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Trachycarpus martianus in its natural habitat, Khasia Hills, India.

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Editorial

We are aware that the term "endangered species" is increasingly becoming a rather meaningless cliche, simply because it is so often applied uncritically. However, we must agree that palm species are threatened with extinction, and some are probably in a far worse state than others. It's easy to bemoan rain forest destruction and make suggestions that palms in their rain forest habitats are thus threatened. The problem is that we know all too little about the distribution and population structure of palms in their natural habitats. There are just two few palm botanists in the major palm areas of the world. An exception is Mexico, a country with a rich and varied palm flora. In this issue we have included an important paper by Andrew Vovides on the status of some species of *Chamaedorea* in the State of Veracruz. The article should be of particular interest to growers and conservationists alike. Andrew explains the value of *Chamaedorea* in Veracruz, and indicates the great potential of sustainable exploitation of the wild stands of these forest undergrowth palms by the rural population, if habitat destruction is controlled and the greed of collectors curbed. Without some sort of intervention, the fate of four species in particular is very much in the balance. The significance of this paper is that it is based on first hand experience and has a positive message for sustainable management.

In contrast the fate of the wonderful palm *Tranchycarpus martianus* seems much more secure. Martin Gibbons and Tobias Spanner have continued the series of papers on *Trachycarpus* in the wild by describing their recent trip in search of a very poorly known palm. They describe how *T. martianus* occurs on sandstone precipes where it seems relatively safe from human interference (see front cover photo). Growing nearby are other palms of great horticultural interest. Palms of horticultural interest are also found on the Andaman Islands, but there many are endangered as documented by Sam Mathew and Susan Abraham.

In another article Henk Beentje recounts, as promised in an earlier article (see *Principes* 37(1) January 1993), the continuing search for the elusive *Louvelia lakatra*, how he found it without first realizing it, and how he also found himself in jail, all part of the thrills of field work in Madagascar.

The rest of the issue has many articles about palms in cultivation. Ralph Velez, interviewed by Don Tollefson, gives an account of how his enthusiasm for palms developed and the astonishing collection of often tropical species that he has built up in southern California. He makes a real plea for growers outside the obvious climatic optima for palms, to experiment and be adventurous in what they grow. This spirit coupled with canny knowledge of palm growth requirements is what has produced Ralph's fine collection.

Over the years in *Principes* we have run innumerable articles on survival of palms during cold weather, articles which may bore those who live in more ideal climes. One could be forgiven for thinking that there was little left to be said about cold tolerance. However, the importance of the study by Severn Doughty and colleagues is its strong statistical base. The observations are not based on what happened in one back yard, but on what happened throughout the New Orleans area, during the exceptionally cold weather in 1989, based on records of 9,039 palms belonging to 14 genera and 21 species, a most impressive body of data. Although the article has special significance for those living in New Orleans or similar climates, it does provide strong evidence of the degree of hardiness of many commonly cultivated species and should thus apply throughout warm temperature areas.

The rewards of growing cold hardy palms can be outstanding as attested by Nick Parker's comments on the performance of *Trachycarpus fortunei* in Canada.

JOHN DRANSFIELD
NATALIE W. UHL

Principes, 38(2), 1994, pp. 64–72

A Systematic Survey of Freeze-Damaged Palms in the New Orleans Area after the 1989 Freeze of the Century

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Palms are used extensively in landscape horticulture in warmer regions of the contiguous United States, principally Florida, the northern Gulf of Mexico coast, Southern Texas, Arizona, and California. According to Tomlinson (1990), they are emblematic of tropical regions and their distinctive form is commonly associated with tropical plants. They have long been sought after by horticulturists even as early as the eighteenth century. Today they still are highly prized by landscape designers, horticulturists and collectors.

According to Uhl and Dransfield (1987), palms do have climatic limitations. They are found more in humid tropics and subtropics and are generally absent from semideserts and deserts unless a water source is present. Very few of the 2,700 species occupy temperate regions. According to Larcher and Winter (1981), a restriction in distribution for palms is the ground frost limit. Roots are the most vulnerable organ of palms, and they are very susceptible to freeze injury (Larcher and Winter 1981). Consequently, palms are unable to survive in regions where sufficient negative Celsius temperature durations develop in soil (Larcher and Winter 1981).

In the New Orleans, Louisiana area, USDA Cold Hardiness Zones 8B and 9A, 14 genera comprising 21 species have been identified growing in landscapes. Occasional advective freeze episodes occur which cause various levels of damage and death to certain species in the total palm population. One such severe episode occurred in 1989. According to the National Weather Service (1989), the severe advective freeze of December 1989 was by far the most significant of this century in New Orleans. Eighty-one of 82 hours, beginning on December 22 and ending on December 25, were below 32° F (0° C). Temperatures were at or below freezing for a consecutive 64 hours from December 22 through December 24. Perhaps more significant is the fact that of the three coldest outbreaks ever recorded in New Orleans, this was the worst, with 15 hours of 15° F (−9.4° C) or less occurring and a record low of 11° F (−11.67° C) on December 23.

Not only were low temperatures a factor, but also high winds contributed markedly to palm damage. Cold, drying winds desiccated plant tissues, obviously producing more damage to exposed plants than to those protected from high winds. In some cases wind protection meant survival or death to certain species such as *Washingtonia filifera* and *Livistona chinensis*.

The determination of freeze damage is often very hard to discern soon after the event but becomes more apparent with time. Freezing temperatures can damage or destroy leaves, the apical bud, the trunk or a combination of tissues. Depending upon the palm species, various plant parts were affected differently. For example, all *Phoenix canariensis* leaves were completely destroyed at 11° F (−11.67° C) temperature and damage was obvious several days after the freeze. The majority of *P. canariensis* apical buds survived. Trunk damage on *Phoenix canariensis* has been observed resulting from prior freezes especially within 3 ft. (.9 m) from the ground. This reduces water conduction to the leaves per-

manently. But this damage may not become apparent for years after the event. Larcher and Winter (1981) indicated that there was a positive correlation between growth activity and frost susceptibility which led them to expect seasonal variations in the cold sensitivity level. According to their work, simulated frost injury to juvenile *Trachycarpus fortunei* leaf bases, unfolding leaves and shoot apices were found to be seasonal. These tissues were able to withstand colder temperatures in January than in May or July. However, there were little differences found in mature leaves (Larcher and Winter 1981).

Two *Trachycarpus fortunei* palms out of 10 displayed significant damage to the trunk at soil level and it was not until a year and a half later that the plants began to decline. Two years after the December 1989 freeze, one palm was near death and the other was declining rapidly.

According to Donselman and Atilano (1981), when warm weather returns after a freeze, primary and/or secondary plant pathogens frequently attack damaged tissues. The extent of decay to severely damaged apical buds can cause death 3 months to several years after the freeze. Damaged trunk tissues also may be attacked, but the extent of damage is poorly understood. Significant cavities can occur, especially in *Butia capitata* and *Phoenix canariensis*, years after a severe freeze.

Tomlinson (1990) reported that tannin cells containing polyphenolic substances are abundant in palms. Whether these cells play a role in inhibiting decay and limiting pathogen invasion to the trunk needs further research.

In one species, *Livistona chinensis*, all leaves were completely destroyed at 11° F (−11.67° C) in 1989 and the damage was evident in approximately one week. By early spring some *L. chinensis* began producing new leaves, indicating that the plants had survived. However, by early summer many died, leaving their brown, shriveled leaves as sad reminders.

With so much palm damage apparent, a systematic survey was conducted to determine the extent of damage to palms in the metropolitan New Orleans area. There are accounts of various species of palms surveyed after cold episodes in Georgia (Manley 1967); Dallas, Texas (Hintz 1978); Daytona Beach, Florida (Smith 1964) and more recently at Fairchild Tropical Gardens in Miami (Hubbuch 1990). Another account of various palms surviving low temperatures may be reviewed by Popenoe (1973). However, no report of a systematic approach using thousands of palms and statistical analyses was found.

The main purpose of this study was to provide a systematic survey of cold-damaged plants. Several other purposes included the determination of the probability of success of the 21 species reported in various areas surrounding New Orleans.

Materials and Methods

The survey began August 16, 1990, approximately 8 months after the freeze, and ended October 30, 1990. Initially, metropolitan New Orleans was divided into 20 geographical regions. Randomly selected streets both with and without a known high population of existing palms were surveyed. All or part of 20 days totaling 57.25 hours were spent traveling approximately 1,125 miles by car.

Twenty-one species of palms belonging to 14 genera were found on both private and public properties and were assigned initially to one of seven categories of condition: (1) no visible freeze-related injury to either leaves or trunk; (2) lost most or all of their foliage but replaced them with vigorous new growth in early to mid-spring; (3) lost their foliage but replaced them slowly with half size and narrower new leaves; (4) lost their foliage and barely resprouted new growth with leaf size and shape severely malformed, small and spindly; (5) lost all of their foliage, resprouted but new growth died soon after emergence; (6) lost their foliage but did not resprout; and (7) lost their foliage, did not resprout and their trunks were either broken in two or had fallen over, indicating death of the apical meristem.

It was noted that one *Washingtonia robusta* that was placed in category six resprouted approximately five months after the completion of the survey. However, the new growth was very small and spindly. With 102 inches (259 cm) of rainfall officially reported in New Orleans for the year (42 inches [107 cm] over the average), decay apparently involved the apical meristem, and the new foliage died within five months.

Several *Sabal mexicana* palms also were reported in category six but resprouted after the survey. They still are growing and developing, and none has died in spite of the rainfall. However, new growth has been observed developing in only one quadrant of the apical meristem. For example, one palm developed growth in the northeast quad-

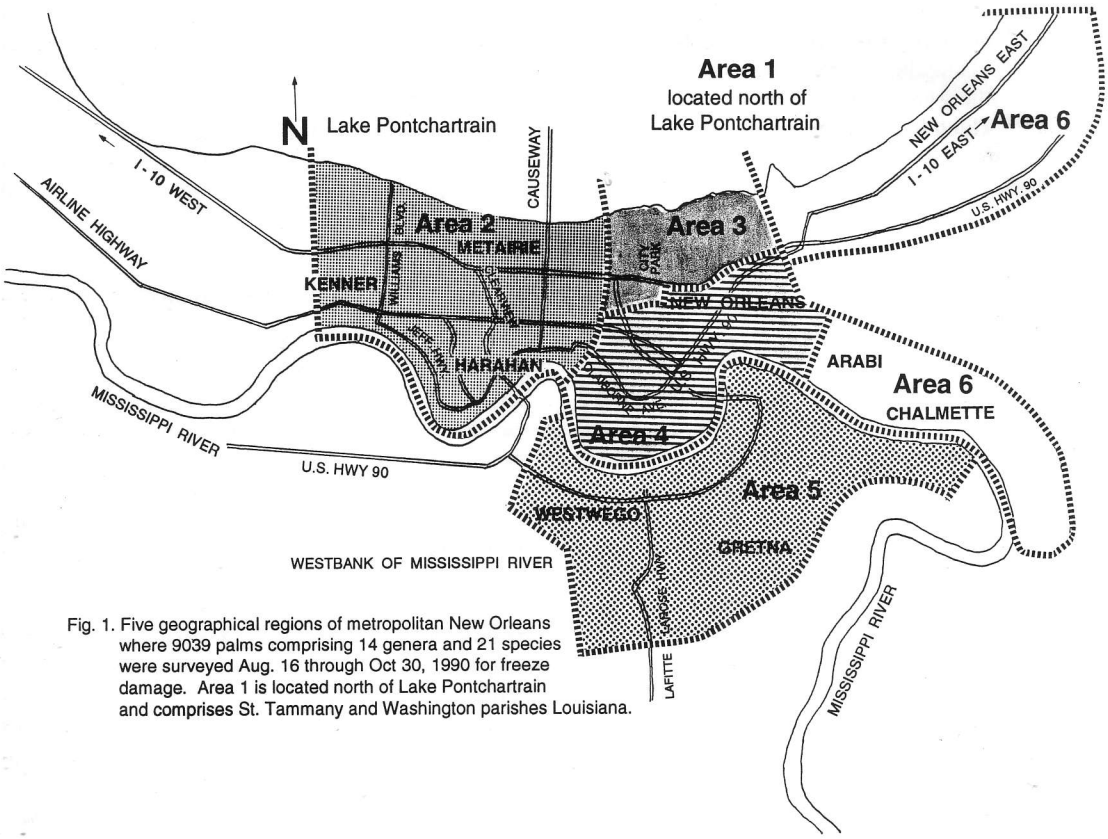

Fig. 1. Five geographical regions of metropolitan New Orleans where 9039 palms comprising 14 genera and 21 species were surveyed Aug. 16 through Oct 30, 1990 for freeze damage. Area 1 is located north of Lake Pontchartrain and comprises St. Tammany and Washington parishes Louisiana.

rant, and two others developed growth in the southern quadrant of the meristems.

High rainfall and decay also are suspected of killing several *Phoenix canariensis* palms after they were reported in categories two and three.

For purposes of statistical analyses and to provide more reliable estimates of survival, the initial 20 geographical regions were reduced to six. They are: area 1, north of Lake Pontchartrain; area 2, metro west; area 3, central; area 4, central south; area 5, west bank (geographically south); and area 6, east and southeast (Fig. 1). Also, the initial seven condition categories were reduced to three. Categories one and two were combined (good condition r = 1), categories three and four were combined (fair condition r = 2) and categories five, six and seven were combined (poor condition r = 3). In all statistical analyses, the percentage of palms doing well (condition category 1) was compared with the combined percentage doing fairly or poorly (condition categories 2 and 3) using the binomial test.

Results and Discussion

In examining all six areas, the total number of palms found and the percent in each category condition are given in Table 1. North of Lake Pontchartrain is not a good area in which to plant palms (Table 1). There was no statistical difference between the percentage doing well (47%) and the percentage doing fairly or poorly (53%). The remaining five areas south of Lake Pontchartrain were better for overall palm survival with the central (area 3) and central south (area 4) areas of the city showing the greatest percent survival rates.

Only seven palm species, with a total of 254 individuals, were found growing in area 1 (north of Lake Pontchartrain, Table 2). Of those, only *Sabal minor* can be highly recommended for survival. *Rhapidophyllum hystrix* and *Trachycarpus fortunei* were found to be statistically marginal species. *Butia capitata* and *Sabal palmetto* should not be considered for planting on the north shore

Table 1. Percentages of overall palm species and conditions by areas.

Area	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
North of Lake Pontchartrain (Area 1)	254	47^{NS}	31	22
Metro West (Area 2)	1,826	65***	20	15
Central (Area 3)	2,666	77***	14	9
Central South (Area 4)	1,881	70***	12	18
Westbank (Area 5)	830	58***	22	20
East & Southeast (Area 6)	1,582	54**	19	27

, *, ^{NS} Significant at P = 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

because there was statistically more damage to these palms.

Phoenix canariensis and *Sabal* sp. representation was too low to analyze statistically. The identity of the *Sabal* is uncertain, but they may be immature specimens of *S. palmetto*, *S. mexicana*, *S. bermudana*, or *S. domingensis* (Zona 1990). Until positive identification can be made, the plants will be designated herein as *Sabal* sp.

In area 2, suburbs west of the city, there were 1,826 palms surveyed comprising 10 genera and 16 species (Table 3). Eight species were found to be reliable for planting: *Livistona chinensis*, *Phoenix canariensis*, *Rhapidophyllum hystrix*, *Sabal mexicana*, *S. minor*, *S. palmetto*, *S.* sp. seedlings and *Trachycarpus fortunei*. Although *Livistona chinensis* was found to be reliable for planting, the low representation (n = 11) lends caution when planting this palm species in spite of the results found here.

Survival of *Butia capitata* was not statistically significant. Therefore, it is considered marginal at best, even though 52% survived. The authors recommend not planting *Chamaerops humilis* and *Washingtonia filifera* because a significant number were damaged. Six species were found in insufficient numbers to accurately analyze statistically.

Area 3, close to Lake Pontchartrain but in the center of the city (west to east), contained 2,666 palms belonging to 11 genera and 16 species (Table 4). Survival of eight species was found to be statistically reliable for planting. These eight are *Butia capitata*, *Chamaedorea microspadix*, *Phoenix canariensis*, *Sabal minor*, *S. palmetto*, *S.* sp., *S.* sp. seedlings and *Trachycarpus fortunei*. It should be noted that *Sabal* sp. seedlings and *S.* sp. are grouped as one species since they are thought to be so interrelated.

Butia capitata, which resulted mostly as marginal or unreliable in the other areas, appeared to be statistically reliable in this area with 67% surviving. This was almost as reliable as *Phoenix canariensis*, which appeared very reliable in all but areas 1 and 6. Also, *P. canariensis* was found to be highly statistically reliable when compared with all species over all areas (74% P < 0.001).

No marginal palms were found in this area, and four species were found in insufficient numbers. Four species, *Chamaerops humilis*, *Livistona chinensis*, *Rhapis excelsa* and *Washingtonia fil-*

Table 2. Percentages of palm species and conditions in area 1 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Butia capitata	23	26**	30	43
Phoenix canariensis	2	50^{Z}	0	50
Rhapidophyllum hystrix	7	57^{NS}	29	14
Sabal minor	10	100***	0	0
S. palmetto	108	39**	36	25
S. sp.	3	100	0	0
Trachycarpus fortunei	101	52^{NS}	31	17

^{Z} Percentages statistically invalid due to low n.
, *, ^{NS} Significant at P = 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

Table 3. Percentages of palm species and conditions in area 2 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Arenga engleri	3	0[Z]	100	0
Brahea armata	3	100[Z]	0	0
Butia capitata	164	52[NS]	18	30
Chamaerops humilis	36	19***	75	6
Livistona chinensis	11	91***	9	0
Phoenix canariensis	84	81***	15	4
P. dactylifera	1	0[Z]	100	0
P. reclinata	1	0[Z]	100	0
Rhapidophyllum hystrix	9	100***	0	0
Sabal mexicana	8	100***	0	0
S. minor	39	97***	3	0
S. palmetto	791	57***	21	22
S. sp.	4	100[Z]	0	0
S. sp. seedlings	33	100***	0	0
Trachycarpus fortunei	594	77***	20	3
Washingtonia filifera	40	13***	10	77
W. robusta	5	0[Z]	0	100

[Z] Percentages statistically invalid due to low n.
***, [NS] Significant at P ≤ 0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

ifera are not recommended for planting in area 3 because they were more often damaged.

In area 4, in the center of the city and south of area 3, 1,881 palms were found, comprising 10 genera and 17 species (Table 5). Six species were found to be reliable. These include *Phoenix canariensis, Sabal mexicana, S. minor, S. palmetto, S.* sp. seedlings and *Trachycarpus fortunei.* Of the three marginal species, *Phoenix* spp., thought at present to be a *Phoenix* hybrid, is not readily available in the nursery trade, but a small population (n = 7), probably planted by the New Orleans Parkway and Park Commission, can be found in front of City Hall. Four species, *Livistona chinensis, Syagrus romanzoffiana, Washingtonia filifera* and *W. robusta,* are not recom-

Table 4. Percentages of palm species and conditions in area 3 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Brahea armata	2	100[Z]	0	0
Butia capitata	101	67***	15	18
Chamaedorea microspadix	34	82***	18	0
Chamaerops humilis	42	36*	64	0
Livistona chinensis	35	23**	29	48
Phoenix canariensis	476	69***	21	9
P. reclinata	3	67[Z]	33	0
Rhapidophyllum hystrix	2	100[Z]	0	0
Rhapis excelsa	8	0**	100	0
Sabal mexicana	545	75***	15	10
S. minor	7	100***	0	0
S. palmetto	388	67***	18	15
S. sp.	177	80***	11	9
S. sp. seedlings	577	97***	1	2
Trachycarpus fortunei	251	83***	14	3
Washingtonia filifera	15	27*	13	60
W. robusta	3	0[Z]	0	100

[Z] Percentages statistically invalid due to low n.
*, **, *** Significant at P = 0.05, 0.01, ≤0.001 when comparing r = 1 to r = 2 and r = 3.

Table 5. Percentages of palm species and conditions in area 4 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Brahea armata	1	100[Z]	0	0
Butia capitata	67	46[NS]	28	26
Chamaerops humilis	24	63[NS]	25	12
Livistona chinensis	119	8***	30	62
Phoenix canariensis	507	82***	8	10
P. dactylifera	2	100[Z]	0	0
P. reclinata	2	0[Z]	100	0
P. spp. (hybrid?)	7	43[NS]	28	29
Rhapidophyllum hystrix	4	100[Z]	0	0
Sabal mexicana	165	82***	9	9
S. minor	79	100***	0	0
S. palmetto	423	75***	13	12
S. sp.	44	98***	0	2
S. sp. seedlings	83	100***	0	0
Syagrus romanzoffiana	6	0**	0	100
Trachycarpus fortunei	218	76***	19	5
Washingtonia filifera	50	12***	4	84
W. robusta	80	1***	0	99

[Z] Percentages statistically invalid due to low n.
, *, [NS] Significant at P = 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

mended for planting in area 4, and four species were found in insufficient numbers to accurately assess statistically.

Area 5 is on the west bank of the Mississippi River (actually south of area 4). A total of 830 palms consisting of seven genera 12 species (Table 6) were found. Four species can be recommended for planting in area 5. They include *Phoenix canariensis, Sabal minor, S.* sp. seedlings and *Trachycarpus fortunei. Sabal* sp. seedlings, having apical buds relatively close to the ground, were protected more from cold, desiccating winds than were their taller-growing counterparts, and this is thought to be the reason for higher survival. *Sabal palmetto* was found to be marginal, as were *Butia capitata, Chamaerops humilis* and *Washingtonia filifera. Washingtonia robusta* was the only palm found to be unreliable, and four species were found in insufficient numbers.

Area 6, located to the east and southeast of the central city, contained 1,582 palms comprising 10 genera and 16 species (Table 7). Four species were found to be reliable for planting. They include *Sabal mexicana, S. minor, S.* sp., *S.* sp. seedlings and *Trachycarpus fortunei.* Four species were found to be marginal, including *Chamaerops humilis, Phoenix canariensis, P. reclinata* and *Sabal palmetto,* and five were found in insufficient numbers to accurately assess statistically. Three species, *Butia capitata, Washingtonia filifera* and *W. robusta,* were found unreliable for planting.

Sabal palmetto, found to be marginal in this area, may have been placed in this category because of statistical combination of data. At one new landscape site, 114 *S. palmetto* palms were in good condition (r = 1), 6 in fair condition (r = 2), and 104 in poor condition (r = 3). It is thus possible that *S. palmetto* may be more reliable than is indicated by these results.

In examining all species over all areas (Table 8), nine species appeared to be statistically reliable for planting: *Brahea armata, Chamaedorea microspadix, Phoenix canariensis, Rhapidophyllum hystrix, Sabal mexicana, S. minor, S. palmetto, S.* sp., *S.* sp. seedlings, and *Trachycarpus fortunei.* However, the authors recommend comparing these results with the area results carefully before making a final decision about planting palms in New Orleans and vicinity.

The reliability of two species, *Phoenix reclinata* (44%) and *P.* spp. hybrid (42%), was found to be marginal. *Phoenix reclinata* will probably not develop tall trunks but will remain alive through most cold episodes in the Gulf Coast region. It will not be a tall growing landscape accent plant, however.

Palms found to be statistically unreliable areawide included *Butia capitata, Chamaerops humilis, Livistona chinensis, Rhapis excelsa, Sya-*

Table 6. Percentages of palm species and conditions in area 5 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Butia capitata	62	45^{NS}	36	19
Chamaerops humilis	16	38^{NS}	62	0
Livistona chinensis	2	100^{Z}	0	0
Phoenix canariensis	37	86***	14	0
P. reclinata	2	100^{Z}	0	0
Sabal mexicana	1	100^{Z}	0	0
S. minor	6	100***	0	0
S. palmetto	461	50^{NS}	22	28
S. sp.	2	100^{Z}	0	0
S. sp. seedlings	6	100***	0	0
Trachycarpus fortunei	218	77***	20	3
Washingtonia filifera	11	27^{NS}	18	5
W. robusta	6	0**	0	100

^{Z} Percentages statistically invalid due to low n.
, *, ^{NS} Significant at P = 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

grus romanzoffiana, *Washingtonia filifera*, and *W. robusta*. It should be pointed out that rhizomes and roots of *Rhapis excelsa* were not killed, but all that were surveyed had leaves and trunks that were killed to ground level. Because the species grows so slowly and with such sparse growth resulting after the freeze, it would not be acceptable as a reliable landscape plant in any area.

Three palms had low representation and could not be statistically evaluated. However, *Arenga engleri* behaved in the same way as *Rhapis excelsa*. Over the past 30 years *Phoenix dactylifera* has experienced a steady decline in cultivated populations in the study area due to cold temperatures, while *Serenoa repens*, an endangered species native to Louisiana, has declined not from cold episodes but from habitat decimation.

Conclusion

Landscape palms were surveyed for cold damage 8 to 10 months after the coldest weather episode recorded this century in the New Orleans, Louisiana area. Fourteen genera and 21 species

Table 7. Percentages of palm species and conditions in area 6 by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Brahea armata	1	0^{Z}	0	100
Butia capitata	183	31***	22	47
Chamaerops humilis	13	38^{NS}	54	8
Livistona chinensis	3	67^{Z}	0	33
Phoenix canariensis	134	52^{NS}	27	21
P. reclinata	8	38^{NS}	50	12
Rhapidophyllum hystrix	2	100^{Z}	0	0
Rhapis excelsa	1	0^{Z}	100	0
Sabal mexicana	21	100***	0	0
S. minor	96	97***	3	0
S. palmetto	738	50^{NS}	16	34
S. sp.	9	100***	0	0
S. sp. seedlings	52	94***	6	0
Serenoa repens	1	100^{Z}	0	0
Trachycarpus fortunei	269	61***	32	7
Washingtonia filifera	24	21**	17	62
W. robusta	27	0***	4	96

^{Z} Percentages statistically invalid due to low n.
, *, ^{NS} Significant at P = 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

Table 8. Percentages of palm species and conditions in all arees combined by species.

Species	n	Good Condition r = 1	Fair Condition r = 2	Poor Condition r = 3
Arenga engleri	3	0[Z]	100	0
Brahea armata	7	86**	0	14
Butia capitata	600	46*	22	32
Chamaedorea microspadix	34	82***	18	0
Chamaerops humilis	131	37***	58	5
Livistona chinensis	170	19***	28	53
Phoenix canariensis	1,240	74***	16	10
P. dactylifera	3	67[Z]	33	0
P. reclinata	16	44[NS]	50	6
P. spp. (hybrid?)	7	42[NS]	29	29
Rhapidophyllum hystrix	24	88***	8	4
Rhapis excelsa	9	0***	100	0
Sabal mexicana	740	77***	13	10
S. minor	237	98***	2	0
S. palmetto	2,909	57***	19	24
S. sp.	239	85***	8	7
S. sp. seedlings	751	97***	2	1
Serenoa repens	1	100[Z]	0	0
Syagrus romanzoffiana	6	0**	0	100
Trachycarpus fortunei	1,651	73***	22	5
Washingtonia filifera	140	16***	10	74
W. robusta	121	1***	1	98
Total	9,039			

[Z] Percentages statistically invalid due to low n.
*, **, ***, [NS] Significant at P = 0.05, 0.01, ≤0.001 or nonsignificant when comparing r = 1 to r = 2 and r = 3.

of palms, totalling 9,039 individuals, were surveyed and assigned to one of three condition categories within 6 geographic areas. Area 1, north of Lake Pontchartrain, was not a reliable area for the majority of the 21 species found. South of Lake Pontchartrain, areas 2, 3, 4, 5 and 6 were considered statistically better for overall palm survival, with area 3 best, followed by areas 4, 2, 5 and 6. Although species survival depended somewhat on area, 10 species were found to be statistically reliable south of Lake Pontchartrain: *Brahea armata, Chamaedorea microspadix, Phoenix canariensis, Rhapidophyllum hystrix, Sabal mexicana, S. minor, S. palmetto, S.* sp. seedlings and *Trachycarpus fortunei.* Two species, *Phoenix reclinata* and *P.* spp., were found to be marginal, and 7 species were found to be unreliable: *Butia capitata, Chamaerops humilis, Livistona chinensis, Rhapis excelsa, Syagrus romanzoffiana, Washingtonia filifera* and *W. robusta.* Due to low individual numbers, survival for three species could not be reliably estimated: *Arenga engleri, Phoenix dactylifera* and *Serenoa repens.*

This study outlines a procedure by which cold-damaged plants can be surveyed to serve as a future potential planting guide. It also provides a good inference as to the survivability of landscape palms in the New Orleans area. Both consumers and growers alike can benefit from this survey because growers can determine the probability of success of 21 palm species and grow those with greatest potential. Consumers, including professional landscape industry personnel, also will know which species are likely to survive in a landscape planting and can select those that are most cold hardy.

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LETTERS

Dear Natalie,

You may recall I sent some photos of the Coco-de-mer in my garden when it had one leaf? It has survived a third Durban winter (temperatures once or twice reportedly hit nightly lows of 7/8° C) but undeterred by the chilly temperatures and even the chilly political and violent climate of the emerging NEW SOUTH AFRICA, a wonderful second leaf has been produced. I would love to hear from other members living in a similar subtropical climate whether they have had any success in growing *Lodoicea*. I have heard that there are two growing in Southern Florida a climate somewhat similar to Durban's but reputedly a little warmer and more humid, especially during winter.

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IN MEMORY OF RON HARRIS

***** A devoted plant person *****

A member of the Board of Directors of the International Palm Society and of the Southern California Chapter

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The Days I Found Lakatra, and Trouble

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In an earlier article (The days I didn't find Lakatra, in *Principes* January 1993) I promised to tell the story of how I was arrested in the course of duty. It is a rather complicated story, but that is how things sometimes happen in Madagascar.

In November 1991 I visited the Réserve Spéciale de Manombo, in SW Madagascar; I had read about this rarely visited site in the excellent 'Revue de conservation et des aires protégées' (Nicoll and Langrand 1989), which I had been combing for references to palms; under Manombo it said that the place was teeming with *Chrysalidocarpus*. This sounded promising, so I embarked on a field-trip to the area. Lucienne, the wife of Olivier Langrand (one of the authors of the book), warned me that the people of this area were a bit weird, and I said I'd be on my guard. A few days after leaving Antananarivo, my driver parked the car in the parking lot of a rather grotty hotel in Farafangana, and we booked a double room for several days in anticipation of a successful palm hunt: as far as I knew, nobody had ever collected a palm in Manombo.

The journey to Farafangana had not been promising: for the last 200 kilometers the road runs parallel to the sea, some 10–20 km inland, and the views from the car had been quite desolate. This is the landscape of the Savoka, as the Malagasy call it, a sea of grassland, with scattered stands of *Ravenala*, the Travellers Palm (but of course not a real palm), caused by endless burning and chopping. This is a somber landscape, despite the brilliant light and vistas (Fig. 1), if you realize that this used to be good forest full of life and products used by man, and man-lit fires have turned it into a virtual desert, unproductive except for some sparse and nearly unpalatable shoots of grass for the few zebu cattle one sees. Erosion cuts red wounds in the hills, and few people manage to scrape a living in this semi-sterile area.

On the way to Manombo, south of Farafangana, it wasn't much better. A few *Ravenea sambiranensis* poked through the secondary growth, but it was poor palm country. We came to Manombo and saw a pick-up truck being loaded with timber; this tiny Reserve (5,000 hectare, some 10,000 acres) is the last patch of forest within a fifty-mile radius of Farafangana. I had a brief tour of the tree nursery with a forest guard. When the herders burnt the land earlier that year, to promote the growth of young grass for their zebu, the nursery had gone up in flames too. It was all rather depressing, but in the meantime, there was work to do for a palm collector. With a few guides, I entered the Reserve, and from that time on I was kept quite busy. *Vonitra fibrosa* was everywhere, and when we came to the real forest, I began to see more species. On the first day there I collected *Neodypsis nauseosus*, eighty years to the month after the type had been collected by Perrier; it had not been seen since then, at least not by botanists! This was an imposing solitary palm of some forty feet high, with almost pendulous leaflets. Its local name is 'Mangidibe', which means 'very bitter' and that conforms nicely to Perrier's report that the palm heart is thought to be poisonous. This does not protect the tree, though; it is still cut down for planks and its leaves used in thatching. I saw about a dozen, and I consider it endangered.

There were several smaller and clustering palms, one of which is to be described as new. I also collected *Dypsis littoralis*, an eighteen foot solitary palm with a thin stem, and the charming *Neophloga integra*, less than a foot high, with entire leaves with only a tiny notch at the very apex (Fig. 2). It was an excellent haul for the day and, after a long processing service in the hotel parking lot (clipping, annotating, measuring, putting flowers in alcohol, laying in between newspapers, tying in bundles—and all the time observed in amazement by the hotel staff), we enjoyed a huge meal of the inevitable rice, but Farafangana being a seaside town, made special with locally harvested crab! A well-deserved beer rounded off a good day.

Next morning I was a bit surprised to have soup for breakfast, instead of the usual rice, and I

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thought I saw what Lucienne had meant about the 'weird'. Little did I know what was in store.

When I reached Manombo and had found my guides again, we set off on a different track into the forest. This passed through a wide area of cultivation obviously cut from the forest and, when we reached the forest itself, the track proved to be well-used. It turned out that a company from Farafangana extracted timber from here, and the state of the forest made clear that they did not use half measures. I collected good material from a *Vonitra fibrosa* which had been dragged down by the fall of a larger tree, the *Vonitra* being the commonest palm in this Reserve. The place looked like a battlefield, and only after crossing a stream did we enter more reasonable-looking forest. I soon bagged a *Neophloga simianensis*, a nice, small, clustering palm with entire leaves and a long, unbranched inflorescence (Fig. 3). For a moment I was sidetracked by an unearthly little saprophyte: *Geosiris aphylla* (family Iridaceae, or Geosiridaceae). This is all of three inches high, and has ghostly purple stems and pale mauve flowers.

But soon I was brought back to the palm world by bigger game: *Chrysalidocarpus piluliferus* started appearing, a solitary palm reaching to the canopy, and an extremely beautiful species. At the time I was convinced I had refound *Neodypsis tanalensis*, not seen since 1911, but sadly that still remains unfound. Several of the *Chrysalidocarpus* had been cut for their palmheart, so it was easy to collect good flowering material. But then we approached another stream, and we noticed several giant palm trunks disappearing into the forest canopy. It was not easy to get a good view of the crowns, but at last I found one standing in a gap: it had a distichous crown, with the leaves arranged in a single plane, 'fan-like' like the Travellers Palm (Fig. 4): it proved to be *Halmoorea trispatha*, the rare relative of *Orania*, known previously only from the Masoala Peninsula! There was green fruit on the tree, but obtaining material for a collection posed some problem, since the trunk was some eighty feet high and too smooth for my guides to climb. Cutting down a tree like this was out of the question, it being a very rare species, and my guides knew of fewer than ten trees in the whole forest. There was nothing for

3. *Neophloga simianensis* is an elegant undergrowth palm. 4. *Halmoorea trispatha*, waving its fan above the forest canopy.

←

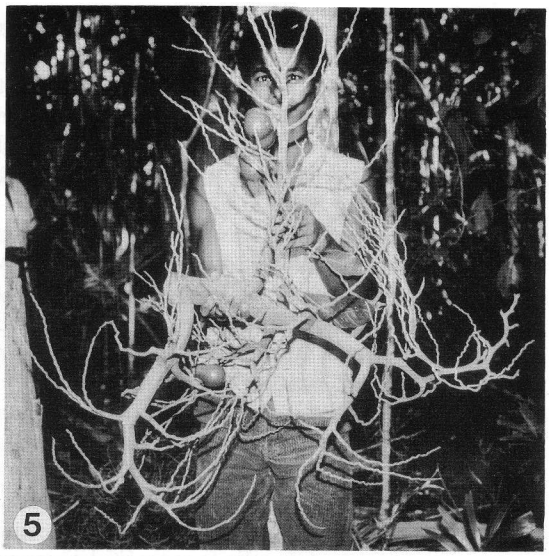
1. Typical "savoka" landscape near Farafangana. 2. *Neophloga integra*: difficult to photograph in the dense forest.

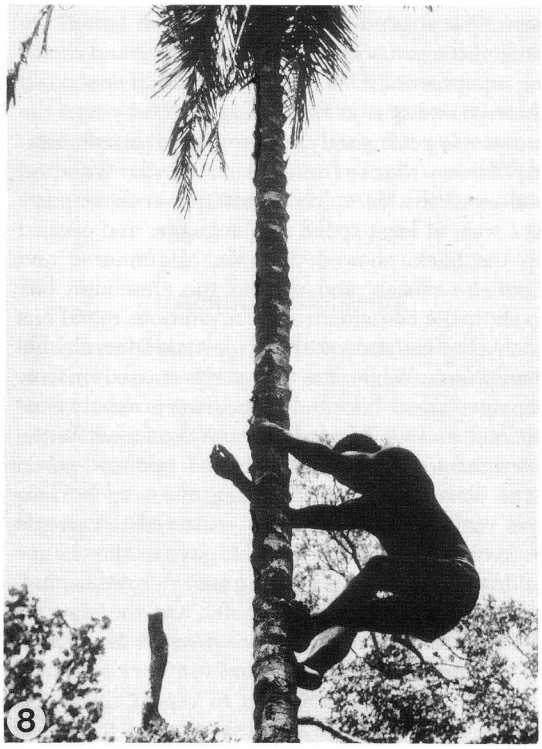
it—I would have to climb this giant myself. I must admit that my heart beat faster than normal when I donned my climbing harness and spikes, as well as a cricket 'box', just in case. I slung my rope belt around the trunk which was a foot in diameter, hooked the running loop into a karabiner on my belt, and started upwards by driving the spike on my left foot into the bark. The wood was hard, which was both good and bad: good because it felt nice and safe once your spike was in, but bad because getting the spike in was not easy, and you had to drive your foot down good and hard. I remember looking upwards soon after starting, and thinking that this was not a good idea: the trunk seemed to go up forever. So I just kept looking straight ahead (view filled by the trunk) and down, to check on my spikes. There is no time to be scared when you are climbing; you have to concentrate, and get on with the job, but there was a moment of pure fear (about halfway up, I think) when my concentration must have flagged slightly and I drove my foot in at the wrong angle. The spike glanced off the bark and I half-lost my balance, and certainly my rhythm. I managed to put the spike back in the previous hole and took a little breather. The ground, by now, looked a long way off. I leaned back on my rope belt and looked up. The crown looked a long way off, as well. I reckoned it was better to act, at this stage, than to think, and therefore continued climbing. There must have been a fabulous view, once I got above the canopy, but I cannot remember it. I do remember reaching the crown, at last, and finding that my line had got snarled; it took minutes to get it free, and to let it down to where my driver attached the 150-foot long climbing rope to it. I started hauling up the climbing rope, passed one end through both end loops of the rope ring I had thrown over one of the *Halmoorea* petioles, attached that end to my climbing harness and knotted the very end of it in a "Prussik" knot to the standing part of the rope. At last I was secure, roped into the crown and could start collecting. I cut some of the fat branches of the inflorescence, full of green fruits the size of tennis balls, growing singly or connate into twos or threes. I threw them down with admonitions to the folk below to catch them, and then started on the leaves. There were eleven leaves in the crown, each about four yards long and *exceedingly* heavy. I am sure of this, because when the second one tumbled towards the earth the whole crown swayed alarmingly—I had cut both from the left side of the crown. I rapidly cut a dead leaf from the right, to restores some balance, and then it was time to start on my way down. The whole tree was swaying slightly in the wind, and I with it. But once you are roped into a crown like this, descending is a joy: you just let go and hang against the trunk, then you squeeze the prussik knot and slide down the climbing rope. All the same, it was good to reach solid ground again.

Then it was time to measure and annotate. A collection like this takes hours; the writing is not the most glamorous part, but is just as essential as the rest. All the data that cannot be seen from the dried material have to be noted: dimensions, colors, textures, peculiarities of trunk, leaf and inflorescence. Count sixty to sixty-five leaflets on each side of the rachis, take a photo, record eight first-order branches on the inflorescence, take a photo (Fig. 5), ask the guides for the local name, and whether it is used for anything? Yes, they said, the wood is used for house construction. My heart sank. Another one for the endangered list. Then we cut the leaves and inflorescence into manageable pieces, put these in sacks, and staggered back to the car, laden with booty. On the way back I enjoyed the forest views and saw helmeted guineafowl in a tree, as well as two small brown lemurs leaping about. I also saw a lemur trap, so I hung back at the end of the column, and broke it. I had no wish to fall out with my guides, who had been helpful, but on the other hand I do not think people should kill lemurs either. Maybe this is cultural imperialism, but I call it a good deed (for the lemurs, that is).

Back at the car, we ate French bread and tinned sardines, and drank lots of water; we were almost ready to drive off when I spotted a middle-sized *Orania*-like palm which was not an *Orania*. It was, I thought, a *Ravenea*, in full fruit, and a new one to boot. All parts were rock-hard; not just the trunk, but the petioles, the leaf rachis and the inflorescence axes. This last was some eight feet long, one of the longer Ravenea inflorescences known (Fig. 6); I opened a fruit, and found two seeds inside; I opened some more, and found that they contained between one and three seeds, and had terminal stigmatic remains. So it was a *Louvelia*, and clearly distinct from all others; *Louvelia manombae*, a new species! We drove back to the main road, I paid the guides and gave them a fat bonus for the excellent finds, and sat back luxuriously as my driver drove me back to Farafangana, the rear of the car filled with sacks full of palm pieces.

In Farafangana we decided to celebrate with a





5. *Halmoorea trispatha* inflorescence with young fruit, held by a guide. 6. *Louvelia lakatra* "steps". 7. *Louvelia* inflorescence, the longest ever, held by a guide. 8. The guide who wouldn't believe me—going up.

large beer, before going back to the hotel for a shower and dinner. Riry, the driver, parked the car on the main street. We bought two ice cold bottles of beer from a Chinese merchant, put the car chairs in a reclining position, and started enjoying the beer thoroughly. As usual, several people gathered around the car, chatting; I did not pay any attention, because this always happened. But more people came, and within a quarter of an hour, the car was surrounded by quite a crowd.

This was fairly unusual. I do not feel at ease when I'm the focus of a lot of attention from strangers, so I decided to return the beer bottles and glasses to the merchant, and to return to the hotel. When I opened the door of the car, people dived away, as if in fear, and formed a chattering wall a good distance away from my path to the store's door. This was most unusual! I cracked a joke in my feeble Malagasy, to lighten the atmosphere, but nobody smiled. Neither did the merchant inside the shop who told me that it would be better if I left town. "But why? Whatever is the matter?" I asked. His answer nearly bowled me over. "The people are angry that you have stolen young girls for their blood. It is better that you leave now." Back at the car Riry had by now gathered more or less the same story that the crowd thought we had kidnapped two young girls and had put them in sacks in the back of the car, taken their hearts and kidneys, and stored them in our freezer—here they pointed to my big aluminum box in the back of the car, where I store collecting and climbing equipment. "Okay, give me a bit of space, I'll show you what is in there" I said, but by now the crowd was getting ugly, and would not let me pass. My driver, who is from the inland plateau area, and so almost as much a stranger in these parts as I was, at least spoke the language, and opened up the back, showed them our *Halmoorea* and *Louvelia* pieces, and opened the aluminum box to show the contents: ropes, mysterious metal bits such as spikes and karabiners, plastic bags, alcohol containers. While the palm bits looked merely strange, these bits and pieces were clearly suspicious, and we decided to leave the scene. When Riry started the car, the crowd hemmed us in even closer and started rocking the vehicle. This was really scary. The horn scattered the people in front for a moment, and this gave us the chance to drive off jerkily. We left an angry crowd behind, and doubled back to our hotel. On the way we decided that this town was not good for our health, so we collected our gear and (on Riry's advice) drove to the Police Station to report the whole thing. The policeman on duty thought the whole thing was a bit of a joke, which put everything back into perspective—until the sergeant came in. Yes, he said, this had happened before, and the fact that our LandCruiser was red had made it worse! Though the logic of this escaped me, our statements were taken, our collecting permits checked, my passport data copied, and then we were escorted out of town by the commissioner himself—by back roads, not through the high street.

It was hours later that we reached the nearest large town with a reasonable hotel, and we were both very tired. We slept late, and it took until noon to process our plants. Riry was jittery, saying this place was too close to Farafangana for comfort, and he suggested leaving this part of the coast altogether. As the landscape was pretty barren, I decided to do some collecting at a forest over a hundred miles away, where I still wanted to look for Lakatra. After lunch we set off, driving through endless "Savoka", with not a palm in sight. "Stop! Palms!" I suddenly cried. The car braked to a halt and in a tiny bit of forest on a hillside there were lots of palms. There was *Vonitra fibrosa* and *Ravenea madagascariensis*, *Phloga nodifera* and *Orania longisquama*, and incredibly, my new *Louvelia manombae*! This was the moment of truth, because I could see what I thought was a multiple inflorescence in a tree quite close to the road. This could be the "missing link" between *Louvelia* and *Ravenea*, and I had to have those flowers. Full of excitement I put on my climbing harness, and in the hot midday sun slogged up a steep slope to the foot of the palm, climbing spikes in one hand, secateurs in the other. I reached the tree and bent down to look for flowers on the ground, when I jumped as if stung. In fact I had been stung, not once but five times in less than a second, around my mouth, and it hurt like blazes. "Wasp! Get out" cried the driver, and that is exactly what I did. I treated the stings with some cream, while Riry told me this menace was called a Takolampanenitra, and was feared by any sensible person. Luckily I could see another *Louvelia* which looked male, so we went up to it, and I found some old, dead bits on the ground. Then I spotted a third once, definitely male, higher up the hill; we started climbing the slope—and then, much quicker, unclimbed it, because Riry had heard and seen another of those dreaded (and dratted) wasps. This was very frustrating, to be scared off by an insect less than an inch long, but my throbbing lip made me decide that I would come back when these wretched sentinels were less common, that is in the rainy season. And so we drove to our target area, where we checked into a hotel and had a good night's sleep.

The next morning we were up nice and early, and had breakfast in a small *hotely* (bar) on the main street: a bowl of rice, of course. When I came out of the door I was surprised to see police-

men standing next to our car; I was even more surprised to be arrested. Under armed escort we were led to the police station, and formally charged with—abducting young girls, and putting them in sacks. It transpired there had been an all points bulletin on the police radio, with all forces searching for a red car with a Malagasy and a vazaha (foreigner) in it. Our statements were taken, and carefully typed out, and I was quite proud of my officialese French, full of 'I proceeded to' and 'when discussing this with the commissar'. The police were very polite, and I think I convinced them quickly that we were palm collectors, and not vampires. They searched the car, checked my paperwork, and then we were told to drive the investigating officers all the way back to Farafangana! I spluttered that is was 150 miles, and kicked up quite a fuss; eventually radio contact was established with Farafangana. It transpired that our statement in Farafangana had been made to the Police, whereas we had been arrested by the Gendarmes; someone had made an accusation to the Gendarmerie on the day we fled town. But now we were cleared of the kidnapping charge and free to go.

I have told of subsequent events in January, 1993 *Principes*, regarding my futile search for Lakatra.

A year after these events I was in England, working on my revision of *Ravenea* and *Louvelia* (to be published later this year). I had borrowed all the types from Paris, and to my amazement I discovered that I had found *Louvelia lakatra*—in Manombo. My '*Louvelia manombae*' was the true Lakatra. What had fooled me was that the Flora (Jumelle and Perrier de la Bathie 1945), but not the original description, describes the tree as being 15–30 m high, and with a diameter of 15–30 cm, while the wood is described as white and soft. I would treat these later additions with suspicion, since I never saw a tree more than 14 m high, and every tree I saw had wood like rock! True Lakatra is very unlike *Ravenea robustior*, and is in fact immediately recognizable—it has woody 'steps' all the way up the trunk, these being the remnants of the leaf sheaths (Fig. 7). I was now more determined than ever to try and obtain those male inflorescences.

Half a year later I was back in Madagascar. My stay in Farafangana was a brief one, and I did not linger on the street; but in Manombo forest, I managed to finish my collecting. Now I knew what the tree looked like, I could ask the right questions, and my guides quickly brought me to a group of true Lakatra. They were as keen as I was, since I had offered substantial rewards for male flowering branches, but we checked several trees in vain. Then one of the guides came running—he had seen one full of flowers. I followed him eagerly, but his 'flowers' were a group of orchids growing in the upper sheath remnants. Of course the guide wouldn't believe me, and he went up the sheath 'steps' to get his just rewards (Fig. 8); but he got more than he bargained for. When he was halfway up, he shouted something incomprehensible, and scrambled down again. "What was that?" I asked; "Wasps!!!" was the answer. We all ran like blazes.

But at the end of the day we hit the jackpot. Finally, we found a male Lakatra, completely waspless. It only had ancient inflorescences, but at last I had enough to draw up a proper description. I was happy, and so were the guides: they got their rewards. My own reward was that my quest was over at last, and I could start on a new one!

Acknowledgments

I would like to thank Andy and the Tree Gang, at Kew, for teaching me how to climb, and how to get down again; Dave Cooke at Kew for the loop trick; and Martin Cheek of Kew, for identifying the *Geosiris*. Lucienne Wilmé of Antananarivo gave me good advice, and I shall listen better in the future.

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Our Humble Beginnings

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This year, 1994, will mark the 20th anniversary of the Palm and Cycad Society of Australia. However, while reflecting on our humble beginnings mention should also be made of the Australia Palm Society and the man who was instrumental in its foundation, Geoff Little.

In 1974 Geoff, who was a journalist and also ran a nursery in Airlie Beach, arranged several meetings of interested palm growers at Bill Williams Alma Park Zoo and Tropical Palm Garden. These informal meetings were to lay the ground work for a national palm society with a membership fee of $30, and be made up of mainly professional nursery-men, specializing in the wholesale production of palms. People such as Len Dellow, Dennis Andreasen, Bill Williams, Geoff Little and Harry Wilschefski.

It was decided that the inaugural meeting should be held in Rockhampton and the election of office bearers should take place at that time. Noted botanists Tony Irvine and, from Sydney, Tony Rodd who was revising the genus Livistona at the time were invited to attend. Dennis Andreasen was elected President, Geoff Little as Secretary and Harry Wilschefski as Treasurer.

Tragically Geoff Little passed away later that year. His dreams of the Australian Palm society died with him and the Society was disbanded before it really ever got off the ground.

The challenge to finish off what Geoff Little had started was taken up by Len Butt and myself. After the hopes of an Australian Palm Society had faded, there was increasing pressure on both of us to form our own society which would be made up of mainly dedicated palm enthusiasts with no financial interest in palm growing.

Several informal meetings were held in the grounds of the Oasis Tourist Garden to discuss the formation of a society dedicated to the growing and preservation of palms and cycads. Some fifteen interested people from all walks of life attended those first few outings.

As the group was initially quite small we met for the first few months on a regular basis in the lounge room of my house at the Oasis. However, as numbers began to grow along with the popularity of palms it was decided we should look for an alternative venue.

We did not have to look far as the reception rooms of the Oasis provided the ideal answer. It was here that we had our first Annual General Meeting and election of office bearers. I was elected President; a position I was to hold until January 1980 and Len Butt as Secretary-Treasurer. Joanne and Ben Myers took over this responsibility in 1975 while Len was on the committee along with Steve Flood and John Docherty.

Len was also the editor of our newsletter called APACS. Harold Caulfield was invited to be patron which he humbly accepted.

Membership in those early days was $3 single and $5 double with a $1 joining fee.

The upstairs lecture room of the Mt. Coottha botanical garden was to be our home for the next few years.

The Palm and Cycad Society of Australia has continued to grow over the last 20 years to a degree which I had never anticipated in those early days when some fifteen dedicated palm enthusiasts all from Brisbane pushed for a society to be formed the results of which we have today as the Palm and Cycad Societies of Australia Ltd.

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Growing Palms in a Temperate Climate Principes Interview—Ralph Velez

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While looking at the color photo of a *Ravenea madagascariensis* var. *monticola* (Fig. 1) on the back cover of the January 1993 issue of *Principes*, I was awed by its beauty. More than beautiful, this palm is one of the many that has proven cold hardy into the mid to low 20 degrees (Fahrenheit) range. *R. madagascariensis* var. *monticola* is but one of several newly introduced palms that have added the entirely new dimensions of a genuinely tropical ambience in a temperate climate zone. But tropical cold hardy palms that survive quite nicely in temperate zones are not restricted to new arrivals. Some have been available for years. What hasn't been available heretofore is the know-how to raise, acclimatize, and plant these palms outdoors with a high expectation of their survival. The emphasis has always been on which palms will survive in a temperate climate utilizing tropical growing methods, rather than on how to grow and when to plant tropical and subtropical palms outdoors in a temperate climate. Forget conventional growing methods that work in the tropics. Practice what works in a temperate climate.

Growing cold hardy tropical palms in a temperate climate isn't difficult if you employ the basic concepts that have proven effective for a few California and Central Florida growers. Unfortunately, only a handful of growers possess this knowledge and without it, palm enthusiasts from temperate climates are universally restricted by self-imposed limitations on what they can grow and what they should try to grow in their gardens. Many don't even have greenhouses, or the ones they have aren't heated. Seldom are they growing any of the many exotic species that have proven cold hardy in California and Central Florida.

This is unfortunate because having a beautiful outdoor collection of exotic palms in a temperate zone can only be accomplished by someone who successfully practices the entire process of raising palms in a temperate climate. In the tropics, almost anyone can obtain and grow the same palm species as anyone else. In a temperate zone you've got a far greater challenge, and if you're successful, you have a phenomenon that can only be duplicated by someone else with a similar knowledge of palm growing. The process is simple:

1. Raise the palms in a greenhouse heated by passive solar heat.
2. Protect the palms from cold during the winters and cold nights with active heat.
3. Grow the palms to the correct size before transferring them outdoors, and acclimatize them to sun and temperature for a specified amount of time before planting.

Ralph Velez has an excellent system for raising palms in a temperate climate and it shows in his extensive and beautiful collection. It occurred to me while conducting this interview with Ralph for the Southern California Palm Journal, that if temperate climate palm growers throughout the world were informed of Ralph's system through a *Principes* article, it would enable hundreds of temperate climate palm growers to develop beautiful exotic and tropical gardens. Ralph generously shares his system with us in this interview and if you live in a temperate climate, try Ralph's methods and some of the species that he has had success with. A list of over 200 palms that Ralph is presently growing outdoors follows at the end of this interview. And don't be afraid to experiment with new species. You will probably be amazed at what will survive, and how beautiful the palms look as they grow.

P.J.—Where are you from?

Ralph—New York, the Bronx to be exact.

P.J.—Why did you leave New York?

Ralph—I couldn't stand the winters. Even when I was a kid I couldn't stand the winters. I left when I was about 26, but I was ready to leave

1. *Ravenea madagascariensis* var. *monticola* in front of a wall.

when I was ten. I told all my friends that I wanted to live in Africa when I grew up.

P.J.—How did you happen to select California?

Ralph—I was considering Florida, but I kept hearing bad reports. I thought about Arizona, but I wasn't sure I wanted the hot desert heat. Puerto Rico beckoned, but there were no jobs. At that time, Southern California was the promised land. You know,"sunny Southern California," so I accepted a job offer teaching in Southern California and I've been with the same school district ever since.

P.J.—What do you teach?

Ralph—I teach art. I have also taught Spanish, Horticulture, and English as a second language.

P.J.—Were you disappointed in California?

Ralph—At first. It was drier and colder than I expected, and there was a six year period when my wife Nelda and I were going to move to a warmer climate, but we stayed.

P.J.—How do you feel about Southern California today?

Ralph—Today I'm very happy here, and I realize now that it's a wonderful place to grow palms as well as a wonderful place to live.

P.J.—What was the first palm you collected?

Ralph—My first palm was a *Chrysalidocarpus lutescens*, commonly known as an Areca palm. I went to Puerto Rico to visit Nelda and when I left I saw this Areca palm. I wanted to take it back to New York with me, but you can't bring back soil so I barerooted it and brought it back to New York in a plastic bag. I potted it up and it did just fine as a house plant.

P.J.—When did you first start growing palms?

Ralph—When I bought my house in 1966 I began planting tropicals. I couldn't see putting in pine trees and cypress and all of the other things that people were planting at the time. I started earnestly collecting as many palms as I could.

P.J.—How did you happen to become a member of the International Palm Society?

Ralph—At the time, I was more interested in the rainforest than in palms. I read everything I could about the rainforest, and in my research I located a book on palms by Desmond Muirhead which mentioned The International Palm Society. I joined The International Palm Society right away. I had about twenty palms at the time. My first meeting was at the Los Angeles Arboretum. There were palms that were only about two inches tall for sale on a table. I couldn't associate the names with the palms so nothing much happened psychologically at that meeting. The next meeting was at Ed Moore's place in San Diego. Ed had a fabulous collection and when I saw it, that did it! I became an avid palm enthusiast. Soon thereafter, Ken Foster began publishing the first ever Palm Society Newsletter. In the Newsletter there were ads selling palms. I began contacting people and collecting as many new palms as I could and I added 100 species to my collection in about a year. Most of the palms were in four inch containers and I began growing them up. I knew then that next I needed a greenhouse.

P.J.—When did you build your first greenhouse?

Ralph—The following year. It was actually a coldframe because it used only passive solar heat. It was just five feet tall because I didn't want it to show over the top of my cinderblock fence. To work in it upright, I dug a two foot trench down the middle. It was wonderful and the palms grew really well, but it was far too small so I tore it down and replaced it.

P.J.—What did you replace it with?

Ralph—I had seen two story greenhouses at some of the residences of other Palm Society members so I decided to build a two story greenhouse. It also included a heater so it was a greenhouse and not a coldframe. We'd had a mild winter the previous year, but I simply didn't want to subject my small palms to chance. I still have the greenhouse, and I have several mature palms in it. I refer to it as my big greenhouse, or my cooler greenhouse.

P.J.—Your cooler greenhouse! Does this mean that you have a warmer greenhouse?

Ralph—Oh yes! That's the small one upstairs.

P.J.—How did you happen to build the one upstairs?

Ralph—Well from time to time, I would give palms to a friend of mine and I would keep tabs on them as they grew because they came from me. It didn't take me long to realize that he was doing something that I wasn't because within a year or so, the palms that I gave him would be twice as large as the ones that I kept for myself. Each time I visited him I would ask him what sort of potting soil he used or how often he fertilized, but I could never figure out what he was doing that made his palms grow so fast. Finally I realized that his greenhouse created more heat than mine, and that the additional heat was what was making the difference.

P.J.—Created more heat! What do you mean?

Ralph—Greenhouse heat is a critical, but often a misunderstood concept for growing palms. When I say created heat, I'm referring to passive solar heat generated by the sun's rays when they become entrapped within the glass, fiberglass, or plastic sheeting that encases the greenhouse. Passive solar heat is the single most essential concept in growing lush vibrant palms in a greenhouse. This heat is strictly passive and I don't have to pay for it after the initial construction of my greenhouse. Passive solar heat shouldn't be confused with active heat provided by natural gas or electricity. Active heat is expensive, and I use it to keep the temperature from dropping below 70 degrees at night or during the winter.

P.J.—So a coldframe utilizes passive solar heat, and a greenhouse utilizes passive solar heat plus active heat?

Ralph—Exactly. And passive solar heat is 95 percent of growing palms and you can do a great job with just a coldframe. I remember growing tender palms in my first coldframe and they did beautifully, but it's risky. One cold winter can set you back severely. The main function of active heat is to protect your palms from cold damage and slow growth during cold times of the year, particularly at night. You can utilize active heat in your growing process as well, but it's expensive.

P.J.—Is it adequate to use active heat just enough to prevent cold damage?

Ralph—Absolutely not. Preventing cold damage to palms is important, but it's more important to realize that even though the cold may not cause damage, it causes the plants to slow down in their growth or even stop, and then you have to deal with an extended start-up lag as well. When it comes to winter growing, my slogan is "thrive not survive." For instance, I try never to let the temperature drop below 70 degrees in my greenhouse, and I wouldn't ever consider letting it drop below 60. I just don't want the extended slow down in growth that the cold causes, let alone cold damage.

P.J.—Do you use double wall?

Ralph—Yes. It's simply a matter of pay now or pay more later and it's a big boost for palm growing, so it's a double bonus.

P.J.—How important do you think solar heat is in growing palms?

Ralph—It makes the most dramatic difference imaginable for tropical and subtropical palms. You want the palms to thrive in the winter and "explode" in the summer! For that you need between 88 to 93 degrees for as long as possible each day of the year and the longer you provide this warmth, the faster the palms grow. The faster they grow the bigger and stronger they become, and the better they acclimatize when you move them outdoors. The passive solar heat generated by my upper greenhouse is the key to my success.

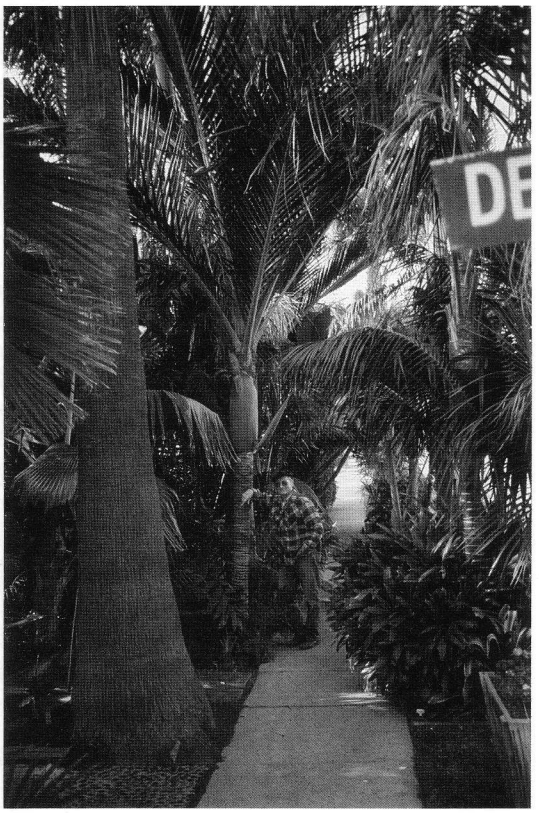
P.J.—Why a maximum of 93 degrees?

Ralph—In the tropical rainforests, it typically doesn't get above 93 degrees. Research indicates optimum palm growth is in the high 80s to low 90s. Over that it begins to stress the palms and slow down their growth resulting in a less robust plant. Palms don't need it hot, they need it warm, for as long as possible.

P.J.—How do you keep the temperature from exceeding 93 degrees?

Ralph—I have an exhaust fan and when it hits 93 degrees, it comes on automatically.

P.J.—You said that the length of time each day that your greenhouse stays warm is important?



2. Ralph and *Rhopalostylis baueri*, one of his favorite palms.

Ralph—Yes. It's a simple formula. The longer it stays warm, the longer the palms grow.

P.J.—How long does your greenhouse stay warm?

Ralph—In the summer, my upper greenhouse heats to 90 degrees by about 8:30 to 9:00 A.M. and stays there until around 7:00 P.M. It even hits 90 degrees most days in the winter, but not for as long a period—generally from about noon until 2:00 P.M. I have to leave my shade cloth up year around. I tried taking it down, and the palms began to sunburn. And talk about rapid growth. I can't believe how quickly things grow in my upper greenhouse. And they move out and adjust well after I grow them to a good size.

P.J.—What's a good size to move them outside?

Ralph—I generally grow them to a five to seven gallon size and then move them out. After that, they're beginning to form trunk and I like to get palms outdoor acclimatized before they begin to form trunk. After that, they're difficult to acclimatize. Smaller than five gallon, they're vulnerable to cold, and they still benefit tremendously from being in the greenhouse. They don't seem to acclimatize as well as when five gallon size.

P.J.—How do you acclimatize the palms from the greenhouse to outdoors?

Ralph—As a good five to seven, I move them outdoors and put them in filtered light for 30 days. Then I put them in direct sunlight for 30 days. After that they're ready to plant in the ground or continue to grow outdoors in containers until I sell them or plant them. Typically I bring out my greenhouse palms in March when the nighttime lows are consistently at about 48 to 50 degrees and plant them in the ground in July.

P.J.—Do you pot them up when you move them out?

Ralph—No. I don't like to move them out and pot them up at the same time so I'll pot them up and leave then in the greenhouse for another 30 days, and then move them out, or I'll move them out and pot them up about 30 days later. That way I avoid that double "pop."

P.J.—Which of those two methods works better?

Ralph—I've never really noticed a difference between the two.

P.J.—How often do you water?

Ralph—I don't believe you can overwater a palm. I water at least every other day.

P.J.—Do you have any special watering methods?

Ralph—Yes. I use a reverse osmosis system which purifies the water. I like it because the water in my area is high in mineral content, and leaves a whitish mineral buildup on the leaves after the water evaporates. With purified water, I can look at green leaves.

P.J.—How many species do you have in your garden at this time?

Ralph—I probably have about 215 different species in the ground at my house and around the neighborhood.

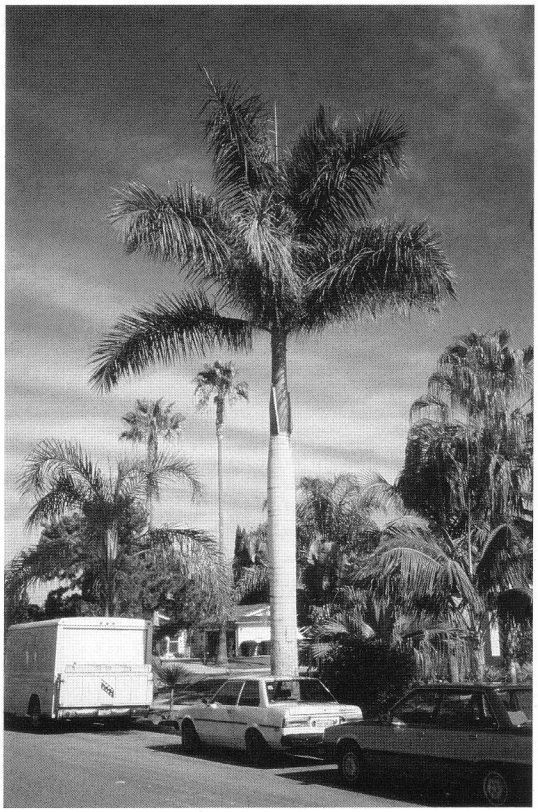
P.J.—How did you discover which palms would survive in your garden?

Ralph—Research, observations, asking questions, and trial and error.

P.J.—What are some of your favorite palms?

Ralph—*Howea forsteriana*, *Rhopalostylis baueri* (Fig. 2), *Rhopalostylis sapida*, *Pritchardia*, *Rhapis humilis*, *Coccothrinax dussiana* and *Ravenea madagascariensis* var. *monticola* are a few of my favorites.

3. *Marojejya darianii* from Madagascar does well in California.



4. A handsome specimen of *Roystonea oleracea* near Ralph's property.

P.J.—How did you happen to wind up with a corner lot when you purchased your house?

Ralph—By accident, but I'm kind of glad it happened that way. It enabled me to plant a lot of palms in the parkways that I couldn't have done otherwise, and the house looks like a tropical island when I drive up.

P.J.—Do you like driving up to your house?

Ralph—I love driving up to my house! It looks so lush and tropical that it pleases me every time I see it.

P.J.—When were you president of the Southern California Chapter of The Palm Society?

Ralph—I was president for the past four years, before Phil Bergman took over.

P.J.—You've done some work at Orange Coast Plaza?

Ralph—Actually, Crystal Court. Both are owned by the Segerstrom family. I'm working with Anton Segerstrom on Crystal Court. Henry Segerstrom, his father, purchased the Vance palm collection and moved it from Beverly Hills to the shopping center several years ago. The Segerstrom's were made complimentary members of The Palm Society because of their efforts in using palms at Orange Coast Plaza, and from that, they decided to expand on their collection.

P.J.—How many palms does Crystal Court presently have?

Ralph—When I started, they had 21, they now have 65. My job is to decide what to plant, where to plant it, from where to procure it, and to supervise the planting. I think it's becoming a fine collection.

P.J.—What are your future plans?

Ralph—I plan on retiring next January and I'm hopeful that I can start some sort of palm garden in Puerto Rico. I'll have to wait and see. I want to keep this house, but I want to get rid of a lot of my potted plants. I'd like to live in Puerto Rico in the winter time. In the winter, palms are so dormant in California that there's

not a lot of maintenance so I could get away during that time of the year.

P.J.—What advice do you have for new Palm Society members?

Ralph—Read all you can about palms. Attend The Palm Society meetings. Try to obtain a piece of property so that you will have enough room to display the palms any way that you want to display them. I would recommend a minimum of one-half to three acres. I often wish I had more space, but then I like the rainforest look. Aside from that, start digging!

P.J.—Thank you Ralph.

Appendix. Palms in the ground, July 1993 at Garden of Ralph Velez.

Genera	Species	No. in Ground	Genera	Species	No. in Ground
Acoelorrhaphe	*wrightii*	1		*geonomiformis*	3
Acrocomia	*mexicana*	1		*glaucifolia*	1
Aiphanes	*aculeata*	1		*graminifolia*	1
	lindeniana	1		*klotzschiana*	2
Allagoptera	*arenaria*	1		*monostachya*	1
Archontophoenix	*alexandra*	1		*neurochlamys*	1
	sp. (purple crownshaft)	1		*pinnatifrons*	1
Arenga	*caudata*	1		*radicalis*	2
	hookeri	1		*sartori*	1
	pinnata	1		*schippi* var. *costaricana*	1
	sp. (dwarf)	2		*stolonifera*	1
	undulatifolia	1		*sullivanorum*	2
Astrocaryum	*mexicanum*	1		*tenella*	3
Basselinia	*eriostachys*	1		*tepejilote*	3
Bismarckia	*nobilis*	3		*tepejilote* (suckering)	1
Borassus	*flabellifer*	1		*tuerckheimii*	3
Brahea	*aculeata*	1	*Chambeyronia*	*macrocarpa*	5
	armata	1	*Chrysalidocarpus*	*ankaizinensis*	1
	brandegeei	1		*decipiens*	2
	dulcis	1		*lutescens*	1
	edulis	1		*madagascariensis*	1
	elegans	1		*madagascariensis* var. *lucubensis*	1
	nitida	1			
Burretiokentia	*hapala*	1		*pembanus*	1
	vieillardii	2		*rivularis*	1
Butia	*capitata*	1		sp.	1
Calamus	*caryotoides*	1	*Coccothrinax*	*argentata*	1
Calyptrogyne	*ghiesbreghtiana*	1		*argentea*	1
Calyptronoma	*occidentalis*	1		*crinita*	1
Carpentaria	*acuminata*	1		*dussiana*	3
Caryota	*mitis*	1		*miraguama*	1
	no	1	*Copernicia*	*alba*	1
	obtusa	1		*prunifera*	1
	ochlandra	1	*Cryosophila*	*albida*	1
	rumphiana	1		*nana*	1
	urens	1		*warscewiczii*	1
Ceroxylon	*interruptum*	1	*Cyphosperma*	*balansae*	1
	quindiuense	1	*Dictyosperma*	*album*	1
	sp.	1	*Euterpe*	*edulis*	1
Chamaedorea	*amabilis*	1	*Gaussia*	*attenuata*	1
	arenbergiana	1		*maya*	1
	atrovirens	1		*princeps*	1
	concolor	1	*Guihaia*	*argyrata*	1
	costaricana	1	*Hedyscepe*	*canterburyana*	2
	deckeriana	2	*Heterospathe*	*delicatula*	1
	elegans	1	*Howea*	*belmoreana*	3
	ernesti-augusti	1		*forsteriana*	15
	falcifera	1	*Hyophorbe*	*indica*	1
	flavovirens	1		*lagenicaulis*	1

Appendix. Continued.

Genera	Species	No. in Ground
	vaughanii	1
	verschaffeltii	1
Hyphaene	*crinita*	1
Johannesteijsmannia	*altifrons*	1
Jubaea	*chilensis*	1
Jubaeopsis	*caffra*	1
Kentiopsis	*oliviformis*	1
Kerriodoxa	*elegans*	1
Laccospadix	*australasica*	4
Latania	*lontaroides*	1
	loddigesii	2
	verschaffeltii	1
Lepidorrachis	*mooreana*	2
Licuala	*elegans*	1
	ramsayi	2
	spinosa	3
Linospadix	*apetiolata*	1
	minor	1
	monostachya	1
	palmeriana	1
Livistona	*australis*	1
	benthamii	1
	carinensis	1
	chinensis	1
	decipiens	2
	drudei	1
	mariae	1
	muelleri	1
	saribus	1
	sp. (F.T.G.)	1
Lytocaryum	*insignis*	1
	weddelianum	1
Marojejya	*darianii* (Fig. 3)	
Nannorhops	*ritchiana*	1
Neodypsis	sp.	1
	baronii	1
	leptocheilos	1
	decaryi	2
	tsaratananensis	1
Normanbya	*normanbyi*	2
Oraniopsis	*appendiculata*	1
Parajubaea	*torrallyi*	1
Phoenix	sp.	1
	reclinata	2
	roebelenii	1
	roebelenii × *reclinata*	1
	rupicola	3
Pinanga	*coronata*	1
	elmeri	1
Prestoea	*montana*	1
Pritchardia	*affinis*	1
	beccariana	1
	gaudichaudii	1
	hillebrandii	1
	remota	1
	sp.	2
	sp. (no. 2)	1
Ptychosperma	*caryotoides*	1
	sp.	1
	elegans	1
	microcarpum	1
Ravenea	*madagascariensis* var. *monticola*	3
	rivularis	1
Reinhardtia	*gracilis* (*gracilior*)	1
	gracilis (*rostrata*)	1
	simplex	1
Rhapidophyllum	*hystrix*	1
Rhapis	*excelsa*	1
	humilis	2
	excelsa "koban"	1
	sp. (varigated)	1
	subtilis	3
Rhopalostylis	*baueri*	6
	sapida	5
Roystonea	*altissima*	2
	borinquena	1
	elata	1
	oleracea (Fig. 4)	1
	regia	2
	venezuelana	1
Sabal	*blackburnia*	1
	causiarum	1
	etonia	1
	mauritiiformis	4
	"*Riverside*"	1
	rosei	1
	sp. (large leaf)	1
	uresana	1
Schippia	*concolor*	1
Serenoa	*repens*	1
Syagrus	*amara*	1
	coronata	1
	flexuosa	1
	oleracea	1
	romanzoffiana	6
	schizophylla	1
Synechanthus	*fibrosus*	1
	warscewiczianus	1
Thrinax	*excelsa*	1
	parviflora	1
	rex	1
Trachycarpus	*fortunei*	1
	martianus	1
	takil	1
Veitchia	*arecina*	1
	joannis	1
	sessilifolia	1
Vonitra	*utilis*	1
Washingtonia	*robusta*	6
Wodyetia	*bifurcata*	2
Zombia	*antillarum*	1

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Trachycarpus martianus

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If you would like to see *Trachycarpus martianus* in the wild, a good place to begin looking is between the covers of Odoardo Beccari's work on Asiatic palms in the 'Annals of the Royal Botanic Garden, Calcutta'. Published posthumously in 1931, it is still the most recent full taxonomic account of *Trachycarpus*, and summarizes all that was known of the genus at that time, in a very readable form (also see Myron Kimnach, *Principes* 21(4): 155–160). Despite the fact that it was written 80 years ago, Beccari was such a scientist that the information contained in his book is as relevant today as it was when it was published, and is surprisingly accurate in almost every respect.

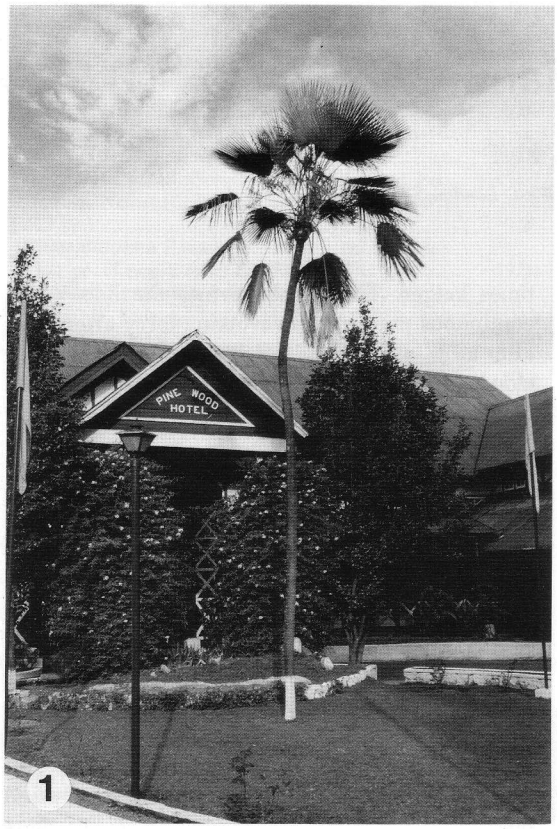
Under 'Habitat' in the section on *Trachycarpus martianus* we read, ". . . Rather frequent in the Khasia Hills, between 1,000 to 1,500 m elevation, at Lonkerden and at Noughedem, at Moosmai and Manloo; in the latter locality Sir Joseph Hooker wrote that '*it grows on the cliffs*' and '*that it may be seen on looking over the edge of the plateau, its long, curved trunk rising out of the naked rocks, but its site is generally inaccessible*' . . . ."

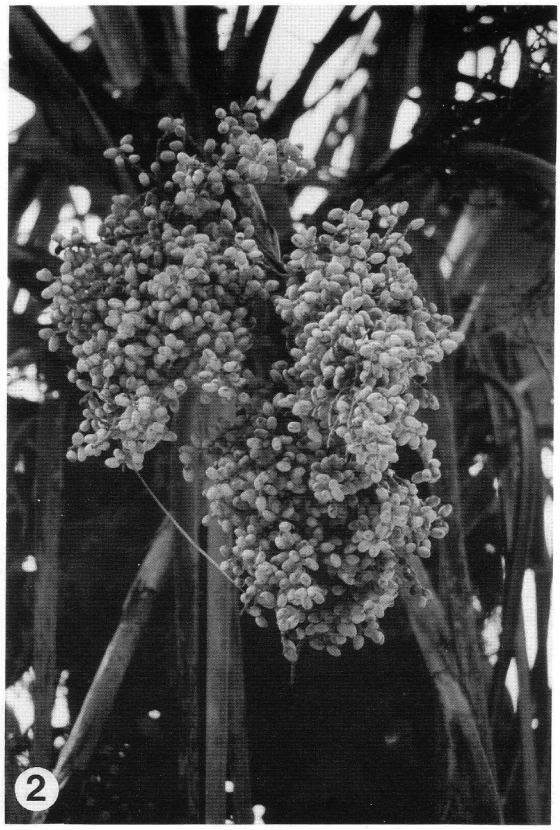
Having seen *Trachycarpus takil* and *T. nanus* in their natural habitat, our next step along the *Trachycarpus* trail had to be towards *T. martianus*, familiar by name, often referred to, and in just about every book on palms, and yet extremely rare in cultivation. In some small numbers at Huntington Botanical Gardens in California, but represented in Europe by but a single mature specimen, in the south of France, and that in a private garden; it seemed time to bring this beautiful tree out of the shadows and into the light.

The Khasia Hills are in Meghalaya Province in remote north-east India. The whole area is 'restricted' and a permit must be obtained before one is allowed to visit. The main town, Shillong, is reached by driving south from Gauhati to which we flew from Calcutta on an Indian Airlines airbus. The flight is just 45 minutes, but the ensuing bus journey, a fraction of the distance, takes many times longer. This climb up into the hills was a continuous pattern of overtaking lorry after lorry after lorry, all crawling uphill and all emitting great clouds of thick and poisonous fumes. This pollution hangs heavy on the still air in the otherwise beautiful countryside.

Pollution aside, Shillong itself is a most interesting and attractive town. Once a 'hill station' during the British rule in India, it was, and still is, a cool retreat from the heat of the plains. At 1,500 meters above sea level the weather in October was extremely pleasant, warm but not hot, the nights comfortably cool. There are many examples of colonial architecture in the town, much unfortunately decaying and not maintained. The Pinewood Hotel is a wonderful example. Like an old aristocratic lady fallen on hard times, it presents a brave face to the world, but time has moved on and passed it by. These days air conditioning and television-in-every-room and mini-bars are more important than ballrooms and verandahs and tiffin and punkah-wallahs. However, in the nicely maintained grounds (lawns, flower beds, and huge *Araucaria*), we saw our first *Trachycarpus martianus*, two tall and beautiful trees, one shown (Fig. 1).

We were to see many more in the town, often outside public buildings, one outside the extraordinary Roman Catholic Cathedral, art deco gone mad. Ward's Lake Garden in the center of town boasted another dozen. They really are beautiful trees; visibly distinct from all other *Trachycarpus* and yet the relationship is clearly seen. *T. martianus* has a comparatively large crown of regularly divided leaves with a strong, whitish bloom on their lower sides. Most have naturally bare trunks, and the fibers from the old leaf bases cover just a foot or two below the crown; old leaves can be pulled off with a minimum of effort. This, however, is not a reliable feature for identification since other *Trachycarpus* species can also shed their fibers naturally, or indeed they may be stripped. Also we came across one or two trees in





1. Colonial echoes: A mature specimen of *Trachycarpus martianus* at the Pinewood Hotel, Shillong. 2. A single infructescence of *Trachycarpus martianus* contains up to 1,000 seeds.

the garden which had fibers right down to the ground, so there is clearly some variability here.

What is a reliable identification characteristic, however, is the fruit and seed which is the size and shape of a coffee bean rather than kidney-shaped as in every other member of the genus. All of the female trees we saw had clusters of bright yellow fruit hanging down from within the crown (Fig. 2). We estimated 6,000 seeds on the six infructescences of a single tree. It is a terrible shame that there are so few young plants. All of these mature trees have been producing seeds in these huge quantities for 50 years or more, countless millions of seeds all gone to waste. Presumably, when these old trees die, there will be no more *Trachycarpus martianus* in Shillong, and the town will be the poorer for it. Curiously, even officers at the Forestry Department in the town were hardly aware of its existence, even though there were a dozen or more scarcely a minute from their office. They were totally unaware of its existence in the wild.

Having inspected and admired every cultivated tree we could find, we were naturally impatient to look for wild specimens. We rented a car-and-driver and with 'Beccari' clutched firmly in our hands we set off to follow his directions, written 80 years previously. Heading south from Shillong, we soon cleared the town and drove through an undulating landscape, densely forested with *Pinus khasia*, gradually changing into a totally deforested hilly plateau, some 1,400 m above sea level. Around 80 km from Shillong we reached the town of Cherrapunjee, one time record-holder as the wettest place on earth, with an annual 12 meters of rain. There was certainly no rain on the day that we were there, though, and we had a clear, fabulous, and unexpected view of huge cliffs, disappearing down into the valley below us. Not far from 'Cherra' near the village of Mawsmai (Beccari's Moosmai) there were more such cliffs, which apparently marked the southern edge of the plateau (Fig. 3).

In contrast to the hilly plateau across which we

3. Steep cliffs protect the habitat of *Trachycarpus martianus*. 4. *Wallichia densiflora* was not uncommon in the undergrowth.

had been driving, which was mainly grassland with the occasional *Pandanus* thicket left in ravines and depressions, the cliffs and lower slopes were densely forested. Though we saw other palms there (at least two species of *Calamus*, *Caryota*—the Fish Tail palm—and a curious *Arenga*-like species we were not able to identify until later) there were no *Trachycarpus* to be seen. Somewhat disappointed, at Manloo (today spelled Mawmloo) we decided to drive further down the road which began to descend steeply in hairpin bends, and, we could tell from the map, eventually ended up in Bangladesh which we could see, lake covered, in the blue and hazy distance. As we went down, the temperature went up, and the vegetation became more tropical. More palms began to appear, and bananas and tree ferns. We again saw *Caryota*, with huge, flatly-held leaves in the manner of the giant *Caryota* from Thailand and southern China, and a little further down at around 1,000 m a.s.l. a second tall, slender Fish Tail palm with quite different leaves in a tumbling habit, possibly *Caryota maxima*, growing together with greater numbers of *Calamus*, later identified as *C. erectus*, in full but unripe fruit. We were also very pleased to find *Wallichia densiflora* (Fig. 4) which perhaps should have given us a clue as to the identity of the mystery palm from before, which turned out to be no less than *Wallichia disticha*, not previously recorded for the Khasia Hills, with its unique, 2-ranked arrangement of leaves (Fig. 5). Palm hunting has to be done carefully here: huge yellow and black spiders as big as your hand sit patiently in webs the size of dinner tables slung between shrubs, waiting for the unwary to stumble in for lunch.

Lest we should end up like the road, in Bangladesh, we turned round in a tiny village and after having some 'chai'—hot, sweet and milky tea served in a glass—set off back up to Mawmloo.

Delighted with our findings but concerned about the apparent absence of *Trachycarpus martianus*, we asked the driver to take us to Nohkalikai Falls, just west of Mawmloo. We should not have worried, for a few miles further on, looming out of the mist that was now gathering as the day drew on, we saw them. First one, then many. They were growing on the very edge of a precipice that we could not see down into because of the mist. We could hear the distant roar of a waterfall, but frustratingly had to return the following morning to see more.

The sun shone bright and clear as we drove back to the same spot the next day. What we had been unable to see was now revealed: the cliffs on the edge of which we were standing were some 300 m (1,000 feet) almost straight down. The waterfall we had heard was half-a-mile away at the head of the valley and the water cascaded in free fall for many hundreds of feet, creating a rainbow with the spray. We could look across the gorge to see the identical cliffs on the far side, and huge butterflies were idly casting themselves out into the void. It really was a magical place. At the base, where the cliffs themselves moderate into a steep slope, densely forested with small epiphyte-covered evergreen trees, we could spot *Wallichia disticha* and that huge, broad leaved *Caryota* again, which formed a conspicuous component of the forest canopy.

And we saw *Trachycarpus*! By the dozen and by the hundred! They were growing, just as Sir Joseph Hooker had reported, out of the bare rock, on ledges and in cracks on the south-facing cliffs, absolutely inaccessible. Even a mountain goat would need climbing gear. It occurred to us that we were undoubtedly standing on the very spot where Sir Joseph had stood 80 years previously (Fig. 6). The rock itself was dark, soft and crumbly, consisting of baked together quartzite sand, and not limestone as we had expected. The soil was sandy and strongly acidic with a pH of only 4–5.

And were they beautiful! The original trees we had spotted from the car were very much closer; indeed, by leaning out slightly over the brink we could actually touch them, though to collect seeds and herbarium specimens would have required some ingenuity with poles and wire secateurs, as well as a head for heights.

Their trunks were growing straight out, or sometimes curiously bent away from the cliffs. Although a few younger plants had their trunks entirely covered, the coarse and loose, light brown

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5. *Wallichia disticha*, not previously recorded for the Khasia Hills. 6. *Trachycarpus martianus* in habitat on the precipice edge, Nohkalikai Falls. 7. *Trachycarpus martianus*: the leaf bases abscise naturally, leaving an attractive, ringed trunk. 8. *Trachycarpus martianus*: thick white tomentum covers the young leaves and petioles.


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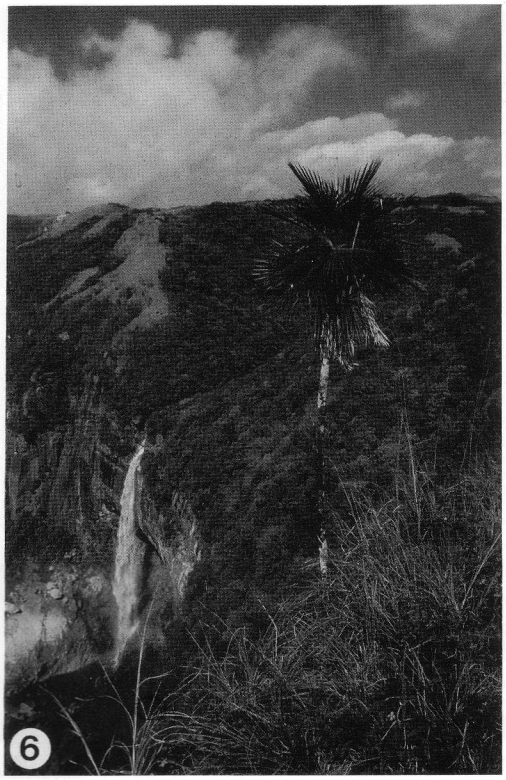
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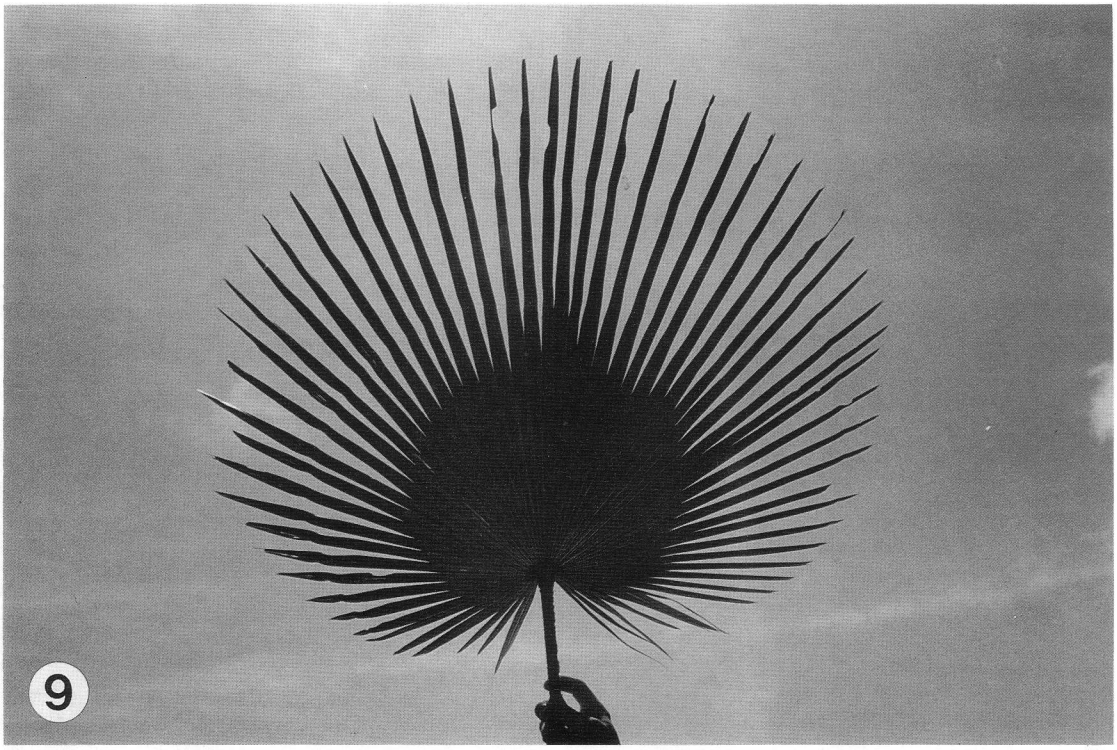

9. The unmistakable silhouette of a *Trachycarpus martianus* leaf.

fibers of the leaf bases persisted only just below the crown in adult trees, and under this a slender, smooth trunk was revealed with clearly visible, closely-spaced leaf scars (Fig. 7). The young petioles and unexpanded leaves were covered in dense white tomentum (Fig. 8). The leaves themselves were large, approximately 120 cm across, mid-green above, strongly glacuous below and very regularly split to about half way, into sometimes more than 75 stiff, erect segments, shallowly bifid and acute at the tip, presenting a distinctive, indeed unmistakable, silhouette (Fig. 9). A unique feature of *Trachycarpus martianus* leaves is the small transverse cross-veins which run from one longitudinal leaf vein to another. These cross veins are much clearer than on other *Trachycarpus* species and are apparent even on seedlings and 100-year-old herbarium specimens. Petioles as well as inflorescences (up to eight on a single tree) were considerably shorter and more erect on these trees than on the cultivated plants we had seen in Shillong and gave the palms a much more compact and wind-resistant appearance.

Though *Trachycarpus martianus* seems doomed through lack of interest in the town, its future in the wild seems as solid as the rocks on which it grows. Because of the inaccessibility of its habitat it is safe from those who would cut it down for firewood, or for building, and it is equally safe from goats, the scourge of so many endangered palm species. Long may it remain so.

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A Survey of Insects Associated with Coconut Palms in NIFOR Benin with Emphasis on Possible Vectors of Bronze Leaf Wilt ("Awka wilt") Disease

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ABSTRACT

One hundred coconut palms planted in 1987 in NIFOR were systematically surveyed once every month from July 1990 to July 1991. Seventeen species of insects were recorded. Of these *Oryctes monoceros* Olivier (Coleoptera: Chrysomelidae) was the most destructive. *Malenia cocos* Van Stalle (Homoptera: Auchenorrhyncha: Derbidae) and *Meenoplus proximus* Synave (Homoptera: Auchenorrhyncha: Meenoplidae) were regularly encountered. Though these auchenorrhynchous plant hoppers have not been implicated as vectors of lethal yellowing (LY) they belong to the same suborder as LY vector. Further survey of the series Auchenorrhyncha will continue.

Bronze leaf wilt ("Awka wilt") a lethal yellowing (LY) like disease of the coconut palm was first observed in Nigeria by Johnson (1918, 1919) in the Awka area (Anambra State) following a severe epidemic in 1917. This disease was termed "bud rot" and, by an Agricultural Ordinance of 1916, farmers had to fell more than 5,000 palms as a control measure. Another outbreak occurred in the latter half of 1951, principally in the Awka-Onitsha area of the then Onitsha Province, but was this time called "bronze leaf wilt"(Bull 1955).

A survey of the distribution of the disease was carried out in the former East Central State (Imo and Anambra states), but no insect was found associated with it (Agwu and Okoye 1978).

Howard (1986) published evidence of transmission of palm lethal yellowing agent by a plant hopper, *Myndus crudus* (Homoptera: Cixiidae). On the basis of the pattern of spread of coconut disease in Cuba, Johnston (1912) hypothesized that LY was spread by flying insects. Additional observations (Bruner and Boucle 1943, Carter and Suah 1964, Johnson and Eden-Green 1978, McCoy 1976, Nutman and Roberts 1955) and evidence from field experiments (Heinz et al. 1972, Howard and McCoy 1980) supported this hypothesis. By the 1940's it was suspected that LY was caused by a virus and probably transmitted by members of the Homoptera (Bruner and Boucle 1943). *M. crudus* was suspected as a possible vector as early as 1958 (Farr 1985), but other Homopterans as well as species outside of this order were investigated as possible vectors during the 1960's and 1970's. The discovery of the association of mycoplasma-like organisms (MLO's) with LY in 1972 concentrated the search on species of the suborder Auchenorrhyncha of the order Homoptera, since most known vectors of MLO-associated plant diseases belong to this taxonomic group (D'Arch and Nault 1982). Based on surveys of auchenorrhynchous insects associated with coconut palms in Jamaica (Schuiling 1976) and Florida (Woodiel 1976), *M. crudus* was the only insect of this suborder found consistently on coconut palms in both areas (Woodiel et al. 1975).

Evidence from electron microscopy (Plasvic-Bajac et al. 1972) and chemotherapy (McCoy 1972) strongly suggests that a mycoplasma-like organism (MLO) is the etiological agent of LY of coconut and other palms (Tsai 1980) and, like most plant diseases of mycoplasmal etiology, it is thought to be transmitted by an auchenorrhynchous insect (Tsai 1979). It was for this reason that Tsai and Mead (1982) investigated the insect fauna associated with palms in southern Florida in hopes of determining the likely LY vector.

The present study to survey insect fauna of the coconut palms in NIFOR, with particular reference to auchenorrhynchous plant hoppers, was undertaken for similar reasons.

Materials and Methods

Sampling Site. The sampling site was the Nigerian Institute for Oil Palm Research coconut

Table 1. Numbers of insects encountered per 100 palms from July 1990–July 1991.*

Species of Insects	July	Aug.	Sept.	Oct.	Nov.	Dec.
Alogista sp. (Coleoptera: Alleculidae)	1.22	1.22	0.70	1.22	0.70	0.70
Aspidomorpha cincta (Coleoptera; Chrysomelidae Cassidinae)	0.70	0.70	1.22	0.70	0.70	0.70
Cassida sp. (Coleoptera: Chrysomelidae: Cassidinae)	0.70	0.70	1.22	1.22	19.27	27.72
Catantops spissus spissus (Orthoptera: Acrididae)	0.70	2.12	0.70	2.12	2.74	1.58
Ceroplastes sp. (Homoptera: Coccidae)	0.70	1.58	1.22	2.35	3.81	4.18
Cedusa sp. (Homoptera: Derbidae) (*Malenia Cocos*)	1.22	1.58	0.70	2.74	6.52	4.53
Coelaenomenodera elasidis (Coleoptera: Chrysomelidae)	0.70	1.37	0.70	0.70	0.70	1.22
Cyrtacantnacris aeriginosa (Orthoptera: Acrididae)	1.22	3.39	6.60	11.68	7.58	1.58
Diostrombus luteus (Homoptera: Derbidae)	0.70	3.24	2.74	1.58	3.81	5.52
Exochomus sp. (Coleoptera: Coccinelidae)	0.70	0.70	0.70	0.70	3.94	5.05
Homocerus sp. (Heteroptera: Coreidae)	0.70	1.22	0.70	0.70	0.70	0.70
Leptoglossus australis (Heteroptera: Lygaeidae)	0.70	0.70	1.58	1.58	1.22	1.22
Meenoplus proximus (Homoptera: Meencplidae)	0.70	1.22	1.37	1.87	5.70	3.30
Cryctes monoceros (Coleoptera: Scarabaeidae)	1.87	2.12	1.22	0.70	0.70	1.22
Proutista fritilaris (Homoptera: Derbidae)	0.70	2.92	1.58	1.58	2.12	2.74
Zonocerus variegatus (Orthoptera: Acrididae)	9.67	25.25	10.42	4.42	1.58	0.70
Unidentified coccinellid (Coleoptera: Coccinellidae)	0.70	0.70	1.37	0.70	0.70	1.22
Unidentified light brownish moth	0.70	1.87	1.22	1.22	1.58	0.70
Number** of palms attacked by *Oryctes monoceros*	11.25	33	43	61	25	11
Number** of palms attacked by scale insects	2	8	7	18	22	144
Number** of palms attacked by *Macrotermes bellicosus*	0	0	0	0	0	0

* Numbers transformed using $\sqrt{X + 0.5}$.
** Not transformed.

hybrid seed garden planted in 1987, consisting of 53 rows of 36 coconut palms (*Cocos nucifera* L.) each (1,908 palms). The palms were planted at a distance of 7.6 m triangular and alternated by planting one row of local tall palms and two rows of Malaysian dwarf palms. Border palms were of the local tall variety.

Sampling Method. 100 coconut palms at heights of 60 cm–1.5 m were systematically surveyed by examining one row in every 5 rows of plantings once every month. All parts of the palms were examined visually and insects encountered recorded. Collections of unfamiliar insects were made, preserved dry or in 70% alcohol and sent to CIE London for identification. Live adults of *Oryctes* sp. found tunnelling into the base of the central spears were handpicked for preservation of destruction. Auchenorrhynchous plant hoppers were collected by inverting either 5 cm × 1.3 cm empty specimen vials or 7.5 cm × 2.5 cm empty specimen tubes over them and then carefully covering them back with their stocks.

The numbers of the surveyed insects were then transformed using $\sqrt{x + 0.5}$ in order to normalize the data. The numbers of palms attacked by *Oryctes monoceros*, *Aspidiotus destructor* and *Macrotermes bellicosus* per month of survey were not transformed.

Results and Discussion

The list and numbers of insects encountered per 100 coconut palms surveyed from July 1990 to July 1991 are presented in Table 1. Of these insects, *Aspidiotus destructor*, *Zonocerus variegatus* L., *Malenia cocos* Van Stalle (formerly *Cedusa* sp.), and *Meenoplus proximus* Synave were the most abundant. The most destructive of these pests encountered was *Oryctes monoceros* Olivier.

Figure 1 illustrates the monthly occurrence of these pests per 100 palms surveyed. Though *Oryctes monoceros* was one of the least abundant, in terms of numbers per 100 palms surveyed, one *Oryctes* could do extensive and visible tunelling into the cabbage of each palm attacked. Its incidence peaked in August 1990 and July 1991, while the number of palms encountered with the visual signs of *Oryctes* damage was highest in October.

Myndus crudus Van Duzee (Homoptera: Cixiidae), which has been implicated in Florida as a vector of LY (Howard, 1986), was not encountered in these surveys. Two auchenorrhynchous plant hoppers which were encountered regularly in the field were observed to have some similar features as *Myndus crudus* following the descrip-

Table 1. Extended.

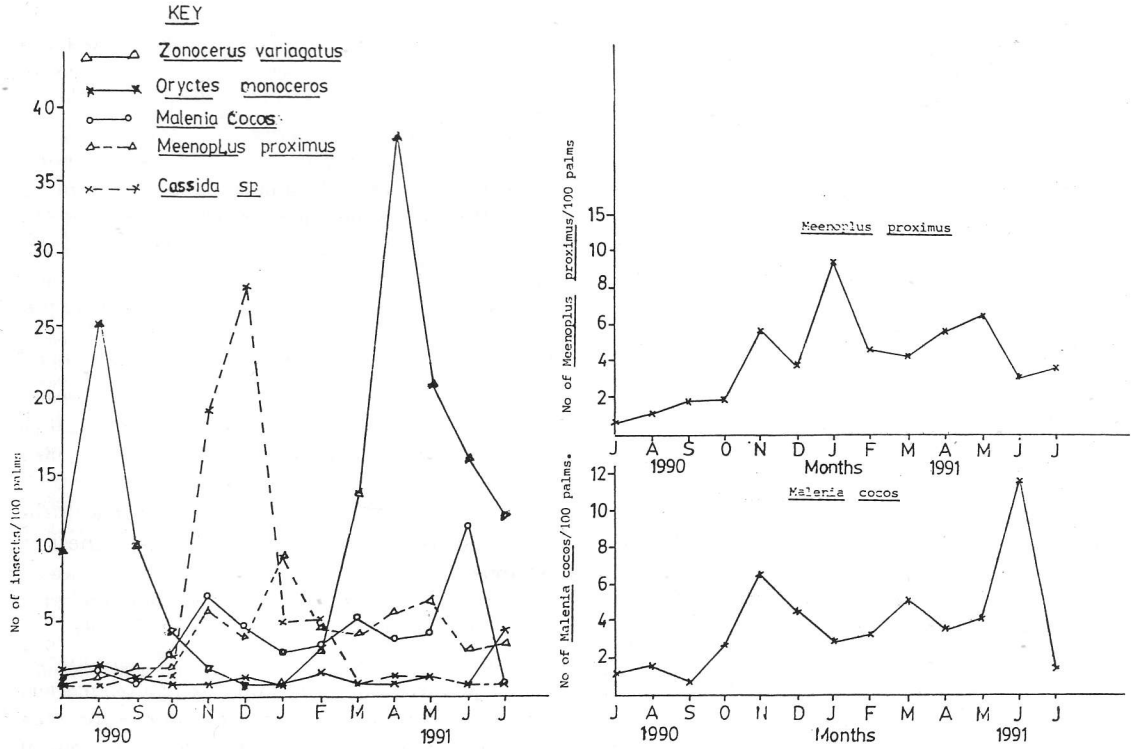
Jan.	Feb.	Mar.	Apr.	May	June	July
1.22	2.91	3.08	1.58	2.12	1.22	1.22
1.22	1.22	0.70	0.70	0.70	0.70	0.70
4.95	5.14	0.70	1.22	1.22	0.70	0.70
3.08	2.12	0.70	0.70	0.70	3.24	3.80
4.17	3.80	5.95	2.91	5.33	6.04	5.14
2.92	3.24	5.14	3.67	4.06	11.64	0.70
0.70	0.70	1.22	0.70	1.22	0.70	0.70
2.35	2.12	4.18	4.63	4.84	3.53	5.61
2.92	2.34	3.99	2.73	8.03	11.2	7.31
2.92	2.12	1.53	4.52	1.22	1.22	0.70
2.35	1.22	1.87	0.70	1.22	0.70	0.70
0.70	0.70	1.22	1.22	1.22	0.70	0.70
9.41	4.52	1.18	5.52	6.44	3.08	3.53
0.70	1.58	0.70	0.70	1.22	0.70	4.30
3.24	2.50	5.14	3.93	4.30	4.74	3.67
0.70	3.08	13.8	37.9	20.74	15.93	12.30
0.70	0.70	0.70	0.70	0.70	0.70	0.70
1.58	0.70	0.70	0.70	0.70	1.22	0.70
40	40	36	33	25	16	18
12	22	41	11	17	7	10
0	0	0	0	0	0	0

tion given by Kramer (1979). However, for positive identification these were dispatched to CIE London (CAB (11E) London). By initial comparison with previously identified specimens from CIE London, which are available in the Museum in Entomology division, NIFOR, these insects were placed as *Cedusa* sp. and *Meenoplus* sp., respectively. Confirmed identification however later placed them as

HOMOPTERA, AUCHENORRHYNCHA: DERBIDAE (M. R. WILSON (11E) det.)
Malenia cocos Van Stalle

HOMOPTERA, AUCHENORRHYNCHA: MEENOPLIDAE (M. R. WILSON (11E) det.)
Meenoplus proximus Synave

Ekpo and Ojomo (1990) documented the Ishan Area of Bendel State (Edo State) as a known focus of infection of bronze leaf wilt (=Lethal yellowing like disease). However, height disadvantage and the distance from NIFOR Benin made it inconvenient for regular monthly insect surveys to be



1. Number of major insects/100 palms recorded from July 1990 to July 1991.

carried out in that area. These preliminary surveys were therefore restricted to 60 cm–1.5 m tall uninfected palms in the NIFOR main station, Benin.

It is proposed to reach foliage of infected taller palms up to 12 m tall by employing skilled climbers or by using aluminium ladders in further surveys. These surveys will continue to pay more premium on auchenorrhynchous plant hoppers, the suborder in which the known vector of LY has been recorded by previous workers (Howard 1986, Cherry and Howard 1984).

Howard et al. (1985) in transmission tests found that lethal yellowing developed in young palms of coconut, *Pritchardia pacifica* and *Trachycarpus forntunei*, in cages in which *Myndus crudus* was present. Based on the above findings, the monthly surveys of the coconut palms planted in NIFOR in 1987 (now aged 4 years) were considered relevant.

Earlier findings by Howard and Thomas (1980) and by Tsai and Thomas (1981) revealed that large numbers of *M. crudus* (over 20,000 per cage) are required to transmit the LY agent. This planthopper appears to be an inefficient vector of the LY agent (Tsai and Mead 1982). Other homopterans are often encountered on coconut palms in NIFOR and other parts of Nigeria (including the Ishan area). There may be other insect vectors. This emphasizes the need for transmission tests to be carried out, with other auchenorrhynchous insects, in Nigeria. Transmission tests with *Oryctes monoceros* may also be an important area of study.

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Principes, 38(2), 1994, pp. 99

PALM BRIEF

Columbus and Raphia taedigera

The year 1992 saw, not surprisingly, a flurry of activity associated with the celebration of the 500th anniversary of the well known departure for the "Indies." There can be no doubt of the historical significance of the voyages of Columbus and the subsequent Hispanic invasions of the Americas that followed hot-foot upon his discoveries.

Whether the event merits coloration or commiseration depends principally on one's point of view and point of origin. Whatever, the publicity involved has also rekindled interest in the claims for transatlantic contact prior the year 1492. Much of the argument in support of earlier crossings is based on the Arabic and Iberian writings of the period and also the early sixteenth century records of the appearance in the Old World of crops indigenous to the New World. This movement took place with remarkable, and some would assert impossible, rapidity, if indeed it was post-Columbian (Tuley 1992).

For those not familiar with *Raphia* palms, the numerous species included in the genus are entirely confined to the African Continent with the one exception of *Raphia taedigera*. There are conflicting arguments as to the status of this species and, particularly, as to whether it is indigenous or introduced to the New World (Otedoh 1977). In the Americas, the plant occurs in two, relatively confined, geographically distinct populations, one in coastal Brazil and the other in the Panama/Nicaragua Isthmus. In Africa, there is a scattering of records for the West Coast between the Niger and Congo deltas. This palm is very similar indeed to the ubiquitous *R. vinifera* P. Beauv. of West Africa and might well be considered to fall within the normal range of variation found in that species or perhaps as a recognizable variety of it. However, as Otedoh points out, the mesocarp of both tends to be low in saponins (highly effective fish poisons found in some other members of the genus) and it is commonly eaten and used for oil in West Africa. He proposes that the fruit was probably employed in the provisioning of post-Columbian slave vessels and viable seed thus carried to the New World. This could well be the case, but if it were a regular feature, perhaps a more diffuse establishment pattern and a wider scatter of recorded sites would be anticipated. Also one would question the probity of the slave masters and their ruffian crews in making anything other than minimal arrangements for the provisioning of their cargo, as they would have looked upon it.

If, however, we consider the evidence for pre-Columbian Moorish expeditions across the Atlantic, the roles would be reversed. European Christian slaves ignorant of local foodstuffs would be manning the sweeps with Berber and Negro troops, familiar with such, forming part of the crew. In such circumstances, the likelihood of a whole range of African foodstuffs being selected to provision the journey is far more likely. Also, if these two-way crossings were to become a regular feature, then the prospect of deliberate planting of favored plants from either shore becomes a real possibility. Such a scenario would certainly extend the historical time frame for such movements and give greater credence to the "Introduction" school of thought.

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The Vanishing Palms of the Andaman and Nicobar Islands, India

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The Andaman and Nicobar Archipelago, situated in the Bay of Bengal, is characterized by a humid tropical climate and sustains luxuriant vegetation over the islands. These islands, isolated from the major land masses of South and Southeast Asia, form a rich reservoir of genetic variability. However, it has been noticed that many of the species described earlier by British botanists are not known to be present on the islands now. Balakrishnan (1989) in his studies on the flora of the Andaman and Nicobar Islands has pointed out that many taxa have never been recollected after the type collection.

Wild palms are one of the most important components of the tropical rain forest of the Andaman and Nicobar Islands and have been found distributed from sea level to high altitudes. Champion and Seth (1968) in their classification of the forest types have demarcated clearly the "cane brakes" occurring in the interior valleys of these islands, as a distinct type of vegetation, thereby recording the abundance of rattans in the tropical forests of Andaman and Nicobar Islands.

The Andaman and Nicobar Islands are known to host 26 species of palms spread over 13 genera, a list of which is given in Table 1. Of these, 12

1. Coconut population at Mus shore—Car Nicobar Island.

2. Wild population of *Areca catechu*—Car Nicobar Island.

species are endemic and ten others are endangered. *Calamus dilaceratus* and *Corypha macropoda* are known only from their type collections and have never been collected again. Another endemic species *Korthalsia rogersii* is confined to its type locality, Havelock Island in South Andaman. *Bentinckia nicobarica* occurs in small populations in the Nicobar group of islands and is on the verge of extinction.

Pinanga is represented by three species, *P. andamanensis*, *P. coronata* and *P. manii*. *P. andamanensis* and *P. manii* are endemic to the Andaman and Nicobar Islands, respectively. *P. andamanensis* has hitherto been thought to be confined to the type collection made by E. H. Mann from Andaman Islands. Recently, small populations of this species have been found occurring on the slopes of Mount Harriet region of South Andaman Island. *P. manii* collected by E. H. Mann from Nicobar Islands is known to be very rare in the islands now and this species has not been collected recently. *P. coronata* occurs very rarely.

Calamus is the most dominant genus among the palms of the islands (Rao and Srivastava 1990) and is represented by eight species. *Daemonorops*, related to *Calamus*, is represented by two species and both are endangered. *Caryota*, *Licuala*, *Nypa* and *Phoenix* are distributed widely over the islands.

Cocos nucifera and *Areca catechu* are widely cultivated, mainly for their nuts. Prain (1890) in his studies on the flora of these islands observed that coconut palms are not found wild in the Andaman Islands. Balakrishnan and Nair (1979), during floristic explorations, observed wild populations of *C. nucifera* from several islands in the Nicobar group (Car Nicobar (Fig. 1), Teressa, Tillangchang, Katchal, Kamorta and Little Nicobar) and also from uninhabited South Sentinal Island of the South Andaman Group. Wild populations of coconut palms are also present on North Reef Island of the North Andaman Group. Balakrishnan and Nair (1979) also observed *Areca catechu* occurring in the wild state at various places in the Nicobar Islands (Great Nicobar, Katchal Island and Car Nicobar (Fig. 2)). This species grows

Table 1. List of palm species present in the forests of Andaman and Nicobar Islands.

Taxon	Occurrence		Distribution	Status/Ecology
	Andaman Islands	Nicobar Islands		
Areca catechu L.	+	+	Very common	Cultivated among the islands of Andamans. Wild populations occurring in Nicobar Islands. Sandy loam or clayey loam in lowland forests, not threatened.
A. triandra Roxb.	+	–	Very common	Occurring in evergreen and semi-evergreen forests with sandy or clayey loam. Not threatened.
Bentinckia nicobarica Becc.	–	+	Very scarce	Endemic to Great Nicobar Island. No recent collections. Endangered.
Calamus andamanicus Kurz	+	+	Very common	Endemic to Andaman & Nicobar Islands; found growing in moist evergreen forests with clay or sandy loam. Maximum commercial exploitation, presently out of danger.
C. dilaceratus Becc.	+	–	?	Endemic to Andaman Islands. Known from the type collection only. Present status unknown.
C. longisetus Griff.	+	–	Very common	Semi-evergreen forests to evergreen forests; slightly clayey to rocky loam. Not threatened.
C. nicobaricus Becc.	–	+	Scarce	Endemic to Nicobar Islands. Few recent collections from North Nicobars. Scrub forests or open places with clayey loam, very rare.
C. palustris Griff.	+	R	Scarce	Lowland forest to high hilly slopes. Common near the stream edges with sandy loam. Few collections from North & South Andamans. Present status rare.
C. pseudo-rivatis Becc.	+	+	Scarce	Endemic to Andaman and Nicobar Islands. Few recent collections from Middle Andaman. Inland forest with clayey soil. Endangered.
C. unifarius Wendl. var. *pentong* Becc.	+	R	Scarce	Endemic to Andaman and Nicobar Islands. No recent collections from Nicobar Islands. Occurring in evergreen forests and littoral forests. Sandy soil. Endangered.
C. viminalis Willd. var. *fasciculatus* Becc.	+	–	Common	Mixed forests with sandy or rocky or slightly clayey loam. Not threatened.
Caryota mitis Lour.	+	–	Common	Hilly forest slopes, stream edges, sandy or rocky or slightly clayey soils. Not threatened.

Table 1. Continued.

Taxon	Occurrence: Andaman Islands	Occurrence: Nicobar Islands	Distribution	Status/Ecology
Cocos nucifera L.	+	+	Very common	Cultivated among the islands of Andamans except at South Sentinal Island and North Reef Island (Wild). Wild population occurring at Nicobar groups also cultivated. Sandy or clayey loam. Not threatened.
Corypha macropoda Lindl. ex Kurz	+	–	?	Known from the first collection only from Andaman group of islands. Present status unknown.
Daemonorops kurzianas Hook. f.	+	+	Very scarce	Endemic to Andaman and Nicobar Islands. Few collections from South Andaman Islands. Inland and sub-tidal forest edges. Rocky or clayey soil. Endangered.
D. manii Becc.	+	R	Very scarce	Endemic to Andaman and Nicobar Islands. No recent collections from Nicobar Islands. Few recent collections from South Andaman Islands. Low inland forests at sea level. Sandy loam. Endangered.
Korthalsia laciniosa (Griff.) Mart.	+	+	Very common	Lowland forests along stream edges with rocky or sandy loam. Out of danger.
K. rogersii Becc.	+	–	Very rare	Endemic to South Andamans. Confined to the type locality (Havelock Island). Endangered.
Licuala peltata Roxb.	+	–	Very common	Edges of semi evergreen, deciduous or tidal forests with rocky or clayey loam. Not threatened.
L. spinosa Wurmb	+	–	Common	Inland forests edges at low altitude. Sandy loam. Not threatened.
Nypa fruticans Wurmb	+	+	Very common	Mangrove and tidal forests with clayey soil. Not threatened.
Phoenix paludosa Roxb.	+	+	Very common	Tidal or sun-tidal forests or near the mangrove edges. Sandy or clayey loam. Not threatened.
Pinanga andamanensis Becc.	+	–	Very scarce	Endemic to Andaman Islands. Inland evergreen forests with rocky loam. Recently collected after type collection. Endangered.
P_1 coronata Bl.	+	–	Scarce	Inland semi-evergreen forests with rocky loam. Endangered.
P. manii Becc.	+	+	Scarce	Endemic to Nicobar Islands. Few recent collections from South Andamans. Endangered.
Rhopaloblaste augusta (Kurz) H.E. Moore	–	+	Scarce	Endemic to Nicobar, scrub and mixed forests. Few collections from Nicobars. Endangered.

+ = present; – = absent; R = recorded earlier, specimens not seen; ? = doubtful occurrence.

abundantly in several large areas in lowland forests with sandy soil rich in moisture.

About fifty percent of the palm species of the Andaman and Nicobar Islands are endemic and over forty percent of the palm species are endangered. Many species of this vulnerable palm flora are facing the threat of extinction. The major factors that have contributed to this dangerous situation for the native palms of the islands are isolation and habitat alterations. Catastrophic events such as earthquakes, the cyclones of 1884, 1891, 1941, and 1988, and the volcanic eruption that occurred in the Barren Islands in 1991 have had a serious impact on the vegetation of the islands. The unique palm flora has to be protected to preserve the natural heritage of our country.

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Northern Limit of Palms in North America: Trachycarpus in Canada

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The growth range of cultivated *Trachycarpus fortunei* has been creeping northward along the Pacific coast for decades and has now reached British Columbia on Canada's west coast. Greater Vancouver and southern Vancouver Island are seeing a dramatic increase in the use of the Chinese windmill palm in both private gardens and commercial landscaping.

The rise in popularity and profile of the humble windmill palm is largely the result of efforts of dedicated individuals who have been quietly planting palms in private gardens for years and not so quietly promoting the notion that palms will actually grow in Canada adding a wonderful, exotic touch to west coast gardens. People in this part of the country take their gardening seriously. They are proud, even smug about the range and variety of plants and flowers that will grow here (and not in Toronto). Show them a 20 ft fan palm that will thrive with little winter care, and the appeal is irresistible.

It wasn't always this way. Any palms that were planted before the 1960s have long since fallen to the cold or the contractor's bulldozer. In Bremerton, Washington, 100 miles south of the border, the Taft St. palm was planted in 1939. It is regarded as one of the earliest plantings in the Seattle area and is now more than 30 ft high, probably the tallest palm north of California. Some of the earliest *T. fortunei* in British Columbia were planted in Beacon Hill Park in Victoria on Vancouver Island in the 1950s. The original trees are gone now, replaced with new ones. In Vancouver, a palm was planted in the zoo area of Stanley Park in 1967. The tallest palm on the British Columbian mainland was planted on Rumble St. in Burnaby in 1968. It is now 25 ft tall towering over an adjacent home (Fig. 1). Beyond these known plantings, however, there is very little historical evidence of interest in cultivating palms.

Things began to change when a young Swiss landscaper named Gerard Pury immigrated to Canada and took up residence in Vancouver. Gerard came from Lugano, an area of Switzerland well known for the postcard windmill palms growing beside Lake Maggiore. Gerard felt confident palms would do well in Vancouver's similar climate. As a landscaper he had a unique opportunity to experiment in gardens around town (with or without the owner's blessing). As his landscaping business became more successful, his palms grew

1. Palm on Rumble St in Burnaby planted in 1968 is Vancouver's tallest. N. Parker photo June 1991.

2. Planted in 1975 on Point Grey Rd. in Vancouver's fashionable Kitsilano district, this is one of hundreds of windmill palms planted by Gerard Pury over the past 30 years. N. Parker photo Sept. 1993.

more impressive and were planted in increasingly more influential locations. In 1966 he planted a palm at his present address on Manitoba Street. Today seeds from this fecund tree produce noticeably hardier plants than the standard 5- and 10-gallon plants imported from California and sold in garden nurseries.

The Palm Society was established in Vancouver in 1984 by Richard Woo and a half dozen palm enthusiasts. The Society has grown steadily to become The Pacific Northwest Palm & Exotic Plant Society, a chapter of the International Palm Society, with about 100 members in British Columbia, Washington, and Oregon. Richard and Rudi Pinkowski, another stalwart, continue tirelessly to promote the use and enjoyment of palms in public and private gardens.

The southwestern corner of Canada is the mildest part of a very cold country. This is the banana belt of the nation, the southern California of Canada. Thousands of people move here each year to live or retire, Canadians from other parts of Canada escaping winter's icy grip, and immigrants from all over the world for the peace and safety that Canada offers. Two-thirds of British Columbia's 3½ million people now crowd themselves into the southwest corner of the province.

Coastal British Columbia is USDA zone 8, and will periodically experience overnight winter temperatures of −7° to −12° C (10° to 20° F). Away from the coastline temperatures on the coldest winter nights will occasionally drop below −12° C (10° F). The coldest temperature ever recorded in Vancouver was −18° C (0° F) on January 15, 1950 and again on December 29, 1968. Rainfall is approximately 50 inches annually. *Trachycarpus fortunei* is the only species that has proven hardy for this climate with its cool summers and mild, damp winters. Mature, acclimatized trees are not severely damaged by winter frosts but younger plants and seedlings usually require some form of protective covering from November through February. Even with protection the survival rate is only about 50–70% for young or newly planted trees that have not been hardened.

There have been no confirmed cases of natural

3. Successful test planting by Vancouver Parks Board on city streets in the West End. N. Parker photo Sept. 1993.

germination, although I have seen seedlings growing naturally beneath the Pury palm. I don't believe they survive without protection.

Other hardy palm species have been tested outdoors in coastal areas but none has proved to be as reliable as the Chusan palm. From time to time Northwest Chapter members report successful wintering but these are usually shortlived. The occasional *Chamaerops humilis* can be found, kept dry during cold weather. Cool, wet winters also disagree with the genus *Washingtonia*. *Rhapidophyllum hystrix* and *Sabal*, on the other hand, can withstand winter cold, but require more summer warmth to grow normally. *Phoenix canariensis*, *Butia capitata*, and *Jubaea chilensis* all have at least a theoretical chance of survival outdoors with some protection, but have not yet proven hardy enough to withstand the coldest winters. *Trachycarpus fortunei* is the only palm that grows to maturity in British Columbia.

In Vancouver the natural beauty of the mountains and the ocean draw thousands of visitors each year. Palms as a viable landscaping option for city streets are only slowly being considered by those civic agencies responsible. Vancouver's famous Stanley Park has had two prominent palms in the zoo area for many years. Recently the Parks Board experimented with street palms in the West End near English Bay. In 1990 sixteen small trees were planted on a traffic island at Beach Ave and Pacific Blvd as a trial Three years later the test has proven to be a complete success. The palms have continued to grow unprotected through three winters, two of which were colder than normal, and have actually grown 2–4 ft in this time, faster than was expected (Fig. 3). Of the original 16 trees, one was stolen and one died of causes unrelated to weather. Needless to say, the Palm Society is delighted and is now urging the Parks Board to plant more palms in high traffic areas of English Bay and Stanley Park around Coal Harbour. This action is being resisted by some groups who wish to see only indigenous trees growing in Stanley Park. On Vancouver Island seventy kilometres north of Victoria near Nanaimo, authorities have planted six mature Trachys along a short stretch of highway; however, these trees are protected inside plywood frames during the winter months.

4. Summer flowers and palms with inflorescences all but consume a front yard garden at this home near Victoria. R. Pinkowski photo Aug. 1993.

Trachycarpus fortunei is not elegant by palm standards. In northern climes, trees are often misshaped, with weather-worn fronds tattered by wind and frost. Their "hairy" trunk is not what anyone would consider graceful. Nevertheless, many commercial landscapers and individual entrepreneurs also seem to have embraced it as a thing of beauty and are willing to risk their investment to exploit the palm's new popularity. Mature palms are springing up around car lots, restaurants, and condominium developments. The $500-and-up pricetag for trees with 4–6 ft trunk development and the risk of losing them all in the winter doesn't seem to be a consideration.

Vancouver and Victoria are a long way from palm-lined boulevards, Los Angeles-style. Most people here are still unaware that palms will grow in their climate and greet the news with skeptical amusement. But this is definitely changing.

The furthest north that palms have been confirmed sighted growing outdoors unprotected in British Columbia is at Savary Island near 50°N between Vancouver Island and the mainland. I have been told palms are growing further north on Quadra Island at 50°12′N, however, this sighting is unconfirmed. The British Columbian coastline as far north as the Queen Charlotte Islands is considered to be USDA zone 8. It is reasonable, therefore, to conclude that *T. fortunei* has not yet reached the northern limits of its growth in cultivation.

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A Study of the in situ Situation of Four Species of Threatened Understory Palms of the Genus Chamaedorea in the Wild in the State of Veracruz, Mexico

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ABSTRACT

This study is a continuation of WWF-US Project 3322, to elucidate the state of conservation, and economic botany of palms of Latin America and the Caribbean. The lack of field information has prevented the allocation of a CITES Appendix I status to *Chamaedorea tuerckheimii* (Dammer) Burret and *C. metallica* Cook ex Moore; both these species are considered threatened or endangered. The authors suggest that *C. tenella* Wendl. and *C. monostachys* Burret, both endemics to southern Mexico, should also be included in the study. Information such as population density of the only known populations as well as a search for new populations is presented. *Ex situ* cultivation of these species in nurseries has been searched for and also local uses of plants or leaves is recorded. It has been suggested that CITES Appendix II listing would be the most appropriate in order to encourage propagation of the species.

There exist 13 palm genera with approximately 35 species in the state of Veracruz. The genus *Chamaedorea* accounts for 15 species. This genus includes the majority of palm species that are threatened and inadequately managed.

The clear cutting of tropical rain-forest for agricultural expansion is the major factor leading to the reduction of populations of *Chamaedorea* palms. Coupled with this is the illegal extraction of plants (to a lesser extent) but still a serious threat to *C. tuerckheimii*, and leaves for the ornamental horticulture industry (to a greater extent). The latter, now being displaced by agricultural expansion, is an entrenched activity among human settlements in or adjacent to rain-forest. This can be one of the major sources of income, supporting various families and middle-men (Saldivia and Cherbonier 1982).

Habitat destruction, intense collecting, and inadequate methods of leaf harvesting coupled with a lack of institutional organization and inefficient law-enforcement has contributed greatly to the reduction in numbers of many *Chamaedorea* species. In spite of the increasing economic importance of the species in local as well as foreign markets, there is still no adequate management of the resource at a national level (Saldivia and Cherbonier 1982). Where there is commercial management of a sort, in rain-forest, at Mr. Enrique Castro's 'farm' at El Bastonal (near Catemaco) many of the existing, but not commercially important *Chamaedorea* spp. (i.e., *C. elatior* Mart.) are destroyed, and the ones with more commercial demand such as *C. atrovirens* and *C. rojasiana* are introduced into the understory as seedlings or seed. The leaves of these species are periodically harvested using adequate techniques since Mr. E. Castro is a professional horticulturist and supervises his workers. Another commercial nursery for *Chamaedorea* spp. is in the Municipality of Juchique de Ferrer near Misantla where palms are cultivated in association with coffee or as a monoculture.

Local uses for *Chamaedorea* palms include cut foliage for decorating altars during the All Souls (Dia de los Muertos) festival in November, civic celebrations in the city of Xalapa and others, as well as the year-round decoration of commercial displays of fruit and meat (*C. tepejilote* Liebm. ex Mart.). Cut foliage as well as seed and plants are also exported, for further information see Saldivia and Cherbonier (1982).

A sustained management of the existing wild populations of *Chamaedorea* palms is urgently needed before further habitat degradation and loss occurs. Cultivation in nurseries from seed is also possible and should be encouraged.

General Information on Plant and Foliage Collecting

Foliage collectors call *Chamaedorea* palm species 'tepjilote', 'camedor', 'guayita de rio', 'xiate (shiate)' or 'palmita'. The principal collecting areas are where tropical rain-forests and cloud-forests still exist in the states of Veracruz, Oaxaca and Chiapas. The Secretaría de Agricultura y Recursos Hidraulicos (SARH) expedites permits for the exploitation of foliage, charging a given amount per gross of cut leaves from natural habitats. There is a strong middle-man element in the export of foliage, but notwithstanding, the peasant foliage collector is assured a regular weekly income for his family whom he employs in the collection; very often whole families venture into the forests to gather 'camedor' leaves and too commonly, inexperienced children are employed and do considerable damage to the palms. Experienced collectors have a defined technique for foliage collecting and damage to the palm is minimal.

Both plants and foliage of *Chamaedorea metallica* Cook ex Moore, and *C. elegans* Mart, which are the preferred species, are collected in the state of Veracruz. To a lesser extent, largely because of their rarity, plants of *C. tuerckheimii* (Dammer) Burret and *Reinhardtia gracilis* (Wendl.) Burret are also collected among others in the Catemaco region of Veracruz. The former species is now critically endangered largely through habitat destruction.

In the regions of Córdoba, Fortín, Misantla and Naolinco it is common to see in the market places plants and foliage of *C. schiedeana* Mart. *C. oblongata* Mart., *C. klotzschiana* Wendl., *C. oreophila* Mart., *C. sartori* Liebm. and *C. tepejilote* Liebm. in Mart. originating from local forests.

In summary *Chamaedorea* palm foliage generates a market value exceeding 30 million dollars per year, and provides a source of employment for over 10,000 persons in Mexico. It is estimated that one million leaves are cut and 205 kilograms of seed are collected daily (*sic*) and the market is controlled by two North American monopolies (Toledo et al. 1989).

Past Work

Saldivia and Charbonier (1982) carried out an investigation on the exploitation of the 'camedor' or 'xiate' palm including an analysis on collecting sites and nurseries of the palm. The study is somewhat incomplete as regards to taxonomy of the species. The majority of the species commercialized for foliage are the more common ones. In contrast a few are rare species or not of commercial interest as regards seeds or foliage.

Methods Used for Census

Using the descriptive and useful work of Aguilar (1986) on the genus *Chamaedorea* in the state of Veracruz, and a map indicating collecting sites made from existing information gathered from the herbarium (XAL), the classical sites were visited. Other possible sites where the species may exist were also noted and visits to the adjacent states of Oaxaca and Chiapas were also carried out.

Whenever possible three 10 × 10 m quadrats were laid out at random in each *Chamaedorea* population and all palms (seedlings, adults and immature) were counted. The population area was estimated by eye and an approximate palm density/m^2 was calculated. Specimens from each site were deposited at XAL, plants and seeds were also collected for the Botanic Garden at XAL.

Visits were made to local nurseries dealing with *Chamaedorea* palms on a commercial scale as well as visits to local markets where palm foliage is regularly sold.

Results

Chamaedorea monostachys Burret.

Common Name: Tepejilote.

Habitat: Cloud-forest between 1,200 and 1,400 meters elevation.

Approximate Area of Population: 5 ha.

Threat to Population: Subsistence farming (maize) and fire-wood cutting.

Land Ownership: Private.

Plant Density/m^2: 0.18 including adults, seedlings and young plants.

Total No. of Plants Estimated in Habitat: 9,000.

Comments: This species is found in the herbaceous strata of cloud-forest associated with *Carpinus caroliniana, Quercus germana, Ulmus mexicana, Clethra mexicana, Oreopanax* spp., C. tepejilote and *C. oreophila*, the last species being similar to *C. monostachys*.

The surrounding areas to this piece of relictual cloud-forest are either private or Ejido lands gazetted for agriculture. It is estimated that within the next five years or so agricultural expansion and

fire-wood cutting will destroy this remaining small and relictual site of *C. monostachys*, even though natural regeneration of the palm is occurring.

It is important, however, as a conservation measure, to organize rescue of this species and propagate it *ex situ* since seeds readily germinate.

Because of their similarity in vegetative habit, *C. monostachys* and *C. oreophila* are considered by some authorities to be the same. Differences only in size of the inflorescences have been noted during this survey.

Chamaedorea tenella

Common Name: Palma cimarrona.

Habitat: Evergreen tropical rain-forest at between 490 and 800 meters elevation.

Approximate Area of Population: Two populations of approx. 10 m^2 each on biological reserve and very widely dispersed in the fragmented rain-forest (400–500 ha), with 450–800 plants/ha.

Threat to Population: None envisaged at biological reserve but logging, agricultural expansion, and illegal collecting elsewhere.

Land Ownership: Universidad Veracruzana and State.

Plant Density/m^2: 0.07–0.9. Individuals very widely scattered.

Total No. of Plants Estimated in Habitat: 17 on reserve; average of 680 plants/ha at other areas 490 and 730 meters elevation.

Comments: This species is a very rare rain-forest understory palm. Two populations have been detected with individuals scattered over a very wide area. Being in this primary rain-forest reserve the species is not threatened and is apparently in a state of equilibrium and conservation along with other species that are protected. In spite of this, the number of individuals existing is extremely low. Searches in neighboring relicts of forests and even in slightly disturbed habitats outside the Reserve has yielded no other populations nor isolated individuals, except on a large area of fragmented rain-forest on volcán San Martín Pajapan. This species apparently has a very low reproduction rate; on fertile individuals, no more than three fruits per raceme has been observed. There appears to be a pollinator problem giving rise to a very slow population growth rate (assuming this population has not been disturbed in any way previous to the study). Very high seed set has been achieved with hand pollination of this species (Hodel, personal communication).

Although this species does not appear to have any general commercial demand since no use or management by palm foliage collectors has been reported, there is a great demand by collectors and hobbyists. The species inhabits sites with difficult access in the rain-forest. The two populations may well be stable but the species should be considered both rare and endangered until more of its biology is known.

Chamaedorea tuerckheimii

Common Name: No local name, Potato chip palm (U.S.A.).

Habitat: Evergreen tropical rain-forest at 700 meters elevation.

Localities Where Encountered: Only at one locality.

Approximate Area of Population: Approx. 10 × 10 m^2.

Threat to Population: Imminent destruction of remaining habitat.

Land Ownership: Private.

Plant Density/m^2: 0.1.

Total No. of Plants Estimated in Habitat: 10 adult plants with very few (5) seedlings.

Comments: A small understory palm that is in great demand by palm collectors and enthusiasts. Though the type locality is at Verapaz, Guatemala, we believed this may also be found in the Lacandona rain-forest in Chiapas. It was more widespread in the Los Tuxtlas region of Veracruz in the past but has since been decimated by commercial collectors and logging.

It grows in heavy shade with understory plants in evergreen rain-forest. The only locality of this rare palm now lies between four sweet-corn fields that are under slash-and-burn agriculture on clay soils and is also under threat by expanding cattle grazing pastures at the Rancho La Chingada locality. The habitat is already disturbed and the penetrating sun rays are causing dehydration of the site thus preventing adequate germination of the few seeds produced per plant.

It is imperative that these plants be rescued and placed under the safe custody of a botanic garden or reserve. Three live plants have been collected for the Botanic Garden.

Some local commercial nurseries have a few habitat collected individuals for sale and it is said that this palm has become very scarce over the last few years but at least one nursery is propagating the palm.

Plants and seeds that originated from larger

populations in Guatemala and Veracruz have been available at commercial nurseries in the USA.

Chamaedorea metallica

Common Name: Metalica, palma brillosa.

Habitat: Evergreen tropical rain-forest at 150 meters elevation.

Approximate Area of Population: 200–300 hectares.

Threat to Population: Coffee plantations and wood-cutting.

Land Ownership: Federal and Ejido lands.

Plant Density/m²: 0.24.

Total No. of Plants Estimated in Habitat: 2,400 per ha.

Comments: Locally very abundant in rain-forest on calcareous mountains. In the 10 × 10 m quadrats there were typically 4 to 5 adult plants with approximately 20 seedling and juvenile plants showing healthy regeneration. The habitat appears relatively undisturbed due to very difficult access and steep slopes. The karst topography makes the habitat unsuitable for agriculture but coffee plantations are slowly creeping up on the lower slopes. Similar hills are quarried for limestone, or clear-felled for grazing, thus a growing threat exists. We estimate over 300,000 individuals including seedlings in these hills which may merit considering this species as vulnerable and not immediately endangered (sensu IUCN categories).

This species seems to be endemic to these hills since exploration of similar hills on the Oaxaca side of the border revealed no other populations of the species. This small mountain range should be recommended as a reserve and management projects financed for the palm before habitat deterioration sets in. This species has also allegedly been seen in rain-forest near the Oaxaca border.

We include a list of palm species reported from the habitats visited in southern Veracruz as a part of the results of this study:

Acoelorraphe wrightii Wendl., *Acrocomia mexicana* Karw. ex Mart., *Astrocaryum mexicanum* Liebm., *Bactris trichophila* Wendl., *Bactris balanoidea* Wendl., *Chamaedorea concolor* Mart., *C. ernesti-augusti* Wendl., *C. lepidota* Wendl. = *C. liebmanni* Mart., *C. tepejilote* Liebm., *C. oblongata* Mart., *C. schiedeana* Mart., *C. elatior* Mart., *Desmoncus quasilarius* Liebm., *D. chinantlensis* Liebm. ex Mart., *Genoma interrupta* (Ruiz & Pavón) Mart., *Reinhardtia gracilis* (Wendl.) Wendl., *Sabal morrisiana* Bartlett, *Scheelea liebmanii* Becc.

Discussion

We recommend that the endangered taxa studied here be annexed to the CITES Appendix II category. Seeds germinate readily and Appendix II listing will encourage propagation and conservation oriented 'Cottage Industries' that might lead to the conservation of the few viable habitats left. Rescue operations and perhaps tissue culture are strongly advised for critically endangered species such as *Chamaedorea tuerckheimii*. Appendix I listing for *C. tuerckheimii* is felt to be redundant since the threat at the present is not commercial collecting but total habitat destruction. In the case of *C. metallica* which is apparently locally abundant, a cottage industry nursery should be encouraged in order to halt the coffee plantations from creeping in and eventually destroying the population. An 'on site' nursery will help to discourage illegal collecting and would be an incentive for the long term conservation of the habitat.

This project has not only thrown some light on the present situation of the four endangered *Chamaedorea* spp., but also has enabled new material to be collected for the herbaria, in many cases where only one report is known from the habitats. Unfortunately further explorations have not uncovered new populations, probably due to the limited time and resources devoted to the project. Perhaps further intensive botanical explorations may uncover other populations in states bordering Veracruz.

A second stage of this project should be contemplated as a continuation of the present study to include other palm species that are little known and have certain potential as useful and ornamental plants. The creation of cottage industry nurseries should be included in such a follow-up project as an immediate contribution to conservation-through-propagation of the species. Proposals to the Mexican environment protection agency (SEDSO) will be made to include sites such as the *C. metallica* population as protected areas. SEDESO (Secretária de Desarrollo Social) is also encouraging small cottage industries as a contribution towards the conservation of species that have a high commercial demand, and as an alternative to slash and burn farming practices and extraction. *Ex situ* studies in propagation techniques should be included where regional botanic gardens could be involved in the rescue and propagation of the critically endangered species. Experience in the Jardín Botánico Clavijero has shown

that *Chamaedorea* palms are readily propagated from seed with good germination rates. Mass propagation and re-introduction into protected areas would be instrumental in preventing the extinction of the rarest of these palms.

Where the more commercial species are managed or introduced i.e., *Chamaedorea atrovirens* and *C. rojasiana* as in the case of the camedora farm of Mr. Enrique Castro at El Bastonal, Los Tuxtlas, many of the naturally occurring and little known species are cut and destroyed. Education and a more conservationist-horticultural approach is needed here to orientate these nurseries that ultimately may be the only means of effective conservation of these palms in the state of Veracruz.

Note

Commercial collectors and overzealous enthusiasts have, in the past, decimated whole populations of palms, cycads, cacti and orchids. For these reasons we have omitted precise localities in this article and we feel it is appropriate to remind collectors and enthusiasts that removing palms and other plants from their habitats in Mexico without a collecting permit from SEDESO and signed by Dra de la Garza is a most serious federal crime which can lead to fines and imprisonment.

Acknowledgments

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CHAPTER NEWS AND EVENTS

COMMUNITY EDUCATION

Palms and their Care

The South Florida Chapter of the International Palm Society has recently confirmed their commitment to the South Florida community through a large and professionally constructed educational exhibit. In the spring of 1993, Education Chairman Rick Leitner spoke about the need of a more thorough and larger educational presentation.

The Chapter had been previously utilizing a successful, but severely tattered exhibit. It was time to devote funds toward an educational exhibit where the community could view photographs of specific palms and gain information about them. The Board of Directors unanimously voted to go ahead and earmark funds to this new and exciting project. Mr. Leitner designed and met with a representative that manufactures such exhibits. After concerns about size, color, lighting, ease of assembly and transport, and weatherproofing, the order was placed and the work was just beginning.

The educational curriculum was to be as simple as possible as this exhibit would be set up for community schools for Arbor Day, Science Fairs, Botany classes, etc. The topics to be covered on the exhibit were to include:

15 of South Florida's Most Common Landscape Palms
Florida Native Palms
Promising 'New' Species for South Florida
What is Lethal Yellowing and What Species are Susceptible
Basic Palm Identification
Simple Palm Vocabulary
Typical Questions about Palms and Their Care

1. Richard Leitner looking at part of the educational exhibit developed by the South Florida Chapter.

How To Plant A Palm Correctly Fertilization Questions

A photographer was hired to take professional color photos of scouted palms for the exhibit. The photos were taken onto slide film so that an educational presentation could also be given indoors from slides. The photographs were expanded for greater appeal and detail, laminated in plastic to be waterproof, then posted with velcro. The velcro was necessary so that the photographs and information could be changed, rearranged, or substituted with others. Labels describing each and every photograph was made so that the reader learned about the palm, its origin, its common and botanical name, its pleasing features, and how it should be incorporated into the garden.

In addition to the exhibit, two attachable tables were purchased so that products of palm parts could be displayed. Applications to the IPS could be presented and educational literature may be distributed on the tabletops as well.

Designed to be typically displayed indoors, halogen lights were included with the design to show off those beautiful, glossy photographs. All of the exhibit will then fit into two hard shelled transport cases complete with buckling straps, castered wheels, and lightweight packaging.

The exhibit was set up and shown to Society members in August at a general meeting, where members could browse and make further suggestions or recommendations. Recognizing the value of community education, everyone was appreciative and excited to see it put to use for the first time at the annual South Florida Palm Show and Sale held the first weekend in November. The show and sale, at Fairchild Tropical Garden, was a wonderful environment to host the unveiling of the large and quite impressive exhibit (Fig. 1).

Set among palms in the show for education and judging, the exhibit was enjoyed by over 2,000 palm enthusiasts. Literature regarding palms, the planting of palms, and proper cold protection was distributed as well as the exhibit. A wealth of knowledge was gained from the exhibit and the volunteers stationed to answer further questions.

A Chapter cannot and should not overlook its responsibility and role of education for the community. Too often we look to educate our members, which is fine, but greater strides must be taken to educate the community.

Civic groups, garden clubs who know little about palms, community schools, senior citizen events, local charity gatherings, home and garden shows are just a small segment of the population that may be reached through education with exhibits such as this one. Education should be viewed as the lifeblood of our chapters, our society, and ourselves.

RICHARD LEITNER
6231 SW 34th St.
Miami, FL 33156

Other News from the South Florida Palm Society

The South Florida Chapter met on February 16 to hear Dr. Scott Zona's excellent lecture on "Taxonomy and Distribution of the Royal Palm Family". Information on what distinguishes the differences amongst the members of the genus *Roystonea* was provided.

The April 20 meeting featured world-famous native Florida landscape photographer Clyde Butcher. Mr. Butcher spoke about his works of photographing the Florida landscape, his techniques of traditional black and white photography, and his new Everglades Gallery, former home of Orchid Isle, west of Miami on Tamiami Trail. Prints of his works were available for sale after the talk.

A field trip was held on Saturday, January 29, to the Fairchild Tropical Garden Palmetum with Chuck Hubbuch and Don Evans. Members were able to assess what had perished in Hurricane Andrew and what did well. A field trip was also held on March 19 to enjoy "Made in the Shade", a visit to Botanics Wholesale Nursery and a shade house luncheon. Participants enjoyed this noteworthy nursery and all the interesting shade and container-grown palms.

Lenny Goldstein reports that the MetroZoo Nursery and replanting project is going well. A permanent fence has been put around the nursery area for security. About 85 percent of existing palms appear to have survived the storm.

The IPS congratulates the South Florida Chapter for signing 35 new IPS members at the November Show and Sale.

Central Florida Palm Society (CFPS)

Following one of its most successful recent meetings in the Ft. Myers area, the CFPS held a record breaking two day winter meeting in the Vero Beach area. Over 75 people attended the event.

On Saturday, the group visited five different palm collections, the most mature being Bill Bidlingmayer's—now part of the Garden Grove subdivision in Vero Beach. In the evening, we were treated to Paul Craft's exciting talk on his recent trip to Australia. Paul auctioned off a number of plants he donated. Then Ed Hall auctioned a beautiful 15 × 24″ palm carving in mahogany given by Bernie Peterson.

In gratitude for providing meeting space Saturday night, the CFPS donated a native Florida needle palm to the Florida Medical Entomology Laboratory.

Sunday the meeting included three gardens. The first was the private garden of John and Ann Kennedy. The second was McKee Jungle Gardens, a once famous tourist attraction closed in 1976. Last but not least was the residence of Joe and Anne Michael on the Indian River side of the barrier island north of Vero Beach. A successful palm sale was held both Saturday and Sunday.

News from the West Palm Beach (Florida) Chapter

Monthly meetings in 1994 began in January with a slide presentation by Paul Craft of his recent trip to northeastern Australia. Slides of the Townsville Palmetum were included.

In February, a talk was given by Terrence Walters, researcher from Fairchild Tropical Garden, on his recent expedition to China. Primary emphasis of the talk was on the cycads found there and conservation.

In March, Chuck Hubbuch, curator of palms and cycads at Fairchild Tropical Garden, talked with the aid of slides on the cycads and palms of Mexico. He recently spent several weeks there studying the cycads in habitat.

Nancy Edmondson spoke on the recovery of Fairchild Tropical Garden from Hurricane Andrew at the April 6th meeting at Mounts Botanical Garden, followed by a palm and cycad auction.

As part of the society's appreciation to Morikami Museum for providing meeting facilities, several specimen size cycads have been donated and planted around the museum. The Spring Sale was held at Morikami Park on April 9–10. Details will be provided in the next issue.

News from the Broward County Chapter

On Jan. 27, Nancy Edmondson of Fairchild Tropical Garden, presented slides of the Garden's recovery from Hurricane Andrew and of various cloud forests of Central America. Before and after slides revealed excellent progress. She also presented slides of a proposed glass conservatory to cover the rare plant house. The could forests covered in her talk included Monte Verde, Costa Rica and Hardware Gap, Jamaica.

Then on March 24, Dr. Peter Mayotte presented a slide talk on his recent trip to peninsular Malaysia and Thailand. The presentation included slides and discussion of palms and cycads, both wild and cultivated, "discovered" on his recent trip. He also covered several species that Thai horticulturists are just introducing into cultivation.

The chapter newsletter circulation has increased to about 500. The Broward chapter also has the 2nd annual spring sale planned for May 7 and 8 at Flamingo Gardens.

News from Florida chapters by Ed Hall

News from North Queensland

In *Mooreana, Journal of The Palmetum,* it was announced that the main pathways throughout the Palmetum were maned to honor important palm botanists. The seven pathways include: **Harold E. Moore Crescent**—which passes through the Savannah and Xerophyte areas; **Odoardo Beccari Way**—commences at the Good Shepherd Hospice gates, passes through the Rainforest Area to the Picnic ground; **Max Burret Walk**—in the southern section of the Rainforest Area; **John Dransfield Walk** and **Natalie Uhl Walk**—both of which pass through the central Rainforest Area; **Hermann Wendland Circuit**—passes through the Swampforest Area; and **Carl von Martius Way**—commences in the Rainforest Area and continues to the Ross River boundary gate. Biographical notes and the botanists' contributions to the study of palms are given in an article in the December 1993 issue of *Mooreana. [Congratulations to the IPS Editors for being included in this august group.—Jim Cain.]*

The North Queensland Palm Society (NQPS) of PACSOA has elected new officers for 1994. These are: President–Joe Schmidt, Vice President—Jill Whalley, Secretary—Jessie Roberts, Treasurer—Rowan Carr, Seed Bank—Terry Hart, Librarian—John Dowe, and Committee—Anne Schmidt and Lorraine Tooth. The NQPS newsletter Editor for 1994 is Chris Gray. For NQPS contact information, see your IPS Membership Roster.

The NQPS met on March 7 at the Tumbetin Lodge in the Townsville Palmetum. Lorraine Tooth spoke on cycads. Various members brought a cycad or a cycad frond for discussion, with a group discussion also held on various palm items.

The Friends of the Palmetum conducted a "tour guides" course beginning on February 26. This is a great way to gain knowledge about palms in general, as well as to become very familiar with the various palms in the Palmetum. It's also a great way to meet fellow plant enthusiasts.

Dr. John Dransfield of the Royal Botanic Gardens Kew, was the featured speaker at a special informal evening hosted by the Friends of the Palmetum on March 3, 1994. Dr. Dransfield spoke on "The Palms of Madagascar". A light supper followed the talk.

News from South Queensland

The SQG met on January 17 at the Bread House. The newly elected SQG President is Bob Davey, with Will Kraa taking over as Vice President. An additional meeting was held on February 21, to finalize plans for the Annual Palm & Cycad Show.

The society's 10th Anniversary Show Dinner was held at the Murrayfield Room at the Queensland Rugby Union Club on March 5. Dr. John Dransfield of Kew Gardens was featured, speaking about the palm flora of Madagascar and about the upcoming book on this subject. The Dinner was very well attended as was the 10th Annual Palm and Cycad Show (and Sale) held at Mt. Coot-tha Botanical Gardens on March 5–6.

News from Western Australia

The Palm and Cycad Society of Western Australia met on April 21 at Leederville Town Hall, Cambridge. Mark Stewart from the Western Australian Quarantine and Inspection Service talked on the reasons for plant and animal quarantine and how the strict rules benefit all Australians. Russell Dyer gave a short talk on *Chamaedorea brachypoda,* a strikingly elegant *Chamaedorea.*

In February, an "African Cycad" night was held, producing a large number of different species of *Encephalartos, Cycas* and *Stangeria* native to Africa. Neil Jones gave a presentation on cultural and botanical information. Ken Adcock gave a short talk on snails in the Perth area. It was staggering to find such a large number of species in the metropolitan area and to find that *all of them* originate overseas. [Note the discussion of the April 21 meeting!]

Progress continues at Gascoyne Park. Police have arrested a suspect in the palm thefts from the park, so hopefully palms will now stop disappearing. Sunday, February 27 saw members at

Shenton Park digging an old *Howea*, a nice *Syagrus* (*Arecastrum*) *romanzoffiana* and a fine *Butia*, all of which were moved and transplanted at Gascoyne Park.

News from the Southern California Chapter of the IPS

The Annual Southern California Palm Society Banquet was held on February 5, 1994, at the Hyatt Newporter in Newport Beach. Nancy Edmondson spoke on the Palms of Madagascar. She is presently Curator of Special Projects at Fairchild Tropical Garden, having previously served at Assistant Horticulturist, Curator of Plants, and curator of Palms and Cycads. Prior to the luncheon, Bill Dickenson conducted a tour of the fabulous palm collection at the Hyatt Newporter.

The March 19 meeting was held in San Diego, consisting of a day of gardens and lectures at the Catamaran Hotel in the Mission Beach area. The day began with a brief tour of Mark Edwards' garden in the "Birdrock" area of La Jolla. Featured were nice *Bismarckia nobilis* and *Latania lontaroides*. At the conclusion of this tour, members returned to the Catamaran Hotel for informal tours of the hotel gardens and/or lunch. Hotel owner Bill Evans has planted a number of large specimens of rare species, including a huge *Jubaeopsis caffra* near the hotel entrance. At 1:00 p.m., Mark Binder provided a presentation on palms in the Wilson Botanical Gardens of Costa Rica where he worked in the summer of 1993; the talk focused on conservation issues and *Chamaedorea* palms. This was followed by Brad Carter's presentation on palms of Ecuador and South Africa, with slides from recent trips to both areas. A palm raffle and auction followed the lectures.

The May meeting on Saturday, May 14 will be hosted by the Ventura/Santa Barbara Section, at the home of Gunther and Michaela Schwarz. The Schwarz's home is situated on three acres in the hills above Santa Barbara. This is its first Palm Society showing after many years of planting palms.

Hawaii Island Palm Society

The Hawaii Island Palm Society held a barbecue, palm giveaway and rare palm exhibit on Friday, January 28, 1994 at Wailoa State Park. Election of officers followed the barbecue.

From the Pacific Northwest

The year opened with a general meeting at John Spaulding's home in Seattle on January 22. The group had a party at Roger Richardson's in Burnaby, BC on Saturday, January 29.

On February 12, a tour was held of the Bloedel Conservatory in Little Mountain, BC. The February 28th general meeting was held at Van Dusen Gardens, Vancouver, with another general meeting on March 26 at the home of Edie Baer in Portland, Oregon.

Additional general meetings scheduled for 1994 will be held on May 31, August 22 and November 28 at Van Dusen Gardens. A summer BBQ will be scheduled later, as will a palm society plant sale.

Louisiana Chapter

The Louisiana Chapter of the IPS met on March 20, 1994, at the Audubon Institute at the Audubon Zoo. Palm and Cycad Society of Western Australia met on April 21 at Leederville Town Hall, Cambridge. Mark Stewart from the Western Australian Quarantine and Inspection Service talked on the reasons for plant and animal quarantine and how the strict rules benefit all Australians. Russell Dyer gave a short talk on *Chamaedorea brachypoda*, a strikingly elegant *Chamaedorea*.

South African Palm Society News

The South African Palm Society held its recent Annual General Meeting (A.G.M.) on February 19, 1994, at Bonamanzi. The venue was a wonderful choice. Bucks were seen virtually every time one drove through the park, with numerous Lalal palms of all ages thriving. The tranquility and quiet of night was interrupted only by the music of frogs and insects and the occasional bucks butting horns.

The chalets and tree houses provided adequate accommodation and the kitchen was well equipped, doubling as a slide viewing venue in the evening. After the A.G.M., the plant sale and raffle raised nearly 1400 Rand for the Society. The weekend was rounded off by a visit to Rob and Sue Kirkwood of Mtubatuba and a tour of their nursery, Maywood, where many desirable palms were to be found at bargain prices. Following drinks and lunch, SAPS members meandered back to their homes and collections.

Trichardtsdal was selected as the venue for the 1995 SAPS Congress. Details will be provided later. At the A.G.M., it was decided that SAPS Editor Adrian van Rensen would attend the IPS Biennial in Caracas on behalf of SAPS. He will be accompanied by Bernard Fischer.

The Pretoria members will hold a social/palm sale on Saturday, May 30th.

News from the European Palm Society

The European Palm Society will hold a meeting in the south of France to begin on Monday, September 12, 1994. Members from the U.K. and continental Europe are planning quite a get-together. Details will follow in a later issue of *Principes.*

News from the French Palm Society, Fous de Palmiers

Fous de Palmiers (The French Palm Society) is planning a joint European meeting in the Nice-Monaco-Hanbury area in the south of France to be held in September of 1994. IPS members from other areas, including USA members, are also welcome to attend. If interested, contact Alain Herve of France or Martin Gibbons of the U.K.

The *Fous* has been very active in developing new chapters in southern Europe, particularly in Italy. In early April, a delegation of 12 *Fous* members visited the magnificent Rome Botanical Garden, met Italian friends and helped them with organizational tasks. Anyone interested in joining the Italian group should contact Francisco Du Santis (see IPS Roster).

Fous intends to develop a joint program with the Italians for a palmetum in the botanical garden of Hanbury near the French border. Part of the *Fous* collection of rare palms will be planted there. In addition, *Fous* is connected with the creation of another palmetum in the island of Porquerolles near Toulon, France.

News for Chapters along the Gulf of Mexico

The Louisiana Chapter of the IPS met on March 20, 1994, at the Audubon Institute at the Audubon Zoo. Members were free to roam the zoo after the meeting.

The Gulf Coast Chapter of the IPS held their Spring 1994 meeting on April 10 in Pensacola Florida, jointly attended by members of the Louisiana Chapter.

The Texas Chapter of the IPS held their Annual Palm Show on April 9, 1994, at Mercer Arboretum in Humble, just north of Houston. The weather was threatening thunderstorms all day and the turnout was light, but numerous unusual palm species were offered, focusing on plants suitable (or possibly suitable) for outdoor planting in the warmer coastal areas of Texas. The Texas Chapter also met on May 7 at the home of Gordon and Shirley Hintz of Cypress.

The next meeting is scheduled for July 23, 1994, at the home of Elizabeth and Jim Cain. The program will feature a slide presentation by Jim on the IPS Venezuela Biennial to be held in June as well as of the ten-day Tropical Venezuela tour arranged to numerous remote locations in Venezuela by the IPS and Lost World Adventures of Marieta (Georgia, USA) and Caracas (Venezuela). Seedling of the month will be *Phoenix paludosa* from seeds collected by Jim in Singapore in 1993.

Other news from Texas includes the good news that the Nature Conservancy has purchased 23 acres of the Brazoria Sabal habitat for preservation of the unusual palm population. Thanks from the Texas Chapter to the IPS for the 1990 donation toward this effort which helped convince the Nature Conservancy of the value of conserving these palms *in situ.*

Two More Groups Request IPS Affiliation

The "Asociacion Venezolana de Palmas", AVEPALMAS, of Venezuela and the "Palm and Cycad Society of Western Australia" have both requested affiliation with the International Palm Society and have submitted required documents.

The IPS Executive Committee has approved the affiliation, subject only to the concurrence of the full IPS board at the June meeting in Venezuela.

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PALM BRIEF

Coco-de-mer in Guyana

I very much enjoyed reading Peter Pritchard's description of the palms of Georgetown, Guyana, and its Botanic Gardens in the January 1993 issue of *Principes* (vol. 37, pages 12–18). His notes on the naturalization and spread of the Asian *Nypa* palm along the Atlantic coast were a revelation. He also said that there is presently only one, relatively young, specimen of the Coco-der-mer or Double coconut (*Lodoicea maldivica*) growing now at the Botanic Gardens. Nothing remains of three plants that were alluded to in the Georgetown Botanic Gardens Illustrated Guide of 1934. Palm Society members might be interested in a photograph taken by David Fairchild in 1932 when he visited that Garden. Note that Fairchild used an outdated scientific synonym for the palm. This picture is taken from the historically important collection of Fairchild negatives and prints housed in the Special Collections of the Montgomery Library of Fairchild Tropical Garden. The following is written in Fairchild's hand on the edge of the 5 × 7 inch negative: "Coco de Mer Palm, Lodoicea callipgye. Georgetown Botanic Garden 2.23.32 Dorsett holding nut."

JACK B. FISHER
Fairchild Tropical Garden
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1. "Coco de Mer Palm," photographed by David Fairchild.

Back Cover

A young, cultivated plant of *Trachycarpus martianus*, Shillong.