

PRINCIPES

Journal of The International Palm Society

October 1986
Vol. 30, No. 4

THE INTERNATIONAL PALM SOCIETY

A nonprofit corporation engaged in the study of palms and the dissemination of information about them. The Palm Society is international in scope with world-wide membership, and the formation of regional or local chapters affiliated with The Palm Society is encouraged. Please address all inquiries regarding membership or information about the society to The Palm Society, Inc., P.O. Box 368, Lawrence, Kansas 66044, U.S.A.

PRESIDENT: Mr. Edward McGehee, 1325 East Lake Drive, Fort Lauderdale, Florida 33136.

VICE PRESIDENT: Mrs. Pauleen Sullivan, 3616 Mound Ave., Ventura, California 93003.

SECRETARY: Mr. Scott MacGregor, 6041 Mayo St., Hollywood, Florida 33023.

TREASURER: Mr. Ross Wagner, 4943 Queen Victoria Road, Woodland Hills, California 91364.

DIRECTORS: 1986–1990: Mr. Don Evans, Florida; Mr. Walter Frey, California; Mr. Jules Gervais, Hawaii; Mr. Dennis Johnson, Maryland; Mr. James Mintken, California; Mrs. Tamar Myers, Ohio; Mr. Robert Paisley, Australia; Mr. Richard Phillips, Fiji; Mr. David Tanswell, Australia. 1984–1988: Mrs. Teddie Buhler, Florida; Dr. T. Anthony Davis, India; Mr. Garrin Fullington, N. California; Mr. Bill Gunther, S. California; Mr. Rolf Kyburz, Qld., Australia; Mrs. Lynne McKamey, Texas; Mr. Tom Pavluvcik, Florida; Dr. Robert Read, Maryland. Others: Dr. John Dransfield, London; Mrs. Inge Hoffman, California; Mrs. Pauleen Sullivan, California; Mr. David Sylvia, California; Dr. Natalie Uhl, New York.

ADVISORY COUNCIL: Mr. Paul Drummond, Florida; Mr. Nat J. De Leon, Florida; Mr. Kenneth C. Foster, California; Dr. Walter H. Hodge, Florida; Dr. Jerome P. Keuper, Florida; Mr. Myron Kimnach, California; Mr. Eugene D. Kitzke, Wisconsin; Dr. John Popenoe, Florida; Dr. U. A. Young, Florida; Mrs. Lucita H. Wait, Florida.

BOOKSTORE: Mrs. Pauleen Sullivan, 3616 Mound Avenue, Ventura, California 93003.

SEED BANK: Mrs. Inge Hoffman, 695 Joaquin Ave., San Leandro, CA 94577 and Mr. David Sylvia, 36279 Christine St., Newark, CA 94560, Managers.

PRINCIPES

EDITORS: Dr. Natalie W. Uhl, 467 Mann Library, Ithaca, N.Y. 14853. Dr. John Dransfield, The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB England.

ASSOCIATE EDITOR: Dr. Dennis Johnson, 3311 Stanford St., Hyattsville, Maryland 20783.

FIELD EDITORS: Mr. DeArmand Hull, Mr. James Mintken, Mr. Ralph Velez.

Manuscripts for PRINCIPES, 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 one page 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.

Contents for October

The Use of Rattan by a Semai Community in West Malaysia
Wanda Avé 143
Palmateer? Palmophile? Palmophilia? Palmologist?
Edith Bergstrom 151
The Common Name of *Washingtonia filifera*
James W. Cornett 153
Ravenea in the Comores
John Dransfield and Natalie W. Uhl 156
A New Species in the Genus *Salacca*
Johanis P. Mogea 161
An Essay on *Metroxylon*, the Sago Palm
Jan B. Rauwerdink 165

Features:
Request from the Editors 150
Bookstore 155
Classified 160
Financial Statement 164
Letters 181
Palm Brief 182
Palm Literature 183
Palm Research 183
Costa Rican Palm Expedition 185
Seed Bank Under New Management 187
Index 189
New Contest 191
Palmeter 192

Cover Picture

The original painting from which the plate of *Ravenea hildebrandtii* in the Botanical Magazine was made. See pp. 156–160.

PRINCIPES

JOURNAL OF THE INTERNATIONAL PALM SOCIETY

(ISSN 0032-8480)

An illustrated quarterly devoted to information about palms and published in January, April, July and October by The International Palm Society, Inc.

Subscription price is $15.00 per year to libraries and institutions. Membership dues of $15.00 per year include a subscription to the Journal. Single copies are $5.00 each, $20.00 a volume. The business office is located at **P.O. Box 368, Lawrence, Kansas 66044.** Changes of address, undeliverable copies, orders for subscriptions, and membership dues are to be sent to the business office.

Second class postage paid at Lawrence, Kansas

© 1986 The International Palm Society

Mailed at Lawrence, Kansas
October 28, 1986

Principes, 30(4), 1986, pp. 143–150

The Use of Rattan by a Semai Community in West Malaysia

WANDA AVÉ
Rijksherbarium, P.O. Box 9514, Leiden, Netherlands

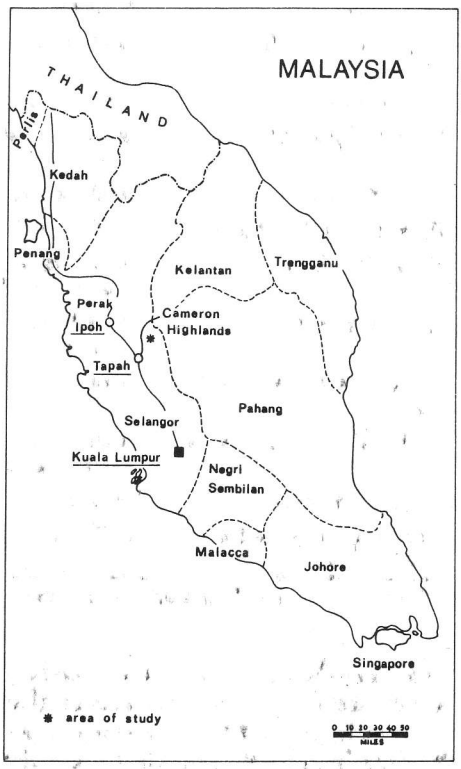
From March 1982 to March 1983, I stayed in West Malaysia, during which time about 10 months were spent in a small community of aboriginal "Semai" people in the Batang Padang District near Tapah (see Fig. 1). The community I studied live in a forested area at ca. 600 m a.s.l. and consisted of around 70 people. The people lead a semi-nomadic existence and practise a form of "ladang" (shifting cultivation) as well as hunting, fishing, and food-gathering in the forest. In addition, various products of "ladang" and the forest are occasionally sold. The latter include durian (*Durio zibethinus*) and rattan canes. In the daily life of the community, rattan still plays a very important role. Some of the products manufactured will be surveyed; however, a full discussion of all uses made of rattan would make this paper too lengthy.

The species of rattan occurring in the study area are enumerated in Table 1 below. In general the scientific classification (Dransfield 1979) agrees closely with the Semai classification, but as one can see in a few cases, the Semai distinguish more than one taxon, where according to Dransfield only one species is involved. *Indicates those species most often utilized by the Semai.

Main Artifacts Made of Rattan

The uses of rattan can best be discussed under four headings: a) house-building, b) basketry, c) traps, d) other products.

a) House-building. The Semai house is built off the ground (see Fig. 2). The poles and the framework mainly consist of bamboo. *Calamus diepenhorstii* is the species used to lash together the poles (Fig. 3). This species and also *C. javensis* and *Korthalsia scortechinii* are utilized for binding the walls and floors which are made of split bamboo. The roof is made of leaves of various palms, such as *Arenga wester-*



1. Location of the study area in West Malaysia.

Table 1. List of rattan species in the study area.

Name	Local Name	Use
Calamus blumei *Becc.*	coonk[1] cemeeh	see *C. javensis*, but this species is very rare
*C. diepenhorstii *Miq.*	coonk juk	house construction, manufacture of baskets, adzes, traps; fruits edible
C. exilis *Griff.*	coonk berber	binding
C. filipendulus *Becc.*	coonk ? (local name unknown)	binding
C. insignis *Griff.* var. longispinosus *J. Dransf.*	coonk gertas	construction of traps, baskets and other household articles
*C. javensis *Bl.*	coonk stook, coonk seek	manufacture of musical instruments, traps, basket covers
C. manan *Miq.*	coonk serpeek	rarely used
C. ornatus *Bl.*	coonk bantak	medicinal and ritual use
C. peregrinus *Furt.*	coonk beet	rarely used, fruits edible
C. viridispinus *Becc.*	coonk ceguup	rarely used (in same way as *C. javensis*)
Daemonorops brachystachys *Furt.*	coonk kanuul	fruits and cabbage eaten
D. didymophylla *Becc.*	coonk jernang	manufacture of traps and baskets
D. geniculata (*Griff.*) *Mart.*	coonk bala	fruits and cabbage eaten
*D. grandis (*Griff.*) *Mart.*	coonk spaal	leaves for construction of roofs, fishing rods and baskets; fruits and cabbage edible
D. kunstleri *Becc.*	coonk cercer	cabbage edible
D. macrophylla *Becc.*	coonk moh leek	occasionally used for manufacturing household articles
D. oligophylla *Becc.*	coonk moh leek	as above
D. verticillaris (*Griff.*) *Mart.*	coonk tunggal	as above
Korthalsia rigida *Bl.*	coonk celdool, coonk tangklah	medicinal use
K. scortechinii *Becc.*	coonk haak, coonk ncuk	binding material
Myrialepis paradoxa (*Kurz.*) *J. Dransf.*	coonk taluut	manufacture of various artifacts, butt cones of darts
Plectocomia elongata *Mart.* ex. *Bl.*	coonk peniil, coonk suaak	fruits and flowers sold for decorations
P. dransfieldiana *Madulid*	coonk ceet	fruits eaten, flowers sold for decorations
*Plectocomiopsis geminiflora (*Griff.*) *Mart.*	coonk lak	medicinal use, manufacture of baskets and various traps

[1] The 'c' in Semai to be pronounced as ch in church.

houtii and *Daemonorops grandis*. Ladang houses are temporary constructions that are sometimes built on very steep slopes receiving much wind, in which case the construction is supported by means of guy lines made of whole canes of *Calamus diepenhorstii*.

b) Basketry. Under this heading a few rattan products will be mentioned that can be broadly classified as baskets but which



2. Semai settlement showing typical dwellings against a forested background.

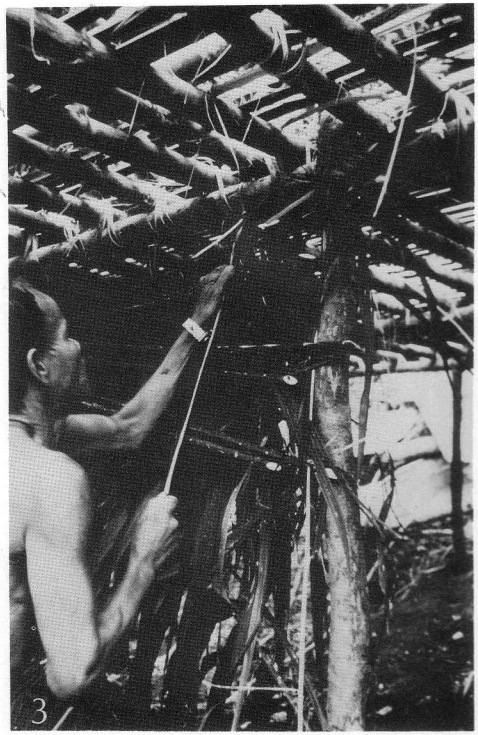
also include such artifacts as winnowing trays. The most frequently made baskets are the "raga sempaa" to carry durian (sempaa = durian) and "raga kayu" (kayu = cassava) to carry cassava or firewood (Fig. 4). These large baskets are usually made from split canes of *Calamus diepenhorstii*. Occasionally *C. manan* or *C. ornatus* are used to make "raga sempaa." Smaller baskets such as "raga tengroi" (Fig. 5) are made of *C. javensis*; they are used to carry food or fish (tengroi = to fish). Other small baskets are likewise made of the split canes of *C. javensis* or other small-stemmed species (*C. viridispinus*).

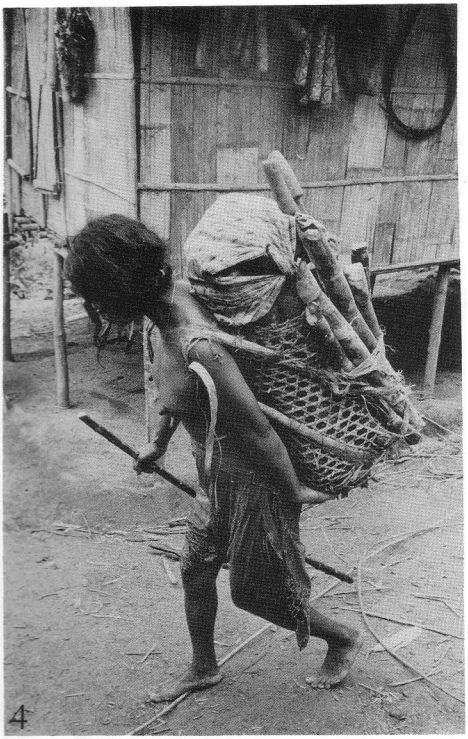
A special type of basket is the "tangguk" (Fig. 6) which is made from the skin of the petiole and rachis of *Daemonorops grandis*. They are used to store food and are suspended from the kitchen roof.

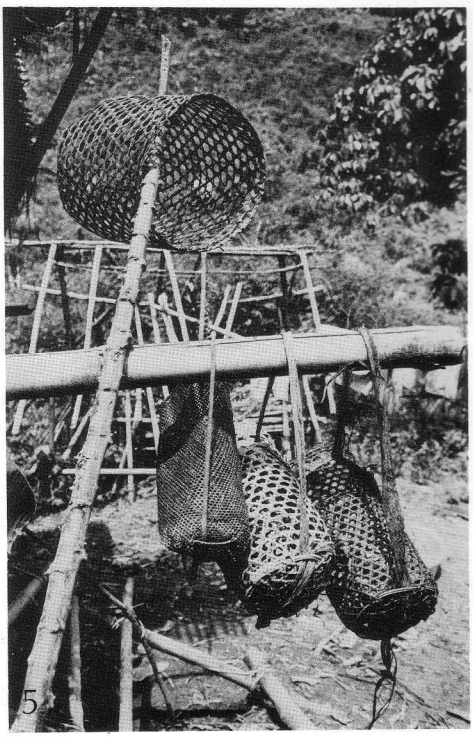
The same material is used to make winnowing trays, "jempiir" (Fig. 8) which are used to separate chaff and padi (rice grains still in husks) from rice grains.

c) Traps. The trapping devices consist of two major groups: the fish traps and the snares.

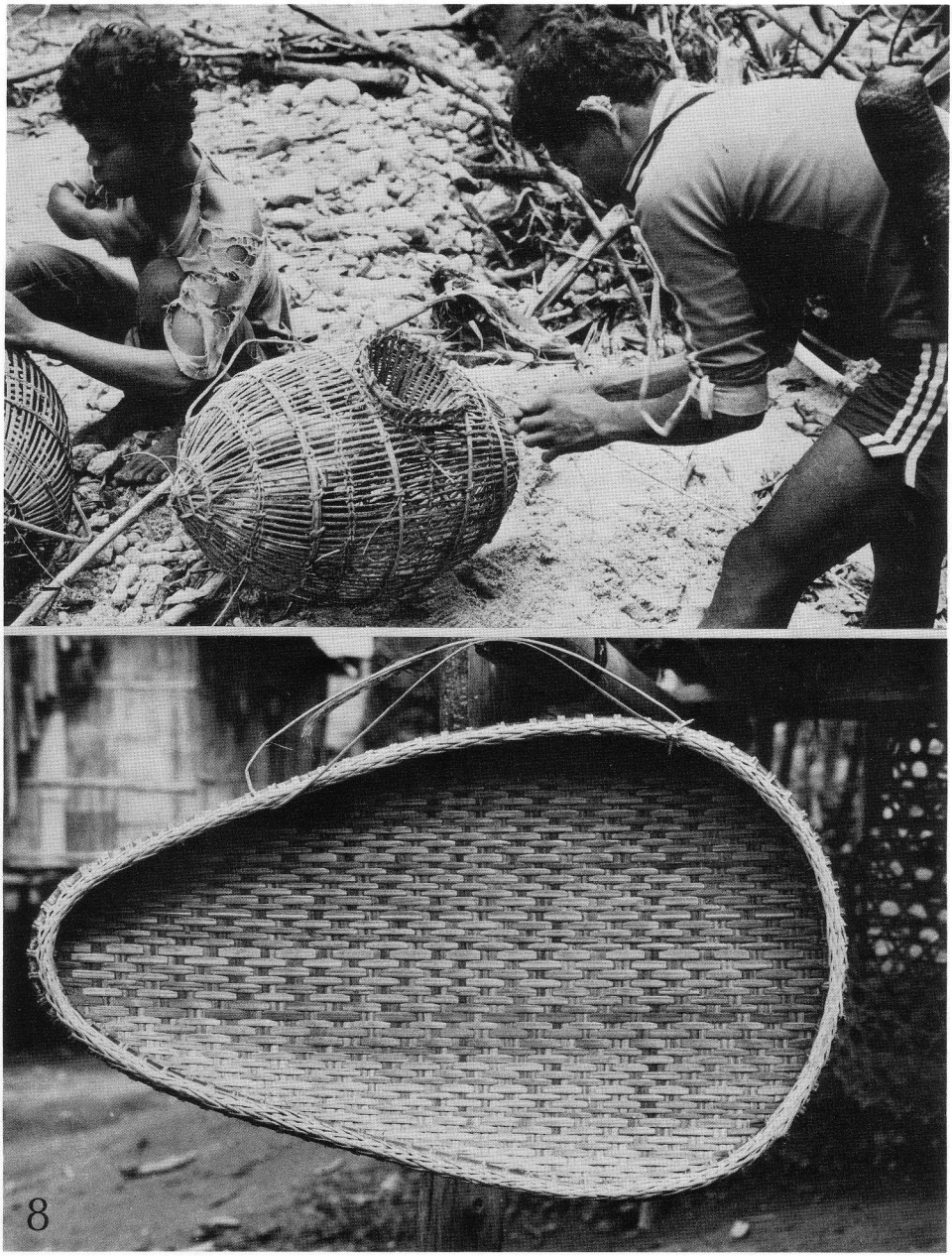
There are four types of fish traps, "bubu." "Bubu uaak" is a large fish trap ca. 90 cm long and 30 cm across (Fig. 9) made of strips of *Plectocomiopsis geminiflora* supported by rings of *Daemonorops geniculata* canes fastened with split canes of *Calamus javensis*. The funnels inside the trap, "hinyaap," are made of


3


4


5


6



7. The "bubu sereek," with opening in the middle. 8. A winnow, "jempiir."

←

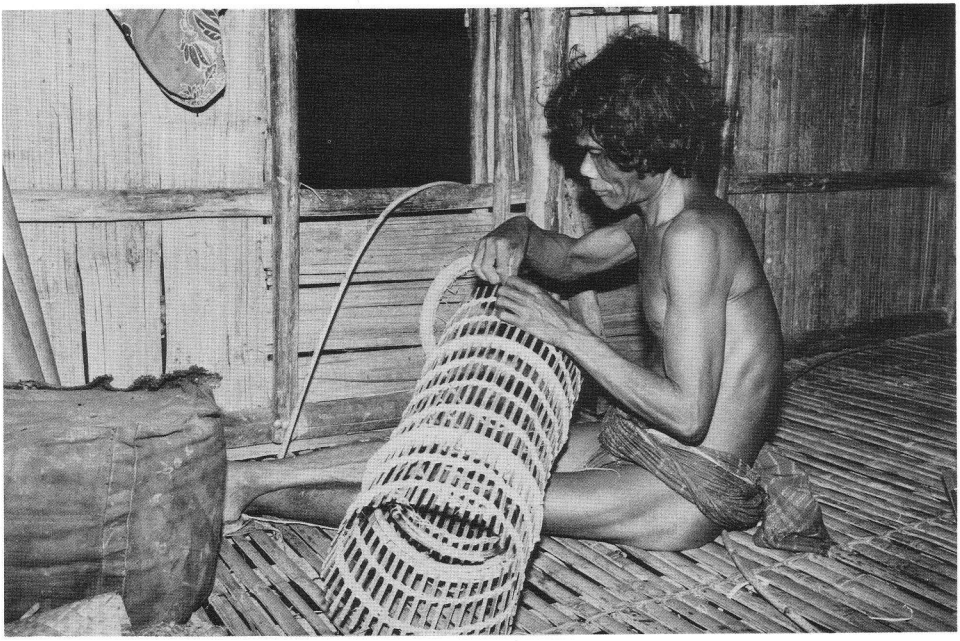
3. A man engaged in house-building. Note extensive use of rattan as binding material. 4. Woman carrying cassava and other products in a "raga kayu." 5. Various types of baskets, top: "raga sempaa," bottom left: "raga tengroi," bottom right: two "raga kayu." 6. A woman manufacturing a "tangguk."



9. A man making a "bubu uaak." Note the inner ring ("gedik") and binding ("berniir").

Plectocomiopsis geminiflora. This trap is used to catch fish of various sizes. "Bubu sereek" is an ovate trap with its opening on the side (Fig. 7). The same material is used as for the previous bubu. "Bubu kadaap" (kadaap = tadpoles) is a smaller version of "bubu uaak" and is used to catch tadpoles. "Bubu kampeet" or "bubu gelpiil" (gelpiil = turtle) is a large cylindrical trap (Fig. 10). This is a very strong contraption made from the canes of *Plectocomiopsis geminiflora,* but is sometimes also made from bamboo or *Donax.* It is used to catch the Malayan mud turtle (*Trionys cartilagineus*).

A variety of snares or noose traps, a second group of the trapping instruments, are used by the Semai. Strong snares such as the "bako" (Fig. 11) and "jawer" are made of *Calamus diepenhorstii* and also of *C. insignis* or *Korthalsia rigida.* These are used to catch larger mammals such as civets and monkeys. Various other small traps are made of *Calamus javensis* and



10. The "bubu kampeet" or "bubu gelpiil" used to catch mud turtles.



11. Example of a noose trap "bako" to catch civets and monkeys.

are used to catch smaller game such as rats, shrews, and birds.

d) Other Uses of Rattan. Rattan plays a role in various other activities of the Semai. The most common use of rattan, of course, is as binding material (Fig. 3). *Calamus javensis* or *C. blumei* are used to make "jerengkob," a cover for dart quivers (Fig. 12). Some species of *Daemonorops* have edible growing tips (cabbage) which are eaten raw or cooked. The fruits of some species have seeds covered by a thin fleshy edible layer, for instance *Daemonorops geniculata.* Other species are used for medicinal purposes, mostly against coughing and stomach ailments; examples are *Calamus ornatus*, *Korthalsia rigida*, and *Plectocomiopsis geminiflora. Calamus ornatus* is used in rituals.

Conclusion

I hope to have shown that rattan plays an important role in the daily life of the Semai. Its role in the economy of the group will be discussed in another paper.



12. Decorated bamboo quivers covered with a "jerengkob."

Acknowledgments

Financial support for my study was given by Wereld Natuur Fonds, Treub-Maatschappij and Stichting Werkgroep Studiereizen Ontwikkelingsladen. The initiative for this study was taken by the late Dr. M. Jacobs. A great number of persons and institutes have been helpful. They cannot all be mentioned, but exceptions must be made for Dr. S. C. Chin (Univ. Malaya) and Dr. J. Dransfield (Kew). Dr. M. M. J. van Balgooy (Rijksherbarium Leiden) supervised my work and helped to draw up this account.

LITERATURE CITED

DRANSFIELD, J. 1979. A Manual of the Rattans of the Malay Peninsula. Mal. For. Rec. 29.

A Request from the Editors

To The Chapters of IPS:

Please have a member or an officer—as you decide—prepare a summary for *Principes* of your main events on an annual basis or more often. All Society members are interested in what you are doing but we cannot abstract and condense the many newsletters we now receive.

Principes, 30(4), 1986, pp. 151–152

Palmateer? Palmophile? Palmophilia? Palmologist?

EDITH BERGSTROM
670 Guinda Street, Palo Alto, CA 94301

Have you ever searched for a word to express your love of palms when talking with a friend about your Palm Society activities? Did you end up telling your friend you are a palm "nut"? I realized I was not the only one frustrated by lack of words to express my feelings when I read in Lynn McKamey's book, the "*Secret of the Orient, Dwarf Rhapis Excelsa*," page 46:

> "What do you call a Palm Collector"? English lacks a one-word term signifying "palm fancier," and besides nobody wants to go about the world blurting out, "I'm a palm fancier!" One occasionally sees the work "palmologist" applied to the scientific investigator of palms, but a good many scientists avoid it as too contrived and doubtful of etymological standing, hardly more than a cut or two above "mixologist" for a bartender. Two good English words that would do are "palmist" and "palmer," but both have been pre-empted . . . the former is a soothsayer; the latter is a pilgrim, or else he is a card shark. The only word left to use seems to be "palmateer." Even though it has a jaunty sound, with overtones of recklessness, its meaning would be apparent to highbrows, lowbrows, and middlebrows alike."

Dent Smith first used palmateer in an article in *Principes*, vol. 1, Number 3.

Knowing that new words are introduced into the English language by the simple process of usage by writers and scholars, I examined *Webster's New World Dictionary*, the *Oxford English Dictionary* and *Webster's New International Dictionary*, 2nd edition, unabridged to see if I could form some new words that would describe my love for palm trees. I found that *phil* or *phile*, from the Greek, is a combining word which is used regularly to indicate love of or liking, as in bibliophile, philharmonic and philhellenic. On this model the new compound palmophile is a good English word meaning one who loves palms.

Searching further, the ending *philia* indicates a tendency toward, or abnormal attaction to, as in hemophilia and coprophilia. The ending *ia* indicates a condition as in anemia or pneumonia. Palmophilia, then, is a term some of us may apply to ourselves depending on the degree of mania we claim or how abnormal our palm fixation is.

The ending *ology* and *logy* indicate a discourse or study as in biology, geology, and psychology. Palmology, then, is a perfectly good word indicating the study of palm trees. After looking at very long lists of combined words using this suffix, palmology seemed very natural, and not a bit contrived. The etymological validity of these words is dependent only on whether it is used by knowledgeable writers or speakers. The rule is that when a word comes to be accepted it is added to the dictionary.

Continuing my research, the ending *eer* indicates "one who." Examples were volunteer, mutineer, and auctioneer. Palm-

ateer, then, gives one the image of a palmophile cutting his way through jungle underbrush in quest of new palm species.

We should use these words in *Principes* and our regional newsletters.* Dictionary publishers should be notified and given examples of the context in which the words are used. It is up to us!

Other words of special interest to the Palm Society which are already in the dictionary include the following:

Palmaceous—(*adj.*) pertaining to palms; of the nature of, or resembling palms

Palmary—a token of victory or supreme excellence, a prize. That bears or is worthy to bear the palm. Holding the first or highest place; of supreme or first-rate importance; pre-eminent, principle, chief. "But the Palmary argument . . . ."

Palmeous—of palms or palmwood

Palmery—a collection of palm trees, a place or house in which they are grown, a palm-house

Palmetto—(*noun*) any of several fan palms; (*adj.*) woven of palmetto leaves, as palmetto baskets, etc.

Palmful—full of or abounding in palm trees. ". . . dry and sandy soil spreads palmful forests."

Palmicolous—(*colus* means inhabiting) growing upon or inhabiting palm trees

Palming—(*verb*) gathering palms—like blackberrying. The second meaning is bearing palms or palm fronds as at Easter

Palmivorous—(*vorus* means devouring) feeding on or obtaining food from palm trees

Palmiferous—(*ferous* means bearing) bearing or carrying palm branches

Palmy—bearing or abounding in palms as a palmy shore

* Walter H. Hodge recently used Palmophile in *Principes*, vol. 30(1): 17.

Principes, 30(4), 1986, pp. 153–155

The Common Name of Washingtonia filifera

JAMES W. CORNETT
Palm Springs Desert Museum, 101 Museum Drive, Palm Springs, CA 92263

Stability and universality are two excellent reasons for the use of scientific names. However, there seems a persistent disdain for the use of scientific nomenclature on the part of the lay public. The result has been that common names have flourished and a barrier restricting the flow of information from professionals to lay persons (and vice versa) has been erected. (Ornithologists have largely solved the problem by standardizing common names for birds.) With these considerations in mind, I wish to propose that the palm *Washingtonia filifera* be given a standardized common name.

Although restricted in its natural (or naturalized) distribution to the Sonoran Desert of southeastern California, western Arizona, extreme southern Nevada, and northeastern Baja California (Fig. 1), it is planted in many parts of the world as an ornamental (Parish 1907, Moran 1977, Blombery and Rodd 1982). Not surprisingly, numerous common names have been used for this species, many of which are confusing or misleading.

Major W. W. Emory discovered, in 1846, what later was to become known to the botanical community as *W. filifera* (Parish 1907). On seeing the palms, members of his exploration party familiar with Florida called them "cabbage trees." Today, the most frequent common name applied to *W. filifera* is "California fan palm" (Vogl and McHargue 1966, Sunset Editors 1979, Peterson 1966). But the name suggests that the palm is restricted to California and, as has already been mentioned, it is found in Nevada, Arizona, and Baja California as well as California. In truth there are nearly as many individuals of *W. filifera* outside of California than within it (Henderson 1961).

Another common name which has made for difficulties is Washington palm (Hanson and Churchill 1961) or Washington fan palm (Kasbeer 1971). Although there are advantages in using the generic name as part of the common name, there are two species in the genus *Washingtonia*, and Washington fan palm could refer to either *W. filifera* or its slender cousin, *W. robusta*, of central Baja California. Jaeger (1941) used the name "desert palm" and, although this is appropriate and not misleading, it is sometimes used to designate *Livistona mariae* of the Australian desert.

Few names are without fault, but I proposed that the common name of *W. filifera* be "desert fan palm." With just one exception (Moran 1979), "desert" describes the climate of its habitat and "fan" describes the shape of its leaf and assigns it to a taxonomic grouping (Moore 1973). "Fan" used in the common name also separates *W. filifera* from the date palm, *Phoenix dactylifera*, which occasionally occurs as an introduced species in desert fan palm oases.

Acknowledgments

This note was made possible through a grant from the Richard King Mellon Foundation of Pittsburgh, Pennsylvania.



1. Desert fan palms in the Couchella Valley, California. Photo by Stephen Willard.

LITERATURE CITED

BLOMBERY, A. AND T. RODD. 1982. Palms. Angus and Robertson Publishers, London.

HANSON, H. C. AND E. D. CHURCHILL. 1961. The Plant Community. Reinhold Publishing Corporation, New York.

HENDERSON, R. 1961. On Desert Trails Today and Yesterday. Westernlore Press, Los Angeles, California.

JAEGER, E. C. 1941. Desert Wild Flowers. Stanford University Press, Stanford, California.

KASBEER, T. 1971. Flora of Baja Norte. La Siesta Press, Glendale, California.

MOORE, H. E., JR. 1973. The major groups of palms and their distribution. Gentes Herbarium 11(2): 27–141.

MORAN, R. 1977. Palms in Baja California. Environment Southwest 478: 10–14.

———. 1979. Palms of Valle de las Palmas. Environment Southwest 485: 16–18.

PARISH, S. B. 1907. A contribution toward a knowledge of the genus *Washingtonia*. Botanical Gazette 44: 408–434.

PETERSON, P. V. 1966. Native trees of Southern California. University of California Press, Berkeley.

SUNSET EDITORS. 1979. New Western Garden Book. Lane Publishing Company, Menlo Park, California.

VOGL, R. J. AND L. T. MCHARGUE. 1966. Vegetation of California fan palm oases on the San Andreas Fault. Ecology 47: 532–540.

BOOKSTORE

A MANUAL OF THE RATTANS OF THE MALAY PENINSULA (J. Dransfield 1979, 270 pp.)	$25.00
COCONUT PALM FROND WEAVING (Wm. H. Goodloe 1972, 132 pp.)	3.95
COCONUT RESEARCH INSTITUTE, MANADO (P. A. Davis, H. Sudasrip, and S. M. Darwis, 1985, 165 pp., 79 pp. color)	35.00
CULTIVATED PALMS OF VENEZUELA (A. Braun 1970, 94 pp. and 95 photographs.)	6.00
EXOTICA (4) (A. Graf, pictorial encyclopedia, 2 vols., including 250 plant families, 16,600 illust., 405 in color, 2590 pp.)	187.00
FLORA OF PANAMA (Palms) (R. E. Woodson, Jr., R. W. Schery 1943, 122 pp.)	17.00
FLORA OF PERU (Palms) (J. F. MacBride 1960, 97 pp.)	8.00
FLORIDA PALMS, Handbook of (B. McGeachy 1955, 62 pp.)	1.95
HARVEST OF THE PALM (J. J. Fox 1977, 244 pp.)	22.50
INDEX TO PRINCIPES (Vols. 1–20, 1956–1976, H. E. Moore, Jr., 68 pp.)	3.00
MAJOR TRENDS OF EVOLUTION IN PALMS (H. E. Moore, Jr., N. W. Uhl 1982, 69 pp.)	6.00
OIL PALMS AND OTHER OILSEEDS OF THE AMAZON (C. Pesce, 1941, translated and edited by D. Johnson, 1985, 199 pp.)	24.95
PALMAS TROPICALES: CULTIVADAS EN VENEZUELA (J. Hoyas F. and A. Braun, 1984, all in color, 134 pp.)	50.00
PALEM INDONESIA (in Indonesian) (Sastraprdja, Mogea, Sangat, Afriastini, 1978. 52 illustrations, 120 pp.)	5.50
PALMS (A. Blombery & T. Rodd 1982, 192 pp., 212 colored photographs)	25.00
PALMS IN AUSTRALIA (David Jones 1984, 278 pp., over 200 color photographs)	25.00
PALMS FOR THE HOME AND GARDEN (L. Stewart 1981, 72 pp., some color)	10.95
PALMS OF THE LESSER ANTILLES (R. W. Read 1979, 48 pp.)	8.00
PALMS OF MALAYA (T. C. Whitmore 1973, 132 pp.)	16.95
PALMS OF SOUTH FLORIDA (G. B. Stevenson 1974, 251 pp.)	7.95
PALMS OF THE WORLD (J. C. McCurrach 1960, 290 pp.)	19.00
PALM SAGO (K. Ruddle, D. Johnson, P. K. Townsend, J. D. Rees 1978, 190 pp.)	10.00
SECRET OF THE ORIENT DWARF RHAPIS EXCELSA (L. McKamey 1983, 51 pp.)	3.95
SUPPLEMENT TO PALMS OF THE WORLD (A. C. Langlois 1976, 252 pp.)	25.00
THE GENUS PTYCHOSPERMA LABILL. (F. B. Essig 1978, 61 pp.)	6.50
THE INDIGENOUS PALMS OF NEW CALEDONIA (H. E. Moore, Jr., N. W. Uhl 1984, 88 pp.)	12.00
THE INDIGENOUS PALMS OF SURINAME (J. G. W. Boer 1965, Part of Flora, 172 pp.)	42.00
THE MINIATURE PALMS OF JAPAN (U. Okita, J. L. Hollenberg 1981, 135 pp.)	19.95
THE PALM FLORA OF NEW GUINEA (F. B. Essig, 1977, 46 pp.)	6.50
TROPICA (A. Graf, 7000 color photos, 1138 pp.)	125.00

PALM PAPERS (Postage Included)

FURTHER INFORMATION ON HARDY PALMS (J. Popenoe 1973, 4 pp.)	1.25
RARE PALMS IN ARGENTINA (reprint from *Principes*, E. J. Pingitore 1982, 9 pp., 5 beautiful drawings)	2.75
PALMS—ANCESTRY AND RELATIONS (B. Ciesla 1979, a chart)	6.00
PALMS FOR TEXAS LANDSCAPES (R. Dewers & T. Keeter 1972, 3 pp.)	1.25
THE HARDIEST PALMS (J. Popenoe 1973, 4 pp.)	1.25

The palm books listed above may be ordered at the prices indicated plus $1.50 extra per book to cover packaging and postage. (California residents please add 6% sales tax.) Foreign checks must be in US dollars and payable on a USA bank. In some countries it is possible to send International Money Orders through the Post Office. Please include your International Palm Society membership number. Send check payable to The International Palm Society to Pauline Sullivan, 3616 Mound Avenue, Ventura, CA 93003, U.S.A. ALL SALES FINAL.

Principes, 30(4), 1986, pp. 156–160

Ravenea in the Comores

JOHN DRANSFIELD
Herbarium, Royal Botanic Gardens, Kew. Richmond, Surrey TW9 3AB, UK

AND NATALIE W. UHL
L. H. Bailey Hortorium, Cornell University, Ithaca, NY 14853, USA

Ravenea hildebrandtii was collected in 1875 in the Comore Islands off the northeast coast of Madagascar and was named and partially described in 1878 by C. Bouché. In 1878 plants of this palm were offered for sale at 20 German Marks by the nurseryman Otto Neumann of Schöneberg, Berlin, and several botanic gardens throughout Europe seem to have obtained examples, including the Royal Botanic Gardens, Kew. An expanded description together with a beautiful illustration (see cover this issue) were published by J. D. Hooker in the Botanical Magazine in 1884, based on the material in cultivation at Kew together with specimens sent by Wendland. Later *R. hildebrandtii* seems to have become lost in cultivation in Europe. In November 1963 H. E. Moore, Jr. visited the Comores and collected a large quantity of seed of a species of *Ravenea* which was distributed via the International Palm Society's Seed Bank as *R. hildebrandtii*. Moore's collection, however is quite distinct from *R. hildebrandtii* and represents an undescribed species which we describe below, naming it for Hal Moore. There seems little argument that true *R. hildebrandtii* is an exceptionally beautiful ornamental and, because of this and the confusion over the naming of the Moore collection we feel it may be of interest to discuss the two palms in some detail.

History of Ravenea hildebrandtii

Carl David Bouché (1809–1881), Inspector of the Botanic Gardens in Berlin from 1844, realized that palm seeds collected by Hildebrandt, and seedlings grown from them, did not match any known species or genus. He named the palm *Ravenea hildebrandtii*, in so doing commemorating Louis Ravené, apparently an official of the Berlin Botanic Gardens, and J. M. Hildebrandt, the collector. The name was first published in a short note with a very short description of the seedling palm in the April number of Monatsschrift des Vereines zur Beförderung des Gartenbaues for 1878. An illustration and more notes were published in the July number of the same journal, but little of the information could be used diagnostically as the cultivated material lacked flowers and fruit. It was not until 1883 that the seedlings, originating from Hildebrandt's collection but now scattered over Europe, began to flower. The first specimen of the palm in Kew to flower proved to be staminate, that at Herrenhausen pistillate. Pistillate plants at Kew appear to have flowered several years later. Wendland sent material of the pistillate flowers to J. D. Hooker, who then provided the expanded description and illustration (cover photo) in 1884 on which the concept of the genus could be based. Bouché certainly coined the name *Rave-*

nea, but it is debatable whether the description in the Monatsschrift is sufficient as a generic diagnosis or whether the description in the Botanical Magazine should be regarded as the protologue—should the genus be cited as *Ravenea* Bouché or *Ravenea* Bouché ex H. A. Wendland in J. D. Hooker? Adding to this complication is the problem of typification. Bouché cited, incidentally, the living plants in Berlin; as far as is known there is no herbarium material of these seedlings. In the herbarium at Florence there is material of *R. hildebrandtii* collected by Hildebrandt himself in 1875, a fragment of a specimen in Berlin, now presumed destroyed, but Bouché's description does not refer to any detail of Hildebrandt's collection. There is however an excellent specimen in Kew to act as type of the plate in the Botanical Magazine. We therefore suggest that the name should be attributable to Bouché ex H. A. Wendland in J. D. Hooker (1884) rather than Bouché (1878). Hildebrandt and Bouché both referred to *R. hildebrandtii* as a dwarf palm only about 3–4 m tall, and indeed the plate in the Botanical Magazine shows a dwarf palm with a very short stem. This aspect of the palm is totally different from that of the taxon named *R. hildebrandtii* by Moore. Moore's palm is perhaps even larger than a coconut; "the trunks reach 60 feet or more in height, more than 10 inches in diameter" (Moore 1965).

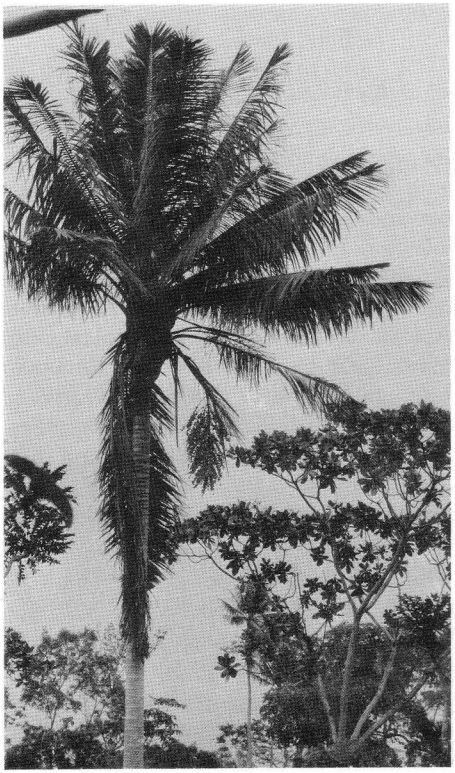
While preparing an account of the genus *Ravenea* for "*Genera Palmarum*" (Uhl and Dransfield in press), we examined all the material of the genus in the Bailey Hortorium and in Kew and realized that, as must already be obvious, there are two species of the genus in the Comores—true *R. hildebrandtii*, a dwarf palm, and another robust species (Fig. 1). Harold St. John, who visited the Comores in 1961, collected and photographed both taxa and, furthermore, sent seed of true *R. hildebrandtii* to the Fairchild Tropical Garden in Florida where (as *Ravenea* sp.) it successfully flowers. Moore's *Ravenea* (as *R. hildebrandtii*) also grows well in Fairchild Tropical Garden but has not yet flowered. This robust taxon (Fig. 1) does not seem to match any of the large species from Madagascar and is thus described as new and named *R. moorei* in honor of the collector. Enthusiasts who grow palms as *R. hildebrandtii* should note the differences between the two taxa and name them accordingly. Fairchild Tropical Garden is fortunate in possessing both staminate and pistillate plants of *R. hildebrandtii*; although pollen has been transfered to the pistillate flowers, no fruit appears to have been produced; this is unfortunate as the palm has exceptional horticultural potential.

Besides describing *R. moorei* we provide a complete description of *R. hildebrandtii*.

Ravenea hildebrandtii C. Bouché ex H. A. Wendland in J. D. Hooker, Botanical Magazine 110: t. 6776 (1884). Type: Cult. in Hort. Bot. Reg. Kew (holotype K).

R. hildebrandtii C. Bouché, Monatsschrift des Vereines zur Beförderung des Gartenbaues 1878: 197, 323, 324 (1878) (description and woodcut of juvenile palm only, inadequate for diagnosis); Lemaire, l'Illustration Horticole 27: 164 (1880) (description of juvenile, inadequate for diagnosis).

Slender, solitary, unarmed, pleonanthic, dioecious palm, sometimes flowering when ± acaulescent; stem to ca. 6 m tall (rarely to 12 m), usually much less, ca. 5–6 cm diam., swollen at the base; internodes apparently short, scarcely evident in old stems, the stem surface grey-brown, becoming fissured longitudinally and laterally (on drying). Leaves ca. 12 in the crown, ± curved; sheath soon splitting, the margins sparsely fibrous, abaxial surface densely covered in thick tomentum,



1. *Ravenea moorei* growing on lava at 600–800 m below Chemin du Capitaine Dubois, Grand Comore. Photo by H. E. Moore, Jr.

white in unexposed areas, soft brown where exposed; petiole 30–50 cm long, ca. 10 mm wide at the base, tapering to ca. 7 mm wide at the tip, adaxially deeply channeled, glabrous, abaxially rounded and rather densely covered in soft brown tomentum; rachis ca. 50–65 cm, gradually tapering, adaxially shallowly grooved or angled, laterally grooved, sparsely tomentose; leaflets ca. 20–40 on each side of the rachis, regularly arranged, 2–3 cm distant, linear, acuminate, the basal few very slender and short (ca. 10 × 0.3 cm), the mid leaf leaflets ca. 30–45 × 1–1.8 cm, the apical pair ca. 10 × 0.7 cm; leaflets ± 5-veined, the midrib much larger than the rest, prominent adaxially, abaxially bearing conspicuous, close, pale, ± rounded, tattered ramenta; transverse veinlets obscure. Inflorescences solitary, axillary; staminate inflorescence 28–60 cm long, branched to 1 order; peduncle very slender, 17–35 cm long, ca. 3–4 mm diam., ± rounded in cross section, tomentose; major bracts 4 or 5 including the prophyll, persistent; prophyll 5–7.5 × 1–1.5 cm, tubular or incomplete, 2-keeled, ± membranous, tending to tatter irregularly, abaxially with scattered soft brown tomentum; first or first 2 peduncular bracts 11–14 × 1.5 cm, similar to the prophyll but not 2-keeled, tending to split along one side, membranous; distal pair of peduncular bracts much longer than the others, 25–40 cm long, splitting longitudinally almost to the base, becoming ± flattened or expanded, ca. 2–2.5 cm wide, acute, distally ± keeled, thick, coriaceous to ± woody, adaxially glabrous, abaxially densely pale grey to brown tomentose; rachis bearing rather crowded, slender, spirally arranged rachillae; basalmost rachillae to 10 cm long, the distal much shorter, to ca. 3 cm long, ca. 0.75–1.5 mm diam., bearing spiral or subdistichous solitary flowers borne on very short pedicels 0.25–0.75 mm long. Staminate flowers ca. 3–5 mm long; calyx explanate, tubular in the basal 0.5 mm, with 3 triangular, acute or mucronate lobes to 1 × 1 mm; petals 3, joined only at the very base, to 4 × 1.5 mm, acute or acuminate, 3-veined; stamens 6, filaments short, fleshy, ca. 0.5 mm long, anthers ± elongate, 2.25 × 0.3 mm; pistillode conspicuous, narrowly pyramidal, ca. 1.5 × 0.4 mm. Pistillate inflorescence 90–160 cm long, branched to one order; peduncle 70–130 cm long, up to ca. 6 mm diam. at the base; bracts like those of the staminate but longer and more coriaceous or woody; rachillae ca. 7–12 cm long, ca. 2–2.5 mm diam. at the base, bearing spiral or subdistichous solitary flowers. Pistillate flowers open early in development; calyx cup-shaped, ca. 0.5 mm, with 3 short to long, acuminate, triangular lobes to 1.5

mm; petals 3, ± free, ca. 2.5 × 0.5 mm, 3-veined, eventually disintegrating leaving the veins free; staminodes 6, filaments very slender, flattened, anthers sagittate, flattened, empty; ovary flask-shaped, ca. 3 × 1 mm, stigmas 3, short, recurved. Mature fruit broadly ovoid, ca. 10 × 8 mm, stigmatic remains lateral near the base; epicarp yellow, drying wrinkled, mesocarp apparently thin, endocarp very thin; seed rounded, ca. 5 mm diam.

Specimens Examined: COMORE ISLANDS: Grand Comore, Charboni-La Grille, at the north end of the island, Aug. 1961, *H. St. John 26544* (pistillate) (BH, K), *26543* (staminate) (BH, K); Maoueni, La Grille, Dec. 1967, *Bernardi 11646* (staminate) (G, K); without locality, *H. Humbert 395* (staminate) (K), *1608* (staminate) (FI, P); Anjouan, March 1877, *Bewsher 34* (staminate) (K); April 1861, *Dr. Kirk s.n.* (pistillate) (K); Moheli, Nov. 1968, *Schlieben 11214* (pistillate) (K); Johanna Is., in mountain forest, *Hildebrandt 1743* (pistillate) (†B, FI).

Cultivated: Royal Botanic Gardens, Kew, Palm House, May 1884 (staminate) (holotype K); April 1891 (staminate and pistillate) (K); June 1901 (pistillate) (K); Herrenhausen, comm. *H. A. Wendland* Sept. 1884 (pistillate) (K), May 1885 (pistillate) (K).

Ravenea moorei J. Dransf. & N. W. Uhl, sp. nov. (Fig. 1).

Palma robusta elegantissima, ab altera specie Insularum Comorensium, *R. hildebrandtii*, habitu multo majore distinctissima, *R. robustiori* et *R. rivulari* Insulae Madagascariensis ut videtur affinis, sed a *R. rivulari* foliis paucioribus, foliolis majoribus, inflorescentiis solitariis, rachillas longiores ferentibus et fructu majore, et a *R. robustiore* fructu semper monospermo, rachillis brevioribus, foliolis minoribus et vagina folii lobo oppositipetiolo carenti differt. Typus: Insulae Comorenses, Grand Comore, *H. E. Moore & A. Moelevoce 9028* (holotypus BH; isotypus K).

Robust, solitary, unarmed, pleonanthic, dioecious tree palm. Stem to 20 m tall, 12–35 cm diam. at breast height, grossly swollen at the base, internodes ca. 20 cm long in lower part, much shorter towards the apex, nodal scars not very prominent, bark grey-brown. Leaves numerous, ± spreading or erect, not curved, ca. 3 m long; sheath soon splitting, margins with long fine fibers, abaxial surface covered with thick tomentum, white in unexposed areas, soft brown where exposed, becoming thinner distally; petiole very short, ca. 10 cm long, 4 cm wide, 1.5 cm thick, adaxially flattened, abaxially ± rounded, sparsely tomentose abaxially, glabrous adaxially; rachis elongate, gradually tapered, abaxially rounded, adaxially shallowly grooved or angled, laterally grooved, sparsely tomentose; leaflets very numerous, pendulous, ca. 80 on each side, regularly arranged, rather close, ± opposite, rather narrow, long acuminate, proximal few leaflets very crowded and narrow, 15–25 cm long, ca. 1 cm wide; mid leaf leaflets 70 × 2.5 cm, decreasing in size towards the leaf tip, apical leaflets 15 × 0.7 cm, main veins ca. 5, the midrib the largest, prominent adaxially, abaxially bearing conspicuous, close, pale, ± regularly arranged ramenta; transverse veinlets obscure, caducous tomentum present abaxially near the base. Inflorescences solitary, axillary; staminate inflorescence known only in the dead state, ca. 90 cm long, branched to 2 orders; peduncle ca. 35 cm long × 1.5 cm diam., ± rounded in cross section, bracts not known; rachillae numerous, slender, up to 15 cm × 1.5 mm; pistillate inflorescence ca. 1.5 m long, ± pendulous, branched to 1 order, rather lax; peduncle ca. 90 cm long, ca. 2 cm diam. near the base, rounded or elliptic in cross section, bearing caducous, soft brown tomentum; prophyll tubular, 2-keeled, 20 × 5 cm, rather thin bearing caducous pale brown tomentum, tattering

and becoming fibrous with age; peduncular bracts 4, inserted close together, the proximal 3 tubular, similar to the prophyll but not 2-keeled, the 4th open, the longest one ca. 130 × 5 cm, irregularly splitting and becoming fibrous; rachis ca. 60 cm long, gradually tapering distally; rachillae numerous, ca. 100, rather stiff, ± straight, 30–45 cm long, distal ones 15–20 cm long, 5 mm diam. at the base, tapering to 1.5–2.5 mm distally, bearing spirally or subdistichously arranged peg-like floral pedicels, 0.5–5 × 1–1.5 mm; pistillate flowers not known. Fruit ripening bright yellow to orange, spherical, 16 mm diam., stigmatic residue lateral, persistent sepals triangular, ca. 1.25 × 1 mm; persistent petals similar but smaller; epicarp smooth, wrinkling on drying, mesocarp fleshy, ca. 1.3 mm thick, endocarp not differentiated. Seed spherical, 9–11 mm diam., dark brown, basally attached; endosperm solid, homogeneous, embryo basal.

Specimens Examined: COMORE ISLANDS: Grand Comore, on lava between Boboni and Kafeni, below Chemin du Capitain Dubois, 600–800 m altitude, surviving in secondary rain forest, vernacular name 'inazi', Nov. 1963, *H. E. Moore & A. Moelevoce 9028* (holotype BH, isotype K); Aug. 1961, *H. St. John 26542* (BH, K).

LITERATURE CITED

MOORE, H. E. 1965. Palm hunting around the world. Principes 9: 13–29.

UHL, N. W. AND DRANSFIELD, J. (in press) Genera Palmarum; a Classification of Palms Based on the Work of H. E. Moore Jr. Allen Press, Kansas.

CLASSIFIED

FOR SALE. Seeds of *Jubaeopsis caffra*, $2.50 each, *Lytocaryum hoehnei*, $5.00 each. Limited number donated to The Revolving Publications Fund. Order quantity desired now but don't send money until contacted. PAULEEN SULLIVAN, 3616 Mound Ave., Ventura, CA 93003 USA.

DWARF RHAPIS EXCELSA, Seven green and variegated varieties available. NEW BOOK, "Secret of the Orient," a comprehensive guide to **Rhapis** palms—52 pages fully illustrated. Catalogue 41. Book and catalogue $5 ppd. ("Secret of the Orient" is also available from The Palm Society Bookstore.) RHAPIS GARDENS—PS, P.O.D. 287, GREGORY, TX 78349.

Principes, 30(4), 1986, pp. 161–164

A New Species in the Genus Salacca

JOHANIS P. MOGEA
Herbarium Bogoriense LBN-LIPI, Bogor, Indonesia

ABSTRACT

A new species, *Salacca ramosiana* is described; it is the only species in the genus possessing lateral leaflets with lobed tips, and represents an addition to section Leiosalacca.

During study for a revision of the genus *Salacca*, remarkable specimens collected about 40 years ago in the Sulu Isl., Philippines and Sandakan in Sabah, were recognized as a distinct new species. A population of this species has also been recently recorded in the field by Dr. J. Dransfield, during his expedition to Palawan, in the Philippines in May 1984. It seems important to describe and name this distinctive new species of the genus before revision of the genus is completed, as this is expected to take some time yet.

Salacca ramosiana *Mogea*, sp. nov. ad sectionem *Leiosalaccam* pertinens; palma acaulescens folius pinnatis, foliolis utrique ca. 40, profunde lobatis, inflorescentiis erectis, floribus pistillatis solitariis, fructibus squamis adpressis tectis. Typus: Borneo: Sabah, Sandakan, *Elmer 20110* (holotypus BO).

Undergrowth pinnate leaved calamoid palm ca. 8 m tall; leaflets ca. 40 on either side of the rachis, all deeply lobed and fanned. Inflorescences erect, pistillate flowers always solitary, fruits covered with adpressed scales, without spiny tips. Type: Borneo: Sabah, Sandakan, *Elmer 20110* (holotype BO).

Plant ca. 8 m tall, girth to 60 cm, including the sheaths, erect, tufted ± stemless. Leaves ca. 2.7–5.5 m long, leaf sheaths dull brown with abundant long brown spines and pale brown indumentum; petiole about 1 m long, channeled near the base, circular in cross section distally, 2 cm in diam., surfaces wrinkled, abaxially spiny; rachis ca. 2.4–4.2 m long, at the base elliptic in cross section, 2.5 cm diam., gradually more angular towards the tip, spiny abaxially; leaflets ca. 40 on either side, irregularly arranged, tending to be held in an upright position especially near the base, at distances of (2.5–)4–8(–11) cm, obtriangular, broadly wedge-shaped with several lobes at the tip, at the base somewhat sigmoid, armed along the margins with small upcurved spines ca. 2 mm long and at distances of 3–10 mm, at the base of the rachis leaflets 11–15 × 2.5–4 cm with ca. 3 lobes in the middle of the rachis; leaflets irregularly grouped, each group consisting of 3–4 leaflets, 35–46 × 8–10 cm with 5–9 lobes, at the top of the rachis, leaflets 21–37 × (5–)8–10 cm with 6–8 lobes, the apical leaflet pair ± obtriangular, deeply bifid, at the base shortly attenuate, 19–34 × 30–38 cm broad at the tips, 8–14 cm broad at the base, with 5–10 lobes, the lobes slightly sigmoid, 2.5–7 × 0.07–2.5 cm, armed along the margins with very small spines, midleaf leaflets with 3 main longitudinal veins, at distances of 2–4.5 cm, with 4–7 more slender ones in between, leaflets of the apical part of the leaf with 3–5 main longitudinal veins, at distances of 2–5 cm, with 6–9 more slender ones in between; transverse veinlets conspicuous; spines triangular, pointing upwards or downwards, pale yellow, confined to abaxial surface, those on the petiole ca. 5–8 × 0.6 cm, 1 mm thick, arranged in transverse or oblique combs, ca. 10 spines

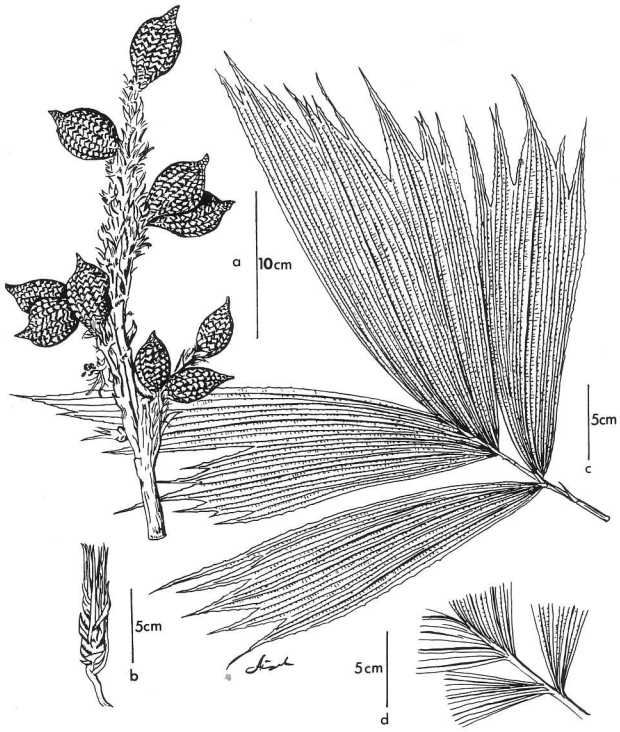
in each comb, with the smaller spines between the combs, decreasing distally, those on the base of the rachis in small combs of 2–3 spines, in mid rachis borne singly; at the very tip, spines upcurved, sometimes with two small ones together in small combs, up to ca. 1.5(–3.5) × 0.2 cm, 0.3 mm thick. Staminate inflorescences ca. 30–80 cm long, 4 cm wide, including the bracts, peduncle 1 cm in diam. at the base, ± stout, erect or pendulous, branching to 3 orders, covered in bracts; bracts mostly boat-shaped, rather tattered, linear-lanceolate, acute, 18–20 × ca. 0.2–0.25 cm broad; rachillae ca. 25 in an inflorescence, each branch bearing ca. 3 rachillae, erect, ± cylindrical, 3–8 × 0.6–1 cm, rachilla bracts free, not ring-like, rhomboid, ca. 2.5 × 4 mm, concave, the tips acute; floral bracteoles adnate to the dyad prophyll, ± transverse elliptic, ca. 1.5 mm, very thin, persistent, hairy along the margins and abaxially. Staminate flowers, many in each rachilla; calyx bell-shaped, 1–3 mm long, split near the tip only, or to 1 mm deep, or almost completely, lobes obtuse; corolla ± bell-shaped, petals linear-lanceolate, 5–6.5 mm × ca. 1 mm, acute. Pistillate inflorescences 45–70 × 5.5 cm including the bracts, erect; peduncle stout, 1.4 cm diam. at the base, covered by bracts, branching to three orders; branches 10–16 cm long, bracts rather tattered, ± boat-shaped, linear-lanceolate 10–20 × 2–3 cm, acute, rather thick, very rarely thin, stiff, very rarely flexible, dull brown; rachillae many in an inflorescence, erect, ± conical, ca. 2 × 1.4 cm, sessile; rachilla bract concave, elliptic ca. 9 × 6–7 mm, free, not ring-like bracteoles ± oblique, 3 × 3.5 mm, concave, tips acute, hairy as in the staminate inflorescences. Flowers ca. 5–7 in each rachilla, solitary in each rachilla bract; calyx bell-shaped, ca. 5–8 mm long, split to about halfway or completely; corolla bell-shaped, lobes ± lanceolate, ca. 9 × 3.5 mm, somewhat concave; ovary ovoid ca. 7 × 3 mm; scales adpressed, reflexed, ca. 0.3 mm long, serrulate. Fruits ± ellipsoidal, beaked, 6 × 3 cm. Scales borne in ca. 28 vertical rows, adpressed in the middle of the fruit, ± rhomboid in shape, ca. 5 × 6 mm, yellowish reddish brown when fresh (Fig. 1,2).

Specimens Examined: BORNEO: Sabah: Sandakan, Staminate and pistillate fl., fr. X–XI. 1921, *Elmer 20110* (holotype BO, isotypes A, BM, CAL, G, K, L, M, NY, SING, U, UC); Sepilok Laut, fr. 4.X.1976, *Ejan Gakial SAN 83453* (BO, SAN); Sepilok Forest Reserve, pistillate fl., fr. 15.I.1964, *H. E. Moore Jr. & W. Meijer 9166* (BH); Batu Lima, staminate fl. 18.XII.1920, *Ramos 1915* (A, BM, BO, K, L, PNH, US); Forest Reserve Sempurna, staminate and pistillate fl. 18. VIII, 1937, *Puasa 7691* (K, SING). PHILIPPINES: Sulu Isl., Tawi-tawi, staminate fl. VII–VIII.1924, *Ramos & Edano BS 44105* (BM, K, NY, UC, US).

Wild *Salacca* with about 18 known species—among them 7 species just recently described (Dransfield 1980, Mogea 1980, Mogea 1983) and one species transferred from *Lophospatha* (Dransfield & Mogea 1981)—is distributed from Southern Yunnan, lower Burma, Thailand, the Malay Peninsula, Sumatra, western part of Java, Borneo and the southern part of the Philippines (Palawan, Mindanao, and Sulu Isl.). The largest number of species occurs in Borneo (about 10 species), followed by the Malay Peninsula and Sumatra (7 species each). *Salacca ramosiana* represents an additional species for Sabah, Borneo, and the Philippines. The habitat of the plant is on the landward fringe of mangrove forests and in small freshwater swamps in the lowlands. Local people in Sabah call the plant 'sungsum' in the Kedayan language.

Compilation of field notes suggests that the leaves are erect, leaf sheath including petiole ca. 3 m long, rachis 3 m long, flowers grey; fruit scales are bright red-brown in color.

Based on the solitary pistillate flower



1. *Salacca ramosiana*: a. infructescence, b. pistillate rachilla, c. abaxial surface of the leaf-tip, d. adaxial surface to show leaflet insertion; after *SAN* 83454.

and the adpressed fruit scales, this species belongs to section Leiosalacca (Becc.) Furtado (Furtado 1949). Other recently described species mentioned above belong to the section Salacca (Becc.) Furtado. The new species is most closely related to *S. affinis* Griff., but has the lateral leaflets, obtriangular, deeply lobed leaflets, with (3–) 5–9 lobes; spines on the petiole are like those of *S. affinis* var. *borneensis* (Becc.) Furtado; the pistillate rachilla is smaller and each rachilla bears only very few flowers (Fig. 1). The fruit of *S. ramosiana* is similar to that of *S. dubia*. In *S. dubia*, the apex of the fruit is briefly beaked, in *S. ramosiana*, there is a long beak, while in the fruit of the other species of the section, *S. affinis*, the fruit is ovoid and scarcely beaked. The number of vertical rows of scales in *S. dubia* is 18–26, while in *S. ramosiana* it is about 28. The specific epithet of this new species honors the late Mr. M. Ramos, a leading plant collector of the Bureau of Science at Manila, who collected widely in the Philippines and Sabah (Steenis-Kruseman 1950).

Acknowledgments

I wish to express my sincere thanks to Dr. J. Dransfield for the use of the photographs in Figure 2, preparation of the Latin diagnosis and valuable suggestions and corrections of the manuscript. Thanks are also due to Mr. M. Anwar, who prepared Figure 1.

Literature Cited

Dransfield, J. 1980. Systematic notes on some Bornean Palmae. Bot. J. Linn. Soc. 81: 1–46.

——— and Mogea, J. P. 1981. A reassessment of the genus *Lophospatha* Burret. Principes 25.

FURTADO, F. X. 1949. Palmae Malesicae X. The Malayan species of *Salacca*. Gard. Bull. Sing. 12: 378–403.

MOGEA, J. P. 1980. The flabellate-leaved species of *Salacca* (Palmae). Reinwardtia 9(4): 461–479.

———. 1983. Three new species of *Salacca* (Palmae) from the Malay Peninsula. Fed. Mus. Journ. 29: 1–19.

STEENIS-KRUSEMAN, M. J. VAN. 1950. Cyclopaedia of collectors. Fl. Males. I. (1): 426–427.

THE INTERNATIONAL PALM SOCIETY, INC.

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
December 31, 1985

Income		
Membership	$ 42,113	
Interest	2,826	
Subscribers	2,471	
Seed Bank	12,060	
Publications	8,999	
Postage	2,103	
Miscellaneous	1,186	
Total Income		$ 71,758
Disbursements		
Printing of Catalog	$ 38,082	
Seed Bank	5,338	
Bookstore	5,202	
Accounting	905	
Travel	639	
Rent & Supplies	340	
Miscellaneous	1,905	
Total Expenses		$ 52,411
Excess Receipts over Disbursements		$ 19,347

BALANCE SHEET
December 31, 1985

Assets		
Petty Cash	$ 567	
Cash in Banks		
Imperial Savings	19,458	
American Commercial Bank	8,518	
Home Bank	5,861	
Douglas County Bank	31,119	
World Savings & Loan (Endowment Fund)	17,409	
Book Inventory	6,716	
Revolving Publications Fund	47,289	
Total Assets		$136,937
Fund Balance		
Fund Balance—December 31, 1985	$117,590	
Net Receipts over Disbursements	19,347	
Balance		$136,937

Principes, 30(4), 1986, pp. 165–180

An Essay on Metroxylon, the Sago Palm

JAN B. RAUWERDINK

Department of Plant Taxonomy, Agricultural University, Wageningen, the Netherlands
P.O. Box 8010, 6700 ED Wageningen

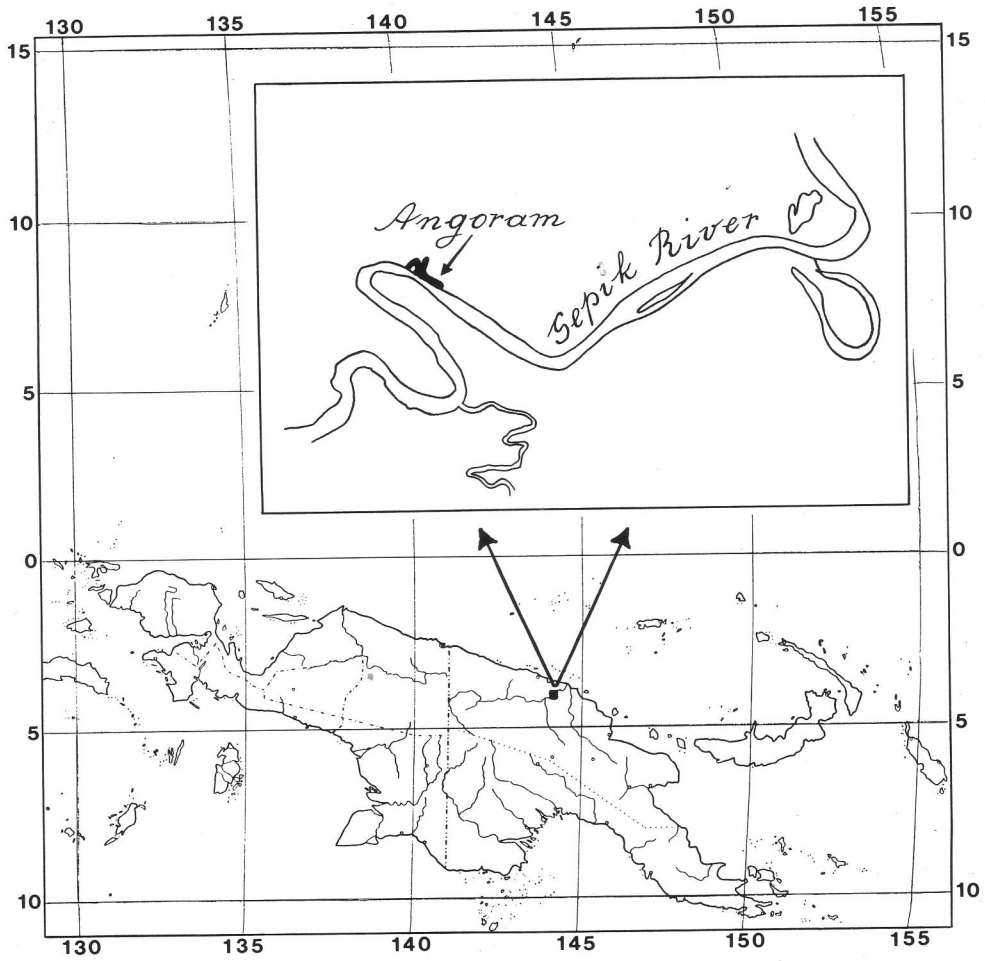
Metroxylon is a genus of arborescent palms of Papuasia and several island groups of Micronesia and Melanesia. There are five species occurring in five separate areas. The most widespread taxon, *M. sagu*, covers Malaysia, Indonesia, Mindanao, and New Guinea. The other four taxa are endemic to the aforementioned island groups.

The palms accumulate starch in the pith of their trunks and are a traditional source of carbohydrate. The best known representative of the genus in this respect is *M. sagu*, known as the sago palm. This species occupies the largest area, estimated to cover 4 million ha in natural stands and about .2 million ha under cultivation. With the exception of *M. salomonense*, the other species of *Metroxylon* are not exploited for their starch content. At present, interest on *Metroxylon* as a starch-producing crop is focused on *M. sagu* which grows in swampy areas usually unsuitable for plantations of other crops. So far, two international symposia have been held to evaluate the exploitation of sago starch (Sago 1977, Sago 1980). In addition, an FAO expert consultation took place in Jakarta in 1984. Studies were carried out in Indonesia (Team Proyek 1982) and Papua New Guinea (DME 1980, 1982).

The present author has made a taxonomic survey for the Papua New Guinean government in the Sepik River flood plain (Fig. 1). An estimated one million ha of natural sago palm stands occur in PNG, and an additional 20 thousand ha are under cultivation. The aim of my survey and the present paper has been to report on the variability of *M. sagu* in PNG, in the context of the diversity found in the genus as a whole. This paper may contribute towards an eventual monograph of *Metroxylon*.

History of the Genus

The first and most competent publication on sago palms is by Rumphius (1741). In the *Herbarium Amboinense* he gives a meticulous description of the sago palm as it occurs in Ambon, and he presents the taxonomic views of the inhabitants on this palm. Four Ambonese species are described under the generic name of *Sagus*. This name was adopted by Gaertner (1788), but unfortunately also included *Raphia* P. de Beauvois. Giseke (1792) does not include *Raphia* and gives the earliest binomial applying solely to the description of Rumphius's *S. genuina*. The name *Sagus* is, however, antedated by *Metroxylon* Rottboell (1783), based partly on Rumphius's description, but in larger part on specimens provided for Rottboell by Dr. Koenig. The next author to adopt *Metroxylon* was Von Martius (1845). Nearly eighty years after Rottboell, Wendland (1862) proposed the generic name *Coelococcus* in which he described a sago palm from the Fiji Islands. *Coelococcus* has henceforward been adopted by various other authors (Dingler 1887, Warburg 1896, Heim 1904) to classify several species of sago palm from



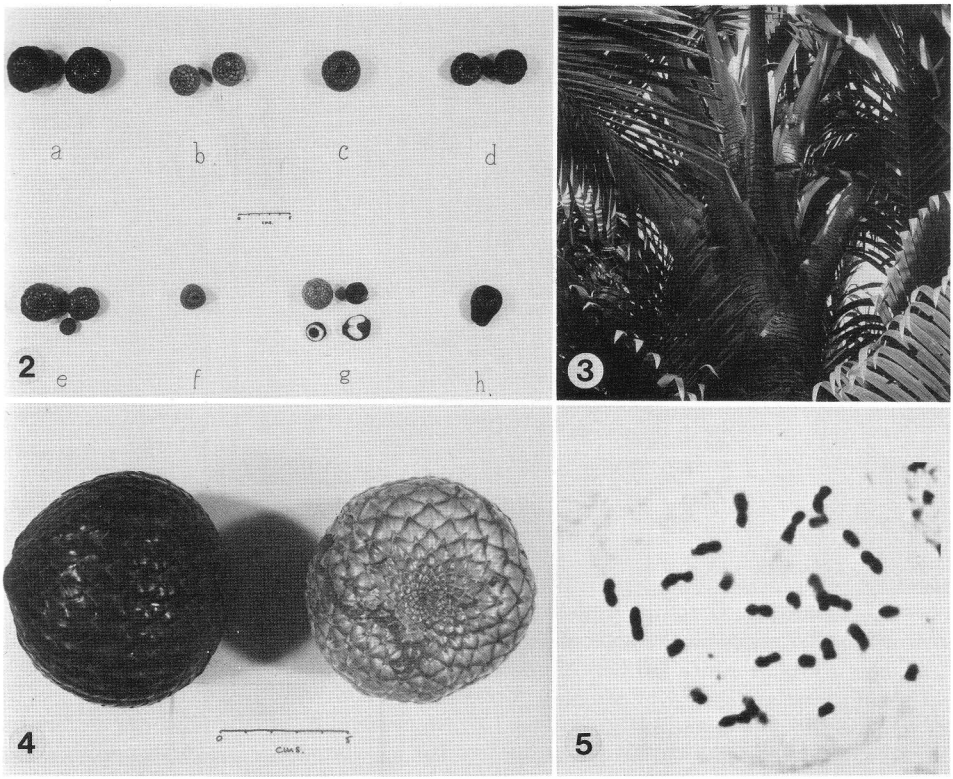
1. Papua New Guinea with an enlarged inset showing where the author made his collections.

Micronesian and Melanesian islands; *Metroxylon* is used exclusively for those sago palms occurring throughout New Guinea, Indonesia, and Malaysia. Beccari (1918) included *Coelococcus* in *Metroxylon* as a section, an opinion that has since been followed. Some commotion may have arisen in the early sixties when Moore (1962) disclosed that Rottboell's *Metroxylon* is actually antedated by *Sagus* Steck (1757). However, Steck's publication is not effectively published, and *Metroxylon* Rottb. is conserved (1968) against this name.

Diagnostic Characters

A brief treatment of the diagnostic characters within *Metroxylon* is appropriate. Especially where the inflorescence is concerned, the application of correct terminology to refer to particular units is vital. In this paragraph, diagnostic characters are treated in an order reflecting the comparative importance of each character within the taxonomy of the genus: the most significant character is treated first.

Inflorescence: The inflorescence of



2–5. 2. Fruits of *Metroxylon sagu*. 3. Spines on leaf sheaths and petioles of a mature specimen. 4. Fruits of *M. amicarum*. 5. *M. sagu*, somatic chromosomes in equatorial plane (photo by J. C. Arends).

Metroxylon is extensively discussed in Tomlinson (1971). For reasons of brevity of this paper, reference to this publication is made for interested readers. As far as diagnostic characters are concerned, the shape of specific units of the inflorescence has proved useful. Most characteristic is whether branches of a certain order are pendulous or not. This single character enables unambiguous distinction of three out of the five species recognized in *Metroxylon*.

Fruits (Figs. 2,4): The fruits of *Metroxylon* are covered with longitudinal series of imbricate rhomboidal scales (Fig. 4). The apex of the fruit is always mucronate, the mucro representing the remains of the style. Although the pistil of *Metroxylon* is three-locular with a single basal ovule in each locule, usually only a single seed matures in each fruit. This seed contains a considerable amount of hard, bony, homogenous endosperm which has a very characteristic horseshoe shape in vertical section, with a large chalazal cavity. The embryo is situated in a smaller, second peripheral cavity. Differences between the taxa are found in the number of longitudinal series of scales on the fruit. The division of the genus into two sections is based upon the number of scales. At the specific level, the shape and the size of the mature fruit is also diagnostic.

Spines (Fig. 3): Spinescence has been emphasized in *Metroxylon* as an important diagnostic character throughout. Authors, such as Rumphius (1741) and Beccari (1918), as well as sago-subsisting

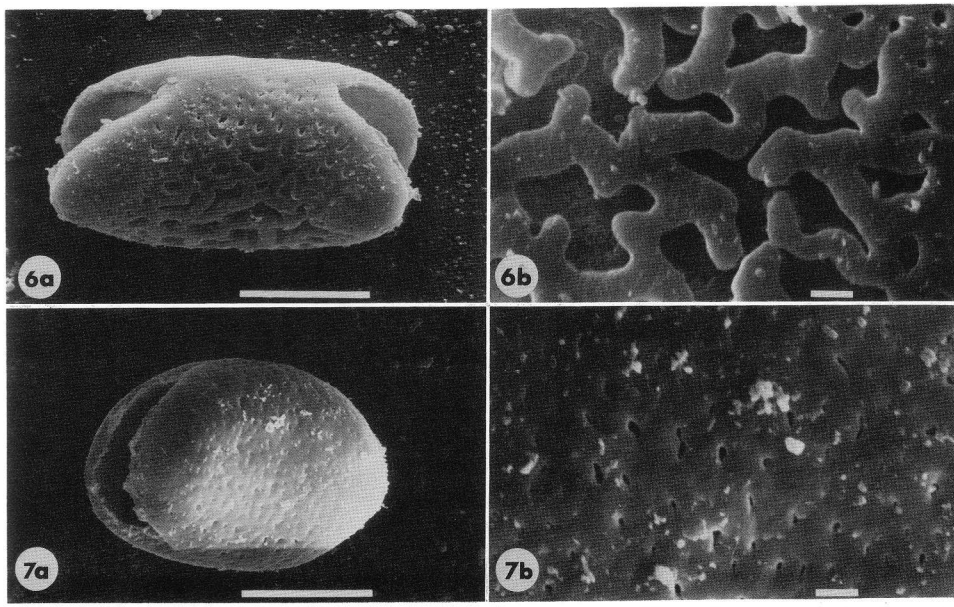
people, all greatly value spinescence in their respective taxonomies. Among other things this led to the division of the section *Metroxylon* into 17 taxa by Beccari. However, in the section *Coelococcus* he distinguished 7 taxa only. Probably this was because Beccari lacked the extensive collections and experience in the field with these taxa that he had in *Metroxylon*. Like Beccari, the present author is familiar with the section *Metroxylon*, but has scant knowledge of *Coelococcus* apart from herbarium specimens and descriptions. According to the data, all taxa in the section *Coelococcus* are spinescent, but details such as length and abundance of spines are not available. Such characters enable me to distinguish between taxa in the section *Metroxylon*, and they may be of the same value in the section *Coelococcus*. Spines are found in transverse crescent-shaped series on the abaxial side of a leaf, over the entire surface of the leaf sheath, and along a strip of about 3 cm wide on the petiole and rachis. Spines are pectinate, flattened, of a brownish color, and confluent by their bases, i.e. arranged as in a comb (Figs. 12,13). Their length ranges from a few cm up to 22 cm. Furthermore, they are unequal, the middle one of a series usually being the longest. Reduction in length of spines occurs, in which case they are referred to as spinules. Spinules are short, up to 10 mm long, and usually of a triangular form. The ultimate reductions of spines are knoblike structures which occur exclusively on the base of leaf sheaths. The variability in spine morphology in the section *Metroxylon* is threefold. The first is related to the age of the palm. Crown leaves of a mature specimen usually have spines that are much shorter than those on leaves from offshoots of the same palm. Secondly, the exact location of the spines is important. Especially in a mature palm, the spines on the leaf sheath are longer than the spines on the petiole and rachis. In the third place, I am of the opinion that the length of spines may be governed by a comparatively simple genetic mechanism. Thus, different *formae* in the section *Metroxylon* (e.g. spiny vs. smooth) are considered to be only slightly different genotypes of a single species, *M. sagu*, instead of two or more different species or subspecies. This assumption will be dealt with in the Discussion.

Somatic Chromosome Numbers: Somatic chromosome numbers of *M. sagu* were determined from root tips of

1) Seedlings grown at the Department of Plant Taxonomy at Wageningen. The seeds were collected in the Sepik area (PNG) by Mr. Van Kraalingen and all specimens were spiny. One seedling has been preserved at WAG (*Rauwerdink 138*).
2) Plants grown at the Department of Tropical Crop Science at Wageningen, from seeds obtained from the Singapore Botanical Gardens. Spiny as well as unarmed plants were available.

Permanent squash preparations were made according to the methods described in De Wilde and Arends (1979). The slides are retained in the slide collection of the Department of Plant Taxonomy. No living material from the other taxa in *Metroxylon* was available for an investigation. The Singapore plants had already been investigated by Verhaar (1977) at $2n = 26$. The present author also obtained the somatic chromosome number of $2n = 26$ in *M. sagu* (Fig. 5), both in the PNG specimens and in the Singapore material. The basic chromosome number of *M. sagu* can therefore be put at $x = 13$, which actually marks *M. sagu* as an exception in Calamoid palms. The basic chromosome number in these palms is $x = 14$, according to Moore and Uhl (1982).

Analysis of Pollen: Recent analyses on the pollen morphology of *Metroxylon* were undertaken by Sowumni (1972) and Thanikaimoni (1970). This paragraph presents a few observations by the latter



6–7. 6. Scanning electron microscope (SEM) photo of a pollen grain; a, *Metroxylon sagu*, overview, bar = 1.0 micrometers; b, detail of exine sculpture, bar = 0.1 micrometers. 7. SEM photo of a pollen grain of *M. warburgii*; a and b, as above for *M. sagu*.

author on the sculpture of the exine in *Metroxylon*.

Pollen grains were obtained from herbarium specimens on loan from various institutions. The specimens analyzed are listed below. Voucher slides of pollen have been filed at Wageningen and the respective institutions.

M. sagu: Bakhuizen v/d Brink 7488 (B).
M. salomonense: Moore 9317 (K).
M. vitiense: Smith 9339 (K).
M. amicarum: leg. *Kramer* s.n. (B) and *Furtado 25868* (K).
M. warburgii: Moore 9319 (P).

Pollen grains have been analyzed with the scanning electron microscope (SEM) and with the light microscope (LM). Samples were prepared according to the acetolysis procedure that is commonly used at the Department. The pollen grains of all taxa in *Metroxylon* are dicolpate, i.e. possessing two germination apertures. They are oval, about 30 μm long and about 15 μm wide. On the basis of the sculpture of the exine of the grains, the genus can be divided into two groups. One group has a reticulate ornamentation on the equatorial sides. The lumina of this reticulum diminish in size towards the colpi, resulting in a perforate tectum (Fig. 6a,b). This group consists of *M. salomonense* and *M. vitiense*. The other group displays a perforate tectum over almost the total surface of the grain (Fig. 7a,b). This group consists of *M. warburgii*, *M. amicarum*, and *M. sagu*. The exine-sculptural types I found were also recognized by Thanikaimoni and Sowumni; neither author, however, had the opportunity to investigate all taxa in the genus. Thanikaimoni used the terms coarsely reticulate and finely reticulate for the exine sculpture of *M. salomonense* and *M. sagu* respectively. Sowumni uses the terms reticulate and vermiculite. Praglowski and Punt, in their 1973 paper, propose the definitions for exine sculpture which I have adopted here. At present, it is difficult to relate the

two types of pollen grains in *Metroxylon* to the taxonomy of the genus. The division of *Metroxylon* into two sections based on fruit characters is not paralleled by a division based on pollen types.

Taxonomic Treatment

Metroxylon Rottboell in Nye S. Kon. D. Vid. Sels. Skr. 2: 527. 1783 nom. cons.: Koenig in Ann. of Bot. ed. K. & S. 1: 193. 1804; Endlicher in Gen. Pl. Sec. Ord. Nat.: 250. 1837; Kunth in Enum. Pl. 3: 213–215. 1841; Meisner in Pl. Vasc. Gen. 1: 354(265). 1843; Martius in Hist. Nat. Palm. 3: 213. 1845 (ex parte *Pigafetta* Blume); Miquel in Fl. Ind. Bat. 3: 139. 1855 (ex parte *Pigafetta* Mart.); Drude in E. & P. Pfl. Fam. 2(3): 47. 1887; Beccari in Ann. Royal Bot. Gard. Calc. 12, 2: 156–157. 1918; Ridley in Fl. Mal. Pen. 5: 31. 1925; Blatter in Palms Brit. Ind. & Ceylon: 256–259. 1926; Lawrence in Gent. Herb. 8: 438. 1956. Type: *M. sagu* Rottboell.

Sagus Steck in De Sagu 21. Diss. Inaug. Medica de Sagu. 1757. Nominum invalidum teste Moore in Taxon 11: 164–166. 1962 and Taxon 17: 85. 1968.

Sagus Giseke in Prael. Ord. Nat. Pl.: 93. 1792 (excl. *S. palmapinus* et *S. filaris*); Blume in Rumphia 2: 144–154, t. 86, 126 and 127. 1843 (ex parte *Pigafetta*); Griffith in Palms Brit. Ind. 24: 18–20. 1850. Type: *S. genuina* in Herb. Amb. 1: 75. 1741.

Coelococcus H. A. Wendland in Bonplandia 10: 199. 1862. Type: *C. vitiense* H. A. Wendland.

Arborescent, solitary or clustering, armed or unarmed, pleonanthic or hapaxanthic, polygamous palms of lowlands and swamps, also known from hillsides. Trunk columnar, to 20 m, ringed with leaf scars and partly covered with clasping, persistent leaf sheaths. Leaves pinnate, erect, spreading and eventually horizontal; sheath broad, clasping the trunk, having semicircular transverse ridges bearing series of ± conspicuous spines, prickles or knobs, or totally smooth: petioles up to several meters in tillers but considerably shorter in mature leaves, strongly channeled, abaxially convex, sometimes armed with transverse series of ± conspicuous spines or prickles, adaxially concave; rachis straight, if armed, similar to the petiole along its convex abaxial side, the adaxial side bifaced with the salient angle smooth; pinnae straight to drooping, ± equidistant or in clusters, green and shiny, faintly paler underneath, linear, unicostate, acute with a spinulous costa and margins. Inflorescences each branching to five orders, the bracts sometimes covered with spinules, sometimes in transverse series. Flowers reddish-brown, arranged in dyads of one male and one hermaphrodite flower each, similar in appearance, the dyads very regularly distributed along third-order axis in spirals, depending on developmental stage, ± immersed in the reddish-brown (greyish) hairs of the flower bracts. Male flower borne on one side of the hermaphrodite; precocious and dropping before anthesis of the hermaphrodite; calyx ± deeply three-lobed in the upper third, the lobes broadly rounded at the apex, coriaceous, ovate, obtuse, tapering below to a narrow base; the corolla 1½ to more than 2 times longer than the calyx, divided in its upper two-thirds into three ± woody, oblong-ovate, glabrous, boat-shaped segments, the lower part entire, campanulate: stamens 6, the united bases of the filaments forming a cup adnate to the undivided part of the corolla, broadly linear in their free part, flattened: anthers elongate-elliptical, obtuse, cells parallel, latrorse, bases disjunct, dorsally attached to the filaments at the middle of the connective: ovary rudimentary, represented by three, small, ± coalescent, oblong bodies, merging into a prominently three-sided style. Hermaphrodite flower with calyx,

corolla and androecium similar to the male flower; ovary globose and shiny with yellowish rhomboidal scales, trilocular, ovules 3, reportedly basal, erect, anatropous; style narrow, prominently three-sided, grooved. Fruits covered with scales, containing one seed.

Key to the Species of Metroxylon

1. Fruit covered with 18 longitudinal series of scales. Clustering palm, unarmed or spiny to various degrees (section *Metroxylon*) New Guinea, Indonesia, Mindanao, Malaysia ..... 1. *M. sagu*
1. Fruit covered with (22) 24–28 longitudinal series of scales. Spinescent, solitary palms lacking basal offshoots (section *Coelococcus*) 2
2. Inflorescences seemingly lateral, first-order branches arising from the axils of unreduced crown leaves. Guam, Caroline Islands and planted in the Philippines ..... 3. *M. amicarum*
2. Inflorescences seemingly terminal, first-order branches arising from the axils of reduced, bractlike, crown leaves 3
3. Second-order branches of the inflorescence pendulous, very short (20 cm). Fiji Islands ..... 3. *M. vitiense*
3. Second-order branches not pendulous 4
4. Third-order branches of the inflorescence pendulous, very long (20 cm), adaxial pedicellar parts of all branches pubescent. Solomon Islands, Bougainville, St. Cruz Island ..... 4. *M. salomonense*
4. All branches of the inflorescence erect. Adaxial pedicellar parts of all branches not pubescent. New Hebrides, Western Samoa ..... 5. *M. warburgii*

1. **Metroxylon sagu** Rottboell in Nye. S. Kon. D. Vid. Sels. Skr. 2: 527. 1783; Miquel in l.c.: 147. 1855; Beccari in N. Giorn. Bot. Ital. 3: 29. 1879; Hooker in Fl. Brit. Ind. 6: 481. 1894; Beccari in Denk. K. Akad. Wiss. M. Nat. Kl., Wien, 84: f. 6. 1913. Type: Koenig specimens and drawings and Rottboell l.c. 1783.

Sagus sylvestris Rumphius in l.c.: 75. 1741; Blume in l.c.: 153. 1843.

Sagus genuina bis sylvestris Giseke in l.c.: 94. 1792.

Metroxylon sylvestre Martius in l.c.: 215. 1845; Miquel in l.c.: 146. 1855.

Metroxylon rumphii Mart. var. *sylvestre* Beccari in Ann. Royal Bot. Gard. Calc. 12, 2: 174, p. 107. 1918. Type: *Sagus sylvestris* in Herb. Amb. 1: 75. 1741.

Metroxylon rumphii Mart. var. *ceramense* subvar. *ceramense* Beccari in l.c.: 175, p. 107. 1918.

Metroxylon rumphii Mart. var. *ceramense* subvar. *platyphyllum* Beccari in l.c.: 175. 1918. Type: *Beccari 12* (isotype at BO).

Metroxylon rumphii Mart. var. *ceramense* subvar. *rubrum* Beccari in l.c.: 175. 1918. Type: *Beccari 8* (isotype at BO).

Metroxylon rumphii Mart. var. *ceramense* subvar. *album* Beccari in l.c.: 175. 1918. Type: *Beccari* s.n. (isotype at BO).

Sagus genuina (excl. *Sagou duri-rottang*) Rumphius in l.c.: 75. 1741; Blume in l.c.: 150. 1843.

Sagus rumphii Willdenow in Sp. Pl. 6: 404. 1805.

Sagus spinosus Roxburgh in Fl. Ind.: 623 excl. syn. 1832.

Metroxylon rumphii Martius in l.c.: 214. 1845; Miquel in l.c.: 140. 1855; Beccari in N. Giorn. Bot. Ital. 3: 30. 1879 et in Malesia 1: 91. 1887; Hooker in Fl. Br. Ind. 6: 481. 1894. Type: *Sagus genuina* in Herb. Amb. 1: 75, t. 17. 1741.

Metroxylon rumphii Mart. var. *ceramense* subvar. *nigrum* Beccari in Ann. Royal Bot. Gard. Calc. 12, 2: 175. 1918. Type: Beccari s.n. (isotype at BO).

Metroxylon rumphii Mart. var. *buruense* Beccari in l.c.: 177–178. 1918. Type: *Labillardiere* s.n.

Metroxylon squarrosum Becc. var. *squarrosum* Beccari in l.c.: 179–180. 1918.

Metroxylon squarrosum Becc. var. *kilwoi* Beccari in l.c.: 180. 1918. Type: *Beccari 1* (isotype at BO).

Metroxylon squarrosum Becc. var. *killasi* Beccari in l.c.: 180. 1918. Type: *Beccari 2* (isotype at BO).

Metroxylon squarrosum Becc. var. *kilkarua* Beccari in l.c.: 180. 1918. Type: *Beccari 3* (isotype at BO).

Metroxylon squarrosum Becc. var. *kilatan* Beccari in l.c.: 181. 1918. Type: *Beccari* s.n. (probably 4, isotype at BO).

Metroxylon squarrosum Becc. var. *kilkour* Beccari in l.c.: 181. 1918. Type: *Beccari* s.n. (probably 5, isotype at BO).

Metroxylon squarrosum Becc. var. *kiltafuk* Beccari in l.c.: 181. 1918. Type: *Beccari 6* (isotype at BO).

Metroxylon squarrosum Becc. var. *kilkikir* Beccari in l.c.: 181. 1918. Type: *Beccari* s.n. (probably 7, isotype at BO).

Metroxylon rumphii Mart. var. *flyriverense* Beccari in l.c.: 178–179. 1918. Type: *D'Albertis* s.n.

Metroxylon oxybracteatum Warburg ined. nomen nudum; Schumann & Lauterbach in Fl. d. Sudsee: 202. 1901.

Clustering palm, 8–20 m high, stem 15–60 cm diameter near base; leaves up to 7 m in mature palms, up to 12 m in vigorous offshoots, unarmed or ± armed with spines or spinules on transverse ridges or series. Inflorescence apparently terminal with first-, second-, and third-order branches erect to spreading (Fig. 8). Bracts of first, second, and third order with spinules or smooth; in hermaphrodite flower, style attains apex of the anthers at anthesis. In male flower ovary rudimentary and style not exceeding filaments. Fruit globose, apple-shaped to shaped like an inverted pine cone, very variable in shape and size within an inflorescence, 4–4.5 cm broad, 18 (19) longitudinal series of straw colored scales; seed frequently abortive, fruit then filled with a fleshy hypertrophic mass.

Distribution: New Guinea and widely planted throughout Indonesia, Malaysia, and the Philippines.

Vernacular Names: sak-sak, rumbia, kiraj, ambulung, lapia, sagu, lumbia, pohon sagu.

Specimens Examined: These specimens have been identified as belonging to the species *M. sagu*, but a further identification as one of the four formae in *M. sagu* has not been possible (veg. = vegetative, i.e. no flowers or fruits available; fl. = displaying flowers; fr. = displaying fruits; pfl. = the specimen is past flowering but has not formed any fruits). NEW GUINEA. Sepik, 1953, *Floyd 5409* (fl. BO, L); Vogelkop, 1948, *Kostermans G et H* (fr., BO). INDONESIA, CELEBES, 1895, *Koorders 19722* bis (veg., BO, L); SUMATRA, Korthals s.n. (veg., L); JAVA, 1903, *Schoute* s.n. (fl., L), 1882, *Treub* s.n. (fr., B), 1885, *Treub* s.n. (fr., B); BATJAN, 1883, *Warburg* s.n. (fr., B); CULTA, 1909. *d'Alleizette 7715* (fr., L, SBG). 1922. *Bakhuizen v/d Brink 1544* (fr., BO), 1958, *Heine s.n.* (fr., BO), 1899, *Koorders 35664* bis (fr., BO), *Schlechter* s.n. (fr., B).

Key to the Formae of M. sagu

1. Leaf sheaths and petioles at all ages of the palm unarmed, totally smooth ..... forma *sagu*
1. Leaf sheaths and petioles not quite smooth or armed 2
2. The bases of leaf sheaths at all ages of the palm with knob-like structures (spine reductions) ..... forma *tuberatum*
2. The leaf sheaths and petioles bearing spines ... 3
3. Leaf sheaths and petioles bearing spines shorter than 4 cm ..... forma *micracanthum*
3. Leaf sheaths and petioles bearing spines of 4–20 cm long ..... forma *longispinum*

1a. **Metroxylon sagu** forma **sagu** (Fig. 9).

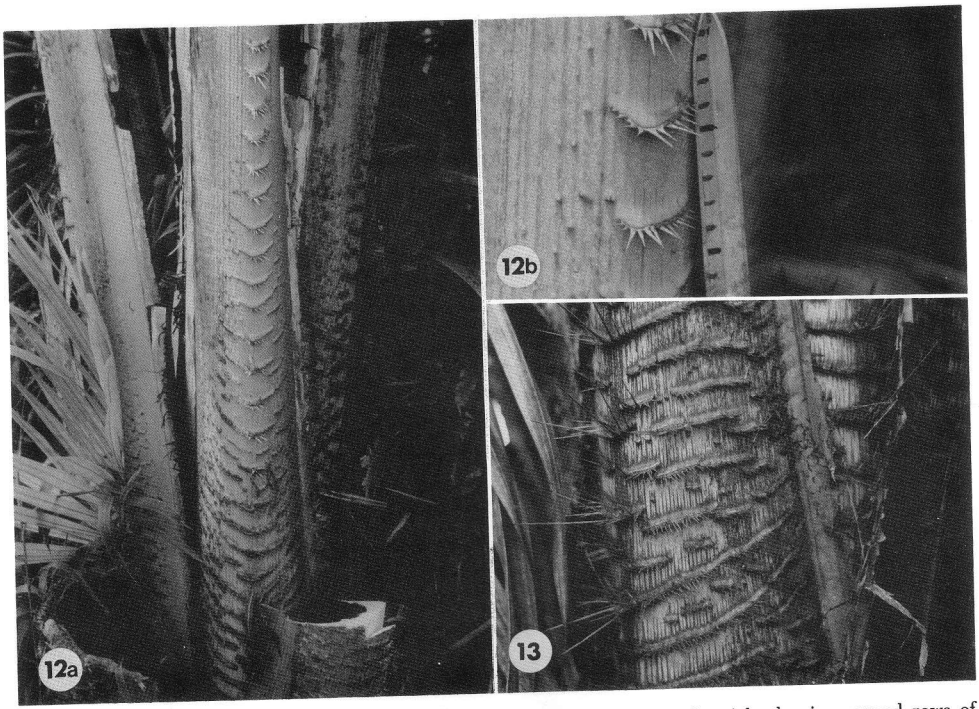
Sagus laevis Blume in l.c.: 146. 1843.

Metroxylon laeve Martius in l.c.: 214. 1845. Typus: Koenig specimens ad Rottboell et Rottboell ut omittam quo ad Rumphius.

Sagus laevis Rumphius in l.c.: 76. 1741; Griffith in Calc. J. Nat. H. 5. 1845 et in Palms Br. Ind. 24. 1850.



8–11. 8. *Metroxylon sagu*, habit showing "terminal" inflorescence. 9. *M. sagu*, forma *sagu*. 10. *M. sagu* forma *tuberatum*. 11. Same, petiole at higher magnification showing knoblike structures (reduced spines).



12–13. 12. *Metroxylon sagu* forma *micracanthum*; a, sheath and base of petiole showing curved rows of spines; b, close up of spines. 13. *M. sagu* forma *longispina*, leaf sheath showing long rows of spines.

Sagus genuina S. laevis Giseke in l.c.: 94. 1792.

Sagus inermis Roxburgh in Fl. Ind. 3: 623. 1832.

Sagus laevis Jack in Comp. Bot. Mag. 1: 266. 1836.

Metroxylon hermaphroditum Hasskarl in Tijd. Nat. Gesch. 9: 175. 1842.

Metroxylon inerme Martius in l.c.: 215. 1845. Typus: *Sagus laevis* in Herb. Amb. I: 76. t. 17. 1741.

Metroxylon sagus Rottb. var. *molat* Beccari in l.c.: 167, p. 107. 1918. Typus: *Beccari 10* (isotype BO).

Metroxylon sagus Rottb. var. *peekelianum* Beccari in l.c.: 167–168. p. 106. 1918. Typus: *Peekel 115* (not seen).

Metroxylon sagus Rottb. var. *gogolense* Beccari in l.c.: 168, p. 106. 1918. Typus: *Lauterbach 861* (not seen).

The leaf sheath, petiole, and rachis of a leaf are entirely devoid of spines, smooth to the touch at all ages of the palm. All bracts of the inflorescence are smooth too. The pinnae may be spinulous at the apex and the costa.

Vernacular Names: ambutrum, kaparang, awirkoma (PNG).

Specimens Examined: NEW GUINEA, Milne Bay, 1953, *Brass 22064* (fr., A, L); Sepik, 1981, *Rauwerdink 112* (fr., WAG), *Rauwerdink 119* (pfl., WAG), *Rauwerdink 123* (veg., WAG), *Rauwerdink 128* (veg., WAG). INDONESIA. SUMATRA, 1933, *Rahmat si Torus 5225* (pfl., A, L). PHILIPPINES. MINDANAO, 1912, *Fenix 1112* (fr., P). 1915, *Miras Medina 24526* (pfl., A). MALAYSIA. SABAH, 1964, *Moore 9218* (fr., BH). CULTA. 1929, *Bakhuizen v/d Brink 7488* (fl., B, BO, L, P), 1952, *Moore 6096* (veg., BH), 1894, *Ridley 6274* (fl., SBG), 1896, *Ridley* s.n. (fr., K).

1b. **Metroxylon sagu** forma **tuberatum** Rauwerdink **form. nov.** (Figs. 10,11) vaginae frondinum tuberatae. Typus: New Guinea. E-Sepik prov., 1981, *Rauwerdink 115* (pfl., holotype WAG; isotypi BO, BH, CANB, K, L, LAE, SIN).

The base of the leaf sheaths covered with knoblike structures, irregular to the touch, at all ages of the palm. Petiole, rachis, and all bracts of the inflorescence perfectly smooth. The pinnae can be spinulous at the apex and costa.

Vernacular Names: koma, oliatagoe (PNG).

Specimens Examined: NEW GUINEA. Sepik, 1981, *Rauwerdink 115* (pfl., WAG), *Rauwerdink 135* (veg., WAG).

1c. **Metroxylon sagu** forma **micracanthum** (Blume) Rauwerdink **stat. nov.** (Fig. 12a,b). Typus: Blume in Rumphia 2: 153 teste Rumphius p. 75, sub. no. 1, Sagu Duri-Rottang.

Sagus duri rottang Rumphius in l.c.: 75. 1741.

Sagus micracantha Blume in l.c.: 153. 1843.

Metroxylon micracanthum Martius in l.c.: 146. 1845; Miquel in l.c.: 146. 1855.

Metroxylon rumphii Mart. var. *micracanthum* Becc. subvar. *micracanthum* Beccari in l.c.: 176. 1918. Typus: *Sagu Duri-Rottang* in Herb. Amb. 1: 75. 1741.

Metroxylon rumphii Mart. var. *micracanthum* Becc. subvar. *makanaro* Beccari in l.c.: 177. 1918. Typus: *Beccari 14* (isotype BO).

The leaf sheath, petiole and rachis from an early age of the palm with spines not longer than 4 cm. Bracts of the inflorescence smooth or with scattered spinules.

Vernacular Names: makapn, waipi, kangrum, mandm (PNG).

Specimens Examined: NEW GUINEA. Sepik, 1981, *Rauwerdink 114* (fr., WAG), *Rauwerdink 118* (pfl., WAG), *Rauwerdink 127* (fl., WAG), *Rauwerdink 134* (veg., WAG).

1d. **Metroxylon sagu** forma **longispinum** (Giseke) Rauwerdink **stat. nov.** (Fig. 13). Typus: Rottboell pro parte quo ad Rumphius.

Sagus longispina Rumphius in l.c.: 75. 1741; Blume in l.c.: 154. 1843.

Sagus genuina longispina Giseke in l.c.: 94. 1792.

Sagus longissimus Hamilton in Mem. Wern. Soc. 5: 320. 1824.

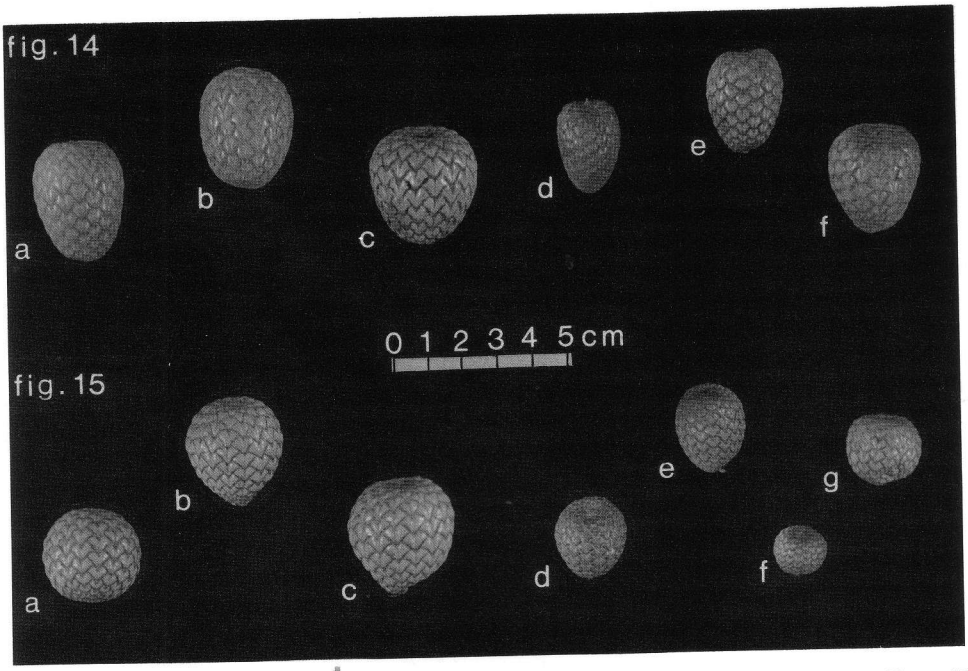
Metroxylon longispinum Martius in l.c.: 215. 18450; Miquel in l.c.: 146. 1855.

Metroxylon rumphii Mart. var. *longispinum* Beccari in l.c.: 173, p. 107. 1918. Typus: *Sagus longispina* in Herb. Amb. 1: 75. 1741.

The leaf sheath, petiole and rachis with spines that are 4–20 cm long. Bracts of inflorescence with spinules, scattered or in transverse series.

Vernacular Names: wakar, ketro, anum, ninginamé, nago, tring, passin, kangrum, wombarang, moiap.

Specimens Examined: NEW GUINEA. Malalaua, 1966, *Graven & Schodde 944* (fl., A, L), *Graven & Schodde 945* (fl., A, L); 1938, *Meyer Drees 378* (fl., fr., BO); Sepik, 1981, *Rauwerdink 100* (fr., WAG), *Rauwerdink 101* (fl., WAG), *Rauwerdink 102* (fr., WAG), *Rauwerdink 104–106* (veg., WAG), *Rauwerdink 107* (pfl., WAG), *Rauwerdink 108* (veg., WAG), *Rauwerdink 110* (veg., WAG), *Rauwerdink 111* (pfl., WAG), *Rauwerdink 113* (fr., WAG), *Rauwerdink 117* (veg., WAG), *Rauwerdink 120* (veg., WAG), *Rauwerdink 121* (fl., WAG), *Rauwerdink 124* (veg., WAG), *Rauwerdink 125* (veg., WAG), *Rauwerdink 126* (veg., WAG), *Rauwerdink 129* (veg., WAG), *Rauwerdink 130* (fr., WAG), *Rauwerdink 132* (fr., WAG), *Rauwerdink 133* (fl., WAG), Morobe, 1964, *Womersley NGF 19234* (pfl., fr.,



14–15. Fruit shapes and sizes, each from a single collection. Figure 14 from *Rauwerdink 112*, Figure 15 from *Rauwerdink 100*.

A, L); SOLOMON ISLANDS 1964, *Moore 9315 BSIP 4090* (fl., SIN, K). INDONESIA. Bengkalis, 1919, *Beguin 1919* (fl., fr., BO); CELEBES, 1895, *Koorders 18397* bis (veg., BO); AMBON, 1913, *Robinson 28* (pfl., L, K, P); JAVA, 1843, *Zollinger 1404* (fl., fr., B, P). PHILIPPINES. 1941, *Ebalo 999* (fl., BH); MINDANAO, 1909, *Elmer 11160* (pfl., fr., A, C, L, K, P), 1927, *Ramos & Edano 49399* (fl., fr., BO). CULTA. 1924, *Bakhuizen v/d Brink 3497* (veg., BO), *Bloembergen* s.n. (D1) (fl., BO), *Bloembergen* s.n. (VL 28) (veg., BO), 1939, *Burret 333* (fr., BO), 1952, *Moore 6095* (veg., BH), 1895, *Ridley* s.n. (fl., K).

2. **Metroxylon amicarum** (H. A. Wendl.) Beccari in Ann. Royal Bot. Gard. Calc. 12, 2: 187–192, p. 111–113. 1918; Moore et Fosberg in Gent. Herb. 8, Fasc. 6, art. 20: 438–444. 1956; Barrau in Econ. Bot. 13: 151–159. 1959.

Metroxylon amicarum (H. A. Wendl.) Becc. var. *commune* Beccari in l.c.: 188. 1918 (note: This name is a homotypical synonym, even though Beccari typified it with *Ledermann 13409*).

Sagus amicarum H. A. Wendland in Bot. Zeit. 36(8): 115. 1878. Typus: *Reichenbach* s.n. (not seen, possibly at W). Proposed neotype: *Furtado 25868* (holotype K, isotype A).

Coelococcus carolinensis Dingler in Bot. Centr. Bl. 32: 349, t. 2. 1887; Schumann & Lauterbach in Fl. D. Sch. Südsee: 606. 1901. Typus: *Schneider* s.n. (not seen).

Coelococcus carolinense Beccari in Denkschr. K. Akad. Wiss. M. Nat. Kl. (Rechinger ed.), Wien, 84: 60, fig. 5a & d. 1913. Typus: *Beccari* s.n. (not seen).

Metroxylon amicarum (H. A. Wendl.) Becc. var. *majus* Beccari in Ann. Royal Bot. Gard. Calc. 12, 2: 188. 1918.

Typus: *Gibbons 1189* (not seen, possibly at B).

Solitary, pleonanthic palm, 6–8(20) m high, stem to 30 cm in diameter near base. Leaves ca. 6 m long, with spines. Inflorescences arising from axils of crown leaves, i.e. these not bractlike, reduced in size as in other *Metroxylon* species. Various inflorescences differing in developmental stage. Infructescence pendulous due to weight of numerous big fruits. In hermaphrodite flower, the style attains apex of anthers at anthesis, but in male flower, gynoecium much reduced to 3 connate, oblong bodies, reaching only to the base of anthers. Fruit globose to apple-shaped, broader than high, 6–9 by 5–8 cm, or higher than broad, 7–13 by 8–12 cm, covered with 24–28 longitudinal series of chestnut-brown (reddish) scales.

Distribution: Guam, Caroline-Islands.

Vernacular Names: röpung (Truk), *oj* (Ponape).

Specimens Examined: GUAM. 1914, *Nelson* s.n. (fl., A, P). CAROLINE-ISLANDS. Truk, *Fosberg 24522* (fl., fr., BH), *Krämer* s.n. (fl., B), 1947, *Wong 244* (fl., A); Ponape, 1914, *Kersting* s.n. (fl., B). CULTA. 1903, *Loher* s.n. (fr., K), 1907, *Lyon* s.n. (fr., K), 1929, *Anon.* (fl., fr., SIN), 1932, *Furtado 25868* (fl., fr., A, K), 1954, *Kiah ONO 114* (fl., BH).

3. **Metroxylon vitiense** (H. A. Wendl.) Beccari in Ann. Royal Bot. Gard. Calc. 12, 2: 185–186, p. 110. 1918; Barrau in Journ. Agr. B. Appl., 3: 32–36. 1956 et in Econ. Bot. 13: 151–159. 1959.

Sagus vitiensis H. A. Wendland in Seem. Fl. Vit.: 279, t. 80. 1865–68 et in App. to Seem. Vit.: 444 (teste Beccari); Benth. & H. in Gen. Pl. 3: 935. 1883; Drake de Cast. in Ill. Fl. Ins. Pac. 8: 323. 1886–92; Warburg in Ber. D. Bot. Ges. 14: 141. 1896.

Coelococcus vitiensis H. A. Wendland in Bonplandia 10: 199–200, 1862. Typus: *Seeman 658* (holotype K, isotype P).

Solitary, hapaxanthic palm, 5–10(15) m high, stem to 50 cm in diameter near base. Leaves 4–5 m long with slender spines, brown to chestnut-brown. Inflorescence apparently terminal, first-order branches erecto-patent, 2–2.5 m long, second-order branches pendulous, those seen by me 20 cm long. Style in male flower not exceeding the filaments, style in hermaphrodite flower as long as stamens. Fruit turbinate, yellowish-brown, about 7 cm high and 5 cm wide, with 27(28) longitudinal series of scales.

Distribution: Fiji-Islands.

Vernacular Name: songa.

Specimens Examined: FIJI-ISLANDS. 1860, *Seeman 658* (fl., K, P); Viti Levu, 1953, *Smith 9339* (fl., GH, K, L), 1969, *Tomlinson & Kuruvoli 16551* (fl., fr., BH).

4. **Metroxylon salomonense** (Warb.) Beccari in Denkschr. K. Akad. Wiss. M. Nat. Kl. (Rechinger ed.), Wien, 84: 60–62, fig. 5b & e & f & i et 7. 1913 et in l.c.: 192–193, p. 114. 1918; Barrau in Journ. Agr. Tr. B. Appl., 3: 32–36. 1956 et in Econ. Bot. 13: 151–159. 1959.

Coelococcus salomonensis Warburg in Ber. D. Bot. Ges. 14: 141, t. 10. 1896; Schumann & Lauterbach in Fl. D. Sch. Sudsee: 606. 1901. Typus: *Warburg* s.n. (fr.), (not seen, possibly B). Proposed neotype: *Kajewski 2300* (B).

Metroxylon bougainvillense Beccari in Denkschr. K. Akad. Wiss. M. Nat. Kl. (Rechinger ed.), Wien, 84: 60–62, fig. 5c & g & h & j. 1913 et in Ann. Royal Bot. Gard. Calc. 12, 2: 193–194, p. 114. 1918; Barrau in Journ. Agr. Tr. B. Appl., 3: 32–36. 1956 et in Econ. Bot. 13: 151–159. 1959. Typus: *Rechinger 4878* (fr.), (not seen, possibly W).

Solitary, hapaxanthic palm, 9–20 m high, stem up to 55 cm in diameter near base. Leaves 9–11 m long, with spines in transverse series. Inflorescence apparently terminal with first-order branches erecto-patent, 3–4 m long, second-order branches spreading but third-order branches pendulous, ca. 20 cm long. Flower bracts with greyish-silvery pubescence. Male and hermaphrodite flowers with filaments with a sharply reflexed subulate top, male flower with style not exceeding fused part of filaments, whereas in hermaphrodite flower, style not reaching beyond point of attachment of anthers. Fruit globose, depressed at apex and base, straw colored, 7–9 cm broad and 5.5–6.5 cm high, with 24–27 longitudinal series of scales.

Distribution: Papua New Guinea, Solomon Islands, Santa Cruz-Islands.

Vernacular Names: bia, nami, haesan.

Specimens Examined: PAPUA NEW GUINEA. BOUGAINVILLE ISLANDS, 1930, *Kajewski 2300* (fl., fr., B, BO, GH), 1964, *Schodde 4013 et 4013a* (fl., fr., A, L). SOLOMON-ISLANDS. 1936, *Lever* s.n. (fl., fr., K), 1964 *Moore 9317 BSIP 4091* (fl., fr., K, L, SIN), *Moore 9302* (fr., BH). SANTA CRUZ-ISLANDS. 1936, *Whitmore BSIP 1818* (fl., K, L, SIN).

5. **Metroxylon warburgii** (Heim) Beccari in Ann. Royal Bot. Gard. Calc. 12, 2: 182–184, p. 109. 1918; Barrau in Journ. Agr. Tr. B. Appl., 3: 32–36. 1956 et in Econ. Bot. 13: 151–159. 1959.

Coelococcus warburgii Heim in Bull. Soc. Bot. Fr. 50: 572, fig. 1–5. 1904. Typus: *Heim* s.n. (fr.), (not seen, possibly HAL). Proposed neotype: *Ridley 3171* (holotype SIN, isotype K).

Solitary, hapaxanthic palm, 6–7 m high, stem to 30 cm in diameter near base. Leaves ca. 3 m long, with spines in transverse ridges or series. Inflorescence apparently terminal with erecto-patent first-order branches, 1–1.5 m long, second- and third-order branches erecto-patent; adaxial sides of all pedicels glabrous. Flowers large, corolla (10 mm) twice as long as calyx and apex minutely punctate; in hermaphrodite flower style attains at least half the length of filaments; style in male flower as long as fused part of filaments. Fruit pear-shaped, seed in the upper, broader part, (4)7-12 cm high and (3.5)6–9 cm broad, with 24 longitudinal series of chestnut-brown scales.

Distribution: New Hebrides, W-Samoa.

Vernacular Names: tenebee, niu olotuma.

Specimens Examined: NEW HEBRIDES. 1964, *Moore 9319* (fl., P); MALEKULA, 1971, *Halle RSNH 6344* bis (fl., fr., A, K, L); PENTECOST ISLANDS, 1949, *MacDaniels 3011* (fr., BH). W-SAMOA. UPOLU, 1968, *Anon. 19331* (fl., K, P), *Bristol 2178* (fr., GH, K, L), *Bristol 2180* (fr., GH), 1971, *Moore 9985* (fl., fr., BH), 1978, *Moore 10396* (fl., fr., BH). CULTA. 1891, *Ridley 3171* (fl., fr., K, SIN), 1941, *Anon.* s.n. (fr., B).

Discussion

The first question to be considered is why *M. rumphii* Mart. (the spiny sago palm) should be synonymous with *M. sagu* (the spineless sago palm). My main argument against recognizing more than one species in the real sago palm is based upon personal observation and references in literature: a spiny sago palm can produce both spiny and spineless seedlings from a single inflorescence. For example Jumelle (1925) mentions this, and I have been able to verify that this situation occurs in PNG (Dreikikir area, road to Maprik, West-Sepik Prov.). The second question to be answered is why I have not upheld Beccari's taxonomy on the real sago palm which, even though not applying to a sin-

gle species situation, covers a remarkable range of variability. It might not prove too hard to maintain at least some of his varieties. As can be seen in his key to the taxa (Beccari in l.c.: 160–162. 1918), Beccari divides species in the real sago palm into varieties and subvarieties on the bases of fruit characters such as size and shape. I do not agree with these distinctions because I have observed a considerable variability in fruit shape on the inflorescence of a single palm. Figures 14 to 15 represent samples of varying shapes selected from material collected in the Sepik-area. Each photograph represents a single number from my collection. I have compared my materials with type material of Beccari at the Herbarium Bogoriense and have found that a single accession collected by me may include several of Beccari's taxa. For example, *M. rumphii* Mart. var. *ceramense* subvar. *nigrum* and subvar. *platyphyllum* material both display fruits that are similar to *Rauwerdink 112* (Fig. 14). Therefore, I have to conclude that fruit shape and size cannot be useful in typifying taxa in the real sago palm. These characteres are most likely very dependent on age and location of the fruit in the infructescence.

For each part of the palm and for each developmental stage, spine characters are independent of age, and hence suitable for use in classification. It is convenient that this classification can take place nearly at ground level in the field. Furthermore a classification on spine characters offers a very clear distinction between the various forms of *M. sagu*. The taxonomic rank of the taxa in *M. sagu* should be low. The fact that a spiny palm may produce spiny and spineless seedlings indicates that it is heterozygous for this character and may produce embryos of at least two genotypes. The classification *forma* should apply to these taxa rather than variety or subvariety. The offspring of the aforementioned young palms may not be of the genotype of the mother-palm. I assume

	AB	Ab	aB	ab
AB	L	L	L	K
Ab	L	L	K	I
aB	L	K	L	I
ab	K	I	I	S

16. Diagram presenting the possible genotypes of the formae of *M. sagu* where two genes control spine length. L, *longispinum*; K, *micracanthum*; I, *tuberatum*; and S, *sagu*.

that a minimum of two genes or alleles governs spine length in its broadest sense. Such a situation can be expressed in Figure 16, which presents the genotypes of the occurring forms in this concept. The thesis is rather academic, however, and can only be tested in the field, but this is unfortunately seriously hampered by the lack of knowledge on the pollination mechanism in *Metroxylon*, and the fact that fruits are eaten by a number of animals. Not much is known for certain, but it is suspected that hornbills and fruit bats eat the fruits at various stages of development (local inhabitants Sepik-area pers. comm.). Wild boars are known to eat fruits on the ground (Rumphius 1741). Furthermore, particularly the formae *sagu*, *tuberatum* and *micracanthum*, long domesticated by man (e.g. the Sepik in PNG), are almost always cut down for starch extraction long before fruits even start to develop. In the rare cases that fruits are produced in these formae I have been unable to find seeds with a well-developed embryo and endosperm, seeds containing instead a hypertrophic cellular mass. In the taxon *longispinum* fruits do frequently develop an embryo and endo-

sperm; this taxon is much less often cultivated.

Acknowledgments

I would like to acknowledge the assistance and kind attention of everyone connected with the Department of Plant Taxonomy. Study on sago palms at Wageningen was, however, initiated by Prof.dr.ir. M. Flach of the Department of Tropical Crop Science.

Special thanks are due to Prof.dr.ir. L. J. G. van der Maesen and Dr.ir. J. J. Bos for their supervision over my work, to Dr. J. Dransfield (Kew) for his, much appreciated, interest in my work, to Ir. J. C. Arends for his help on the cytological part of this paper and the photograph he provided of the chromosomes, to Dr. R. G. van den Berg for his help on the palynological part of this paper and the photographs he provided of the pollen grains, to Miss H. G. D. Zewald for her fine drawings and the preparation of all illustrations, and to Mr. J. W. Mugge who printed all macromorphological photographs.

Furthermore I am indebted to the Directors and Curators of the herbaria of A, B, BO, BH, GH, K, L, LAE, P and SIN for kindly putting their material at my disposal.

LITERATURE CITED

DE WILDE, J. J. F. E. (taxonomy) AND J. C. ARENDS (cytology). 1980. Begonia section Squamibegonia Warb. A Taxonomic Revision. Misc. Papers 19: 377–421. Landbouwhogeschool, Wageningen, The Netherlands. Liber Gratulatorius in honorem H. C. D. De Wit.

DE WILDE, J. J. F. E. AND ARENDS, J. C. 1979. *Begonia loranthoides* Hook. F. (Sect. *Tetrophila* A. DC.). Acta Bot. Neerl. 28(4/5): 357–374.

DME 1980. Newcombe, Holmes and Paivoke in Palm energy-alcohol fuel from the sago and nipa palms of Papua New Guinea. Report 6/80, Energy Planning Unit, Dept. of Minerals and Energy, Konedobu, PNG.

DME 1982. Newcombe and Holmes in Implementation of alternative fuels in developing countries: alcohol fuels in Papua New Guinea. Report 7/82, Energy Planning Unit, Dept. of Minerals and Energy, Konedobu, PNG.

JUMELLE, H. 1925. Cultures Coloniales, Plantes a Fecule et Cereales. Paris.

MOORE, H. E., JR. AND N. W. UHL. 1982. Major trends of evolution in palms. Bot. Rev. 48: 1–69.

PRAGLOWSKI, J. AND W. PUNT. 1973. An elucidation of the Microreticulate Structure of the Exine. Grana 13: 45–50.

SAGO '76. 1977. Papers of the 1st. Int. Sago Symp., Kemajan Kanji Sdn. Bhd., Kuala Lumpur.

SAGO '80. 1980. The equatorial swamp as a natural resource. Proceedings of the 2nd. Int. Sago Symp., Martinus Nijhoff, the Hague.

SOWUMNI, M. A. 1972. Pollen morphology of the Palmae and its bearing on taxonomy. Rev. of Pal. Bot. and Paly. 13: 1–80.

TEAM PROYEK. 1982. P3 S.B.P.E. (SAGU). Hasil survai potensi sagu di kepuluan Maluku: Bagain I, bagain II dan bagain III. Jakarta.

THANIKAIMONI, G. 1970. Pollen morphology, classification and phylogeny of Palmae. Adansonia, ser. 2, 10(3): 347–365.

TOMLINSON, P. B. 1971. Flowering in *Metroxylon*. Principes 15: 49–62.

VERHAAR. 1977. Papers of the 1st Int. Sago Symp.: 155–156.

Principes, 30(4), 1986, pp. 181–182

LETTERS

5 January 1985

Editors, Principes
L. H. Bailey Hortorium
467 Mann Library
Ithaca, N.Y. 14853

Dear Natalie and John,

I was very interested in R. A. DeFilipps's paper on Bernardo de Iriarte (*Principes*, 29: 156–159. 1985). I have been studying the systematics of the genus *Iriartea*, and have often wondered about Iriarte.

There has been much confusion surrounding the correct names for the species of *Iriartea*, and the related genera *Socratea* and *Dictyocaryum*, and the illustration accompanying DeFilipps's paper (p. 149, op. cit.) is a good example of this. The illustration is captioned (p. 150, op. cit.):

> "*Iriartea altissima*" at Los Canales, Venezuela, reproduced from Carl Ferdinand Appun, "Unter den Tropen". Vol. 1, Venezuela. Jena 1871. Originally described as a species of *Iriartea*, this palm is now considered the same as *Dictyocaryum fuscum*. See pp. 156–159.

This illustration, although apparently done by, or for, Appun, was originally published ten years earlier, as a plate in Hermann Karsten's *Florae Columbiae* (1, f. 3, t. 54. 1860). But the scenic background shown in *Unter den Tropen* is missing from *Florae Columbiae*, and in its place are detailed drawings of flowers and fruit of the palm. Perhaps just as well they were painted over, because Karsten's version is actually a mixture of two genera.

Karsten's palm was not originally described as a species of *Iriartea*, but as a *Socratea*, *S. fusca* Karsten (*Florae Columbiae*, 1, f. 3, pp. 109–110, t. 54). The type locality was given as Puerto Cabello, in Venezuela. The detailed drawings given by Karsten of the fruits (t. 54, figs. 9–12, op. cit.) belong to a different genus, as does possibly the drawing of the young plant (retained in *Unter den Tropen*). The error was pointed out by Wendland (Bot. Zeit. 21: 129–131. 1863), who also realized that Karsten's *Socratea fusca* was not a *Socratea* at all, but a *Dictyocaryum*, and so it is correctly called *Dictyocaryum fuscum* (Karst.) H. A. Wendl. The other genus, to which the fruits belong, is a true *Socratea*. I have recently been in Venezuela, near Puerto Cabello, and it is easy to see how the confusion arose. *Socratea* and *Dictyocaryum* grow together, and look remarkably alike. This sympatry and similarity is quite unusual, and is not found in Andean species of the two genera.

What, then, is the correct name of the *Socratea* from Puerto Cabello? It seems not to have one. Apparently, Karsten collected seeds, and Burret (Notizblatt. 10: 925. 1930) wrote that these seeds existed in the Berlin Herbarium, bearing the name '*Iriartea altissima*' and the label 'leg. Karsten, Venezuela'. Apart from *Unter den Tropen*, this name appeared in the literature in an article by Linden giving a list of plants recently introduced into commerce (L'Illustration Horticole. 28: 31. 1881) as *Iriartea altissima* Klotzsch ex Linden. Klotzsch was curator at Berlin in the last century, and probably told Linden about the seeds called *Iriartea altissima*, and Linden put the name on his list. The name was not validly published by Linden, but was validly published by Jahn (Las Palmas de la Flora Venezolana, p. 52. 1908). Unfortunately, Jahn's description appears to refer to the *Dictyocaryum*, and not the *Socratea*, and therefore *Iriartea*

altissima Klotzsch ex Jahn becomes a synonym for *Dictyocaryum fuscum*.

The *Socratea* from Puerto Cabello is very similar to *S. exorrhiza*, but I believe it is a distinct species, and am in the process of describing it. Burret (op. cit. p. 925) recommended using the name *Socratea altissima*.

Sincerely,

ANDREW HENDERSON
New York Botanical Garden
Bronx, NY 10458

Principes, 30(4), 1986, p. 182

PALM BRIEF

The American Oil Palm, Elaeis oleifera, in Peruvian Amazonia

According to Blank (1952), Macbride (1960), Meunier (1975) and Ool et al. (1981), the American oil palm is not known to occur in Peru. However, this species was collected on the Rio Chambira in December 1984 by A. Vasquez (n 6055, Iquitos). In March 1985, we found a population of *Elaeis oleifera* (H.B.K.) Cortes at 5 km from the Research Center of Jenaro Herrera/C1-JH (4°55′18″ lat S; 73°40′36″ long W), at about 200 km southwest of Iquitos on the Rio Ucayali. The 102 palms (with greater than 2 m leaf length) are in a seasonal swamp forest dominated by *Mauritia flexuosa* L.f. and *Jessenia bataua* (Mart.) Burret. Sixty-six of them have developed a procumbent stem, up to 4 m in length, and 27 were fruiting. Natural regeneration is shown by the abundant seedlings and juveniles. The palm, locally known as "poloponta," is not used by the local people, and nobody recollects former uses. All these characteristics suggest that the species is native in this part of Peruvian Amazonia. This is not the case of most Brazilian populations with equal-aged palms and occasionally natural regeneration, which are found on good well-drained soils, often associated with deposits of broken pottery (Blank 1952, Ool et al. 1981).

LITERATURE CITED

BLANK, S. DE. 1952. A Reconnaissance of American Oil Palm. Trop. Agric. Trin., 4–6: 90–101.

MACBRIDE, F. 1960. Flora of Peru. 16. Palmae. Bot. ser., Field Mus. Nat. Hist., 8(1) n 2: 321–418.

MEUNIER, J. 1975. Le "palmier a huile" americain *Elaeis melanococca*. Oleagineux, 30, (2): 51–61.

OOL, S. C., DA SILVA, E. B., MUELLER, A. A. AND J. C. NASCIMIENTO. 1981. Oil Palm Genetic Resources—Native *E. oleifera* Populations in Brazil Offer Promising Sources Pesq. Agropeca. Bras., Brasilia 16, (3): 385–395.

FRANCIS KAHN
KEMBER MEJIA

Principes, 30(4), 1986, p. 183

PALM LITERATURE

COCONUT WOOD: PROCESSING AND USE. 58 pp. Food and Agriculture Organization of the United Nations, FAO Forestry Paper 57, Rome, 1985.

It is an established fact that coconut palms suffer a decline in nut production when they reach about 50 years of age, and modern plantation practices recommend replanting. Removal of senesent trees produces large quantities of coconut wood. Increasing attention being directed toward integrated development of the multiple products provided by palms has resulted in studies such as *Coconut Wood.*

This book draws together the results of all the research which has been conducted, much of it over the past 10 years, on coconut wood utilization. The text is organized into 8 concise chapters, beginning with a discussion of the tree itself. There follows an excellent description of the many uses of coconut wood, from making fine furniture to constructing entire houses. Next to be treated are the subjects of logging, primary conversion; chapters on, respectively, grading, seasoning and preserving of coconut timber; and finally a discussion of the use of residues for fuelwood, charcoal and other industrial products. The book is handsomely illustrated, easy to read and represents a major new contribution to our knowledge about coconut palm utilization.

By my count, *Coconut Wood* is the 11th book FAO has published on the subject of palms. They have contributed more to our knowledge of palms than any other single organization, and I commend them for it.

DENNIS JOHNSON

OIL PALM BREEDERS' SOCIETY

The African oil palm (*Elaeis guineensis*) has been the subject of more research than any other palm except the coconut. As the world's leading producer of palm oil, Malaysia has taken the lead in promoting this highly productive plantation crop. In 1979, the Palm Oil Research Institute of Malaysia (PORIM) was established near Kuala Lumpur. Subsequently, because the community of oil palm breeders had become rather sizable and needed a forum to facilitate international cooperation in the exchange of information and germplasm, it was decided to found an organization for oil palm breeders and launch a quarterly publication.

The inaugural issue of the Newsletter of the International Society for Oil Palm Breeders appeared in July 1984. Its contents include editorials, feature articles, abstracts, short technical communications and news of conferences and other events. Information about membership in the Society and/or a subscription to the Newsletter, can be obtained from: Dr. N. Rajanaidu, The International Society for Oil Palm Breeders, % PORIM, P.O. Box 10620, Kuala Lumpur, Malaysia.

DENNIS JOHNSON

Principes, 30(4), 1986, p. 183

PALM RESEARCH

Ecuador

Henrik Balslev (associate professor), Anders Barfod (Ph.D. student), and Flemming Skov (M.Sc. student) have formed a group for palm research at the University of Aarhus, Denmark. They intend to carry out studies in systematic, ecological, and economic aspects of Ecuadorian palms. The fieldwork was started during Henrik

Balslev's residence in Ecuador in 1981–1984. A four-month expedition was undertaken in 1985, and in 1986, another four-month expedition will take place. Anders Barfod studies the Phytelephantoid genera, and Flemming Skov, the genus *Hyospathe* for their theses. An important part of fieldwork is the collecting of herbarium specimens. Whenever possible, this is done in sets of six duplicates. Some of this material is available for exchange. Those possessing duplicates of South American palms for exchange may contact the group for an exchange arrangement. Until now, 40 different localities have been visited and the collections include about 500 numbers. Address: Henrik Balslev, Botanical Institute, University of Aarhus, Nordlandsvej 68, DK-8240 Risskov, Denmark.

Principes, 30(4), 1986, pp. 185–186

NEWS OF THE SOCIETY

Costa Rican Palm Expedition
April 5–21, 1987

Immerse yourself in the spectacular rain forests of Costa Rica, amid one of the most diverse palm floras in the world. Join us in a unique combination of travel, adventure, and palm hunting. With experienced leaders, you will enjoy comfortable accommodations at:

* the world renowned **La Selva Biological Field Station** and the adjacent Braulio Carrillo National Park (4 days, 5 nights)
* **Monteverde Cloud Forest Reserve**, famous for bellbirds and quetzals, as well as palms (2 days, 3 nights)
* **Las Cruces Tropical Botanical Garden**, with outstanding collections of horticultural plants from the American tropics and around the world, featuring palms, aroids, and ferns (2 days, 3 nights).

Dr. Robin Chazdon, of the University of California (Berkeley) Department of Botany will lead the expedition. Dr. Chazdon is an authority on Costa Rican palms and has conducted extensive research at La Selva and the adjacent Braulio Carrillo National Park. Other staff include Dr. Paul Rich, who recently finished a study of arborescent palms at La Selva, and Dr. Luis Diego Gomez, director of Las Cruces Tropical Botanical Garden, and an authority on ferns and tropical floras.

Best of all, your participation will contribute directly to the conservation and management of the vanishing rain forests of Costa Rica.

The participant fee for the expedition includes a tax-deductible donation of $350 to the Braulio Carrillo Extension Endowment Fund, administered by the Costa Rican National Parks Foundation. This fund will provide financial resources necessary to protect and manage the newly created extension to Braulio Carrillo National Park. The members of the Expedition Staff are donating their time and effort to lead this unique fundraising expedition to benefit the Park. The funds initially raised for land acquisition for the park extension have been spent, leaving little financial resources available for the hiring of park guards, construction of guard posts, maintenance of trails and facilities, and environmental education of local residents.

From La Selva in the lowlands (100 ft above sea level), the Park rises steeply through continuous forest up the Caribbean slope of the extinct Barba Volcano to an elevation of nearly 9,000 ft, covering a total area of over 100,000 acres. Within the park borders live an estimated 80% of the 800 land bird species known to Costa Rica and 40% of the 1,600 tree species. In an initial survey of palms in this altitudinal transect Dr. Chazdon found over 55 species, including a variegated *Geonoma* species and several potentially new species of *Chamaedorea*.

Cost per person is $1,500 (based on 15 participants). This figure includes the $350 contribution to the Park Endowment Fund, all lodging, domestic transportation, group airport transfers, meals at field stations, bilingual naturalist guide, guides' and drivers' expenses. Local arrangements are being handled by Costa Rica Expeditions, a highly regarded, experienced, fully insured, Costa Rican travel agency. Cost does *not* include

international airfare, travel documents, gratuities, or meals in San Jose. Participation is limited to 15 people. Please note that general collecting will not be allowed.

Reservations must be made by January 15, 1987 and require an advance deposit of $200 per person, non-refundable if you cancel and no replacement is available. For further information about contributions to the Braulio Carrillo National Park Endowment Fund or the palm expedition, write to:

Between October 15 and December 10:
Dr. Robin Chazdon
Organization for Tropical Studies
Apartado 676
2050 San Pedro
Costa Rica, Central America

After December 10, 1986:
Dr. Robin Chazdon
Department of Botany
University of California
Berkeley, CA 94720
USA

If you are unable to join us, please pass the word on!!



Principes, 30(4), 1986, pp. 187–188

Seed Bank Under New Management

On April 14, 1986 the management of the International Palm Society Seed Bank passed from Lois Rossten to David Sylvia and Inge Hoffmann. Lois Rossten had worked since 1979 as volunteer for this branch of The Palm Society services and had seen a large increase in seeds handled. For personal reasons she felt she could no longer continue. David Sylvia was suggested for the job but he accepted with the proviso that he would get a co-worker. Inge Hoffmann volunteered since she was already a member of several botanically oriented service organizations and thus had some experience in managing such a job.

The Society owned computer and all files were transferred to David Sylvia's address and slowly the two volunteers have developed a system that would allow them to work in different time slots on the seed shipments. Inge Hoffmann has devoted her time to designing a more efficient accounting system. This system enables Seed Bank members to pay their accounts ahead of time, in effect establishing credit, which is of great importance to our foreign membership since small amounts of money are too expensive as bank drafts. Also, every package of seed is now accounted for as being paid for, a seed trade arranged, or distributed free of charge as a service of The Palm Society to various botanical institutions.

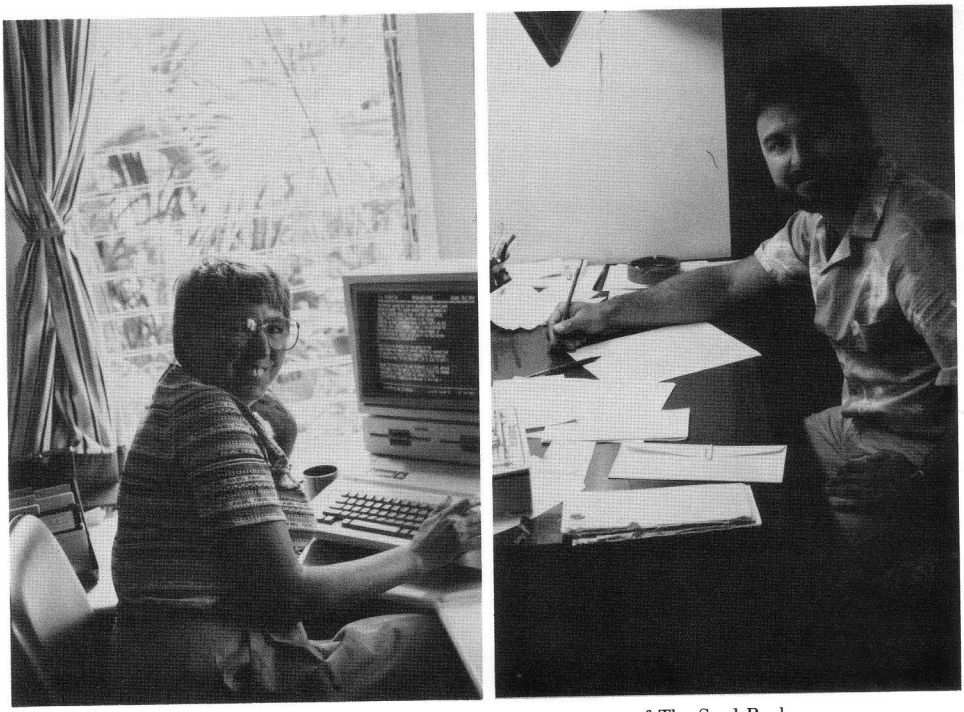
David Sylvia has devoted his time mainly to the establishment and keeping of correct membership records plus the designing of various files necessary for the accession of incoming seed. The new Seed Want List is also his work.

However, the running of the seed shipments is a joint venture that passes from one hand to the other to insure the fastest possible turnaround. In fact, all members of the Sylvia/Hoffmann households are employed in this task.

Here is an example of how the Seed Bank works: When you join The International Palm Society, the first thing you receive is the "Seed Want List" and some information on seed germination. You now have 250 different species of palms within your grasp! You want them all, especially when you are a new member—but hold on, first do a bit of homework! WHAT CAN YOU REASONABLY GROW IN YOUR AREA WITH OR WITHOUT A HOTHOUSE? Your Palm Society has some fine books available through the Book Store that tell much about the areas where these palms prefer to grow. Look them up. It would be good to view that Want List as a giant forest of palms that is stretching all over the world and your check mark puts you under each one of your desired trees, waiting for the seed to ripen.

Here is where we come into the picture—but first we would like to clear up one common misunderstanding. The Seed Bank is not a warehouse of cupboards filled with seed. We cannot fill requests for immediate delivery or specific demands for species and time for shipping. What really happens is that we must first find you that most wonderful of human beings—THE DONOR—the one person that makes it all possible. He or she is the person who collects the seed, cleans it sometimes, packages it and spends his/her own money to send it when ripe to the Seed Bank. A true labor of love.

The moment we receive the seed we get into action. We assign a number that is forever unique for the particular lot of seed and check our computer lists to see who waited for this seed. On "Rare Seed" we have no lists; they are seeds that come in perhaps just once, then never again. That is the big chance; we must choose at random (by area and special demand) and sometimes we make mistakes. We then count and package and bill each



1. Inge Hoffman and David Sylvia, new managers of The Seed Bank.

package to a customer and finally put it thru the postage meter and then we wait: TO BE PAID.

Dear customers: Those $2.00 must be the last great bargain of this world. From the $2.00 we pay for—

the little sack
the plastic bag
the address labels
computer paper
the postage (to foreign countries often over $1.00)
and we sometimes refund shipping costs to the donors.

For this reason we have imposed a $20.00 debt limit after which a reminder is sent, but no more seed is shipped. Please be prompt. The reminder is extra work for your willing but overworked volunteers and you may loose just the one species you were waiting for in the interval until your payment is received and shipment can resume.

Now a few words on seed germination. Our own experience with germination shows us that even *Jubaea spectabilis* still came up after two years, while other seed has begun to germinate right in the package. Please keep this wide range of germination time in mind and don't discard seed (as we have done so often) until you are sure that it is no longer viable.

We hope that we have so far served our customers well. Of course we are still in the learning stages and beg forgiveness for some mistakes we undoubtedly will make. We also would like the cooperation of all to make this a more efficient service.

INGE HOFFMAN
695 Joaquin Ave.
San Leandro, CA
94577

DAVID SYLVIA
36279 Christine St.
Newark, CA 94560

Principes, 30(4), 1986, pp. 189–191

INDEX

Acanthophoenix rubra 104
Acoelorrhaphe wrightii 23
Acrocomia 28; aculeata 28; mexicana 28; totai 28
Aiphanes linearis 41
Along the Dent Smith Trail 21
Alvarez-Buylla, Elena
as coauthor, 108
An outline of a classification of palms 3
Archontophoenix 28; alexandrae 85; cunninghamiana 33, 118
Areca 29; catechu 29; langloisiana 29; triandra 29, 87
Arecastrum 31
Arenga 29; engleri 29; pinnata 29; westerhoutii 143
Arikuriyroba 29, 31
Asterogyne 29, 92; martiana 92, 94, 95, 96, 97, 98, 119
Astrocaryum 29; aculeatum 65, 66, 68; huicungo 66, 69; mexicanum 108, 109, 110, 111, 112, 113, 114, 115
Avé, Wanda
The use of rattan by a Semai community in West Malaysia 143
Bactris gasipaes 66, 69; humilis 66, 69; monticola 66, 69
Barcella odora 74, 75, 76
Barrios, E. P.
as coauthor 85
Bergstrom, Edith
Palmateer? palmophile? palmophilia? palmologist? 151
Bernal-Gonzalez, Rodrigo
Catoblastus distichus, an interesting new palm from Colombia 38
Biennial meeting 88
Bismarckia 29; nobilis 29
Bookstore 34, 70, 99, 155
Boom, Brian M.
The Chacobo Indians and their palms 63
Brahea 29
Brief comments on palms suited to indoor culture 32
Broschat, Timothy K. and Henry Donselman
Effects of several plant growth substances on height, flowering and lateral shoot development of Chamaedorea seifrizii 135
Butia 29; capitata 42
Calamus 29
Calamus blumei 144, 149; diepenhorstii 143, 144, 145, 148; exilis 144; filipendulus 144; insignes var. longispinosus 144, 148; javensis 143, 144, 145, 148, 149; manan 144, 145; ornatus 144, 145, 149; peregrinus 144; viridispinus 144, 145
Calyptrogyne 43
Caryota 29
Catoblastus 38; distichus 38, 39, 41; inconstans 40, 41; kalbreyeri 40
Catoblastus distichus, an interesting new palm from Colombia 38
Catostigma inconstans 41
Ceroxylon 29
Chacobo Indians and their palms 63
Chamaedorea 29, 81, 185; elegans 33, 85; microspadix 21, 29; radicalis 29; seifrizii 29, 135, 136, 137
Chamaerops 29
Chazdon, Robin L.
Physiological and morphological basis of shade tolerance in rainforest undergrowth palms 92
Chrysalidocarpus 29, 35; cabadae 36; lutescens 35, 36, 37, 85; madagascariensis var. lucubensis 35, 36, 37
Classified 25, 81, 104, 160
Coccothrinax 29, 32
Coconut 47
Cocos 29; nucifera 42, 45, 47, 48, 50, 119
Coelococcus 165, 166, 168, 170; carolinense 176; carolinensis 176; salamonensis 177; vitiense 170; vitiensis 177; warburgii 178
Comparative demography of Oenocarpus mapora subsp. mapora 100
Copernicia 29
Cornett, J. W., Theo Glenn and Jon M. Stewart
The largest Desert Fan Palm Oases 82
Cox, Paul Alan and H. E. Moore, Jr.
The identity of Clinostigma onchorhynchum 77
Clinostigma 77, 78; onchorhynchum 77, 78, 79, 80; powellianum 77; samoense 77, 78, 79, 80; savaiiense 77; vaupelii 77; warburgii 77
Cryosophila 29; albida 117, 120, 122, 123, 124, 125, 127, 128, 129; nana 29
Cyphokentia samoense 77
Daemonorops 29, 149; brachystachys 144; didymophylla 144; geniculata 144, 145, 149; grandis 144, 145; kuntsleri 144; macrophylla 144; oligophylla 144; verticillaris 144
Deckenia 29
Dent Smith and The Palm Society 25
Dent Smith's favorite palm 24
Dent Smith's horticultural contributions 17
Dent Smith, a recollection 12
Desmoncus 29
Dictyocaryum 181
Dictyosperma 29; album 104
Donselman, Henry
as coauthor 135
Doughty, S. C., E. N. O'Rourke, E. P. Barrios and R. P. Mowers
Germination induction of pygmy date palm seed 85
Dransfield, John and Natalie W. Uhl
An outline of a classification of palms 3
Ravenea in the Comores 156
Drymophloeus 29
Durio zibethinus 143
Editors' Note 43
Elaeis 29, 74; guineensis 87, 137, 183; oleifera 182
Erythea 27
Euterpe 29; edulis 29; macrospadix 117, 120, 122, 123, 125, 127, 128, 129; precatoria 65, 66, 67, 68
Financial statement 164
Galeano-Garcés, Gloria
Geonoma chlamydostachys, a new species from Colombia 71
Gastrococos 30
Geonoma 30, 71, 73, 92, 97, 185; acaulis 73; camana 73; chlamydostachys 71, 72, 73; chococola 73; congesta 92, 94, 95, 96, 97, 98; cuneata 92, 93, 94, 95, 96, 97, 98, 119; juruana 66, 69; macrostachys 73; oldemanii 73; paradoxa 73; poiteauana 73; schottiana 30; tamandua 73
Geonoma chlamydostachys, a new species from Colombia 71
Germination of pygmy date palm seed 85
Glenn, Theo
as coauthor 82
Hawaii Tropical Botanical Garden 87
Hedyscepe 30; canterburyana 30

Henderson, Andrew
Barcella odora 74
Heterospathe 30
Hodge, Walter H.
Dent Smith's horticultural contributions 17
Hogan, Kevin P.
Plant architecture and population ecology in the palms Socratea durissima and Scheelea zonensis on Barro Colorado Island, Panama 105
Howea 27, 30; forsteriana 40
Hybrid in Chrysalidocarpus 35
Hydriastele 30
Hyospathe 184
Hyophorbe lagenicaulis 87, 104; verschaffeltii 104
Hyphaene 30
Iriartea 117, 120, 121, 122, 124; gigantea 117, 118, 120, 121, 122, 123, 124, 125, 127, 128, 129, 181; altissima 181
Jessenia bataua 65, 66, 68, 182
Jubaea 27, 30; chilensis 42; spectabilis 188
Jubaeopsis 30
Keuper, Jerome P.
Along the Dent Smith Trail 21
Korthalsia scortechinii 143, 144; rigida 144, 148, 149
Latania 30; loddigesii 104
Laurent-Täckholm, Vivi
Snakes in paradise 132
Leopoldinia piassaba 74
Licuala 30
Livistona 30, 138, 140; australis 30; mariae 153; rotundifolia 30, 32, 138
Lodoicea 30
Lytocaryum 30
Martínez-Ramos, Miguel
as coauthor 108
Mauritia flexuosa 182
Maximiliana maripa 65, 66, 67
Mechanical architecture of rainforest palms 117
Meeting of palm specialists 62
Mendoza, Ana
as coauthor 108
Metroxylon 165, 166, 167, 168; amicarum 167, 169, 171, 176; amicarum var. commune 176; amicarum var. majus 176; bougainvillense 177; hermaphroditum 174; inerme 174; laeve 172; longispinum 175; micracanthum 175; oxybracteatum 172; rumphii 171, 178; rumphii var. buruense 171; rumphii var. ceramense subvar. nigrum 179; rumphii var. ceramense subvar. album 171; rumphii var. ceramense subvar. ceramense 171; rumphii var. ceramense subvar. nigrum 171; rumphii var. ceramense subvar. platyphyllum 171, 179; rumphii var. ceramense subvar. rubrum 171; rumphii var. flyriverense 172; rumphii var. longispinum 175; rumphii var. micracanthum subvar. micracanthum 175; rumphii var. micracanthum subvar. makanara 175; rumphii var. sylvestre 171; sagu 167, 168, 169, 171, 172, 173, 178; sagu forma longispinum 172, 175, 179; sagu forma micracanthum 172, 175, 179; sagu forma sagu 172, 179; sagu forma tuberatum 172, 173, 174, 175, 179; sagu var. gogalense 174; sagu var. molat 174; sagu var. pukelianum 174; salamonense 169, 171, 177; squarrosum 171; squarrosum var. kilatan 172; squarrosum var. kilkarua 172; squarrosum var. kilkikir 172; squarrosum var. kilkour 172; squarrosum var. kiltafuk 172; squarrosum var. kilasi 172; squarrosum var. kilwoi 171; sylvestre 171; vitiense 169, 171, 177; warburgii 169, 171, 178
Microcoelum 30
Moore, H. E., Jr.
as coauthor 77
Mowers, R. P.
as coauthor 85
Myrialepis paradoxa 144
Nannorrhops 30; ritchiana 30
Neodypsis 30; decaryi 30
News of the Society 42, 43, 185
Normanbya 30; normanbyi 30
Nypa 30; fruticans 30
Oenocarpus 100, 101, 102, 103; mapora 65, 66, 68; mapora subsp. mapora 100, 101; panamanus 100
Opsiandra 30
Orbignya 30; cohune 30; guacuyule 30; spectabilis 30
O'Rourke, E. N.
as coauthor 85
Palm conservation 44
Palm research 43, 183
Panama collecting trip 131
Parajubaea 30; cocoides 30
Phoenicophorium 30; borsigianum 30
Phoenix 30, 86; abyssinica 30; canariensis 21, 30, 42, 43, 133; dactylifera 30, 89, 133, 134, 135, 153; roebelenii 30, 85, 86; paludosa 30; reclinata 30, 133; sylvestris 30, 133, 135
Pinanga 30; kuhlii 30
Piñero, Daniel, Miguel Martínez-Ramos, Ana Mendoza, Elena Alvarez-Buylla and José Sarukhán
Demographic studies in Astrocaryum mexicanum and their use in understanding community dynamics 108
Plectocomiopsis geminiflora 144, 145, 148, 149
Plectocomia elongata 144; dransfieldiana 144
Podzorski, A. C.
Veitchia merrillii and its karst island home 138
Polyandrococos 31; caudescens 31
Prestoea 117; decurrens 117, 120, 122, 123, 125, 127, 128, 129
Pritchardia 31; pacifica 31; thurstonii 31
Pseudophoenix 31
Ptychosperma 31; macarthurii 85
Putz, Francis E.
Studies in palm ecology: an introduction 91
Raphia 31, 165; farinifera 31
Ravenea 156, 157; hildebrandtii 156, 157, cover, 141, 142; moorei 158, 159
Read, Robert W.
as coauthor 35
Reinhardtia 31; gracilis 87
Rhapidophyllum hystrix 21, 31
Rhapis 151; excelsa 25, 31, 81, 104
Rhopalostylis 31; baueri 31; sapida 31
Rhyticocos 31
Rich, Paul M.
Mechanical architecture of arborescent rainforest palms 117
Rosengarten, Frederic
Coconut 47
Rossten, Lois
Palm Brief 87
Roystonea 24, 31; elata 31; oleracea 31; regia 31
Sabal 14, 31; minor 14, 31; palmetto 1, 15, 31
Sagus 165, 166, 170; amicarum 176; duri-rotang 171, 175; duri rottang 174; filaris 170; genuina 165, 171, 174; genuina longispina 175; inermis 174; laevis 172, 174; longispina 175; longissimus 175; micrantha 174; palmapinus 170; rumphii 171; spinosus 171; vitiensis 177
Salacca 161, 162; affinis 163; affinis var. borneensis 163; dubia 163; ramosiana 161, 162, 163

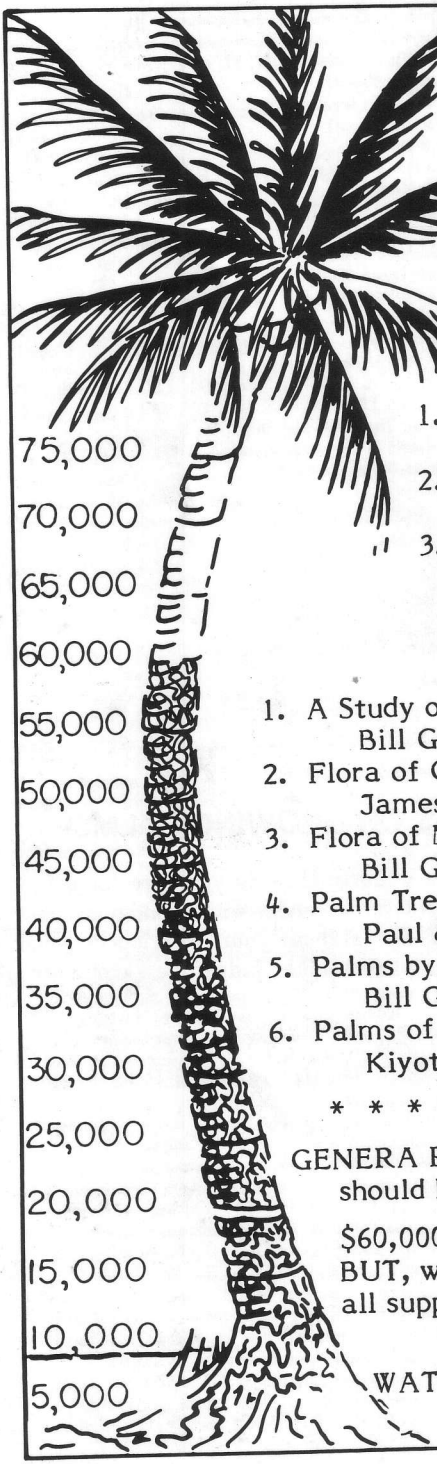
Sarukhán, José
as coauthor, 108
Scheelea 31, 105, 106, 107; liebmannii 31; princeps 65, 66, 68; zonensis 105, 106, 107
Schippia 31; concolor 31
Seed Bank, change of address 131
Serenoa 31; repens 31
Shade tolerance in undergrowth palms 92
Smiley, Nixon
Dent Smith, a recollection 12
Smith, Dent 1, 12, 17, 21, 22, 24
Smith, Dent
Brief comments on palms suited to indoor culture 32
U.S.D.A. hardiness zones as applied to cultivated palms, and other horticultural comments 26
Sneed, Melvin W.
Dent Smith's favorite palm 24
Socratea 105, 106, 107, 181; altissima 182; durissima 105, 106, 107, 117, 118, 120, 122, 123, 125, 127, 128, 129; exorrhiza 65, 66, 68, 182; fusca 181
Steven, Diane De
Comparative demography of a clonal palm (Oenocarpus mapora subsp. mapora) in Panama 100
Stewart, Jon M.
as coauthor 82
Studies in palm ecology: an introduction 91
Syagrus 27, 31; amara 31; comosa 31; coronata 31; flexuosa 31; romanzoffiana 27, 31; schizophylla 31
Synechanthus 31
Thrinax 31; floridana 31
Trachycarpus 31
Trithrinax 31
U.S.D.A. hardiness zones 26
Uhl, Natalie W.
as coauthor 3, 156
Veitchia 31; merrillii 31, 138, 139, 140; winin 87
Verschaffeltia 31
Wait, Lucita Hardie
Dent Smith and The Palm Society 25
Wallichia 31
Washingtonia 31, 82, 153; filifera 18, 31, 82, 84, 153; robusta 31, 42, 153
Welfia 117, 120, 124; georgii 92, 117, 118, 120, 121, 122, 123, 124, 125, 127, 128, 129
Zanoni, Thomas A. and Robert W. Read
Hybrid in Chrysalidocarpus 35
Zombia 31; antillarum 31

PRIZES OFFERED FOR ARTICLES ON GROWING PALMS

Readers of *Principes* want information on palm culture. How do you care for palms in your house or garden? Do different palms respond better under some conditions than others? Which are your favorite palms and why? Write about your experiences; send the article to Dr. Natalie W. Uhl by 1 April 1987. Articles will be judged by a committee including the editors and two others.

First Prize: An autographed copy of *Genera Palmarum*.

Second, Third, and Fourth Prizes: Membership in The International Palm Society for one year.



FINAL RESULTS

of our

REVOLVING PUBLICATIONS FUND DRIVE

Thanks to all of you for your support

WINNERS OF THE BIENNIAL MAJOR AWARDS

1. GENERA PALMARUM
   Bill Shannon, Hollywood, FL
2. EXOTICA 4
   Ed Moore, San Diego, CA
3. PRINCIPES, Complete bound set
   Paul Drummond, Miami, FL

and RARE BOOK RAFFLE

1. A Study of the Genus Pritchardia
   Bill Gunther, San Diego, CA
2. Flora of Guatemala
   James Beach, North Carolina
3. Flora of Madagascar
   Bill Gunther, San Diego, CA
4. Palm Trees of the Amazon
   Paul & Eric Anderson, AUSTRALIA
5. Palms by D. Muirhead
   Bill Gunther, San Diego, CA
6. Palms of the Philippine Island
   Kiyotake Ishihata, JAPAN

* * * * * * * * * *

GENERA PALMARUM is now at the press and should be available in April 1987

$60,000 won't publish GENERA PALMARUM, BUT, we hope we won't need more, IF, you all support our PRE-PUBLICATION SALE, beginning SOON.

WATCH FOR OUR NOTICE IN PRINCIPES and respond promptly.