# PALMS

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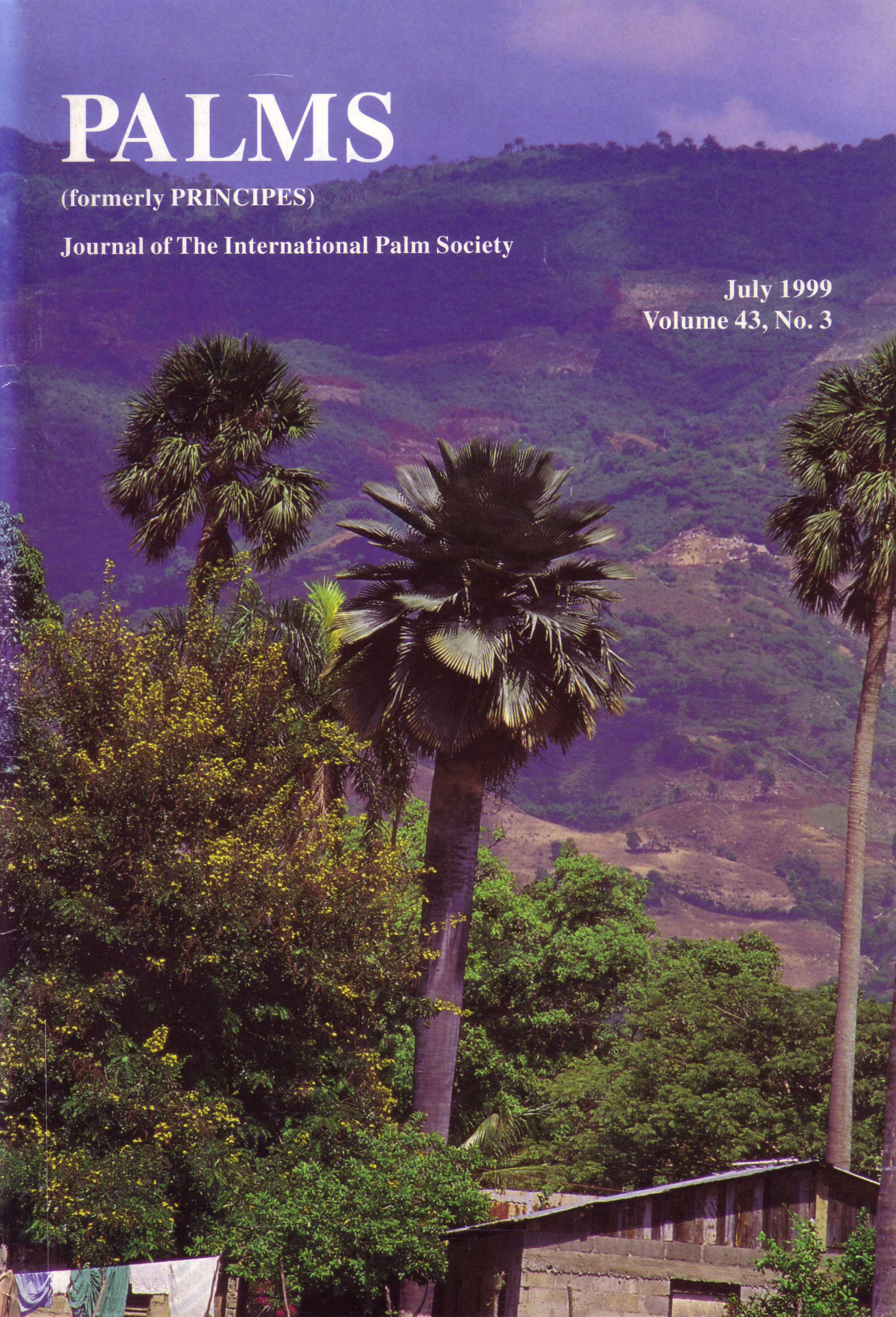

# THE INTERNATIONAL PALM SOCIETY, INC.

## THE INTERNATIONAL PALM SOCIETY

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## Front Cover

The biggest and oldest *Copernicia baileyana* in Cruce de La Delgada. The other tall palms are *Sabal domingensis*. Photo by Carlo Morici. See pp. 138–139.

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*Accredited with the International Association for Plant Taxonomy for the purpose of registration of new non-fossil vascular plant names.*



Manuscripts for PALMS, including legends for figures and photographs, must be typed double-spaced on one side of 8½ × 11 bond paper and addressed to Dr. Natalie W. Uhl for receipt not later than 90 days before date of publication. Authors of two pages or more of print are entitled to six copies of the issue in which their article appears. Additional copies of reprints can be furnished only at cost and by advance arrangement. Further guidelines for authors are given in the roster.

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# President's Message

On June 17 and 18 the Directors and Officers met for our annual Board of Directors' Meeting at Montgomery Botanical Center in Miami, Florida. Dr. Terrence Walters and his staff were most gracious hosts and shared with us their exciting accomplishments in establishing populations of palm and cycad species in the Center for use in scientific studies. Twenty-four Directors and several Society Members from eight countries around the world attended the Meeting. On the weekend following the Meeting, most Directors stayed for the Palm Symposium hosted by Fairchild Tropical Gardens and the I.P.S. Chapter, The Palm Beach Palm and Cycad Society. An estimated 150 people from around the world attended the Symposium. Its emphasis was solely on palm horticulture and offered a fantastic opportunity to learn more about growing palms and make new friends from distant lands. Our sincere thanks are extended to both institutions, and also to IPS Director Libby Besse for her superb help in coordinating and arranging the Board's activities while in Miami.

Highlights of the Board Meeting included the Board's continuing determination to emphasize palm horticulture and useful information for Members in Palms. Dr. Natalie Uhl, our Editor for the past twenty years, announced her planned retirement at the end of the year; she will remain in an advisory position to assist as needed in maintaining the high quality of our journal. Dr. Scott Zona, our present Associate Editor from Fairchild Tropical Gardens, was appointed by the Board to replace Dr. Uhl. Members know Scott from his work in editing the April Horticulture Issue of Palms. Dr. Zona will join existing Editor Dr. John Dransfield of the Royal Botanical Gardens, Kew. Bernie Peterson from Cocoa, Florida, will continue the well-received Horticulture Column dealing specifically with questions on palm horticulture. I think you will find upcoming issues of Palms exciting with many new and different contributions.

The Board also established a new and hopefully highly coveted award, the Dent Smith Memorial Award for major contributions in the world of palms. The intent of this award is to honor our Society's founder, Dent Smith, and to recognize those with truly outstanding contributions in the world of palms. For her many decades of work in palm taxonomy and research, twenty years as Editor of our Journal, and as a dedicated Director on the Board, Dr. Natalie Uhl was awarded the first Dent Smith Memorial Award on June 18, 1999. On behalf of the Society and all Members, I wish to congratulate Natalie and thank her for her many years of contributions.

The next I.P.S. Biennial will be from October 8 to 14, 2000, in New Caledonia with a Post Tour immediately following in Northern Queensland, Australia. I.P.S. Chapter, Chambeyronia, promises an unforgettable Biennial. Details will be announced in future issues of Palms. The Biennial 2002 will be in France with Post Tour visits to Spain and Italy. The Board voted to have our Biennial 2004 in Hawaii with a Post Tour to Fiji.

The Board also voted to maintain our current Society dues at $35 US, despite financial demands from ever-increasing costs of production of our journal. We want to keep dues as low as possible and are hoping to accomplish this through increased membership. As membership increases, the cost per member to produce Palms decreases. Our goal is for all Members to get a friend or associate to join the I.P.S. We will soon be spearheading major membership promotions in Florida, California, Hawaii, Australia and France. Also, as our elections of Directors will be held next year, please forward any nominees to our Nominating Committee Chairperson, Libby Besse, in Sarasota, Florida.

Finally, the Board accepted as a new Chapter the Maui Palm Society in Hawaii. Welcome aboard!

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*Palms*, 43(3), 1999, pp. 109–113

# The Palms of Belize: Species Richness and a Key Based on Vegetative Characters

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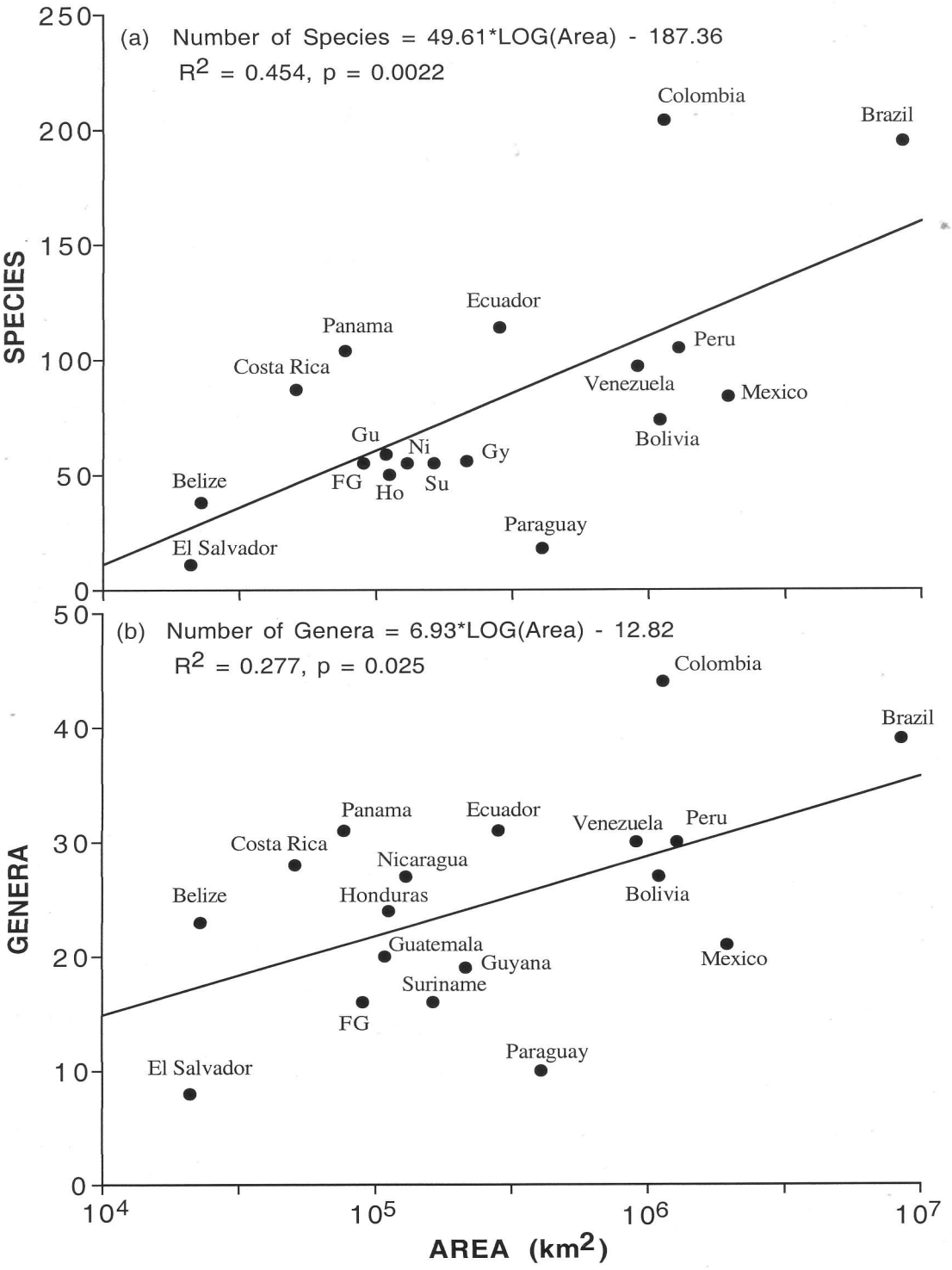
Belize (formerly British Honduras) lies between 15°53′ and 18°30′ N latitude and is the second smallest country in mainland America. When its small area is taken into account, Belize is above average for number of palm species and well above average for number of genera among tropical American countries (Figure 1a and b respectively). Six of Belize's 38 palm species are restricted in their range to one or two neighboring countries. One of these species (*Schippia concolor*) is endemic, and *Pseudophoenix sargentii* is considered endangered in the Yucatan peninsula (Durán 1995). *Colpothrinax cookii* has a very patchy distribution among Guatemala, Costa Rica, and Panama.

Perhaps the relatively high species richness of Belize is due to a great variety of vegetation types packed into a small area, from savanna and drought-deciduous scrub to evergreen wet forests. Annual rainfall and topography is also highly variable in Belize, ranging from approximately 1350 mm in the lowland north to well over 4000 mm in the mountainous south.

Furthermore, Belize is politically stable, is sympathetic to conservation and scientific research, and gives a large proportion of its land some degree of protected status. Consequently, this sparsely populated country has experienced a great increase in biological research and ecotourism. Unfortunately, an increase in the resources available for identification of woody plants in Belize using vegetative characters has not accompanied the growth of biological research and visitor interest. A notable exception is Balick and Johnson's (1994) vegetative key to the palmate-leaved palms of Belize.

The following key is a result of my work on a vegetative key to the trees of Belize. Nomenclature follows Henderson et al. (1995), and this key is meant to complement that comprehensive work. The key was developed from field observations, plus data and descriptions from Standley and Record (1936), Standley and Steyermark (1958), Balick and Johnson (1994), and Henderson et al. (1995). Those species reported by Henderson et al. (1995) for Belize (37 plus *Colpothrinax cookii*, reported by Meerman and Williams 1995 and reported as possibly in Belize by Henderson et al. 1995) are included in the key. Those species with reasonable potential to be found in Belize (8) are also included. Potential species are marked with an asterisk.

Although this key emphasizes vegetative characters, fruit characters (and occasionally inflorescence characters) are included in cases where persistent fruits (or inflorescences/infructescences, on the palm or ground beneath) are likely to enhance identification to species. Flower characters are included when useful vegetative characters may be weak or few. All identifications using this key should be confirmed with herbarium specimens, especially for the difficult genera *Chamaedorea* and *Geonoma*. It is strongly encouraged that suggestions for improvements to the key, new species records for Belize, and more consistent and/or easily observed vegetative characters for separating species in the field be sent to the author. Updated versions of the key based on such suggestions will be posted on the World Wide Web.




1. A regression of the number of (a) species and (b) genera on the area (in log scale) for the mainland neotropical countries. FG = French Guiana, Gu = Guatemala, Gy = Guyana, Ho = Honduras, Ni = Nicaragua, Su = Suriname.

## A Key to the Palms of Belize

* denotes potential species

1. Leaves palmate (or "costapalmate"), i.e. fan-shaped ..... 2
1. Leaves pinnate, i.e. feather-shaped, or pinnately veined (in simple-leaved taxa) ..... 9
2. Stem armed with slender, often branched spines ... ..... *Cryosophila stauracantha*
2. Stem unarmed ..... 3
3. Petioles armed with thorns or spines ..... 4
3. Petioles unarmed ..... 5
4. Stems clumped in groups of 2–15+, covered with persistent leaf bases; savannas and pine forests, of low elevation in wet soils; leaves bright green above ..... *Acoelorraphe wrightii*
4. Stems solitary (rarely clumped), only apically covered with persistent leaf bases; on hill sides; leaves dull green (to glaucous) above ..... *Brahea dulcis*
5. Leaves with a long rachis on which the segments attach (costapalmate); leaf sheaths and petioles conspicuously split lengthwise at the base; ripe fruits black ..... 6
5. Leaf blades with a very short rachis, or rachis absent; leaf sheath split or not at the base; ripe fruits black or not ..... 7
6. Segments joined for almost their entire length in groups of 2–3, the groups joined for about one-third their length; stem swollen at the base; inflorescence branched to 4 orders; widespread, south of Corozal ..... *Sabal mauritiiformis*
6. Segments joined for one-half their length in groups of 2 (rarely 3), the groups joined for about one-sixth their length; stem not swollen at the base; inflorescence branched to 3 orders; northern Belize (Corozal district) ..... *Sabal yapa*
7. Stem 20–35 cm diameter, often conspicuously swollen near the middle; leaf sheaths not split; ripe fruits brown or black ..... *Colpothrinax cookii*
7. Stem smaller, usually 5–13 cm diameter, not swollen near the middle; ripe fruits white ..... 8
8. Leaf sheath and petiole conspicuously split lengthwise; blade not bilobed; bark not corky ..... ..... *Thrinax radiata*
8. Leaf sheath and petiole inconspicuously split lengthwise at the very base; blade divided to the base into 2 lobes; bark often corky ..... *Schippia concolor*
9. Stems and/or leaves spiny ..... 10
9. Stems and leaves without spines ..... 15
10. Climbing palms; leaves with a whip-like extension of the rachis (cirrus) containing barb-like hooks ..... ..... *Desmoncus orthacanthos*
10. Arborescent palms to 4 m tall (or taller in the cultivated *Bactris gasipaes*), cirrus absent ..... 11
11. Stems clumped, rarely solitary, mostly 6 cm diameter (10–25 cm in *Bactris gasipaes*) ..... 12
11. Stems solitary ..... 14
12. Found only in cultivation; stems >6 cm diameter ..... **Bactris gasipaes*
12. Wild palms; stems >6 cm diameter ..... 13
13. Leaflets glabrous beneath, regularly arranged and spreading in the same plane; spines on sheath, petiole, and rachis <9 cm long; found in relatively dry, open habitats near groundwater; fruits purple-black ..... *Bactris major* var. *major*
13. Leaflets often pubescent beneath, clustered and spreading in different planes; spines on sheath, petiole, and rachis to 15 cm long; in wet forest; fruits orange to red ..... *Bactris mexicana*
14. Stems to 8 cm diameter, with whorls of flattened, black spines; fruits bristly; in lowland moist to wet forests ..... *Astrocaryum mexicanum*
14. Stems ≥10 cm diameter, spines not flattened; fruits smooth; in open and/or disturbed areas of seasonal rainfall ..... *Acrocomia aculeata*
15. Stems tall and stout, often much >15 cm diameter, never cane-like (i.e. stem more or less uniform in color and leaf scars not prominent), solitary ..... 16
15. Stems slender (<15 cm diameter) and usually cane-like (i.e. with conspicuous, and contrasting or prominent leaf scars), solitary or clumped ..... 25
16. Cultivated, or naturally-occurring and most often found along beaches; stems often markedly curved; woody "coconuts" >20 cm diameter .... *Cocos nucifera*
16. Naturally-occurring in a variety of habitats, rarely along beaches; stems usually straight; fleshy or woody fruits <6 cm diameter ..... 17
17. Crownshaft, of closed (or partially closed) leaf sheaths, present; leaflets spreading in different planes (appearing plumose) or not ..... 18
17. Crownshaft never present; leaflets not spreading in different planes ..... 23
18. Leaves plumose, with leaflets spreading in different planes ..... 19
18. Leaves not plumose, leaflets in 1 row per side, not spreading in different planes (the tips may be pendulous, but not plumose) ..... 22
19. Stems generally >30 cm (to 60 cm) diameter; crownshaft conspicuous, of closed leaf sheaths; inflorescences born below the leaves ..... 20
19. Stems usually smaller; crownshaft open, short; inflorescences born among the leaves ..... 21
20. Peduncular bract shorter than the crown-shaft; on wet soil in forest or open savanna, disturbed areas, also cultivated ..... *Roystonea regia*
20. Peduncular bract ≥ the crown-shaft; found on flooded soils in coastal swamps and estuaries ..... ..... **Roystonea dunlapiana*
21. Palms of the coastal plain, usually near the sea; leaflets somewhat glaucous, with brown scales beneath; inflorescence branched to 5 orders ..... ..... *Pseudophoenix sargentii* subsp. *sargentii*
21. Widespread palms; leaflets not glaucous, without brown scales; inflorescence branched 1–2 orders ..... *Gaussia maya*
22. Montane palms with a partially closed (for 1/3 to 1/2 the length of the leaf sheaths), purplish or purple-green crownshaft; stem brownish ..... ..... **Prestoea acuminata*
22. Montane or lowland palms with conspicuously closed, green or yellowish crownshaft; stem gray ... ..... *Euterpe precatoria* var. *longevaginata*
23. Leaves irregularly divided into wide leaflets with serrated apical margins; stems to 20 cm diameter; fruits covered with pyramidal protrusions ..... ..... *Manicaria saccifera*
23. Leaves regularly divided into many narrow, entire leaflets; stems usually >30 cm diameter; fruits smooth ..... 24
24. Margins of leaf sheath and petiole naked; male flow-

ering branches short, ≥15 cm; endocarp fibers in clusters ..... *Attalea cohune*
24. Margins of leaf sheath and petiole with stout fibers; male flowering branches long, 30–50 cm; endocarp fibers scattered ..... **Attalea butyracea*
25. Leaves simple ..... 26
25. Leaves compound ..... 33
26. Stems <1 cm diameter, clumped via rhizomes..... **Chamaedorea brachypoda*
26. Stems solitary, often >1 cm diameter ..... 27
27. Stems 3–5 cm diameter or acaulescent adults; leaves 8–15 or more, usually bifid, leaf sheaths brownish.. 28
27. Stems ≤2 cm (to 3 cm in *Chamaedorea pinnatifrons*) diameter; leaves mostly-8, bifid or not; leaf sheaths green..... 29
28. Apparently acaulescent (stems short, underground); leaves usually not simple; inflorescences spicate and with a deciduous bract (leaving a conspicuous scar) near the apex of the peduncle; fruits obovoid to 2 cmdiameter, green to black ..... *Calyptrogyne ghiesbreghtiana*
28. Stems not underground (as adults), 3–5 cm diameter; leaves bifid; inflorescences branched, fruits reddish ..... *Asterogyne martiana*
29. Leaf blades bifid, leathery, rigid, with a velvety aspect, blue-gray-green; female infl. spicate, male infl. with 2–10 branches ..... *Chamaedorea adscendens*
29. Leaf blades bifid or not, thin, not blue-gray-green .. 30
30. Leaves bifid for 1/3 of their length, but usually some leaves pinnate; stem ≤0.75 m tall, often apparently stemless; female infl. spicate or bifurcate, male infl. with 10–25 branches ..... **Chamaedorea pygmaea*
30. Leaves bifid for ≥1/3 of their length; stem conspicuous, potentially ≥0.75 m ..... 31
31. Leaf blade obscurely nerved above, more or less oblong; female infl. usually with up to 3 flowering branches, male infl. with 1–6 branches ..... *Chamaedorea geonomiformis*
31. Leaf blade prominently nerved above, more or less obovate; female infl. with >3 flowering branches or spicate ..... 32
32. Blades thick, simple, with ≥12 major veins per side; female infl. usually spicate, rarely with up to 4 branches, male infl. with 13–25 branches..... *Chamaedorea ernesti-augusti*
32. Blades thin, rarely all simple, with ≤10 major veins per side; female infl. usually with up to 20 flowering branches, rarely spicate, male infl. with 2–45 branches ..... *Chamaedorea pinnatifrons*
33. Stems solitary..... 34
33. Stems clumped..... 54
34. Apparently acaulescent (stem short, underground); with 8–21 leaves inflorescences spicate ..... *Calyptrogyne ghiesbreghtiana*
34. Stems evident in mature palms; leaves usually ≤8 (to 12 in *Synechanthus*) inflorescences branched (except in *Chamaedorea nationsiana*) ..... 35
35. Stems green; leaves clustered at stem apex, often ≤7 36
35. Stems not green, and/or leaves spread loosely along the stem; leaves often >7 ..... 45
36. Leaflets many (>10) per side and arranged in groups of 2–6; sub-apical leaflets with one principal vein; monoecious; flowers arranged in rows along the flowering axes ..... *Synechanthus fibrosus*
36. Leaflets few or many per side, not arranged in groups of 2–6, sub-apical leaflets without one principal vein; dioecious; flowers solitary or in groups ..... 37
37. Leaves leathery and leaflets ≤3.5 cm wide, leaflets 2–6 per side, rigid and with a velvety aspect, blue-gray-green; female infl. spicate, male infl. with 2–10 branches ..... *Chamaedorea adscendens*
37. Leaves thin and/or leaflets wider, rigid or not, green in color ..... 38
38. Leaflets mostly ≤10 per side; stems usually <2 cm diameter ..... 39
38. Leaflets ≥10 per side, stems variable..... 42
39. Leaflets thick, leathery, lanceolate to oblong; leaflets with a dominant midrib and 2 submarginal, obscure, unkeeled 10 nerves; apex of leaf sheath whitish; infl. with 6–25 branches ..... *Chamaedorea oblongata*
39. Leaflets thin, sigmoid or lanceolate, 10 nerves conspicuous and/or keeled; leaf sheath apex green .... 40
40. Leaflets sigmoid, with ≤7 10 nerves; inflorescences branched ..... 41
40. Leaflets lanceolate with 8–9 prominent 10 nerves; female, male inflorescences spicate; flowers greenish ..... **Chamaedorea nationsiana*
41. Leaflets 4–8/side with 2–7 angular 10 nerves; stem to 3 cm diameter; female flowers greenish; female, male infl. mostly with 5–20 branches..... *Chamaedorea pinnatifrons*
41. Leaflets to 11/side with 2 marginal, rounded 10 nerves; stem to 1.6 cm diameter; female flowers orange; female infl. with 4–8 branches, male infl. to 20 branches ..... **Chamaedorea sartori*
42. Small, slender palms <2 cm diameter and >2 m tall; leaf sheaths tubular near base; leaflets 11–21/side, linear to lanceolate, contracted at base; female, male infl. with 5–35 branches ..... *Chamaedorea elegans*
42. Small to medium-sized palms, 2–10 cm diameter, 2–12 m tall; leaf sheaths tubular for ± entire length; leaflets not contracted at base ..... 43
43. Leaflets linear-lanceolate or lanceolate; female infl. with c. 50 branches, or spicate..... 44
43. Leaflets sigmoid, to 25 per side; female infl. with 5–20 flowering branches, male infl. with 7–50 branches ..... *Chamaedorea tepejilote*
44. Leaf sheaths ≥30 cm long, smooth, green to thinly brown-edged; leaflets linear-lanceolate, to 36 per side; female infl. with c. 50 flowering branches..... *Chamaedorea woodsoniana*
44. Leaf sheath to 30 cm long, rough, conspicuously brown-edged; leaflets lanceolate, to 11 per side; inflorescences spicate ..... **Chamaedorea nationsiana*
45. Leaves 7–18, loosely spread apart along the stem; stems brown or green, usually clumped, 0.5–3 cm diameter ..... *Geonoma deversa*
45. Leaves 6+, clustered at stem apex; stems not green, usually solitary and >3 cm diameter (except *Reinhardtia*) ..... 46
46. Leaflets 4-ranked, spreading in 4 different planes and giving leaves a plumose appearance; stem to 15 cm diameter; leaves 6–8; crown open; fruits red; palm of rocky places over limestone at low elevations ..... *Gaussia maya*
46. Leaflets generally spreading in 1–2 planes; stems large or small; leaves often <8; crown usually dense; fruits red or not; on limestone soils or not ..... 47
47. Leaves with brown scales on lower surface; salt-tolerant, found near the sea; stem to 30 cm diameter;

fruits red .... *Pseudophoenix sargentii* subsp. *sargentii*
47. Leaves without brown scales beneath; most commonly found in wet or moist forest; fruits brown or blackish ..... 48
48. Leaves very large (2–8 m long), erect and irregularly divided into wide leaflets with serrated apical margins, persistent and forming a skirt around the stem; stems 15–20 cm diameter; fruits large (4–6 cm diameter), brown, covered in pyramidal protrusions; on wet, lowland soils ..... *Manicaria saccifera*
48. Leaves smaller, generally <3 m long, arching or erect, regularly divided, persistent or not, but never forming a skirt around the stem; leaflets not serrated (but apically toothed in *Reinhardtia gracilis*); stem diameter large or small; fruits small, <2 cm diameter, black or purple-black, fleshy ..... 49
49. Leaflets few, usually 2 per side; slender palm <2 cm diameter, leaf sheaths closed but not forming a crownshaft (forming interwoven fibers instead) .... 50
49. Leaflets many, often >10/side; stem much larger; crownshaft present in *Euterpe* ..... 51
50. Leaves large: leaf rachis 11–23 cm long, with 14–22 nerves on each side; the lower pinnae 14.5–25 cm long ..... *Reinhardtia gracilis* var. *gracilis*
50. Leaves small: leaf rachis 3.5–6 cm long, with 8–11 nerves on each side; the lower pinnae 8.5–12 cm long ..... *Reinhardtia gracilis* var. *gracilior*
51. Stem gray, with a green crownshaft formed by closed leaf sheaths; tall (to 20 m), to 23 cm diameter; leaves 5–10; leaflets linear; fruits 1 cm diameter, purple-black ..... *Euterpe precatoria* var. *longevaginata*
51. Stem brown, with a (purplish) crown shaft only in *Prestoea*, ≤10 m tall, to 20 cm; leaves 6–20; fruits <7 mm, black ..... 52
52. Crownshaft open, purplish or purple-green; stem to 20 cm diameter ..... **Prestoea acuminata*
52. Crownshaft absent; stem to 15 cm diameter ..... 53
53. Montane rainforest palm; rare; leaflets ± linear; pits in flowering branches with a lower and upper lip ... ..... *Geonoma undata*
53. Most common in lowland and pre-montane forests as well as on mountain slopes, sometimes in disturbed areas; leaflets sickle-shaped; pits in flowering branches without a distinct upper lip..... .....*Geonoma interrupta* var. *interrupta*
54. Stems green and leaves tightly clustered at stem apex ..... 55
54. Stems not green or leaves loosely clustered at stem apex ..... 57
55. Stems, sheath, petiole, and rachis often glaucous; leaflets 22–42 per side; stems 2–3 cm diameter; female, male infl. with 10–35 branches ..... .....*Chamaedorea graminifolia*
55. Not glaucous; leaflets usually >22 per side..... 56
56. Stems sometimes clumped, 2–10 cm diameter, to 7 m tall; leaflets wide (3.5–10 cm) and long (16–70 cm), 6–25 per side, with several prominent 10 nerves above; female infl. with up to 20 branches, male infl. with up to 50 branches ..... *Chamaedorea tepejilote*
56. Stems always clumped, 1–2 cm diameter, to 3 m tall; leaflets narrow (≤3 cm) and short (20–35 cm), 5–18 per side, with one 10 nerve; female, male infl. with 4–12 branches ..... *Chamaedorea seifrizii*
57. Leaflets numerous (usually >20/side, at least >3/side), without "windows" between the folds and the rachis ..... 58
57. Leaflets usually >4 per side, or 2–3 compound leaflets with small windows between the folds on either side of the rachis ..... 60
58. Crownshaft formed by closed, or partially closed leaf sheaths present, stem to 20+ cm diameter; leaflets ± uniform in size, linear ..... 59
58. Crownshaft absent; leaflets sickle-shaped, broad ones intermixed with narrow ones; stems 2–12 cm diameter ..... *Geonoma interrupta* var. *interrupta*
59. Montane palms with a partially closed (for 1/3 to 1/2 the length of the leaf sheaths), purplish or purple-green crownshaft; stem brownish ..... ..... **Prestoea acuminata*
59. Montane or lowland palms with conspicuously closed, green or yellowish crownshaft; stem gray ... .....*Euterpe precatoria* var. *longevaginata*
60. Leaves clustered at the apex, with compound leaflets having small windows between the folds on either side of the rachis ..... 61
60. Leaves loosely spread apart along the stem, without windows; stem ≤3 cm diameter ..... *Geonoma deversa*
61. Stems thick, c. 6–7 cm diameter; leaf blades ≥1 m long ..... *Reinhardtia latisecta*
61. Stems c. 1.5 cm diameter; leaf blades ≥1 m. (usually <0.5 m) ..... 62
62. Leaves large: leaf rachis 11–23 cm long, with 14–22 nerves on each side; the lower pinnae 14.5–25 cm long ..... *Reinhardtia gracilis* var. *gracilis*
62. Leaves small: leaf rachis 3.5–6 cm long, with 8–11 nerves on each side; the lower pinnae 8.5–12 cm long ..... *Reinhardtia gracilis* var. *gracilior*

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# Bill Manley: In Appreciation of a Palm Pioneer

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Mr. Manley's home just off a busy state highway outside of Atlanta has become not just a place for someone to live. It has emerged as a dwelling with a sense of history, all of it provided by Mr. Manley. After all, the man is 93 years old, and he has lived there since 1963.

Bill Manley has been growing palms for longer than most of us have been alive. This extraordinary man, who bought his first palm during the Great Depression, still loves the princes of plants just as much now as the first time he saw a *Sabal palmetto* in a sunny North Carolina town.

A walk through Mr. Manley's yard is an invitation to storytelling. Each palm has a history. By the patio are a grouping of *Sabal minor* var. *louisiana* that Mr. Manley bought as seedlings during a trip to visit IPS Founding President Dent Smith in Daytona Beach, FL. By the pond is a large *Persea borbonia* that Mr. Manley grew from seed collected on a trip to the Georgia coast. A rock wall on the slope behind the house was built by Mr. Manley a few years ago using rocks from a chimney on his great-great-grandfather's farm in Meriwether County, GA—a farm, by the way, that Mr. Manley still owns. A patio off his back door was constructed especially for the several large *Sabal palmetto* that shade and cool the back on hot summer days and lend a touch of the tropics on frosty winter mornings.

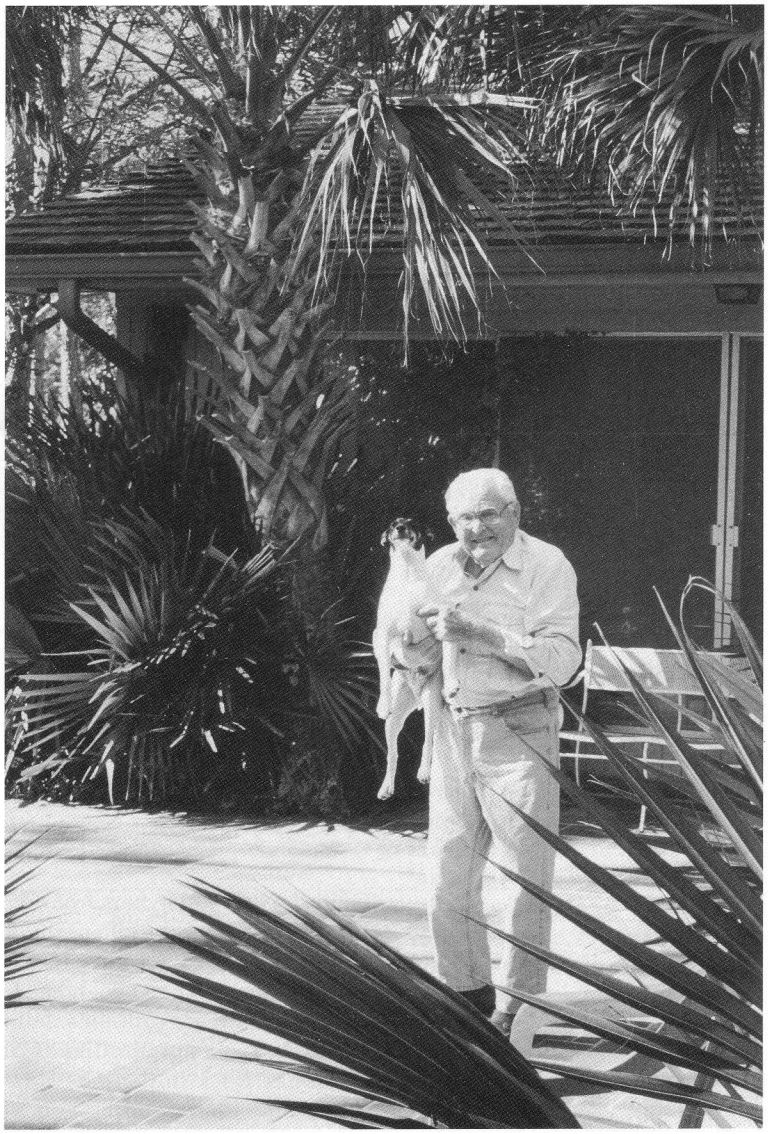
Here is a man who has seen most of the 20th Century, a man who graduated from high school six years before the Crash of 1929, who has outlived two wives and several cherished dogs, who has raised children and grandchildren and great-grandchildren. He was successful in one business—building and repairing pipe organs—and after retiring, started another successful business, this time repairing player pianos. Many would say he has lived a full life.

Yet Mr. Manley still loves today. He keeps up with current events. He has many friends, and the telephone rings constantly. Some of the calls are from friends and some are questions from people in Missouri or Massachusetts or Virginia, all of whom have heard of Mr. Manley and have called to seek the advice of this pioneer who was growing palms when no one else was. Mr. Manley has influenced many palm lovers in Atlanta and around the world.

Between calls Mr. Manley worries about an offer on his property. "The woman said she wants to live here, but I know she just wants to build a subdivision," he said. Like many areas of metro Atlanta, Stockbridge is growing rapidly and old farmsteads and tracts of timber are succumbing to the bulldozer and the asphalt paver. If he cannot stop his home from seeing the same fate, he feels he can at least stave it off for the rest of his life.

If he feels protective, he certainly has a right. You won't find junipers and red-tip photinias at this house. Indeed, his palms are in many ways a part of his family. They surround his house in Stockbridge, lending the brick ranch character and definition. His 20-acre property is filled with most of the species of palms that can be grown in the Georgia Piedmont, including *Sabal palmetto, Sabal minor, Trachycarpus fortunei, Rhapidophyllum hystrix* (Figs. 1, 2), and *Chamaerops humilis*. Their sizes range from 25-foot cabbage palms to the seedling *Trachycarpus* that have begun naturalizing beneath the mature palms. Twelve-foot needle palms with four-foot trunks loom like behemoths on the front lawn. *Sabal minor* with emerging stems fan down a grassy slope in back toward a crystal-clear pond filled with bass and bream and surrounded by bald cypress and *Magnolia virginiana*.

But Mr. Manley will readily admit that he was not always an expert—and that his vast knowledge of palms did not come easily. After all, in the 1920s there was no internet, no *Principes*, no



1. Bill Manley and dog on the patio with *Sabal minor* in the foreground and *S. palmetto* and *Rhapidophyllum hystrix* in the background.

Palm Society, and the first time this native of Atlanta saw a palm tree was just after his high school graduation. He remembers the experience as if it were yesterday and not some 76 years ago. Mr. Manley accepted a friend's invitation to visit him in Wilmington, NC and did what today might seem impossible: he hopped on his bicycle and rode for three days and more than 400 miles—all on dirt roads—to the coastal North Carolina city. It was his first time seeing the Atlantic Ocean.

"The streets of Wilmington were lined with palmettos. I guess they still are," Mr. Manley said. "I rode the streetcar out to Wrightsville Beach and stayed there for two weeks with a friend. There were Big Bands playing on the boardwalk every night, and I had the time of my life." The experience of sun, sea, and palms enchanted the young man.

Several years later Mr. Manley married a girl whose parents lived in a Florida boom town called Miami. He and his wife frequently took

the train from Atlanta to Miami, and Mr. Manley recalls looking out wistfully at the dwindling tropical vegetation on the way back to Atlanta. But on one trip during a stop in the small town of Fort Valley, southwest of Macon, GA, Mr. Manley spied a *Sabal palmetto,* the first he had seen in middle Georgia and only 80 miles south of Atlanta.

"I asked the conductor about it. I call him the first palm nut in Georgia, because he knew all about it," Mr. Manley said, chuckling. "He said a fellow had brought it back from Savannah Beach. I couldn't believe it. I knew there were cabbage palms in Albany, but I never thought they'd grow up here."

The palm had about six feet of trunk at the time. Mr. Manley produced photos of it taken in 1998, showing a 40-foot *Sabal* surrounded by innumerable progeny ranging from seedlings to fully mature palms with 25 feet of trunk.

This sighting piqued Mr. Manley's interest in growing palms in Atlanta. Could it be possible? Several more years would pass before he tried growing his own, mainly because he had nowhere to plant them. "I didn't have a house, a lot—I didn't have anything."

But not long after moving into his first home in Atlanta, a friend told him that he had seen some palms at a local nursery. "That perked my ears up," Mr. Manley said. "When I went down to the nursery, the fellow said he had two palms he called needle palms. He wanted $2.50 apiece for them, so I only got one." Four moves and 62 years later, that *Rhapidophyllum hystrix* resides happily in front of Mr. Manley's home, testimony to 12 bits well spent.

Not long after, in 1937, Mr. Manley started his own business building and repairing pipe organs. As might be expected, a pipe organ repair man must make house calls, and Mr. Manley probably has traveled every road in Georgia, from hemlock-clad mountains to great stretches of pine forest clothed with *Serenoa repens.*

It was in Madison, GA, the middle Georgia town so beautiful that William T. Sherman refused to burn it during the War Between the States, that Bill Manley saw the palm tree he knew he could grow in Atlanta. At a house on the Old Post Road, which at one time was the main artery between New Orleans and Charleston, Mr. Manley saw a large *Trachycarpus fortunei.*

"Of course I didn't know what it was at the time," Mr. Manley said. The woman of the house said she had gotten hers from Fruitlands Nursery in Augusta (now the site of the Augusta National Golf Club) to replace one given her by a Dr. Hunt in Eatonton. "When I got home I wrote a letter for the catalog from Fruitlands. I didn't know the address, so I just put 'Fruitlands Nursery, Augusta, Georgia.' Back in those days you didn't have to know the whole address—if you just put the name and the city it got there."

2. *Trachycarpus fortunei* and *Rhapidophyllum hystrix* on Bill Manley's property.

In due time the catalog from Fruitlands arrived, with "Fortune's Chusan Palm" listed for $1.75. Mr. Manley promptly ordered one.

"That palm grew mightily," Mr. Manley said. Unfortunately, when he moved he put the palm under a drain spout, where the excess moisture killed it. "I was still learning about palms then." In 1956 Bill Manley joined the fledgling Palm Society, and he still belongs. In later years he often wrote of his experiences in *The Palm Quarterly,* the ground-breaking journal of the Temperature Zone Chapter of IPS edited by Tamar Myers.

"He was an inspiration," Tamar said. Tamar

edited (and often wrote much of) *The Palm Quarterly* from 1984 to 1992, when she moved to balmy South Carolina. "I sort of look at him as the grandfather of the hardy palm people. He was there when all this started."

One of the many people Bill Manley influenced through *The Palm Quarterly* was Gerry McKinness, who grew up in Miami and now lives in nearby McDonough, GA, where he owns a thriving mail-order palm nursery specializing in cold-hardy palms. "I had read his articles in PQ, and he influenced me—I thought I'd have to leave all my palms behind," Gerry said. "When I saw his *Sabal palmettos*, which were just huge, it inspired me to try. He's always been generous with his knowledge—and more than generous with his needle palm seed!"

Unlike many people his age, Mr. Manley shows no signs of slowing down. He complained that once he sits in a chair he has difficulty getting back out, but his strength is such that dragging a heavy wooden chair across carpet for a visitor posed no difficulty for him. He spoke of plans for the next day, the next season, the next year. He planned to take cuttings off his creeping fig to root and give away since the vine had done so well for him, covering a third of the north side of his house.

For years he tossed palm seeds in a damp area behind his house, and last spring he transplanted several of them to build an emerging palm garden behind his pond. With his driveway filled with *Trachycarpus* and *Sabal* seedlings ready to be planted out, he seemed ready to begin the next 93 years of his life. Mr. Manley's zeal for life shone in his blue eyes and in his attention to the small things in life: his plants, his friends, his dog. He does not sell his palm seedlings, preferring instead to share them with friends and visitors, anyone who shows an interest in the Princes of Plants.

"Come back when you can," Mr. Manley said. "I love to talk. And I especially love to talk about palms."

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# Bentinckia nicobarica: An Endemic, Endangered Palm of the Nicobar Islands

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*Bentinckia*, a palm genus endemic to India, consists of two species: *B. condapanna* Berry ex Roxb., which is restricted to the border areas of Tamilnadu and Kerala; and *B. nicobarica* (Kurz) Becc., which is endemic to the Nicobar Islands. While on a recent botanical exploration of the grasslands of the Nancowry Islands in the Nicobar district, the senior author encountered a few disjunct populations of *B. nicobarica* in the Camorta, Nancowry, and Trinkat Islands. The grasslands of the Nancowry Islands are a remnant of this endangered, native palm's natural habitat, spread over 10 500 ha of landmass on the far-flung islands of Bompoka, Camorta, Kachal, Nancowry, Terassa, and Trinkat. This arecoid palm is found growing abundantly in the tropical evergreen forest patches of these islands, along the fringes of savannah-like grassheaths.

The Nancowry Islands, situated between 7°50′–8°10′N and 93°30′–93°40′E consist of eight or nine small islands with hills, ridges, dense forests, and grasslands. Geologically, these islands are characterized by the presence of alluvial deposits, plutonic rocks, and polycistine clay throughout. The islands are exposed to both the monsoons and fair weather prevails from February through April, and for a short spell in October as well. Rainfall occurs throughout the year, usually in torrential showers, and varies from 2 286 to 3 429 mm annually. The temperature ranges from 17.8° to 33.3°C.

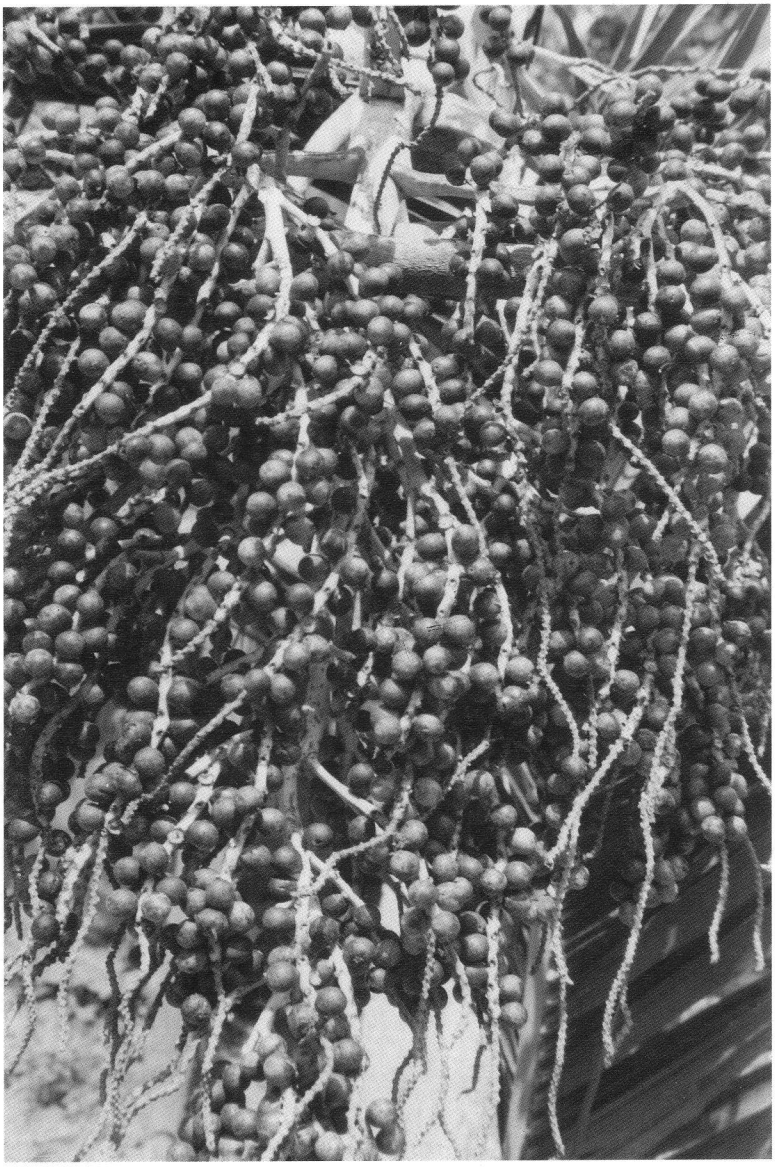
*B. nicobarica* was declared a threatened species in its natural habitat (Basu 1988). The main causes can be postulated as habitat alteration, human intervention, expansion of agriculture, annual firing and cutting, and the depletion of natural resources. Palms in the understory of canopy trees are seriously affected by forest cutting, as they are very sensitive to insolation. Once their shaded, humid habitat has been destroyed, they tend to perish.

Basu (1984) studied the growth of this species in detail, and concluded that it is a fast-growing palm in cultivation and attains maturity after a period of at least 15 years. Plants grown in conservatories are rather slender, and take comparatively longer to flower. A fully grown palm produced three to four inflorescences in each flowering period, with the emergence of new leaves occurring from May to September. Basu adds that it takes over 60 days from the emergence of flower buds to the commencement of anthesis; fruit setting is abundant in the first two inflorescences of a season. Fruits are single-seeded, ovoid or sub-globose, ~1.5 × 1.2 cm, and maroon or reddish-brown when ripe. Fresh seeds germinate within 60 days in a porous compost medium. This palm is elegant and impressive with its gracefully arching leaves and attractive, grayish-white trunk, similar to those of the Royal Palm. It can be used as an ornamental, avenue palm, but is said to be susceptible to drought (Basu and Chakraverty 1994).

*B. nicobarica* grows in a few grassy patches of the Nancowry Islands, where population occurs in a discontinuous pattern. Although Mathew and Abraham (1994) report this palm on Great Nicobar Island (occurrence there is doubtful), we were able to locate over 300 palms growing along forests bordering the grassy slopes of Bompoka, Camorta, Nancowry, and Trinkat Islands.

1. *Bentinckia* in its natural habitat .

Due to its restricted distribution and probable loss of habitat (because of human interference and overgrazing), this palm can be categorized as endangered in its natural habitats. There is an urgent need to develop some means of protecting it. Although the habitats of *B. nicobarica* come under the protection of forest laws, it has been observed that some of the areas are now seriously threatened due to various biotic interferences. Moreover, the local inhabitants widely use this rare palm to construct their huts and fences. It is hoped that one or two of the Nancowry Islands with rich populations of this palm could be declared sanctuaries in order to afford it effective protection. Attempts could be made to reintroduce it into its depleted natural habitats. Local settlers and aborigines could be educated about the importance of conserving the region's biodiversity; made aware of their rights to the biological resources around them and encouraged to



2. A close-up view of the fruits of *B. nicobarica*.

regulate their use of these natural resources in a sustainable manner. In situ conservation of this unique native palm is imperative.

Scientists at the Botanical Survey of India have achieved success in the ex situ conservation of this species. The Indian Botanic Garden of the Botanical Survey of India, Howrah, is self-sufficient in the multiplication and supply of *B. nicobarica*. However, while ex situ measures preserve biodiversity, they arrest the process of evolution. In cases of in situ conservation, both processes can occur simultaneously. We hope that some of the best preserved islands with good palm populations will be identified as Priority Conservation Area Matrices, and sustained efforts will be made to conserve these natural heritage sites. The authors would like to appeal to those in authority to create a *Bentinckia* sanctuary, as we have for the Megapodes, the Thermometer Bird, and other fauna. Palms and other

plants are a vital part of nature, and are equally deserving of protection.

## Acknowledgments

The authors wish to express sincere thanks to Dr. P. K. Hajra, Director, Botanical Survey of India, Calcutta, and to Dr. P. S. N. Rao, Scientist D, Botanical Survey of Port Blair, for their encouragement and the use of their facilities. Gratitude is due to Mr. C. P. Oberai, Principal Chief Conservator of Forests, Andaman and Nicobar Islands, for innumerable things. Thanks are also due to Mr. M. Hamza, our photographer; to Mr. R. K. Ram, Fieldman of the Botanical Survey of India, Port Blair; and to Ms. Asiya of the Forest Department, Port Blair, for their assistance.

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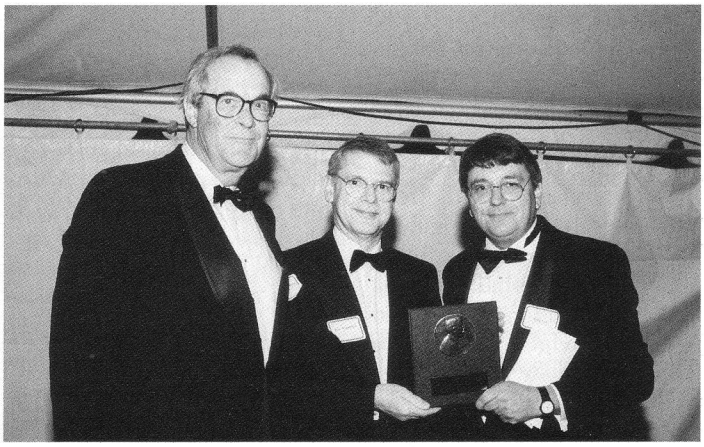
# Editor Receives Award

One of our co-editors, Dr. John Dransfield, received the prestigious David Fairchild Medal for Plant Exploration from the National Tropical Botanical Garden on 19 February 1999. Citing Dr. Dransfield's contributions to *Genera Palmarum* and *Palms of Madagascar* and his numerous publications on rattans, Dr. Paul Alan Cox, Director of the National Tropical Botanical Garden, awarded Dr. Dransfield a bronze plaque and citation. The citation commended Dr. Dransfield "as being expert in the art and skill of botanical exploration, employing ingenious conveyances and curious itineraries to traverse areas both remote and inaccessible throughout the world, bringing to the notice of polite and learned company plants of singular beauty and economic importance ..." To that, we can add only, "Congratulations, John!"

Scott Zona



Douglas McBryde Kinney (left), Chairman of the National Tropical Botanical Garden, with John Dransfield (center) and Paul Alan Cox (right).

*Palms*, 43(3), 1999, pp. 122–129

# Products Derived from Palms at the Puerto Ayacucho Markets in Amazonas State, Venezuela

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ABSTRACT

Due to the nutritive value, importance in the commerce of other non-palm products, and the high quality of the manufactured articles, a description of the uses of nine species of palms circulating among the two main markets of the city of Puerto Ayacucho in the State of Amazonas, Venezuela are reported. Information about the origin and commercialization of the palm products is also included. Three important uses for different parts of the palms were identified: food, handicraft and medicine. The fruits of seven species and the leaves of three species are used. At least four indigenous groups (Piaroa, Curripaco, Guahibo and Baniva) from 10 neighboring communities, include palm products in the economic support of their families.

Key words: Palms, Arecaceae, Market, Ethnobotanic, Puerto Ayacucho, Amazonas, Venezuela

The city of Puerto Ayacucho, municipality of Atures, is the capital of the State of Amazonas, Venezuela. It is found near the north section of the State near the Orinoco River, the main river of Venezuela. The municipality of Atures has the highest population density, reports 48.4% of the indigenous population of the State (OCEI, 1993), and has the highest commercial activity for the State.

The city has two central markets, which have their main commercial activity on Saturdays when the neighboring indigenous groups come to sell their goods. One of the markets sells fresh and processed food to the residents and neighboring communities of Puerto Ayacucho. The other market is mainly folkloric, sells herbal remedies and handicrafts, and is important for regional and national tourism. The palm products sold in both markets are an excellent commercial resource, which additionally represent the culinary art and craftsmanship of indigenous groups living near the city.

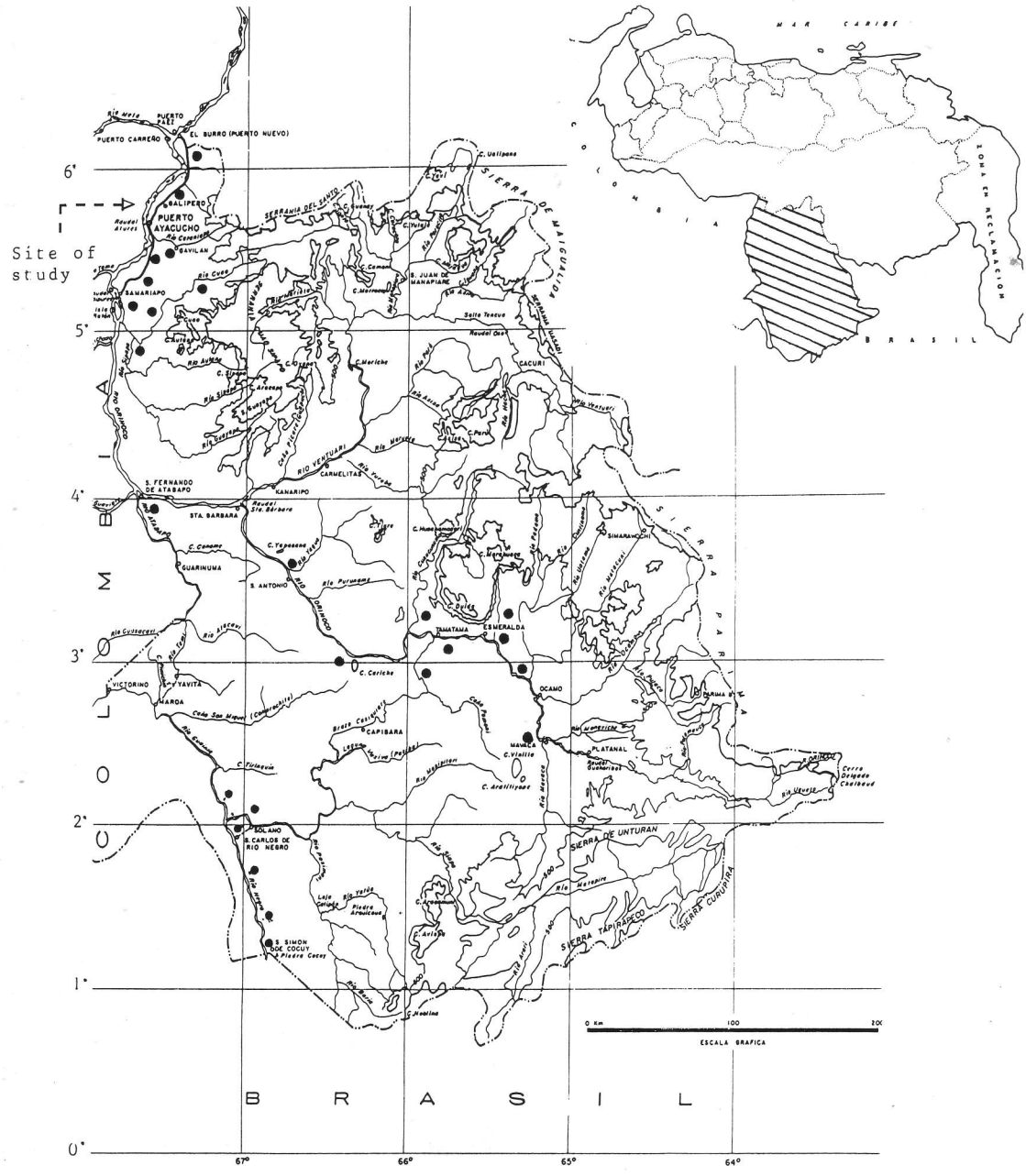
The palms play a very important role in the lives of many native societies of the tropics, providing food, dress, shelter, and so forth (Balick 1986). In the markets of Puerto Ayacucho, the commercial activity with palms is an important part of the economic earnings of many indigenous families. Melnik (1995) reported the commercialization of at least two species of palms, Seje (*Oenocarpus* sp.) and Moriche (*Mauritia flexuosa*), in the markets of Puerto Ayacucho. These generate income sufficient to satisfy some of the basic needs of the families Huottuja (Piaroa). Mejía (1992), in other markets of the Amazonia, identified 19 palms in Iquitos, Peru and Kahn (1997) pointed out the presence of *Astrocaryum aculeatum*, *Astrocaryum chambira* and *Mauritia flexuosa* in two markets of the Amazon basin.

## Methods

This study was carried out during five visits to the two main markets of Puerto Ayacucho between January 1997 and July 1998. Each of the visits included interviews with the market's merchants, the inhabitants of the city, and the neighboring indigenous communities to compile information on the origin of the, their uses, methods of preparation, and cost. The taxonomic identification of species was made using the keys proposed by Henderon (1995) and Kahn (1997), and the revision of botanical specimens deposited at MY, MYF, NY, TFAV, US, and VEN. Field collections and additional ethnobotanic observations were carried out in several other localities throughout the State (Fig. 1).

## Results

In this study nine species of palms are reported, parts of which are directly commercialized for human consumption and constitute the raw mate-




1. Map. Localities where botanical specimens were collected.

rial in the manufacture of handicrafts, and indirectly contribute to the selling of other products.

The uses, common names, methods of preparation, prices (when available) and the period of availability presented for each of the nine species. Additional information about uses and common names were taken from herbarium specimens and literature searches for the same palms reported from other regions of Venezuela (Table 1).

***Astrocaryum jauari*** Mart.

C.N.: Albarico

*Table 1. Other reported uses and common names given to the studied species*

| Species | Uses | Common names |
|---|---|---|
| *Astrocaryum jauari* | In the Amazonas basin, the fruit is used as bait for fishing (Stauffer et al. 334, 476-VEN). The Pumé Indians use the fiber from the leaves to weave baskets and bags (Gragson 1992). | Kiajuara (Gentry and Stein 47325-NY). |
| *Attalea butyracea* | In Cojedes, the oil extracted from the fruits is used to fortify the hair of men and animals and the stems to build corrals and bridges (Delascio 11710-VEN). In Barinas, the pulp of fruits is eaten by hogs and the leaves used for roof (Ramia 1669-VEN). In the upper Orinoco River, the Yanomamis eat the fruit after boiling it. | Yagua, Corozo (Cojedes State) (Delacio and López 111710-VEN). |
| *Attalea maripa* | In Bolivar, the fruit is eaten boiled and with the flour, a flat bread (*arepa*) is made (Stauffer *et al.* 274-VEN). In Amazonas, from the crushed and boiled seed semi-solid whitish grease is obtained which is used for medicines. Mixed with vegetable pigments or minerals, it serves as a base for paint the indians use in their bodies. The oil also serves as a fuel for burners. In the upper Orinoco a starch from the mesocarp is obtained to make cakes (Civrieux 1957; Braun and Delascio 1987). The Yanomamis eat the raw fruit (Fuentes 1980). The big peduncular bracts serves as toys for children (Civrieux 1957). | Careshi (Yanomami) (Stauffer et al. 274-VEN), Wasai (Yekuana, Bolívar state) (Goldstein and Salas 328-VEN), Mabaco (Piapoco) (Braun and Delascio 1987) |
| *Bactris gasipaes* | The wood from the trunk is used when the palm becomes sterile and the shoot is edible (Braun and Delascio 1987). The Yekuanas use the wood to make bows (*haia*) and the epicarp is used to sweeten the *yarake* (fermented drink made with *Manihot esculenta*) (Delascio 1992). The Venezuelan and Brazilian Yanomamis celebrate the harvest of Pijiguao with dances and a thick drink made from the fruit (Patiño (1992). In the Venezuelan Amazonas, the liquid extracted from the fruits is used as an astringent (Braun and Delascio 1987). When there is no pottery for cooking, the fruits are roasted (Civrieux 1957). | Pijiwao (Wessels-Boer 2252-NY), Jijiri, Fhi-hidi, Lasha (Yekuana) (Braun and Delascio 1987; Delascio 1992). Raxa (Yanomami) (Fuentes 1980). |
| *Euterpe precatoria* var. *precatoria* | Occasionally boards are obtained from the trunk. The fruits are used to prepare a refreshing drink (Stauffer et al. 286, 306, 328, 475-VEN). The heart of the palm is edible (Holst and Liesner 2710-VEN). With the ashes of the leaves the Pumé Indians from the southwest Venezuela, in Apure, prepare *paramán* a substance used to seal, tie and make many products waterproof (Gragson 1992). | Nenea (Piaroa) (Stauffer et al. 286, 306, 328, 475-VEN). Wa-hu (Steyermark 107188-NY). Wahima (Yanomami) (Salaroli and Rucci 7-NY). |
| *Leopoldinia piassaba* | The fiber is used to make handicrafts (Stauffer et al. 391-VEN). The threads from the petioles are very resistant to water, flexible, and long-lasting; because of this, they are used to make ropes, brooms, collars, and brushes to clean budares, bracelets, hammocks, carpets and, mats (Braun and Delascio 1987). The leaves are also used for thatching roofs (Henderson 1997). | Marama, Madama (Yekuana) (Delascio 1992) |
| *Mauritia flexuosa* | The leaves are used for thatching, the fiber resulting from the first partly grown leaf, is used to make handicrafts. From the fruit a paste is made to produce a refreshing drink. Old stems shelter the beetle larvae of (*Rynchophorus palmarum)* which is | Kuia (Yekuana), Eteweshi (Yanomami), (Braun and Delascio 1987); Cuhuai (Yekuana) (Delascio 1992). |

*Table 1. Continued*

| Species | Uses | Common names |
|---|---|---|
| | eaten by the Yanomamis due to its high fat content. The fruits are eaten raw or cooked. When they are too ripe the Waraos Indians of the Orinoco Delta crush the fruit to obtain a paste, *ojiguari*, a kind of cheese that lasts a few days (Braun and Delascio 1987). Starting from the seeds a thick drink or *carato* is prepared (Braun and Delascio 1987). The heart of this palm is consumed by the Pumé Indians from Apure State (Gragson 1992). | |
| *Oenocarpus bacaba* | The epidermis of the leaf sheath is used to make cigars (Braun and Delascio 1987). The leaves are used for thatching (Henderson 1997). From the fruits alcoholic and refreshing drinks are prepared, and also a good edible oil (Berry 791-VEN; Braun and Delascio 1987). The pulp from the fruit crushed and mixed with water, produces an emulsion which is drunk with coffee instead of milk (Braun 1997) | Palma de vino, Macaba (Yanomami) (Braun and Delascio 1987). Kujedi (Yekuana, Bolívar State) (Goldstein and Salas 343-VEN). |
| *Oenocarpus bataua* var. *bataua* | The leaf rachis is used to make arrows for hunting and the trunk is used to make bows (Braun and Delascio 1987). The oil that comes from the fruit is used against asthma and to cure skin irritation and diseases (Stauffer et al. 382-VEN), and Guánchez (1996) points out that this oil is used as an antidote to the bite of poisonous animals. The medicinal oil also has culinary uses (Williams 14345-VEN). The fruits soaked in water for several days produce a very palatable strong drink (Braun and Delascio 1987) that is nutritious (Berry 2133-VEN). From the fruit, a starch is obtained which is used in confectionery. The seeds in decoction, crushed and emulsified in water are used to prepare a *carato* which is very nutritious. The seeds can be eaten raw (Civrieux 1957). | Kudai (Yekuana, Bolívar State) (Goldstein and Salas 342-VEN). |

Use: Handicraft (fruit)

The hard endocarp is employed for carving figures, necklaces and rings, which are sold in markets and handicraft stores in the city. The products are available year round.

***Attalea butyracea*** (Mutis ex L. f.) Wess. Boer

C.N.: Coroba

Use: Food (fruit)

The fruit is boiled with salt until it is soft. The epicarp is discarded and the mesocarp and endosperm are eaten. Another method of preparation is to boil it, peel off its cover, and leave it to dry in the sun. It is grated into flour, and dried again on a *budare* (baking pan). The flour is kept in cans. This flour can be consumed dried or mixed with water. A dough can also be prepared to make *arepas* (flat bread) which is cooked on a *budare*. It is usually scarce in the market. However, it was seen in February (Fig. 2).

***Attalea maripa*** (Aubl.) Mart.

C.N.: Cucurito

Use: Handicraft (leaves)

The leaves of this palm play an important commercial role in the market. Its leaves are woven to make *catumares* (bags used for carrying products by the local indigenous populations) and to wrap smoked fish (Fig. 3). It is available throughout the year.

***Bactris gasipaes*** Kunth

C.N.: Pijiguao

Use: Food (fruit)

The fruit is boiled for 10 minutes, the epicarp discarded, and the mesocarp eaten. The whole infrutescences are also sold in the market (Fig. 4). They are boiled and wrapped in *tirite* (*Ischnosiphon* sp.) leaves. The raceme is sold for about $3.57 (2.000 Bs.), however, its price directly depends on size and abundance. A package (1

2. Fruits of Coroba (*Attalea butyracea*).

3. Leaves of Cucurito (*Attalea maripa*) wrapping smoked fish.

kg) with fruits costs $0.71 (400 Bs.) (Fig. 5). They are available from February to May.

***Euterpe precatoria*** var. ***precatoria*** Mart.

C.N.: Manaca montañera var.

Use: Food (fruit)

The fruits are boiled for 10 minutes, drained, crushed, mixed with water and strained. This beverage can be served hot or cold with or without sugar, and can be accompanied with *mañoco* (*Manihot esculenta* flour). The fresh fruits are sold for $0.44–0.53 per kg (250–300 Bs.), and are available from June to September (Fig. 6).

***Leopoldinia piassaba*** Wallace

C.N.: Chiqui-chiqui

Use: Handicraft (leaves)

The fibers from the petioles and the leaf sheaths are very resistant and are used to make mats, brooms, brushes, ropes, etc. (Fig. 7). The prices depend on the size and quality of the products. The products are available throughout the year.

***Mauritia flexuosa*** L. f.

C.N.: Moriche

Use: Food (fruit) and handicraft (leaves)

The ripe fruits are collected from the ground. After the pericarp is discarded, the mesocarp is separated from the seed to prepare a paste that can be consumed as a drink mixed with sugar and water. It is also used as an ingredient to make ice cream and other products. At the market the fruits are sold whole. The paste is wrapped in *Ischnosiphon* sp. leaves (Fig. 8). The fresh leaves of the moriche palm are used to wrap bales of *casabe* (bread made of *Manihot esculenta* flour).

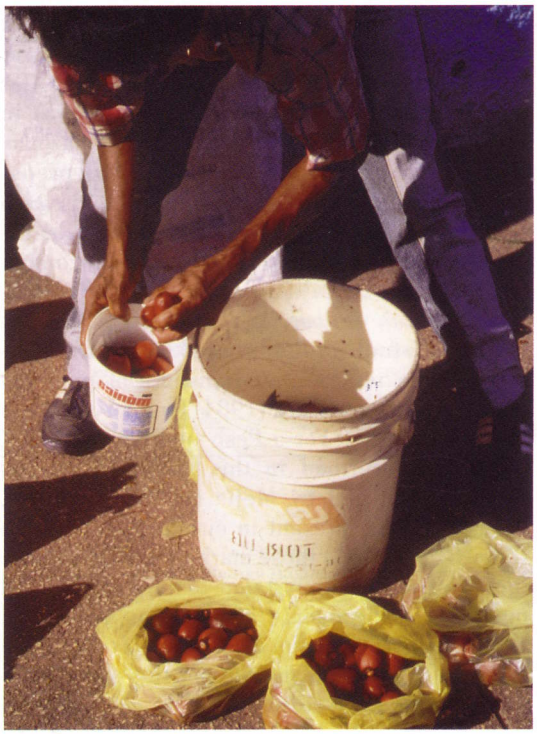
The moriche paste is sold in packages of approximately 1 kg at a cost of $2.67 (1.500 Bs.). At the handicraft market many products from the fiber of leaves and petioles are sold, including bags, handbags, hats, and hammocks. They can cost between $71.43—80.36 (40.000—45.000 Bs.). The fruit products are sold from April to May, and the crafts are sold throughout the year.

4. The racemes of Pijiguao (*Bactris gasipaes*).

***Oenocarpus bacaba*** Mart.

C.N.: Sejito, Seje pequeño
Use: Food (fruit)

The ripe fruits are cooked in water, macerated, and the extracted juice consumed as a drink. Some people report that the oil and juice extracted from the fruits of this palm are higher in quality than those of seje grande (*Oenocarpus bataua* var. *bataua*). The fruits are sold at $0.89 per kg (500 Bs.), are available from January to May and are less abundant than those of seje grande.



5. Fruits of Pijiguao (*Bactris gasipaes*).

6. Fruits of Manaca montañera (*Euterpe precatoria* var. *precatoria*).

***Oenocarpus bataua*** var. ***bataua*** Mart.

C.N.: Seje grande
Use: Food and medicinal (fruit)

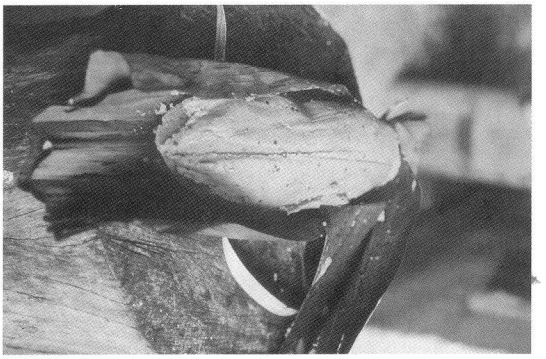
The ripe fruits are cooked in water until soft, the epicarp is discarded and a drink is prepared from the mesocarp. The mesocarp, when ripe, produces oil that can be used for cooking and as a remedy against asthma, flu and tuberculosis. To extract the oil, the fruits are submerged in tepid water until soft. They are immediately taken out of the water and exposed to the sun until the oil is released. Once the oil is released, it is passed through a *sebucan* (a mesh of vegetal fiber), filtered, and bottled. It is sold pure or mixed with honey. The fruit costs between $0.45—0.89 per

7. Products made from the fiber of Chiqui-chiqui (*Leopoldinia piasaba*).

kg (250—500 Bs.). A bottle of seje oil (1.5 liter), can cost between $5.66—7.54 (3.000—4.000 Bs.). The fruits were observed in the market between April and September. In the handicraft market, bottles of seje grande oil are present all year-round (Fig. 9).

## Origin of the Products

The food products, most of them perishable, come from at least 10 indigenous communities near Puerto Ayacucho city: Agua Blanca, Cucurital, Gavilan, Las Pavas, Parhueña, Paria, Pintado, Platanillal, Rueda and Sipapo. Occasionally, some products such as seje oil and handicrafts made from leaves of palms, arrive at Puerto Ayacucho, thanks to a cooperative organization situated in San Juan de Manapiare (180 km southeast of Puerto Ayacucho). This cooperative receives manufactured products made by Piaroa communities established along the Manapiare and Marieta rivers. Goods also arrive from Chaguachinoto



8. Paste of fruits of Moriche (*Mauritia flexuosa*) wrapped in *Ischnosiphon* sp.

village located along the upper Suapure River (between Bolívar and Amazonas States). The highest number of palm products comes from the Piaroa and to a lesser degree from Curripaco, Guahibo, and Baniva groups. The Baniva are originally from the Rio Negro basin and later moved to northern Amazonas.

## Discussion

From the start of this investigation the importance of the products of the Arecaceae family in the markets of Puerto Ayacucho was evident, not only because of their great variety but also, for their abundance. In this sense, Melnik (1995), in her work on edible forest products of Amazonas State, pointed out the uses and methods of preparation of fruits for some palms species. She also said that on one Saturday, she observed 34 indigenous people selling manaca (*Euterpe precatoria* var. *precatoria*) and 14 selling seje (*Oenocarpus bataua* var. *bataua*).

Similar studies in other markets of the Amazonas basin report a great variety of products made from palms. Berg (1984) found 10 species in the market of Ver-o-Peso in Brazil. Four of those are described in this study. Of the 19 species identified by Mejía (1992) in Iquitos, Peru, five were present in our study. The three species common in these markets, and which are therefore of great importance to the economy and nutrition of the people of northern Amazonas, were the moriche palm (*Mauritia flexuosa*), the pijiguao (*Bactris gasipaes*), and the seje (*Oenocarpus bataua* var. *bataua*).

This study identified three categories of utilization of the products, which are in order of im-


9. Bottles of Seje grande oil (*Oenocarpus bataua* var. *bataua*).

portance: food, handicrafts, and medicine. The fruit in most cases are sold fresh. It is the part used most often, being utilized in six species as food (mainly the mesocarp), one species for handicraft and another species for medicine. As in the markets of Brazil and Peru, in the Puerto Ayacucho markets the palm fruits represent the most economically important products available throughout the year. These results demonstrate the importance of this plant family. Palms are part of the diet of many communities in Amazonas and are a source of income for many indigenous groups of the region.

## Acknowledgments

We thank Dr. Kember Mejía (Instituto de Investigaciones de la Amazonia Peruana), and Alfredo Gómez-Beloz (NYBG) for revision of the manuscript. Assistance was provided by Emigdio Melgueiro, Luis Alvarez, and Carlos Gómez in the field. This project was partially financed by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ).

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Left

*Trachycarpus martianus* grows in great quantity in the Marsyangdi Valley in Nepal. It is abundant on precipitous slopes up to an altitude of 2000 m, although it can be difficult to observe from the path as local people have long since made use of accessible individuals. In the village of Tal, below which this photo was taken, we made camp on the local football pitch where the trunks of *Trachycarpus* are used as goal posts.—Bill Baker

Right

*Satranala decussilvae* growing in primary forest on the Masoala Peninsula. Photo: Andrew McRobb (Copyright Royal Botanic Gardens Kew). See pp. 145–148.

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# PALM RESEARCH IN 1998

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*(Continued on p. 136)*

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# Brazoria Hybrid Palm Update

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In 1989 I began the effort to protect the Brazoria County *Sabal mexicana* × *S. minor* hybrid palms, or at least the ones that stood on a 40 acre tract that was for sale, by trying to find some conservation organization to buy the tract. Shortly after I began this effort an International Palm Society member in Victoria, the late Dennis O'Connor, responded to my plea for help in raising money to buy the tract by offering to contribute $40,000 toward the purchase price, if others would contribute a matching amount. I then began a campaign to raise a matching amount, and find a conservation organization to accept the tract and protect it, if I could raise the money to buy it. So the donations would be tax-exempt I arranged for the Brazosport Nature Center and Planetarium, a tax-exempt organization, to accept and hold contributions. To solicit such contributions, and urge people to write The Nature Conservancy of Texas and the Texas Department of Parks and Wildlife asking them to protect the tract, I prepared a slide show titled *Texas' Invisible Palms* and showed it at meetings of interested groups, such as the San Antonio and Austin chapters of the Native Plant Society of Texas, the Travis Audubon Society, the Houston chapter of the IPS and the Piney Woods Wildlife Society. Concurrently I gave scientific papers on the Brazoria palms at a meeting of the Texas Academy of Science and at the annual symposium of the Native Plant Society of Texas, and published a cover article on them in *Principes* (1991, pp. 64–71). A total of about $4,000 was collected, with $1,000 from the International Palm Society and $500 from the Piney Woods Wildlife Society.

My main focus, however, was on The Nature Conservancy of Texas, since I felt it was the most appropriate organization to protect the palms, even though it had initially shown no interest. For one thing, I wanted TNCT to be the one to bargain with the owner, since their negotiators were far more experienced than I was. Accordingly Dennis O'Connor changed his original offer. He wrote TNCT Director David Braun saying that if TNCT agreed to buy the tract he would contribute $40,000 to TNCT. And along about then (1991) I wrote President Bush, whom I had once met back in 1957, telling him about the Brazoria hybrids and suggesting that the U.S. Fish and Wildlife Service acquire the tract. I never heard from Bush, but eventually received a letter from the regional office of the USFWS advising me that President Bush had sent my letter on to them. Soon afterward the long stalemate with TNCT began to break. USFWS informed TNCT that it would make the palm tract part of the nearby San Bernard National Wildlife Refuge if TNCT would buy the tract and donate it to USFWS. This made protecting the tract a much more attractive option to TNCT since it meant that TNCT would not have to administer the site. USFWS biologist Mike Lange, who had always been enthusiastic about the Brazoria palms, had much to do with persuading USFWS to make this offer. Meanwhile various biologists who advise TNCT (such as Professor Larry Gilbert, Chairman of Zoology at the University of Texas at Austin, and TNCT's own biologist, Tom Hayes) visited the palm site and urged acquisition. Helping push this process along was the discovery that the dense coastal forest of Brazoria, Matagorda, Fort Bend and Wharton counties is a vital recovery area for birds arriving from South and Central America during spring migration, and USFWS has embarked on an effort to save as much of this forest as possible.

Finally, in 1992, three and a half years after I began the campaign, TNCT agreed to buy the palm tract, and TNCT lawyer Robert Potts began negotiations with the owner. It was not, however, until 1994 that Potts, after much delay and many difficulties, was able to buy the western 20 acres of the 40 acre tract. This was not what we had originally hoped for, but was the part with the most palms (including the tallest, Fig. 1), and was all there was money for, considering what the owner was asking. After all, TNCT has a necessary policy of never paying more than the market

1. The tallest of the Brazoria hybrids. Photo by R. De Lay.

price, and, for all the attractiveness of the palms for palm enthusiasts, the land is of little economic value. Subsequently TNCT acquired, from another owner, an adjoining three acre tract, and eventually the total of 23 acres was donated to the USFWS.

The Brazoria hybrids we know about (Fig. 2) are almost all concentrated on several tracts of land which add up to about 90 acres. There are, however, three palms we know of beyond this area—two near it and one two miles away. And, given the density of the forest, and the fact that it

2. Another large hybrid with Mike Rayburn (blue shirt) and others from the Texas Area Chapter. Photo by R. De Lay.

is almost all privately owned, there could well be other individual palms, or even clusters, we don't know about. After all, the second tallest palm (16 foot trunk) on the 23 acre tract was not discovered until the tract was being surveyed for sale to TNCT. Obviously we (including USFWS) would like to see more of the hybrids discovered, and more of the tracts making up the 90 acres acquired. Whether this happens will depend on the availability of funds, and willing sellers.

Finally, although the evidence discussed in my *Principes* article strongly suggests that these palms are *Sabal mexicana* × *S. minor* hybrids, so far I have not found any botanist to do a genetic study to show that this is indeed what they are. Such proof, or even proof that they are something else, should help create interest in protecting more of them.

(This article appeared in the Vol. 9, No. 4 (July 1988) newsletter of the Houston, Texas Area chapter of IPS, along with a short account by Randy De Lay of a Chapter field trip to the site.—eds)

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*(Continued on p. 139)*

*Palms*, 43(3), 1999, pp. 138–139

# The Historical Introduction of *Copernicia baileyana* from Cuba to Hispaniola

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In October 1997 we were cruising the provinces of the Dominican Republic, trying to visit as many *Coccothrinax* populations as we could in just a few days.

One day, Leonel convinced the other two of us to go through an area mostly devoted to tobacco plantation, where the only wild palms were the ubiquitous *Sabal domingensis* and *Roystonea borinquena*. We stopped in La Delgada, 10 km W of Santiago de los Caballeros, a countryside settlement which revealed itself to be a place of botanical marvels.

1. The branched *Sabal domingensis*, in La Delgada.

2. Close-up of the branching portion of the trunk of *Sabal domingensis*, in La Delgada.

The first surprising sight in the area is a specimen of *Sabal domingensis*, growing in the garden of a private house. This plant had suffered multiple branching and its trunk splits at about 2 m of height into 13 different branches. The total height of the plant is about 15 m.

Less than a mile away from the branched *Sabal*, grows the second suprise: a spectacular *Copernicia baileyana*. This palm is an endemic of the savannas of central Cuba and it is really uncommon in cultivation, even in Cuba, probably due to its slow growth rate. The old and healthy specimen of La Delgada appeared unique in that ocean of *Sabal* and *Roystonea*.

The man responsible of this marvel was Juan de la Cruz Martínez, from Santa María de Puerto Príncipe, Province of Camagüey, Cuba. This man left Cuba with his family during the Cuban Revolution of 1868, with the aim of avoiding his son being recruited in the army. The family moved to San Francisco de Jacagua (Dominican Republic), where they started to grow crops commercially. Juan de la Cruz went back to Cuba in 1883 and sent, to a man named Francisco Antonio Espaillat García, seeds of yarey cubano (*Copernicia baileyana*) together with cuttings of roses of different kinds and piñón cubano (*Gliricidia sepium*). These seeds germinated in the Hacienda Espaillat and the only survivor of this introduction is now 115 years old or only a few years younger. Afterwards, local people reproduced this palm from seeds and five of this *Copernicia baileyana* became adults.

The oldest mother plant (the one pictured in this paper) is growing in antigua finca de los Minaya en el Cruce de La Delgada. The other younger adults are located in: 1) La Delgada, three km east of the oldest plant, in the property of the heirs of José Manuel Mera. 2) Two grow in La Ciénaga (property of Fernando León, I.P.S. Member). 3) Three smaller specimens grow in the garden of the late Víctor Espaillat Mera (grandson of F.A. Espaillat García), and they have just started to set fruit.

All these palms feel at home in the flatlands of central Hispaniola, somehow similar to their native Cuban savannas. These adult plants produce regularly fertile seeds and some saplings are growing around most of the adult plants mentioned. The area in which these palms grow is quite far from the natural populations of *Copernicia berteroana*, the only indigenous *Copernicia* of the Dominican Republic, so, hybridization is not likely to occur.

A bibliographical note:

Most of the information about the origin of the copernicias published in this paper comes from a small article published by J. Agustín Concepción on the Dominican Newspaper "Listín Diario" on February, 23rd 1985: "Cubanos Martínez en Jacagua," in the section "Genealógicas"

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*Principes*, 43(3), 1999, pp. 140–144

# Fire Resistance in a Queensland Livistona

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Palms demonstrate an amazing ability to survive harsh conditions in nature. I've seen photographs of *Trachycarpus fortunei* lumbering under snow in the foothills of the Himalayas, and of *Medemia argun* roasting in the heat and drought of the Sudan Desert. The most extreme treatment nature can offer—fire—spells doom to most life forms, yet there are palms that can survive even this.

Last October I visited the Cooktown area of North Queensland, hoping to see an undescribed *Livistona* species in habitat. With only vague instructions that it was "locally common near the town," I set out down some dirt roads in a rented 4WD. Initially I made the mistake of looking in creek bottoms and in damp areas, which is where most east coast *Livistona* can be found. Coming up empty, and becoming increasingly frustrated, I was ready to give up, and started heading back to Cairns. Driving on Barrett's Creek Road, just behind the airfield, I spotted a young fan palm by the roadside, and with a feeling of "Eureka!" I thought I'd found it.

Scattered here and there in the midst of dry, open eucalypt forest were many specimens of *Livistona,* with heights to 4–5 m. I had thought they were the undescribed species, but later they proved to be *L. muelleri.* The land appeared to be vacant crown land, although much of the area surrounding Cooktown is used for cattle grazing.

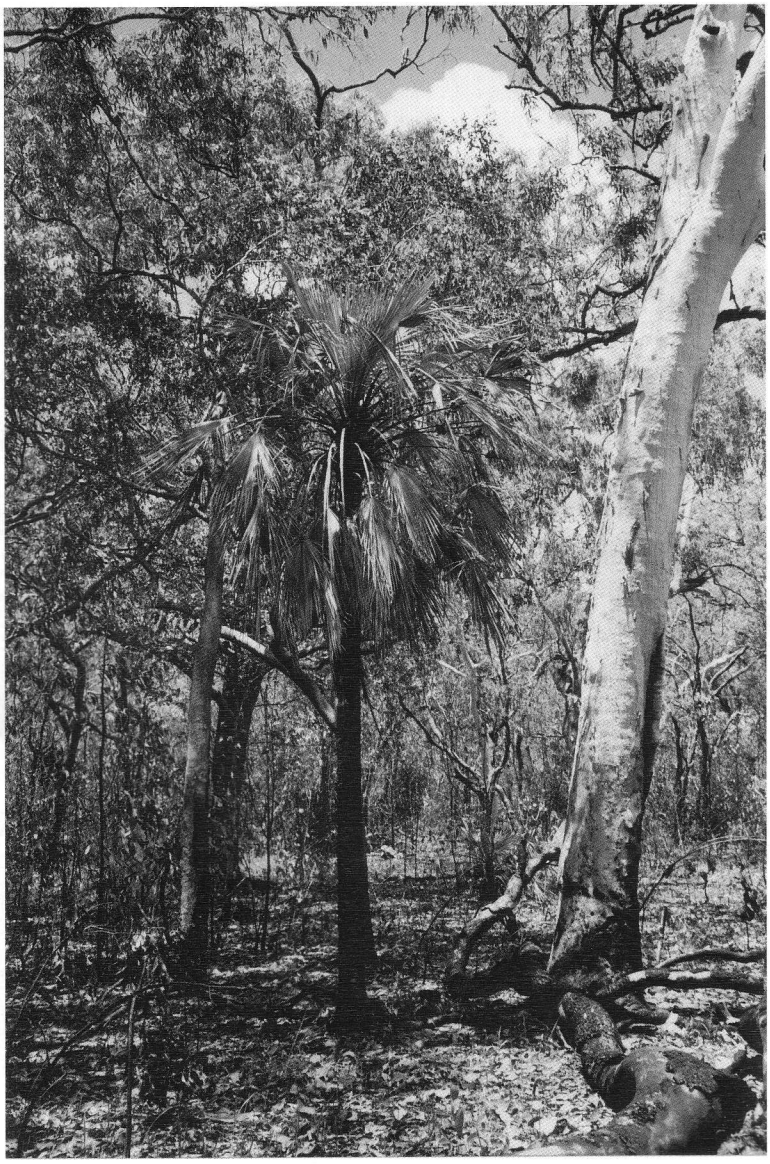
What struck me was that nearly the entire area, as far as the eye could see, had been burnt by bushfire only a couple of months earlier. It was late in the dry season, with little or no rainfall recently, and there was a near-total absence of undergrowth. The ground was stiff and crunchy to walk on, with hardly a blade of grass in sight. In fact, the only green to be seen was the leaves of some eucalypts, and in the palms themselves. The trunks of the older palms were blackened, their crowns surrounded by a ring of scorched fronds. Yet the tops of the crowns themselves showed lush, new growth (Fig. 1).

Even more striking was that young plants, some under a meter tall and still trunkless, were also still alive, having survived total engulfment in flames (Fig. 2). The *Livistona* has evidently evolved a durable, fire-resistant trunk, which is thick enough to protect the growing point from the intense but short-lived heat of the fire.

Palms are monocotyledons; their trunks do not have true bark, normally an easily damaged vital zone in dicotyledonous trees. They lack a cambium, the thin formative layer between the xylem and phloem that gives rise to new cells and permits secondary growth. While this means mature palms cannot grow significantly in girth once their trunks are formed, it does give them a clear advantage when it comes to fire. As long as the growing point remains undamaged, well protected as it is at the apex of the palm by layers of developing leaf sheaths, partial damage to the stem is not necessarily fatal.

Bush fires are a major factor in the ecology of many parts of Australia. Human activities in the last few thousand years of settlement have only increased the frequency of what was already a natural occurrence. The drier parts of the interior, and those parts of the North with a pronounced dry season (such as Cooktown) are at serious risk of fire, and many species of plants have adapted to it. For example, next to one palm was a blackened specimen of *Cycas media* (Fig. 3). In 1991 I had seen burnt, lifeless trunks of this cycad near Cardwell and assumed they were killed by fire. However, I found them alive and well some months later, with large flushes of new leaves.

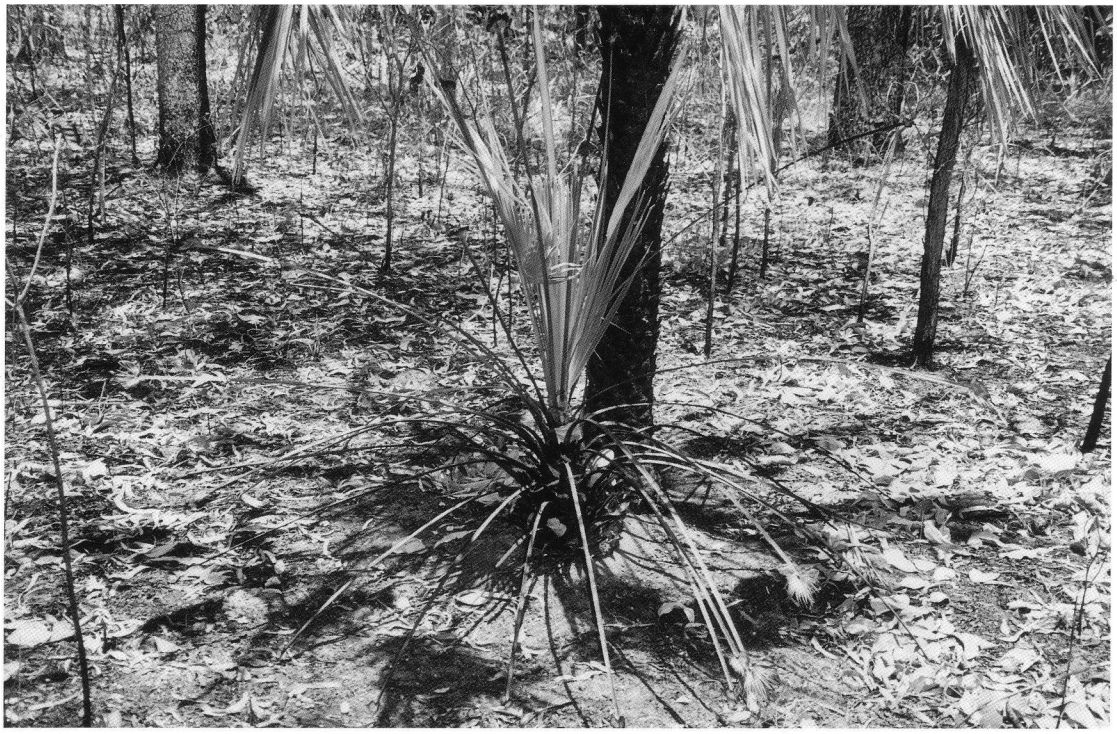
In January 1998 I had the interesting (and terrifying) experience of seeing a bushfire up close, when my own home on the outskirts of Melbourne was threatened by a fire only a few hundred me-



1. *Livistona muelleri,* new growth emerging after recent fire.

ters away in the bushland behind my property. It too is mainly grassland with a few eucalypts. With high temperatures (40°C/104°F) and a strong wind, the fire front moved rapidly through the dry grass, moving as fast as a person can walk. At any one spot, the fire burned for only a few seconds, then moved on, leaving only smoking black ashes. Occasionally the larger trees burst spectacularly into flames, but even these were out in a minute or two, as their foliage and smaller branches burnt off. Some trees were killed outright, but most of the larger eucalypts were unharmed, and grew new leaves within a couple of months.

Fire is responsible for the continuation of many plant communities in Australia. In the ranges near Melbourne, the towering Mountain Ash (*Eucalyptus regnans*) holds on to its seed capsules for years, until fire cracks them open; they germinate within a week on the now-uncrowded forest floor. In South West Australia, "mallee" eucalypts form multiple trunks from a



2. *Livistona muelleri,* new growth emerging after recent fire.

3. Fire-blackened *Livistona*; to its right, a singed *Cycas media* trunk.

4. A thriving specimen in an unburnt area.

massive root stock. These can all be burnt without killing the tree; new stems rapidly sprout from a ring of stout buds. Bottlebrushes (*Callistemon* spp.) will not shed seed until there is a fire; likewise the woody seed capsules of some *Banksias* will not open except in the intense heat of a fire. Grass trees (*Xanthorrhoea* sp.), common in dry areas, are helped in a different way by fire. The great quantities of ethylene gas released by burning vegetation is believed to be a trigger for the appearance of its flower spike (Attenborough 1995).

John Dowe, who helped me identify the correct species at Barrett's Creek, believes that 30% of the world's palm species are adapted to fire, including all of the Australian *Livistona*. He considers that rather than being a destructive element, for many species fire is beneficial, and a primary factor in the maintenance of populations. Benefits are realized from the reduction in competition from grasses in open forest habitats, and the temporarily increased soil nutrient levels.

With the benefits come the obvious lethal ef-

fects on regeneration of the palms. At the Barrett's Creek site I could find no trace of fallen seed beneath any of the trees, nor any seedlings under the age of at least four years. (Interestingly, there were a large number of one-leaf seedlings of the *Cycas* present.) For a population to regenerate, it would seem that several fire-free seasons must pass for the palm seedlings to become sufficiently established and reach an adequate size to survive a fire. Fruiting of most *Livistona* in northern Australia occurs in the wet season, around December to March, with germination taking place late in this period. As fires occur from the middle to the end of the dry season, most surface seeds would by then have become unviable due to predation, rot, or desiccation. Only those that survive and enter the upper soil layer would receive adequate protection from the typical low-intensity fires that characterize tropical monsoonal Australia.

Palms in other parts of the world have also had to adapt to fire. The Cerrado of Brazil is open woodland scrub or savannah that is subject of burning. Many palms growing there are remarkable for their ability to survive fire. Most of these have acaulescent, deep subterranean stems which initially grow deep into the soil and not upwards. Palms of the Cerrado include *Allagoptera campestris, Syagrus petraea,* and *Acrocomia* sp. In the southeastern USA, *Serenoa repens* is adapted to fire: plants can endure several hot fires before any noticeable decrease in vigor (Uhl and Dransfield 1987).

In the lowlands of western Madagascar, human activity has created palm savannahs. Fire-resistant fan palms *Bismarckia nobilis, Hyphaene coriacea, Borassus madagascariensis,* and *B. sambiranensis* survive in annually burned grassland, the only perennial woody plants that are capable of doing so (Dransfield and Beentje 1995).

Returning to the object of my original search in North Queensland, I never did locate any specimens of the so-called Cooktown *Livistona,* though it is indeed present near the town. It is very different in appearance from *L. muelleri,* being taller (20–30 m) and having a large crown of deeply divided leaves with drooping (rather than stiff) leaf segments (Tucker 1987). Currently, John Dowe is describing it as part of a broader study of the genus in Australia.

As for *Livistona muelleri,* it is an attractive ornamental palm, having stiff, finely divided fan-shaped leaves, and a compact growing habit. On young plants the leaves are deeply divided. When unmolested by fire it develops a large head of upright bright green fronds (Fig. 4). It is capable of withstanding hot, dry conditions, and would seem ideal for such places as southern California or inland Australia. In my limited experience, it is reasonably cold-tolerant. I have several plants under four years old that have seen nights down to freezing with no apparent harm. Seed and plants can occasionally be purchased from suppliers around Cairns, but it is not a commonly cultivated species due to its slow growth rate.

While in Cooktown, I inquired about the local fan palms from a nurseryman. He said they were slow-growing plants (I assume he was referring to *L. muelleri*), and that he rarely sold any, as they were common enough for locals to simply dig one out of a nearby field. He advised that transplanting was not always successful, and far easier in the wet season than in the dry.

Human activity remains the principal threat to palms in Australia, mainly from loss of habitat due to development and the encroachment of the grazing and sugar industries. It is the attitude of some in Queensland that all land must be "used" for something, and cattle ranches can now be found even in the remotest and driest areas. Fortunately, *L. muelleri* is still a common palm with a wide distribution; its natural range extends from just south of Innisfail to the top of the Cape York peninsula (Irvine 1984), and can easily be seen in undeveloped land just north of the city of Cairns. It certainly deserves both our admiration and protection as a truly remarkable survivor.

## Acknowledgments

My thanks to John Dowe of James Cook University in Townsville for correctly identifying the *Livistona* species, and for his general comments on fire in Northern Australia.

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# The Conservation Status of Satranala decussilvae in the Ianobe Valley, Masoala National Park, Madagascar

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*Satranala decussilvae* H. Beentje and J. Drans. is endemic to northeast Madagascar, where it is found only in the Mananara Biosphere Reserve and on the eastern side of the Masoala peninsula. It is one of the most attractive palms in Madagascar, with a solitary trunk attaining 12 m in height bearing a crown of large palmate leaves on very long (to 2 m) thin petioles (see page 131). It is dioecious, and has fleshy fruits containing large seeds with extraordinary flanged endocarps. Satranala decussilvae has been known to science for only three years (Dransfield and Beentje 1995), and little is known about its biology or its conservation status. The objective of this study was to provide information on the conservation status of this palm in the Ianobe valley, Masoala peninsula (15°14′–15°20′S, 50°18′–50°29′E) by estimating its abundance, population structure, habitat, and uses.

The Ianobe valley was chosen for this study because it is relatively accessible and was considered representative of the eastern side of Masoala peninsula. The climate here is classified as warm perhumid (Morat 1969), with a mean annual rainfall of 2 750 mm distributed throughout the year and a mean monthly temperature of 24°C (National Meteorological Office, Antananarivo). The climax vegetation is classified as lowland evergreen rainforest and littoral forest (Koechlin et al. 1974).

## Methods

*Abundance and population structure.* Populations of *Satranala* were located by systematically visiting villages and hamlets in the Ianobe valley and asking their inhabitants if they knew of populations of this palm. If they did, they were asked to show us these plants. When a population was located, a count was made of the number of individuals in each of 11 size classes (defined in Table 1) and the number of mature male and female plants (identified by the presence of old reproductive parts).

*Habitat.* Three *Satranala* populations were chosen which occupied contrasting habitats (i.e. at Sahabe, Isinda, and Andranoanala), and these habitats were decided in terms of relief, soil type, vegetation type, canopy height, percentage of canopy cover, and the associated species of canopy and sub-canopy trees. The associated species were defined by identifying canopy trees (trees with dbh ≥ 20 cm for Sahabe and Isinda and ≤ 10 cm for Andranoanala) and sub-canopy trees (trees with dbh > 10 cm–20 cm for Sahabe and Isinda, not surveyed at Andranoanala because here the forest is too low to have a distinct sub-canopy) along transects. Three hundred canopy and 300 subcanopy trees were identified at Sahabe and Isinda, and 100 canopy trees at Andranoanala.

*Exploitation.* The uses made of *Satranala* by the population within the Ianobe valley were described by interviewing villagers, and the level of exploitation was estimated by counting the number of felled *Satranala* trunks in each of the sub-populations.

## Results and Discussion

*Abundance and population structure.* Eight sub-populations of *Satranala* were located, of which six were visited and surveyed (two populations were not surveyed because of lack of time, but these were reported to contain few individuals). Fig. 2 shows the study area and the location of these sub-populations. The populations were

*Table 1. Number of individuals in various size and sex classes for each of the sub-populations.*

| Sub-population | Size class (height in meters) | | | | | | | | | | Sex class (fertile plants) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Without trunk | | | With trunk | | | | | | Total | Male | Female | Total |
| | 0–1 | 1–2 | >2 | 0–1 | 1–2 | 2–3 | 3–4 | 4–5 | 5–6 | 6–7 | >7 | | | | |
| Sahafary N | 4 | 3 | 5 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 22 | 3 | 2 | 5 |
| Sahafary NW | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |
| Antsoha | 21 | 98 | 106 | 24 | 15 | 12 | 12 | 8 | 6 | 3 | 2 | 307 | 16 | 6 | 22 |
| Sahabe E | 21 | 53 | 125 | 7 | 3 | 4 | 4 | 2 | 1 | 2 | 2 | 223 | 9 | 3 | 12 |
| Isinda | 0 | 14 | 9 | 5 | 4 | 3 | 2 | 2 | 1 | 1 | 1 | 41 | 2 | 1 | 3 |
| Andranonala | 0 | 10 | 4 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 20 | 1 | 1 | 1 |
| TOTAL | 46 | 178 | 252 | 40 | 23 | 21 | 21 | 13 | 9 | 7 | 5 | 616 | 31 | 13 | 44 |

scattered over an area of ca. 100 km$^2$ and were often isolated from their nearest neighbor by several kilometers. Dransfield (1996) reported a similar distribution for this palm around Sahamalaza and Iketra in the area southeast of Masoala peninsula. Table 1 shows the number of individuals in each of the size-classes and the number of fertile female and male plants in each sub-population. The sub-populations ranged in size from three to 307 individuals. In all, 616 plants were counted, most of which were in the smallest size-classes. Only 44 mature plants were recorded, of which 70.5% were male. Just two fertile plants were seen: one with a young inflorescence (in October); and one with unripe fruit in October and then ripe fruit in December. During the survey it was noted that seedlings were always close (i.e. within a few meters) to a mature female plant (presumably their mother), suggesting that their dispersal is poor and supporting the theory that the seeds of this species were once dispersed by the now-extinct *Aepyornis* (a large flightless bird) (Dransfield and Beentje 1995).

*Habitat.* The habitat for three populations of *Satranala* is summarized in Table 2. For most of the parameters considered these habitats are extremely different. Their only similarities are that the forest is primary, has a high percentage canopy cover, and includes *Ravenala madagascariensis* and *Uapaca* spp. As abundant species in the canopy. Elsewhere on Masoala peninsula, *Satranala* has been recorded growing in shallow soils on steep slopes in a forest rich in *Pandanus* and palms (Dransfield and Beentje 1995).

*Exploitation.* The inhabitants of the Ianobe valley exploit *Satranala* for its "cabbage," which they say has a very sweet taste. In addition, the leaves are used occasionally for house roofs and for weaving into fish traps. On one occasion a child was seen playing with a young *Satranala* leaf by closing and opening it in the manner of an accordian. In order to exploit this palm it is felled. In all, 13 felled palms were recorded, 11 of which were in the Isinda sub-population (38% of the palms with trunks at this site).

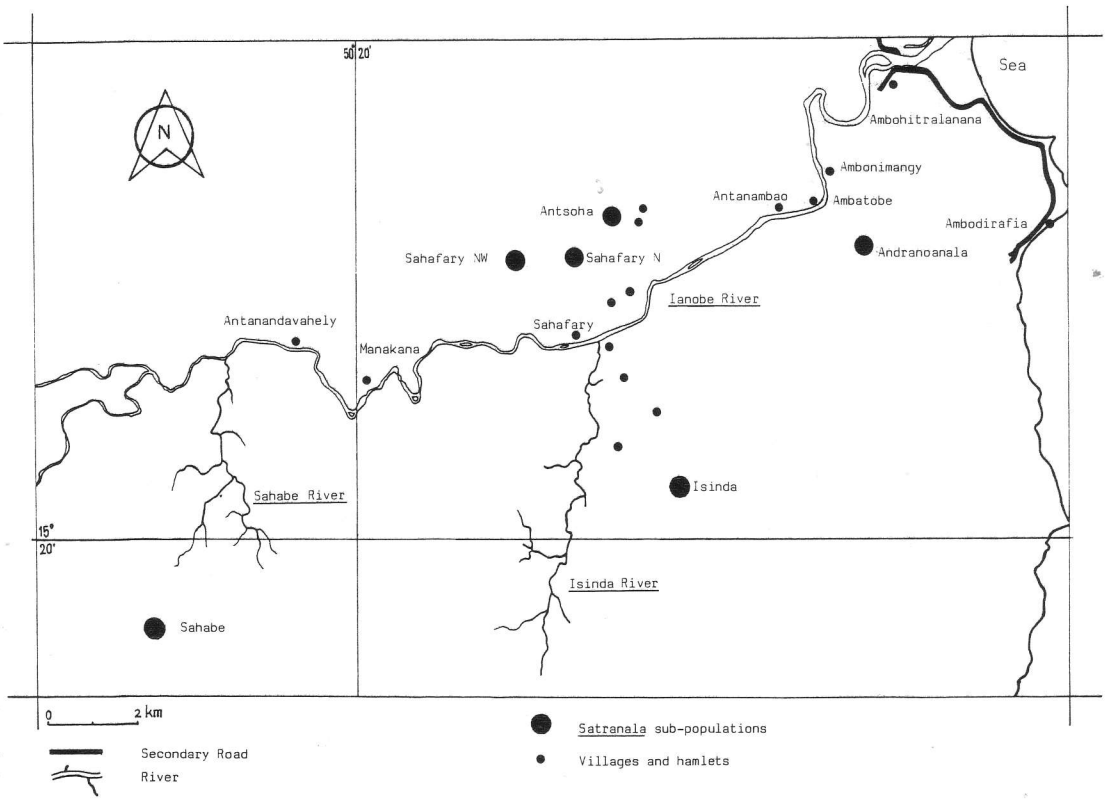
## Conclusions

*Satranala* can be considered somewhat threatened in the Ianobe valley because, although it shows good regeneration, the population is not large and consists of small (sometimes very small) and often isolated sub-populations.

*Table 2. Habitats for three* Santranala *sub-populations.*

| Habitat Parameters | Sub-Population | | |
|---|---|---|---|
| | Sahabe | Isinda | Andranoanala |
| Relief | Hills with steep slopes | Flat | Flat |
| Soil | Clayey silt with numerous rocks and boulders | Sand | Sand |
| Vegetation type | Primary lowland evergreen forest | Primary lowland evergreen forest | Primary littoral forest |
| Canopy height | 25 m | 20 m | 12–15 m |
| Canopy cover | >80% | >80% | >80% |
| Associated canopy species* (percentage of plants surveyed) | *Anthostema madagascariensis* (11.0)<br>*Uapaca* sp. 2 (10.3)<br>*Ravenala madagascariensis* (10.0)<br>*Uapaca* sp. 1 (10.0)<br>*Symphonia* sp. 2 (4.3) | *Calophyllum fibrosum* (15.6)<br>*Uapaca* sp. 2 (9.3)<br>*Cleistanthus* sp. 1 (6.3)<br>*Ravenala madagascariensis* (6.0)<br>*Anthostema madagascariensis* (6.0) | *Uapaca* sp. 1 (15.0)<br>*Faucheria* sp. 1 (11.0)<br>*Ravenala madagascariensis* (11.0)<br>*Poupartia* sp. 1 (11.0) |
| Associated sub-canopy species* (percentage of plants surveyed) | *Uapaca* sp. 1 (6.7)<br>*Dypsis lutescens* (5.7)<br>*Symphonia* sp. 1 (5.0)<br>*Symphonia* sp. 2 (4.7)<br>*Micronychia tsiramiramy* (4.7) | *Symphonia fasciculata* (13.7)<br>*Homalium laxifolium* (8.7)<br>*Mammea* sp. 1 (8.7)<br>*Brochoneura* sp. 1 (8.3)<br>*Calophyllum fibrosum* (4.0) | Canopy is too low for clear sub-canopy. |
| Comments | *Satranala* plants were restricted to the ridges and slopes, and were not found in the valley bottoms. | Some areas are periodically inundated. | Some areas are periodically inundated, and these contain *Nepenthes*. |

* the five most common species




2. Study area showing the location of *Satranala* sub-populations.

In addition, there are very few mature female plants, seed dispersal is poor, some populations are over-exploited, and it is confined to primary forest.

The conservation of this palm would be assisted by a program for the sustainable harvest of seeds for sale to palm growers and other horticulturists. This would ensure that the species is well-represented in cultivation, and that living plants of this species are preserved by the inhabitants of the Masoala peninsula. In addition, palm enthusiasts should be encouraged to visit the Masoala peninsula to enjoy its rich and unique palm flora. If properly managed, such ecotourism could provide revenue for the local people and encourage them to preserve the forest.

## Acknowledgments

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*Palms*, 43(3), 1999, pp. 149–151

# Notes on the Palms of Mayotte, Comoro Islands, Indian Ocean

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In October 1998 when I left Reunion for a 10 day trip to Mayotte, I thought of listing the palms to be found on this island for my friends of Palmeraie-Union which is a rather newly established association of palm enthusiasts.

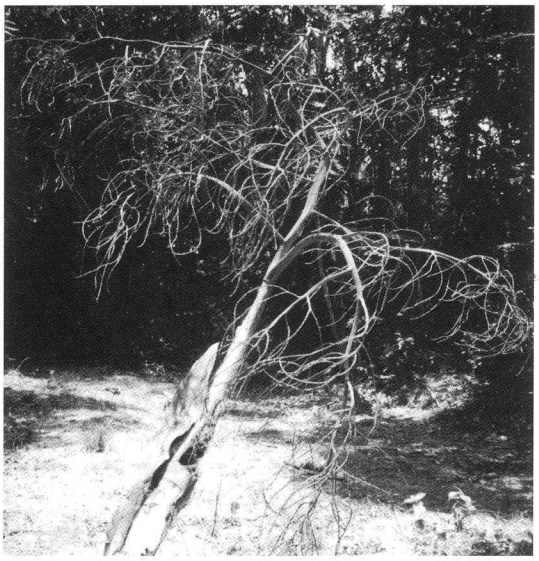
Therefore, I checked in Palms of Madagascar (Dransfield and Beentje 1995) the endemic species of north-west Madagascar and Grande Comore that might occur in Mayotte. Mayotte is a French overseas Communauté Territoriale, and not part of the Republic of the Comores, even though geographically it is part of the Comoro Archipelago.

I recorded the following palms:

*Areca catechu*
*Bismarckia nobilis*
*Borassus sambiranensis*
*Caryota mitis*
*Cocos nucifera*

1. *Borassus sambiranensis* at Sazilé. 2. *Dypsis humblotiana* at Sohoa.

3. A close-up view of the stem of *Dypsis humblotiana*, Sohoa; stem diameter is about 18 cm.



4. Last year's dead inflorescence of *Dypsis humblotiana*, Sohoa.

*Corypha utan*
*Dypsis humblotiana*—the "Sohoa palm"
*D. lanceolata*
*D. lutescens*
*D. madagascariensis*
*Hyophorbe lagenicaulis*
*Hyphaene coriacea*
*Livistona chinensis*
*Phoenix reclinata*
*Raphia farinifera*
*Roystonea oleracea*

Among these species, *Caryota mitis, Corypha utan, Dypsis lutescens, D. madagascariensis, Hyophorbe lagenicaulis, Livistona chinensis* and *Roystonea oleracea* occur as ornamental palms in some private gardens, public parks and squares in Dzaoudzi and Mamoudzou.

*Areca catechu* seems to be naturalized on the west coast with a small population along the stream near Soulou Waterfall. *Bismarckia nobilis* is locally known as "palmier de Koungou" as it is quite abundant in the Koungou area in the north coast. However, I saw two other specimens at Ngouja in the gardens of the Jardin Mahorais hotel.

Concerning *Borassus sambiranensis*, there is a small population at Sazilé Pass (Fig. 1) between the villages of Moutsamoudou and Dapani. It consists of several old specimens, some young ones and seedlings under the female trees. When falling, some fruits roll down embankments and germinate in gravel on the roadside. I have seen a few other old trees on the Sazilé Peninsula, including one with a trunk base damaged by fire. It is possible that *B. sambiranensis* was introduced by Sakalava settlers who migrated from north Madagascar to Mayotte a few centuries ago.

*Cocos nucifera*, the coconut, is very abundant in the lowlands and is widely used for food, woven fences, baskets and as building material. The second most abundant palm in Mayotte is *Phoenix reclinata*, that occurs in rather dry localities.

In the Majimbini rain forest reservation, I recorded *Dypsis lanceolata* above 500 m elevation. I did not see any inflorescences or infructescences, but found quite a large number of seedlings under the mature trees. This species could also occur in the forest at Mont Benara.

On one day I had an appointment with Alain Pibot from Service de l'Environnement et de la Forêt and we visited Sohoa Forest Reservation where we found a few specimens of a palm, scattered from 160–210 m elevation. This is a single-stemmed palm with trunks 8–10 m tall (Figs. 2, 3, 4), with keeled leaf rachises and leaflets with bifid tips, glossy green on the upper surface and dull green beneath, the leaflet margins thickened. We thought it could be the very poorly

known *Dypsis humblotiana.* I have sent a leaflet and photographs to John Dransfield and Henk Beentje at the Royal Botanic Gardens Kew, and they agree that this may well be the elusive species, known previously only from a single herbarium specimen.

Among other species, *Hyphaene coriacea* occurs in small populations near Chirongui pass, and, on Petite Terre, at Dziani Dzaha crater lake. I did not stay long enough in Mayotte to visit Mont Benara forest and look for *Ravenea hildebrandtii* which might occur in that area. This will have to wait for another visit

### Literature Cited

Dransfield, J. and H. J. Beentje. 1995. The Palms of Madagascar. The Royal Botanic Gardens Kew and the International Palm Society.

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## PALM LITERATURE

Non-Timber Forest Products of East Kalimantan—Potentials for Sustainable Forest Use. By J. L. C. H. van Valkenburg. X + 202 pp, 6 appendices, 23 figures, 14 color illus. Tropenbos Series 16, ISSN 1383-6811. Backhuys Publishers, Leiden, The Netherlands. 1997. Paperbound, ISBN 90-5113-030-9. 76,00 NLG (approximately $40).

Humankind is challenged to harmonize the needs and aspirations of a growing population with ecological imperatives. Nowhere is the challenge more daunting than in the world's tropical forests. One proposed alternative to forest degradation and loss is found in the sustainable extraction of non-timber forest products (NTFP), an approach that would leave basic forest structure intact, preserve indigenous cultures, and provide an ongoing livelihood to local and regional inhabitants. Since palms, in their variety of habits and ubiquitous distribution provide a rich store of NTFP, ranging from building and craft materials to fruits, starch, and sugar, it is not surprising that they are major components of many ongoing and proposed extractive programs. This volume, *Non-Timber Forest Products of East Kalimantan,* gives palms no less attention, for two of its seven principal chapters are devoted to rattans, and they otherwise enter the discussion as critical elements in assessing the potential of NTFP.

Despite its focus on East Kalimantan, this volume serves as a general primer to the underlying concepts and issues of forest utilization. It provides economic and ecological arguments for the sustained harvest of forest resources, rather than periodic timber cutting or the conversion of forests to plantation monocultures. Following a general introduction, Chapter 2 contrasts in detail systematic and ecological measures the three study sites reported on, each of which encompasses primary forest of a somewhat different character. One site also includes logged areas. Chapter 3 summarizes NTFP available in those sites. While comprehensive in its coverage of primary forest and logged portions of the study sites, the exclusions of secondary forest bamboos and medicinal plants does leave a gap in assessing the full forest management potential of the region. Chapter 4 deals with edible fruits and nuts with actual and potential use as forest and home garden products. Market determinants, including access, ethnic preference, and seasonality and periodicity of fruiting are considered. While no palms enter this discussion a number of familiar names appear, including the durians (*Durio*), the breadfruits and jackfruits (*Artocarpus*) and rambutans (*Nephelium*).

The rattans constitute Chapters 5 and 6. The former considers species richness and abundance of these remarkable lianas. Dominant genera, in species numbers, are *Calamus, Daemonorops,* and *Korthalsia,* but with *Ceratolobus, Plectocomia,* and *Plectocomiopsis* also represented. This inventory is not a mere taxonomic listing, but rather a richly detailed presentation of rattan dynamics in natural and human-influenced primary and logged forests. Chapter 6 considers rattan trade in a broad forum—attention being given to rattan quality, processing, economic value under different conditions, and role in contrasting social situations.

Using a number of different comparative measures, including those economic, the closing chapter is a reasoned discussion of the potential

and limitations of NTFP. Monetary comparisons and projections are made, but these are, of course, dependent on the assumptions that underlie them. Nonetheless, it can be argued that under appropriate circumstances, that is, those that employ enrichment plantings, multiple extraction strategies, and/or refined agroforestry techniques, NTFP extraction has economic and social advantages over timber harvest, when the benefits of the latter are spread over long rotational or fallow periods. Yet, questions of sustainability remain unanswered, for we cannot look to the future and predict what impacts forthcoming global events will have on forests and forest peoples. Whether or not the extraction of NTFP is a viable solution to forest and cultural preservation is not a decision to be left to science or peoples of the developed world. Rather the obligation is to assure that those people who are directly affected have the knowledge to chart their own course of action and destiny. This volume serves that obligation in admirable fashion.

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L. H. Bailey Hortorium

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# HORTICULTURE COLUMN

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Q. Hardy? Recently there was a question posted on the IPS e-mail list asking for opinions about the cold-hardiness of the Foxtail Palm, *Wodyetia bifurcata*.

A. There was a flurry of replies from different palm growing areas, where this species might be put to the test, but the answers were not in agreement; one respondent compared *Wodyetia*'s cold-hardiness to that of a Queen Palm, while another thought it less hardy than *Adonidia merrillii*, a difference of opinion of at least seven degrees F. Members of The International Palm Society have always been concerned about the cold hardiness of palms since so many of us grow our favorite plants near or beyond the fringes of where mother nature intended them to grow. We are fascinated by stories of beautiful palms, perhaps untried in our areas, that have survived frighteningly low temperatures and we want to try to grow these in our own gardens. Yet when we compare lists of cold tolerances of the same species from different sources, in separate states or countries there is often a significant difference between what is considered hardy or tender, as with the Foxtail Palms already mentioned. Obviously some of this difference is in perception, and this may depend on one's proximity to the Equator; someone who lives closer to it than you do simply doesn't understand your problem. In other words if you live in an area that never suffers hard freezes, *Wodyetia* and Queen palms are equally hardy. Undoubtedly differences in overall climate and even topography can affect the freeze-survivability of a given palm species, and the duration of the freeze is very important too. For one who is starting out in the business or pastime of growing palms in a freeze prone area, a trusted mentor who lives in a similar climate, but 50 miles farther from the Equator can be a valuable source of information, and should be encouraged to write a book. Perhaps it would be interesting and useful to consider, in this column, some of the reasons why a given palm species might be considered hardy in one part of the world but less so in another, even when subjected to the same low temperatures. I'll give some reasons why I think this might be so and I trust some of you will contribute your own thoughts and experiences on the subject.

A few years ago during a moderately severe central Florida freeze a number of *Archontophoenix cunninghamiana* that I had, both in the ground and in large containers, were damaged quite a bit especially on their upper leaf

surfaces. The temperatures had only gone down to 27 degrees F (Fahrenheit, −3° Celsius) but had stayed below freezing for about 10 hours. I was a little surprised at the damage since this species is said to be the most cold hardy of the crownshaft palms. I called my friend who had sold me most of the *A. cunninghamiana* and complained a little about their lack of durability in the cold, when I told her that they were planted out in the open she replied, "they're only hardy if they're protected." I though about this a lot and to me it seemed like a nonsense statement, something like "this watch is waterproof as long as it doesn't get wet." Eventually, with the help of someone wiser, and farther from the Equator, I realized that it wasn't the 27 degrees that damaged my *A. cunninghamiana* but frost. The word frost, unfortunately, has more than one meaning; here in Florida which is one of the more humid of the freeze-prone palm growing areas, frost refers to the minute ice crystals that form when water vapor condenses at a temperature below freezing, a light frost can happen here even when thermometer readings are well above freezing. In other parts of the world "frost" is simply a synonym for freeze and its mention does not always indicate the presence of the minute ice crystals that are known as frost in Florida. Frost (the Florida kind), forms only in areas with open sky above, and, apparently, can injure some palms that otherwise could stand a lower temperature, resulting perhaps in a report of cold-hardiness that conflicts with that recorded in a climate where frost is rare. The truly hardy palms that I have any experience with are not damaged by frost alone.

Not everyone has the same definition of cold-hardiness at a given temperature; does it mean that the palm came through a freeze of 22 degrees F (−6C), for instance, unharmed and unaffected in any way? Or many could call it hardy at that temperature if it simply survived having lost all of its foliage and was able to struggle back to face another winter the next year. The term "bud hardy" is sometimes used to describe a palm that can take such punishment without apparent permanent damage. Once a field of several hundred Queen Palms which I was growing was subjected to temperatures in the low twenties F. for 3 nights in a row. All of the palms had their foliage killed and all of them that were large enough to be dug and sold (the 12–18 ft range), died, but several dozen small, newly planted Queen palms recovered and suffered no permanent damage. Are young Queen Palms hardier than older ones? Were these young palms grown from seeds that came from a source toward the south of the Queen Palm's natural range, and, therefore were hardier? No, they survived because at their early stage of development their buds were still at or even a little below ground level and the warmth of the ground was enough to save them while the older trees with their buds well above ground didn't have that bit of protection. It's very easy to spot this "phenomenon" for what it is in a field of several hundred palms all of the same species. But if it happened to one or two species in a collection of many different species of different sizes (which is what many of us have in our gardens), we might be tempted to think that the little palm which was able to recover from the terrible freeze, while so many large ones did not, was indeed "bud hardy." A similar freeze a few years later, when the palm had formed an aboveground trunk could kill that same "bud hardy" palm. This is not to say that there aren't any "bud hardy;" at least some of the Hyphaenes would fit this description in most of central Florida, several mature plants having survived many prolonged freezes in at least a couple of locations here.

Seeds and plants are often misidentified. A classic case is *Livistona chinensis*, which in the first half of the 20th century was known by some nurserymen as *Latania borbonica*. *Latania borbonica* is also a synonym of *Latania lontaroides*. As recently as 10 or 12 years ago seeds of *Livistona chinensis* were being distributed as *Latania* sp., and were described as having survived very low temperatures at a location in Italy. Fortunately the seeds of *Livistona* and *Latania* are so different that the mistake was quickly corrected, but when the confusion involves two species of the same genus it may not be so easy to detect. A simple mislabelling of seeds that came from a botanic garden in Cuba in 1964 let to a certain amount of discussion and confusion among palm growers a couple of decades later. The seeds, which were of *Livistona saribus*, were mistakenly labelled as *L. muelleri*. Some of these palms found their way into some prominent public and private collections in Florida, and were noticed, particularly since they had the ability to tolerate prolonged freezing temperatures about as well as *Livistona chinensis*. Some collectors obtained and planted *L. muelleri* as a result, but as it turns

out *L. muelleri* is quite sensitive to frost and cannot stand freezes nearly as well as *L. chinensis*, or *L. saribus*. It should be noted that the form of *L. saribus* with maroon colored petioles is less cold hardy than the one with green petioles. The fact that *L. saribus*, whose native range is in the lowland equatorial tropics, can stand cold as well as it does, at least in my part of the world, is rather surprising. If anyone knows of a palm from a similar climate that can survive a freeze as well I hope you will tell us about it. I don't think I've been able to cover all of the possible reasons for conflicting reports of cold-hardiness in palms, I really think it's difficult to be a worldwide expert on such an issue, except in a general way, so I hope we'll have some input from other sources.

Q. The bud of one of my Coconut seedlings, which is about 6 months old, was attacked by some kind of fungus; the top stopped growing, and then rotted away. White worm-like larvae were crawling around the bud area. What could they be and why did it happen? I have three other seedlings that grow just fine. Also, all of these plants are outside. Andy G., Jacksonville, Florida.

A. Coconuts are truly tropical palms, they thrive best in areas that have warm weather year round. The winters in north Florida, where you live, will have a significant effect on the health and appearance of a Coconut palm, even when the winter is relatively mild, and even if you cover them up during the coldest nights. Seedlings are especially prone to suffer from lack of warmth, and when they are in this weakened condition they may be more likely to suffer from a fungus which could rot the bud; bacterial rot may also occur. The insect larvae are a secondary problem; they arrived after the disease had already begun to kill your Coconut seedling. You can drench the bud of your remaining seedlings with copper fungicide, which is effective against bacteria as well as fungus. Copper should not be used too frequently since it has a certain degree of toxicity to all plants, even small quantities of copper will kill bromeliads. Always read and follow the instructions on the label. In the future you may want to apply fungicide to young palm seedlings to prevent the sort of bud rot diseases that can occur even in warmer conditions. Some growers have had good results using an organic fungicide called Mycostop, and there are, of course, a number of chemicals available. Remember, that in the case of cold damaged palms it's best to use a copper based fungicide, since other products are effective against fungus only and not the bacteria which often kills cold damaged palms.

Members are invited to contribute, or make suggestions for this column. I also invite members to submit horticultural questions for inclusion along with an answer. I'll try to respond to all questions personally, whether they are used in the column or not, and as quickly as possible in case prompt action is necessary.

## DESIGN COMPETITION FOR LOGO

The Board of the IPS invites artists worldwide to submit an IPS logo in black and white and of simple design involving palms. The winning artist will be recognized.

Please submit your designs by March 1, 2000 to: Scott Zona, Fairchild Tropical Garden, 11935 Old Cutler Rd., Miami, FL 33256-4329.

## NOTICE OF THE AVAILABILITY OF GRANT MONEY

The South Florida Chapter of the International Palm Society is now accepting proposals to fund palm research. Applications must contain:

- A description of the research, including remarks about why the research is necessary or desirable (three page limit)
- The specific amount of funding requested (not to exceed $5,000)
- A time schedule for the completion of the research

Grants will be made on the basis of the relevancy of the proposed research to the study of the propagation, culture, and use of palms in the landscape, and the exploration and study of palms in the field.

Applications will be accepted throughout the year and should be mailed to:

MURRAY CORMAN
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## Back cover

*Geonoma leptospadix* in the Brazilian Amazon. Photo by Andrew Henderson.