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. The Society relies on voluntary contribution for support, and membership is open to all persons interested in the family. 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 on the first day of January, April, July, and October, and sent free to members of the Palm Society.

EDITOR: Harold E. Moore, Jr.

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Contents for October

COVER PICTURE

The trunk of *Trachycarpus Fortunei* at Hampton, Virginia, well clothed with fibrous leaf sheaths. Photograph by Walter H. Hodge. See also page 139.

EDITOR'S CORNER

Continuing the publication of papers presented at the Palm Conference, we have as a contributor in this issue the Superintendent of the Fairchild Tropical Garden, Stanley Kiem, who has been at the Garden since graduation from the University of Miami. Other contributors are already familiar to readers of PRINCIPES. We also include some letters and a photo held from a previous issue.

Fig. 60. This artfully trimmed *Phoenix canariensis* stands in the front yard of a hotel on the Boulevard des Anglais in Nice, France. The leaf bases were shaped while green and easier to cut than when dry and hard. Photograph by David Barry, Jr., 1953.

LETTERS FROM MEMBERS

"As a new member of the Society I wish to make known my interest in palms and in the Society by listing those species I am growing here in the Salt River Valley. Also I wish to learn of other species which might do well here and ask Society members to make suggestions. I am growing the following in the open: *Washingtonia filifera, W. robusta, Arecastrum Romanzoffianum, Butia capitata, Phoenix canariensis, P. dactylifera, Sabal Blackburniana, Chamaerops excelsa, C. humilis, Erythea edulis, E. armata.* In addition the following are growing in containers under the roof but outside: *Chamaedorea elegans, Howeia Forsteriana, Archontophoenix Cunninghamiana, Phoenix Roebelenii.*

"Our outdoor temperature drops to about 27° but I have orchard heaters located at strategic locations about the property. Summertime brings 110° and 10 per cent relative humidity for long periods. This limits the selection as well as winter cold but not so severely in the shade with automatic fog sprayers.

"I would be interested in meeting Society members in this area and in learning of and procuring new species."

JEROME F. LOWENSTEIN,
Phoenix, Arizona

* * *

And from a letter addressed to Dent Smith the following paragraphs are shared:

"Your article in PRINCIPES [vol. 2: 41-51] concerning washingtonias, the desert area and Palm Springs is most interesting. I have been a desert dweller for ten years, a palm admirer for more than ten years, a Palm Society member for six months, and a palm collector in earnest for about a year.

"You will be interested to know that only a few of the groves you mention are available to tourists by motor car. The temperature still surpasses 120° (five times last summer)! The groves along the Little San Bernardino (fed by springs along the San Andreas fault) recently have been added to the state park system and are now protected from marauders who recently started selling them in Palm Springs as ornamentals. Twenty-nine Palms has considerably more trees now and is in the Joshua Tree National Monument. Two-Bunch Palms is privately owned by a "health-water" type resort. Seven Palms is owned by a few people for private residence. Thousand

Palm Oasis is being developed as a plush resort area. As for the other groves, they are as difficult to reach as ever. A road (trucks only) leads to the Chino Canyon group which is still safe from subdividers. The *Phoenix dactylifera* groves are becoming more valuable as subdivisions and golf courses and a source from which to obtain ornamental trees than they are as commercial ventures—although date culture is still a major crop in the area and new gardens are planted once in a while.

"My own private collection includes twenty-six different species, of which the *Phoenix* do the best. The sabals do fine if not left entirely exposed to summer sun and *Arecastrum Romanzoffianum* grows at a phenomenal rate. I have three coconuts planted last summer that thrive in 115° and did make it through the winter, which had no freezing nights but had fewer warm days than usual. Most of the difficulties here seem to be low humidity, high temperatures and sunburn, although *Chamaedorea* does fine outside in almost complete shade.

"Your recent article on the palms in Tabasco, etc. was most interesting. I hope to try *Brahea dulcis* here when I can get a plant or two, also the *Acrocomia* from Nayarit. Some very small *Attalea Cohune* from Nayarit [but if native probably *Orbignya Guacayule*—Ed.] survived last winter and are starting to grow now. My next trip will follow your route through the Tabasco country."

ROBERT O. SCHNABEL
1155 Sunny Dunes Rd.,
Palm Springs, Calif.

* * *

Some time ago, a letter from Mr. G. L. Guy, Conservator of Forests in Matabeleland, P. O. Box 467, Bulawayo, Southern Rhodesia, was forwarded to the editor by Dent Smith. Printing has been delayed due to correspondence about one of the species mentioned by Mr. Guy who, in the meantime, has sent some reprints which we hope to utilize later. The original letter is reproduced here.

"Volume 1 no. 3 of PRINCIPES was recently sent to me by Edwin Menninger of Stuart, Florida, and I was particularly interested in the photo of the *Raphia* leaf on the back page.

"About two years ago I had something to do with the preservation of the two groves of *Raphia ruffia* existing naturally in this country, and I can assure you that 27 or 29 feet is a small leaf. Mr. Aylen of the Natural Resources Board and I felled one leaf which measured 53 feet, and it was by no means

(Continued on page 126)

Cold Tolerance of the Cultivated Palms

Based on Observations Made at Daytona Beach, Florida, During the Winter of 1957-1958

DENT SMITH

During the past seven years the writer has maintained at Daytona Beach, Florida, a collection of several hundred planted palms ultimately containing upwards of 135 species belonging to 64 genera. The purpose of this planting has been twofold, (1) to make a more northern palm garden of as many different palms as might be grown, and (2) to determine what species could endure the colder winters of a region nearly two hundred miles north of the Florida latitudes considered warm enough for success in growing any really large number of species.

The second consideration was an experiment full of risks, for the weather records revealed that the Daytona Beach area had been subjected, occasionally, to invasions of deep cold even though the outbreaks usually had occurred many years apart. However improbable, a heavy freeze may descend upon the area in any winter, and several such freezes actually did occur in the winter of 1957-1958 just past, with the inevitable dire results to most tropical plants. The latest outbreak of comparable cold had been eighteen years earlier, in late January, 1940, when a temperature of 18°F. established an absolute minimum in the records of the Weather Bureau station. During the interval of eighteen years between the two outbreaks only a negligible number of the myriad tropical plants had been winter-killed in the warmer parts of the area. Perhaps no planted palms at all had been killed during the period, but only the hardier kinds had ever been generally planted.

The main object of this article is to record as accurately as possible the effect of the past winter's multiple freezes upon each of the planted palm specimens in the writer's collection. In order for such a report to be of much value to subtropical gardeners it becomes necessary to go into some detail about the location, the climate and other factors affecting the palms, so that the gardener may relate the facts (temperatures, *etc.*) to his own situation and perhaps draw practical conclusions.

Daytona Beach is on the east coast of Florida, at latitude 29° 11′ N., about 425 miles north of Havana and about 360 miles north of the Tropic of Cancer. The distance north from Miami is 263 road miles or 242 miles in a straight line. The climate is classified as "humid subtropical" and according to a climatological summary of the U. S. Weather Bureau ". . . is characterized by mostly sunny days, gentle breezes, and pleasant year-round temperatures, suitable for bathing and sunning at the beach every month of the year. . . . Average annual temperature is 71°." But there are, in fact, two separate winter climates in Daytona Beach, that of the mainland and that of the peninsula, a narrow strip of land confined between the salt-water Halifax River and the open Atlantic. The palm collection dealt with here is located on the peninsula, which is more subject to marine influences and hence distinctly warmer in winter.

This usually benign climate was reversed the past winter by three months of record cold weather, suddenly beginning with a light frost on December 2, 1957, followed by hard freezes on December 12 and 13, when minima of 25°F. and 27° were recorded. These two freezes destroyed all the foliage of about half the writer's palms and damaged that of certain others. Although the recorded 25° temperature was the absolute minimum for the three winter months, much worse was yet to come, in January and February, 1958, in the form of continuous cold weather punctuated by eight additional freezes — a total of eleven during the three months. For severe and protracted cold this was by all odds the coldest winter in the history of the local Weather Bureau and in the memory of the oldest lifetime residents. At last here was something an experimenter with palms could sink his teeth into: a trial by cold of historically unheard-of duration, for it eclipsed anything experienced here in over fifty years.

Obviously the result to the palms was calamitous, but by no means was it a total catastrophe. Had it been total, there would be no point in writing this report. Besides the palms already known to be remarkably cold-hardy, a few hitherto believed tender, by surviving unscathed, were proved equally hardy or nearly so. Many others that were defoliated or otherwise injured are now, nearly eight months after the first freezes, fully recovered, or are definitely recovering, or are attempting to recover with the outcome still in doubt. Much the greater number of the so-called tender palms, however, were killed and conclusively proved not even slightly tolerant of hard freezes.

Without wanting to appear in the least didactic, the writer must make it clear that only a close study of the factors involved—and there were many—could avoid certain misleading conclusions. For example it would be wrong to conclude, from the summary appearing near the end of this article, that the royal palms, just because three specimens here are now unquestionably recovering, can take anything produced by the whims of subtropical weather; on the contrary, only large, older specimens can survive repeated freezes and young ones will surely perish if not protected. The reverse of this is to conclude, and again wrongly, that a planted specimen of *Drymophloeus Beguinii*, say, will succumb to one short freeze of 25° simply because one specimen was finally killed here by the later freezes of the past winter, in February. Actually dozens of palms were not visibly affected by the first few freezes here, but were eventually killed by much later ones. If this report is to be of substantial use or reliability to anyone concerned with periodic invasions of cold air masses, it must be read in conjunction with the Appendices. Reference is made chiefly to Appendix A, which contains the temperature range for each day of the three cold months of December, January and February.

The whole matter of plant injury and survival here is complicated, and not only by the fact that there were eleven freezes during the winter instead of just one. Though the thermometers were housed in the prescribed standard shelter for such instruments, the recorded temperatures do not allow for the differences bound to exist at various locations on the premises. Temperatures may vary by several degrees within only one hundred feet (much more vertically), depending usually on a change in ground level, on proximity to foliage or solid objects, and on air circulation. But there were other factors, of which the principal was insect attack upon freeze-weakened plants. Which one of the eleven freezes finally killed a palm? Which palms finally succumbed to insect attack instead of primarily to cold destruction? These questions are not easily answered, but in the summary towards the end of this report the writer attempts to answer them in every ascertainable case. No attempt, however, is made here to account for numerous other considerations, as, for instance, the moisture content of the plants or the soil, the vigor of the specimens, nor in all cases the size and age of the palms. These are but a few of the factors that directly bear on the subject, and indeed to deal with every one would require more than the available space.

About a quarter of the palms killed owed this outcome directly to bud infestation by insect larvae and only indirectly to cold injury. In many cases an apparently healthy bud appeared only to sicken and die, whereupon it was pulled out and found heavily infested in its soft basal parts with larvae resembling maggots. Unfortunately the insect responsible for these larvae was not discovered, but without presuming to name the culprit, a fly was suspected. The larvae infested the buds of not only the freeze-injured palms but also of thirty or more uninjured palms in perfect vigor. In the latter case the insect showed a preference for the arecastrums, seven of which were attacked and their buds destroyed by larvae; but all of these palms fully recovered, for they and some of the other cocoids are able to thrust up a new leaf bud when one is destroyed—an ability notably shared with the *Phoenix* and certain other palms not allied with *Arecastrum*.

Presumably the freeze losses could have been reduced by the use of several hundred grove heaters or some other kind of artificial heating. The temperature could have been raised several degrees by such methods, but this would have defeated the purpose of learning the true cold-tolerance of the palms. For this reason no artificial heat was used at any time, and the palms were strictly on their own. On the morning of each of the heaviest freezes it might have been legitimate to sprinkle the frosted palm foliage to prevent the rising sun from thawing it too fast, but this could not be done because the irrigation system was frozen solid.

Defining a freeze as each time the temperature dropped to 32° or lower, there were during this historic winter of eleven freezes a total of approximately 63 hours of freezing weather. The first one, which was also the shortest, occurred on December 2 and lasted but twenty minutes. The longest one occurred on January 9 and lasted 13 hours. (Actually the latter freeze began at 8:30 p.m. on the 8th and ended at 9:30 a.m. on the 9th, but the weather reports at the writer's station have been made once daily covering the 24 hours from 5 p.m. of the previous day to 5 p.m. of the day newly reported, for the reason that the thermometers are read but once each 24 hours.) December had three freezes with 20 hours of freezing weather, January had one with 13 hours, and in February there were four freezes on consecutive days with 30 hours. No temperatures below freezing were recorded during daylight after 10 a.m. The most damaging weather occurred in mid-February, when the minimum temperatures were in either the 20's or 30's on nine consecutive mornings. A good many of the tropical palms that had survived all seven preceding freezes—some of them virtually unaffected—at last were killed by the sustained cold of February, which was the winter's parting shot. No frost recurred after February 20th.

Including the palms in containers there were represented in this collection, before the freezes, over 250 species in more than 100 genera. About half of the potted palms were casualties, but this account is concerned only with planted specimens, of which there were 445. More than half of these were still very small juveniles, and hence less resistant to cold.

In the alphabetical summary below, an attempt is made to account for each individual palm up to August 1, 1958, the date of this report. Brevity occasionally has been sacrificed in favor of detail that may be essential. Because the size of a palm has a great deal to do with its cold resistance, the overall height of each specimen is shown in either feet (′) or inches (″). Figures in parentheses signify the total number of individuals of each species. The word "now" always means at August 1st.

Acanthophoenix rubra (1), 20″, killed Dec.

Acrocomia aculeata (2), 11′ and 17′, both severe foliage damage Dec., total loss remaining foliage Feb., both now healthy with new foliage. *A. fusiformis* (1), 20″, unaffected. *A. Totai,* (1), 10′ unaffected at any time. *A. mexicana* (1), 2′, slight damage Dec., seemingly dead Feb., began recovery late Mar., now fully recovered. *A.* sp. (1), 3′, quickly recovered from very slight damage.

Aiphanes acanthophylla (2), 5′ and

8′, both killed outright Dec. *A. caryotaefolia* (1), 11′, killed Dec. *A. erosa* (1), 3′, killed Dec. *A. Lindeniana* (3), all 2′, two killed Jan., the third apparently dead also but began recovery July 3, recovery now certain.

Archontophoenix Alexandrae (4), one of 9′, two of 15′, one of 25′. The three smaller specimens slowly died from effects Dec. and Jan. freezes. Woody stems as well as foliage destroyed. Only the foliage of the tallest injured; not yet dead, but recovery not likely.

A. Cunninghamiana (2), 11′ and 16′, foliage of both gradually made unsightly but none of it destroyed, buds of both killed by larvae early June despite drenchings of malathion solution, smaller died early July, larger slowly recovering after July 15th.

Areca Cathecu (1), 4′, killed Dec. *Areca triandra* (2), 4′ and 8′, slight damage to the smaller Jan., severe Feb., died May from insect attack. Minor damage to foliage of the larger Dec., more in Jan. and Feb., 3 stems killed by insects Mar., 1 stem alive and rapidly growing. *A. sp.* (2), 3′ and 5′, killed Jan.

Arecastrum Romanzoffianum (8), 8′ to 24′, unaffected.

Arenga Engleri (3), 4′ to 9′, unaffected. *A. pinnata* (1), 7′, foliage destroyed Dec., pruned back to bare 2′ stub, so remaining till late June, when a stunted leaf appeared. Recovery now likely but not certain.

Arikuryroba schizophylla (1), 8′, only minor damage early freezes, severe in Feb., lingered till mid-Mar. and died.

Bismarckia nobilis (1), 1′, unaffected.

Butia capitata (4) 1′, 5′, 7′ and 13′ all unaffected. *B. eriospatha* (1), 6′, unaffected.

Caryota mitis (6), 6′, 8′, 9′, 12′, 20′, most or all foliage destroyed Dec. except of shaded suckers. The three smaller specimens killed Dec., the three larger now alive only through the three to six suckers in each clump. *C. urens,* (3), two of 8′ and one of 16′, the two smaller killed Dec. but the largest, also apparently dead, began recovery late Apr., now definitely safe. *C.* sp., rec'd as *C. Cumingii,* (1), 2′, killed Dec. *C.* sp., rec'd as "*C. plumosa,*" (1), killed Feb.

Chamaedorea brachypoda (1), eleven stems to 2′, six stems killed Jan., five uninjured. *C. cataractarum* (1), 2′, unaffected. *C. costaricana,* (1), 2′, one stem killed Dec. and one Feb., two stems now alive, flourishing. *C. elegans* (3), 1′ to 4′, all unaffected. *C. erumpens* (12), two weak plants killed Feb., ten alive suffered very slight to moderate injury.. *C. fragrans,* (1), 3′, killed to ground Jan., new stem of this single-stem plant rose from roots late June. *C. geonomiformis* (1), 1′, foliage shabby from repeated freezes, larvae destroyed bud, recovery doubtful. *C. Klotzschiana* (1), 5′, unaffected. *C. oblongata* (1), 3′ severe injury Jan., killed Feb. *C. radicalis* (2), 10″ and 16″, smaller killed Feb., larger unaffected. *C. Seifrizii* (1), 3′, unaffected. *C. Tepejilote* (2), each 18″, both killed Dec. *C. Wendlandiana* (3), 2′ to 3′, all injured Dec., killed Feb. *C.* spp. (11), 1′ to 3′, four of these several undet. species killed Dec., remaining seven uninjured.

Chamaerops humilis (2), 1′ and 6′, both unaffected.

Chrysalidocarpus lutescens (5), 7′, 9′, two of 10′, 12′, severe injury to foliage and stems Dec. except shaded suckers, one killed outright Feb., remainder alive only through new suckers and shorter stems. *C.* sp. "Soledad" (2), 2′ and 3′, minor injury to both Dec., larger killed Feb., smaller no further injury till May when killed by insect larvae.

Coccothrinax argentata (1), 2′, injured Jan., killed Feb. *C. crinita* (2), 1′ and 2′, very minor damage to foliage of smaller, larger totally uninjured, obviously suitable for the climate. *C. Dussiana* ? (1), 3′, unaffected. *C.* sp. (1), 2′, killed Dec.

Cocos nucifera (9), 3′ to 13′, five killed Dec. incl. one dwarf Malay, two killed Jan., two killed Feb., all severely injured unless killed by the first hard freeze.

Corypha umbraculifera (1), 10″, damage quite minor, killed by insect larvae late Mar.

Cryosophila Warscewiczii (1), 2′, seemingly killed Dec. when stem pruned back to 3″ stub, first new leaf mid-June, now definitely recovering. *C.* sp. (1), 3′, killed Dec.—or, one might well ask, would it not have recovered as the other plant did if it had not been grubbed out and discarded?

Dictyosperma album (4), 2′ to 9′, all except smallest severely injured Dec., no recovery, but smallest persisted with only minor damage till May when killed by insect larvae. *D. album* var. *rubrum* (1), 8′, killed Dec.

Drymophloeus Beguinii (1), 4′, unaffected by first seven freezes, killed Feb.

Elaeis guineensis (3), 2′, 8′, 11′, total destruction foliage of all Dec. and all presumed dead till late June when the bare stub of the former 8′ palm erected a first leaf and is now rapidly recovering, but no recovery of the others as yet.

Euterpe edulis (1), 4′, killed Dec.

Gaussia attenuata (4) 2′ to 3′, all killed Dec.

Geonoma sp. (1), 3′, stem killed Dec., suckers killed Jan.

Guilielma Gasipaes (1), 6′, killed Dec., new suckers have since risen from roots.

Hedyscepe Canterburyana (1), 10″, killed Dec.

Heterospathe elata (1), 4′, severe injury Dec., killed Jan.

Howeia Belmoreana (1), 3′, killed Dec. *H. Forsteriana* (5), 2′ to 7′, all but one of only 2′ killed Dec., but inexplicably the two-footer was uninjured at any time.

Latania borbonica (5), 1′ to 5′, all minor to moderate leaf damage Dec., more extensive Jan., all killed Feb. except for one small specimen that lingered on till killed by larvae late July.

Licuala grandis (2), 10″ and 16″, only minor damage to foliage of either through first seven freezes, smaller killed Feb., larger never did lose quite all its foliage and is now definitely recovering. *L. peltata* (1), 14″, unaffected Dec. and Jan., killed Feb. *L. spinosa* (1), 1′, weak plant, killed Feb.

Livistona australis (1), 3′, unaffected. *L. chinensis* (5), 3′ to 5′, none affected. *L. cochinchinensis* (6), 2′ to 4′, none affected. *L. rotundifolia* (2), 1′ and 3′, the smaller killed Jan., the larger lost half the foliage but is now fully recovered.

Mascarena Verschaffeltii (7), 2′ to 8′, foliage of all seven destroyed Dec., no recovery of six, seventh recovered partially June only to lose bud to larvae.

Mauritia setigera (1), 2′, killed Dec.

Metroxylon amicarum (1), 3′, killed Dec.

Nephrosperma Vanhoutteanum (1), 1′, killed Dec.

Opsiandra Maya (11), 2′ to 6′, all but one killed Dec., and that one appeared dead till early July, full recovery still uncertain.

Orbignya Cohune (1), 2′, unaffected. *O. speciosa* (4), 1′ to 2′, injury none to inconsequential, apparently hardy here.

Parajubaea cocoides (1), 20″, unaffected.

Paurotis Wrightii (2), 3′ and 7′, unaffected.

Phoenix. Plants of the following species were in no way affected: *P. abyssinica* (1), 6′; *P. canariensis* (4), 2′ to 12′; *P. dactylifera* (3), 2′ to 7′; *P. humilis* (1), 5′; *P. Roebelenii* (5), 3′

to 5′; *P. reclinata* (20), 4′ to 11′; *P. rupicola* (1), 5′; *P. sylvestris* (2), 6′ and 9′. A few of each of the following hybrids, of which only the female parent is known, lost their buds but not any of the opened leaves and subsequently grew new buds: *P. pusilla* × ? (6), 2′ to 5′; *P. rupicola* × ? (5), 2′ to 3′; *P. zeylanica* × ? (6), 1′ to 2′.

Phytelephas macrocarpa (1), 2′, killed Dec.

Pinanga Kuhlii (1), 3′, minor damage Dec., extended Jan., killed Feb.

Pritchardia Beccariana (1), 2′, minor injury Dec. and Jan., seemingly killed Feb., revived Apr., killed by larvae May. *P. pacifica* (2), 2′, killed Dec. *P. Thurstonii* (8), all 2′, all killed Dec. save one specimen which retained one green leaf and is now gradually recovering.

Pseudophoenix vinifera (1), 5′, killed Dec. *P. Sargentii* (1), 2′, inexplicably not injured. *P. saonae* (2), 18″, killed Dec.

Ptychosperma elegans (9), 5′ to 12′, foliage and also woody trunks destroyed Dec., trunks exuding a pinkish paste where cells were ruptured, fatal damage obvious to every specimen from the first hard freeze (these palms had survived, without the slightest injury, five light freezes in past years). *P. Macarthuri* (2), 3′ and 4′, killed Dec. *P.* sp. "Ragey" (2), 5′ and 7′, killed Dec. Also killed Dec., five specimens of two undetermined species.

Raphia Ruffia (1), 2′, foliage destroyed Dec. and plant seemingly dead, recovery started early June and now rapidly progressing.

Rhapis excelsa (2), 3′ and 6′, unaffected.

Rhapidophyllum hystrix (1), 3′, unaffected.

Reinhardtia gracilis var. *gracilior* (1),, 1′, three fruiting stems killed, two suckers remained alive, plant dug up and placed indoors on eve of Jan. freeze, not yet replanted.

Rhopalostylis Baueri (1), 1′, apparently killed Dec., revived late Mar., killed by larvae Apr.

Rhyticocos amara (1), 4′, half foliage destroyed by successive freezes, recovery now seems certain.

Roystonea elata (8), all 4′ and two years old, planted Nov. '57, all killed the following month. *R. oleracea* (2), 3′ and 5′, both killed Dec. *R. regia* (17), 5′ to 24′, nine of which were 2½ years old averaging 5′ in overall height, all killed Dec.; five six-year olds averaging 12′ killed Dec. except for one survivor growing under oak foliage, this survivor now healthy again; one 14′ specimen eight years old killed Jan; one 16′ specimen ten years old lost all foliage Dec., grew two new leaves late in the month, new foliage destroyed Jan., began recovery late Mar., now rapidly recovering; one 24′ specimen about twenty years old lost all foliage Dec., made no recovery till Apr. but full recovery now certain.

Sabal causiarum (1), 3′, unaffected. *S. Etonia* (14), 3′ to 5′, native, unaffected. *S. glaucescens* (1), 3′, unsightly damage to foliage, no deep injury. *S. mauritiaeformis* (1), 20″, ugly but inconsequential damage to foliage. *S. mayarum* (1), 5′, unaffected. *S. nematoclada* (1), 3′, foliage mostly burned, otherwise uninjured. *S. Palmetto* (42), 8′ to 26′, native, unaffected. *S. parviflora* (1), 2′, totally uninjured though its "saucer" was covered with a thick cake of ice for seven hours. *S. texana* (1), 3′, unaffected. *S. umbraculifera* (2), 1′ and 3′, unaffected. *S. Yapa* (1), 2′, unaffected. Note degree of variance in cold-tolerance of the strictly tropical species: *S. causiarum* (Puerto Rico), *S. mayarum* (British Honduras), *S. parviflora* (Cuba), *S. umbraculifera* (Hispaniola), *S. Yapa*, are all hardy here, whereas *S. glaucescens* (Trinidad), *S. mauritiaeformis* (Colombia), and *S. nematoclada* (British Honduras) are only half hardy.

Salacca edulis (1), 3′, killed Dec.

Scheelea sp. (1), 8′, third of foliage lost Dec., more in Jan., severe injury Feb., appeared moribund Mar., recovery now almost complete.

Serenoa repens (3), 1′ to 6′, native, unaffected.

Syagrus coronata (4), all 2′, all seemingly killed by cumulative effect of freezes, three dug up and discarded, mere stub of the fourth invisible after being mashed by wheel of tree-crane truck, began revival early May, now fully recovered, wherefore it may be suspected that the three other plants might have survived if not discarded. *S. quinquefaria* (1), 3′, seemingly dead from December 12 till late May, this palm has fully recovered. *S. Sancona* (1), severe damage Dec., seemingly dead early Jan. till early July, now recovering beyond any doubt. *S. Weddelliana* (2), each 2′, minor damage to one which was later killed, Mar., by larvae in bud, the other one unaffected.

Synechanthus sp. (1), 3′, its only stem killed Dec., suckers killed Feb.

Thrinax parviflora (8), 1′ to 4′, three killed Dec., three others killed Jan., two largest both survived the winter but were killed May by larvae in lower buds. (This palm much more cold-resistant when adult).

Trachycarpus Fortunei (3), 18″ to 3′, unaffected. *T. Martiana* (1), 18″, unaffected.

Trithrinax brasiliensis (1), 2′, unaffected.

Veitchia Merrillii (19), 3′ to 9′, all killed Dec. (*Adonidia Merrillii* now synonymous for this palm). *V. sp.* (probably *V. Montgomeryana*) (2), 5′ and 6′, both killed Dec.

Washingtonia robusta (3), 6′ to 14′, unaffected.

Zombia antillarum (1), 1′ foliage off-color from cumulative effect of freezes, three buds killed by larvae Mar., foliage now restored to good green color (all of it last year's) but no buds have as yet risen, survival possible but not certain.

APPENDIX A

Daily Range of Temperature for the Three Cold Months

The maximum and minimum temperatures below were recorded at 2514-2518 S. Peninsula Drive, Daytona Beach, Florida, in degrees Fahrenheit. Each recording was made at 5 p.m. for the 24-hour period then ending. Temperatures of 32° or less are shown in bold-face type.

Day	Dec. '57	Jan. '58	Feb. '58
1	64-35	70-56	65-41
2	62-**32**	56-45	59-35
3	69-40	58-54	49-**32**
4	66-40	52-50	56-**30**
5	62-39	61-50	63-35
6	69-44	65-54	76-44
7	76-57	53-47	75-57
8	80-59	42-35	57-39
9	66-50	43-**27**	57-36
10	55-38	52-33	53-57
11	65-43	61-35	55-45
12	44-**25**	63-38	54-45
13	55-**27**	65-58	47-35
14	63-35	68-53	55-**31**
15	62-42	63-44	68-36
16	63-50	53-45	61-35
17	70-45	59-39	49-**29**
18	69-55	55-39	48-**26**
19	67-55	55-45	54-**26**
20	78-58	68-46	53-**29**
21	64-52	66-47	58-35
22	72-61	57-48	63-42
23	76-64	59-45	65-47
24	77-63	71-57	67-47
25	76-62	62-41	66-59
26	70-63	68-44	67-40
27	71-58	61-45	83-60
28	73-61	61-40	75-55
29	67-58	57-44	
30	69-56	59-39	
31	68-54	69-56	

APPENDIX B

Under the heading "Severe Weather," the following summary of the winter weather in Florida as a whole is taken from the February, 1958, "Climatological Data" for Florida, a Weather Bureau publication of the U. S. Department of Commerce.

The persistent pattern of abnormal cold that was established in early January of this year continued unabated the first three weeks of February. Monthly average temperatures were 8° to 11° below the long-term February mean in all areas. February temperatures averaged lower than those recorded in January 1958, and at almost all central and southern peninsula points temperatures this February averaged lower than any other month since records have been kept. In the northern and western county area February 1895 averaged slightly colder, making this February the second coldest in those areas. When Old Man Winter finally released his grip the last week of the month, Florida had been subjected to eight consecutive weeks of abnormal cold.

February 5th brought a most destructive freeze to all of Florida [the peninsula at Daytona Beach escaped this freeze] and particularly to the extreme southern portion where farming areas of Dade, Broward and Palm Beach Counties were subjected to early morning temperatures in the middle twenties. Except for a brief period of moderating temperatures following this freeze, the general temperature trend was downward during the first three weeks of the month. Periodic cold surges from a vast cold air reservoir, which covered most of the continent east of the Rocky Mountains, prevented any appreciable temperature moderation. Relatively strong winds accompanied each cold air surge and added to the general discomfort. The week of the 15th to 21st, on the basis of average temperatures, was the coldest period. Temperatures were generally 15 to 20 degrees below seasonal averages and many northern and western county points experienced freezing on seven consecutive days. Frost or freezing temperatures were noted in the central peninsula areas and at numerous Everglades points on 5 days the same week.

Precipitation-wise, February was not nearly as extreme. The general snowfall in the northern and western counties on the night of the 12th-13th was the outstanding precipitation feature. Total snowfall in the area west of the Suwannee River and the northern-most counties east of that river ranged from one to three inches. At several places this snow was the heaviest since February 13, 1899. At Jacksonville, the 1.5 inches measured there occurred on the 59th anniversary of the only other measurable amount: 1.9 inches on February 13, 1899. At Tallahassee, the 2.8 inches measured was the greatest amount ever observed since records began in 1886. Snowfall was observed as far south as Gainesville but at that point it melted as it fell. The relatively light rainfall in the southern area was about the only weather feature this month that can be considered other than adverse. Drainage of lands in that area, left inundated or waterlogged by the record January rains, was aided by the light rainfall.

The persistent and prolonged cold was especially damaging to agriculture. A large portion of the crops that survived the earlier freezes was either destroyed or seriously damaged by the freeze of the 5th. Subsequent continued cold and freezing retarded the germination of seeds planted soon after this freeze. Cattle continued to suffer from the cold and wind as pastures already devastated by the earlier freezes and flooding could not provide the much needed forage. The unrelenting cold continued to discourage tourists and adversely affected the vacation trade.

A survey of historical weather records reveals the past three months [December, January, February], judged on the basis of average temperature, is the coldest three-month period ever recorded at nearly all places. Significantly, these record low average temperatures were the result of persistently cold weather over a lengthy period of time and the all-time low temperature for Florida (2° below zero at Tallahassee on February 13, 1899) was never seriously threatened.

KEITH BUTSON, *State Climatologist*
Weather Bureau Office
Gainesville, Florida

APPENDIX C

I. Check list of the hardier cultivated palms

II. Check list of half-hardy cultivated palms.

NOTE: Because the term "hardy" cannot be universally applied with accuracy to suit all subtropical climates, the adjective "hardier" has been availed of to avoid any possible misinterpretation. Obviously the climates of the cooler palm-growing regions are not identical, and on the contrary are sometimes drastically different even within the borders of each state or country where palms are cultivated. It follows, then, that the word "hardy" referring to cold tolerance is only relative and cannot always be used interchangeably for the cultivated palms of northern Florida, southern California, southern Texas, southern Japan, *etc.* In the check list below, however, the names of those palms actually proved cold-hardy for the peninsula at Daytona Beach, Florida, are preceded by an asterisk (see Appendix A for range of temperatures).

I. The Hardier Cultivated Palms

ACROCOMIA
*fusiformis
*Totai
ARCHONTOPHOENIX
*Cunninghamiana
ARECASTRUM
*Romanzoffianum
ARENGA
*Engleri
BISMARCKIA
*nobilis
BORASSUS
flabellifer
BRAHEA
dulcis
BUTIA
*capitata
*eriospatha
all other spp.
CEROXYLON
spp.
CHAMAEDOREA
*cataractarum
*elegans
*erumpens
*Klotzschiana
*radicalis
*Seifrizii
CHAMAEROPS
*humilis
COCCOTHRINAX
*crinita
COPERNICIA
australis
cerifera
DIPLOTHEMIUM
campestre
ERYTHEA
armata
Brandegeei
edulis
JUBAEA
chilensis
JUBAEOPSIS
caffra
LIVISTONA
*australis
*chinensis
*cochinchinensis
decipiens
Mariae
NANNORHOPS
Ritchieana
ORBIGNYA
*Cohune
*speciosa
PARAJUBAEA
*cocoides
PAUROTIS
*Wrightii
PHOENIX
*"abyssinica"
*canariensis
*dactylifera
*humilis
paludosa
*reclinata
*Roebelenii
*rupicola
*sylvestris
zeylanica
RHAPIS
*excelsa
humilis
RHAPIDOPHYLLUM
*hystrix
SABAL
*causiarum
*Etonia
*mayarum
mexicana
minor
*Palmetto
*parviflora
*texana
*umbraculifera
*Yapa
SERENOA
*repens
TRACHYCARPUS
*Fortunei
*Martiana
Takil
TRITHRINAX
acanthocoma
*brasiliensis
WASHINGTONIA
filifera
*robusta

The check list above is not represented to be complete, for no records exist for all the palms cultivated at one time or another in all the subtropical climates throughout the world. Moreover the list might be extended by the inclusion of borderline cases. Longer experience with more palm species and larger specimens should lead to an expansion of a check list. There is more than just a suspicion that many palms having tough or waxy foliage may possess cold-resistant properties, as untried species of *Copernicia, Coccothrinax, Corypha,* several other genera; and there is little question that several dozen species of *Chamaedorea* not yet tested for cold endurance would prove markedly hardy in cultivation.

II. Half-hardy Cultivated Palms

NOTE: The term "half-hardy" as used here is restricted to the palms which suffered relatively minor damage during the coldest winter of record on the peninsula at Daytona Beach, or else, though severely damaged, have shown a consistent ability fully to recover; plus certain other palms for which good grounds exist to consider them equally cold-resistant. The names of those palms proved half-hardy on the peninsula are preceded by an asterisk.

ACROCOMIA
*aculeata
armentalis
*hospes
*mexicana
sclerocarpa
AIPHANES
*Lindeniana
ARCHONTOPHOENIX
*Cunninghamiana
CARYOTA
*mitis (suckers, shorter stems only)
*urens (older specimens only)
ochlandra
CHAMAEDOREA
*brachypoda
*costaricana
*Ernesti-Augustii
graminifolia
*several undet. spp.
CORYPHA
*umbraculifera
CRYOSOPHILA
*Warscewiczii
DIPLOTHEMIUM
maritimum
LICUALA
*grandis
LIVISTONA
*rotundifolia
PSEUDOPHOENIX
*Sargentii
RHOPALOSTYLIS
Baueri (older specimens only)
sapida (older specimens only)
RHYTICOCOS
*amara
ROYSTONEA
*elata (older specimens only)
*regia (older specimens only)
SABAL
Allenii
*glaucescens
*mauritiaeformis
Morrisiana
*nematoclada
yucatanica
SCHEELEA
*sp.
(prob. other spp.)
SYAGRUS
*coronata
insignis
*quinquefaria
*Sancona
*Weddelliana
ZOMBIA
*antillarum

The above list might be extended almost indefinitely, depending on the degree of conservatism brought to bear. None of the palms surviving in the compiler's collection solely by some odd streak of luck have been included in it, though of these there are a surprisingly fair number. Something less than half-hardy, as defined above, but well able to tolerate a few light freezes not followed by continuous cold weather are some of the palm species of the following genera: *Areca (A. triandra), Arenga (A. pinnata, A. Ambong), Arikuryroba, Chrysalidocarpus, Drymophloeus, Hedyscepe, Howeia, Latania, Licuala, Mascarena, Pinanga, Pritchardia (P. Beccariana* and certain other Hawaiian spp.), *Pseudophoenix, Raphia, Thrinax* and still other genera not much represented in cultivation as yet if at all.

EDITOR'S CORNER
(Continued from page 116)
the longest but it was the only easily accessible one . . .

"We are poorly off for indigenous palms in this country having only *Phoenix reclinata, Hyphaene crinita, H. ventricosa, Raphia ruffia* and *Borassus aethiopum.* The last is very rare; I know of only three specimens which are probably on the old slave routes.

"*Hyphaene ventricosa* is common in some localities, but since the native learnt to tap it, and distill a virulent bootleg liquor, a lot of trees are being destroyed annually.

"Seeds of *Phoenix* and *Hyphaene* are easy to come by if any of your members want any, and I could arrange to have *Raphia* seed collected and sent at cost, but *Borassus* would be best obtained from Tanganyika. But from the list of palms at your address [Dent Smith] you need only genera from undiscovered lands!"

Busman's Holiday on a Tropical Island -- Barro Colorado

H. F. Loomis

As we came down the jungle trail to the clearing in the late afternoon a band of howling monkeys was feeding in the top of the huge *cuipo* tree growing at the edge of the clearing near the boat landing. We had come to Barro Colorado Island in the Panama Canal Zone that March morning for a week's stay and almost the first sound that greeted us was the astonishing howls of these great monkeys perhaps a quarter of a mile away. Now all were quiet as they browsed on the leaf buds swelling on the bare limbs nearly opposite our vantage point of the dining hall porch and hardly more than a hundred feet from us. It was unbelievable that these shaggy black animals, appearing almost as big as humans, could move about so freely on slender branches that sagged perilously but never broke beneath their weight.

Here a mother, with newborn baby clinging to her, hung head down by her tail while snatching buds with either hand, taking a bite and letting the rest fall. Other mothers had older babies, one large enough to make sallies of his own but holding to his mother when she changed branches. The old males, largest of the band, looked particularly fearsome but we watched them all with fascination until the light began to fade and they moved into the forest for the night.

The island we were on was once a tremendous hill in the lower Chagres Valley but, with the building of the Panama Canal and the damming of the Chagres River, the rising waters of Gatun Lake, which was thus formed, surrounded and isolated it from the mainland. Sometime after this happened it was given the name of Barro Colorado in reference to the red clay soil composing most of it.

When the need arose for an easily controlled and accessible wildlife research area in the American tropics, the efforts of many scientists, particularly Dr. Thomas Barbour and Mr. James Zetek, resulted in having the Governor of the Canal Zone designate Barro Colorado Island a wildlife preserve in 1923. Since then it has been maintained as a biological study area in as nearly a natural state as possible, and from 1946 has been administered by the Smithsonian Institution through which scientists obtain permission to use the island and its facilities for their investigations in natural history subjects. Probably there is no area of like size or larger in tropical America wherein the various phases of the endemic plants and animals are so well known and have so many publications devoted to them.

The island can be reached by railroad and launch from either side of the isthmus in about 90 minutes. It is very irregularly circular in outline; rises sharply from the shore to the highest point near the center, about 430 feet above the lake; is approximately three miles across and contains nearly 4,000 acres covered by jungle of which the second growth is old enough that it cannot readily be distinguished from the virgin forest.

Beneath the jungle canopy, often a hundred and fifty feet or more above one's head, run some 25 miles of well-marked trails by which nearly every part of the island, including over a dozen points on the shore, may be reached. The names of the trails read like a roster of naturalists and indicate a few of the famous people who have tramped along them. Commemorated in this fashion are Allison V. Armour, Thomas Barbour, Frank M. Chapman, David Fairchild, Barbour Lathrop, Raymond Shannon, Paul Standley, William Morton Wheeler, James Zetek, and a number of others.

The only permanent habitations on the island are those of the Resident Naturalist and the staff of laborers who act as guides, boatmen and woodsmen in addition to maintaining the grounds, laboratories and quarters. A dormitory-dining hall and several small cabins provide living facilities for visiting workers while a well equipped laboratory and library also are available. The buildings are concentrated in a small clearing on the northeast shore overlooking the canal; the principal ones being on the shoulder of a ridge more than a hundred feet above the lake and reached by stairs beginning at the boat landing.

Our own cabin, a few steps below the dining hall, was in itself a tropical experiment as its woodwork and compressed wallboards had been impregnated with a chemical mixture to repel termites, the worst enemies of wooden buildings and furniture in the tropics. A note on the door named the compound and warned against removing or replacing any part of the building or otherwise interfering with the test without special permission.

As our bags were brought into the cabin, a family of bats under the eaves, and clinging to the screen ventilator at the top of the wall, was disturbed and fluttered further down the roof with much squeaking. They never became accustomed to our presence but still could not bring themselves to give up this cool dry shelter for the undersides of palm leaves in the forest where their wilder relatives lived.

Because the writer has been interested for many years in both millipeds, commonly known as "thousand-legged worms", and palms, our visit to Barro Colorado had a two-fold purpose in addition to celebrating his retirement from years of plant work with the Federal Government. First was the hope of collecting more specimens of a tiny pill-like milliped of which a single female, thought to represent an undescribed species, genus and family, was found there in 1923. Our second objective was to gather fresh seeds of its palms for planting in Florida as only a few of them had been introduced there.

For an entire week almost every waking moment was spent on or near the trails searching for palms or millipeds or sitting silently absorbing the sights and sounds of the unspoiled jungle. Among our first impressions were the height of the trees about us, their diversity and the varied plant life they supported on roots, trunks and branches. While many of the smaller plants were unknown, a surprising number were familiar as the house and patio decorations of the north, but with what a difference! Here in their natural home grew bromeliads, monsteras, anthuriums, philodendrons and other aroids of a lushness and size not equalled in cultivation. Another of the interesting and attractive plants frequently seen almost appressed to the ground had its iris-like leaves spread in a single plane, the whole plant resembling a fan palm leaf, probably accounting for its common name of *palmita.* A second name given us, and one we liked was *mano de Dios* — God's hand. Botanically the plant is called *Xiphidium caeruleum.*

The vines, usually referred to as lianas, hanging leafless or nearly so from great heights were a novel sight, especially one belonging to the genus *Bauhinia* that was broad and flat, curiously bent and twisted and perforated with holes of different sizes. Except for these holes it reminded one of the ribbon candies we found in our Christmas stockings as children.

Everywhere we looked were literally scores of plant species. A botanist would have little trouble in counting over a hundred kinds within a radius of a few rods if he could see and include the epiphytes on the trees above him. Most of these air plants are invisible in the crown of leaves of the forest giants but fallen branches bring down a sampling of these upperstory treasures and make one envious of the birds and monkeys that pass so freely among them.

And the palms! Members of this family seemed more numerous than of any other single family and several kinds usually were to be seen by looking in any direction, beginning as tiny seedlings and progressing through various ages and sizes to the imposing *Scheelea zonensis*, with clean two-foot-thick shafts rising thirty or more feet to the beginning of the leaf crown which adds at least as much again to the height of the palm. From the crowns of these palms, which also gave footholds to ferns, vines and other small plants, hung great clusters of tightly packed egg-shaped fruits; those of the ripe clusters being dull orange in color. Not only is this the largest palm of Barro Colorado but also in Panama. It was described by L. H. Bailey in *Gentes Herbarum* 3:32-116, 1933, wherein were listed 16 other palms native on the island, the number not having been increased in the last 25 years.

The most striking of the island palms, however, is *Socratea durissima*, the stilt palm, of which mature specimens rear their heads 70 or 80 feet in the air at the tops of smooth, relatively slender trunks beginning eight or ten feet above the ground from supporting cones of rigidly straight spiny roots. This palm is scattered throughout the woods, seemingly not favoring damp locations, although the curious root system has been thought an adaptation to allow growth in such places. The numerous broad pinnae with irregular tips project from the rachis at several angles and are a rich dark green. The finest individual of this palm we saw was on the Shannon Trail where also was found the largest *Geonoma decurrens*, the beautiful little deep shade species seldom exceeding six feet in height with all leaf pinnae completely united to form a continuous blade nearly a foot wide and several times as long, deeply cleft at tip and gracefully arching.

The morning spent on this trail was otherwise noteworthy. It showed that our choice of palms and millipeds for collection was a happy one, as Mrs. Loomis discovered, in a decaying palm inflorescence on the ground, the only two specimens of the much desired pill milliped we found on our visit. Shortly after this find we spotted a band of white-collared peccaries, or wild hogs, rooting along the opposite side of a ravine. We watched them until they moved out of sight while several of the marvelously iridescent blue morpho butterflies tittuped along in apparently aimless flight below us. As we came back up the trail the treetops were alive with white-faced monkeys objecting to our presence by shaking the branches and breaking others to drop on us, but for sanitary reasons we were too smart to get directly beneath them. When they finally swung off we continued on our way.

Another handsome palm we saw frequently, and generally growing in clumps of a dozen or more smooth slender ringed trunks, was *Oenocarpus*

Fig. 61. Typical root system of large stilt palm (*Socratea durissima*). Even small seedlings of this palm have the trunk supported above the ground on a similarly formed cone of roots.

Fig. 62. An unusually large plant of *Geonoma decurrens* with young stilt palm (*Socratea durissima*) behind it.

panamanus, the largest specimens reaching a height of 70 feet. The inflorescences, resembling the modern pony-tail hair-do, are cream-colored at first but turn to burnt orange as they grow older and when mature bear nearly globular black fruits larger than marbles. The freshly expanded new leaves of the young plants in the understory have a beautiful autumn coloring of light reddish brown which presents a striking note in an otherwise green world.

Conspicuous throughout the woods was the viciously spiny *Astrocaryum Standleyanum* rising straight and tall on a six-inch-thick trunk ringed by broad naked leaf scars but with the intervals between them closely beset with deflexed double-edged spines to eight inches long. The leaves, petioles and flower spathes also are protected by closely placed spines but still we thought the palm a thing of beauty, especially when the densely clustered fruits on the long drooping inflorescences had turned from green to bright orange at maturity.

Walking along any of the trails we were constantly halting to look at smal-

Fig. 63. *Geonoma procumbens.* A spicate inflorescence reaches the top of the picture just left of center.

Fig. 64. *Synechanthus Warscewiczianus.* Extremely variable in leaf character as shown by palm the writer touches and another far left which have groups of united pinnae in contrast to that immediately behind the writer and another at right.

ler palms such as the quite similar *Chamaedorea Wendlandiana* and *Synechanthus Warscewiczianus* that were easily distinguished when old or new inflorescences could be found. Seldom were we where one or several of the spiny, cluster-stemmed bactrids could not be seen and we were happy that previous collectors had prepared the specimens from which they had been identified. *Bactris coloniata,* with canelike stems widely separated on underground runners, is said to be the most common palm on the island and although we saw several other species it was the only one we found in fruit.

Largest of the geonomas, *G. binervia,* is not met with too commonly but it is well worth the search to stand beneath the evenly spaced pinnae of its curving fronds fifteen or more feet above one's head. It differs further from the other two species on the island by having a large much branched infloresence hanging below the leaves instead of a simple slender spike projecting upward above them.

Dr. Bailey had reported the American

oil palm, *Corozo oleifera*, as growing along the shore of Barro Colorado but we did not find any on the short walks we took there. Instead, the only specimen seen was in a swampy spot near the highest point of the island and, while the palm had the typical reclining trunk, it bore neither flowers nor fruit. We passed this palm as we followed the Armour Trail to view the largest of the island's trees, a *Bombacopsis Fendleri* estimated to be nearly 200 feet tall with huge buttress roots. A related giant species seen on various trails was *Bombax Barrigon*, lacking buttresses but with a distinct swelling of the trunk a little above the roots, which accounted for the similar specific and common name, meaning big-bellied. The bark of the trunk is quite bright green and surprisingly smooth for so large a tree.

Along some of the trails the tall, single-trunked fan palm, *Cryosophila Warscewiczii*, was met with. It is the only fan-leaved palm of the island or, for that matter, of the Canal Zone and is further noteworthy for having spine-like roots or specialized projections growing abundantly from the trunk, those near the base of the stem being longest and usually with supplementary branches. Ripe fruit the size of marbles are white.

One of the pleasantest times on Barro Colorado comes after a day on the trails when, following an early dinner, everyone gathers on the terrace in front of the dining hall to discuss the day's finds and adventures and, with binoculars and telescope poised, to watch the evening flight of birds, ships of the world passing by in the canal or to gaze into the mysteries of the treetops on the hillsides at either hand. Thus we saw a five-foot-long bright green iguana lying along a limb; a hawk-eagle preening on a dead stub; watched parrots and parakeets in pairs or flocks chopping the air with rapid wing beats while keeping up a constant chatter; and marvelled at the beautiful colors of the toucans hopping about in the upmost branches or in lilting flight when they appeared to be "pushing a banana" as one of our friends said in referring to their over-sized bills. Here also, silhouetted against the sky on the ridge to our left, a group of several leafy stems of the climbing palm, a species of *Desmoncus* not yet accurately determined, swayed above the treetops with the backwardly spined prolongations of the leaf rachis ready to fasten upon any branch they touched. We had found few of these palms in our wanderings but their very slender stems could easily be overlooked in the welter of trailside vegetation. Still, two of those we saw had stems that reached further above the jungle floor than the tallest of other palms and their tops were hidden in the crowns of the supporting trees.

A week in such a storehouse of interesting plants and animals speeds all too quickly and before we realized it the morning of our departure was upon us. The family of bats, returned from a night's foraging, squeaked and changed position as our cases, heavier now with our collections, were carried from the cabin and stowed aboard the launch. As we pulled away from the dock, backward looks at the clearing and buildings left us with regrets but happy memories also; and the rapidity with which plants grow in the tropics was manifest when we saw that the *cuipo* tree that had been barren a week before when the howling monkeys feasted in it now was fully decked in a new season's foliage.

Propagation of Palms*

STANLEY C. KIEM

Plants in general can be propagated by a number of different methods such as cuttings, layering, budding, grafting, root suckers, etc., as well as by seeds. Some palms can be multiplied by divisions and suckers, but seeds are the only means of propagating most, as the majority of palms usually remain single-stemmed plants with one terminal bud. Also, like most other monocots, they cannot be grafted or budded or the stems rooted as cuttings. Without true bark and a cambium layer which will heal over with a callous to form new tissue it is impossible to cut off a trunk of a palm and expect it to re-establish itself as a new plant. Palms usually have only a single terminal bud at the tip of the stem with no axillary buds. If the bud is injured or becomes diseased in any way, the plant will die unless, of course, it is a type that might develop suckers from the base.

Propagation by seeds is more convenient than any other means, but sometimes seeds are unobtainable for a specific palm. In the case of a suckering palm, such as *Phoenix dactylifera*, vegetative propagation is the only way to ensure the maintenance of a particular strain or variety of date, since seedlings would be very likely to produce a strain slightly different from the parent plant.

Vegetative Propagation

Some genera of palms normally have a clumping type of growth; that is, over a period of time they develop several stems which are joined at the base in the ground. A partial list of palm genera that sometimes develop clumps or suckers are: *Arenga, Astrocaryum, Bactris, Calamus, Caryota, Chrysalidocarpus, Chamaerops, Chamaedorea, Desmoncus, Guilielma, Licuala, Oncosperma, Paurotis, Rhapis, Phoenix,* and the *Actinophloeus* group of *Ptychosperma*. Sometimes clumps are compact as in the *Actinophloeus* group of *Ptychosperma* and with most of the *Chrysalidocarpus* species, where the bases of the stems are crowded tightly together. Another group of cluster-forming palms such as *Rhapis, Bactris,* and some species of *Chamaedorea,* develop a "runner" or underground rhizome that may grow out as much as several feet from the parent plant before the upright stems are formed.

Theoretically, any palm that will develop suckers or off-shoots with roots can be divided and a new plant created. Actually, however, it is practical to make divisions of palms in only a very few instances. Seeds are usually comparatively easy to obtain and to ship from one place to another, while propagations from suckers or offsets are time-consuming and difficult to make and are often bulky and unwieldy to transport. Newly separated divisions also tend to be very delicate immediately after they are detached and before they are established with a permanent root system in a new location.

Sometimes viable seeds of a particularly rare or desirable suckering palm, such as *Rhapis,* are very difficult or impossible to obtain. In such a case, the extra work and time needed to take off a sucker or to divide the plant is justifiable, but only after careful consideration. Cutting off a major section of a palm is a severe shock to both parts, and unless the person doing the work is careful, either part of the plant, or both parts, could easily be lost.

*Presented at the Palm Conference, Fairchild Tropical Garden, April 18, 1958.

The technique of dividing a palm consists mainly of the following:

1. After making certain that the risk to the parent plant is justified, carefully dig down about the offshoot or stem to be taken off and check to see if it has already developed roots of its own.
2. If it has no roots of its own, the general practice is to cut partially through the stem that joins the division to the parent plant and then to replace any soil removed. This serves to cut off part of the food supply of the offset and thus encourages it to begin new roots of its own. A plentiful supply of fertilizer and water during this time will help to form new roots quickly.
3. When the portion to be removed has its own roots, a sharp spade or pruning shears can be used to sever any remaining connection and the division can then be carefully dug out. Meanwhile, be careful to keep with it the largest possible ball of undisturbed earth and roots.
4. After the division is potted or placed in its new location, it is best to remove from one-half to three-quarters of the leaf area, depending upon the amount of roots which were transferred with it. The new plant should be tied to a stake and watered regularly to prevent drying out. A temporary shade and applications of liquid fertilizer will also help in the successful establishment of the new plant. A fungicide, such as one of the copper compounds, can be used to treat the exposed stem surface which has been cut as a means of discouraging fungus infections, particularly of the parent plant.

When large numbers of roots are taken off with the division, as in dividing *Chamaedorea* or *Rhapis* clumps, the whole operation can be greatly simplified and done at one time with only normal precautions being taken. Also, as in most other transplanting, divisions can be established easiest during the warm spring and summer months when the plants are in vigorous growth.

Unusual as it may seem, it is possible to marcott, or "moss off" the top of a very few palms, namely some of the chamaedoreas. Quoting from O. F. Cook's article entitled "Household Palms and Related Genera" in *National Horticultural Magazine* 22:89, 1943:

> "An experiment of marcotting was tried by Mr. Albert W. Close and proved entirely successful. The process of marcotting is simple, merely wrapping a ball of sphagnum and burlap around the trunk, tying it on and keeping it moist. In a few months after roots have begun to grow, the lower trunk can be cut away and the palm set in new soil."

Although Cook mentions marcotting as being done only with *Chamaedorea elegans ("Neanthe bella")*, I am sure it can also be duplicated with any *Chamaedorea* that would normally develop adventitious roots on the stem, such as *Chamaedorea Tepijilote*.

Growth and Care of Young Palm Seedlings

Seeds can be sown in flats or seed pans in a soil mix approximately two to three inches deep. After the seeds germinate, it is best to grow them in 50 per cent to 70 per cent shade. Warm moist conditions will encourage fast growth, especially if liquid fertilizer is applied periodically. Exposure to full sunlight or dry winds will set back young seedlings considerably. It is best to protect the young seedlings, both in the seed pan and in individual pots, from too much exposure or from heavy rains that might wash the soil from the pots. If slat protection is unavailable a spreading tree can sometimes be used as a substitute. Although sprouting palm seeds need to be kept moist, care must be taken not to keep the soil soggy as there is then danger of losing the seedlings from rot and damp-off fungus.

It is usually best to take palm seedlings from the seed pan about the time the first leaf is fully developed or as the second leaf begins to emerge. This is the time the root system is just beginning to develop and few if any rootlets will be lost in transplanting. Also, the young seedling is still receiving nourishment from the endosperm of the seed which helps to tide it over until it establishes itself in an individual pot. If potting is delayed too long beyond this stage, the seedlings often suffer shock and have a tendency to die back.

When many seeds are sowed thickly in a seed pan or flat it is even more important not to delay in potting seedlings, because the root systems will grow together in a tight mass, making it almost impossible to separate them without loss of the small rootlets.

Most seeds will germinate fairly uniformly; but some seeds, especially those that are a bit old, will sprout a few at a time with some coming up months after the first ones. Then it is best to pot the seedlings as they sprout instead of waiting until they have all germinated.

When seedlings are taken out of the seed pan they should be potted into as small a pot as will accommodate the roots with sufficient allowance for several months growth. Seedlings should not be jammed and twisted into too small a pot; but neither should the very young seedlings be overpotted to the extent that the soil may remain too wet and become compacted before the next shift is made. In larger stages young palm plants can hardly be over-potted if the soil mix and growing conditions are ideal. Usually two and one-half-inch and three-inch pots will take care of the first potting, except for those palms that develop a long root system prior to the sprouting of the first leaves. These sometimes need up to eight-inch pots. The soil mixture used in the smaller sized pots should be loose and porous, preferably with a large percentage of organic matter such as leaf-mold or peat-moss. Good drainage as well as sufficient aeration must be provided if optimum root growth is to be expected.

Small seedlings when first transplanted from the seed pan will grow best under greenhouse conditions with about 70 per cent shade. When they are shifted into larger pots, four-inch to six-inch, most of them need more light and the shade may be reduced to 50 per cent. Exceptions are palms that are particularly sun-loving, such as *Copernicia*. These will grow much faster in full sun from six-inch pots on. As they become large enough to be shifted to eight-inch pots or to four- to five-gallon cans, most palms can be put in full sun for much of the day after they have become gradually accustomed to it to prevent sunburn. When in comparatively sunny locations, the foliage will not develop as dark green or lush as the shade grown plants; but plants will become hardened in preparation for planting and seem much better able to withstand low temperatures.

Young palms, like most tropical and subtropical plants, grow much faster during warm weather. During the cool winter months new growth of roots and leaves almost stops, while during the spring and summer growth is comparatively rapid if the necessary nutrients and moisture are available.

Young tender palm seedlings benefit greatly from controlled temperatures in a greenhouse or hot house during the winter, but if this is not available they generally will do quite well if protected from hard frosts or strong dry winds. In many cases, drying winds seem to cause much more burning of tender leaves than actual low temperatures so it is advisable to give as much protection from winds as possible.

Most palms do not seem to require a particular soil mixture as long as it has approximately the proper texture, drainage, and nutrients. More care is justified in preparing the soil for very young seedlings in small pots since they tend to be much more sensitive to extremes in texture and drainage than older established plants. A suitable soil mixture for young palms can be made up of the following: 3 parts "hammock sand" (or sandy muck, preferably neutral or slightly acid), 2 to 3 parts peat-moss, 1 part fine grit, coarse sand, or Perlite (for drainage). Add a small amount of sheep manure and balanced chemical fertilizer to provide sufficient nutrients.

Although in many cases the pH is difficult to control, a neutral or slightly acid soil is preferred, except in instances of palms known to prefer alkaline soil.

In discussing the water requirements of young palms, I would like to quote from *Choice Stove and Greenhouse Plants*, 2nd Edition, by Benjamin Samuel Williams, London, 1876, the following advice from an English palm grower over 75 years ago: "Most stove palms should be provided a strong moist heat and be potted in equal parts of peat and loam, to which should be added a good portion of sand. Drain pots well and supply them liberally with water. Those requiring especially moist conditions may benefit from plunging in warm water, if such a convenience exists." He goes on further to caution against allowing the soil to become completely dry, as this would damage the roots of many palms considerably.

In some ways the key to watering lies in the soil mix. The soil mixture must be loose enough to provide good drainage and allow sufficient aeration so that roots are encouraged to grow rather than remain static and rot off. If the soil becomes solid and compact about the roots and is heavily and regularly watered meanwhile, the roots can easily become rotted and the plant will begin to die back.

The amount of water needed will vary greatly according to the size of the plant and its root system; how fast it is growing; or, if it is dormant (as during cool weather), the size of the container, the porosity and water-holding capacity of the soil, and the extent that it is exposed to the drying effects of sunlight and wind. All the above should be taken into account rather than trying to specify that a certain size pot needs so much water at certain intervals. Generally, watering should be frequent enough and in large enough amounts to maintain an even, moist condition.

Although many palms can exist on very little feeding, much better growth can be obtained if an adequate amount of nutrients is made continually available to the roots. Usually enough organic and chemical fertilizer can be included in the soil mixture, and if this is supplemented with regular applications of liquid fertilizer the palms should have adequate nutrients. Any balanced soluble fertilizer such as Hy-Gro, 13-26-13, or Hyponex can be used. Palms seem to respond especially to organic fertilizers such as sheep manure if they are balanced with the other elements obtainable in commercial chemical fertilizers. A commercial fertilizer mixture of 6-6-6 [6 parts of Nitrogen (N), 6 of Phosphoric Acid (P), 6 of Potassium (K)] or 5-7-5, is quite satisfactory in most cases. Usually minor element sprays are not needed but they are sometimes useful in correcting nutritional deficiencies that might show up.

When palm seedlings are ready to be shifted from the pots in which they were established as seedlings, they should be given sufficient room with each repotting. The size of the root system may be used as a guide to repotting. Plants should be repotted as soon as the pot becomes fairly well filled with roots and before they become root-bound and stunted. It is necessary to allow the roots room enough to develop in the larger container without becoming root-bound before the next shift is anticipated. With normal growth, they can usually be shifted from two and one-half-inch pots to four-inch pots; then from four-inch to six-inch, and from six-inch into tin, five-gallon cans or large pots or tubs of equivalent size. If a palm seedling is an especially fast grower, it could conceivably be moved from a four-inch pot into a four- or five-gallon can, but only if it shows rapid top growth with correspondingly developed roots. Beyond the four-inch pot size, it is difficult to over-pot palms if one is careful to provide a well drained soil with adequate sun and ventilation. Nevertheless, over-potting in a compact, water-retaining soil and placing the plant in a damp shady location can prove disastrous. Those palms that develop thick large roots usually need much more growing space than those that have many small fibrous roots.

When shifting from one container to another, unnecessary shock can be avoided if one is careful to have the soil moist so that it does not drop off the roots and leave the feeding rootlets exposed to bruising. Also, it is important to pot the plant so that the soil is not above the root crown. Planting too deep can hold back young plants considerably and even kill those that are especially tender. It is well to place drainage material in the bottom of the pot to allow excess water to drain out easily and to discourage roots from growing through the hole into the soil beneath. When a major part of the root goes down through the drainage hole and is broken off when the pot is taken up for shifting a severe setback if not the death of the plant may be caused. When roots are damaged to any extent during repotting, it is best to cut off a portion of the leaves and move the newly shifted plant to a more shaded location until it has a chance to recover from the shock.

There are some palms that may be difficult to grow as seedlings, such as *Stevensonia, Nephrosperma, Oenocarpus, Orania, Calyptrocalyx, Rhopaloblaste.* Although relatively little is known about the cultural requirements of these palms, the following points should be kept in mind:

1. These palms seem to be more sensitive than most to pH in that they prefer an acid soil to one that is alkaline.
2. Keep the soil mixture evenly moist at all times. If the soil in which they are planted is allowed to dry out thoroughly, they often do not recover from the damage to the roots.
3. If leaves become chlorotic, minor element sprays and neutral iron and manganese soil treatments sometimes help if the deficiency has not developed too far.
4. If possible, keep in a warm moist atmosphere, but with good air ventilation.
5. Most important of all, do everything possible to keep the seedlings in healthy active growth. If they once become stunted recovery will be very slow, if at all.

Among palms one group which includes *Hyphaene, Borassus, Corypha, Latania* and *Orania,* needs more than general care. These genera develop a long extended hypocotyl or root structure before the first leaves sprout. If sprouting seedlings are kept in a crowded seed pan until the secondary roots begin to develop it is almost impossible to separate them for potting without damaging most of them badly. The long brittle root-like growth that first develops can stand crowding if need be, but if it is damaged or broken the young seedling will be severely stunted. In years past, seeds of palms such as *Borassus* were planted singly at the top of a box three feet long set on end. As the seed sprouted the hypocotyl pushed down several feet before the primary leaves were put out at its base and the roots developed just below that point. This made it difficult to handle and plant the young palm. In recent years we have learned to sprout the seeds in small pots just large enough to hold the seed until it begins to germinate. Then the seed is shifted to a six-inch or seven-inch pan, and the long root-like structure is allowed to wind about the lower sides of the pan until it stops and the leaves and true roots begin to develop. When leaves appear, the seedling is shifted into an eight-inch pot or a large tin can for growing. This method has proved successful with a number of palms that germinate in this way. It is absolutely necessary, however, to keep the developing plants under close observation so that they do not become stunted.

Some sun-loving palms, such as *Coccothrinax* and *Copernicia* will grow much faster and stronger if they are moved into slightly larger than usual containers and put in almost full sun as soon as possible. Under shaded conditions growth is very slow.

Chamaedorea, Geonoma, and other similar small, shade-loving palms have a particular dislike for growing in pots in a compact, heavy soil. These normally grow in moist loose leaf-mold on the forest floor so they do much better in containers if the soil is loose and the drainage good, or if they can be planted out in a shaded protected location.

PALM LITERATURE

The quarterly journal *Economic Botany* devoted to applied botany and plant utilization, contains a number of excellent and well illustrated articles on palms which are noted below. *Economic Botany* is obtainable at a price of $1.50 per single copy or $6.00 per volume at Box 749, Lancaster, Pa., or The New York Botanical Garden, New York 58, N. Y.

Acosta-Solis, M., Tagua or Vegetable Ivory A Forest Product of Ecuador. *Economic Botany* 2: 46-57. 1948. [A study of *Phytelephas* in Ecuador with notes on common and scientific names, habitat and distribution, production and exploitation, pests and diseases, local and industrial uses.]

Aschmann, Homer, The Introduction of Date Palms into Baja California. *op. cit.* 11: 174-177. 1957. [Evidence is presented to show that 1765 or thereabout is a more acceptable date of introduction than 1730.]

Hume, E. P., Coir Dust or Cocopeat—a Byproduct of the Coconut. *op. cit.* 3: 42-45. 1949. [An analysis of the tiny particles residual after extraction of fibers from coconut husks and suggested use as a mulching, rooting, soil-conditioning and seed-germinating medium.]

Lévi-Strauss, Claude, The Use of Wild Plants in Tropical South America. *op. cit.* 6: 255-258. 1952. [A section

(Continued on page 142)

Hardiness of Trachycarpus Fortunei

WALTER H. HODGE

Our present information about cold tolerance in palms seems to indicate that the windmill palm, *Trachycarpus Fortunei,* a species of Eastern Asia, is among the hardiest if not the most hardy of all palms. It is said to be "the only truly hardy species in Britain" and this is verified by the recent note (*Principes* 2: 74-75, 1958) about a plant of this species which has been growing for some years in the Royal Botanic Garden in Edinburgh, Scotland, located at 56° north latitude. This is very likely as far north as any palm has been recorded growing outdoors. It should be remembered, however, that the tempering influence of the Gulf Stream makes the climate of the British Isles far milder than most lands lying at similar latitudes.

Although *Trachycarpus Fortunei* does not grow in North America at any such high latitudes (an equivalent spot in the New World would be high on the coast of Labrador!), it is grown under as severe winter conditions, if relative temperatures are compared, in at least two locations on this continent. One of these locations is Victoria, British Columbia (48.5° north latitude); the other is Hampton, Virginia (37° north latitude).

If one examines the geographical distribution of winter temperatures, it will be seen that Edinburgh, Hampton and Victoria—as well as the northern natural limits of this palm in Eastern Asia — all fall approximately on the same January isotherm of 40° F. In other words, the severity of winter cold, the main limiting factor in the distribution of palms, is approximately the same at all these locations where this palm can be grown. It should be added that these locations have the other common feature in that all are situated on or close to the sea thus receiving the benefit of the ameliorating influence of the ocean during periods of sudden cold which may exert severe damage even a short distance inland.

A few years ago, while on a trip to the Pacific Northwest, I noted a specimen of the windmill palm growing outdoors in one of the parks in Victoria, British Columbia. In response to my recent inquiry asking about this palm, Mr. W. H. Warren, Park Administrator of Victoria, very kindly supplied the following information on this species which has been growing at Victoria for about 15 years.

"We had three windmill palms, *Trachycarpus Fortunei,* given to us in the 1920's. They were about 10 feet high in 1930. One died of freak frost November 11 and 12, 1955, when the temperature suddenly dropped to 12° F. I would say that they just survive here and no more.

"Records for one of our lowest months in recent years was in January, 1955, mean temperature 26.1° F., lowest 6.4° F. I suspect it was several degrees colder in Beacon Hill Park where another died from cold. We have just one left." (From letter dated April 29, 1958)

In early March of the present year a colleague, Dr. J. T. Baldwin, Jr., Professor of Botany at the College of William and Mary, drove me to see several palms which he had observed growing on the grounds of a private home at 1400 Chesapeake Avenue, Hampton, Virginia. This property lies on the bay front at Hampton Roads and the palms themselves are growing, therefore, within several hundred feet of the water. The plants proved to be three fine specimens of *Trachycarpus Fortunei*, averaging about 15 feet tall. Although much younger than the fifty-year old (?) specimen at Edinburgh (see Figure 50 in April, 1958 *Principes*), they appear considerably taller. It was a distinctly novel, in fact almost incongruous, sight to see palms growing at that latitude associated with such northern shade trees as elms and maples. Although these Hampton, Virginia, palms had just passed through one of the worst winters experienced, they were in surprisingly good shape. To be sure the older leaves in early March showed considerable browning, presumably from the cold, but the younger leaves were far less damaged. Past years' infructescences were still holding a small quantity of the ripe, blue, pea-sized fruits.

Unfortunately, at the time of our visit, the owner of the property, Mr. Herbert D. Hinman, was away, but in subsequent correspondence the basic information about his palms and how they have been handled at his home was learned. Mr. Hinman apparently first became interested in palms during nine years residence in Panama where he had ample opportunity to observe them. On his return to Virginia from the tropics he decided to attempt to grow a few palms at his Hampton home and happily settled on just the right species. The young plants "about 24 to 30 inches high" were obtained around 1940 from Fruitland Nurseries of Augusta, Georgia. They were probably several years old when purchased and so from this one would estimate that the plants are now about 25 years old. Good-sized holes were dug outdoors and filled with well prepared soil into which the palms were planted. Even when small the palms required little attention and no winter covering, though they were shielded the first several winters with a canvas windbreak. About four years after planting flowers began to be produced. Since then the palms have bloomed annually, producing abundant viable fruits.

As for culture, Mr. Hinman reports "I did pour vitamin B water down their throats when they were little. That is, I would water them by pouring slowly, so three or four quarts would be absorbed and hardly wet the ground." In recent years the trees have been fed regularly with commercial fertilizer placed in holes drilled around the plants. Mr. Hinman believes that his fertilizer program has resulted in better than normal growth although he suggests that perhaps the palms may have a shorter life span than if they had been allowed to grow slowly at their normal rate.

With regard to the effect of the Hampton winter climate on this palm, Mr. Hinman has this to say:

"Over their lifetime they have never been hurt by cold here; this is the first time and I believe that was from ice. We as a rule do not have temperatures below 20° F. or perhaps one or two mornings of 18° F. As a rule these palms are green, fresh and beautiful. I believe the temperature this winter [1957-1958] has gotten down to near 5° F. one or two mornings [as compared with the '28° frost' (4° F.) of 1941, the lowest on record at Edinburgh]. My palms don't look so well this spring due to the fact that this was the hardest winter that they have ever had. The leaves that were evidently iced and blown by the wind will have to be cut off. It was very cold for this section and continued so and with a high wind a lot of the time out of the north during the cold period. The worst thing I think for a palm along the coast

Fig. 65. *Trachycarpus Fortunei* at Hampton, Virginia.

all the way to Florida is a freeze after a rain — that is a change from rain to sleet resulting in freezing in the palm head. I have seen this happen to palms farther south. These [his specimens of *Trachycarpus*] never have frozen in the top."

From the above we can agree with the statement of Mr. James Keenan of the Royal Botanic Garden at Edinburgh that *Trachycarpus Fortunei* "can scarcely be called tender."

Another palm which may approach the hardiness of the windmill palm is the South American *Butia capitata* which I have seen growing at not-too-great-a-distance south of Norfolk in coastal Virginia and North Carolina. At Savannah, Georgia, at the USDA's Barbour Lathrop Plant Introduction Station, this species of *Butia* has withstood temperatures of 11° F. It is of interest to note that in both *Trachycarpus* and *Butia* the palm trunk is well protected. In the case of *Trachycarpus* there is a heavy mat of hairs, while in *Butia* the mass of old leaf stubs may serve the same purpose. It may well be that this sort of natural protection helps the species to exist during the short periods of lethal colds which they must occasionally endure at their northern limits of range.

WHAT'S IN A NAME?

Howeia (hów ee a) was proposed by Beccari for the genus of palms that includes the common florist's palms known in the trade as *Kentia.* The name comes from that of the island on which they are native—Lord Howe Island off the coast of Australia 435 miles northeast of Sydney. The name is often spelled *Howea* but, although Beccari himself used the latter version at times, the original spelling should be followed.

Nypa (née pa) is a vernacular name in the Moluccas carried over into the technical name. This spelling was used by Wurmb who first described the genus. A later spelling, *Nipa,* used by Thunberg is frequently but incorrectly used.

Ptychosperma (tie ko spér ma) comes from the Greek words *ptyx* (a fold or a cleft) and *sperma* (a seed). It is a most apt name since the seeds of the genus are longitudinally grooved.

Actinophloeus (ak tin o flée us) is also from the Greek. *Aktis* means "a ray" and *phyloios* means "the bark of trees" or "a husk" or "an enclosing membrane." Beccari did not explain the derivation of the name but since he used it first for a subgenus (spelled *Actynophloeus*) in *Drymophloeus* which differed from the true *Drymophloeus* in grooved rather than rounded seeds, it is possible that the rays or arms of the seed projecting into the fruit coat inspired the name. The name was modified to *Actinophloeus* for the genus. Recent students of palms unite *Actinophloeus* with *Ptychosperma* using the latter, older name.

Ponapea (po na pée a), another synonym of *Ptychosperma,* is derived from Ponape, an island in the Carolines.

Drymophloeus (dry mo flée us) from the Greek *drymos* (a wood) and *phloios* (bark) was not explained by Zippelius who proposed the name.

PALM LITERATURE

(Continued from page 138)

on palms considers about 20 genera useful for edible fruit, palm wine, cabbage, starch, oil, salt, thatch, basketry, cord, wooden objects, beads and ornaments.]

Markley, Klare S., Caranday—a Source of Palm Wax. *op. cit.* 9: 39-52. 1955. [An unexploited source of hard vegetable wax from *Copernicia* in Paraguay is considered with distribution map, comparison of species, yield and quality of wax, prospects for exploitation.]

Markley, Klare S., Mbocayá or Paraguay Cocopalm — an Important Source of Oil. *op. cit.* 10: 3-32. 1956. [A full discussion of *Acrocomia Totai* as a source of oil with description, notes on distribution, yields, processing, and analysis of pulp and kernel oil.]

Markley, Klare S., Fat and Oil Resources and Industry of Brazil. *op. cit.* 11: 91-125. 1957. [Contains paragraphs on *Orbignya, Astrocaryum, Cocos, Elaeis, Jessenia, Syagrus.*]

Taube, Edward, Carnauba Wax—Product of a Brazilian Palm. *op. cit.* 6: 379-401. 1952. [A discussion of *Copernicia cerifera* and its importance as a source of wax, with distribution, description, processing data, uses and properties.]

Another journal, *Botanical Museum Leaflets,* published by Harvard University also includes some articles on economic plants. The following will interest the student of palms.

Gowda, M., The Story of Pan Chewing in India. *Botanical Museum Leaflets* 14: 181-214. 1951. [The betel nut, *Areca Cathecu,* as used in India is treated fully with a description of the palm, the associated *Piper Betle* whose leaf is chewed with the *Areca,* the harvesting and preparation of fruits, utilization of the fruit in non-habitual and habitual chewing, ceremonial and medicinal manners, importance of the palm, and a list of plants associated with pan chewing.]

Standley, Paul C. & Steyermark, Julian A., Flora of Guatemala, *Fieldiana: Botany,* volume 24, part I. Pages 196-299 of this volume, published by the Chicago Natural History Museum on August 29, 1958, contain a treatment of palms native in Guatemala and British Honduras with full descriptions, keys, and line drawings illustrating one or more species in many genera.

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Figures in *Italic* indicate pages with photographs or other illustrations

Classified Section

CONTAINER GROWN

1 gal. and 5 gal. sizes

Aiphanes erosa, Pritchardia pacifica, Howeia (Kentia), Butia capitata, Coccothrinax radiata and barbadensis, Latania borbonica, Thrinax Wendlandiana, Arikuryroba schizophylla, Chrysalidocarpus lutescens.

FIELD GROWN

Specimen plants, 4 ft. and up.

Chrysalidocarpus lutescens, Actinophloeus Macarthuri and propinquus, Archontophoenix Alexandrae, Elaeis guineensis, Caryota mitis, Dictyosperma album and var. rubrum, Hyophorbe Verschaffeltii, Ptychosperma elegans, Veitchia Merrillii, Heterospathe elata, Phoenix Roebelenii, Phoenix farinifera (pusilla), Royals.

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Four Pseudophoenix Sargentii, about 6 years old, more or less 3 ft. high, $1.50 per foot. Seedlings, 1 and 2 years old, 50c and $1.00 each. Mrs. Nis Juhl, 541 N.W. 47th Terr., Miami, Fla.