow, cane-like internodes, often reaching a length of several feet, while the stem as a whole may reach an overall length of several hundred feet, being supported by various devices which enable the crown to grow into the forest canopy. The biological advantages of this growth habit in the tropical rain forest are obvious.

The scandent aerial stems usually arise from underground rhizomes so that the palms are basically tufted or somewhat colonial (Fig. 45E). The habit is most conspicuously developed in the lepidocaryoid palms. The construction of the slender stems is always the same, but their grapnel-like supports are not all identical. This is evidence that all climbing palms are not equally related. *Calamus* shows unique morpho-

45. Growth habits in palms (not to scale). A, stem solitary, columnar, e.g. *Roystonea* (c—crown-shaft); B, aerial stem dichotomizing, e.g., *Hyphaene* sp.; C, stem slender, canelike, e.g., *Chamaedorea* sp.; D, stems tufted, e.g., *Phoenix* sp.; E, aerial stems climbing, leaves of *Ancistrophyllum* or *Desmoncus* type; F, stilt palm, e.g., *Iriartea;* G, stems creeping, subterranean, e.g. *Sabal Etonia;* H. colonial palms, e.g. *Bactris* sp.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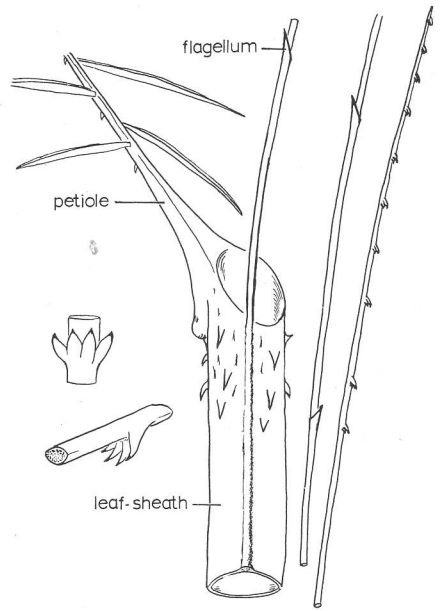
logical features which have given it considerable advantages in producing new forms. The genus includes some 300 known species. Most of these are supported by modified inflorescence branches. These are normally unbranched whiplike organs called flagella and they bear distal grapnel-like claws. Each flagellum is peculiarly disposed since it apparently arises from the side of the leaf sheath. These organs are, however, truly axillary, but each is fused to the internode and most of the leaf sheath above its node of origin (Fig. 46). That these are equivalent to inflorescences is made obvious by comparative study. The inflorescence in *Calamus* has the same peculiar mode of attachment as the flagellum, commonly terminating in clawed appendages, and there are all transitions between flagella and inflorescences (Furtado, 1958). Commonly the flagellum also bears small spathe-like organs which can only be interpreted as reduced bracts.

All other climbing palms are supported by cirri which are prolongations of the leaf rachis as previously described (Tomlinson, 1961). Such palms therefore constitute a second distinctive biological group, but not a taxonomic one, since palms with this habit occur in quite unrelated tribes and in different parts of the world. Also their leaf morphology is not wholly identical. Thus the scandent lepidocaryoid palms of the Eastern tropics, which include genera like *Daemonorops, Korthalsia* and *Plectocomia,* have evolved independently of the African climbing palms, *Ancistrophyllum, Eremospatha* and *Oncocalamus,* although they belong to the same subfamily. The former genera have clawed appendages arranged along their cirri, whereas the latter have pairs of backwardly-directed spines which are modified leaflets (Fig. 45E). In the



46. Leaf morphology in *Calamus.* Upper part of tubular leaf sheath with laterally attached flagellum, this, with three reduced bractlike organs, drawn in three separate parts. Insets show distal claws (ungues) from two aspects and enlarged.

American tropics similar modified leaflets occur on the cirri in *Desmoncus* and a few species of *Chamaedorea.* These two genera are, however, quite unrelated. The scandent species of *Chamaedorea* are the least specialized of all the scandent palms and differ little from certain related *Chamaedorea* species which have a straggling habit. These transitional forms suggest the way in which the scandent habit has evolved.

From this brief account it will be gathered that palms show more diversity in their growth form than is generally realized. This diversity represents elegant variation on a basic theme, the theme being best represented by the tufted palm. This basic type may also be primitive, and the various modifica-

tions described above, in producing new forms, have allowed new habitats to be explored.

Literature Cited

Furtado, C. X. 1956. Palmae Malesicae XIX—The Genus *Calamus* in the Malayan Peninsula. *Garden's Bulletin, Singapore* 15: 32-265.

Holttum, R. E. 1955. Growth-habits of Monocotyledons — Variations on a Theme. *Phytomorphology* 5: 399-413.

Tomlinson, P. B. 1960. Essays on the Morphology of Palms, II. The Early Growth of the Palm. *Principes* 4: 140-143.

———. 1961. IV. The Leaf. *Principes* 5: 46-53.

Linospadix monostachya – An Attractive Australian Ornamental

W. H. HODGE

Longwood Gardens, Kennett Square, Pennsylvania

To palm enthusiasts with limited space for gardening, dwarf species are always of interest. *Linospadix monostachya* (Mart.) H. Wendl, is just such a dwarf palm. The writer first observed this species in 1958 growing in state botanic gardens at Melbourne and Sydney, the only two cities of the continent "down under" that have outstanding palm collections. It is an unfortunate fact that Australian horticulture still makes but rather limited use of the wide range of ornamental material available in the palm family and this is well illustrated by the present species, which is known solely as obscure specimen plants in the botanic gardens mentioned.

Linospadix monostachya, which sometimes passes incorrectly under the later name *Bacularia monostachya,* is a native of Australia ranging from northern New South Wales into Queensland. As can be seen from the illustrations this is a slender palm with stems from 1 to 1½ inches in diameter. Plants in cultivation average about 5 feet tall, but undoubtedly they attain greater heights in nature. Numerous 2- to 3-foot-long interfoliar flowering spikes were present during October (which is mid-spring in Australia). These arch gracefully out from the axils of attractive dark green pinnate leaves. The inflorescences in this genus are also characterized by the presence of a tubular bract at the base of the spike, similar to that found in the New World genus *Calyptrogyne.*

The dark green foliage, slender habit, and diminutive size are indications that *Linospadix* is an understory palm of moist woodland or forest. In cultivation it apparently thrives best in partial to full shade and in this respect is similar in its cultural needs to such New World genera as *Chamaedorea* and *Geonoma.* Because of its obvious ornamental merit, seed of *Linospadix* was subsequently obtained through the courtesy of the Director of the Melbourne Garden and as a result the establishment of this rare species in the New World has been assured. According to De Leon (in *Principes* 2:96. 1958) the seeds of this genus, which are the size and shape of wheat grains, are very short-lived, remaining viable only for periods of from two to three weeks, after which germination falls off sharply. At Longwood Gardens, fresh seed sown in sand and

47. *Linospadix monostachya* in Botanic Garden, Sydney, Australia. Photograph by W. H. Hodge.

placed in a greenhouse sweat-box under temperatures ranging from 75°-95°F., required 142 days to germinate.

This small palm should be a worthwhile addition for shady or partially shaded gardens in the tropics or subtropics. In this country it should be tested in those areas of sub-tropical Florida and southern California which are relatively or completely frost-free. A healthy lot of young seedlings is presently ready for test at the Fairchild Tropical Garden in Miami while similar plants raised in the experimental greenhouse range at Longwood Gardens will, it is hoped, prove the merit of *Linospadix monostachya* as a new palm subject for conservatory culture.

Foster Botanical Garden

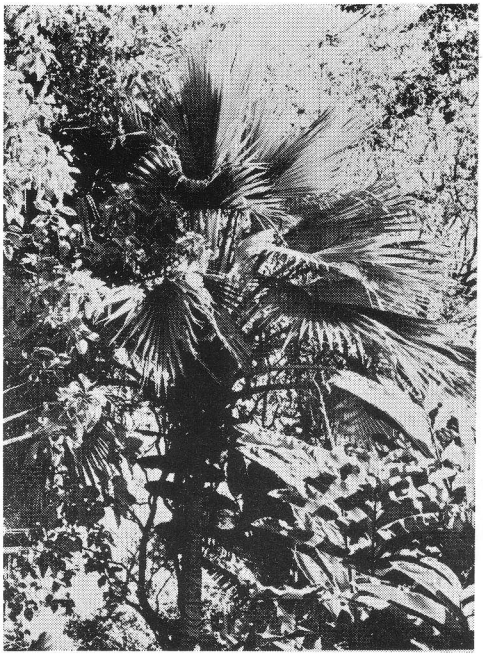
PAUL R. WEISSICH

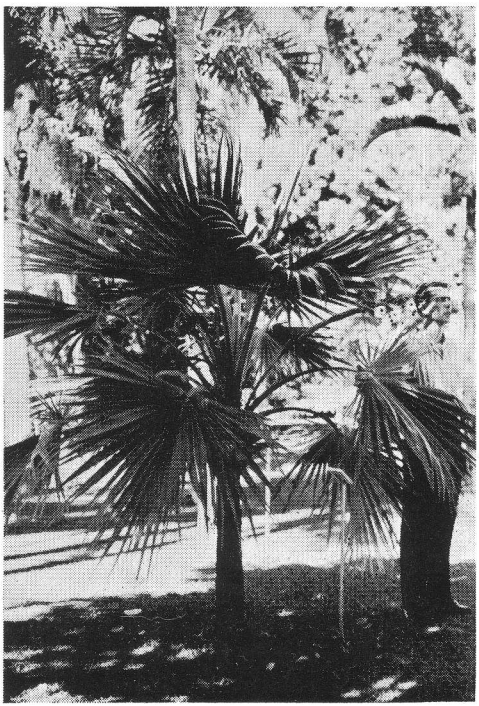
In 1855 William Hillebrand, the German-born physician to the Hawaiian royal family, purchased a four-acre piece of property just two blocks from modern downtown Honolulu, Hawaii, and began the plantings that were to become the nucleus of Foster Botanical Garden. The garden, bequeathed to the City and County of Honolulu in 1930 by Mrs. Mary Foster, then owner, now comprises some sixteen acres. The area includes a scenic portion of Nuuanu Stream and the beautiful Waikahalulu Falls once a garden spot planted in honor of Queen Liliuokalani.

The palm collection at Foster Botanical Garden includes, a hundred and eleven species in fifty-two genera. The palms are not concentrated in any one planting but are spread throughout the garden wherever growth conditions are optimum. Special attention has been given the native species of *Pritchardia.* It is interesting to note that the specimen of *Pritchardia macrocarpa* is approximately a hundred years old and was undoubtedly one of the first subjects to be planted by Dr. Hillebrand.

At the present time the Foster Botanical Garden is host to some ninety thousand visitors a year. The Garden operates a trial planting program in cooperation with forty private gardens on Oahu. These gardens are located at various elevations and enjoy widely varying temperatures, rainfall, soils, and exposures to sun, wind, and salt spray. An active seed exchange program is carried on with botanic gardens and private individuals all over the tropics. Top priority in the new capital improvement program is the construction of fa-

48. Foster Botanical Garden, Honolulu, Hawaii. *Pritchardia arecina,* 23 years old (upper left); *P. Hillebrandii,* 100 years old (upper right); *P. remota,* 27 years old (lower left); *P. macrocarpa,* 100 years old (lower right). Photographs by Paul R. Weissich.





cilities that will lead to a public education department, thus greatly increasing the capacity of Foster Botanical Garden for living community service.

On the Trail of the Lonesome Palms

A Jeep Trip in Northwestern Mexico

ROBERT H. NELSON
San Isidro, California

In January and February of 1961 I made an overland trip with Dent Smith starting from San Diego, California, down into northwestern Mexico, throughout the length of Baja California, and then, after ferrying across the Gulf of California, through sections of Sinaloa, Nayarit and finally Sonora. This excursion, which lasted one month, was undertaken partly to see the palms where any existed and partly just to see the country.

Baja California was the most challenging part of the trip because of the truly infernal trails miscalled roads, the sparsely populated country and the total lack, usually, of communications and supplies. To deal with those conditions we went equipped with extra supplies of gasoline and water, sleeping bags, and American groceries—till they gave out. Expressly for this trip, moreover, I acquired a new Willys jeep station wagon with six-cylinder engine and four-wheel drive. It never failed us in mire, jagged rocks, mile-deep ruts or in any of the other hurdles along the route.

Baja is that long lanky finger of land pointing southeast from the U. S. border, with the Pacific to the west and the Gulf of California separating it from mainland Mexico to the east. It is twice as long as the Florida peninsula and arid in varying degree. The distance from San Diego to the tip, Cabo San Lucas, came to something over 1200 miles by the route we took. At that point we were in the tropics, having crossed Cancer about 65 miles south of La Paz. Civilization is represented in Baja by a few towns and villages spaced at distances made immense by the lack of good roads. The vast voids are made up of plains, valleys, canyons, mountains and seacoasts populated chiefly by coyotes and jack rabbits, and thousands of square miles are dominated by cardon cactus, weird idrias, elephant trees and other "impossible" plants.

During the month-long trip both in Baja and on the mainland we encountered and photographed eleven, or possibly thirteen, species of palms as they are to be found in their native ranges in northwestern Mexico. We saw other palms along the way, but these were introduced and I will try to limit myself to the native species. Other plant families are abundantly represented, both on the Baja peninsula and on the mainland. Many are extremely interesting as well as very beautiful and curious, but I must ignore these at this time.

Dent arrived here in California the evening of January 18th, and the 19th was a day of preparation for the first part of the trip. We were about to drive from San Diego to La Paz, Baja California, and this requires more than one day of preparation, but last-minute details took almost all day to complete. The following morning we crossed the border and headed south.

It was during the third day of driving that we caught sight of the first palms. These are to be found growing in a dry

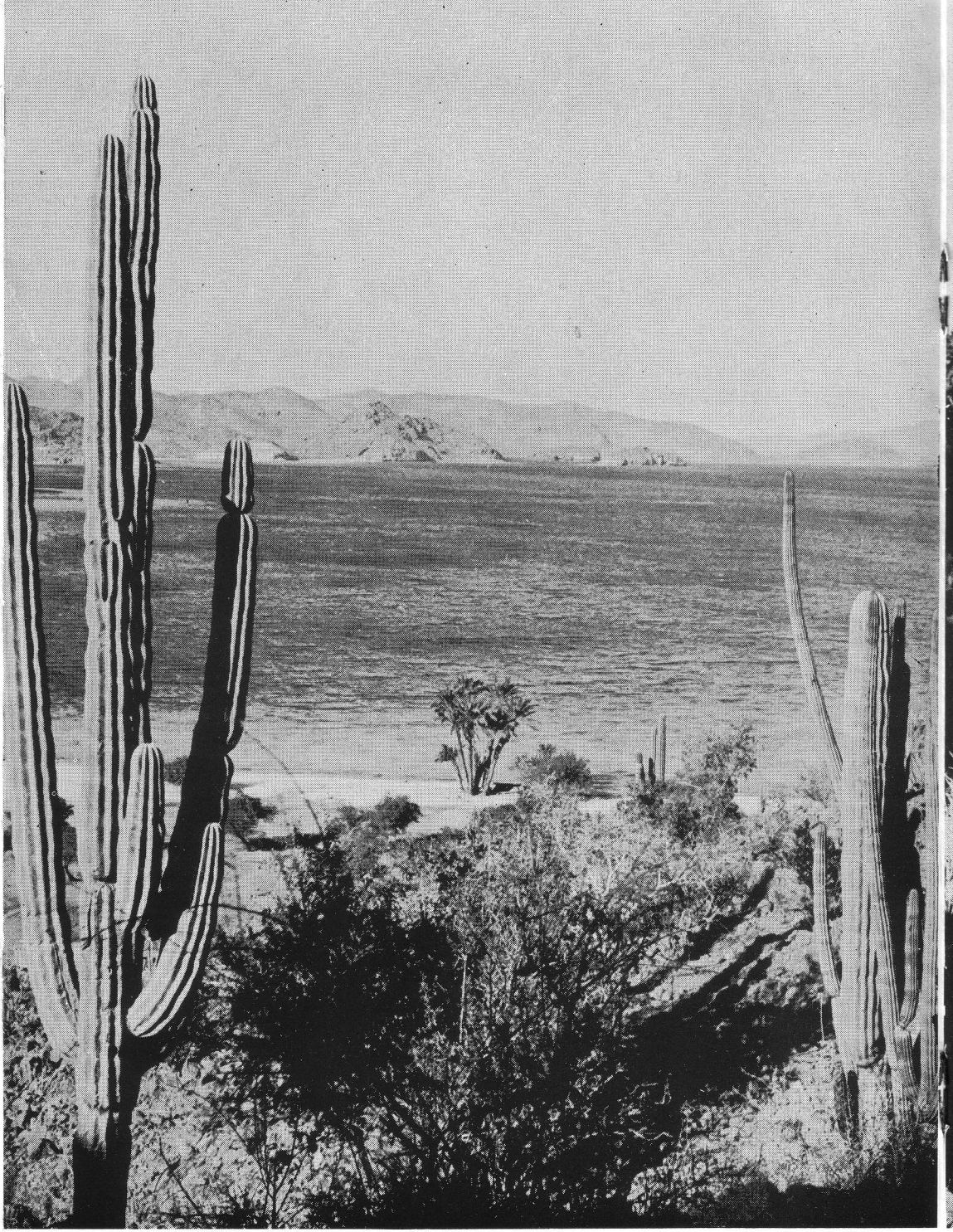
rocky wash just north of a spot called Catavina. Also, more and healthier palms are encountered a few miles farther south at Santa Inés. The two species found at these places are *Washingtonia filifera* and *Erythea armata*, and you can't miss them as the road crosses the dry washes at both places. Both species are represented by some very old specimens, as their height and sad condition seem to indicate. The tallest *Erythea armata* as well as *Washingtonia filifera* I have ever seen are growing in the wash just north of Catavina. Two or three have trunks that might approach or even exceed sixty feet, and the very height of these palms gives their trunks the appearance of being slender. It would be easy to say these palms appeared to be somewhat different from the same species inhabiting the canyons on the eastern drainage of the Juárez and Mártir ranges some 250 miles or so to the north.

Continuing on southward we found the next palms at the mission towns of San Ignacio, Santa Rosalía and Mulegé respectively. I mention the palms at these oasis mission towns only because they are the dominating plants and the sheer weight of their numbers makes them worthy of mention. *Washingtonia robusta* and *W. filifera* are there in good numbers, but the date palm, *Phoenix dactylifera*, is to be seen by the tens of thousands. Dates are a crop important commercially to the residents of San Ignacio and Mulegé. We couldn't buy a single date on the Baja California peninsula and found the reason to be that practically all are shipped to the interior of mainland Mexico. It would be very interesting to search back through the records of the mission padres who originally brought the date palm to this area, hundreds of years ago, to find out just how important they were to the existence of the missions.

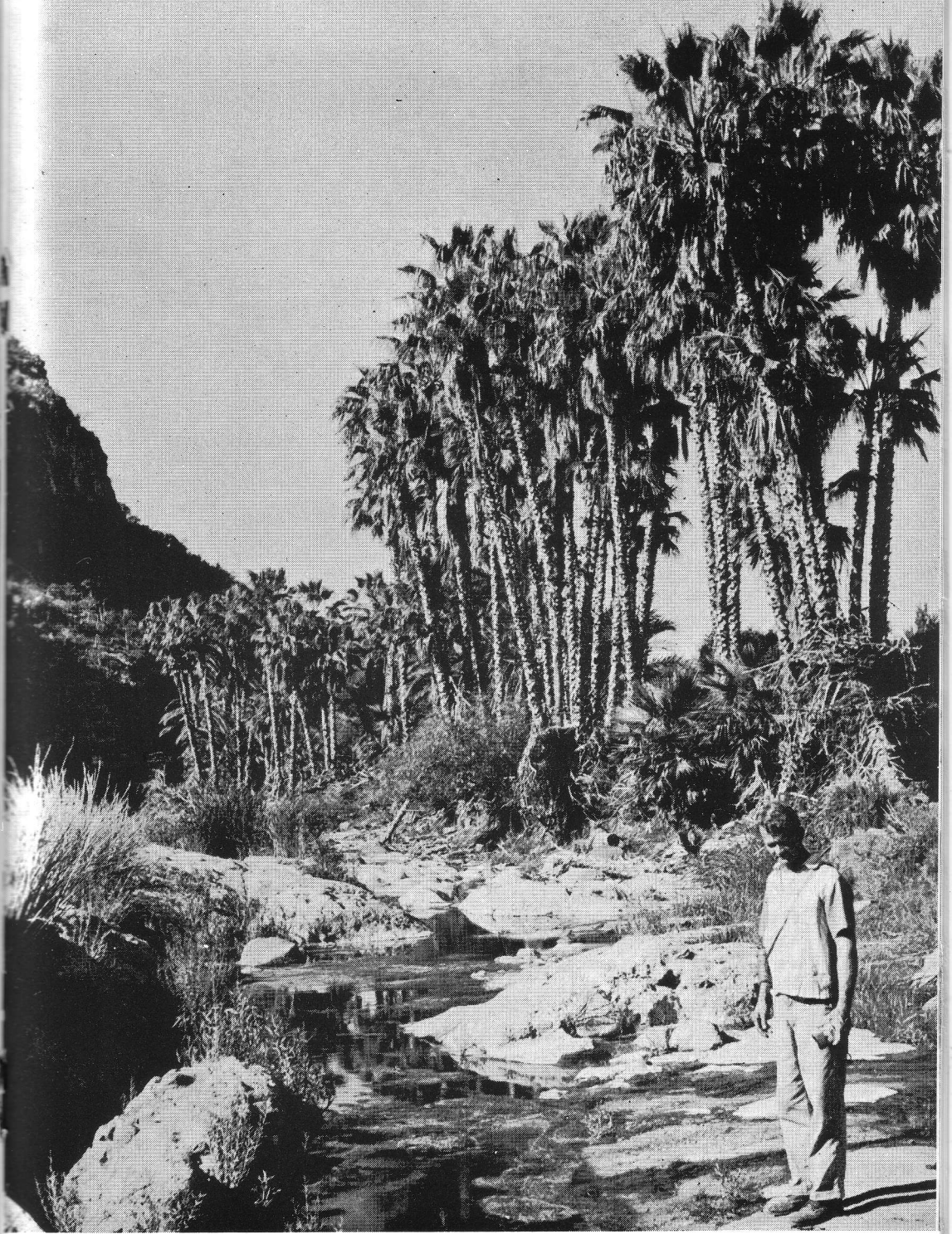
From Mulegé we drove on south along the Gulf of California, passing beautiful Concepción Bay, to Canípole. Approximately ten miles southwest of Canípole, on the road to Comondú, Dent spotted a grove of palms and we stopped and investigated. They turned out to be *Washingtonia robusta*, about fifty in number, grouped near a small flowing spring of good water. This could be the remnant of a native grove, but the nearness of several small ranches and other evidence of people inhabiting this area for many years suggests that someone might have planted these palms. The group of *W. robusta* is the first encountered that can be seen from the road, and could be an indication of the northern limit of its natural range.

Descending into the Comondú gorge is really a thrill. By a series of switchbacks that were intended only for a burro, we finally dropped from the surrounding terrain into what seemed a bottomless pit. The double town of Comondú is actually composed of San José de Comondú and San Miguel de Comondú, and many small ranches. It seemed to us that everything was hidden among the thousands of date palms, citrus, avocado, grape vines and mangos.

Here in this Comondú gorge could also be the natural home of *Washingtonia robusta*. There are about twenty miles of them and they can be seen in almost any size and condition, from the extremely tall healthy specimens in the upper end of the gorge, to the drought-stunted, burned, uprooted palms at the extreme southwestern limit. By checking the speedometer mileage, we calculated the palms to extend from about five



49. Solitary date palms by the shore of Coyote Bay, an indentation in the larger Bahia de la Concepción, Baja California, Mexico. Photograph by Dent Smith.



50. Natural grove of *Washingtonia robusta* near a spring located between Canípole and Comondú, Baja California, Mexico. Photograph by Dent Smith.

miles northeast of the Comondú settlements to about fifteen miles southwest. Abundant water and the protective walls of the gorge provide perfect growing conditions for this palm and also for the *Phoenix dactylifera.*

The rafters of many buildings in Comondú are of squared lumber made from the trunks of the washingtonias. Also, the residents are experts at constructing a thatched roof of washingtonia leaves. Everywhere on this trip we kept a sharp lookout for roofs thatched with palm leaves, for this was a sure indication that palms could be found not too far away.

The next palms encountered after leaving Comondú were the ornamentals in the city of La Paz. These were limited to the coconut and *Washingtonia robusta.* La Paz was a welcome sight, and after a day of recuperation and arranging boat passage for ourselves and the jeep across the gulf of Mazatlán, we found we had two days to tour the Cape area of the peninsula and accordingly proceeded to do it.

We had hoped to see in that area mainly the native stands of *Erythea Brandegeei,* but we found instead that the palms grow at some distance from the road, in almost inaccessible mountain arroyos. We did see, however, some erytheas along the roadside at a few places. There are isolated ones in San Bartolo and Triunfo; also at Todos Santos, and twenty to thirty in a group near the road north of Santiago where we were able to observe them closely.

The Brandegee palms that we saw differ from those growing in southern California mainly in the color and habit of the leaves. The introduced plants I know in California have pale green leaves that have a tendency to droop at the outer extremes. All the erytheas we saw in Baja had leaves that tended to be rigid and without any droop at all. Besides, the leaves of the young palms we saw near Santiago had very dark shiny green upper surfaces and a glaucous gray-green below. The older palms, perhaps twenty feet tall, appeared to have both upper and lower surfaces of their leaves a gray-green. Another characteristic I noted was the absence of adhering leaf bases. All the erytheas I have ever seen in California have had persisting leaf bases covering most of the trunk.

About two miles north of Todos Santos, on the road back to La Paz, I spotted at some distance to the right a palm that appeared to be a tall erythea growing in a pasture along with a few washingtonias. We left the jeep for a closer look. What we found was a *Washingtonia robusta* with approximately ten heads! This being my first sight of such a palm, I was duly impressed; and if there are others anywhere with more than a single crown I would like to know of them. It was not possible to count the exact number of branches because the upper ones were partly hidden in the shag of old leaves. We pondered the condition of this palm at some length and finally concluded that bud injury resulting from fire or insects could have been responsible. No seed was to be found on or near the palm. We photographed it from several angles and continued the return journey to La Paz for the voyage to Mazatlán.

The Cape area south of La Paz is truly the native home of the *Washingtonia robusta.* These tall slender-trunked beauties are found growing in large natural groves in the bottoms of almost all river valleys. Isolated palms are growing both on the east and west coasts, in some places almost to the shore line.

We reached Mazatlán two and a half days after embarking at La Paz. On the drive south from Mazatlán a *Sabal* began to be noticeable as part of the native vegetation—first in small groups in the low areas, and farther south towards the Sinaloa-Nayarit border it appeared everywhere, in the bottomlands as well as on the high rocky ridges. This palmetto is *Sabal Rosei.* In certain lights the recurved leaves look almost gray-green in color, but the trunkless seedling palms seem to lack this color cast. The slenderness of the trunks and the compactness of the heads make the adult palms seem small for a *Sabal.* The majority have a trunk diameter of from six to eight inches, and if I remember correctly we saw none that would exceed twenty feet in height. Dent called my attention to the telegraph poles along the road in several places where the poles were actually palm logs set in a row and strung with wire, and in fact there were many miles of them.

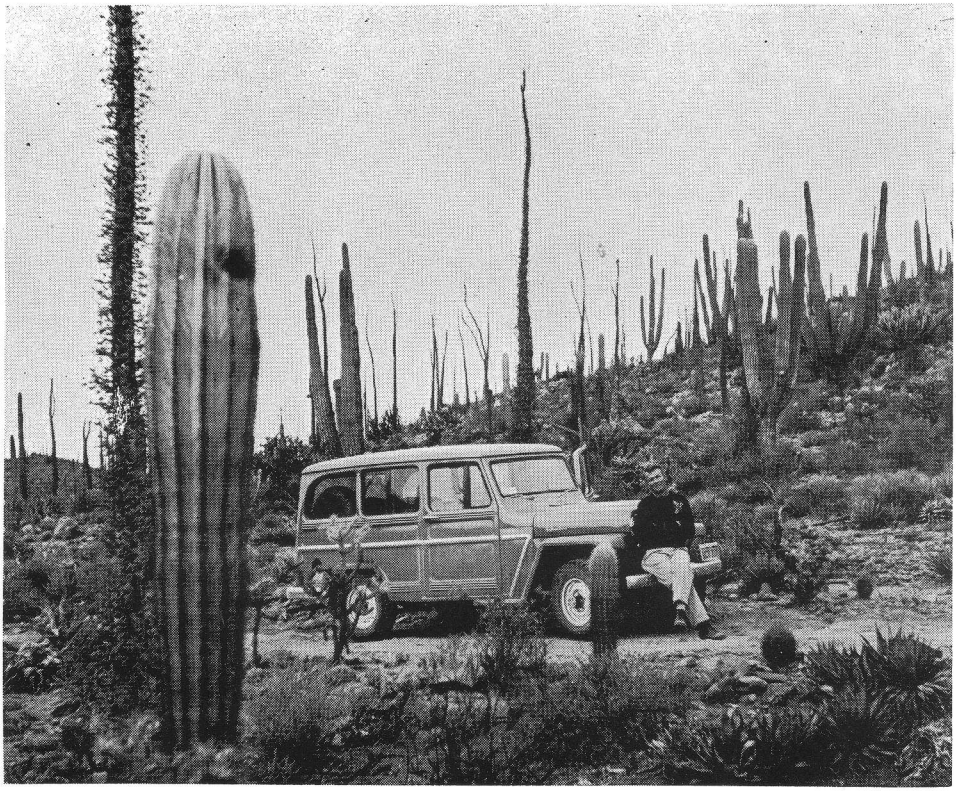
We arrived at dusk at the point where the San Blas road meets the main highway, and there we stopped at the home of Señor Heriberto Parra. He too is a Palm Society member and was our host for the three days we were in the area, which incidentally may boast of five native palm species. Here we found *Orbignya Guacuyule, Sabal Rosei, Acrocomia mexicana, Cryosophila nana* and one species of *Chamaedorea* which we were unable to identify.

The largest palm of this region is the impressive *Orbignya.* It is restricted to the coastal region and can be found in dense jungle-like stands where the land has not been cleared for banana plantations. We found the acrocomias farther from the coast, perhaps fifteen to twenty miles inland, and sometimes mixed with the sabals. The chamaedoreas grow on shaded hillsides a mile or so from the coast and also in shaded barrancas ten to fifteen miles inland in the vicinity of the coffee plantations. One side trip to an area above the settlement of La Palma gave us a glimpse of the many chamaedoreas (a multi-stemmed species) to be found in some of the deeper barrancas. The tallest were from five to eight feet, with a stem diameter of about one-half to three-quarters of an inch.

Sr. Parra obligingly escorted us to one spot where a less conspicuous palm was growing, one which resembles and most likely is *Cryosophila nana.* The group we observed was less than a mile south of his home, in a heavily shaded ravine. There we found many seedlings, but only eight or ten trees with six to twelve feet of trunk. One palm branched into three trunks about a foot above the ground. Sr. Parra remarked that most of the cryosophilas in the area are found growing under similar conditions, but that to the north, near Acaponeta, some of them are growing in full sun. The palms we saw in deep shade were very handsome, with shiny, dark green, long-petioled leaves and slender, straw-brown, spiny trunks.

Our time was beginning to run short, so we left the San Blas region after saying our farewells to Sr. Parra, and headed the jeep back northward. Between Culiacán and Los Mochis in two places close to the road we spotted another species of *Sabal.* This was *S. uresana* which appears to be very similar to *S. Rosei. S. uresana,* however, has longer petioles and a more open crown of leaves; and we did not see the noticeable gray-green color cast as we did to the south with *S. Rosei.* The stems of *S. uresana,* moreover, appear to be slightly larger in diameter.

Having been urged by Ed Moore to visit the Jardín Botánico "Las Palmas" adjacent to the sugar mill in Los Mo-



51. Typical landscape in northern Baja California, about one mile west of Arenosa, showing the ubiquitous cardon cactus, chollas, agaves, biznagas, creosote bush and *Idria columnaris*.

chis, we stopped there and asked for Ed's friend Sr. Ingeniero Mario Zamora who is an enthusiastic member of The Palm Society as well as having charge of the mill and botanical garden. We found him very generous with his time and quite eager to show us the palms. Many are unusual in their proportions, perhaps due to the heavy rich soil and the abundant shade and water. There are two specimens of an unidentified *Sabal* that are spectacular, each with leaf petioles from eight to twelve feet long though as yet without trunk development. Dent was really bugged by these sabals and hopes to find out what the species is. We admired a double colonnade of tall royal palms (presumably *Roystonea regia*), toured with keen interest the rest of the palmetum, and then tried adequately to thank Ingeniero Zamora for having been a perfect host, which he achieved despite the demands upon his time at the mill during the busy grinding season. He even took us, in the company of his charming wife and daughter, to the place with the resounding name, Topolobampo, for a shrimp dinner.

Our next objective was Alamos, Sonora, which we accomplished without undue strain. From there we journeyed eastward on a rough unpaved road towards Tecoragui, and perhaps a mile east of Alamos we spotted two *Sabal uresana* with trunks and also some seed-

52. Date palms at the oasis-village of Mulegé, Baja California, Mexico. Photograph by Dent Smith.

lings of it. Their appearance was similar to the ones we had seen south of Los Mochis. Ten or fifteen miles east of Alamos we began to see the first of the *Erythea aculeata.* As we slowly climbed into the sierra we saw more of these palms, and healthier ones, seemingly preferring the vicinity of water courses and moist areas; but at two or three places we spotted them growing out of rock walls high above the road. We estimated the range of this *Erythea* to extend well above 4500 feet.

Near the highest limits of the erytheas we found a trunkless *Sabal,* quite glaucous, and in some places growing along with the former. We did not find any seed or any sign of an inflorescence. Dent speculated that these were only seedlings and that possibly the natives had cut the trunked palms for lumber. It seemed to me, though, that we would certainly see at least one plant with three or four feet of trunk if this were true, but we did not. This *Sabal* has a midrib that extends quite deeply into the leaf and the leaves are quite recurved and somewhat folded, some of them similar to *Sabal Rosei.* If they are *S. uresana* they differ from the ones we saw at lower elevations.

Upon leaving the Alamos district we again headed north. Dent had with him a letter from Bob Schnabel of Palm Springs, California, telling of Bob's visit to San Francisco Bay, about twenty miles north of Guaymas, Sonora, and once again we left the main highway

to have a close look at some palms—in this case, those mentioned in the letter. We found in the canyon beyond the bay palmettoes that are surely *Sabal uresana*, and an *Erythea* that grew not only by the watercourse but even on one or two of the high rocky ridges. The palms of both genera are mature specimens. The erytheas on the ridge and those down below had identical inflorescences and fruits, very close in appearance to *Erythea armata*.

From San Francisco Bay we made fast time back to San Diego, stopping over one night in Hermosillo and another in a dry wash not far south of the border. All in all we had a wonderful trip and were fortunate to have seen such a variety of palms on this one tour. For brevity's sake I have left out two-thirds of the story, which as you can well guess would include no small number of incidents and experiences, some of them for the worse but most of them for the better.

Notes on the Hardiness of Palms on the French Riviera

David Barry, Jr.

During the early years of the present century an ardent grower of palms, A. Robertson-Proschowsky, introduced a great many species to his villa at Nice. He recorded his experiences in the *Bulletin de la Societé Nationale d' Acclimatation de France*, in an issue of 1906, and again in 1916.

The introduction of palms from the tropics to the semi-tropics is engaging the time and interest of many of our members. Robertson-Proschowsky's extensive work may serve to guide them in this activity.

The climate of the French Riviera is warmer in summer, and colder in winter, than that of the coastal plain of Southern California. During the winter the cold mistrals blow down from the clearly visible white peaks of the French Alps. In many ways, the climate of the Riviera is also comparable to that of much of Florida, which is visited from time to time by "northers."

Robertson-Proschowsky did not consider that his villa at Nice was especially sheltered when compared to other places on the Riviera. He stated that the climate was milder elsewhere, such as at Menton-Garavan, where a *Caryota* reached 16 feet in height and eventually ended a normal life span with its last and lowest inflorescence. Other milder places were named as Eze, Beaulieu, Villefranche, and Monte Carlo. As an encouragement to die-hards, those palm enthusiasts who will not take "no" for an answer, he cited the case of a specimen of *Cocos nucifera* that lived in the open at Eze for a dozen years.

The experiments of this grower began before the date of his first article in 1906 and extended beyond the date of his second article in 1916. During that period he did not experience the occasional great freeze that is catastrophic in effect upon growers. It came later with the intense cold of 1918 which nullified

many of his findings and brought snow, the weight of which not only broke the fronds of his lovely palms, but also his heart.

We should salute a notable palmateer, a dedicated man, and one who worked ardently and intelligently in the days of slow communication. The tropical palms that he so hopefully exposed, in so many cases to certain death, were first grown under glass, and were probably bought in many instances from continental nurserymen at good prices.

Before his lengthy writings become buried further in obscurity and the labor of his love lost with the passing of time, the gist of his experience is set forth for quick reference in the following tabulation.

[Editorial note. The list that follows uses nomenclature that is often outdated. The correct name of today is indicated in brackets when different. Fatal temperatures, first in degrees Centigrade, then in degrees Fahrenheit, and Mr. Robertson-Proschowsky's remarks, if any, follow in parentheses.]

Acanthophoenix crinita (3°C, 37.4°F).

Acanthorrhiza aculeata [*Cryosophila nana*] *and A. Warscewiczii* [*C. Warscewiczii*] (0°C, 32°F).

Acrocomia sclerocarpa (−4° C, 24.8°F, withstood −2° C, 29.4° F for several years).

Archontophoenix Alexandrae and *A. Cunninghamiana* (−5° C, 23° F).

Areca glandiformis (0° C, 32° F).

A. triandra (−2° to −3° C, 29.4°-26.6° F).

Arenga Engleri (perfectly hardy).

Arecastrum Romanzoffianum (−5° C, 23° F).

Astrocaryum aculeatum (0° C, 32° F); *A. Ayri* [*A. aculeatissimum*] (0° C, 32° F); *A. mexicanum* (reported hardy at Santa Barbara, California).

Attalea Cohune [*Orbignya Cohune*] (3°C, 37.4°F); *A macrocarpa* [?] (0°C, 32°F, without development at this temperature; "languishing"); *A. spectabilis* [*Orbignya spectabilis*] (−4°C, 24.6°F).

Bactris major (0°C, 32° F).

Borassus flabellifer (0°C, 32°F, perhaps would exist in sheltered places).

Brahea calcarea, B. dulcis (very hardy but of slow growth).

Butia spp. (very hardy).

Calamus spp. (3°C, 37.4°F, several species failed at this temperature).

Calyptrogyne Ghiesbreghtiana (0°C, 32°F).

Caryota urens (−2°C, 29.4°F); *C. Cumingii* (not hardy); *C. mitis* (not hardy); *C. ochlandra* (resisted freezes for 3 years and later died); *C. Rumphiana* (only one year's experience with this species).

Ceroxylon andicola [*C. alpinum*] (found to withstand the climate of San Remo, Italy).

Chamaedorea spp. (all the 15 species tried to prosper in semi-shade).

Chamaerops (hardy as a genus).

Chrysalidocarpus lutescens (1°-2° C, 33.8°-35.6°F).

Clinostigma Mooreanum [*Lepidorrhachis Mooreana*] (hardy).

Copernicia australis [*C. alba*] (perfectly hardy); *C. Miraguama* [*Coccothrinax Miraguama*] (0°C, 32°F, no growth after this temperature); *C. tectorum* (a plant from Venezuela of three meters appeared very resistent and vigorous).

Corypha elata (−2° to −3°C, 29.4°-26.6°F); *C. umbraculifera* (0°C, 32°F).

Cyphokentia gracilis [*Basselinia gracilis*] (−3°C, 26.6°F).

Cyrtostachys Renda (2°-3°C, 35.6°-37.4°F).

Daemonorops spp. (0°C, 32°F, half-dozen species tried).

Didymosperma porphyrocarpum [*Arenga porphyrocarpa*] (hardy to −3° to −5°C, 26.6°-23°F).

Diplothemium caudescens [*Polyandrococos caudescens*] (withstood −3°C, 26°F).

Dypsis pinnatifrons [?] (3°C, 27.4°F).

Elaeis guineensis (0°C, 32°F).

Eremospatha Hookeri (3°C, 37.4°F).

Erythea armata, E. Brandegeei, E. edulis, E. elegans (hardy).

Eugeissona triste (1°C, 33.8°F).

Euterpe edulis (−2°C, 29.4°F); *E. oleracea* (3°C, 37.4°F).

Geonoma gracilis [*G. Riedeliana*] (hardy for several years. Finally lost during a rigorous winter).

Howeia Forsteriana (hardy); *H. Belmoreana* (somewhat less hardy).

Hydriastele Wendlandiana (0°C, 32°F).

Hyophorbe amaricaulis [*Mascarena lagenicaulis*]; *H. indica; H. Verschaffeltii* [*Mascarena Verschaffeltii*] (2°C, 35.6°F).

Juania australis (−2° to −3°C, 29.4°-26.6°F).

Jubaea spectabilis [*J. chilensis*] (next to *Trachycarpus excelsa* [*T. Fortunei*] perhaps the hardiest of all palms).

Latania Commersonii [*L. borbonica*]; *L. Loddigesii; L. Verschaffeltii* (3°C, 37.4°F).

Licuala horrida [*L. spinosa*] 3°C, 37.4°F).

Livistona australis (−5° to −6°C, 23° to 22.8°F); *L. Mariae* (very hardy); *L. chinensis* (−4° to −5°C, 24.8° to 23°F); *L. cochinchinensis* (−3°C, 26.6°F); *L. Jenkinsiana, L. rotundifolia* (very hardy).

Mauritia armata (−2° to −3°C, 29.4° to 26.6°F); *M. flexuosa* (0°C, 32°F).

Metroxylon laeve (5°C, 41°F).

Phytelephas Poeppigiana [*P. macrocarpa?*] (0°C, 32°F).

Pinanga Kuhlii (5°C, 41°F).

Pritchardia Gaudichaudii (−3°C, 26.6° F).

Pseudophoenix Sargentii (withstood −2° to −3°C, 29.4° to 26.6°F, finally dying).

Ptychosperma elegans (withstood 0°C, 32°F).

Raphia Ruffia; R. taedigera (3°C, 37.4°F).

Ravenea Hildebrandtii (resisted −3°C, 26.6°F).

Rhapidophyllum hystrix (very hardy).

Rhapis flabelliformis [*R. excelsa*]; *R. humilis* (very hardy).

Rhopalostylis Baueri (hardy to at least −6°C, 21.2°F); *R. sapida* (hardy to at least −5°C, 23°F).

Roystonea spp. (0°C, 32°F).

Nannorrhops Ritcheana (will take −10° C, 14°F).

Nenga Wendlandiana [*N. pumila*] (0°C, 32°F).

Nephrosperma Vanhoutteanum (3°C, 37.4°F).

Normanbya Muelleri [*N. Normanbyi*] 0°C, 32°F).

Oenocarpus Bacaba (0°C, 32°F).

Oncosperma spp. (2°C, 35.6°F).

Orania philippinensis (0°C, 32°F).

Phloga nodifera [?] (−1°C, 30.2°F).

Phoenix canariensis; *P. dactylifera* (stated to withstand −7°C to −9°C): *Phoenix* spp. (as a group will withstand −3°C to −5°C).

Sabal spp. (hardy as a genus).

Saguerus saccharifera [*Arenga pinnata*] (0°C, 32°F).

Scheelea regia (resisted one winter around 0°C, 32°F).

Serenoa arborescens, S. serrulata [*S. repens*] (very hardy).

Stevensonia grandiflora [*Phoenicophorium Borsigianum*] (3°C, 37.4°F).

Syagrus insignis, S. Weddelliana (withstood −3°C, 26.6°F without damage).
Thrinax spp. (all species failed to live).
Trachycarpus excelsa [*T. Fortunei*] (the hardiest palm known; resisted −15°C, 5°F, in Paris); *T. Martiana* (perhaps less hardy than *T. excelsa*).
Trithrinax brasiliensis; *T. campestris* (very hardy).
Washingtonia filifera, W. robusta (very hardy).
Wallichia caryotoides (−1°C to −2°C, 30.2°-28.4°F).

Palms at the Jardin Botanique "Les Cedres," France

J. MARNIER-LAPOSTOLLE

The Botanical Garden "Les Cedres" is located on the French Riviera near Nice, France. It is a private garden, consisting of about thirty-five acres, founded by my father in 1922. There are over twelve thousand different species of plants represented in the garden, and it is particularly rich in cacti and succulent euphorbias, Araliaceae, Araceae, bromeliads, aloes, and agaves.

The palms are scattered over most of the garden but they are for the most part located in the warmest places, for we have severe winters about every twenty years when the temperature falls to 21.2°F (−6°C) and can cause heavy losses. The winter of 1956 was particularly severe. On the whole, the trees withstood cold fairly well. They are, however, more resistant when they reach an age of twelve to twenty years. We protect the rare species either by putting them under a light plastic cover or straw mats. The suckering palms, if frozen down to the ground, will spring up again.

Although a number of palms were planted many years ago and have reached good size, the collection was begun in earnest only a few years ago. As a result, many specimens in the collection are still small. I personally believe that many more palm trees could be introduced and acclimatized on the French Riviera than we already have. But they grow very slowly and it is very difficult to obtain them except by growing them from seed. In this area most palms are slow growing and it may take fifty to sixty years for some species to become adults.

Nearly a hundred and fifty species of palms are represented in our garden. We have a specially good collection of *Chamaedorea* consisting of twenty-six named species and several unnamed ones. Only twenty-four of our palm species produce seed for us. They are the following: *Archontophoenix Cunninghamiana, Arecastrum Romanzoffianum, Butia capitata, B. eriospatha, Chamaedorea Ernesti-Augusti, C. cataractarum, C. oblongata, C.* species, *Chamaerops humilis, C. humilis* var. *macrocarpa, Erythea armata, E. edulis, Livistona australis, L. chinensis, Phoenix canariensis, P. canariensis* var. *glauca, P. reclinata, Rhapidophyllum hystrix, Sabal Etonia, S. minor, S. Palmetto, S. texana, Trachycarpus Fortunei, Washingtonia filifera, W. robusta.*

These species can be considered as hardy here. In addition to these, others which have survived the cold of 1956 with little or no injury are the following: *Arenga Engleri, Brahea Berlandieri,*

53. Jardin Botanique "Les Cedres." *Archontophoenix Cunninghamiana* (right) with *Arenga Engleri* behind and *Chamaedorea* species (left center). Photograph by J. Marnier-Lapostolle.

54. Jardin Botanique "Les Cedres." *Erythea armata* (left) and *Washingtonia robusta* (right). Photographs by J. Marnier-Lapostolle.

55. *Phoenix canariensis* at Jardin Botanique "Les Cedres." Photograph by J. Marnier-Lapostolle.

B. calcarea, B. dulcis, Erythea Brandegeei, Howeia Belmoreana, Jubaea chilensis, Livistona decipiens, Orbignya Cohune, Phoenix dactylifera, P. paludosa, P. Roebelenii, P. rupicola, Rhapis excelsa, R. humilis, Rhopalostylis Baueri, R. sapida, Sabal "Blackburniana", S. causiarum, Serenoa repens, Trachycarpus Martianus, Trithrinax acanthocoma, Wallichia densiflora, W. disticha.

Other specimens of *Chamaedorea* proved to be hardy. These are: *Chamaedorea costaricana* (*C. Biolleyi*), *C. elatior, C. elegans, C. graminifolia, C. Klotzschiana, C. Martiana, C. oblongata* (*C. corallina*), *C. Sartorii, C. Tepejilote.*

56. A general view of the Federal Experiment Station, Mayaguez, Puerto Rico. The palms to the right are *Roystonea borinquena*, a native royal palm; to the left are *Sabal texana* and *Elaeis guineensis.*

Palms at the Federal Experiment Station, Mayaguez

LUIS E. GREGORY

The Federal Experiment Station is located at the western end of the island of Puerto Rico and on the northern outskirts of the city of Mayaguez. This station was established in 1901 by act of the U. S. Congress and is administered through the Agricultural Research Service of the U. S. Department of Agriculture in Washington, D. C.

The principal functions of the station are research on crops of importance to continental agriculture, fundamental

research on tropical plants, and research on special crops of interest to the development of Puerto Rican agriculture. One of the important projects of the station since its foundation has been the introduction of plants for testing from all over the tropical world.

The palms, which comprise ninety-one species, constitute a very important group in the station plant collection. These are found distributed mostly on the main station grounds. Some, like the majestic *Roystonea borinquena*, *Sabal causiarum*, and *Acrocomia media*, are native, but the majority are introductions from other tropical regions. Among the most interesting are *Arenga pinnata*, *Bactris Gasipaes (Guilielma Gasipaes)*, *Caryota urens*, *Chrysalidocarpus lutescens*, *Corypha umbraculifera*, *Cryosophila Warscewiczii*, *Elaeis guineensis*, *Raphia pedunculata*, and *Scheelea zonensis*.

Some species have been introduced because of their ornamental value, a good example of which is the talipot palm *(Corypha umbraculifera)*, the national floral emblem of Ceylon. Others, such as the African oil palm *(Elaeis guineensis)*, have been introduced because of their economic value.

Many of the palms are labelled and are easily accessible. Upon request, when available, seeds are distributed free of charge.

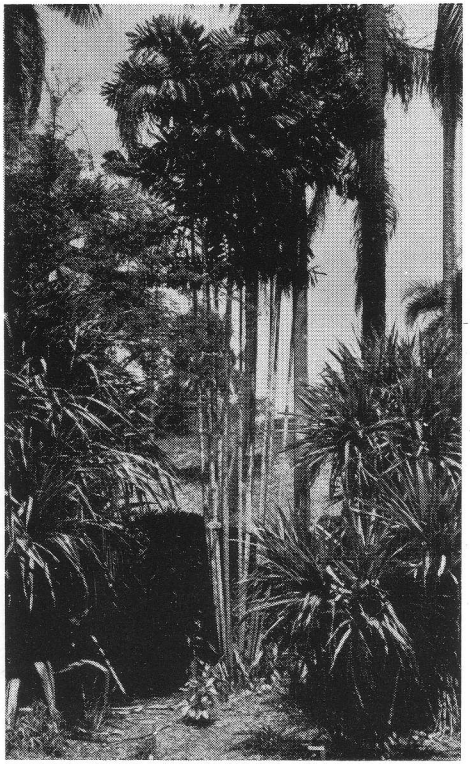
Palms of the Brisbane Botanic Gardens, Australia

H. W. CAULFIELD

Brisbane, capital city of the Australian State of Queensland, is situated in the southeast coastal corner of the State midway between the 27th and 28th parallels of latitude South. Climatic conditions are a combination of both temperate and tropical. The months of winter bring forth a Mediterranean-type climate of pleasantly warm, sunny days with cool nights, whilst the summer or monsoon season of December to April produces hot humid weather with frequent fierce electrical storms accompanied by torrential downpours of rain. Annual rainfall is approximately 46 inches, the majority of which falls during the monsoon period.

The Botanic Gardens is situated along the banks of the Brisbane River less than half-a-mile from the centre of the city, and was first established in 1855, the then known area being about 9 acres. To-day it is in the vicinity of 48 acres. Apart from displaying a great array of tropical and sub-tropical trees and shrubs, the Gardens possess many fine specimens of palms—in all 450 plants of 58 different species. The majority are growing excellently, although it can be noted with some that the extreme dry winters experienced time and again have left their mark on the trunks, the size of which have been greatly reduced during the bad seasons.

The largest planting of any one palm is that of *Arecastrum Romanzoffianum* locally known as the "cocos" or "plume palm," of which about 200 plants are scattered throughout the Gardens. Next largest plantings are those of two Australian native palms namely *Archontophoenix Cunninghamiana* (the picabeen) and *Livistona australis* (the cabbage tree palm). The picabeen is a delightful plant, being quick-growing and a most graceful subject. It does not pre-



57. Brisbane Botanic Gardens. *Archontophoenix Cunninghamiana* (left) in clump formation thought to have developed from a pot of seedlings or from self-sown plants from an early fruiting; *Ptychosperma Macarthurii* (right) in the palm border. Photographs by H. W. Caulfield.

sent the feathery appearance of the *Arecastrum* but has a decided advantage over this rival in that it is self-cleaning, dead fronds being usually blown down during any slight wind disturbance. No praise as a garden plant is too great for this native species. The local fan palm, *Livistona australis,* is found growing wild in the mountain valley areas along most parts of the eastern coastline of Australia. Under cultivation it develops into a rather sturdy customer, much different from the many willowy plants sometimes seen in nature.

The main groupings of palms are studded over an eight-acre sloping lawn area referred to as "Residence Hill," being below the Curator's Cottage, and along a small palm border close by. On the lawn can be noted many excellent sizeable clumps of *Chrysalidocarpus lutescens,* greatly admired by botanists from near and far; a thick clump of *Arenga Engleri* with its dull green foliage; slender plants of *Dictyosperma album;* pleasing specimens of *Butia capitata* and its variety *odorata;* various species of *Livistona, Phoenix,* and *Sabal.* A lone *Elaeis guineensis* standing about 25 feet is quite a feature although it does show signs of its resentment of the cold nights of July and August when temperatures at grass level are often down to 32°F. or below. Situated prominently beside a pathway is a single specimen of *Latania Loddigesii*—this fan palm never fails to attract attention from the Gardens' visitors.

Possibly the most outstanding feature of all the palms growing in the Gardens is a large circular grouping of *Roystonea regia* situated near the main gateway. These specimens, at least 70 years old, are 40 feet in height with a circumference measurement near the base of almost eight feet. Near relation *Roystonea oleracea* does not thrive quite so well; the Gardens has three plants, all of which display definite evidence of the struggle for survival during extended drought periods.

Throughout the area *Phoenix rupicola, P. reclinata,* and *P. sylvestris* do much to enhance the beauty of the Gardens. *P. rupicola* could be said to be the most graceful of the species being a much more satisfactory grower under Brisbane conditions than the more popular *Phoenix Roebelenii.* Growing on a moisture-retentive flat in the center of the Gardens can be seen several excellent plants of *Livistona chinensis.*

Along the somewhat over-crowded border *Rhapis excelsa* has become naturalized. *Arecastrum, Archontophoenix,* and *Livistonia* have added to their numbers with self-sown specimens, whilst *Corypha umbraculifera* wages a battle for room against *Rhapis* and *Pandanus.* A massive specimen of *Jubaea chilensis* humbles all about it, and nearby *Ptychosperma Macarthurii* from New Guinea displays its slender canes.

Unfortunately two fine Australian palms *Licuala Muelleri* and *Linospadix monostachya (Bacularia)* have been wrongly sited in a hard dry section of the gardens and needless to say are growing poorly. Soon an attempt will be made to move them to the more congenial surroundings of the palm border. If native Australian palms are to win acclaim abroad, no better ambassadors could be chosen than these two. *Licuala* grows naturally in the high rainfall areas in the north of the State and makes a most attractive pot plant. However, it is sad to relate that *Licuala Muelleri* is hardly known in its own country; also seed is most difficult to procure.

Palms are and always will be a notable feature of the Brisbane Botanic Gardens, for Brisbane is the center of a large tourist trade from the southern states whose tourists expect to see lush tropical foliage which is suggested more by palms than any other plant.

LETTERS

R. W. THOMAS
C/O GENERAL DELIVERY
CONCORD, CALIF.

"There are numerous points to the knack of successfully transplanting a large palm tree. For instance, it took me twenty years to find out that a large palm tree that has had many main roots severed must be set much lower in the ground than it was originally set."

R. H. SCHNABEL
1155 SUNNY DUNES RD.
PALM SPRINGS, CALIF.

"We are spending ten days or so in southern Sonora just relaxing. I am also searching for palms, especially those tolerant of high temperature and low humidity extremes. This is such a tremendously open and unsettled country that to find anything in it is almost hopeless, and to most of the inhabitants a palm is a *palma!* Specifically, I am looking for *Sabal uresana*—this is its native area, but not a one has shown in any of the town squares as yet, only *Washingtonia* and *Phoenix,* and I think I shall have to beat my way into some canyons east of Alamos to find that elusive *palma blanca.* I will send photos if I find it.

I also hope to find *Erythea aculeata* (not in culture, so I read) and *Erythea elegans*, the Franchesci palm.

You may be interested to note that the coconut flourishes in the open at Guaymas, and there are a few roystoneas around. This is undoubtedly the northern range on the west coast for these two as the coast further north is uninhabited. Thermometer range today — Dec. 21 — was about 88° — 60°F., but they do have cold snaps down to 40°F. during the winter."

2252 RIVER ROAD
JACKSONVILLE 7, FLA.

I have never seen a *Rhapis* injured by cold in Jacksonville, and this includes the severe winter of several years ago. My closest examination, of course, was of the specimens in our yard. These plants manifested not the slightest trace of damage, although it must be mentioned that our grounds lie in an exceptionally mild part of Jacksonville. In contrast, all eleven *Phoenix Roebelenii* on the grounds were completely defoliated and three perished during the bad winter. The survivors passed unhurt through last winter and now are thriving.

To me . . . hardiness is a relative concept. Royals may be thought of as being slightly hardier than coconuts; *Chamaerops* is enormously hardier than *Phoenicophorium (Stevensonia)*. Between the latter two genera one may envision a continuum of species, arranged in order of hardiness. From such a compilation a collector may ascertain that, if *Arecastrum* is marginal in his locale, *Livistona chinensis* is a good bet, but *Archontophoenix Alexandrae* is a bad risk. This is a rather obvious example, but it should demonstrate my point.

How to devise such a continuum? I would suggest that first a list of the commonest species be made and ranked in order of their hardiness. Then let Society members in various climates place the less ubiquitous species at first in relation to the common ones and later, as more accurate comparisons are made, in relation to one another. No doubt there would be disagreements and discrepancies arising from seedling variation, differences in nurture, observer sentiments, etc., but there seems to me to be little doubt that such a list, albeit imperfect, would be of great benefit to those of us in marginal zones.

JOHN E. SWISHER

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL HERBARIUM
WASHINGTON, 25, D. C.
17 January 1961

I noted with interest in the recent volume of PRINCIPES (4: 144) in the feature section "In and out of the Palm Garden" the mention of the coconut palm and the various theories on its origin and distribution. Perhaps the readers of PRINCIPES might be interested in some observations on the dispersal of coconuts which I have noted in recent years.

In the Hawaiian Islands the coconut palm is certainly introduced, probably by the very first Polynesian voyagers to set foot there about twenty centuries ago. Except perhaps for the southern end of the "Big Island," Hawaii itself, most of the areas in the islands suitable for coconut palms are along the coasts. The islands are apparently a trifle too cool for ideal nut production, and the trees, though becoming rather tall—perhaps 90 to 100 feet at most—are usually slender and present somehow a less vigorous appearance than those of the more indubitable tropics.

One sight of the drift nuts which pile up on certain beaches in the Hawaiian

Islands is usually enough to make you wonder whether any coconuts are naturally distributed by currents. Especially the northwest coast of little Lanai, which I visited in 1955; on that beach, which is directly in line with currents cutting through the channel between Lanai, Maui, and Molokai, there must have been ten thousand nuts tumbled up on the beach, and not a single one germinated. Hundreds were rotten, whether from exposure at sea or on the beach could not be told. The habitat is not unsuitable for coconuts, yet none apparently ever germinate there, or if they do, fail to grow to maturity. Similar sights may be seen at other locations on other islands, although the tremendous number of nuts along the Lanai coast was not duplicated.

But there are exceptions, and one merits mention. In the Marshall Islands the coconut is very common, and there one may find germinating nuts occasionally along the beaches, and sometimes a young tree following some of the more aggressive plants, such as beach morning-glory, onto a new sandspit.

It seems to me that the experiments of Edmondson ("Viability of Coconut Seeds after Floating in Sea," *Bishop Museum Occasional Papers* vol. XVI, no. 12, 1941) could well be repeated, with attention to reduplication of sets and a much greater use of samples. As it is, he has shown that nuts may survive after floating for as long as 110 days, which time is sufficient, according to Edmondson, for a possible drift of 3,000 miles.

Sincerely yours,
BENJAMIN C. STONE

WHAT'S IN A NAME?

Astrocaryum (as tro cárry um) was erected in 1818 by G. F. W. Meyer on a palm collected in British Guiana. A combination of the Greek nouns *astron* (star) and *karyon* (nut), the Latinized generic term is neuter gender which is reflected in the -um termination of modifying adjectives used as specific epithets: *A. aculeatum, A. mexicanum, A. Standleyanum.* A number of autochthonous names for these strongly armed pinnate palms from the New World tropics came to be applied as specific epithets in formal taxonomy. These terms are correctly spelled with a capital letter to denote that they are vernacular words standing in apposition to the generic name: *A. Burity, A. Chambira, A. Guara, A. Huicungo, A. Malybo, et al.* The star-nut palms, numbering more than 40 species, were so named because of the curious starlike marks radiating from the pores of the hard endocarp.

Chrysalidocarpus (kris al i do cár pus) is basically the Latinized combination of the Greek words *chrysallis* (gold-colored pupa of butterflies) and *karpos* (fruit). The six-syllable union which results, with its primary accent on the penultima (next-to-the-last syllable), requires a weaker secondary accent on one of the preceding syllables. The Latin genitive singular chry-sál-li-dis gives us a clue as to the most logical site for this essential secondary stress. This position is further supported by the pronunciation of the English word chrysalides (kris á li deez), one of two possible plural forms of chrysalis (krís a lis), a term used by zoologists to indicate the pupa of insects in general. As regards our generic term, then, in English phonetic syllabification, the complete stress pattern would be: kris á li do cár pus. When Hermann Wendland founded the generic name, he first printed the word with a double l in his preliminary discussion; however, in his ensuing formal account of the genus, he spelled the name *Chrysalidocarpus.* About 20 species of these unarmed Ma-

dagascar feather palms are now known to science. When stripped of the epicarp to reveal the spotted mesocarp, most of the fruits bear a striking resemblance to butterfly pupae. Concerning those generic names whose final component is -carpus, in the *Palmae* family all such names are masculine gender with the specific epithet, if an adjective, in agreement: *Chrysalidocarpus lanceolatus, Oenocarpus panamanus, Pholidocarpus macrocarpus, Trachycarpus Martianus*. Regrettably this consistency does not extend to genera in other families of the plant kingdom. We have, for example: *Podocarpus elongata* but *Pachycarpus grandiflorus*; *Artocarpus integra* but *Orthocarpus tennifolius*; *Lithocarpus glabra* but *Lonchocarpus speciosus*; etc.

Serenoa (ser ee nó a), a monotypic genus with the *S. repens* as the unique representative, was established by Joseph Dalton Hooker to honor Sereno Watson (1826-1892), American botanist and erstwhile curator of the Gray Herbarium at Harvard University. The generic name represents one of those unusual instances in which an individual's given name was utilized to form the technical term. Inasmuch as a genus *Watsonia* had previously been validly published for certain South African herbs of the *Iridaceae* group, Hooker had no other recourse for his dedication. Previous to our present understanding of this variable fan palm ranging from South Carolina to the Florida Keys, the so-called "saw palmetto" had been referred to *Corypha, Sabal, Brahea,* and *Chamaerops*.

BRUCE H. BEELER

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