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**A Taxonomic Treatment
of the Palm Subtribe
Attaleinae (Tribe *Cocoeae*)**

SIDNEY F. GLASSMAN

ILLINOIS BIOLOGICAL MONOGRAPHS 59

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Abstract

Detailed taxonomic treatments of all genera in the subtribe *Attaleinae* are included in the present study. *Attalea* contains 21 species; 2 interspecific hybrids, *A.* × *piassabossu* and *A.* × *voeksii*; and 1 intergeneric hybrid, × *Attabignya minarum*. *Orbignya* has 11 species; 1 interspecific hybrid, *O.* × *teixeirana*; 2 intergeneric hybrids, × *Attabignya minarum* and × *Maximibignya dahlgreniana*; 1 putative intergeneric hybrid, *Ynesa colenda*; and 1 undescribed putative intergeneric hybrid. *Scheelea* contains 31 species and 2 undescribed putative intergeneric hybrids. *Maximiliana* contains 1 species with 1 intergeneric hybrid, × *Maximibignya dahlgreniana*, and 1 undescribed putative intergeneric hybrid. A total of 13 new species are described here (*Attalea*, 3, *Orbignya*, 1, and *Scheelea*, 9), as well as 3 new combinations and name transfers.

The main emphasis of this treatment is taxonomic, but other systematic aspects have been considered, such as leaf anatomy and chemotaxonomy as well as geographical and ecological distribution. Evolutionary relationships among all four genera, as well as alliances among species within each genus (including a tentative division into infrageneric categories), are followed by a section on geographical distribution of species within each genus, a description of each genus, and keys to their species. Taxonomic treatments of all four genera and their individual species include original as well as other pertinent publications, complete synonymy, designation of types, a detailed morphological description, a list of specimens examined, distribution and habitat, vernacular names, economic importance, a discussion of evolutionary relationships, and nomenclatural problems. A total of 10 tables, 201 illustrations, and 17 distribution maps are also included. Illustration and map numbers are listed as Figs. in bold type for each species.

Lists of doubtful and excluded species for each genus are also incorporated into the text, as are acknowledgements, a list of references, and an alphabetical index to names of all taxa in the subtribe *Attaleinae*.

Cladistic studies are not included in the present treatment due to incomplete diagnostic morphological data for a number of taxa. At this juncture I should point out that this work does not represent a conventional monograph or revision. However, the total amount of information contained in it, and found nowhere else, forms a basis for future study that should lead to a more complete monographic treatment. Therefore, the main purpose of this study is to lay the groundwork to stimulate further research (including the collection of additional specimens) of this complex group of palms.

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I am indebted to the National Science Foundation for three grants (GB6899, GB3737, and BMS7509779) and to the Research Board and the Department of Biological Sciences at the University of Illinois at Chicago for additional assistance. These grants enabled me to take field trips to Brazil; visit herbaria in Europe, South America, and the United States; and study cultivated palms of various genera in the subtribe *Attaleinae* at Fairchild Tropical Garden in Miami, Florida. I would like to thank J. B. Harborne and C. Williams, both at the University of Reading, England, for carrying out chemotaxonomic studies on flavonoids; the late Timothy Plowman of the Field Museum for numerous valuable suggestions; and the late Rolf Singer of the Field Museum for revising the Latin descriptions of new species. Special thanks go to Larry Noblick of Montgomery Botanical Center for important field information on the distribution of *Attalea* in Bahia; to Margaret Kleist and Joan Cureton of UIC for preparation of the original manuscript; to my son Bob for his computer expertise and excellent editorial assistance; to my wife, Ida, for continuous support in the preparation of this manuscript; to Marlene Werner of the Field Museum and Janice Rajecki of UIC for preparation of the illustrations; to several people at the Instituto Botanica, São Paulo, especially A. Milanez and D. Vital, for making available to me transportation, guides, drivers, and herbarium facilities during my trip to Brazil in 1976; to the late Pedrito Silva of CEPLAC in Salvador for facilitating the shipment of palm specimens to the United States and for useful information on the disposition of Gregorio Bondar's palm collections; to Leticia Faria of the Federal University of Salvador, Edna Olivera of EMBRAPA in Salvador, Luis Silva of CEPEC in Itabuna, and Luciano Lima of CEPLAC in Petrolina for making available transportation, drivers, and herbarium facilities (all of which was coordinated by Larry Noblick) during our trip to Bahia, Brazil, in 1988. I am also grateful to the curators of the herbaria cited for the privilege of studying their specimens.

Herbaria Cited

- A Arnold Arboretum, Cambridge, Mass.
ALCB Herbario Alexandre Leal Costa, Instituto de Biologia, Salvador, Brazil
B Botanisches Museum, Berlin-Dahlem
BAH Herbario Antonio Nonata Marques, Salvador, Brazil
BH Liberty Hyde Bailey Hortorium, Ithaca, N.Y.
BM British Museum, London
BR Herbarium, Jardin Botanique National de Belgique, Meise, Belgium
C Botanical Museum and Herbarium, Copenhagen
CAS Herbarium, California Academy of Sciences, San Francisco
CAY Herbarie Centre ORSTOM, Cayenne, French Guiana
CEN Herbario CENARGEN/EMBRAPA, Brasilia, D.F., Brazil
CEPEC Herbario de Centro de Pesquisas do Cacau, Itabuna, Brazil
COL Instituto de Ciencias Naturales, Bogotá
CPATSA Herbario, Centro de Pesquisas Tropica, Petrolina, Brazil
F Field Museum of Natural History, Chicago
FI Herbarium Universitatis Florentinae, Florence, Italy
FTG Fairchild Tropical Garden, Miami
G Conservatoire et Jardin Botaniques, Geneva
GH Gray Herbarium of Harvard University, Cambridge, Mass.
HUEFS Herbario Universidade Estual, Feira Santana, Brazil
IPA Instituto de Pesquisas Agronomicas, Dois Irmãos, Recife, Brazil
K Royal Botanic Gardens, Kew, Great Britain
LE Botanical Institute, Academy of Sciences of the USSR, Leningrad
M Botanische Staatssammlung, Munich
MG Museu Paraense Emilio Goeldi, Belém, Brazil

- MICH Herbarium, University of Michigan, Ann Arbor
MO Missouri Botanical Garden, St. Louis
NY New York Botanical Garden, Bronx, N.Y.
P Museum National d'Histoire Naturelle, Paris
PMA Herbario, Universidad de Panamá, Panama
R Museu Nacional, Rio de Janeiro
RB Jardim Botânico, Rio de Janeiro
S Naturhistoriska Riksmuseet, Stockholm
SP Instituto de Botânica, São Paulo
U Botanical Museum and Herbarium, Utrecht
UB Universidade de Brasília, D.F.
US United States National Museum, Washington, D.C.
USM Herbario San Marcos, Lima
VEN Instituto Botánico, Caracas

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Introduction

The purpose of this study is to correlate all available information pertaining to the systematics (mainly taxonomy) of the subtribe *Attaleinae*. It is my hope that the present treatment will stimulate further research on this group of palms as it has in some of my other taxonomic treatments (*Butia* in 1979, and *Syagrus* in 1987).

Moore (1973) classified palms into 15 different groups, which in turn were divided into alliances and units. The four genera being treated here (*Attalea*, *Orbignya*, *Scheelea*, and *Maximiliana*) were placed in the cocosoid group in the *Cocos* alliance within the *Attalea* unit. In a more recent formal classification of the family *Palmae* (*Areaceae*) by Dransfield and Uhl (1986), the above genera were included in the subtribe *Attaleinae* within the tribe *Cocoeae* and subfamily *Arecoideae*. *Attaleinae* differs from the other subtribes in *Cocoeae* by having two kinds of inflorescences, usually on the same plant: a staminate, usually with staminate flowers only; and an androgynous inflorescence, in which a pair of staminate flowers forms a series of triads with one pistillate flower on the proximal part of each rachilla, and on the distal portion of the same rachilla there are only staminate flowers. All other subtribes in *Cocoeae* (*Beccariophoenicinae*, *Butiinae*, *Elaeidinae*, *Bactridinae*) usually have only androgynous inflorescences.

The four genera in subtribe *Attaleinae* can be differentiated by the following key:

1. Anthers coiled, petals of staminate flowers divided into 4 groups of species: (1) 3 in number and spatulate in shape; (2) 1–8 by fusion and broad below with notched or coarsely toothed tips, frequently with additional lanceolate petals, rarely with only lanceolate petals (up to 8 in number); (3) 1 species with 3 petals with fleshy hooked tips; (4) 1 species with 3 curved lanceolate petals
. *Orbignya* (includes *Parascheelea*)

- 1. Anthers usually straight, not coiled, petals of staminate flowers usually 3 in number, lanceolate or more or less linear in shape, with entire tips
- 2. Petals of staminate flowers, more or less linear, somewhat fleshy, usually convex outside and grooved inside or more or less terete and angular *Scheelea*
- 2. Petals of staminate flowers lanceolate, usually flattened, not fleshy
- 3. Petals usually much longer than stamens *Attalea*
- 3. Petals usually much shorter than stamens, which are consistently 6 in number *Maximiliana*

Henderson and Balick (1991), Henderson (1994, 1995), and Henderson, Galeano, and Bernal (1995) have concluded that subtribe *Attaleinae* consists of only one genus, *Attalea*, because several intermediate forms obscure supposed differences between genera. In the latter article, all published names of the 4 genera in *Attaleinae* are lumped together; 29 recognized species of *Attalea* and 4 hybrids are listed but at least 17 of these names are considered to be synonyms or *species dubia* by me. On the other hand, in the subtribe *Attaleinae* I recognize a total of 66 species (including 13 new species) and several interspecific and intergeneric hybrids within 4 different genera. I disagree with this lumping concept. As long as I can recognize 4 distinct genera based mainly on differences in the staminate flowers, I cannot accept 1 genus to cover all taxa in the *Attaleinae*. Most intermediate forms can be treated as either (1) intergeneric hybrids (e.g., \times *Maximbignya dahlgreniana*, \times *Attabignya minarum*, and *Ynesa colenda*); (2) ancestral types that are differentiating at the extremes of their ranges (currently, I cannot cite any examples of this possibility); or (3) representatives of subgeneric types within a genus (e.g., *O. luetzelburgii*, *O. polysticha*, *O. phalerata*, and *O. crassispatha*). All four species of *Orbignya* are differentiated by their petals in the staminate flowers (see “Key to Species of *Orbignya*”), but are held together in one genus by the coiled stamens. I believe that the subtribe *Attaleinae* is presently a highly evolving group of palms with many diverse characteristics. Further research, such as more collections and DNA analysis, may lead to a less controversial classification. Lumping all of the genera into one genus and the wholesale reduction of a large number of species to synonymy ignores the problem and results in a simplistic classification.

History of Subtribe *Attaleinae*

Attalea

Attalea (named after Attalus I, king of Pergamum, Greece, 241–197 B.C.) was first distinguished as a genus by Kunth in Humboldt, Bonpland, and Kunth (1816), in which he described one species, *A. amygdalina*. Closely related genera were later described by Martius in 1826 (*Maximiliana*) and 1837 (*Orbignya*), by Karsten in 1857 (*Scheelea*), by Dugand in 1940 (*Parascheelea*), by Cook in 1942 (*Ynesa*), and by Bondar in 1957 (*Markleya*). Since its original description, *Attalea* has been treated taxonomically by Martius (1824, 1826, 1844, 1845, 1853), Karsten (1857), Drude (1881), Barbosa Rodrigues (1903b), Burret (1929a), Bondar (1942a, 1942b, 1964), Dugand (1953, 1954), Wessels Boer (1965, 1972, 1988), and me (1977a). Drude (1881) divided the genus into three sections: (1) *Attalea verae* (including six species with staminate flowers having flattened petals), (2) *Cylindrostachys* (containing only *A. nucifera*, characterized by having its staminate flowers arranged all around the rachilla) and (3) *Pseudoscheelea* (containing *A. princeps* and *A. phalerata*, which later were transferred to the genus *Scheelea*). Burret (1929a) also divided *Attalea* into three sections: *Euattalea* (including 15 species split into two groups based on size of the trunk) and two other sections differentiated by the arrangement of staminate flowers on the rachillae, size of trunk, and amount of fibers in the endocarp. Bondar (1942a, 1942b, 1964) described several new species and constructed keys to 16 species found in Brazil. Wessels Boer recognized 7 species from Suriname (1965) and 14 species from Venezuela (1972, 1988), but within the genus *Attalea* he included other closely related genera, *Maximiliana*, *Orbignya*, *Scheelea*, *Markleya*, and *Parascheelea*. In 1973, Moore considered all of these except *Markleya* as separate genera within the *Attalea* unit and listed 30 species for the genus *Attalea*; In my 1977a article, I did a preliminary taxonomic study of the genus *Attalea* in which I tentatively recognized 21 taxa; Balslev and Henderson (1987) transferred *Ynesa colenda* to genus *Attalea*.

Orbignya

Martius established the genus *Orbignya* in 1837a (named after A. d'Orbigny, a French collector in the 1820s and 1830s), but no species were described in this article. The first two taxa (*O. phalerata* and *O. humilis*) were delineated in 1844 by Martius. Other species were described or transferred from other genera (mainly *Attalea*) by Drude (1881), Barbosa

Rodrigues (1879, 1888, 1891b, 1898, 1903b), Burret (1929a, 1930, 1932, 1940), and Bondar (1954a).

Burret (1929a) did a comprehensive study of *Orbignya*, recognizing 19 species. The genus was divided into three sections: *Distichanthus* Burret, *Pleioanthus* Burret, and *Spirostachys* Burret. In the first two sections the staminate flowers are arranged along one side of the rachilla (and these in turn are differentiated by abundance or scarcity of fiber clusters in the endocarp), while the arrangement of staminate flowers is spiral in section *Spirostachys*. In addition, a partial key to sections and species was included. Of 13 species partly keyed out in the first section, 8 are listed as unknown or doubtful by Burret; of 4 listed in the second section, 2 are considered doubtful; while in the last section the 2 species are not keyed out, but 1 of these is doubtful.

Bondar (1964) listed 14 species in his treatment of Brazilian *Orbignya*, but no keys were included; Wessels Boer (1965, 1972, 1988) submerged all species of *Orbignya* (as well as other genera in the subtribe *Attaleinae*) from Suriname and Venezuela under the genus *Attalea*, *sensu lato*; in a preliminary taxonomic treatment of *Orbignya*, I included keys and cited specimens of 21 recognized taxa (1977b); and Anderson and Balick (1988) did a taxonomic study of the *Babassú* complex in which two species and hybrids of *Orbignya* were discussed.

Scheelea

Scheelea (named after C. W. Scheele, a Swedish pharmacist and chemist, 1742–86) was established as a new genus by Karsten (1857). In this article he described four new species and transferred three others from *Attalea* and *Maximiliana*. Karsten (1861, 1866) also published illustrations of the species he described. During the next several decades, other taxa of *Scheelea* were described or transferred from other genera (mainly *Attalea*) to *Scheelea* by Barbosa Rodrigues (1891a, 1891b, 1894, 1898, 1899, 1903a, 1907), Hooker (1897), Beccari (1916), Burret (1929a, 1934b, 1940), Bailey (1933, 1947), Bartlett (1935), and Dugand (1959).

Undoubtedly, the most comprehensive study of *Scheelea* was done by Burret (1929a). In the same article he also treated the genera *Attalea*, *Orbignya*, and *Maximiliana*. Besides describing 13 new species of *Scheelea* and transferring 8 others to the genus from *Attalea* and *Maximiliana*, he divided *Scheelea* into two sections, *Synalphocaryum* Burret and *Dialphocaryum* Burret. In the first section (characterized by having very large endocarp fibers dis-

tributed in dense clusters and 1–5 closely arranged pistillate flowers on each androgynous rachilla) Burret included 23 species, and in section *Dialphocaryum* (differentiated by having endocarp fibers about one-half as small and distributed in smaller clusters and 5–many loosely arranged pistillate flowers per androgynous rachilla) 15 taxa were listed. Burret also constructed a partial key to the species within the first section and a more or less complete key to those in the second section. In the same article Burret emphasized the pitfalls in undertaking a comprehensive study of *Scheelea* because a number of taxa are based on incomplete descriptions as well as inadequate material. Wessels Boer (1965, 1972, 1988) treated all species of *Scheelea*, as well as other closely related genera (*Attalea*, *Orbignya*, *Maximiliana*, *Parascheelea*, and *Markleya*), as part of the genus *Attalea*, *sensu lato*. In my 1977c article, I published preliminary studies of *Scheelea*; and in my 1977a article, I discussed all six genera in the *Attalea* complex.

One important study not discussed in my 1977c article is the FAO Oilseed Mission for Venezuela (Claassen, Jenkins, and Markley, 1949). A total of five species of *Scheelea* (*S. macrocarpa*, *S. macrolepis*, *S. maracaibensis*, *S. humboldtiana*, and *S. passargei*) along with distribution maps were mentioned as possible oil producers. It was estimated that one of these palms (*S. macrocarpa*) was represented by almost 6 million trees. Unfortunately, there is no record of where, if any, herbarium specimens were deposited. Therefore, identifications and distribution records of these species cannot be accurately verified.

Maximiliana

The genus *Maximiliana* (named after Maximilian Joseph I, king of Bavaria, 1756–1825), was established by Martius (1824), but no species were described until 1826 (*M. regia* and *M. insignis*) and 1844 (*M. crassispatha*). Other species of *Maximiliana* were described or transferred from other related genera to *Maximiliana* by Karsten (1857), Grisebach (1864), Spruce (1871), Barbosa Rodrigues (1875, 1891b), Wendland (1878), Drude (1881), and Burret (1929a).

Kuntze (1891) erected the genus *Englerophoenix* as a new name for *Maximiliana* Martius 1824, which was published as a homonym for *Maximiliana* Martius 1819 (in the family *Cochlospermaceae*). *Maximiliana* Martius 1824 was later given conserved name status (see Voss 1983). Some other authors (Barbosa Rodrigues, 1903b and Bondar, 1938, n.d.) considered *Englerophoenix* as a separate, distinct genus.

Drude (1881) divided *Maximiliana* into section *Eumaximiliana* (including *M. maripa* and *M. regia*) and section *Scheelea* (including *M. insignis* and *M. tetrasticha*) based on whether the stamens were longer than the petals in the staminate flowers. Barbosa Rodrigues (1903b) recognized two sections (*Inaya* and *Inayay*) under *Englerophoenix*, primarily based on the presence or absence of trunks. The most comprehensive study of *Maximiliana* was done by Burret (1929a), in which he also treated *Attalea*, *Orbignya*, and *Scheelea*. He keyed out nine species of *Maximiliana* in two sections, *Exanthera* and *Cryptanthera*, distinguished by having anthers extending a considerable distance beyond the petals rather than anthers included in the petals or scarcely longer than the petals. He also excluded the two sections identified by Barbosa Rodrigues.

Burret (1953) distinguished *Maximiliana* from its closest relatives, *Attalea*, *Scheelea*, and *Orbignya*, by the following: (1) the endocarp is thin rather than thick at the location of the embryo pore, (2) the embryo pore is covered with an operculum instead of devoid of an operculum, and (3) the endocarp lacks fibers rather than includes fibers. Wessels Boer (1965, 1972) submerged all species of *Maximiliana*, as well as its three closely related genera, under the genus *Attalea*, *sensu lato*, and I (1978a, 1978b) published preliminary studies of the genus *Maximiliana* but only one species was eventually recognized. Henderson (1995) and Henderson, Galeano, and Bernal (1995) reduced *M. maripa* to synonymy under *A. maripa*.

Systematic Studies of Subtribe *Attaleinae*

As with other groups of palms, individual genera and species may show a range of morphological variation depending on the age and kind of habitat of individual palms. Examples: Some normally acaulescent palms may exhibit a short trunk when older (e.g., *A. humilis*); some palms that are arborescent when mature may remain in an acaulescent juvenile state for a long period of time due to growing in adverse habitats (e.g., *A. funifera*). The leaves are pinnate, and the middle series pinnae are either in clusters of 2-several or regularly arranged and usually 1-several cm wide. Juvenile palms often exhibit longer petioles and leaves and sometimes wider pinnae than mature plants. Petioles vary less in length in adult plants and are consistently absent or very short in some species. Mature palms growing in wetter habitats may have leaf and inflorescence parts with larger dimensions than those growing under optimal conditions. Sterile bracts are usually several mm to several cm thick and sulcate on the outer sur-

face. Individuals usually have separate staminate and androgynous inflorescences on the same plant. Sometimes individuals may have only staminate inflorescences or predominately pistillate inflorescences on the same plant. Staminate rachillae and flowers are usually longer on the lower parts of the rachis and rachillae than on the upper parts. Basically, four distinct kinds of staminate flowers exist, based on the shape of their petals and anthers (see the key above). The size of individual staminate flowers within each genus does not vary much; however, stamens vary in number (6–75) in species of *Attalea* and *Orbignya*, but are constant (6) in species of *Scheelea* and *Maximiliana*. Anthers usually vary within a few mm in individual specimens; these are coiled in species of *Orbignya*, but are usually straight in the other three genera. The petals are usually three in number, but some species of *Orbignya* have as many as eight. The shape of the petals in each genus is delineated in the key above. Sepals are usually much shorter than petals and three in number. The length of pistillate rachillae is fairly constant in individual species, and pistillate flowers do not vary much in size. The number of stigmas ranges from three to eight. Fruits vary in size and shape based on their degree of development. Some species are consistently one-seeded, others have as many as eight or more seeds. Younger fruits are usually narrower and smaller, and fruits of many species turn orange or yellow at maturity.

Except for some chemotaxonomic studies in the subtribe *Attaleinae*, previous systematic investigations based on other than gross morphology have not yielded much information for phylogenetic studies.

Very few chromosome counts have been made for this subtribe. Darlington and Wylie (1945) reported the following: *A. cohune*, *A. spectabilis*, and *O. lydiae* are $n = 16$, but all three taxa belong to genus *Orbignya*; and Read and Moore (1967) report $n = 16$ for *A. allenii*. Very little or no information has been published about polyploidy, aneuploidy, breeding experiments, or population studies.

Comprehensive palm pollen studies have been carried out by Punt and Wessels Boer (1966), who surveyed 20 species in the subtribe *Attaleinae*, and by Thanikaimoni (1971), Sowunmi (1972), and me (unpublished data), in which I treated a number of taxa in this subtribe as part of a broader survey of palms. In all cases, the results were similar. Due to the lack of distinct differences in pollen structure among taxa, palynology appears to be a poor tool for studying evolutionary relationships among genera and among species of each genus in the subtribe *Attaleinae*. I reached the same conclusions in my unpublished palynological survey of

genera in the *Syagrus* group. Chemotaxonomic surveys of genera in the subtribe *Attaleinae* were carried out by Glassman et al. (1981), who studied the leaf flavonoids and lipids, and Williams, Harborne, and Glassman (1983, 1985), who surveyed the leaf flavonoids of various palms in the tribe *Cocoeae*. No major differences were found among species of *Attalea* and *Orbignya*.

Chemotaxonomic analyses of flavonoids and lipids by Glassman et al. (1981) showed some differences among the three species of *Scheelea* tested; however, later flavonoid studies by Williams, Harborne, and Glassman (1983, 1985) of several species of *Scheelea* were inconclusive and somewhat puzzling. Five of the seven taxa studied are confined to Central America; and three of these, *S. rostrata*, *S. preussii*, and *S. zonensis*, were reduced to one species (*S. rostrata*) because I could not find any major morphological differences among them. Results showed that *S. rostrata* differed from *S. preussii* and *S. zonensis* by three and four flavonoid compounds, respectively, whereas it differed from *S. lundellii* and *S. liebmannii*, the other distinct Central American species, by only one and two compounds, respectively. Results of major significance were found in the genus *Maximiliana*. Chemotaxonomic studies of four different collections (labeled different species) of *Maximiliana* showed the presence of flavonoid sulphates in two of the four collections (Williams, Harborne, and Glassman, 1983). All four collections also revealed the presence of flavonoid C-glycosides and tricin. This combination of characteristics separated these specimens (one species) from all other species of *Orbignya*, *Scheelea*, and *Attalea* treated in the survey.

I carried out a leaf anatomy survey of more than 100 collecting numbers in *Attalea* and related genera. Cross sections of middle series pinnae were prepared in the same manner as described for *Syagrus* and *Butia* (subtribe *Butiinae*) in my 1972b, 1979, and 1987 publications. It was not possible to construct a key to all genera and species in the subtribe *Attaleinae* as I did in the subtribe *Butiinae*, based on leaf anatomy alone. Only a handful of species in each genus could be keyed out. No clear pattern between related groups of species could be established. When a key was attempted for all taxa, very few differences could be found to distinguish a large percentage of the species. The relatively few species that could be keyed out were frequently those in different genera occurring in the same couplet or distantly related species in the same genus. The usefulness of the leaf anatomy survey, therefore, lies in the distinct char-

acteristics of certain isolated species of *Attalea*, *Orbignya*, and *Scheelea*, which adds to the morphological information.

Specifically, in a survey of 20 different collections of *Orbignya* and its hybrids, most of the species showed similar or the same leaf anatomy patterns, whereas some others had distinct patterns (e.g., *O. cuatrecasana*, *O. luetzelburgii*, and \times *Maximbignya dahlgreniana*). Even though no related groups of species could be distinguished, the survey was useful because it showed that \times *Maximbignya dahlgreniana* and *O. luetzelburgii* appear to be distinct and that other isolated species could be differentiated by their leaf anatomy.

Cross sections of middle pinnae of 10 specimens of *Maximiliana* (identified as several different species) did not reveal any unique combination of characteristics that could distinguish them from other genera in the subtribe. There is a certain amount of variability in the specimens observed, but most of them have elongated midribs, divided expansion cell tissue, common or very common distribution of adaxial nonvascular fibers, and frequent or common distribution of abaxial nonvascular fibers.

Fossil fruits of cocoid palms have been reported from the Eocene from several different localities by Moore (1973); however, none of these can be definitely attributed to any genera in the *Attaleinae*.

Unfortunately (as stated in the abstract), a cladistic analysis of the subtribe *Attaleinae* was not undertaken because of incomplete diagnostic morphological data for certain taxa. It is my hope that future research and new collections will fill in these morphological gaps and eventually lead to a more complete monographic treatment of this group.

Genus *Attalea*

Geographic Distribution of Genus *Attalea*

The genus *Attalea* is almost entirely South American in distribution (see table 1). Its center of distribution appears to be eastern Brazil, specifically in the state of Bahia. Of the 24 taxa (21 species, 2 interspecific hybrids, and 1 intergeneric hybrid) recognized in this treatment, 17 are native to Brazil, 5 to Colombia, 2 each to Peru and Panama, and 1 each to Venezuela and Paraguay. The greatest concentration of Brazilian species occurs in Bahia (10); others are in Minas Gerais (4); Goiás and São Paulo (3 each); Espírito Santo, Rio de Janeiro, Mato Grosso, Alagoas, and Sergipe (2 each); and Santa Catarina, Paraíba, and Pernambuco (1 each). Only 3 taxa are found in the Amazon region of Colombia, Peru, and Venezuela. In contrast to genus *Syagrus* (Glassman, 1987), most members of *Attalea* inhabit mesic inland or coastal forests (Brazil: 12, Colombia: 3, Peru: 2, Panama: 2), whereas several others are found in drier habitats such as cerrados, campos, roadsides, savannas, and rocky hillsides with limestone (Brazil: 4, Colombia: 2, Venezuela: 1, Paraguay: 1). Some of the species have limited or restricted distributions, and some of these are known from a relatively few collections. At least three species (*A. burretiana*, *A. funifera*, and *A. humilis*) are found mainly in the Atlantic coastal forest of Bahia, where they are fairly common, with the latter species extending into adjacent Espírito Santo, Rio de Janeiro, and São Paulo. Some species have a limited distribution in parts of central and western Bahia but are common in these small areas (*A. pindobassu*, *A. seabrensis*, and *A. barreirensis*); others from Goiás, *A. brasiliensis* and *A. exigua* (which are less common), were collected from relatively few areas. With further exploration, however, some of these species eventually may have their known ranges extended. Perhaps the most common and widespread species in Brazil is *A. geraensis*, which forms dense stands in cerrados and disturbed areas in parts of Minas

Gerais, São Paulo, Goiás, Bahia, and Mato Grosso. Another fairly common species is *A. apoda* (*A. camposportoana*), which has been observed in several localities in Minas Gerais. The most common species of *Attalea* outside of Brazil are *A. allenii*, collected from several localities in Panama and a number of provinces in Colombia, and *A. ferruginea*, known from a number of localities in the Venezuelan Amazon region and from Colombia and Peru. *A. nucifera* also seems to be fairly common in several provinces in Colombia; but *A. septuagenata* is apparently known mainly from its type locality in Colombia.

Table 1. Geographic Distribution of *Attalea*

Species	Country and State	Habitat
<i>A. allenii</i>	Panama: Colon, Canal Zone, Comarca de San Blas, Bocas del Toro; Colombia: Valle, Antioquia, Bolivar, Nariño, Chocó	Primary and secondary forests, along streams, hills, and ravines
<i>A. amygdalina</i>	Colombia: Valle, Caldas, Quindío, Antioquia, Risaralda	Forests along streams in mountain areas; most of former habitats converted to coffee plantations
<i>A. apoda</i>	Brazil: southern Minas Gerais from Serra de Mantiqueira to Copelinho and Serro de Palácio	Common in primary and secondary forests, areas along hillsides, and in cerrados
<i>A. barreirensis</i>	Brazil: western Bahia	Cerrados
<i>A. brasiliensis</i>	Brazil: Goiás, Fer Cal area of Brasília	Remnant of climax deciduous upland forest in limestone derived soils
<i>A. burretiana</i>	Brazil: eastern Bahia and Sergipe	Remnants of Atlantic coastal forest, transitional forest, and Mata Cipó
<i>A. compta</i>	Brazil: western Minas Gerais, mostly west of Rio São Francisco	Forested areas
<i>A. dubia</i>	Brazil: Espírito Santo, Rio de Janeiro, São Paulo, Paraná, and Santa Catarina along the coast	Atlantic coastal forest
<i>A. exigua</i>	Brazil: Goiás, Minas Gerais, Bahia, Mato Grosso, Maranhão?	Campos and roadsides
<i>A. ferruginea</i>	Venezuela: Amazonas, Bolívar; Colombia: Amazonas, Caquetá, Guainia, Vaupes; Peru: Loreto; Brazil: Amazonas	Savannas and open mesic forests in sandy soils

Table 1. Cont.

Species	Country and State	Habitat
<i>A. funifera</i>	Brazil: coastal Bahia, Alagoas, Sergipe	Sand dunes and Atlantic coastal forest
<i>A. geraensis</i>	Brazil: Minas Gerais, São Paulo, Mato Grosso, Goiás, southwestern Bahia; Paraguay: Cordillera	Cerrados (fine sandy fertile soils) and roadsides
<i>A. humilis</i>	Brazil: eastern Bahia, Espírito Santo, Rio de Janeiro, São Paulo	Coastal forest, wet restingas
<i>A. iguadummat</i>	Panama: Colon, Comarca de San Blas	Extremely wet primary forests, along streams, and on ridges and slopes
<i>A. nucifera</i>	Colombia: Santander, Nariño, Bolivar, Norte de Santander, Tolima, Cundinamarca	Dense forests
<i>A. oleifera</i>	Brazil: Paraíba, Pernambuco, Alagoas	Atlantic coastal forest
<i>A. × piassabossu</i>	Brazil: eastern Bahia	Atlantic coastal forest
<i>A. pindobassu</i>	Brazil: central Bahia	Transitional mesophytic forest
<i>A. salvadorensis</i>	Brazil: eastern Bahia, near Amelia Rodrigues	Secondary forest
<i>A. seabrensis</i>	Brazil: central Bahia	Transitional mesophytic forest
<i>A. septuagenata</i>	Colombia: Amazonas, endemic to Rio Miritiparana area	Forested areas along rivers
<i>A. tessmannii</i>	Peru: Loreto, Madre de Dios, Ucayali; Brazil: Acre	Flood-free and seasonally inundated forests

Lleras, Giacometti, and Coradin (fig. 3, 1983) illustrated a distribution map of 34 species of *Attalea* extracted primarily from the literature. A total of 12 of these taxa have been treated by me either as synonyms or uncertain species or have been transferred to other genera.

Relationships within Genus *Attalea*

Alliances or relationships between taxa cannot always be accurately determined because descriptions of several species are incomplete; i.e., either the androgynous inflorescence with its pistillate flowers or the staminate inflorescence has not been collected or described in the field. In addition to this, some species are known from only one or two collections. As ex-

plained earlier, this lack of diagnostic data is the main reason for not undertaking a cladistic analysis. It is possible that a few of these taxa are actually narrow endemics, but it is likely that with further exploration the ranges of these as well as other species may be extended and morphological gaps will be filled in. Hence, it is important that additional collections be made before the habitats where these palms grow are completely destroyed because of agricultural and lumbering practices. A number of botanists are currently making extensive palm collections throughout the state of Bahia as well as in other Brazilian states, which should be important in clarifying relationships between certain poorly known species.

Although leaf anatomy proved to be an important systematic tool in my other studies of *Syagrus* and allied genera (1972b, 1978c, 1987) and *Butia* (1979), for *Attalea* it has not provided much additional data that can be correlated with the morphological characteristics. In the following outline, I have tentatively divided the genus into infrageneric categories. The largest subgeneric division is based on clustering of pinnae. Seven species (*A. exigua*, *A. barreirensis*, *A. allenii*, *A. funifera*, *A. tessmannii*, *A. seabrensis*, and *A. dubia*) have their middle series pinnae arranged in clusters of 2–5, whereas middle series pinnae of the remaining 14 are regularly arranged. In *A. seabrensis* and *A. × piassabossu*, however, middle series pinnae are mostly regularly arranged, but only the lower one-third to one-half of the rachis has clustered pinnae. Of the taxa with clustered pinnae, three are acaulescent, while the others are arborescent. *A. barreirensis* may be more closely allied to *A. allenii* than to *A. exigua* from central Brazil. *A. exigua* differs from the other two in having much longer pistillate rachillae and a distinct leaf anatomy pattern (abaxial nonvascular fiber bundles [NVF]) attached to the base of veins instead of alternating with the veins (see fig. 75). On the other hand, *A. allenii* is distinct from the other two species by having petals of staminate flowers with punctate glands and is geographically disjunct.

Concerning the arborescent taxa, *A. funifera* is one of the most distinct, apparently with few close relatives, because of its unusually long petiolar fibers and grooved fruits with a very thick mesocarp and endocarp without visible fibers; *A. tessmannii* is probably without close relatives because it is the only species of *Attalea* with clustered pinnae in which the staminate flowers completely encircle the staminate rachilla instead of being inserted on only one side of the rachilla. One other species of *Attalea*, *A. iguadummat*, has spirally arranged staminate flowers, but does not appear to be closely related to *A. tessmannii*. *A. × piassabossu* is a hybrid between

A. funifera and *A. burretiana*; and *A. × voeksii*, between *A. funifera* and *A. humilis*; *A. seabrensis* seems to be closely related to *A. pindobassu*.

Taxa with regularly arranged pinnae are more difficult to characterize; nevertheless, there seem to be several distinct species or groups of related species. As with the subdivision having clustered pinnae, these members can also be divided into palms with trunks and palms without trunks. The acaulescent species are separated into two groups based on their number of stamens. The two taxa with more stamens (12–52) are *A. amygdalina* and *A. ferruginea*, but each has several distinct characteristics. Concerning the group of four taxa with fewer stamens (6–10), *A. iguadummat* and *A. nucifera* appear to be the most distinct because of their rather specialized features, such as spirally arranged staminate flowers and staminate flowers with reddish glandular hairs, respectively. The remaining taxa, *A. humilis* and *A. geraensis*, appear to be allied to one another, although *A. humilis* has more distinct characteristics than *A. geraensis*.

Regarding the eight remaining arborescent members, *A. septuagenata* is easily differentiated from the others by an unusually high stamen number in each flower (60–75). *A. pindobassu*, *A. burretiana*, and *A. seabrensis* are apparently closely related because they have fairly wide middle series pinnae, relatively long staminate rachillae, and staminate flowers similar in size. They differ primarily in the arrangement of the lower pinnae along the rachis. *A. oleifera* and *A. compta* are probably closely related because they have pinnae of similar width and staminate rachillae, staminate flowers, and fruits of similar size. They differ mainly in the number of seeds in their fruit. *A. salvadorensis* may be a hybrid between *A. humilis* and *A. burretiana*. Finally, *A. apoda* and *A. brasiliensis* seem to be closely allied because of their similar appearance. They differ mainly in the number of seeds in their fruit and the nervation of their staminate petals.

Evolution within the genus *Attalea*, as well as within other genera in the subtribe *Attaleinae*, probably has been taking place since the Eocene period. Fossil cocoid fruits of mostly indeterminate genera from this period have been reported from several localities (see Moore, 1973). In some ways, the evolution of *Attalea* parallels that of *Syagrus* and other genera in the subtribe *Butiinae*. Both *Attalea* and *Syagrus* are almost entirely South American in distribution with a large number of acaulescent species occupying similar habitats, although more members of *Attalea* are found in mesic rather than dry habitats. In addition to this, *Attalea* is not easily divided into infrageneric categories, but part of the problem may be attributed to the genus being incompletely known or poorly understood. The disparity between species

or groups of species may be due to its long evolutionary history, and perhaps the well-differentiated, less closely related taxa have been in existence a much longer period of time than the more closely related species. It is unfortunate that the fossil record is not complete enough to determine more accurately when some of these evolutionary events took place.

Outline of Tentative Division of *Attalea* into Infrageneric Categories

Subgenus I. All middle series pinnae in clusters of 2–6.

Section 1. Plants acaulescent for the most part, leaf rachis 1.0–3.5 m long. *A. exigua*, *A. barreirensis*, *A. allenii*.

Section 2. Plants arborescent for the most part, leaf rachis 6–18 m long.

Subsection A. Staminate flowers completely encircling the staminate rachillae. *A. tessmannii*.

Subsection B. Staminate flowers on one side of rachillae, sheath and petiole fibers up to 3 m long, endocarp of fruit without visible fibers. *A. funifera*.

Subsection C. Staminate flowers on one side, fibers up to several cm long, endocarp with at least some visible fibers. *A. dubia*.

Subgenus II. Middle series pinnae regularly arranged except for one species with partially clustered middle series pinnae.

Section 3. Plants mostly acaulescent.

Subsection D. Stamens 12–52 in number. *A. ferruginea*, *A. amygdalina*.

Subsection E. Stamens 6–10 in number.

Series a. Staminate flowers completely encircling rachillae. *A. iguadummat*.

Series b. Staminate flowers arranged on one side of rachillae

Subseries 1. Petals of staminate flowers with reddish glandular hairs. *A. nucifera*.

Subseries 2. Petals of staminate flowers without glandular hairs.

A. humilis, *A. geraensis*.

Section 4. Plants mostly arborescent.

Subsection F. Stamens 60–75 in number, mesocarp of fruit with conspicuous air pockets. *A. septuagenata*.

Subsection G. Stamens 6–12, mesocarp without air pockets.

Series c. Middle series pinnae 6–8 cm wide, anthers 9–14 mm long. *A. seabrensis*, *A. pindobassu*, *A. burretiana*.

Series d. Middle series pinnae 3.5–5.5 cm wide, anthers 6–8 mm long. *A. oleifera*, *A. compta*, *A. apoda*, *A. brasiliensis*.

Taxonomic Treatment of Genus *Attalea*

In the present paper I am recognizing 21 species and 2 hybrids of genus *Attalea* (out of 68 published taxa), including the descriptions of 4 new species.

All published names pertaining to *Attalea* as a genus are included here. Following the taxonomic treatment is a list and discussion of doubtful and uncertain species of *Attalea*. A list of excluded species of *Attalea* will be found after the discussion of hybrids of *Maximiliana*.

Subfamily **Arecoideae**

Tribe **Cocoeae** Martius in Endlicher, Gen. Plant. 254. 1837. ("Cocoineae").
Subtribe **Attaleinae** Drude in Engler and Prantl, Natural. Pflanzenfam. 2, 3:27, 78. 1887. ("Attaleae"). TYPE: *Attalea*.

Attalea Kunth, in Humboldt, Bonpland, and Kunth, Nov. Gen. Sp. 1:folio edition 248. quarto edition 309. 1816; Martius, 1824, 1826, 1844, 1845, 1853; Drude, 1881; Barbosa Rodrigues, 1903b; Burret, 1929a, 1938; Bondar, 1942a, 1942b; Dugand, 1953, 1954; Wessels Boer, 1965, 1972, 1988; Glassman, 1977a. **TYPE:** *Attalea amygdalina* Kunth, in Humboldt, Bonpland, and Kunth, Nov. Gen. Sp. 1:309. 1816; section *Attalea Verae* Drude, Martius Fl. Bras. 3:1881; section *Euattalea* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:1929a; section *Cylindrostachys* Drude, Martius Fl. Bras. 3:1881; section *Chaunostachys* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:1929a; section *Dasystachys* Burret, Notizbl. Bot. Gart. Berlin Dahlem 10:1929a.

Pindarea Barb. Rodr., Pl. Jard. Rio de Janeiro 5:17. 1895. 1903b.
TYPE: *P. concinna* Barb. Rodr., Pl. Jard. Rio de Janeiro 5:17, t. 4C. 1895. (= *Attalea dubia* [Martius] Burret).

Lithocarpus Targioni-Tozzetti, Mem. Mat. Fis. Soc. Ital. Sci. Modena 20:312. 1833. (non *Lithocarpus* Blume 1825–26). **TYPE:** *L. cocciformis* Targioni-Tozzetti, Mem. Mat. Fis. Soc. Ital. Sci. Modena 20:312. 1833 (illegitimate name).

Sarinia Cook, Nat. Hort. Mag. 21:78. 1942. **TYPE:** *S. funifera* (Martius) Cook, Nat. Hort. Mag. 21:78. 1942. (= *Attalea funifera* Martius).

Trees (in 12 species), from 4–6 m tall to 25–30 m tall and 13–46 cm in diam, trunks usually single, sometimes caespitose, at first with prominent scars caused by abscission of leaves, later becoming obscured through weathering; without emergent stem or **acaulescent** (in 8 species), but with

subterranean stem and occasionally with short aerial trunk; **leaves** borne at apex of stem in a dense crown or cluster, with youngest ones in the center; **sheathing leaf base** 20–130 cm long, usually consisting of a mass of relatively thin or coarse interwoven fibers, individual fibers sometimes up to 3.6 m long and of commercial value, surfaces sometimes with brownish lepidote indument; **petiole** absent or short (6–34 cm long) in some taxa to 2.0–3.6 m long in others, and 2.5–17.0 cm wide, margins fibrous, becoming smooth with age, surfaces glabrous, ferruginous lepidote or tomentose, sometimes with dark ferruginous indument consisting of sharp, narrow, irregularly curved scales; **leaf rachis** 1–10 m long, surface glabrous or glaucous in several species, rarely soft blackish pubescent or harsh blackish pubescent, ferruginous lepidote in others or whitish brown lepidote, becoming glabrescent or green with age; blades pinnately compound, **pinnae** reduplicate in veneration (inverted V-shaped in cross section), 50–200 in number on each side of rachis, uppermost and lowermost series usually much shorter and narrower than middle series pinnae, which are 40–43 cm long and 1.5–2.5 cm wide in some species and up to 130–40 cm long and 6–8 cm wide in others, usually regularly (singly) arranged or in clusters of 2–6 (in several species), regularly or irregularly spaced, usually lie flat, but divergent in a few taxa, intervals between pinnae or clusters 0.5–9.0 cm apart, mostly with acuminate or aristate asymmetrical tips, surfaces usually glabrous or glaucous, but ferruginous or brownish lepidote or tomentose on margins and tips in several species, or with small patches of brown rammenta along midrib grooves or abundant reddish punctate dots on abaxial side in some others, cross veinlets sometimes prominent; **inflorescences** located within leaf crown among older leaf bases, several per tree and usually of two kinds: (1) **androgynous** with both pistillate and staminate flowers and (2) **staminate** with only staminate flowers, for the most part; each inflorescence consists of a basal prophyll (usually concealed by a leaf sheath), one or more peduncular bracts, and a much larger and wider rameal bract or sterile bract that at maturity (anthesis) splits longitudinally along a midventral line, exposing part or most of the rachis and its flowers; expanded part of **staminate sterile bract** 26 cm long and 4–6 cm wide in some species to 235 cm long and 30 cm wide in others (including beak or rostrum of 4–27 cm long) and up to 4 cm thick, sulcate, depths of grooves variable, grooves often irregularly spaced, woody-fibrous, sometimes brittle, glabrous, glaucous or with brownish indument, frequently becoming greenish or glabrous with age, peduncular or narrowed basal part of sterile bract 16–60 cm long; **rachis**

of **staminate inflorescence** 20–24 cm long in several species to 200 cm long in a few others, peduncle 10–125 cm long, **rachillae** numerous, 3–7 cm long in several species to 38–41 cm long in a few others, glabrous or whitish or brownish pubescent; **staminate flowers** numerous, mostly arranged in two rows along one side of the rachilla, twisting of rachillae sometimes gives the appearance of a third row of flowers, spirally arranged around rachilla in two species, occasionally with one basal pistillate flower on some rachillae, staminate flowers 10–15 mm long and 2–3 mm wide in several species to 20–30 mm long and 6–7 mm wide in a few others, **petals** mostly 3 (rarely 4), always flattened, usually with acuminate tips and denticulate margins, obscurely or prominently veined, usually glabrous and free of glands, but margins sometimes with patches of brownish white pubescence, or with tiny punctate glands covered with brownish pubescence, becoming glabrous with age exposing glands, or with patches of reddish glands or short reddish glandular hairs, or dark brown in color with white lepidote or farinose indument along margins, sepals usually 3, very short (mostly 0.5–2.0 mm), triangular, with free, acuminate or acute tips and fused bases, **stamens** vary in number from consistently 6 to 6–10, 10–15, 17–21, 15–52, and 60–75, separate, included in the corolla, **anthers** dorsifixed, thecae usually straight, 3–6 mm long (in several species) to 12–14 mm long in a few others, **filaments** 1–4 mm long, inserted on receptacle; expanded part of **androgynous sterile bract** from 29–34 cm long to 158–63 cm long (usually with prominent beak 6–33 cm long), 4–6 cm wide in some species to 40 cm wide in others and up to 4 cm thick, mostly deeply sulcate, grooves usually irregularly spaced, woody-fibrous in texture, sometimes brittle, surfaces glabrous, glaucous, or brownish pubescent peduncular or narrowed basal part 20–80 cm long; **rachis** of **androgynous inflorescence** 10–140 cm long, brownish or whitish tomentose or lepidote, or glabrous, usually with many **rachillae** that are very short or sessile in several species, and 1–18 cm long in others, with 1–8 pistillate flowers on lower half of rachilla, each usually accompanied by two adjacent staminate flowers that fall off early in anthesis, each androgynous rachilla with a narrower **staminate rachilla extension** (very brittle and easily broken off) containing one or two rows of staminate flowers only, 6–18 cm long; (in species descriptions of all four genera, the androgynous rachillae will be referred to as lower pistillate portion and upper narrower staminate extension); **pistillate flowers** 2–5 cm long and 1–3 cm in diam, **petals** 3, usually same size as the 3 sepals, sometimes slightly longer or shorter, texture of both more or less smooth, obscurely or distinctly nerved, petals rarely

rugose and glandular dotted, **pistil** 2–4 cm long, ovary sometimes glabrous, more commonly with whitish or brownish indument, rarely farinose, style very short or obscure, **stigmas** usually 3 in number, occasionally 4 or 6, each 6–12 mm long, staminodial ring 0.5–1.5 cm high, usually glabrous and with smooth margins, but rarely brownish tomentose and with ciliate margins; **staminate flowers** (from rachillae of pistillate flowers or extended part of rachilla with staminate flowers only) often the same size as those from staminate inflorescence, but frequently abnormal or sterile, rarely with petals up to 4 cm long, stamens usually the same number as in staminate flowers from staminate inflorescence, but anthers sometimes much smaller and probably sterile; pubescent and glaucous androgynous sterile bracts and inflorescences gradually become glabrous and greenish or brownish, and rachillae usually become thickened during fruit development; **fruit** from 4–5 cm long and 2.5 cm in diam to 15 cm long and 9 cm in diam, mostly ovoid in shape, beak usually 0.5–2.5 cm long, sometimes with distinct longitudinal grooves or irregularly angled (probably due to crowding of fruits in infructescence), persistent perianth 1.5–5.0 cm high, staminodial ring connate, 0.8–1.5 cm high, margins usually smooth, but others with brown ciliate margins; **epicarp** usually greenish and glabrous, sometimes yellow, ferruginous tomentose at maturity in several species, mostly fibrous, 1–2 mm thick, but woody-fibrous and 4–6 mm thick in a few others; **mesocarp** soft, 0.5–2.0 mm thick (in several species) 4–6 mm thick (in several others, sometimes divided into two parts) and rarely up to 13 mm thick, oily in a number of species, sometimes with conspicuous air pockets; **endocarp** usually woody or bony in texture 0.5–2.0 cm thick; **fiber clusters** usually scattered and inconspicuous, sometimes completely free of visible fibers, but in several species with prominent irregular patches of fibers or with prominent patches arranged in a circular pattern; **seeds** more commonly 1–2, less commonly 3–5, rarely 8 in number, 2–5 cm long and 1.0–2.5 cm in diam, yielding an edible oil in a number of species.

Key to Species of *Attalea*

1. Middle series pinnae in clusters of 2–6 or only lower one-third to one-half of rachis with clustered pinnae in some arborescent species . . .
 (*A. seabrensis* and *A. × piassabossu*).
2. Plants acaulescent, leaf rachis 1.0–3.5 m long.
3. Staminate rachillae 10–15 cm long, staminate flowers 20–24 mm long, stamens about one-third as long as petals, leaf sheath fibers

- very long (up to 3 m), angled toward base
- 4. *A. funifera* (Brazil: Bahia).
- 3. Staminate rachillae 3–8 cm long, staminate flowers 12–16 mm long, stamens one-half to two-thirds as long as petals, leaf sheath fibers much shorter, angled upward.
- 4. Pistillate portion of androgynous rachilla up to 9 cm long, middle series pinnae 1.5–2.0 cm wide, endocarp of fruit with conspicuous ring of fiber clusters
- 1. *A. exigua* (Brazil: Goiás, Minas Gerais, Mato Grosso).
- 4. Pistillate portion of androgynous rachilla very short (0.5–1.0 cm), middle series pinnae 3.0–5.5 cm wide, endocarp of fruit with inconspicuous clusters of fibers.
- 5. Petals of staminate flowers without punctate glands covered with brownish lepidote indument, anthers 9–11 mm long, tips of pistillate petals tridentate
- 2. *A. barreirensis* (Brazil: Bahia).
- 5. Petals of staminate flowers with distinct punctate glands covered with brownish lepidote indument, anthers 5–7 mm long, tips of pistillate petals acute
- 3. *A. allenii* (Panama, Colombia).
- 2. Plants arborescent, leaf rachis 6–18 m long.
- 6. Middle series pinnae mostly regularly arranged, only lower one-third to almost one-half of rachis with clustered pinnae.
- 7. Lower staminate rachillae 15–20 cm long, pistillate portion of androgynous rachillae 1–3 cm long, stigmas 3–6 in number
- 14. *A. seabrensis* (Brazil: Bahia).
- 7. Lower staminate rachillae 25–29 cm long, pistillate portion of androgynous rachillae 12–18 cm long, stigmas 3 in number
- *A. × piassabossu* (Brazil: Bahia).
- 6. Pinnae clustered throughout except for extreme upper pinnae.
- 8. Staminate flowers completely encircling the staminate rachillae
- 5. *A. tessmannii* (Peru).
- 8. Staminate flowers in two rows on one side of the staminate rachillae.
- 9. Staminate flowers 21–24 mm long, petals 3–5 mm wide and valvate, fruits 10–15 cm long, mesocarp up to 13 mm thick, individual sheath and petiole fibers up to 3.5 m long, mostly projected downwards toward base
- 4. *A. funifera* (Brazil: Bahia).

9. Staminate flowers 10–20 mm long, petals 1.5–2.5 mm wide and imbricate, fruits 6.0–8.5 cm long, mesocarp 3–4 mm thick, individual sheath and petiole fibers up to several cm long, projected upward away from the base
- 6. *A. dubia* (Brazil: Espirito Santo to Santa Catarina).
1. Middle series pinnae regularly arranged along rachis, sometimes lower one-tenth of rachis with loose, widely spaced pairs of pinnae (*A. pindobassu*).
10. Plants acaulescent.
11. Stamens 12–52 in number, staminate petals without patches of reddish glandular hairs, and staminate flowers not spirally arranged around rachilla.
12. Middle series pinnae 80–95 cm long and 3–4 cm wide, margins and apices ferruginous-lepidote, staminate flowers 2.5–3.0 mm wide, petals with patches of brownish white lepidote indument, stamens 15–52 in number, petals of pistillate flowers rugose and glandular dotted, fruits 6.5–9.0 cm long, mesocarp about 1 mm thick
- 8. *A. ferruginea* (Venezuela, Colombia, Peru, Brazil).
12. Middle series pinnae 115–25 cm long and 6–8 cm wide, margins and apices more or less glabrous, staminate flowers 4–6 mm wide, petals mostly glabrous, stamens 12–21 in number, petals of pistillate flowers not rugose or glandular dotted, fruits 10–12 cm long, mesocarp 2–6 mm thick 7. *A. amygdalina* (Colombia).
11. Stamens 6–15 in number, staminate petals either with reddish glandular hairs or staminate flowers spirally arranged in *A. nucifera* and *A. iguadummat*.
13. Middle series pinnae 100–148 cm long and 6–7 cm wide; staminate rachillae 13–19 cm long.
14. Petals of staminate flowers with scattered patches of reddish glandular hairs at anthesis, staminate flowers arranged on one side of rachillae
- 9. *A. nucifera* (Colombia).
14. Petals of staminate flowers without reddish glandular hairs, staminate flowers spirally arranged around rachillae 10. *A. iguadummat* (Panama).
13. Middle series pinnae 46–95 cm long and 2.5–5.5 cm

wide, staminate rachillae 5–11 cm long, staminate petals without reddish glandular hairs, flowers arranged on one side of rachilla.

15. Leaf rachis 2.5–5.3 m long, rachis of staminate inflorescence 34–44 cm long, stamens consistently 6 in number, middle series pinnae 3.5–5.5 cm wide, anthers 8–12 mm long. 11. *A. humilis* (Brazil: Bahia, Espirito Santo, Rio de Janeiro, São Paulo).
15. Leaf rachis 1.5–2.2 m long, rachis of staminate inflorescence 20–30 cm long, stamens 6–10 in number, middle series pinnae 2.5–3.0 cm wide, anthers 7–9 mm long. 12. *A. geraensis* (Brazil: Minas Gerais, Goiás, Bahia, São Paulo, Mato Grosso).
10. Plants arborescent.
 16. Petiole and leaf rachis covered with indument of dark, sharp, curved scales, stamens 60–75 in number, petals of staminate flowers with white lepidote or farinose margins, mesocarp of fruit with conspicuous air pockets 13. *A. septuagenata* (Colombia).
 16. Petiole and leaf rachis not covered with indument of sharp, curved scales, stamens 6–12 in number, petals of staminate flowers more or less glabrous, mesocarp without air pockets.
 17. Staminate rachillae 15–31 cm long, rachis of staminate inflorescence 85–150 cm long.
 18. Middle series pinnae 6–8 cm wide, anthers 9–14 mm long.
 19. Lower pinnae with several widely spaced loose clusters of 2–3, petiole 1.2–2.0 m long, stigmas 6 in number, pistillate portion of androgynous rachilla 2.0–4.5 cm long, epicarp of fruit 3–5 mm thick 15. *A. pindobassu* (Brazil: Bahia).
 19. Lower pinnae not in widely spaced loose clusters, petiole very short or absent, stigmas 3 in number, pistillate portion of androgynous rachillae either less than 1 cm, 6–7 cm, or 13–14 cm long, epicarp of fruit 1.5–2.0 mm thick 16. *A. burretiana* (Brazil: Bahia).
 18. Middle series pinnae 3.5–5.5 cm wide, anthers 6–8 mm long.
 20. Petiole 0.6–1.5 m long, staminate rachillae 18–22 cm long, staminate flowers 12–15 mm long, stamens 6–

- 9 in number, fruits 1–2 seeded
- 17. *A. oleifera* (Brazil: Pernambuco).
20. Petiole 0.1–0.2 m long, staminate rachillae 15–18 cm long, staminate flowers 15–18 mm long, stamens 10–12 in number, fruits with 3–4 seeds
- 18. *A. compta* (Brazil: Minas Gerais).
17. Staminate rachillae 6–14 cm long, rachis of staminate inflorescence 35–45 cm or 60–80 cm long.
21. Staminate rachillae 6–11 cm long, usually acaulescent, but sometimes with trunk up to 1 m tall
- 11. *A. humilis* (Brazil: Bahia).
21. Staminate rachillae 12–14 cm long, trees up to 30 m tall.
22. Rachis of staminate inflorescence 60–80 cm long, staminate rachillae 12–14 cm long, staminate flowers 17–20 mm long, petals strongly nerved, mesocarp 1 mm thick, fruits 1 seeded
- 19. *A. apoda* (Brazil: Minas Gerais).
22. Rachis of staminate inflorescence 35–45 cm long, staminate rachillae 9–11 cm long, staminate flowers 13–16 mm long, mesocarp 2.5–3.0 mm thick.
23. Staminate flowers mostly with four petals, each strongly nerved, fruits about 9 cm long, 1 seeded, fiber clusters in endocarp not prominent
- 20. *A. salvadorensis* (Brazil: Bahia).
23. Staminate flowers with three petals, each obscurely nerved, fruits about 6 cm long, 2 seeded, fiber clusters in endocarp prominent
- 21. *A. brasiliensis* (Brazil: Goiás).

Taxonomic Treatment of Species of *Attalea*

1. *Attalea exigua* Drude, Martius Fl. Bras. 3:439. t. 100, fig. 1. 1881; Burret, 1929a; Glassman, 1977a; Henderson, Galeano, and Bernal, 1995.
TYPE: Brazil, between Goiás and Cuyaba, 1844, *Weddell 2965* (lectotype, P!, only 1 of 2 sheets, flower of sheet 2 belongs to *Orbignya*; isotype F!). **Figs.** 37, 75, 78.

Acaulescent; sheathing leaf base and petiole not measured; leaves about 1 m long (fide Drude); 50–60 **pinnae** on each side of rachis, those from middle series in clusters of 2–3, 50–54 cm long, 1.5–2.0 cm wide, with asymmetrical tips; expanded part of **staminate sterile bract** about 28 cm

long and 3.5 cm wide (immature?), peduncular part about 12 cm long; **rachis** of **staminate inflorescence** about 19 cm long, peduncle 10 cm long, **rachillae** 30–40 in number, 6–7 cm long; **staminate flowers** mostly in single row on one side of the rachilla, 12–15 mm long, **petals** flat, 2–3 mm wide, distinctly nerved, with acuminate tips, margins somewhat denticulate, sepals 1–2 mm long, **stamens** 6–7 in number (9, fide Drude), **anthers** 5–6 mm long, **filaments** 2–3 mm long; **androgynous inflorescence** not measured; **androgynous rachilla** (from *Weddell 2022* [B]) with stalk of 9 cm and flowering part of 9 cm, with 7 **pistillate flower** scars, **extended staminate rachilla** about 3 cm long (incomplete); **fruit** (from *Weddell 2022* [B]) 6 cm long and 3.5–4.0 cm in diam (including beak of 8 mm long), **epicarp** and **mesocarp** not readily distinguishable, fibrous, about 2 mm thick, **endocarp** hard, 6–8 mm thick, with conspicuous ring of **fiber clusters** confined to middle of endocarp, seed cavities 2, **seeds** not seen.

Distribution and Habitat. See table 1.

Vernacular Name. *Indaia rasteira*.

Representative Specimens Examined. BRAZIL. Goiás: near Salinas, 1844, *Weddell 2022* (B, P); near Goiás, campo, July 1895, *Glaziou 22267* (P). Minas Gerais: Riacho das Varas, Campo, Mar. 1893, *Glaziou 20022* (P).

Specimens Tentatively Included. BRAZIL: Maranhão: *Sneathlage 735* (B), 737 (B).

As previously mentioned, this taxon is most similar to *A. barreirensis* from Bahia and *A. allenii* from Panama and Colombia; however, its present distribution is uncertain because the last known collection was made in 1895.

2. *Attalea barreirensis* Glassman. *sp. nov.* **TYPE:** Brazil, Bahia, munic. Barreiras, 28 km west of Barreiras, cerrado, Aug. 1976, *Glassman 13048* (holotype, F!; isotype, SP!). **Figs.** 31–32, 69, 78.

Palma acaulis, pinnis mediis aggregatis, 35–46 cm longis, 3.0–4.6 cm latis, bractea mascula 36–46 cm longa, 9–13 cm lata, fusco-ferruginea, inflorescentia mascula multiramosa, pedunculo 21–25 cm longo, rachide 16–27 cm longa, rachillis 4–8 cm longis, flores masculi 14–16 mm longi, stamina 6 numero, antherae 9–11 mm longae, fructus 5.0–5.5 cm longus, 3.0–4.5 cm diametro, exocarpio fibroso, 1 mm crasso, mesocarpio pulposo, 1 mm crasso, endocarpio osseo, 5 mm crasso, semina 1, 2.2 cm longa, 2 cm lata.

Acaulescent, plants solitary or caespitose; **sheathing leaf base** not measured, **petiole** 14–45 cm long, **leaf rachis** 0.8–1.8 m long; 60–112 **pinnae** on each side of rachis, those from middle series in clusters of 2–4, 35–46 cm long, 3.0–4.6 cm wide, with asymmetrical tips; expanded part of

staminate sterile bract 36–46 cm long (including beak of 4 cm long), 9–13 cm wide and 2–3 mm thick, deeply sulcate, covered with dense brownish tomentum, peduncular part about 20 cm long; **rachis of staminate inflorescence** 16–27 cm long, peduncle 21–25 cm long, **rachillae** 35–79 in number, 4–8 cm long; **staminate flowers** arranged in two rows along one side of the rachilla, 14–16 mm long and 4–5 mm wide, **petals** obscurely nerved, mostly with acute tips, **sepals** 1–2 mm long, **stamens** 6 in number, **anthers** 9–11 mm long, **filaments** about 2 mm long; **androgynous sterile bract** 21–30 cm long and 6–9 cm wide, **rachis of androgynous inflorescence** 8–11 cm long, peduncle 8–10 cm long; **pistillate rachillae** very short or absent, **pistillate flowers** with apices of petals tridentate, 3.0–3.5 cm long and 1.5–2.0 cm in diam, **stigmas** 3; expanded part of **fruiting sterile bract** about 29 cm long (including beak of 4 cm long) and 8 cm wide, deeply sulcate, with brownish tomentose indument, becoming glabrous with age; **rachis of infructescence** 16 cm long, with about 32 fruits per rachis, **fruiting rachillae** short, 0.5–1.0 cm long, with only 1 fruit per rachilla; **fruit** yellow to reddish-orange, turning purple when mature (fide Noblick, 1991), 5.0–5.5 cm long and 3.0–4.5 cm in diam, persistent perianth 2–4 cm high, staminodial ring about 1 cm high, **epicarp** fibrous, about 1 mm thick, **mesocarp** soft, about 1 mm thick, **endocarp** hard, about 5 mm thick, with scattered **fiber clusters** mostly arranged in a circle, **seed** 1 in number, about 2.2 cm long and 2 cm in diam, with central cavity about 1 cm long.

Distribution and Habitat. Brazil, common in western Bahia, in cerrados at elevations of 600–800 m. According to Noblick (1991), this species was also observed at the old airport in Barreiras, between Cocos and Coribe in the south and various points between, e.g., Baianópolis. Noblick observed large populations from São Desiderio and Roda Velho to Barreiras and north to São Marcelo; he believed that this species eventually will be found in southern Piauí, Goiás, and Minas Gerais.

Vernacular Name. *Catolé* (fide Noblick, 1991).

Representative Specimens Examined. **BRAZIL.** Bahia: munic. Barreiras, 28 km west of Barreiras, cerrado, Aug. 1976, *Glassman 13047* (F, SP); Baianópolis, 12–13 km sul do povoado de Cocos (Rio São Desiderio) na estrada Varzeas-Correntina, sandy soil, cerrado, 700–800 m, Feb. 1986, *Noblick and Lobo 4528* (HUEFS); Coribe, 7–8 km sul da cidade na BR172 (Coribe/Cocos), common, poor sandy soil, in cerrado, 650–700 m, Jan. 1986, *Noblick and Lobo 4522* (HUEFS).

This taxon appears to be most similar to *A. exigua* from Mato Grosso and

A. allenii from Panama and Colombia in being acaulescent, having clustered middle series pinnae, and having similar-sized staminate flowers (12–16 mm long). The new species can be differentiated from *A. exigua* by longer anthers (9–11 vs. 5–6 mm) and 1-seeded fruits with inconspicuous patches of endocarp fibers rather than 2-seeded fruits with a conspicuous ring of endocarp fibers. *A. barreirensis* has the same number of stamens and very short androgynous rachillae as in *A. allenii*, but has longer anthers (9–11 vs. 5–7 mm), narrower middle series pinnae (3.0 cm vs. 4.0–5.5 cm), and smooth staminate petals rather than petals with punctate glands.

The fruits of *A. barreirensis* are edible, and the sweet seeds are used locally in making candy.

3. *Attalea allenii* H. E. Moore, Gentes Herb. 8:191, fig. 82. 1949; Dugand, 1953; Glassman, 1977a; de Nevers, 1987; Henderson, Galeano, and Bernal, 1995. **TYPE:** Panama (*Allen 4103*, holotype, MO!; isotype, BH!). **Figs.** 42, 65, 82.

Acaulescent or with very short trunk; **sheathing leaf base** about 73 cm long, **petiole** 0.6–3.6 m long, densely ferruginous-lepidote on convex (adaxial) side, 2.5 cm in diam at base; **leaf rachis** 3.3–3.6 m long, densely ferruginous-lepidote on flat (abaxial) side, glabrous adaxially; 85–114 **pinnae** on each side of rachis, those from middle series in clusters of 3–6, intervals of 5–9 cm between clusters, 75–95 cm long, 4.0–5.6 cm wide, with more or less prominent cross veinlets, with acuminate asymmetrical tips, margins of pinnae covered with ferruginous lepidote indument chiefly near tips; expanded part of **staminate sterile bract** 30–38 cm long (including beak of 6 cm long) and 4–6 cm wide, deeply sulcate, peduncular part 19 cm long; **rachis** of **staminate inflorescence** 22–39 cm long, peduncle about 28 cm long, **rachillae** 30–50 in number, 3.0–4.5 cm long, covered with a dark brown lepidote indument; about 12–15 **staminate flowers** per rachilla, arranged in two rows along one side of the rachilla, 10–15 mm long, **petals** flat, 2–4 mm wide, with acuminate tips and denticulate margins, obscurely or more or less prominently nerved, with tiny punctate glands covered with brownish lepidote indument that exposes the glands more clearly when the indument falls off, sepals 1–2 mm long, **stamens** 6 in number, **anthers** 5–7 mm long, **filaments** 1–2 mm long; expanded part of **androgynous sterile bract** about 40 cm long (including beak of 6.5 cm long), about 6 cm wide, deeply sulcate, grooves irregularly arranged, covered with dense brownish lepidote indument, peduncular part 38–40 cm long; **androgynous inflorescence** mostly unbranched, **rachis** 10–11 cm

long, peduncle 34–35 cm long, 25–35 pistillate flower scars, pistillate flowers sessile or on short **rachillae** up to 0.5 cm long, **staminate extension** of each rachilla about 8 cm long; **pistillate flowers** 2.5–2.7 cm long and 1.5–2.0 cm in diam, sepals 1.5–1.7 cm long, shorter than petals, **pistil** about 2 cm long and 1 cm in diam, ovary covered with dense dark brown indument, **stigmas** 3, about 1 cm long, staminodial ring about 0.7 cm high; **staminate flowers** (from rachillae of pistillate flowers) 13–16 mm long, **petals** about 5 mm wide, with acute tips, more or less nerved, with scattered patches of brown lepidote indument, sepals 1–4 mm long, **stamens** 6 in number, **anthers** about 6 mm long, **filaments** 3 mm long; complete **fruiting sterile bract** not seen; **infructescence** unbranched, **rachis** 13–14 cm long, peduncle about 34 cm long; **fruit** 6.0–7.5 cm long (including beak of 5–8 mm long), 3.5–4.0 cm in diam, persistent perianth 2–3 cm high, staminodial ring 1.5–2.0 cm high and 2.5–3.0 cm in diam, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, about 0.5 mm thick, **endocarp** hard, up to 1 cm thick, **fiber clusters** obscure, **seeds** 1–3 in number, about 3 cm long and 1.5 cm in diam.

Distribution and Habitat. See table 1.

Vernacular Names. *Bangue, mangue, igua* (Panama); *mangue, taparo, taparo chiquito, taparin, corozo chiquito* (Colombia).

Representative Specimens Examined. **PANAMA.** Colon: Salud Hills, *Lao and Holdridge 197* (MO); Canal Zone: Coco solo, Sept. 1972, *Gentry 6298* (MO, R); Comarca de San Blas: El Llano-Carti road, km 16.7 west to Rio Carti Grande, Nov. 1984, *de Nevers and Herrera 4152* (NY). **COLOMBIA.** Valle: vicinity of Buenaventura, forests in concession of Carton Colombia, Feb. 1967, *Moore et al. 9460* (BH); Buenaventura, May 1926, *Cook 64* (US); slopes and ravines of Aqua Dulce, an island in Buenaventura Bay, Feb. 1967, *Moore et al. 9468* (BH); Bahia de Buenaventura, Quebra de San Joaquin, Feb. 1946, *Cuatrecasas 19948* (COL, F); Buenaventura, Camp Cartin, Mar. 1967, *D'Alessandro and Gutimes 19* (BH); R. Salaqui, Hydro Camp 14, May 1967, *Duke 11377* (BH); km. 15 Carretera Buenaventura—Buga, Finca de Moises-Caicedo, May 1958, *Patiño 203* (COL); munic. Istmina, Correg. de Togroma, May 1958, *Patiño 205* (COL); Rio Calima, La Troijita, Feb. 1944, *Cuatrecasas 16397* (COL); Corcovada region, upper Rio San Juan, dense forest, Apr. 1939, *Killip 35311* (US); Dindo area, Bajo Calima, pluvial forest, July 1984, *Gentry and Monsalve 48429* (NY); Antioquia: entre Dabeiba y Llanitos, Feb. 1942, *Cuatrecasas and Metcalf 30184* (COL); Bolivar: Bajo Magdalena, Orillas del Brazo de Mompos, Aug. 1940, *Najar 11* (COL); Nariño: Tumaco, May 1958, *Patiño CL-1* (COL), *CL-2*

(COL), *CL-3* (COL); Chocó: environs of Quibido, secondary forest, mixed with *Jessenia* and *Bactris*, July 1984, *King et al.* 548 (NY); same locality, partially disturbed forest, June 1985, *King et al.* 671 (NY); environs of Las Animas, roadside, entrance to Pan American Highway, secondary forest, *King et al.* 664 (NY).

This taxon seems to be most closely related to *A. exigua* from Goiás and Minas Gerais because both species are acaulescent and have clustered middle series pinnae. *A. allenii* differs from *A. exigua* in its mostly unbranched rather than branched androgynous inflorescences and its petals of staminate flowers with punctate glands.

According to Dugand (1961), *A. allenii* as well as other species of *Attalea* from Colombia (*A. nucifera*, *A. septuagenata*, *A. amygdalina*) have edible seeds that yield a fine edible oil. This product has not been exploited commercially for lack of efficient machines to break the hard endocarp without damaging the seeds. Endosperm of seed is used as a food and drink by local inhabitants (fide *King et al.* 664).

4. *Attalea funifera* Martius ex Sprengel, Syst. Veg. 2:624. 1825; Martius, Hist. Natur. Palm. 2:136, ts. 95–96, fig. 4. 1826; Bondar, figs. 4–10. 1942b; Noblick, 1991; Henderson, Galeano, and Bernal, 1995. **LECTO-TYPE:** (Glassman, 1977a) Brazil, Espírito Santo, Porto Seguro and Bahia (Martius, ts. 95–96, fig. 4. 1826). **Figs.** 5–8, 43, 68, 80. *Sarinia funifera* (Martius) O. F. Cook, Nat. Hort. Mag. 21:78. 1942. *A. acaulis* Burret, Repert. Spec. Nov. Regni Veg. 32:103. 1933. **TYPE:** Brazil, Bahia, *Werdermann 3182* (holotype, B). *A. funifera* var. *acaulis* Burret, in Bondar, Bol. Inst. Centr. Fom. Econ. Bahia 13:fig. 8. 1942b. *pro syn.*

Acaulescent or **trees** 1.5–15.0 m tall and 25–30 cm in diam; **sheathing leaf base** about 1.3 m long, individual fibers up to 3.6 m long; **petiole** 0.4–2.0 m long, margins with long rigid fibers up to 3.5 m long; **leaf rachis** 3.5–6.0 m long; 130–60 **pinnae** on each side of rachis, those from middle series in clusters of 3–4 (2–9), divergent, often arranged at different angles in separate interrupted groups, 60–120 cm long (up to 150 cm in cultivated specimens) and 4–7 cm wide; **staminate sterile bract** 75–135 cm long (including beak of 13–27 cm long), 14 cm wide, and 3–4 cm thick, deeply sulcate; **rachis of staminate inflorescence** 30–40 or 60–85 cm long, peduncle 35–70 cm long, **rachillae** 70–80 or 90–145 in number, 10–15 or 18–22 cm long on basal part; **staminate flowers** in two rows along one side of the rachilla, 21–24 (30) mm long, **petals** flat, 3–5 mm wide, with acute or

acuminate tips, distinctly nerved, sepals 0.5–1.0 mm long, **stamens** 6 in number, **anthers** 4–7 mm long, **filaments** 3–4 mm long; **androgynous sterile bract** 80–165 cm long (including beak of 16–37 cm long), about 12 cm wide and 4 mm thick, deeply sulcate; **rachis** of **androgynous inflorescence** 35–55 cm long, peduncle 40 cm long, with many **rachillae**, **pistillate portion** sessile, 2.0–2.5 or 4–6 cm long, with 1–4 **pistillate flowers**, each 3.0–3.5 cm long, **stigmas** 3 in number; **fruiting sterile bract** 60–93 cm long (including beak of 16 cm long) and 9 cm wide, deeply sulcate, **rachis of infructescence** 47–72 cm long, with many **rachillae**; mature **fruit** 10–15 cm long (including beak of 2.0–2.5 cm long) and 5.5–9.0 cm in diam, surface marked by 3 longitudinal grooves being sutures between carpels which are not completely closed (fide Cook, 1942), persistent perianth about 3 cm high, staminodial ring about 4 cm across and 1.4 cm high, **epicarp** fibrous, 2.0–2.5 mm thick, **mesocarp** soft, oily, 3–6 mm thick (13 mm thick, fide Burret, 1929a), **endocarp** hard, without **fiber clusters**, 1.5–1.8 cm thick, **seeds** 1–3 in number, about 4 cm long and 1.5–1.8 cm in diam.

Distribution and Habitat. Martius *ex* Sprengel (1825) cites the following: "Southern Brazil, mainly along strand, between 10–20 degrees So. lat., in coastal forests near ocean in Espirito Santo and Bahia: Porto Seguro and Ilheus, entering Minas Gerais." According to Bondar (1942b), however, *piassava* is not native in the states of Espirito Santo and Minas Gerais; it is distributed in littoral soils of Tertiary origin in Bahia from the municipality of Jiquirica, south of Salvador, to Rio Corumbahy, in the municipality of Prado. He also saw dense native forests of an acaulescent stage of *piassava* (which he called *A. acaulis*) from Reconcavo da Bahia to Rio Real near the border of Sergipe. Bondar speculated that these particular stands are trunkless and have a poor grade of fiber because they grow on poor soils with less than normal precipitation. Other fairly large populations of mostly acaulescent *piassava* (probably several thousand plants) were observed in August 1988 by Larry Noblick and me in the sand dunes area of Itapoan, in the environs of Salvador. The acaulescent plants occur mainly on the slopes, whereas in the ravines, the plants are mostly arborescent (6–10 m tall). Palm associates include *Allagoptera arenaria*, two species of *Bactris*, and *Syagrus coronata*.

According to Medeiros-Costa (1985), *A. funifera* occurs in the states of Espirito Santo, Bahia, Sergipe, and Alagoas (mainly in sand dunes and remnants of the Atlantic coastal forest); however, Voeks (1987) reports that the southern limit of this species is near Caraiva, in southern Bahia; and Voeks (1985, 1988) discusses reproductive ecology of this species.

In the northernmost part of its range (i.e., Maceio, Alagoas), the plants are unusually small (fide Noblick, 1991). One of the densest populations observed by Larry Noblick and me was in Bahia, on the island of Itaparica, along highway BR101, from Colonia de Ferias to Nazaré. Perhaps one hundred thousand trees were growing in the region, mostly on red, sandy soils, in remnants of the Atlantic coastal forest, associated with *Syagrus botryophora*, *Bactris* sp., and *Polyandrococos caudescens*. In a few localities near Salvador, *A. funifera* hybridizes with *A. burretiana* to produce *A.* × *piassabossu*; *A. funifera* also crosses with *A. humilis*, resulting in *A.* × *voeksii*, known only from one station. These taxa will be treated in more detail under "Hybrids of *Attalea*."

Vernacular Names. *Piassava*, *piaçaba*, *piraçaba*, *coquilha*, *coquilla* (fruits), *piassaveira* (fibers).

Representative Specimens Examined. **BRAZIL.** Bahia: Bondar 21 (F-404620), Bondar s.n. (F-619760); Salvador, sand dunes, Nov. 1935, Dahlgren s.n. (F-614747); 9 km east of Nazaré, along BA245, remnant of Atlantic coastal forest, stand of 750–1,000 trees, Aug. 1988, Noblick and Glassman 4578 (BAH, F), 4579 (BAH, F), 4580 (BAH, F), 4581 (BAH, F); munic. Aguas Claras, 15 km west of Salvador, along BR324, 500 m north of access to USIBA, remnant of Atlantic coastal forest, in low area, above stream associated with *Syagrus botryophora*, *Bactris*, and *Polyandrococos*, about 300 trees in area, near FRIMASA meat processing plant, Aug. 1988, Noblick and Glassman 4586 (BAH, F). **CULTIVATED.** **BRAZIL.** Jard. Bot. Rio Jan., July 1886, Glaziou 16483 (BR, C, MO, P); Bailey and Bailey 484 (BH); Dahlgren s.n. (F-611639).

As previously mentioned, this taxon is probably most closely related to *A. dubia* because both are mostly arborescent with clustered middle series pinnae. They differ mainly in the size of their staminate rachillae and flowers, the number of stamens per flower, the size of their fruits, and the very long fibers from the leaf base in *A. funifera*.

According to Cook (1942), *A. funifera* belongs in a separate genus because of the unusual fibrous structure of the sheathing leaf bases and exceptionally thick and uniform texture of the endocarp (i.e., not reinforced by an indurated layer of mesocarp fibers that are fused and incorporated into the endocarp). He described a new genus (*Sarinia*) and subsequently made a new combination, *Sarinia funifera*; however, the genus was originally thought to be invalid because it lacked a formal Latin description. Cook compared this taxon with other genera described by him having similar characteristics, *Ynesa*, *Bornoa*, *Temenia*, and *Ethnora*, but apparently most (except *Ynesa*) are invalid because they were

published without Latin diagnoses after 1935. On page 84, Cook mentioned that the diagnostic characters of *Sarinia*—long fibers, interrupted pinnae, and uniform endocarp—are scarcely different in Latin: *fibris longis, pinnis interruptis, endocarpiis uniformis*. Therefore, according to the rules of botanical nomenclature, this genus is treated as having a valid description.

These characteristics, however, are insufficient to delineate *Sarinia funifera* as a separate genus because other members of *Attalea* have similar specialized characteristics, such as leaf sheaths with very long fibers, interrupted pinnae, homogeneous (nonfibrous) endocarp, and grooved or angled fruits.

A. funifera is known as the original source of *piassava*, a coarse rigid fiber used extensively in Europe and in the United States for brushes, brooms, and street cleaning machinery (Cook, 1942). Similar fibers have been obtained from *Leopoldinia piassaba* and other palms not related to *Attalea*. According to Bondar (1942b), *piassava* fiber is extracted for commercial use almost entirely from native trees in coastal forests in southern Bahia. No known cultivated *piassava* plantations existed at that time. Fonseca (1927) reported that *piassava* is “spontaneously” cultivated for fiber and oil production all along the coast of Bahia. At the time, the species was in danger of extermination because of the method of fiber extraction, i.e., some plants were cut down to pull the leaf fibers, whereas others were uprooted to search for fibers on the roots in addition to the leaf bases. Fruits yield oil equal to that from *babassú*. Heyne (1927) said oil from seeds of *piassava* was used for oiling watches and other fine instruments, and seeds were used to carve buttons and rosaries. Booth (1889) reported that *piassava* fibers were used for cables, ropes, blankets, hats, and fences in Brazil, but in Europe the fiber was used mostly for brushes and brooms by itself or mixed with other fibers. The main types of fiber-producing plants are *bananeira*, young trunkless plants that yield a fresh and supple fiber, and *coquiera*, mature plants that yield two or three kinds of fibers. One of these, from the younger leaves, is similar to fibers of *bananeira*. In the late 1880s, about 7,000 tons of *piassava* fiber was exported to Europe from Brazil.

According to Bondar (1942b) fruits and seeds had commercial value as a vegetable ivory in the manufacture of buttons and carved objects, the oil could be used as a fuel in gasoline engines, and the fruits were an excellent source for the production of charcoal.

5. *Attalea tessmannii* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:538. 1929a. 12:155. 1934; Glassman, 1977a; Henderson, 1995; Henderson, Galeano, and Bernal, 1995. **TYPE:** East Peru, Upper Amazon region, lower Itaya, Soledad, in flood-free forests, June 1925, *Tessmann 5167* (holotype, B!; isotypes, G!, F!, NY!). **Figs.** 52, 82.

Trees 15–30 m tall and 25–46 cm in diam; **sheathing leaf base** and **petiole** not measured; **leaves** about 18 m long (fide *Gentry et al. 29032*); middle series **pinnae** in clusters of 2–5, 82 cm long and 4–6 cm wide; **staminate sterile bract** 2.4 m long (fide Burret); **staminate inflorescence** not measured, with numerous **rachillae**, 25–28 cm long; **staminate flowers** arranged in pairs, completely encircling the rachilla, about 286 staminate flowers per rachilla, each 14–16 mm long, **petals** flat, 2–3 mm wide, distinctly nerved, with acuminate tips and denticulate and short ciliate margins on upper third of petal, **stamens** 6–9 in number (12, fide Burret), **anthers** 4–5 mm long, **filaments** 2.0–2.5 mm long; **androgynous inflorescence** not measured; **pistillate portion of androgynous rachilla** 13–18 cm long, mostly with 1–3 **pistillate flowers**, each about 2.5 cm long, sepals shorter than petals, about 1 cm long, **stigmas** 3, **extended staminate rachilla** 7–9 cm long, with sterile **staminate flowers**; **rachillae of infructescence** 9–13 cm long, mostly 3 fruits per rachilla; **fruit** 11–15 cm long and 4.5–5.5 cm in diam (including beak of 1.3 cm long), persistent perianth about 4 cm high, staminodial ring about 1.5 cm high, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, 0.5 mm thick, **endocarp** 10–15 mm thick, with abundant, scattered, and conspicuous **fiber clusters**, but obscured by dark brown deposits of tannin, **seed** cavities 1–3, surrounded by a circular fiber-free area.

Distribution and Habitat. See table 1.

Vernacular Names. *Conta, chonta.*

Representative Specimens Examined. PERU. Loreto: prov. Maynas, Yanamono Explorama Tourist Camp on Río Amazonas, between Indiana and mouth of Rio Napo, July 1980, *Gentry et al. 29032* (MO); same locality, June 1983, *Gentry and Vasquez 42322* (MO).

Specimens Tentatively Included. PERU. Madre de Dios: prov. Manu, Parque Nacional Manu, Rio Manu, Rio Sotileja, steep forested hills, alt. 400–500 m, Oct. 1986, *Foster and d'Achille 11554* (F).

The spiral arrangement of staminate flowers around the rachillae is unusual for *Attalea*; however, a recently described species from Panama,

A. iguadummat, also has this arrangement. All other species in the genus have staminate flowers in 1–2 rows along one side of the rachilla. Burret (1929a) classified *A. tessmannii* in a separate section, *Dasystachys*. It would seem that *A. tessmannii* and *A. iguadummat* are closely allied because of their unusual flower arrangement, but there are some major differences. The first species is a tall tree with clustered middle series pinnae, staminate rachillae 25–28 cm long, and fruits 11–15 cm long, whereas *A. iguadummat* is acaulescent with regularly arranged pinnae, staminate rachillae 13–18 cm long, and fruits 7–10 cm long.

According to Henderson and Balick (1991), staminate petals of this species are 3–5 in number, linear in shape, and 1.5 mm long and the flowers have 11–14 stamens; however, my observations of type material show that *A. tessmannii* has 3 flat petals, 2–3 mm wide and 14–16 mm long, and 6–9 (12) stamens.

6. *Attalea dubia* (Martius) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:537. 1929a; Dahlgren, pls. 27–28, 32. 1959; Reitz, 118–24, figs. 52–55. 1974; Glassman, 1977a; Henderson, Galeano, and Bernal, 1995. **Figs.** 57, 74, 78.

Orbigynya dubia Martius, Hist. Natur. Palm 3:304, t. 169, fig. 6. 1845.

LECTOTYPE: (Glassman, 1977a) Brazil, Rio de Janeiro, prov. Sebastionopolitana (Martius, Hist. Natur. Palm. 3:t. 169, fig. 6. 1845).

Pindarea dubia (Martius) Hawkes, Arq. Bot. Est. S. Paulo 2:185. 1952.

Attalea indaya Drude, Martius Fl. Bras. 3:437, t. 100, fig. 2. 1881.

LECTOTYPE: (Dahlgren, pl. 27, 1959) Brazil, Rio de Janeiro, Corcovado, *Glaziou 8070* (C!; isolectotypes, BR!, F!, P!).

Pindarea fastuosa Barb. Rodr., Pl. Jard. Rio de Janeiro 5:23, t. 5A.

1895. t. 59B. 1903b. **LECTOTYPE:** (Glassman, 1972a) Cultivated. Brazil, Rio de Janeiro (Barb. Rodr., t. 5A, 1895).

Attalea concinna (Barb. Rodr.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:537. 1929a; Glassman, 1977a. **Fig.** 73.

Pindarea concinna Barb. Rodr., Pl. Jard. Bot. Rio Jan. 5:17, t. 4c. 1895;

Sert. Palm. Bras. 1:t. 59A. 1903b. **LECTOTYPE:** (Glassman, 1977a) Brazil, origin of specific locality not indicated; cultivated, Jard. Bot. Rio Jan. (Barb. Rodr., Sert. Palm. Bras. 1:t. 59A. 1903b).

Trees 5–25 m tall and 20–40 cm in diam; complete **sheathing leaf base** not seen; **petiole** 1–2 m long, 15 cm wide near base and 6 cm thick, margins fibrous; **leaf rachis** 6–7 m long; 114 **pinnae** on each side of rachis,

those from middle series in distinct clusters of 2–4, 90–150 cm long and 4.5–6.5 cm wide, with acute or acuminate asymmetrical tips; expanded part of **staminate sterile bract** 65–78 cm long (including beak of 10–15 cm long), about 6 mm thick, and 20–30 cm wide, deeply sulcate except for smooth apex, peduncular part 30–60 cm long; **rachis** of **staminate inflorescence** 40–55 cm long, peduncle about 22 cm long, with many **rachillae**, lower ones 21–30 cm long, upper ones 15–20 cm long; **staminate flowers** in two rows on one side of the rachilla, 10–20 mm long, **petals** flat, 1.5–2.5 mm wide, with acuminate tips, distinctly nerved, sepals 1–2 mm long, **stamens** 6–10 in number, **anthers** 5–8 mm long, **filaments** 1.0–2.5 mm long; expanded part of **androgynous sterile bract** about 1 m long (including beak of 20 cm long), 30–45 cm wide and 5 mm thick, deeply sulcate, peduncular part (incomplete) 20 cm long, with brownish lepidote indument; **rachis** of **androgynous inflorescence** 60–140 cm long (fide Barbosa Rodrigues, 1895), peduncle 1.0–1.2 m long (fide Barbosa Rodrigues, 1895), with many rachillae, **pistillate portion** of each rachilla 8–11 cm long, with 3–5 pistillate flowers, **extended staminate rachilla** 6–15 cm long, **staminate flowers** (adjacent to individual pistillate flowers) up to 20 mm long, mostly sterile with tiny **stamens**, **staminate flowers** (on staminate part of rachilla) 10–15 mm long, mostly sterile with tiny undeveloped **stamens**; **pistillate flowers** 2.5–4.0 cm long and 1.5–1.7 cm in diam, sepals and petals about same size, **pistil** 2.0–2.5 cm long and about 1 cm in diam, mostly light brown lepidote, **stigmas** 3 in number, 0.5–1.0 cm long, style very short or absent, staminodial ring dark brown, about 0.8 cm high; **rachis** of **infructescence** 1 m long, peduncle about 60 cm long; **fruit** 6.0–8.5 cm long (including beak of 1.5 cm long) and 3–4 cm in diam, persistent perianth 2–3 cm high, staminodial ring 1 cm high, with ciliate margins, **epicarp** fibrous, 1–2 mm thick, **mesocarp** soft, 3–4 mm thick, **endocarp** hard, 4–6 mm thick, **fiber clusters** scattered and inconspicuous, **seeds** usually 1 in number, rarely 2, about 2.5 cm long and 1 cm in diam.

Distribution and Habitat. See table 1. Reitz (1974) says that the distribution of this palm in Santa Catarina is irregular and discontinuous, but is more frequent in coastal forests to the north of the state of Santa Catarina, principally in the municipalities of Garuva and Joinville, and is rare or absent in the southern half of the state. According to Burret (1938), this species was frequently seen in forests in the vicinity of Rio de Janeiro and in the streets near the Jardim Botânico and was very common in forests approaching the Hauptstadt station. It was also seen in the state of Rio de

Janeiro on a trip to Serra de Tijuca and in Serra Estrella and Serra do Mar in Itataya. No specimens were cited by Burret to verify these observations.

Vernacular Names. *Camarinha*, *palmito do chao*, *indaya*, *coqueiro indaia*, *indaya-assú*, *inaya*, *naia*, *perina*, *anaja*.

Representative Specimens Examined. BRAZIL. São Paulo: 225 km south of São Paulo, Feb. 1973, *Krapovickas et al.* 21354 (F, MO). **CULTIVATED. BRAZIL.** Jard. Bot. Rio Jan., *Glaziou* 17341 (F, US); Oct. 1893, *Glaziou* 20534 (B, MO, NY, P); *Glaziou* 14365 (C, F, MO, NY, P, US); *Glaziou* 14456 (B); *Glaziou* 16480 (C, F, G, MO, P); *Burret* 207 (B).

Specimens Tentatively Included. BRAZIL. São Paulo: Caragauatatuba, swampy forest behind beach, Jan. 1985, *Gentry and Zardini* 49360 (F, MO). **CULTIVATED. BRAZIL.** Jard. Bot. Rio Jan., *Bailey and Bailey* 517 (BH); Jard. Bot. São Paulo, *Toledo and Pereira s.n.* (SP-50433); Jard. Bot. Lagoa de Freitas, *Glaziou* 16489 (F).

No specimens were cited by Martius (1845) for *A. dubia*, nor could any be found. Therefore, his illustration was chosen as lectotype. The same situation applies to *Pindarea fastuosa* by Barbosa Rodrigues (1895, 1903b). For *A. indaya*, Drude (1881) cited both *Glaziou* 303 and 8070 with no herbarium indicated. *Glaziou* 8070 (C) was chosen as lectotype because it was illustrated in Dahlgren (1959) and is represented by ample material. Specimens of *Glaziou* 303 could not be found, but photographs of an infructescence were seen at C.

A. dubia is probably most closely allied to *A. funifera* because both have an arborescent habit and clustered middle series pinnae. It differs from *A. funifera* in the much smaller 1 seeded rather than 1–3 seeded fruits, thickness of mesocarp, and length of petiole fibers.

7. *Attalea amygdalina* Kunth in Humboldt, Bonpland, and Kunth, Nov. Gen. Sp. 1:310, ts. 95–96. 1816; Dugand, 1940, 1953; 1954; Glassman, 1977a; Henderson, Galeano, and Bernal, 1995. **TYPE:** Colombia, dept. Chocó, near Zitara, Humboldt and Bonpland s.n. (holotype, P!). **Figs.** 1–2.

Attalea victoriana Dugand, Mutisia 18:9. 1953. 20:4. 1954; Glassman, 1977a. **TYPE:** Colombia, dept. Valle, Correg. Galicia and Ceilan, east of Bugalagrande, sitio "El Almendronal," primeras estribaciones de la Cordillera Central, vertiente occidental, June 1945, *Patiño s.n.* (holotype, COL 29718!). **Figs.** 29, 40, 81.

Attalea uberrima Dugand, Mutisia 18:4. 1953. 20:5. 1954; Glassman, 1977a. **TYPE:** Colombia, dept. Caldas, munic. Palestina, Jan. 1942, Jaramillo Mejia 199 (holotype, COL!). **Figs.** 28, 82.

Acaulescent; leaves 7.0–7.5 m long; **sheathing leaf base** not measured; **petiole** about 55 cm long and 40 cm wide at base; middle series **pinnae** about 120 on each side of rachis, regularly arranged, about 5–6 cm apart, 90–125 cm long and 6–8 cm wide, with asymmetrical tips; expanded part of **staminate sterile bract** 2.35 m long (including beak of 19 cm long), deeply sulcate; **rachis** of **staminate inflorescence** 50–68 cm long, peduncle 55–110 cm long, **rachillae** numerous, 15–18 cm long, covered with whitish lepidote indument; **staminate flowers** in two rows on one side of rachilla (in *Patiño 213* a few lower rachillae have one basal pistillate flower), 12–20 mm long, **petals** 2–6 mm wide, distinctly nerved, with acute or acuminate tips, sepals 1–2 mm long and 1 mm wide, **stamens** 12–21 in number, **anthers** 4.5–7.0 mm long, **filaments** 2–4 mm long; expanded part of **androgynous sterile bract** 1.5 m long and 18 cm wide, deeply sulcate; **rachis** of **androgynous inflorescence** 1.2–1.4 m long, peduncle 0.7–1.2 m long, **androgynous rachillae** numerous, pistillate portion 2–7 cm long, each with 2–3 **pistillate flowers**, 3.0–3.5 cm long and 2.5–3.0 cm in diam, petals shorter than sepals, **pistil** 2.5–3.0 cm long, densely ferruginous pubescent on upper half, **stigmas** 3, about 1 cm long, staminodial ring about 1 cm high, **extended staminate rachilla** 10–30 cm long, covered with whitish lepidote indument, **staminate flowers** anomalous, 2–3 cm long, petals 5–7 mm wide, sepals 3–8 mm long, stamens 12–21 in number, in one row on one side of the rachilla; **fruit** 8–12 cm long, 4.0–6.3 cm in diam (including beak of 1.0–1.5 cm long), persistent perianth 2.5–3.2 cm long, **epicarp** fibrous, about 1 mm thick, **mesocarp** soft and fibrous, 2–6 mm thick, **endocarp** hard, 4.5–5.0 cm thick, **seeds** 2–4 in number, 4–5 cm long and 1–2 cm in diam.

Distribution and Habitat. See table 1. According to Bernal (1989), most of this species' former habitat is now converted into coffee plantations, and it is considered to be endangered.

Vernacular Names. *Almendro, palma almendron, palma de cueso, taparo.*

Representative Specimens Examined. COLOMBIA. Valle: *Patiño s.n.* (COL-29721 through 29729); *Patiño s.n.* (COL-1177, includes sheet of photos); El Almendronal, 12 km de Bugalagrande, 1945, *Patiño 1* (F); Caldas: Agudas, El Boqueron (Pito), Aug. 1959, *Patiño 213* (COL); Antioquia: munic. Bolivar, Finca La Palmera, Aug. 1959, *Patiño 215* (COL).

In 1977a, I designated *Humboldt and Bonpland s.n.* (P) as the lectotype of *A. amygdalina* because no specimens were cited in the original article. Since no other specimens of this species collected by Humboldt and Bonpland have been found, I am satisfied that the collection from P is the holotype.

Dugand (1953) discussed the type locality with reference to comments

by Karsten (1857:257). In addition to the locality listed above, Humboldt and Bonpland said that *A. amygdalina* was cultivated in orchards near Cartago and Guaduas. Dugand believed that the species seen by these two men in Guaduas was not the same one they saw in Cartago. They passed through Guaduas in April 1801 but traveled to Cartago in October during the time this palm usually flowers. He also thought that the plant seen in flower there was the basis for Humboldt and Bonpland's description of *A. amygdalina*. In Cartago, they probably were informed that this species originated in the province of Chocó, near Zitara, because it seems that the two explorers did not visit the Chocó region themselves.

This is the type species of *Attalea* because it is the first one described in the genus (Glassman, 1977a). The morphology of the staminate flowers definitely place it in the genus *Attalea*; however, there is insufficient herbarium material (four staminate rachillae, one pistillate rachilla, a packet of staminate flowers, an incomplete description, and an uncertain type locality) to delineate it as a clear-cut species. Therefore, I previously (1977a) designated *A. amygdalina* as a species dubium. On the other hand, Henderson, Galeano, and Bernal (1995) recognize *A. amygdalina* as a good species and place *A. uberrima* and *A. victoriana* in synonymy under it. After careful consideration, I have decided to follow Henderson, Galeano, and Bernal (1995) and treat *A. amygdalina* as a good species.

This taxon seems to be most closely related to *A. ferruginea*, as both are acaulescent with regularly arranged pinnae and with similar-sized staminate flowers, anthers, and pistillate flowers. *A. amygdalina* is distinguished by having fewer stamens per flower (12–21 vs. 15–52), longer and broader middle series pinnae with glabrous rather than ferruginous lepidote margins, and smooth rather than rugose and glandular pistillate flowers. De Nevers (1987) considered *A. iguadummat* to be allied to *A. amygdalina* (*A. victoriana*) because of the regularly arranged pinnae and acaulescent habit. They differ, however, in the arrangement of staminate flowers on the rachilla, size of androgynous rachillae, number of stamens, and size of anthers.

8. *Attalea ferruginea* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 11:1044. 1934a; Glassman, 1977a. TYPE: Venezuela-Brazil border, Rio Negro, *Lako s.n.* comm. *G. Huebner 166* (holotype, B!). Figs. 46, 59, 82.

Acaulescent; sheathing leaf base 70–80 cm long, **petiole** 2.0–2.4 m long; **leaf rachis** 4.0–4.5 m long, densely ferruginous lepidote on convex side, becoming glabrescent with age; **pinnae** rigid, 100–130 on each side of

rachis, those from middle series regularly arranged, intervals of 3.5–10.0 cm between pinnae, 80–94 cm long and 3–4 cm wide, with acuminate, asymmetrical tips, margins, and especially apical 10–15 cm of pinnae usually covered with ferruginous lepidote indument on adaxial side, adaxial midrib usually lined with patches of brownish ramenta; expanded part of **staminate sterile bract** 30–50 cm long (including beak of 7–10 cm long), 5–7 cm wide, deeply sulcate, densely ferruginous lepidote, peduncular part about 55 cm long; **rachis** of **staminate inflorescence** 25–35 cm long, peduncle about 55 cm long, **rachillae** 35–55 in number, 9–11 cm long, from 10–25 flowers per rachilla, arranged in one row along one side of the rachilla; **staminate flowers** 17–22 mm long, **petals** flat, slightly unequal in length, about 3–4 mm wide, with acute or acuminate tips, more or less nerved below, smooth above, margins with patches of brownish-white lepidote indument, sepals 1–2 mm long, **stamens** 16–52 in number (fide Wessels Boer, 1988), **anthers** 3–5 mm long, **filaments** 2.5–3.0 mm long; expanded part of **androgynous sterile bract** 40–57 cm long and 5–9 cm wide, deeply sulcate, covered with ferruginous lepidote indument, peduncular part about 67 cm long; **rachis** of **androgynous inflorescence** 24–35 cm long, peduncle 0.57–1.5 m long, with 20–30 **rachillae**, **pistillate portion** of each rachilla 2–4 cm long, with 1–2 pistillate flowers, **staminate extension** of each rachilla about 4 cm long with 8 **staminate flowers**; **pistillate flowers** 2.8–3.2 cm long and 1.8–2.5 cm in diam (3.5–4.5 cm × 3 cm in young fruit), sepals shorter than petals, about 2.5 cm long, ferruginous lepidote mostly on apical part, petals usually rugose and covered with tiny glandular dots on narrowed apical portion, more or less nerved on basal part, usually with ferruginous indument, becoming glabrescent with age, **pistil** 2.0–2.5 cm long and 1.3–1.5 cm in diam, usually dark brownish in color, **stigmas** 3 in number, 0.5–1.0 cm long, upper part of ovary covered with whitish tomentose indument, staminodial ring 0.8–1.0 cm high, and about 2.5 cm in diam, dark brown in color, but usually covered with a dense brownish tomentose indument and tiny glandular dots, margins usually ciliate; complete **infructescence** not seen; **fruit** 6.5–9.0 cm long (including beak of 1–2 cm long), 4–5 cm in diam, usually dark brown in color and covered with a ferruginous indument, persistent perianth 3.5–5.0 cm high, staminodial ring 1.0–1.5 cm high and 3–4 cm across, with brown ciliate margins, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, about 1 mm thick, **endocarp** hard, 0.8–1.5 cm thick, **fiber clusters** conspicuous in some fruits but obscured by dark brownish tannins in others, **seeds** 1–3 in number, about 3.5 cm long and 0.8–1.3 cm in diam.

Distribution and Habitat. See table 1. According to Wessels Boer (1988), in Venezuela this palm occurs in relatively open forests on granitic tablelands and white sandy soils that are poorly drained and usually inundated during part of the year.

Vernacular Name. *Curua*.

Representative Specimens Examined. **COLOMBIA.** Vaupes: Rio Negro, San Felipe, and vicinity, Oct. 1952, *Schultes et al. 18040* (BH, US). **VENEZUELA.** Amazonas: near Sanariapo, poorly drained sandy soil July 1967, *Wessels Boer 1894* (U); Puerto Ayacucho, in well-drained sandy clay, July 1967, *Wessels Boer 1906* (U); near San Carlos de Río Negro, white sandy soil, Jan. 1968, *Wessels Boer 2322* (U); dept. Atabapo, bosque ribereño in Trapichote, 15 km rio abajo de Santa Barbara, July 1982, *Huber et al. 6440* (NY); Bolivar: from Puerto Ayacucho to Puerto Paez, savanna and poorly developed forest, along creeks, Aug. 1967, *Wessels Boer 1945* (U). **PERU.** Loreto: prov. Maynas, Mishana, Rio Nanay, noninundated lowland forest, stamens 34–36 in number, May 1978, *Gentry et al. 22347* (F, MO); between Rios Nanay and Itaya, on white sand, Nov. 1977, *Gentry et al. 21010* (MO).

Specimens Tentatively Included. **PERU.** Loreto: prov. Maynas, Mishana, Río Nanay, upland forest on white sand, Mar. 1982, *Gentry et al. 36535* (MO); July 1980, *Gentry et al. 28878* (MO). **VENEZUELA.** Amazonas: dept. Atures, 23 km northeast of Puerto Ayacucho, evergreen lowland forest, Apr. 1978, *Davidse and Huber 15357* (MO); dept. Atabapo, Cucurital del Caname, south bank, Middle Caño Caname, evergreen forest, Apr. 1977, *Davidse et al. 17025* (NY). **COLOMBIA.** Santander, Curare Opon, June 1979, *Renteria et al. 1499* (NY).

This species appears to be closely allied to *A. amygdalina* from Colombia, as both are acaulescent with regularly arranged pinnae, have similar-sized staminate flowers and anthers, and have similar-sized pistillate flowers. *A. ferruginea* is differentiated by having a larger number of stamens per flower (16–52 vs. 12–21), shorter and narrower middle series pinnae whose margins and apices are ferruginous lepidote instead of glabrous, and pistillate flowers with rugose and glandular dotted petals rather than smooth petals.

A. ferruginea is also distinguished from most of the other species of *Attalea* by having almost all of its parts covered with a ferruginous indument instead of being glabrous or having other types of indument.

As I noted in 1977a, Wessels Boer equated *A. racemosa* Spruce with *A. ferruginea* probably because pinnae of the holotype (Spruce 54-K) have ferruginous margins. In fact, Henderson, Galeano, and Bernal (1995)

reduce *A. ferruginea* to synonymy under *A. racemosa*. However, I am treating *A. racemosa* as a *species incerta* because staminate flowers were not described or collected and because it was transferred to *Orbignya* by Drude in 1881. A more detailed discussion of *A. racemosa* can be found under "Doubtful and Uncertain Species of *Attalea*."

9. *Attalea nucifera* Karsten, *Linnaea* 28:255. 1857. t. 68. 1861; Drude, t. 101. 1881; Burret, 1929a; Dugand, 1940, 1953, 1954; Henderson, Galeano, and Bernal, 1995. **LECTOTYPE:** (Glassman, 1977a). Colombia (Nova Granada): Guaduas (Karsten, *Florae Columbianae* 1:t. 68. 1861). **Figs.** 30, 55a, 55b, 81.

Acaulescent; leaves 4.6–7.3 m long (fide Karsten), **sheathing leaf base** and **petiole** 1.5–2.5 m long; **leaf rachis** 5.0–5.5 m long; 90–146 **pinnae** on each side of rachis, those from middle series regularly arranged, 100–130 cm long and 5.5–6.7 cm wide, with asymmetrical tips; **staminate inflorescence** incomplete, **rachillae** numerous (6 cm long, fide t. 68, Karsten), 15–19 cm long (*Castañeda* 5339), covered with whitish lepidote indument; **staminate flowers** arranged in two rows along one side of rachilla, 14–17 mm long, **petals** flat, 2–3 mm wide, with acuminate tips, nerves more or less distinct at anthesis, becoming more prominent with age, with scattered or dense patches of reddish glands or short reddish glandular hairs at anthesis, becoming caducous and almost completely disappearing with age, sepals 1.5–2.0 mm long, **stamens** 6–7 in number, **anthers** 5–6 mm long, **filaments** about 2 mm long; expanded part of **androgynous sterile bract** 31 cm long (including beak of 6 cm long) and 10 cm wide, peduncular part about 21 cm long, deeply sulcate; **androgynous inflorescence** mostly unbranched, **rachis** 15 cm long, peduncle about 23 cm long, about 50 pistillate flowers per inflorescence; **pistillate flowers** almost sessile, 2.0–2.5 cm long and 1.5 cm in diam, sepals shorter than petals, petals with strongly fluted margins, both distinctly nerved and with reddish glandular hairs; **pistil** about 2 cm long, ovary about 1 cm long and 1 cm in diam, densely brownish pubescent; **stigmas** 3, about 1 cm long, staminodial ring 0.5–1.0 cm high, densely brownish pubescent; staminate flowers (from androgynous inflorescence) 12–14 mm long, with abundant reddish glandular hairs; **fruiting sterile bract** not measured; **infructescence** about 18 cm long, peduncle about 25 cm long, **rachillae** very short, about 0.5 cm long, each fruiting scar subtended by one long caudate bract about 6 cm long and two shorter bracts; **fruit** 6.5–10.0 cm long, (including beak of 1 cm long), and 4.5–5.0 cm in diam, persistent perianth about 2 cm

high, staminodial ring about 3 cm across and 2 cm high, **epicarp** fibrous, about 1 mm thick, **mesocarp** soft, about 1 mm thick, **endocarp** hard, 5–8 mm thick, **seed** cavities 3 in number, 3.0–3.2 cm long and 1.0–1.5 cm in diam.

Distribution and Habitat. See table 1.

Vernacular Names. *Palma real* (Nariño), *taparo calimeno* (Chocó), *almendron* (Santander).

Representative Specimens Examined. **COLOMBIA.** Santander: east of Pt. Berrio, selvas compactas, May 1949, *Scolnik 19S016* (US); munic. Puerto Wilches, entre Gomez and 80 km del Atlantico R.R., Apr. 1960, *Romero Castañeda 8392* (COL). Nariño: Tumaco, near Pinal Dulce, Oct. 1955, *Romero Castañeda 5339* (COL).

Specimens Tentatively Included. **COLOMBIA.** Chocó: munic. Baudo, entre Cola del Barco and Canalete, May 1958, *Patiño 206* (COL).

No specimens were cited by Karsten (1857) nor could any be found; therefore, t. 68 (1861) was chosen as lectotype.

Karsten (1857) described the staminate flowers as completely surrounding the rachillae. As a result, both Drude (1881) and Burret (1929a) included *A. nucifera* in a separate section of *Attalea* because of this unusual flower arrangement for *Attalea*. A close look at t. 68 of Karsten (1861), however, reveals that the staminate flowers are actually in two rows along one side of the rachilla instead of spirally arranged. Collections purported to be this species (see specimens examined) also have the staminate flowers arranged in two rows on one side of the rachilla. Plate 101-I of Drude (1881) illustrates a pinna and staminate inflorescence based on *Trail 212* (K) from Brazil (near Barreiras de Mutum), which is erroneously labeled *A. nucifera*. The staminate flowers completely encircle the rachilla, but the specimen is undoubtedly a species of *Orbignya*.

A. nucifera differs from other Colombian species of *Attalea* as follows: Both *A. nucifera* and *A. allenii* are acaulescent and have a similar number of stamens, but *A. nucifera* has regular rather than clustered middle series pinnae. The remaining taxa are distinguished mainly by the number of stamens per flower. In *A. nucifera* there are 6–7, whereas *A. septuagenata* has 60–75, *A. amygdalina*, 12–21, and *A. ferruginea*, 16–52. All of the above taxa have regular middle series pinnae and all except *A. septuagenata* are acaulescent.

Even though certain discrepancies exist between Karsten's original description (1857) and the specimens cited here, these can be resolved if one interprets the staminate flowers of the staminate rachilla in Karsten's

t. 68 (1861) to be in two rows on one side instead of spirally arranged. The other differences could be included within the range of morphological variation considered due to incomplete or broken off parts, e.g., length of staminate rachillae about 7 cm long in Karsten's t. 68 and 15–19 cm long in *Castañeda 5339*. On a more positive note, staminate flowers of *Castañeda 5339* and *Scolnik et al. 19S016* match Karsten's illustration closely, especially the glandular hairs on the petals. Therefore, in view of the above evidence, I am reasonably certain that the specimens cited here (except for *Patino 206*, which lacks staminate flowers, but has similar pinnae and an androgynous inflorescence with sessile pistillate flowers) are representative of *A. nucifera*.

With reference to Dugand's (1953) cited specimens as examples of *A. nucifera* (e.g., *Najar 11* [COL] and *Rangel-Calindo s.n.* [COL]), I have concluded that the first one is most probably *A. allenii* mainly because of the clustered pinnae, and the other specimen has insufficient material for positive determination.

10. *Attalea iguadummat* de Nevers, Ann. Missouri Bot. Gard. 74:506, fig. 2. 1987; Henderson, Galeano, and Bernal, 1995. **TYPE:** Panama, Colon, Santa Rita Ridge, Feb. 1986, *de Nevers 7197* (holotype, CAS!; isotypes, K, MO, PMA).

Acaulescent or with short trunk; **petiole** 55–80 cm long, 6–7 cm wide; **leaf rachis** 6.75–7.25 m long; 104–9 **pinnae** on each side of rachis, those from middle series regularly arranged, 144–48 cm long and 6.5–7.0 cm wide; **staminate sterile bract** 115–200 cm long and 30 cm wide; **rachis of staminate inflorescence** 35–45 cm long, peduncle 90–100 cm long, **rachillae** 40–50 in number, 13–18 cm long; **staminate flowers** spirally arranged around rachillae, each 13–17 mm long, **petals** about 1 mm wide, flat, sepals 1.0–1.5 mm long, **stamens** 8–10, **anthers** 2–3 mm long, straight, **filaments** 2–3 mm long; **androgynous sterile bract** as in staminate inflorescence, **rachis of androgynous inflorescence** 35–45 cm long, peduncle 60–70 cm long; **pistillate flowers** on short pedicels or sessile, sepals 2.5–3.5 cm long, **petals** 4.0–4.5 cm long, **stigmas** 3, staminodial ring 1–2 cm high, with 15–20 lobes; **infructescence** with 45–65 **fruits**, 7–10 cm long and 4.5–6.3 cm in diam, **epicarp** fibrous, 1–2 mm thick, **mesocarp** fibrous, 3–5 mm thick, **endocarp** 2–8 mm thick, without evident **fiber clusters**, **seeds** 1–3 in number.

Distribution and Habitat. See table 1.

Vernacular Name. *Igua dummat* (Kuna Indians of San Blas).

Representative Specimens. De Nevers cites about six specimens from Panama, but I have seen only some of the type material.

This is the second species of *Attalea* described from Panama. The other species, *A. allenii*, can be easily distinguished from *A. iguadummat* by its clustered rather than regular pinnae, its one-sided rather than spiral staminate flower arrangement, and its petals of staminate flower with punctate glands. Both species are acaulescent. *A. iguadummat* probably has few close relatives because of its unusual staminate flower arrangement. The only other species in the genus with spirally arranged staminate flowers is *A. tessmannii*, but it is arborescent with clustered middle series pinnae.

According to Henderson and Balick (1987), the staminate petals of this species are similar to those of *Scheelea*. The petals are narrow (about 1 mm wide), but they are flat, like other members of the genus *Attalea*.

11. ***Attalea humilis*** Martius ex Sprengel, Syst. Veg. 2:624. 1825; Martius, p. 121. 1844. t. 168, fig. 1. 1845; Burret, 1929a; Glassman, 1977a; Henderson, 1995. **LECTOTYPE:** (Dahlgren, pl. 29, 1959) Brazil, plures provincias, *Princ. M. Neovidensis s.n.* (M!). **Figs.** 15–17, 53, 60, 77.
- A. compta* var. *acaulis* Martius, Hist. Natur. Palm. 2:t. 75. 1826. **LECTOTYPE:** (Glassman, 1972a) Brazil (Martius, t. 75, 1826).
- A. borgesiana* Bondar ex Dahlgren, Trop. Woods 77:42. 1944; Bondar, Bol. Inst. Centr. Fom. Econ. Bahia 13:67, figs. 20–22. 1942b (*sine descr. lat.*). **LECTOTYPE:** (Glassman, 1977a) Brazil, Bahia, on hills, 100 m, in silicious soils of tertiary rock, Reconcavo de Bahia, Fazenda Carmo, munic. São Sebastião, no date listed, *Bondar s.n.* (F-619755!).
- A. borgesiana* Hawkes, Arq. Bot. Est. S. Paulo 2:176. 1952. *Superfluous name.*

Acaulescent or with short trunk up to 1 m tall; **sheathing leaf base** about 50 cm long; **petiole** 50–80 cm long (70–150, fide Noblick, 1991) and 6 cm wide at base, margins fibrous; **leaf rachis** 2.5–5.3 m long; 85–130 **pinnae** on each side of rachis, those from middle series regularly arranged, about 1.5–3.0 cm apart, 65–95 cm long, and 3.5–5.5 cm wide, with acute, asymmetrical tips; expanded part of **staminate sterile bract** 0.9–1.8 cm long (including beak of 10–20 cm long), 8–13 cm wide, and 4 mm thick, deeply sulcate; **rachis** of **staminate inflorescence** 34–44 cm long, brownish or whitish tomentose, peduncle about 65 cm long, **rachillae** numerous, whitish tomentose, 6–11 cm long; **staminate flowers** arranged in two rows along

one side of the rachilla, each 16–21 mm long, **petals** flat, somewhat unequal, 2–3 mm wide, with acute or acuminate tips and denticulate margins, distinctly nerved, sepals 1.0–1.5 mm long, **stamens** 6 in number, **anthers** 8–12 mm long, **filaments** 2–3 mm long; **androgynous sterile bract** 56–80 cm long (including beak of up to 16 cm long), 11–14 cm wide, deeply sulcate; **rachis of androgynous inflorescence** 28–36 cm long, peduncle 20–26 cm long, individual **pistillate rachillae** very short (about 1 cm long) or sessile; **pistillate flowers** 3–4 cm long, 1.0–1.5 cm in diam, sepals shorter than petals, both strongly nerved, **pistil** about 2 cm long, ovary whitish brown pubescent, style short, **stigmas** 3 in number, about 1 cm long, staminodial ring about 5 mm high; **extended staminate rachilla** 2–5 cm long, with 10–20 staminate flower scars arranged on one side, **staminate flowers** anomalous, 2–4 cm long, **petals** flat, 3–5 mm wide, with acuminate tips and denticulate margins, distinctly nerved, sepals 0.5–2.5 mm long, **stamens** 6 in number, **anthers** 7–11 mm long (or sometimes undeveloped—only 2 mm long), **filaments** about 3 mm long; **fruiting sterile bract** about 60 cm long and 17 cm wide, covered with brownish indument; **rachis of infructescence** about 28 cm long, peduncle about 31 cm long; fruits numerous, about 100 or more on each rachis; **fruit** 6–9 cm long and 4–8 cm in diam (including beak of 1 cm long), persistent perianth 3.5–4.0 cm high, staminodial ring 4–5 mm high, **epicarp** 1–2 mm thick, **mesocarp** soft and fibrous, 2–3 mm thick, **endocarp** hard, 8–12 mm thick, with inconspicuous scattered **fiber clusters**, **seeds** 1–3 in number, 1.5–2.5 cm long, 1.2–1.8 cm in diam, oily, with acid taste.

Distribution and Habitat. See table 1. According to Martius (1844), *A. humilis* occurs in “eastern Brazil, prov. Sebastianopolis, Espirito Santo, Porto Seguro, Minas Gerais, Bahia and Pernambuco,” but no specimens have been seen from Minas Gerais or Pernambuco. According to Burret (1938), *A. humilis* was seen on dry hills and mountains in the vicinity of Rio de Janeiro, and it was also common between Rio de Janeiro and Serra Estrela, near Pilar and on the way to Serra do Mar. No specimens were collected to verify these observations. This palm reaches its northernmost limit near São Sebastião do Passé in Bahia.

Vernacular Names. *Catolé, pindova, palmerim, palmerinha, coco de pindoba* (Burret, 1929a); *pindoba mirim, pindoba brava, anaja mirim*.

Representative Specimens Examined. **BRAZIL.** São Paulo: Socavão, perto de Bananal Mandioca Palma, Feb. 1883, *Herb. Saldanha 7106* (R); Espirito Santo: 1946, *Bondar 20* (F-404620); Bahia: *Bondar 22* (F-404620), on coast road between Alcobaca and Prado, 7 km northwest of Alcobaca

and 1 km north along road from Rio Itanheninga, restinga, Jan. 1977, *Harley et al.* 17968 (F); munic. Alcobaca, Rod. BA001, 5 km south of Alcobaca, restinga in solo arenoso, Mar. 1978, *Mori et al.* 9611 (NY); munic. Candeias, 50 km northwest of Salvador, 4–5 km south of turnoff to São Sebastião, grassy hillsides, Aug. 1976, about 1,000 plants seen on two hillsides, *Glassman* 13011 (F, SP), 13012 (F, SP), 13013 (F, SP), 13014 (F, SP); Amelio Rodrigues, remnant of Atlantic coastal forest, mata secundario, adjacent to bamboo forest, abundant on hillside, alt. 150 m, associated with *Syagrus botryophora*, *Polyandrococos*, *Bactris*, and *Attalea burretiana*, Aug. 1988, *Noblick and Glassman* 4575 (BAH, F); Rio de Janeiro: estrada do Porto da Estrella, Aug. 1925, *Kuhlmann* 19164 (RB); without locality, *Glaziou* 2756 (BH, BR, C, P). **CULTIVATED.** Jard. Bot. Rio Jan., *Dahlgren s.n.* (F-611620). Bahia: Fazenda Camuruçu, Amelio Rodrigues, tree about 25 years old, trunk about 1 m tall, Aug. 1988, *Noblick and Glassman* 4577 (BAH, F).

No specimens were cited by Martius (1825, 1844, 1845) for *A. humilis* or for *A. compta* var. *acaulis* (1826); lectotypes were chosen for each.

Type specimens of all new species described by Bondar in his 1942a and 1942b articles were listed as isotypes deposited in F. Hence, I assumed that the holotypes were deposited in another herbarium in Brazil. Since the holotypes were never located, I designated all isotypes of *Attalea* in the above articles as lectotypes (1977a). According to the late Pedrito Silva of CEPLAC in Salvador, all of Bondar's original palm collections (including type specimens) were discarded after he died in 1954. Fortunately, B. E. Dahlgren of the Field Museum of Natural History in Chicago previously had received a duplicate set of most of these specimens.

Originally, I considered *A. borgesiana* as a distinct species, mainly because its habitat (grassy hillsides) is different from that of *A. humilis* (wet forested areas). The size differences of the flowering parts could be attributed to the fact that the grassy hillsides where *A. borgesiana* grows are subjected to continued burning and cutting. In fact, in August 1976, I counted about 1,000 plants of this species on two hillsides in the São Sebastião area; but when I revisited the same area in August 1988, only a handful of palms were still present there. This particular region was probably originally Atlantic coastal forest but has been completely destroyed along with the palms by extensive burning and cutting for farming and grazing.

A. humilis appears to be most closely related to *A. geraensis*, which is also acaulescent and has regularly arranged middle series pinnae. It differs from this species in the wider middle series pinnae, fewer stamens, longer anthers, fewer stigmas, and longer fruits with fewer seeds; *A. humilis* is

found mainly in restingas and coastal forests, whereas *A. geraensis* is mostly a cerrado palm.

Apparently, *A. humilis* crosses with *A. funifera* to produce *A. × voeksii* and with *A. burretiana* resulting in the putative hybrid *A. salvadorensis*. Both hybrids are rare, each known from one locality.

12. *Attalea geraensis* Barb. Rodr., Pl. Jard. Bot. Rio Jan. 6:22, t. 7. 1898 ("ceraensis"); Sert. Palm. Bras. 1:66, t. 56. 1903b; Glassman, fig. 10, 1967. 1977a; Noblick, 1991. **LECTOTYPE:** (Glassman, 1972a) Brazil, Minas Gerais, Alfenas (Barb. Rodr., t. 7. 1898). **Figs.** 4, 56, 63, 80.

? *Attalea monogyna* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:534. 1929a; Glassman, 1977a. **TYPE:** Brazil, Goiás, Serra dos Pyreneos, common in forest, July 1894, *Glaziou 22269* (holotype, B, destroyed; isotypes, BH!, BR!, C!, K!, MO!, P!, US!).

Attalea guaranitica Barb. Rodr., Palm. Paraguay. 27:t. 4d. 1899. t. 57B. 1903b. **TYPE:** Paraguay, ad Cordilla dos Altos, prope Pueblo Valenzuela, ad ripas Rio Y-Aka (Barbosa Rodrigues, 1899). **LECTOTYPE:** (Glassman, 1977a) Paraguay, Cordillera de Piribebuy, campo rupestre sicco, *Hassler 1860* (G). **Figs.** 48, 64, 81.

Acaulescent; sheathing leaf base about 20 cm long, **petiole** about 10 cm long (15–80 cm long, fide Noblick, 1991; probably includes petiole size of juvenile leaves) and 4 cm wide at base, both with long, fine fibrous margins and brownish lepidote indument; **leaf rachis** 1.4–2.2 m long, brownish lepidote on axis; 75–79 **pinnae** on each side of rachis, those from middle series regularly arranged, 46–71 cm long and 2.2–3.0 cm wide, with acuminate or aristate asymmetrical tips; expanded part of **staminate sterile bract** 35–50 cm long (including beak of 9 cm long), 7–10 cm wide, and 5 mm thick, sulcate except for apex, grooves 1.0–1.5 mm apart, peduncular part about 16 cm long; **rachis of staminate inflorescence** 20–30 cm long, peduncle 15 cm long (60 cm and 40 cm, fide Barbosa Rodrigues), with many **rachillae**, 3–8 cm long, about 20 flowers per rachilla, arranged in two rows along one side of the rachilla; **staminate flowers** 13–17 (21) mm long, **petals** flat, 2–5 mm wide, with acute or acuminate tips, distinctly nerved, margins denticulate, sepals 1–2 (3) mm long, **stamens** 6–10 in number, **anthers** 5–9 mm long, **filaments** 2–3 mm long; expanded part of **androgynous sterile bract** 29–34 cm long (including beak of 6 cm long), 4–6 cm wide, and 5 mm thick, deeply sulcate except for apex, peduncular part about 20 cm long; **rachis of androgynous inflorescence** 15–27 cm

long, peduncle about 20 cm long, with many **rachillae**, **pistillate portion** of each rachilla 2.5–4.0 cm long, with 1–3 pistillate flowers, **staminate extension** of each rachilla 2.5–3.0 cm long; **pistillate flowers** 2.5–3.5 cm long and 1.8–2.5 cm in diam, petals and sepals more or less equal in size, sepals sometimes shorter, **pistil** 1.8–2.0 cm long and 0.8–1.0 cm in diam, whitish brown lepidote on proximal half, **stigmas** mostly 3 in number (4–6 in Bahia, fide Noblick, 1991), 6–10 mm long, style short or absent, staminodial ring 0.8–1.0 cm high and 1 cm across; expanded part of **fruiting sterile bract** 26–35 cm long (including beak of 10–14 cm long), 8–10 cm wide and 5 mm thick, sulcate, grooves about 1 mm apart, peduncular part about 19 cm long; **rachis of infructescence** 15–17 cm long, peduncle about 20 cm long, with many **rachillae**, each 1.5–3.5 cm long; mature **fruit** yellow, covered with a rusty velvet tomentum (Noblick, 1991) and very aromatic (fide Fonseca, 1927), 5–7 cm long and 3.0–4.5 cm in diam (including beak of 1–2 cm long), persistent perianth 2.7–3.5 cm high, staminodial ring about 1 cm high and 2 cm across, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, 1.5–4.0 mm thick, **endocarp** hard, 0.2–1.0 cm thick, **fiber clusters** arranged in a circle and mostly prominent, **seeds** 2–4 (6) in number, about 2 cm long and 1.5 cm in diam.

Distribution and Habitat. See table 1. *A. geraensis* is probably the most widespread and one of the most common species of *Attalea* in Brazil and extends into adjacent Paraguay.

Vernacular Names. *Indaya do campo*, *catolé* (Brazil); *mbocaya guazu*, *coco de la cordillera*, *bocaiá guazul* (Paraguay).

Representative Specimens Examined. **BRAZIL.** São Paulo: campos das Sete Lagoas, Fazenda Campininha, 3.7 km northwest of Padua Sales, Apr. 1960, *Eiten and Eiten 1902* (BH); 4.6 km northwest of Padua Sales, cerrado, Sept. 1960, *Eiten and Eiten 2212* (BH); degraded campo cerrado, *Eiten and Eiten 2220* (BH); 4 km north of Padua Sales, cerrado, Aug. 1960, *Eiten and Eiten 2208* (BH); Sertão de Itirapina, 12 km northwest of city, burned-over savanna, July 1965, *Glassman and Gomes 8014* (F, SP), *8017* (F, SP); 5 km south of Emas, 7 km north of Pirassununga, in cerrado, common, July 1969, *Glassman 8744* (F, SP), *8745* (F, SP). Minas Gerais: munic. Curvelo, 54 km north of Sete Lagoas, near entrance to road to Curvelo, highway BR7, cerrado remnant, July 1965, *Glassman and Gomes 8106* (F, SP). Mato Grosso: 40 km south of Rondópolis, along BR163, common in cerrado, Sept. 1976, *Glassman 13085* (F, SP), *13087* (F, SP). Goiás: 26 km northeast of Rio Verde, dense cerrado, along roadside and plowed fields, about 75,000 plants seen in area, Aug. 1976, *Glassman 13065* (F, SP), *13066* (F,

SP), 13068 (F, SP), 13073 (F, SP), 13074 (F, SP). Bahia: munic. Baianópolis, 7 km south of Rio Angico on road to Inhumas and Correntina, cerrado, sandy soil, alt. 700–720 m, Oct. 1988, *Noblick and Lima 4628* (BAH, CEPEC, CPATSA, F). Noblick (1991) also cites specimens from munic. Coribe and munic. Cocos, in Bahia. **PARAGUAY.** Cordilleras de Valenzuela, Nov. 1878, *Balansa 3316* (P); Valle de l'y-acan guazu, near Valenzuela, Jan. 1884, *Balansa 4775* (P); 5 km east of Caacupe, Cordillera de Altos, Apr. 1978, *Schinini 14805* (F).

Specimens Tentatively Included. BRAZIL. Minas Gerais: vicinity of Mendanha, Sept. 1936, *Archer 4074* (US); without locality, May 1881, *Glaziou 13296* (C, P). **Cultivated.** Jard. Bot. Rio de Janeiro, Jan. 1924, *Bailey and Bailey 601* (BH), *601a* (BH).

A. geraensis is probably most closely allied to *A. humilis*. It differs mainly in its number of stamens, width of pinnae, and size of anthers.

Burret (1929a) cites *Glaziou 8069* and *20022* for *A. geraensis*. The first is doubtful and probably out of range (coastal Rio de Janeiro), and *20022* has been identified as *A. exigua*. In 1977a, I treated *A. monogyna* as a synonym of *A. oleifera* because Burret said they were probably the same. The type specimens of *A. monogyna* (*Glaziou 22269*) appear to be closer to *A. geraensis* in total characteristics, and hence are tentatively included under that species here. No specimens were cited in the original article of *A. guaranitica* (Barbosa Rodrigues, 1899), but the locality was listed as Cordillera dos Altos, prope pueblo Valenzuela, ad ripas Rio Yaka. However, Barbosa Rodrigues later cited *Hassler 1860* (1903b), hence it was chosen as the lectotype.

This palm is often used as an indicator of good soils and the seeds are edible.

13. *Attalea septuagenata* Dugand, *Mutisia* 18:3. 1953. 20:4. 1954; *Caldasia* 7:145. 1955; Glassman, 1977a; Henderson, 1995; Henderson, Galeano, and Bernal, 1995. **TYPE:** Colombia, Amazonas, Rio Miriti-Paraná, Mar. 1952, *Schultes and Cabrera 15796* (holotype, COL!; isotype, BH!). **Figs.** 27, 39, 66, 81.

Trees 18–20 m tall; **leaves** 5.4–6.7 m long; **sheathing leaf base** and **petiole** not measured; petiole and **leaf rachis** glabrous on upper flat surface, densely dark ferruginous lepidote, consisting of sharp, narrowly oblong, curved irregular scales, 1.0–1.5 cm long on lower convex surface; middle series **pinnae** regularly arranged, distributed at 4–5 cm intervals along rachis, 90–103 cm long and 3.5–4.5 cm wide, with asymmetrical tips; ex-

panded part of **staminate sterile bract** 59 cm long (incomplete), 14 cm wide, and about 6 mm thick, deeply and irregularly sulcate, covered with a densely ferruginous lepidote indument, peduncular part 39 cm long (incomplete); **rachis** of **staminate inflorescence** 1.0–1.2 m long, peduncle 1.2 m long, **rachillae** numerous, 13–19 cm long, whitish in color; **staminate flowers** on one side of the rachilla, mostly in two rows, 15–18 mm long, **petals** flat, with acute or acuminate tips, obscurely nerved, 3–4 mm wide, dark brown with white lepidote or farinose indument along margins, sepals about 1 mm long, **stamens** 60–75 in number (fide Dugand), **anthers** 4–5 mm long, very narrow, **filaments** 2.0–2.5 mm long; **androgynous inflorescence** not measured; **androgynous rachillae** about 9 cm long with 2 pistillate flower scars, **pistillate flowers** not seen; **fruit** 10.0–11.5 cm long and 5.5–6.0 cm in diam (including beak of 1.0–1.3 cm long), persistent perianth about 4 cm high, staminodial ring about 1.5 cm high, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, about 3 mm thick, with conspicuous air pockets in cross section, **endocarp** hard, 1.0–1.5 cm thick, **seeds** 2–3 in number, 3.5–4.5 cm long and 1.3 cm in diam.

Distribution and Habitat. See table 1. Only known from the Miriti-Paraná area.

Vernacular Names. *Karijona*, *makuna*, *tanikuma*, *yukuna*, *mirana*, *kujita*, *kurua*.

REPRESENTATIVE SPECIMENS EXAMINED. Only type material was examined. Henderson (1995) cites *Galeano et al. 2078* in which the stamens are only one-half the number reported by Dugand (1953).

This palm differs from all of the other species of *Attalea* by the petiole and leaf rachis covered with dark, sharp, curved scales and the unusually large number of stamens (60–75). The only species that has stamens approaching this number is *A. ferruginea*, which has 16–52 stamens. *A. septuagenata* also differs from this taxon mainly in the smaller staminate flowers (15–18 mm vs. 17–22 mm) and larger fruit (10.0–11.5 cm vs. 6.5–8.0 cm) with conspicuous air pockets in the mesocarp.

14. *Attalea seabrensis* Glassman *sp. nov.* **TYPE:** Brazil, Bahia, munic. Seabra, Veredinha, gallery forest, Aug. 1976, *Glassman 13034* (holotype, F!; isotype, SP!). **Figs.** 23–26, 35, 45, 62, 80.

Caudex 15–20 m altus, folium regulariter pinnatum ex parte, pinnis mediis 0.8–1.1 m longis, 4–6 cm latis, inflorescentia mascula multiramosa, pedunculo 40–50 cm longo, rachide 1.0–1.8 m longa, rachillis 15–20 cm longis, flores masculi 15–20 mm longi, stamina 9–13, antherae 5–9 mm

longae, bractea androgyna 0.8–1.0 m longa, 15–30 cm lata, inflorescentia androgyna multiramosa, pedunculo 50–70 cm longo, rachidi 70–80 cm longi, rachillis 1–3 cm longis, flores feminei 4–5 cm longi, 2–3 cm diametro, fructus 6.5–9.0 cm longus, 5.5–7.0 cm diametro, epicarpio lignoso et fibroso, 2–6 mm crasso, mesocarpio pulposo, 1–3 mm crasso, endocarpio osseo, 1–2 cm crasso, fibris conspicuis, semina 3–4, 3 cm longa, 1.2–1.5 cm lata.

Trees 15–20 m tall and 25–40 cm in diam; **petiole** 0.6–2.0 m long; **leaf rachis** 4.0–6.3 m long; 150–200 **pinnae** on each side of rachis, only lower one-third to one-half of rachis with pinnae in clusters of 2–4, and lying in divergent planes, remaining pinnae regularly arranged, those from middle series 0.8–1.1 m long and 4–6 cm wide; **staminate sterile bract** 1–2 m long, 15–30 cm wide; **rachis of staminate inflorescence** 1.0–1.8 m long, peduncle 40–50 cm long, **rachillae** 250–90 in number, lower ones 15–20 cm long; **staminate flowers** arranged in two rows along one side of the rachilla, those on lower part 15–20 mm long, those on upper part 13–15 mm long, **petals** flat, 4–5 (8) mm wide, with acute to acuminate tips and denticulate margins, faintly or distinctly nerved, sepals 1.5–3.0 mm long, **stamens** 9–13 (17) in number, **anthers** 5–9 mm long, **filaments** 1–2 mm long; expanded part of **androgynous sterile bract** 0.8–1.0 m long and 15–30 cm wide (including beak of 9–30 cm long), peduncular part 50–60 cm long; **rachis of androgynous inflorescence** 70–80 cm long, peduncle 50–70 cm long, **rachillae** numerous (250–300), **pistillate portion** of each 1–3 cm long, **staminate extension** 7–12 cm long, one **pistillate flower** per rachilla, each 4–5 cm long, 2–3 cm in diam, **pistil** 3 cm long and 1.5 cm in diam, **stigmas** 3–6 in number, 1.0–1.5 cm long, staminodial ring about 1 cm high; **fruit** 150–220 in number, 6.5–9.0 cm long and 5.5–7.0 cm in diam, reddish brown in color, persistent perianth 3–4 cm high, staminodial ring 1.0–1.5 cm high, **epicarp** woody and fibrous, 2–6 mm thick, **mesocarp** soft, yellow or orange when fresh, 1–3 mm thick, **endocarp** bony, 1–2 cm thick, with more or less conspicuous irregular **fiber clusters**, **seeds** 3–4 (6) in number, each 3 cm long and 1.2–1.5 cm in diam.

Distribution and Habitat. Brazil, central Bahia, in transitional forest remnants, on hills and in valleys, associated with streams, mostly at elevations of 500–1,200 m. In August 1988, Larry Noblick and I observed large populations of this palm from Barra do Mendes south to Seabra, Palmeras, Boninal, Piata, Jussiape, Ituaçu, and Contendas do Sincorá. Actually, Serra do Tombador is the dividing line between populations of *A. seabrensis* on the western slopes, which extend farther south, and *A. pindobassu* on the eastern slopes, which extend farther north along this mountain range.

Vernacular Names. *Palmerão, palmeira, catolé, açu.*

Representative Specimens Examined. **BRAZIL.** Bahia: munic. Seabra, Veredinha, about 291 km west of Salvador, depressed semi-moist lowland area, mostly in pure stands, in gallery forest of about 50 trees, Aug. 1976, *Glassman 13035* (F, SP), *13036* (F, SP); Serra do Sincorá, Caraibinha, 15–25 km from Contendas do Sincorá, 500–600 m, transitional forest remnant, about 2,000 trees in region, Aug. 1988, *Noblick et al. 4590* (CEPEC, F); Serra do Sincorá, Fazenda Andrai, munic. Ituaçu, 10–15 km south of Barra da Estiva, transitional forest remnant, 940 m, about 100 trees seen in area, Aug. 1988, *Noblick et al. 4591* (CEPEC, F); Fazenda Cochó, munic. Piata, Riacho Cochó, 31 km south of Boninal, along stream, 1,060 m, about 300 trees seen, Aug. 1988, *Noblick et al. 4597* (ALCB, F), *4598* (ALCB, F); Fazenda Lagoa, munic. Barra do Mendes, povoado of Areias, 25 km from Barra do Mendes, alt. 920 m, stand of about 50 trees, Aug. 1988, *Noblick et al. 4599* (ALCB, F).

The new species seems to be most closely related to *A. pindobassu* because both are arborescent, have staminate flowers of about the same length with a similar number of stamens, have 6 stigmas in the pistillate flowers, and have similar-sized fruits with an exceptionally hard and thick (4–6 mm) epicarp. The lower one-third to one-half of the rachis in *A. seabrensis* have clustered pinnae and short anthers (5–9 mm); in *A. pindobassu* the lower pinnae are arranged in several widely spaced loose clusters of 2–3 and the anthers are 10–12 mm long.

A. seabrensis is also probably closely related to *A. burretiana*. Differences are those mentioned above for *A. pindobassu* plus the much longer petioles (up to 2 m) and 3–6 stigmas. In *A. burretiana*, the pinnae are regularly arranged throughout; anthers are 9–10 mm long; petioles are very short or absent; epicarp of the fruit is only 1.5–2.0 mm thick; and pistillate flowers have 3 stigmas.

Leaves of this palm are used to cover roofs; leaf rachises are used in construction of doors and walls; fruits are sweet tasting and seeds are utilized as food and as a cooking oil.

15. *Attalea pindobassu* Bondar, Field Mus. Natur. Hist. Bot. 22:462. 1942a; p. 62, figs. 15–16. 1942b; Henderson, Galeano, and Bernal, 1995.
LECTOTYPE: (Glassman, 1977a) Brazil, Bahia, Serra de Ouro, 1940, *Bondar s.n.* (F-619761!). **Figs.** 18–22, 80.

Trees up to 15 m tall and 35–50 cm in diam; **sheathing leaf base** about 1.5 m long; **petiole** 1.2–2.0 m long, **leaf rachis** 5–7 m long, abaxial side of

rachis and petiole with ferruginous or whitish indument; 160–90 **pinnae** on each side of rachis, lower pinnae with several widely spaced loose clusters of 2–3, those from middle series regularly arranged, 80–135 cm long and 5–7 cm wide with asymmetrical tips; **staminate sterile bract** 1.3–2.0 m long and 21–25 cm wide (including beak of 25–60 cm long); **rachis of staminate inflorescence** 0.8–1.5 m long, peduncle 0.4–1.0 m long, with ferruginous indument, **rachillae** 220–470 in number, lower ones 18–31 cm long, whitish tomentose; **staminate flowers** arranged on one side of rachilla, mostly in two rows, lower ones 20–22 mm long, upper ones 15–17 mm long, **petals** with acute tips and denticulate margins, 3–7 mm wide, **stamens** 8–12 in number, **anthers** 9–12 mm long; **androgynous sterile bract** similar in size to staminate bract, **rachis of androgynous inflorescence** 1 m long, peduncle 50–60 cm long, **rachillae** about 270 in number, **pistillate portion of rachilla** 2.0–4.5 cm long, 1–2 **pistillate flowers** per rachilla, each 4.5 cm long and 2.5 cm in diam, petals and sepals 3.5–4.0 cm long, **pistil** about 4 cm long and 2 cm in diam, farinose on upper half, **stigmas** 6, whitish when fresh, turning black when dried, about 6 mm long, staminodial ring about 1.5 cm high; **extended staminate rachilla** about 19 cm long, **staminate flowers** arranged along one side of rachilla, mostly in one row, 9–12 mm long, **petals** flat with acute tips about 4 mm wide, some irregular in shape, sepals 2.0–3.5 mm long, **stamens** 11–12 in number, **anthers** only about 1 mm long and probably sterile, **filaments** 0.5 mm long; **fruit** 8–10 cm long and 5.0–6.5 cm in diam, yellowish brown in color, persistent perianth about 3–4 cm high, staminodial ring 1.0–1.3 cm high, **epicarp** woody-fibrous, 3–5 mm thick, **mesocarp** yellow or orange, oily, edible, and sweet in some fruits, flavorless in others, 1–3 (2–6) mm thick, **endocarp** bony, 8–10 mm thick, with inconspicuous **fiber clusters**, **seeds** usually 3–4 in number.

Distribution and Habitat. Bondar (1942b) lists the following localities: Bahia, center of state, munic. de Campo Formoso, Saude, Jacobina, Miguel Calmon. Serra de Ouro, munic. Djalma Dutra (old name for Miguel Calmon) is on the caption under fig. 15.

In August 1988, Larry Noblick and I observed several hundred thousand trees of this species in transitional forest areas between Pindobaçu on the north and Tapirimutá on the south. No palms were seen in Pindobaçu itself, but in the neighboring povoado of Tapicuru, thousands of *pindobassú* trees were seen along the hillsides. Between Pindobaçu and Saude, about 1,000 more trees were observed; and between Saude and Jacobina, several thousand additional trees were seen, mostly after the village of Caem was

passed. The greatest concentration of *A. pindobassu* was observed between Miguel Calmon and Itapura, in the Serra do Sapucaia (Serra do Ouro) for a distance of 50 km, at elevations of 450–600 m. We estimated there are probably several hundred thousand trees along hillsides and in valleys, and this region may possibly be the center of distribution for the species. This palm is usually found on the lower, wetter mountain slopes or in wet valleys at elevations of 350–900 m.

Vernacular Names. *Pindobassú* (fide Bondar), *palmeira*, *coco palmeira*, *babaçu*, *coco babaçu* (fide Noblick).

Representative Specimens Examined. **BRAZIL.** Bahia: Fazenda Santo Cristo, munic. Piritiba, near Posto Feliz, 12 km north of Tapirimutá, remnant of transitional forest, alt. 710 m, about 600 trees in area of 1,000 hectares, Aug. 1988, *Noblick et al.* 4600 (ALCB, F); *Noblick et al.* 4601 (ALCB, F); Fazenda Riachao, along Rio Mangabera, povoado of Tapicuru, turn-off north of town of Pindobaçu, transitional forest, alt. 410 m, several thousand trees in area, Aug. 1988, *Noblick et al.* 4602 (ALCB, F); *Noblick et al.* 4603 (ALCB, F); Serra do Ouro, Fazendinho, munic. Jacobina, about 10 km south of Jacobina, dense transitional forest, dissected by streams, alt. 450 m, about 5,000 trees in area, Aug. 1988, *Noblick et al.* 4604 (ALCB, F); Fazenda Estreita Campo Grande, 2 km west of Miringaba, transitional forest remnant, alt. 730 m, a few hundred trees in area, Aug. 1988, *Noblick et al.* 4605 (ALCB, F).

As previously mentioned, *A. pindobassu* seems to be closely allied to *A. burretiana*. It differs from that species mainly in having 6 instead of 3 stigmas, a much longer petiole (0.5–1.5 m long), and lower pinnae with several widely spaced loose clusters of 2–3 rather than lower pinnae not clustered in this manner. This species is probably more closely related to *A. seabrensis*, which has clustered pinnae on the lower one-third to one-half of its rachis, whereas in *A. pindobassu*, the lower pinnae are in several widely spaced loose clusters of 2–3. They also differ in size of anthers and relative prominence of fiber clusters in the endocarp. Both species are fairly tall trees with similar-sized staminate flowers and fruits with an exceptionally thick epicarp.

According to Bondar (1942b), an edible oil extracted from the seeds of this palm is used in the diet of local inhabitants; a certain number of fruits are shipped to Salvador (Bahia) for use in the oil industry. Larry Noblick relates a story of a young boy (from a family of 14 children) from Serra de Tobira (Jussiape), a remote area in Bahia with no roads. The staple food of the family for a number of years was fruits of *pindobassú*: the

yellow mesocarp (*dende*) and seeds were the main parts eaten. Leaves are used in dwellings, and the apical meristem is edible.

16. *Attalea burretiana* Bondar, Field Mus. Natur. Hist. Bot. 22:460. 1942a; Bol. Inst. Centr. Fom. Econ. Bahia 13:63–64, figs. 17–19. 1942b. **LECTOTYPE:** (Glassman, 1977a) Brazil, Bahia, Aratú, *Bondar 24* (F-619754!). **Figs.** 9–11, 47, 71, 78.

Attalea concentrista Bondar, Field Mus. Natur. Hist. Bot. 22:461. 1942a, 1942b, 1964. **LECTOTYPE:** (Glassman, 1977a) Brazil, Bahia, munic. S. Antonio de Jesus, Castro Alves, Amargosa, Aeria, S. Ines, alt. 200–400 m, on granitic or gneissic terrains, *Bondar s.n.* (F-619759!).

Trees 10–30 m tall and 35–40 cm in diam; **sheathing leaf base** about 0.65 m long, **petiole** absent, or 1–6 cm long and 17–30 cm wide near base, mostly with dark brown or grayish white indument, margins with relatively long stiff fibers 11–30 cm long, **leaf rachis** 5.5–8.5 (10) m long; 140–200 **pinnae** on each side of rachis, those from middle series regularly arranged, 95–140 cm long and 5–7 (8) cm wide, with acute, asymmetrical tips, partially covered with brownish lepidote indument; **staminate sterile bract** 1.2–1.9 m long (including beak of 15–40 cm long) and 10–20 cm wide, deeply sulcate; **rachis** of **staminate inflorescence** 80–125 cm long, peduncle 45–62 cm long, **rachillae** about 300 in number, 22–26 cm long on lower part, 16–20 cm long on upper part; **staminate flowers** in two rows on one side of the rachilla, 18–25 mm long on lower part, 14–15 mm long on upper part, **petals** usually 3 in number (rarely 4, in *Noblick 4722*), flat, 3–4 mm wide, with acuminate tips and denticulate margins, prominently nerved, sepals 1–2 mm long, **stamens** 6–9 in number, **anthers** 9–10 (14) mm long, **filaments** 2–3 mm long; **androgynous sterile bract** 2.3–2.5 m long (including beak of 25–40 cm long) and 25–45 cm wide, deeply sulcate, **rachis** of **androgynous inflorescence** 0.85–1.2 m long, peduncle about 0.8 m long, **rachillae** numerous, **pistillate portion** of each rachilla either less than 1 cm, 6–7 cm, or 13–14 cm long, 1–2, 2–4, or 5–7 pistillate flowers per rachilla, **staminate extension** of each rachilla 15–16 cm long; in *Noblick and Glassman 4584*, rachillae on lower one-third of androgynous rachis with staminate flowers only, but rachillae on upper two-thirds of rachis with the normal arrangement of pistillate and staminate flowers; **pistillate flowers** 3.5–4.0 cm long and 2 cm in diam, sepals much shorter than petals, one 0.8 cm long, the other two fused, about 1.5 cm long, **pistil** 2.5 cm long, **stigmas** 3 in number, subsessile, about 1.2 cm long, staminodial ring

about 5 mm high; **fruit** 8–11 cm long (including beak of 1 cm long) and 4.5–6.0 cm in diam, covered with a rusty brown indument, persistent perianth 3–5 cm high, staminodial ring 1.0–2.5 cm high, 2.5–3.0 cm across, dark banded on outer and inner margins, **epicarp** fibrous, 1.5–2.0 mm thick, **mesocarp** soft, 3–6 mm thick, **endocarp** hard, 1–2 cm thick, with more or less conspicuous **fiber clusters**, **seeds** 1–3 in number, 3–4 cm long and 1.0–1.5 cm in diam.

Distribution and Habitat. Brazil, Bahia, municipalities adjacent to Salvador, alt. 10–100 m, associated with *A. × piassabossu* and in Agua Comprida (Bondar, 1942b); confined to eastern Bahia in the Atlantic coastal forest and its remnants and in the transitional forest (mata cipó), from Serra da Pioneira, near Amargosa in the north, to Cravolandia and Gandú in the south, and extending southwest to several km north of Itororo. In August 1988, Larry Noblick and I observed dense populations of many thousands of trees on inaccessible, steep mountain slopes and in valleys on the road to Amargosa along highway BA046; this area may be the center of distribution for *A. burretiana*. Thousands of trees were also seen both south and north of Salvador, especially about 15 km north of Salvador on BR324; along the old airport road; and near Valeria, on the road to Feira Santana, in remnants of the Atlantic coastal forest, about 350 m in elevation. Other large populations of this palm were observed along BR101 both north and south of Gandú for about 50 km or more. According to Noblick (1991), populations of *A. burretiana* were also observed within the borders of Sergipe on the north and Espírito Santo on the south, and it appears to thrive in areas where the original forest was cleared.

Vernacular Names. *Palmeira, andaia, catolé, pindoba-graúda.*

Representative Specimens Examined. **BRAZIL.** Bahia: Aratú, *Bondar s.n.* (F-619753); without definite locality, 1940, *Bondar s.n.* (F-619758); munic. Cravolandia, Fazenda Ponto Novo, 25 km east of Santa Ines, mata primario, about 1,000 trees seen in area, Aug. 1976, *Glassman 13008* (F, SP), *13009* (F, SP); vicinity of Aratú, 25 km west of Salvador, dense mata, about 75–100 trees seen in area, Aug. 1976, *Glassman 13010* (F, SP); Dom Macedo Costa, 2 km leste da cidade, mata hygروفilica, yellow latosol reddish clay, only a few trees seen, rare, May 1985, *Noblick and Lemos 3810* (F, HUEFS); Fazenda Serra Branca, Amelio Rodrigues, remnant of Atlantic coastal forest, mata secundario, stand of about 100 trees, Aug. 1988, *Noblick and Glassman 4574* (BAH, F); *Noblick and Glassman 4576* (BAH, F); city limits of Salvador, Avenida Paralela, circa 1 km from center de Administração da Bahia going toward airport, Atlantic coastal forest, about 750 trees in area, Aug. 1988, *Noblick and Glassman 4582* (BAH, F); *Noblick and*

Glassman 4584 (BAH, F); 20 km north of Gandú, remnant of transitional forest, along BR101, a few thousand trees seen in area along hillsides, Aug. 1988, *Noblick et al. 4588* (CEPEC, F); Alto Seco, 20 km from Laje, alt. 350 m, in mata cipó, several hundred trees seen in valleys and on steep slopes in region, Aug. 1988, *Noblick et al. 4589* (CEPEC, F); on Fazenda, 46 km northeast of Itororo, alt. 300 m, along BR101, on grassy hillsides and in remnants of transitional forest with *Syagrus romanzoffiana* as one of its associates, a few hundred trees seen in region, Aug. 1988, *Noblick et al. 4594* (CEPEC, F); 10–15 km from Palmira, along rocky dirt road, remnant of transitional forest, about 50 trees in area on steep, inaccessible slopes, Aug. 1988, *Noblick et al. 4595* (CEPEC, F); *Noblick et al. 4596* (CEPEC, F); munic. Jandaira, 14–18 km east of Jandaira, Fazenda Lagoa Escura, disturbed coastal rain forest, Dec. 1988, *Noblick 4722* (F).

A. burretiana seems to be most closely related to *A. pindobassu* and *A. seabrensis*. Similarities and differences between these three species have been discussed previously.

Medeiros-Costa (1985) said that *A. burretiana* may be conspecific with *A. camposportoana* (now transferred to *A. apoda*). According to my investigations, they are distinct species and differ as follows: *A. burretiana* is found primarily in eastern Bahia and has staminate rachilla 15–17 cm long, anthers 9–10 mm long, 3 stigmas, fruits 8–11 cm long with 1–3 seeds, and mesocarp 3–6 mm thick; *A. camposportoana* (*A. apoda*) has been collected mainly in Minas Gerais and has staminate rachillae 10–15 cm long, anthers 7–8 mm long, 4 stigmas, fruits 5–7 cm long with one seed, and mesocarp about 1 mm thick.

A. burretiana crosses with *A. funifera* to produce *A. × piassabossu* in a few localities in the vicinity of Salvador. This taxon will be treated in more detail under “Hybrids of *Attalea*.” Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. oleifera* Barb. Rodr.

Leaves of *A. burretiana* are used as a covering for houses and to shade vegetable crops. Fruits and seeds are edible, and seeds yield a fine cooking oil.

17. ***Attalea oleifera*** Barb. Rodr., Nov. Rev. Bras. Rio Jan. 7:123. 1881; Sert. Palm. Bras. 1:69, t. 58. 1903b; Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:534. 1929a; Henderson, Galeano, and Bernal, 1995. **LECTOTYPE:** (Glassman, 1977a) Brazil, common in stands in arid or dry lands along the basin of Rio São Francisco, prov. Alagoas, Pernambuco, and Ceará (Barb. Rodr., Sert. Palm. Bras. 1:t. 58, 1903b). **Figs.** 41, 67, 77.

Trees 7–25 m tall and 30–45 cm in diam (fide Barb. Rodr.); **sheathing leaf base** not measured; **leaves** 9 m long, **petiole** 0.6–1.5 m long, **leaf rachis** 4.0–7.5 m long, both with ferruginous indument; 180–200 **pinnae** on each side of rachis, intervals of 3–9 cm between some pinnae, those from middle series regularly arranged, 80–115 cm long and 3.0–5.5 cm wide, with asymmetrical tips; **staminate sterile bract** 0.5–2.6 m long (fide Barb. Rodr.) (including beak of 30 cm long), 19–26 cm wide, covered with a ferruginous tomentum, deeply sulcate; **rachis of staminate inflorescence** 1.0–1.4 m long, peduncle about 1.25 m long, both covered with a whitish tomentum, **rachillae** numerous, 18–22 cm long, covered with a brownish white lepidote indument; **staminate flowers** arranged in two rows along one side of the rachilla, 1.5–2.5 cm long, **petals** 2–3 mm wide, distinctly nerved, with acuminate tips and denticulate margins, **sepals** 1–2 mm long, **stamens** 6–9 in number, **anthers** 6–8 mm long, **filaments** 1.5–2.0 mm long; **androgynous sterile bract** 0.65–2.65 m long (fide Barb. Rodr.) (including beak of 30 cm long), and 24–40 cm wide, covered with a ferruginous tomentum, deeply sulcate; **rachis of androgynous inflorescence** 1.0–1.3 m long, peduncle about 1.25 m long, both covered with a whitish tomentum, **androgynous rachillae** numerous, **pistillate portion** 10–11 cm long (25 cm long, fide Barb. Rodr.), covered with a brownish white lepidote indument, with 6–8 **pistillate flowers** (2–4, fide Lyra-Lemos, 1987), each 2.5–3.5 cm long and 1.5–2.0 cm in diam, **pistil** 2.5 cm long and 1.2 cm in diam, covered with brownish lepidote indument, **stigmas** 3, about 6 mm long, staminodial ring about 7 mm high; **extended staminate rachilla** 8–11 cm long; **fruit** 7–9 cm long and 4.0–4.5 cm in diam, ferruginous tomentose, **epicarp** fibrous, about 1 mm thick, covered with ferruginous tomentum, **mesocarp** soft, about 3 mm thick, watery-oily, **endocarp** hard, 7–10 mm thick, dark brown, with scattered **fiber clusters**, **seeds** 1 in number, sometimes 2, 3.0–3.5 cm long, endosperm solid, oily.

Distribution and Habitat. See table 1. Medeiros-Costa (1982) reported this species from Paraiba, Alagoas, Sergipe, Bahia, and Minas Gerais, but cites specimens only from Pernambuco; and Lyra-Lemos (1987) cited specimens from Alagoas. Noblick (1991) did not list this palm from Bahia. The reports of *A. oleifera* from Rio São Francisco and Minas Gerais by Barbosa Rodrigues probably should refer to *A. compta*.

Vernacular Names. *Catolé, palmeira, pindoba* (Medeiros-Costa, 1982).

Representative Specimens Examined. **BRAZIL.** **Cultivated.** Rio de Janeiro: Jardim Publico de Campos, Rio de Janeiro, 1882, 1885, *Glaziou 15556* (B, C, G, MO, P).

A. oleifera seems to be closely allied to *A. compta* because both are arborescent with regularly arranged pinnae and have similar-sized anthers. It differs from this taxon mainly in the longer staminate rachillae, the shorter staminate flowers, and the smaller 1-seeded fruits.

Fruit is economically important: the mesocarp and endosperm of seed are oily and are used by native inhabitants as a source of cooking and illuminating oil; leaves are used as a thatching material.

18. ***Attalea compta*** Martius, Hist. Natur. Palm. 2:137, t. 41, 97. 1826; Bondar, figs. 1–3, 11. 1942b; Dahlgren, pl. 26. 1959; Balick, Anderson, and Medeiros-Costa, 1987. **LECTOTYPE:** (Glassman, 1977a) Brazil, in plures provincias, *Princ. M. Neovidensis s.n.* (M!). **Figs.** 50, 79.

Trees 10–15 m tall, about 15 cm in diam (2.5–7.5 m × 20–32 cm, fide Balick, Anderson, and Medeiros-Costa, 1987); **sheathing leaf base** 0.4–1.3 m long, **petiole** 10–20 cm long, margins coarsely fibrous; **leaf rachis** 4.0–6.5 m long; 132–91 **pinnae** on each side of rachis, those from middle series regularly arranged about 1.5–1.8 cm apart, 90–110 cm long, and 3.5–4.0 cm wide, with abundant reddish punctate dots on abaxial side (observed in lectotype, but not mentioned by Balick, Anderson, and Medeiros-Costa, 1987 in their description), more or less prominent cross veinlets on adaxial side, with acute asymmetrical tips, margins of pinnae covered with ferruginous lepidote indument chiefly near tips; expanded part of **staminate sterile bract** 0.75–1.60 m long, 11–30 cm wide, and 1 cm thick, deeply sulcate and plicate as well, grooves irregularly distributed; **rachis of staminate inflorescence** 0.8–1.0 m long, peduncle 0.4–1.3 m long, **rachillae** numerous, 15–18 cm long; **staminate flowers** 15–18 mm long, **petals** flat, 4–5 mm wide, with acute to acuminate tips, distinctly nerved, sepals 2 mm long, **stamens** 10–12 in number, **anthers** 7–8 mm long, **filaments** about 1 mm long; **androgynous inflorescence** and **pistillate flowers** not recorded; **fruit** 8.0–9.5 cm long and 5.0–5.5 cm in diam, persistent perianth 4.0–4.5 cm high, staminodial ring 0.5–1.0 cm high and 2.5 cm across, **epicarp** fibrous, 2–3 mm thick, **mesocarp** soft, 2–3 mm thick, oily, **endocarp** woody, about 1 cm thick, **fiber clusters** inconspicuous, **seeds** 3–4 in number, about 3 cm long and 1 cm in diam.

Distribution and Habitat. Martius (1826) listed *A. compta* from the following nine different Brazilian states: along the coast in forests of Bahia (Ilheus), Piauí, Pernambuco, and Maranhão and in Espírito Santo (Porto Seguro), Rio de Janeiro, São Paulo, Minas Gerais, and Goiás. Bondar

(1942b) said that this species forms dense forests in the north of Espírito Santo and in all of the coastal area of southern Bahia up to Reconcavo in the municipalities of Poçoas, Bôa Nova, Jequie, and Rio Novo. According to Balick, Anderson, and Medeiros-Costa (1987), *A. compta* occurs in the state of Minas Gerais in the municipalities of Uberlandia and Santa Fé, where it hybridizes with *O. oleifera* to produce \times *Attabignya minarum*. This taxon will be discussed in more detail under "Hybrids of *Attalea*." Noblick (pers. comm.) collected specimens of *A. compta* from Vazante, Minas Gerais, near the headwaters of Rio São Francisco; however, no *Orbignya* palms were observed in this location.

From Martius's description of *A. compta* occurring "in plures provincias," it would be impossible to determine the exact type locality. The particular specimen was chosen as lectotype because it contains information similar to that in the original article and was also illustrated by Dahlgren (1959). Several other specimens collected by Princ. M. Neovidensis determined as *A. compta* are also deposited at M. Some have no localities listed, but two others are inscribed with Rio São Francisco. The main course of this river runs through Bahia and into Minas Gerais for some distance until it branches into several smaller tributaries above Pirapora. Balick, Anderson, and Medeiros-Costa (1987) reported *A. compta* from Uberlandia, which is more than 200 km west of these tributaries, and from Santa Fé, which is considerably closer to Rio São Francisco. Before trying to establish the probable type locality, it will be necessary to make more collections to get a better idea of the distributional range of this palm. As it now stands, the only precise localities are those cited in Balick, Anderson, and Medeiros-Costa (1987) and recent collections of Noblick from Minas Gerais. I have seen the following specimens determined as *A. compta* by Bondar from Bahia and Espírito Santo, without specific localities: *Bondar s.n.* (F-619757) and *Bondar 18* (F-404618); the specimens of the first one do not match the original description closely, and the specimen from Espírito Santo consists of leaf parts only. The localities mentioned above for the distribution of *A. compta* probably refer to other species of *Attalea* that occur in eastern Bahia and Espírito Santo, such as *A. funifera*, *A. humilis*, and *A. burretiana*. Recent collections of the last three taxa by Larry Noblick and me have enabled us to pinpoint the morphological characteristics and distribution patterns more accurately. It is not likely that *A. compta* is found in all the nine states mentioned by Martius (1826), nor is it likely that it occurs in both eastern Bahia and central Minas Gerais, since there is such a wide disjunction between these two places. There are

sufficient differences between *A. compta* and the above three species from eastern Bahia to conclude that the native distribution of *A. compta* is probably confined to Minas Gerais, mainly west of Rio São Francisco.

According to a survey done by Tenorio (1982), *A. compta* was observed in about 50 different localities in Minas Gerais. It is uncertain how many collections were made to verify its identity, but if most of these observations are accurate, then *A. compta* must be considered a common or abundant species, probably with populations of several hundred thousand trees.

Vernacular Names. *Pindoba-ussú*, *babassú* (Espírito Santo); *naia*, *catolé* (Bahia); *andaja*, *ndaja* (Princ. M. Neovidensis); *indaia*, *andaia*, *palmeira* (Minas Gerais, fide M. Balick); *bandarra*, *baguaçu* (Minas Gerais). It should be noted that the names listed above for Espírito Santo and Bahia probably belong to other species of *Attalea*.

Representative Specimens Examined. BRAZIL. No localities listed on two sheets, but Rio São Francisco listed on two others, *Princ. M. Neovidensis s.n.* (M).

This species appears to be closely allied to *A. brasiliensis* because their staminate flowers are similar in size with a similar number of stamens and their anthers are similar in size. *A. compta* differs chiefly in the longer staminate rachillae, distinctly nerved rather than obscurely nerved staminate petals, and larger fruits with inconspicuous rather than prominent fiber clusters in the endocarp. It also seems to be closely related to *A. oleifera*, differing principally in the narrower pinnae, shorter staminate rachillae, longer staminate flowers, and longer fruits with several seeds rather than one seed. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. oleifera* Barb. Rodr.

19. *Attalea apoda* Burret, Repert. Spec. Nov. Regni Veg. **32**:105. 1933.

TYPE: Brazil, Minas Gerais, Porto de Rio Paracatú and Piquiero, sandy cerrado, Sept. 1895, *Glaziou* 22266 (holotype, P!; isotypes, BR!, C!, G!, MO!).

Attalea camposportoana Burret, Notizbl. Bot. Gart. Berlin-Dahlem **14**:257. 1938; Glassman, 1977a. **TYPE:** Minas Gerais, Serra de Mantiqueira, on road between Juiz da Fora and Barbacena, by Palmyra, Dec. 1937, *Burret* 17 (holotype, B!; isotype, RB!). **Figs.** 3, 58, 61, 79.

Trees 8–13 m tall; **sheathing leaf base** not measured; **petiole** (incomplete) about 34 cm long and 8 cm wide; **leaf rachis** about 6.7 m long (fide Burret), more or less covered with a brownish indument; middle series **pinnae** regularly arranged along rachis, with brownish indument along

edges, 96–110 cm long and 3.5–4.7 cm wide (7 cm, fide Burret), mostly with acuminate, asymmetrical tips; **staminate sterile bract** 2 m long (fide Burret) (including beak of about 27 cm long), deeply sulcate; **rachis of staminate inflorescence** 60–80 cm long, peduncle 18 cm long, **rachillae** numerous, 12–14 cm long; **staminate flowers** arranged in two rows along one side of the rachilla, 17–20 mm long, 3–5 mm wide, **petals** strongly nerved, sepals 1 mm long, **stamens** 8–9, **anthers** 6–8 mm long, **filaments** 2 mm long; complete **androgynous sterile bract** not measured, deeply sulcate, beak about 15 cm long; **rachis of androgynous inflorescence** 30 cm long (incomplete), peduncle 24–32 cm long, **rachillae** numerous, **pistillate portion** of each rachilla 1–3 cm long, 2–4 pistillate flowers per rachilla, **staminate extension** of each rachilla 5–7 cm long, with many staminate flowers; **pistillate flowers** 1.8–2.0 cm long, **pistil** about 1.5 cm long, **stigmas** 4 in number, staminodial ring about 0.6 cm high; **staminate flowers** (from staminate extension) 15–22 mm long, **petals** flat, about 5 mm wide, with acuminate tips and denticulate margins, more or less prominently nerved, sepals 2 mm long, **stamens** 9 in number, **anthers** 6–7 mm long, **filaments** about 2 mm long; **fruit** 5–7 cm long and 3.0–3.5 cm in diam, persistent perianth 3–4 cm high, **epicarp** about 1 mm thick, **mesocarp** 1 mm thick, **endocarp** bony, 5–8 mm thick, with scattered, inconspicuous **fiber clusters**, **seeds** 1 in number, 2.3 cm long and 1.9 cm in diam.

Distribution and Habitat. See table 1.

Vernacular Name. *Catolé*.

Representative Specimens Examined. **BRAZIL.** Minas Gerais: Fazenda Catolé, 27 km east of Copelinha, along Catolé correqueio, along hillside and in Manihot plantation, about 1,000 young stemless plants and mature trees seen, Aug. 1976, *Glassman 13004* (F, SP), *13005* (F, SP), *13006* (F, SP), *13007* (F, SP); munic. Juiz da Fora, 7 km south of Eubang de Camara, 10 trees seen on fazenda grazing area, also common for 20 km north of Juiz da Fora, Aug. 1976, *Glassman 13000* (F, SP).

Specimens Tentatively Included. **BRAZIL.** Minas Gerais: Serro de Palacio, part of stand of thousands of trees, July 1965, *Glassman and Gomes 8043* (F, SP). Goiás: Meia Ponte, Rio Vagabine, virgin forest, July 1894, *Glaziou 22270* (BR, C, K, MO, P).

This taxon differs from *A. compta*, which also occurs in Minas Gerais, mainly in the fewer number of stamens (8–9 vs. 10–12), smaller fruits (5–7 cm vs. 8.0–9.5 cm) and fewer seeds (1 vs. 3–4). *A. apoda* seems to be closely related to *A. oleifera*. Both are arborescent, have regularly arranged

pinnae, and have 1-seeded fruits. They differ primarily in the size of their fruits, the size of their staminate and pistillate rachillae, and the number of stigmas. This species also appears to be closely related to *A. brasiliensis*; comparisons will be discussed under that species. Figure 9, illustrated in my 1967 article, shows a stand of *Attalea* from Serro de Palacio that may possibly be this species. Unfortunately, only fruits were collected from these trees.

A. apoda Burret (1933) was originally thought to be a synonym of *A. geraensis* Barb. Rodr., but after reexamining the type specimens, I discovered that its characteristics matched those of *A. camposportoana* more closely than those of *A. geraensis*, especially since the pistillate flowers have four stigmas. Other features, such as the size of staminate flowers, number of stamens, and size of anthers also match those of *A. camposportoana* closely. When this change was made, it became apparent that *A. apoda* is now the "correct" name because it was described by Burret at an earlier date (1933) than *A. camposportoana* (1938) was. Henderson, Galeano, and Bernal (1995) reduce this taxon to synonymy under *A. speciosa* Martius, which I treat as a synonym of *O. phalerata* Martius.

20. ***Attalea salvadorensis*** Glassman, *sp. nov.* **TYPE:** Brazil, Bahia, 78 km north of Salvador (vicinity of Amelia Rodrigues), near turnoff for Itapetingui, along highway BR324, mata secundario, in Atlantic coastal forest remnant, associated with *Elaeis* and *Bactris*, about 200 *Attalea* trees seen in area, Aug. 1976, *Glassman 13016* (holotype, F!; isotype, SP!). **Figs.** 51, 72, 77.

Caudex ca 30 m altus, folium regulariter pinnatum, pinnis mediis 106–18 cm longis, 3.5–4.2 cm latis; bractea mascula 61 cm longa, inflorescentia mascula multiramosa, pedunculo 67 cm longo, rachide 40–45 cm longa, rachillis 10–11 cm longis, flores masculi 13–15 mm longi, petalis 3–4, stamina 6–9, antherae 7–9 mm longae; fructus 9 cm longus, 5 cm diametro, epicarpio 1.5–2.0 mm crasso, mesocarpio 2.5–3.0 mm crasso, endocarpio osseo, 10–15 mm crasso, fibris inconspicuis, semen 1.

Trees up to 30 m tall; **petiole** 80–95 cm long; **leaf rachis** 6.0–7.5 m long; **pinnae** regularly arranged along rachis, those from middle series 106–18 cm long and 3.5–4.2 cm wide; expanded part of **staminate sterile bract** about 61 cm long and 10 cm wide, peduncular part about 72 cm long; **rachis of staminate inflorescence** 40–45 cm long, peduncle 67 cm long, **rachillae** numerous, 10–11 cm long; **staminate flowers** arranged in two rows along one side of the rachilla, each 13–15 mm long, mostly with 3–

4 **petals**, each about 2 mm wide, strongly nerved with acuminate tips and denticulate margins, sepals 3–4 in number, about 1 mm long, **stamens** 6–9 in number, **anthers** 7–9 mm long, **filaments** about 2 mm long; complete **androgynous inflorescence** not seen; **fruit** about 9 cm long and 5 cm in diam (including beak of 1.5 cm long), persistent perianth 3–4 cm high, staminodial ring about 1 cm high, 2.5 cm across, **epicarp** fibrous, 1.5–2.0 mm thick, **mesocarp** soft, 2.5–3.0 mm thick, **endocarp** hard, 10–15 mm thick, **fiber clusters** scattered, not conspicuous, **seeds** 1 in number, off-center, about 1.5 cm in diam.

Distribution and Habitat. See table 1.

Vernacular Names. None recorded.

Representative Specimens Examined. Only material from the type locality has been collected.

Superficially, this newly described species seems to be most closely allied to *A. brasiliensis* from Goiás because both have regularly arranged pinnae, are arborescent, have relatively short staminate rachillae, and have staminate flowers similar in size. It differs primarily in the staminate flowers with 3–4 petals instead of 3, which are strongly, rather than obscurely, nerved and longer fruits with inconspicuous fiber clusters. Staminate flowers (from the staminate inflorescence) with 4 petals are unusual in the genus *Attalea*. Therefore, I am not certain whether the 4 petals in this particular specimen is teratological or if it is an inherited trait. The flowers, however, do not appear to be infested with insects or attacked by a bacterial, viral, or fungal disease. Also, the single seed is off-center, indicating that one or more other seeds may have been suppressed from developing.

A more plausible explanation for the origin of *A. salvadorensis* may be that it is a hybrid between *A. burretiana* and *A. humilis*, the two most common species of *Attalea* in the general area where it was collected. Table 2 shows a comparison of the three taxa.

The data in the table reveal that only one characteristic, pinnae length, is more or less intermediate between the two taxa. The following features of *A. salvadorensis* are closer to those of *A. burretiana*: size of plant, rachis length, and stamen number; the length of petiole, pinnae width, length of staminate rachillae, microscopic cross sections of pinnae, and size of fruit more closely resemble those of *A. humilis*. Its flower length is smaller than those in either putative parent, and the 3–4 petals are unlike those in either one.

Analysis of table 2 does not strongly indicate that *A. salvadorensis* is a hybrid between *A. burretiana* and *A. humilis*; however, *Glassman 13016* may

Table 2. Comparison of *A. salvadorensis* with Its Possible Hybrid Parents, *A. burretiana* and *A. humilis*

	<i>A. burretiana</i>	<i>A. salvadorensis</i>	<i>A. humilis</i>
Plant size	trees 10–30 m tall	up to 30 m tall	acaulescent, trunk up to 1 m tall
Petiole length	sessile or 1–6 cm	80–95 cm	50–80 cm
Rachis length	5.5–7.8 m	6.0–7.5 m	5.5–8.5 m
Pinnae length	95–140 cm	106–18 cm	65–95 cm
Pinnae width	5–7 cm	3.5–4.2 cm	3.5–5.5 cm
Staminate rachillae length	22–26 cm	10–11 cm	6–11 cm
Staminate flower length	18–25 mm	13–15 mm	16–21 mm
Stamen number	6–9	6–9	6
Petal number	3	3–4	3
Fruit size	8–11 × 4.5–6.0 cm	9 × 5 cm	6–9 cm × 4–8 cm
Seed number	1–3	1, off-center	1–3
Microscopic cross section of pinnae	expansion cell tissue (ECT) not divided, adaxial nonvascular fibers (NVF) mostly in short oval clusters, abaxial NVF common in separate clusters and attached to some veins	ECT divided, adaxial NVF in small rounded clusters, abaxial NVF common in separate clusters and attached to most veins	ECT divided, adaxial NVF in small rounded clusters, abaxial NVF common in separate clusters and attached to most veins
Geographic distribution	eastern Bahia, in Atlantic coastal forest and remnants	eastern Bahia, only known for one locality in Atlantic coastal forest remnant	eastern Bahia, Espirito Santo, and Rio de Janeiro, in Atlantic coastal forest and remnants

represent a backcross with one of these species, probably *A. humilis* (even though most of the palms in the stand appear to be *A. burretiana*), because it seems to share more characteristics with this taxon than with *A. burretiana*. Certainly, more collections are necessary before a final determination of the status of this taxon can be made.

21. *Attalea brasiliensis* Glassman *sp. nov.* **TYPE:** Brazil, Goiás, 23.5 km north of central Brasilia, Fer Cal area, remnant of climax deciduous upland forest, Aug. 1976, *Glassman and Eiten 13057* (holotype, F!; isotype, SP!). **Figs.** 33–34, 70, 79.

Caudex 4–6 m altus, folium regulariter pinnatum, pinnis mediis 76–82 cm longis, 3.5 cm latis; bractea mascula 69 cm longa, inflorescentia mascula multiramosa, pedunculo 53 cm longo, rachide 43 cm longa, rachillis 8–11 cm longis, flores masculi 14–16 mm longi, stamina 10–11, antherae 6–7 mm longae, bractea androgyna 124 cm longa 15 cm lata, inflorescentia androgyna multiramosa, pedunculo ca 25 cm longo, rachidi 74 cm longi, rachillis feminis ca 2.5 cm longis, rachillis masculis 7–10 cm longis, fructus 6 cm longus, 4.8–5.2 cm diametro, epicarpio 1 mm crasso, mesocarpio 3 mm crasso, endocarpio osseo 10–13 mm crasso, fibris conspicuis, semina 2, 2.2 cm longa 1.2–1.5 cm lata.

Trees 4–6 m tall; **sheathing leaf base** not measured; **petiole** (incomplete) 13 cm wide near base, margins with fibers 8–15 cm long, **leaf rachis** not measured; **pinnae** regularly arranged along rachis, those from middle series 76–82 cm long and 3.5 cm wide with acuminate, asymmetrical tips; **staminate sterile bract** deeply sulcate, expanded part 69 cm long (including beak of 16 cm long); **rachis of staminate inflorescence** 43 cm long, peduncle 53 cm long, **rachillae** numerous, 8–11 cm long; **staminate flowers** arranged in two rows along one side of the rachilla, each 14–16 mm long, **petals** flat, 4–5 mm wide, with acuminate tips and smooth margins, obscurely nerved, sepals 1.5 mm long, **stamens** 10–11 in number, **anthers** 6–7 mm long, **filaments** about 1.5 mm long; expanded part of **androgynous sterile bract** deeply sulcate, grooves unequally spaced, about 78 cm long (including beak of 15 cm long) and 15 cm wide, peduncular part about 46 cm long; **rachis of androgynous inflorescence** about 74 cm long, peduncle about 25 cm long, **rachillae** numerous, **pistillate portion** of each rachilla about 2.5 cm long, 1 pistillate flower scar per rachilla, **staminate extension** of each rachilla 7–10 cm long; **pistillate flowers** not seen; **fruit** 6 cm long and 4.8–5.2 cm in diam, persistent perianth 3 cm high, staminodial ring 0.7 cm high and 3 cm across, **epicarp** about 1 mm thick, **mesocarp** about 3 mm thick, **endocarp** 10–13 mm thick, dotted with prominent **fiber clusters**, **seed** cavities 2, 2.2 cm long and 1.2–1.5 cm in diam.

Distribution and Habitat. See table 1.

Representative Specimens Examined. **BRAZIL.** Goiás: 23.5 km north of central Brasilia, Fer Cal area, remnant original low trees in climax deciduous upland forest area, in limestone derived soil, Aug. 1976, *Glassman and Eiten* 13058 (F, SP), 13059 (F, SP), 13060 (F, SP).

The new species seems to be closely allied to *A. apoda* from Minas Gerais because both are arborescent, have regularly arranged pinnae, have rela-

tively short staminate and androgynous rachillae, and have relatively small fruits. *A. brasiliensis* differs in having staminate flowers with obscure rather than strongly nerved petals, a thicker mesocarp, and 2-seeded rather than 1-seeded fruits with prominent instead of inconspicuous clusters of fibers.

Doubtful and Uncertain Species of *Attalea*

Attalea agrestis Barb. Rodr., Enum. Palm. 42. 1875; Sert. Palm. Bras. 1:t. 55. 1903b. **LECTOTYPE:** (Glassman, 1972a) Brazil, Rio Uauincha (Barb. Rodr., t. 55, 1903b).

Orbignya agrestis (Barb. Rodr.) Burret, 1929a.

Acaulescent; petiole 20–25 cm long, **leaf rachis** 1 m long, tomentose; middle series **pinnae** regularly arranged, 30 cm long and 2.5 cm wide; **inflorescence** 30–35 cm long; **fruit** 4 cm long and 2.8 cm in diam, with 3 seeds.

Distribution. Amazon region of Brazil.

Vernacular Name. *Curua-y* (Barb. Rodr.).

Representative Specimens. No authentic specimens seen. Burret (1929a) cited *Huebner 4b* (B), but this specimen is not diagnostic (Glassman, 1977b).

In Barbosa Rodrigues's original article (1875), *Barbosa Rodrigues 324* was cited, but this specimen could not be found. Therefore, the above illustration was chosen as lectotype. The genus to which this taxon belongs is uncertain because staminate flowers were not described or illustrated in t. 55. Burret (1929a) transferred this species to *Orbignya* because of its resemblance to *O. sabulosa* Barb. Rodr. Henderson, Galeano, and Bernal (1995) treat this taxon as a synonym of *A. microcarpa* Martius, which I treat as a doubtful species.

Attalea blepharopus Martius, Palmet. Orbign. 116, t. 5, fig. 2, t. 31C. 1844; Hist. Natur. Palm. 3:t. 167. 1845. **TYPE:** Bolivia, *d'Orbigny 34* (holotype, P, destroyed?).

Scheelea blepharopus (Martius) Burret, 1929a.

Burret (1929a) transferred this species to *Scheelea* without explanation, but probably did so because staminate flowers were described as fleshy by Martius (1844). Staminate flowers illustrated by Martius (t. 167), however, appear to have flattened petals. Since the description of the staminate flowers is questionable and no other specimens (besides the type, which

was probably destroyed) have been collected, this taxon should be considered an uncertain species.

No other species of *Attalea* have been reported from Bolivia; however, *S. princeps* is the only species of *Scheelea* collected from that country. At any rate, I cannot equate *S. blepharopus* with *S. princeps* because of a lack of available specimens for examination and a questionable description. Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat this taxon as synonymous with *A. phalerata* Martius.

Attalea excelsa Martius ex Sprengel, Syst. Veg. 2:624. 1825; Martius, t. 96, fig. III, 1–2. 1826. t. 169, fig. 3. 1845. **TYPE:** Brazil, Maranhão and Pará (no specimens cited). **LECTOTYPE:** (Henderson, 1995) Martius, Hist. Natur. Palm. 2:t. 96, figs. 1–3. 1826.

Scheelea martiana Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:661. 1929a.

Burret (1929a) transferred this species to *Scheelea*, but was obliged to give it a new name because *S. excelsa* Karsten (1857), based on a different type, was already published. Staminate flowers were not mentioned in Martius's original description; however, Burret justified his transfer to *Scheelea* on the presence of fiber clusters in the endocarp of the fruit. This is a questionable distinction because a number of species of *Attalea* also have clusters of fibers in the endocarp. On the other hand, there is nothing in the description to place it in *Attalea* either. Therefore, this binomial is designated as a *species dubium*. Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat this taxon as a synonym of *A. phalerata* Martius.

Attalea goeldiana Huber, Bull. Herb. Boiss. ser. 2, 6:268. 1906. **TYPE:** Brazil, Rio Acre (no specimens cited). Type not designated.

Scheelea goeldiana (Huber) Burret, 1929a.

I am considering this species as doubtful because Huber's description is inadequate and lacks illustrations. Burret probably transferred it to *Scheelea* because Huber placed it in section *Pseudoscheelea* Drude of the genus *Attalea*. Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat this binomial as a synonym of *A. insignis* (Martius) Drude.

Attalea gomphococca Martius, Hist. Natur. Palm. 3:301, t. 167, fig. 6. 1845.

LECTOTYPE: (Glassman, 1972a) Central America (t. 167, fig. 6).

Scheelea gomphococca (Martius) Burret, p. 666. 1929a.

Since Martius's original description and illustration is based mainly on the fruit and since the exact locality is in doubt, it is difficult to delimit

this taxon with any degree of confidence. Apparently, Burret had no basis for transferring it to *Scheelea* because the staminate flowers were not described. Henderson, Galeano, and Bernal (1995) treat this binomial as a synonym of *A. butyracea* (Mutis ex L.f.) Wessels Boer.

Attalea hoehnei Burret, Notizbl. Bot. Gart. Berlin-Dahlem **10**:522. 1929a.

TYPE: Brazil, Mato Grosso or Acre, Agua Limpa, Campo, *Hoehne* 2196 (holotype, B, destroyed?).

The entire description of Burret indicates this taxon is probably based on depauperate specimens. Size of pinnae, staminate inflorescence, rachillae, and staminate flowers are all very small for this genus and hence are difficult to compare to those of other species. Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat this binomial as a synonym of *A. phalerata* Martius.

Attalea lapidea (Gaertner) Burret, Notizbl. Bot. Gart. Berlin-Dahlem **10**:533. 1929a; Henderson, Galeano, and Bernal, 1995.

Cocos lapidea Gaertner, Fruct. Sem. Pl. **1**:16, t. 6, fig. 1. 1788. **LECTOTYPE:** (Glassman, 1972a) Brazil, Bahia (Gaertner, t. 6, fig. 1., 1788).

Burret placed this palm close to *A. funifera* based on the similarity of the fruits; however, it should be considered a doubtful species because there is virtually no information on the leaves, inflorescences, flowers, or size of the plant.

Attalea microcarpa Martius, Palm. Orbign. 125, 1844. t. 168, fig. 2. 1845. t. Z16, fig. 5. 1849. **TYPE:** Brazil, Pará, *Martius s.n.* (holotype, M, destroyed?). **LECTOTYPE** (Henderson, 1995) Martius, Hist. Natur. Palm. **3**:t. 168, fig. 2. 1845.

Orbignya microcarpa (Martius) Burret, 1929a.

Size of plant, leaves, rachis, pinnae, and androgynous and staminate inflorescences and flowers not measured; **fruit** about 3.7 cm long and 2.5 cm in diam.

The description and illustrations are insufficient for determination (neither the leaves nor the staminate flowers are mentioned), but Burret thought it may belong to *Orbignya*. No specimens were cited by Martius; however, according to Burret, the infructescence illustrated by Martius (t. 168) was preserved in the Munich collections. Nevertheless, this name should be treated as a *species dubium* because even the genus to which it

belongs is uncertain. On the other hand, Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat *A. microcarpa* as a good species. They also place *O. sagotii* and *O. polysticha* in synonymy, but I consider both as bona fide species.

Attalea monosperma Barb. Rodr., Enum. Palm. Nov. 42, 1875. t. 57A. 1903b.

LECTOTYPE: (Glassman, 1972a) Brazil, Pará (t. 57A, 1903b).

A. spectabilis var. *monosperma* (Barb. Rodr.) Drude, Martius Flora Bras. 3:440. 1881; Burret, 1929a.

Burret (1929a) said this palm may belong to *Orbignya*, but it is different from *O. spectabilis*. Staminate flowers were neither described nor illustrated by Barbosa Rodrigues or Drude, hence determination of the genus is doubtful. No specimens were cited by Barbosa Rodrigues, but Drude listed *Sagot 601* and *831* from French Guiana. The latter specimen is part of the type collection of *O. sagotii*. Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat this taxon as a synonym of *A. spectabilis*.

Attalea pixuna Barb. Rodr., Enum. Palm. Nov. 43. 1875. **LECTOTYPE** (Glassman, 1972a). Brazil: Pará, calcareous soil of Igarape Bom Jardim, Villa de Itaituba, Rio Tapajos (t. 49, 1903b).

Orbignya pixuna (Barb. Rodr.) Barb. Rodr., Prot. App. 49. 1879. t. 49. 1903b; Glassman, 1977b.

See *Orbignya pixuna* for discussion.

Attalea pycnocarpa Wessels Boer, Pittieria 17:299. 1988. **TYPE:** Venezuela, Terr. Amazonas, Puerto Ayacucho, mesophytic forest on well-drained sandy clay, July 28, 1967, *Wessels Boer 1910* (holotype, U!).

Since staminate flowers were not described, it is difficult to determine the genus of this taxon. Wessels Boer surmised that it may belong to *Orbignya*, but there is insufficient evidence to draw this conclusion. Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat this species as a synonym of *A. butyracea*.

Attalea racemosa Spruce, Journ. Linn. Soc. 11:166. 1871; Wessels Boer, 1972, 1988. **TYPE:** Venezuela, Amazonas, Rio Negro, *Spruce 54* (holotype, K!; isotype, P!).

Orbignya racemosa (Spruce) Drude, 1881.

This taxon will be discussed under *O. racemosa*.

Attalea rhynchocarpa Burret, Notizbl. Bot. Gart. Berlin-Dahlem **12**:617. 1935; Dugand, 1940, 1954; Henderson, Galeano, and Bernal, 1995. **TYPE**: Colombia, Rio Frio, bei Salonique, *Dryander s.n.* (holotype, B, destroyed?).

The description for this taxon is incomplete. Neither staminate or pistillate inflorescences or flowers nor length and width of pinnae are described.

Attalea spectabilis Martius, Hist. Natur. Palm **2**:136, t. 96, figs. 1–2. 1826; Wessels Boer, 1965, 1972, 1988.
Orbignya spectabilis (Martius) Burret, 1929a.

This taxon will be discussed under *O. spectabilis*.

Attalea wallisii Huber, Bull. Herb. Boiss., ser. 2, **6**:267. 1906. **TYPE**: Brazil, Amazonas, Rio Purus (no specimens cited). **LECTOTYPE** (Glassman, 1977a) Brazil: Rio Purus or Rio Acre (*Huebner 163–B!*).
Scheelea wallisii (Huber) Burret.

The original description by Huber is mainly a comparison of characters with *A. humboldtiana*, which it most closely resembles.

Burret probably transferred the species to *Scheelea* because of its close resemblance to *A. humboldtiana*. In 1934 he gave *S. wallisii* a rather lengthy description, except for the flowers. Since neither staminate nor pistillate flowers are known, this species is doubtful. Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat this taxon as a synonym of *A. butyracea*.

Genus *Orbignya*

Geographic Distribution of Genus *Orbignya*

The genus *Orbignya* (11 species) is essentially South and Central American in distribution (see table 3). Its center of distribution appears to be wet forested areas of northern Brazil. A total of 7 of the 9 South American species as well as 3 hybrids, *O.* × *teixeirana*, × *Maximbignya dahlgreniana*, and × *Attabignya minarum*, are found in Brazil. Other South American taxa occur in Suriname (3, including × *Maximbignya dahlgreniana*); Colombia (3, including *Ynesa colenda*); French Guiana, Guyana, and Venezuela (2 each); and Bolivia, Peru, and Ecuador (1 each). In Brazil 4 taxa each are found in Amazonas and Maranhão; 3 each in Goiás, Bahia, and Piauí; 2 each in Pará and Minas Gerais; and one each in Ceará and Mato Grosso. In Central America and the Caribbean 1 species is found in each of the following: Mexico, Belize, El Salvador, Guatemala, Honduras, Nicaragua, and Haiti.

In contrast to genera like *Syagrus* and *Attalea*, which have a number of taxa growing in xerophytic regions, and much like the genus *Scheelea*, most species of *Orbignya* occupy mesophytic or wet forested areas. Some persist in drier disturbed habitats after the original vegetation has been cut.

In spite of deforestation, several species of *Orbignya* are still fairly common or abundant today: *O. phalerata* is common or abundant in several states of Brazil in mesophytic or wet forests; × *Maximbignya dahlgreniana* forms large uniform populations associated with *O. phalerata* in Suriname; *O. cohune* is common in several provinces along the Atlantic coast in Guatemala; *O. guacuyule* is apparently still fairly common in forests in several states of Mexico; *O. polysticha* appears to be common in forests in the Amazon regions of Peru, Venezuela, and Brazil; and judging from recent collections, *O. sagotii* seems to be holding its own in wet forests of Suriname. On the other hand, certain other species may not be as common

Table 3. Geographic Distribution of *Orbignya*

Species	Country and State	Habitat
<i>O. brejinhoensis</i>	Brazil: Bahia, east of Rio São Francisco	Mesophytic forests in stream valleys at 400–900 m alt.
<i>O. cohune</i>	Belize; El Salvador; Honduras: Atlantida; Guatemala: Izabel, Alta Verapaz, Petén; Nicaragua: Zelaya	Climax forests, Atlantic lowland and mountain forests, in well-drained soils
<i>O. crassispatha</i>	Haiti: western part of southern peninsula and eastern part of Massif de la Hotte	Scattered stands, rocky areas
<i>O. cuatrecasana</i>	Colombia: Valle	Rain forest, along streams
<i>O. eichleri</i>	Brazil: Goiás, Bahia, Maranhão, Piauí	Forests and secondary growth areas
<i>O. guacuyule</i>	Mexico: Oaxaca, Guerrero, Michoacan, Colima, Jalisco, Nayarit	Forests and deciduous forests
<i>O. luetzelburgii</i>	Brazil and Venezuela: Amazonas; Colombia: Vaupes	Rain forests, sandy savannas, sandy soil between forest and open savanna
<i>O. oleifera</i>	Brazil: western Minas Gerais, Munic. de Pirapora, Santa Fé; Bahia: west of Rio São Francisco, Munic. de Barra, Bianópolis, Cocos, São Desiderio	Forests, along river margins, adjacent to cerrados or caatingas
<i>O. phalerata</i>	Bolivia: departments of Santa Cruz and Beni; Brazil: Amazonas, Pará, Maranhão, Ceará, Piauí, Mato Grosso, Goiás; Guyana and Suriname	Wet forests, sandy soils, subhydrophytic forest
<i>O. polysticha</i>	Amazon regions of Peru, Venezuela, Brazil; French Guiana	Forests, rain forests on white sandy soil
<i>O. sagotii</i>	French Guiana; Suriname; Guyana; Brazil: Amazonas	Wet, well-drained soil in undergrowth of savanna-like forest on sandy soil often among granite in dense shade
Hybrids:		
<i>O. × teixeirana</i>	Brazil: Maranhão (Codó, Caxias), Goiás (Tocatinópolis), Piauí (Terezina)	Cerrados (soils of low water and low fertility during dry season)
× <i>Maximbignya dahlgreniana</i>	Brazil: Pará, Maranhão; Suriname	Matas, mesophytic forests, in clay or sandy loam soils
× <i>Attabignya minarum</i>	Brazil: Minas Gerais	Forests, along streams

Table 3. Cont.

Species	Country and State	Habitat
<i>Ynesa colenda</i>	Ecuador: Los Rios, Manabi, Esmeraldas, Guayas; Colombia: Nariño	Dense wet forests on northern coastal plain; more abundant in drier forests of western and southern coastal plain; much destruction of vegetation, but persists in pastures on well-drained and hilly ground

as *O. phalerata*; *O. brejinhoensis*, which was known only from several stands in Bahia, in the municipality of Oliveira dos Brejinhos, recently has been reported from a number of other localities in Bahia; *O. eichleri* is known from a number of collections in Goiás, Piauí, and Maranhão, and more recently from Bahia; *O. oleifera* is known from limited areas in Minas Gerais and several localities in Bahia; *O. cuatrecasana* has a limited distribution in the department of Valle in Colombia; and *O. luetzelburgii* is apparently local in the Amazon regions of Brazil and Venezuela and in the province of Vaupes in Colombia.

According to Markley (1971), the genus *Orbignya* (especially *O. phalerata*) originated in the interior high plateau of Goiás. With few exceptions, *babassú* areas in Brazil are connected with watersheds of the highlands of Goiás. These highlands contain Archeozoic rocks that have undergone long periods of erosion, resulting in complex river systems. The shoreline habitats provided a means of migration and dispersal for many genera of palms that probably evolved during the Cretaceous period. Currently, *O. phalerata* occurs in greatest density and pure stands on deltas in Maranhão, in flood plains of the Paraguay River drainage basin, and in broad river valleys of the interior. In these areas, there is little or no competition from dicotyledonous trees.

Relationships within Genus *Orbignya*

In contrast to *Attalea* and *Scheelea*, which are divided into subgenera based on clustering of middle series pinnae, *Orbignya* seems to fall into four natural groups or subgenera based on morphology of the staminate flower petals. In the first group (comprising four species), petals are flattened and 1–8 in number resulting from fusion of 2–several petals and additional petals resembling anthers; petals are usually of two shapes, lanceolate with acute tips and broad with lacinate or coarsely toothed tips. The second

subgenus, with five species, has 3 flattened spatulate petals (very wide near the middle and narrow at the base) with acute or obtuse tips; in the third group petals are curved and lanceolate; and the last group has fleshy petals with hooked, acute tips. The first subgenus can be split into two distinct units or sections based on the size of plants, the number of stamens per flower, and clustering of middle series pinnae (see the "Key to Species and Hybrids of *Orbignya*"). *O. eichleri* is the only member of the first grouping. It is distinct and does not seem to be closely related to species of the second unit; however, it does hybridize and backcross with *O. phalerata* to produce *O. × teixeirana*. The second section, characterized by arborescent plants, regularly arranged pinnae, and flowers with 24–57 stamens, comprises three species that seem to form a close alliance. *O. phalerata* has a much broader geographic range than the other two species, *O. oleifera* and *O. brejinhoensis*.

The second subgeneric group is divided into three acaulescent and two arborescent species. The latter two palms from Central America appear to be closely allied, differing mainly in the size of their staminate rachillae and staminate flowers, size of pistillate rachillae, and number of stamens. *O. guacuyule* may have been derived from *O. cohune*, which has a more extensive range. Apparently, the acaulescent taxa do not show very close relationships. *O. cuatrecasana* differs from the others in having pinnae with glandular dots, a large number of stamens (20–24), and very large fruits (11–14 cm); and *O. polysticha* is differentiated from *O. sagotii* chiefly in having staminate flowers completely encircling the staminate rachilla instead of being on one side of the rachilla.

In the third subgeneric group, *O. crassipatha* can be easily separated from the other subgenera by its curved, flattened petals and clustered instead of regularly arranged middle series pinnae. It seems to be without close relatives in *Orbignya*.

The fourth subgenus is represented by one species, *O. luetzelburgii*, whose staminate flowers are so distinct that it was transferred to a separate genus (*Parascheelea*) by Dugand (1941).

In contrast to *Syagrus*, the genus *Orbignya* seems to have a higher percentage of closely related species. In *Orbignya*, only about 5 of 11 taxa are isolated, whereas in *Syagrus* more than 50 percent of the species appear to be without very close relatives, and most of these represent sections containing a single species. *Scheelea* seems to be more of a homogeneous genus than *Orbignya* because a higher percentage of its species are closely

allied, mainly because its staminate flowers are very much alike, i.e., all have fleshy petals mostly of the same shape (more or less terete) and consistently with 6 stamens. On the other hand, in *Orbignya* the petals are of four distinct shapes and have stamens ranging from 6 to 57 in number. In *Attalea*, petals are fairly similar in shape (consistently lanceolate), but like *Orbignya* its species have evolved high stamen numbers (up to 64).

It is not certain when *Orbignya* first appeared in the geological record, but as previously mentioned, its cocoid ancestors were present in the Eocene period. Three of the four genera in the subtribe *Attaleinae* (*Orbignya*, *Scheelea*, and *Attalea*) have a similar distribution, being found in both South and Central America. The ranges of both *Orbignya* and *Scheelea* extend as far north as Mexico, but *Attalea* reaches only Panama in Central America. *Maximiliana*, the fourth genus, with only one species, is distributed in northern South America.

Outline of Tentative Division of *Orbignya* into Infrageneric Categories

Subgenus I. Staminate flowers with 1–8 petals, usually of two distinct shapes, one as a result of fusion of 2 or more petals with coarsely toothed tips, the other lanceolate with acute tips. Staminate flowers arranged on one side of the rachillae.

Section 1. Acaulescent, middle series pinnae in clusters of 2–4. *O. eichleri*.

Section 2. Arborescent, middle series pinnae regularly arranged. *O. brejinhoensis*, *O. oleifera*, *O. phalerata*.

Subgenus II. Staminate flowers with 3 petals, usually separate, spatulate, and flattened. Staminate flowers mostly spirally arranged around rachillae.

Section 3. Acaulescent.

Subsection A. Staminate flowers with 20–24 stamens. *O. cuatrecasana*.

Subsection B. Staminate flowers with 11–15 stamens. *O. polysticha*.

Subsection C. Staminate flowers with 8–12 stamens, arranged on one side of rachillae. *O. sagotii*.

Section 4. Arborescent. *O. cohune*, *O. guacuyule*.

Subgenus III. Staminate flowers with 3 curved, flattened lanceolate petals. Middle series pinnae in clusters of 2–4. Arborescent. *O. crassispatha*.

Subgenus IV. Staminate flowers with 3 narrow, fleshy, curved petals with hooked tips, and connate at base. Middle series pinnae regularly arranged. Acaulescent. *O. luetzelburgii*.

Taxonomic Treatment of Genus *Orbignya*

In the present paper, I am recognizing only 11 species of *Orbignya* out of 30 that have been included in this genus. This number includes 1 newly described species, *O. brejinhoensis*, and 1 new combination, *O. crassispatha*. The remaining 19 names have been designated *species incerta* or *species dubia* (9) or *nomen nudum* (1), or reduced to synonymy (9). In addition to 11 species of *Orbignya*, I am recognizing 1 interspecific hybrid, *O. × teixeirana*, 2 intergeneric hybrids, *× Maximibignya dahlgreniana* (described as new) and *× Attabignya minarum*; and 1 putative hybrid, *Ynesa colenda*.

In the taxonomic treatment of *Orbignya* the same format as that used for *Attalea* is followed.

ORBIGNYA Martius ex Endlicher, Gen. Plant. 257. 1837a (conserved name); Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:493–543. 1929a; Glassman, Phytologia 36:89–115. 1977b; not *Orbignya* Bertero, Mercurio Chil. 16:737. 1829 (Euphorbiaceae). **TYPE:** *Orbignya phalerata* Martius.

Section *Distichanthus* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:498. 1929a. **TYPE:** none listed.

Section *Pleioanthus* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:499. 1929a. **TYPE:** none listed.

Section *Spirostachys* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:499. 1929a. **TYPE:** none listed.

Parascheelea Dugand, Caldasia 1:10. 1940. **TYPE:** *P. anchistropetala* Dugand. = ***Orbignya luetzelburgii*** Burret.

Trees (in 6 species) 6–38 m tall (up to 70 m in one species, fide Ryder, 1978) and 30–50 cm in diam; **acaulescent** in 5 species. **Sheathing leaf base** 0.5–2.0 m long; **petiole** absent or 0.15–2.5 m long, whitish tomentose and greenish punctate in at least 1 species, petiole margins with fibers 10–32 or more cm long and 3 mm thick; **leaf rachis** 2–18 m long, frequently covered with a ferruginous indument; 50–290 **pinnae** on each side, those from middle series regularly arranged (in 9 species) or in clusters of 2–4 (in 2 species and 1 hybrid), with intervals of from 2 cm between pinnae or clusters in several species to 5–7 cm apart in several others, pinnae from middle series 60–150 cm long and 2.5–9.0 cm wide, glaucous abaxially in some species, rarely with scattered, tiny brownish glandular dots adaxially, margins near tips frequently with ferruginous indument, pinnae tips acute or acuminate and asymmetrical; expanded part of **staminate ster-**

ile bract from 35 cm long and 4–5 cm wide to 2.5 m long and 60 cm wide (including beak of 10–40 cm long), deeply sulcate, frequently covered with a brownish or ferruginous indument, peduncular part of bract (frequently included in size of whole bract) 0.35–1.0 m long; **rachis of staminate inflorescence** 15–60 cm long, peduncle 0.2–3.0 m long, with numerous **rachillae** (30–600), usually covered with a whitish indument or sometimes with a brownish farinose indument, individual rachillae 7–30 cm long, **staminate flowers** in pairs and completely encircling rachilla or single or in pairs on one side of rachilla, each 7–15 mm long, **petals** of four types: (1) consistently 3, usually of one shape (spatulate and flattened), about 1 mm wide at base and 3–8 mm wide near middle; (2) petals 1–8 in number, resulting from complete fusion of 2–several petals, and usually with one or more additional separate petals, usually of two shapes, one irregular and mostly broad throughout, with notched and coarsely toothed tips, the other lanceolate, with acute tips, rarely with only lanceolate petals; (3) 3 fleshy petals with hooked, acute tips; and (4) 3 flat, curved lanceolate petals; sepals 3 in number, usually 1–2 (5) mm long, **stamens** 6–57 in number, **anthers** 1–2 mm long, spirally twisted and coiled, **filaments** 1.5–3.5 mm long; **androgynous sterile bract** 0.35–1.9 m long, 5.5–60.0 cm wide and 2–3 cm thick (including beak of up to 32 cm long), peduncular part 23–50 cm long, deeply and irregularly sulcate, frequently brownish pubescent; **rachis of androgynous inflorescence** 0.2–1.0 m long, peduncle 0.15–1.5 m long, frequently with brownish indument, **androgynous rachillae** numerous (up to 300 in some species), comprising a basal **pistillate portion** with each pistillate flower accompanied by two staminate flowers that fall off early and a narrower terminal portion with staminate flowers only (**staminate rachilla extension**); basal portion from almost sessile to 10–15 cm long, frequently with scattered whitish lepidote indument, **pistillate flowers** 1–11 per rachilla, each 2.0–4.5 cm long and 1.5–4.0 cm in diam, sepals 3 and petals 3, either equal in size or sepals somewhat shorter than petals and more or less nerved, **pistil** 2–4 cm long, ovary glabrous or brownish lepidote, style very short or sessile, **stigmas** 3–8 in number, each 0.5–1.5 cm long, staminodial ring 0.5–1.5 cm high; **transitional pistillate flowers** about 15 mm long, sepals 3, broad and imbricate, about 9 mm long, petals 3, narrow, lanceolate, black in color, about 15 mm long, stigmas black, **pistil** about 8 mm long, **staminate flowers** from pistillate rachilla frequently sterile and transitional, 5–8 mm long and 2 mm wide, **petals** black, flat, somewhat fleshy and curved, **stamens** mostly 6 in number, **anthers** 1.0–1.5 mm long, coiled and twisted, pistillode about

4 mm long; **staminate extension** of androgynous rachilla usually unbranched and frequently broken off, 11–21 (28) cm long, sometimes with 8–14 branches; **fruit** usually orange when ripe, 3.5–14.0 cm long and 2.0–9.5 cm in diam, persistent perianth 3–6 cm high, staminodial ring 1.0–1.5 cm high, **epicarp** fibrous, 1.5–3.5 cm thick, **mesocarp** soft, 1–6 mm thick, **endocarp** hard, 0.5–2.5 cm thick, **fiber clusters** usually inconspicuous, but occasionally with conspicuous fibers, **seeds** 1–7 in number, each 2.5–5.2 cm long and 1.0–1.5 cm in diam.

Key to Species and Hybrids of *Orbignya*

1. Staminate flowers with 1–8 petals, which are usually of two distinct shapes: one resulting from complete fusion of 2 or more petals and mostly broad throughout, with notched or coarsely toothed tips, the other lanceolate with acute tips; staminate flowers arranged on one side of rachilla, pistillate flowers with 3–8 stigmas.
 2. Acaulescent or up to 8 m tall (in *O.* × *teixeirana*), staminate flowers with 12–24 stamens, middle series pinnae in clusters of 2–5.
 3. Middle series pinnae 45–95 cm long and 2.5–3.6 cm wide, staminate sterile bract 35–65 cm long and 4–5 cm wide, staminate rachis 18–35 cm long, rachillae of staminate inflorescence up to 15 cm long 1. *O. eichleri* (Brazil: Goiás).
 3. Middle series pinnae up to 110 cm long and up to 4 cm wide, staminate sterile bract 85–130 cm long and 10–13 cm wide, staminate rachis 50–100 cm long, rachillae of staminate inflorescence up to 20 cm long *O.* × *teixeirana* (Brazil: Goiás).
 2. Trees 6–38 m tall, staminate flowers with up to 57 stamens, middle series pinnae regularly arranged.
 4. Stamens 8–9 or 11–20 in number, anthers 5–10 mm long, usually twisted, sometimes partially coiled or straight.
 5. Stamens 8–9, anthers 5–6 mm long, usually twisted, sometimes straight, not coiled, fruit 1-seeded
. *Ynesa colenda* (Ecuador and Colombia).
 5. Stamens 11–20, anthers 8–10 mm long, usually twisted, sometimes partially coiled, fruit 2–4 seeded
. × *Attabignya minarum* (Brazil: Minas Gerais).
 4. Stamens up to 57 in number, anthers 1–2 mm long, distinctly coiled.
 6. Petiole 80–100 cm long, pistillate portion of androgynous

- rachilla up to 1 cm long, stigmas mostly 6–8 in number, fruits 8–10 cm long 2. *O. brejinhoensis* (Brazil: Bahia).
6. Petiole absent or up to 50 cm long, pistillate portion of androgynous rachilla 2–15 cm long, stigmas 3–6 in number, fruits 10–14 cm long.
7. Petiole absent or up to 10 cm long, pistillate portion of androgynous rachilla 2–3 cm long
 3. *O. oleifera* (Brazil: Minas Gerais, Bahia).
7. Petiole 15–50 cm long, pistillate portion of androgynous rachilla 10–15 cm long
 4. *O. phalerata* (Brazil, Bolivia, Guianas).
1. Staminate flowers consistently with 3 petals, usually separate, spatulate, and flattened (about 1 mm wide at base and 3–8 mm wide near middle, usually with acute or obtuse tips); or sometimes lanceolate, flat, and curved with acuminate tips; or narrow, fleshy, connate for about one-third of corolla base and with curved, hooked, acute tips; staminate flowers mostly completely encircling the rachilla (except *O. sagotii*), pistillate flowers mostly with 3–4 stigmas.
8. Staminate flowers usually with spatulate or curved, flattened lanceolate petals.
9. Middle series pinnae in clusters of 2–4, staminate flowers with curved petals 5. *O. crassispatha* (Haiti).
9. Middle series pinnae regularly arranged, staminate flowers with spatulate petals.
10. Plants acaulescent.
11. Staminate flowers with 20–24 stamens, pistillate portion of androgynous rachilla 1–3 cm long, with 2–3 pistillate flowers, fruits 11–14 cm long
 6. *O. cuatrecasana* (Colombia).
11. Staminate flowers with 8–15 stamens, pistillate portion of androgynous rachilla 4–8 cm long, with 4–11 pistillate flowers, fruits 3.5–4.5 cm long.
12. Pinnae sometimes with tiny orange glandular dots, staminate flowers completely encircling rachilla, stamens 10–15 in number
 7. *O. polysticha* (Amazon: Peru, Venezuela, Brazil, Guianas).
12. Pinnae without orange glandular dots, staminate flowers arranged on one side of rachilla, stamens 8–12 in number
 8. *O. sagotii* (Guianas, Brazil).

10. Trees mostly 6–20 m tall and 30–50 cm in diameter.
13. Staminate rachillae 20–30 cm long, staminate flowers 13–15 mm long, petals 6–8 mm wide, stamens 24 in number, pistillate portion of androgynous rachilla 10–13 cm long, fiber clusters in endocarp inconspicuous 9. *O. cohune* (Guatemala).
13. Staminate rachillae 10–18 cm long, staminate flowers 8–10 mm long, petals 4–5 mm wide, stamens 19–20 in number, pistillate portion of androgynous rachilla 5–8 cm long, fiber clusters in endocarp common and conspicuous 10. *O. guacuyule* (Mexico).
8. Staminate flowers with narrow, fleshy, somewhat terete petals or sickle-shaped petals.
14. Acaulescent, middle series pinnae regularly arranged, staminate rachillae 3–6 cm long, staminate flowers with almost terete or plano-convex petals, which are connate for one-third of length at base, with hooked, sharply acute tips, stamens 6 in number, anthers 1.5–2.0 mm long, distinctly coiled, pistillate portion of androgynous rachilla 4–6 cm long, fruits 1 seeded 11. *O. luetzelburgii* (Venezuela, Colombia, Brazil).
14. Trees 5–7 m tall and 20–30 cm in diameter, middle series pinnae in clusters of 2–3, staminate rachillae 13–17 cm long, staminate flowers with flat and somewhat sickle-shaped petals with acuminate tips, which are not fused at base, stamens 7–10 in number, anthers 4–6 mm long, twisted, but not coiled, pistillate portion of androgynous rachilla 11–15 cm long, seeds 3 in number × *Maximibignya dahlgreniana* (Brazil, Suriname).

Taxonomic Treatment of Species of *Orbignya*

1. ***Orbignya eichleri*** Drude, Martius Fl. Bras. 3:449, t. 103. 1881; Glassman, p. 99. 1977b; Balick, Anderson, and Madeiros-Costa, p. 1022. 1987. **TYPE:** Brazil, Goiás, Sertao d'Amaroleite, mountain forest, 1844, Weddell 2705 (P, lectotype!, excluding leaf); cf. Dahlgren, pl. 339. 1959. **Figs.** 91, 101, 126. *Attalea eichleri* (Drude) Henderson, Galeano, and Bernal, Field Guide Palm. Amer. 265. 1995. ? *Orbignya urbaniana* Dammer, Engl. Bot. Jahrb. 31, Beibl. 70:23. 1902; Dahlgren, pl. 344. 1959; Glassman, p. 107. 1977b. **TYPE:**

Brazil, Goiás, Serra Dourada, in campis, Aug. 1895, *Glaziou* 22265 (C!, holotype; F!, G!, P!, isotypes).

Acaulescent; sheathing leaf base 20–30 cm long, **petiole** 30–80 cm long; **leaf rachis** 1.2–2.5 m long; 63–128 **pinnae** on each side of rachis, those from middle series in irregularly spaced clusters of 2–5, each about 45–95 cm long and 2.5–3.6 cm wide, grayish in color on both sides, not glaucous, with acute, asymmetrical tips; **staminate sterile bract** 35–65 cm long and 4–5 cm wide (including beak of 3–12 cm long), deeply sulcate, sometimes tomentose; **rachis of staminate inflorescence** 18–35 cm long, **rachillae** 30–35 in number arranged on one side of the rachis, 8–15 cm long, sometimes with single pistillate flower at base; **staminate flowers** usually solitary, arranged on one side of rachilla, each 7–12 mm long (14 mm, fide *Pires and Black 1575a*), **petals** usually 1 (3 fused) or sometimes 2 (2 fused and 1 separate) in number, fused petals broader above and narrowed below, with lacinate or notched tips, separate, single petals lanceolate, with acute or notched tips, sepals 3, separate, 0.5–2.0 mm long, **stamens** 14–20 in number, **anthers** coiled and twisted, 1.0–1.5 mm long; expanded part of **androgynous sterile bract** 35–40 cm long (including beak of 4–7 cm long) and 5.5 cm wide, deeply sulcate, usually brownish tomentose; **rachis of androgynous inflorescence** 18–24 cm long, **rachillae** 10–34 in number, **pistillate portion** 0.1–1.0 cm long, 1–2 pistillate flowers per rachilla, **staminate extension** up to 7 cm long, **staminate flowers** arranged on one side of rachilla; **pistillate flowers** 2–4 cm long and 1.8–2.0 cm in diam, petals shorter than sepals, which are striated, both with umbonate tips, **pistil** 1.5–2.2 cm long, ovary densely light brownish tomentose, style short, **stigmas** 4–8 in number, about 0.5 cm long, staminodial ring about 0.8 cm high and 1 cm across; **fruit** 5.0–7.5 cm long (including beak of 1 cm long) and 4–5 cm in diam, arranged on one side of rachis, persistent perianth about 3 cm high, staminodial ring about 1 cm high and 2.5 cm in diam, **epicarp** fibrous, 1.5–2.0 mm thick, **mesocarp** soft, 2.0–3.5 mm thick, **endocarp** hard, 5–7 mm thick, **fiber clusters** inconspicuous or absent, **seeds** 4–7 in number, 2.5–2.7 cm long and 1.0–1.5 cm in diam.

Distribution and Habitat. See table 3.

Vernacular Names. *Piassava*, *piassaveira*, *pindoba*.

Representative Specimens Examined. BRAZIL. Maranhão: Caxias, Jan. 1952, *Bondar s.n.* (F, RB-80812); Ilha dos Botes, duas leguas de Carolina, July 1949, *Murça Pires and Black 1575a* (US); Bahia (not seen): 33 km south of Formosa do Rio Preto, *Noblick and Lima 4530* (F), 4674 (BAH).

Specimens Tentatively Included. BRAZIL. Goiás: entre Goiás and Cuyaba, *Weddell 2965* (P, another sheet of this number is holotype of *Attalea exigua*, but packet of staminate flowers are definitely *Orbignya*).

I discussed the choice of the lectotype for *O. eichleri* in my 1977b article. This palm hybridizes with *O. phalerata* in certain localities of Piauí, Goiás, and Maranhão to produce *O. × teixeirana*; the hybrid also backcrosses with both parent species (Medeiros-Costa, Campos Mendes, and Castro Brito, 1985).

In 1977b, I treated *O. urbaniana* as a *species incerta* because it was poorly described. The size of leaf rachis, size of staminate and androgynous inflorescences, and fruit dimensions are not known. Here, however, I am tentatively including it as a synonym of *O. eichleri*. There are a number of similarities such as habit, length and width of middle series pinnae, length of staminate rachillae, arrangement and size of staminate flowers, shape of petals, number of stamens, size of pistillate rachilla, and number of pistillate flowers per rachilla. The only drawback is that *O. urbaniana* was described as having regularly arranged instead of clustered pinnae, but perhaps this description did not refer specifically to the middle series pinnae.

O. eichleri is probably most closely allied to *O. phalerata* because both taxa have staminate flowers arranged on one side of the rachilla and petals of their staminate flowers are fused and with notched or laciniate tips. *O. eichleri*, however, is acaulescent rather than arborescent, has clustered rather than regularly arranged middle series pinnae, has staminate rachillae arranged on one side of the rachis rather than spirally arranged, and has fewer stamens per flower (14–20 rather than 24–35) than does *O. phalerata*.

2. ***Orbignya brejinhoensis*** Glassman *sp. nov.* **TYPE:** Brazil, Bahia, munic. Oliveira dos Brejinhos, 40 km east of Ibotarama, Fazenda de Brejinho da Serra Negra, in forest of about 500 trees seen on both sides of the road, associated with *Copernicia prunifera*, Aug. 1976, *Glassman 13041* (F!, holotype; SP!, isotype). **Figs.** 98, 114, 125.

Caudex 15–30 (40) m altus; rachide circa 6–8 m longa, folium regulariter pinnatum pinnis mediis 105–30 cm longis 5.0–6.5 cm latis; bractea inflorescentiae masculae 1.2–1.4 m longa; inflorescentia mascula multiramosa, rachide 85–115 cm longa, rachillis 21–37 cm longis; flores masculi unilateraliter dispositi 8–13 mm longi, petala 3–5, inaequaliter apice laciniata basi latiora, stamina 24–36, fructus 8–10 cm longus 5–7 cm diametro.

Trunk solitary, 15–30 (40) m tall and 40–50 cm in diam; **sheathing leaf base** not measured; **petiole** 0.8–1.0 m long, 30–35 cm wide near base and about 4.5 cm thick, margins fibrous; **leaf rachis** 6–8 m long, some parts prominently winged on adaxial side; 135–65 **pinnae** on each side of rachis, regularly arranged, those from middle series 105–30 cm long and 5.0–6.5 cm wide; **staminate sterile bract** 1.2–1.4 m long (including beak of 10–25 cm long), expanded part 50–60 cm long and 9–10 cm wide, deeply sulcate, partly covered with dense brown lepidote indument; **rachis** of **staminate inflorescence** 85–115 cm long, peduncle 60–80 cm long, **rachillae** 250–315 in number, 21–37 cm long, brownish in color and occasionally with brownish lepidote indument; **staminate flowers** arranged in two rows along one side of the rachilla (flower scars conspicuously depressed), 8–13 mm long and 12–17 mm wide, **petals** irregular in size and shape, two longer (10–13 mm long) and broader at base, with notched and lacinate tips (2–4 coarse teeth), faintly nerved, 1–2 (or occasionally 3) petals are shorter (5–8 mm) and narrower (lanceolate) with acute tips and superficially resemble anthers in a transitional state, sepals 3, about 1.5 mm long, **stamens** 24–36 in number, **anthers** 1.5–2.0 mm in diam, distinctly coiled, **filaments** 1.5–3.0 mm long; **androgynous sterile bract** 1.5–1.8 m long (including beak of 15–25 cm long), expanded part 0.8–1.2 m long and 18–25 cm wide, **rachis** 0.85–1.0 m long, peduncle 0.8–1.2 m long, **rachillae** 200–250 in number, **pistillate portion of rachilla** 0.8–1.0 cm long, each with 1–2 pistillate flowers, **staminate extension of rachilla** about 11 cm long; **pistillate flowers** 5–7 cm long and 4–5 cm in diam, **pistil** about 4 cm long, **stigmas** 6–8 in number, ovary 2.5 cm in diam, staminodial ring 2 cm high; **fruit** 8–10 cm long and 5–7 cm in diam, persistent perianth 5–6 cm high, **epicarp** fibrous, 1–2 mm thick, **mesocarp** white, starchy, fibrous, 1–3 mm thick, **endocarp** hard, 7–13 mm thick, with scattered **fiber clusters**, **seeds** 3–8 in number, 4–5 cm long and 0.5–1.5 cm in diam.

Distribution and Habitat. See table 3.

Vernacular Names. *Babassú, palmeira, coco-palmeira.*

Representative Specimens Examined. **BRAZIL.** Bahia: munic. Oliveira dos Brejinhos, 40 km east of Ibotarama, Fazenda de Brejinho da Serra Negra, in forest of about 500 trees seen on both sides of the road, associated with *Copernicia prunifera*, Aug. 1976, *Glassman 13042* (F, SP); munic. Rio do Pires, 10 km de Varginha na Serra da Onça, forest along length of Serra, rocky and sandy soil, common, Jan. 1986, *Noblick and Lobo 4515* (F, HUEFS, NY). Noblick (1991) also cited specimens from additional municipalities in Bahia: Palmas de Monte Alto, Sebastião de Lorangeira, and Sento Sé (*Noblick 4520-F, Lima s.n. CPATSA, Noblick 4614-F*).

This newly described species seems to be closely related to *O. oleifera* and *O. phalerata* because all three taxa have regularly arranged pinnae similar in size, staminate flowers arranged on one side of the rachilla, petals approximately the same size and shape, which are mostly fused and with notched or lacinate tips, and pistillate flowers with a large number of stigmas (3–8). *O. brejinhoensis* can be distinguished from the other two species mainly by its much longer petioles (80–100 cm), its somewhat longer staminate rachillae (up to 37 cm), its shorter pistillate portion of androgynous rachilla (up to 1 cm rather than 2–15 cm long), its smaller fruits (10 cm instead of 14 cm), and its longer persistent perianth in relation to the size of its fruit. Table 4 differentiates the three species.

3. ***Orbignya oleifera*** Burret, Notizbl. Bot. Gart. Berlin-Dahlem 14:240. 1938; Balick, Anderson, and Medeiros-Costa, p. 30. 1987; Anderson and Balick, p. 39. 1988. **TYPE:** Brazil, Minas Gerais, Pirapora, Dec. 1937, *Burret and Brade 19* (RB!, holotype; B!, isotype). **Figs.** 112, 113, 126.

Trees 10–20 m tall and 30–50 cm in diam; **sheathing leaf base** 1.0–2.5 m long; **petiole** absent or up to 10 cm long; **leaf rachis** 6.0–7.5 m long; 153–206 **pinnae** on each side of rachis, those from middle series regularly arranged, 140–70 cm long and 4.5–6.0 cm wide; **staminate sterile bract** up to 2.4 m long and 30–40 cm wide (including beak of 30–50 cm long); **rachis of staminate inflorescence** 1.0–1.5 m long, peduncle 1.0–1.2 m long, **rachillae** numerous (up to 360), 20–30 cm long; **staminate flowers** arranged in 2–3 rows along one side of rachilla, **petals** 2–8 in number, 9–14 mm long and 9–14 mm wide (lanceolate petals only about 4 mm wide); sepals 3 in number, about 1.5 mm long, **stamens** 24–39 in number; **anthers** irregularly coiled and twisted, **filaments** about 2 mm long; **androgynous sterile bract** 1.3–1.7 m long, **rachis of androgynous inflorescence** 0.9–1.3 m long; **pistillate portion of androgynous rachillae** 2–3 cm long, each with 1–2 **pistillate flowers**, 3.0–4.5 cm long, **stigmas** 3–6 in number; **fruit** 10–14 cm long, 6–9 cm in diam, persistent perianth 3.5–5.5 cm long (7.0–7.5 cm, fide Balick, Anderson, and Medeiros-Costa, 1987), staminodial ring 1.4–2.0 cm high, **epicarp** fibrous, 1–2 mm thick, **mesocarp** 1–3 mm thick, mealy, dry, white, **endocarp** woody, 7–11 mm thick, with single ring of more or less conspicuous **fiber clusters**, **seeds** 4–6 in number, 4.5–6.0 cm long, endosperm white, oily.

Distribution and Habitat. See table 3.

Vernacular Names. *Palmeira, babaçu.*

Table 4. Comparison of *O. brejinhoensis* with Closely Related Species

	<i>O. brejinhoensis</i>	<i>O. phalerata</i>	<i>O. oleifera</i>
Leaf rachis length	7–8 m	6.0–8.5 (13) m	6.0–7.5 m
Petiole length	80–100 cm	15–50 cm	absent or up to 10 cm
Middle series pinnae, length × width	1.05–1.30 m × 5.0–6.5 cm	0.9–1.7 m × 5–7 cm	1.2–1.7 × 4.5–6.0 cm
Staminate inflorescence			
rachis length	0.85–1.15 m	0.7–1.7 m	1.0–1.5 m
peduncle length	0.6–0.8 m	0.5–2.0 m	1.0–1.2 m
Staminate rachillae			
length	21–37 cm	20–28 cm	15–30 cm
Staminate flowers			
arrangement	one side of rachilla	one side	one side
length	8–13 mm	10–17 mm	9–14 mm
stamen number	24–36	usually 24–36, sometimes 20–30	25–39 (57)
Pistillate part of androgynous rachilla, length	0.8–1.0 cm	10–15 cm	2–3 cm
Number of pistillate flowers per rachilla	1–2	1–4	1–2
Pistillate flowers			
length	5–7 cm	3–5 cm	3 cm
stigma number	6–8	3–6	3–6
Fruits			
length × width	8–10 × 5–7 cm	10.0–12.5 × 5–10 cm	10–14 × 7.5–8.0 cm
mesocarp thickness	1–3 mm	2–12 mm	1–3 mm
seed number	3–8	3–6 (1–11)	4–6
Persistent perianth			
length	5–6 cm	4.0–5.5 cm	3.5–5.5 cm
Geographic distribution	Brazil: western Bahia, east of Rio São Francisco	Brazil: common in several northern states; the Guianas; and Bolivia: depts. of Beni and Santa Cruz	Brazil: Minas Gerais; western Bahia, west of Rio São Francisco

Representative Specimens. Balick, Anderson, and Medeiros-Costa (1987) cited several collections from Minas Gerais, and Noblick (1991) cited the following from Bahia: *Noblick and Lobo 4526* (F); *Noblick and Lima 4622* (F), *4645* (F), *4679* (F).

In *Noblick and Lima 4645* nine different combinations of numbers and shapes of petals were found: (1) two petals, one 2-toothed and the other with 3-toothed tips; (2) three petals (a) all lanceolate, (b) one lanceolate and two 2-toothed, (c) two lanceolate and one 3-toothed, (d) three 2-toothed; (3) five petals (a) all lanceolate, (b) four lanceolate, one 2-

toothed; (4) six petals, all lanceolate; (5) eight petals, seven lanceolate, one 2-toothed. *O. oleifera* seems to be most closely related to *O. phalerata* and *O. brejinhoensis* because all three species have staminate flowers with broad fused petals and irregularly dentate tips. It differs from both species in the size of its petiole, the number of stamens, the size of its androgynous rachillae, the number of stigmas, and the size of its fruits. According to Balick, Anderson, and Medeiros-Costa (1987), *O. oleifera* hybridizes with *A. compta* to produce \times *Attabignya minarum*. Henderson, Galeano, and Bernal (1995) reduce this taxon to synonymy under *A. speciosa* Martius, which I treat as a synonym of *O. phalerata* Martius.

Leaves are used to cover houses, and seeds are edible and used as a source of cooking oil. Extraction of the oil is done on a large scale in the municipality of Bianapolis (Noblick, 1991).

4. **Orbignya phalerata** Martius, Palm. Orbign. 126, t. 13, fig. 2, 32A. 1844. t. 170. 1845; Karsten and Schenck, ts. 35–36. 1910; Burret, p. 500. 1929a; Dahlgren, pl. 342. 1959; Glassman, p. 102. 1977b; Anderson and Balick, Syst. Bot. 13:35. 1988. **TYPE:** Bolivia, 12–16°S, Chiquitos and Moxos, immense forests of pure stands, Guarayos, covering 16 sq. km, *d'Orbigny 20* (P!, holotype; F!, M!, isotypes). **Figs.** 83–87, 103a-b, 115, 125, 128.

Orbignya martiana Barb. Rodr., Palm. Mattogross. 68, t. 22, 23, figs. 1–14. 1898. **TYPE:** Published as a new name for *O. speciosa* because of incomplete description (no flowers) by Martius and uncertainty of its delimitation by subsequent authors; in 1903b, however, *O. martiana* was reduced to synonymy under *O. speciosa* by Barbosa Rodrigues.

Attalea speciosa Martius, Hist. Natur. Palm. 2:138. t. 96, figs. 3–6. 1826; Wessels Boer, Indig. Palms Suriname, 164–65. pls. 14, 16. 1965. p. 298. 1988. **TYPE:** Brazil, Maranhão and Pará (no specimens cited). Nomen confusum.

Orbignya speciosa (Martius) Barb. Rodr., Pl. Nov. Cult. Jard. Bot. Rio Jan. 1:32, t. 9, figs. B1–9. 1891a. Sert. Palm. Bras. 1:ts. 52–53. 1903b; Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:503–5. 1929a.

Orbignya barbosiana Burret, Notizbl. Bot. Gart. Berlin-Dahlem 11:690. 1932; H. E. Moore, Principles 7:155. 1963a; Glassman, p. 94. 1977b. **TYPE:** Published as a new name for *O. speciosa* mainly because of confusion with *O. cohune* (Martius) Dahlgren by Barbosa Rodrigues and others.

Orbignya lydiae Drude, Mart. Fl. Bras. 3:448, t. 102. 1881; Lindman, Kongl. Svenska Vetenskapsakad 26:fig. 8. 1900. **TYPE:** Brazil, Cult. Jard. Bot. Rio Jan., *Glaziou 9006* (C!, lectotype; NY!, P!, isoelectotypes). cf. Dahlgren, pl. 341. 1959.

Attalea lydiae (Drude) Barb. Rodr., Sert. Palm. Bras. 1:65. 1903b.

Trees 10–30 m tall, 30–60 cm in diam; **sheathing leaf base** 0.5–2.0 m long; **petiole** 15–50 cm long, margins with stiff fibers up to 10 cm or more long; **leaf rachis** 6–13 m long; 175–260 **pinnae** on each side of rachis, those from middle series regularly arranged, about 2.5–5.0 cm apart, 0.9–1.7 m long and 5–7 cm wide, usually glaucous below, with acuminate, asymmetrical tips; **staminate sterile bract** 1.5–2.5 m long, 20–30 cm wide, and 1.5 cm thick (including beak of 20–60 cm long), deeply sulcate, turning brownish with age; **rachis of staminate inflorescence** 0.7–1.7 m long, peduncle 1–3 m long, **rachillae** 300–400 in number (400–600, fide Wessels Boer), 20–28 cm long, usually covered with white lepidote indument, becoming caducous with age, occasionally brownish pubescent; **staminate flowers** arranged in two rows along one side of rachilla, **petals** usually 2 in number, occasionally 3–4, one petal wider than others, 10–17 mm long and 4.0–7.5 mm wide, the narrower petals 10–17 mm long and 3–5 mm wide, usually distinctly nerved, sometimes obscurely nerved, usually brownish in color, sometimes white or beige, slightly narrowed at base, usually irregularly curved or with bowed out bases, tips usually notched, dentate, and lacinate, occasionally acute, sepals 3 in number, usually 1–2 mm long, sometimes up to 5 mm long, **stamens** usually 24–26 in number, sometimes 20–30, **anthers** distinctly coiled, 1.5–2.0 mm long, brownish in color, **filaments** 2–3 mm long; **androgynous sterile bract** 2.0–2.3 m long and 23–28 cm wide (including beak of about 32 cm long), deeply sulcate, **rachis** 1.0–1.3 m long, peduncle 1.00–1.85 m long, with 300–450 **rachillae**, **pistillate portion** 10–15 cm long (10–24 cm, fide Anderson and Balick, 1988, probably includes **staminate extension**), with 1–4 **pistillate flowers** per rachilla, each subtended by 1–2 bracteoles, 1–2 mm long, sepals usually 3, 3–4 cm long, petals usually 3, 3–5 cm long, **pistil** 2–3 cm long, ovary glabrous or brownish lepidote, style short or absent, **stigmas** 3–6 in number, about 5 mm long, staminodial ring 0.5–1.5 cm high, **staminate flowers** (on androgynous rachilla) usually abnormal, some with 9 **petals** and sterile **stamens**; **fruiting sterile bract** 1.75–2.5 m long and 26–30 cm wide, **rachis of infructescence** 0.75–1.15 m long, peduncle about 2.75 m long, **rachillae** numerous, **pistillate portion** 3–7 cm long, **staminate extension** about 15 cm long, 2–3 fruits per rachilla; **fruit** 10–12 cm long (including beak of

1.5 cm long), 5–10 cm in diam, persistent perianth 4.0–5.5 cm high, staminodial ring about 1.5 cm high and 3.5 cm across, with ciliate margins, **epicarp** fibrous, 1–4 mm thick, **mesocarp** soft, 3–6 mm thick (2–12 mm, fide Anderson and Balick, 1988), mealy-dry at maturity, **endocarp** hard, 0.5–1.5 cm thick, **fiber clusters** usually inconspicuous (with many unequal black fibers, fide Wessels Boer, 1988), **seeds** 3–7 in number, each 3–6 cm long and 1.0–1.5 cm in diam, endosperm white, oily.

Distribution and Habitat. Bolivia, Santa Cruz, in northern part of province of Chiquitos and in Moxos, forming immense forests (covering about 16 square kilometers) of pure stands in the land of Guayaros, on sandy, wet, but not flooded, soil; often planted in streets of above localities (fide Martius, 1844); departments of Beni and Santa Cruz in wet forested areas and clearings (fide Balick *et al.* 1359, 1432); Brazil, in the states of Pará, Maranhão, Ceará, Piauí, Mato Grosso, Amazonas, and Goiás, mostly in wet forests, persisting in disturbed areas after lumbering; Guyana; and in Suriname restricted to the Upper Corantijn area, usually in subhydrophytic forest near watercourses, always associated with \times *Maximibignya dahlgreniana*, which it resembles in general appearance (fide Wessels Boer, 1965). Markley (1971) gave a detailed account of the natural distribution of *babassú* in various Brazilian states based on aerial surveys, observations, and collections made by Bondar and himself. In Pará, it was seen in forests, associated with *Maximiliana maripa* and \times *Maximibignya dahlgreniana* (more or less equally distributed) in the vicinity of Tracuateua, the municipality of Bragança, on poor siliceous soils of Tertiary origin. Maranhão has the largest number of *babassú* palms of any area of similar size in Brazil; it is found in more or less pure stands in most of the river valleys in the central part of the state, e.g., Itapicurú, Mearim, Grajau, Pindaré, and Parnaíba. In Piauí, it is found in relatively pure stands in valleys of the Parnaíba River and its branches and on plateaus of Serra da Ibiapaba (alt. 900 m). In Ceará, it is in mixed forests on steep ravines of Serra Grande (900 m) and in similar situations and in valleys of the Chapada do Araripe (900 m) as well as scattered in pastures and cultivated fields. In Goiás, it is found in the middle portion of the Tocantins River system from confluence with Araguaia in the north to the estuary of Manoel Alves Grande farther south; it is confined to the west bank of the Tocantins, where it is abundant, and from Manoel Alves Grande southward to Porto Nacional, where it is found on both banks. In Minas Gerais, *babassú* occurs from Rio São Francisco on the east and borders with Goiás on the west, the border of Bahia on the north, and about 20°S on the south, in

the lower valley of Urucina River; near the confluence with Rio São Francisco there are extensive forests of about 1,000,000 trees (the Minas Gerais populations are probably *O. oleifera*). In Mato Grosso, the densest populations of *babassú* are in the "Pantanal region," an extensive area subject to flooding and covering about 600 km north and south by 400 km east and west. The most vigorous stands are associated with permanently brackish water with a high magnesium content. Any extensive *babassú* forests reported in the past have since been decimated by grazing and agriculture. In Amazonas, *babassú* is reported growing in 12 municipalities, mostly in the valleys of southern tributaries of the Maranhão-Solimoes-Amazon River system and in areas of Labrea, Canutama, and Coari, which have extensive stands of unexplored and unexploited *babassú* trees. Reports from other Brazilian states have not been verified.

Vernacular Names. *Babassú*, *babaçu*, *uauassú*, *baguaçu*, *guaguçu* (Brazil); *cusi* (Bolivia).

Representative Specimens Examined. **BOLIVIA.** Beni, prov. Marban, Villa Alba, 10 km south of Sachojere, 35 km south of Trinidad, *Balick et al. 1359* (NY); Beni, prov. Mamoré, 18 km south of San Joaquin, seasonally inundated open forest with *Acrocomia*, Aug. 1982, *Balick et al. 1432* (NY). **BRAZIL.** Pará: Tapajos, *Kuhlmann 2203* (F-611585); Tapajos, Bôa Vista, *Capucho 537* (F); São Luiz, 1938, *Dahlgren s.n.* (F-615321); Mujuhy dos campos, near Santarem, *Dahlgren s.n.* (F-615318, 612408); without locality, Marshall Field Amazon Expedition, 1929, *s.n.* (F-612400); 1932, *Hopp 14* (B); munic. Itupiranga, on Rio Tocantins, 20 km downstream from Itupiranga at Caja-Zeirinha, primary forest with *Bertholletia* and *babaçu* dominant, Nov. 1981, *Balick et al. 1304* (NY). Piauí: without locality, *Dahlgren s.n.* (F-612403). Ceará: Pacoty, Nov. 1940, *Dahlgren s.n.* (F-619725); Serra de Baturite, 1932, *Dahlgren s.n.* (F-613570). Mato Grosso: Angustura, region of Rio Machado, Dec. 1931, *Krukoff 1600* (F-620732). Goiás: Rio Araguaya, 1929, Marshall Field Amazon Expedition *s.n.* (F-611587). **SURINAME.** Pailime Kreek, 20 km west of Sipaliwini airstrip, forest, Feb. 1963, *Wessels Boer 806* (F); Coeroeni R., near airstrip, subhydrophytic forest, June 1963, *Wessels Boer 1588* (U). **CULTIVATED.** **USA.** Florida, Miami, Fairchild Tropical Garden, No. 58-831B, Plot 177, originated in Bolivia, prov. Velasco, dept. Santa Cruz, Feb. 1986, *Sanders 1762* (FTG). **GUYANA.** Georgetown Bot. Gard., 1922, *Dahlgren s.n.* (F-610806); Mar. 1922, *Bailey 509* (BH). **BRAZIL.** San Souci, Belém, prop. of A. Alfredo, 1938, *Dahlgren s.n.* (F-615317); without locality, *Dahlgren s.n.* (F-614714, F-614748).

Specimens Tentatively Included. **BOLIVIA.** prov. Velasco, July 1892,

Kuntze s.n. (US, excluding leaf material); **BRAZIL**. Goiás, Rio Araguaya, Concesção, 1926, without collector's name *s.n.* (F-612401). **CULTIVATED**. **JAVA**. Buitenzorg XII E65, *Burret 358* (B). **BRAZIL**. Rio de Janeiro, 1886, *Glaziou 8906* (G). **USA**. Florida: Miami, Plant Introduction Station, USDA, P.I. 9917-123846, July 1963, *Read 912* (FTG).

This taxon is the first one described in the genus *Orbignya*, hence it is the type species. The type material from Paris consists of an androgynous inflorescence with some sterile pistillate flowers matching t. 32 closely; but the isotype from Munich is represented by only a packet of staminate flowers that do not resemble those of t. 32. Some of the flowers have fused petals and others have up to four irregularly shaped petals, which are mostly deeply notched and irregularly toothed. The individual staminate flowers have 3–5 separate lanceolate petals with acute tips; but the flowers attached to the staminate rachillae match those from Munich closely.

Karsten and Schenck (1910) include a photo of *O. phalerata* from the province of Velasco in Bolivia, which shows both arborescent and acaulescent palms.

In 1977b, I discussed reasons for using *O. barbosiana* as the valid name for this species (instead of *O. speciosa*) and also discussed its synonymy. Here I considered using *O. martiana* as the valid name because it is an older substitute name for *O. barbosiana*. Anderson and Balick (1988), however, contend that there are no consistent differences between *O. phalerata* and *O. martiana* and hence reduced *O. martiana* under the former species. At any rate, Henderson (1995) and Henderson, Galeano, and Bernal (1995) reduce *O. phalerata* to synonymy under *A. speciosa*.

I have tentatively included *Kuntze s.n.* (US) from Velasco here because of the locality and because the staminate flowers are on one side of the rachilla and are similar in shape, but smaller (6–7 mm), and because the number of stamens is uncertain; the pistillate flowers are single on a very short rachilla, but are shorter (3 cm) and have 4–6 stigmas. Apparently, the leaf material does not belong to this species, but to another palm, probably *Syagrus flexuosa*.

O. phalerata probably is most closely allied to *O. oleifera* from Minas Gerais and *O. brejinhoensis* from Bahia because both taxa have similar staminate flowers and regularly arranged middle series pinnae. It differs from *O. oleifera* mainly in the number of stamens (20–30 vs. 25–57) and longer petioles and from *O. brejinhoensis* in having fewer stamens (20–30 vs. 24–36) and shorter petioles.

According to Martius (1844), this palm is planted in Bolivia in church-

yards and open places and grows to be 20 m tall and 1 m in diam. The fruit is not edible, but the seeds have an excellent taste and yield an oil used for burning and for rubbing into the hair; the leaves make a good roof thatch.

Babassú is one of the most important oil-producing palms in Brazil. Numerous articles have been written on its economic importance, e.g., Anderson and Anderson (1985), Anderson and Balick (1988), Fonseca (1927), Froes Abreu (1929), Bondar (1954b), Gonsalves (1955), and Markley (1971). J. T. Medeiros-Costa, of the University of Pernambuco, did a systematic study for the Brazilian government with a research group in Teresina, Piauí—Unidade Experimental de Pesquisa de Ambito Estadual (UEPAE), which is now the leading center for the study of *babaçu*. Apparently, the results of this study have not yet been published.

According to Balick (1985), production of the *babaçu* palm (*Orbignya* species) amounts to more than 250,000 tons of seeds per year. Production is primarily in the states of Maranhão, Goiás, and Piauí, with minor production in Ceará, Bahia, Minas Gerais, and Pará. In 1980 (May et al., 1985), about 30 oil factories operated in Maranhão alone. Seeds usually contain less than 8 percent oil of the fruit by weight, but others have been found with up to 17 percent. The remaining fruit parts can be used for production of charcoal and feed meals. *Babaçu* seeds are third only to timber and rice in gross agricultural value in Maranhão. Until recently, *O. phalerata* trees were seldom planted, but were managed within regional agroforestry systems, performing a vital role in the local economy.

In 1980, a major project was established to domesticate *babaçu* and to lay the groundwork for conversion of the industry from the collection of a wild source to a plantation crop (Balick, 1985). In 1981, CENARGEN-EMBRAPA created a germ plasm bank in Bacabal, Maranhão, under the sponsorship of the Instituto Estadual do Babaçu (INEB). At that time, a collaborative research project between Brazil and the United States (through AID) was initiated. The aim of this project is to collect and evaluate germ plasm of the *babaçu* palm throughout its distribution in the neotropics and to study its nutrition, taxonomy, ecology, and other aspects of domestication.

According to Markley (1971), oil from the *babassú* seed is of the lauric acid type, which is used for manufacture of toilet soap, for production of fatty acids, and for reduction of the oil or fatty acids to alcohol for the manufacture of detergents.

Markley (1971) gave an excellent account of the development and rise and fall of the *babassú* industry in Brazil. Between 1920 and 1928, almost

all fruits produced in the country were exported to Europe. During the depression (1929–35) exports declined, but between 1936 and 1945, they increased again, especially to the United States. During the period 1946–67, exports were small and erratic, including a five-year period when no *babassú* fruits were shipped overseas. Domestic consumption of the fruits increased gradually from 1935 to the present, and today the *babassú* industry is almost entirely domestic. It is probably the largest vegetable oil industry in the world wholly dependent on a “wild plant.”

An interesting theory proposed by Markley (1971) is that the present abundance of *babassú* palms, especially in Maranhão and Piauí, may be partly due to the intervention of humans. Maranhão was colonized by Europeans in the 16th century, but *babassú* was not mentioned in the literature until the middle of the 19th century despite a flourishing agriculture and commerce. After slavery was abolished in Brazil in 1888, vast areas of cultivated land were abandoned when slaves moved into the forests. After a while, this abandoned land probably was reforested by secondary succession, but it was not replaced by the original forest, which was dominated by dicotyledonous trees. Before settlement, *babassú* probably existed only in small numbers along river banks and flooded areas. Following the abandoning of cultivated lands over a period of many years, *babassú* migrated into these disturbed areas, as well as into land adjacent to the rivers, as seeds washed in on the annual floods of the rivers, forming pure stands in many localities.

5. *Orbignya crassispatha* (Martius) Glassman, *comb. nov.* **Figs.** 94, 106, 122.

Maximiliana crassispatha Martius, *Palm.* Orbign. 110. 1844. **LECTOTYPE:** (Glassman, p. 110. 1977b). Haiti, “insulam Sandomin, versus regiones dictas l’Ile a Vache et le fond des Negres” (Plumier), *Nov. Pl. Amer.* t. 1. 1703.

Attalea crassispatha (Martius) Burret, *Kongl. Svenska Vetenskapsakad.* 6:23, ts. 8–11. 1929b; Bailey, *Gentes Herb.* 4:263–65, figs. 167–70. 1939; Henderson and Aubry, 1989; Henderson and Balick, 1991; Timyan and Reep, 1994; Henderson, Galeano, and Bernal, 1995.

Trees 20–25 m tall and 30–40 cm in diam; **sheathing leaf base** and **petiole** 1.0–1.5 m long; **leaf rachis** 4.5–5.7 m long; 127–200 **pinnae** on each side of rachis, those from middle series in clusters of 2–4, glaucous abaxially, greenish adaxially, 90–120 cm long and 5.0–7.5 cm wide, with acute asymmetrical tips; **staminate flowers** with 3 flat, lanceolate, somewhat

curved **petals** 7 mm long, **stamens** 8–9 in number, **anthers** coiled, 4 mm long; **androgynous sterile bract** 0.6–1.0 m long (including beak of 15 cm long), 40–60 cm wide, and 2–3 cm thick; **rachis** of **androgynous inflorescence** 35–50 cm long, axis about 8 cm in diam, peduncle about 20 cm long; **rachillae** numerous, **pistillate portion** about 11 cm long, whitish or grayish in color, with 8–11 pistillate flower scars; **staminate extension** about 5 cm long, with about 26 staminate flower scars, **pistillate flowers** 1.8–2.0 cm long and 1.2 cm in diam, petals and sepals about equal in size or with sepals sometimes shorter, wrinkled, and more or less nerved, **pistil** 1.2–1.5 cm high, ovary 6.0–7.5 mm long and 6.5–7.0 mm in diam, whitish in color, style short, about 4 mm in length, separated from ovary by a distinct joint, **stigmas** 3 in number, each about 3 mm long, very dark in color, staminodial ring constricted, about 2 mm high and 4 mm in diam; **transitional pistillate flowers** about 10 mm long, sepals 3, broad and imbricate, about 9 mm long, petals 3, narrow, lanceolate, black in color, about 1.5 cm long, style and stigmas black in color, **pistil** about 8 mm long; **staminate flowers** (some sterile and transitional) from androgynous rachilla 5–8 mm long, about 2 mm wide, **petals** black, flat, and curved, **stamens** 6 in number (*Ekman 7164*, *Loomis and Fennell s.n.*; 9–11, fide Cook, 1939 and Wessels Boer, 1971; and 12, fide Burret, 1929b); **anthers** 1.0–1.5 mm long, distinctly coiled and twisted, pistillode about 4 mm long; **fruit** 3.5–4.0 cm long and 2 cm in diam, **epicarp** fibrous, about 1 mm thick, **mesocarp** very thin, **endocarp** woody, 2–4 mm thick, **seeds** 1 in number, 1.9–2.2 cm long and 1.2–1.4 cm in diam.

Distribution and Habitat. See table 3. Although it has been collected in two sites relatively recently (Henderson and Aubry, 1989), this palm is apparently rare and not extending its range, probably because the seeds are eaten by children and the seedlings are grazed by various animals. According to Thomas Zanoni (pers. comm.), this palm may not be native to Haiti and may have been introduced and cultivated at an early date in the island's history. The type locality, fond des Negres, was an old plantation, probably dating back to the French colonial days. However, no records have been found to corroborate this theory. Henderson and Aubry (1989), on the other hand, maintain that this palm is undoubtedly native to Haiti.

Vernacular Names. *Carossier*, *petit coco*.

Representative Specimens Examined. HAITI. Massif de la Hotte, fond des Negres, *Ekman 7164* (NY, US); July 1939, *Bailey 299* (BH); Sept. 1928, *Cook s.n.* (BH); Estacion experimental en fond des Negres (cultivated?),

July 1956, *Figueriras and Louis 2785* (F); between Cavaillon and Aux Cayes, July 1940, *Loomis and Fennell s.n.* (US).

Cook (1939) transferred the *carossier* palm to the new genus *Bornoa*, but this name is invalid because it lacked a Latin description. The new genus was created mainly on the basis of this palm's thickened androgynous sterile bract and probably because it lacked a staminate inflorescence. Parts of the English description are inaccurate, i.e., the pinnae are described as being regularly spaced, but they are actually in clusters of 2–4, especially those from the middle series. Also, much of the information is repeated from descriptions by Martius and Burret.

The staminate inflorescence was collected by Henderson and Aubry (1989) for the first time. Nevertheless, staminate flowers from the androgynous inflorescence are present in some of the above cited specimens and also have been illustrated by Plumier (1703) and Burret (1929b). They are definitely not characteristic of *Attalea* or *Maximiliana* because the petals are curved and the anthers are coiled and twisted. Therefore, I believe that this species belongs in the genus *Orbignya*. On the other hand, Henderson and Balick (1991) and Henderson, Galeano, and Bernal (1995) have retained this species in the expanded genus *Attalea* following Wessels Boer (1988).

6. *Orbignya cuatrecasana* Dugand, *Caldasia* 2:285, fig., p. 285. 1943; Cuatrecasas, pl. 2, fig. 2. 1947; Glassman, p. 98. 1977b. **TYPE:** Colombia, dept. Valle, Rio Naya, Puerto Merizalde, forest, Feb. 1943, *Cuatrecasas 13980* (COL!, holotype; F!, isotype). **Figs.** 93, 99, 124, 127. *Attalea cuatrecasana* (Dugand) Henderson, Galeano, and Bernal, *Field Guide Palm. Amer.* 265. 1995.

Plants mostly **acaulescent**; **sheathing leaf base** not measured, **petiole** 1–2 m long, **leaf rachis** 4–8 m long; middle series **pinnae** regularly arranged, 4–7 cm apart, each 90–125 cm long, 5–6 cm wide (7–9 cm, fide Dugand), with common, scattered tiny orange or brownish glandular dots on adaxial side, with acuminate or aristate asymmetrical tips, margins near tips with ferruginous indument; expanded part of **staminate sterile bract** 55–80 cm long and 11–15 cm wide (including beak of 7–8 cm long), peduncular part 23 cm long, about 8 mm thick, glabrous at maturity, deeply and irregularly sulcate; **rachis** of **staminate inflorescence** 37–42 cm long, peduncle 30–38 cm long, **rachillae** many (about 28 in holotype), covered with brownish farinose indument, 9–12 cm long; **staminate flowers** in

pairs, completely surrounding rachilla (basal 3 cm of rachilla naked), each 10–15 mm long (7–8 mm, fide Dugand), **petals** 3, equal in size, twisted, spatulate, mostly smooth, yellowish, narrowed and fused at base, broader near middle, 3.0–3.5 mm wide (4–5 mm wide, fide Dugand), with mostly acute, fleshy tips, sepals 1–2 mm long, **stamens** 20–24 in number, **anthers** subglobose, coiled and twisted, 1.5–2.0 mm long, **filaments** 2–3 mm long; expanded part of **androgynous sterile bract** about 53 cm long (including beak of 7 cm long), about 11 cm wide, peduncular part about 23 cm long, deeply and irregularly sulcate; **rachis** of **androgynous inflorescence** about 25 cm long (*Cuatrecasas 16389*), with 9–10 **rachillae**, **pistillate portion** 1–3 cm long, with scattered white lepidote indument, with 2–3 pistillate flowers, **staminate extension** 12 cm long, **pistillate flowers** 3.5–4.0 cm long and 3.0–3.5 cm in diam, sepals and petals about equal in size, **pistil** about 3 cm long, ovary about 1 cm high and 2 cm in diam, with scattered brownish pubescence, style 1–2 cm long, brownish pubescent, **stigmas** 3–4 in number, each about 1 cm long, staminodial ring about 2 cm long and 2.2 cm across; **fruit** 11–14 cm long and 7.5–9.5 cm in diam (including beak of 1 cm long), persistent perianth 3.5–4.5 cm long, staminodial ring 1.5 cm high, about 3.5 cm in diam, **epicarp** fibrous, very irregular and wavy, 1–2 mm thick, **mesocarp** soft, 1.0–2.5 mm thick, **endocarp** hard, 1.3–2.5 cm thick, **fiber clusters** obscure or absent, **seeds** 1–3 in number, 5–6 cm long and 3.0–3.5 cm in diam.

Distribution and Habitat. See table 3.

Vernacular Names. *Corozo, taparo.*

Representative Specimens Examined. COLOMBIA. Valle. Rio Calima (Chocó region), La Trojita, 1944, *Cuatrecasas 16389* (COL, F); Rio Calima, Quebrada de la Brea, May 1946, *Schultes and Villareal 7373* (GH); Agua Dulce, Buenaventura, May 1926, *Cook 81* (US); Bajo Calima, 10 km north of Buenaventura, transition between tropical wet and pluvial forest, Dec. 1981, *Gentry 35265* (MO); Bajo Calima, pluvial forest, July 1984, *Gentry et al. 47842* (NY); Bajo Calima, Cartin Colombia transect, recently cut forest, May 1982, *Murphy et al. 506A* (MO).

This taxon and *O. luetzelburgii* are the only species of *Orbignya* known from Colombia. *O. cuatrecasana* probably has no very close relatives, but may be distantly allied to *O. polysticha* because both are acaulescent with regularly arranged pinnae and have staminate flowers completely encircling the rachilla. They differ mainly in the number of their stamens, the size of their pistillate rachillae, the number of their flowers, and the size of their fruits.

7. ***Orbignya polysticha*** Burret, Notizbl. Bot. Gart. Berlin-Dahlem 11:324. 1932; Wessels Boer, p. 355. 1972; Glassman, p. 103. 1977b. **TYPE:** Peru, dept. Loreto, Mishuyacu, near Iquitos, forest, 1929, *Klug 205* (US!, holotype; F!, isotype). **Figs.** 104, 117, 128.
Attalea polysticha (Burret) Wessels Boer, *Pittieria* 17:301. 1988.

Acaulescent; sheathing leaf base about 0.5 m long; **petiole** 0.2–2.0 m long, brownish lepidote adaxially; **leaf rachis** up to 4 m long, brownish lepidote adaxially; 80–120 **pinnae** on each side of rachis, those from middle series regularly arranged, 80–105 cm long and 4–6 cm wide, mostly with acuminate, asymmetrical tips, some tips caudate, extending for as much as 17 cm in length, margins often with ferruginous indument, sometimes with tiny orange glandular dots (*Gentry et al. 31753*–MO); expanded part of **staminate sterile bract** 36–50 cm long (including beak of up to 20 cm long), 13–15 cm wide, and 7 mm thick, deeply sulcate, penduncular part 35–50 cm long; **rachis** of **staminate inflorescence** 30–50 cm long, peduncle about 70 cm long, numerous **rachillae** (about 75, fide Wessels Boer), 9–12 cm long, covered with irregular clusters of whitish, short thickened hairs; **staminate flowers** in pairs, numerous (60–100 per rachilla), spirally arranged around rachilla, each 6–9 mm long, **petals** usually 3 in number, spatulate, flat, narrowed at base (almost 1 mm wide), usually distinctly nerved, sometimes fused at base, much wider above (about 4 mm), with acute tips, sepals 3, each about 1.5 mm long, **stamens** 10–15 in number, **anthers** 2.0–2.5 mm long, considerably coiled and inrolled, **filaments** straight, 1.0–3.5 mm long; **androgynous sterile bract** not measured; **rachis** of **androgynous inflorescence** about 50 cm long, peduncle about 70 cm long, **rachillae** numerous, **pistillate portion** 4–8 cm long, each with 6–11 pistillate flowers, **staminate extension** up to 6 cm long, **pistillate flowers** 1.5–2.5 cm long, sepals shorter than petals, **pistil** up to 2 cm long, ovary up to 1.5 cm long, glabrous, style short, **stigmas** 3 in number, about 5 mm long, staminodial ring about 7 mm high and 1 cm across; **fruit** dark orange, 3.5–4.5 cm long and 2.0–3.3 cm in diam, persistent perianth 1.5–2.0 cm high, staminodial ring about 1 cm high and 1.6 cm across, **epicarp** fibrous, about 1 mm thick, **mesocarp** very narrow, **endocarp** hard, 2–3 mm thick, with inconspicuous **fiber clusters**, **seeds** usually 1 in number, cavity about 1.7 cm long and 1.3 cm in diam.

Distribution and Habitat. See table 3.

Vernacular Names. *Catirina* (Peru); *mavaco*, *mabaco* (Venezuela).

Representative Specimens Examined. PERU. Loreto: Santa Rosa, lower

Rio Huallaga, Sept. 1929, *Killip and Smith 28814* (NY, US); prov. Maynas, Mishana, Rio Nanay, halfway between Iquitos and Santa Maria, mature forest on upland white sand, near Camp. Uno, Feb. 1981, *Gentry et al. 31753* (MO). **VENEZUELA.** Amazonas: near San Carlos de Río Negro, white sandy soil, Jan. 1968, *Wessels Boer 2273* (U); Río Orinoco, San Pedro, en sabanita y bosque detras del Pueblo, July 1969, *Bunting et al. 3571* (F, U); Brazo Casiquiare, near Solano, tropical rain forest on white sandy soil, *Wessels Boer 2409* (U). **BRAZIL.** Amazonas: Manaus-Itacoatiara Highway, Reserva Florestal Ducke, forest on terra firme, *Prance et al. 2155* (NY). **FRENCH GUIANA.** Fleuve Grand Inini, in aval de Degrad Fourmi. Forêt de terre ferme sur crete, Aug. 1985, *de Granville 7442* (CAY, F).

Specimens Tentatively Determined. **VENEZUELA.** Amazonas, 4 km northeast of San Carlos de Río Negro, Lateritic soil, Dec. 1977, *Liesner 3627* (MO), 4120 (MO).

O. polysticha appears to be a distinct species because it has a combination of characteristics not shared by other species. It is probably most closely related to *O. sagotii* because both are acaulescent with regularly arranged pinnae similar in size and have staminate flowers similar in shape with a similar number of stamens. They differ mainly in the arrangement of their staminate flowers along the rachilla (completely encircling rachilla in *O. polysticha* and on one side in *O. sagotii*). Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. microcarpa* Martius, which I treat as *species dubia*.

8. ***Orbignya sagotii*** Trail ex Im Thurn, *Timehari* 3:276. 1884; Glassman, p. 105. 1977b; Pires-O'Brien, 1993. **TYPE:** French Guiana, Karouany (Acarouany), in sylvia paludosis, 1855–56, *Sagot 831* (K!, **LECTOTYPE**, erroneously inscribed as 631; P!, isolectotype). cf. *Wessels Boer*, p. 162. 1965. **Figs.** 105, 118, 128.

Attalea sagotii (Trail ex Im Thurn) *Wessels Boer*, *Indig. Palms Surin.* 162. pls. 17–18. 1965; *Wessels Boer*, 1988.

Orbignya sabulosa Barb. *Rodr.*, *Vellozia* 1 ed. 1:54. 1888. t. 48. 1903b; Burret, p. 510. 1929a; Glassman, p. 104. 1977b. **LECTOTYPE** (Glassman, 1972a) Brazil, Amazonas, in sandy pastures near Rio Tarumauçu, in Rio Negro (t. 48, 1903b).

Acaulescent; sheathing leaf base about 0.5 m long; **petiole** 0.5–2.5 m long; **leaf rachis** 4.5–7.5 m long; 65–110 **pinnae** on each side of rachis, those from middle series regularly arranged, 90–140 cm long and 4–6 cm wide, with acuminate asymmetrical tips, intervals of 4–6 cm between pin-

nae; expanded part of **staminate sterile bract** 70–90 cm long (including beak of up to 50 cm long), peduncular part about 1 m long, deeply sulcate; **rachis of staminate inflorescence** 25–35 cm long, **rachillae** numerous (35–65), about 7 cm long; **staminate flowers** solitary, arranged on one side of the rachilla, each 7–10 mm long, **petals** 3, separate, spatulate, narrow at base and much broader near middle, with acute or obtuse tips, yellowish in color, sepals 0.5–1.0 mm long, **stamens** 8–12 in number, **anthers** coiled and twisted, 1.5–2.0 mm long, **filaments** straight, about 2 mm long; **androgynous sterile bract and inflorescence** not measured; **pistillate portion of androgynous rachilla** 5–8 cm long, with 4–7 (10) pistillate flowers, **staminate extension** of rachilla broken off, **pistillate flowers** 1.7–2.2 cm long and 1.2–1.5 cm in diam, sepals and petals about equal in length, **pistil** 1.3–1.5 cm long, ovary usually brownish tomentose, style very short, **stigmas** 3 in number, 3–5 mm long, staminodial ring 5–7 mm high, brownish pubescent; **fruit** oblong, 3.5–4.5 cm long and 2–3 cm in diam, persistent perianth about 1.5 cm high, staminodial ring about 1 cm high, **epicarp and mesocarp** about 2 mm thick, **endocarp** hard, 4–7 mm thick, with scattered and inconspicuous **fiber clusters**, **seeds** usually 1 in number (3 in *Im Thurn* 27), 1.0–1.2 cm long and 0.7–0.8 cm in diam.

Distribution and Habitat. See table 3.

Vernacular Names. *Macoupi* (French Guiana); *bergi-maripa* (Suriname); *kurua* (Guyana); *curuai*, *pindova*, *palha preta* (Brazil).

Representative Specimens Examined. **FRENCH GUIANA.** Karouany, 1858–84, *Sagot 601* (K, P); Region de Nana, Forêt marecageuse, Feb. 1985, *de Granville 7208* (CAY). **GUYANA.** Corentyne R., *Everard Im Thurn 27* (K); Oct. 1879, *Jenman 520* (K). **SURINAME.** Vicinity of Zanderij, in hydrophytic forest on silt loam, Nov. 1962, *Wessels Boer 276* (F, U); near Brokopondo, in high forest, Dec. 1962, *Wessels Boer 392* (U); without locality, 1962–63, *Wessels Boer 165* (U), *708* (U), *1440* (U), *1493* (U); Bakhuis Mts., Feb. 1965, *Florschütz and Maas 2960* (U).

Specimens Tentatively Determined. **BRAZIL.** Amazonas, Manaus, Rio Negro, 1926, *Huebner 4a* (B), Oct. 1929, *Huebner 100* (B), *100a* (B), *100x* (B); basin of Rio Negro-Rio Cuieras, below mouth of Rio Brancinho, savanna forest on sand, Sept. 1971, *Prance, Coelho, and Monteiro 14830* (NY).

No specimens were cited by Trail (1884); a lectotype (*Sagot 831* [K]) was chosen by Wessels Boer (1965).

O. sabulosa is included here in synonymy because parts of Barbosa Rodrigues's description and illustrations match *O. sagotii* fairly closely; however, this taxon seems to have been described from an immature or

depauperate specimen. Another reason for uniting both species is that they appear to grow in similar habitats.

As previously mentioned, *O. sagotii* seems to be most closely allied to *O. polysticha* from Peru. Similarities and differences have been discussed under that species and can also be found in the "Key to Species of *Orbignya*." Henderson, Galeano, and Bernal (1995) reduce this taxon to synonymy under *A. microcarpa* Martius.

9. ***Orbignya cohune*** (Martius) Dahlgren ex Standley, Trop. Woods **30**:3. 1932; Burret, Notizbl. Bot. Gart. Berlin-Dahlem **11**:688. 1932; Standley and Steyermark, Fieldiana **24**:274, fig. 46. 1958; Glassman, p. 97. 1977b. **Figs.** 88, 100, 121.

Attalea cohune Martius, Palmet. Orbign. 121. 1844. t. 167. 1845; Henderson, Galeano, and Bernal, 1995. **LECTOTYPE** (Glassman, 1972a) Honduras (Martius, t. 167, 1845).

Orbignya dammeriana Barb. Rodr., Sert. Palm. Bras. **1**:62, t. 54. 1903b. **TYPE**: Brazil, cult. Jard. Bot. Rio Jan., *Glaziou 16468* (B!), **LECTOTYPE** (Glassman, 1977b; C!, MO!, isoelectotypes).

Trees 6–15 m tall, 40–50 cm in diam, sometimes flowering when acaulescent; **sheathing leaf base** about 25–55 cm long, **petiole** 70–120 cm long, 20–38 cm wide and 8 cm thick near base, margins with fibers 7–32 cm long and up to 3 mm thick; **leaf rachis** frequently 10–12 m long (sometimes up to 18 m long, fide Standley and Steyermark, 1958), usually covered with a ferruginous indument; 180–200 **pinnae** on each side of rachis, those from middle series regularly arranged, 1.2–1.3 m long and 5–7 cm wide, with acute or acuminate asymmetrical tips; expanded part of **staminate sterile bract** about 2.5 m long and 60 cm wide, covered with ferruginous tomentum; **rachis of staminate inflorescence** 1.3–1.6 m long (containing an estimated 30,000 flowers, fide Standley and Steyermark, 1958), peduncle 80–90 cm long, brownish tomentose, **rachillae** numerous, 20–30 cm long (including a naked stalk up to 10 cm long); **staminate flowers** in pairs, completely encircling the rachilla, each 13–15 mm long, **petals** usually 3 in number, yellowish, smooth, frequently curved, spatulate, very narrow and cylindrical at base (about 1 mm wide), broader and becoming flattened above (6–8 mm wide), obtuse or acute, not notched, sepals 3, triangular, 1.5–2.0 mm long, **stamens** usually 24 in number, **anthers** about 2 mm long, distinctly coiled, **filaments** 1.5–2.0 mm long; expanded part of **androgynous sterile bract** 1.9 m long, 23 cm wide, and 1 cm thick, peduncular part about 50 cm long, irregularly sulcate, brownish pubes-

cent, becoming glabrous with age; **rachis of androgynous inflorescence** about 90 cm long, peduncle 1.0–1.5 m long, brownish tomentose; **pistillate portion of androgynous rachilla** 10–13 cm long, each with several pistillate flowers, **staminate extension** not measured; **pistillate flowers** 3–4 cm long and 2.0–2.5 cm in diam, sepals shorter than petals, **pistil** 2.5–3.0 cm long, ovary brownish tomentose on upper part, **stigmas** 3 in number, 1.2–1.5 cm long, style short, staminodial ring about 1 cm high, densely brownish pubescent; expanded part of **sterile bract of infructescence** 2.45 m long (including beak of 12 cm long) and 19 cm wide; peduncular part about 60 cm long, fruits produced in abundance, a single infructescence may weigh more than 100 pounds; **fruit** 6–8 cm long (including beak of 1 cm long) and 4.0–4.5 cm in diam, persistent perianth 3.0–3.5 cm high, staminodial ring about 1 cm high, **epicarp** fibrous 1.5–3.5 mm thick, **mesocarp** soft, 1–2 mm thick, **endocarp** hard, 7–10 mm thick, **fiber clusters** not evident, **seeds** usually 1 in number, 2.5–3.5 cm long and 1.5–2.0 cm in diam.

Distribution and Habitat. See table 3. In Guatemala this palm is often associated with *Pinus caribaea*, and in Polol, Petén, *O. cohune* grows together with *Scheelea lundellii*. Standley and Steyermark (1958) and Hernandez Xolocotzi (1949) listed this palm from southern Mexico (in states of Quintana Roo and Campeche) as possible extensions of forests in Belize, but some of these reports should probably refer to *O. guacuyule*. Burret (1929a) also recorded it from Nicaragua, Costa Rica, and Panama, but I have not seen authentic specimens of *O. cohune* from Costa Rica and Panama; however, some of these reports may possibly be references to *Scheelea rostrata*, which resembles *O. cohune* in the vegetative stage. Furley (1975) discusses the importance of *O. cohune* in development of the soil profile in Central America.

Vernacular Names. *Cohune* (Belize, Honduras, Guatemala); *manaca*, *corozo* (Guatemala); *tutz* (Maya); *coros* (Quecchi).

Representative Specimens Examined. **BELIZE (BRITISH HONDURAS).** Punta Gorda, *Turner s.n.* (F); Stann Creek Valley, *Geortle 3234* (B, photo of staminate inflorescence); without locality, *Kinloch s.n.* (F). **HONDURAS.** Puerto Sierra: *Wilson 472* (F); Atlantida: Lancetilla Valley, near Tela, wet forest, Dec. 1927, *Standley 53981* (F); vicinity of Lancetilla, forests, Aug. 1934, *Yuncker 4970* (F). **GUATEMALA.** Izabel: between Virginia and Lago Izabel, Apr. 1940, *Steyermark 38771* (F); between Bananera and La Presa, Montana del Mico, Apr. 1940, *Steyermark 39210* (F); Alta Verapaz: woods, southeast of Finca Yalpemech, Mar.–Apr. 1942, *Steyermark 45211*

(F), 45693 (F). **NICARAGUA.** dept. Zelaya, Las Mercedes, alt. 120–40 m, P. C. Vincelli 342 (MO). **CULTIVATED.** **CUBA.** Soledad, Atkins Garden, July 1946, Dahlgren 4619 (F). **GUYANA.** Georgetown Botanical Garden, 1922, Dahlgren s.n. (F-610577, 610649, 610697, 610772). **BRAZIL.** Jard. Bot. Rio Jan., Oct. 1886, Glaziou 16488 (P).

Specimens Tentatively Determined. **CULTIVATED.** **USA.** Florida, Fairchild Tropical Garden, PI 201833-13347, Feb.–Mar. 1965, R. W. Read 1398 (FTG).

Martius (1844, 1845) did not cite any specimens nor could any early collections be found pertaining to this species; therefore, t. 167 (1845) was chosen as lectotype.

Even though Barbosa Rodrigues (1903b) did not cite any specimens for *O. dammeriana*, I have selected *Glaziou 16468* (B) as lectotype because Burret (1929a) said that this specimen (erroneously cited as *Glaziou 16488*) probably came from the type tree. I discussed this matter in more detail in my 1977b article. Burret (1929a) listed both *O. speciosa* Barb. Rodr. and *O. macrostachya* as synonyms of *O. dammeriana*. Barbosa Rodrigues (1903b) cited *Glaziou 16488* in connection with *O. macrostachya* (which is a *nomen nudum*). *Glaziou 16488* (P) is actually *O. cohune*, but *Glaziou 16488* (BR) is definitely a species of *Scheelea*.

As previously mentioned, *O. cohune* has been confused with *O. martiana* (= *O. phalerata*), but the two can be easily distinguished by the number of seeds in the fruit, the arrangement of staminate flowers on the rachilla, and the shape of the staminate flower petals. *O. cohune* was not differentiated from *O. guacuyule* until 1949 by Hernandez Xolocotzi. In fact, plates 336–38 listed under *O. cohune* by Dahlgren (1959) are actually *O. guacuyule*. The two species, which are apparently closely allied, differ mainly in the size of their staminate rachillae and staminate flowers, the number of stamens per flower, and the size of their pistillate rachillae.

In Guatemala, *cohune* is used in construction of dwellings. Roof frameworks are made from a dense thatch of pinnae and petioles. Leaves are also used for making hats and large mats (*suyacales*), which often substitute for umbrellas. Throughout its range, a wine is fermented from sap of the terminal bud. Oil is also extracted from the seeds and used in soap making and other purposes. Seeds were also used in the preparation of charcoal for gas masks during World War I.

In the late 1920s, a commercial *corozo* oil industry was established in Belize by developing machinery that breaks the extremely hard nuts to facilitate extraction of the oil. This was followed by a silviculture program

in which all vegetation except *O. cohune* trees was cleared from certain tracts of land in order to increase the yield of oil. This program was abandoned during the depression; however, I do not have any recent information as to whether there still is a *corozo* oil industry in Belize today.

10. **Orbignya guacuyule** (Liebmann ex Martius) Hernandez Xolocotzi, Bol. Soc. Bot. Mex. 9:17. 1949; Dahlgren, pls. 336–38. 1959; Glassman, p. 100. 1977b. **Figs.** 92, 102, 123.

Cocos guacuyule Liebmann ex Martius, Hist. Natur. Palm. 3:323.

1853. **TYPE:** Mexico, Oaxaca, pr. Guatulco, *Liebmann 6559* (C!, holotype). cf. Dahlgren, pl. 338. 1959.

Cocos cocoyule Martius, Hist. Natur. Palm. 3:324. 1853. **TYPE:** Mexico, Acapulco. **LECTOTYPE** (Glassman, 1977b) *Karwinski s.n.* (M!).

Trees 10–20 m tall (50–70 m, fide Ryder, 1978) and 30–35 cm in diam; **sheathing leaf base** and **petiole** about 22 cm long (incomplete) and 17 cm wide at base, with long fibrous margins; **leaf rachis** 4.0–5.8 m long; 250–90 **pinnae** on each side of rachis, those from middle series regularly arranged, 1.5–3.2 cm apart, 90–120 cm long, and 5–6 cm wide, with asymmetrical tips, margins and tips frequently with ferruginous indument; **staminate sterile bract** about 1.3 m long; **staminate inflorescence** about 1 m long with numerous **rachillae**, 10–13 cm long (16–18 cm long in *Moore and Cetto 6405*), including naked base of 5.5 cm; **staminate flowers** completely surrounding rachilla (with occasional pistillate flowers on lower part), each 8–10 mm long, **petals** usually 3 in number, whitish, more or less nerved, spatulate, narrow at base (about 1 mm wide), broader above (about 4–5 mm wide), tips acute or acuminate, not notched, sepals 3, about 1 mm long, **stamens** 19–20 in number, **anthers** about 2 mm long, spirally twisted and coiled, **filaments** 1.5–2.0 mm long; **androgynous sterile bract** about 1.2 m long; **rachis** of **androgynous inflorescence** about 60 cm long, peduncle about 15 cm long, with numerous **rachillae**, **pistillate portion** of each 5–8 cm long, **staminate extension** 17–21 cm long (up to 28 cm long and with 8–14 branches in *Moore and Cetto 6405*), pistillate rachillae with 4–7 **pistillate flowers**, each 3.0–3.5 cm long and 1.8–2.2 cm in diam, sepals slightly shorter than petals, **pistil** 2.2–2.5 cm long, ovary covered with whitish or brownish indument, style very short, **stigmas** 3 in number, about 1 cm long, staminodial ring 7–10 mm high and about 1.5 cm across; **fruit** 5.6–7.5 cm long (including beak of 1.0–1.5 cm long) and 3.5–4.5 cm in diam, persistent perianth 3.0–3.5 cm high, staminodial ring

about 1 cm high and 2.5 cm across, **epicarp** fibrous, 1–2 mm thick (2.5–3.0 mm in *Conzatti s.n.*), **mesocarp** soft, 1–2 mm thick, **endocarp** hard, 6–10 mm thick, **fiber clusters** common and conspicuous (*Moore and Valiente 6199*), **seeds** usually 1 in number, 2.5–3.0 cm long and 1.5–2.0 cm in diam.

Distribution and Habitat. See table 3. Forests near Melenque, north of Manzanillo, Mexico with trees 50–70 m tall (fide Ryder, 1978).

Vernacular Names. *Cohune*, *palma de aceite* (fide T. H. Lewis).

Representative Specimens Examined. MEXICO. Oaxaca: San Benito, Oct. 1917, *Reno 3462* (US, photo); Oaxaca de Juarez, Feb. 1935, *Conzatti s.n.* (BH, fruit only); Guerrero: near El Papayo, 30 mi north of Acapulco, Mar. 1952, *Moore and Valiente 6199* (BH); Rio Verde, carretera Pinotepa a Puerto Escondida, deciduous forest, Mar. 1968, *Pennington and Sarukhan K. 9488* (NY). Nayarit: outside San Blas, rich woods, May 1952, *Moore and Cetto 6405* (BH); San Blas, forest, July 1955, *Lewis s.n.* (BH). Colima: beyond Armeria, at turnoff to Cuyutlan on road to Manzanillo, Oct. 1959, *Moore 8166* (BH).

As I mentioned in my 1977b article, no specimens were cited in Martius (1853) for *Cocos guacuyule* and *C. cocoyule*, hence the selection of lectotypes for each; however, now I am satisfied that the large sheets of leaf material of *Liebmann 6559* (C) represent the holotype of *C. guacuyule*.

O. guacuyule is probably most closely allied to *O. cohune* and is discussed in detail under that species. Differences can also be found in the “Key to Species of *Orbignya*.” Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. cohune* Martius.

Hodge (1975) listed *O. guacuyule* as one of the palms that produces oil in its fruits, but according to Hernandez Xolocotzi (1949), it is not of commercial importance because of its limited distribution in Mexico.

11. ***Orbignya luetzelburgii*** Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:1019. 1930. **TYPE:** Brazil, Amazonas, Jutica Varadouro, Ubergang von Rio-Ayari zum Rio Uapes, um feuchten Urwald, Nov. 1928, *von Luetzelburg 21969* (B!, holotype; M!, isotype). **Figs.** 95–96, 107, 116, 125, 127.

Parascheelea luetzelburgii (Burret) Dugand, *Caldasia* 1:24. 1941.

Attalea luetzelburgii (Burret) Wessels Boer, *Pittieria* 17:303. 1988; Henderson, Galeano, and Bernal, 1995.

Parascheelea anchistropetala Dugand, *Caldasia* 1:12, figs. 4–5. 1940; Schultes, p. 6, fig. 1. 1974; Glassman, p. 111. 1977b. **TYPE:** Colombia, Vaupes, Cerro de Circasia, alt. 300–500 m, Oct. 1939, *Cuatrecasas 7172* (COL!, holotype).

Acaulescent; sheathing leaf base about 0.5 m long, mostly subterranean; **petiole** 1–2 m long, densely brownish pubescent adaxially; **leaf rachis** 4–5 m long; 80–90 **pinnae** on each side of rachis, those from middle series regularly arranged, 80–90 cm long and 4–5 cm wide, with acute or acuminate, asymmetrical tips, margins and tips usually covered with dense ferruginous indument; expanded part of **staminate sterile bract** 45–50 cm long (including beak of 10 cm long), 10–12 cm wide, and 1 cm thick (180 cm long and 75 cm wide, fide Dugand), peduncular part 20–30 cm long, mostly subterranean, deeply sulcate; **rachis** of **staminate inflorescence** 20–40 cm long, peduncle 60–70 cm long (fide Wessels Boer, 1972), brownish pubescent, with about 100 **rachillae** (fide Wessels Boer, 1972), 3–6 cm long; **staminate flowers** in pairs, arranged on one side of rachilla, each 6–8 mm long (fide all herbarium specimens examined), 14 mm long (fide Burret, 1930), **petals** 3 in number, fleshy, more or less terete, upper two-thirds strongly curved and sometimes twisted, with hooked and sharply acute tips, basal one-third of corolla connate, sepals 0.5–1.5 mm long, **stamens** 6 in number, **anthers** 1.5–2.0 mm long, strongly coiled and with united thecae, **filaments** about 2 mm long; size of **androgynous sterile bract** not recorded; **rachis** of **androgynous inflorescence** (incomplete?) about 28 cm long, with numerous **rachillae**, **pistillate portion** 4–6 cm long with 2–6 **pistillate flowers**, each 2.0–2.5 cm long and 1.2–1.4 cm in diam, sepals mostly shorter than petals, **pistil** about 1.8 cm long, ovary brownish tomentose, style very short or absent, **stigmas** usually 3 in number, each about 4 mm long, staminodial ring about 5 mm high; **fruit** (immature) 5–7 cm long (including beak of 1.0–1.5 cm long), 2.0–2.5 cm in diam, persistent perianth about 2 cm high, staminodial ring 1.0–1.3 cm high, with irregularly lobed margins, **epicarp** fibrous, about 1 mm thick, **mesocarp** very thin, (undeveloped?), **endocarp** hard, 3–6 mm thick, **fiber clusters** not evident, **seeds** 1 in number, 2.2–3.0 cm long and 0.7–1.0 cm in diam.

Distribution and Habitat. See table 3.

Vernacular Names. *Curuaraua* (Brazil); *curua*, *yapo* (Colombia); *grua* (Venezuela)

Representative Specimens Examined. **COLOMBIA.** Vaupes: Rio Vaupes, Circasia, sandy savanna, quartzite base, alt. 240 m., Apr. 1953, *Schultes and Cabrera 19207* (US). **VENEZUELA.** Amazonas: near Santa Rosa de Amanadona, white sandy soil, alt. 120 m, Jan. 1968, *Wessels Boer 2357* (F, U), *2374* (F, U).

This taxon was originally described under *Orbignya* but was later trans-

ferred to *Parascheelea* by Dugand after another species had been described. In 1977b I inadvertently used *P. anchistropetala* as the "correct" name, but *P. luetzelburgii* has priority.

The staminate flowers of *O. luetzelburgii* have characteristics of *Orbignya* (coiled anthers) and *Scheelea* (fleshy petals), but differ from both in having petals with hooked and sharply acute tips. Even though *O. luetzelburgii* has been collected from three different localities in the Amazon region, it apparently is not common in any of them. This taxon is still incompletely known because I have not seen mature fruits. I have seen immature fruits from the localities in Colombia and Venezuela, but these are hardly diagnostic because all parts are not completely developed.

In 1977b, I considered this taxon as a species under *Parascheelea*, but here I am following Dransfield and Uhl (1986), who treat it as another species of *Orbignya*. The main difference is in the rounded, hooked petals of the staminate flowers, which the above authors believe is insufficient evidence for generic separation. However, I have considered *O. luetzelburgii* as representative of a separate subgenus (see "Relationships within Genus *Orbignya*").

According to Schultes (1974), this palm has a religious significance to the Kubeo Indians in the Circasia region of Colombia. They are convinced that the basal staminate inflorescence houses tiny spirit men who hide in it during the day but venture forth at night. They represent the souls of children of medicine men of the past who have inherited the malevolent powers of their fathers. For that reason, the Kubeos will avoid camping in this savanna area where *curua* grows, preferring the less habitable dense forests nearby where the plant does not grow.

Doubtful and Uncertain Species of *Orbignya*

Orbignya agrestis (Barb. Rodr.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:511. 1929a; Glassman, p. 108. 1977b.

Attalea agrestis Barb. Rodr.

This species was previously discussed under *A. agrestis*.

Orbignya huebneri Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:501. 1929a; Glassman, p. 108. 1977b. **TYPE:** Brazil, Amazonas, Lago Monduruçu am Rio Manacapuru, Solimoes, highland, *Huebner 64* (B!, holotype).

Trees about 13 m tall; **sheathing leaf base** and **petiole** 65 cm long, 18 cm wide, and 3.5 cm thick, brownish lepidote; middle series **pinnae** regularly arranged, 95 cm long and 4.3 cm wide, with acuminate, asymmetrical tips; **pistillate portion** of **androgynous rachilla** 8–10 cm long, with 1–2 **pistillate flowers**, **staminate extension** up to 28 cm long, staminate flower scars in two rows on one side of rachilla (fide *H. A. Johnstone 1038*); **infructescence** about 55 cm long, each rachilla with 1 fruit; **fruit** 9–10 cm long and 5.0–6.8 cm in diam (including beak of 1.5 cm high), persistent perianth 3–4 cm high, staminodial ring 1.5 cm high and 3 cm across with ciliate margins in *Johnstone 1038*, **epicarp** fibrous, about 1 mm thick, **mesocarp** soft, 3–4 mm thick (fide *Johnstone 1038*), **endocarp** hard, 1.2–1.8 cm thick, with conspicuous **fiber clusters**, **seeds** 2–3 in number, cavities 4.5 cm long and 1.2–1.5 cm in diam.

Distribution. Brazil, Amazon region.

Vernacular Name. *Uauassú*.

Specimens Tentatively Determined. **CULTIVATED.** **BRAZIL.** Pará, Museu Goeldi Botanic Garden, *H.A. Johnstone 1038* (B).

This palm is inadequately described (especially since no staminate rachillae or flowers are available) and is based on incomplete herbarium material. Therefore, it has been treated as a *species dubia* (see Glassman, 1977b for further discussion). Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat this palm as a synonym of *A. speciosa* Martius.

Orbignya humilis Martius, Palm. Orbign. 129, t. 32. 1844. t. 169–1. 1845. t. z16–3. 1849; Glassman, p. 100. 1977b. **TYPE:** Bolivia, Santa Cruz, prope Mission S. Anna de los Chiquitos, sandy soil (*d'Orbigny 22* [P], destroyed). **LECTOTYPE** (here designated) Martius, Hist. Natur. Palm 3:t.169–1. 1845.

Acaulescent or up to 1.5 m tall; **sheathing leaf base**, **petiole**, and **leaf rachis** not measured; 70–80 **pinnae** on each side of rachis, those from middle series in clusters of 3–4, 15–20 cm long and 2.5 cm wide; **staminate inflorescence**, **staminate rachillae**, and **staminate flowers** from staminate inflorescence not measured; **androgynous inflorescence** about 45 cm long, **rachis** about 20 cm long, peduncle about 10–12 cm long, **rachillae** numerous, **pistillate portion** of rachilla short, each with 2–3 **pistillate flowers**, each about 2.5 cm long, sepals and petals about equal in size, style very short or absent, **stigmas** 3 in number; **staminate flowers** (from androgynous rachilla) 8–10 mm long, **petals** 3 in number, wider mostly on lower half, with acute or notched tips, **stamens** 12 in number, **anthers**

coiled and twisted; **fruit** about 5 cm long and 3 cm in diam, brownish on outside, **seeds** 2–3 in number.

Distribution. Bolivia.

Vernacular Name. *Palmier de Chiquitos*.

Representative Specimens. Apparently, the type specimen (*d'Orbigny* 22 [P]) has been destroyed. No other specimens associated with this species have been seen.

The description of *O. humilis* is incomplete, i.e., the size of the leaf is not known, the pinnae described are probably immature or not from the middle of the rachis, and the staminate inflorescence is unknown. It seems to be close to *O. eichleri*, but it is out of the range for this species, which occurs in northeastern Brazil; hence I prefer to treat *O. humilis* as a *species dubia* because of the poor description and lack of herbarium material. Illustrations of the staminate flowers (t. 169–1) resemble several other species of *Orbignya*, but there are not enough diagnostic characteristics to pinpoint the species.

The only other species of *Orbignya* described from Bolivia is *O. phalerata*, but there are too many discrepancies and inadequacies in the description to consider *O. humilis* as a synonym of *O. phalerata*. Henderson, Galeano, and Bernal (1995) consider this taxon to be a synonym of *A. eichleri* (Drude) Henderson.

Orbignya macrocarpa Barb. Rodr., Palm. Mattogross. 74, ts. 23–24B. 1898. t. 50A. 1903b; Burret, p. 103. 1940; Glassman, p. 102. 1977b. **LECTOTYPE** (Glassman, p. 179, 1972a) Brazil, Mato Grosso, Capão Bonito, prope Quebra Cabeça (ts. 23–24B, 1898).

Orbignya campestris Barb. Rodr., Palm. Mattogross. 78, t. 25. 1898. t. 50B. 1903b; Burret, p. 500. 1929a; Glassman, p. 97. 1977b. **LECTOTYPE** (Glassman, p. 178, 1972a) Brazil, Mato Grosso, Capão Bonito (t. 25, 1898).

Orbignya longibracteata Barb. Rodr., Palm. Mattogross. 79, t. 26. 1898. t. 51. 1903b; Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15:103. 1940. **LECTOTYPE** (Glassman, p. 101, 1977b) Brazil, Mato Grosso, Capão Bonito, fere Serra do Melgaço (t. 51, 1903b).

Acaulescent or with **trunk** 2–5 m tall and 25 cm in diam; **sheathing leaf base** not measured; **petiole** up to 90 cm long, whitish tomentose, greenish punctate; **leaf rachis** 2.7–5.0 m long; about 50 **pinnae** on each side of rachis, those from middle series in clusters of 2–3, 60–80 cm long and 4–5 cm wide, with acuminate, asymmetrical tips; staminate sterile bract 60–

90 cm long and 10–13 cm wide, deeply sulcate (45 cm long and 6.7 cm wide in *O. campestris*); **rachis of staminate inflorescence** 15–30 cm long, peduncle 20–45 cm long, numerous **rachillae**, 10–11 cm long; **staminate flowers** arranged along one side of rachilla, each about 10 mm long, **petals** 1 or 2 in number (3 or 2 are fused), broadest near middle, apices irregularly notched and coarsely toothed, sepals very short, **stamens** 16–24 in number, **anthers** coiled and twisted; **androgynous sterile bract** not measured; **rachis of androgynous inflorescence** about 40 cm long, peduncle about 25 cm long; **androgynous rachillae** very short or sessile, **pistillate flowers** 3–4 cm long, petals and sepals about the same length, style very short, **stigmas** 6 in number, staminodial ring about 7 mm high; **fruit** 6–9 cm long and 4.5–6.0 cm in diam, persistent perianth 4–5 cm high, staminodial ring about 2 cm high and 3.5 cm across, **epicarp** fibrous, about 2 mm thick, **mesocarp** soft, about 0.5 mm thick, **endocarp** hard, about 1 cm thick, with conspicuous **fiber clusters** arranged in a circle, **seeds** 4–7 in number, each 3.5 cm long and 2 cm in diam.

Distribution and Habitat. Brazil in state of Mato Grosso, in forests.

Vernacular Names. *Indaya assú*, *inaja assú* (*O. macrocarpa*); *indaya verdadeiro*, *indaya redondo* (*O. campestris*); *indaya mirim*, *indaya crespo*, *inaja* (*O. longibracteata*).

Specimens Tentatively Determined. Cultivated. BRAZIL. Mato Grosso, Bocaine, Aug. 1982, *Kuntze s.n.* (BH, originally cited as *Attalea compta* in Kuntze, p. 321, 1898); Mato Grosso, 1936, dry forest steppe, *Hopp 3002* (B); Mato Grosso, flussgebiet des Amazonas, *Hopp 3011* (B).

As I mentioned in my 1977b article, Barbosa Rodrigues (1898) cited *B.R. 217*, *240*, and *239* for *O. macrocarpa*, *O. campestris*, and *O. longibracteata*, respectively, but these specimens could not be found. Therefore, illustrations of each species were chosen as lectotypes. In 1977b, I considered them as separate taxa, but similarities in the descriptions, illustrations (pinnae, staminate rachillae and flowers, pistillate flowers, and longitudinal and cross sections of fruits), and type localities indicate that all three palms are conspecific. Of the three specimens cited as uncertain here, only *Kuntze s.n.* may be close because it has pinnae, pistillate flowers, and fruits that resemble those of *O. macrocarpa* (but no staminate flowers were available for comparison). The other two specimens, *Hopp 3011* and *3002*, cited by Burret (1940), are fragmentary and photos show a fruit and leaf material.

Even though authentic specimens (mainly staminate flowers) have not been seen, fairly complete, but not always accurate, descriptions and illustrations of diagnostic parts appear to indicate a distinct species; how-

ever, parts of the description could apply to *O. eichleri* or *O. phalerata* or even a hybrid between the two.

In August 1976, I visited the general area of the type locality, "Capão Bonito," of all three "species" described, but I could not find any palms at all. The area was under heavy cultivation and any original forest vegetation that may have existed in the past appeared to have been destroyed.

In view of the fact that type specimens have been destroyed, vegetation in the general area of the type localities has been decimated, and no authentic specimens have been seen to pinpoint *O. macrocarpa* as a distinct species, I have decided to treat it as a *species incerta*. Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat these taxa as synonyms of *A. butyracea*.

Orbignya macropetala Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:507. 1929a; Glassman, p. 95. 1977b. **TYPE:** Guyana (British Guiana), Rupununi River, *Schomburgk s.n.* (B!, holotype).

Size of plant, **leaves**, **androgynous** and **staminate inflorescences**, and **pistillate** and **staminate flowers** not recorded; **fruit** (immature?) 9 cm long and 3.5 cm in diam, persistent perianth about 5 cm high, staminodial ring about 1 cm high and 2.5 cm across, **epicarp** fibrous, 1 mm thick, **mesocarp** soft, 1.5 mm thick, **endocarp** hard, 7–8 mm thick, with abundant and conspicuous **fiber clusters**, **seeds** 3 in number.

Distribution. Guyana.

Vernacular Name. *Curua*.

Representative Specimens Examined. Known only from the holotype.

In 1977b, I considered this palm as a synonym of *O. martiana* (*O. phalerata*), but since the description and holotype is based primarily on the fruit, I am now treating it as a *species dubia*.

The only species of *Orbignya* reported from Guyana are *O. sagotii* and *O. phalerata*, but the fruit of *O. macropetala* resembles a species of *Scheelea*. Henderson, Galeano, and Bernal (1995) treat this species as a synonym of *A. mariþa* (Aublet) Martius. The vernacular name, *curua*, has been recorded for several species of *Orbignya* and *Scheelea*.

Orbignya macrostachya Drude *nomen* in Scheda ex Barb. Rodr., Sert. Palm. Bras. 1:60. 1903b; Burret, p. 513. 1929a; Glassman, p. 109. 1977b. *Nomen nudum*.

This binomial is based on a herbarium specimen (*Glaziou 16488* [BR]) determined by Drude as a new species, but a description was never published.

Orbignya microcarpa (Martius) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:507. 1929a; Glassman, p. 109. 1977b.

Attalea microcarpa Martius.

This species has been discussed previously under *A. microcarpa*.

Orbignya pixuna (Barb. Rodr.) Barb. Rodr., Prot. App. 49. 1879. t. 49. 1903b; Glassman, 1977b.

Attalea pixuna Barb. Rodr. (see previous treatment for type).

Attalea spectabilis var. *polyandra* Drude, Martius Fl. Bras. 3:440. 1881.

TYPE: Brazil, Rio Purus (*Wallis s.n.* [K], holotype, destroyed?).

Acaulescent; sheathing leaf base not measured; **petiole** about 1 m long; **leaf rachis** about 6 m long; 100–120 **pinnae** on each side of rachis, those from middle series regularly arranged, not measured, about 4 cm apart, tips acuminate and asymmetrical; **staminate sterile bract** not measured; **staminate inflorescence** 40 cm long, **rachillae** not measured; **staminate flowers** in pairs (not measured), **petals** 3 in number, incurved and concave, apices 2–3 toothed, irregular, **stamens** 22 in number; **androgynous sterile bract** not measured; **rachis** of **androgynous inflorescence** 55 cm long, peduncle whitish tomentose; **pistillate flowers** solitary, not measured, sepals longer than petals, **pistil** tomentose, **stigmas** 3 in number; **fruit** 8.5 cm long and 5 cm in diam, **epicarp** fibrous, **mesocarp** fleshy, 4 mm thick, **endocarp** hard, 7 mm thick, dark brown, **seeds** 2 in number.

Distribution. Brazil, in state of Pará.

Vernacular Names. *Kurua-pixuna*, *kurua preto*.

Representative Specimens. No specimens were cited by Barbosa Rodrigues (1875, 1879, 1903b) nor could any be located bearing this name.

The type locality and parts of the description (especially the staminate flowers) could refer to *O. phalerata*. However, no authentic specimens of this species have been seen, and the description is incomplete, i.e., staminate rachillae, staminate flowers, and androgynous rachillae and pistillate flowers are not measured. Therefore, I am treating *O. pixuna* as a *species dubia*. Henderson (1995) and Henderson, Galeano, and Bernal (1995) consider this taxon to be a synonym of *A. speciosa* Martius.

Orbignya racemosa (Spruce) Drude, Martius Fl. Bras. 3:448. 1881; Burret, p. 507. 1929a; Dahlgren, pl. 343. 1959; Glassman, p. 109. 1977b.

Attalea racemosa Spruce (see previous discussion for type).

Acaulescent; petiole short; **leaves** about 4 m long; about 90 **pinnae** on

each side of **rachis**, those from middle series regularly arranged, each about 60 cm long and 3 cm wide, with acute asymmetrical tips, ferruginous lepidote on margins, especially near tip (fide *Spruce 54* [K]); **staminate inflorescence** and its **flowers** not seen; **androgynous sterile bract** about 1 m long, **rachis** of **androgynous inflorescence** 20–30 cm long, **rachillae** up to 20 in number, **pistillate portion** very short, 1–2 cm long, with 1–2 **pistillate flowers** (not measured), **staminate extension** of rachilla about 5 cm long (fide *Spruce 54* [P]), **staminate flowers** in pairs along one side of rachilla; staminate flowers not seen by Spruce, but Drude describes them as having ovate-acute **petals** with tridentate apices and 12–16 **stamens**; **fruit** 5 cm long and 4–5 cm in diam (fide Drude).

Distribution and Habitat. Amazon region of Venezuela (fide Spruce); in Brazilian Amazon and observed in Amazon valley, without specific locality, by Wallis (fide Drude).

Vernacular Names. *Piaçaba verdadeira* (fide Drude, comm. by Wallis).

Representative Specimens Examined. Known only from the type specimens.

Type specimens from K and P consist of leaf parts, and parts of androgynous sterile bract, inflorescence, and rachillae, but no staminate flowers or fruits are included with this material. When Drude (1881) transferred *A. racemosa* to *Orbignya*, he most likely examined staminate flowers of *Spruce 54* (which have since been lost?) from an androgynous rachilla. He did not measure the flowers, but recorded the number of stamens and described the petals with tridentate tips, a characteristic of several species of *Orbignya*, but not of *Attalea*. Therefore, the switch to *Orbignya* appeared to be justified. Drude's description, however, did not specify whether the anthers were coiled or straight.

Wessels Boer (1972) treated *A. racemosa* as a good species with *A. ferruginea* in synonymy (which has been followed by some other authors, including Henderson [1995] and Henderson, Galeano, and Bernal [1995]) probably because both have pinnae with ferruginous lepidote margins and both have been reported from the Río Negro region of Venezuela. A few other species of *Orbignya* and *Attalea* also have this characteristic. Staminate petals in *A. ferruginea* have acute or acuminate apices and the flowers have 16–52 stamens; whereas in Drude's description of *O. racemosa*, the staminate petals have trident tips and the flowers have 12–16 stamens.

Apparently, the description and specimens of *Spruce* are based on an immature plant because measurements indicate the pinnae and androgynous inflorescence are rather small for species of *Orbignya*.

In my 1977b article I treated *O. racemosa* as a *species dubia* because of the incomplete description and inadequate type specimens, making it impossible to recognize it as a clear-cut taxon. The only other species of *Orbignya* recorded from the Amazon region of Venezuela are *O. luetzelburgii* and *O. polysticha*, but both of these have staminate flowers entirely different from those of *O. racemosa*.

Orbignya spectabilis (Martius) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:508. 1929a; Glassman, p. 105. 1977b.

Attalea spectabilis Martius, Hist. Natur. Palm. 2:136, t. 96, figs. 1–2. 1826. t. z16. 1849; Wessels Boer, p. 160. 1965. p. 357. 1972. 1988.

TYPE: Brazil, Pará, Serra de Barú, near Pará and Rio Negro (Martius s.n. [M], holotype, destroyed?). Burret (1929a) mentioned an infructescence he saw from M labeled *A. spectabilis*, which was not determined by Martius and could not be located by Wessels Boer or myself.

Acaulescent or with short **trunk** 0.9–1.2 m tall, about 30 cm in diam; **leaves** 5.9–6.1 m long, **petiole** about 1.8 m long, with scattered ferruginous indument adaxially; **pinnae** numerous along rachis, those from middle series regularly arranged, about 80 cm long and 2.5–4.5 cm wide; **staminate inflorescence** not seen; **androgynous sterile bract** not measured, deeply sulcate, brownish tomentose; **androgynous inflorescence** about 60 cm long, **rachillae** and **pistillate flowers** not measured; **staminate flowers** from androgynous rachilla not measured, **petals** obovate-lanceolate, shallowly mucronate, membranous, sepals short, **stamens** 6 or 9–12 in number, **anthers** not described; **infructescence** about 90 cm long; **fruit** about 5 cm long, **endocarp** hard, fibrous, **seeds** 2–3 in number, about 2.5 cm long.

Distribution. Brazil, in province of Pará.

Vernacular Name. *Curua*.

Representative Specimens. No authentic specimens attributed to this species could be found.

This species is poorly described. In fact, the genus to which it belongs is uncertain because the description of staminate flowers is ambiguous. Wessels Boer (1965) cited 1365 and 1503 from Suriname, but neither one of these specimens contains staminate flowers. Wessels Boer (1972) and other authors, including Henderson (1995) and Henderson, Galeano, and Bernal (1995), recognize *A. spectabilis* as a bona fide species; but because of the above reasons I am treating it as a *species dubia*.

Genus *Scheelea*

Geographic Distribution of Genus *Scheelea*

The genus *Scheelea* is chiefly South American in distribution with only 3 Central American members; 5 species are known only from cultivation. Its center of distribution appears to be in wet forested areas of northern South America. Of the 23 South American taxa, 7 are distributed in Peru, 5 in Venezuela, 4 in Colombia, 4 in French Guiana, 3 in Brazil, and 1 each in Ecuador, Bolivia, Paraguay, Trinidad, and Tobago. In Central America, 2 species occur in Guatemala, and 1 each in Mexico, Costa Rica, Panama, and Nicaragua (see table 5).

In contrast to the genera *Syagrus* and *Attalea*, which have a number of species growing in dry regions, such as cerrados and caatingas, *Scheelea* primarily occupies wet forested areas with some species persisting in drier secondary growth habitats after the original vegetation has been cut.

Unfortunately, many members of *Scheelea* are known only from one, two, or three collections. Forest vegetation has been and is being destroyed on a large scale in South America and Central America. Also, some botanists are reluctant to collect these exceptionally bulky palms, especially if they are not in flower or fruit. As a result, geographic distribution is not as well documented as species in some other better known genera in the tribe *Cocoeae*, such as *Syagrus* and *Butia*.

For two of the five cultivated species of *Scheelea*, it is not known with certainty where they originated. The others are thought to be native to Peru, Brazil, and Colombia. Most of the seven Peruvian taxa are distributed in forests in the department of Loreto; however, *S. weberbaueri* occurs in Junín and *S. cephalotes* grows in San Martín. Besides in Loreto, *S. moorei* is found in the departments of San Martín and Huanuco. Apparently, none of these species is abundant.

Of the five Venezuelan taxa, two are known from Bolívar, the others

Table 5. Geographic Distribution of *Scheelea*

Species	Country and State	Habitat
<i>S. moorei</i>	Peru: Huanuco, San Martín, Loreto	Dry woodlands or thickets (secondary growth)
<i>S. kewensis</i>	Uncertain (Peru?)	Cultivated
<i>S. macrocarpa</i>	Venezuela: Bolivar, Cojedes, Miranda	Rain forests, and pastures as remnants
<i>S. magdalenica</i>	Colombia: Atlantico, Bolivar, Magdalena, in valley of Rio Magdalena	Forested areas
<i>S. butyracea</i>	Colombia: Tolima, Cundinamarca, Caldas, Valle, Putumayo, Caquetá	Wet forests, savannas
<i>S. guianensis</i>	French Guiana	Forests
<i>S. camopiensis</i>	French Guiana	Forests along riverbanks
<i>S. degranvillei</i>	French Guiana	Mountain forests
<i>S. maripensis</i>	French Guiana: prov. Maripa Soula	Forests on high slopes
<i>S. rostrata</i>	Costa Rica, Guatemala, Panama, Nicaragua	Rain forests, pastures
<i>S. plowmanii</i>	Peru: Loreto, prov. Maynas	Primary upland forests
<i>S. salazarii</i>	Peru: Loreto, prov. Maynas	Forests
<i>S. osmantha</i>	Trinidad; Tobago; Venezuela: Sucre	Semidry deciduous forests
<i>S. anisitsiana</i>	Paraguay; Brazil: Mato Grosso	Forests along rivers
<i>S. phalerata</i>	Brazil: Goiás, Mato Grosso	Cerrados, gallery forests, disturbed areas
<i>S. weberbaueri</i>	Peru: Junín	Forests at elevations of 600–1,000 m
<i>S. amylacea</i>	Uncertain (native of Brazil?)	Cultivated
<i>S. lauromuelleriana</i>	Uncertain (Brazil: Minas Gerais?)	Cultivated
<i>S. insignis</i>	Colombia: Amazonas, Meta, Caquetá, Vaupes, Casinare; Ecuador: Napo	Llanos, gallery forests, wet forests, alluvial plains
<i>S. princeps</i>	Bolivia: Santa Cruz (Moxos, Chiquitos, Nuflo de Chavez, Santiesteban) and Beni (Cercado/Marban, Ballivian)	Gallery, seasonally inundated, and secondary growth forests
<i>S. cephalotes</i>	Peru: San Martín	Lowland forests of Huallaga valley
<i>S. macrolepis</i>	Venezuela: Bolivar	Savannas, open grassy areas
<i>S. fairchildensis</i>	Uncertain (Colombia?)	Cultivated
<i>S. huebneri</i>	Brazil: Amazonas, Machado region of Rondonia (Mato Grosso), Acre	Alluvial forests
<i>S. leandroana</i>	Unknown (native of Brazil?)	Cultivated

Table 5. Cont.

Species	Country and State	Habitat
<i>S. bassleriana</i>	Peru: Loreto	Flood-free forests
<i>S. tessmannii</i>	Peru: Loreto, prov. Maynas	Flooded or dry highlands
<i>S. wesselsboerii</i>	Venezuela: Barinas	Secondary forests
<i>S. maracaibensis</i>	Venezuela: Zulia, surrounding Lake Maracaibo; Colombia: Guajira	Hot humid deciduous and evergreen forests and pastures up to 1,000 m
<i>S. liebmannii</i>	Mexico: Veracruz, Oaxaca, Chiapas, Tabasco, Campeche (Hernandez Xolocotzi 1949)	Wet primary forests (secondary growth)
<i>S. lundellii</i>	Guatemala: Petén, Alta Vera Paz	Forests

from the states of Cojedes, Sucre, Barinas, and Zulia. Reports of millions of trees seen for two of these species (*S. macrocarpa* and *S. maracaibensis*) have been made in the past, and a population of close to 1,000,000 trees was estimated for *S. macrolepis* by Claassen, Jenkins, and Markley (1949). According to George Bunting (pers. comm.), *S. maracaibensis* is still very common in several localities in the state of Zulia; however, I do not have any current information on the other two palms. Three of the Colombian taxa are found in several regions and are fairly common today. Of the two Brazilian species, only *S. phalerata* seems to be relatively common in gallery forests, cerrados, and pastures of Mato Grosso and Goiás. In the remaining countries of South America, *S. princeps* is apparently still common in gallery forests and secondary forests of Bolivia, but the distribution of four new species from French Guiana is uncertain because they are each known from only one or two collections. In Central America, recent collections of *S. rostrata*, mostly in secondary forests in Guatemala and Costa Rica, indicate that this palm is still fairly common in those countries; in Mexico, *S. liebmannii* is probably not as common because of its much smaller area of distribution.

Lleras, Giacometti, and Coradin (1983) illustrated a distribution map of 41 species of *Scheelea* extracted primarily from the literature. Twenty of these taxa have been treated by me either as synonyms or as uncertain species.

Relationships within Genus *Scheelea*

In the following outline I have tentatively divided *Scheelea* into infrageneric categories. The largest (subgeneric) subdivision is based on clustering of

pinnae. A total of 13 of the 31 species have regularly arranged pinnae. Of these, only *S. moorei* seems to be isolated from the others because its staminate flowers are arranged on one side of the rachilla instead of spirally arranged. The remaining 12 taxa are mostly differentiated by size of plant, size of staminate flowers, staminate rachillae, and size of fruits. This may indicate close relationships between all of these species except the Central American *S. rostrata*, which has only 1 seed per fruit instead of 1–4 seeds, and the 4 acaulescent species from French Guiana, which, judging from their relatively short staminate rachillae, appear to form a close alliance.

Four of the remaining 18 members with clustered pinnae can be separated from the others by having staminate flowers arranged on one side instead of surrounding the rachilla. *S. moorei* may be related to this group in spite of having regularly arranged pinnae. The 4 species can be separated into two groups, acaulescent (*S. anisitsiana* and *S. weberbaueri*) and arborescent (*S. phalerata* and *S. amylacea*); however, *S. anisitsiana* and *S. phalerata* appear to be more closely allied to each other because they have more characteristics in common.

Concerning the taxa with spirally arranged staminate flowers, 2 are acaulescent (*S. lauromuelleriana* and *S. insignis*) and appear to be closely related. For the most part, the remaining 12 species are differentiated by size of staminate rachillae, flowers, pinnae, and fruits and size of pistillate flowers and rachillae when present. Of these, only *S. lundellii*, with glandular punctate staminate sterile bracts and rachillae, seems to be isolated from the others, which may be closely related as a group.

In contrast to *Attalea* (Glassman, 1977a) and *Syagrus* (Glassman, 1987), *Scheelea* seems to be a more homogeneous genus. Its species appear to be more closely allied to one another than those of the other two genera do. For example, the staminate flowers of *Attalea* have stamens ranging from 6 to 75 and anthers from 6 to 14 mm long, whereas in *Scheelea* they are consistently 6 in number and the anthers are mostly 2–4 mm long. In members of *Attalea*, structural divisions of the fruit pericarp seem to be much more diverse and complex than in species of *Scheelea*. On the other hand, a number of species of *Scheelea* have developed fruits with a complicated system of fiber clusters in the endocarp. In *Syagrus*, the pistillate flowers vary considerably in size (0.4–3.5 cm long) and shape (pyramidal, round, ovoid, or obtuse), have several species with unbranched inflorescences, and range widely in size from some diminutive, acaulescent taxa less than 0.5 m high to large trees up to 30 m tall. In *Scheelea* the pistillate flowers are mostly 2.0–3.5 cm long and more or less uniform

(ovoid) in shape, all species have branched inflorescences, and 9 of the 31 species are without trunks (rather than 14 of the 29 species in *Syagrus*), but none of these are diminutive because most have very long leaves (about 2–8 m), which are usually erect.

From an evolutionary standpoint, it is not certain when *Scheelea* appeared in the geological record, but fruits of undetermined cocoid palm genera have been reported from several localities in Eocene rocks (see Moore, 1973).

Outline of Tentative Division of *Scheelea* into Infrageneric Categories

Subgenus I. Middle series pinnae regularly arranged along rachis.

Section 1. Acaulescent.

Subsection A. Staminate rachillae 5–10 cm long. *S. guianensis*, *S. maripensis*, *S. camopiensis*, *S. degranvillei*.

Subsection B. Staminate rachillae 17–22 cm long. *S. plowmanii*.

Section 2. Arborescent.

Subsection C. Staminate flowers arranged on one side of staminate rachilla. *S. moorei*.

Subsection D. Staminate flowers spirally arranged around staminate rachilla.

Series a. Staminate flowers 6–7 mm long, staminate rachillae 10–15 cm long. *S. kewensis*.

Series b. Staminate flowers 10–19 mm long, staminate rachillae 25–40 cm long.

Subseries 1. Petiole very short or absent. *S. macrocarpa*.

Subseries 2. Petiole 0.5–1.0 m long. *S. rostrata*, *S. osmantha*.

Series c. Staminate flowers 10–17 mm long, staminate rachillae 16–25 cm long.

Subseries 3. Petiole very short or absent. *S. magdalenica*, *S. butyracea*.

Subseries 4. Petiole about 1 m long. *S. salazarii*.

Subgenus II. Middle series pinnae in clusters of 2–10.

Section 3. Staminate flowers arranged on one side of staminate rachilla.

Subsection E. Acaulescent. *S. anisitsiana*, *S. weberbaueri*.

Subsection F. Arborescent. *S. phalerata*, *S. amylacea*.

Section 4. Staminate flowers spirally arranged around staminate rachilla.

Subsection G. Acaulescent. *S. lauromuelleriana*, *S. insignis*.

Subsection H. Arborescent.

Series d. Staminate rachillae 7–15 cm long.

Subseries 5. Petiole absent or up to 15 cm long. *S. macrolepis*, *S. fairchildensis*.

Subseries 6. Petiole 0.6–1.0 m long. *S. princeps*, *S. cephalotes*, *S. huebneri*, *S. leandroana*.

Series e. Staminate rachillae 18–46 cm long.

Subseries 7. Staminate rachillae 42–46 cm long. *S. tessmannii*.

Subseries 8. Staminate rachillae 18–35 cm long.

Cohort 1. Petiole very short or absent. *S. wesselsboerii*, *S. maracaibensis*, *S. bassleriana*?

Cohort 2. Petiole 20–65 cm long. *S. liebmannii*, *S. lundellii*.

Taxonomic Treatment of Genus *Scheelea*

A total of 56 taxa have been described under or transferred to the genus *Scheelea*. Of this number, I am recognizing only 31 species (including descriptions of 9 new taxa, *S. fairchildensis*, *S. moorei*, *S. plowmanii*, *S. salazarii*, *S. guianensis*, *S. camopiensis*, *S. degranvillei*, *S. maripensis*, and *S. wesselsboerii*), with 16 binomials being reduced to synonymy. The remaining taxa have been treated as *species dubia* or *species incerta*.

Compared with some other genera in the tribe *Cocoeae*, such as *Butia* or *Syagrus* (Glassman, 1979, 1987), *Scheelea* is poorly known taxonomically. Of the 31 good species recognized by me, 17 taxa are based on three or fewer collections (3 species are based on three collections, 7 species are based on two collections, and 7 species are based on one collection). In addition to this, 11 of the 31 taxa lack collections or descriptions of the androgynous inflorescences, 6 species are without petiole measurements, and 1 lacks leaf material completely (*S. tessmannii*); the species of a large number of *Scheelea* specimens, especially several collected in Peru from the remote department of Madre de Dios, could not be accurately determined because certain diagnostic parts were missing. As previously mentioned in the treatments of *Attalea* and *Orbignya*, because of this lack of information of diagnostic morphological parts, a cladistical study of the subtribe *Attaleinae* as a unit was not possible.

The taxonomic treatment of *Scheelea* is in the same format previously used for *Attalea* and *Orbignya*.

Scheelea Karsten, *Linnaea* 28:264. 1857 ("1856"). 1861. 1866; Burret, 1929a; Glassman, 1977c. **LECTOTYPE:** (H. E. Moore, 1963b).
Scheelea regia Karsten. = ***S. butyracea*** (Mutis ex Linnaeus filius)

Karsten ex H. A. Wendland (*Cocos butyracea* Mutis ex Linnaeus filius); *Scheelea* section *Synalphocaryum* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:652. 1929a; *Scheelea* section *Dialphocaryum* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:652. 1929a; *Attalea* section *Pseudo-Scheelea* Drude, Mart. Fl. Bras. 3:442. 1881; *Maximiliana* section *Scheelea* Drude, Mart. Fl. Bras. 3:454. 1881; *Attalea* subgenus *Scheelea* Drude, Natur. Pflanzenf. 2(3):80. 1887. *Englerophoenix* Kuntze, Rev. Gen. Pl. 2:728. 1891 (in part).

Solitary trees 3–30 m tall and 19–92 cm in diam, usually with relatively smooth trunks and inconspicuous leaf scars, or lacking trunks (**acaulescent**) in nine species; **sheathing leaf base** 1.5–2.0 m long, with densely fibrous margins, frequently brownish lepidote, **petiole** sometimes indistinguishable from sheathing base, 0.0–1.8 m long, 14–18 cm wide at base, and 3.5–7.0 cm thick, frequently brownish lepidote adaxially, margins coarsely fibrous, individual fibers 12–45 cm long; **leaf rachis** 2–9 m long, frequently with chestnut brown or ferruginous indument on adaxial surface, sometimes whitish brown tomentose or with appressed grayish purple indument or blackish brown lepidote; 150–300 **pinnae** on each side of rachis, those from middle series in clusters of 2–5 or regularly arranged in 13 species, intervals of 3–12 cm between clusters of individual pinnae, 50–160 cm long and 2–4 cm wide, with acute or acuminate asymmetrical tips, cross veinlets sometimes prominent, frequently glaucous on both surfaces, margins sometimes with ferruginous indument and occasionally with resinous punctate dots; expanded part of **staminate sterile bract** 0.34–2.00 m long (including beak of 10–70 cm long), 12–37 cm wide, and 2–10 mm thick, peduncular part 0.3–2.0 m long, deeply sulcate, usually brownish or ferruginous tomentose or lepidote, rarely with pale ferruginous indument and resinous punctate dots; **rachis of staminate inflorescence** 0.2–1.2 m long, peduncle 0.25–2.00 m long, with numerous **staminate rachillae** (100–230), 5–40 (46) cm long, usually covered with a whitish, silvery, or light brown indument, rarely glabrous, occasionally bright white in color; **staminate flowers** solitary or in pairs, usually spirally arranged around rachillae, but in 5 species arranged on one side of rachilla (occasional pistillate flowers on lower part, basal 2–8 cm of rachilla without flowers), each 5–19 mm long, sometimes purple when fresh, but probably more commonly brownish in color, occasionally glutinous and with a sickly sweet odor, or fragrant and pungent, **petals** 3, usually dark brown or sometimes ferruginous when dried, fleshy, more or less terete, or angular, or convex outside and grooved inside, about 0.5–1.5 mm thick,

usually nerved or wrinkled and narrowed at base, sepals 3, 0.5–1.5 mm long, **stamens** consistently 6 in number, included in the corolla, **anthers** straight, 2–5 mm long, usually beige in color, sometimes ferruginous, rarely bright white, **filaments** 1–3 mm long; expanded part of **androgynous sterile bract** 0.5–2.0 m long (including beak of 10–54 cm long) and 10–40 cm wide and 0.5–2.5 cm thick, deeply sulcate, grooves usually unevenly spaced, frequently covered with brownish indument, sometimes glaucous, peduncular part 0.4–2.0 m long; **rachis** of **androgynous inflorescence** 0.3–1.5 m long, sometimes flattened on one side, peduncle 0.3–2.0 m long, **rachillae** numerous, 30–200 or more, **pistillate portion** sessile or less than 1 cm long in several taxa to 27 cm long in others, from 1–3 pistillate flowers per rachilla in several species to 23 flowers per rachilla in others, **staminate extension** of androgynous rachilla frequently broken off, up to 26 cm long in some species, usually narrower than pistillate portion, sometimes the same thickness, rarely with scattered isolated pistillate flowers in addition to **staminate flowers** that are usually similar in size and arrangement to those on regular staminate rachillae (but in some species staminate flowers are longer on androgynous rachillae, e.g., 16–17 mm rather than 10–12 mm), **pistillate flowers** more or less ovoid, 2.0–3.5 cm long and 1.5–2.5 cm in diam, sepals and petals 3 each in number, frequently about the same size, but in a number of taxa sepals are longer than petals, whereas in some others petals are longer than sepals, both frequently nerved, especially on apical portion, sometimes with brownish or whitish farinose indument, **pistil** 1.7–3.0 cm long, 1.0–1.5 cm in diam, ovary usually covered with a dense whitish or brownish indument, style short, usually with 3 **stigmas**, but several taxa with 4 stigmas, rarely with 6 stigmas, each 4–9 mm long, staminodial ring 0.5–1.5 cm high, sometimes with ciliate margins, frequently with a brownish indument; **fruiting sterile bract** not generally collected or measured, expanded part 0.50–1.38 m long (including beak of 20–28 cm long), 10–32 cm wide and 1.5–3.0 cm thick, peduncular part 0.35–1.00 m long, deeply sulcate, light brown or ferruginous in color, pubescence frequently persisting; **rachis** of **infructescence** 0.35–1.16 m long, peduncle 0.43–1.33 m long, **rachillae** less than 1 cm or up to 15 cm long, fruit production usually less than number of pistillate flowers; **fruit** 4–6 cm long and 2.5–3.0 cm in diam in several species and up to 11 cm long and 6 cm in diam in others (usually with beak of 0.5–1.5 cm long), mostly greenish or dark brown in color when collected, but when fully mature are yellowish or orange, persistent perianth 1.5–3.5 cm high, staminodial ring 0.5–2.0 cm high and 1.5–3.0 cm across, **epicarp** fibrous, 1.0–2.5 mm thick, **mesocarp** usually soft, 1.0–

3.5 mm thick, **endocarp** bony, light brown or ferruginous in color, 0.3–1.5 cm thick, **fiber clusters** usually common and prominent (in cross section), in a number of species arranged in two or more circles, an inner circle with conspicuous clusters and an outer circle or circles usually with less conspicuous or obscure clusters; **seeds** only 1 in a few species, more commonly 1–3, but other species with 2–5 seeds, each 2.0–3.7 cm long and 0.5–1.5 cm in diam.

Key to Species of *Scheelea*

1. Middle series pinnae regularly arranged along rachis.
 2. Petiole very short (less than 15 cm) or absent.
 3. Staminate flowers arranged on one side of staminate rachilla
..... 1. *S. moorei* (Peru).
 3. Staminate flowers spirally arranged around staminate rachilla.
 4. Staminate flowers 6–7 mm long, staminate rachillae 10–15 cm long, leaf rachis covered with appressed grayish-purple indument. 2. *S. kewensis* (cultivated).
 4. Staminate flowers 10–17 mm long, staminate rachillae 16–40 cm long, leaf rachis covered with dense brownish indument or glabrous.
 5. Staminate rachillae 30–40 cm long, staminate flowers mostly solitary, fruits 8–9 cm long
..... 3. *S. macrocarpa* (Venezuela).
 5. Staminate rachillae 16–25 cm long, staminate flowers mostly in pairs, fruits 4–7 cm long.
 6. Staminate flowers 10–12 mm long, pistillate portion of androgynous rachillae 16–27 cm long, pistillate flowers 14–23 in number, fruits 6–7 cm long, orange at maturity
..... 4. *S. magdalenica* (Colombia).
 6. Staminate flowers 13–17 mm long, pistillate portion of androgynous rachillae 12–15 cm long, pistillate flowers 8–11 in number, fruits 4–5 cm long, yellow at maturity
..... 5. *S. butyracea* (Colombia).
 2. Petiole 0.5–2.0 m long.
 7. Staminate rachillae 5–10 cm long, acaulescent.
 8. Staminate flowers 9–12 mm long, staminate rachillae either reddish brown with scattered whitish lepidote indument or brownish pubescent mixed with whitish indument.

9. Staminate rachillae 5 cm long, brownish in color, brownish pubescent, mixed with whitish indument, anthers beige in color 6. *S. guianensis* (French Guiana).
9. Staminate rachillae 9–10 cm long, reddish brown in color with scattered whitish lepidote indument, anthers light brown or reddish brown in color 9. *S. maripensis* (French Guiana).
8. Staminate flowers 5–7 mm long; staminate rachillae either brownish in color and whitish farinose and glandular or bright whitish or beige with scattered white lepidote indument.
10. Staminate flowers with relatively smooth petals, anthers beige in color, staminate rachillae 5–7 cm long, brownish in color covered with a whitish farinose indument plus short hairs over a glandular surface 7. *S. camopiensis* (French Guiana).
10. Staminate flowers with coarsely nerved and wrinkled petals, anthers bright whitish or beige in color, staminate rachillae 8–10 cm long, bright whitish or beige in color, with scattered white lepidote indument 8. *S. degranvillei* (French Guiana).
7. Staminate rachillae 17–35 cm long; arborescent (except *S. plowmanii*).
11. Fruits about 10 cm long, fruiting rachillae short, up to 2 cm long, middle series pinnae 4–5 cm wide, acaulescent 11. *S. plowmanii* (Peru).
11. Fruits 5–8 cm long, fruiting rachillae 10–22 cm long, middle series pinnae 5–8 cm wide, trees 3–26 m tall.
12. Staminate rachillae 20–24 cm long, pistillate portion of androgynous rachilla up to 12 cm long, endocarp fiber clusters prominent . . . 12. *S. salazarii* (Peru).
12. Staminate rachillae 25–35 cm long, pistillate portion of androgynous rachilla 10–22 cm long, endocarp fiber clusters inconspicuous or prominent.
13. Petiole 60–120 cm long, fruits 5–6 cm long, seed only 1, endocarp fiber clusters arranged in two circles, one prominent, the other less conspicuous 10. *S. rostrata* (Central America).
13. Petiole up to 44 cm long, fruits 7–8 cm long, seeds usually 2–3, endocarp fiber clusters scattered, inconspicuous 13. *S. osmantha* (Trinidad, Tobago, Venezuela).
1. Middle series pinnae in clusters of 2–10.
14. Staminate flowers arranged on one side of staminate rachilla.

15. Acaulescent or with very short trunk, staminate rachillae 7–9 cm long.
16. Middle series pinnae 50–60 cm long and 3 cm wide, fruits 4–6 cm long, with 2–4 seeds 14. *S. anisitsiana* (Paraguay).
16. Middle series pinnae 95–100 cm long and 5 cm wide, fruits 7–8 cm long, with 1–2 seeds 16. *S. weberbaueri* (Peru).
15. Arborescent, staminate rachillae 10–13 cm long.
17. Middle series pinnae 80–90 cm long and 2.5–3.0 cm wide, stigmas 4 in number, endocarp with two groups of fiber clusters, a thin outer inconspicuous circle and a thicker inner conspicuous circle 15. *S. phalerata* (Brazil).
17. Middle series pinnae 95–115 and 4.5–6.0 cm wide, stigmas 3–6 in number, endocarp with conspicuous fiber clusters more or less evenly arranged 17. *S. amylacea* (cultivated).
14. Staminate flowers spirally arranged around staminate rachilla.
18. Acaulescent or with very short trunk.
19. Staminate rachillae 10–14 cm long, staminate flowers 6 mm long, pistillate portion of androgynous rachilla 4–5 cm long, 4–5 pistillate flowers per rachilla, each with 3 stigmas 18. *S. lauromuelleriana* (cultivated).
19. Staminate rachillae 16–21 cm long, staminate flowers 10–13 mm long, pistillate portion of androgynous rachilla 0.4–0.8 cm long, 1–2 pistillate flowers per rachilla, each mostly with 4 stigmas 19. *S. insignis* (Colombia, Ecuador).
18. Trees 3–30 m tall.
20. Lower staminate rachillae 7–15 cm long.
21. Middle series pinnae 70–90 cm long and 3–4 cm wide.
22. Staminate rachillae 7–10 cm long, staminate flowers 7–10 mm long, mature fruits 6–8 cm long, fiber clusters in endocarp more or less evenly arranged in a circle 20. *S. princeps* (Bolivia).
22. Staminate rachillae 11–13 cm long, staminate flowers 11–13 mm long, mature fruits about 10 cm long, fiber clusters

- in endocarp unevenly arranged
- 21. *S. cephalotes* (Peru).
21. Middle series pinnae 100–145 cm long and mostly 5–6 cm wide.
23. Petiole absent or up to 15 cm long, fruits 4.0–4.5 cm long.
24. Staminate flowers 12–15 mm long, pistillate portion of androgynous rachilla up to 7 cm long, with up to 8 pistillate flowers, endocarp fiber clusters prominent 22. *S. macrolepis* (Venezuela).
24. Staminate flowers about 10 mm long, pistillate portion of androgynous rachilla up to 10 cm long, with up to 18 pistillate flowers, endocarp fiber clusters inconspicuous 23. *S. fairchildensis* (cultivated).
23. Petiole about 1 m long, fruits 6–9 cm long.
25. Staminate flowers 10–14 mm long, pistillate portion of androgynous rachilla very short, with 1–2 pistillate flowers, stigmas 4 per flower, fruits 3–5 seeded
- 24. *S. huebneri* (Brazil: Amazonas, Mato Grosso).
25. Staminate flowers 6–9 mm long, pistillate portion of androgynous rachilla 5–7 cm long, with 4–6 pistillate flowers, stigmas 3–6 per flower, fruits 2–3 seeded 25. *S. leandroana* (cultivated).
20. Lower staminate rachillae 18–46 cm long.
26. Staminate rachillae 42–46 cm long . . . 27. *S. tessmannii* (Peru).
26. Staminate rachillae 18–35 cm long.
27. Mature fruits 9.5–11.0 cm long . . . 26. *S. bassleriana* (Peru).
27. Mature fruits 5–7 cm long.
28. Petiole very short (2–3 cm) or absent.
29. Staminate rachillae 18–20 cm long, staminate flowers 8 mm long, anthers 1.5 mm long, pistillate portion of androgynous rachilla 10–13 cm long with 14–16 pistillate flowers 28. *S. wesselsboerii* (Venezuela).
29. Staminate rachillae 25–35 cm long, staminate flowers 11–14 mm long, anthers 3–4 mm long, pistillate portion of androgynous rachilla up to 24 cm long with 21–22 pistillate flowers 29. *S. maracaibensis* (Venezuela).
28. Petiole 20–65 cm long.
30. Middle series pinnae 6.0–6.5 cm wide, margins resinous punctate, staminate sterile bract glandular punctate

- tate, staminate rachillae 25–35 cm long
 31. *S. lundellii* (Guatemala).
 30. Middle series pinnae 4–5 cm wide, margins not resinous punctate, staminate sterile bract not glandular punctate, staminate rachillae 18–24 cm long
 30. *S. liebmannii* (Mexico).

Taxonomic Treatment of Species of *Scheelea*

1. *Scheelea moorei* Glassman, *sp. nov.* **TYPE:** Peru, dept. Huanuco, prov. Leoncio Prado, roadside thickets and in yards near Naranjilla, May 1960, *Moore et al.* 8392 (holotype, BH!). **Figs.** 167, 200.

Caudex circa 10.6 m altus; petiolo brevi, rachide 6.0–7.6 m longa folium regulariter pinnatum pinnis mediis 1.05–1.40 m longis 4–6 cm latis; inflorescentia mascula multiramosa pedunculo 50 cm longo rachidi 33–40 cm longi, rachillis 11–15 cm longis; flores masculi ignoti sed unilateraliter dispositi; fructus 8.0–10.2 cm longus 3.5–4.0 cm diametro.

Trees solitary, 10–20 m tall, with thick trunk; **sheathing leaf base** 1.2–1.5 m long, **petiole** very short, with fibrous margins, **leaf rachis** 6.0–7.6 m long, with brownish indument adaxially; 200–300 **pinnae** on each side of rachis, those from middle series regularly arranged, 3.0–3.5 cm apart, 1.05–1.40 m long and 4–6 cm wide, with asymmetrical tips; **staminate sterile bract** not collected; **rachis** of old **staminate inflorescence** about 40 cm long, peduncle about 50 cm long, **rachillae** numerous, 11–15 cm long (partially broken off), covered with a whitish indument, staminate flower scars arranged on one side of rachilla; **staminate flowers** not collected; expanded part of **androgynous sterile bract** about 1 m long (including beak of 33 cm long), 26 cm wide and 2.0–2.5 cm thick, deeply sulcate, with irregularly spaced grooves, covered with ferruginous lepidote indument; **rachis** of **androgynous inflorescence** 33–40 cm long, flattened on one side, peduncle about 73 cm long, **rachillae** numerous, **pistillate portion** very short, 0.5–1.0 cm long, with 1–2 **pistillate flowers**, each about 2.8 cm long and 1.5 cm in diam, sepals shorter than petals, 1.7–1.8 cm long, both distinctly nerved on apical portions and both with scattered light brown indument, **pistil** about 2 cm long and 1 cm in diam, ovary densely ferruginous tomentose, style very short, **stigmas** 3–4 in number, each 4–5 mm long, staminodial ring about 6 mm high; expanded part of **fruiting sterile bract** about 1.2 m long (including beak of 17 cm long), 18 cm wide,

and 3 cm thick, with ferruginous indument; **fruit** 8.0–10.2 cm long and 3.5–4.0 cm in diam, rounded or angled, persistent perianth about 3 cm high, staminodial ring about 1 cm high and 3 cm across, **epicarp** fibrous, 1–2 mm thick, **mesocarp** usually soft, 2–4 mm thick, **endocarp** 0.8–1.5 cm thick, in cross section **fiber clusters** mostly arranged in two circles, inner clusters large and prominent, outer ones smaller and less conspicuous, **seeds** 3–5 in number, 4.5–6.0 cm long and 0.6–0.8 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Name. *Shapaja*.

Representative Specimens Examined. PERU. San Martín: prov. San Martín, between Tarapoto and Cacatache, dry roadside thickets, May 1960, *Moore et al.* 8539 (BH); between Tarapoto and Shapaja, dry woods, May 1960, *Moore et al.* 8536 (BH); San Martín, prov. Mariscal Caceres, Fundo Curare land near Tinanta at northern edge of palm plantation, mature forest and forest edge, on alluvial soil near Rio Huallaga, Mar. 1979, *Gentry* 25731 (BH); Loreto: prov. Alto Amazonas, Quebrada Santa Maria area, in woods along trail, May 1960, *Moore et al.* 8505 (BH); Ucayali, Coronel Portillo, 22 km south km 86, Feb. 1981, *Gentry et al.* 31233 (MO).

At first, I was reluctant to describe these specimens as a new species in *Scheelea* because staminate flowers were not collected; however, the arrangement of endocarp fiber clusters in two circles convinced me they belonged to this genus. When I realized that *Moore et al.* 8392 was the first species of *Scheelea* with regular pinnae in which the staminate flower scars were arranged on one side of the rachilla, I decided that this specimen, indeed, represented a new species. Even though some of the other cited specimens (*Moore et al.* 8536, 8539, 8505) lack staminate rachillae and staminate flowers, the fruits seem to closely resemble the holotype and are therefore included here.

S. moorei (named after the late H. E. Moore Jr.) may be one of the most distinct species in the genus because of the characteristics mentioned above. It seems to be related to *S. plowmanii* from Peru because both have similar fruits, but *S. moorei* may be more closely allied to the four other members in the genus with one-sided staminate flowers (especially *S. phalerata*) even though their pinnae are clustered rather than regularly arranged.

2. *Scheelea kewensis* J. Hooker, Curtis Bot. Mag. **123**:ts. 7552–53. 1897; Burret, 1929a; Glassman, 1977c. **TYPE:** Cultivated, Royal Botanic Gardens, Kew (illustrated in Bot. Mag. pls. 7552–53), origin unknown, cult. as *Maximiliana martiana*, Oct. 1895, *sin Coll. and Num.* (holotype, K!). **Figs.** 132, 159, 185.

Trees about 7.6 m tall and 90 cm in diam; **sheathing leaf base** not measured, **petiole** very short, **leaf rachis** about 7.6 m long, with appressed grayish purple indument; middle series **pinnae** regularly arranged along rachis, 90–122 cm long and about 4 cm wide; expanded part of **staminate sterile bract** about 75 cm long; **rachis** of **staminate inflorescence** about 45 cm long, with numerous **rachillae**, 10–15 cm long; **staminate flowers** purple when fresh (dark brown when dry), completely encircling rachilla, each 6–7 mm long (10–14 mm, fide Hooker), **petals** fleshy, angular in cross section, sepals about 0.5 mm long, **stamens** 6, **anthers** 2.0–2.5 mm long, **filaments** about 1 mm long; **androgynous sterile bract, inflorescence**, and **rachillae** not measured; **pistillate flowers** (fide *Furtado s.n.*) 2.0–2.2 cm long and 1.5–2.0 cm in diam, sepals and petals about same size, **pistil** about 2 cm long and 1.5 cm in diam; ovary whitish tomentose, staminodial ring about 7 mm long and 1.5 cm in diam; **rachis** of **infructescence** (incomplete) about 16 cm long, peduncle about 24 cm long, **rachillae** short, each up to 1.5 cm long, mostly with 1 fruit per rachilla, **staminate extension** of rachilla about 8 cm long, staminate flower scars encircle rachilla; **fruit** 5.5–6.5 cm long (7.5 cm, fide Hooker) and 2.5–3.3 cm in diam, persistent perianth 2.2–2.5 cm long, staminodial ring about 7 mm high, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, scarcely distinguishable, 0.5–1.0 mm thick, **endocarp** hard, 5–8 mm thick, with more or less distinct **fiber clusters** arranged in a circle, **seed** cavities 3–4 in number, 2.5 cm long and 0.5 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. None recorded.

Representative Specimens Examined. **CULTIVATED. ENGLAND.** Mar. 1896, Royal Botanic Gardens, Kew, *sin Coll. and Num.* (K, leaf only).

Specimens Tentatively Included. **CULTIVATED. SINGAPORE.** Botanical Gardens (cult. as *Attalea spinosa*), June 1929, *Nus s.n.* (BH); June 1933, *Furtado s.n.* (B). **BRAZIL.** Without locality, 1887, *Glaziou 16485* (BR). **PERU.** Loreto: prov. Coronel Portillo, in yard at house, 4 km from Pucallpa, May 1960, *Moore et al. 8409* (BH).

Since no specimens were cited by Hooker in his original article, I chose plates 7552–53 of *Curtis Botanical Magazine* as the lectotype (1977c). Subsequently, a specimen was discovered (with the help of Sheila Hooker of the herbarium in Kew) containing information referring to plates 7552–53, which undoubtedly pinpoints them as the holotype. This specimen (cited above) consists of separate pinnae, several staminate rachillae, staminate flowers, and fruits. Both specimens from Singapore have fruits

that closely resemble those of the holotype; *Furtado s.n.* has pistillate flowers (illustrated but not adequately described by Hooker) and *Nus s.n.* contains part of an infructescence (not described by Hooker).

Since I have tentatively included a cultivated specimen from Peru under this species, it has been suggested that *S. kewensis* may be native to that country. I shall reserve that conclusion until further collections are made from other localities in Peru.

S. kewensis appears to be a distinct species with regularly arranged middle series pinnae and relatively small staminate flowers (6–7 mm in the holotype, but 9–14 mm in Hooker's description). The other seven taxa in *Scheelea* with regularly arranged pinnae have longer staminate flowers, 9–20 mm. For the present, *S. kewensis* is considered to be an incompletely known species based on fragmentary herbarium material. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. butyracea*.

3. ***Scheelea macrocarpa*** Karsten, *Linnaea* 28:268. 1857. t. 176, figs. 12–15.

1866; Burret, 1929a; Glassman, 1977c. **LECTOTYPE:** (Wessels Boer, p. 317, 1988) Venezuela, in moist forests, Rios Tuy and Jaracuy, *Karsten s.n.* (LE, fruit only). **Figs.** 161, 188, 200.

Attalea macrocarpa (Karsten) Wessels Boer, *Pittieria* 17:317. 1988.

? *Scheelea passargei* Burret, *Notizbl. Bot. Gart. Berlin-Dahlem* 10:671.

1929a. **TYPE:** Venezuelan Guiana, without definite locality (holotype, *Passarge s.n.* [B]!, fruit only).

Trees 8–10 m tall (18–24 m, fide Karsten) and 20–60 cm in diam; **sheathing leaf base** about 1.5 m long, with fibrous margins and dense brownish lepidote indument; **petiole** very short or absent, **leaf rachis** 5.5–10.0 m long, with dense brownish lepidote indument; 180–210 **pinnae** on each side of rachis, those from middle series regularly arranged, some 6–7 cm apart, 95–150 cm long and 4.7–7.0 cm wide, somewhat glaucous on adaxial side, with acute or acuminate, asymmetrical tips; expanded part of **staminate sterile bract** about 2 m long (including beak of 40 cm long) and 25 cm wide; **rachis** of **staminate inflorescence** about 80 cm long, 100–160 **rachillae**, 30–40 cm long, with whitish lepidote indument; **staminate flowers** solitary, spirally arranged around rachilla, each 10–15 mm long, **petals** fleshy, distinctly nerved and narrowed at base, 1.0–1.5 mm thick, sepals less than 1 mm long, **stamens** 6, **anthers** 2.5–3.0 mm long, **filaments** about 2 mm long; **androgynous sterile bract** 1.5–2.0 m long, **rachis** of **androgynous inflorescence** 70–90 cm long, peduncle about 50 cm long,

with 140–200 **rachillae**, **pistillate portion** of each 10–15 cm long, with 9–11 pistillate flowers, **staminate extension** of rachilla 10–16 cm long; both portions with whitish lepidote indument; **pistillate flowers** (fide *Steyermark and Davidse 116494*) 2.7–3.0 cm long and 1.5 cm in diam, sepals much longer than petals, with black constricted apices, rest of sepals lighter and distinctly nerved, petals only about 1.8 cm long, smooth and with fluted margins, **pistil** about 2 cm long, **stigmas** 3 in number, about 7 mm long, style short, ovary covered with dark brownish indument, staminodial ring 5–8 mm high, covered with light brown indument; **fruit** 8–9 cm long and 3.5–5.0 cm in diam (including beak of 0.6–1.2 cm long); persistent perianth 2.5–3.5 cm high, staminodial ring 1.0–1.8 cm high, **epicarp** fibrous, about 1.5 mm thick, **mesocarp** soft, 2–3 mm thick, **endocarp** woody, 7–10 mm thick, **fiber clusters** conspicuous, mostly arranged in one or two circles, **seeds** 1–3 in number, 3.5 cm long and about 1 cm in diam.

Distribution and Habitat. See table 5. The following information has not been corroborated by herbarium specimens: According to Braun (1968), *S. macrocarpa* is frequent in Rio Tuy and in Barlovento, in Miranda state; and Claassen, Jenkins, and Markley (1949) reported it from La Fria, Tachira state, in extensive stands south of Lake Maracaibo and along railroad, and Río Zulia near the Colombian border, an estimate of 2,000,000 trees along the above railroad for 20 km and a total of 6,000,000 trees in 20,000 hectares. The observations of palm trees near Lake Maracaibo and Río Zulia are probably *S. maracaibensis* rather than *S. macrocarpa*. The latter authors also showed *S. passargei* from La Paragua on a map of Venezuela (fig. 13, 1949).

Vernacular Names. *Coroba* (fide Claassen, Jenkins, and Markley, 1949); *yagua*, *corozo* (fide Braun, 1968); *curua* (Georgetown Bot. Gard.).

Representative Specimens Examined. **VENEZUELA.** Bolivar: near El Palmar, tropical rain forest, Nov. 1967, *Wessels Boer 2105* (U); Cojedes: along road from Tinaco to Valencia, near side road to Macapo, pastures, Nov. 1967, *Wessels Boer 2106* (U).

Specimens Tentatively Included. **VENEZUELA.** Miranda: Cerros del Bachiller, common in virgin forest, 10 km west of Cupira, Mar. 1978, *Steyermark and Davidse 116494* (BH, MO, VEN). **CULTIVATED.** **GUYANA.** Georgetown Botanic Garden, 1922, *Bailey 489* (BH); *Dahlgren s.n.* (F-610696). **CUBA.** Atkins Garden, Soledad, Mar. 1952, *Moore 6117* (BH). **PERU.** Loreto: prov. Coronel Portillo, Yarinacocha, on grounds of Linguistic Institute, May 1960, *Moore et al. 8407* (BH). **COLOMBIA.** Cartagena, Nov. 1935, *Bailey 252* (BH).

No specimens were cited by Karsten (1857, 1866). Wessels Boer (1988) cited a fruit specimen collected by Karsten as the lectotype of *S. macrocarpa*. In my 1972a article, I listed t. 176 of Karsten (1866) as the type.

S. macrocarpa is probably most closely allied to *S. osmantha*, also from Venezuela, because of its large staminate flowers and large fruits. They differ mainly in the length of their petiole. As with a number of other species of *Scheelea*, this taxon is known only from a handful of collections that are mostly incomplete (some lack androgynous rachillae and pistillate flowers, others lack fruits). Henderson, Galeano, and Bernal (1995) reduce this taxon to synonymy under *A. butyracea*.

4. *Scheelea magdalenica* Dugand, Mutisia 26:1. 1959. **TYPE:** Colombia, dept. Magdalena, Santa Marta, near Tucurinca, *A. Schultze 707* (holotype, B, destroyed). **LECTOTYPE:** (Glassman, 1977c) Colombia, Santa Marta, 1898–99, *Smith 2639* (GH!, isolectotypes, F!, MO!, NY!, P!, US!). **Figs.** 134, 163, 200.

Trees up to 25 m tall and 70–80 cm in diam at base, about 40 cm in diam in middle; **sheathing leaf base** not measured, **petiole** very short, about 25 cm wide at base, **leaf rachis** 6–7 m long; 160–80 or more **pinnae**, those from middle series regularly arranged, about 2–3 cm apart, 80–100 cm long and 4–5 cm wide, with acuminate, asymmetrical tips; **staminate sterile bract** 130–50 (180) cm long (including beak of 7–10 cm long), 12–16 cm wide, and 2–3 mm thick, deeply sulcate; **rachis of staminate inflorescence** about 70 cm long, peduncle about 40 cm long, **rachillae** numerous, 16–20 cm long (lower 6–10 cm naked), usually with whitish lepidote indument; **staminate flowers** mostly in pairs, spirally arranged around rachillae, 10–12 mm long, **petals** fleshy, nerved, sepals about 0.5 mm long, **stamens** 6, **anthers** 2–3 mm long, **filaments** 1.5–2.0 mm long; **androgynous sterile bract and inflorescence** not measured, **pistillate portion of androgynous rachilla** 15–27 cm long, with 14–23 pistillate flowers per rachilla, **staminate extension of rachilla** 4.0–7.5 cm long, attached **staminate flowers** 16–17 mm long, **petals** fleshy, sepals 0.5–1.0 mm long, **stamens** 6, **anthers** 3.5–4.0 mm long, **filaments** 1.5–2.0 mm long; **pistillate flowers** 2.0–2.5 cm long and 1.5–1.7 cm in diam, sepals mostly shorter than petals, **pistil** 1.2–1.7 cm long, style short, **stigmas** 3 in number, staminodial ring 5–7 mm high and about 1 cm across; **infructescence** 90–120 cm long, peduncle 70–100 cm long; **fruit** 6–7 cm long and 2.8–4.5 cm in diam, becoming orange at maturity, persistent perianth about 3 cm high, staminodial ring about 1 cm high, **epicarp** and **mesocarp** 2–5 mm thick, **en-**

docarp hard, 7–10 mm thick, **seeds** 1–3 in number, 3.0–3.5 cm long and 0.7–0.9 cm in diam.

Distribution and Habitat. See table 5. According to Dugand (1959), this palm had been common in the region between Sabanalarga and Guajaro and from there to Los Pendales to the west; and Puerto Giraldo and Suan to the east (Atlántico), but tens of thousands of trees were destroyed, leaving small isolated stands. The greatest concentration of this species was found in Magdalena between Medialuna and Pivijay, on the highway from Fundacion to Salamina; however, these stands were cut down and burned in the 1950s and the area was converted to pasture based on the pretext that too much shade would impede the fattening of grazing cattle (Dugand, 1959).

Vernacular Names. *Palma de vino, curua, corua.*

Representative Specimens Examined. COLOMBIA. Magdalena: between Pivijay and Medialuna, Aug. 1940, *Najar 4A* (COL); between Cienaga and Fundacion, entre los Puentes de la Quebrada de Orihueca y Rio Sevilla, Apr. 1960, *Romero-Castañeda 8225* (COL); Atlántico: bosques frondosos near Guajaro lagoon, Mar. 1934, *Dugand 558* (F).

Specimens Tentatively Included. COLOMBIA. Bolivar, vicinity of Estrella, Caño Papaya, lands of Loba, pasture land and secondary growth forests, Apr. 1916, *Curran 354* (US).

In 1977c, I selected *Smith 2639* (GH) as the lectotype of *S. magdalenica* from one of the paratypes cited by Dugand (1959) to replace the holotype, which was destroyed at B.

S. magdalenica seems to be most closely related to the Colombian *S. butyracea* because both species have regularly arranged pinnae and similar-sized staminate flowers. They differ mainly in the size and color of their mature fruits (6–7 cm long and orangish rather than 4–5 cm long and yellowish). Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. butyracea*.

The leaves of this species are used by Colombians for thatch; the terminal buds are edible and also used in wine making (Dugand, 1959).

5. *Scheelea butyracea* (Mutis ex Linnaeus filius) Karsten ex H. A. Wendland, in Kerchove, Palmiers 240, 256. 1878; Beccari, 1888; Dugand, 1941; Burret, 1929a; Glassman, 1977c. **Figs.** 135, 151, 201.

Cocos butyracea Mutis ex Linnaeus filius, Suppl. Plant. 454. 1781.

TYPE: (Glassman, 1977c) Colombia, dept. Tolima, near mines of Ibague (observed by Mutis, but no specimens cited).

Attalea butyracea (Mutis ex Linnaeus filius) Wessels Boer, *Pittieria* 17:312. 1988; Henderson, 1995; Henderson, Galeano, and Bernal, 1995.

Scheelea regia Karsten, *Linnaea* 28:266. 1857; Fl. Columb. 2:t. 176, figs. 1–6. 1866. **LECTOTYPE:** (Glassman, 1977c) Colombia, in warm valleys of Río Magdalena and Cauca, up to 1,000 m. Karsten, t. 176, figs. 1–6. 1866. No specimens cited. **Fig.** 129.

? *Scheelea humboldtiana* (Spruce) Burret, *Notizbl. Bot. Gart. Berlin-Dahlem* 10:658. 1929a; Dugand, 1955; Glassman, 1977c.

Attalea humboldtiana Spruce, *J. Linn. Soc., Bot.* 11:163. 1871. **TYPE:** Venezuela, Amazonas, on the Orinoco above the waterfall and Rio Casiquiare, above the mouth of Vasiva Lake, *Spruce 43* (holotype, K!; isotype, F!, leaf material only).

Scheelea dryanderæ Burret, *Notizbl. Bot. Gart. Berlin-Dahlem* 11:1049. 1934a. **TYPE:** Colombia, dept. El Valle, near Cali, *Dryander 12* (holotype, B!).

Trees usually 15–18 m tall and 45–90 cm in diam, but older trees up to 30 m tall and 30–40 cm in diam (fide Wessels Boer); **sheathing leaf base** 1.5–2.0 m long, densely brownish lepidote, **petiole** very short or absent; **leaf rachis** 5–9 m long, brownish lepidote abaxially; 180–230 **pinnae** on each side of rachis, those from middle series regularly arranged, 0.9–1.5 m long and 4.0–6.5 cm wide, with acute, asymmetrical tips; expanded part of **staminate sterile bract** about 1.5 m long (including beak of up to 0.5 m long), peduncular part about 2 m long; **rachis** of **staminate inflorescence** about 1 m long, peduncle about 2 m long, **rachillae** numerous, 190–230 in number, 16–25 cm long, whitish brown tomentose or lepidote; **staminate flowers** completely encircling the rachillae, 13–14 (17) mm long, **petals** fleshy, about 1 mm thick, sepals 0.5–1.0 mm long, **stamens** 6, **anthers** 2.5–4.0 mm long, **filaments** 1.5–2.0 mm long; expanded part of **androgynous sterile bract** about 1.5 m long, deeply sulcate, peduncular part about 2 m long, **rachis** of **androgynous inflorescence** about 1 m long, peduncle about 2 m long, **rachillae** numerous (up to 215), **pistillate portion** of each 12–15 cm long, **staminate extension** 18–23 cm long, 8–11 **pistillate flowers** per rachilla (23–32, *Moore et al.* 9482), each 2.8–3.0 cm long and 1.5–2.0 cm in diam, sepals longer than petals, **pistil** about 2 cm long, ovary brownish pubescent, style very short, pubescent, **stigmas** 3 in number, about 1 cm long, staminodial ring about 1 cm high, usually ciliate along margins; **staminate flowers** (from androgynous inflorescence)

10–12 mm long, **petals** fleshy, 0.5–1.0 mm thick, sepals about 0.5 mm long, **stamens** 6, **anthers** 2.0–2.5 mm long, **filaments** about 1.5 mm long; **fruit** 4–5 cm long and 2.5–3.0 cm in diam (including beak of about 1 cm long), yellow at maturity, persistent perianth 1.5–2.0 cm long, staminodial ring about 0.5 cm high and 1.5 cm in diam, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, about 1 mm thick, **endocarp** hard, 5–7 mm thick, with inconspicuous **fiber clusters**, **seeds** usually 1–2 in number.

Distribution and Habitat. See table 5.

Vernacular Names. *Palma de vino*, *palma de cuesco*, *palma real*, *palma de puerco*, *corozo de puerco*, *marano*, *corozo de marano*, *palma dulce* (Colombia); *jagua* (Venezuela).

Representative Specimens Examined. **COLOMBIA.** Cundinamarca: near Melgar, 455 m., Oct. 1946, *Foster and Foster 1891* (A, COL); Nocaima, Hacienda Tobia, *Garcia-Barriga 10674* (COL). El Valle: Cali, 1,040 m, June 1941, *Dryander s.n.* (COL); Zarzal, *Dryander s.n.* (B); Caquetá: between Florencia and Venecia, sabanas, Mar. 1940, *Cuatrecasas 8945* (COL); Putumayo: selva higrofilica del Rio Putumayo en Puerto Ospina, Nov. 1940, *Cuatrecasas 10858* (COL).

Specimens Tentatively Included. **COLOMBIA.** Without locality, *E. Perez-Arbelaez 10226* (COL); Caldas: La Dorada, *Vanegas 1* (COL); El Valle: Manuelita, Valle de Cauca, cultivated, Feb. 1967, *Moore et al. 9482* (BH); Caldas: 13 km north of La Dorada on road to San Miguel, Mar. 1977, *Gentry et al. 18205* (MO). **VENEZUELA.** Sucre: Cumana, 1833, *Bonpland s.n.* (P); Amazonas: Los Claros, vicinity of Maroa, Rio Guïania, Feb. 1942, *Williams 14301* (G); Isla Ratón, disturbed mesophytic forest, sandy soil, July 1967, *Wessels Boer 1912* (U).

No specimens were cited by Mutis in his original publication of *Cocos butyracea*, nor could any early collections be found that came from the general vicinity of the type locality. Also no illustrations of this palm were published; hence, no lectotype was chosen.

The reasons for reducing *S. regia* and *S. dryanderæ* to synonymy under *S. butyracea* were discussed in some detail earlier (Glassman, 1977c; Dugand, 1941). Moore (1963) chose *S. regia* as the lectotype of *Scheelea* because it was the most completely illustrated of the four species described by Karsten (1857, 1866). However, *S. regia* has been reduced to synonymy because *S. butyracea* was originally published at an earlier date than *S. regia*, i.e., 1781 instead of 1857. This corrects my earlier statement to the contrary (1977c).

Differences between *S. magdalenica* (included under *S. butyracea* by

Burret) and *S. butyracea* were pointed out by Dugand (1941) and me (1977c). The first species grows mainly in the Caribbean region of Colombia and has fruits that are larger (6–7 cm long \times 2.8–4.5 cm in diam vs. 4–5 cm \times 2.5–3.0 cm in diam), orange or orange-red instead of yellow, and with a longer persistent perianth (3.0 cm vs. 1.5–2.0 cm).

Burret (1929a) transferred *A. humboldtiana* Spruce to *Scheelea* mainly on the basis of its fruits, but also because Drude included it in the section *Pseudoscheelea*. Spruce was not sure of the genus because he did not collect staminate flowers. Dugand (1955) recognized it as a good species in his account of Colombian palms, based mainly on a comparison of Spruce's detailed description with photographs of this palm growing in abundance along the margins of the Bajo Guaviare and the Orinoco. In 1977c, I included *S. humboldtiana* as a possible synonym of *S. butyracea* at the suggestion of Wessels Boer, whose interpretation was hindered by the lack of authentic herbarium material. Upon reconsideration, it appears that *S. humboldtiana* could be treated as a separate species until more collections can be examined to clarify its status. According to most reports, it occurs outside the distributional range of *S. butyracea*, being found mainly in the Venezuelan Amazon. Claassen, Jenkins, and Markley (1949) and Braun (1968) reported extensive stands of *S. humboldtiana* from various parts of the region, but these reports are not verified by specimens. Furthermore, the divergent rather than normally flat arrangement of the pinnae on the rachis described by Spruce and corroborated by others may indicate a separate entity. Until this palm can be clearly delineated, however, I shall continue to treat it as a synonym of *S. butyracea*. Although our understanding of *S. humboldtiana* is incomplete, this species has the following characteristics in common with *S. butyracea*: tall trees (up to 20 m) with thick trunks (60–90 cm in diam), very short petiole, leaf rachis up to 10 m long, more than 200 pinnae on each side of rachis, those from middle series pinnae regularly arranged, length and width of middle series pinnae, size of pistillate rachillae and flowers, number of pistillate flowers, and size of fruits, and size of persistent perianth.

According to Wessels Boer (1988), *S. butyracea* seems to be closely allied to *S. macrocarpa*, *S. maracaibensis*, and *S. osmantha* by having staminate flowers about 14 mm long, pistillate rachillae with more than 10 pistillate flowers, and relatively small fruits (about 5 cm long and 2.5–3.0 cm in diam). Wessels Boer also stated that *S. magdalenica* is almost identical to *S. maracaibensis*. The latter species should be considered distinct from the other four mentioned above because it has clustered rather than regularly

arranged pinnae. *S. butyracea* seems to be most closely related to *S. magdalenica*, differing mainly in the color and size of its fruits. Apparently, it also has close affinities to *S. macrocarpa* and *S. osmantha*; it is distinguished from them mostly by its smaller fruits.

6. *Scheelea guianensis* Glassman, *sp. nov.* **TYPE:** French Guiana, Haut Camopi. Forêt à 1361 km env. au Nord du Mont Belvédère (alt. 180 m), Dec. 1984, *de Granville 7087* (holotype, CAY!). **Figs.** 139, 148–49, 176, 203.

Palma acaulis; petiolo ca 1 m longo, rachidi 5 m longii, folium regulariter pinnatum, pinnis mediis 86–100 cm longis, 3.5–5.0 cm latis; bractea mascula 50–70 cm longa; inflorescentia mascula multiramosa pedunculo 50–100 cm longo, rachide ca 25 cm longi, rachillis ca 5 cm longis brunneolis, pubescens, flores masculi spiraliter dispositi ca 11 mm longi; antheris brunneolis; fructus ignotus.

Acaulescent; petiole about 1 m long, **leaf rachis** about 5 m long, covered with dense brownish indument; 80 **pinnae** on each side of rachis, those from middle series regularly arranged, 86–100 cm long and 3.5–5.0 cm wide, with asymmetrical tips; **staminate sterile bract** 50–70 cm long; **rachis of staminate inflorescence** about 25 cm long, peduncle 50–100 cm long, numerous **rachillae**, about 5 cm long, brownish in color, with patches of brownish indument mixed with some whitish indument; **staminate flowers** spirally arranged around rachilla, each about 11 mm long, **petals** brown or reddish brown in color, finely striated or smooth, fleshy, about 0.5 mm thick, convex outside and grooved inside, sepals 0.5–1.0 mm long, **stamens** 6, **anthers** 3–4 mm long, beige in color, **filaments** 2.0–2.5 mm long; **androgynous inflorescence, pistillate flowers, infructescence, and fruit** not collected.

Distribution and Habitat. See table 5.

Vernacular Names. None recorded.

Representative Specimens Examined. See type specimen.

This palm is the first of four species of *Scheelea* described from French Guiana. These species are the first records of the genus *Scheelea* from French Guiana. Unfortunately, three of the four species lack material from the androgynous inflorescence and all four species lack fruiting material. Specimens from the leaf and staminate inflorescence, however, are sufficient to distinguish them as new entities. All four species seem to be closely related by having the following characteristics in common: middle series pinnae regularly arranged, a fairly long petiole (at least 1 m long),

acaulescent habit, rachis of staminate inflorescence 20–25 cm long, relatively short staminate rachillae, and staminate flowers spirally arranged around rachilla. *S. guianensis* differs from both *S. camopiensis* and *S. degranvillei* by having longer staminate flowers (11 mm vs. 5–7 mm) and staminate rachillae with patches of brownish indument rather than rachillae with a whitish farinose indument over a glandular surface (in *S. camopiensis*) or bright white rachillae with scattered whitish indument (in *S. degranvillei*). It also differs from *S. maripensis* in its much shorter staminate rachillae and beige instead of reddish brown anthers.

7. ***Scheelea camopiensis*** Glassman, *sp. nov.* **TYPE:** French Guiana, Rivière Camopi, Forêt de flat rive gauche, en amont du S. Yanie, abundant in the understory, Mar. 1974, *de Granville 2087* (holotype, CAY!). **Figs.** 177, 203.

Palma acaulis; petiolo 1.0–1.5 m longo, rachide 4–7 m longe, folium regulariter pinnatum, pinnis mediis 1.2–1.3 m longis, 5.0–5.5 cm latis; bractea mascula 0.6–1.0 m longa 16–17 cm lata; inflorescentia mascula multiramosa pedunculo 30–60 cm longo, rachidi ca 22 cm longi, rachillis 5–7 cm longis albo-farinosis et pubescenti-glandulosis, flores masculi spiralter dispositi 5–6 mm longi antheris brunneolis; fructus ignotus.

Acaulescent; petiole 1.0–1.5 m long, **leaf rachis** 4–7 m long; **pinnae** numerous, those from middle series regularly arranged along rachis, 1.2–1.3 m long and 5.0–5.5 cm wide, with asymmetrical tips, apex and margin of pinnae covered with ferruginous indument for a distance of about 30 cm; **staminate sterile bract** 0.6–1.0 m long and 16–17 cm wide; **rachis of staminate inflorescence** about 22 cm long, peduncle 30–60 cm long, numerous **rachillae**, 5–7 cm long and very narrow (about 1 mm in diam), brownish in color, covered with a whitish farinose indument plus short hairs over a glandular surface; **staminate flowers** mostly single, spirally arranged around rachilla, 5–6 mm long, **petals** more or less smooth, fleshy with blunt tips, convex outside and grooved inside, sepals about 0.5 mm long, **stamens** 6, **anthers** 2.5–3.0 mm long, beige in color, **filaments** about 2 mm long; **androgynous inflorescence, pistillate flowers, infructescence, and fruit** not collected.

Distribution and Habitat. See table 5.

Vernacular Names. None recorded.

Representative Specimens Examined. See type specimen.

This species is one of four described from French Guiana. It differs from *S. guianensis* mainly in its shorter staminate flowers (5–6 mm vs. 11 mm)

and different kind of indument on the staminate rachillae. *S. camopiensis* is distinguished from *S. degranvillei* chiefly by its brownish staminate rachillae with pubescent glandular indument, rather than whitish staminate rachillae with scattered white lepidote indument, and shorter staminate rachillae. See table 6 for a comparison of all four taxa.

8. ***Scheelea degranvillei*** Glassman, *sp. nov.* **TYPE:** French Guiana, Forêt sur colline au sud de la Crique Martin, RN2 (route de l'Est) PK22, Apr. 1983, *de Granville 5566* (holotype, CAY!). **Figs.** 140, 178, 203.

Palma acaulis; petiolo 1.5–4.0 m longo, rachide 4.5–6.0 m longa, folium regulariter pinnatum, pinnis mediis 90–100 cm longis, 5–6 cm latis; bractea mascula 74–90 cm longa; inflorescentia mascula multiramosa pedunculo 40–50 cm longo, rachidi 20–25 cm longi, rachillis 8–10 cm longis, glabris, albidis, flores masculi spiraliter dispositi 5–7 mm longi, antheris albidis.

Acaulescent; petiole 1.5–4.0 m long and 5–7 cm wide at base, densely ferruginous lepidote, **leaf rachis** 4.5–6.0 m long, with similar indument as petiole; 80–100 **pinnae** on each side of rachis, those from middle series regularly arranged, 90–100 cm long and 5–6 cm wide, light green on both surfaces, cross veins more or less prominent abaxially, with asymmetrical tips, apex and margin of pinnae covered with ferruginous indument for a distance of about 35 cm; **staminate sterile bract** 74–90 cm long and

Table 6. Comparison of Four Species of *Scheelea* from French Guiana

	<i>S. maripensis</i>	<i>S. guianensis</i>	<i>S. degranvillei</i>	<i>S. camopiensis</i>
Staminate rachillae				
a. length	9–10 cm	5 cm	8–10 cm	5–7 cm
b. color and indument	reddish brown, with scattered whitish lepidote indument	brownish, mostly brownish pubescent but mixed with some whitish indument	bright whitish or beige, with scattered white lepidote indument	brownish, whitish farinose with short hairs over a glandular surface
Staminate flowers				
a. size	9–12 mm	11 mm	5–7 mm	5–6 mm
b. color of petals	reddish brown	brown or reddish brown	dark reddish brown	brownish
c. anther size	2.5–3.0 mm	3–4 mm	2.5–3.0 mm	2.5–3.0 mm
d. anther color	light brown to light reddish brown	beige	bright whitish or beige	beige

8.5 cm in diam (including beak of 28 cm long); **rachis of staminate inflorescence** 20–25 cm long, peduncle 40–50 cm long, many **rachillae**, 8–10 cm long at base and 5 cm long at apex of rachis, bright whitish or beige in color, distinctly grooved, glabrous, or with sparsely or scattered white lepidote indument; **staminate flowers** spirally arranged around rachilla, 5–7 mm long, **petals** 1.0–1.5 mm thick, yellow green and sticky when fresh, dark reddish brown when dried, irregularly nerved and wrinkled, fleshy with obtuse tips, convex outside and flat or grooved inside, sepals 0.7–1.0 mm long, dark reddish brown, **stamens** 6, **anthers** 2.5–3.0 mm long, bright whitish or beige in color, **filaments** 1–2 mm long; **androgynous inflorescence, pistillate flowers, infructescence, and fruit** not collected.

Distribution and Habitat. See table 5.

Vernacular Names. None recorded.

Representative Specimens Examined. FRENCH GUIANA. *de Granville 9094* (CAY, F).

This is the third described species of *Scheelea* from French Guiana. Affinities with *S. guianensis* and *S. camopiensis* are discussed in detail under each of these species and illustrated in table 6.

9. *Scheelea maripensis* Glassman, *sp. nov.* **TYPE:** French Guiana, prov. Maripa Soula, Montagne Bellvue de l'Inini, alt. 750 m, forest on high slopes, Aug. 1985, *de Granville 7823* (holotype, CAY!; isotype, F!). **Figs.** 179–81, 203.

Palma acaulis; petiolo 0.5–1.0 m longo, rachide 6 m longa, pinnis mediis regulariter dispositis 0.9–1.0 m longis, 4.5–5.0 cm latis; inflorescentia mascula multiramosa, rachide 23 cm longa, pedunculo 21 cm longo, rachillis 9–10 cm longis, pubescentia alba, flores masculi spiraliter dispositi, 9–12 mm longi, petalis ferrugineus, antheris 2.5–3.0 mm longis, ferrugineus.

Acaulescent; petiole 0.5–1.0 m long, **leaf rachis** about 6 m long; 100–110 **pinnae** on each side of rachis, those from middle series regularly arranged, 0.9–1.0 m long and 4.5–5.0 cm wide, apices and margins ferruginous lepidote for distance of 14–15 cm; complete **staminate sterile bract** not seen; **rachis of staminate inflorescence** about 23 cm long, peduncle 21 cm long, **rachillae** numerous, 9–10 cm long, reddish brown in color, with scattered whitish lepidote indument; **staminate flowers** spirally arranged around rachilla, 9–12 mm long, **petals** 0.75–1.0 mm thick, fleshy, convex outside and grooved inside, irregularly nerved and wrinkled, red-

dish brown in color, sepals about 0.75 mm long, **stamens** 6, **anthers** 2.5–3.0 mm long, light brown to light reddish brown in color; **androgynous sterile bract** 38 cm long and 14 cm wide (incomplete) (including beak of 8 cm long), **rachis** of **androgynous inflorescence** 16 cm long, **pistillate** portion of **androgynous rachilla** 1.5–2.5 cm long, with two **pistillate flowers** per rachilla, each 2 cm long and 1 cm in diam, sepals 1.0–1.3 cm long, petals 1.5 cm long, beige in color, **stigmas** 3 in number, 3–4 mm long, dark brown, beak of ovary 4–5 mm long, whitish in color; **staminate extension** of androgynous rachilla broken off; immature **fruit** 5.5–6.5 cm long and 2.0–2.5 cm in diam, persistent perianth about 2 cm long, staminodial ring about 4 mm high.

Distribution and Habitat. See table 5.

Vernacular Name. *Macoupi*.

Representative Specimens Examined. FRENCH GUIANA. *Sist 171* (CAY, F), *172* (CAY, F); *de Granville 10174* (CAY, F); Bassin du Haut Sinnamary, region de Crique Jupiter, forêt primaire, sur Crête, Apr. 28, 1992, *de Granville et al. 11604* (CAY, F).

This is the fourth species of *Scheelea* described from French Guiana. All four are acaulescent with regularly arranged middle series pinnae. Similarities and differences are shown in table 6.

10. *Scheelea rostrata* (Oersted) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:688. 1929a; Uhl and Moore, 1973; Glassman, 1977c. **Figs.** 136–37, 172, 194.

Attalea rostrata Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjobenhavn 50:1858. 1859. **TYPE:** Costa Rica, west coast near Puntarenas with *Elaeis melanococca* in forest between Palmar and Esparsa; no specimens cited.

Scheelea preussii Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:678. 1929a; Hernandez Xolocotzi, 1945; Standley and Steyermark, fig. 50. 1958; Glassman, 1977c. **TYPE:** Guatemala, Pacific side, very common in virgin forest, *Preuss s.n.* (holotype, B!).

Scheelea zonensis L. H. Bailey, Gentes Herb. 3:37. figs. 20–23. 1933; Glassman, p. 244. 1977c. **TYPE:** Panama, Barro Colorado Island, June 1931, *Bailey and Bailey 1* (holotype, BH!).

? *Scheelea costaricensis* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:684. 1929a; Glassman, 1977c. **TYPE:** Costa Rica, *Hoffmann s.n.* (holotype, B, destroyed).

Trees solitary, 10–26 m tall and about 50 cm in diam in Costa Rica, 9 m

tall and 33–43 cm in diam in Panama, and 3–6 m or more tall in Guatemala; **sheathing leaf base** about 30 cm long (incomplete), **petiole** 0.6–1.2 m long, up to 40 cm wide at base, brownish lepidote adaxially, margins coarsely fibrous, individual fibers up to 25 cm long; **leaf rachis** up to 9 m long in Costa Rica, up to 6 m long in Panama, and about 3.5 m in Guatemala, brownish lepidote or tomentose adaxially; 176–200 **pinnae** on each side of rachis, those from middle series regularly arranged, 2.5–4.0 cm apart, 90–140 cm long, and 6–8 cm wide, with acute or acuminate asymmetrical tips, sometimes glaucous on abaxial side, greenish adaxially, cross veinlets frequently prominent; expanded part of **staminate sterile bract** 1.0–1.7 m long (including beak of 45–50 cm long) and 30–37 cm wide, deeply sulcate, covered with a brownish indument, peduncular part 65–95 cm long; **rachis of staminate inflorescence** 57–120 cm long, peduncle 60–95 cm long, numerous **rachillae**, 25–35 cm long, basal 5–10 cm naked, with whitish lepidote or floccose indument; **staminate flowers** fragrant and pungent when fresh, mostly arranged in pairs, completely surrounding rachilla (some rachillae with a few pistillate flowers at base), 10–18 mm long, **petals** fleshy, convex outside and flattened or grooved inside, distinctly nerved or wrinkled, 1.0–1.5 mm thick, sepals 0.5–1.5 mm long, **stamens** 6 in number, **anthers** 2–4 mm long, **filaments** 1.5–2.0 mm long; expanded part of **androgynous sterile bract** 0.7–1.0 m long (including beak of up to 54 cm long) and 21–24 cm wide, deeply sulcate, peduncular part 40–55 cm long; **rachis of androgynous inflorescence** 60–70 cm long, peduncle 55–80 cm long, with numerous **rachillae**, **pistillate portion** 10–18 cm long, with 10–20 pistillate flowers per rachilla, **staminate extension** 15–26 cm long, **staminate flowers** spirally arranged around rachilla, **pistillate flowers** 2.0–2.8 cm long and 1.0–1.5 cm in diam, sepals and petals about equal in size or sepals slightly longer, **pistil** 1.7–2.0 cm long, ovary usually densely brownish lepidote, style short, **stigmas** 3 in number, 7–9 mm long, staminodial ring 4–7 mm high; **fruit** orange when fresh, 5–6 cm long (including beak of 1 cm long) and 2.5–3.0 cm in diam, persistent perianth 1.8–2.5 cm long, staminodial ring 0.5–0.8 cm high and 1.5–2.0 cm across, **epicarp** fibrous, about 1–2 mm thick, dark chestnut brown in color when dried, **mesocarp** soft, 2–3 mm thick, **endocarp** hard, 5–8 mm thick, with inner ring of more or less conspicuous **fiber clusters**, outer ring of fiber clusters less conspicuous, **seeds** 1 in number, 2.0–2.6 cm long and 0.8–1.0 cm in diam.

Distribution and Habitat. Guatemala, in forests and pastures, in the departments of San Marcos, Suchitepequez, Retalhuleu, and Escuintla; reported from Chiapas, Mexico (Hernandez Xolocotzi, 1945), but probably

is *S. liebmannii*. According to Standley and Steyermark (1958), *S. rostrata* is abundant in many plains areas and is probably in all of the coastal departments of Guatemala on the Pacific side, ascending to 900 m. Originally, it was probably a forest palm, but now is more abundant on the plains, forming pure stands, because most of the original forest has been cut. Much of the land where it presently grows is very wet in winter, and some trees remain in wet depressions throughout the year. In Costa Rica, *corozo* occurs in the provinces of Puntarenas and Alajuela on the Pacific side, commonly in pastures and rain forests; in Panama, *palma real* is found in forests on Barro Colorado Island and in the Canal Zone and in Nicaragua in forests.

Vernacular Names. *Coquito*, *manaca* (Guatemala); *corozo* (Guatemala, Costa Rica); *palma real* (Panama).

Representative Specimens Examined. **GUATEMALA.** San Marcos: palmetto flats, 2–4 km north of Ocos, Mar. 1940, *Steyermark 37869* (F); Suchitepequez: south of Tiquisate, along road, alt. 30–50 m, June 1942, *Steyermark 47732* (F); Retalhuleu: mixed forest between Retalhuleu and Nueva Linda, alt. 120–220 m, Feb. 1941, *Standley 87277* (F), *87289* (F), *87314* (F); vicinity of Las Delicias, south of Retalhuleu, alt. 200 m, abundant on plains where land was cleared, Feb. 1941, *Standley 92369* (F). **COSTA RICA.** Puntarenas: abundant in open pasture near Puerto Cortez, Mar. 1953, *Moore 6540* (BH); Cabo Blanco Nature Reserve, south tip of Nicoya Peninsula, secondary vegetation, Dec. 1969, *Burger and Liesner 6696* (F); Alajuela: vicinity of Los Chiles, Rio Frio, low tropical rain forest, Aug. 1949, *Holm and Iltis 809* (BH); without definite locality or habitat, 1950, *Quiros Calvo s.n.* (BH). **PANAMA.** Canal Zone: Barro Colorado Island, Snyder Molino Trail 10, Apr. 1968, *Croat 4600* (F); forest north of Golf Club at Summit, Aug. 1971, *Croat 16649* (F). **NICARAGUA.** Vicinity of San Juan del Norte (Greytown), Mar. 1896, *Smith s.n.* (MO); dept. Zelaya: Sur de Rio Wawa, 60 km N.O. de Puerto Cabazas, Mar. 12, 1971, *Little 25118* (MO).

Specimens Tentatively Included. **NICARAGUA.** Dept. Bluefields: Bluefields, Apr. 1948, *Long 154* (F).

No specimens of *S. rostrata* were cited by Oersted with his original description, nor have I seen any collected by others during the 1800s. The two specimens from Puntarenas cited above were probably collected near the type locality.

In 1977c, I treated *Bailey and Bailey 1* as the lectotype of *S. zonensis* because no specimens were cited by Bailey (1933) or annotated by him. Now, however, I am satisfied that the above specimen is the holotype since no other specimens labeled *S. zonensis* collected before 1933 have been located.

The description of *S. costaricensis* was based solely on fruits, and no type locality was given. In 1977c I treated this palm as a doubtful species, but now I am tentatively placing it in synonymy under *S. rostrata*; Burret identified the fruit as a *Scheelea* and it is the only other palm in the subtribe *Attaleinae* recorded from Costa Rica.

S. rostrata, *S. preussii*, and *S. zonensis* were described as three distinct species by their authors without being critically compared with each other. From a morphological standpoint, however, there are no reliable characteristics that distinguish them, except size of trunk and leaves. Populations of *S. rostrata* may be in the process of differentiating into subspecies because of geographic isolation, but there are not enough differences to give them formal designations. However, flavonoid studies (Williams, Harborne, and Glassman, 1983) show that Costa Rican plants have at least three compounds not found in present populations in Guatemala and Panama. Guatemalan and Panamanian plants differ from each other by only one flavonoid compound. This species seems to grow taller and in denser stands in Costa Rica and Panama probably because of the greater availability of mesophytic habitats. The trees are smaller and more scattered in Guatemala probably because many populations are found in drier, disturbed habitats.

S. rostrata can be easily distinguished from the other two Central American species of *Scheelea* (*S. liebmannii* and *S. lundellii*) in having regularly arranged rather than clustered middle series pinnae. It seems to be more closely related to the South American *S. osmantha* from which it differs mainly in fruit size and number of seeds. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. butyracea*.

According to Standley and Steyermark (1958), *corozo* is of great local economic importance in Guatemala. Its leaves are used for starting kitchen fires and for making thatch, rain capes (*suyacales*), fans (*sopladores*), brooms, and coarse brushes. The "palmito" is eaten raw or cooked, and a fermented drink with brown sugar is also made from the sap of the terminal bud. Fruits and seeds are eaten by cattle, and oil from the seed is used to manufacture soap. The trunks are often used for lumber and fuel.

11. ***Scheelea plowmanii*** Glassman sp. nov. **TYPE:** Peru, dept. Loreto, prov. Maynas, Rio Yaguasyacu, Brillo Nuevo, Apr. 1977, *Plowman 6778* (holotype, BH!; isotypes, GH!, USM). **Figs.** 168, 202.

Palma subacaulis; petiolo 1.85 m longo, rachide 4.65–6.00 m longa, folium regulariter pinnatum, pinnis mediis 75–105 cm longis 4–5 cm latis; bractea mascula 34–50 cm longa 13–17 cm lata; inflorescentia mascula

multiramosa pedunculo 29 cm longo, rachide 20–32 cm longa, rachillis 17–22 cm longis; flores masculi spiralter dispositi 12–14 mm longi; fructus 10 cm longus, 6 cm diametro.

Acaulescent or with very short **trunk**; **sheathing leaf base** not measured, **petiole** about 1.85 m long, with fibrous margins; **leaf rachis** 4.65–6.00 m long; 107–110 **pinnae** on each side of rachis, those from middle series regularly arranged, 3.5–5.0 cm apart, 75–105 cm long, and 4–5 cm wide, with acute and asymmetrical tips; expanded part of **staminate sterile bract** 34–50 cm long (including beak of 3–4 cm long), 13–17 cm wide, and 0.8–1.0 cm thick, deeply sulcate, grooves very close together, covered with chestnut brown tomentum, peduncular part 23–30 cm long; **rachis** of **staminate inflorescence** 20–32 cm long, peduncle 29 cm long, **rachillae** numerous, 17–22 cm long, with dense whitish lepidote indument; **staminate flowers** solitary, spirally arranged around rachilla, each 12–14 mm long, **petals** fleshy, convex outside and grooved inside, distinctly nerved, **stamens** 6 in number, **anthers** 3–4 mm long, **filaments** 1.5–2.0 mm long; **androgynous inflorescence** not collected; **fruiting sterile bract** not collected, **rachis** of **infructescence** about 28 cm long, peduncle about 10 cm long, **rachillae** very short, up to 2 cm long, each with 1–2 fruits; **fruit** about 10 cm long (including beak of 2 cm long) and 6 cm in diam, with dense pale brownish lepidote indument, persistent perianth 3.5–4.5 cm high, staminodial ring about 2 cm high and 4.5 cm across, with ciliate margin and dark narrow band adjacent to margin, **epicarp** fibrous, 1–2 mm thick, **mesocarp** soft, 1–2 mm thick, **endocarp** hard, 1.5–2.0 cm thick, with an inner circle of prominent **fiber clusters** and two outer circles of less conspicuous fiber clusters, seed cavities 3, **seeds** destroyed by pests.

Distribution and Habitat. See table 5.

Vernacular Names. *Umeh, okehuba* (Bora); *shapajilla, shapaja* (Peru).

Representative Specimens Examined. PERU. Loreto: prov. Maynas, upper Rio Yaguasyacu, near Brillo Nuevo, Nov. 1977, *Gentry and Revilla 20479* (MO); Fundo Ciudadilla, on Rio Itaya, Dec. 1974, *Moore et al. 10214* (BH); Río Itaya on varadero de Omaguas from Fundo Ciudadilla, Mar. 1967, *Moore et al. 9510* (BH); Rio Nanay, upland forest near Chiriara, Feb. 1969, *Plowman 2545* (BH).

Specimens Tentatively Included. PERU. Loreto: prov. Maynas, Rio Yaguasyacu, Brillo Nuevo, Feb. 1978, *Balick et al. 1000* (F, MO).

S. plowmanii (named after the late Timothy Plowman), along with four other species from French Guiana, are the first known acaulescent members of *Scheelea* with regularly arranged pinnae. This species is probably

most closely allied to *S. salazarii* from Peru because both have long petioles and unclustered pinnae, similar-sized staminate flowers, and similar-sized staminate rachillae that are covered with a whitish lepidote indument. *S. plowmanii* differs from this palm mainly in being acaulescent instead of arborescent and in having narrower middle series pinnae, shorter fruiting rachillae with fewer fruits, and longer fruits with fewer circles of conspicuous fiber clusters in the endocarp.

12. *Scheelea salazarii* Glassman *sp. nov.* **TYPE:** Peru, dept. Loreto, prov. Maynas, on banks of Rio Itaya below Munich, May 1960, *Moore et al.* 8478 (holotype, BH!). **Figs.** 175, 201.

Caudex circa 15 m altus; rachide 7.2–9.0 m longa; folium regulariter pinnatum, pinnis mediis 100–136 cm longis, 6–8 cm latis; bractea inflorescentiae masculae 1.2–2.0 m longa 14 cm lata; inflorescentia mascula multiramosa pedunculo 0.45 m longo, rachide 1.0–1.2 m longa, rachillis 20–25 cm longis; flores masculi spiraliter dispositi, 11–15 mm longi; fructus 6–8 cm longus, 3.0–3.5 cm diametro.

Trees 15 m tall and 43–52 cm in diam; **sheathing leaf base** and **petiole** 0.9–1.5 m long, margins with coarse fibers up to 15 cm long; **leaf rachis** 7.2–9.0 m long, ferruginous on adaxial side; 175–200 **pinnae** on each side of rachis, those from middle series regularly arranged, averaging about 4 cm apart, 100–136 cm long, and 6–8 cm wide, tips acute and asymmetrical; expanded part of **staminate sterile bract** 1.2–2.0 m long (including beak of 38–50 cm long), about 14 cm wide, and 6–8 mm thick, deeply sulcate, covered with ferruginous indument, peduncular part 43–65 cm long; **rachis of staminate inflorescence** 1.0–1.2 m long, peduncle about 0.45 m long, **rachillae** numerous, 20–25 cm long, with dense whitish lepidote indument; **staminate flowers** in pairs, completely surrounding rachilla, each 11–15 mm long, **petals** fleshy, convex outside and grooved inside, distinctly nerved, 0.75–1.0 mm thick, sepals 0.5–0.75 mm long, **stamens** 6, **anthers** 2.5–3.0 mm long, **filaments** about 1.5 mm long; **androgynous sterile bract** not collected; **rachis of androgynous inflorescence** about 1.1 m long, flattened, peduncle about 1.6 m long, **rachillae** numerous, **pistillate portion** 10–12 cm long, with 7–9 pistillate flower scars, **staminate extension** broken off, **pistillate flowers** not collected; **fruiting sterile bract** not measured; **infructescence** 0.8–1.0 m long, with numerous **rachillae**, **pistillate portion** 12–15 cm long, with 8–16 fruiting scars, **staminate extension** about 14 cm long; **fruit** 6–8 cm long and 3.0–3.5 cm in diam (including beak of about 1 cm long), persistent perianth 2–3 cm high,

staminodial ring about 0.6 cm high and 1.5 cm across, mostly with ciliate margins, **epicarp** fibrous, about 1 mm thick, **mesocarp** soft, 1–2 mm thick, **endocarp** hard, 6–9 mm thick, with 2–4 circles of prominent **fiber clusters**, **seeds** usually 2 in number, 3.0–3.5 cm long and 0.6–0.8 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. *Shapajillo, sheboncita, shebon.*

Representative Specimens Examined. PERU. Loreto: prov. Maynas, banks of Río Itaya, May 1960, *Moore et al.* 8479 (BH), 8481 (BH).

Specimens Tentatively Included. PERU. Loreto: prov. Loreto, Río Samiria, between Campament 2 and Flor de Yarina, Aug. 1982, *Gentry et al.* 38074 (MO); prov. Maynas, Yanamono Expl. Tourist Camp, Río Amazonas, between Indiana and mouth of Río Napo, seasonally inundated tahuampa forest, June 1983, *Gentry and Vasquez* 42321 (MO).

This is one of three newly described species of *Scheelea* from Peru with regularly arranged pinnae. All other known Peruvian species have clustered pinnae. *S. salazarii* (named after A. Salazar) differs from *S. moorei* in having staminate flowers completely surrounding the rachilla rather than on one side of the rachilla and from *S. plowmanii* in being arborescent rather than acaulescent and in having smaller fruits, longer fruiting rachillae with more fruits, and wider middle series pinnae. *S. salazarii* also differs from the Colombian species *S. magdalenica* and *S. butyracea* in having a much longer petiole and endocarp of fruit with 2–4 circles of prominent fiber clusters.

13. *Scheelea osmantha* Barb. Rodr., Pl. Jard. Bot. Rio Jan. 4:24. 1894. t. 4B. 1896. t. 43. 1903b; Wessels Boer, 1972. **LECTOTYPE:** (Glassman, 1977c) Cultivated, Brazil, Jard. Bot. Rio Jan., Oct. 1886, *Glaziou* 16487 (MO!; isolectotypes, BR!, F!, P!). **Figs.** 169, 187, 201. *Attalea osmantha* (Barb. Rodr.) Wessels Boer, *Pittieria* 17:318. 1988. *Scheelea urbaniana* Burret, *Notizbl. Bot. Gart. Berlin-Dahlem* 10:672. 1929a. 14:476. 1937. **TYPE:** Tobago, Easterfield, Apr. 1911, *Broadway* 4015 (holotype, B, destroyed; isotypes, F!, G!). *Scheelea curvifrons* L. H. Bailey, *Gentes Herb.* 7:443, figs. 206, 209–10. 1947. **TYPE:** Trinidad, Leasehold Reservation, St. Patrick, Jan. 1946, *Bailey* 124 (holotype, BH!).

Trees 5–10 m tall, trunk 50–90 cm in diam; **sheathing leaf base** about 1.5 m long, with fibrous margins and brownish lepidote indument, **petiole** about 44 cm long, margins with dense stiff fibers (fide *Dahlgren and Millar s.n.*, F-611598), petiole very short or absent (fide Wessels Boer,

1988); **leaf rachis** 6–9 m long, brownish lepidote adaxially; 160–200 **pinnae** on each side of rachis, those from middle series mostly regularly arranged, averaging 3–4 cm apart, 100–160 cm long, and 5–7 cm wide, somewhat glaucous adaxially, with acuminate, asymmetrical tips; expanded part of **staminate sterile bract** 1.0–1.5 m long (including beak of about 20 cm long), about 22 cm wide, and 5 mm thick, deeply sulcate, brownish tomentose, peduncular part about 1 m long; **rachis** of **staminate inflorescence** 0.6–1.0 m long, peduncle 1.0–1.5 m long, **rachillae** 170–200 in number, 25–35 cm long, basal 8 cm of each rachilla naked, with whitish lepidote indument; **staminate flowers** spirally arranged around rachillae, each 16–19 mm long, **petals** fleshy, angled or more or less terete, about 1 mm thick, sepals 0.5–1.0 mm long, **stamens** 6, **anthers** 3–4 mm long, **filaments** 1.5–2.5 mm long; **androgynous sterile bract** not measured; **rachis** of **androgynous inflorescence** 2.5 m long, peduncle about 1.3 m long, ferruginous tomentose, with numerous **rachillae**, **pistillate portion** 12–22 cm long, each with 10–20 pistillate flowers, **staminate extension** incomplete, **pistillate flowers** 2.5–3.0 cm long and 1.4–1.8 cm in diam, sepals and petals about same size, **pistil** 1.7–3.0 cm long and 1.0–1.5 cm in diam, ovary densely brownish pubescent, style short, **stigmas** 3 in number, 0.5–1.0 cm long, staminodial ring 0.5–1.0 cm high and 1 cm across; expanded part of **fruiting sterile bract** about 1.4 m long (including beak of 22 cm long) and about 32 cm wide, deeply sulcate, peduncular part about 1 m long; **rachis** of **infructescence** 1.00–1.16 m long, peduncle 0.90–1.35 m long, with numerous **rachillae**, each up to 15 cm long; **fruit** 7–8 cm long and 3–5 cm in diam (including beak of 4–7 mm long), persistent perianth 2–3 cm high, staminodial ring about 1 cm high, 1.5–2.0 cm across, mostly with ciliate margins, **epicarp** fibrous, 1–2 mm thick, brownish pubescent at first, becoming glabrous with age, **mesocarp** soft, 2–3 mm thick, **endocarp** hard, 5–10 mm thick, **fiber clusters** inconspicuous, **seeds** usually 2–3 in number, 2–3 cm long and 1.0–1.3 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. *Trash palm* (Trinidad); *corozo* (Venezuela).

Representative Specimens Examined. **TOBAGO.** Mason Hall, Mar. 1914, *Broadway 4744* (F, G, GH, NY, P, US). **TRINIDAD.** Horseshoe Reservation, Forest Reserve, Sept. 1963, *Wessels Boer 1660* (U). **VENEZUELA.** Sucre: Peninsula de Paria, near Yaguarapa, secondary forest on hillsides, June 1967, *Wessels Boer 1837* (U). **CULTIVATED.** **SURINAME.** Without locality, May 1963, *Wessels Boer 1339* (U). **BRAZIL.** *Jard. Bot. Rio Jan., 1926, Dahlgren and Millar s.n.* (F-611598).

Specimens Tentatively Included. CULTIVATED. TRINIDAD. Lapeyrouse Cemetery, June 1932, *Broadway 8922* (F). **GUYANA.** Georgetown Botanic Garden, 1922, *Dahlgren and Millar s.n.* (F-610614, 610615, 610816). **USA.** Florida: Fairchild Tropical Garden, Miami, no. P1853B, Plot 78, *Sanders 1734* (FTG).

Barbosa Rodrigues originally described this species under *S. excelsa* (1891a) but could not use this binomial because it was preempted by Karsten (1857). In 1894 he changed the name to *S. osmantha* but no specimens were cited. *Glaziou 16487* (MO) was chosen as lectotype because the inscription on the specimen is "could be from type tree."

This species seems to be most closely related to *S. macrocarpa* from Venezuela since both are arborescent, have regularly arranged middle series pinnae, and have staminate rachillae and fruits similar in size. *S. osmantha* differs in having longer petioles, longer staminate flowers, and fruits with inconspicuous rather than prominent fiber clusters in the endocarp. It is also related to *S. rostrata* from Central America, differing mainly in size of petioles and prominence of fiber clusters in the endocarp. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. butyracea*.

14. ***Scheelea anisitsiana*** Barb. Rodr., *Palm. Mattogross.* 63, t. 20. 1898 ("anisitziana"). t. 47B. 1903b ("anisitsii"). **LECTOTYPE:** (Glassman, 1977c) Brazil, Matto Grosso, et culta ad Assumpção, Paraguay, herb. 223, no specimens cited (Barb. Rodr., t. 20, 1898). **Figs.** 173, 190, 200.

Attalea parviflora Barb. Rodr., *Bull. Herb. Boissier ser. 2*, 3:625. 1903a. **TYPE:** Paraguay, near Concepcion, in silva humida, no date, *Hassler 7165* (holotype, G!).

Scheelea parviflora (Barb. Rodr.) Barb. Rodr., *Sert. Palm. Bras.* 1:53. t. 45A. 1903b; Burret, 1929a; Glassman, 1977c.

Scheelea quadrisperma Barb. Rodr., *Palm. Paraguay* 23, t. 6. 1899. t. 46A. 1903b; Burret, 1929a. **LECTOTYPE:** (Glassman, 1972a) Paraguay, ripas Arroyo Y-aka in Pule-cus, near Santa Maria de la Sierra and in ripas Río Apa, no specimens cited (Barb. Rodr., t. 6, 1899).

Scheelea quadrisulcata Barb. Rodr., *Contr. Jard. Bot. Rio Jan.* 4:107, t. 22B. 1907. **LECTOTYPE:** (Glassman, 1977c) Paraguay, near Villa Concepcion, no specimens cited (Barb. Rodr., t. 22B, 1907).

Acaulescent or rarely with very short trunk; **sheathing leaf base** and

petiole not measured; **leaf rachis** 2–4 m long; middle series **pinnae** mostly in clusters of 2–4, 50–60 cm long and 2.8–3.0 cm wide; **staminate sterile bract** about 90 cm long and 13 cm wide, ferruginous tomentose; **rachis of staminate inflorescence** about 80 cm long, peduncle about 45 cm long, numerous rachillae, 7–8 cm long; **staminate flowers** arranged on one side of rachilla, each 7–8 mm long, **petals** fleshy, about 0.5 mm thick, sepals 0.5 mm long, **stamens** 6, **anthers** 2–3 mm long, **filaments** 1–2 mm long; **androgynous sterile bract** 55–65 cm long and 15 cm wide, ferruginous tomentose; **rachis of androgynous inflorescence** 60–65 cm long, peduncle about 40 cm long, **rachillae** numerous, **pistillate portion** 3.5–6.0 cm long, with 2–3 **pistillate flowers** per rachilla, each about 1.8 cm long, sepals longer than petals, with whitish farinose indument, ovary usually tomentose, **stigmas** mostly 3 in number; **fruit** 4–6 cm long and 2.3–3.3 cm in diam, yellowish and ferruginous tomentose before drying, persistent perianth about 1.5 cm high, staminodial ring about 0.5 cm high and 2 cm across, **epicarp** fibrous, 1–2 mm thick, **mesocarp** soft, 2–3 mm thick, **endocarp** hard, brownish in color, about 5 mm thick, **fiber clusters** more or less conspicuous, **seeds** 2–4 in number.

Distribution and Habitat. See table 5.

Vernacular Name. *Yatay-guazu*.

Representative Specimens Examined. PARAGUAY. Centurion, between Río Apa and Río Aquidiban, 1908–9, *Fiebrig 4037* (GH).

Specimens Tentatively Included. PARAGUAY. Amambay: Cerro Cora, selva, margin of Río Aquidiban, Aug. 1980, *Schinini and Bordas 20316* (F).

Hassler 7165 (holotype of *A. parviflora*) is one of the few specimens cited by Barbosa Rodrigues that could be found for any of his descriptions of cocoid palms. No specimens were cited for *S. quadrisperma* and *S. quadrisulcata*, but for the latter species Barbosa Rodrigues (1907) mentioned that Hassler had sent him a specimen in 1903, which I have not been able to locate. The descriptions and plates of both taxa, however, seem to fit *S. anisitsiana* fairly closely.

For *S. anisitsiana*, Barbosa Rodrigues (1898) cited 223, but no specimens have been located; t. 20 was selected as the type. In 1977c, I considered this palm a separate species, but now I am treating it as being conspecific with *S. parviflora* because of the similarity of descriptions and geographic distribution. The only acaulescent species of *Scheelea* from Paraguay or close to Mato Grosso is *S. parviflora*. As a result of this, *S. anisitsiana* becomes the correct name and *S. parviflora* becomes a synonym because of priority.

Michalowski (1958) described *S. parviflora* as an acaulescent palm for

Paraguay; but *S. quadrisperma* and *S. quadrisulcata* were listed by him as being medium-sized trees 2–4 m tall. However, he cited no specimens to verify these observations.

S. anisitsiana seems to be allied to three species that have clustered middle series pinnae and staminate flowers arranged on one side of the rachilla. It is easily distinguished from *S. phalerata* and *S. amylacea* by being acaulescent rather than arborescent and from *S. weberbaueri* by its shorter and narrower pinnae and smaller fruits with more seeds. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. phalerata* Martius.

15. ***Scheelea phalerata*** (Martius ex Sprengel) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:669. 1929a; Glassman, 1977c. **Figs.** 170, 189, 199. *Attalea phalerata* Martius ex Sprengel, Syst. Veg. 2:624. 1825; Martius, t. 169, fig. 5. 1845; Drude, t. 101, fig. 2. 1881; Henderson, 1995; Henderson, Galeano, and Bernal, 1995. **LECTOTYPE:** (Glassman, 1977c) Brazil, Goiás, exact locality not indicated. No specimens cited (Martius, t. 169, fig. 5, 1845).

Scheelea princeps var. *corumbaensis* Barb. Rodr., Palm. Mattogross. 66, t. 21A. 1898. **LECTOTYPE:** (Glassman, 1972a) Brazil, Mato Grosso, Corumbá (Barb. Rodr., t. 21A, 1898). **Fig.** 147.

Scheelea corumbaensis (Barb. Rodr.) Barb. Rodr., Sert. Palm. Bras. 1:54, t. 47A. 1903b.

Scheelea microspadix Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15:104. 1940. **TYPE:** Brazil, Mato Grosso, without definite locality, *Hopp 3010* (holotype, B!). **Fig.** 146.

Trees 5–10 m tall and 60–75 cm in diam; **sheathing leaf base** about 60 cm long, **petiole** 34–44 cm long and 6–7 cm wide at base, with long fibrous margins, individual fibers up to 45 cm long; **leaf rachis** 3.0–4.6 m long (fide Martius), with dense patches of blackish brown lepidote indument on adaxial surface; 120–50 **pinnae** on each side of rachis, those from middle series in clusters of 2–4, 3–4 cm apart, 80–90 cm long, and 2.5–3.0 cm wide, with acuminate, asymmetrical tips; expanded part of **staminate sterile bract** 38–46 cm long (including beak of 13 cm long) and 4 mm thick, deeply sulcate, not plicate in drying, covered with dense brownish lepidote indument, peduncular part about 32 cm long; **rachis** of **staminate inflorescence** 42–45 cm long, peduncle 21–26 cm long, **rachillae** numerous, 10–13 cm long, with patches of white lepidote indument; **staminate flowers** arranged in 2–4 rows along one side of the rachilla (basal 1–2 cm of

rachilla naked), each 6–9 mm long, glutinous and emitting a sickly sweet odor when fresh (*Glassman 13063, 13090*), **petals** dark brown, fleshy, angular or convex outside and flattened or grooved inside, about 0.75–1.00 mm thick, narrowed at base, sepals 0.5–1.0 mm long, **stamens** 6 in number, **anthers** 2 mm long, **filaments** 1.0–1.5 mm long; expanded part of **androgynous sterile bract** about 50 cm long (including beak of 7 cm), 10–11 cm wide and 7–11 mm thick, deeply sulcate, not plicate in drying, individual grooves 5–9 mm apart, peduncular part about 50 cm long; **rachis** of **androgynous inflorescence** about 39 cm long, peduncle about 39 cm long, **rachillae** numerous, **pistillate portion** of each 3–5 cm long, accompanying **staminate extension** mostly broken off, 2–7 **pistillate flowers** per rachilla, pinkish in color when fresh (*Glassman 13063*), each about 2 cm long and 1.5 cm in diam, **pistil** about 1.5 cm long, ovary 1 cm in diam, style very short or absent, **stigmas** 4 in number, each 4–6 mm long, staminodial ring about 7 mm high; expanded part of **fruiting sterile bract** about 50 cm long, 10 cm wide and 1 cm thick, deeply sulcate, covered with dense brownish lepidote indument, peduncular part about 35 cm long; **rachis** of **infructescence** about 46 cm long, peduncle 43–50 cm long, **rachillae** 50 or more in number, each 6–11 cm long, with 2–6 fruit scars or fruits per rachilla; **fruit** 5–6 cm long and 3.0–4.5 cm in diam, persistent perianth about 2 cm high, staminodial ring 1.0–1.3 cm high and 2.5–2.7 cm across, **epicarp** and **mesocarp** about 2 mm thick, **endocarp** hard, 4–6 mm thick, with two groups of **fiber clusters**, forming a thin outer circle of inconspicuous fibers and a thicker inner circle of conspicuous fibers, **seeds** 2–4 in number, 3.0–3.3 cm long and 0.8–1.0 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. *Acuri* (Corumbá); *guacuri*, *gururi*, *cabeçudo*, *bacuri* (Goiânia).

Representative Specimens Examined. **BRAZIL.** Mato Grosso: munic. Pedro Gomes, Rio Pequire, about 150 km south of Rondopolis, in gallery forests for more than 100 km along highway BR163, Sept. 1976, *Glassman 13089* (F), *13090* (F), *13091* (F), *13092* (F). Goiás: Dona Barbara at Morinhos, Aug. 1894, *Glaziou 22268* (BR, P); munic. Goianopolis, 34 km north of Goiânia along highway BR063, pasture, Aug. 1976, *Glassman 13063* (F), *13064* (F). **Cultivated.** **USA.** Florida, Miami, Fairchild Tropical Garden, Plot 117. Origin. Brazil, Mato Grosso, Serra Chapada, coll. by S. Kiem, May 1985, *Sanders 1730* (FTG); Plot 83. Origin. Paraguay via Nat de Leon, Apr. 1985, *Sanders 1732* (FTG).

Specimens Tentatively Included. BRAZIL. State not indicated, Salinas, 1844, *Weddell 2030* (P); Mato Grosso: Yatuarresa-Machado, Dec. 1931, *Krukoff 1615* (BH); locality not indicated, *Glaziou 16454* (BR).

On a recent trip to Brazil, Noblick (pers. comm.) noted differences in the populations of *S. phalerata* from Corumbá (in the Pantanal) and those from Goiânia. The Corumbá palms have a thin, low fibrous mesocarp and a smooth endocarp, which makes seed cleaning easy, whereas the Goiânia plants have a thick mesocarp and a very fibrous endocarp, which makes seed cleaning difficult. Further study is necessary to evaluate these differences. Barbosa Rodrigues (1903b) recognized the Corumbá plants as a distinct species.

As previously mentioned, this palm is probably most closely related to *S. aisisiana*, *S. weberbaueri*, and *S. amylacea* all of which have staminate flowers arranged on one side of the rachilla and clustered middle series pinnae. Differences can be found in the "Key to Species of *Scheelea*."

16. *Scheelea weberbaueri* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:659. 1929a; Glassman, 1977c. **TYPE:** Peru, dept. Junín, prov. Tarma, La Merced bei Chanchamayo-Tal, alt. 1,000 m, Dec. 1902, *Weberbauer 1848* (holotype, B!). **Figs.** 174, 201.

Plants **acaulescent**; **sheathing leaf base** and **petiole** not measured, **leaves** 9–10 m long (fide Burret); middle series **pinnae** in clusters of 2–3, 95–100 cm long and about 5 cm wide; **staminate sterile bract** not seen or measured; **rachis** of **staminate inflorescence** 55–60 cm long, peduncle about 14 cm long (incomplete), numerous **rachillae**, 8–9 cm long (basal 2 cm naked), with scattered whitish lepidote indument; **staminate flowers** mostly single, in several rows, but arranged on only one side of rachilla, each 5–6 mm long, **petals** fleshy, convex outside and flattened or grooved inside, about 0.5 mm thick, sepals about 0.5 mm long, **stamens** 6, **anthers** 2.0–2.5 mm long, **filaments** about 1 mm long; **androgynous sterile bract, inflorescence, rachillae, and pistillate flowers** not seen or measured; **rachis** of **infructescence** about 80 cm long, peduncle about 26 cm long; **fruit** 7–8 cm long (including beak of 7 mm long) and 2.7–4.0 cm in diam, persistent perianth about 2.5 cm high, staminodial ring about 1 cm high and 2.8 cm in diam, **epicarp** fibrous, 1–2 mm thick, **mesocarp** soft, about 0.5 mm thick, **endocarp** hard, 10–13 mm thick, with conspicuous whitish **fiber clusters**, **seeds** 1–2 in number.

Distribution and Habitat. See table 5.

Vernacular Name. *Shapaja*.

Representative Specimens Examined. PERU. Junín: along Río Perene, near "Hacienda 3," Colonia Perene, alt. 600 m, in forest, June 1929, *Killip and Smith 25141* (F, NY).

As previously noted, this palm appears to be closely related to *S. anisitsiana*, *S. phalerata*, and *S. amylacea*. Differences have been detailed in the "Key to Species of *Scheelea*." Henderson (1995) and Henderson, Galeano, and Bernal (1995) reduce this taxon to synonymy under *A. phalerata* Martius.

17. ***Scheelea amylacea*** Barb. Rodr., Pl. Jard. Bot. Rio Jan. 1:17, t. 5A, t. 6. 1891a. t. 45B. 1903b; Glassman, 1977c. **LECTOTYPE:** (Burret, 1929a) Brazil, cult. Jard. Bot. Rio Jan. no. 151, *Glaziou 17340* (lectotype, P!; isolectotypes, BR!, C!). **Figs.** 152, 191.

Trees about 4.5 m tall and 70 cm in diam; **sheathing leaf base** and **petiole** about 128 cm long, 23 cm wide at base and 8 cm wide near apex, margins fibrous, some fibers up to 23 cm long, **leaf rachis** 4.8–5.2 m long, ferruginous lepidote on adaxial surface; middle series **pinnae** in clusters of 2–5, 95–115 cm long and 4.5–6.0 cm wide, with acuminate, asymmetrical tips; **staminate sterile bract** up to 1.5 m long (fide Barb. Rodr.), deeply sulcate, brownish tomentose; **rachis of staminate inflorescence** 40–45 cm long, peduncle 60–65 cm long (fide Barb. Rodr.), **rachillae** numerous, 10–13 cm long; **staminate flowers** arranged on one side of rachilla, 7–10 mm long, **petals** fleshy, convex outside and flattened or grooved inside, sepals much shorter, about 0.5 mm long, **stamens** 6 in number, **anthers** 2.0–3.5 mm long, **filaments** 1–2 mm long; **androgynous sterile bract** 90–120 cm long (including beak of 20 cm long), 19 cm wide and 2.5 cm thick, deeply sulcate, grooves more or less evenly spaced, with numerous air spaces in cross section; **rachis of androgynous inflorescence** 54–56 cm long, peduncle 47–62 cm long, **rachillae** numerous, **pistillate portion** of each 4–5 cm long (**staminate extension** broken off), 2–4 **pistillate flowers** per rachilla, 2.5–3.0 cm long and 2.0–2.2 cm in diam, petals 2.0–2.5 cm long, sepals shorter than petals, 1.5–2.0 cm long, **pistil** 1.8–2.5 cm long, ovary brownish tomentose (fide Barb. Rodr.) or glabrous, 1.5 cm long and 1.5 cm in diam, style very short, **stigmas** 3–6 in number, 4–8 mm long, staminodial ring 7–12 mm high; **fruiting sterile bract** and **infructescence** similar to androgynous sterile bract and inflorescence; **fruit** 7–8 cm long, 3.7–4.7 cm in diam, persistent perianth about 1.5 cm high, staminodial

ring about 1 cm high and 3 cm in diam, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, about 2 mm thick, **endocarp** hard, 5–8 mm thick, with conspicuous **fiber clusters** more or less evenly arranged, **seeds** 2–4 in number, 2.6–3.7 cm long and 1.0–1.7 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. *Anaja, catolé.*

Representative Specimens Examined. **CULTIVATED. BRAZIL.** Rio de Janeiro, Jardim Botânico, no date, *Glaziou 16484* (MO, P); *Dahlgren and Millar s.n.* (F-611598, F-611601, F-611599); *Johnstone 1838* (B), *1840* (B), *1842* (B); Rio de Janeiro, Lagoa de Freitas au Jardin Botanique, Nov. 1885, *Glaziou 16486* (BR, MO, P); same locality, *Glaziou 16485* (P; mixed collection, specimen at F has staminate flowers belonging to *Attalea*).

Specimens Tentatively Included. **CULTIVATED. BRAZIL.** Rio de Janeiro: Sete Pontes, Nov. 1890, *Glaziou 18587* (F, MO).

Barbosa Rodrigues (1891a, 1903b) did not list any specimens but mentioned the number of a tree growing in Jardim Botânico Rio de Janeiro. Since Burret (1929a) cited *Glaziou 17340* collected from the same location, I have chosen that number from P as the lectotype.

S. amylacea is probably most closely related to other species with clustered pinnae in which the staminate flowers are arranged on one side of the staminate rachillae (*S. phalerata*, *S. anisitsiana*, and *S. weberbaueri*). It differs from *S. anisitsiana* and *S. weberbaueri* mainly in being arborescent rather than acaulescent and from *S. phalerata* by having longer and wider middle series pinnae and more stigmas in the pistillate flowers. *S. amylacea* may also be allied to *S. leandroana* (with spirally arranged staminate flowers) and will be discussed under the treatment of that species. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. phalerata* Martius.

18. *Scheelea lauromuelleriana* Barb. Rodr., Contr. Jard. Bot. Rio Jan. 4:108. t. 25. 1907. **TYPE:** seedlings from Brazil, Minas Gerais, locality not indicated, no specimens cited. **LECTOTYPE:** (Glassman, 1977c) Brazil, cultivated, Jardim Botânico Rio de Janeiro, 1926, *Dahlgren s.n.* (F-611607!). **Figs.** 164, 197.

Plants **acaulescent**; **sheathing leaf base** about 41 cm long and 20 cm wide; **petiole** 77–80 cm long, 18 cm wide at base and about 7 cm thick, margins fibrous; **leaf rachis** 4.8–5.6 cm long; about 210 **pinnae** on each side of rachis, those from middle series in clusters of 2–4, 80–98 cm long,

and 3.3–4.4 cm wide, with acute, asymmetrical tips; expanded part of **staminate sterile bract** 81–87 cm long (including beak of 10–18 cm long), 18–22 cm wide, and 2–3 cm thick, deeply sulcate, grooves more or less evenly spaced, extending for one-half to three-fourths the thickness of bract, peduncular part 14–22 cm long; **rachis** of **staminate inflorescence** 41–51 cm long (80 cm, fide Barb. Rodr.), peduncle about 36 cm long (60 cm, fide Barb. Rodr.), with sparse brownish indument, **rachillae** numerous, 10–14 cm long, with more than 50 staminate flowers spirally arranged around each rachilla, in some staminate rachises one well developed normal-sized pistillate flower is at the base of each rachilla on the lower half of the rachis, but rachillae on the upper half are with staminate flowers only; **staminate flowers** 6 mm long (purple in color and 10 mm long, fide Barb. Rodr.), **petals** fleshy, more or less terete, sepals about 0.5 mm long, **stamens** 6, **anthers** 2.0–2.5 mm long, **filaments** 1 mm long; expanded part of **androgynous sterile bract** 74–90 cm long (including beak of 10 cm long), 10–14 cm wide and 0.5 cm thick, deeply sulcate, grooves more or less evenly spaced, dark brownish tomentose, peduncular part about 22 cm long; **rachis** of **androgynous inflorescence** about 31 cm long, peduncle about 50 cm long, with numerous **rachillae**, **pistillate portion** 4–5 cm long, with 4–5 pistillate flowers per rachilla, **staminate extension** of rachilla broken off, **pistillate flowers** 2.0–2.3 cm long and 1.5 cm in diam, sepals about 1.3 cm long, petals 1.5–1.7 cm long; **pistil** about 2 cm long and 1 cm in diam, ovary glabrous, style short, **stigmas** 3 in number, about 5 mm long, staminodial ring 7–8 mm long; expanded part of **fruiting sterile bract** about 85 cm long (beak broken off), 19 cm wide and about 1.7 cm thick, deeply sulcate, grooves penetrating from one-half to seven-eighths thickness of bract, peduncular part about 13 cm long; **rachis** of **infructescence** about 61 cm long, peduncle about 70 cm long, with numerous **rachillae**, each up to 12 cm long, with as many as 11 fruit scars per rachilla; **fruit** about 6 cm long, 3.5–4.0 cm in diam, persistent perianth about 2 cm high, staminodial ring about 1 cm high and 2 cm across, more or less pubescent, **epicarp** fibrous, 1.5–2.0 mm thick, **mesocarp** soft, 2.0–3.5 mm thick, **endocarp** hard, 5–8 mm thick, with **fiber clusters** arranged in two circles, an outer circle of scattered inconspicuous fibers and an inner circle of distinct prominent clusters, **seeds** 2–4 in number, 3.2–3.6 cm long and 0.7–1.0 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Name. *Baguaçu*.

Representative Specimens Examined. CULTIVATED. BRAZIL. Jardim Botânico Rio de Janeiro, 1926, *Dahlgren s.n.* (F-404661); Jan. 1924, *Bailey 490* (BH).

As I mentioned in my 1977c article, the above specimens and the lectotype are the only ones I have seen identified as *S. lauromuelleriana* and probably came from the original trees planted in the Jardim Botânico.

This species may be most closely allied to *S. amylacea*; both species have clustered middle series pinnae and staminate rachillae, staminate flowers, pistillate rachillae, and fruits of about the same size. They differ mainly in the number of stigmas and arrangement of staminate flowers around rachilla (spiral in *S. lauromuelleriana* and one-sided in *S. amylacea*). *S. lauromuelleriana* is probably also related to *S. insignis* and is discussed under the treatment of that species. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. phalerata* Martius.

19. *Scheelea insignis* (Martius) Karsten, *Linnaea* 28:269. 1857; Burret, 1934a; Dahlgren, pls. 372–73. 1959; Glassman, 1977c; Galeano and Bernal, 1989. **Figs.** 130–31, 133, 186, 202.

Maximiliana insignis Martius, *Hist. Natur. Palm.* 2:133, t. 94. 1826.

TYPE: “In horrendis sylvis ad cataractus Cupatensis et Araracoara fluminis Japura, in ripa fluviorum Messai et dos Enganos in confinis Regni Quitensis et Provinciae Lusitanicae de flumine Negro.” Colombia, Caquetá, Rio Caquetá *Martius s.n.* (holotype, M!).

Attalea insignis (Martius) Drude, *Engl. Prantl. Natur. Pflanzenf.* 2:80. 1887; Henderson, 1995; Henderson, Galeano, and Bernal, 1995.

Englerophoenix insignis (Martius) Kuntze, *Rev. Gen. Pl.* 3:322. 1898.

Scheelea attaleoides Karsten, *Linnaea* 28:265. 1857. t. 67. 1861; Dugand, 1955. **TYPE:** Colombia, Vallis Orinocensis margines pede andium bogotensium, alt. 400 m (no specimens cited by Karsten, 1857).

LECTOTYPE: (Glassman, 1977c) Colombia, Meta (“Prov. Bogota”), Llano de San Martín, 300 m, “Yagua,” 1851–57, *J. Triana 731* (P!).

Plants **acaulescent** (trees 15–18 m tall, 19–30 cm in diam, fide Martius); **sheathing leaf base** about 0.5 m long, **petiole** 1.5–2.0 m long; **leaf rachis** 4–6 m long, brownish tomentose abaxially; about 150 **pinnae** on each side of rachis, those from middle series in clusters of 3–10, 10–30 cm apart,

85–100 cm long (180 cm, fide Martius), and 4.5–5.0 cm wide, with acuminate, asymmetrical tips; **staminate sterile bract** about 1.9 m long (including beak of 8 cm long), expanded part about 50 cm long and 20 cm wide, deeply sulcate; **rachis of staminate inflorescence** 15–35 cm long, peduncle about 1.4 m long, **rachillae** 30–100 in number, 16–21 cm long; **staminate flowers** completely encircling rachilla, 10–13 mm long, **petals** fleshy, convex outside and flat or grooved inside, more or less nerved, 0.75–1.25 mm thick, sepals about 0.5 mm long, **stamens** 6 in number, **anthers** 2–3 mm long, **filaments** 1.5–2.5 mm long; **androgynous sterile bract** 1.0–1.7 m long (including beak of 10–15 cm long), expanded part 40–60 cm long and 14 cm wide; **rachis of androgynous inflorescence** 20–40 cm long, peduncle 20–70 cm long, **rachillae** numerous, arranged all around rachis, **pistillate portion** of each rachilla very short, 0.4–0.8 cm long, **staminate extension** up to 14 cm long, 1–2 **pistillate flowers** per rachilla, each 2.5–3.0 cm long and 2.0–2.5 cm in diam, sepals and petals about same size, 2.0–2.5 cm long, **pistil** 2–3 cm long, ovary brownish tomentose, style about 5 mm long, **stigmas** 3–4 in number, 8–9 mm long, staminodial ring 5–10 mm high and 1–2 cm in diam; **fruit** 4.5–6.5 cm long (including beak of 1 cm long), 3–5 cm in diam, persistent perianth 2.5 cm high, staminodial ring about 1 cm high and 3 cm in diam, **epicarp** fibrous, 2.0–2.5 mm thick, **mesocarp** soft, about 2 mm thick, **endocarp** hard, 0.8–1.5 cm thick, with distinct **fiber clusters**, irregularly arranged, **seeds** 1–3 in number, 2.5–3.0 cm long and 1 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. *Yagua* (Meta); *cucurita* (Casanare); *towijiboto* (Vichada).

Representative Specimens Examined. COLOMBIA. Meta: 20 km south-east of Villavicencio, 500 m, dense forest, Mar. 1939, *Killip 34270* (COL, US); Llanos orientales, between Villavicencio and Rio Ocoa, 450 m, Feb. 1941, *Dugand and Jaramillo 2519* (COL); Monte de Rio Meta, Puerto Lopez, 200 m, Feb. 1944, *Herrmann 11208 1/2* (COL, US); Los Llanos, Rio Meta, Umapo, Oct. 1938, *Cuatrecasas 3654* (COL); Vaupes: Selva del caño Popore (Aparoris-Vaupés), Sept. 1939, *Cuatrecasas 7101* (COL).

In addition to the specimens cited above, Galeano and Bernal (1989) include the following from Colombia: Amazonas, *Galeano et al. 1139, 1140* (COL), *Galeano and Mirana 1566* (COL); Casanare, *Bernal and Barfod 1514, 1515* (COL); Meta, *de Granados 1* (COL), *Plowman et al. 4190* (COL), *Thomas et al. 1542* (COL).

According to Galeano and Bernal (1989), *S. insignis* was described from a territory that was then in Brazil (in 1826) but today belongs to Colombia. In addition to this, the above authors showed that Martius confused his new species *M. insignis* with *M. maripa*, an arborescent palm. Burret (1934a) was the first to recognize that *S. insignis* was actually an acaulescent species (based on *Hopp 1097* at B, from Ecuador). Exploration by Galeano in the region of Araracuara and from Rio Caquetá revealed that there are no palms that exactly fit the description and illustration of Martius. The only palm with a tall trunk in those areas is *M. maripa*, an abundant plant. There is another palm in this region that compares favorably with the description of *S. insignis*, except that it is acaulescent instead of being a tall tree. Therefore, according to Galeano and Bernal, this palm undoubtedly corresponds to the rest of the description of *M. insignis* Martius.

The above taxon is most closely related to *S. lauromuelleriana* and *S. leandroana*, both cultivated species with clustered pinnae and staminate flowers spirally arranged around staminate rachilla. *S. insignis* differs from *S. lauromuelleriana* mainly in its longer staminate flowers, longer staminate rachillae, and shorter androgynous rachillae, and from *S. leandroana* primarily in being acaulescent and having longer staminate rachillae. *S. insignis* differs from the other Colombian species, *S. butyracea* and *S. magdalenica*, chiefly in being acaulescent and in its clustered rather than regularly arranged middle series pinnae.

20. ***Scheelea princeps*** (Martius) Karsten, *Linnaea* 28:269. 1857; Barb. Rodr., 1898; t. 47c. 1903a. **Figs.** 171, 202.

Attalea princeps Martius, *Palmet. Orbign.* 113, t. 4, fig. 3, t. 31B. 1844.

TYPE: Bolivia, dept. Santa Cruz, prov. Moxos and Chiquitos, in large groups in humid forests, no date, *d'Orbigny 16* (holotype, P, destroyed). **LECTOTYPE:** (Glassman, 1977c) Martius, t. 31B. 1844.

Trees 9–15 m tall and 30 cm or more in diam; **sheathing leaf base** about 70 cm long, **petiole** about 75 cm long; **leaf rachis** 3.7–4.6 m long; 155–90 **pinnae** on each side of rachis, those from middle series in clusters of 2–4, 2–3 cm apart, 70–90 cm long, and 3–4 cm wide, with acute or acuminate, asymmetrical tips; expanded part of **staminate sterile bract** 60–90 cm long, 13–15 cm wide, and 9–10 mm thick, deeply sulcate, grooves about 5 mm apart; **rachis of staminate inflorescence** about 60 cm long, **rachillae** nu-

merous, 7–10 cm long, surface rugose, whitish lepidote; **staminate flowers** single or in pairs, spirally arranged around the rachillae, each 7–10 mm long, **petals** dark brown, fleshy, more or less terete or convex outside and flat or grooved inside, about 0.75 mm thick, nerved, sepals 0.50–0.75 mm long, light brown, **stamens** 6 in number, **anthers** 2–3 mm long, light brown, **filaments** about 1 mm long; **androgynous sterile bract** and **inflorescence** not seen; **pistillate flowers** 3 cm long and 1.6 cm in diam, style very short, **stigmas** 3–4 in number, each about 5 mm long; **fruit** 6–8 cm long and 3–4 cm in diam, usually dark brown when dried, persistent perianth 2–3 cm high, staminodial ring 1 cm high and 3 cm across, **epicarp** and **mesocarp** 2–4 mm thick, mesocarp sometimes indistinct, **endocarp** hard, 6–10 mm thick, frequently dark brown, with large conspicuous **fiber clusters** arranged in a circle, **seeds** 3–5 in number, 2.5 cm long and 0.5–1.0 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. *Motacu*, *mana'i*.

Representative Specimens Examined. **BOLIVIA.** Santa Cruz: prov. Nuflo de Chavez, 24 km west of Concepcion, camino a San Javier, 62°14'W, 16°14'S, about alt. 600 m, interior en selva en galeria, May 1977, *Krapovickas and Schinini 32178* (F); Finca of Don Louis Olivarria, 3 km north of Ascencion de los Guayaros, common, Aug. 1983, *Hopkins et al. 173* (NY); prov. Santiesteban Gral. Saavedra, 63°12'W, 17°13'S, Estacion Experimental, en selva secundaria, Apr. 1977, *Krapovickas and Schinini 31543* (F, MO); Beni: prov. Cercado/Marban, Estacion Experimental Peroto, 97 km east-southeast of Trinidad, July 1982, *Balick et al. 1358* (NY).

Specimens Tentatively Included. **BOLIVIA.** Beni: prov. Ballivian, Rio Maniqui, 3 days by dugout below Mission of Fatima, June 1981, *Davis and Marshall 1188* (NY).

S. princeps is the only species in this genus reported from Bolivia. It is probably most closely related to *S. cephalotes* from Peru because both species have clustered pinnae about the same length and width and similar-sized staminate rachillae and staminate flowers. They differ mainly in the size of their fruits and the distribution of fibers in the endocarp (see the "Key to Species of *Scheelea*"). Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. phalerata* Martius.

21. *Scheelea cephalotes* (Poeppig ex Martius) Karsten, *Linnaea* 28:269. 1857; Burret, 1929a; Glassman, 1977c. **Fig.** 202.

Attalea cephalotes Poeppig ex Martius, *Palmet. Orbign.* 119. 1844; Martius, t. 169. 1845. **TYPE:** Peru, dept. San Martín, "Maynas Alto," Tocache, no date on label, *Poeppig 2000* (holotype?, W, destroyed; isotypes, BR!, M!); cf. Dahlgren pl. 371. 1959.

Trees 3–4 m tall and about 30 cm in diam; **sheathing leaf base** not measured; **petiole** 60–90 cm long, margins long, fibrous; **leaf rachis** 2.4–3.0 m long, whitish brown tomentose abaxially; **pinnae** in clusters of 2–4, middle series pinnae 70–90 cm long and 3–4 cm wide, with acuminate asymmetrical tips; **staminate sterile bract** and **inflorescence** not measured; **staminate rachillae** numerous, 10–13 cm long, with whitish brown indument, **staminate flowers** spirally arranged around rachillae, 11–13 mm long, **petals** fleshy, convex outside and flattened or grooved inside, less than 1 mm thick, sepals about 0.5 mm long, **stamens** 6 in number, **anthers** about 4 mm long; **androgynous sterile bract** not measured; **androgynous inflorescence** 45–60 cm long, **pistillate flowers** numerous, sessile or on very short rachillae, measurements not recorded; **fruit** (ex Poeppig) about 10 cm long, ovate-oblong, covered with ferruginous tomentum, persistent perianth 2–3 cm high, **epicarp** fibrous, 1–2 mm thick, **mesocarp** soft, **endocarp** hard, dark chestnut brown in color, with conspicuous, unevenly arranged **fiber clusters**, **seeds** 4 in number, oily.

Distribution and Habitat. See table 5.

Vernacular Name. *Shapaja*.

Specimens Tentatively Included. PERU. 1909–14, *Weberbauer 6762* (F).

Poeppig did not cite any specimens in his original article, but photographs of *Poeppig 2000* (W) published in Dahlgren (1959) indicated that it was probably the holotype of *S. cephalotes*.

As previously noted, this species appears to be most closely related to *S. princeps*; however, it also has close affinities with *S. bassleriana* from Peru mainly because both have clustered middle series pinnae similar in size, staminate flowers similar in size, and fruits about 10 cm long. *S. cephalotes* has shorter staminate rachillae (10–13 cm vs. 17–34 cm) and shorter androgynous rachillae (sessile instead of 10 cm) than *S. princeps*. It differs from other Peruvian *Scheelea* as follows: from *S. tessmannii* by the much shorter staminate rachillae; from *S. weberbaueri* by being arborescent; and from *S. moorei*, *S. salazarii*, and *S. plowmanii* mainly by having clustered rather than regularly arranged middle series pinnae. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. butyracea*.

22. ***Scheelea macrolepis*** Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:688. 1929a; Glassman, 1977c. **TYPE:** Venezuela, Bolivar, Yopal, Uferwald, *Passarge* 774 (holotype, B, destroyed). **Figs.** 166, 202. *Attalea macrolepis* (Burret) Wessels Boer, Pittieria 17:311. 1988.

Trees about 6 m tall (9–12 m, fide Claassen, Jenkins, and Markley, 1949) and 30 cm in diam; **sheathing leaf base** about 24 cm long (incomplete?), margins densely fibrous, individual fibers up to 12 cm long, **petiole** absent or up to 15 cm long, **leaf rachis** 5–6 m long; about 180 **pinnae** on each side of rachis, those from middle series in clusters of 2–4, 100–125 cm long and up to 5 cm wide, with acuminate, asymmetrical tips, somewhat glaucous on adaxial side; expanded part of **staminate sterile bract** 1.0–1.5 m long and about 11 cm wide (including beak of up to 70 cm long), deeply sulcate; **rachis** of **staminate inflorescence** 24–30 cm long, peduncle about 44 cm long, numerous **rachillae**, 9–10 cm long, with whitish lepidote indument; **staminate flowers** completely encircling the rachilla (the basal 2 cm of rachilla without flowers), each 12–15 mm long, **petals** fleshy, angled, nerved, sepals about 1 mm long, **stamens** 6, **anthers** 3–4 mm long; expanded part of **androgynous sterile bract** 60–100 cm long and 12 cm wide, deeply sulcate, peduncular part about 70 cm long, **rachis** of **androgynous inflorescence** about 35 cm long, peduncle about 80 cm long, with 30–40 **rachillae**, **pistillate portion** of rachilla 2.5–7.0 cm long, with 3–8 **pistillate flowers** per rachilla, pistillate flowers not measured, **staminate extension** of rachilla broken off; **fruiting sterile bract** 0.5–1.0 m long and about 15 cm wide, peduncular part about 49 cm long, deeply sulcate, **rachis** of **infructescence** about 35 cm long, peduncle about 83 cm long, **rachillae** about 6.5 cm long; **fruit** 4.0–4.5 cm long (including beak of 7 mm long) and 2.5–3.0 cm in diam, persistent perianth 2–3 cm high, staminodial ring 6–7 mm high and about 1.5 cm across, **epicarp** fibrous, about 1.5 mm thick, **mesocarp** soft, 1.0–1.5 mm thick, **endocarp** hard, about 3–5 mm thick, **fiber clusters** prominent, arranged in a circle, **seeds** 1–3 in number, about 2 cm long and 1 cm in diam.

Distribution and Habitat. See table 5. According to Claassen, Jenkins, and Markley (1949), this palm occurs along the Orinoco River and its tributaries, being common from Puruy near the mouth of the Caura River and beyond Caicara (Bolivar). The trees grow in dense stands called *corobales* on the edge of tropical forests bordering savannas or grasslands. This species is the most abundant oil palm observed, with about 30,000 trees in an area from Caicara to the Cuchivero River and El Rosario. In

some places they reported 300–1,000 palms per hectare, and in the Caura and Cuchivero valleys an estimated 900,000 trees were seen. Unfortunately, no specimens were cited to support these observations.

Vernacular Names. *Caroba*, *coroba*.

Representative Specimens Examined. VENEZUELA. Bolivar: El Tigre, Middle Orinoco, near Rio Cuchivero, in open grassy field, June 1940, *Williams 13315* (F). Wessels Boer (1988) also cited *Tamayo 3418* (VEN), Bolivar: sabanas de Cuchivero.

S. macrolepis appears to be a distinct species related to *S. fairchildensis*, but as with several other species of *Scheelea*, it is based on only a few modern collections. At any rate, it differs from other Venezuelan *Scheelea* as follows: from *S. macrocarpa* and *S. osmantha* by having clustered instead of regularly arranged middle series pinnae; and from *S. wesselsboerii* and *S. maracaibensis* mainly by having much shorter staminate and androgynous rachillae. It is interesting to note that four of the five Venezuelan *Scheelea* (all except *S. osmantha*) have very short petioles, which may indicate some sort of alliance. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. butyracea*.

According to Claassen, Jenkins, and Markley (1949), the fruits of this species are collected for home processing of oil, but not used commercially.

23. ***Scheelea fairchildensis*** Glassman *sp. nov.* **TYPE:** USA. Florida, Miami, cultivated, Fairchild Tropical Garden, plot 117, RM-979, July 1963, *Read 900* (holotype, BH!; isotype, FTG!—excluding pistillate flowers and fruits). **Fig.** 150.

Caudex erectus; petiolo nullo; rachide circa 7.9 m longa, pinnis mediis aggregatis 94–146 cm longis 4.5–5.5 latis; bractea inflorescentiae masculae 1.25 m longa 15 cm lata; pedunculo 40 cm longo, rachide 68 cm longa, rachillis numerosis 14–17 cm longis; flores masculi spiraliter dispositi 10 mm longi; fructus 4.3 cm longus 2.2–2.4 cm diametro.

Tree with large heavy trunk (not measured); **sheathing leaf base** not measured, with coarse fibers up to 15 cm long, **petiole** absent; **leaf rachis** about 7.9 m long; middle series **pinnae** mostly in clusters of 2, 4.5–6.0 cm apart, 94–146 cm long and 4.5–5.5 cm wide, glaucous on both surfaces, mostly ferruginous along margins, and ferruginous or brownish lepidote along adaxial midrib; expanded part of **staminate sterile bract** about 1.25 m long (including beak of 24 cm long), 15 cm wide, and 6 mm thick, peduncular part about 50 cm long; **rachis of staminate inflorescence** about

68 cm long, peduncle about 40 cm long, numerous **rachillae**, 14–17 mm long and 5 mm thick (lower 3–5 cm of rachilla naked), with whitish lepidote indument; **staminate flowers** completely surrounding rachillae, each about 10 mm long, **petals** fleshy, angled, reddish brown, distinctly nerved, about 0.75 mm thick, sepals about 1 mm long, **stamens** 6, **anthers** about 3 mm long, lemon yellow in color, **filaments** about 1 mm long; expanded part of **androgynous sterile bract** about 173 cm long, 17 cm wide, and about 5 mm thick, deeply sulcate, grooves unevenly spaced, peduncular part about 94 cm long; **rachis** of **androgynous** inflorescence about 90 cm long, peduncle about 86 cm long, with numerous **rachillae**, **pistillate portion** about 7–10 cm long, with 5–18 pistillate flower scars, **staminate extension** of rachilla 6–10 cm long with several isolated pistillate flowers, about same thickness as regular staminate rachilla, **pistillate flowers** about 2 cm long and 1.3 cm in diam, sepals about 1.2 cm long, shorter than petals (1.8 cm long), sepals and petals with distinct narrow horizontal line and with white farinose indument, more or less distinctly nerved, tips of petals lobed and shriveled, **pistil** about 1.8 cm long, ovary brownish tomentose, style short, **stigmas** 3 in number, about 5 mm long, staminodial ring about 7 mm high and 1 cm across; **fruit** about 4.3 cm long and 2.2–2.4 cm in diam, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, 0.5–1.0 mm thick, **endocarp** hard, 4–5 mm thick, **fiber clusters** in one ring, obscure, **seeds** 3 in number, 2.5 cm long and 0.7–0.8 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. None recorded.

Representative Specimens Examined. Only type material has been examined by me.

According to records from the Fairchild Tropical Garden, this palm was received in September 1934 from M. J. Rivero in Cali, Colombia. It should be noted that the pistillate flowers and fruits of the isotype do not match those of the holotype; therefore, these parts are excluded from the type collection.

As previously noted, this palm appears to have a close alliance with *S. macrolepis* from Venezuela. *S. fairchildensis* differs from its other probable relatives, *S. huebneri* and *S. leandroana*, mainly by having a very short petiole, smaller fruits, and an endocarp with inconspicuous rather than conspicuous fiber clusters. It does not seem to be closely related to any of the other native Colombian species of *Scheelea*, being easily distinguished from *S. magdalenica* and *S. butyracea* by having clustered rather than regularly

arranged pinnae, and from *S. insignis* by having much longer androgynous rachillae and being arborescent instead of acaulescent.

24. ***Scheelea huebneri*** Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:633. 1929a; Campos Porto, 1936; Glassman, 1977c. **TYPE:** Brazil, Amazonas, Lower Rio Purus, in Igarape and Igapo, upper alluvial forest, *Huebner 23a* (holotype, B!). **Figs.** 153, 158, 184, 199.

Trees 15–45 m tall; **sheathing leaf base** not measured; **petiole** about 1 m long; **leaf rachis** about 3 m long (fide *Krukoff 1615*), dark brown lepidote abaxially; about 150 **pinnae** on each side of rachis (fide *Krukoff 1615*), those from middle series irregularly spaced in clusters of 2–4, 100–124 cm long, and 4.0–4.5 cm wide, with acute or acuminate asymmetrical tips; expanded part of **staminate sterile bract** about 63 cm long, 15 cm wide, and 2.5–4.0 cm thick, peduncular part about 39 cm long, fairly smooth outside, but expanded part deeply sulcate, grooves of unequal depth (as much as 2 cm deep) and unequally distributed (1–2 cm apart); **rachis of staminate inflorescence** 35–49 cm long, peduncle about 41 cm long, numerous **rachillae**, 10–15 cm long; **staminate flowers** solitary, completely encircling rachilla, 10–14 mm long, **petals** fleshy, more or less terete in cross section, sepals about 0.5 mm long, **stamens** 6, **anthers** 3.0–3.5 mm long, **filaments** about 1.5 mm long; **androgynous sterile bract** 0.8–1.0 m long; **rachis of androgynous inflorescence** 20–34 cm long, peduncle 20–50 cm long, **pistillate portion of androgynous rachilla** very short, **staminate extension** not measured; 1–2 **pistillate flowers** per rachilla, 2.2–2.5 cm long, **stigmas** 3–4 in number; **staminate flowers** extremely abnormal in appearance and probably sterile (compared with normal staminate flowers from staminate inflorescence), consisting of at least five different **transitional morphological flower types** in *Krukoff 5618* (NY): (1) about 18 mm long, sepals 0.5–1.0 mm long, petals more or less thickened, but narrow and definitely flat, anthers 5 mm long, filaments 3–4 mm long; (2) about 18 mm long, sepals up to 2 mm long, petals wider (2 mm) and flatter, unequal in length, anthers 3 mm long, filaments 1.5 mm long; (3) about 18 mm long, sepals up to 6 mm long, petals flat, anthers 4.5 mm long; (4) about 20 mm long, sepals 11 mm long, petals fleshy, but flat, up to 2.75 mm wide, anthers 2.5 mm long; (5) about 24 mm long, bisexual pistillode, sepals extremely unequal in size (5, 12, and 18 mm long), petals thin and flat (up to 5 mm wide), anthers 3.5 mm long, pistil probably sterile, 13 mm long, very narrow, ovary about 7 mm long, densely tomen-

tose, stigmas 3, narrow, about 7 mm long; **infructescence** about 36 cm long, peduncle about 24 cm long, **rachillae** numerous, very short; **fruit** 6–9 cm long (including beak of 6 mm), 3.5–5.5 cm in diam, persistent perianth about 1.7 cm high, staminodial ring about 0.8 cm high and 2 cm in diam, **epicarp** fibrous, about 2 mm thick, **mesocarp** soft, 1–2 mm thick, **endocarp** hard, about 8 mm thick, light brown to cinnamon color in some cross sections, prominent **fiber clusters**, **seeds** 3–5 in number, seed cavities about 2.8 cm long and 0.8–1.0 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. *Urucuri*.

Representative Specimens Examined. **BRAZIL.** (Mato Grosso), region Machado, Ytaturassa, *Krukoff 1615* (F); Acre, Basin of Rio Purus, near mouth of Rio Macauhan, Aug. 1933; *Krukoff 5572* (A, NY), *5618* (A, NY), *5622* (A, NY). **CULTIVATED.** **BRAZIL.** Rio de Janeiro, Jardim Botânico, June 1936, *Johnstone 1846* (B).

Specimens Tentatively Included. **BRAZIL.** Pará, Tapajos, Bôa Vista, Dec. 1932, *Capucho 516* (F).

This palm is poorly known. Burret's description is incomplete and the holotype consists of only leaf parts. A large part of the description is based on Krukoff's collections, which match Burret's description closely. It seems to be a distinct species allied to *S. leandroana*. However, Henderson (1995) and Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. butyracea*.

According to Burret (1929a), the fruit (mesocarp?) is edible and is also burned for smoking rubber.

25. **Scheelea leandroana** Barb. Rodr., Pl. Jard. Bot. Rio Jan. 1:19, t. 7, t. 8B. 1891a. t. 44. 1903b. **LECTOTYPE:** (Glassman, 1977c) Brazil, cultivated, Jardim Botânico Rio de Janeiro, 1926, *Dahlgren s.n.* (lectotype, F-611640!). **Fig.** 162.

Trees about 3.15 m tall and 40–50 cm in diam; **petiole** (including part of **sheathing leaf base**) about 1 m long, 14 cm wide, and 3.5 cm thick, margins long fibrous, some fibers up to 45 cm long, **leaf rachis** about 5.53 m long (whole **leaf** 7–8 m long, fide Barb. Rodr.); about 212 **pinnae** on each side of rachis, those from middle series in clusters of 2–4, 100 cm long and 3.5–4.0 cm wide (150 cm long and 5 cm wide, fide Barb. Rodr.); expanded part of **staminate sterile bract** 78–100 cm long (including beak of 20 cm long), 20–23 cm wide, and 2.5 cm thick, peduncular part 21–40 cm long, deeply sulcate; **rachis of staminate inflorescence** 51–53 cm long,

rachillae numerous, 11–14 cm long; **staminate flowers** spirally arranged around rachilla, 6–9 mm long, rose colored (fide Barb. Rodr.), sticky, sweetly scented (fide *Watson 1924*), **petals** fleshy, black, about 0.75 mm thick, more or less terete or convex outside and flattened or grooved inside, sepals 0.5–0.75 mm long, **stamens** 6, **anthers** 2.5–3.0 mm long, beige in color, **filaments** 1.0–1.5 mm long; expanded part of **androgynous sterile bract** about 1 m long (including beak of 30 cm long), 1–2 cm thick; **rachis of androgynous inflorescence** 50–57 cm long, peduncle about 110 cm long, **rachillae** numerous, 5–7 cm long, each with 4–6 pistillate flowers, **staminate extension** of rachilla not measured, **pistillate flowers** 2.0–3.5 cm long and 2.3 cm in diam, sepals shorter than petals, 1.5–2.0 cm long, petals 1.8–2.5 cm long, **pistil** 1.7–2.5 cm long and 1.8 cm in diam, ovary with scattered whitish brown lepidote or tomentose indument, becoming glabrous with age, style short, **stigmas** 3–6 in number, 4–8 mm long, with same indument as ovary, staminodial ring 7–10 mm high and 1.8 cm across, margins with whitish pubescence; expanded part of **fruiting sterile bract** 89–113 cm long (including beak of 23–28 cm long), 14 cm wide, and 1.5–3.0 cm thick, peduncular part about 62 cm long, deeply sulcate, grooves more or less evenly distributed; **rachis of infructescence** about 70 cm long, peduncle about 65 cm long, **rachillae** numerous, each 6.5–7.0 cm long, with about 4 fruits per rachilla; **fruit** 7–8 cm long and 3.5–4.2 cm in diam, sometimes angled in cross section, persistent perianth 2.0–2.8 cm long, staminodial ring 1.0–1.2 cm high, **epicarp** fibrous, 1.5–2.0 mm thick, **mesocarp** soft, 1–3 mm thick, **endocarp** hard, 0.5–1.0 cm thick, with prominent **fiber clusters** arranged in 2 circles, seeds 2–3 in number, each 3–4 cm long and 0.7–0.9 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. None recorded.

Representative Specimens Examined. **CULTIVATED. BRAZIL.** Jardim Botânico Rio de Janeiro, 1926, *Dahlgren s.n.* (F-611617, F-611597); *Dahlgren and Millar s.n.* (F-611651), Jan. 1924, *Bailey 462* (BH); Florida, Miami, Fairchild Tropical Garden, Plot 144, P-1351, native to Brazil, Sept. 1978, *P. R. Fantz 3200* (FTG).

Specimens Tentatively Included. **BRAZIL.** Jardim Botânico Rio de Janeiro, *Johnstone 1845* (B). **USA.** Florida, Miami, Fairchild Tropical Garden, Plot 117, received from Jardim Botânico Rio de Janeiro, Apr., June 1985, *Watson 1924* (FTG); Fairchild Tropical Garden, Jennings Estate, RM-2733, Dec. 1969, *Hull H-34* (FTG).

No specimens were cited by Barbosa Rodrigues (1891a, 1903b). *Dahlgren*

s.n. (F-611640) was chosen as lectotype because it was the only specimen I examined from Jardim Botânico that was labeled *S. leandroana* and probably came from the original tree. All other specimens cited above were either undetermined or identified with other species names.

This species seems to be most closely related to *S. huebneri* (see the “Key to Species of *Scheelea*”). It may also be allied to *S. amylacea* (with staminate flowers arranged on one side of the rachilla) because of the similar size of staminate rachillae and staminate flowers and because both have 3–6 stigmas in the pistillate flowers. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. phalerata* Martius.

26. ***Scheelea bassleriana*** Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:655. 1929a; Glassman, 1977c. **TYPE:** Peru, dept. Loreto, Middle Ucayali, Yarinacocha, alt. 155 m, in flood-free highland, Nov. 1925, *Tessmann* 5490 (holotype, B!; isotypes, NY!, US!). **Figs.** 156, 183, 201.

Scheelea brachyclada Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:680. 1929a. **TYPE:** Peru, dept. Loreto, Lower Itaya, Soledad, flood-free high forest, alt. 110 m, June 1925, *Tessmann* 5237 (holotype, B, destroyed; isotypes, F!, NY!).

Scheelea stenorhyncha Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:675. 1929a. **TYPE:** Peru, dept. Loreto, flood-free forest on Lower Itaya near Soledad, July 1925, *Tessmann* 5256 (holotype, B, destroyed; isotypes, F!, G!).

Trees 12–25 m tall and about 40 cm in diam; **sheathing leaf base, petiole, and leaf rachis** not measured; middle series **pinnae** in clusters of 2–3, 90–100 cm long and 3–4 cm wide, with acuminate, asymmetrical tips; **staminate sterile bract and inflorescence** not measured; **staminate rachillae** numerous, each 25–34 cm long, covered with scattered to dense patches of white floccose pubescence, **staminate flowers** spirally arranged around rachilla, 10–14 mm long and 1.0–1.5 mm thick, **petals** fleshy, convex outside and flattened or grooved inside, sepals much shorter, about 0.5 mm long, **stamens** 6, **anthers** 2.5–3.0 mm long, **filaments** 1.5–2.0 mm long; **androgynous sterile bract** 1.8 m long (fide Burret), **inflorescence** not measured; **rachillae** numerous, **pistillate portion** of each about 10 cm long, with 4–5 pistillate flowers per rachilla, **staminate extension** 7–15 cm long, both parts of rachilla and pistillate flowers covered with scattered to dense patches of white floccose pubescence; **pistillate flowers** about 3 cm long and 1.7 cm in diam, sepals somewhat longer than petals, **pistil** about 2.5 cm long and 8–9 mm in diam, ovary dense brownish white tomentose, style

very short, **stigmas** 3 in number, about 8 mm long, staminodial ring about 5 mm high; **staminate flowers** (from androgynous inflorescence) about 15 mm long, **petals** usually fleshy, but somewhat flattened, 1.0–1.5 mm thick, sepals usually 1–2 mm long, sometimes up to 8 mm long, **stamens** 6, **anthers** 2.5–3.0 mm long, **filaments** 1.5–2.0 mm long; **fruit** 9.5–11.0 cm long and 4.0–5.5 cm in diam (including beak of 1 cm long), persistent perianth 2.5–3.0 cm high, staminodial ring about 1 cm high and 2.5 cm in diam, usually ciliate along margin, **epicarp** fibrous, 1–2 mm thick, **mesocarp** inconspicuous or soft and 0.5 mm thick, **endocarp** hard, 8–10 mm thick, with conspicuous brownish **fiber clusters**, **seeds** 2–3 in number, about 3.7 cm long and 0.6–1.2 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. *Chebon*, *shapaja*.

Specimens Tentatively Included. PERU. No specific locality, mountain slopes, 1923, *Macbride 5429* (F-611146); Ucayali: Yarinacocha, *Tessmann 5439 a* (NY).

The holotypes of *S. brachyclada* (*Tessmann 5237*) and *S. stenorhyncha* (*Tessmann 5256*) were destroyed at B during World War II. Burret (1929a) also cited *Tessmann 3266* and *Tessmann 5493* under *S. brachyclada*, both from the Middle Ucayali, but these specimens could not be found and were probably lost at B as well.

S. bassleriana is one of seven distinct species recognized from Peru. It differs from *S. weberbaueri* in being arborescent rather than acaulescent and in its longer staminate flowers (10–14 mm vs. 5–6 mm); from *S. tessmannii* in its shorter staminate rachillae and shorter staminate flowers (17–34 cm vs. 42–46 cm; and 10–14 mm vs. 16–17 mm); and from *S. cephalotes* mainly in having longer staminate rachillae (17–34 cm vs. 10–13 cm). This species is easily distinguished from the other three Peruvian members (*S. moorei*, *S. plowmanii*, and *S. salazarii*) by having clustered rather than regularly arranged pinnae. Henderson, Galeano, and Bernal (1995) reduce this taxon to synonymy under *A. butyracea*.

27. *Scheelea tessmannii* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:682. 1929a; Glassman, 1977c. **TYPE:** Peru, dept. Loreto, prov. Maynas, Iquitos, alt. 100 m, in flooded or dry highlands, Apr. 1925, *Tessmann 5085* (holotype, B!; isotype, NY!). **Fig.** 200.

Trees about 12 m tall and 50 cm in diam; **leaves** neither collected nor described; **staminate sterile bract** about 1 m long, **staminate inflorescence** not measured, **rachillae** numerous, 42–46 cm long, with scattered whit-

ish lepidote indument; **staminate flowers** spirally arranged around rachilla, each 16–17 mm long, **petals** fleshy, convex outside and grooved inside, nerved or wrinkled, about 1 mm in diam, sepals 0.5–1.0 mm long, **stamens** 6, **anthers** 3–5 mm long, **filaments** about 2 mm long; **androgynous sterile bract** and **inflorescence** neither collected nor described; **pistillate portion of androgynous rachilla** 17–21 cm long, **staminate extension** 10–13 cm long, about 13 **pistillate flowers** per rachilla, each 2.2 cm long and 1.1 cm in diam, sepals longer than petals, **pistil** about 1.7 cm long and 0.4 cm in diam, style short, **stigmas** 3, about 7 mm long, staminodial ring about 5 mm high; **fruit** (fide Burret) about 8 cm long and 3 cm in diam, with prominent beak, persistent perianth about 2.5 cm high, **mesocarp** 2–4 mm thick, **endocarp** with conspicuous **fiber clusters**, **seeds** not measured.

Distribution and Habitat. See table 5.

Vernacular Name. *Chapaja*.

Representative Specimens Examined. PERU. Loreto: Iquitos, no other data, *Tessmann 5088* (NY).

It is difficult to compare *S. tessmannii* with other species in *Scheelea* because of the absence of leaf material. The main reason for maintaining *S. tessmannii* as a distinct species is its unusually long staminate rachillae (42–46 cm long) and relatively long staminate flowers. Henderson (1995) and Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. butyracea*.

28. *Scheelea wesselsboerii* Glassman *sp. nov.* **TYPE:** Venezuela, Estado Barinas, near Barrancas, 150-year-old secondary forest, Aug. 1967, *Wessels Boer 1990* (holotype, F!; isotype, U!). **Figs.** 155, 196, 202.

Caudex circa 30 m altus; petiolo nullo; rachide 5.5–8.0 m longa; pinnis mediis aggregatis 80–95 cm longis 4.5–5.0 cm latis; bractea peduncularis inflorescentiae masculae 1.5 m longa; pedunculo circa 2 m longo, rachide 0.8 m longa, rachillis numerosis 18–20 cm longis; flores masculi spiraliter dispositi circa 8 mm longi; fructus 5.0–5.5 cm longus 2.5–2.8 cm diametro.

Trees up to 30 m tall and 43 cm in diam; **sheathing leaf base** 1.2–2.0 m long, **petiole** absent, **leaf rachis** 5.5–8.0 m long; about 220 **pinnae** on each side of rachis, those from middle series in clusters of 2–4, arranged in somewhat irregular intervals, 80–95 cm long and 4.5–5.0 cm wide, greenish and with prominent cross venation on adaxial side, glaucous and with prominent cross venation in parts on abaxial side, with acute asymmetrical tips; expanded part of **staminate sterile bract** about 1.5 m long, deeply

sulcate; **rachis** of **staminate inflorescence** about 0.8 m long, peduncle about 2 m long, **rachillae** about 188 in number, 18–20 cm long, covered with dense whitish lepidote indument; **staminate flowers** single, spirally arranged around rachilla, each about 8 mm long, **petals** fleshy, convex outside and grooved inside, sepals about 0.5 mm long, **stamens** 6, **anthers** about 1.5 mm long, **filaments** about 1.5 mm long; expanded part of **androgynous sterile bract** about 1.5 m long, deeply sulcate; **rachis** of **androgynous inflorescence** about 0.8 m long, peduncle about 2 m long, rachillae about 215 in number, **pistillate rachillae** and **flowers** not measured; **pistillate portion** of each **fruiting rachilla** 10–13 cm long, with 14–16 pistillate flower and fruit scars, **staminate extension** of rachilla about 5 cm long; **fruit** 5.0–5.5 cm long and 2.5–2.8 cm in diam, persistent perianth 1.8–2.5 cm high, staminodial ring 0.7 cm high and 1.3 cm across, margins ciliate, accompanied by dark circular band near margin, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, 1.5–2.0 mm thick, **endocarp** hard, about 4–6 mm thick, dark brown in *Wessels Boer 1990*, with more or less distinct **fiber clusters**, arranged in two circles, **seeds** 2–3 in number, 1 cm long and 0.5 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Name. *Palma de agua*.

Representative Specimens Examined. **VENEZUELA.** Barinas, near Barancas, Bosque Experimental Comital (70°8'W, 8°45'N), 150-year-old secondary forest, Apr.–May 1966, *Schulz and Rodrigues 416 (U), 417 (U), 420 (U), 423 (U), 432 (U), 433 (U)*; *Canua 43269 (VEN)*.

The type specimen was originally cited as *A. butyracea* by Wessels Boer (1988); however, the middle pinnae are clustered in this specimen instead of regularly arranged as in *S. butyracea*. *S. wesselsboerii* is the fifth species of *Scheelea* described from Venezuela and the first reported from Estado Barinas. It most closely resembles *S. maracaibensis* in having clustered, middle series pinnae similar in size, very short petiole, and spirally arranged staminate flowers. This newly described species is distinguished mainly by having shorter pinnae (85–95 cm vs. 130–70 cm), shorter staminate rachillae (18–20 cm vs. 25–35 cm), shorter staminate flowers (8 mm vs. 11–14 mm), and shorter anthers (1.5 mm vs. 2.5–4.0 mm). The other Venezuelan species differ from *S. wesselsboerii* as follows: *S. macrocarpa* and *S. osmantha* have regularly arranged middle series pinnae, and *S. macrolepis* has shorter staminate rachillae (9–10 cm) and longer staminate flowers (12–15 mm).

29. ***Scheelea maracaibensis*** (Martius) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:676. 1929a; Glassman, 1977c. **Figs.** 165, 195, 200.

Attalea maracaibensis Martius, Palmet. Orbign. 124. 1844. t. 167, fig. 3. 1845; Wessels Boer, 1972. 1988. **TYPE:** Venezuela, Maracaibo, no date, *Plee s.n.* (holotype, P, destroyed?). **LECTOTYPE** (here designated): t. 167, fig. 3. 1845.

Trees 12–15 m tall and 30 cm in diam; **sheathing leaf base** about 2 m long, covered with chestnut brown lepidote indument, margins with fibers 28–32 cm long, **petiole** very short or absent, **leaf rachis** 5–8 m long, chestnut brown lepidote; 220–40 **pinnae** on each side of rachis, those from middle series in clusters of 2–5, 1.3–1.7 m long and 4.0–5.3 cm wide, with acuminate, asymmetrical tips, margins with thin line of ferrugineous indument for part of their length, glaucous on abaxial side, greenish on adaxial side, with prominent cross veins; expanded part of **staminate sterile bract** 1.0–1.5 m long (including beak of 20–30 cm long), about 17 cm wide, and 7 mm thick, peduncular part about 1 m long, deeply sulcate; **rachis of staminate inflorescence** 70–80 cm long, peduncle 1.0–1.5 m long, **rachillae** 150–80 in number, 25–35 cm long, surface rugose, covered with dense brown lepidote indument (eventually becoming caducous), topped with a dense white lepidote indument, lower 5.0–7.5 cm of rachilla naked; **staminate flowers** mostly in pairs, spirally arranged around rachilla, 11–14 mm long, **petals** fleshy, convex outside and flattened or grooved inside, nerved, about 1 mm thick, sepals less than 1 mm long, **stamens** 6, **anthers** 3–4 mm long, **filaments** 2–3 mm long; expanded part of **androgynous sterile bract** about 2.4 m long (including beak of 19 cm long), deeply sulcate; **rachis of androgynous inflorescence** 70–75 cm long, peduncle about 1.6 m long, with 145–80 **rachillae**, **pistillate portion** of each rachilla whitish lepidote, up to 24 cm long, with 21–22 pistillate flowers per rachilla, **staminate extension** of rachilla 10–15 cm long, whitish lepidote; **pistillate flowers** 2.5–2.8 cm long and 1.8 cm in diam, sepals and petals about equal in size, sepals with darkened tips, prominently nerved, covered with a light brown or whitish lepidote indument, **pistil** 2.0–2.4 cm long, ovary light brown lepidote, style short, **stigmas** 3 in number, about 6 mm long, staminodial ring 7–8 mm high, with brownish lepidote indument and ciliate margins; **staminate flowers** from some androgynous rachillae abnormal, about 10 mm long, with only one or two petals, **stamens** 6, **anthers** 2–3 mm long, other staminate flowers normal, resembling those from staminate inflorescence; **pistillate portion of fruiting rachilla**

15–25 cm long, with 16–25 fruit scars, **staminate extension** of rachilla about 15 cm long; **fruit** 5–7 cm long and 3.5–4.5 cm in diam (including beak of up to 1.8 cm long), persistent perianth 2–3 cm high, staminodial ring about 1 cm high and 2 cm across, with ciliate margins, **epicarp** 1 mm thick, **mesocarp** 1 mm thick, **endocarp** 6–8 mm thick, **fiber clusters** usually conspicuous and common, occasionally arranged in 2 rings, sometimes obscured by tannin deposits, **seeds** 1–3 in number, about 2.5 cm long and 1.0–1.6 cm in diam.

Distribution and Habitat. See table 5. George Bunting (pers. comm.) said this palm is currently common in many localities in the state of Zulia.

Vernacular Names. *Palma de agua, coruba.*

Representative Specimens Examined. VENEZUELA. Zulia: near Santa Barbara del Zulia, in pastures, Aug. 1967, *Wessels Boer 2007* (F, U); Perija, near Mission Los Angeles del Tucuco, forest at base of mountains, Apr. 1968, *Wessels Boer 2463* (U); Dist. Mara, Hacienda Marantiales, 12 km west of Campamento Caruchano, pasture, June 1982 *Steyermark 123409* (VEN); Dist. Mara, alrededores del Campamento Carichuano de Carbozulia, via caño Colorado entre el campamento y el caño Vaqueta, bosque humedo premontano, Aug. 1981, *Bunting 10.145* (NY); Dist. Mara, alrededores de Campamento Carichuano de Carbozulia en la via entre el caño Paso de Diablo y el caño Vaqueta, zone of deciduous forest with evergreen elements, July 1981, *Bunting 10.001* (NY); Dist. Mara, cuenca del Rio Guasare, alrededores del Destacamento Guasare no. 1 (La Yolanda), en la Hacienda Doña Clara, in virgin humid forest, alt. 200–500 m, Dec. 1982, *Bunting 12715* (NY); Dist. Lagunillas, cuenca del Embalse Burro Negro, laderas occidentales de la Serrania de Ziruma o el Empalado, virgin evergreen forest, Apr. 1982, *Bunting 11265* (NY); Dist. Bolivar, cuenca del Embalse Burro Negro, sector entre Quiros–El Pensado y el pie de Cerro Socopo in virgin evergreen forest, alt. 250–300 m, Aug. 1980, *Bunting 9536* (NY). **COLOMBIA.** Guajira: road from Mingueo to San Antonio de Pueblo Viejo, Serrania de Santa Marta, south of Mingueo, July 1984, *Gentry and Cuadros 47517* (MO, NY).

I have not been able to locate the holotype of this species. The original description and illustration by Martius (1844, 1845) considered only the fruit. The present description of *S. maracaibensis* is based mainly on the above cited specimens and on a modification of the description from Wessels Boer (1988).

Wessels Boer equated this species with *S. magdalenica* from Colombia, but he overlooked the basic difference between them. *S. maracaibensis* has

clustered middle series pinnae, whereas in the Colombian species its middle pinnae are regularly arranged.

S. maracaibensis seems to be most closely related to *S. wesselsboerii* from Estado Barinas, Venezuela. Similarities and differences were discussed under that species. Henderson, Galeano, and Bernal (1995) reduce this taxon to synonymy under *A. butyracea*.

30. *Scheelea liebmannii* Beccari, Agric. Colon. 10:617. 1916; Miranda, 1945; Hernandez Xolocotzi, 1947. 1949; Dahlgren, pls. 374–75. 1959; Glassman, 1977c. (Proposed as a new name for *Cocos regia* Liebmann because of existence of *Scheelea regia* Karsten, 1857). **Figs.** 143–45, 160, 192.

Cocos regia Liebmann in Martius, Hist. Natur. Palm. 3:323. 1853.

LECTOTYPE: (Glassman, 1977c) Mexico, State of Veracruz, Xicaltepec, pr. Río Nautla, 1841, *Liebmann 6560* (lectotype, C!); cf. Dahlgren, pl. 374. 1959.

Trees 15–30 m tall and about 65 cm in diam at base; **sheathing leaf base** not measured, **petiole** about 20 cm long, with very long stiff fibers up to 22 cm long (fide *Williams 9636*); **leaf rachis** 5–8 m long; more than 190 **pinnae** on each side of rachis, those from middle series mostly in clusters of 2–4, 100–140 cm long and 4–5 cm wide, with asymmetrical tips, margins ferruginous when young; expanded part of **staminate sterile bract** 1.2–1.5 m long (including beak of 23 cm long) and 30–40 cm wide, peduncular part 40–80 cm long, deeply sulcate; **rachis** of **staminate inflorescence** 1.0–1.2 m long, with strong odor when fresh (fide Miranda), peduncle 40–100 cm long, **rachillae** about 200 in number, 18–24 cm long, occasionally with a few pistillate flowers at base of rachilla; **staminate flowers** numerous, spirally arranged around rachilla, each 12–16 mm long, **petals** fleshy, less than 1 mm thick, more or less convex outside and flattened or grooved inside, sepals 0.5–1.0 mm long, **stamens** 6, **anthers** 3–4 mm long, **filaments** 1–2 mm long; expanded part of **androgynous sterile bract** about 1.5 m long (including beak of 30 cm long) and about 40 cm wide, peduncular part about 1.1 m long, deeply sulcate, grooves irregularly spaced and of different depths; **rachis** of **androgynous inflorescence** about 1.3 m long, covered with silvery lepidote indument, peduncle about 1 m long, **rachillae** numerous (up to 200), covered with silvery lepidote indument, **pistillate portion** 12–14 cm long, with 10–14 pistillate flower scars, **staminate extension** of rachilla 8–20 cm long, **staminate flowers** spirally arranged around rachillae, **pistillate flowers** 2.0–2.5 cm long, sepals slightly longer than petals, **stig-**

mas 3 in number, about 5 mm long, staminodial ring about 5 mm high; expanded part of **fruiting sterile bract** about 70 cm long and 18 cm wide, peduncular part about 84 cm long, deeply sulcate, **rachis** of **infructescence** 60–65 cm long, peduncle about 90 cm long, **rachillae** numerous, 12–14 cm long, about 10–14 fruits per rachilla; **fruit** dark yellow (fide Miranda) or orange (fide *Moore and Cetto* 6229) when mature, 5–6 cm long and 2.5–2.7 cm in diam, persistent perianth 1.5–2.0 cm high, staminodial ring about 0.6 cm high and 1.5 cm across, margins ciliate, **epicarp** fibrous, 1.0–1.5 mm thick, **mesocarp** soft, 1.0–1.5 mm thick, **endocarp** hard, about 5 mm thick, **fiber clusters** more or less prominent, **seeds** 1–3 in number, 2.2–2.5 cm long and 0.9–1.2 cm in diam.

Distribution and Habitat. See table 5.

Vernacular Names. *Palma real* (fide Galeotti), *coyol largo* (fide Moore), *corozo* (fide Williams).

Representative Specimens Examined. MEXICO. Veracruz: Monte Mistan, Mar. 1845, *Galeotti* 4977 (BR); between Terra Blanca and Tres Valles, on road to Tlacotalpan, Apr. 1952, *Moore and Cetto* 6229 (BH); banks of Arroyo San Miguel, outside Juanita on road to Papaloapam basin, Sept. 1959, *Moore* 8056 (BH). Oaxaca: low wet wooded land on Isthmus road beyond Mathias Romero, 60 km from Empalme Balboa, May 1952, *Moore and Brossard* 6353A (BH); around Ubero and Almoloya, common in pastures and clearings, *Williams* 9636 (F). CULTIVATED. USA. FLORIDA. Miami, Fairchild Tropical Garden, Plot 79, seed from Moore, native to Mexico, Oct. 1978, *Fantz* 3426 (FTG).

Specimens Tentatively Included. CULTIVATED. COLOMBIA. El Valle: Manuelita, *Moore* 9482 (BH). CUBA. Soledad, Atkins Garden, Mar. 1952, *Moore* 6121 (BH).

No specimens were cited by Liebmann (*in* Martius, 1853) or Beccari (1916); hence, a lectotype (a photograph of leaf material) originally illustrated by Dahlgren (pl. 374, 1959) was chosen.

This species seems to be most closely related to *S. lundellii* from Guatemala. Differences between the two are discussed under that species. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. butyracea*.

31. *Scheelea lundellii* Bartlett, Publ. Carnegie Inst. Wash. 461:45, pls. 1–5. 1935; Standley and Steyermark, 1958; Glassman, 1977c. **TYPE:** Guatemala, dept. Petén, Monte Polol, June 1933, *Lundell* 3752 (holotype, MICH!; isotypes, GH!, US!). **Figs.** 141–42, 154, 193.

Trees about 20 m tall; **sheathing leaf base** about 67 cm long, **petiole** 50–65 cm long, with ferruginous indument, marginal fibers up to 30 cm long; **leaf rachis** up to 8 m long (fide Bartlett), with ferruginous indument; **pinnae** numerous, those from middle series in clusters of 2, in irregular intervals of 3–5 cm and up to 12 cm, 100–125 cm long and 6.0–6.5 cm wide, with acuminate, asymmetrical tips, margins with ferruginous indument and resinous punctate as well; expanded part of **staminate sterile bract** 126–35 cm long (including beak of 36–45 cm long) and 25–37 cm wide, deeply sulcate, glandular punctate and with pale ferruginous indument; **rachis** of **inflorescence** not measured, peduncle about 78 cm long, with numerous **rachillae**, each 25–35 cm long, with densely whitish floccose indument, **staminate flowers** in pairs, spirally arranged around rachillae (8–9 cm of rachilla base without flowers), 13–14 mm long (16–18 mm, fide Bartlett), **petals** fleshy, angular, sepals about 1 mm long, **stamens** 6, **anthers** 2.5 mm long, **filaments** about 1.5 mm long (3.5–4.0 mm and 2.5–3.0 mm long, fide Bartlett); **androgynous sterile bract** and **inflorescence** and **pistillate flowers** not seen; **fruit** 6.3–6.6 cm long, 2.8–3.4 cm in diam, persistent perianth 3.0–3.5 cm long, **epicarp** dark brown, **endocarp** hard, 2.5 cm thick (fide Bartlett); **seeds** not seen.

Distribution and Habitat. See table 5. Cited from Mexico by Hernandez Xolocotzi (1949), but this report should probably refer to *S. liebmannii*.

Vernacular Names. *Kanutz* (Maya), *corozo*.

Representative Specimens Examined. **GUATEMALA.** Alta Verapaz: between Candelaria and Samanzana, Apr. 1942, *Steyermark 45718a* (F).

According to Bartlett (1935) and Standley and Steyermark (1958), this species very closely resembles *Orbignya cohune* at Polol, Petén, where the two species grow together, forming forests characteristic of this region. In fact, they look so much alike that they both have the same vernacular name, *corozo*, and the plant community in which both palms grow is called the *corozal*.

Apparently, this palm is most closely related to *S. liebmannii* from Mexico, but differs from it mainly in having wider middle series pinnae, longer staminate rachillae, much longer petiole, resinous punctate pinnae margins, and a glandular punctate staminate sterile bract. Flavonoid studies (Williams, Harborne, and Glassman, 1983) also indicate a close relationship between the two taxa because they differ from each other by only one compound. Henderson, Galeano, and Bernal (1995) reduce this species to synonymy under *A. butyracea*.

Doubtful and Uncertain Species of *Scheelea*

Scheelea blepharopus (Martius) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:674. 1929a; Glassman, 1977c.

Attalea blepharopus Martius.

This species was previously discussed under *A. blepharopus*.

Scheelea cubensis Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:671. 1929a; León, 1946; Glassman, 1977c; Henderson, Galeano, and Bernal, 1995. **TYPE:** Cuba, 1885, *Gundlach s.n.* (holotype, B).

The description of *S. cubensis* is based solely on one **fruit**: approximately 6 cm long and 3.5–4.0 cm in diam, persistent perianth about 3 cm high, staminodial ring ciliate along margins, about 2.5 cm across and 1.2 cm high, **epicarp** fibrous, about 1 mm thick, **mesocarp** soft, about 1 mm thick, **endocarp** bony, 7–9 mm thick, **fiber clusters** conspicuous and common, arranged in a ring, **seeds** 1–2 in number, 2.3 cm long and 1.5 cm in diam.

No native species of *Scheelea* have been reported from Cuba, so it is possible the fruit was collected from a cultivated specimen.

Scheelea excelsa Karsten, Linnaea 28:267. 1857; Fl. Columb. 2: t. 176, figs. 10–11. 1866; Dugand, 1941. **LECTOTYPE:** (Glassman, 1977c) Colombia, in warm valleys of Magdalena and Cauca, up to alt. 1,000 m, no specimens cited (Karsten, t. 176, figs. 10–11, 1866).

Trees 12–15 m tall and 61–92 cm in diam; **sheathing leaf base** and **petiole** not measured; **leaf rachis** 4.5–7.3 m long; about 180 **pinnae** on each side of rachis, those from middle series in clusters of 2–5, about 90 cm long and 5 cm wide; **staminate sterile bract** not measured; **rachis** of **staminate inflorescence** about 90 cm long, peduncle 1.5–1.8 m long, **rachillae** 10–15 cm long; **staminate flowers** arranged singly or in pairs, completely surrounding the rachilla, 10–12 mm long, **petals** fleshy, more or less terete, sepals minute, **stamens** 6, much smaller than petals, **anthers** linear, not measured, **filaments** short; **androgynous sterile bract, inflorescence, rachillae, and pistillate flowers** not measured; **fruit** (immature?) 6.0–6.5 cm long and about 2.5 cm in diam (fide Karsten, t. 176), pericarp mucilaginous, oily, persistent perianth about 3 cm high, sepals and petals about equal in length, staminodial ring about 8 mm high, **epicarp** yellow, fibrous, about 1 mm thick, **mesocarp** about 1 mm thick, **endocarp** woody, with

conspicuous **fiber clusters**, **seeds** 1–3 in number, oily, about 2.5 cm long and 0.5 cm in diam.

Distribution. Colombia, mainly in the middle Magdalena region (fide Dugand).

Vernacular Name. *Palma de vino*.

No specimens were cited by Karsten (1857, 1866), nor could any be found at LE, where most of his specimens are deposited; therefore, figs. 10–11 of t. 176 were chosen as lectotype. Unfortunately, figs. 10–11 illustrate only an external view and longitudinal section of the fruit. Karsten's description is also incomplete, e.g., there are no details on measurements of androgynous inflorescence, rachillae and pistillate flowers, and some of the staminate parts. Certain important diagnostic characteristics, however, are given, such as pinnae in clusters of 2–5, 90 cm long and 5 cm wide, staminate rachillae 10–15 cm long, staminate flowers 10–12 mm long, and fruits 6.0–6.5 cm long. In my 1977c article, I cited several specimens under this species as doubtful. *Curran 354* (US), from the department of Bolivar, Colombia, tentatively determined by Dugand, has staminate rachillae 20 cm long with staminate flowers 14–16 mm long, but lacks leaf material (now cited under uncertain specimens of *S. magdalenica*); *Wessels Boer 1990* (F, U) from Estado Barinas, Venezuela, has clustered pinnae 69 cm long and 5 cm wide, staminate rachillae about 18 cm long, and fruits about 5 cm long, but the staminate flowers are only 6–8 mm long; this and the following six specimens were described as a new species, *S. wesselsboeri*: *Schulz and Rodriguez 416* (U), *417* (U), *420* (U), *423* (U), *432* (U), *433* (U). They do not fit Karsten's description and are here excluded from *S. excelsa*. The Venezuelan specimens are more closely related to *S. maracaibensis* from Estado Zulia.

According to Dugand (1941), *S. excelsa* grows in the middle or lower Magdalena regions but not in the upper Magdalena or Valle de Cauca, where he observed only *S. butyracea*. He saw a palm in the middle Magdalena region, distinct from *S. butyracea* and *S. magdalenica*, which he thought may be *S. excelsa*; however, no specimens were collected to verify this observation.

Claassen, Jenkins, and Markley (1949) gave the following information on a palm that they tentatively identified as *S. excelsa*: tree 21–27 m tall with a leaf 10.6 m long and fruits with a sweet, edible pulp (mesocarp?) and seeds with a white oil similar to coconut, growing in tropical forests and on cleared land. The greatest concentration (estimate of 1.5 million trees in 20,000 hectares) was found in Venezuela, between Tucacas–San Felipe and Puerto Cabello, in lowlands surrounding the Aroa and Yaracuy Rivers, and between

the Aroa River and the Tucacas-Barquismeto railroad. Unfortunately, no specimens were cited; however, the large populations observed by Claassen, Jenkins, and Markley (1949) are probably *S. macrocarpa*, which falls within the range of geographic distribution of the above mentioned regions.

Since no authentic specimens of *S. excelsa* have been seen, I cannot consider it a distinct species.

The description of *S. excelsa* most closely resembles that of *S. insignis*. The main obstacle to combining these two taxa is the habit (*S. excelsa* is a tree and *S. insignis* is acaulescent). Besides, *S. excelsa* lacks androgynous inflorescence material and has an imprecise geographic distribution. Otherwise, the descriptions of both palms are similar. The only other Colombian species with which it may be conspecific are *S. butyracea* and *S. magdalenica*, but both of these have regularly arranged middle series pinnae, whereas in *S. excelsa* they are clustered. Henderson, Galeano, and Bernal (1995) treat this taxon as a synonym of *Attalea butyracea*.

Scheelea goeldiana (Huber) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:658. 1929a; Miranda, 1945; Glassman, 1977c.

Attalea goeldiana Huber.

This species was previously discussed under *A. goeldiana*.

Scheelea gomphococca (Martius) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:666. 1929a; Glassman, 1977c.

Attalea gomphococca Martius.

This binomial was discussed previously under *A. gomphococca*.

Scheelea martiana Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:661. 1929a; Glassman, 1977c. Proposed as a new name for *Attalea excelsa* because *Scheelea excelsa* Karsten, 1857, already existed.

Attalea excelsa Martius.

This taxon was previously discussed under *A. excelsa*.

Scheelea tetrasticha (Drude) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:667. 1929a; Dahlgren, pl. 376. 1959; Glassman, 1977c.

Maximiliana tetrasticha Drude, Martius Fl. Bras. 3:455. 1881. **TYPE:** Brazil, Pará, forests on Rio Tocantins and Rio Araguaí, 1844, Weddell 2331 (holotype, P!; isotype, F!).

Englerophoenix tetrasticha (Drude) Barb. Rodr., Sert. Palm. Bras. 1:76. 1903b.

Vernacular Name. *Anaja*.

The type specimens consist of pinnae parts and staminate flowers that fit *Scheelea*; however, the description is lacking staminate inflorescence parts and androgynous inflorescence parts. This palm may fall within the distributional range of *S. huebneri*, but not enough is known to combine the two species. Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat this species as a synonym of *A. maripa*.

Scheelea wallisii (Huber) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:657.

1929a. 11:1048. 1934; Glassman, 1977c.

Attalea wallisii Huber.

This taxon has been discussed previously under *A. wallisii*.

Genus *Maximiliana*

Geographic Distribution of Genus *Maximiliana*

I am recognizing only one species of *Maximiliana*, *M. maripa*, in this treatment. All other described species have been reduced to synonymy or transferred to other genera. This palm is probably the most wide-ranging species in the subtribe *Attaleinae* and seems to have extended its range of distribution from the original closed rain forest habitats to more open disturbed habitats as a result of extensive destruction of forests through lumbering and agricultural practices.

M. maripa is confined to the northwestern third of South America, primarily in rain forests, but some populations have become adapted to disturbed habitats of sandy savannas and to secondary forests on white sandy soil. It is distributed in the following countries: Brazil (Pará, Maranhão, Rondonia, and Amazonas); all three Guianas; Venezuela (Amazonas and Bolívar); Trinidad; Colombia (Vaupes and Caquetá); Peru (Loreto); Ecuador (Napo); and Bolivia (Beni).

This species is frequently common or abundant, occurring in pure stands, but sometimes it grows in association with other genera in the subtribe *Attaleinae*; occasionally it hybridizes with one of the species. For example, in the Upper Corantijn region of Suriname and in the Bragança area of Pará, Brazil, *M. maripa* shares dominance with *O. phalerata*, sometimes hybridizing to produce \times *Maximbignya dahlgreniana* (*Markleya dahlgreniana*).

Claassen, Jenkins, and Markley (map, fig. 24, 1949) reported *Maximiliana* from several localities in Venezuela, and in an area of 230 square km in Guyana, an estimated 1,000,000 trees were seen. According to H. F. Loomis (photos 86840–41), this palm is an indicator of poor soil in Trinidad.

Taxonomic Treatment of Species of *Maximiliana*

Maximiliana Martius, Palm. Famil. 20. 1824 (conserved name). **TYPE:** *M. martiana* Karsten. = *M. maripa* (Correa) Drude (*M. regia* Martius, 1826) (non *Maximiliana regia* Martius, 1819 = Cochlospermaceae). *Maximiliana* sect. *Eumaximiliana* Drude, 1881; sect. *Exanthera* Burret and sect. *Cryptanthera* Burret, 1929a.

Englerophoenix O. Kuntze, Rev. Gen. Pl. 2:728. 1891. **TYPE:** *E. regia* (Martius) O. Kuntze (illegitimate name) (*Maximiliana regia* Martius 1826, non 1819). *Englerophoenix* sect. *Inaya* Barb. Rodr. and sect. *Inayay* Barb. Rodr. 1903b.

A monotypic genus with a description under its species below.

Maximiliana maripa (Correa) Drude, Mart. Fl. Bras. 3:452. t. 104. 1881; Glassman, 1978b. **Figs.** 204–17.

Palma maripa Correa, Ann. Mus. Hist. Natur. Paris 8:75. 1806. **TYPE:** French Guiana (Henderson, Galeano, and Bernal, 1995), without locality, *Aublet s.n.* (holotype, P).

Attalea maripa (Correa) Martius, Palmet. Orbign. 123. 1844. t. 167, fig. 3. 1845; Wessels Boer, 1965. 1972. 1988; Henderson, 1995; Henderson, Galeano, and Bernal, 1995.

Englerophoenix maripa (Correa) O. Kuntze, Rev. Gen. Pl. 2:728. 1891. *Maximiliana martiana* Karsten, Linnaea 28:273. 1857; Braun, 117–18, figs. 63–65. 1968; Glassman, 1978a. Published as a new name to replace *M. regia* Martius 1826, a homonym for *M. regia* Martius, 1819.

Maximiliana regia Martius, Hist. Natur. Palm. 2:132, ts. 91–93. 1826; Wallace, t. 47. 1853; Dahlgren, pls. 326–27. 1959. **LECTOTYPE** (Glassman, 1978) Brazil, prov. Maranhão and Pará, *Martius s.n.* (M!), cf. Dahlgren, pl. 327. 1959.

Englerophoenix regia (Martius) O. Kuntze, Rev. Gen. Pl. 2:728. 1891. *Attalea regia* (Martius) Wessels Boer, Indig. Palms Suriname 150, pl. 15, fig. 8. 1965.

Maximiliana elegans Karsten, Linnaea 28:271. 1857; Dugand, Caldasia 2:451–54. 4 figs. 1944. 1955. **TYPE:** Flat, humid forest regions of Orinoco and confluence of Maranhão (no specimens cited). **LECTOTYPE** (here designated). Nova Grenada, Villavicencio, prov. Bogotá, 1851–57, *Triana 734* (P!).

Maximiliana caribaea Grisebach and Wendland ex Grisebach, Fl.

Brit. West Ind. 522. 1864. **TYPE:** Trinidad, *Crueger s.n.* (holotype, K, destroyed?).

Englerophoenix caribaea (Grisebach and Wendland) O. Kuntze, Rev. Gen. Pl. 2:728. 1891.

Maximiliana longirostrata Barb. Rodr., Vellosia 1 ed. 2:112, t. 2. 1891b. **LECTOTYPE** (Glassman, 1978). Brazil, Manaus (t. 2, 1891b).

Englerophoenix longirostrata (Barb. Rodr.) Barb. Rodr., Sert. Palm. Bras. 1:77, t. 60B. 1903b.

Maximiliana macrogyne Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:692. 1929a. **TYPE:** Brazil, Maranhão, by Turyassu, Capoeira, *Snethlage 279* (holotype, B, destroyed; isotype, NY).

Maximiliana stenocarpa Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:696. 1929a. **TYPE:** Peru, Loreto, Iquitos, *Tessmann 5081* (holotype, B, destroyed; isotype, NY!).

Maximiliana macropetala Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10:699. 1929a; Glassman, 1978a. 1978b. **TYPE:** Venezuelan Guiana, Rosalia, *Passarge 63* (holotype, B, destroyed).

Attalea macropetala (Burret) Wessels Boer, Indig. Palms Suriname 155. 1965.

Trees usually with erect trunks, occasionally decumbent, 7–24 m tall and 20–40 cm in diam, obscurely ringed or becoming smooth with age; **leaf sheath** and **petiole** frequently not clearly separated, 1.5–3.0 (4.6) m long, margins fibrous, **leaf rachis** 3.5–8.0 m long; 140–260 **pinnae** on each side of rachis, in several planes, giving the whole leaf a plumose appearance, those from middle series in clusters of 2–5, 0.86–1.5 m long and 3–5 (6.3) cm wide; **staminate sterile bract** 0.7–1.5 m long (including beak of 20–80 cm long), 16–40 cm wide, and up to 1.2 cm thick, brownish tomentose at maturity, deeply sulcate; **rachis** of **staminate inflorescence** 40–80 cm long, peduncle 1.0–1.5 m long, **rachillae** 200–400 in number, spirally arranged around rachis, 15–25 cm long, frequently covered with whitish indument; **staminate flowers** solitary or in pairs, spirally arranged around rachillae, 10–12 (16) mm long, with 3 sepals 0.5–1.0 mm long, 3 **petals** more or less flattened, 2–8 mm long and about 1 mm wide, **stamens** 6, usually longer than petals, **anthers** straight, sometimes finely punctate (*Krukoff 1602*), 5–11 mm long, **filaments** 1–4 mm long; **androgynous sterile bract** and **inflorescence** similar in size to staminate counterparts, **androgynous rachillae** numerous, **pistillate portion** 13–15 cm long, with 5–12 pistillate

flowers, **staminate extension** 8–12 cm long; **pistillate flowers** 2.5–3.5 cm long and 1.2–1.5 cm in diam, with 3 subequal or equal imbricate sepals and 3 similar petals, **pistil** 2–3 cm long, style short, with 3 **stigmas**, 5–7 mm long, ovary 1.5 cm long, whitish or brownish pubescent, staminodial ring about 1 cm high, brownish tomentose, lobed and margins sometimes ciliate; **fruit** 4–8 cm long and 2–3 cm in diam, persistent perianth 2–3 cm high, staminodial ring up to 1.5 cm high, margins frequently brownish tomentose and ciliate, **epicarp** fibrous, 0.5–1.0 mm thick, **mesocarp** soft, 1–2 (3–4) mm thick, endocarp hard, 3–8 mm thick, **fiber clusters** absent or obscure, **seeds** 1–3 in number, 2.0–2.6 cm long and 1 cm in diam.

Distribution and Habitat. See “Geographic Distribution.”

Vernacular Names. *Inaja*, *cocorito*, *pirina* (Brazil); *maripa*, *kokelite*, *koeroliti* (Guianas); *guajo*, *guichire*, *huichire indaya* (Colombia); *cucurito* (Venezuela); *inayuca* (Peru); *xebichoqui*, *motacusillo* (Bolivia); *wa-ho*, *inayo* (Ecuador).

Representative Specimens Examined. **BRAZIL.** Pará: without locality, *Martius s.n.* (M); Souza, Belém, *Dahlgren s.n.* (F-619728); Rio Guama, near Belém, *Dahlgren and Sella 699* (F); Maranhão: São Luis, *Dahlgren s.n.* (F-615319), *Kuhlmann 1918* (RB); Amazonas: munic. Humaita, between Rio Livramento and Rio Ipixuna, *Krukoff 7065* (A, BR, F, G, NY); 18 km north of Manaus, secondary growth, *Moore et al. 9524* (NY); munic. Humaita, along highway BR230, Estrada Transamazonica, Apr. 1985, *Henderson et al. 254* (NY); Rondonia: Machado, Angustura, lowland of Terra Firma, *Krukoff 1601* (F-620733), *1602* (F-620734). **GUYANA.** Corentyne, *Jenman 527* (NY); Madewini Highway, East Bank Demerara, secondary forest swamp on white sand, Oct. 1972, *Omarwale and Persaud 220* (NY). **FRENCH GUIANA.** 1819–21, *Poiteau s.n.* (G); Acarouany, 1858, *Sagot 602* (P). **SURINAME.** South of Paramaribo, along road to Zanderij, *Wessels Boer 288* (U); Arrawara Monding, *Wessels Boer 345* (U), *347* (U); Attobaka, *Wessels Boer 357* (U); Paloemeu River, near confluence with Tapanohony River, *Wessels Boer 1329* (U). **BOLIVIA.** Beni: prov. Vaca Diez, vicinity of Chacobo village, wet secondary forest, Feb. 1984, *Boom 4537* (NY). **VENEZUELA.** Amazonas: along road from Puerto Ayacucho to Sanariapo, savannas, *Wessels Boer 1920* (U); Cerro Duida, along Caño Negro, forest at base of slopes, *Steyermark 58064* (F); Monagas: Reserva Forestal de Guarapiche, rain forest, *Wessels Boer 1821* (U); Bolivar: San Mateo, Bajo Paragua, *Williams 12816* (F); at base of Altiplanicie de Nuria, *Steyermark 88912* (NY); Lower Orinoco, Catalina, *Rusby and Squires 413* (A, F, G, GH, NY). **COLOMBIA.** Bogotá: Villavicencio, *Triana 1776–1* (COL); Vaupes: Mitu, interior forest, *Cuatrecasas 6941* (COL); Caquetá: Florencia, in los Cerros La Estrella, *Cuatrecasas 8870* (COL). **PERU.** Loreto: upper

Amazon, Iquitos, *Tessmann 5078* (B); Aripo Valley, Feb. 1932, H. F. Loomis, negs. 86840–41 (US). **ECUADOR.** Napo: Reserv. Faunistica Cuyabeño, northern side of Laguna Grande, tropical rain forest near black water swamps and lakes, Jan. 1984, *Balslev 4789* (NY). **TRINIDAD.** Teteron Bay, wooded hillside, *Britton 494* (GH, NY, US). **CULTIVATED. BRAZIL.** Rio de Janeiro, Quinta de São Christovão, *Glaziou 10112* (P); Jardim Botânico, *Dahlgren s.n.* (F-611654); Museu Goeldi, Belém, *Dahlgren s.n.* (F-620812). **GUYANA.** Georgetown Botanic Gardens, *Dahlgren s.n.* (F-610617, F-610752, F-610841); **SINGAPORE.** Botanic Garden, *Furtado s.n.* (NY).

M. martiana was published by Karsten (1857) as a new name to replace *M. regia*, 1826, a homonym for *M. regia* Martius, 1819. Since I am recognizing only one species of *Maximiliana* here, the correct name is *M. maripa* (Correa) Drude because its basionym, *Palma maripa* Correa, 1806 precedes the publication of *M. martiana*.

No specimens were cited by Martius for *M. regia*, 1826. A lectotype was chosen from a Martius specimen figured in plate 327 of Dahlgren (1959) because the information on the label was the same as that in his 1826 paper: "Prov. Maragnoniensis et Paranensis."

Dugand (1944) recognized *M. elegans* as a good species and discussed Karsten's inexact designation of the type locality and tried to pinpoint it more specifically; he also outlined its distribution in Colombia.

Braun (1968) distinguished between *M. elegans* and *M. martiana* in Venezuela by the stiffer and erect rather than drooping foliage of *M. elegans*. He noted that neither species has been cultivated in the Caracas area.

Cook (1940) published a new generic name, *Ethnora*, based on *M. maripa*; however, the name is invalid because it was published without a Latin description after 1935. Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat *M. maripa* as a synonym of *A. maripa*.

According to Claassen, Jenkins, and Markley (1949), natives of Venezuela do not use *cucurito* as a source of edible oil because pulp oil spoils quickly and becomes rancid. Also the pulp oil from the upper Orinoco has a high free fatty acid content.

Doubtful and Uncertain Species of *Maximiliana*

Maximiliana attaleoides Barb. Rodr., Enum. Palm. Nov. 41. 1875; Glassman, *Phytologia* 38:169. 1978a. **LECTOTYPE:** (Wessels Boer, 1965) Brazil, Pará, below Mt. Curumu, near Rio Trombetas and by Ikuypeua near Alenquer (Barb. Rodr., Sert. Palm. Bras. 1:t. 60A. 1903b).

Englerophoenix attaleoides (Barb. Rodr.) Barb. Rodr., Sert. Palm. Bras. 1:76, t. 60A. 1903b.

Attalea attaleoides (Barb. Rodr.) Wessels Boer, Indig. Palms Suriname 157. 1965.

Attalea transitiva Barb. Rodr., Prot. App. 49. 1879. *superfluous name* = *Scheelea* sp.? *species confusum*.

I discussed this binomial in more detail in my 1978a article. Since no specimens were available for study and since the description of pinnae arrangement is confusing, I have designated it as *Scheelea* sp. (*species confusum*). The staminate flower description matches the genus *Scheelea*. If transferred to *Scheelea* a new name would be necessary. The epithet is already in use by *Scheelea attaleoides* Karsten (= *S. insignis*). Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat *A. attaleoides* as a bona fide species.

M. jagua Seeman ex H. Wendland in Kerchove, Palm. 251. 1878. *Nomen nudum*.

Apparently, based on the vernacular name *palma jagua*, this binomial was listed in Linden (1881), Burret (1929a), Dahlgren (1936), and my 1972a article. Burret thought it may refer to *S. humboldtiana* because *palma jagua* is one of its vernacular names. Nevertheless, *M. jagua* is clearly a *nomen nudum* because a description was never published.

Hybrids in the *Attaleinae*

At present, hybrids can usually be recognized by their intermediate characteristics in a population of two different taxa. If the hybrids are fertile and continue to reproduce over a period of time, eventually they could be recognized as isolated species and components of the local flora. New hybrid taxa are treated taxonomically in a similar manner as new species and new genera.

In palms, intergeneric crosses between *Butia* and *Syagrus* and at least five interspecific hybrids within the genus *Syagrus* are well documented (Glassman, 1979, 1987). It is true that within the *Attaleinae* some hybrids are known from only one collection; others are more common (backcrossing with one or both parents in *O. × teixeirana* or forming fairly extensive populations in \times *Maximibignya dahlgreniana*).

All four genera of the *Attaleinae* are involved in intergeneric hybridization and two produce interspecific crosses. *O. oleifera* and *A. compta* hybridize to produce \times *Attabignya minarum*; and *O. phalerata* crosses with *M. maripa*, resulting in \times *Maximibignya dahlgreniana*. *Ynesa colenda* is treated by me as a possible hybrid between unknown species of *Orbignya* and *Attalea*; and an undescribed cultivated hybrid between undetermined species of *Orbignya* and *Scheelea* has been collected from the Fairchild Tropical Garden. *Orbignya* also has been involved in interspecific hybridization between *O. phalerata* and *O. eichleri*, resulting in *O. × teixeirana*. *A. × piassabossu* is a hybrid between *A. burretiana* and *A. funifera*; *A. × voeksii*, between *A. funifera* and *A. humilis*; and *A. salvadorensis*, possibly between *A. burretiana* and *A. humilis*. Putative hybrids between *Scheelea* and *Orbignya* and *Scheelea* and *Maximiliana* have been collected from cultivation from Suriname; however, there are no reports of crossing within the genus *Scheelea*.

Hybrids of *Attalea*

1. *Attalea* × *piassabossu* Bondar, *pro sp.*

A. piassabossu Bondar, Field Mus. Natur. Hist. Bot. 22:462. 1942a. p. 61, figs. 12–14. 1942b. **LECTOTYPE:** (Glassman, 1977a) Brazil, Bahia, Alegre, *Bondar s.n.* (F-619762!). **Figs.** 12–14, 54, 76, 77.

Trees 6–10 m tall and 35–40 cm in diam; **petiole** 0.6–1.5 m long, margins with relatively long fibers; **leaf rachis** 5.0–6.5 m long; 130–50 **pinnae** on each side of rachis, only lower one-third to one-half of rachis with pinnae in clusters of 3–5, generally arranged in several planes, divergent, those from middle series mostly regularly arranged, 0.7–1.3 m long and 4–7 cm wide; **staminate sterile bract** 1.0–1.8 m long (including beak of 20 cm long); **rachis** of **staminate inflorescence** 0.6–1.0 m long, peduncle 0.4–0.6 m long, **rachillae** 155–95 in number, 16–23 (29) cm long at base, 14–15 cm above, brownish lepidote; **staminate flowers** on one side of the rachilla, 20–24 (30) mm long at base, 16–18 mm above, **petals** flat, with acuminate tips and denticulate margins, distinctly nerved, about 3 mm wide, sepals 1.5–2.0 mm long, **stamens** 6–7 in number, **anthers** 10–11 mm long, **filaments** about 3 mm long; **androgynous sterile bract** 1.00–1.65 m long (including 33 cm of beak) and 40 cm wide, **rachis** of **androgynous inflorescence** 74–90 cm long, peduncle 0.5–1.0 m long, with about 120 **rachillae**, **pistillate portion** 12–15 cm long, with 1–6 **pistillate flowers** per rachilla, 3.5–5.0 cm long and 2.5 cm in diam, sepals about 3.5 cm long and 4 cm wide, petals about 3 cm long and 4.0–4.5 cm wide, **pistil** about 4 cm long, ovary about 2.7 cm long, **stigmas** 3, black, each about 1.2 cm long, staminodial ring about 1 cm high; **staminate extension** of each rachilla 10–14 cm long, **staminate flowers** arranged along one side of the rachilla, solitary above, 12–15 mm long, paired below, up to 17 mm long, **petals** mostly flattened, with acute tips and crenulate margins, nerved, about 4 mm wide, sepals 1.0–1.5 mm long, **stamens** mostly absent indicating sterility, occasional staminate flowers with fleshy and irregular shaped petals indicating **transitional stages** to pistillate flowers; up to 200 fruits per **infructescence**; **fruit** 9–10 cm long and 5–6 cm in diam (including beak of 1.8 cm long), persistent perianth 2.5–3.0 cm long, staminodial ring 7–10 mm high, **epicarp** fibrous, 1–2 mm thick, **outer mesocarp** soft, 2–5 mm thick, **inner mesocarp** fibrous, 2–4 mm thick, **endocarp** hard, 10–13 mm thick, with indistinct **fiber clusters**, **seeds** 1–3 in number, 3.5 cm long and 1.0–1.5 cm in diam.

Distribution and Habitat. See tables 1 and 7. "Bahia, in natural forests in the vicinity of Salvador and in Agua Comprida in association with *A. burretiana* and *A. acaulis* (*A. funifera*)," fide Bondar (1942b); and Bondar (1964) considered *A. piassabossu* as a possible hybrid between the two species. Collections by Larry Noblick and me of *A. × piassabossu* from the vicinity of Salvador, in the coastal forest, confirmed some of the intermediate characters between the two parent species. Several possible backcrosses were also observed. In one population *A. burretiana* was present, but *A. funifera* was not; however, populations of the latter species were seen in an extensive sand dune area only a few km away. In another area where a putative hybrid was collected (*Noblick and Glassman 4585*), *A. funifera* was common, but no *A. burretiana* was found in the immediate area; however, populations of *A. burretiana* were observed in several localities nearby.

Vernacular Names. *Piassabossú, palmeira.*

Representative Specimens Examined. BRAZIL. Bahia: Alegre, *Bondar s.n.* (F-619732); *Bondar s.n.* (F-619714); *Bondar s.n.* (F); Salvador, 1 km do centro administrativo, Avenida Paralela in do para o aeroporto, mata hygروفilica, solo argiloso, reddish yellow, Dec. 1985, *Noblick and Britto 4508* (F, HUEFS); same general locality, remnant of Atlantic coastal forest, associated with *A. burretiana* and *Syagrus coronata*, only two hybrid trees seen, July 1988, *Noblick et al.* (ALCB, F); same locality revisited, six hybrids and probably five backcrosses with *A. burretiana* observed in area of 500–750 trees of *A. burretiana*, Aug. 1988, *Noblick and Glassman 4583* (BAH, F).

Specimens Tentatively Included. BRAZIL. Bahia: Aguas Claras, 15 km west of Salvador, along highway BR324, 500 m north of access to U.S. IBA, remnant of Atlantic coastal forest, in low area above stream, associated with *A. funifera*, *Bactris*, and *Polyandrococos*, two putative hybrid trees seen, Aug. 1988, *Noblick and Glassman 4585* (BAH, F).

Table 7 shows a comparison between *A. × piassabossu* and its parent species.

Inspection of table 7 reveals that the main characteristics of the hybrid that are intermediate between the two parent species are arrangement of the pinnae and division of the mesocarp into two parts, the outer soft, like *A. funifera*, and the inner fibrous, like *A. burretiana*. Other features that are more or less intermediate are the size of the plant, number of stamens, size of anthers, and distribution of NVF in the pinnae cross sections. Some structures in the hybrid, i.e., staminate rachillae and staminate flowers, are longer than those in either parent (in some specimens), and the mesocarp is divided into two distinct parts, whereas it appears to be a single

Table 7. Comparison of *A. × piassabossu* and Its Parent Species

	<i>A. buretiana</i>	<i>A. × piassabossu</i>	<i>A. funifera</i>
Plant size	trees 10–30 m tall	6–10 m tall	acaulescent or up to 10 m tall
Leaf appearance	perpendicular to rachis in stiff manner	flaccid or drooping	drooping
Middle series pinnae: width	4–7 cm	4–7 cm	4–7 cm
arrangement	regular, flat	lower third to half of rachis with clustered pinnae, divergent, remaining pinnae regular	in clusters of 3–4, divergent
Fibers of leaf sheath and petiole	relatively short, stiff, and woody (11–30 cm)	relatively short to moderately long, rigid, flexible, 16–23 (28) cm	very long, rigid and flexible (up to 3.5 m)
Length of staminate rachillae	22–26 cm	16–23 (28) cm	9–15 or 18–22 cm
Staminate flowers			
length	18–25 cm	20–24 (30) mm	20–24 mm
petal width	3 mm	3 mm	3–5 mm
stamen number	6–9	6–7	6
anther length	9–14	10–11	4–7
Fruit length	8–11	9–10	10–15
Mesocarp thickness	3–6 mm, fibrous	outer: 2–5 mm, soft inner: 2–4 mm, fibrous	3–6 mm, soft
Microscopic cross section of pinnae	adaxial nonvascular fibers (NVF) mostly in short oval clusters; abaxial NVF common, in separate clusters and attached to some veins	adaxial NVF in both short and long narrow or oval clusters; abaxial NVF common, separate, and attached to veins	adaxial NVF in long narrow or oval clusters; abaxial NVF uncommon, sometimes attached to veins
Geographic distribution	eastern Bahia, in Atlantic coastal forest and transitional forest	known only from the vicinity of Salvador in the Atlantic coastal forest	alagoas, Sergipe, Bahia, and Espirito Santo, in the Atlantic coastal forest and sand dunes

homogeneous structure in both parents. Leaf appearance and fibers of the petiole and leaf sheath of the hybrid are closer to those of *A. funifera* than those of *A. burretiana*; but the fruit size is closer to that of *A. burretiana*.

2. *Attalea* × *voeksii* Noblick, *sp. hybr. nov.* A natural interspecific hybrid between *Attalea funifera* Martius and *A. humilis* Martius. **TYPE:** Brazil, Bahia, Fazenda Barra do Manguinho, Ramal direita, com entrada no km 10 do Rodovia Ilheus/Olivença (BA-001), Aug. 1985, Noblick *et al.* 4241 (holotype, CEPEC; isotypes, F, HUEFS).

Caudex ca 1 m altus, folium regulariter pinnatum supra, aggregatum infra, inflorescentia mascula non visus, bractea androgyna ca 1.2 m longa, inflorescentia androgyna multiramosa, pedunculo ca 115 cm longo, rachidi ca 40 cm longi, rachillis feminis 2.5–3.0 cm longis, rachillis masculis 3–4 cm longis, fructus 7.5–8.0 cm longus, 5.0–5.5 cm diametro, epicarpio 2–3 mm crasso, mesocarpio 1–2 mm crasso, edocarpio osseo, 5–8 mm crasso, semina 2–3, 3.5 cm longa, 1.5–2.5 cm lata.

Trees about 1 m tall and 20–30 cm in diam; **sheathing leaf base** not measured, with abundant reddish brown fibers, **petiole** 2.7–2.8 m long, **leaf rachis** about 5 m long; 141–46 **pinnae** on each side of rachis, regularly arranged on upper four-fifths of rachis and in clusters of 2–3 on lower one-fifth of rachis, those from middle series 95–100 cm long and 5.0–5.5 cm wide, mostly with acuminate tips; **staminate inflorescence** not collected; **androgynous sterile bract** about 1.2 m long (including beak of 10 cm), **rachis of androgynous inflorescence** about 40 cm long, peduncle about 115 cm long, **androgynous rachillae** about 75 in number, **pistillate portion** 2.5–3.0 cm long, with 1–2 **pistillate flowers** per rachilla, **extended staminate rachilla** 3–4 cm long, **staminate flowers** usually sterile, arranged in two rows along one side of rachilla; **fruit** 7.5–8.0 cm long and 5.0–5.5 cm in diam, **epicarp** fibrous, 2–3 mm thick, **mesocarp** fibrous, 1–2 mm thick, **endocarp** hard, 5–8 mm thick, with indistinct **fiber clusters**, **seeds** 2–3 in number, 3.5 cm long and 1.5–2.5 cm in diam.

Distribution and Habitat. Known only from the type locality, south of Ilheus, in stabilized sand dunes within a large restinga forest dominated by *A. funifera*.

Representative Specimens. Only one collection was made. According to Noblick (pers. comm.), the hybrid *A.* × *voeksii* appears to be a cross between *A. funifera* as the seed parent and *A. humilis* as the pollen parent. Although *A. humilis* is not actually found in this forest, it grows only a few hundred meters away. The leaf blade (with pinnae in clusters like those

in *A. funifera* and evenly spaced pinnae like those in *A. humilis*) and fruits (ovoid like those in *A. funifera* and with a thin endocarp like those in *A. humilis*) are intermediate between both parent species. The trunk is obscured by short fibers like that of *A. funifera*, and the pinnae are arranged rigidly at a 90-degree angle from the rachis like those in *A. humilis*.

3. ***Ynesa colenda*** Cook, Nat. Hort. Mag. **21**:70–85, figs. 1–6. 1942. **TYPE:** Ecuador, prov. Los Rios, Hacienda Santa Lucia, Canton Vinces, alt. 50 m, dense forest, coastal plain, common, Oct. 20, 1934, *Ynes Mexia* 6574 (holotype, US!; isotype, BH!). **Figs.** 82, 110.

Attalea colenda (Cook) Balslev and Henderson, Brittonia **39**:1–6. 1987; Henderson, Galeano, and Bernal (1995).

Trees 25–38 m tall and 40–50 cm in diam, trunk with numerous adventitious roots at base; **sheathing leaf base** about 1.1 m long, **petiole** about 1 m long, margins with many fibers, 70–130 cm long and 3 mm thick, **leaf rachis** 5.0–7.5 m long; 130–70 **pinnae** on each side of rachis, those from middle series regularly arranged, 3.5–5.0 cm apart, 128–60 cm long and 6.5–10.0 cm wide, with asymmetrical tips; **staminate sterile bract** about 3 m long; **staminate rachis** 40–66 cm long, peduncle about 1 m long, with numerous **rachillae**, each 16–40 cm long, covered with whitish and light brown lepidote indument, **staminate flowers** arranged in two rows on one side of the rachilla, each 10–14 mm long, **petals** either three in number, lanceolate, 2.0–3.5 mm wide, distinctly nerved, with acute or acuminate tips, or petals two in number, one lanceolate, the other much broader (due to fusion of two petals), distinctly nerved, with irregularly notched or laciniate tips, sepals three in number, 1.5–2.0 mm long, **stamens** 8–11 in number, **anthers** 5–6 mm long, sometimes straight, but usually twisted, not coiled in a ball, **filaments** 2–3 mm long; **androgynous sterile bract and rachis** not measured; **androgynous rachillae** 16–20 cm long (basal 6 mm without flowers), each with 10–19 **pistillate flowers**, about 1.5 cm long; **infructescence** about 1.5 m long, with many **rachillae**, each 16–20 cm long, with 8–10 fruits per rachilla; **fruit** orange or yellow, 4–6 cm long and 2.5–3.5 cm in diam, persistent perianth 1.7–1.8 cm high, staminodial ring about 8 mm high and 1.5 cm across, **epicarp** 1 mm thick, **mesocarp** soft, 2–3 mm thick, **endocarp** 2.5–4.0 mm thick, woody, **fiber clusters** obscure, **seeds** 1 in number, about 2.5–3.0 cm long and 1.5 cm in diam.

Distribution and Habitat. See tables 3 and 8. According to Balslev and Henderson (1987), in Ecuador *Ynesa colenda* is occasional from 900 m on the western Andean slopes across the coastal plain to sea level and from the Colombian border in the north, south to Guayaquil.

Table 8. Comparison of Diagnostic Characteristics of *Ynesa colenda* with Possible Parent Species

	<i>Ynesa colenda</i>	<i>O. sagotii</i>	<i>O. phalerata</i>	<i>A. amygdalina</i>	<i>M. maripa</i>
Habit	trees 25–38 m tall	acaulescent	trees 8–23 m tall	acaulescent	trees 7–24 m tall
Pinnae arrangement	regular	regular	regular	regular	clusters of 2–5
width (middle series)	6.5–10.0 cm	4–6 cm	5–7 cm	5.8–6.5 cm	3.0–6.3 cm
Staminate rachillae length	16–40 cm	7 cm	21–27 cm	15–18 cm	15–23 cm
Staminate flowers arrangement					
on rachillae	one side	one side	one side	one side	spirally arranged
length	10–14 mm	7–10 mm	12–14 mm	12–15 mm	10–16 mm
number, shape, and size of petals	3, lanceolate, nerved, 2–3 mm wide; or 2, 1 lanceolate, 1 broader, laciniate tips, all longer than stamens	3, narrow at base and broad at middle, longer than stamens	usually 2, broad with laciniate tips; when 3, 1 lanceolate, longer than stamens	3, lanceolate, nerved, 2–3 mm wide, longer than stamens	3, lanceolate, 1 mm wide, shorter than stamens
Stamens					
number; size and shape of anthers	8–11; 5–6 mm long; sometimes straight, but usually twisted, not coiled	8–12; 1.5–2.0 mm long, coiled and twisted	24–37; 2 mm long, coiled and twisted	12–15; 4.5–7.0 mm long, straight	6; 5–11 mm long; straight
Fruit					
size	4–6 × 2.5–3.5 cm	3.5–4.5 × 2–3 cm	9–12 × 4.5–6.0 cm	8.5–10.8 × 4.0–5.2 cm	4–8 × 2–3 cm
thickness of epicarp	1 mm	1 mm	1–2 mm	1 mm	0.5–1.0 mm
thickness of mesocarp	2–3 mm	1 mm	3–6 mm	1–2 mm	1–2 (3–4) mm
thickness of endocarp	2.5–4.0 mm	4–7 mm	0.5–1.5 cm	2–4 cm	3–8 mm
fiber clusters in endocarp	obscure	scattered and inconspicuous	inconspicuous	obscure	absent or obscure
Seed number	1	1–3	2–6	1–4	1–3
Geographic distribution	Ecuador: Los Rios, Esmeraldas, Manabi, Guayas; Colombia: Nariño	The Guianas and Amazon part of Brazil	Bolivia; northern states of Brazil; the Guianas	Colombia: Valle, Caldas, Antioquia Quindio	Amazon region of Brazil, the Guianas, Venezuela, Colombia, Peru, Trinidad, Ecuador (Napó), Bolivia

Vernacular Name. *Palma real*.

Representative Specimens Examined. ECUADOR. Los Rios: Pichilingue, return trip by horseback from Río Macul to headquarters, May 1943, *Little 6518* (BH); Río Palenque Biological Station, km 56 Quevedo-Santo Domingo, Mar. 1975, *Dodson 5753* (BH), *Dodson and Duke 7742* (MO); Jauneche forest, Canton Vinces, between Mocachi and Palenque in the Estero Penafiel, Oct. 1979, *Dodson et al. 9229* (MO).

Specimens Tentatively Included. ECUADOR. Esmeraldas: Businga (Vilda) in Río Verde en Oceano Pacifico, alt. 150 m, bosque secundario, Oct. 1965, *Little and Dixon 21208* (NY).

The original publication of this taxon was probably ignored because staminate flowers were not present in the type collection, but later collections of staminate flowers showed that they are arranged along one side of the rachilla, with either three lanceolate petals or two petals, one lanceolate, the other broader (as a result of fusion) and with notched or laciniate tips; the stamens are 8–11 in number, anthers are sometimes straight, but usually twisted as in \times *Maximibignya* (*Markleya*) but not coiled in a ball as in *Orbignya*. Straight or twisted anthers occur in flowers with both kinds of petals.

I am not certain whether *Ynesa* is a distinct genus or a hybrid between species of *Orbignya* and *Attalea* or *Maximiliana* or a combination of all three genera. At any rate, it certainly should not have been transferred to *Attalea*. In the genus *Attalea* the petals are consistently three in number (except in *A. salvadorensis*) and lanceolate without laciniate tips, and the anthers are always straight. If it is a hybrid, which species comprise the parents? Some of the possibilities for the parents are *O. phalerata*, *O. sagotii*, *A. amygdalina*, and *M. maripa*. The problem with these candidates is that none has been reported from the coastal provinces of Ecuador, and they are mostly distributed a long distance from this Pacific coastal region; however, it is possible that the original parent species may have become extinct in this region since hybridization occurred. Table 8 shows a comparison of the remotely possible parent species with *Ynesa*.

The origin and relationship of *Ynesa colenda* to other members of the subtribe *Attaleinae* remain a puzzle. It has certain features in common with each of the species listed in table 8, but one of the few intermediate characteristics seems to be the twisted anthers like those found in the intergeneric hybrid \times *Maximibignya dahlgreniana* (Bondar, 1957). This hybrid, however, differs from *Ynesa* mainly in having clustered middle series pinnae and sickle-shaped staminate petals. It is distributed in the state of Pará,

Brazil, and in Suriname. None of the species included in the table is found anywhere in the vicinity of the Pacific coast of Ecuador or in adjacent Colombia. The closest palm is probably *M. maripa*, reported from eastern Ecuador in the province of Napo, several hundred km away. *A. amygdalina* is found farther up the coast of Colombia in the state of Valle. Some of the others are probably a few thousand km or more from the type locality of *Ynesa*. Based on the above discussion, I have concluded that *Ynesa colenda* is probably of intergeneric hybrid origin, involving certain species of *Orbignya*, *Attalea*, and *Maximiliana*, which were perhaps abundant thousands or even millions of years ago on the Pacific coast of Ecuador and adjacent Colombia, but have since become extinct in the region. Since the parent species cannot be determined with certainty at the present time, *Ynesa colenda* should be recognized as a distinct genus and species related to the three genera mentioned above.

According to Cook (1942), the infructescences of *Ynesa* are unusually large and heavy (weighing up to 250 pounds); an assay of the individual seeds showed 51.74 percent oil and 4.28 percent water; the long fibers on the petiole margins also have commercial value.

Balslev and Henderson (1987) reported that the oil-rich seeds of *Ynesa* were previously an important export item from Ecuador to Colombia and the United States; but now the African oil palm is much more important and grown on a large commercial scale. *Ynesa* seeds are still gathered and sold locally, however. Each tree produces one to four infructescences per year. Based on the oil content, it is estimated that 100 trees per hectare could produce 10 to 27 tons of seeds, or between 5 and 13 tons of oil per hectare per year.

4. × ***Attabignya minarum*** Balick, Anderson, and Medeiros-Costa, *Brittonia* 39:27. 1987. **TYPE:** Brazil, Minas Gerais, Munic. de Santa Fé, 11 km from town of Santa Fé, near stream called Logra do Rio, on Fazenda Santa Maria, Nov. 30–Dec. 1, 1984, *Balick et al.* 1694 (holotype, CEN; isotype, NY). **Figs.** 79, 90; table 3.

Trees 2–6 m tall, 35–40 cm in diam; **sheathing leaf base** 70–74 cm long, **petiole** 5–10 cm long, **leaf rachis** 5.4–5.5 m long; 180–90 **pinnae** on each side of rachis, those from middle series regularly arranged, 98–110 cm long and 4–7 cm wide; **staminate sterile bract** 128–40 cm long and 22–27 cm wide (including beak of 17–20 cm long); **rachis** of **staminate inflorescence** 50–150 cm long, peduncle about 50 cm long, **rachillae** about 300 in number, 14–30 cm long; **staminate flowers** arranged in two rows

along one side of rachilla, each 0.9–1.8 × 2.5–5.0 mm, **petals** 2 or 3, free, more or less straight to inrolled, elliptic to ovate, with acute or notched tips, sepals 3, triangular, 1.2–3.0 mm long, **stamens** 11–20, **filaments** straight, **anthers** linear to loosely coiled and twisted; **pistillate portion** of **androgynous rachilla** 9–12 cm long, mostly with one **pistillate flower**, **staminate extension** of each rachilla 4 cm long with 25–38 **staminate flowers**; **fruit** 9.2–10.0 cm long and 4.3–6.7 cm in diam, persistent perianth 4–7 cm long, **epicarp** 2–3 mm thick, **mesocarp** 2–5 mm thick, **endocarp** 4–5 cm in diam, **seeds** 3–4 in number, 3–4 cm long, endosperm oily.

The hybrid × *Attabignya minarum* is an intergeneric cross between *A. compta* Mart. and *O. oleifera* Burret. At present, it is known only from the type locality near Santa Fé, Minas Gerais, where the ranges of both parent species overlap. Balick, Anderson, and Medeiros-Costa (1987) showed a table comparing and differentiating the three taxa. It revealed that the hybrid has a number of intermediate characteristics between the parents. The hybrid is common in low-lying areas near streams, its seeds are viable, and it appears to be reproducing.

5. Other Hybrids

An interesting intergeneric hybrid between a species of *Orbignya* and *Attalea* or *Scheelea*, or a combination of all three genera, has been discovered from herbarium specimens deposited in the Fairchild Tropical Garden. Seeds came from the Royal Botanical Garden, Peradeniya, Sri Lanka, but the native origin is unknown. See fig. 111. The following is a description of the specimen.

Trees 3 m tall and 80 cm in diam; **leaf** 5–6 m long, **sheathing leaf base** and **petiole** not measured; middle series **pinnae** regularly arranged, 5.5–6.0 cm wide; **staminate sterile bract** about 2 m long; **rachis** of **staminate inflorescence** about 1.2 m long, **rachillae** 16 cm long, covered with whitish lepidote indument; **staminate flowers** arranged on one side of rachilla, each 14–16 mm long, **petals** light brown in color, flat, with fleshy acute tips, about 1 mm wide, distinctly nerved, some with midrib, **stamens** 9 in number, **anthers** distinctly coiled like *Orbignya*, about 2 mm wide, sepals about 1 mm long; **infructescence** not measured, **fruiting rachillae** about 11–12 cm long, with 2–3 fruit scars per rachilla, **staminate extension** about 7 cm long; **fruit** 7.5 cm long and 4.3 cm in diam, **epicarp** about 1 mm thick, **mesocarp** soft, 4 mm thick, **endocarp** 7–8 mm thick, with more or less prominent **fiber clusters** arranged in a circle, but obscured by dark brown tannin deposits, **seeds** 2–3 in number.

Representative Specimens Examined. CULTIVATED. USA. Florida, Miami, Fairchild Tropical Garden, Acc. 3541C, Plot 91. Material obtained through H. Johnson, June 22, 1954; collected June 13, 1985, *Sanders 1735* (FTG).

At present I cannot be certain of the parent species involved in this hybrid, so I can only speculate that it is the product of a cross between a species of *Orbignya* (either *O. phalerata* or *O. cohune*), because of the coiled anthers, and a species of *Attalea*, because of the flattened distinctly nerved petals, and possibly a species of *Scheelea*, because of the narrow petals that are fleshy at the tips only. It is possible that this hybrid is an artificial one, produced by some large nursery in southeast Asia. Other palm hybrids have been known to be artificially produced by the Reasoner Nursery in Florida (pers. comm.), e.g., \times *Butyagrus nabonnondi*, between *Butia capitata* and *Syagrus romanzoffiana*.

Hybrids of *Orbignya*

At least four or five hybrids between species of *Orbignya* and between *Orbignya* and other closely related genera have been reported: *O.* \times *teixeirana*, between *O. phalerata* and *O. eichleri*; \times *Maximbignya dahlgreniana*, with *O. phalerata* and *Maximiliana maripa* as the parent species. Another hybrid, \times *Attabignya minarum*, between *A. compta* and *O. oleifera*, has been previously treated under the genus *Attalea*.

Ynesa colenda is probably a hybrid between a species of *Orbignya* and *Maximiliana* or *Attalea*, but the parent species are uncertain and unknown in the region where it grows. The name was recently changed to *A. colenda*, and hence was already covered under the treatment of hybrids of *Attalea*.

Another hybrid between a species of *Orbignya* and *Attalea* or *Scheelea* from the Fairchild Tropical Garden also has been treated under the genus *Attalea*.

1. *Orbignya* \times *teixeirana* Bondar, in Balick, Pinheiro, and Anderson, Am. J. Bot. 74:1024. 1987. Figs. 109, 126.

Orbignya teixeirana Bondar, Arq. Jard. Bot. Rio Jan. 13:58, figs. 5, 6–3. 1954a; Palm. Bras., fig. 41. 1964; Glassman, p. 106. 1977b; Medeiros-Costa, Campos Mendes, and Castro Brito, pp. 1–5. 1985. **TYPE:** Brazil, Maranhão, Caxias, Jan. 1952, *Bondar s.n.* (holotype, RB-80813!).

Acaulescent or **tree** up to 8 m tall and 20–25 cm in diam; **sheathing leaf base** 40–90 cm long, **petiole** 30–80 cm long; **leaf rachis** 2–6 m long, glau-

cous below; 110–50 **pinnae** on each side of rachis, those from middle series in clusters of 2–4, widely spaced, 7–17 cm apart, 60–110 cm long, 3–4 cm wide, with acuminate or acute, asymmetrical tips, cross venation prominent on adaxial side, very narrow margin of ferruginous lepidote indument for about one-half length of pinna; **staminate sterile bract** 85–130 cm long and about 13 cm wide; **rachis** of **staminate inflorescence** 50–100 cm long, peduncle 40–80 cm long, all with dense whitish or brownish indument, **rachillae** up to 150 in number, 15–20 cm long, with whitish or brownish farinose-lepidote indument; **staminate flowers** 8–12 mm long, in two rows, arranged along one side of rachilla, globose in shape, **petals** 2 in number, 5–7 mm wide, 2–4 toothed at tips, incurved, imbricate, sepals 3, 0.5–1.5 mm long, **stamens** 18–26 in number, **anthers** irregularly coiled, about 2 mm long, **filaments** 1–4 mm long; **androgynous sterile bract** 108–29 cm long, **androgynous rachis** about 34 cm long, peduncle 75 cm long, **rachillae** numerous, **pistillate portion** sessile or 1–3 cm long, **staminate extension** up to 12 cm long, **pistillate flowers** 1–2 per rachilla, each about 3.5 cm long and 1.75 cm in diam, petals about same size as sepals, with fluted edges and darkened tips, sepals distinctly nerved, **pistil** 1.75 cm long, densely light brown pubescent, **stigmas** 5–6 in number; **fruit** 6–9 cm long (including beak of 1 cm long) and 4–6 cm in diam, ferruginous brown in color, persistent perianth about 4 cm high, staminodial ring 1 cm high, 2–3 cm in diam, margins pubescent or ciliate, **epicarp** fibrous, 1.0–2.5 mm thick, **mesocarp** soft, 3–6 mm thick, **endocarp** hard, up to 1 cm thick, **fiber clusters** absent or inconspicuous, **seeds** 4–7 in number, 3.0–4.5 cm long and 1.0–1.5 cm in diam, endosperm oily.

Distribution and Habitat. See tables 3 and 9.

Table 9. Comparison of *O. phalerata* and *O. eichleri* with Their Hybrid *O. × teixeirana* and Its Backcrosses (modified from Medeiros-Costa, Campos Mendes, and Castro Brito, 1985).

	<i>O. phalerata</i>	<i>O. × teixeirana</i>			<i>O. eichleri</i>
		Teixeirana P	Teixeirana T	Teixeirana E	
Size of leaf rachis	5.2–9.9 m	5.7–7.2 m	4.31–5.10 m	3.77–4.12 m	1.20–2.53 m
Total number of pinnae per leaf	145–240	163–67	127–47	113–25	63–128
Percent of clustered pinnae	0	15	33	46	95–97
Percent of regular pinnae	100	85	67	54	3–5
Number of stamens	26–35	17–24	16–21	17–21	13–20

Vernacular Names. *Perinao*, *coco de macaco*, *piaçava grande* (fide Balick).

Representative Specimens Examined. BRAZIL. Maranhão: Caxias, Jan. 1953, *Bondar s.n.* (F-405.257); Belem-Brasília Hwy., 10 km north of Estreito de Goiás, disturbed cerrado on red sandy loam, *O. eichleri* and *O. martiana* in vicinity, Dec. 1982, *Balick et al.* 1312 (NY); munic. São Felix de Bolsas, along roadside in cerrado woodland, Dec. 1981, *Balick et al.* 1347 (NY).

Bondar surmised that this taxon may be a hybrid between *O. phalerata* and *O. eichleri* because both species occur in the type locality.

Originally, *O. × teixeirana* was poorly described. It was believed that Bondar may have been describing two different taxa when he said it ranged from acaulescent to 8 m tall; however, Balick, Pinheiro, and Anderson (1987) confirmed the range in size. In addition to this, the middle pinnae were not described (Bondar said that the basal pinnae are clustered, which is not diagnostic) and very little information was given on the staminate inflorescence—the rachis, rachillae, and flowers were not measured. Also the two specimens he collected consist of upper pinnae parts and a mature fruit.

More recent collections and an article by Medeiros-Costa, Campos Mendes, and Castro Brito (1985), however, indicate that *O. × teixeirana* is indeed a hybrid between *O. phalerata* and *O. eichleri*. The hybrid is represented by three morphological types: one intermediate between the two parent species and the other two resembling *O. phalerata* or *O. eichleri* more closely, probably due to backcrossing with either parent. Table 9 differentiates the hybrid from its parent species and the backcrosses with each parent. Balick, Pinheiro, and Anderson (1987) gave a detailed treatment of the hybrid and its parent species along with comparative illustrations of flowers and pinnae cross sections.

× **MAXIMBIGNYA** Glassman, *gen. hybr. nov.* *Maximiliana* Martius × *Orbignya* Martius. *Hybridus naturalis morphologicus inter Maximilianum maripam* (Correa) Drude et *Orbignyam phaleratum* Martius.

A natural intergeneric hybrid between *M. maripa* (Correa) Drude and *O. phalerata* Martius.

2. × **Maximbignya dahlgreniana** (Bondar) Glassman, *stat. nov.* **Figs.** 108, 120, 126, 127.

Markleya dahlgreniana Bondar, *Arq. Jard. Bot. Rio Jan.* 15:50, photos 1–3. 1957; Glassman, pp. 110–11. 1977b. **TYPE:** Brazil: Pará, munic. Bragança Tracuateua, *Bondar s.n.*: (holotype RB-95829!; isotype, F!).

Attalea dahlgreniana (Bondar) Wessels Boer, Indig. Palms. Suriname 1965; Henderson, 1995; Henderson, Galeano, and Bernal, 1995.

Trees 5–7 m tall (up to 10 m, fide Wessels Boer) and 20–30 cm in diam; **sheathing leaf base** 6–8 m long, **petiole** 0.6–1.1 m long; **leaf rachis** up to 8 m long, brownish lepidote beneath; 210–70 **pinnae** on each side of rachis, those from middle series mostly in clusters of 2–5, 100–130 cm long, 5–6 cm wide (up to 8 cm wide, fide Wessels Boer, 1965), with acuminate, asymmetrical tips; expanded part of **staminate sterile bract** about 1.7 m long (including beak of 22–30 cm long) and 30 cm wide, peduncular part about 1 m long (fide Wessels Boer); **rachis of staminate inflorescence** 70–90 cm long, peduncle about 1 m long, with numerous **rachillae** (600–700, fide Wessels Boer), 13–17 cm long, covered with whitish lepidote indument; **staminate flowers** arranged in two rows on one side of rachilla, each 8–12 mm long, **petals** 3 in number, lanceolate, and somewhat sickle-shaped, 0.6–1.0 mm wide, flattened, with curved, acuminate tips, **stamens** 6–11 in number, **anthers** 4–6 mm long (10 mm, fide Wessels Boer, 1965), almost straight or twisted, not coiled, **filaments** 1–2 mm long; expanded part of **androgynous sterile bract** 2.6–2.7 m long, peduncular part 1.6–1.7 m long; **rachis of androgynous inflorescence** about 70 cm long, peduncle about 1 m long, with numerous **rachillae**, **pistillate portion** 11–15 cm long, with 3–4 pistillate flowers per rachilla, **staminate extension** of rachilla about 5 cm long, **pistillate flowers** 2–3 cm long and 1 cm in diam, petals longer than sepals, **pistil** about 1.3 cm long, style very short or absent, **stigmas** 3 in number, about 6 mm long, ovary brownish pubescent, staminodial ring about 5 mm high, with distinct lobes; **fruit** 6–8 cm long and 3–4 cm wide (including beak of 1.0–1.5 cm long), persistent perianth 3.5–5.0 cm high, staminodial ring about 1.5 cm high, **epicarp** fibrous, 1–2 mm thick, **mesocarp** (in relatively fresh fruits) soft, slightly oily, about 6 mm thick, drying out and becoming much narrower in older fruits (2.5–3.0 mm), **endocarp** hard, 4–6 mm thick, **fiber clusters** inconspicuous, seed cavities 3 in number, 8–12 mm in diam, **seeds** not seen.

Distribution and Habitat. See tables 3 and 10.

Vernacular Names. *Perinao, dois por dois* (Brazil).

Representative Specimens Examined. **SURINAME.** Palaima Creek, tributary of Upper Sipaliwini R., mesophytic forest, on clay soil, Feb. 1963, *Wessels Boer 805* (F, U); near Coeroeni airstrip, wet sandy loam, June 1963, *Wessels Boer 1587* (F, U).

Even though Bondar (1957) noted that material was deposited in three

Table 10. Comparison of \times *Maximbignya dahlgreniana* with Its Parent Species

	<i>O. phalerata</i>	\times <i>Maximbignya dahlgreniana</i>	<i>M. maripa</i>
Height of plant	10–30 m	5–10 m	7–20 m
Petiole size	15–50 cm	60–110 cm	150–300 cm
Number of pinnae per leaf (each side)	180–260	210–270	170–260
Middle pinnae length \times width	regularly arranged 90–170 \times 5–7 cm	clusters of 2–5 100–130 \times 5–8 cm	clusters of 4–9 100–150 \times 4–6 cm
Staminate sterile bract:			
length \times width	1.5–2.0 \times 0.2 m	1.0–1.7 \times 0.3 m	0.7–1.0 \times 0.4 m
curving	slightly curved	moderately curved	strongly curved
Staminate inflorescence			
length of rachis	70–170 cm	70–90 cm	40–80 cm
Staminate rachillae			
length	20–28 cm	13–17 cm	15–20 cm
Staminate flowers arrangement on rachillae	one side	one side	completely encircling rachilla
length	10–17 mm	8–12 mm	9–15 mm
Petals			
number, shape, relative size	2–3, slightly narrowed at base, irregularly curved or bowed out at base, tips notched and laciniate, longer than stamens	3, lanceolate, flat, curved, with acuminate tips, longer than stamens	3, lanceolate, straight, with acute tips, much shorter than stamens
Stamen number	21–30	6–11	6
Anthers			
length	2 mm	4–6 mm	6.5–11.0 mm
shape	coiled	twisted but not coiled	straight
Pistillate flowers			
stigma number	3–6	3	3
Fruits			
length	10–12 cm	6–8 cm	5–7 cm
Mesocarp thickness	3–6 mm	2.5–3.0 mm	1–2 mm
Seed number	3–6	3	1–3
Fiber clusters in endocarp	inconspicuous	inconspicuous	inconspicuous
Geographic distribution	Brazil: common in several northern states; the Guianas; Bolivia	Brazil: Pará, Maranhão; Suriname	Northern South America (including Brazil and Suriname)

different herbaria, no actual specimens were cited in his article; however, I am satisfied that the RB specimen is the holotype.

Bondar (1957) described *Markleya dahlgreniana* as a possible hybrid between *M. maripa* and *O. martiana* (*O. phalerata*) because it grows in conjunction with these two species. Wessels Boer (1965) questioned the hybrid origin of *Markleya* because of the uniform populations in Suriname; however, Moore (1973), Dransfield and Uhl (1986), and Henderson and Balick (1987) treated *Markleya* as a hybrid. Hence, I have formally changed its status to an intergeneric hybrid, \times *Maximbignya dahlgreniana*. Henderson (1995) and Henderson, Galeano, and Bernal (1995), however, treat this taxon as a synonym of *A. dahlgreniana*.

Staminate flowers do not resemble either parent species. The petals are lanceolate and somewhat sickle-shaped, with curved, acuminate tips, unlike *O. phalerata*, which has mostly broader petals with lacinate tips. Anthers are twisted, but not coiled, and are much longer (4–6 mm) than those of most species of *Orbignya*, which average about 2 mm. *M. maripa* has petals that are much shorter than its stamens, and the anthers (7–11 mm long) are not coiled or twisted, but straight.

Table 10 shows similarities and differences between the hybrid and its parent species. Parts of this table are based on Appendix I in Anderson and Balick (1988).

Analysis of table 10 reveals that \times *M. dahlgreniana* is more or less intermediate between the parent species in the number of pinnae per cluster, width and curving of staminate sterile bract, number of stamens, size and twisting of anthers, mesocarp thickness, and number of seeds. The hybrid appears to be closer to *M. maripa* in its clustering of middle series pinnae, size of staminate rachillae, and number of stigmas; it seems to resemble *O. phalerata* more closely in the width of its middle pinnae and in its unilateral arrangement of flowers on the staminate rachillae; the hybrid differs from both parent species mainly in the shape of its staminate petals.

Hybrids of *Scheelea*

Another putative hybrid has been collected from Suriname (Wessels Boer 1330 [U]) and determined as *A. macropetala* by Wessels Boer (p. 155, 1965). This palm appears to be a cross between a species of *Scheelea* and *M. maripa*. The staminate flowers have fleshy narrow terete petals about 8 mm long like *Scheelea* and fairly long anthers (for *Scheelea*) up to 4.5 mm like

Maximiliana. The latter genus has been collected from several localities in Suriname, but no collections of *Scheelea* have been recorded; however four acaulescent new species of *Scheelea* have been described from French Guiana. Therefore, it is likely that the genus *Scheelea* eventually will be collected from Suriname. See **figs.** 182, 198.

Solitary **arborescent palm**; **sheathing leaf base** and **petiole** 3–4 m long, **leaf rachis** about 7 m long; 139 pairs of **pinnae**, those from middle series mostly regularly arranged, 2–5 cm apart, each 110–30 cm long and up to 4.6 cm wide; **staminate sterile bract** 0.7–1.0 m long; **rachis** of **staminate inflorescence** about 40 cm long, **rachillae** numerous, up to 11 cm long; **staminate flowers** completely encircling rachilla, each about 8 mm long, **petals** 3, fleshy, convex outside and grooved or flat inside, less than 1 mm thick, longer than **stamens** (6 in number), tips slightly hooked, sepals about 1 mm long, **anthers** 3.5–4.5 mm long, **filaments** 1.5–2.0 mm long.

Representative Specimens Examined. SURINAME. Paloemeu R., near confluence with Tapanahony R., on riverbank, in forest, Apr. 17, 1963, *Wessels Boer 1330* (F, U).

In his treatment of *A. macropetala*, Wessels Boer (p. 156, 1965) cited *Wessels Boer 1330* and *1371* from Suriname; apparently part of his description of that species is based on these two specimens. Staminate flowers of *1371* definitely match *M. maripa*, but the flowers of *1330* appear to be a hybrid involving species of *Scheelea* and *Maximiliana*. See “Excluded Species of *Attalea*” for discussion of *A. macropetala* (Burret) Wessels Boer.

Since only one collection has been seen, which is incomplete (no androgynous flower or fruiting material), I have declined to describe this putative hybrid as new.

Hybrids of *Maximiliana*

At least one hybrid between *Maximiliana* and other related genera has been reported in the literature, \times *Maximbignya dahlgreniana*, a cross between *O. phalerata* and *M. maripa*; another possibility is *Ynesa colenda* probably involving an unknown species of *Orbignya* and probably *M. maripa*. Both of these have been treated previously.

Another possible hybrid was described from Venezuela as a new species (*A. cryptanthera*) by Wessels Boer (1988) and also will be discussed under “Excluded Species of *Attalea*.” Only one depauperate specimen was collected and seen (*Wessels Boer 2323* [F!, U!]). The staminate flowers (stamens longer than petals and exerted) and immature or underdeveloped

fruits (the pericarp is very thin and not divided into three distinct parts) are typical of the genus *Maximiliana*; but the pinnae are not clustered along the rachis and the staminate flowers are arranged along one side of the rachilla instead of encircling the rachilla, both of which are characteristic of some species of *Scheelea*, *Orbignya*, and *Attalea*. I am not sure what the other parent species may be because characteristics of staminate flowers are not intermediate between any of the above genera but are strictly *Maximiliana*. Remote possibilities for the other parent are *A. ferruginea*, also found in the Amazonas region of Venezuela, and *O. sagotii*, distributed in the Guianas, both of which have unclustered middle series pinnae and staminate flowers arranged along one side of the rachilla. It is also possible that *Wessels Boer 2323* may be a new species, but only one specimen has been seen. Hence, there is really insufficient material and information to recognize this palm as a new taxon.

Another possible hybrid between *M. maripa* and an unknown species of *Scheelea* from Suriname (*Wessels Boer 1330*) has been previously treated.

Excluded Species of *Attalea*

- A. butyracea* (Mutis ex Linnaeus filius) Wessels Boer. = **Scheelea butyracea** (Mutis ex Linnaeus filius) Karsten ex H. A. Wendland.
- A. cephalotes* Poeppig ex Martius. = **Scheelea cephalotes** (Poeppig ex Martius) Karsten.
- A. cohune* Martius. = **Orbignya cohune** (Martius) Dahlgren ex Standley.
- A. crassispatha* (Martius) Burret. = **Orbignya crassispatha** (Martius) Glassman.
- A. cryptanthera* Wessels Boer, Pittieria **17**:310. 1988. **Type:** Venezuela, Terr. Amazonas, near San Carlos de Río Negro, white sandy soil, artificial clearing, Jan. 22, 1968, *Wessels Boer 2323* holotype, U!; isotype, F!.
- Staminate flowers and fruits of this palm are typical of the genus *Maximiliana*, but the leaves probably belong to another genus. *A. cryptanthera* was discussed in more detail under “Hybrids of *Maximiliana*.” Henderson (1995) and Henderson, Galeano, and Bernal (1995) treat this species as a synonym of *A. maripa*.
- A. dahlgreniana* (Bondar) Wessels Boer. = × **Maximbignya dahlgreniana** (Bondar) Glassman.
- A. humboldtiana* Spruce. = **Scheelea butyracea** (Mutis ex Linnaeus filius) Karsten ex H. A. Wendland.
- A. insignis* (Martius) Drude. = **Scheelea insignis** (Martius) Karsten.
- A. luetzelburgii* (Burret) Wessels Boer. = **Orbignya luetzelburgii** Burret.
- A. lydiae* (Drude) Barb. Rodr. = **Orbignya phalerata** Martius.
- A. macrocarpa* (Karsten) Wessels Boer. = **Scheelea macrocarpa** Karsten.

- A. macrolepis* (Burret) Wessels Boer. = **Scheelea macrolepis** Burret.
- A. macropetala* (Burret) Wessels Boer. = **Maximiliana maripa** (Correa) Drude.
- A. maracaibensis* Martius. = **Scheelea maracaibensis** (Martius) Burret.
- A. maripa* (Correa) Martius. = **Maximiliana maripa** (Correa) Drude.
- A. osmantha* (Barb. Rodr.) Wessels Boer. = **Scheelea osmantha** Barb. Rodr.
- A. parviflora* Barb. Rodr. = **Scheelea anisitsiana** Barb. Rodr.
- A. phalerata* Martius ex Sprengel. = **Scheelea phalerata** (Martius ex Sprengel) Burret.
- A. pixuna* Barb. Rodr. = *Orbignya* (*species dubia*).
- A. polysticha* (Burret) Wessels Boer. = **Orbignya polysticha** Burret.
- A. princeps* Martius. = **Scheelea princeps** (Martius) Karsten.
- A. regia* (Martius) Wessels Boer. = **Maximiliana maripa** (Correa) Drude.
- A. rostrata* Oersted. = **Scheelea rostrata** (Oersted) Burret.
- A. sagotii* (Trail ex Im Thurn) Wessels Boer. = **Orbignya sagotii** Trail ex Im Thurn.
- A. speciosa* Martius. = **Orbignya phalerata** Barb. Rodr.
- A. spectabilis* var. *polyandra* Drude. See *Orbignya pixuna* (Barb. Rodr.) Barb. Rodr. under "Doubtful and Uncertain Species of *Orbignya*."
- A. transitiva* Barb. Rodr., Prot. App. 49, 1879; Les Palmiers 29, 1882. Superfluous name.

This is a superfluous name for *A. attaleoides* (which has staminate flowers like *Scheelea* and has been previously discussed). After describing *M. attaleoides* as a new species in 1875, Barbosa Rodrigues (1879, 1882) decided that it was a transitional species between this genus and *Attalea*. Therefore, he renamed it *A. transitiva*.

Excluded Species of *Maximiliana*

M. attaleoides Barb. Rodr. = *Scheelea* sp. (*species confusum*).

M. crassispatha Martius. = **Orbignya crassispatha** (Martius) Glassman.

M. inajai Spruce, Journ. Linn. Soc. **11**:163. 1871. = **Syagrus inajai** (Spruce) Beccari, Agric. Colon. **10**:467. 1916. **TYPE**: Brazil, Amazonas, Rio Negro, *Spruce 83* (holotype, K!).

M. insignis Martius. = **Scheelea insignis** (Martius) Karsten.

M. tetrasticha Drude. = *Scheelea* (*species dubia*).

M. venatorum (Poeppig ex Martius) H. Wendland in Kerchove, Palm. 251. 1878.

Cocos venatorum Poeppig ex Martius, Hist. Natur. Palm. **3**:325. 1853.
= **Oenocarpus or Euterpe?** **TYPE**: Peru, Tocache, Maynas Alto, *Poeppig 1998* (holotype, W, destroyed; isotype, P!).

Glossary

Morphological Terms Used in Text

Acaulescent: Without a vertical aboveground trunk.

Androgynous inflorescence: Containing both pistillate and staminate flowers.

Arborescent: With a vertical aboveground trunk.

Bract or sterile bract: Usually broad, leaf-like organ that subtends the inflorescence; woody in the *Attaleinae*; formerly called a spathe.

Ciliate: Bearing a fringe of hairs on an organ (e.g., staminodial ring).

Connate: Fused or united parts.

Endocarp: Innermost layer of pericarp.

Epicarp (also exocarp): Outer layer of pericarp.

Farinose: Covered with a mealy coating or indument.

Indument: Any covering such as hairs (pubescent) or scales (lepidote).

Inflorescence: Structure bearing flowers; formerly called spadix.

Lamina: Blade of pinna or leaflet.

Lanceolate: Relatively narrow and tapering at both ends.

Lepidote: Indument consisting of scales (i.e., Lepidoptera = scale wings).

Mesocarp: Middle layer of pericarp.

Pedicel: Stalk of an individual flower.

Peduncle: Stalk of an inflorescence.

Perianth: Collective term for sepals (calyx) and petals (corolla).

Pericarp: Wall of fruit, usually comprising three layers: epicarp, mesocarp, and endocarp.

Persistent perianth: Sepals and petals remaining on base of fruit during its development.

Petiole: Stalk of whole leaf.

Pinnae: Divisions of a pinnate leaf blade, either separate or in clusters.

Pistillode: Sterile or undeveloped pistil of a staminate flower.

Rachilla(e): Branch(es) that bear the flowers.

Rachis: Axis of a leaf blade bearing pinnae or axis of an inflorescence.

Rugose: Densely wrinkled surface.

Sessile: Lacking a stalk (e.g., lacking a petiole).

Sheath or sheathing base: Base of leaf that clasps the stem.

Staminode: Sterile or undeveloped stamen of a pistillate flower.

Staminodial ring: Structure located on inside base of pistillate flower and becoming larger on inside base of persistent perianth of fruit during its development.

Tomentose: Covered with dense wooly hairs.

Ecological Terms Used in Text

For further information on this subject, consult Eiten (1972, 1974, 1978, 1982, 1984).

Atlantic coastal forest: Tropical mesophytic forest of evergreen or semideciduous trees along eastern coast of Brazil (from Rio Grande do Norte to Rio Grande do Sul), usually in mountainous terrain. Much of the region has been cleared for crops, pastures, and Eucalyptus plantations. Fortunately, a number of areas have been spared. In northeastern Bahia, palm vegetation (especially comprising several species of *Attalea*) is a prominent part of the landscape with hundreds of thousands of individual trees.

Caatinga: Unfortunately, there are two different examples of this type of vegetation: (1) Amazon region: closed canopy forest of low or tall trees on white sandy soil; (2) northeastern Brazil: semidesert vegetation on shallow soils that dries out completely during the dry season consisting of arborescent and acaulescent palms, spiny shrubs, low trees, cacti, and terrestrial bromeliads.

Campo limpo: Predominantly grassy with many herbs, semishrubs, and ground vines.

Campo sujo: Short grass or tall grass with very scattered low shrubs.

Cerrado region: Central Brazil. Moderate rainfall, dry season of five months, sterile, very deep soils. Vegetation is xeric, semideciduous low arboreal woodland (open canopy) or low forest with closed canopy. Both arborescent and acaulescent palms are prevalent. Dominance is usually shared by several species. Consult Eiten (1972, 1978) for further information.

Dominant: Tallest and most abundant species in a population; palms exhibit dominance in many plant communities.

Gallery forest: Forest that closely follows a stream that is a constant source of water, even during the dry season. Frequently, pure stands of palms (e.g., *O. phalerata*) comprise these forests.

- Llanos:** Large areas of grassland at low altitudes with readily available water from rainfall or high water table found in Colombia, Venezuela, and the Guianas.
- Mata cipó:** Forest with many lianas or vines, mostly in disturbed areas (e.g., in northeastern Bahia).
- Restinga vegetation:** On podzolic sandy soil of a narrow coastal plain, from Pernambuco to Santa Catarina, Brazil. Low broadleaf forest with many palms. On sites from highly drained sand dunes to low, flat swampy ground. Several species of palms are found in this type of vegetation.
- Savanna:** Broad term usually referring to a grassy area with scattered trees and shrubs. Consult Eiten (1982) for more detailed information.
- Secondary growth:** Vegetation growing in disturbed areas cleared or partially cleared of original vegetation by burning or agricultural practices. The new vegetation that replaces the original is usually entirely different, e.g., a bamboo forest coming into a partially cleared palm forest of *A. burretiana* in central Bahia.
- Shared dominance or codominance:** Two species in a population more or less equally common and equally distributed. Occasionally the two species hybridize and backcross in a palm forest community. Several examples are given in the text.
- Transitional forest:** Disturbed areas where secondary growth vegetation is mixed with Atlantic coastal forest vegetation in northeastern Bahia. Certain species of palms are found here.

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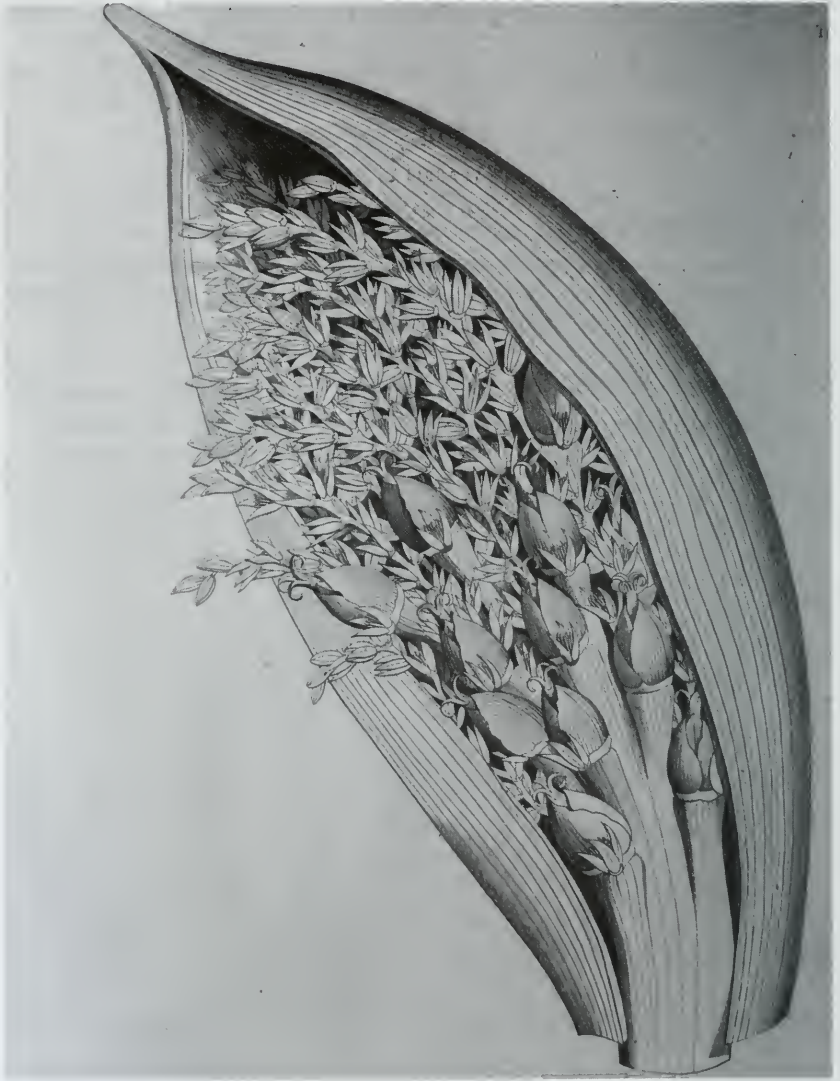
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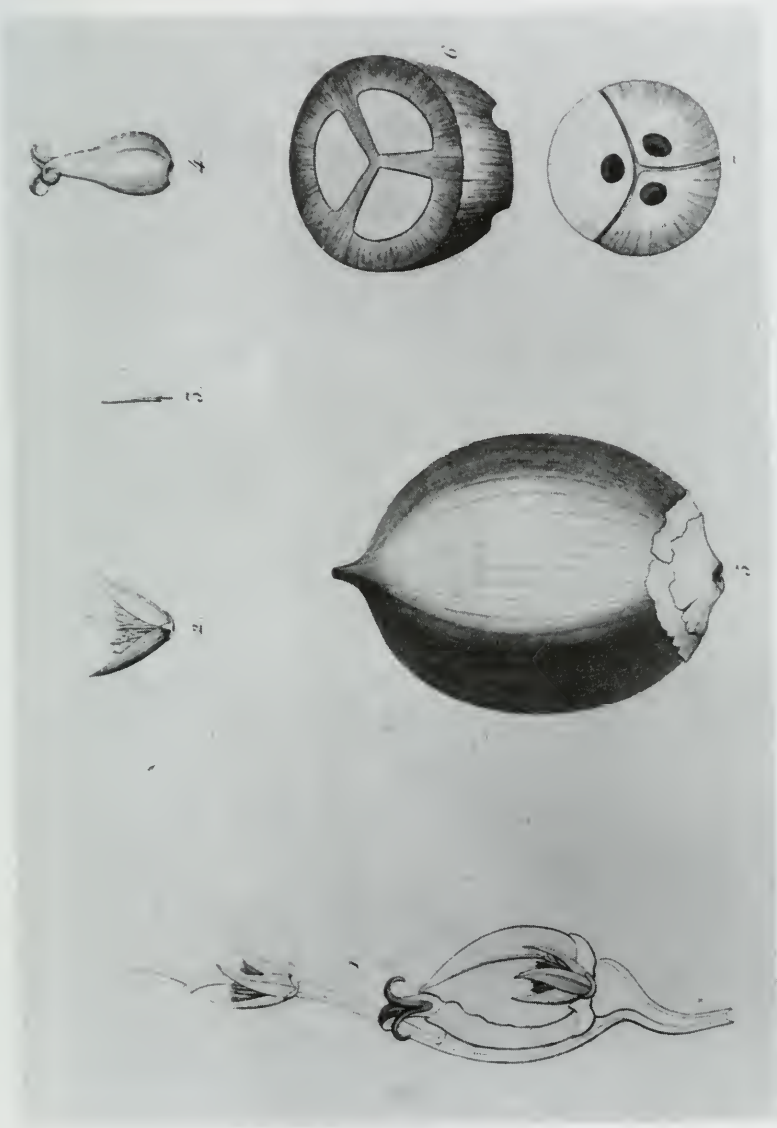
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Attalea Figures



1. *A. amygdalina*. From Humboldt, Bonpland, and Kunth t. 95–96. 1816. Androgynous inflorescence with mostly pistillate flowers below and staminate flowers above.



2. *A. amygdalina*. From Humboldt, Bonpland, and Kunth t. 95-96. 1816. Far left: Pistillate flower with attached staminate flowers at base and on rachilla. Top center: Staminate flowers. Top right: Ovary. Bottom center and bottom right: Views of fruit.



3. *A. apoda*. Minas Gerais, Serra do Palácio. Abundant throughout this mountain range.



4. *A. geraensis*. Curvelo, in cerrado. J. C. Gomes holding fruit taken from base between leaves.



5. *A. funifera*. Municipality of Salvador. Itapoan sand dunes. Dense stand in background. Note large number of cut palms.



6. *A. funifera*. Bahia. Exact locality not known. Photo by Bondar.



7. *A. funifera*. Bahia. Bolandeira. Staminate inflorescence. Photo by Bondar.



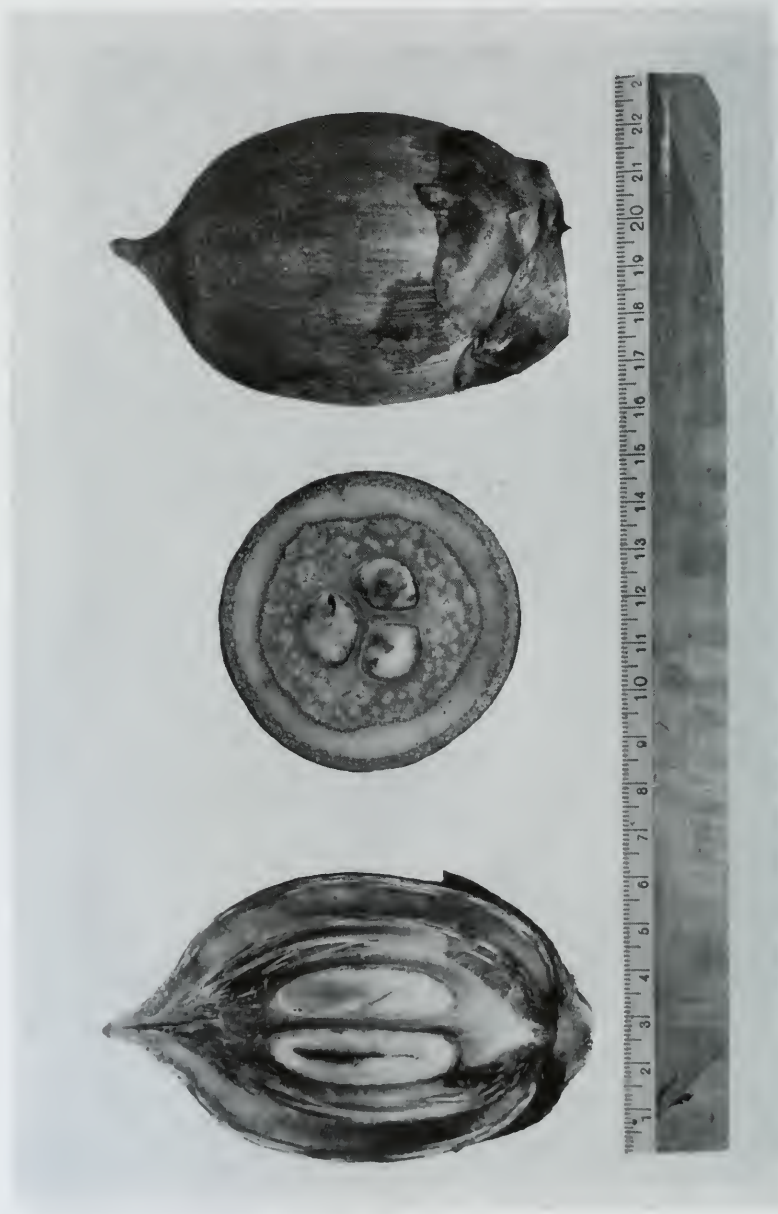
8. *A. funifera*. Bahia. Bales of *piassava* fiber in warehouse. Photo by Vosylius.



9. *A. burretiana*. Bahia. Amelia Rodrigues. Noblick and George holding very long leaf. Note dense forest of *A. burretiana* in background.



10. *A. burretiana*. Bahia. Amargosa. Inflorescence. *Noblick et al.* 4589 (F).



11. *A. bureitiana*. *Left to right*: Longitudinal, cross section, and external view of fruit. Note conspicuous clusters of fibers and very thick mesocarp in cross section. Photo by Vosylus.



12. *A. x piassabossu*. Bahia. Salvador. Faria and Noblick next to hybrid tree in forest of *A. burretiana*.



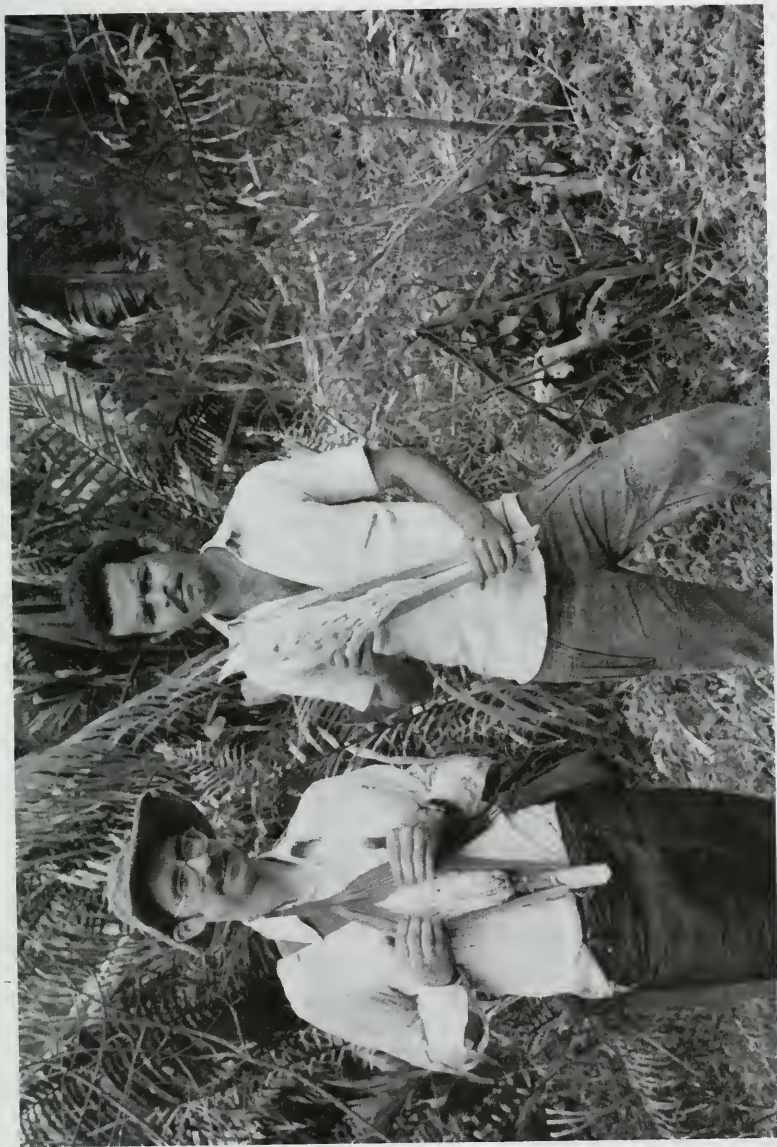
13. A. \times *piassabossu*. Bahia, Salvador. Noblick holding leaf showing petiole and lower pinnae. Noblick *et al.* 4573 (F).



14. *A. × piassabossu*. Bahia, Salvador. Same locality. George and Noblick holding inflorescences next to hybrid tree. Noblick and Glassman 4583 (F).



15. *A. humilis*. Bahia, Amelia Rodrigues. Acaulescent plants in foreground and secondary growth bamboo forest in background. Note leaves with regularly arranged pinnae.



16. *A. humilis*, Bahia, Amelia Rodrigues. Noblick and George holding staminate inflorescences. Noblick and Glassman 4575 (F).



17. *A. humilis*. Bahia. Amelia Rodrigues. George and Noblick next to planted tree with infructescence. Noblick and Glassman 4577 (F).



18. *A. pindobassu*. Bahia, Piritiba, Fazenda Santo Cristo. Stand of trees being cleared for agriculture.



19. *A. pindobassu*. Bahia, Piritiba. Part of leaf showing loose clustering of lower pinnae and regular arrangement above that. *Noblick et al.* 4601 (F).



20. *A. pindobaçu*. Municipality of Pindobaçu. Dense stand of rather young trees along stream and on hillside.



21. *A. pindobassu*. Bahia, Municipality of Jacobina. Alt. 450–550 m. Uneven stand of more mature trees in transitional forest.



22. *A. pindobassu*. Bahia. Municipality of Jacobina. Dense stand of trees in transitional forest.



23. *A. seabrae*. Bahia, Municipality of Barra do Mendes. Dense stand of tall trees.



24. *A. seabrensis*. Bahia. Municipality of Piata, Fazenda Cochó. Noblick and Lima with local inhabitants. Land being cleared of trees, but dense stand remains in background.



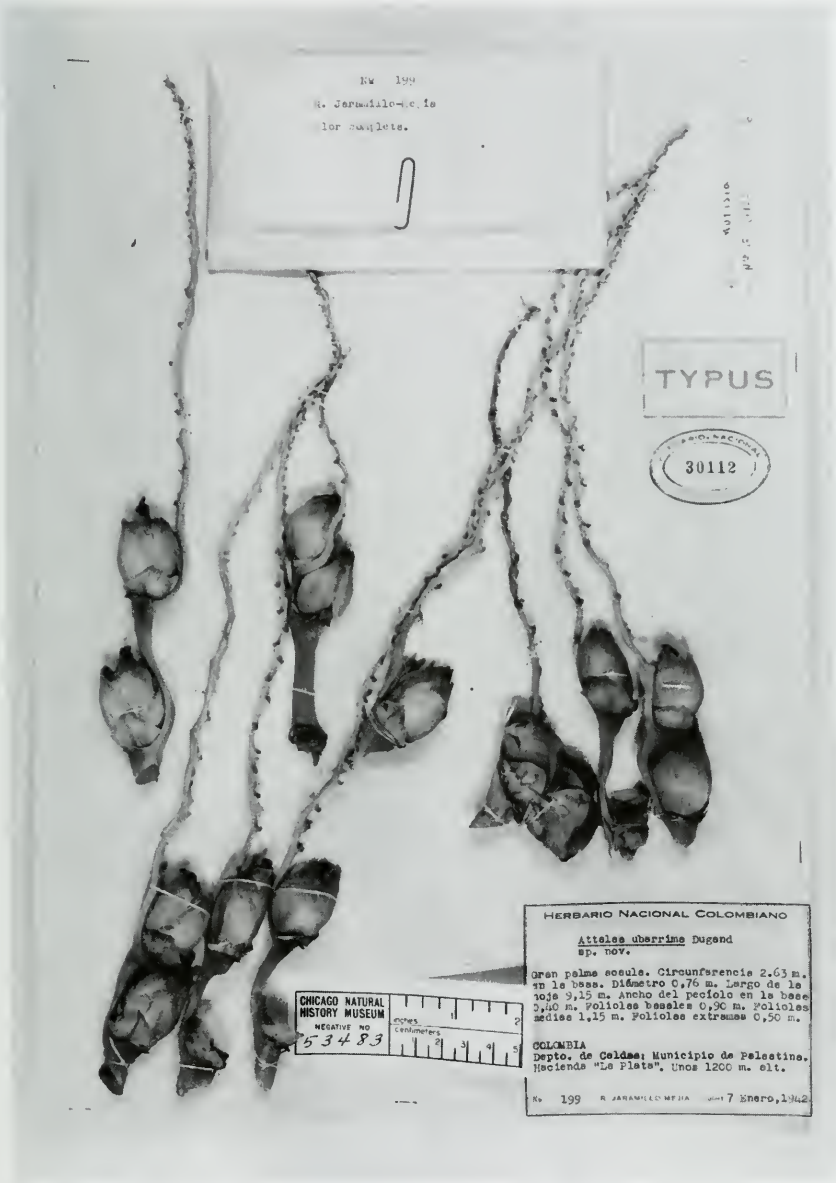
25. *A. seabrensis*. Bahia, Municipality of Barra do Mendes, Noblick and Lima holding infructescence and staminate inflorescence. Noblick et al. 4599 (F).



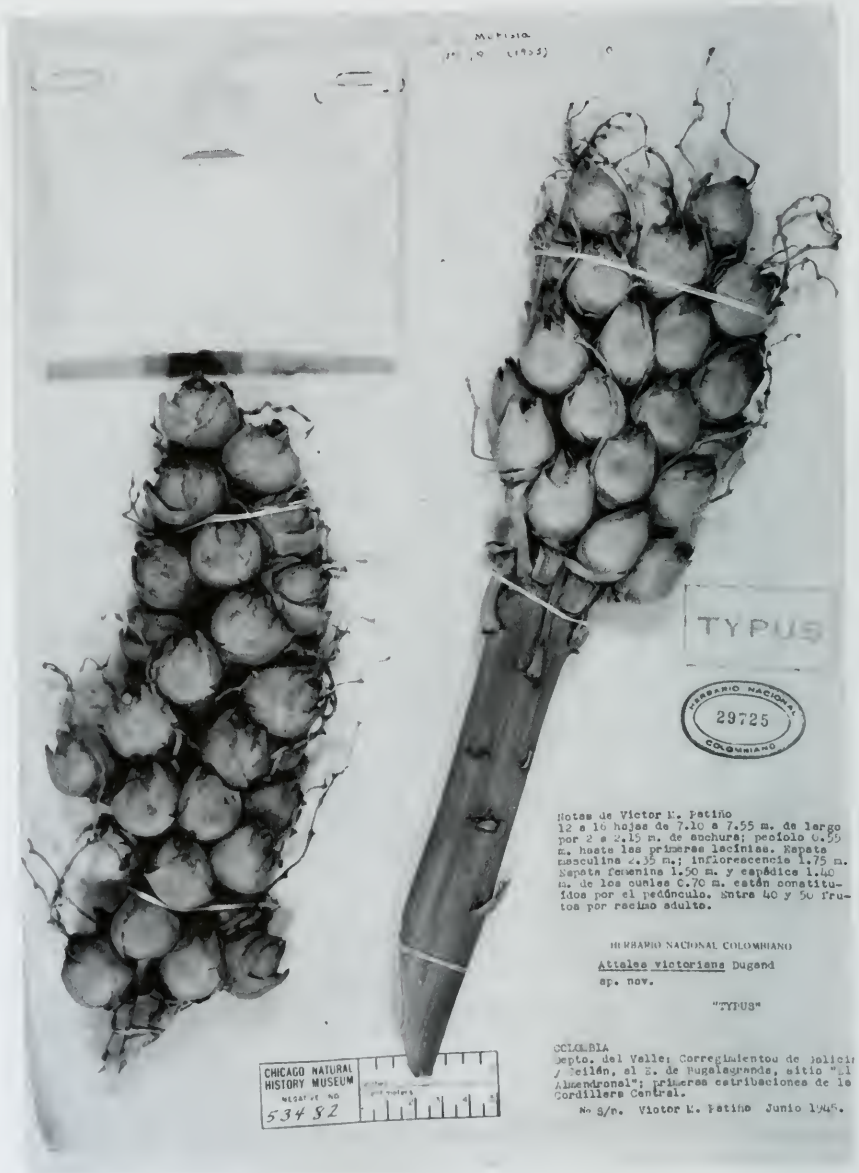
26. *A. seabrensis*. Bahia. Municipality of Piata, Fazenda Cochó. Showing clustering of pinnae on lower half of leaf. *Noblick et al.* 4597 (F).



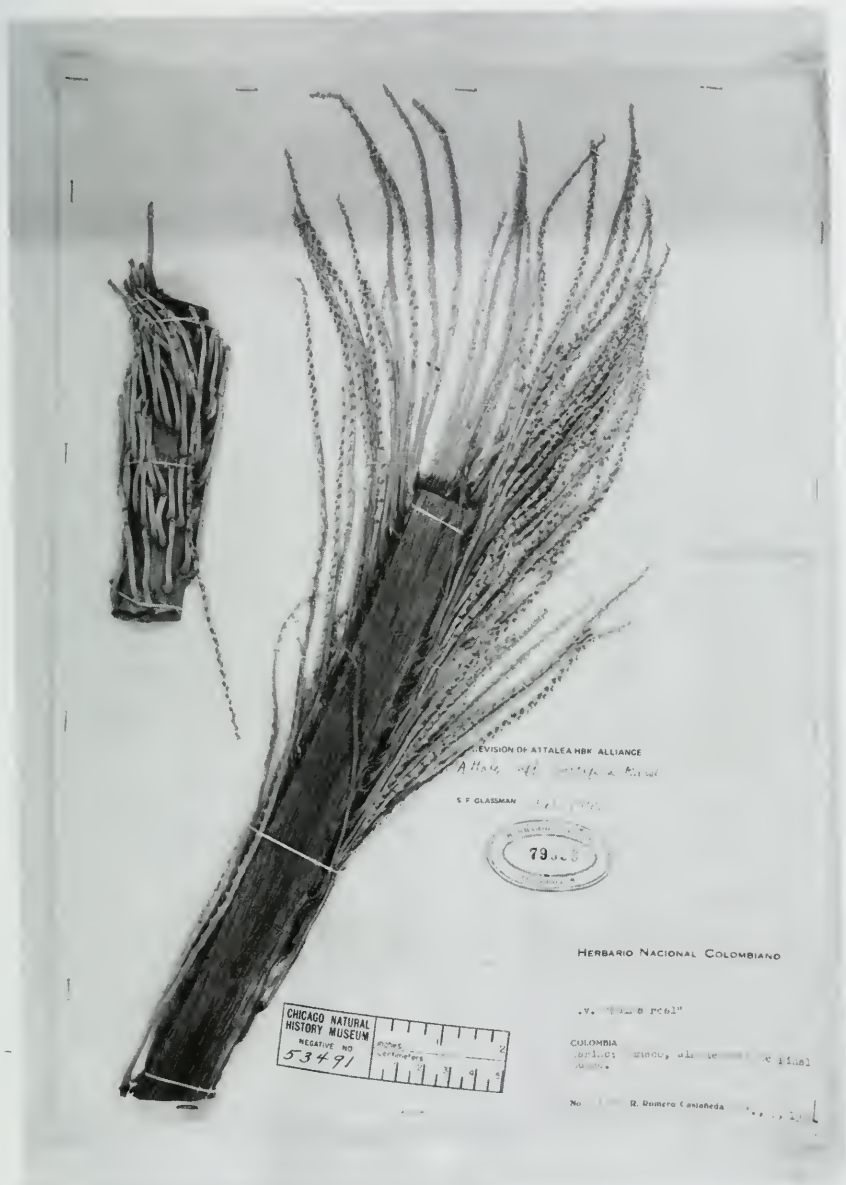
27. *A. septuagenata*. Holotype. *Scholtes and Cabrera 15796* (COL). Note dense dark indument consisting of sharp curved scales on three rachises on right and regularly arranged pinnae on left.



28. *A. uberrima*. Holotype. *Jaramillo Mejia* 199 (COL). Individual androgynous rachillae each with two pistillate flowers and very long attached staminate rachillae (up to 30 cm). = *A. amygdalina*.



29. *A. victoriana*. Holotype. Patiño s.n. (COL). Note large pistillate flowers and relatively short attached staminate rachillae. = *A. amygdalina*.



30. *A. nucifera*. Castañeda 5339 (COL). Part of staminate inflorescence showing long staminate rachillae (up to 19 cm) and staminate flower scars arranged in two rows along one side of rachilla. Original description by Karsten (1857) erroneously described short staminate rachillae (6 cm) and staminate flowers completely surrounding rachilla.



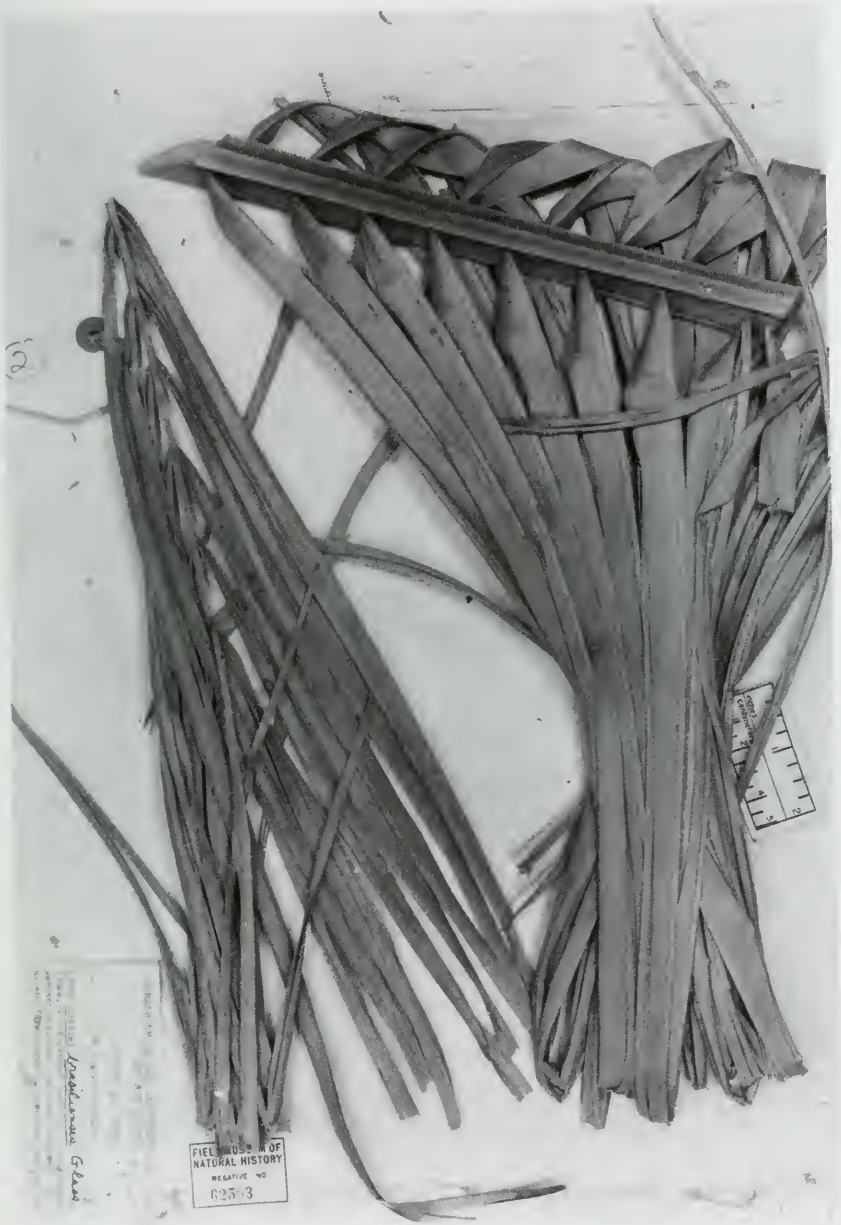
31. *A. barreirensis*. *Glassman 13048* (SP). *Left to right*: Individual staminate flowers. Staminate inflorescences showing relatively short staminate rachillae with one-sided staminate flower scars.



32. *A. barreirensis*. Glassman 13047 (F). Part of leaf showing clustered middle series pinnae.



33. *A. brasiliensis*. Glassman and Eiten 13057 (SP). *Top left*: Part of sterile bract with long beak. *Bottom left*: Separate staminate flowers. *Right*: Staminate inflorescences.

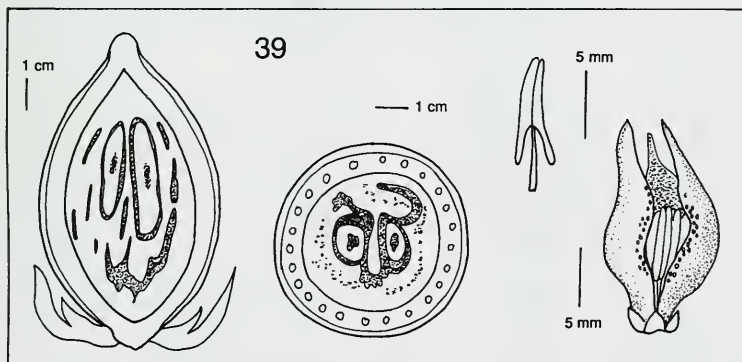
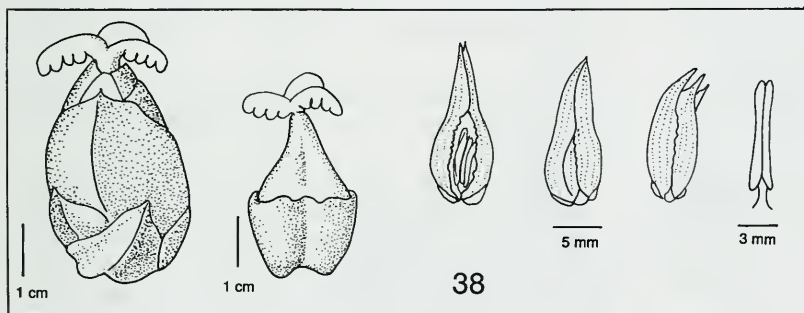
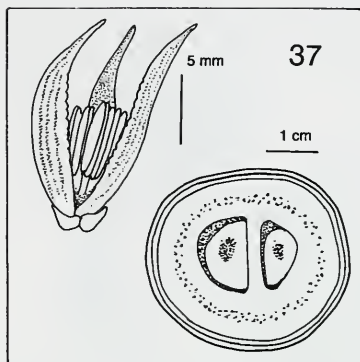
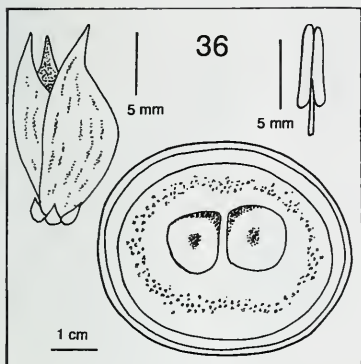


34. *A. brasiliensis*. Glassman and Eiten 13059 (F). Portions of leaves showing regularly arranged pinnae.

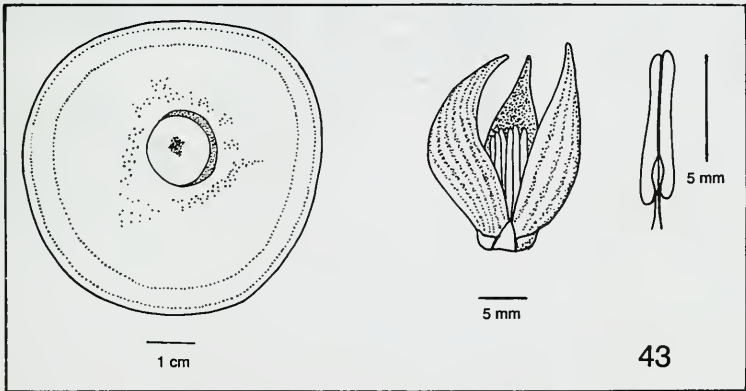
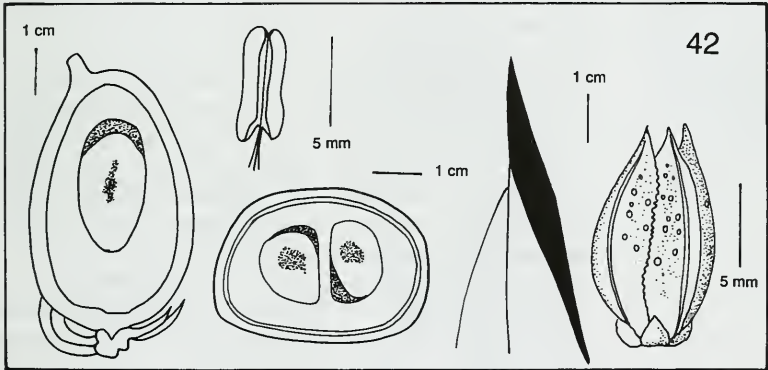
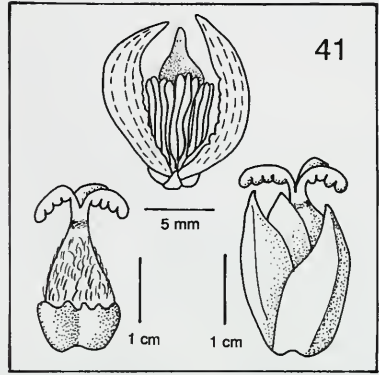
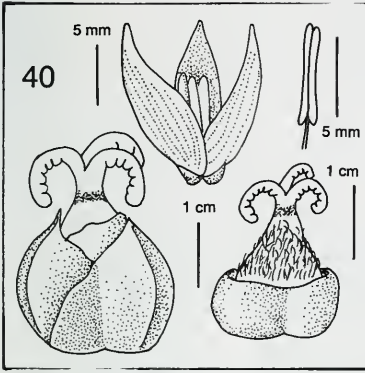


35. *A. seabrensis*. *Glassman 13034* (SP). Part of staminate inflorescence with staminate flowers on one side of rachillae.

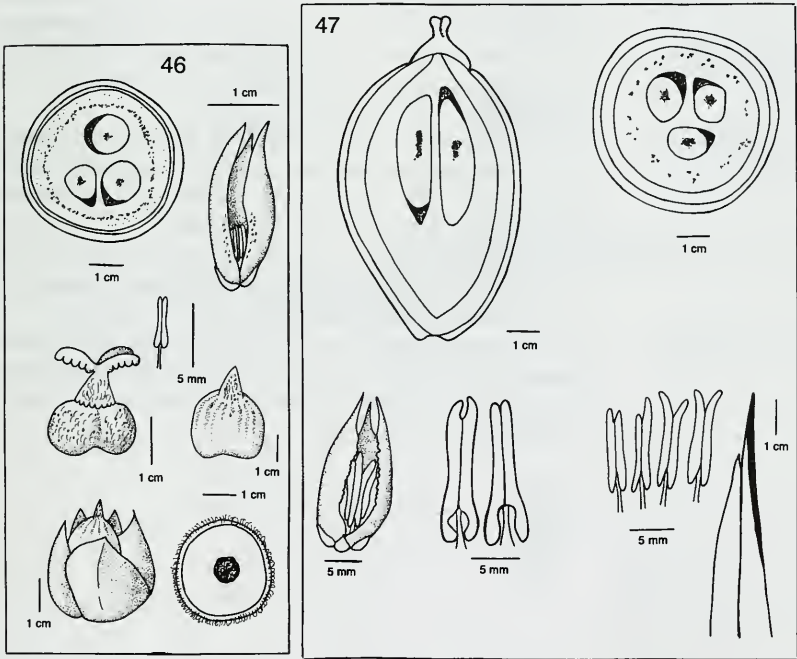
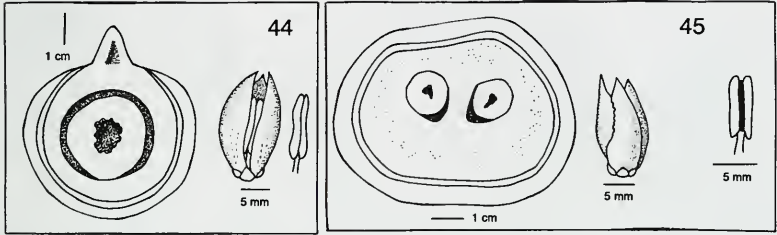
36. *A. brasiliensis*. *Top left*: Staminate flower. *Top right*: Stamen. *Glassman 13057* (F). *Bottom*: Cross section of fruit showing conspicuous fiber clusters in endocarp and two seed cavities. *Glassman 13058* (F).
37. *A. exigua*. *Left*: Staminate flower. *Weddell 2965* (P). *Right*: Cross section of fruit showing narrow epicarp and mesocarp and conspicuous fiber clusters in endocarp. *Weddell 2022* (B).
38. *A. pindobassu*. *Far left*: Pistillate flower with perianth. *Next left*: Pistil with staminodial ring. *Center to right*: Various views of staminate flowers showing nerved petals. *Far right*: Stamen. *Bondar s.n.* (F-619761).
39. *A. septuagenata*. *Left to right*: Longitudinal section of fruit showing 2 seeds, large irregular dark areas of tannin. Cross section of fruit showing 2 seeds, air spaces in mesocarp, clusters of fibers and irregular dark areas of tannin in endocarp. Stamen. Staminate flower showing clusters of glands on inner margins of petals. *Schultes and Cabrera 15796* (BH).



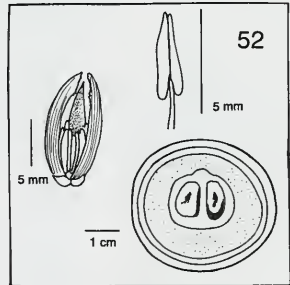
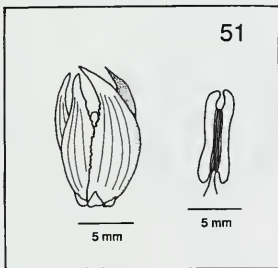
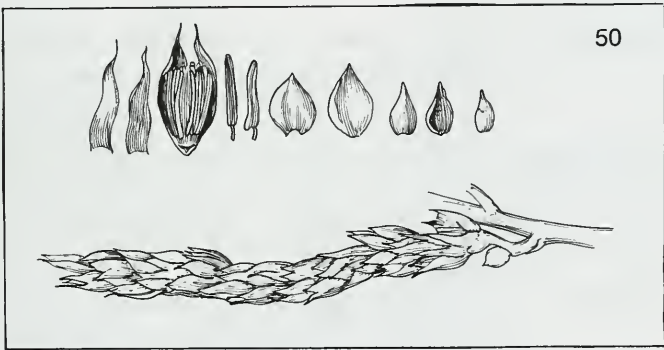
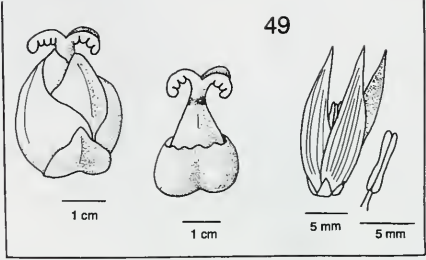
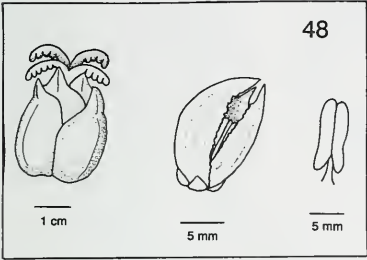
40. *A. victoriana*. *Top row, left to right*: Staminate flower. Stamen. *Bottom row, left to right*: Pistillate flower with perianth. Pistil with staminodial ring. *Patiño 215* (COL), *Patiño s.n.* (COL-39725). = ***A. amygdalina***.
41. *A. oleifera*. *Top*: Staminate flower showing partially nerved petals. *Bottom row, left to right*: Pubescent pistil. Pistillate flower. *Glaziou 15556* (G).
42. *A. allenii*. *Top center*: Stamen. *Cook 64* (US). *Bottom row, left to right*: Longitudinal and cross sections of fruit. *Moore et al. 9460* (BH). Apical portion of leaf showing asymmetrical tip and dark pubescent margin. *Moore et al. 9460* (BH). Staminate flower showing punctate glands and nerved petals. *Cook 64* (US).
43. *A. funifera*. *Left to right*: Cross section of fruit with seed, inconspicuous fibers in endocarp, and conspicuous line of fibers on both sides of mesocarp. *Dahlgren s.n.* (F-611639). Staminate flower. Stamen. *Glaziou 16483* (MO).



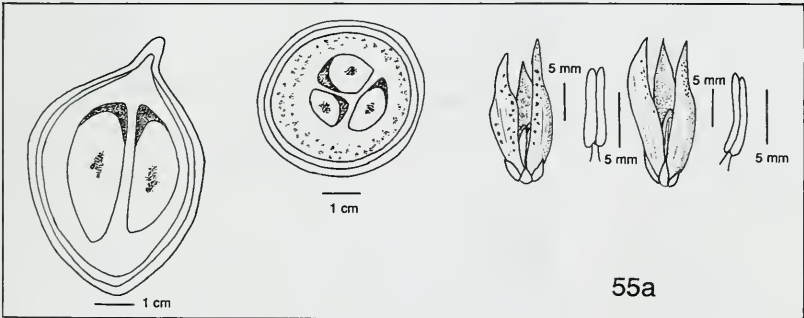
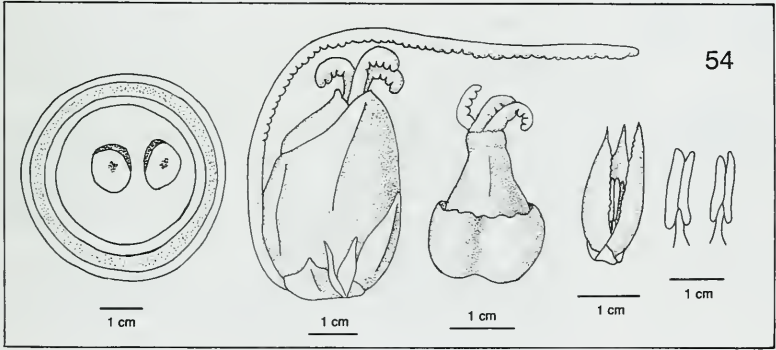
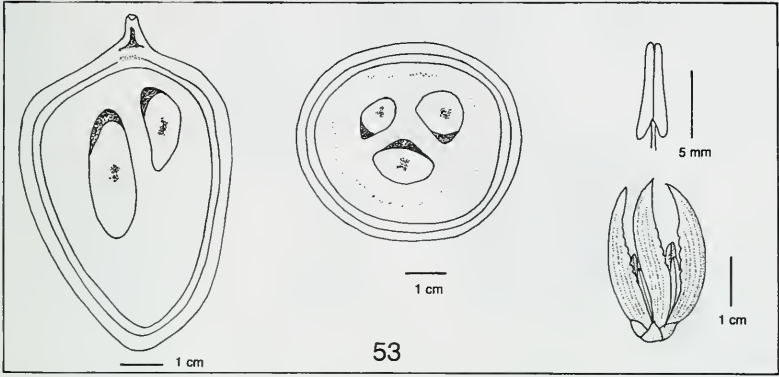
44. *A. barreirensis*. *Left to right*: Longitudinal section of fruit showing single seed. Staminate flower. Stamen. *Glassman 13048* (F).
45. *A. seabrensis*. *Left to right*: Cross section of fruit showing 2 seeds and conspicuous fibers in endocarp. *Glassman 13036* (F). Staminate flower. Stamen. *Glassman 13034* (F).
46. *A. ferruginea*. *Top row, left to right*: Cross section of fruit showing 3 seeds and fiber clusters. *Balick et al. 1000* (F). Staminate flower showing floccose patches of indument on lower half of petals. *Schultes et al. 18040* (US). *Second row*: Stamen. *Third row, left to right*: Pistil. Pistillate petal with nerves. *Bottom row, left to right*: Pistillate flower. Top view of staminodial ring of fruit showing ciliate margins. *Schultes et al. 18040* (BH).
47. *A. burretiana*. *Top row, left to right*: Longitudinal and cross sections of fruit showing thick mesocarp. *Bondar s.n. (F-619753)*. *Bottom row, left to right*: Staminate flower showing petals with dentate margins. Variations of shapes of stamens. *Bondar s.n. (F-619754, F-619759)*. Apical portion of leaf showing asymmetrical tip and dark lepidote margin. *Glassman 13008* (F).



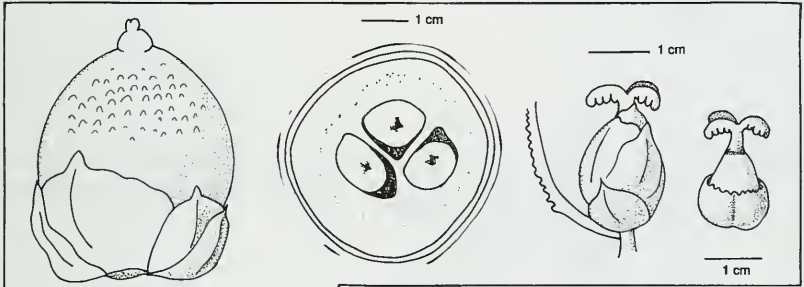
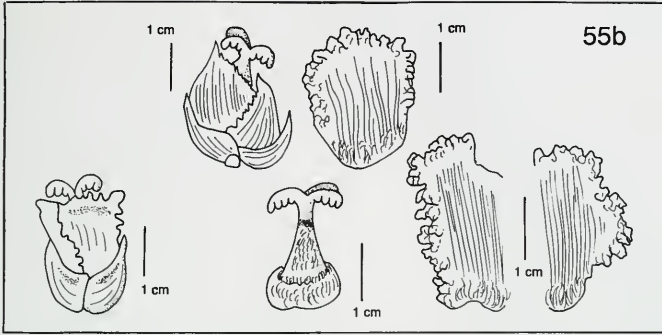
48. *A. guaranitica*. *Left to right*: Pistillate flower. Staminate flower with partially nerved petals. Stamen. *Schinini 14805* (F). = ***A. geraensis***.
49. *A. uberrima*. *Left to right*: Pistillate flower. Pistil. Staminate flower showing nerved petals. Stamen. *Jaramillo Mejia 199* (COL). = ***A. amygdalina***.
50. *A. compta*. *Top row*: Staminate flower with petals and stamens. *Bottom*: Sepals and petals of pistillate flower and staminate rachilla with staminate flowers and one pistillate flower at base. Martius, *Hist. Natur. Palm.* 2. t. 97. 1824.
51. *A. salvadorensis*. *Left to right*: Staminate flowers showing four petals with strong nerves, acuminate tips, and denticulate margins. Stamen with fairly long anther. *Glassman 13016* (F).
52. *A. tessmannii*. *Left*: Staminate flowers with nerved petals. *Top center*: Stamen. *Tessmann 5167* (NY). *Bottom right*: Cross section of fruit showing conspicuous fiber clusters and ring around seeds. *Tessmann s.n.* (B).



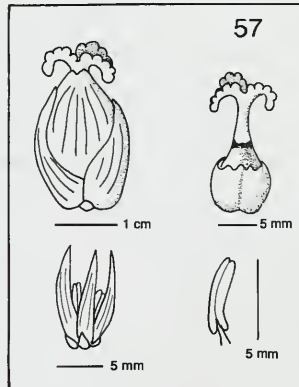
53. *A. humilis*. *Far left and center*: Longitudinal and cross sections of fruit showing relatively narrow mesocarp. *Bondar s.n.* (F-619755). *Top right*: Stamen. *Bottom right*: Staminate flower with nerved petals and denticulate margins. *Glassman 13014* (F).
54. *A. × piassabossu*. *Left to right*: Cross section of two-seeded fruit showing epicarp and two mesocarp layers (outer one is dotted). Pistillate flower with attached staminate rachilla. *Bondar s.n.* (F-619732). Pistil. Staminate flower. Stamens. *Bondar s.n.* (F-619762).
- 55a. *A. nucifera*. *Left to right*: Longitudinal and cross sections of fruit showing scattered fibers. Staminate flowers showing patches of dark glands. *Skolnik et al. 195016* (US). Stamens. *Romero Castañeda 5339* (COL).



- 55b. *A. nucifera*. *Top row, left to right*: Pistillate flower. Pistillate petal showing strong nerves and fluted margins. *Bottom row, left to right*: Pistillate flower. Pistil. Pistillate petals showing strong nerves and fluted margins. *Romero Castañeda 8392 (COL)*.
56. *A. geraensis*. *Top row, left to right*: External view of fruit showing rugose exterior. Cross section of fruit with three seeds. *Glassman 13087 (F)*. Pistillate flower with attached staminate rachilla. Pistil. *Eiten and Eiten 2212, 2220 (BH)*. *Bottom row, left to right*: Staminate flower. Stamen. *Glassman 8744 (F)*.
57. *A. dubia*. *Top row, left to right*: Pistillate flower. Pistil showing staminodial ring. *Glaziou 17341 (P)*. *Bottom row, left to right*: Staminate flower. Stamen. *Krapovickas 23154 (F)*.



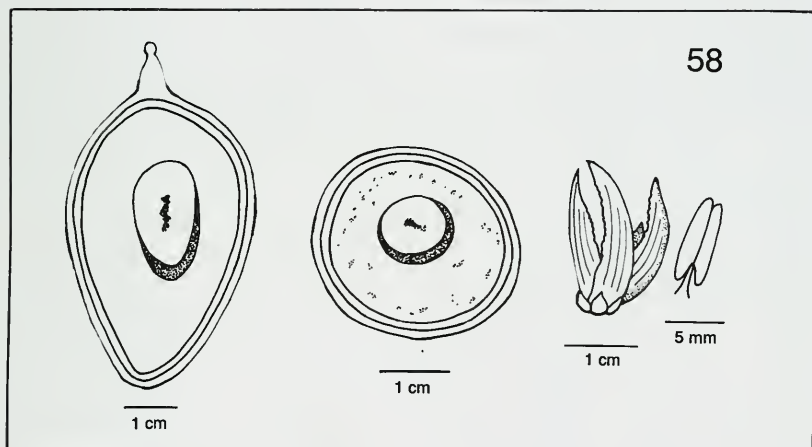
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58. *A. apoda*.

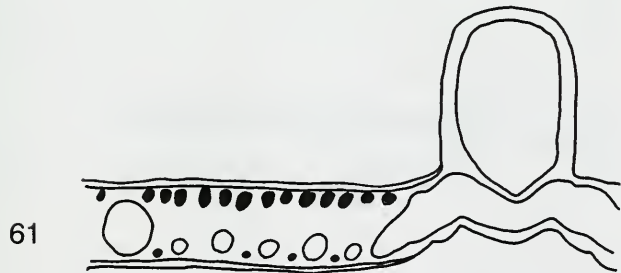
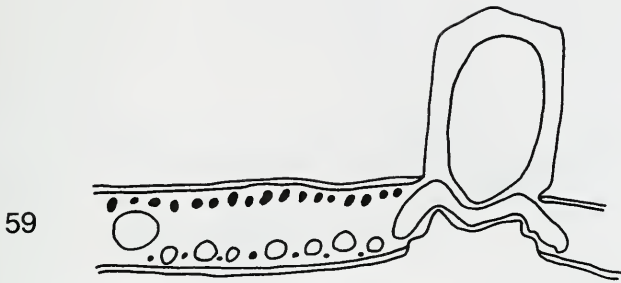
Left to right: Longitudinal and cross sections of fruit showing single seed. *Glassman 13000* (F). Staminate flower. Stamen. *Glassman 13006* (F).



***Attalea* Pinnae Cross Sections**

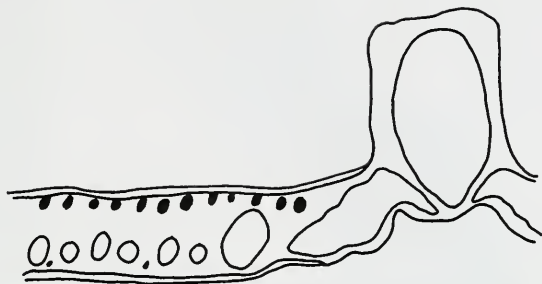
All illustrations are diagrams. Lamina (on left) shows upper and lower epidermis (double lines), adaxial nonvascular fiber bundles (NVF—upper solid patches), abaxial NVF (lower solid patches), and veins of three different sizes (empty circles). Midrib (on right) shows main vascular bundle (MVB) and expansion cell tissue (ECT). Sometimes, fibers are present in either or both (solid patches). Voucher specimens for each cross section are also listed. Most sections are magnified approximately 90 \times .

59. *A. ferruginea*. Wessels Boer 1945 (U).
60. *A. humilis*. Glaziou 8069 (C). Note irregularly shaped adaxial NVF and divided ECT.
61. *A. camposportoana*. Glassman 13006 (F). = ***A. apoda***.
62. *A. seabrensis*. Glassman 13034 (F).

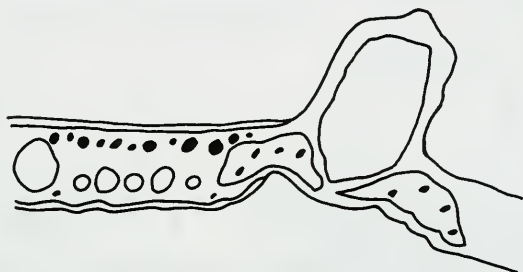


63. *A. geraensis*. Glassman 13065 (F).
64. *A. guaranitica*. Hassler 1860 (G). = ***A. geraensis***.
65. *A. allenii*. O. F. Cook 64 (US).
66. *A. septuagenata*. Schultes and Cabrera 15796 (BH). Note irregular size and distribution of NVE.

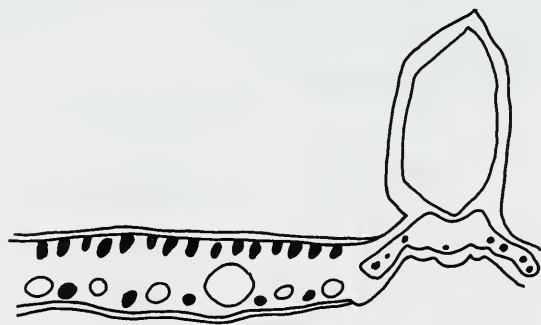
63



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66

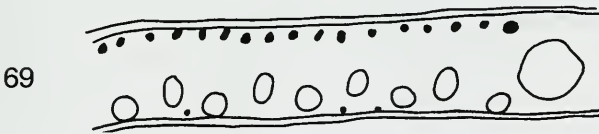
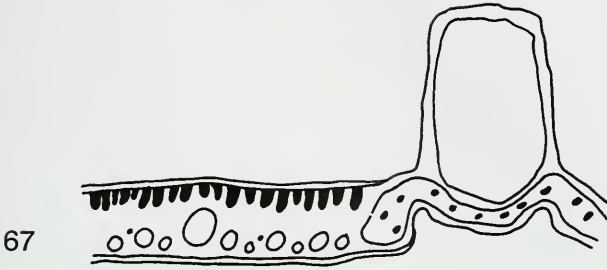


67. *A. oleifera*. *Glaziou 15556* (G).

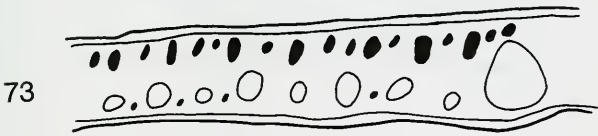
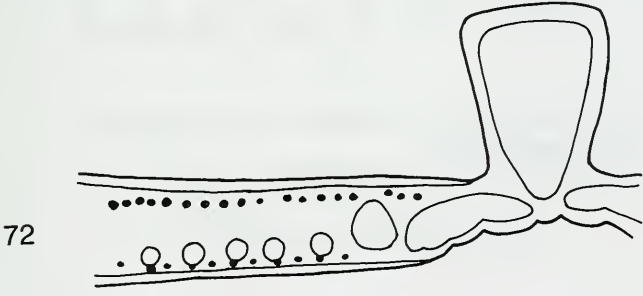
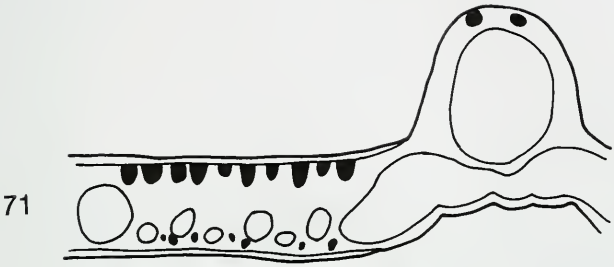
68. *A. funifera*. *Dahlgren s.n.* (F-16483). Note broad midrib, sharply pointed MVB, divided ECT, and triangular large vein.

69. *A. barreirensis*. *Glassman 13047* (F).

70. *A. brasiliensis*. *Glassman 13060* (F).

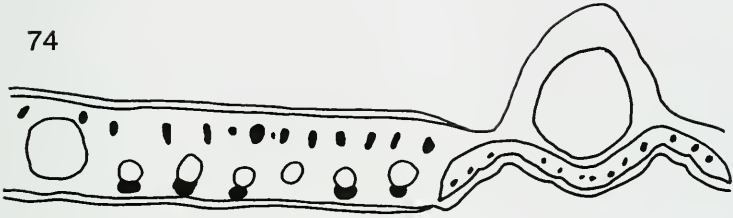


71. *A. burretiana*. Glassman 13008 (F).
72. *A. salvadorensis*. Glassman 13016 (F).
73. *A. concinna*. Bailey and Bailey 517 (BH). = **A. dubia**.

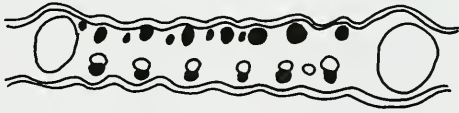


74. *A. dubia*. *Glaziou 8070* (F). Note differences from figs. 59, 60.
75. *A. exigua*. *Weddell 2965* (F).
76. *A. × piassabossu*. *Bondar s.n.* (F-619762).

74



75



76



Attalea Distribution Maps



77. *A. humilis*, *A. salvadorensis*, *A. x piassabossu*, *A. oleifera*.



78. *A. exigua*, *A. burretiana*, *A. dubia*, *A. barreirensis*.



79. *A. compta*, × *Attabignya minarum*, *A. brasiliensis*, *A. camposportoana* (= *A. apoda*).



80. *A. geraensis*, *A. seabrensis*, *A. pindobassu*, *A. funifera*.



81. *A. victoriana* (= *A. amygdalina*), *A. guaranítica* (= *A. geraensis*), *A. nucifera*, *A. septuagenata*, *A. iguadummat*.



82. *A. allenii*, *A. uberrima* (= *A. amygdalina*), *A. ferruginea*, *A. tessmannii*, *Ynesa colenda*.

Orbigny Figures



83. *O. phalerata*. Near Terezina. Piaui, Brazil. Natural stand of trees showing shape. Photo by B. E. Dahlgren.



84. *O. phalerata*. Near Terezina. Piaui, Brazil. Tree showing several infructescences with subtending sterile bracts. Photo by B. E. Dahlgren.



85. *O. phalerata*. Near Terezina. Piaui, Brazil. Boy holding relatively large staminate inflorescence and sterile bract. Photo by B. E. Dahlgren.

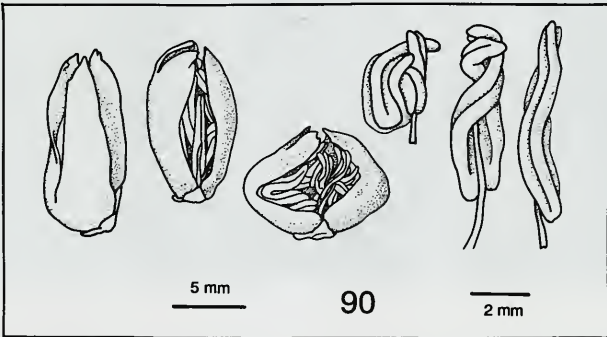
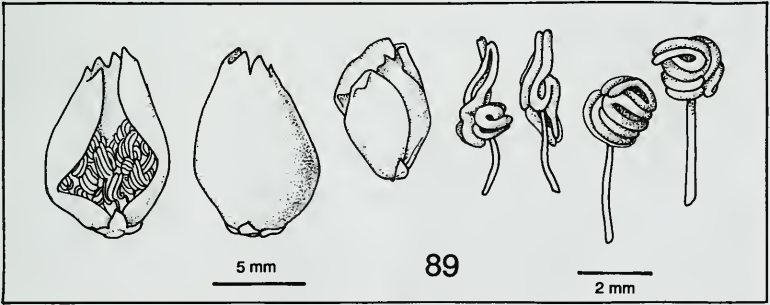
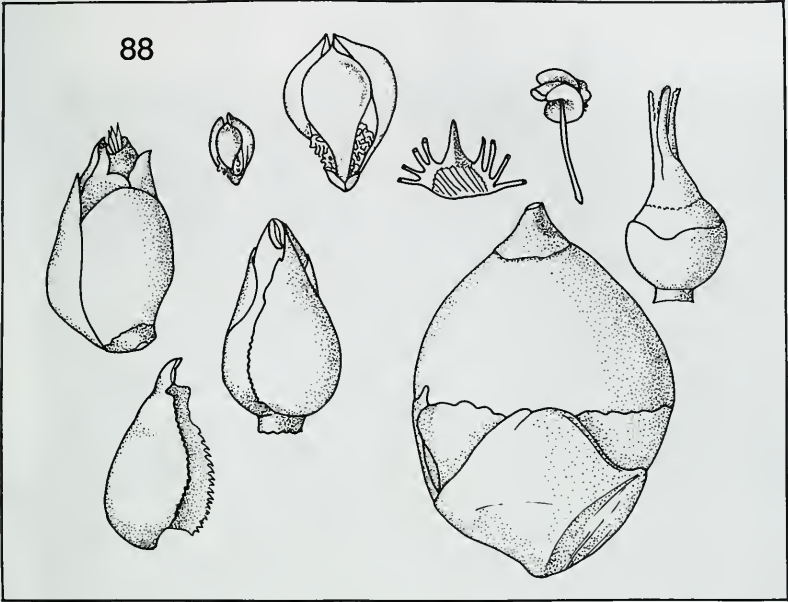


86. *O. phalerata*. Near Terezina. Piaui, Brazil. Cross sections of fruits showing 2-6 seeds and shape of whole seeds. Photo by B. E. Dahlgren.



87. *O. phalerata*. Far left: Androgynous inflorescence. Center: Various views of fruits and pistillate and staminate flowers. Far right: Staminate inflorescences. Lower right: Stamens with coiled antlers. Martius, Hist. Natur. Palm. 3:t. 170. 1845.

88. *O. cohune*. Pistillate and staminate flowers and fruit. Barbosa Rodrigues. Sert. Palm. 1:t. 54. 1903.
89. *O.* × *teixeirana*. Staminate flowers. Balick et al. (1987b).
90. × *Attabignya minarum*. Staminate flowers. Balick et al. (1987b).





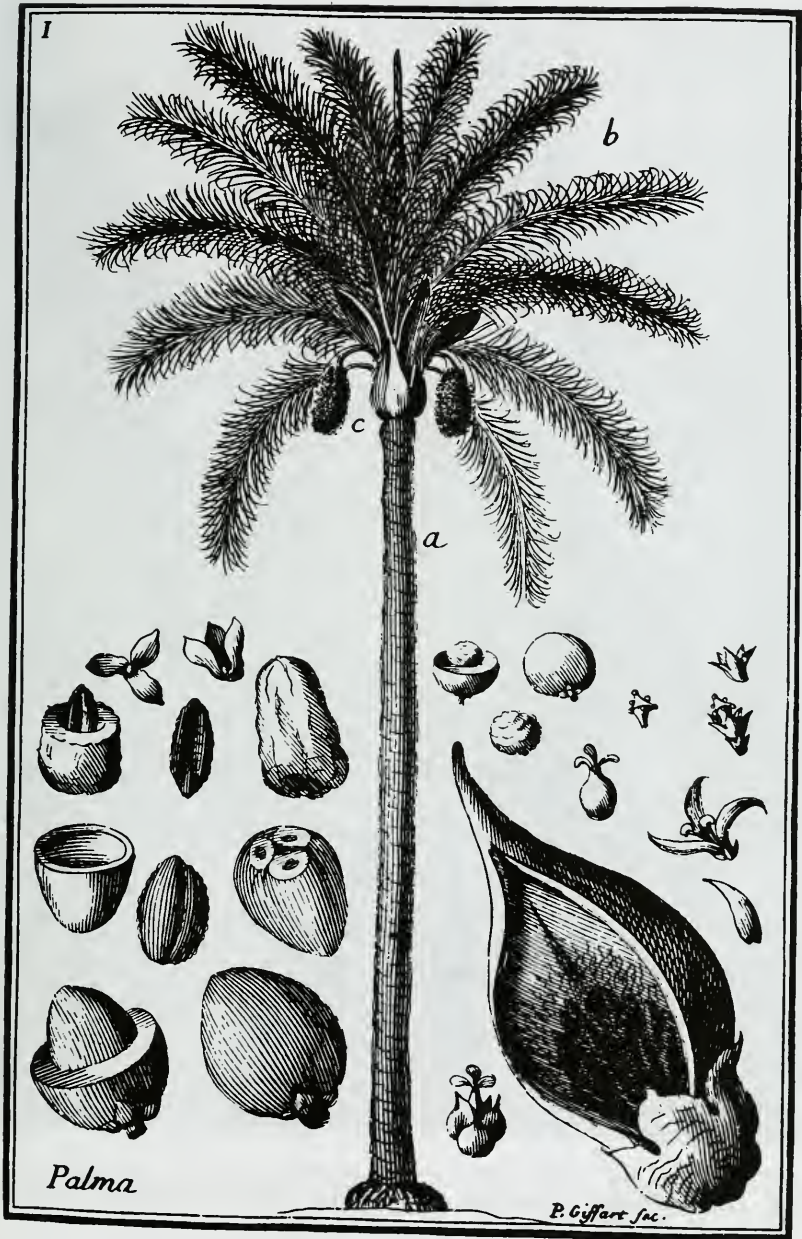
91. *O. eichleri*. Bondar s.n. (RB-80812).



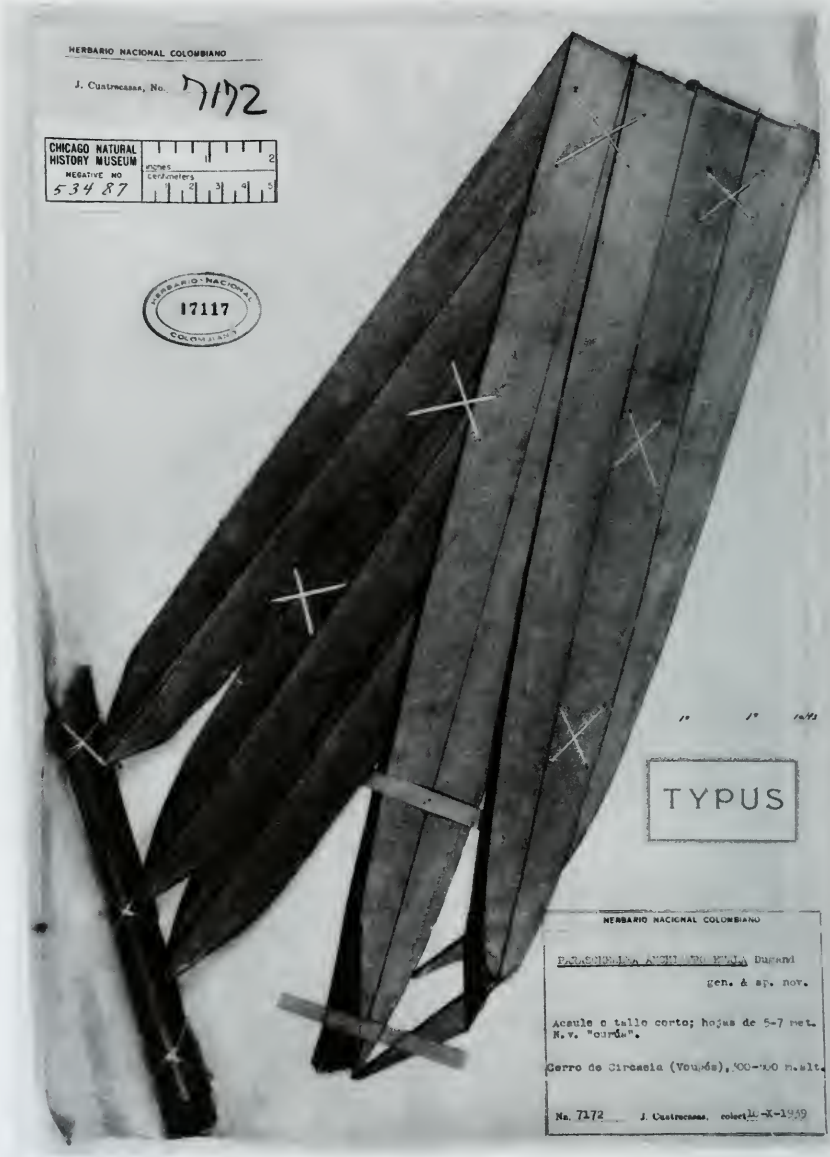
92. *O. guacuyule*. Hodge, *Principes* 19:133. 1975.



93. *O. cuatrecasana*. Cuatrecasas. Rev. Acad. Colomb. Cienc. 7:pl. 2, fig. 2. 1947.



94. *O. crassispatha*. Plumier, Nov. Pl. Amer. Gen. t. 1. 1703.

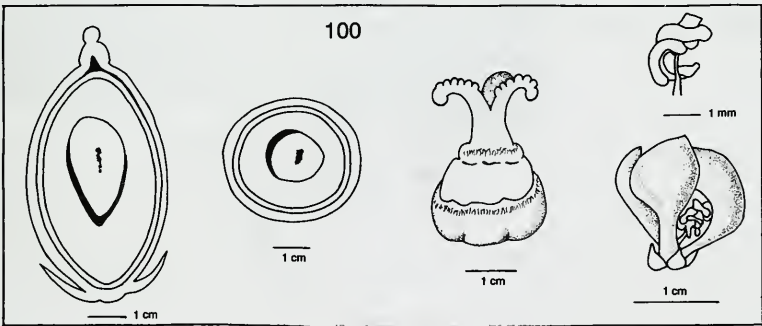
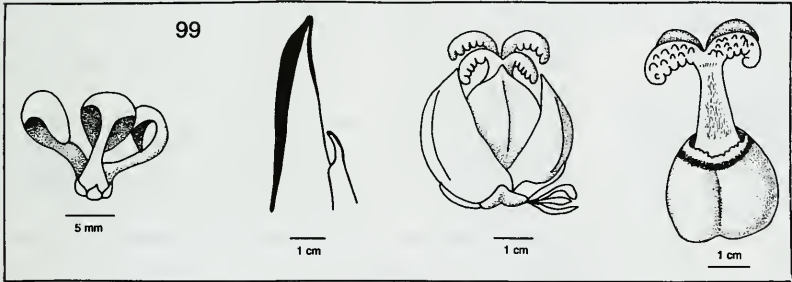
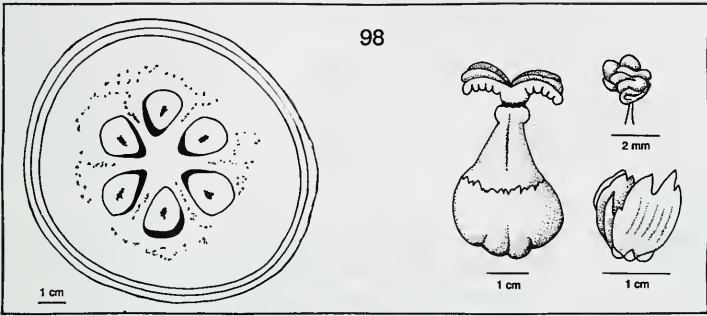


95. *O. luetzelburgii*. Cuatrecasas 7172 (COL). Type specimen of *Parascheelea anchistropetala*.

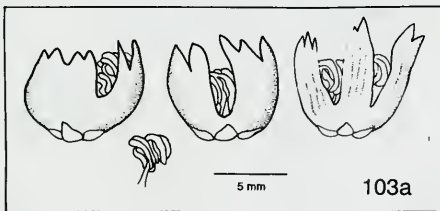
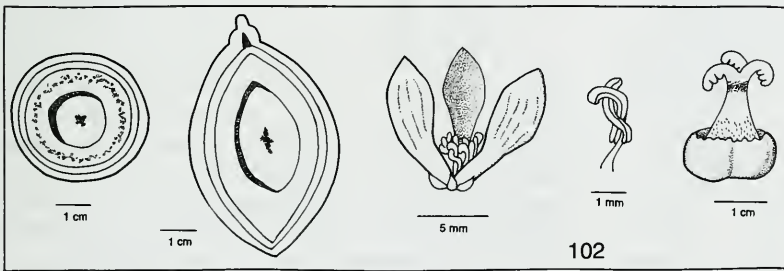
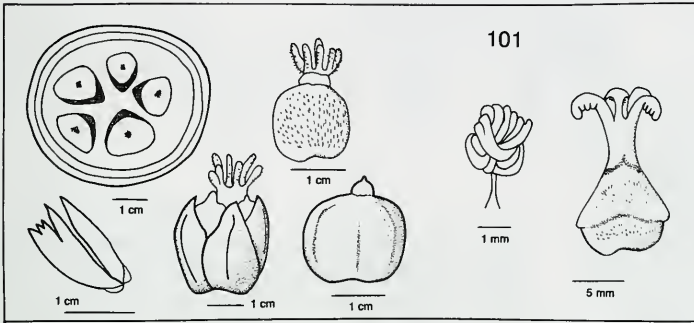


96. *O. luetzelburgii*. Staminate inflorescence at base of leaves. Schultes, *Principes* 18:6, fig. 1. 1974.

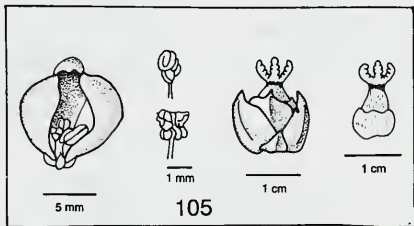
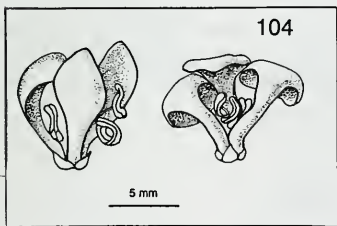
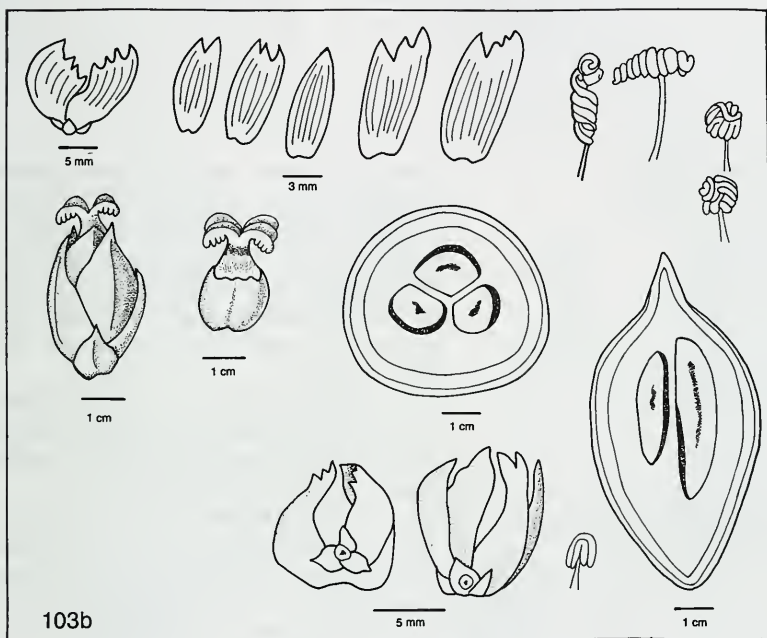
98. *O. brejinhoensis*. *Left*: Cross section of fruit showing relatively thick mesocarp, seeds, and scattered fibers in endocarp. *Glassman 13042* (F). *Center*: Pistil showing 6 stigmas and staminodial ring. *Top right*: Stamen with coiled anther. *Bottom right*: Staminate flower showing petals with irregular margins. *Glassman 13041* (F).
99. *O. cuatrecasana*. *Left to right*: Staminate flower showing spatulate petals fused at base. *Cook 81* (US). Apical portion of pinna showing asymmetrical tip and pubescent margin. *Schultes et al. 7373* (GH). Pistillate flower with attached staminate flower at base. Pistil showing 4 stigmas, pubescent style, and pubescent staminodial ring. *Cuatrecasas 16389* (COL).
100. *O. cohune*. *Far left*: Longitudinal and cross sections of fruit showing relatively thin mesocarp, single seed, and lack of fibers. *Yuncker 4970* (F). *Right of center*: Pistil showing 3 stigmas and short staminodial ring. *Glaziou 16468* (MO). *Top right*: Stamen showing coiled anther. *Bottom right*: Staminate flower showing spatulate petals and coiled anthers. *Glaziou 16468* (B).



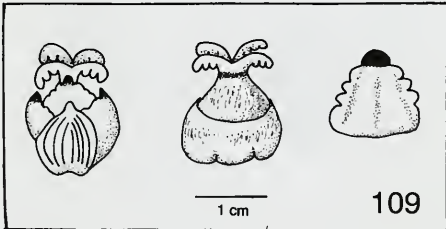
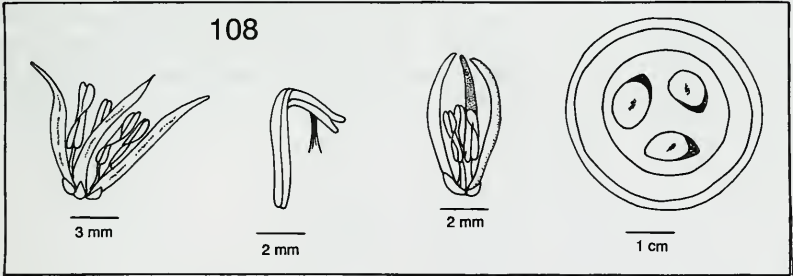
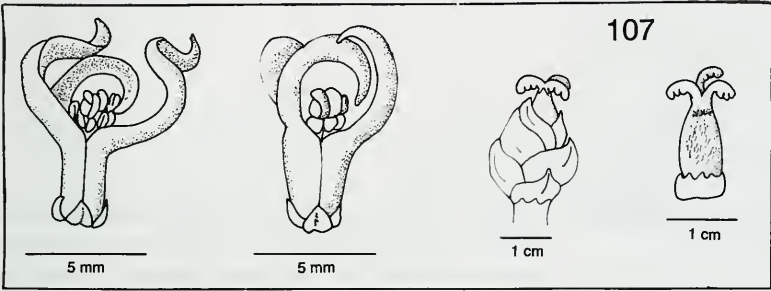
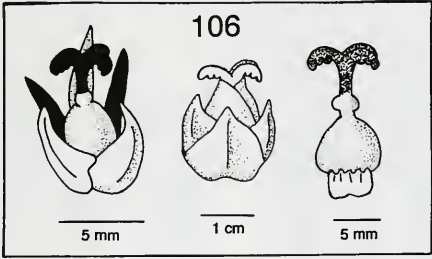
101. *O. eichleri*. *Top left*: Cross section of fruit showing 5 seeds. *Bottom left*: Staminate flower showing fused petals with irregular laciniate tips and one lanceolate petal. *Middle, top to bottom*: Pistillate flower with 6 stigmas. Pistil with 7 stigmas. Pistillate petals with apical projections. *Right*: Stamen showing coiled anther. Pistil with staminodial ring removed showing 4 stigmas and pubescent ovary. *Bondar s.n.* (F).
102. *O. guacuyule*. *Left to right*: Cross and longitudinal sections of fruit showing ring of fibers in endocarp (cross section) and single seed. *Moore and Valiente 6199* (BH). Staminate flower showing nerved spatulate petals. Stamen showing coiled anthers stretched out from drying. *Moore and Valiente 6199* (BH). Pistil showing 3 stigmas, pubescent ovary, and staminodial ring. *Moore and Cetto 6405* (BH).
- 103a. *O. phalerata*. *Top row, left to right*: Staminate flowers showing various degrees of fusion of petals and irregular laciniate tips. Flower on far right with partially nerved petals. *Bottom*: Coiled anthers. *Kuntze s.n.* (NY).



- 103b. *O. phalerata*. *Top row, left to right*: Staminate flower with partially nerved petals. *Sanders 1762* (FTG). Staminate petals showing strong nerves and irregular tips (five views). *Balick et al. 1359* (NY). Anthers (*left*). *Martius, t. 32* (1844). Anthers (*right*). *Burret, t. 9* (1929a). *Second row, left to right*: Pistillate flower with 4 stigmas. Pistil with 6 stigmas and pubescent ovary. *Kuntze s.n.* (NY). Cross sections of fruit showing relatively thick endocarp and seeds. *Dahlgren s.n.* (F-614714). *Bottom row, left to right*: Staminate flowers showing partially fused and separate petals. Frontal view of calyx with scars. Coiled anthers. *Orbigny 20* (M). Longitudinal section of fruit showing relatively thick endocarp and seeds. *Dahlgren s.n.* (F-614714).
104. *O. polysticha*. Two views of staminate flowers showing spatulate petals. *Prance et al. 2155* (NY), *Bunting et al. 3571* (F).
105. *O. sagotii*. *Left to right*: Staminate flower with spatulate petals. *Sagot 601* (P). Stamens with coiled anthers. *Wessels Boer 276* (U). Pistillate flower. Pistil. *Sagot 831* (P).



106. *O. crassipatha*. *Left to right*: Transitional flower showing outer imbricate pistillate sepals, a pistil with black style and stigmas, and 3 black, narrow fleshy staminate petals. *Figueras and Louis 2785* (F). Pistillate flower with imbricate sepals and petals. Pistil showing black style and stigma with constricted staminodial ring. *Ekman 7164* (US).
107. *O. luetzelburgii*. *Left to right*: Staminate flowers showing hooked and curved fleshy petals (two views). *Wessels Boer 2374* (F); *Luetzelburg 21969* (B). Pistillate flower. Pistil. *Wessels Boer 2374* (F).
108. \times *Maximbignya dahlgreniana*. *Left to right*: Staminate flower showing flattened sickle-shaped petals and stamens with twisted anthers. *Wessels Boer 805* (U). Enlarged stamen with twisted anther. Staminate flower with flattened petals. *Bondar s.n.* (F). Cross section of fruit showing very thick mesocarp and 3 seeds. *Bondar s.n.* (F).
109. *O. \times teixeirana*. *Left to right*: Pistillate flower showing 4 stigmas and nerved sepals. Pistil with staminodial ring. Separate petal with fluted edges and darkened tip. *Balick et al. 1312* (NY).



- 110a-d. *Ynesa colenda*. All figures are of staminate flowers from staminate inflorescences. Figure a represents a collection from several trees; but b and c each represent flowers collected from a single tree showing two kinds of petals and two kinds of anthers. Figure a. *Little 6518* (BH). Figure b. *Dodson 5753* (BH). Figure c. *Dodson and Duke 7742* (BH). Figure d. Staminate flowers. After Balslev and Henderson, fig 8. 1987.

110

Figure a

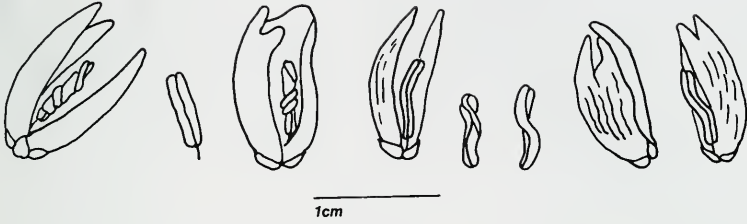


Figure b

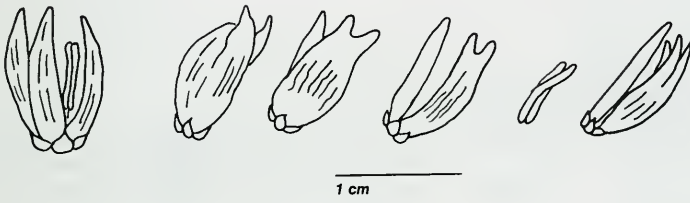


Figure c

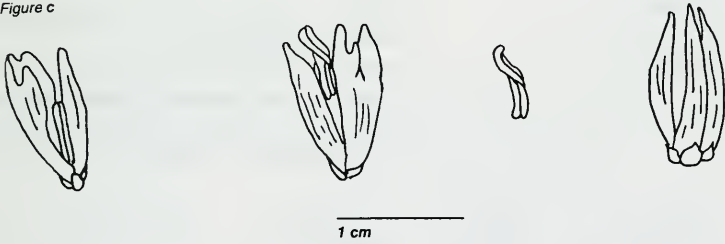
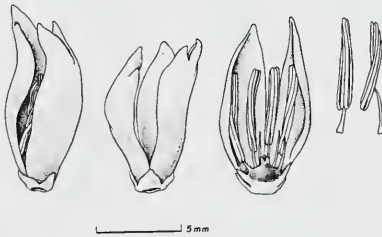


Figure d



111. Hybrid between
Orbignya sp. and *Scheelea* sp.
or *Attalea* sp. Sanders 1735 (FTG). *Left to right:* Staminate flower with flat narrow petals. Coiled anthers. Cross section of fruit with 3 seeds and clusters of fibers in endocarp.
112. *O. oleifera*. Staminate flowers. Balick, Anderson, and Medeiros Costa (1987).
113. *O. oleifera*. *Noblick and Lima 4645* (F). *Left:* Cross section of fruit showing seeds and conspicuous clusters of fibers. *Right:* Variation of staminate flowers from one collection.

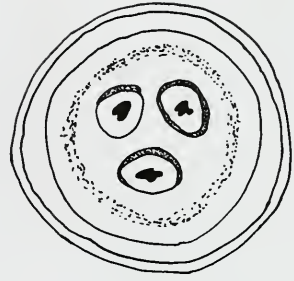
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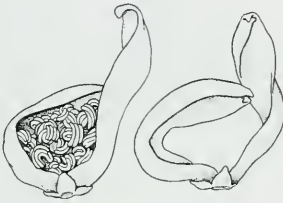
1 cm



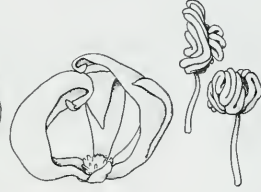
0.5 cm



1 cm

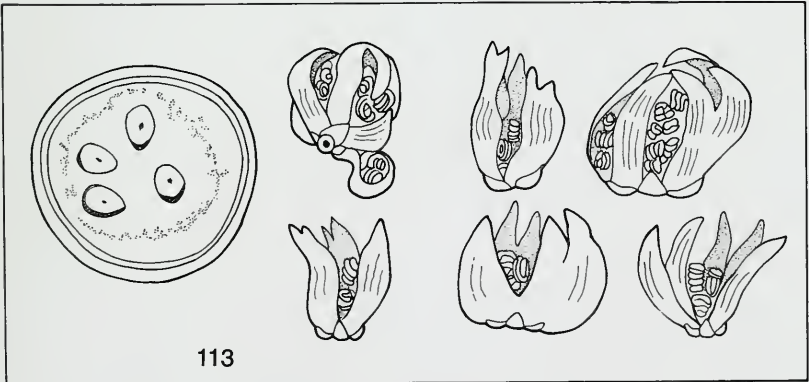


5 mm



2 mm

112



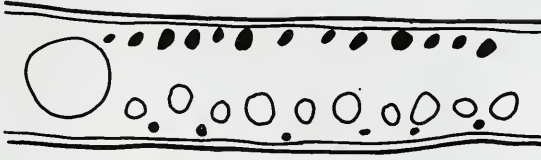
113

***Orbignya* Pinnae Cross Sections**

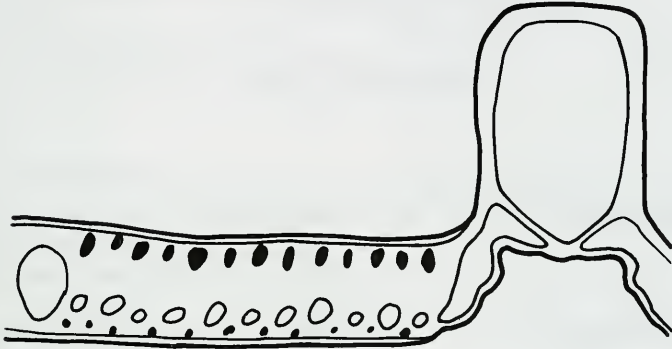
All illustrations are diagrams. Lamina (on left) shows upper and lower epidermis (double lines), adaxial nonvascular fiber bundles (NVF—upper solid patches), abaxial NVF (lower solid patches), and veins of three different sizes (empty circles). Midrib (on right) shows main vascular bundle (MVB) and expansion cell tissue (ECT). Sometimes, fibers are present in either or both (solid patches). Voucher specimens for each cross section are also listed. All sections are magnified approximately 90 \times .

114. *O. brejinhoensis*. *Glassman 13041* (F). Note similarity in shape and distribution of NVF to that in *O. phalerata*.
115. *O. phalerata*. *Glassman 10418* (F). Note divided expansion cell tissue (ECT), abundant adaxial NVF mostly regular in shape, and common abaxial NVF.
116. *O. luetzelburgii*. *Luetzelburg 21969* (M). Note abundant, irregularly arranged and shaped adaxial NVF and common, large, and irregularly shaped abaxial clusters attached to base of small and medium veins.
117. *O. polysticha*. *Wessels Boer 2409* (U). Note abundant, adaxial NVF, scattered abaxial NVF, and common fiber clusters in ECT.

114



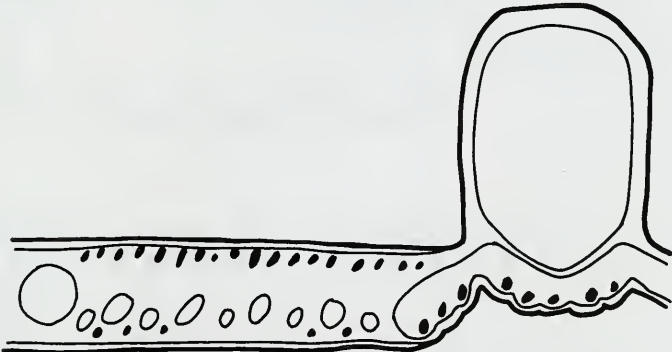
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116

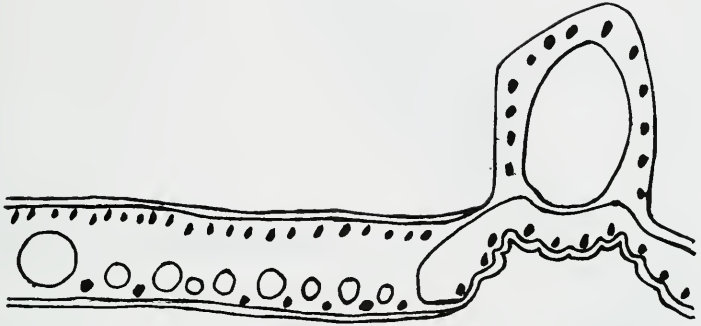


117

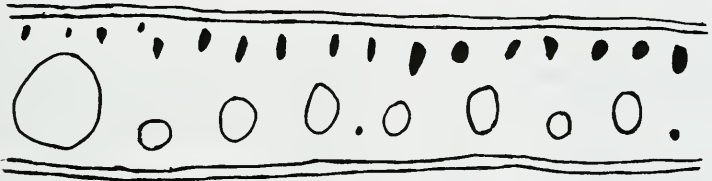


118. *O. sagotii*. *Huebner 100* (B). Note abundant, regularly shaped adaxial NVF, fairly common abaxial NVF, and common fiber clusters in midrib and ECT.
119. *O. huebneri*. *Huebner 64* (B). Note abundant and irregularly shaped adaxial NVF and uncommon abaxial NVF.
120. × *Maximbignya dahlgreniana*. *Bondar s.n.* (F). Note uncommon, small adaxial and abaxial NVF.
121. *O. cohune*. *Steyermark 45693* (F). Note abundant, large, irregularly arranged clusters of adaxial NVF and scattered abaxial NVF.

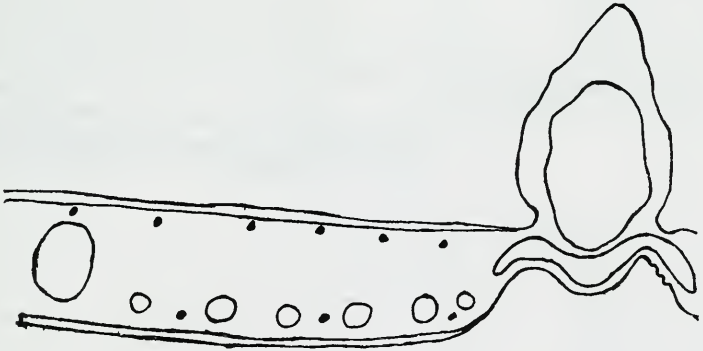
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119



120

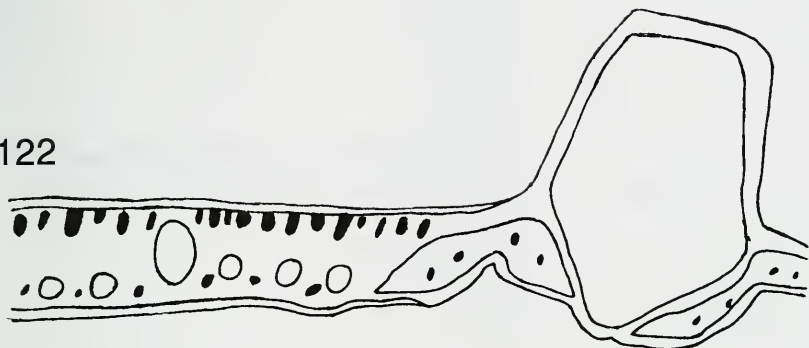


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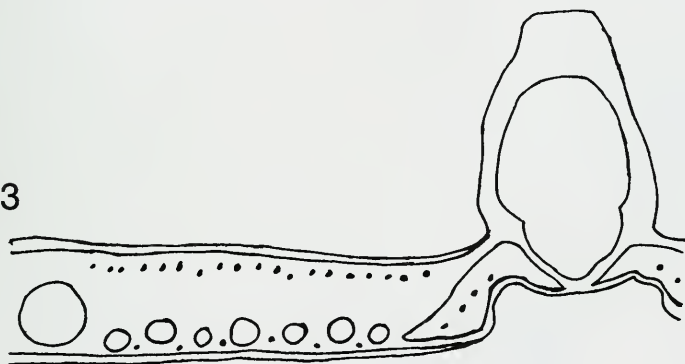


122. *O. crassispatha*. *Ekman H7164* (NY). Note abundant, irregularly shaped adaxial NVF, fairly common abaxial NVF, and divided ECT with few fiber clusters.
123. *O. guacuyule*. *Bennington 9488* (NY). Note abundant, very small clusters of adaxial NVF, fairly common abaxial NVF, and divided ECT with few fiber clusters.
124. *O. cuatrecasana*. *Schultes et al. 7373* (GH). Note abundant, irregularly shaped adaxial NVF, fairly common abaxial NVF, and divided ECT with abundant fiber clusters.

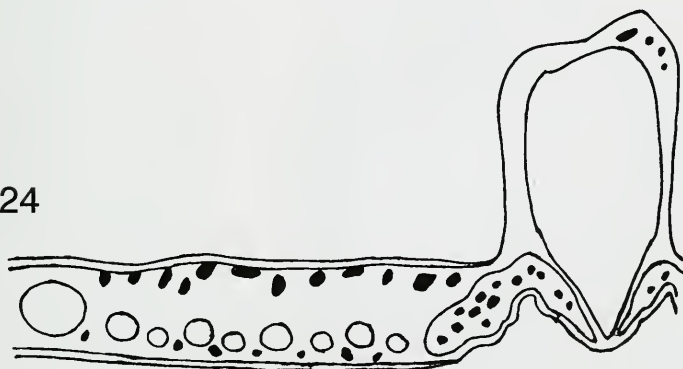
122



123



124



***Orbignya* Distribution Maps**



125. *O. phalerata*, *O. brejinhoensis*, *O. sagotii*, *O. luetzelburgii*



126. *O. eichleri*, *O. oleifera*, *O. polysticha*, × *Maximbignya dahlgreniana*,
O. x teixeirana

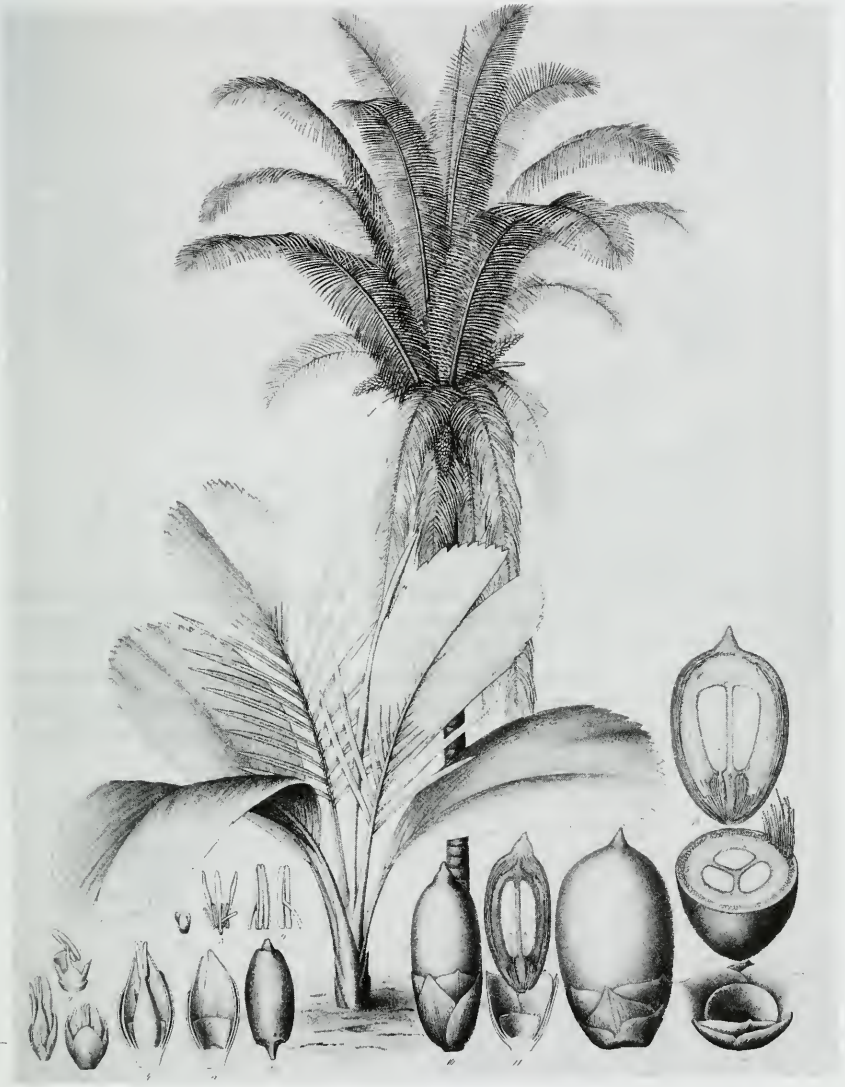


127. x *Maximibignya dahlgreniana*, *O. luetzelburgii*, *O. cuatrecasana*



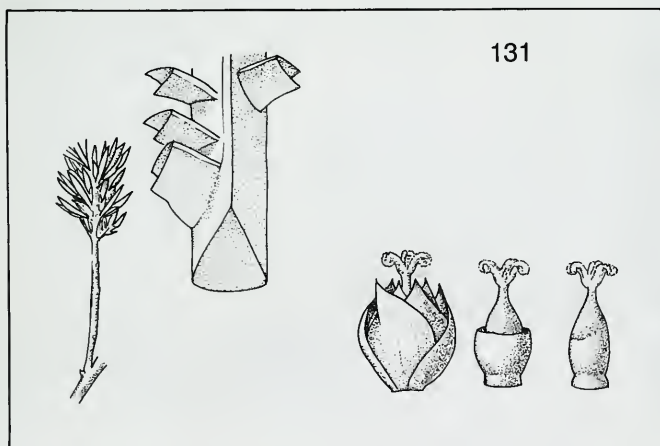
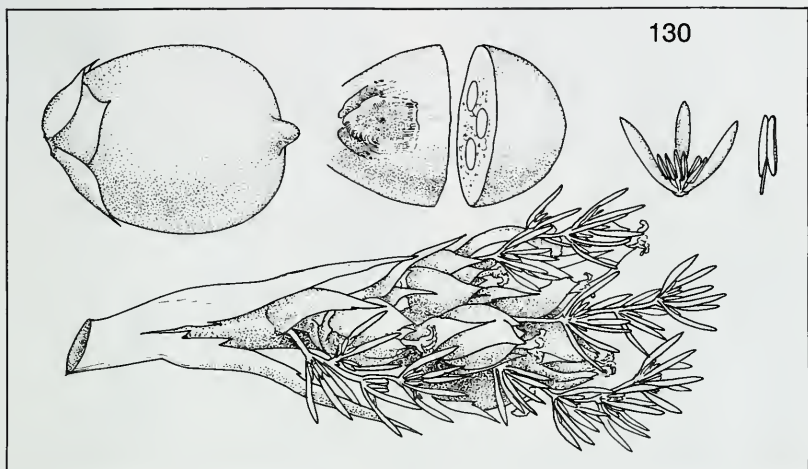
128. *O. phalerata*, *O. polysticha*, *O. sagotii*

Scheelea Figures

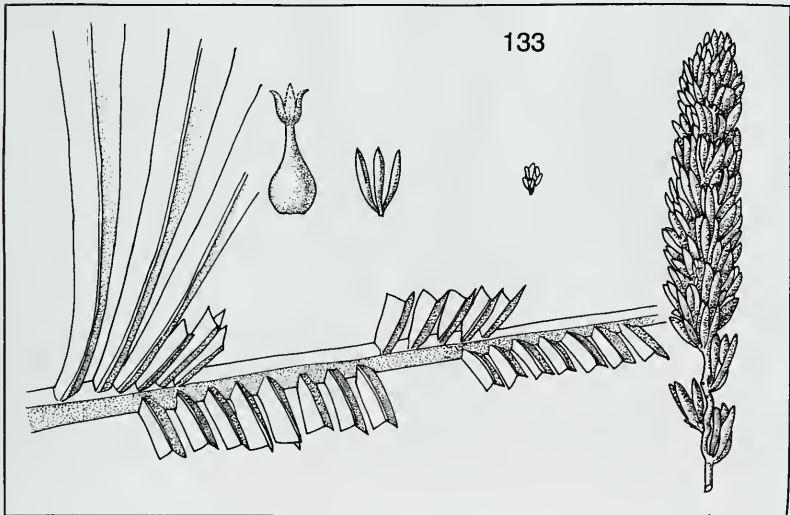
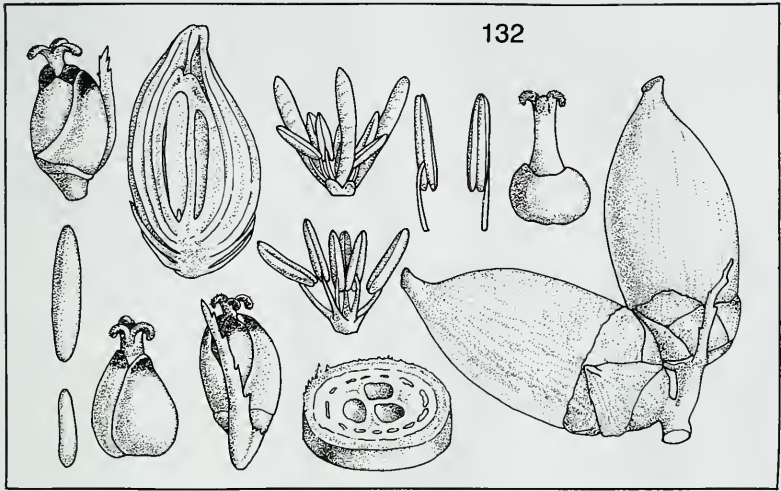


129. *S. regia* Lectotype of Scheelea Karsten, Fl. Columb. 2:t. 176. 1866.
= *S. butyracea*.

130. *S. attaleoides* *Top row, left to right:* Fruit. Staminate flower. Stamen. *Bottom:* Part of androgynous inflorescence. Karsten, Fl. Columb.1:t. 67. 1861. = **S. insignis.**
131. *S. attaleoides* *Left to right:* Part of staminate inflorescence. Part of leaf showing base of pinnae. Pistillate flower. Pistils with and without staminodial ring. Karsten, Fl. Columb.1:t. 67. 1861. = **S. insignis.**



132. *S. kewensis*. Fruits and staminate and pistillate flowers. J. Hooker, Curtis Bot. Mag. t. 7552, 7553. 1897.
133. *S. insignis*. *Left and bottom*: Part of leaf showing clustered pinnae, *Center*: Pistillate and staminate flowers. *Far right*: Staminate inflorescence. Martius, Hist. Natur. Palm. 2:t. 94. 1826.

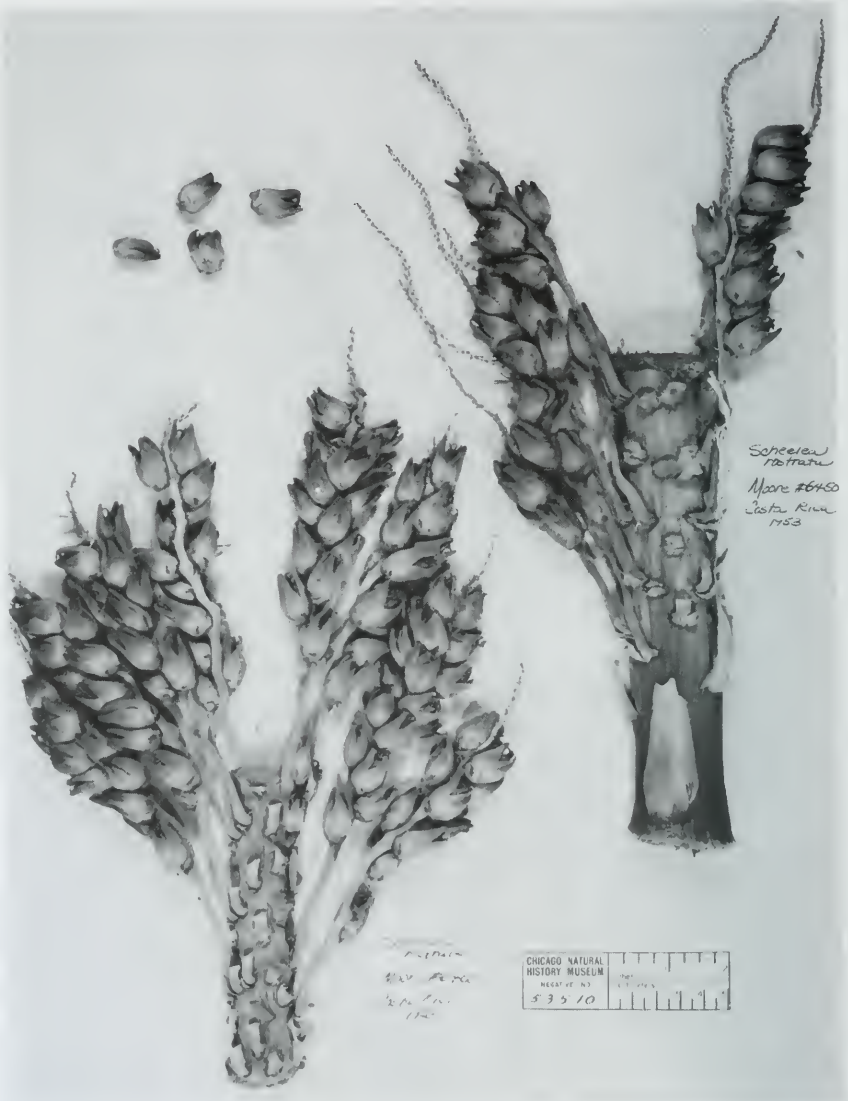




134. *S. magdalenica*. Romero Castañeda 8225 (COL). Several androgynous rachillae showing pistillate flowers below and rather short naked extension of staminate portion of rachilla.



135. *S. butyracea*. Cuatrecasas 8945 (COL). Several androgynous rachillae showing pistillate flowers below and rather long naked extension of staminate portion of rachilla.



136. *S. rostrata*. Moore 6450 (BH). Portions of androgynous inflorescence showing androgynous rachillae with pistillate flowers below and rather short- to medium-sized extensions of staminate portion of rachillae.



137. *S. rostrata*. Moore 6450 (BH). Portion of staminate inflorescence showing rather long staminate rachillae with staminate flowers.



138. *S. osmantha*. Photo by A. C. Langlois from Trinidad.



139. *S. guianensis*, de Granville 7087 (CAY). Staminate inflorescences showing relatively short rachillae and spirally arranged staminate flowers.

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NEGATIVE NO.
62369

REVISION OF *ATTALEA* HBK. ALLIANCE

Scheelea degranvillei Glassman

HOLOTYPE

n. sp.

S. F. GLASSMAN

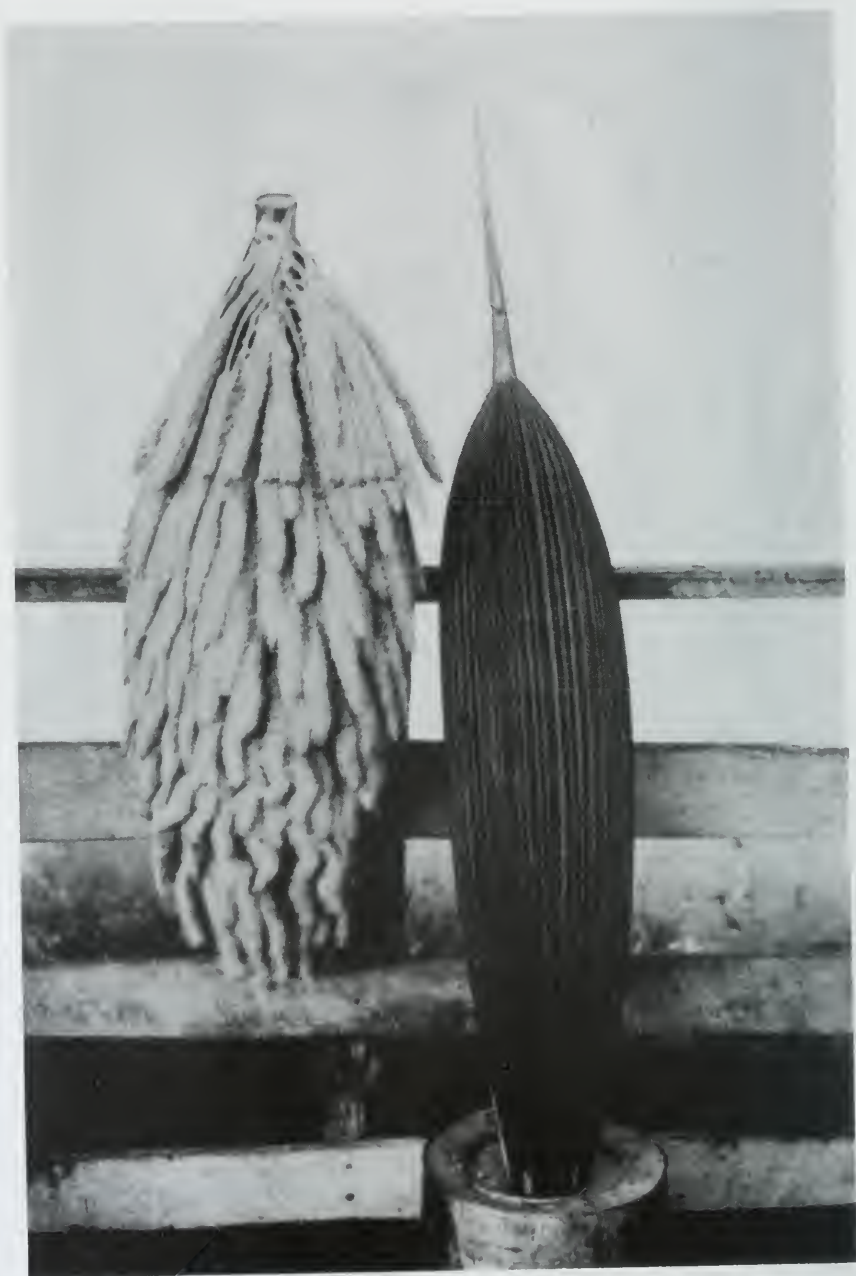
May 1986



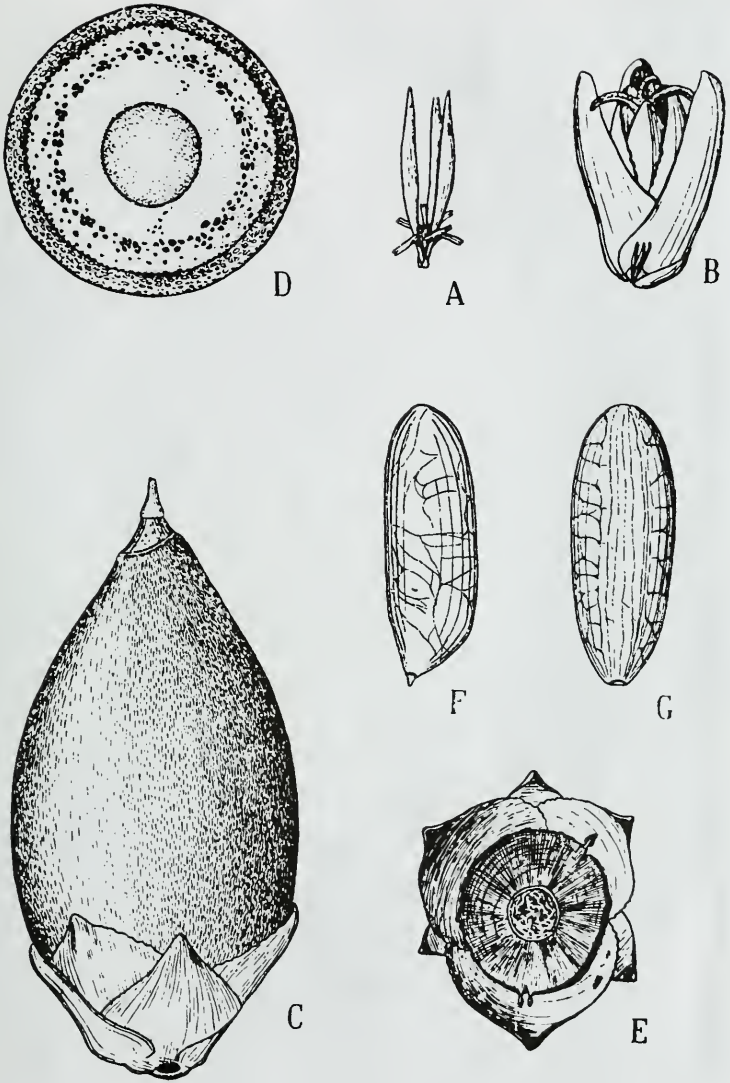
140. *S. degranvillei*. de Granville 5566 (CAY). Whitish staminate rachillae showing spiral staminate flowers with whitish anthers.



141. *S. lundellii*. Base of petiole showing long fibers. Bartlett (1935).



142. *S. lundellii*. Staminate inflorescence. Bartlett (1935).



143. *S. liebmannii*. Various fruits, seeds, and staminate and pistillate flowers. Hernandez Xolocotzi (1947).



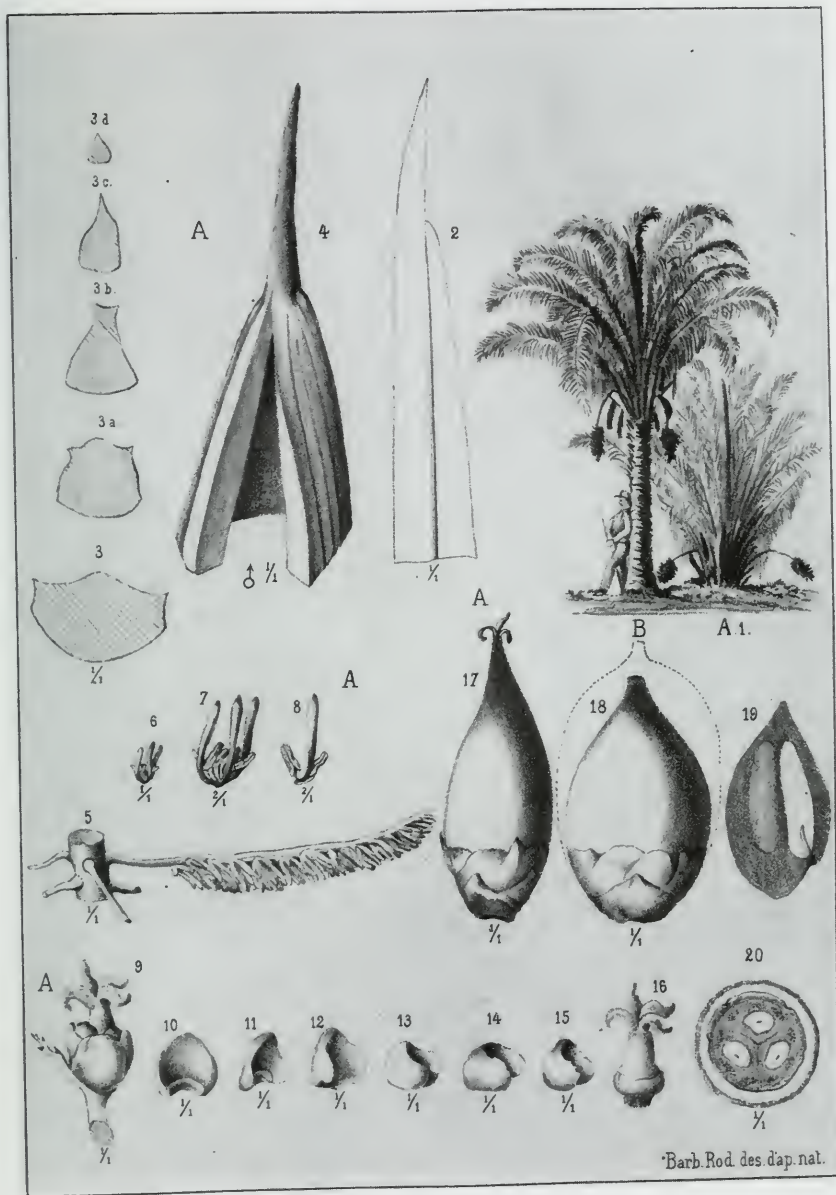
144. *S. liebmannii*. Androgynous inflorescence. Hernandez Xolocotzi (1947).



145. *S. liebmannii*. Various seeds and fruit sections. Hernandez Xolocotzi (1947).



146. *S. microspadix* Burret. Holotype. Hopp 3010 (B). = *S. phalerata*.



147. *S. princeps* var. *corumbaensis* Barb. Rodr., Palm. Matt. t. 21A. 1898. = *S. phalerata*.

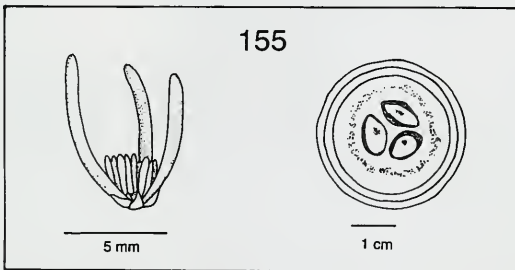
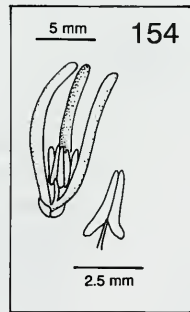
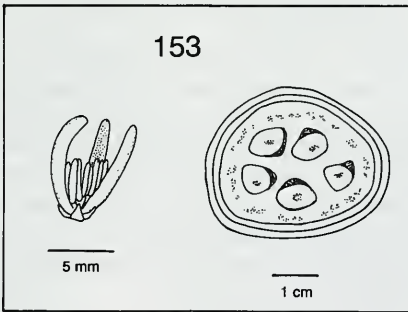
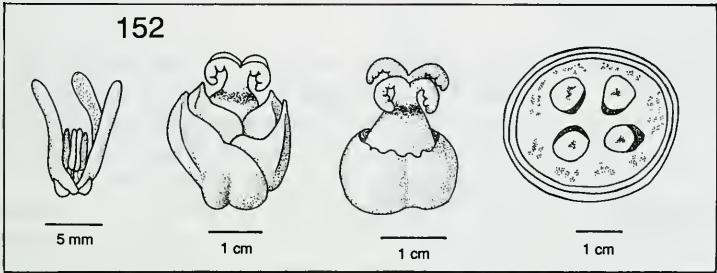
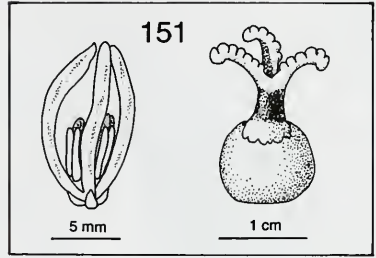
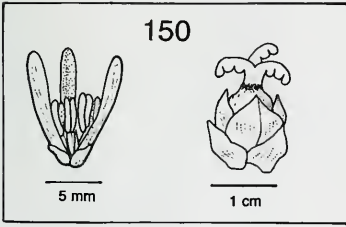


148. *S. guianensis*. Staminate inflorescence at base of acaulescent plant. *de Granville* 7087 (CAY).



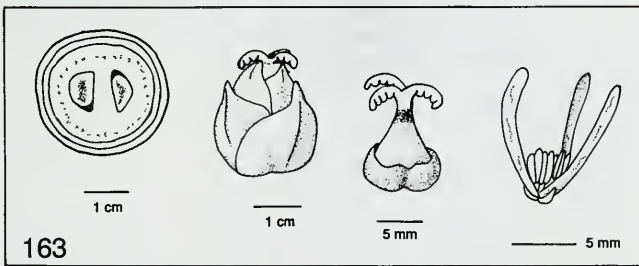
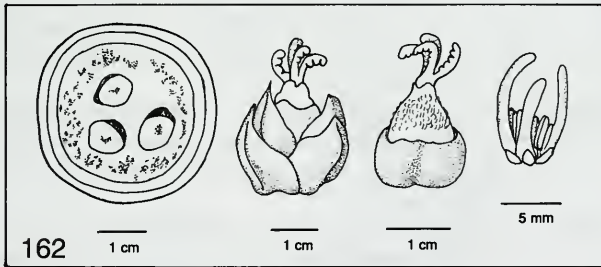
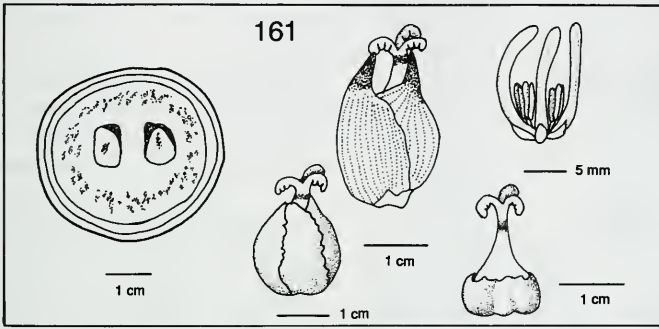
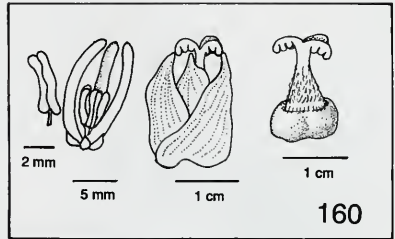
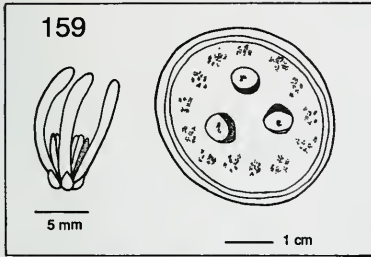
149. *S. guianensis*. Acaulescent plant showing leaf with regularly arranged pinnae. de Granville 7087 (CAY).

150. *S. fairchildensis*. *Left to right*: Staminate flower. Pistillate flower. *Read 900* (BH).
151. *S. butyracea*. *Left to right*: Staminate flower showing partially nerved petals. *Dryander 12* (B). Pistil showing 3 stigmas and large staminodial ring. *Cuatrecasas 8945* (COL).
152. *S. amylacea*. *Left to right*: Staminate flower. Pistillate flower showing 4 stigmas. Pistil showing staminodial ring. *Glaziou 16489* (P). Cross section of fruit showing 4 seeds and conspicuous fiber clusters in endocarp. *Dahlgren and Millar s.n.* (F-611601).
153. *S. huebneri*. *Left to right*: Staminate flower. Cross section of fruit showing 5 seeds. *Krukoff 1615* (F).
154. *S. lundellii*. *Left to right*: Staminate flower. Stamen. *Steyermark 45718a* (F).
155. *S. wesselsboerii*. *Left to right*: Staminate flower. *Wessels Boer 1990* (F). Cross section of fruit showing 3 seeds. *Schulz and Rodrigues 420* (U).

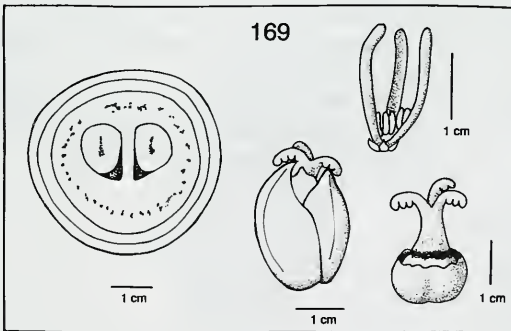
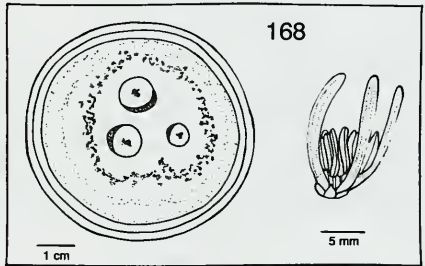
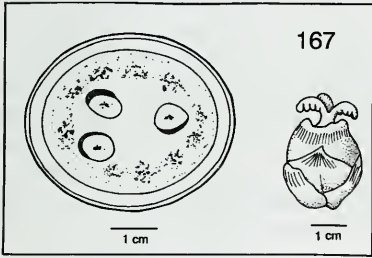
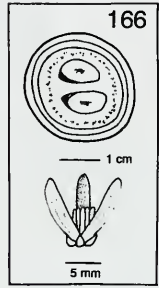
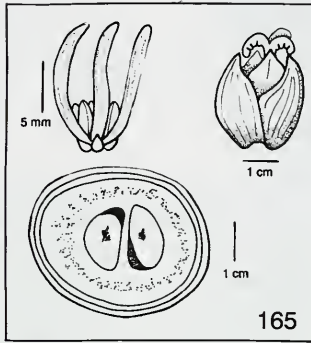
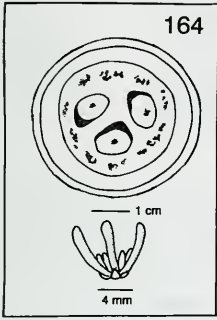


156. *S. bassleriana*. *Top*: Pistillate flower showing staminate extension of rachilla. *Middle left*: Pistil with 3 stigmas and pubescent ovary. *Tessmann 5237* (NY). *Middle right*: Staminate flower. *Tessmann 5490* (NY). *Bottom*: Cross section of fruit with seeds and conspicuous clusters of fibers. *Tessmann 5490* (B).
157. *S. insignis*. *Top row, left to right*: Pistillate flower. Pistil with 4 stigmas and pubescent ovary. *Triana 731* (P). *Bottom row, left to right*: Staminate flower. Stamen. *Dugand and Jaramillo 2915* (COL). Cross section of fruit showing relatively conspicuous clusters of fibers. *Killip 34270* (US).
158. *S. huebneri*. *Top row, left to right*: Cross section of fruit with one seed. Pistil without and with staminodial ring, both showing pubescent ovary. Pistillate flower with petals covering stigmas. Pistillode showing long narrow stigmas and pubescent ovary. *Far left*: Normal staminate flower. Stamen. *Bottom row, left to right*: Series of five staminate flowers from androgynous rachilla showing normal unisexual in 1 and 2, transitional unisexual in 3 and 4, and transitional bisexual in 5. *Krukoff 5618* (NY).

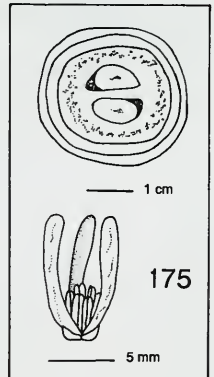
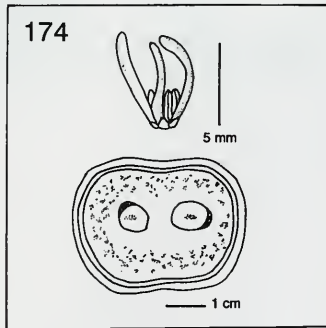
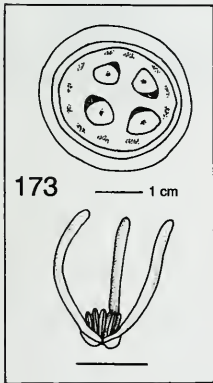
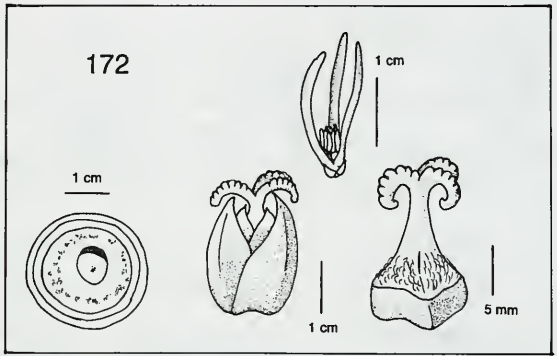
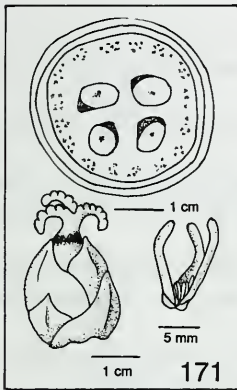
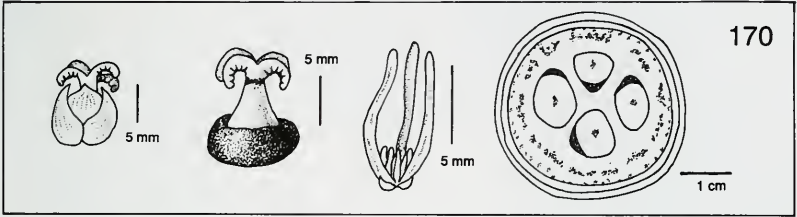
159. *S. kewensis*. *Left to right*: Staminate flower. *Royal Bot. Gard. Kew s.n.* (K). Cross section of fruit with conspicuous fiber clusters and 3 seed cavities. *Nuss s.n.* (BH).
160. *S. liebmannii*. *Left to right*: Stamen. Staminate flower. *Moore et al. 9482* (BH). Pistillate flower with finely nerved sepals and petals. Pistil. *Moore 6121* (BH).
161. *S. macrocarpa*. *Far left*: Cross section of fruit showing prominent fibers in endocarp and 2 seeds. *Bailey 252* (BH). *Top center*: Pistillate flower with striated sepals and dark constricted tips. *Top right*: Staminate flower. *Bottom center*: Pistillate flower showing sepals removed and fluted margins of petals. *Bottom right*: Pistil. *Steyermark and Davidse 116494* (MO.)
162. *S. leandroana*. *Left to right*: Cross section of fruit with relatively thick mesocarp, conspicuous fibers in endocarp, and 3 seeds. *Dahlgren s.n.* (F-611640). Pistillate flower. Pistil showing 4 stigmas and pubescent ovary. *Bailey 462* (BH). Staminate flower showing unequal petals. *Dahlgren s.n.* (F-611651).
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170. *S. phalerata*. *Left to right*: Pistillate flower showing nerved perianth and 4 stigmas. Pistil showing dark staminodial ring. *Weddell 2030* (P). Staminate flower with partially nerved petals. *Glaziou 22268* (P). Cross section of fruit with conspicuous clusters of fibers and 4 seeds. *Glassman 13091* (F).
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176. *S. guianensis*. *de Granville 7087* (CAY). Staminate flower showing finely nerved fleshy petals.
177. *S. camopiensis*. *de Granville 2087* (CAY). Staminate flower showing smooth fleshy petals.
178. *S. degranvillei*. *de Granville 9094* (CAY). Staminate flowers showing rather thick, irregularly nerved, and wrinkled fleshy petals.
179. *S. maripensis*. *de Granville 10174* (CAY). Staminate flower showing relatively long, irregularly nerved, and wrinkled fleshy petals.
180. *S. maripensis*. *Sist 172* (CAY). Staminate flower showing relatively long, irregularly nerved, and wrinkled fleshy petals.
181. *S. maripensis*. *Sist 171* (CAY). Pistillate flower and young pistil.
182. Hybrid between *Scheelea* sp. and *Maximiliana maripa*. Staminate flower showing narrow fleshy petals with hooked tips and very long anthers. *Wessels Boer 1330* (F).

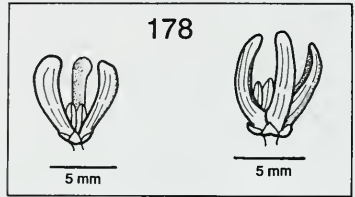
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***Scheelea* Pinnae Cross Sections**

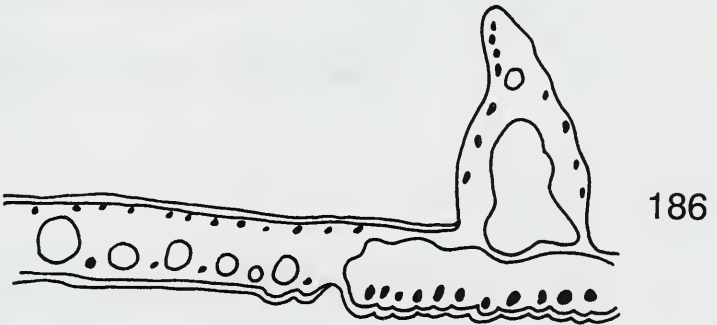
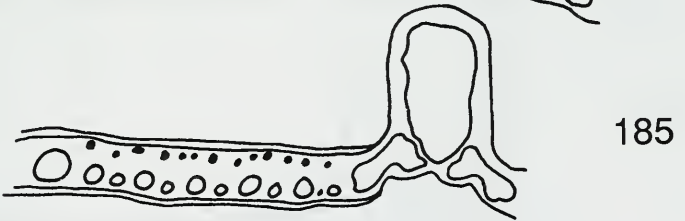
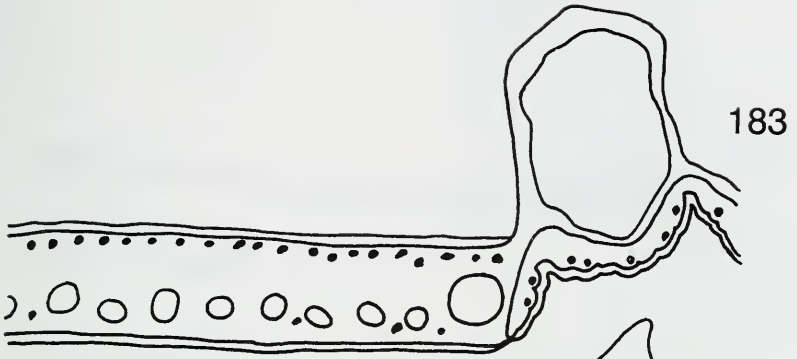
All illustrations are diagrams. Lamina (on left) shows upper and lower epidermis (double lines), adaxial nonvascular fiber bundles (NVF—upper solid patches), abaxial NVF (lower solid patches), and veins of three different sizes (empty circles). Midrib (on right) shows main vascular bundle (MVB) and expansion cell tissue (ECT). Sometimes, fibers are present in either or both (solid patches). Voucher specimens for each cross section are also listed. All sections are magnified approximately 90 \times .

183. *S. bassleriana*. *Tessmann 5490* (NY). Note abundant, evenly sized adaxial NVF, scattered abaxial NVF, and fibers in ECT.

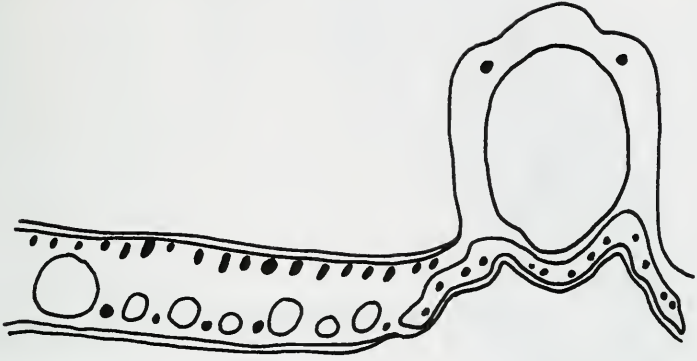
184. *S. huebneri*. *Krukoff 5572* (NY). Note uncommon adaxial NVF and relatively large ECT with fiber clusters.

185. *S. kewensis*. *Furtado s.n.* (BH). Note abundant, irregularly shaped adaxial NVF, rare adaxial NVF, and divided ECT.

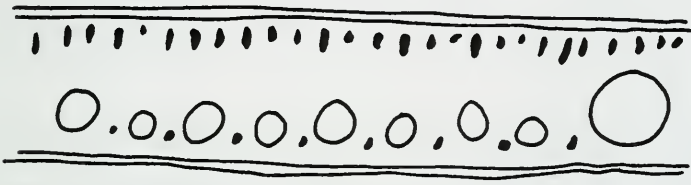
186. *S. insignis*. *Triana 731* (P). Note relatively large ECT with fiber clusters and midrib with fiber clusters.



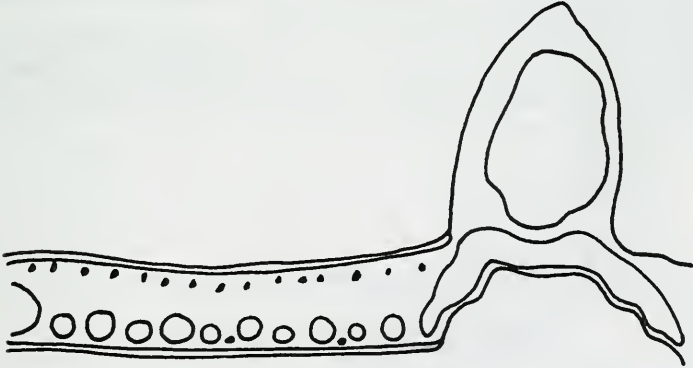
187. *S. osmantha*. *Glaziou 16487* (F). Note abundant, irregularly shaped adaxial NVF, scattered abaxial NVF, and fiber clusters in ECT.
188. *S. macrocarpa*. *Wessels Boer 2106* (U). Note abundant, irregularly shaped adaxial NVF and common abaxial NVF.
189. *S. phalerata*. *Glassman 13063* (F). Note abundant adaxial NVF and uncommon abaxial NVF.
190. *S. anisitsiana*. *Hassler 7165* (G). Note common adaxial NVF and rare abaxial NVF.



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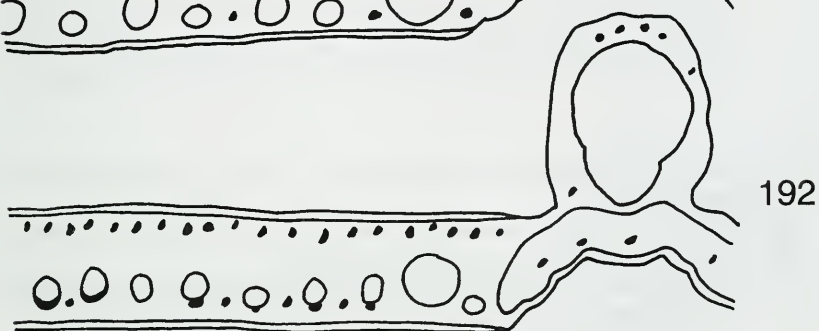
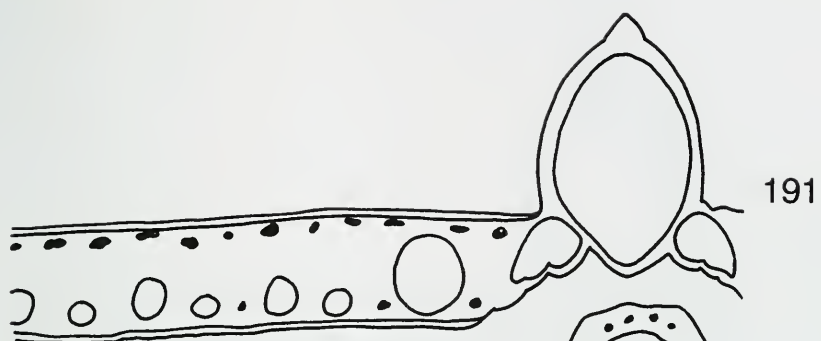


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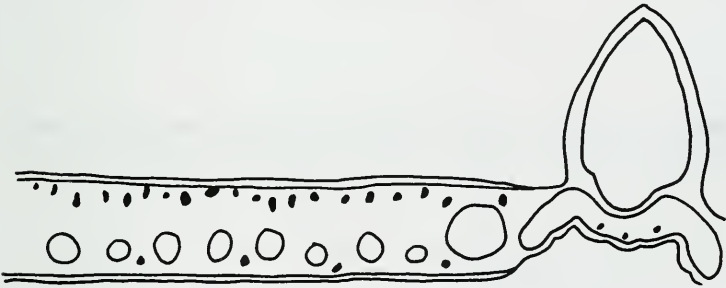
191. *S. amylacea*. *Dahlgren s.n.* (F-611601). Note mostly horizontal irregular adaxial NVF, uncommon abaxial NVF, and divided ECT.
192. *S. liebmannii*. *Moore and Cetto 6229* (BH). Note abundant adaxial NVF and common abaxial NVF mostly attached to base of veins.
193. *S. lundellii*. *Lundell 3752* (MICH). Note abundant adaxial NVF, scattered abaxial NVF, and fiber clusters in ECT.
194. *S. rostrata*. *Bailey and Bailey s.n.* (BH). Note abundant adaxial NVF, scattered abaxial NVF, and fiber clusters in ECT.



195. *S. maracaibensis*. *Wessels Boer 2007* (US). Note common adaxial NVF and scattered abaxial NVF.
196. *S. wesselsboerii*. *Wessels Boer 1990* (U). Note abundant irregularly shaped and distributed adaxial NVF and scattered abaxial NVF.
197. *S. lauromuelleriana*. *Dahlgren s.n.* (F-611607). Note abundant irregularly shaped and distributed adaxial NVF, common abaxial NVF, and divided ECT.



195

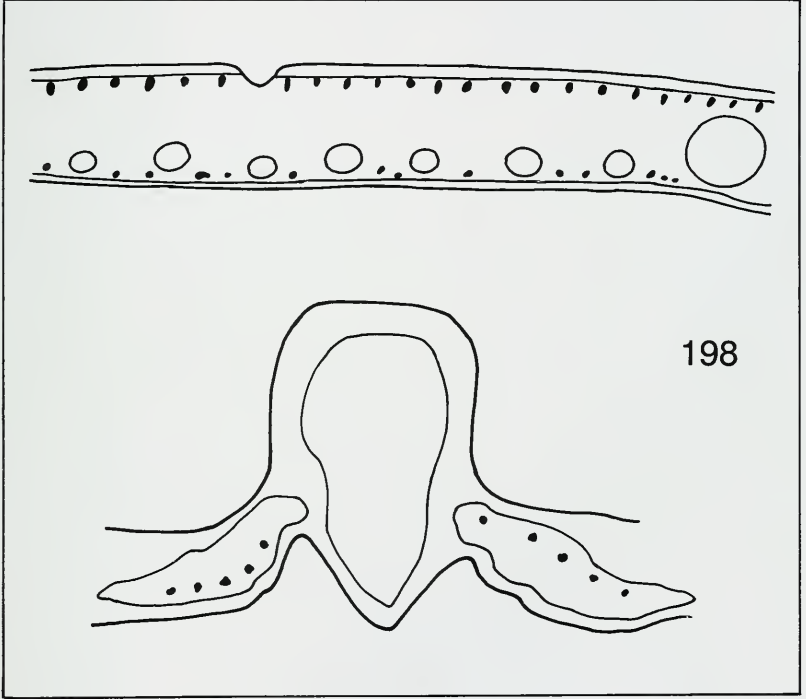


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198. Hybrid between *Scheelea* sp. and *Maximiliana maripa*. *Wessels Boer 1330* (U).
Note short clusters of adaxial NVE, common abaxial NVE, and divided ECT.



Scheelea Distribution Maps





200. *S. moorei*, *S. tessmannii*, *S. macrocarpa*, *S. magdalenica*, *S. maracaibensis*, *S. parviflora* (= *S. anisitsiana*)



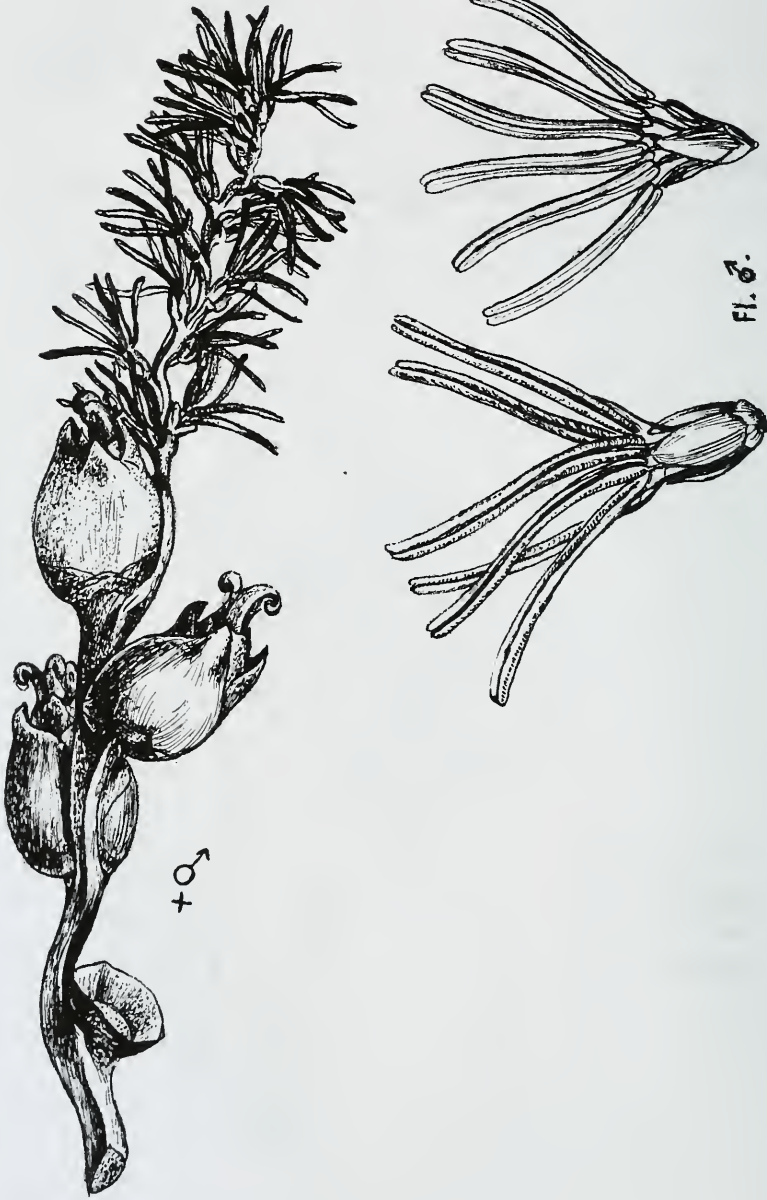
201. *S. osmantha*, *S. bassleriana*, *S. salazarii*, *S. butyracea*, *S. weberbaueri*



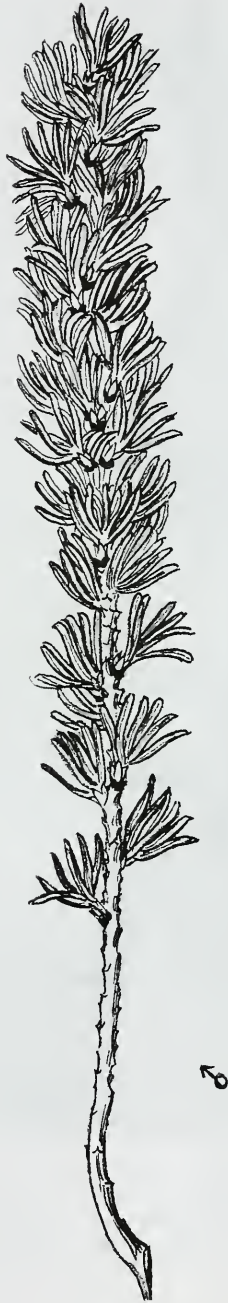
202. *S. insignis*, *S. wesselsboerii*, *S. princeps*, *S. macrolepis*, *S. cephalotes*, *S. plowmanii*

203. *S. guianensis*, *S. camopiensis*, *S. degranvillei*, *S. maripensis*

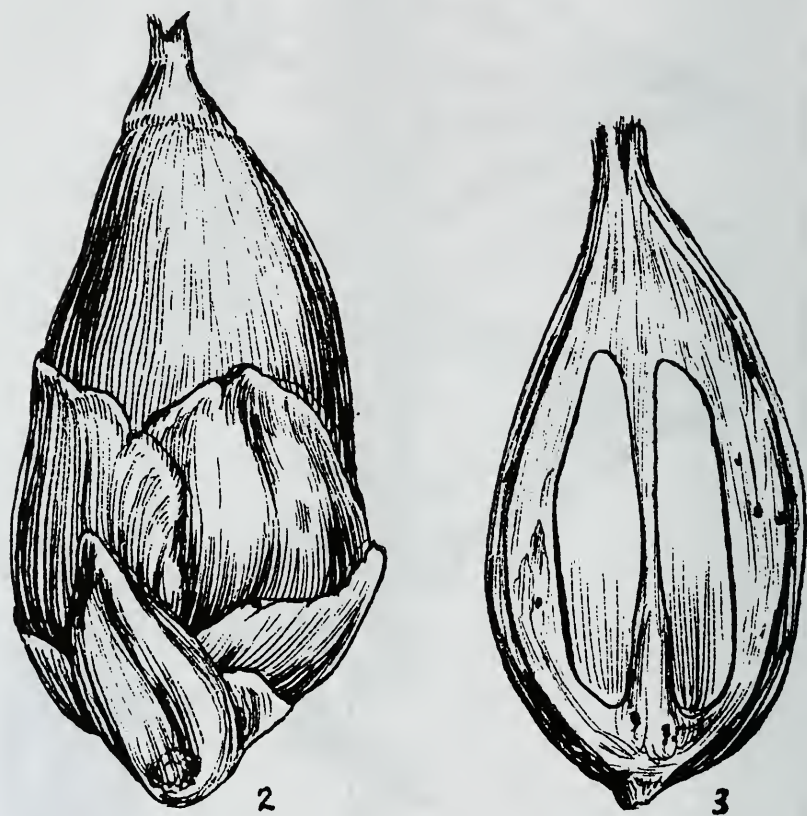
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204. *Top*: Androgynous rachilla showing pistillate flowers on proximal part and staminate flowers on distal part. *Bottom*: Individual staminate flowers showing exserted stamens and very short petals and sepals. Martius, t. 92. 1826.



205. Staminate rachilla with staminate flowers spirally arranged. Martius, t. 93. 1826.



206. *Left to right*: External view of fruit showing persistent perianth. Longitudinal section of fruit showing persistent perianth and two seed cavities. Drude, t. 104. 1881.



207. Relatively young tree showing staminate (*left*) and androgynous (*right*) inflorescences subtended by sterile bracts with long beaks. Georgetown Botanic Garden, Guyana. *Dahlgren and Persaud s.n.* (F-610752).



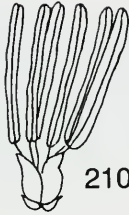
208. Part of leaf showing clustered pinnae and part of staminate inflorescence showing numerous staminate rachillae surrounding rachis. *Krukoff 7067* (NY).

209. Staminate flower showing short petals and sepals and exerted stamens. *N. L. Britton 494* (NY).
210. Staminate flower showing short petals and sepals and exerted stamens. *Rusby and Squires 413* (F).
211. Staminate flower. *L. Williams 12816* (F).
212. Pistillate flower showing 3 stigmas. *Martius s.n.* (G).
213. Pistil showing staminodial ring. *Martius s.n.* (G).
214. *Left and center*: Longitudinal and cross sections of fruit showing single seed, relatively thin epicarp, and mesocarp. *Right*: Top view of staminodial ring showing ciliate margins. *Wessels Boer 1920* (U).

209



1 cm



210

0.5 cm



211

0.5 cm

212

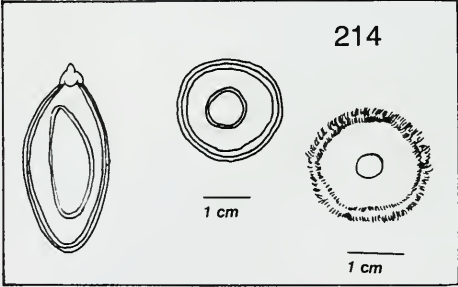


1 cm

213



1 cm



214

1 cm

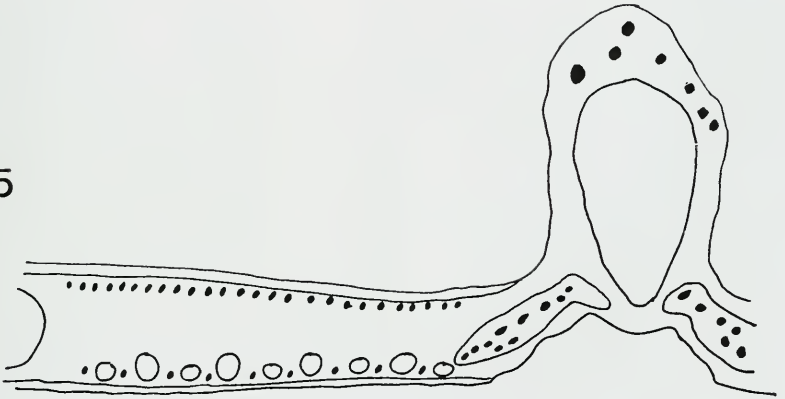
1 cm

***Maximiliana* Pinnae Cross Section**

Lamina (on left) shows upper and lower epidermis (double lines), adaxial nonvascular fiber bundles (NVF—upper solid patches), abaxial NVF (lower solid patches), and veins of three different sizes (empty circles). Midrib (on right) shows main vascular bundle (MVB) and expansion cell tissue (ECT). Fibers are present in both (solid patches). A voucher specimen for the cross section is listed. The section is magnified approximately 90 \times .

215. *M. maripa*. *Wessels Boer 1920* (U). Note small rounded common clusters of adaxial NVF, abaxial NVF alternating with veins, and divided ECT with fiber clusters.

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216. *M. maripa*.



217. *M. maripa*.

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A Note on the Author

Sidney F. Glassman received his Ph.D. in botany at the University of Oklahoma in 1950. He served in the U.S. Navy in 1943-46 with a research unit studying tropical diseases. He was professor of biological sciences at the University of Illinois at Chicago from 1952 to 1989 and is now professor emeritus. He has been a research associate in palms at the Field Museum of Natural History since 1958. His research has yielded more than fifty publications since 1948, mostly dealing with systematics of palms. Pertinent to this, he has received several National Science Foundation grants to collect palms in Brazil. His major works include "A Revision of the Genus *Copernicia*" (with B. E. Dahlgren, 1961, 1963), "A Revision of B. E. Dahlgren's Index of American Palms" (1972), and *Revisions of the Palm Genus Syagrus Mart. and Other Selected Genera in the Cocos Alliance* (1987). Other significant publications include "The Flora of Ponape" (1952) and "Grass Flora of the Chicago Region" (1964). Currently, he is preparing an update of his "Revision of the Index of American Palms."

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