PRINCIPES

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THE INTERNATIONAL PALM SOCIETY

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PRINCIPES

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Contents for April

Cover Picture

Carpoxylon macrospermum on Espiritu Santo, Vanuatu. Photo by J. L. Dowe, see pp. 63–73.

PRINCIPES

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Principes, 33(2), 1989, p. 55

Editorial

The papers in this issue address a wide range of subjects: For those growing palms in areas prone to unpredictable cold spells, Leonard Goldstein's well-documented assessment of the effects of the 1984/85 winter on Frank Beer's collection of palms in south Florida has many useful suggestions and recommendations. Tamar Myers, with characteristic flair, discusses the merits of including *Butia capitata* in a palm garden. Ron Harris of Huntington Botanical Gardens discusses and offers a potential seed source for *Trithrinax campestris*, a much coveted ornamental.

In 1875 palm fruits from Vanuatu were used by Wendland and Drude as the basis of a new genus, *Carpoxylon*, with a single species, *C. macrospermum*. Since its publication, the genus has remained an enigma, as attempts to relocate the palm have been in vain. John Dowe writes of his exciting and chance rediscovery of *Carpoxylon* which is illustrated in color on the front cover. John was able to obtain a few seeds and this handsome but little known palm may soon be in cultivation. A second paper by John Dowe and Natalie Uhl provides the technical description (using the "Genera Palmarum" format) which will be an essential basis for reference and comparison with other genera. According to the authors the affinities of *Carpoxylon* lie with *Clinostigma*.

Two articles in this issue describe aspects of the dependence of rural people in the tropics on palms and palm products. Dr. Ruth Kiew has found in Peninsular Malaysia that bee keeping provides an important supplementary cash crop and that the bees are heavily dependent on palm pollen. There is a double advantage in that coconut production is actually increased when bees are acting as pollinators. She further discusses the involvement of bees in pollinating other palms.

In the other paper Steve Siebert provides an excellent assessment of the need and advantages of using rattan as a sustainable source of income for households in Kerinci, Sumatra. This important paper suggests a practical solution to uncontrolled destruction of tropical forest—the use of the forest as a renewable resource.

Can one estimate the total number of palms that will eventually be described? Dr. P. B. Tomlinson provides a method that leads to some significant conclusions. The "Palmy Extracts" in this issue give us an opportunity to transcribe "old English."

Finally we must comment on the short article from Ruth Kiew on the collecting of endangered palms in Malaysia. This is a problem that will gain in significance. We in the International Palm Society as palm lovers must be concerned about the long term future of the world's palms and we shall need to debate the effects of collecting activities on wild palms.

JOHN DRANSFIELD
NATALIE W. UHL

Principes, 33(2), 1989, pp. 56-62

Cold-Weather Experience in South Florida

LEONARD GOLDSTEIN
8101 S.W. 72nd Avenue, #313-W, Miami, FL 33143

Anyone who had to nurse tropical plants through the winter of 1984–85 in South Florida is not likely soon to forget the experience. It was one of those unintended cold-hardiness tests that everyone can do without, and palm fanciers aren't likely to complain if the testing skips a few years.

But at least there were useful lessons to be learned about cold tolerance in palms. Probably the best source of data is the collection of South Florida Chapter member Erik Beers. His property, located in western Broward County about 18 miles from the Atlantic Ocean, has relatively rough winters for a South Florida site. Low and open to the wind and somewhat removed from the influence of the Gulf Stream, the area is subject to cold weather of an intensity and duration historically unlikely to occur elsewhere in the region.

At the peak of the 1985 cold invasion, the night of January 21–22, temperatures in western Broward County were under freezing for more than 12 hours. The minimum was no higher than 26° F (−3.3° C) and possibly as low as 22° F (−5.6° C). Under those circumstances, palms which survived the freeze in western Broward are good candidates to do well in climates like that found in the more densely populated, warmer areas of South Florida closer to the ocean.

The chart that follows shows progress over time of a large selection of the palms growing at the Beers property. The data reflect subjective observations made about two weeks after the freeze and again on August 25, 1985. The key below should indicate what most of the entries signify, and further explanation is provided beneath Table 1.

Some observations merit special mention:

1. Although specimens of both *Thrinax* and *Coccothrinax* recovered very well, those of the latter recovered more rapidly.

2. A specimen of *Pritchardia beccariana* outperformed the locally common *Chrysalidocarpus lutescens*. The *Pritchardia* recovered completely, while two large clumps of *Chrysalidocarpus* were devastated, losing most major stems.

3. *Livistona* species were virtually unfazed by the cold, even young plants 18″ high, fully exposed to the wind. Consequently, most species of *Livistona* should come to occupy a special niche in the colder areas of South Florida.

4. Despite the record cold, there were very few total losses. Even where clumping palms were badly burned, by the time of the second inspection, almost all exhibited viable lower stems and suckers. So optimism is a major lesson learned from the great cold-hardiness test. Don't rush to remove badly damaged palms.

5. Easily the most significant result observed is the benefit of icing palms down. All of Beers' containerized material was under irrigation, and the insulating value of ice is obvious from the survey data.

Optimally, irrigation heads or sprinklers should be positioned for overhead watering. But, in any event, the key to success in this endeavor is to delay the start of irrigation until just before frost begins to form and then to leave it on until the temperature rises above freezing. This tactic will ice over and insulate the plant. But an interruption in irrigation, such as a selective "brownout" by the electric power company, can be disastrous, so do not

Table 1. Observations on cold hardiness.

Species		Height	IRR	EXP	Condition 1st Observation	Condition 2nd Observation
1. *Aceolorraphe wrightii*	(M)	2′	S	O	ND	R
2. *Archontophoenix alexandrae* var. *beatricae*	(M)	2′	S	O	ND	R
3. *Arenga pinnata*	(M)	3½′	S	O	ND	R
4. *Syagrus schizophylla*	(M)	2–4′	S	O	ND	R
5. *Carpentaria acuminata*	(M)	2½′	S	O	ND	R
6. *Coccothrinax crinita*	(M)	2′	S	O	ND	R
7. *Coccothrinax barbadensis*	(M)	1½–2′	S	O	ND	R
8. *Hyophorbe lagenicaulis*	(M)	2′	S	O	ND	R
9. *Livistona drudei*	(M)	6′	S	O	ND	R
10. *Livistona rotundifolia*	(M)	1½′	S	O	Minor burn	R
11. *Livistona* sp. "*tardom*"	(M)	3′	S	O	ND	R
12. *Livistona woodfordiana*	(M)	2½′	S	O	ND	R
13. *Neodypsis decaryi*	(M)	2–6′	S	O	ND	R
14. *Phoenix roebelenii*	(M)	1–3′	S	O	ND	R
15. *Sabal bermudana*	(M)	4′	S	O	ND	R
16. *Sabal causiarum*	(M)	2½′	S	O	ND	R
17. *Sabal minor*	(M)	2′	S	O	ND	R
18. *Syagrus coronata*	(M)	2½′	S	O	ND	r, stunted leaves
19. *Trachycarpus martiana*	(M)	1–2½′	S	O	ND	R
20. *Veitchia montgomeryana*	(M)	3½′	S	O	ND	R
21. *Zombia antillarum*	(M)	2′	S	O	ND	R
22. *Phoenix roebelenii*		9′	NS	O	25%	R
23. *Syagrus romanzoffiana*	(2)	18–25′	NS	O	30%	r
24. *Archontophoenix alexandrae* var. *beatricae*	(6)	20–25′	NS	O	50–100%	1 dead, 1 r, 4 R
25. *Roystonea* sp.		40′	NS	O	75%	R(6)
26. *Livistona chinensis*		18′	NS	O	ND	R
27. *Latania lontaroides*		10′	PS	O	100% burn except for lower leaves reached by sprinkler	R(5)
28. *Archontophoenix alexandrae* var. *beatricae*	(5+)	20–25′	NS	O	50%	R(5–6)
29. *Syagrus romanzoffiana*		20′	NS	O	ND	R
30. *Chrysalidocarpus lutescens*		12′	NS	O	95%	Most major stems dead, suckers R
31. *Chrysalidocarpus lutescens*		25′	NS	O	100%	2 major stems dead, 3 major stems alive

Table 1. Continued.

Species		Height	IRR	EXP	Condition 1st Observation	Condition 2nd Observation
32. *Arenga pinnata*		20′	NS	O	85%	R(4)
33. *Bismarckia nobilis*		7′	NS	O	60%	R(5)
34. *Corypha umbraculifera*		12′	NS	O	100%, heart OK	R(3)
35. *Borassodendron* sp.		8′	NS	O	80%	R(4)
36. *Licuala muelleri*	(M)	2–4½′	NS	P	25%	R
37. *Coccothrinax* spp., including *barbadensis*	(M)	7–15′	NS	O	25%	R
38. *Caryota mitis*	(M)	30′	NS	O	85%, suckers less	⅓ stems survived, 2 flowered, suckers R
39. *Caryota* sp. (single trunk)		35′	NS	O	100%	R(3)
40. *Aiphanes* sp.	(6)	15–25′	NS	P	100%	r(3)
41. *Livistona rotundifolia*		30′	NS	O	90%	R(8)
42. *Carpentaria acuminata*	(2)	40′	NS	O	100%	r(3)
43. *Carpentaria acuminata*		20′	NS	O	30%	r, fungus
44. Oil palms, unidentified	(M)	30′	NS	O	90%	r(3), scaly, weak
45. *Zombia antillarum*	(2)	2½′	NS	P	25%	R
46. *Licuala grandis*		4½′	NS	P	Minor burn	R
47. *Latania loddigesii*	(2)	18–20′	NS	O	70–90%	R(8)
48. *Licuala spinosa*	(2)	9′	NS	P	80% upper leaves, less lower	R
49. *Neodypsis decaryi*		20′	NS	O	90%	r(4)
50. *Chamaedorea cataractarum*	(2)	6′	NS	P	90% upper leaves	R
51. *Pinanga* sp. (ivory crownshaft)		12′	NS	P	100% except suckers	All major stems dead suckers r
52. *Howea forsteriana*	(M)	4½–10′	NS	P	50%	R
53. *Rhapidophyllum hystrix*		10′	NS	O	ND	R
54. *Roystonea* sp.	(2)	25–30′	NS	SP	90%	R(4)
55. *Archontophoenix cunninghamiana*		35′	NS	SP	10%	R(8)
56. *Cocos nucifera* 'Red Panama Tall'		25′	NS	O	100%	r(3), weak
57. *Cocos nucifera* 'Red Panama Tall'		15′	NS	O	80%	r(3)
58. *Chrysalidocarpus cabadae*		20′	NS	O	100% except suckers	All major stems dead, suckers R
59. *Hyophorbe lagenicaulis*	(3)	3–15′	NS	O	95%	R(3)
60. *Wallichia disticha*	(2)	18′	NS	O	15%	R(4, 10)
61. *Livistona saribus*	(4)	18′	NS	O	Tip burn	R
62. *Copernicia baileyana*	(5)	3–7′	NS	O	40%	R

Table 1. Continued.

Species		Height	IRR	EXP	Condition 1st Observation	Condition 2nd Observation
63. *Borassus* sp.		20′	NS	O	30% upper leaves	R
64. *Chrysalidocarpus madagascariensis*		12′ hedge	NS	O	100%	All stems dead,
65. *Veitchia montgomeryana*		50′	NS	O	100%	R(3)
66. *Thrinax* sp.	(2)	20–25′	NS	O	ND	R
67. *Arenga* sp. (clustering)		12′	NS	O	100% except small suckers	R(2)
68. *Allagoptera arenaria*		2½′	NS	O	10%	R
69. *Coccothrinax* sp.	(2)	20′	NS	O	90%	R
70. *Licuala spinosa*		8′	NS	P	100% except suckers	R
71. *Sabal mauritiiformis*		30′	NS	O	25%	R(7)
72. *Ptychosperma* sp. (clustering)		20′	NS	O	100%	Dead
73. *Hyphaene* sp.		10′	NS	O	15%	R
74. *Acoelorraphe wrightii*	(Many clumps)	20′	NS	O	ND	R
75. *Ptychosperma microcarpum*		20′	NS	O	100% except small suckers	All stems dead, suckers R
76. *Licuala spinosa*		3′	NS	O	50% upper leaves, 20% lower leaves	R
77. *Pritchardia beccariana*		10′	NS	P	70%	R(7)
78. *Rhapis excelsa*		5½′ hedge	NS	P	ND	R
79. *Archontophoenix alexandrae* var. *beatricae*	(14)	25–40′	NS	O	50%	R
80. *Syagrus schizophylla*	(3)	3–5′	NS	O	100%	r, scaly
81. *Pseudophoenix sargentii*		5′	NS	O	90%	r, stunted leaves
82. *Bactris* sp.		7′	NS	O	90%	suckers R
83. *Chamaerops humilis*		5′	NS	O	ND	R
84. *Bismarckia nobilis*	(6)	4–6′	NS	O	60%	R
85. *Astrocaryum mexicanum*		7′	NS	O	100%	r, stunted leaves
86. *Syagrus* sp. (small fruit)		20′	NS	O	98%	R(3½)
87. *Syagrus* sp. (large fruit)		25′	NS	O	50% (outer portions)	R
88. *Dictyosperma album*	(2)	6–25′	NS	O	100%	r, weak
89. *Cryosophila* sp.	(2)	5–6′	NS	O	100%	R
90. *Coccothrinax* sp.	(3)	4–15′	NS	O	80–90%	R
91. *Trithrinax campestris*		6′	NS	O	ND	R
92. *Copernicia macroglossa*		5′	NS	O	30% (outer portions)	R
93. *Livistona australis*	(5)	1½–3′	NS	O	ND	R
94. *Livistona drudei*	(3)	5′	NS	O	ND	R
95. *Butia capitata*		3′	NS	O	ND	R

Table 1. Continued.

Species	Height	IRR	EXP	Condition 1st Observation	Condition 2nd Observation
96. *Zombia antillarum*	6′	NS	O	100% except suckers	R
97. *Scheelea* sp.	20′	NS	O	50%	R
98. *Syagrus* sp.	18′	NS	O	90%	R
99. *Coccothrinax crinita* (2)	15′	NS	O	90%	R
100. *Coccothrinax crinita*	5′	NS	P	5%	R
101. *Copernicia alba* (3)	1½–2′	NS	O	Minor burn	1 dead (bud rot), 2 R

Alphabetized entries, Nos. 1-21, represent containerized palms. All others are in the ground. In many cases, more than a single plant of a species is present in one location. Such plants are indicated in the 'HEIGHT' column by either the letter M or the actual quantity in parentheses. 'EXP' indicates whether the palm was open to the sky and thus to more rapid radiant cooling. It does not indicate whether the palm was shielded by other plants from exposure to desiccating winds. Under 'CONDITION 2ND OBSERVATION', figures in parentheses show the number of new leaves that had emerged since the freeze. Species listed more than once in the survey are found in separate plantings on the property, which covers about five acres.

Key: IRR—irrigation, EXP—exposed, M—multiple specimens, S—under sprinkler, PS—partly under sprinkler, NS—not under sprinkler, O—open, P—protected, SP—semi-protected, ND—no damage, %—percentage of leaf surfaces burned, R—recovered, r—recovering.

attempt icing unless you can guarantee that sprinkling will be maintained throughout the frost period.

This survey should help you choose palm species which will thrive in climates where frost occasionally occurs. Remember, though, that the list is limited to palms growing on the Beers property; doubtless there are others which would perform quite well under the same conditions. Intentionally some of the common cold-hardy palms are not mentioned here.

One essential element that remains to be addressed is the type of weather preceding a frost or freeze and how it affects damage to palms. In most areas of the continental United States where palms can be grown outdoors, conventional wisdom teaches that a freeze following warm weather will do more harm than a freeze following an extended period of cool weather. However, South Florida (roughly the region south of a Fort Pierce–Fort Myers line) seems to fall into a unique category in this regard, to the extent that many palms here are more tolerant of a sudden freeze following normal weather than following a prolonged cool period. In fact, some palms fare worse as a consequence of protracted subnormal temperatures even without a frost event.

While superficially controversial, this statement makes sense when key words "warm" and "hardening off" are defined in South Florida terms. The daily average temperature in Miami in the statistically coldest period of the year is 67° F (19.4° C), representing a diurnal range of about 58°–76° F (14.4°–24.4° C). Consequently the typical winter day in South Florida is warmer than any place in the palm-growing states along the Atlantic Ocean, the Gulf of Mexico, and the southwestern border. To compare further, the average winter day in South Florida is generally as warm as the average *summer* day along the coastal fringes of California. Clearly, a normal winter day in South Florida is

balmier than any other mainland U.S. site without being abnormally warm.

With respect to the other continental U.S. palm-growing areas, the term "hardening off" refers to a process by which a plant adjusts to increasingly colder weather with the grower's knowledge and expectation that inevitably frost and occasionally hard freezes will follow. In South Florida, on the other hand, hardening is a subtly different process that consists of the almost immediate cessation of "tropical" rainfall and high humidity at the end of October. During the six dry months that follow, only 25% of the average annual rainfall of about 60 inches (1,524 mm) occurs. At the same time, however, the temperature decreases only gradually from the daily average of 75° F (23.9° C) at the end of the rainy season. Soil temperatures and tap water thus remain rather warm. Regular frosts and freezes are not part of the South Florida picture, particularly in the southeastern portion of the region.

Because the typical winter season here is warm but for a relatively few days, hobbyists are inclined to gamble on raising a large number of palm species outdoors. Many of these plants are highly tropical in origin; they have a chance to succeed in South Florida only because of the long tropic-like growing season. It is some of these exotics which appear ironically to be more successful at surviving a frost during an otherwise standard South Florida winter than surviving an abnormally cool, but frostless, winter.

A brief look at statistics may support the point. In 1977, the year of the Miami snowfall (snowfall in the sense that flakes could almost be counted individually), tender palms were assaulted on a couple of fronts. Not only was there a hard freeze—the USDA Plant Introduction Station at Chapman Field recorded lows of 29° F (−1.7° C) and 25° F (−3.9° C) on consecutive nights in mid-January—but there was also prolonged cool weather preceding the freeze. The last 15 days of December 1976 were 3.1° F (1.7° C) below normal, and the mean January temperature departed from the 67.2° F (19.6° C) daily norm by 6.1° F (3.4° C).

By contrast, the Broward County January 1985 freeze surveyed in this article occurred during a month when daily temperatures were 3.3° F (1.8° C) below average. December 1984 had actually been 2.6° F (1.4° C) above normal. As seen from the chart, many tender palms survived these conditions.

Surprisingly, though, many hobbyists consider the winter of 1980–81 to have been harder on palms than the freeze of January 1985. The last seven days of December 1980 were a whopping 10° F (5.6° C) below normal, and January 1981 was 7.5° F (4.2° C) under the historical average. Thus the period was significantly cooler than the cold spells of 1984–85 and even 1976–77! Yet, in contrast to those times, there was no freeze in January 1981. (Though a reading of 32° F [0° C] was officially recorded briefly one night, wind speeds no lower than 11 knots [12.65 mph] precluded frost.)

By conventional standards, the cool temperatures of winter 1980–81 should have hardened off and protected palms, minimizing damage. But, on the contrary, significant losses occurred. Many of the highly tropical palm species appeared to survive the nadir of the subnormal winter, only to die in early spring. Why? Most likely, day after day of cool weather imposed excessive stress, and cold soil left roots incapable of providing nutrients to the buds of sensitive palms. Plants were thus rendered vulnerable to pathogen invasion, and by the advent of spring weather, buds of many tender palms simply collapsed, having succumbed to secondary infections encouraged by the cool weather weeks before.

It therefore appears that in South Florida many highly tropical palm species can better handle a sudden frost or freeze than an extended cool spell. For at least those

palms, cold damage is cumulative and not a result predictable from the one-dimensional measurement of a thermometer reading. The search for dependable indicators, however, is frustrating, for each frost or freeze appears to leave a unique set of results. But, to define the problem simplistically, it may be said that occasional subnormal winter temperatures keep *Areca triandra* from lining the streets of Miami for the same reason that long-term cool weather keeps *Roystonea elata* from lining the streets of Beverly Hills.

Nonetheless, tender palms can be helped to survive a rough winter of any sort in South Florida. When temperatures drop, foliar applications of trace elements can provide nourishment that cold roots cannot. After extended cool spells or frost or freeze episodes, even those tender palms that appear undamaged should be sprayed with a fungicide to help fend off potentially lethal secondary infections. Many commercial fungicides are helpful, but it has been found in many trials that Kocide and Manzate, applied together at the same rate as if used alone, have a synergistic, or enhanced, effect. Treatments should be administered in strict compliance with the instructions for use and with recognition that no fungicide is capable of eliminating all pathogens. Until and unless the dynamics of cold weather in tissue damage is better understood, maintaining a sharp eye and employing an ounce or two of prevention may be your best allies in keeping a palm healthy through and following atypical cold weather.

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LETTERS

Dear Dr. Uhl:

We are studying fruit-seed morphology at the family level.

As part of this study we would like to ask readers of *Principes* to help us obtain fruits of the palm genera listed. . . . unlisted generic names have accessions in the U.S. National Seed Herbarium. Usually any species of a listed genus will do, and the seeds need not be viable. For the most part, 5–10 fruits per sample will be sufficient.

Anyone contributing fruits to this study will receive a letter of acknowledgement from the Agricultural Research Service and will be acknowledged in our publication and receive a copy of the publication.

CHARLES R. GUNN
Curator, U.S. National Seed Herbarium
USDA/ARS/PSI/SBM7NL
Bldg 265, BARC-EAST
Beltsville, MD 20705 USA
301-344-4695

Actinokentia
Alloschmidia
Alsmithia
Ammandra
Asterogyne
Balaka
Barcella
Basselinia
Borassodendron
Brassiophoenix
Brongniartikentia
Burretiokentia
Calospatha
Campecarpus
Carpoxylon
Chambeyronia
Chuniophoenix
Clinosperma
Cyphokentia
Cyphophoenix
Cyphosperma
Eleiodoxa
Gastrococos
Goniocladus
Gronophyllum
Guihaia
Gulubia
Halmoorea
Hyospathe
Iguanura
Iriartella
Itaya
Kerriodoxa
Laccospadix
Laccosperma
Lavoixia
Lepidocaryum
Lepidorrhachis
Lytocaryum
Mackeea
Masoala
Maxburretia
Moratia
Nannorrhops
Oraniopsis
Palandra
Pholidostachys
Physokentia
Plectocomiopsis
Podococcus
Pogonotium
Pritchardiopsis
Retispatha
Satakentia
Sclerosperma
Siphokentia
Sommieria
Tectiphiala
Veillonia
Welfia
Wendlandiella
Wodyetia

Principes, 33(2), 1989, pp. 63–67

The Unexpected Rediscovery of *Carpoxylon macrospermum*

JOHN L. DOWE
18 Amelia Street, Albion 4010, Queensland, Australia

In the late 19th century, a palm with large woody fruits was reported as occurring on Aneityum (also known as Anatom), an isolated island in the south of the Vanuatu chain (previously New Hebrides) about 400 km northeast of New Caledonia. The palm was subsequently named *Carpoxylon macrospermum* by Wendland and Drude in Linnaea 39 in 1875. Apart from meager but adequate illustrations of a single fruit and the seed in three views (Plate I in Wendland and Drude 1875) which was reprinted in A. C. Langlois' "Supplement to Palms of the World" (1976) no other record, description or material is presently known to exist.

For over one hundred years the palm has remained in obscurity and one was only able to speculate about its habitat, appearance, and relationships. At one time it was thought to be synonymous with *Kajewskia aneityensis* but this was disproved by Dr. H. E. Moore (1957) and *K. aneityensis* was placed in synonymy under *Veitchia spiralis*, an accepted but imperfectly known species definitely known to occur on Aneityum.

This uncertain situation prompted a search on Aneityum in 1982 by Ken Foster and Don Hodel, but *Carpoxylon* was not located. The failure to find the palm placed a very large question mark against its existence (Hodel 1982).

In all probability, *Carpoxylon* no longer occurs on Aneityum, if in fact it ever did. Aneityum is a small island of 160 km^2 with a maximum elevation of 852 m and since the turn of the century has been slowly denuded of natural vegetation through human activity, especially the clearing of the land for cultivation and the burning of previously exhausted land in the false hope of rejuvenation. Extensive logging has also been responsible for the permanent alteration of the natural conditions. The island has experienced a rapid population increase in recent years due to repatriation of villagers from nearby islands affected by violent volcanic activity, particularly from Tanna, 90 km to the north.

The Sighting

In early 1987, a decision was made by the Publication Fund of the Palm and Cycad Societies of Australia to commence the gathering of material which was to be the basis of a book on the palms of the southwest Pacific, an ambitious project covering a vast area from Vanuatu in the north to New Zealand in the south, from Lord Howe Island in the west to Fiji in the east and to include New Caledonia, Norfolk, and Raoul Islands. This area contains about 83 palm species in 36 genera.

Some parts, such as Vanuatu, had been poorly studied as regards the palm flora, so the gathering of firsthand information was important and a study trip to the area was organized for November–December 1987. Vanuatu consists of some 80 islands, strung out through 800 km of ocean; a plan which would allow the inclusion of the most obviously important islands was formulated. Due to the unwieldy logistics of visiting Aneityum—lack of amenities and

infrequent transport to and from the island—a decision was made not to include it on the trip. Regrettably, with this decision also went the possibility of searching for *Carpoxylon*, which at that stage was still presumed to occur only on Aneityum.

The three islands chosen for the trip included Efate, on which is situated the capital city of Port Vila, approximately in the center of the island chain, Vanua Lava, a small but palm rich island in the Banks Group in the far north of the country, and Espiritu Santo, the country's largest island, situated about halfway between Efate and Vanua Lava.

Preliminary study had acquainted me with the palm flora of Vanuatu, consisting of about 19 species, most being closely related to species in the Solomon Islands to the north and Fiji to the east. Even though New Caledonia is the closest land mass and presumably of floristic influence, the relationship of its palm flora is tenuous, with only one genus (*Cyphosperma*) reported to have species elsewhere. A very distinct "botanical boundary" lies between New Caledonia and Vanuatu with species within the subtribes of Calaminae, Metroxylinae, Arecinae, and Ptychospermatinae not occurring further south than Vanuatu. The only subtribes which occur in both areas are Iguanurinae and Livistoninae.

The islands of Efate and Vanua Lava proved to be of immense interest with most indigenous species being located, studied, and photographed. Noteworthy was the sighting of *Metroxylon salomonense* on Vanua Lava, the first record of it in Vanuatu, as well as the finding of a *Licuala* sp. which displays an affinity with both *L. lauterbachii* and *L. grandis*. It possesses symmetrically divided leaves, as in the former, but long pendulous inflorescences as in the latter.

The third and final part of the trip was a "tour" of Espiritu Santo to locate *Metroxylon warburgii*, *Veitchia macdanielsii*, *Licuala grandis* and undetermined species of *Clinostigma*, *Calamus*, *Cyphophoenix*, and *Cyphosperma*.

On one excursion, the day prior to my planned departure to Australia, I took the road west along the coast from Luganville (Santo Town) in the direction of Tasmalum. The road is a coral based structure suitable for all-weather driving and despite its rough appearance proved relatively comfortable. *Veitchia macdanielsii* is common throughout this area and two fruiting specimens were observed in a garden close to the road. Before entering a private property, a certain amount of protocol is to be observed, as is the Melanesian custom, so I had first to find the landowner who happened to be working with the copra dryer nearby. After explaining my request to collect the mature fruits of the *Veitchia*, he obligingly helped me fill my plastic bags. As the topic turned to palms in general, the farmer offered to take me to a palm "which is different from this one." My first reaction was to say to myself, "Oh no, not another *Veitchia*," as I had become blasé about the many hundreds which I had been so confused by in the previous weeks, but of course I agreed to his suggestion.

We proceeded along the road and after some time a turn-off was taken in the direction of the seashore. The vegetation in the area became predominantly moist habitat species—*Rhizophora*, swamp *Pandanus* and *Metroxylon warburgii*. We came

→

1. *Carpoxylon macrospermum*. A. The youngest of the group of four, with the first inflorescence and another in bract. Note the epiphytic aroid on the trunk at left. B. Inflorescence with immature fruit and one in bract. C. The arch of the leaf can be seen, accentuated with the help of the native assistant. The angle at which the erect pinnae are inserted can also be appreciated from this photo. D. The fruits are produced in the extreme basal nodes of the rachillae. The infructescence being held by local villagers.


A
B
C
D

across a river. The farmer, now turned guide, urged me to wait in the car for him while he fetched some fruits of the mystery palm. He dashed off into the swampy undergrowth lining the river, reemerging some 10 minutes later displaying in his open hand a large green fruit. To my astonishment, I was looking at a three-dimensional version of the illustration in "Supplement to Palms of the World." "*Carpoxylon*?" I questioned aloud. I could scarcely contain my excitement and dashed off into the undergrowth amid shouts of "Don't go—mosquitoes, mud—" etc. Within a few minutes I was standing amidst the bases of four graceful palms growing in a close group, the tallest to about 18 meters and the smallest to about 6 meters (Fig. 1A). They had large pinnate leaves, gracefully arching with erect mid-leaf pinnae (Fig. 1C), a long glossy green crownshaft (Fig. 1B), and wide-spreading inflorescences below (Fig. 1D).

"*Carpoxylon*," I said aloud again, contemplating my wonderfully good fortune.

After composing my thoughts and actions, I arranged with the farmer guide to climb the palm to secure a sample of flowers, fruits, and leaves. Unfortunately flowers were not available, but an infructescence with immature fruits was removed along with a complete leaf and a small number of semi-mature fruits from another infructescence. These samples were later deposited at the herbarium in Port Vila (PVV—Dowe 030). A selection of photographs were also taken.

To maintain polite protocol, the local chief was contacted to gain permission to search the area for other specimens. Chief Molicosotamata, a venerable and jovial character from a nearby village situated on the opposite side of the river, and possessing a knowledge of every square inch of bush in the surrounding district, informed me that apart from this group of four palms, there was only one other individual some distance upstream. Unfortunately daylight was failing and as my return to Australia was planned for the following day, I had to return to Santo Town without a thorough search of the area and many questions left unanswered.

The Second Collection

Upon returning to Australia, the announcement of the rediscovery of the elusive *Carpoxylon* filtered through the palm world (Dowe 1988). Forthwith, a second trip was planned to collect flowers and mature fruits to allow a complete description to be made.

The second trip was undertaken in April 1988 and an active involvement by the Department of Agriculture and Forestry was sought and obtained. I was accompanied to the site by Rodney Ambai, Forestry Officer stationed in Santo Town. We reached the site early in the morning, made contact with Chief Molicosotamata, and proceeded to arrange some tree climbers. This proved somewhat difficult as all men and boys were away working in the fields, but after some searching and prompting in nearby villages some volunteers were recruited.

The subsequent collection included flowers in bud, fully mature fruits, prophyll and peduncular bracts, and a number of leaf sections. These were promptly dispatched to Natalie Uhl at Cornell University, who had previously agreed to assist with the description of *Carpoxylon* (pp. 68–73). A bonus was the collection of a limited number of mature fruits which were distributed to appropriate persons and institutions in Fiji, Australia, and the United States in an attempt to introduce this handsome, elegant palm into cultivation.

Further discussion with Chief Molicosotamata also raised doubts as to whether this population of five individuals are of natural occurrence. Two specimens, one the tallest of the group of four and the other, the individual farther upstream, were largish trees when Molicosotamata was only a boy of around 10 and at that time were

pointed out as special trees to him by his father. The other three specimens are the natural progeny of the tallest within the group of four. Whether the two original trees were actually planted by his father is still open to debate, but it appears that it may be so. Two other reports of *Carpoxylon* have also been received by the author, both being single cultivated specimens, one on the island of Ambai to the east of Espiritu Santo, the other on Erromango, 150 km to the north of Aneityum. As yet, these reports have not been verified.

It appears possible that *Carpoxylon* is extinct in the wild, but a few cultivated and seminatural specimens are still surviving.

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Principes, 33(2), 1989, p. 67

Palms of Africa

A limited edition (500 sets) of prints of palm paintings by botanical artist Elsa Pooley—*Phoenix reclinata*, *Raphia australis*, *Hyphaene coriacea* and *Borassus aethiopum*. These finely detailed art prints (20 × 14 in.) come in a cover with line drawing to scale of the 4 palms, with detailed notes, and cost US $230 including airmail postage. Orders to: Pooley Wildlife Productions, P.O. Box 295, Scottburgh 4180, South Africa 03231-31503.

(Note: Two sets of colored proofs of these paintings were sent here. I'll be glad to forward them for examination to any individual or Chapter. Natalie W. Uhl, 467 Mann Library, Cornell University, Ithaca, N.Y. 14853)

Principes, 33(2), 1989, pp. 68–73

Carpoxylon macrospermum

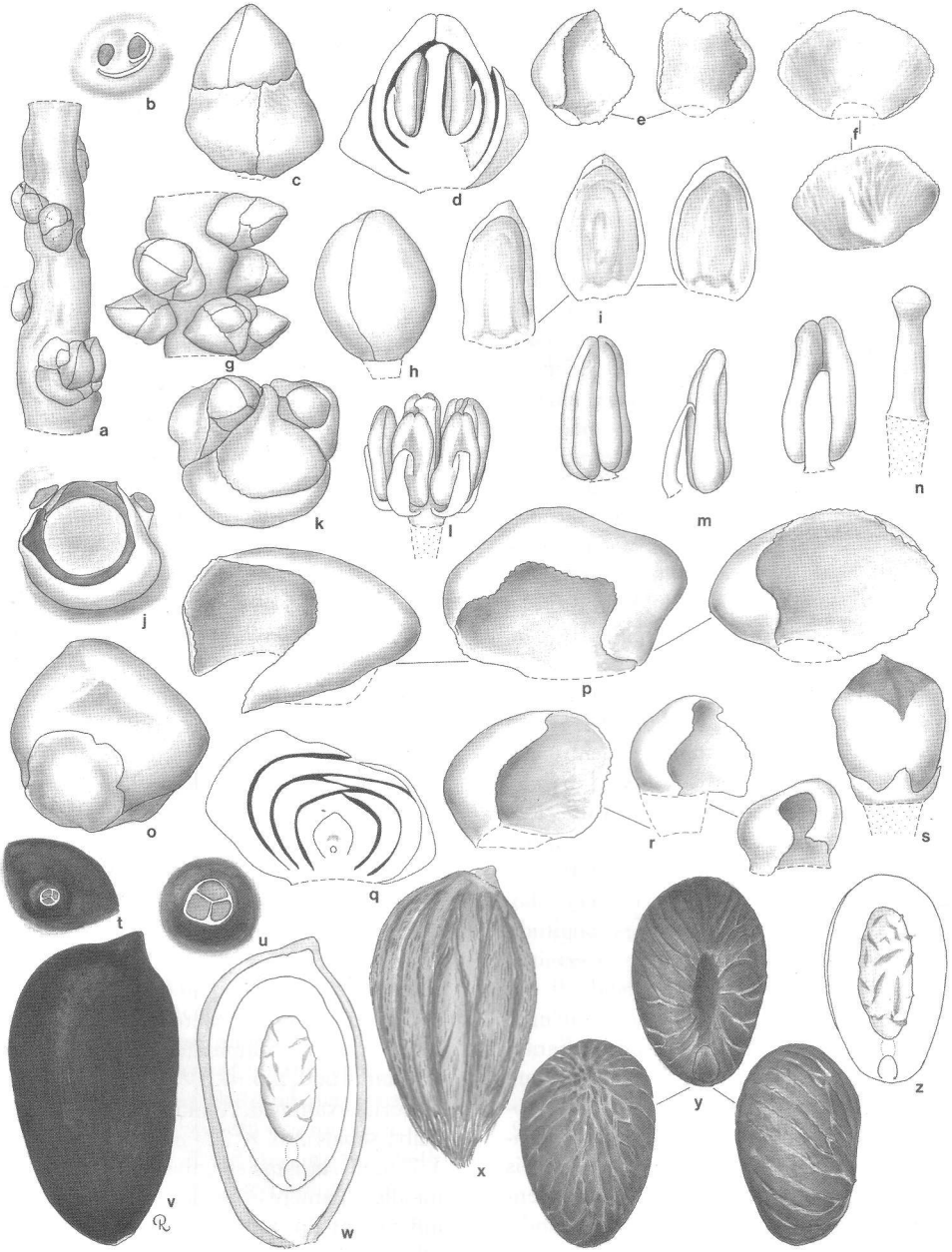
JOHN L. DOWE AND NATALIE W. UHL

18 Amelia Street, Albion 4010, Queensland, Australia, and
L. H. Bailey Hortorium, 467 Mann Library, Cornell University, Ithaca, NY 14853

When "Genera Palmarum" went to press in 1986, *Carpoxylon* was known from fruit only. Since lack of information made it impossible to include the genus in the hierarchy of the classification, it was placed in an "Incertae Sedis" group along with the Madagascar genus *Masoala*. The rediscovery of *Carpoxylon*, described in the accompanying paper (Dowe 1989), allows us to provide here a complete description of the genus and its one species and to consider further the relationships of this unusual palm.

Carpoxylon H. A. Wendland & Drude, Linnaea 39: 177. 1875. Type: **C. macrospermum** H. A. Wendland & Drude. (Fig. 1, Cover Photo; see also Fig. 1, accompanying paper, p. 65).

Moderate, solitary, unarmed, pleonanthic, monoecious palm. Stem erect, longitudinally fissured, swollen basally and with a boss of adventitious roots, prominently ringed with slightly sunken leaf scars, internodes short. Leaves regularly pinnate, spreading but arched towards the tips, neatly abscising; sheaths forming a crownshaft, crownshaft glossy, glabrous to lightly scaly, splitting opposite the petiole; petiole short, wider proximally, ridged adaxially, rounded abaxially; rachis flexible, broadly ridged adaxially at base, narrowly ridged distally, rounded abaxially, extending beyond the apical leaflets in a flexible tip; leaflets subopposite, in one rank, apically and basally inserted at right angles to the rachis, more obliquely inserted at midleaf, leaflets single fold, erect, linear, tapering to an irregularly rounded, more or less bifid tip, stiff, coriaceous, horizontal to erect, glabrous adaxially, with numerous punctate scales abaxially, midveins most prominent, marginal veins next largest, two other pairs of large veins conspicuous, transverse veinlets not evident. Inflorescences infrafoliar, branched to three orders basally, to one order distally, branches stiffly spreading; peduncle short, stout, elliptical in cross-section; prophyll completely encircling the peduncle at insertion, tubular, two-keeled, tapering distally, splitting abaxially, tomentose; peduncular bracts 2, the first inserted shortly above the prophyll, the second an equal distance above the first, both tubular, complete, tapering to rather short pointed tips, glabrous, caducous; scars of 2–3 incomplete bracts above the inner peduncular bract; rachis about twice as long as the peduncle, rachis bracts low, ridgelike in slitlike cavities, subtending ca. 10 primary branches; primary branches stout, dorsiventrally flattened, with a short bare part and two large lateral pulvini at the base, bearing very shallow bracts, each in a slitlike cavity, subtending rachillae; rachillae angled, tapering, also with basal pulvini, rachilla bracts shallow, rounded, subtending triads of flowers for about one-third their length, paired staminate flowers with some intermingled solitary staminate flowers above the triads, and solitary staminate flowers distally, in triads one staminate flower often distal and one lateral to the pistillate flower, flowers lateral to each other in staminate dyads, rachilla ending in a short bare portion; first bracteole surrounding the pistil-



Carpoxylon macrospermum. a, portion of rachilla in bud ×1⅓; b, scars of staminate dyad ×3⅓; c, staminate bud ×6⅔; d, staminate bud in vertical section ×6⅔; e, two stminate petals ×6⅔; f, staminate petal in two views ×6⅔; g, portion of rachilla with staminate buds ×2⅔; h, staminate bud sepals removed ×6⅔; i, staminate petals ×6⅔; j, scars from floral triad ×3⅔; k, triad ×3⅔; l, androecium ×6⅔; m, stamen in three views ×6⅔; n, pistillode ×6⅔; o, young pistillate bud ×6⅔; p, pistillate sepals ×6⅔; q, pistillate bud in vertical section ×6⅔; r, pistillate petals ×6⅔; s, gynoecium with staminodes ×6⅔; t, end of stigma ×1; u, end of stigma enlarged ×3; v, fruit ×⅔; w, fruit in vertical section ×⅔; x, endocarp ×⅔; y, seed in three views ×⅔; z, seed in vertical section ×⅔.

late flower large, rounded, coriaceous, the second smaller and more shallow. Staminate flowers very asymmetrical in bud, rounded or pointed apically; sepals 3, distinct, irregular, imbricate basally, keeled, prominently ridged when dry; petals 3, distinct, valvate, tips thickened, ridged when dry; stamens 6, filament slender, inflexed at tip, anthers more or less sagittate basally, slightly bifid apically, dorsifixed just below the middle, latrorse, versatile, connective tanniniferous; pollen elliptic in polar view with finely reticulate tectate exine; pistillode elongate, slightly longer than anthers in bud, tip enlarged, rounded. Pistillate flowers in young bud, irregular, rounded; sepals 3, distinct, very broadly imbricate, extremely thick basally; petals 3, very broadly imbricate, thick basally, tips thick, valvate; staminodes joined in a shallow ring with about 5 broad toothlike tips; gynoecium irregularly obovoid, unilocular, uniovulate, stigmas 3, fleshy, ovule erect at stage studied, ? anatropous. Fruit obovoid to ellipsoidal, red at maturity, stigmatic remains eccentrically apical, epicarp smooth, wrinkled basally when mature, mesocarp thick, with close packed longitudinal fibers, endocarp rather thick, whitish, bony, longitudinally ridged, large operculum over embryo. Seed obovoid, raphe elongate, branches longitudinal, endosperm homogeneous. Germination adjacent ligular, eophyll bifid.

Distribution: One species rediscovered 30 November 1987 on Espiritu Santo, Vanuatu where growing in silty alluvium on the edge of a small stream. The population may have been planted (see accompanying article), thus the wild location is uncertain. The original description mentions the mountains of the Vanuatu Islands.

Carpoxylon macrospermum H. A. Wendland & Drude, Linnaea 39: 177, Plate 1, Fig. 3. 1875. Type: Vanuatu, fruit only,? in GOET, not found.

Stem erect to 18 m, ca. 35 cm diam. DBH, base enlarged, 50 cm in diam., leaf scars whitish, prominent, internodes 7 cm long near base to 2 cm long distally. Leaves regularly pinnate, 3.5–4.0 m long; crownshaft green, 1.5–2.0 m long, somewhat larger in diam. towards base; petiole 25 cm long or less, wider proximally; rachis wide to 6.5 cm at base, 4.5 cm wide in middle, 4.0 cm wide distally, extending beyond apical leaflets in a flexible tip about 12 cm long; leaflets about 70 on each side of rachis, proximal ones 114 × 1.5 cm, mid-leaflets 122 × 3.2 cm, distal ones 36 × 1.5 cm. Inflorescences infrafoliar; peduncle stout, elliptical in cross-section, about 14 cm long, 4 cm diam.; prophyll 70 cm long, about 8 cm wide, peduncular bracts two, the first inserted ca. 5 cm above the prophyll, the second 5 cm above the first, each 70 × 7 cm tapering to a woody tip ca. 5 cm long; scars of two to three incomplete bracts above the inner peduncular bract; rachis ca. 36 cm long, rachis bracts subtending 10 primary branches; primary branches stout, lower ones to 2 cm wide with a basal bare portion 7–8 cm wide; rachillae stout, ca. 5 mm diam. and 30–40 cm long, tapering, also with basal pulvini, bearing spirally arranged, rather distant triads, 1.5–1.0 cm apart, for about one-third their length, rachillae much reduced in diam. to 2–3 mm distally, first bracteole surrounding the pistillate flower shallow, 2–4 mm high, rounded, coriaceous, evident in fruiting rachillae, second bracteole smaller and more shallow. Staminate flowers very irregular in bud, 2.5–4.5 × 2.0 mm in young material examined, rounded or pointed apically; sepals 2.5 × 3.0 mm; petals 2.9 × 1.7 mm; stamens six, dorsifixed near the middle, filaments slender, 1.5 mm long, inflexed at tip; anthers 2.0 mm long; pistillode 2.0 mm long. Pistillate flowers studied in very young bud, 2 × 6 mm, irregular; sepals various in size, about 4 × 2 mm; petals imbricate, also not completely developed and varying in size, about 3 × 2 mm; staminodes 0.5 mm high; gynoecium obovoid, 2 mm high × 1.5 mm wide. Fruit slightly obovoid to ellipsoidal, 6 ×

3.5 cm, stigmatic remains eccentrically apical; epicarp thin, mesocarp 2 mm thick with large fibers, endocarp 3–4 mm thick, thicker basally, longitudinally ridged, bony below ridges, operculum circular, large. Seed large, ellipsoidal, 4 × 2.5 cm, raphe fibers abundant, extending laterally, little anastomosing, endosperm homogeneous with central cavity; embryo basal. Germination adjacent ligular, eophyll bifid.

Discussion

Carpoxylon, then known only from fruit, was put in Areceae Incertae Sedis in "Genera Palmarum" (Uhl and Dransfield 1987). The newly collected material allows a subtribal placement. The large operculum over the embryo places the genus clearly in Subtribe Iguanurinae of the Areceae, where it appears most closely related to *Clinostigma*. This relationship is further supported by preliminary cladistic studies of Iguanurinae; using a data base of 32 characters, *Carpoxylon* and *Clinostigma* are indicated as sister genera (Uhl and Dransfield unpubl.). *Carpoxylon* differs from *Clinostigma* in lacking stilt roots, in the stiffly ascending rather than the pendulous pinnae of most species of *Clinostigma*, in two rather than a single peduncular bract, in inflorescence branches stiff and spreading rather than more or less pendulous, and in a ridged, bony rather than a thin crustaceous endocarp. Species of *Clinostigma* are poorly known as are those of other genera of Iguanurinae; more field studies are needed and may change the circumscription of *Carpoxylon*. A revised "Key to the Iguanurinae," with *Carpoxylon* now included follows:

Key to the Genera of the Iguanurinae

1. Prophyll completely encircling the peduncle at insertion, leaving a circular scar when caducous; stamens 6 or more 2
1. Prophyll incompletely encircling the peduncle at insertion, open abaxially, leaving an incomplete scar upon falling; stamens always 6 20
2. Seed irregularly ridged, furrowed and sculptured with adherent fibers ..... *Alsmithia*
2. Seed ± small, not ridged or sculptured 3
3. Staminate flowers borne in vertically oriented pairs sunken in distinct depressions distally, smaller than and lateral to pistillate flowers proximally on the rachillae; fruit large, with apical stigmatic remains. Fiji ..... *Neoveitchia*
3. Staminate flowers borne in horizontally oriented pairs distally, lateral to pistillate flowers proximally on the rachillae; fruit moderate, rarely large with apical, lateral, or basal stigmatic remains 4
4. Inflorescence interfoliar; fruit covered with prominent corky warts; stigmatic remains basal in fruit 5
4. Inflorescence interfoliar, or infrafoliar, fruit smooth or merely pebbled to granulose when dry; stigmatic remains various 6
5. Peduncular bract inserted near the base of the peduncle; fruit more than 2.5 cm in diameter. Marquesas Islands ..... *Pelagodoxa*
5. Peduncular bract inserted at the apex of the peduncle; fruit 1.5 cm in diameter or less. New Guinea ..... *Sommieria*
6. Flowers borne in laterally compressed pits, the staminate on long, hairy pedicels; fruit with stigmatic remains lateral in lower ¼; seeds ridged and grooved. Southern India and Nicobar Islands ..... *Bentinckia*
6. Flowers sessile or impressed in the rachillae but neither in laterally compressed pits nor the staminate with hair covered pedicels; stigmatic remains apical to basal; seeds smooth 7
7. Leaflets several-ribbed with praemorse apices or leaf blades, when not divided laterally, with toothed margins; inflorescences usually interfoliar; triads shallowly to deeply sunken in depressions in the rachillae. Malay Peninsula, Borneo, Java, Sumatra ..... *Iguanura*
7. Leaflets 1-ribbed with acute or acuminate apices; inflorescences various; triads superficial 8
8. Seed with ruminate endosperm 9
8. Seed with homogeneous endosperm 12
9. Leaf sheaths splitting opposite the petiole, not forming a prominent crownshaft; inflorescences interfoliar, at least in bud, sometimes infrafoliar at anthesis or in fruit; the peduncle elongate, prominent, usually as long as the rachis or longer. Philippines to Micronesia, New Guinea, Solomon Islands ..... *Heterospathe*
9. Leaf sheaths tubular, forming a prominent crownshaft; inflorescence infrafoliar; peduncle usually much shorter than the rachis 10
10. Inflorescence lacking branches adaxially except at the apex, branched to 1 order only and the lower branches ± ascending, not divaricate from the rachis at a 90° angle; fruit black at maturity. Mascarene Islands ..... *Dictyosperma*

10. Inflorescence with branches spirally arranged, the lower branches abruptly divaricate at about a 90° angle from the rachis and again once- or twice-branched; fruit yellow, orange, or red 11
11. Stamens 6–9; pistillode prominent. Nicobar Islands, Malay Peninsula, Moluccas, New Guinea to the Solomon Islands ..... *Rhopaloblaste*
11. Stamens 15–30 or more; pistillode minute or lacking. New Guinea, Solomon Islands ..... *Actinorhytis*
12. Staminate flowers mostly larger than the pistillate; stamen filaments inflexed at the apex in bud; anthers dorsifixed, with elongate connective, not didymous 13
12. Staminate flowers mostly smaller than pistillate; stamen filaments erect in buds; anthers didymous 19
13. Stamens 12; fruit with basal stigmatic remains, lacking a shell of sclereids. New Caledonia ..... *Cyphokentia*
13. Stamens 6; fruit various 14
14. Endocarp minutely pitted; seed with lateral embryo. New Caledonia ..... *Alloschmidia*
14. Endocarp not pitted; seed with basal embryo 15
15. Leaf sheaths split opposite the petiole; inflorescence interfoliar. Lord Howe Island ..... *Lepidorrhachis*
15. Leaf sheaths forming a prominent crownshaft; inflorescence infrafoliar 16
16. Inflorescence densely tomentose; fruit with apical stigmatic residue. Ryukyu Islands ..... *Satakentia*
16. Inflorescence glabrous or at most minutely hairy; fruit with subapical to nearly basal stigmatic remains 17
17. Complete peduncular bracts two; endocarp hard, moderately thick, with longitudinal ridges. Vanuatu ..... *Carpoxylon*
17. Complete peduncular bracts one; endocarp thin or thick and prominently sculptured 18
18. Stilt roots usually developed; staminate flowers markedly asymmetrical, with short, trifid pistillode and acute sepals and petals; fruit lacking sclereids but with prominent, often greatly thickened fibers. New Ireland to Samoa ..... *Clinostigma*
18. Stilt roots not developed; staminate flowers symmetrical, with pistillode as long as stamens in bud and rounded sepals and petals; fruit with a layer of short sclereids beneath the exocarp. New Caledonia ..... *Moratia*
19. Fruit ellipsoidal, with basal stigmatic remains; sclereids lacking in mesocarp but tannin cells present. New Caledonia ..... *Brongniartikentia*
19. Fruit globose or nearly so, with lateral stigmatic remains; mesocarp with a shell of short sclereids beneath the exocarp 19
20. Leaf sheaths with minute scales, split opposite the petiole and not forming a crownshaft; peduncle short; fruit small, 1.4–1.6 cm in diameter, with tannin cells interior to sclereid layer. New Caledonia ..... *Clinosperma*
20. Leaf sheaths densely scaly, tubular and forming a prominent crownshaft; peduncle elongate; fruit large, ca. 3.2 cm in diameter, lacking tannin cells. New Caledonia ..... *Lavoixia*
21. Seed terete or 2-lobed in cross-section, ovoid, ellipsoidal, globose or rarely kidney-shaped in outline 21
21. Seed irregular in cross-section, externally angled or intricately ridged, furrowed, and sculptured 23
22. Fruit with apical stigmatic remains 22
22. Fruit with lateral stigmatic remains. New Caledonia ..... *Basselinia*
23. Stilt roots prominent and stout; pistillode of staminate flower shorter than stamens; fruit often curved apically. New Caledonia ..... *Campecarpus*
23. Stilt roots not prominently developed; pistillode of staminate flower longer than stamens, columnar; fruit straight. New Caledonia and Loyalty Islands ..... *Cyphophoenix*
24. Leaf sheaths split opposite the petiole in bud, not forming a prominent crownshaft; inflorescence among the leaves in bud, becoming infraoliar in fruit; peduncle elongate, much exceeding the rachis; prophyll and peduncular bract more or less persistent, at length marcescent; inflorescence branches with long bare basal portions, prominently swollen at the insertion, stiffly and divaricately 1-branched or the distal undivided. Fiji and New Caledonia ..... *Cyphosperma*
24. Leaf sheaths forming a prominent crownshaft; inflorescence infrafoliar; peduncle shorter than the rachis; prophyll and peduncular bracts caducous; inflorescence branches without a long basal bare portion, nor swollen at the insertion 24
25. Staminate flowers symmetrical; pistillode thick, columnar, longer than the stamens in bud, expanded into a broadly capitate apex; fruit subglobose with stigmatic remains lateral in upper third, the surface minutely granular-papillate. New Caledonia ..... *Veillonia*
25. Staminate flowers slightly to markedly asymmetrical, the pistillode elongate-conic to angled-columnar, shorter than the stamens in bud, not broadly capitate; fruit smooth or drying pebbled but not granular-papillose 25
26. Bracteoles surrounding the pistillate flower sepallike; anthers with locules not continuous but interrupted by sterile connectivelike areas; fruit drying densely pebbled and shouldered; mesocarp not readily separable from the stony, intricately sculptured, 4-angled endocarp with

dorsal groove, flanked by 2 ridges. New Caledonia ..... *Burretiokentia*

26. Bracteoles surrounding the pistillate flower very narrow, rarely (*P. dennisii*) with a slender process but never sepallike; locules of anthers continuous; fruit globose or subglobose or collapsing and drying wrinkled but not pebbled; mesocarp with a shining inner layer adjacent to and readily separated from the endocarp, endocarp sharply 4-angled to variously ridged and sculptured but always with a dorsal ridge. New Britain to Fiji ..... *Physokentia*

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Bees and Palms in Peninsular Malaysia

RUTH KIEW AND MOHAMAD MUID

Department of Biology and Department of Plant Protection, Universiti Pertanian Malaysia, 43400 Serdang, Selangor, Malaysia

Bees which in Malaysia have been observed visiting palms belong to the genera *Apis* and *Trigona*. These include the two important honeybees in Malaysia, the Malaysian honeybee, *Apis cerana indica*, which can be kept in hives, and the giant honeybee, *Apis dorsata*. The sweat bees, *Trigona* spp., are important pollinators in the rain forest but they accumulate very little honey.

Palms and *Apis cerana indica*

The past five to ten years have seen a surge in beekeeping among smallholders as a means of supplementing their income. The impetus for this has partly been the high retail price of local honey (M$25 or US$9.70 per kilo compared with M$9 for imported Australian or Chinese honey) and partly because apicultural research on the local honeybee has put beekeeping on a sounder footing.

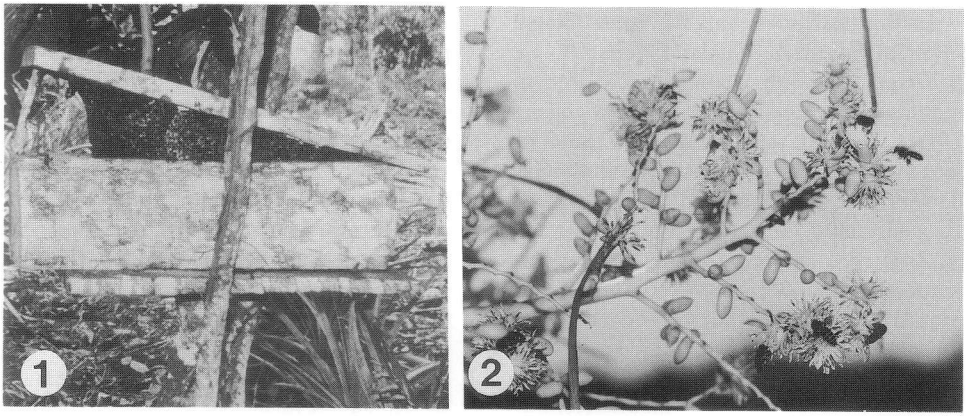
Prime beekeeping areas in Peninsular Malaysia are the coconut growing areas: Bagan Datuk (Perak), Tanjung Karang-Sabak Bernam (Selangor) and Batu Pahat-Pontian (Johore). This is because coconut supplies a steady source of nectar and pollen for the honeybee throughout the year. In mixed farming areas bees also forage preferentially on coconut. MaiShihah (1987*a*) found that they will go beyond their usual range (300–500 m) to collect coconut pollen and nectar.

Coconut provides both pollen and nectar to the bees. Observations on pollen loads carried in the pollen baskets of bees returning to the hive showed that *Apis cerana indica* collected coconut pollen from 0700–1300 hrs (MaiShihah 1987*b*). Male flowers release their pollen early in the morning. Both male and female flowers secrete nectar early in the morning and by 1000 hrs it has dried up. The female flowers have a second but smaller nectar secreting peak in the afternoon (Che Tek Kamariah 1985).

Coconut pollen forms over 85 percent of all pollen types found in honey from coconut growing areas and is the only pollen type found in all Malaysian honey investigated (MaiShihah 1987*a*). Farmers have remarked that after keeping bees their harvest of coconuts has increased, though they have no exact figures to substantiate this claim.

Annual honey yield averages about 4 to 5 kg per hive but there is a wide range, from 0 to 10 kg, the result of using genetically variable wild colonies and varying degrees of management, especially of requeening. Muid has found that vigorous dwarf hybrids of coconut at Tanjung Karang produce seven regular harvests of honey a year compared with the tall Malayan varieties which produce honey only between April and July. The stocking rate is about ten hives per hectare in coconut-coffee areas with a lower stocking rate in coconut-cacao areas. Although in absolute terms, this may seem a small monetary return for the time invested, beekeeping is an important supplementary cash input for the small farmer.

Under natural conditions, *Apis cerana indica* nests in hollow coconut trunks. Farmers also make simple hives out of coconut logs, which sell for M$3. They are called by the Javanese name, *gelodog*



1. A *gelodog*, a coconut trunk hive, containing a colony of *Apis cerana indica*. 2. *Apis cerana indica* bees collecting pollen from *Veitchia merrillii*.

(Fig. 1). Fragments of coconut husk also come in handy to burn in the smoker when handling the bees.

Apis cerana indica kept in hives will also forage on other cultivated palms depending on their availability. In the Batu Pahat area where sago, *Metroxylon sagu*, is widely cultivated, sago pollen accounted for 7 percent of the pollen in honey from that area (MaiShihah 1987*a*).

The Manila palm, *Veitchia merrillii*, attracts bees in its vicinity, which avidly collect pollen and also nectar. Each flower has 60 stamens with large white anthers (Fig. 2). In the mixed farming area at Universiti Pertanian Malaysia, *Veitchia* pollen accounted for 7 percent of the pollen in honey. Fruit set is heavy.

Kiew observed that the honeybee was the most regular visitor on the MacArthur palm, *Ptychosperma macarthuri*, though in lesser numbers than for *Veitchia*. Bees began to visit the male flowers when there were about twenty or more male flowers open on a single inflorescence and peaked in number (10 to 20 bees at any one time) when there were between 200 and 300 flowers open. They began to visit the flowers as they were opening (0700 hrs) and were most active before 0900 hrs. Although there were more female flowers open in the peak flowering period (between 400 and 1,200 flowers, male and female, on a single inflorescence) only a few bees (1–3 at any one time) visited the female flowers irregularly and then later (1000 hrs) than the male flowers. However, their behavior indicated they were collecting nectar as they systematically circled the stigma. Fruit set in *P. macarthuri* in Malaysia is heavy indicating that pollination is successful. *Apis cerana indica* is probably the major pollinator as the only other insect visitors seen, and then only rarely, were a blowfly and a wasp species (the latter probably a predator of the honeybee).

Mardan and Kiew (1985) recorded the betel nut, *Areca catechu*, as a pollen source. Lee (1980) reported that the Royal palm, *Roystonea regia*, was exceptionally attractive to all species of bees, and that *Apis cerana indica* was only able to forage for pollen from the fallen male flowers as those on the inflorescences were "always under the control of wild bees." Burkill (1919) observed that *A. cerana indica* collected pollen from the fallen flowers of the sugar palm, *Arenga pinnata*, perhaps for the same reason. He also reported pollen collection from the Princess palm, *Dictyosperma album*. Kiew has also observed clouds of *Apis cerana indica* in the wild collecting pollen from the orange-yellow flowers of *Arenga westerhoutii*.

In the coastal regions of Samut Songkram in Southern Thailand, nipa, *Nypa fruticans*, is an important pollen source as it flowers throughout the year (Wongsiri 1987). In Malaysia, Fong (1987) noted that apid bees (?*Apis cerana*) visited male flowers in the morning to collect pollen. He considered them to be pollen thieves.

Apis cerana indica is the major pollinator of coconut. In both the Manila and MacArthur palms, *Apis cerana indica* is the most abundant visitor and visits both the male and female flower (though the latter less frequently and in lower numbers). It is likely therefore that *Apis cerana* is a pollinator of these two palms. In other species where pollen is collected from the male flowers but the female flower is not visited, it is probably just a pollen thief.

Apis cerana indica also avidly visits male inflorescences of the oil palm, *Elaeis guineensis*, for its copious pollen. (Oil palm in Malaysia is mostly pollinated by the introduced weevil, *Elaeiodobius kamerunicus*). This source of pollen is not recommended as it results in dark, bitter honey.

Palms and Wild *Apis* and *Trigona* Bees

The giant honeybee, *Apis dorsata*, nests in tall trees in the lowland rain forest where it builds its single combs below the branches. Between twenty to more than a hundred combs can be found on a single tree. The bee forages widely over the forest but it is also found in orchard areas. Makhdzir Mardan (pers. comm.) in the course of his research on this bee was told by honey hunters that *Apis dorsata* forages on a wide range of palms. These include coconut, betel nut, oil palm, nipa, bertam (*Eugeissona tristis*), bayas (*Oncosperma horridum*), nibong (*O. tigillarium*), ibul (*Orania sylvicola*), salak (*Eleiodoxa conferta*) and several rattans. It is not known whether the bee collects only pollen or both pollen and nectar.

Burkill (1919) noted that *A. dorsata* visited coconut as well as the ornamental palms, *Chrysalidocarpus lutescens*, the Princess, and Royal palms.

There are about 30 species of *Trigona* in Malaysia. Fong (1987) reported two species of *Trigona* visited both the male and female inflorescences of nipa in greater numbers than did *A. cerana indica*. He considered that they are pollen robbers. *Trigona* spp. are also reported to visit male flowers of bertam, which produce purple pollen (Dransfield 1970, cited by Henderson 1986) and *Iguanura wallichiana* (obs. by Kiew). Dransfield (1979) observed trigonids and honeybees visiting male flowers of *Plectocomia* sp., a rattan with hyacinth-scented flowers. Kiew observed male flowers of *Daemonorops didymophylla* visited by *Trigona melina* (identified by Khoo S. G.), which collected pollen. In all these palms the trigona bee was not observed visiting the female flowers, so they are unlikely to be pollinators.

Palms therefore are an important food source for bees. Primarily they collect pollen, which as a protein source, is an important foodstuff for the developing larvae. As Burkill remarked (1919) in most cases the bees obtain "food without giving what would seem adequate return," i.e., they are not the pollinators. However, in palm species that they visit, the male flowers are produced in abundance, usually have many large stamens, which produce copious pollen. The fact that these species all reproduce by seed shows that pollen theft by bees does not jeopodize their pollination.

Palm species pollinated by *Apis cerana indica* in Malaysia include the coconut, MacArthur, and Manila palms. They initially attract the bee to the inflorescence by the mass effect of the simultaneous opening of many showy orange-yellow or white flowers. Scent seems of minor importance as they are scarcely scented. The Manila palm flowers smell faintly of honey, those of the MacArthur palm have a slight sourish smell, and coconut flowers smell faintly sweet.

Cross pollination is effected by the male flowering phase being separated by a few days from the female phase on a single inflorescence. Pollen and nectar of the male flowers are only available early in the morning, after which the female flowers secrete nectar. This effects the movement of bees from male flowers on one inflorescence to the female flowers on another inflorescence, which results in pollination.

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Principes, 33(2), 1989, pp. 77–78

Seed of Trithrinax campestris

RON HARRIS

965 Terrace 49, Los Angeles, CA 90042

The palm *Trithrinax campestris* is both very rare and unique. The upper surfaces of the leaves on its multiple trunks are covered with a white woolly fuzz which makes the palm look white rather than green. And because it is a native of Argentina, it is far more cold tolerant than most palms.

When I first came to work as curator of the palm and jungle gardens at the Huntington Gardens, San Marino, California, Inge Hoffmann of the International Palm Society's Seed Bank, and John Tallman of Ventura College, asked me for seed of *Trithrinax campestris*. I went into the garden to check on our mature specimen of this species, and found six green seeds on one old inflorescence, plus at least twelve new flower heads forming.

A few people warned me to protect the seeds from rodents, but I didn't move fast enough. One by one the new flower heads were eaten, after which the seeds disappeared. Since then requests have come from all over the world for seeds of this palm—together with suggestions on how to protect the seeds from rodents by placing some type of wire mesh around the inflorescence. That procedure works well for most palms, but not for *Trithrinax*

campestris—for the reason that the inflorescence of *T. campestris* is practically inaccessible. Not only are the leaves very stiff and very sharply pointed, but in addition the leaf base consists of many sharply pointed spines the size of knitting needles. The inflorescence is quite small and is neatly packed inside this formidable defense.

Another idea was to place a wire cage completely around one of the heads of the palm. I decided against that because it would require cutting away the skirt of the palm to permit sealing the wire against the trunk, and I think that the skirt is a very beautiful aspect of the palm.

The third alternative is to cage the entire tree as a protection from rodents. With a generous donation of $250 from the International Palm Society's Seed Bank, and with a matching amount from a Special Project fund, we are now erecting a rodent-proof cage around the entire tree. We hope that possibly within a year, the Seed Bank will have seeds of the very rare and beautiful palm *Trithrinax campestris* to distribute to members of the International Palm Society who request them.

To request a packet of seeds of *Trithrinax campestris*, members of the International Palm Society should *NOW* address a request for them to the IPS Seed Bank, 695 Joaquin Avenue, San Leandro, CA 94577. Packets will be distributed in sequence of orders received, as seeds are received, at the standard billed price of $2 per packet.

Principes, 33(2), 1989, p. 78

Coconuts: An Appeal for Information

The coconut palm is the most widely distributed crop plant in the tropics but its one time supremacy as a source of vegetable oil has been superseded by soybean and oil palm. These have relegated the coconut to a less important position than it deserves.

The first edition of Longman's COCONUTS was written by Reginald Child in 1964 and a second edition in 1974. The opportunity to write a new edition for Longman comes at a time when the competition from other vegetable oils makes it necessary to reassess the coconut palm as a source of energy as well as food. Subjects which were only mentioned in the earlier editions can be dealt with in greater detail; for example, the commercial performance of F1 hybrids can be evaluated, the progress in embryo and tissue culture can be compared with the successes and failures in other crops and the economics of processing and marketing of copra can be examined in terms of the renewable resource requirements of the tropical countries in which coconuts grow.

The book is intended to be used at both the practical and the academic level. In addition to obvious chapters on breeding, agronomy, pests, diseases and processing, there will be a whole chapter devoted to extension and another to economics and marketing. Any scientists, extension officers, economists or planters who have worked with the coconut palm over the last 20 years are invited to tell the author what, in their opinion, should be included in the new book. In particular, lists of publications and recent reprints are requested. All letters will be answered and no work will be quoted without attribution.

Please write to:

HUGH C. HARRIES
17 Alexandra Road
Lodmoor Hill Weymouth
Dorset DT4 7QQ
England

Principes, 33(2), 1989, pp. 79–87

The Dilemma of a Dwindling Resource: Rattan in Kerinci, Sumatra

STEPHEN F. SIEBERT

Department of Natural Resources, Cornell University, Ithaca, NY 14853

In 1972, John Dransfield (1974) observed that "rotan manau" (*Calamus manan*) was "extraordinarily abundant" in the hill dipterocarp forests of the Batang Merangin in Jambi, Sumatra and that "the hill-slopes and ridges (in the nearby Bukit Barisan) carried an almost overwhelming variety of rattans." In 1987, all that remained of the Batang Merangin forests were huge burnt stumps and where previously "manau" had flourished there are now thousands of hectares of coffee, cinnamon, and pepper farms. In similar fashion, the forests of the Bukit Barisan are pockmarked by small farms whose numbers seem to be growing at exponential rates.

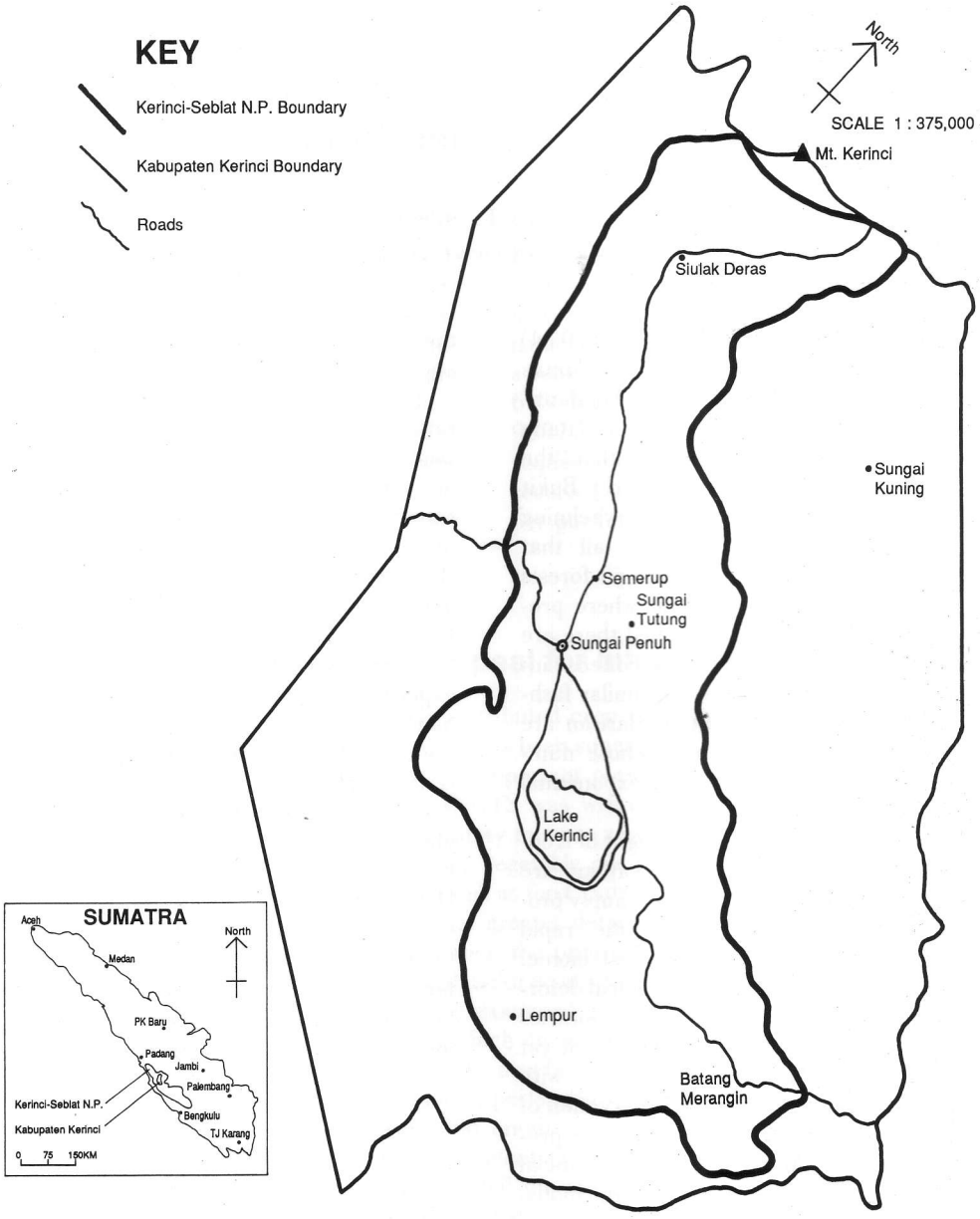
To those familiar with the plight of tropical rain forests, these observations are neither new nor profound; they simply provide additional evidence of the rapid destruction of the world's richest biome. While the rate and extent of tropical deforestation is grim, particularly in countries such as Indonesia, the situation is not yet hopeless. As Mares (1986) notes with respect to South America, conservation of tropical flora and fauna is still possible provided there is a Marshall Plan-like financial and institutional commitment by the industrialized West and major reforms in tropical countries themselves.

Increased financial support and improved institutional capacities alone will not control deforestation. Effective tropical forest conservation will also require improved understanding of the underlying causes and rationale of deforestation and the identification and development of appropriate remedial measures.

This article examines deforestation and rattan exploitation in the Kerinci region of west-central Sumatra, Indonesia. Following a discussion of forest conversion and rattan use, the cultivation and management of the rattan, *Calamus pilosellus* Becc., is examined as a potential economic development and forest conservation tool. Random sample plot analyses of wild rattans, seedling propagation trials, on-farm experiments, and interviews with rattan handicraft producers were used to gather the data. The basic premise of the article is that the popular preservationist plea, "conservation for development" is misplaced and that emphasis should actually be "development for conservation." Deforestation in Kerinci will likely be controlled only to the extent that alternatives to forest conversion, expecially forest farming, are found. Enterprises that simultaneously encourage economic growth and forest conservation are desperately needed.

Kerinci

Kerinci is an administrative unit (Kabupaten) in Jambi, Sumatra (Fig. 1). It has been inhabited for centuries by an indigenous ethnic group, the Kerincinese, who developed an extensive rice culture in the 10 by 80 km long valley. Kerinci also refers to a 1.5 million hectare national park, Kerinci-Seblat, that completely encircles the valley and to Mt. Kerinci,



1. Kerinci, Sumatra.

which at 3,800 m, is one of the highest peaks in the Malay Archipelago.

Kerinci-Seblat N.P. contains a diverse assemblage of flora and fauna, including the entire range of lowland dipterocarp to alpine heath communities and critical wildlife habitat for such rare and endangered species as the Sumatran tiger, serow, Sumatran rhino and elephant. In short, it is a preserve of global conservation sig-

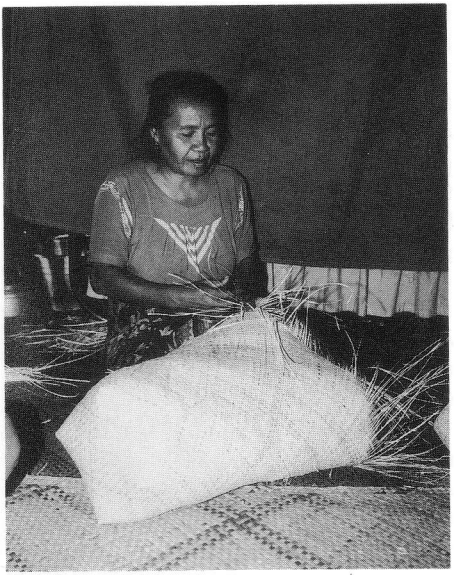
nificance. Management of Kerinci-Seblat N.P. is seriously complicated by the Kabupaten Kerinci enclave. At present, approximately 275,000 people live in the Kerinci enclave and the population is increasing at about 2.2% annually. Agriculture remains the economic base of the region with irrigated rice and perennial cash crops (i.e., cinnamon and coffee) the major products. Kerincinese utilize forest resources, which means the national park, for a variety of purposes, especially rattan and timber gathering and for acquiring new farm land.

The Use and Abuse of Rattan in Kerinci

Rattan has been widely used in binding, weaving, and basketry for many generations in Kerinci. In fact, a tradition of rattan basket weaving developed in the village of Sungai Tutung to the extent that this single village now provides the entire valley with its rattan basket needs (Fig. 2).

At present, local rattan use is largely confined to two species: *Calamus manan*, whose large, strong canes are used to make basket frames, and *C. pilosellus* whose small, white canes are split and used in basket weaving and general binding. Other rattans, such as *Calamus* sp. and *Korthalsia rigida*, may be occasionally used, but because of inferior color, strength, and workability, they are much less desired than *C. manan* and *C. pilosellus*.

The history of commercial rattan gathering in Kerinci dates from the Dutch colonial period. Dutch records reveal, for example, that as early as 1913 16,361 kg of "rotan sego" (probably *Calamus caesius*) worth 3,009 Dutch guilders was exported from Kerinci (Anom., 1915). The extent of this early rattan trade and its impact on the abundance and diversity of wild rattan is difficult to determine. However, based on Dransfield's observations (1974) and the recollections of collectors, rattan in Kerinci appears to have been an abundant and largely undisturbed resource prior to the mid-1970s.



2. Sungai Tutung artisans weave rattan baskets (*janke*) using split *Calamus pilosellus* canes.

In the mid-1970s two events would begin to shake the foundation of the Sungai Tutung rattan business and ultimately threaten the forest resources of the entire region: the illegal and nearly complete extermination of *C. manan* for export furniture manufacturing and a rapid increase in the rate and extent of forest conversion to farms.

The collection of rattan and all other plant and animal products from Kerinci forests is prohibited. In reality, observance of this regulation is far from complete. Beginning in the mid-1970s and continuing until the early 1980s, *C. manan* harvesting was big business in Kerinci. Reconstructing details of this trade is difficult due to its illegal nature. However, conversations with former "manau" collectors revealed that, at its peak, hundreds of men, working in teams of 6 to 8 cruised the National Park forests up to 40 km from the valley. Harvested canes were carried to the roadside where they were stored in

warehouse-like buildings and then shipped by truck to Padang for export.

One wonders how an illegal business of this size and longevity could prosper without official knowledge. The answer is simple, it was "official." KODIM, the local military unit, in cooperation with a Javanese businessman reportedly operated the business. Such blatant disregard for forestry regulations is unfortunately not unusual in Indonesia where, as Robison (1985) cogently argues, state (military) exploitation of natural resources for its own benefit is the norm.

Commercial rattan exploitation in Kerinci has now ceased, not because Indonesian institutions have changed, although there is increased concern about forest conservation, but rather because all export-quality canes have already been collected. The commercial rattan operation gathered only *C. manan* and thus did not affect other rattans. However, the impact on *C. manan* was profound; hundreds of tons were extracted and the species was almost exterminated. Rattan gatherers report that *C. manan* are now found only as immature plants in isolated sites and that fruiting plants have not been observed since the early 1970s. The fact that *C. manan* does not reproduce vegetatively and that collection of immature canes (i.e., before fruiting) continues for Sungai Tutung basket making casts serious doubt about the potential survival of this species.

Conservation of *C. manan* will require the complete cessation of all harvesting in the hope that remaining immature plants will mature and set fruit. If *C. manan* harvesting is to stop, however, alternative basket framing material will have to be developed. Some Sungai Tutung artisans have already begun making portions of their basket frames out of wood (*Toona sureni*), while others substitute the crude but serviceable canes of another rattan (*Korthalsia rigida*). Undoubtedly, a substitute will be found, for as one artisan put it, "for us rattan is like 'sambal' (the fiery chili-pepper sauce that is a staple at every Kerincinese meal); we prefer fish 'sambal,' but if the fish is gone we'll settle for vegetable 'sambal' or as a last resort, just plain 'sambal,' but we have to have 'sambal.' "

Whether or not *C. manan*, *C. piloselllus*, or any other rattans survive over the long-term will ultimately depend on the extent to which deforestation is controlled. Habitat destruction, particularly the conversion of forests to perennial cash crops, is widespread and completely uncontrolled throughout Kerinci-Seblat N.P. (Fig. 3). The current rate and extent of forest degradation is unknown and in the absence of remote sensing data, is probably impossible to determine. However, informal ground surveys in the eastern and central sectors of the park indicate complete or imminent forest conversion in most flat to gently sloping areas (Fig. 4). The favorable soil and topographic conditions of these sites are probably also productive for many rattan species as well.

Control of forest conversion will require identifying the farmers involved and understanding the rationale for their activities. Deforestation in the eastern and central sectors of Kerinci-Seblat is largely the work of young, resource-poor households from three villages in the central valley (Semerup, Siulak Deras and Sungai Tutung). Discussions with forest farmers from these villages reveal that land degradation (i.e., soil infertility and erosion) has made hillside farming unproductive or unprofitable in their home regions, that population pressure and resultant land scarcity deprive many young families of access to farming altogether (either on the slopes or in the rice fields), and that there are no alternative income sources available. In other words, from the forest farmer's point of view, forest conversion is a logical response to resource scarcity in the absence of economic alternatives.

Understanding the logic of deforestation is invaluable because it can steer resource managers towards potentially viable alter-

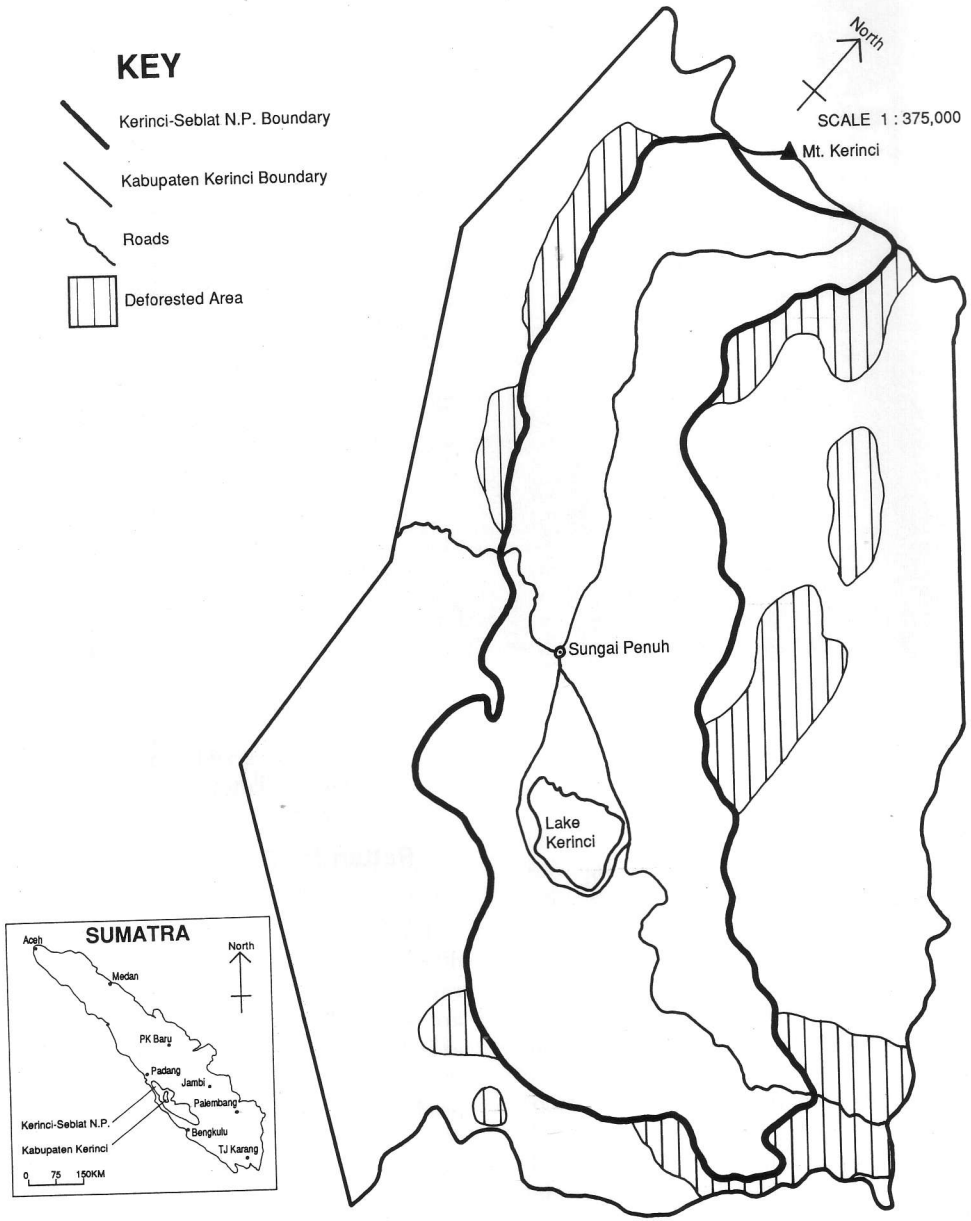
3. View of Sungai Kuning forest conversion, 25 km inside Kerinci-Seblat National Park.

natives and away from strategies that are likely to fail. For example, given economic necessity, coercive measures and simple prohibitions alone are unlikely to stop deforestation. In fact, years of vigorous policing and now an extremely costly program of forced eviction and relocation support this point; deforestation has not even slowed.

The realization that economic need is the driving force behind deforestation implies that its control will require developing real economic alternatives. That young households who lack access to land or other opportunities are the principal forest farmers, suggests that this group should be targeted for assistance programs and that initial efforts should focus on the three villages noted above. Lastly, a detailed understanding of local conditions suggests at least one potential remedial measure worthy of further consideration: the cultivation and management of *C. pilosellus* in conjunction with rattan handicraft manufacturing and marketing in the village of Sungai Tutung.

Rattan for Development and Conservation

Environmental and socioeconomic conditions in Sungai Tutung are poor by Kerinci standards; the slopes above the village are severely degraded and now largely abandoned to *Imperata cylindrica* grass, there is no room to expand irrigated rice production and many households lack access to land altogether, traditional rattan basket and handicraft making is constrained by shortages of canes and capital, and economic alternatives to forest farming are unavailable to the bulk of the population. The predictable result is that hundreds of Sungai Tutung residents migrate to the forest to cultivate coffee, cinnamon, and other cash crops. In cruel irony, Sungai Tutung rattan artisans are flocking primarily to the Batang Merangin



4. Forest conversion in the Kerinci region of Kerinci-Seblat National Park.

where Dransfield marveled at the abundance of "manau" just 15 years ago. Discussions with these migrants reveal that: most would prefer to live and work in Sungai Tutung given the choice and most remain interested in producing rattan products. What then are the prospects for developing viable household rattan businesses in Sungai Tutung?

A sustainable and productive rattan

industry requires assured supplies, efficient production, and adequate markets. The availability of rattan, in terms of quantity, quality, and desired species, probably represents the greatest constraint to expanded rattan handicraft production. As previously noted, current rattan harvesting in Kerinci occurs primarily in the National Park and is thus illegal. Before rattan businesses can be expanded a sustainable and legal source of cane must be identified.

High quality rattan handicraft production will require an abundant supply of *C. pilosellus* and small amounts of *C. manan* or a suitable substitute. For conservation purposes the prohibition against *C. manan* collection should be maintained and an alternative found for its use in basket frames. As noted above, wood or secondary rattan species appear to be viable substitutes. The prohibition against *C. pilosellus*, on the other hand, needs to be reevaluated.

C. pilosellus, unlike *C. manan*, is a clustering rattan, capable of profuse vegetative propagation (Siebert, unpubl. data) and, according to collectors, is not adversely affected by repeated harvesting (i.e., it sprouts new canes). In addition, it is found in a wide variety of forest types throughout Kerinci and appears to be extremely abundant (Siebert, unpubl. data).

Basic abundance and age class distribution data of *C. pilosellus* populations were estimated in undisturbed and previously collected primary forests in the two principal rattan collecting regions of Kerinci (Sungai Kuning and Lempur, Fig. 1). Twenty-five sample plots, each 10 × 20 m or 1/50 ha, were established at regular intervals along random transects in four locations (one undisturbed and one disturbed site in both areas) and the number and size of *C. pilosellus* plants noted in each plot. The results indicate that there is an average of 122 (±164) and 320 (±452) *C. pilosellus* plants per hectare in the Sungai Kuning and Lempur regions, respectively. The wide standard deviation in *C. pilosellus* populations appears to result from microtopographic features, particularly soil drainage characteristics and the density of the forest canopy (Siebert, unpubl. data). Disturbed and undisturbed sites did not differ significantly with respect to the proportion of mature plants (i.e., those producing canes), which supports collectors' observations that *C. pilosellus* can be repeatedly harvested.

Based on the apparent abundance, vegetative reproductive characteristics, and ability to be repeatedly harvested, National Park personnel should consider allowing managed collection of *C. pilosellus* for use in local basketry and handicraft businesses. Sections of the park could be opened for limited rattan gathering based upon estimates of supply and demand while periodic monitoring could insure sustained yield management.

National Park personnel will have to be convinced of the conservation value of managed forest product trade and encouraged to assist the program. At present, the only alternative to forest farming provided by park planners is eviction and relocation. This program will move approximately 150 forest farmers from Kerinci to lowland Jambi where they are to become rubber tappers. The viability of this "transmigration" program is dubious due to the high cost (thousands of dollars per household), thousands of households involved and high failure rate; the majority of those relocated in an earlier program have reportedly already given up rubber tapping and returned to Kerinci.

In addition to managed harvesting of wild *C. pilosellus*, the cultivation of this economically important species should be examined. Cinnamon and coffee are the most important cash crops in Kerinci; collectively they occupy about 60,000 ha. Cinnamon is typically cultivated on fertile or recently cleared forest land with seedlings planted at about 3 m intervals. The trees grow rapidly and are usually harvested between 10 and 18 years of age.

Following harvest, the trees coppice and the cycle is repeated. The partial shade, moist fertile soils, and lengthy rotation period in cinnamon cultivation may be conducive to intercropping *C. pilosellus* beneath trees that already provide partial shade (i.e., at year 3 or 4). The same opportunity may exist beneath coffee as well, although the thorns of *C. pilosellus* could make coffee harvesting very unpleasant.

To explore the possibility of intercropping *C. pilosellus* in hillside farms, 20 cuttings (each comprised of root stock and an aboveground shoot) were collected and transplanted beneath perennial crops (cinnamon, coffee, and rubber) in four hillside farms. Dozens of farmers expressed interest in the trials, thus if successful, extension of the program to other Sungai Tutung farmers could proceed rapidly. Results of the trial will not be available for several years; however, two months after transplanting, seedling survivorship appeared high in all sites.

Expanding household rattan businesses will also require improvements in processing, production, and marketing. A survey of rattan artisans in Sungai Tutung revealed that lack of capital (to purchase raw materials) and need for labor saving devices (especially machinery to clean and split canes) are major constraints to increased productivity. The Department of Industry, which has been an advocate of local rattan businesses, has assisted Sungai Tutung artisans with production and marketing problems in the past and is aware of these problems. In fact, the Department conducted a study in 1986–87 and concluded that while the industry would benefit from cane processing equipment, the volume of production was too small to warrant investing in it.

Finally, if rattan businesses are to provide a viable livelihood, it will be necessary to expand present markets and increase net income. The vast majority of current Sungai Tutung production is sold in the local Kerinci market. Not surprisingly, the demand for rattan products in Kerinci is limited. However, several artisans produce handicrafts (e.g., lamps, vases, cassette holders, etc.) for other Indonesian markets. The demand for Sungai Tutung handicrafts is strong and, according to the producers, is constrained only by the supply of cane, lack of capital, and absence of cane processing equipment. The Department of Industry should expand capital and marketing assistance and, given adequate rattan supplies and markets, assist in the acquisition of cane processing equipment.

Conclusion

The cultivation and management of *C. pilosellus*, in conjunction with rattan marketing and processing assistance, represents a potentially productive and sustainable livelihood activity for Sungai Tutung households who lack alternative income sources. A vigorous household rattan industry could not only provide poor households with a much needed source of income, but would offer an economic alternative to forest farming and thereby reduce deforestation pressures in Kerinci-Seblat National Park. Intercropping *C. pilosellus* beneath perennial crops would also intensify hillside farming and raise farm household incomes.

Obviously, rattan cultivation and management alone will not solve the forest conservation problems in Kerinci or anywhere else. However, development efforts that build upon existing livelihood activities, utilize local resources, generate a viable means of subsistence, and provide incentives to maintain forest cover, such as household rattan businesses, represent perhaps the only way tropical rain forests in Kerinci and in many other regions of the tropics can be preserved.

Acknowledgments

Special thanks are due to John Dransfield for determining the identity of *C. pilo-*

sellus and to Natalie W. Uhl for editorial assistance. Research funding was provided by grants from The Garden Club of America and the Harold E. Moore Jr. Endowment Fund.

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Principes, 33(2), 1989, pp. 87, 90

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Attalea crassispatha, an Endemic and Endangered Haitian Palm

ANDREW HENDERSON AND MICHEL AUBRY

New York Botanical Garden, Bronx, NY 10458, and
Institut de Sauvegarde du Patrimoine National, P.O. Box 2484, Port-au-Prince, Haiti

Most people are aware of the terrible destruction of tropical forests which is taking place throughout the world. Palms are predominantly tropical plants, and like other groups of plants and animals, many species are becoming threatened or endangered. Recently Dr. Dennis Johnson has initiated a project aimed at assessing the conservation status of neotropical palms, a project funded by the World Wildlife Fund (Johnson 1986). As part of this we have recently assessed the status of one of the New World's rarest palms, the Haitian *Attalea crassispatha* (Figs. 1–4).

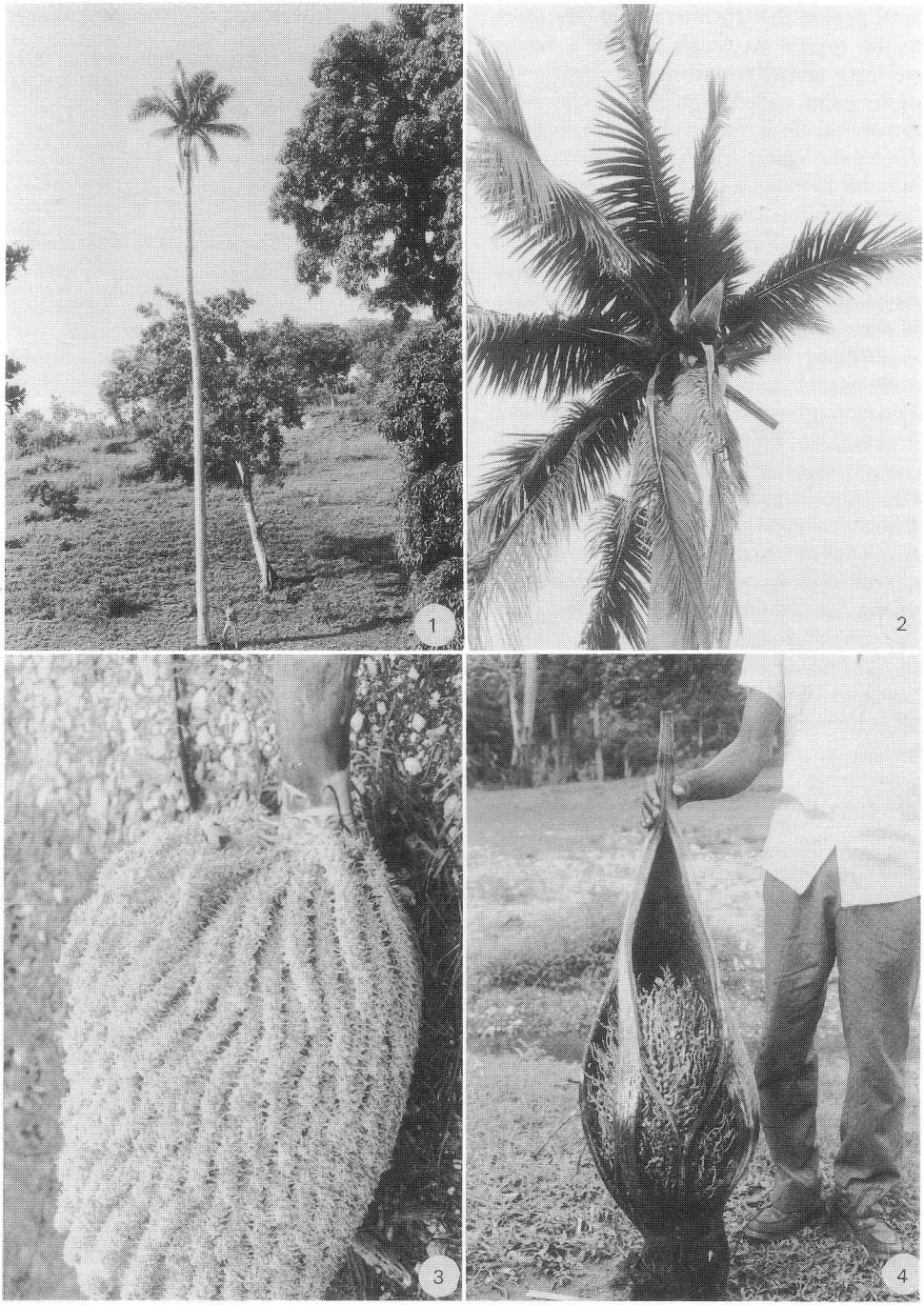
Exactly 300 years ago the French naturalist Charles Plumier travelled to Haiti. Among the palms he discovered and illustrated was "palma cocifera, vaginis ventricosis & liratis" (Plumier 1703). This was one of the earliest scientific descriptions of a neotropical palm, even though the name, being pre-Linnean, is not validly published. Much later, Martius (1847) called the palm *Maximiliana crassispatha*, and later still Burret (1929*a*) transferred the palm to the genus *Attalea*, and so the name became *Attalea crassispatha* (C. Martius) Burret.

This palm, known to science for almost 300 years, has long fascinated botanists. Three of the most prolific students of palms during the early part of this century, Burret, Bailey, and Cook, all wrote about it, and the last two collected it in the same locality where Plumier saw it, at a place called Fond des Negres on Haiti's southwestern peninsula. Burret (1929*b*) reproduced more of Plumier's unpublished illustrations; Bailey (1939) called the palm "such a rare and mighty object"; Cook (1939) wrote "One of the largest and most attractive palms of the West Indian flora." Cook went on to propose the name *Bornoa* for the palm, after a president of Haiti, Borno. Cook's disregard of the rules of botanical nomenclature prevented the use of this name.

There are various reasons why the palm has received so much attention. One is its rarity, but it is also interesting for other reasons. It is the only species of the Attaleinae (*Attalea*, *Orbignya*, *Scheelea*, and *Maximiliana*) found outside of Central and South America (including Trinidad and Tobago). And it also has unusual staminate flowers, intermediate between those of *Attalea* and *Orbignya* (Fig. 3).

In November 1988 we travelled throughout Haiti's southwestern peninsula in order to look for *Attalea crassispatha*. We had four localities to investigate—Fond des Negres (Plumier's original locality); Ile à Vache (another locality given by Plumier); Glace, on the road to Pestel (suggested by Cook 1939); and near Cavaillon (suggested by Dr. Tom Zanoni). Dr. Zanoni had looked for the palm in 1983 and reported that just two plants existed at Fond des Negres.

Our first stop was Fond des Negres. We found our first tree easily; it had been blown down and killed by Hurricane Gilbert in September 1988. However we found two more adults and several seedlings, and



1. *Attalea crassispatha* at the type locality, Fond des Negres, with Michel Aubry for scale. The stem is approximately 20 m tall. 2. *Attalea crassispatha* near Cavaillon, with interfoliar inflorescences and infructescences. 3. Predominantly staminate inflorescence of *Attalea crassispatha*. 4. An old infructescence of *Attalea crassispatha*.

local people thought there might be more in the region. At Glace and Ile à Vache we were unlucky, and no one had heard of the palm, called 'corossier' in Creole. A farmer on Ile à Vache showed us a huge dead palm stem, which he had cut down in order to make a pigsty. It seemed likely that it was an *Attalea*, and the last one at that locality. Finally we were lucky, and near Cavaillon we found one, then two more, and eventually a small population of the palms growing on a steep hillside.

Attalea crassispatha is not only rare in the wild, but also in cultivation. Dr. John Popenoe informed us that three trees are growing at Fairchild Tropical Garden. These trees are approximately 8 m tall and in healthy condition, but have not yet flowered. Apparently few, if any, other cultivated plants are known.

Our future research plans include a study of the floral morphology of *Attalea crassispatha* in order to find its correct place in the Attaleinae. We are also initiating a program for the *in situ* and *ex situ* conservation of this magnificent Haitian palm.

Acknowledgments

Our trip to Haiti was initiated by Dr. Dennis Johnson and funded by the World Wildlife Fund (WWF 3322).

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Principes, 33(2), 1989, pp. 91–93

How Many More Palms?

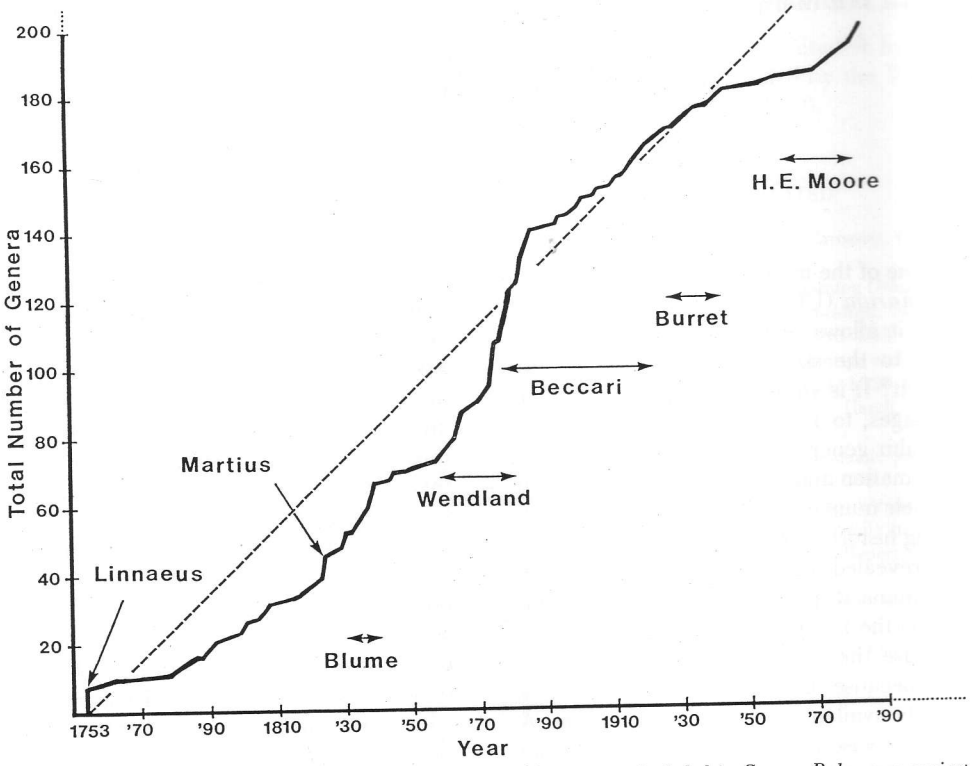
P. B. TOMLINSON
Harvard Forest, Harvard University, Petersham, MA 01366

One of the many benefits of the *Genera Palmarum* (Uhl and Dransfield 1987) is that it allows one to estimate the likely limit to the size of the palm family. Or does it? It is an interesting exercise, using its pages, to assess the rate of description of palm genera and, perhaps, to use this information and extrapolate an upper limit to their number. In doing this, some interesting historical, or even sociological trends are revealed that reflect the way in which taxonomic discoveries are made. I use genera as the taxonomic unit, not necessarily because they provide a precise estimate, but because information about them is readily available in *Genera Palmarum*. A more precise evaluation would come from an enumeration of species, but to assemble the information would be a work of great labor. However, my guess is that it would not modify the present conclusions because the same principles apply to any taxonomic unit.

Figure 1 plots the date of formal establishment of the genera of palms, as recognized in *Genera Palmarum*, as cumulative totals. It begins with the eight generic names still in current use and used by Linnaeus (1753) in his *Species Plantarum*, which is the starting point for the application of the present rules of botanical nomenclature. He used the names *Areca*, *Borassus*, *Calamus*, *Caryota*, *Chamaerops*, *Cocos*, *Corypha* and *Phoenix*, although usually in a form modified from Linnaeus' initial circumscription, and one more, *Elate*, which is now regarded as a synonym of *Phoenix* (Moore and Dransfield 1979).

Genera Palmarum recognizes 200 genera, a nice round figure, but somewhat conservative since H. E. Moore had recognized 212 genera. Clearly a number of genera recognized by Moore (1973) have been reduced to synonymy in the later analysis. This illustrates that numbers of recognized genera fluctuate according to taxonomic opinion; in fact, in their "finding list," Uhl and Dransfield catalogue an additional (236) generic synonyms i.e., names that have at one time been formally proposed but, for various reasons are not accepted by these authors, i.e., there are more names discarded than used. Clearly some of these exist for trivial reasons, but many are capable of being resurrected according to later taxonomic opinion. An old name cannot, however, be applied to anything newly discovered. The number of accepted genera, as an indication of family size is therefore not an absolute value. It still remains as a very useful measure. It would, of course, be very interesting to plot the appearance of all generic names. This would exaggerate considerably the curve shown in Figure 1.

The overall shape of the curve is roughly sigmoid, with the exception that no asymptote has been approached, i.e., the curve has not yet reached a constant value, which would be expected if all palms, or at least all genera of palms, were known, other things being equal. The sigmoid shape is what one might expect from a knowledge of the history of plant systematics, since it reflects the early slow development of knowledge, its acceleration in the middle and late nineteenth century as exploration was intensified and the subsequent decline as palms became more completely known,



1. (From Tomlinson 1989.) Plot of date of publication of palm genera included in *Genera Palmarum* against accumulated total number. This does not imply the total number of generic names at each date since many names in older use have become synonymous. Dotted line represents an arbitrary increase of a generic name every year.

i.e., it became more difficult to find new genera. Or does it?

If the curve indeed were precisely sigmoid, then one would be able to estimate the total number of genera of palms quite precisely because the point of inflection in the middle part of the curve would be the midpoint of discovery. The hundredth genus (*Hedyscepe*) was published in 1875 about the midpoint of the period covered by Figure 1 and also a midpoint in the steep rise in the rate of description covering the second part of the nineteenth century. According to this the limit could be 200, but we must consider the top of the curve before deciding this.

Added to the graph is a dotted line which shows a convenient 45° slope, representing a purely imaginary rate of naming of new genera at one per year. Surprisingly many parts of the curve have a slope close to this line. Significantly the head of the curve (i.e., its most recent part) still maintains this slope; i.e., there seems no sign of the asymptote being approached. In other words the rate of description of palm genera does not seem to be slowing down. In fact no less than 17 generic names for palms have been proposed since 1970.

Now, one might object that this assessment of our state of knowledge of the palms is spurious since it relates to the designation by name of a taxon, which is not the same as its discovery as new to science. New generic names can be created by segregating a species or groups of species from

existing genera, the change is then only hierarchical and does not represent "discovery."

However, if one examines most of the recently created genera of palms, the majority relate to genuine new discoveries of taxa, even though in many instances their existence had been suspected from the records of casual collectors. This rate of discovery seems totally independent of taxonomic practice that is determined solely by opinion.

In Figure 1 I have added the names of the more prominent botanists who have recognized or named palm genera, indicating the period over which their currently accepted genera were published. This is, of course, not all authors of palm genera (some 60 botanists have named palm genera) but some particularly significant ones. This addition shows what seems a particular correlation between the activities of certain botanists and the creation of generic names, since most of the names coincide with rises in the slope of the curve. This is not surprising since it is the responsibility of the taxonomist to do systematics, and one manifestation of professional activity is the creation of new genera. However, there is clear indication, from a knowledge of the history of these botanists that most of them were indefatigable field workers, they not only described new genera, they also discovered them for themselves. The correlation is not absolute, Herman Wendland's name is associated with more palm genera than any other botanist, frequently in association with that of Oscar Drude. These two described many of these genera from collections made by others. The fact that so many of Wendland's names are still accepted suggested that he was particularly good at the naming aspect of his craft. Also his activity coincided with the flood of specimens being directed towards European botanic gardens.

Nevertheless, the chart suggests that two conclusions can be drawn; first, that we are still some way from the likely upper limit of knowledge of all existing palms; and second, that their discovery is dependent on the activity of energetic field workers who are capable of making informed comparisons. Field work on palms needs to be very actively supported if our knowledge of palms is to continue to grow; the description of a new genus increases our knowledge of the diversity of the palm family quite considerably. Who knows what unexpected benefits may derive from these discoveries; the palm family is too important commercially to neglect the opportunity for the ultimate utilization. This can only come from initial exploration and taxonomic description.

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Principes, 33(2), 1989, p. 93

Notice

An interim Board Meeting of the International Palm Society will be held in Corpus Christi, Texas on June 3–4, 1989. Those desiring more information should contact: Lynn McKamey, Rhapis Gardens, P.O. Box 287, Gregory, TX 78359. (512) 643-2882

Principes, 33(2), 1989, pp. 94–95

Collecting Endangered Palms in Peninsular Malaysia

RUTH KIEW

The Malayan Nature Society, P.O. Box 10750, Kuala Lumpur, Malaysia

I strongly endorse the recommendations suggested by Chazdon (1988) on conservation-conscious collecting of palms. Recently I was requested by a visitor from a botanic garden overseas to take her to collect seed of *Johannesteijsmannia magnifica*. She was horrified to learn it is an endangered species (Table 1).

Unfortunately there have been two articles in palm journals (Sneed 1984; Tanswell 1986) reporting collecting seed of this species (called Joey by some) and giving details of one of its accessible sites. Both these articles extol the beauty and variety of the palm scene in the Malaysian rain forest, but the purpose of both visits was "palm hunting." Sneed ends his article by saying: "it behooves all of us (Palm Society members) to . . . mount and support some effort to capture seeds of 'Joey' to get it growing someplace outside of Malaysia."

They are not the only collectors of seed of *J. magnifica*. The Singapore Botanic Gardens has about 20 seedlings, a "gift" from a professional Australian plant collector, one of a number of professional plant collectors who are known to have taken seed from this site. His seed will end up as odd plants in home gardens overseas and in no way can be considered as contributing to a gene pool for the long-term conservation of the species. Will any botanic garden be prepared to give sufficient space for a reasonably sized population of this large and long-lived palm? The surest way of long-term survival is to protect its natural habitat, the rain forest. Sadly, palm collectors must now be numbered as one of the causes for the endangered status of this species.

The point that Chazdon makes about sharing seed with local institutes is also very relevant. *Johannesteijsmannia magnifica* is now grown in Australia, Thailand, and the United States but it is not yet

Table 1. Endangered palms in Peninsular Malaysia (from Kiew and Dransfield, 1987).

1. Calamus balingensis
2. C. endauensis
3. C. flabellatus
4. C. minutus
5. C. moorhousei
6. C. padangensis
7. C. pulaiensis
8. C. radulosus
9. C. senalingensis
10. C. setulosus
11. C. viminalis
12. Daemonorops oligophylla
13. Iguanura corniculata
14. Johannesteijsmannia magnifica*
15. J. lanceolata*
16. Licuala corneri
17. L. kemamanensis
18. L. moyseyi
19. L. ridleyi
20. Pinanga acaulis
21. P. adangensis
22. P. glaucescens
23. Plectocomia dransfieldiana

* Considered among the ten most endangered plants in Malaysia (Kiew et al., 1985).

cultivated in any Malaysian public garden. Neither is the more common and widespread *J. altifrons* or the trunked *J. perakensis* (neither are considered endangered species), although they grow in the Singapore Botanic Gardens. Botanic Gardens can play an important role in cultivating and distributing seed of native species, such as the rare and beautiful *Iguanura "spectabilis"* (Fig. 1), which fruits freely in the Waterfall Gardens, Penang.

Visitors making palm collecting trips (with proper documentation) can positively contribute to conservation in Malaysia by contacting appropriate local institutes to offer to share the seeds collected. Emphasizing how attractive and unique tropical species are and how they are valued overseas brings awareness and pride in local natural heritage. It is ultimately this local support for conservation that saves the tropical rain forest from being destroyed.

I appeal to members of the Palm Society to stop collecting the seed of endangered species and not to buy their seed or plants offered for sale. After all there are many other common species that are not yet in cultivation that are just as beautiful and interesting. A full list of the conservation status of Peninsular Malaysian palms can be obtained from the Malayan Nature Society.

1. The rare and beautiful *Iguanura "spectabilis"* is cultivated only in the Waterfall Gardens, Penang. Photo by Ilsa Sharp.

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Please note: R. Kiew does not collect palm seed for individuals.

Principes, 33(2), 1989, pp. 96–97

Palmy Extracts

from literature published in 1633
compiled by Bill Gunther

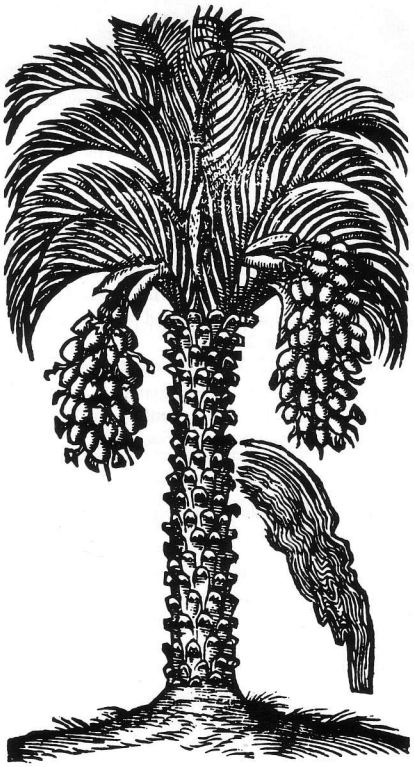
Of the Date Tree

(to transcribe old English, substitute "s" for "f" & "v" for "u.")

The Description

The Date tree groweth very great and high: the body or trunke thereof is thicke, and couered with a fcaly rugged barke, caufed by the falling away of the leaues: the boughes grow onely on the top, confifting of leaues fet vpon a wooddy middle rib like thofe of Reeds or Flags: the inner part of which rib or ftalke is foft, light, hollow, and fpongie. Among the leaues come forth the floures included in a long skinny membrane, as it were a fheath or

Palma.
The Date tree.



Palmarum fructus & flores cum Elate.
The fruit and floures of the Date tree.

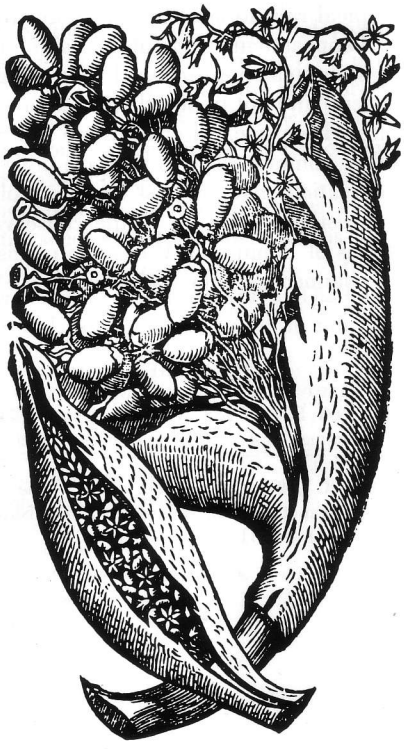


Fig. 1.

hofe, like that which couereth the Floure-de-Luce before it be blowne, which being opened of it felfe, white floures ftart forth, ftanding vpon fhort and flender foot-ftalkes, which are faftened with certaine fmall filaments oir threddy ftrings like vnto little branches: after which fpring out from the fame branches the fruit or Dates, which be in fafhion long and round, in tafte fweet, and many times fomewhat harfh, of a yellowifh red colour; wherein is contained a long hard ftone, which is in ftead of kernell; and feed; the which I haue planted many times in my Garden, and haue growne to the height of three foot: but the firft froft hath nipped them in fuch fort, that foone after they perifhed, notwithftanding my induftrie by couering them, or what elfe I could doe for their fuccour.

The Temperature and Vertues

The Dates which grow in colder regions, when they cannot come to perfect ripeneffe, if they be eaten too plentifully, do fill the body full of raw humors, ingender winde, and oft times caufe the leprofie.

The drier forts of Dates, as *Dioscorides* faith, be good for thofe that fpetbloud, for fuch as haue bad ftomacks, and for thofe alfo that be troubled with the bloudy flix.

Dry Dates do ftop the belly, and ftay vomiting, and the wambling of womens ftomackes that are with childe, if they be either eaten in meates or otherwife, or ftamped and applied vnto the ftomacke as a pectorall plaifter.

from THE HERBAL, by John Gerard, published in 1633.

Principes, 33(2), 1989, pp. 97–98

Brava for Butia

TAMAR MYERS
3819 S. Waynesville Road, Morrow, OH 45152

Call me fickle if you will, but my "favorite palm" keeps changing with more regularity than does my hairstyle. Quite often the palm in favor will be that one in my collection which is growing the most satisfactorily. Sometimes, however, I abandon my loyalties and go spiritually sashaying after some elusive exotic that I have just read about in *Principes*, pledging to be ever faithful to that species if only I could obtain a nice specimen or two. On a few occasions my weak heart has been swayed by the sight of a gorgeous specimen (perhaps itself swaying) in someone else's garden or in a public conservatory.

But all of these infatuations are short-lived and each time I find myself returning, with a great deal of guilt, to my one true love, *Butia capitata*.

"Pshaw!" I just heard someone exclaim in disgust. "*Butia capitata* is a common palm. You can find that species anywhere. It isn't special in the least!"

Pshaw indeed. *B. capitata* may be common in that it doesn't bear such a lofty appellation as "King" or "Queen," or even "Princess," but it is far less common in cultivation than I would like to see it. True, this palm is often planted in colder areas on the margin of the subtropics, but as soon as one reaches latitudes in which more exotic species can be grown, *Butia* is restricted to a place on the sidelines, if at all, like yesterday's out-of-date fashions.

This is a shame, because although *Butia* is not special in the sense that it is rare, or for some other reason in vogue, a well-groomed *Butia* is, in my opinion, the most attractive of all palms. Unfortunately, rarely are *Butia* grown and shown to their advantage. Admittedly *Butia* are not stunners when shade-grown or when left untrimmed, or when the trimming has been botched. *Butia* should be grown in full sun. This promotes a stiffer, more compact crown, which actually accentuates, rather than diminishes, the recurving nature of *Butia* leaves, which is their most distinguishing feature. The leaves, as they age and begin to dry, should not be permitted to remain on the tree. What *Butia* lacks in the grace department it more than makes up for in its stiff, formal elegance, and this element is detracted from by dying fronds. Not only should *Butia* be kept free of unsightly fronds, but the pruning should be done with exactitude. The true beauty of *Butia* lies in its geometry, both of leaves and trunk. The leaf bases on the trunk, then, should always be pruned to a uniform length. The resulting marriage of trunk and crown in a well-pruned *Butia* is a veritable work of art and enough to bring tears of admiration to the eyes of all palm-lovers, with the possible exception of the most avid devotees of *Cocos nucifera* and a few renegade *Ravenea* groupies.

Besides its breathtaking beauty, *Butia* offers several other benefits that have helped endear it to me. First, there is the matter of its fruit. It is not for naught that *Butia capitata* has been nicknamed the Jelly Palm. This jelly, made from ripe *Butia* fruit, is tasty indeed and a far more appropriate way for a palmateer to devour a palm product, than to eat preserved palm hearts from a tin.

Butia capitata is also an extraordinarily easy palm to transplant. Even large, mature specimens can be moved with minimal root balls and after a few weeks in their new site, provided their temperature and water requirements are met, will commence growing without a complaint.

Butia is of course legendary in its cold-hardiness. Only *Jubaea chilensis*, a distant cousin, is known to be hardier amongst the pinnate palms. Although *B. capitata* will usually show some cold damage once temperatures hit the low teens, individual specimens have been known to recover from temperatures near 0° F. Should severe cold threaten, the fronds of *B. capitata* can be bundled up and tied for protection quite easily, as it lacks the vicious spines that make tying up a *Phoenix* on a par with wrestling a porcupine.

Lastly, because of its relatively slow growth rate, *B. capitata* need not remain solely within the province of those palmateers lucky enough to live where winters are warm enough to melt a chocolate bar. *Butia capitata* makes an excellent container plant for a sunny spot on the patio. When it has outgrown commercially available pots, construct a large wooden box for it and mount the box on wheels. When the first sharp winds of winter come howling out of the north, or south, depending on which hemisphere you live in, simply wheel your prize specimen into the garage or store it in an enclosed porch. When the palm gets too large for this procedure you can decide then if you want to risk it outside in the ground or donate it to a public conservatory. Whatever you decide, you won't regret having had the *Butia* for all those years, for it will have provided you with more pleasure than a palmateer has a right to expect from any one palm.

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In Appreciation of Iris Bannochie and her Garden "Andromeda"

LYNN McKAMEY
Rhapis Gardens, P.O. Box 287, Gregory, TX 78359

On September 2, 1988, the world of palms and foliage lost a leading horticulturist, Iris Bannochie of Barbados. She was a newly elected director of The International Palm Society and held numerous honors, merits, and memberships in more than ten other horticulture societies. Her lifetime devotion to plants will endure in her special botanical garden, ANDROMEDA, a highlight of the Caribbean.

While she simply called herself "a gardener," Mrs. Bannochie was elected a Fellow of the Linnaean Society of London and recognized with the Gold Veitch Memorial Medal by the Royal Horticulture Society, the highest award given to a non-U.K.

1. Iris Bannochie and Prince Edward at the flower show in Barbados, 1987. Photo courtesy of Ray Baker.

resident. But her finest and most endearing achievement was creating, developing, and expanding ANDROMEDA on land which had been in her family since 1740.

In December of 1986, I had a chance to visit Iris and her husband, John. Barbados is the easternmost island in the archipelago of islands stretching from North to South America. It is hilly with a delightful climate varying from 75° F (24° C) to 85° F (29° C), humidity from 57 to 74%, with an annual rainfall of 59 inches, and abundant sunshine.

The Caribbean west coast of Barbados is dotted with resorts nestled amidst lush tropical vegetation along calm, quiet lagoons. Facing the Atlantic, the windward east coast is rugged with rocky cliffs gently rolling down to pounding surf and rushing tides. Midway down the coast near St. Joseph is ANDROMEDA. As we were greeted by John and Iris and stepped out on the high point of the garden, the scenery was breathtaking—paradise found. The myriad of plants was astounding, for here in near perfect climate grew tropicals, subtropicals, and temperate plants, gathered from the four corners of the earth and planted over the years by Iris. Here a lily pond, there rare orchids, ferns, bamboo, bromeliads, heliconias, and of course palms of every kind, including the spectacular *Cyrostachys renda*, the Red Sealing Wax Palm. The garden is beautifully arranged with each area holding related groups of plants. One must see it to believe the hundreds of genera, species, and varieties thriving and growing in perfect harmony.

Iris Bannochie published a softbound book *Andromeda Gardens* in which a visitor wrote, "there are times when we all wish that fairy tales come true. Times when we long to come upon the door of enchantment, the escape route from the world of noise, strain and tedium, leading to a haven of peace and serenity. The other day I found one. It was the Garden at Andromeda."

Beautifully said and a tribute to Iris Bannochie. We will miss her.

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THE I.P.S. DOWN UNDER REPORT

GREG CUFFE
42 Queenscroft St., Chelmer Qld. 4068, Australia

September 1988 had long been earmarked by the I.P.S. as the date for the 1988 Biennial Conference—the venue Australia. David Tanswell, a local I.P.S. Director, was given the job of tying the deal together aided by other members of PACSOA (Palm & Cycad Society of Australia) Executive and by outgoing I.P.S. Director Rolf Kyburz. Late in 1987 when the whole project was in its infancy, I also made the mistake of breaking one of the oldest rules in the book—'Never volunteer.'

Thus was borne the single most ambitious project ever undertaken by PACSOA, the organization of the Biennial Conference and Tours of the International Palm Society. North Queensland was the obvious venue as it had been decided early that the theme of the conference was to be Palms in Habitat.

North Queensland boasts at least 800+ species of native and exotic palms in the ground and as well has a number of superb venues in which to hold such a conference. The plan was set and all that was left to

do was to make it happen. There is no need to elaborate on the organizational details, as that in itself could be the subject of a whole series of volumes.

The 1700km drive north from Brisbane was full of 'What hasn't been done? Has anything been left in Brisbane? What else could go wrong?' but was otherwise enjoyable. It all started with a late night meeting with Pauline Sullivan and Ed McGehee on Monday, September 5th, and was the end of months of phone calls, faxes and letters with the two persons who had more than adequately coped with arrangements at the U.S. end.

The next day saw the collection of all the U.S. Registrants and the transfer from Cairns to Port Douglas for the first sector. The venue was the truly outstanding Sheraton Mirage Resort which it can be argued lives up to its claims of too good to be true. Many of the Registrants commented on both the scale and presentation of the resort which is indeed accentuated by its mass planting of tropical vegetation and superb indoor arrangements of both plants and cut flowers. Other than the welcome cocktail party which was attended by 75 persons, there were no other set down events.

Wednesday, September 7th, saw our first trip into the NQ rainforest and what better place for an introduction than the Daintree/Cape Tribulation National Parks area. At this point it would be appropriate to introduce Tony Irvine who acted as our guide and commentator for all of the day trips. Tony's knowledge of the northern rainforests is unbelievable with hardly a question unable to be answered. He certainly astounded many of our Registrants—and even the bus drivers handed over their microphones when Tony was in full Flight. Cape Tribulation area is well known to all Queenslanders as it has been and still is something of a political football. Its beauty defies description and a lot of our overseas Registrants saw a *Licuala* forest for the first time in this area.

Time always seems to get away and getting people back on the bus was often a problem especially when they are interested in one of the absorbing private collections, the first of which they saw on this day. Dr. John Dransfield rated the Cape Tribulation area as one of the most suitable on earth for growing palms, an observation that must be given a certain amount of credence owing to his extensive travels to palm rich areas.

The evening activities contained an absorbing talk by Tony Irvine titled "An Introduction to the Northern Rainforests Habitats and Ecosystems".

The next day was much more leisurely, where the group was split into two groups and visited both Mossman Gorge and the garden of Maria Walford-Huggins.

Maria's garden has been written about many times before and I don't think many of the Registrants really could believe the volume of mature and semi-mature specimens that Maria has on her property.

One of the highlights of the whole conference was to occur the next day with the second of our 4-wheel drive bus tours, this time to Mt. Lewis. The weather was fine but cloudy when we left Port Douglas. The road up the mountain was not in good condition at all. The farther we climbed, the worse it became, until a rather large tree trunk part way across the road caused more than a little excitement and resulted in slightly bending one of the buses. A decision was made not to take both buses on past the obstacle which necessitated a simulated peak hour for the rest of the journey with standing room only.

Mt. Lewis vegetation is truly remarkable and is certainly in need of further exploration and writing. The day of our visit it was very cool to say the least with a strong southeast wind blowing the clouds into the mountain which for most of the morning resulted in eerie foggy conditions with light rain.

By the time we arrived back at the Sheraton Mirage there was barely enough time to prepare for the evening addresses.

The program that evening was three

totally absorbing talks by Tony Irvine "Genus Linospadix"; John Dowe "Palms of Vanuatu and Their Relationship to the Palms of the South-West Pacific" and Dr. Natalie Uhl "Palms of New Caledonia".

All Registrants welcomed the following free morning; it was really the first chance to swim in the six acres of swimming pools the resort has to offer and more importantly to relax. I.P.S. Directors were however not quite so lucky as they had to continue their meeting which had started a couple of days earlier.

The afternoon conference activities were addresses by Tony Irvine "Genus Livistona" and Dr. John Dransfield "Palms of Madagascar".

Dr. Dransfield indicated that the material in his address may well form the basis of a retirement project and possibly a future publication on the same topic. From his comments, it is indicated that the area of palm flora in Madagascar is in need of urgent study as the taxonomy requires more sorting out and the urgency factor is brought about by the indigenous people's love of clearing and destroying the habitat.

Saturday saw the culmination of the formal conference activities with the holding of the Grand Dinner. The resort must be complimented on the presentation and the range of foodstuffs it made available for the buffet . . . a truly memorable evening.

Sunday saw the group transfer to Cairns via Kuranda amidst cries of 'I wish we had more time to enjoy this place' with a lunch stop at the famous mountain village. Visits to some of the local tourst attractions filled in time until a portion of the group opted for the scenic railway trip to Cairns whilst others decided on a visit to Rosebud Farm, an outstanding local palm garden and nursery.

The time spent by the group in Cairns allowed free time each evening to enjoy the many attractions of this beautiful northern city and its many restaurants.

The day trips took the group to a variety of locales around the Cairns region including the Atherton Tablelands, the Flecker Botanic Gardens and a number of local private gardens. Such collections included that of Dusan Balint whose collection of understory palms in the ground is unsurpassed.

Tuesday saw the group head south along the Bruce Highway to Edmonton to a large production nursery which produces millions of *Chamaedorea elegans* for the southern market. Time was allowed for visits to both scenic Boulders National Park and Josephine Falls National Park during the day which are outstanding examples of rainforest environments. A great proportion of the day was spent at Glen Idle Nursery, one of the largest production nurseries in the world, at which the group was treated to a sumptuous Bar-B-Que lunch provided by Glen and Margaret Dawes. Glen actually closed his nursery for the day and provided his staff to act as cooks and guides around the immense venture.

In addition to the Luncheon, Glen Dawes provided a number of large *Pelagodoxa henryana* for commemorative plantings. One of these palms was planted by Drs. Uhl and Dransfield, an event that was reported in the local press both in Cairns and Innisfail.

Thursday was set down for the coach transfer from Cairns to Townsville. We as organizers always suspected that this would be the problem day of the whole tour from a time point of view and in any event the arrival at Sheraton Breakwater Casino Hotel in Townsville wasn't too late at 7:50 p.m.

Before that however, was a day packed with yet more exciting things. The trip from Cairns to El Arish was slowed considerably by heavier than usual traffic (so we were informed) which meant that the available time at the garden of Terry Mead regretfully had to be cut short.

Terry's garden was about the fifth or so that had so far been visited but was once again unique. Set amongst the mountains in a beautiful little valley with its own waterfall, the garden commands attention

due to the diversity of plants contained therein. Of particular interest (other than the palms of course) was an incredibly large Heliconia whose identification even eluded the experts. From there we proceeded to the Mission Beach Resort for a smorgasbord lunch and then on to view the local rattan industry.

The weavers are a family of Laotians and produce a large array of cane objet d'art. Judging by the large volume of woven items walking out of the yard, I don't think that they could have been anything but happy that their property was included on the itinerary.

From here the bus scorched down the Bruce Highway to Halifax to view the southern most stand of *Nypa fruticans* in the world. By this time, however, darkness has almost descended and the trillion or so mosquitoes did detract a little from the enjoyment of the stop.

The final sector of the trip had been planned in North Queensland's largest city, Townsville. The group was to attend the official opening of the Townsville Palmetum set down for September 18th.

Thanks at this point are extended to Robert Tucker; as co-ordinator of that project and due to his other influences in the setting of the itinerary in the Townsville area.

Two more dinners were held in Townsville and provided excellent vehicles for more addresses by our seemingly large contingent of speakers:

Dr. Dennis Johnson spoke on "South American Palms, *Copernicia*," Dr. Andrew Henderson on "South American Palms—A Geographic Tour," and Dr. John Dransfield on "Genus *Pinanga* and Palms of Malaysia."

In addition to the above, an Open Forum was held on Taxonomy, Conservation and discussions on any other relevant matters, which provided some conflicting views on the above topics, and excellent debate.

During a visit to Queens Gardens, the North Queensland Palm Society provided another sumptuous Bar-B-Que Luncheon which preceded a visit to the Palmetum related display in the city. On Monday we ventured into the true Australian bush to a property owned by the Coutts family, in order to see *Livistona* sp., 'Cape River.' We were treated to damper and billy tea and yet another great lunch at the Burdekin Wilderness Lodge also owned by the Coutts family.

The opening of the Palmetum was very well patronised with approximately 400 locals attending. The Mayor of Townsville City, Alderman Mike Reynolds, did the honours and was presented with PACSOA's cheque for $500 by our President, Mr. John Batterham. This was to commence the "Friends for the Palmetum" trust fund. The concept of the Palmetum is an exciting one, and the extent of both the area and the diversity of planting will provide palm lovers with an invaluable garden in the future.

All in all, an incredibly packed and exciting couple of weeks, there were just so many events and places to visit. Thanks to everyone who was involved at all levels for making it a huge success.

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Back Cover

Livistona sp. 'Cape River' on Coutts' cattle station in "true Australian bush." See pp. 90–103. Photo by Natalie Uhl.