VERY SMALL OR LOW SPECIES—*Sabal Etonia, S. minor, Phoenix pusilla, Rhapidophyllum hystrix, Chamaedorea elegans, C. tenella.*

Many more species are growing in this region and locating desirable specimens and including them in diversified group arrangements will be a pleasant experience for anyone, make a worthy contribution to knowledge of the use of palms, and enhance the variety and beauty of landscape plantings.

More about Cold Tolerance

Effects of a Hard Freeze upon Cultivated Palms during December, 1962, at Daytona Beach, Florida

DENT SMITH

Having already dealt in these pages with the cold tolerance of certain cultivated palms, the writer hardly had expected to return to that frigid subject in just five years. The hard freeze of December, 1962, gave rise to a different set of circumstances, however, and the effects upon the palms were different also. Hence it has seemed advisable to report anew.

Six years ago nearly everybody was convinced that the world was growing warmer. Most of the meteorologists subscribed to the notion and helped to give it wide credence. The ice was said to be melting and the glaciers receding. Certainly in the United States much of the eastern seaboard had been enjoying less rigorous winters for several years. But if the trend was in a warm direction, it was not confirmed by the weather in many states following the 1956-1957 winter, for the very next winter there were several hard freezes extending well down into Florida. Such severe cold, the Floridians thought, might not again invade their peninsula for decades. It would have been against reason to expect that much worse would come within a few years, but come it did in December, 1962.

The delay in publishing this report until January, 1964, thirteen months after the freeze occurred, is owing to valid reasons. The freeze effects upon the injured palms were not simultaneous with the occurrence of the freeze itself. On the contrary, these effects were in a state of constant change over more or less extended periods of time, with the outcome continuing to be in doubt for from one month to as many as ten months. In some instances it was still impossible to know, by late summer, which palms would survive among all those still ailing but alive at that time; and even somewhat later on, ten months after freeze injury, the issue remained doubtful in a few cases. Not until late November was it possible to tabulate all the facts and to prepare this account for publication in the next issue of PRINCIPES —the current one. Any earlier report would have been inevitably misleading because of inaccuracies. Many palms survived that for a time appeared dead or dying, others in extremely sorry condition with only the slenderest of holds on life managed in time fully to recover, and a number that appeared to be safely mending ultimately died from hidden injuries.

At the time of the freeze there were one thousand planted palms, slightly more or less, under the writer's care at 2514-2518 South Peninsula Drive, Daytona Beach, Florida. This number was substantially larger than in prior years,

but the number of genera and species had been reduced by losses from 94 genera and 242 species to 70 and 207 respectively. No attempt to grow coconut palms and some of the other tenderer kinds had been repeated since the large losses of the 1957-1958 winter.

Accompanied by high surface winds from the northwest, a mass of Arctic air descended on December 12, 1962, and blanketed most of Florida. The northern and central regions were subjected to much deeper cold than the southern, and generally the inland sections at any given latitude were colder than the immediate coasts. Marine influence was lessened, however, even on the littoral of the Atlantic Ocean, for the strong northwest winds off the land hardly permitted much warmth from the water to make headway landwards. Although the palm plantings reported on here are located a scant quarter-mile from the open sea, any benefit from the proximity was, if not negligible, quite small on this occasion.

There was less than one day's warning of a record-breaking freeze, making the time all too short to prepare for it. In the few hours of grace some six hundred small palms in pots and cans were placed in a heated shed and an unheated garage, as a consequence of which none was lost. Stakes were driven upright around some of the smallest planted palms and sheet blankets draped over them, so that the plants were enveloped without being touched by the fleecy cotton material. Shelters of windproof but translucent acetate mesh stapled to stakes were built around three sides of about thirty small palms, leaving the south side and top open to be covered with a sheet blanket in case of a threatened cold attack as in this instance (Fig. 9).

No heat was used outdoors for several reasons, the chief one being that not

9. Type of shelter for protection of small palms from cold northerly winds. Further protection, in case of a threatened freeze, may be effectively added by draping a sheet blanket or other material over the open top and side.

even two hundred "salamanders" or other grove heaters could give full protection to every palm needing it. Firing would have been of little value anyhow, for as it turned out the force of the icy winds would have dissipated most of the heat. A still more compelling reason for the lack of any heat at all was that the rush to buy grove heaters had exhausted the supply in central Florida at the first alarm and they were not to be had.

On that fatal day, December 12, the temperature fell to 32° F. at 8 p.m. and continued falling till it reached a minimum of 22° at 7 a.m. on the morning of the 13th. It gradually started to rise at 8:30 a.m., but did not reach 32° until 10 a.m., thus making a total of 14 hours below freezing. The maximum temperature during the daylight hours of the 13th was only 42°.

The damage to plants was apparent enough at first, but not nearly so appalling as a week later when it looked as if a fire had run through the grounds. Immediately, however, once the frozen veg-

etation had thawed out, a faintly sweet but sickly odor began to permeate the air, becoming more pronounced within the next few days and not unlike that of a battlefield strewn with dead.

On the 13th one could not hazard a good guess as to the number of palms killed or to the proportion of their total number. Perhaps three-quarters of them had suffered fatal injury, perhaps only one-third or just a quarter. Two more consecutive nights with freezing temperatures were to ensue: 11 hours from 9 p.m. on the 13th to 8 a.m. on the 14th, with a minimum of 26°; and 3 hours from 10 p.m. on the 14th to 1 a.m. on the 15th, with a minimum of 29°. New injury was caused by the two additional freezes, and the damage from the first freeze was extended.

With the lapse of a week dead fishes floated in the river shallows and others were cast up to rot on the bank, adding nothing pleasant to the pervading stench from decaying vegetation. It looked as if six or seven hundred palms had been lost, though a correct tally could not be made before fall. Hundreds of other tropical plants were either killed outright or frozen down to the ground—trees, vines, shrubs, foliage plants, bromeliads, tree ferns. Citrus was not vitally injured except the fruit and except lemon and lime trees; but many kinds of plants that no one had seen cold-damaged before, on the local peninsula, were either killed or converted into ghastly eyesores, as for example Brazilian pepper trees, Norfolk Island "pines" and the commonly planted melaleucas.

Fortunately a fair number of the writer's palms were of the hardiest kinds and sustained no injuries whatsoever, but too many others, including some of those that had always been considered absolutely cold-tolerant for the locality, suffered severe damage to the foliage or else lost all of it together with any unexpanded leaves. Some of these died, and some made a natural recovery; others had to be aided by human agency, as without it they were doomed. If, as time wore on, no new growth became visible within six weeks to three months, radical surgery was resorted to in an effort to save any palms that, though devoid of foliage, remained upright with the lower part of the stems (trunks) still sound up to within two feet of the top. Nothing was to be lost by it, for these palms appeared to be already dead or about to die, most of them rotting at the top of the stem which at that point was infested with maggots. However futile it seemed, the larvae-infested rotten tops of the stem or trunk were sawed off with a pruning saw. From only a few inches of a very small stem to as much as two feet of a large woody trunk had to be amputated, thus leaving in the latter instance only a gaunt pole with a flat top. These cutoffs were made many times at a point well below the base of the latest leaf to emerge, and certainly where no vestige of the sheathing leaves could be readily discerned. Nevertheless, about eighty of these shorn and sawed-off palms, out of approximately one hundred and fifty so treated, began to push up new leaf growth that was feeble, sickly and stunted at first, but becoming more promising with each succeeding leaf until, in some instances, the normal leaf crown was attained and in other instances a slow progress maintained (Fig. 10). Not miraculous, perhaps, but most amazing to this writer, who had been zealously attached to the belief that palms chopped in twain are finished for all eternity. And so they were in every case where a cut had to be made below the shoot apex. Regeneration could not take place when the removal of all unsound tissue resulted in a cut too far below the

10, (left). *Syagrus quinquefaria* recovering from a mere stump left by the saw. 10a, (right). Same palm as at left, showing where the very drastic crosscut was made.

crown, and this was the case with many of the palms cut back.

The word "bud," when used to signify an emerging leaf of a palm, is erroneously applied according to P. B. Tomlinson, Research Scientist at the Fairchild Tropical Garden, and therefore this popular usage is avoided in the preceding paragraph and in the rest of this article. When gardeners and growers refer to the "bud" of a palm they usually mean by that term *the latest unexpanded leaf to become visible in whole or in part.* Because the usage is erroneous, Dr. Tomlinson has suggested that "emerging leaf" will suffice to convey the intended meaning, and that suggestion is being followed in the writing of this article. The matter is brought to the fore here because "emerging leaf" often appears in the succeeding pages of the report. The term may seem somewhat awkward at first, but no one will be mystified by it; and perhaps it is better to be a little awkward than to continue in support of an error, which the writer readily admits has been his own in common with most of the other dirt-gardeners.

The emerging leaves, now converted to respectability from "buds," had to be lifted or pulled out of hundreds of the writer's palms, often leaving deep sockets which had to be drained of rainwater to prevent new rot. The innermost leaves extracted were of course dead, but not uniformly loose; a good deal of force had to be exerted for removal of some. No ordinary bulb-syringe proved long enough to reach the bottom of the largest sockets; a twenty-inch catheter had to be added to a battery filler to drain the deepest cavities created by extraction of emergent leaves. No wonder someone was prompted to remark that only a palm-nut of the first magnitude would lavish such care on the sorry snags and stumps then abounding. It was not love, however, that redeemed a few of the seemingly most hopeless palms, nor was it faith; it was unremitting attention and effort.

Not to be overlooked is the fact that the 1962-1963 winter as a whole was slightly warmer than normal for the

11. Tall specimen of *Phoenix Roebelenii*, S. Beach St., Daytona Beach, Fla., was over forty years old when freeze-killed in Dec., 1962. *News-Journal* photograph.

area. All the damage resulted from the one cold outbreak beginning the evening of December 12th and ending in early morning of the 15th. The temperature did not again fall to the freezing point during the remainder of the winter and frost did not recur, yet the severity of the one outbreak caused more damage than any other of the century. Witness Figs. 11 and 12, showing two palms nearly half a century old that were finally struck down by the 1962 freeze after having defied perhaps one hundred or more less violent freezes. Numerous palms and other plants in the writer's collections that had survived the long cold winter of 1957-1958, officially the coldest of record, were at last destroyed by the short but unprecedented cold outbreak of 1962.

By no means were all the survivors of the 1957-1958 winter damaged by the 1962 outbreak, much less killed. Moreover, the number of recoveries of severely injured palms exceeded by far any reasonable expectation. Certainly to judge by early appearances there were no grounds for optimism, and no one would have been rash enough to predict that, despite the heavy losses, there would be many survivors among the palms of strictly tropical habitat—which there were, especially notable in such genera as *Bismarckia, Licuala, Livistona, Sabal, Acrocomia, Syagrus* and *Orbignya,* to name a few.

The alphabetical summary below is as detailed as may be without extending the matter far beyond the available space. It is aimed at showing the effects of the 1962 freeze upon all the palms planted in the grounds here, and does not take any potted palms into account. The summary is comprised of whatever facts were available up to December 1, 1963. Heights given are over-all, expressed in feet (′). The palm names conform with the usage established by Harold E. Moore, Jr., in "An Annotated Checklist of Cultivated Palms," PRINCIPES 7:119-182, 1963.

ACOELORRHAPHE *(Paurotis).* 3 palms, 1 sp., 14 to 30 yrs. old, 9′ to 17′. *A. Wrightii* (3), unaffected.

ACROCOMIA. 17 palms, 6 spp., 5 to 16 yrs., 8′ to 32′. *A. aculeata* (2), both defoliated, rotten tops of trunks sawed off, but both recovered. *A. crispa* (1), young palm with much new and tender growth, killed outright. *A. mexicana* (1), defoliated, attacked by larvae, stem cut back one foot, fully recovered; this same palm had survived injury almost as severe in 1957-1958. *A. Totai* (6), virtually uninjured. 7 other individuals of 2 undet. spp., damaged in varying degree, all recovered.

AIPHANES. 9 palms, 3 spp., 4 to 9 yrs., 5′ to 8′. *A. acanthophylla* (6), *A. caryotaefolia* (1), *A. Lindeniana* (2), all killed, incl. one of the last-named that had survived the freezes of '57-'58.

ARCHONTOPHOENIX. 10 palms, 2 spp., 5 to 8 yrs., 10′ to 15′. *A. Alexandrae* (2), *A. Cunninghamiana* (8), all killed, though some life persisted in the latter for several months.

ARECA. 5 palms, 2 spp., 5 to 8 yrs., 7′ to 10′. *A. Aliceae* (1), killed. *A. triandra* (4), 2 killed; 2 frozen down to ground, both rising from the roots after March 1, for the 2nd time.

ARECASTRUM. 28 palms, 1 sp., 17 yrs., 9′ to 36′. *A. Romanzoffianum* (28), 3 killed; 11 others had severe damage to foliage; 6 others completely defoliated, developed "heart rot" and infested with larvae, trunks cut back 1′ or more, all recovered; 3 others, minor burn of foliage; 5 others, no slightest injury, but all of these were grown here from seed obtained in southern Brazil by Mr. David Barry. No queen palms here were in-

jured by the several freezes of '57-'58 when the minimum was 25°, though that was not true of the Daytona Beach mainland where lower minima were established in some places.

ARENGA. 15 palms, 5 spp., 5 to 14 yrs., 4′ to 13′. *A. Engleri* (8), moderate damage to foliage of 5, none to 3 (this sp. markedly more cold-resistant than most strains of *Phoenix reclinata* found in the trade). *A. pinnata* (4), all killed. *A. porphyrocarpa* (1), killed down to ground, now alive through new suckers. *A. Wightii* (1), killed. *A.* sp. (1), moderate injury, recovering.

ARIKURYROBA. 4 palms, 1 sp., 4 to 8 yrs., 3′ to 9′. *A. schizophylla* (4), 3 killed; 1 severe injury, cut back to merest stub, but recovered.

ASTROCARYUM. 1 palm, 1 sp., 6 yrs., 5′. *A. alatum* (1), killed.

ATTALEA. 2 palms of undet. spp., 7 yrs., 4′ to 5′, some foliage damage, not vitally injured.

BACTRIS. 3 palms, 3 spp., 5 to 10 yrs., 3′ to 5′. *B. Gasipaes (Giulielma Gasipaes)* 1, killed to ground for the 2nd time, again slowly rising from the roots. *B. major* (1), killed to ground, reviving through new stems. *B. Ottostapfeana* (1), killed to ground, re-establishing itself slowly from roots.

BISMARCKIA. 6 palms, 1 sp., 4 to 8 yrs., 3′ to 10′. *B. nobilis* (6), the smallest killed; very severe damage to the remaining 5, necessary with 2 to prune away 1′ from the top of stem, but all 5 have fully recovered.

BUTIA. 6 palms, 2 spp., 6 to 20 yrs., 4′ to 14′. *B. capitata* (5), unaffected. *B. eriospatha* (1), unaffected.

BUTIA × ARECASTRUM. 4 of these natural crosses, 9 yrs., 12′ to 16′, unaffected. This hybrid handsome, fast-growing and said to have endured 14° with but little damage.

CALAMUS. 1 palm, 1 sp., 7 yrs., 3′. *C.* sp., a dwarf sort, killed.

CARYOTA. 7 palms, 4 spp., 4 to 15 yrs., 4′ to 22′. *C. Cumingii* (1), killed. *C. mitis* (4), all frozen to ground except few small stems; 2 of the 4 had been frozen down before, in '57-'58, one regaining height of 18′ in only 5 years, the other regaining 10′; all 4 again rising from stubble, one already reaching 7′. *C. ochlandra* (1), slowly died, in contrast to immediate destruction of following sp. *C. urens* (1), killed outright. Note that multiple-stem spp. may restore themselves, but single-stem spp. do not.

CHAMAEDOREA. 345 palms, 23 named spp. plus various undet. spp., 2 to 11 yrs., 1′ to 11′. *C. brachypoda* (2), considerable foliage damage, about half the stems lost, but this stoloniferous palm rapidly recovers by means of new offshoots, resulting in both patches being already larger than before freeze. *C. concolor* (2), killed. *C. costaricana* (2), killed to ground, slowly recovering from roots. *C. elatior* (2), killed. *C. elegans* (7), all killed though this sp. unscathed in '57-'58. *C. Ernesti-Augusti* (10), all killed. *C. erumpens* (16), average destruction about 90%, restoration by new stems ranging poor to good. *C. fragans* (1), killed. *C. geonomaeformis* (6), all killed. *C. glaucifolia* (4), all killed though undamaged by prior freezes. *C. Klotzschiana* (3), all killed, unhurt by prior freezes. *C. lepidota* (1), killed. *C. microspadix* (18), absolutely unharmed, undoubtedly the hardiest *C.* sp. ever cultivated here. *C. monostachys* (1), killed. *C. neurochlamys* (2), killed. *C. oblongata* (12), all killed. *C. pumila* (1), uninjured. *C. radicalis* (16), undamaged, apparently second only to *C. microspadix* in degree of cold tolerance. *C. Schiedeana* (52), all killed. *C. Seifrizii* (8), about 70% or more of each plant destroyed, though undamaged in prior freezes; several clusters have made good recovery. *C. Schippii* (2), killed. *C. tenella* (5), killed.

12. *Roystonea regia* on the mainland at Daytona Beach, Fla., said to have been 46 years old when destroyed by the freeze of December, 1962. It had seemed indestructible, for it had survived scores of freezes, total defoliation several times, and the loss of a fourth of its woody trunk when the first building before which it had stood burned to the ground—despite all of which it had always fully recovered and borne huge quantities of fruit. *News-Journal* photograph.

13, (left). *Coccothrinax Miraguama* trying to recover, and apparently succeeding, after loss of its foliage and amputation of uppermost part of stem. 13a, (right). Detail revealing the point at which stem of the palm at left was cut off and showing the plant in bloom even if only feebly.

C. Tepejilote (6), all killed. *C.* sp. from Chiapas (65), all killed. *C.* sp. from Michoacan (4), all killed. *C.* sp. from Nayarit (2), both killed. 5 or more other undet. spp. (95), all killed. During the summer scores of volunteer seedlings sprang up from seeds dropped just before or after the freeze, thus forming the nucleus of new plantings.

CHAMAEROPS. 4 palms, 1 sp., 7 to 13 yrs., 3′ to 8′. *C. humilis* (4), unaffected.

CHRYSALIDOCARPUS. 13 palms, 3 spp., 5 to 11 yrs., 4′ to 15′. *C. Cabadae* (2), all but a few inner stems destroyed, one plant making rapid new growth, the other languishing. *C. lutescens* (10), the 3 largest discarded because of vital injuries; the remaining 7 reduced to about one-third their bulk, but most of the crowded small stems still sound, should make handsome plants again in 2 yrs. barring freezes. *C. madagascariensis* (1), expanded foliage destroyed, emerging leaves pulled out, three larger stems lopped off because of rot, two smaller remained sound, new leaves rose from all five, now fully recovered.

COCCOTHRINAX. 49 palms, 11 spp., 5 to 30 yrs., 3′ to 22′. *C. acuminata* (1), killed. *C. argentata* (9), 4 killed; remaining 5 damaged in varying degree, but all recovered, flowered and fruited in season. *C. argentea* (1), killed. *C. crinita* (5), 2 killed; 1 minor damage; 2 required very drastic surgery, but recovered. This sp. withstood 25° min. of prior freezes. *C. Dussiana* (6), all killed, though at least 1 had withstood 25° in '57 without any damage. *C. Eggersiana* (12), 10 killed, 2 survived after removal of emerging leaves and drainage of socket provided. *C. fragrans* (1), killed. *C. Martii* (2), 1 killed; severe injury to the other, necessitating amputation of 1′ of stem to remove larvae and rotten tissue, whereafter it slowly grew a full new crown of

leaves. *C. Miraguama* (4), 3 quite small protected with covers and so uninjured; the unprotected one so badly frozen that, later on, the trunk had to be cut back 16″ to eliminate rot and maggots, after which it slowly added foliage and new stem, even flowering from 3 spathes in early fall. *C. Yuraguana* (1), killed. *C.* spp. (7), all killed.

COPERNICIA. 15 palms, 8 spp., 4 to 8 yrs., 2′ to 7′. *C. alba* (1), foliage temporarily shabby, no other damage; prob. the hardiest sp. of the genus. *C. Berteroana* (4), 1 killed; 3 heavy damage but recovering. *C. cerifera* (1), killed. *C. Curtissii* (1), minor damage though protected, now restored. *C. Ekmanii* (1), emerging leaf pulled out, expanded foliage lost, fully recovered. *C. glabrescens* (2), both lost emergent leaves, attacked by flies, larvae cut out, both recovering and developing suckers. *C. Torreana* (4), all but one protected, no considerable damage to any, all in good condition. *C. gigas* (1), partial protection but foliage badly burned, now restored.

CORYPHA. 3 palms, 2 spp., 5 to 6 yrs., 1′ to 2′. *C. elata* (1) and *C. umbraculifera* (2), all small enough to be shielded, and so undamaged.

CRYOSOPHILA. 1 palm, 1 sp., 8 yrs., 6′. *C. Warscewiczii* (1), killed though it survived 25° in '57.

DICTYOSPERMA. 1 palm, 1 sp., 8 yrs., 9′. *D. album* (1), killed.

DRYMOPHLOEUS. 2 palms, 1 sp., 5 yrs., 5′ to 6′. *D. Beguinii* (2), killed.

ELAEIS. 1 palm, 1 sp., 6 yrs., 9′. *E. guineensis* (1), killed. This specimen had survived 27°, but another failed to recover from 25° freeze of '57.

ERYTHEA. 9 palms, 4 spp., 3 to 9 yrs., 2′ to 6′. *E. aculeata* (1), minor damage. *E. Brandegeei* (2), slight damage to the smaller, none to the larger. *E. armata* (3), unaffected. *E. edulis* (3), some slight burn of leaf tips.

GEONOMA. 4 palms, 1 sp., 4 yrs., 3′. *G. binervia* (4), 3 killed; 1 survived with protection.

HOWEIA. 8 palms, 2 spp., 5 to 13 yrs., 3′ to 10′. *H. Belmoreana* (1), killed. *H. Forsteriana* (7), all killed. Other palms of the latter sp. were likewise killed by the 25° freeze of '57. Exceptionally tolerant of cool weather, the howeias are not at all tolerant of hard freezes of long duration.

HYDRIASTELE. 1 palm, 1 sp., 5 yrs., 8′. *H. Wendlandiana* (1), killed.

HYPHAENE. 6 palms, 4 spp., 4 to 5 yrs., 2′ to 4′. *H. crinita* (2), *H. Schatan* (2), *H. thebaica* (1), *H.* sp. (1), total loss of emergent leaves and expanded foliage; all ostensibly dead after 30 days, but elimination of rotting tissue and maggots by sawing off several inches from the tops of stems permitted resumption of growth, and by fall all 6 were restored to full vigor and normal appearance.

14. Young *Hyphaene thebaica*, while still ostensibly frozen to death, was beheaded by an axe, only to rise again from both stems as if nothing had happened.

JUBAEA. 1 palm, 1 sp., 7 yrs., 2′. *J. chilensis* (1), unaffected.

LATANIA. 1 palm, 1 sp., 8 yrs., 8′. *L. lontaroides* (1), killed.

15. *Syagrus flexuosa* recovering from defoliation following freeze and loss of the upper eighteen inches of its trunk to the pruning saw.

LICUALA. 19 palms, 6 spp., 4 to 6 yrs., 18″ to 4′. *L. grandis* (6), all saved by protection, but surely would have been lost otherwise. *L. paludosa* (4), all killed. *L. peltata* (2), 1 killed, other survived injury. *L. pumila* (1), severely injured, recovering. *L. Rumphii* (4), 2 killed; 2 others survived with but little injury. *L. spinosa* (2), 1 survived severe injuries; the other uninjured.

LINOSPADIX. 1 palm, 1 sp., 4 yrs., 3′. *L. monostachya* (1), survived with some leaf loss, lacking in vigor since freeze.

LIVISTONA. 34 palms, 10 spp., 4 to 40 yrs., 2′ to 36′. *L. australis* (3), unaffected. *L. chinensis* (14), mostly unaffected, several with tip burn of lower leaves. *L. decipiens* (1), unaffected. *L. humilis* (1), a 2′ juvenile, killed. *L. Jenkinsiana* (1), minor burn. *L. Mariae* (1), unaffected. *L. Merrillii* (1), unaffected. *L. rotundifolia* (3), 2 killed; 1 recovering, but only

16. Same palm as on facing page, showing detail of trunk where it was lopped off and the new growth rising from what was recently only a stump.

with help of drastic surgery. *L. Saribus* (8), unaffected. *L.* sp. (1), New Guinea palm with unarmed petioles, killed.

MASCARENA. 2 palms, 2 spp., 4′ to 9′, 5 to 11 yrs. *M. lagenicaulis* (1), *M. Verschaffeltii* (1), both killed.

MYRIALEPSIS. 1 palm, 1 sp., 8 yrs., 8′. *M. Scortechinii* (1), killed.

NANNORHOPS. 1 palm, 1 sp., 7 yrs., 3′. *N. Ritchieana* (1), unaffected.

NORMANBYA. 1 palm, 1 sp., 7 yrs., 10′. *N. Normanbyi* (1), killed.

ORBIGNYA. 7 palms, 3 spp., 8 to 9 yrs., 4′ to 9′. *O. Cohune* (1), killed. *O. spectabilis* (4), emerging leaves and tall foliage killed, all 4 recovered. *O. Guacuyule* (2), defoliated but recovered.

PAUROTIS. See *Acoelorrhaphe.*

PHOENIX. 105 palms, 9 spp. plus many hybrids, 5 to 30 yrs., 3′ to 26′. *P. abyssinica* (1), all foliage badly burned, otherwise unharmed. *P. canariensis* (10), un-

affected. *P. dactylifera* (7), unaffected. *P. Loureirii* (1), severe injury, recovery poor, outcome still doubtful. *P. paludosa* (1), an old palm with tall slender stems, no leaf burn or other damage. *P. reclinata* (39), 7 undamaged, the remaining 32 burned in varying degree, from minor to total loss of expanded foliage and emerging leaves, 15 of the 32 seemingly dead, but all fully recovered without artificial aid. *P. Roebelenii* (10), 2 minor damage, remaining 8 severe injury involving loss of all emerging and expanded leaves. Score: 5 died, 5 fully recovered. *P. rupicola* (2), defoliated except for leaves barely starting to emerge, full recovery of both. *P. sylvestris* (2), unaffected. *P. pusilla* × ? (8), *P. rupicola* × ? (9), *P. zeylanica* × ? (7), various other hybrids (8), all suffered destruction of most or all foliage, including emerging leaves, but all recovered in full.

PINANGA. 2 palms, 1 sp., 4 yrs., 4′. *P. Kuhlii* (2), both killed to ground, both rising from several new shoots apiece.

POLYANDROCOCOS. 2 palms, 1 sp., 5 yrs., 3′. *P. caudescens* (2), killed.

PRITCHARDIA. 5 palms, 5 sp., 4 to 10 yrs., 2′ to 8′. *P. affinis* (1), killed. *P. arecina* (1), killed. *P. lanaiensis* (1), killed. *P. Lowreyana* (1), survived with protection. *P. Thurstonii* (1), killed.

PSEUDOPHOENIX. 4 palms, 2 spp., 9 to 11 yrs., 4′ to 6′. *P. vinifera* (1), killed. *P. Sargentii* (3), 2 killed; the other alive though sawed off near base, poor condition.

PTYCHOSPERMA. 14 palms, 2 named spp., various undet. spp., 5 to 9 yrs., 4′ to 11′. *P. Macarthurii* (3), killed to ground, slowly rising from roots. *P. Nicolai* (1), small palm badly burned but none of 6 stems killed, condition good. Undet. spp. (10), all killed to ground, some recovery from roots.

RAPHIA. 3 palms, 1 sp., 4 to 9 yrs, 3′ to 9′. *R. farinifera* (3), 2 smaller killed; the other had badly burned foliage but did not lose emerging leaf, recovered fully.

RHAPIDOPHYLLUM. 2 palms, 1 sp., 6 to 9 yrs., 2′ to 5′. *R. hystrix* (2), unaffected.

RHAPIS. 14 palms, 2 spp., 4 to 12 yrs., 3′ to 9′. *R. excelsa* (13), 4 or 5 stems died among perhaps 150 undamaged. *R. humilis* (1), unaffected.

RHYTICOCOS. 1 palm, 10 yrs., 9′. *R. amara* (1), killed, though it had survived the hard freezes of 1957-1958 winter.

ROYSTONEA. 14 palms, 2 spp., 8 to 21 yrs., 12′ to 33′. *R. elata* (1), killed. *R. regia* (13), 12 killed outright, other lingered 'til Sept., a sad object with hardly a spark of life and had to be removed. The latter and one other had been defoliated by the freeze 5 yrs. earlier, but had fully recovered.

SABAL. 106 palms, 15 named spp. plus 3 or more undet. spp., 5 to 45 yrs., 2′ to 45′. The following in no way affected: *S. bermudana* (2), *S. causiarum* (3), *S. domingensis* (5), *S. Etonia* (8), *S. mexicana* (1), *S. minor* (8), *S. Palmetto* (62), *S. parviflora* (1), *S. Rosei* (1), *S. texana* (1), *S. Yapa* (1). Devastated, with loss of most or all foliage: *S. glaucescens* (1), *S. mauritiaeformis* (2), *S. mayarum* (1), *S. nematoclada* (1), *S.* sp. Veracruz and Tabasco (2), *S.* sp. Guatemala (1), *S.* sp. Br. Honduras (1), other undet. sabals (4). All severely damaged palms recovered—no losses in *Sabal*. Note wide cleavage, however, between hardier and tenderer species, without any intermediates.

SCHEELIA. 3 palms, 2 spp., 5 to 13 yrs., 3′ to 10′. *S. Liebmannii* (2), all foliage destroyed, incl. emergent leaves, both recovered. *S.* sp. (1), leaves to 15′ all destroyed, emerging leaf drawn out, larvae and advanced decay in upper trunk, cut back 1′, gradually recovering; this specimen had fully recovered from ex-

treme injury suffered in '57-'58.

SERENOA. 13 palms, 1 sp., 6 to 50 yrs., 1′ to 12′. *S. repens* (13), unaffected.

SYAGRUS. 7 palms, 6 spp., 7 to 10 yrs., 7′ to 10′. *S. comosa* (1), severe injury to leaf crown and upper stem, cut back 17″, recovering. *S. coronata* (1), killed, though it survived extreme injury in '57-'58. *S. campestris* (1), killed. *S. flexuosa* (1), injuries necessitated decapitation with pruning saw, severely cut back as illustrated in Figs. 15 and 16; recovering, as shown. *S. quinquefaria* (2), both lost emerging leaves and expanded foliage, attacked by rot and larvae, over 1′ of stem amputated from each, both recovering as shown in Figs. 10 and 10a. *S. sancona* (1), survivor of '57-'58 freezes, lost. *S. Weddelliana:* see *Microcoelum Weddellianum* out of alphabetical order, at end of this list.

THRINAX. 18 palms, 3 spp., 9 to 35 yrs., 5′ to 22′. *T. microcarpa* (4), all killed, though these palms had endured 27° in prior freeze without the least damage. *T. parviflora* (12), though cultivated under the name of this Jamaican sp., are quite possibly *T. floridana*, now ruled a valid name; 11 killed, including small young ones and old tall ones; 1 severely injured, stem pruned back 1′, has erected a few stunted leaves and ripened two reduced bunches of white fruits (Fig. 17). *T.* sp. (2), 1 killed; the other severely damaged but fully recovered.

TRACHYCARPUS. 7 palms, 2 spp., 5 to 12 yrs., 2′ to 7′. *T. Fortunei* (6), unaffected. *T. Martianus* (1), unaffected.

TRITHRINAX. 1 palm, 1 sp., 6 yrs., 3′. *T. acanthocoma* (1), unaffected.

17. *Thrinax parviflora* once 14 feet tall, but now much shrunken due to losing all its foliage to the freeze and the uppermost part of its trunk to the saw. Here it is making a valiant effort to restore itself, and despite its pathetic appearance has managed to ripen a hundred or so fruits containing viable seeds.

VEITCHIA. 6 palms, 3 spp., 4 to 8 yrs., 3′ to 10′. *V. Joannis* (3), *V. Merrillii* (2), *V. Winin* (1), all killed.

WALLICHIA. 3 palms, 1 sp., 4 yrs., 4′. *W. disticha* (3), all killed.

WASHINGTONIA. 10 palms, 2 spp., 5 to 17 yrs., 7′ to 24′. *W. filifera* (6), unaffected. *W. robusta* (4), unaffected.

ZOMBIA. 2 palms, 1 sp., 5 to 12 yrs., 1′ to 4′. *Z. antillarum* (2), 1 killed; the larger very little damaged, condition good.

ADD: MICROCOELUM. 3 palms, 1 sp., 6 to 14 yrs., 2′ to 5′. *M. Weddellianum* (3), all killed even though the oldest and tallest had never been cold-damaged during 10 yrs. here in the open ground.

THE EDITOR'S CORNER

It's a small corner this time. The editor, Dr. Moore, is not in it just now. He is in other corners of the planet, having left Ithaca, N. Y., on sabbatic leave September 30, 1963 for extended travel abroad in pursuit of his taxonomic work with the palms. At the year end he was in Singapore, following visits to Madagascar, Ceylon and India.