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Cover Picture

Guihaia argyrata growing in scrub on the steep slopes of a limestone hill near Guilin, Guangxi Province, People's Republic of China. See pp. 3–12.

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Guihaia, a New Coryphoid Genus from China and Vietnam

JOHN DRANSFIELD,[1] LEE SHU-KANG,[2] AND WEI FA-NAN[2]

An extraordinary landscape of towering limestone hills stretches over a large area of Southwest China and reaches its most spectacular and picturesque development in the Autonomous Region of Guangxi (Kwangsi), the area of Gui Hai in old Chinese literature (Fig. 1). The limestone hills of this area have been the inspiration of poetry and painting for many centuries in China, and the epitome of Chinese painting as viewed from outside China—misty towering crags—has its origin in paintings of the landscape of Guangxi, in particular the area around Guilin (Kweilin). Elsewhere in South East Asia, karst limestone topography has become famous among palm enthusiasts because three such areas of limestone are the habitat of the three species of *Maxburretia*, *M. rupicola* and *M. gracilis* in Malaysia and *M. furtadoana* in Southern Thailand (Dransfield 1978). Given the huge area of limestone farther north in Vietnam and Southern China, could there perhaps be further calcicole palms waiting to be discovered?

Sterile juvenile specimens of a fan palm in the herbarium at Kew, collected by Morse near Lungzhou in Guangxi from limestone, suggested indeed that there was at least one undescribed calcicolous palm. What is extraordinary about Morse's specimens is that, though the leaves are clearly palmate and seem to have a coryphoid affinity, they are reduplicate rather than induplicate. Epidermal preparations made by Soejatmi Dransfield in Kew suggested that this palm is anatomically distinct from *Maxburretia*. Reduplicate splits occur in the leaves of most species of *Licuala*, but in *Licuala* the splits reach the insertion of the lamina and the segments thus produced are usually compound (consisting of more than one fold) and the margins are further split in an induplicate fashion (Dransfield 1977). One inference to be made from the leaf of *Licuala* is that it is basically induplicate but has reduplicate splits secondarily superimposed upon it. The Chinese palm, however, has leaves split to ca. ¾ to ⅘ the radius into single fold segments just as in most Coryphoid palms, but the splits are reduplicate (Fig. 2). Later, in the herbarium in Paris, a specimen of the same palm was found in 1983, bearing a dead inflorescence; material of the same number, *Steward & Cheo 1196* from Ch'ang An (now Rongan, Guangxi), was borrowed from the Herbarium of the Arnold Arboretum, but still lacked flowers.

Independently, two of us (Lee and Wei) realized that a fan palm, locally common on limestone around Guilin (Fig. 3) and elsewhere in Guangxi, did not fit the description of any known Chinese species and therefore described it as new, including it in the genus *Trachycarpus* as *T. argyratus*, the specific epithet referring to the silvery undersides of the leaves (Lee and Wei 1982). When Guihaia Volume 2 Part 3, journal of the Guangxi Institute of Botany, arrived at Kew in the summer of 1983, Dransfield realized that the mys-

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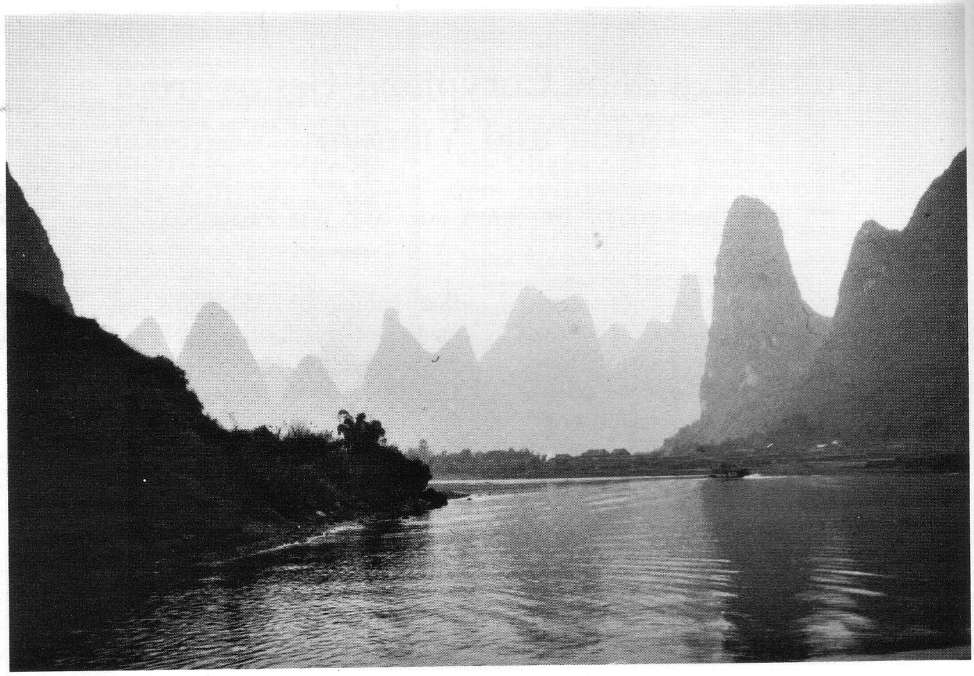
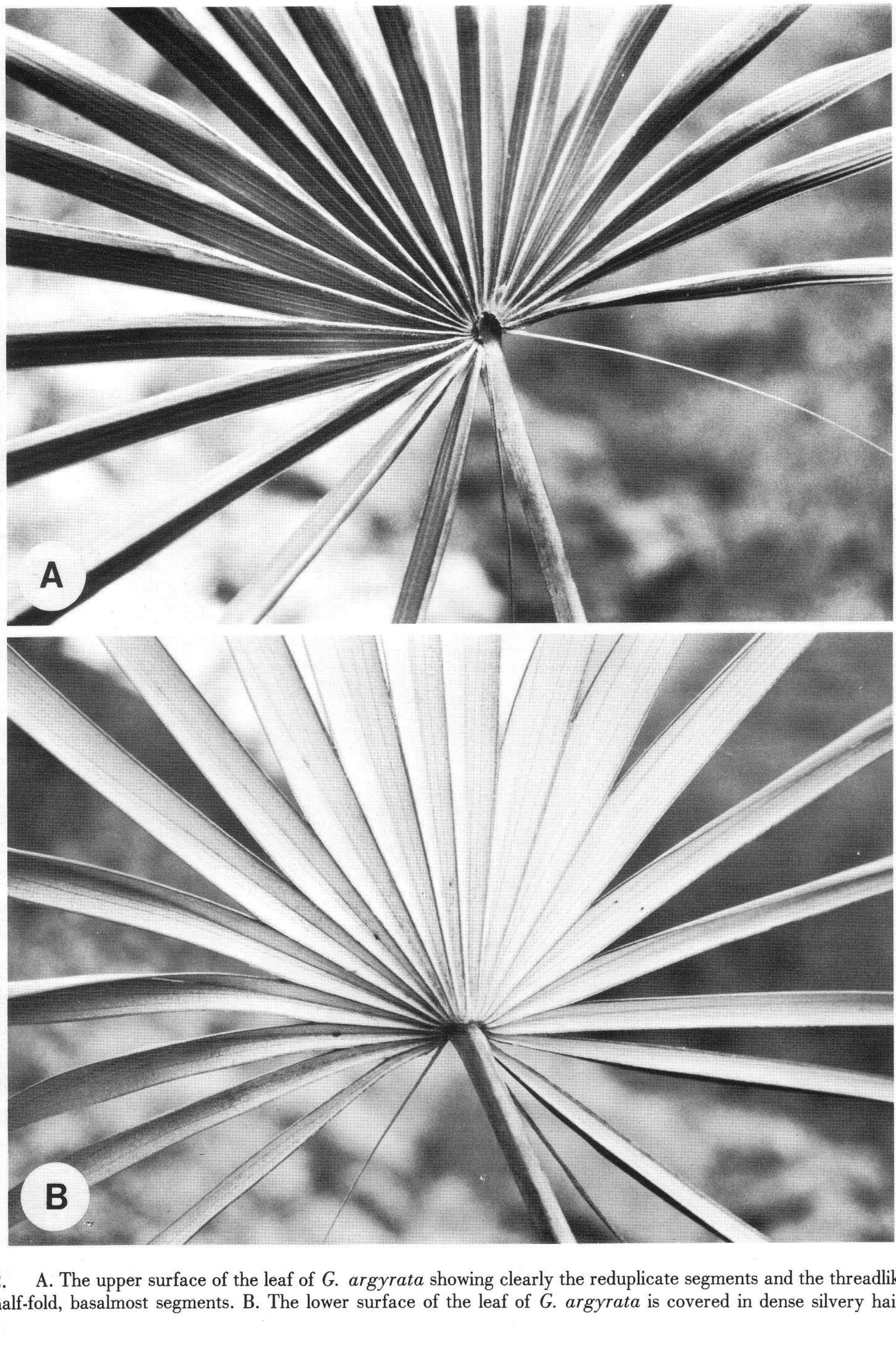


1. Karst limestone hills tower above the Lijiang River, south of Guilin; *Guihaia argyrata* is locally abundant on the limestone cliffs.

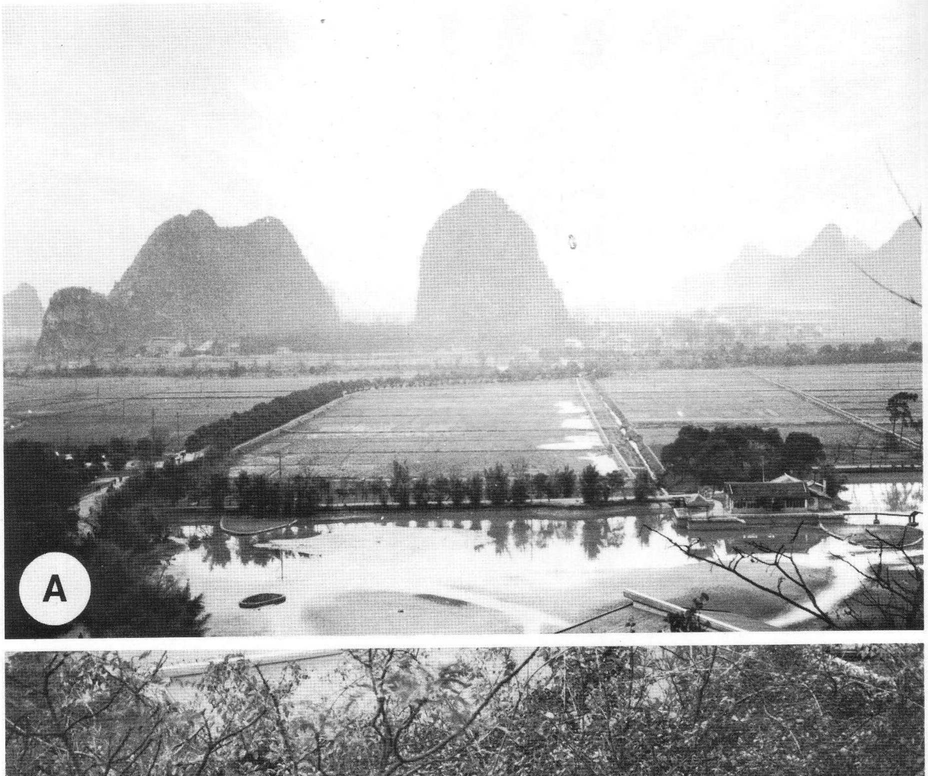
tery palm of South China and *T. argyratus* were probably one and the same. Shortly after the publication of *Trachycarpus argyratus*, Lee and Wei realized that the species was probably misplaced in *Trachycarpus*.

Then in February and March 1984, Dransfield had the opportunity to visit China under the auspices of the exchange agreement set up between Academia Sinica, Beijing, and the Royal Society, London. Guilin was, of course, high on the priority list of areas to be visited. On the 2nd and 3rd of March the three of us were able to meet and discuss this extraordinary reduplicate coryphoid palm and its affinities and to make a short excursion to a limestone hill within the city limits of Guilin to see it growing (Figs. 4, 5). After two days of exciting discussion we decided that the palm represents an undescribed genus related to *Maxburretia* and *Rhapis*.

This is, however, not the only Chinese palm with reduplicate palmate leaves. Gagnepain (1937) described from northern Vietnam a fan palm from limestone but incorrectly included it in *Rhapis* as *R. grossefibrosa*. Examination of the type specimen in Paris seemed to indicate that its affinities are with *Maxburretia*; however the leaf is reduplicate. The type is in fruit so details of flowers are lacking. Another specimen of the same palm was found in the Beijing Herbarium, collected during the Guangxi Expedition of 1955 near Lungzhou (Longzhou) near the border with Vietnam, but this too is in young fruit. Finally one of us (Dransfield) tracked down a specimen of the same palm in the Guangzhou Herbarium in pistillate flower. The pistillate flowers are scarcely distinguishable from those of the palm from Guilin, but the leaf lacks the silvery indumentum. Then, this specimen was bor-



2. A. The upper surface of the leaf of *G. argyrata* showing clearly the reduplicate segments and the threadlike, half-fold, basalmost segments. B. The lower surface of the leaf of *G. argyrata* is covered in dense silvery hairs.



3. A. View of Guilin from the type locality. B. *G. argyrata* growing among rough limestone boulders.

rowed by Lee and Wei in Guilin, who found that it had been collected in Yangchun, Guangdong. Afterwards three specimens of the same palm, one in staminate flower, one in pistillate flower and one in fruit, were found in the Herbarium at Guilin among the unnamed specimens by two of us (Lee and Wei). The structure of the flowers and the remarkable reduplicate leaves suggest that the two taxa are congeneric.

The generic name we have chosen for these two strange palms, Guihaia, is based on the ancient name for the area of Guilin and Guangxi. It is also the name of the journal of the Guangxi Institute of Botany in Guilin.

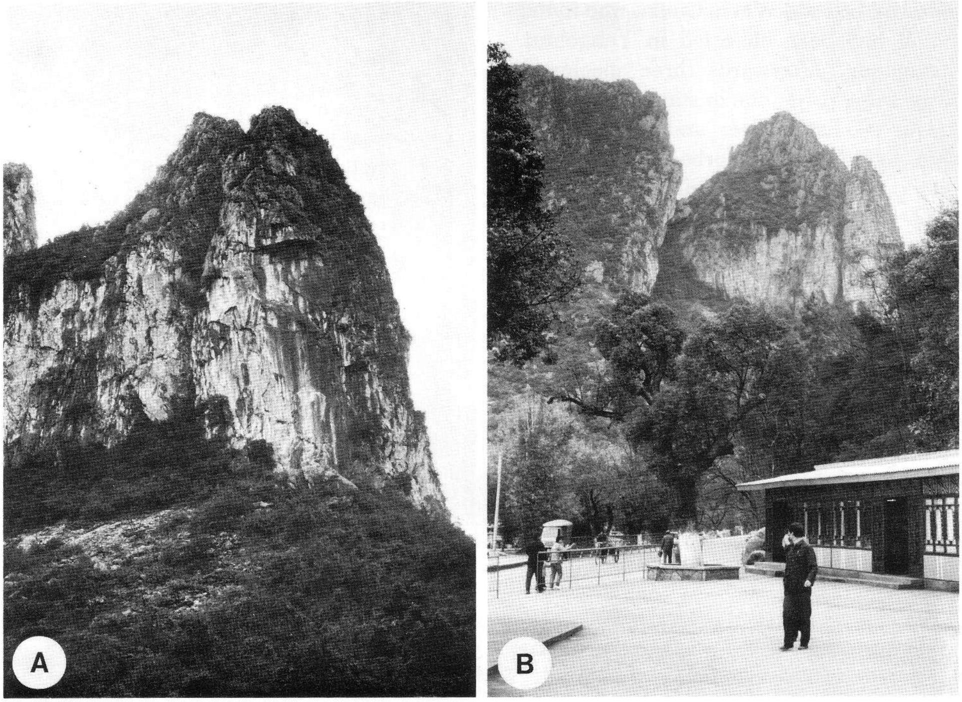
Guihaia J. Dransf., Lee & Wei, gen. nov.

Palmae dioeciae, pleonanthae, caespitosae, humiles, ad coryphoideas pertinentes. Caudex brevis vel brevissimus, fibris vaginarum spiniformibus vel cancellatis tectus. Folia palmata, flabellata vel suborbiculata, in segmenta reduplicata fere ¾ vel ⅘ radii fissa, hastula adaxiali circulari, hastula abaxiali nulla, lamina supra atroviridi subtus dense argyrato-villosa vel glabra, margine minute serrulata. Inflorescentia staminata pistillatae similis, axillaris, solitaria, in ordines usque 4 ramificans; prophyllum elongatum, tubulosum, bicarinatum; rami primarii 2–5; rachillae numerosae, gracillimae; flores staminati minuti, symmetrici; sepala 3, libera vel fere, imbricata; petala 3, ⅓–½ longitudinis connata; stamina 6, epipetala, antheris rotundatis, didymis; pistillodium nullum; flores pistillati staminatibus similes, carpellis 3, liberis, glabris; fructus glabri rotundati vel ellipsoidi; endospermium homogeneum a chalaza distincte penetratum. Genus *Maxburretiae* et *Rhapidis* affinis et forsan inter duo genera intermedium.

4. *Guihaia argyrata* growing in crevices.

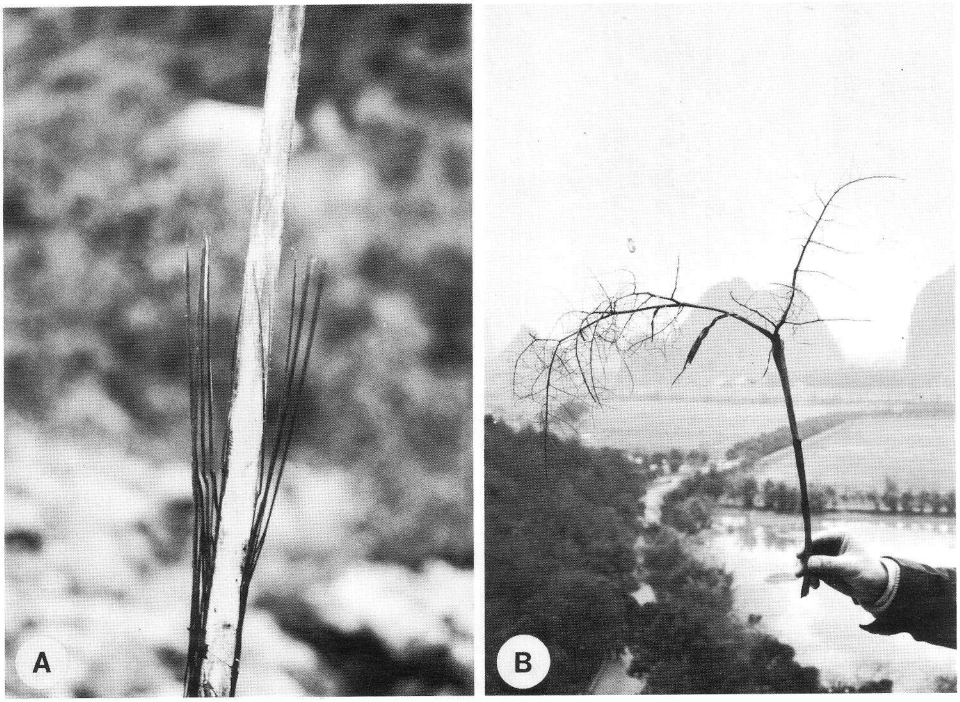
Typus: *G. argyrata* (Lee & Wei) Lee, Wei & J. Dransf.

Dwarf, clustering, pleonanthic dioecious palms. Stem decumbent or erect, short or very short, petiole bases and sheaths persistent or deciduous. Leaves reduplicately palmate, marcescent; sheath tubular at first, distintegrating into an interwoven mass of coarse, erect, black, spine-like fibers (Fig. 6A) or into a tongue-shaped lattice of coarse flat fibers; petiole moderate, unarmed, abaxially rounded, adaxially flattened or slightly rounded, the margins quite sharp, bearing caducous woolly hairs or glabrous; adaxial hastula rounded, glabrous or bearded with woolly hairs; lamina orbicular or cuneate, rather small, divided to ¾ to ⅘ the radius or nearly to the insertion along the abaxial ribs into several (ca. 20) ± linear, 1- or



5. A. *Guihaia argyrata* grows on the talus slope at the foot of the cliffs. B. Limestone hill on the outskirts of Guilin, the type locality of *Guihaia argyrata*.

rarely 2-fold reduplicate segments, minutely bifid at the tips, the outermost segments consisting of ½ folds only, the margins of the segments minutely toothed or smooth. Lamina adaxially dark green, glabrous except for scales along the ribs, abaxially covered with a dense felt of silvery woolly hairs or glabrous except for scattered dot-like scales; transverse veinlets conspicuous or obscure. Inflorescences (Fig. 6B) solitary, axillary, interfoliar, branching to 4 orders, staminate and pistillate superficially similar; prophyll elongate, tubular, 2-keeled, thin somewhat coriaceous, apically splitting along 2 sides, glabrous or bearing caducous hairs; peduncle elongate, ± flattened, caducously scaly; peduncular bracts absent or 1, similar to prophyll; rachis longer or shorter than the peduncle; rachis bracts ca. 2–5, similar to the prophyll but not 2-keeled, with tattering limb; 1st order branches 2–5, adnate to the rachis to just below the insertion of the following bract; subsequent bracts minute, scarcely evident; rachillae spreading, very slender, ± straight, glabrous or bearing scattered caducous scales and spirally arranged solitary flowers borne on very low swellings. Staminate flower extremely small, symmetrical; sepals 3, free except at the very base, basally imbricate, ± rounded to ovate, abaxially bearing hairs and fringed with wool-like hairs; petals longer than the sepals, connate in the basal ca. ⅓–½, with rounded lobes distally, glabrous; stamens 6, the filaments not forming a staminal tube, but completely adnate to the corolla, anthers ± rounded, didymous, apparently inserted directly on to the corolla, latrorse; pollen (Fig. 7) elliptic, monosulcate, with finely reticulate, semitectate exine; pistillode absent. Pistillate flower similar to the staminate but perhaps more rounded;



6. A. Fiber spines developed at the base of the petiole of *G. argyrata*. B. Dead staminate inflorescence of *G. argyrata*.

sepals as in staminate; petals only slightly longer than to more than twice as long as the sepals, joined in the basal ⅓ to ½; staminodes 6, minute, borne directly on the petals; carpels 3, free, glabrous, ± abruptly narrowed to short style, ovule basally attached. Fruit developing from only 1 carpel, rounded to ellipsoidal, the stigmatic remains apical, the abortive carpels basal; epicarp glabrous, blue-black and bearing thin white wax; mesocarp very thin, fleshy; endocarp papery. Seed with lateral hilum, ± flattened on one side, with well defined rounded intrusion of integument; endosperm homogeneous, embryo lateral. Germination and eophyll not known.

Key to Species of Guihaia

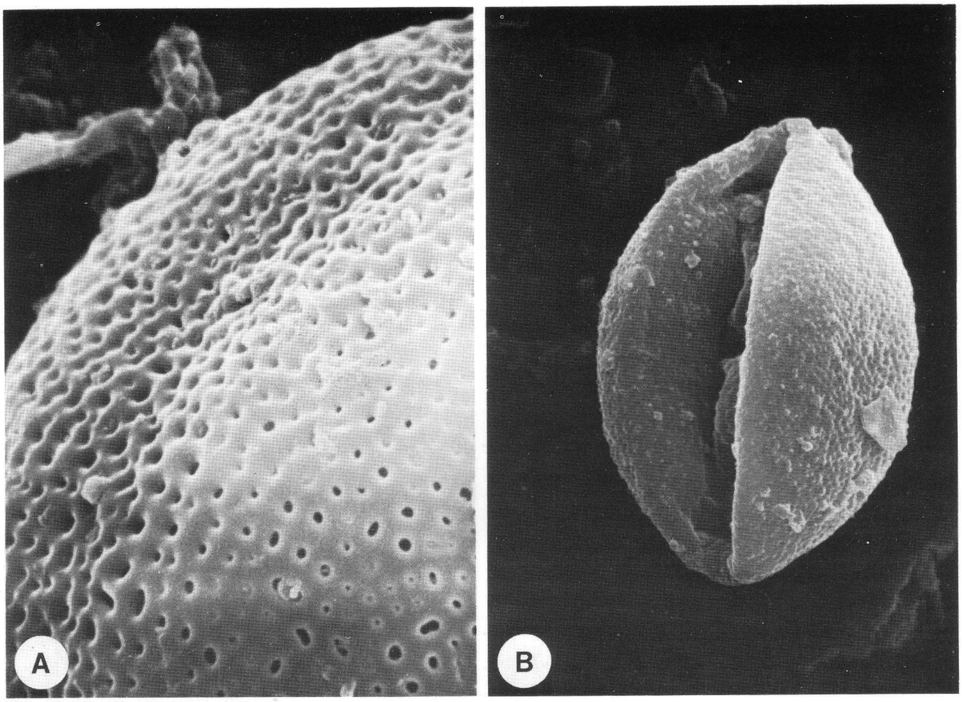
Stem very short, usually completely obscured by the old leaf sheaths; leaves strongly discolorous with a dense felt of silvery hairs abaxially; leaf sheath disintegrating into spines; apex of sepals obtuse, externally pilose, the margins ciliate, internally lacking scales; fruit rounded .... *G. argyrata*

Stem ca. 1 m tall, clothed with old leaf sheaths only at the tip; leaves only slightly discolorous, abaxially with scattered dot-like scales; leaf sheath disintegrating into a lattice of flat fibers, the margins remaining entire; apex of sepals mucronate, externally glabrous, the margins not ciliate, internally bearing scales; fruit ellipsoidal .... *G. grossefibrosa*

1. **Guihaia argyrata** (Lee & Wei) Lee, Wei & J. Dransf., comb. nov.

Trachycarpus argyratus Lee & Wei in Guihaia 2(3): 131. 1982. Type: China, Guangxi, Yanshuo, 27.5.1964, *F. N. Wei 937* (holotype IBK).

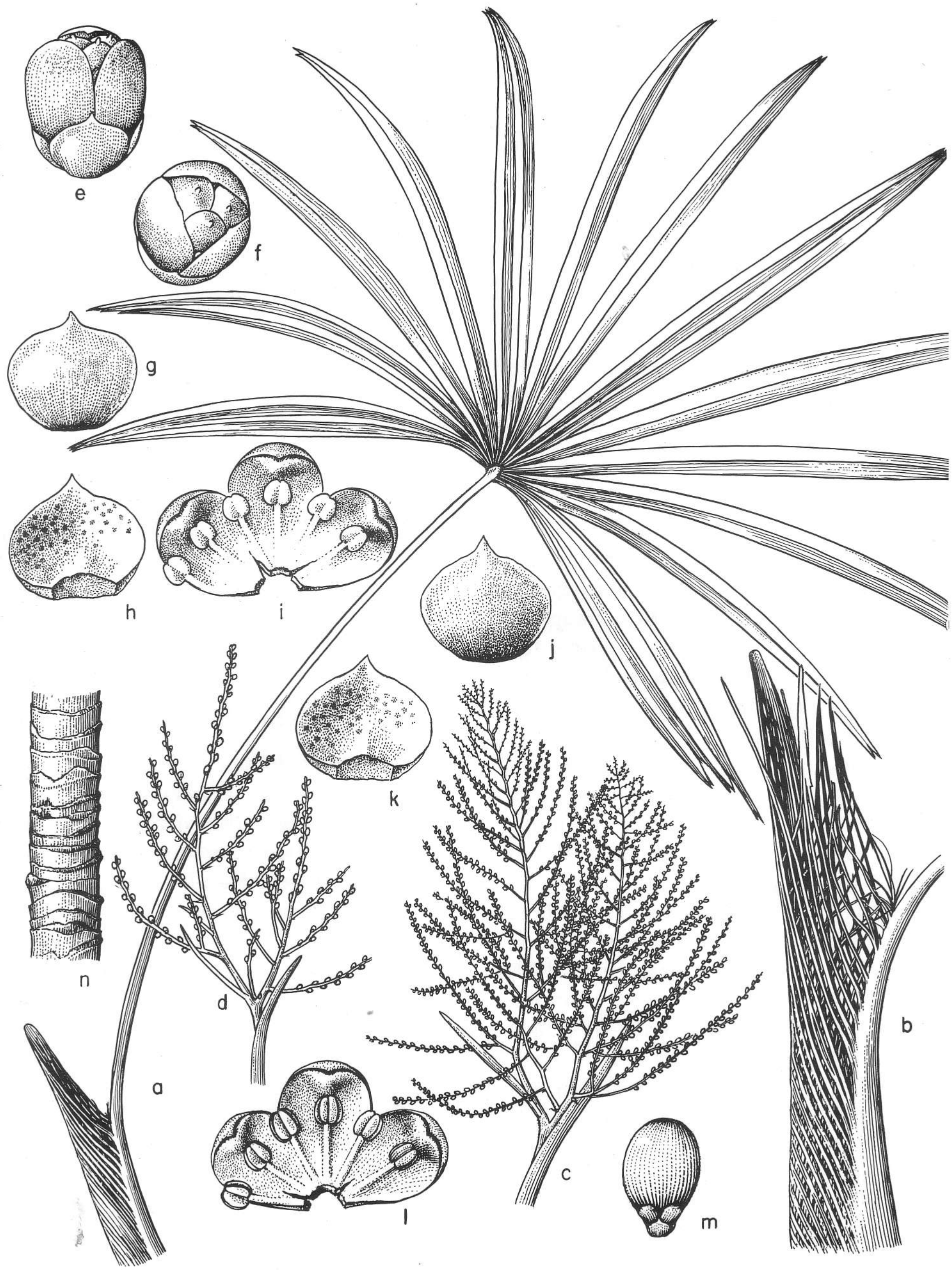
Low clustering fan palm to ca. 1 m tall; stem decumbent or erect, very short, ca. 3–5 cm diam., sometimes up to 0.5 m tall, with very close leaf scars, the stem



7. Scanning electron micrographs of the pollen of *G. argyrata* A. exine (×1,000), B. polar view (×2,500) (from *Wei Fa-nan 937*, prepared at South China Institute of Botany, Guangzhou).

usually completely obscured by the old leaf sheaths. Leaves several in crown, spreading; sheath tubular at first, expanding into very sharp needle-like, erect dark brown fibers to ca. 14 cm long, ca. 1 mm wide; petiole up to ca. 1 m long, usually less, much shorter in exposed individuals, ca. 11 mm wide near the base, very slightly narrowed distally, ± hemispherical in cross section, bearing caducous silky hairs when young; adaxial hastula ca. 1 × 1 cm, fringed with hairs when young; lamina ca. 20–60 cm diam. in mid-line, divided to ca. ¾ to ⅘ into up to ca. 26 single-fold (rarely two-fold) reduplicate segments, up to ca. 2.5 cm wide, the outermost segments very narrow, the segment tips very briefly bifid, adaxial surface dark green, abaxial surface silvery grey hairy. Inflorescences 30–80 cm long, with 2–5 partial inflorescences branching to the 4th order; rachillae very slender, the pistillate to 50 × 0.5 mm, the staminate usually shorter and even more slender. Staminate flower in bud ca. 1.5 mm long or less; sepals ca. 1 × 0.8 mm; corolla ca. 1.2 mm long, the lobes ca. 0.8 mm wide; anthers ca. 0.3 mm diam. Pistillate flower ca. 1.5 mm long; sepals ca. 1 × 0.8 mm; corolla ca. 1.2 mm, the lobes ca. 1 mm wide; staminodes minute, the empty anthers ca. 0.2 mm long; carpels ca. 0.5 × 0.4 mm. Mature fruit subglobose up to ca. 6 mm diam.; epicarp blue-black, waxy; seed ca. 4–5 mm diam.

Specimens examined: CHINA. Guangxi: Guilin, *Wei Fa-nan 409* (IBK), *1513* (IBK), *1524* (IBK), *Chen San-yang 18869*, *18870* (HITBC); Lungzhou (Longzhou), *Morse 195* (K); Tianyang, *Li Chung-ti 601840* (KUN); Rongan (Ch'ang An), *Steward & Cheo 1196* (A, P); Yanshuo, *Chen Zhao-zhou 53103* (IBK), *Wei Fa-nan 937* (holotype IBK); Jingxi, *Chang*



8. **Guihaia grossefibrosa.** a, whole leaf with sheath, ×¼; b, expanded leaf sheath, ×½; c, a portion of staminate inflorescence, ×⅕; d, a portion of pistillate inflorescence, ×⅕; e–f, pistillate flowers, ×10; g, sepal of pistillate flower from outside, ×16; h, sepal of pistillate flower from within, ×16; i, opened corolla of pistillate flower showing staminode and appendages at apex, ×12; j, sepal of staminate flower from outside, ×16; k, sepal of staminate flower from within showing scales, ×16; l, opened corolla of staminate flower showing insertion of stamens and appendages at apex, ×12; m, fruit ×1¾; n, a portion of stem, ×½. (Drawn by He Shun-quing)

Chao-chien 4479 (IBK), *Chung Chi-hsing 84063* (IBK), *82372* (IBK). Guangdong: Yinde, *Wei Chao-fen 123182* (IBSC).

Notes: Flowers open towards the end of May until June. Fruit ripens at the end of October to November.

2. **Guihaia grossefibrosa** (Gagnep.) J. Dransf., Lee & Wei, comb. nov. (Fig. 8)

Rhapis grossefibrosa Gagnep. in Notulae System. 6: 159. 1937 and in Humbert, Fl. Générale de l'Indochine 6: 994. 1937. Type: Vietnam, Vinh Province, Lin-ca, *Poilane 16383* (holotype P).

Clustering fan palm to ca. 1.8 m tall; stem erect or decumbent, ca. 1 m tall, 2–3 cm diam. Leaves several in crown; sheath tubular, prolonged into a triangular tongue-like lobe to 10 cm opposite the petiole, distintegrating into a lattice of broad flat fibers but the margins remaining entire; petiole usually 40–50 cm long, the longest up to 1.8 m, ca. 3–4 mm wide, ± hemispherical in cross-section, unarmed, bearing scattered caducous scales; adaxial hastula rounded, ca. 6 mm × 6 mm, fringed with caducous hairs; lamina to ca. 35 cm diam. at the mid-line, divided to ca. $\frac{4}{5}$ or almost to the insertion into ca. 10–21 single-fold (rarely two-fold) reduplicate segments up to ca. 15 mm wide, the outermost segments very narrow, the segment tips very briefly bifid, adaxial surface glabrous, abaxial surface slightly paler, with very sparse dot-like scales; transverse veinlets short, conspicuous. Inflorescences 80 cm long, with 2–5 partial inflorescences branching to the 4th order; peduncle to ca. 40 cm long bearing a single peduncular bract; rachis shorter than the peduncle; rachillae to 10 cm × 1 mm or less. Staminate flower ca. 2.2 mm long; sepals ca. 0.8 × 0.8 mm, apex mucronate; corolla ca. 2 mm long, the lobes ca. 1.5 mm wide, with appendage on adaxial surface; anthers ca. 0.3 mm diam. Pistillate flower ca. 2.2 × 1.5 mm; sepals ca. 1 × 1 mm ovate-orbicular, glabrous; corolla ca. 2 mm long, the lobes ca. 1.5 mm wide, with appendage on adaxial surface; staminodes minute, the empty anthers ca. 0.3 mm long; carpels ca. 0.6 × 0.4 mm. Mature fruit ± ellipsoidal, ca. 6–8 × 4–5 mm; epicarp blue-black; seed ± ellipsoidal ca. 5 × 2.5 mm.

Specimens examined: VIETNAM, Vinh Province, massif de Lin Ca, 27. 7. 1929, *Poilane 16383* (holotype P). CHINA. Guangxi, Gou Chang, Feng Wang Shan, 20. 6. 1955, *Guangxi Expedition 493* (PE); Daxin, 13. 8. 1958, *Zhang Zong-xiang Wang Shan-ling 3952*, (fr., IBK); Debao, 27. 5. 1983, *Wei Fa-nan 1562* (fl. ♀, IBK), *1563* (fl. ♂, IBK). Guangdong, Yangchun, 3. 5. 1957, *S. China Bot. Inst. 03373* (IBSC).

Acknowledgments

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LITERATURE CITED

DRANSFIELD, J. 1977. A dwarf *Livistona* (*Palmae*) from Borneo. Kew Bulletin 31(4): 759–762.

———. 1978. The genus *Maxburretia* (*Palmae*). Gentes Herbarum 11(4): 187–199.

GAGNEPAIN, F. 1937. Palmiers d'Indochine nouveaux ou litigieux. Notulae Systematicae 6(3): 149–160.

LEE, S. K. AND WEI, F. N. 1982. New plants on limestone hills from Guangxi. Guihaia 2(3): 129–133.

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The Root System of Prestoea montana and Its Ecological Significance

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Abstract

The root system of *Prestoea montana* consists of a thick mat of surface and shallow subterranean roots, stilt roots, and pneumatorhiza (on surface and stilt roots). The anatomy of pneumatorhiza and stilt roots is characterized by an abundance of air spaces and other structures that facilitate gas exchange in anaerobic soils. Stilt roots are believed to provide support to palms and surface roots may contribute to local nutrient cycling and reduce sheet soil erosion.

The "Palma de Sierra" (*Prestoea montana* [Graham] Nichols.) forest or "Palm-brake" (Beard 1949) occupies steep slopes, stream edges in valley bottoms and intra-mountain floodplains in the Luquillo Experimental Forest of Puerto Rico. This species is conspicuous in the *Cyrilla racemiflora* L. ("Colorado") and *Dacryodes excelsa* Vahl ("Tabonuco") dominated forests and is also a common tree in the rain forests of the wet slopes of other West Indies islands (Stehle 1945, Beard 1949). In the Luquillo mountains this palm grows at elevations between 300 and 1,000 m. The adult palm reaches a height of 20 m and a diameter of 25 cm dbh in the rain forest of El Verde at an altitude of 510 m and decreases to a height of 10 m in Palm Slope Forests near 1,000 m altitude.

Palm species frequently dominate the vegetation of wet and otherwise edaphically limited sites (Tomlinson 1979). *Prestoea montana* is an important constituent of vegetation covering wetland areas on slopes (Frangi 1983). The plants exhibit adaptations to permanently wet soils and to periodically flooded conditions. This paper deals with the description of such adaptations in the root systems of the Sierra Palm of the Luquillo mountains.

Methods

The arrangement and external characteristics of the palm root system were studied in the field by direct observation of palm trees growing under different topographic and edaphic conditions. Roots were collected and fixed in FAA and transported to Argentina. Roots for anatomical examination were embedded in Paramat, sectioned, and stained with safranin-fast green.

Results

External morphology and distribution of the roots. The presence of stilt roots is common in *Prestoea montana.* In the seedling stage (seedlings are smaller than 50 cm and their age was estimated between 1–8 years [Bannister 1970]), and also in adult palms, the plants are supported by stilt roots and the lower portion of the stem sometimes appears above the soil surface. In adult palms aerial adventitious roots radiate from the enlarged lower portion of the stem, forming a more or less closed cone of stilt roots surrounding the trunk up to 1.5 m above the surface (Fig. 1). These reddish-brown aerial roots have a consistent diameter of approximately 2 cm and branch mainly dichotomously near the ground surface.

1. *Prestoea montana.* A general view of Sierra Palm stilt roots on a steep slope near Icacos River, Luquillo Mountains. The lower portion of the stem is covered by epiphytes.

On the soil, smaller roots are arranged in a dense branching pattern covering the surface and upper layer of the soil.

The distribution of roots in a palm forest soil in the same location have already been described (Frangi 1983, Frangi and Lugo in preparation). Most of the biomass is concentrated in the upper 30 cm of the soil and on the surface. Some of the prop roots penetrate deeply into the soil suggesting that they have a supporting function and help in maintaining the trunk upright.

First order stilt roots (except the growing distal portions) and higher order surface orangish-yellow roots have specialized rootlets of limited growth that were described as "pneumathodes" by Jost in 1887 (Yampolsky 1924). De Granville (1974) coined the word "pneumatorhiza" to designate this particular type of pneumathode which has a gas exchange function (Fig. 2).

The pneumatorhiza of Sierra Palm are short and whitish with a mealy distal portion. They grow at right angles to the mother roots as do those described by Yampolsky (1924) for *Elaeis guineensis* Jacq. The ageing process observed is the same as the sequence described for *Euterpe oleracea* by De Granville (1974). Pneumatorhiza begin as more or less tubular bodies with root caps; following this, the distal portions appear fluffy without a cap, and the latest condition is characterized by a reduced body with a longer persisting and exposed vascular cylinder (Figs. 3-1–3-4 and 4-13).

Anatomy

Stilt and surface roots. The epidermis of these roots is papillose; the radial and inner tangential cells are thin, and the external tangential wall is thick, lignified, and suberized (Fig. 4-6).

The outer cortex has a fibrous subepidermal exodermis with very thick walls and nearly obliterated lumens. Immediately beneath this exodermis or separated from it by several layers of parenchymatous tissue is a more or less continuous sheath of fibers with thin walls and wide lumens (Figs. 4-6 and 4-7). The middle and inner cortex are of a more or less compact thin-walled parenchyma with fibers that are isolated or in bundles. There are mucilaginous cells scattered in the cortex and medulla and air chambers of lysigenous origin irregularly distributed in the middle cortex (Fig. 4-8).

The endodermis is uniseriate, lignified, and suberized. The vascular cylinder has a 1–2 layered pericycle, a polyarch stele and a medullary zone (Figs. 3-1, 3-4, and 4-9). The medulla was composed mostly of mechanical or support tissue. Its parenchymatous center has lysigenous air chambers and some mechanical tissue.

Pneumatorhiza. These structures are of endogenous origin. Anatomically these roots are different from the mother roots in the cortical structure. The structure of

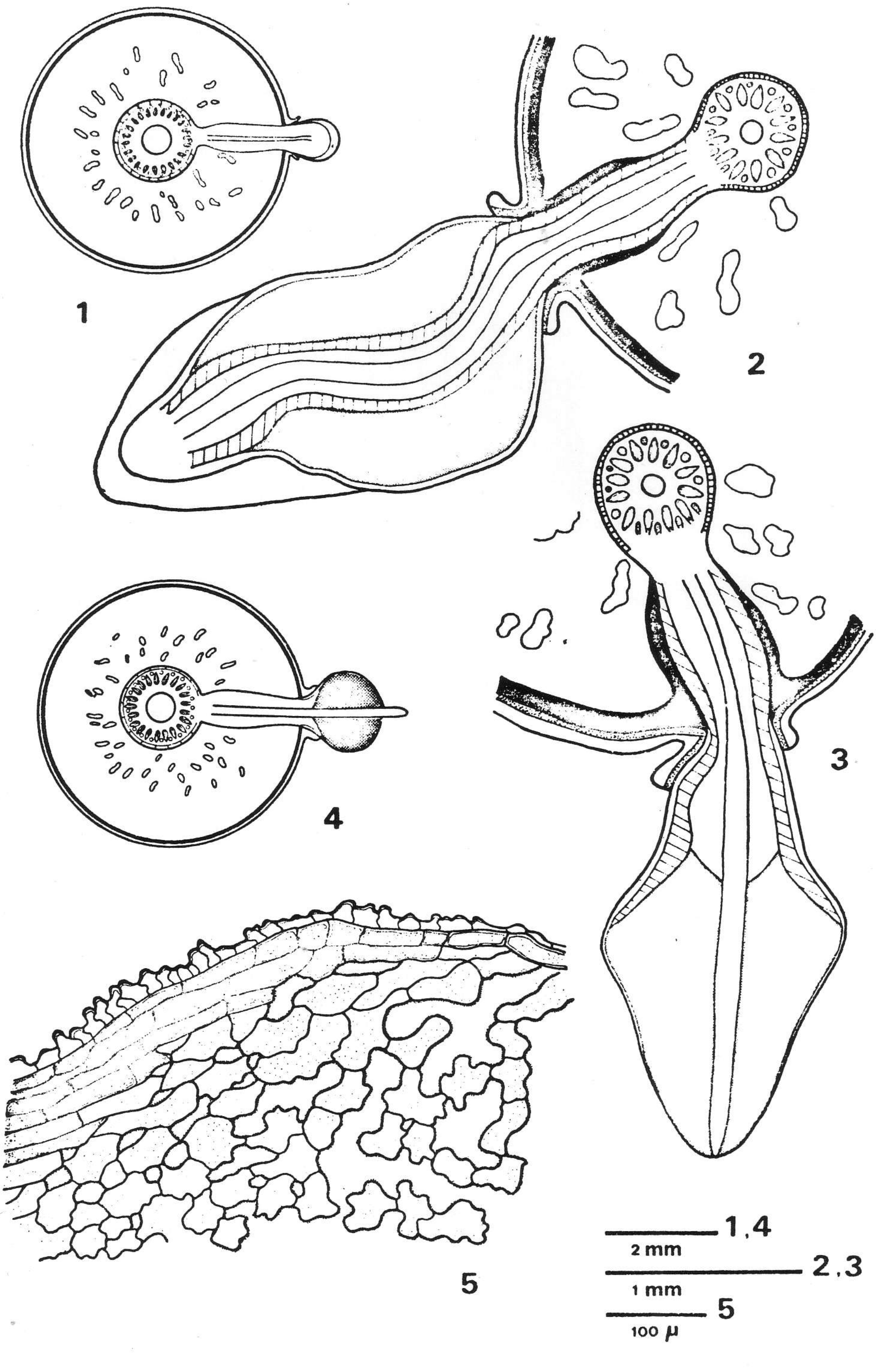
2. *Prestoea montana.* A close up view of stilt roots with pneumatorhiza near the butt of the stem.

the vascular cylinder is similar in both. Once the pneumatorhiza pass through the cortex of the mother root and are in contact with the environment, they begin to develop an aerenchymatous tissue (Fig. 4-2). The development of the aerenchyma is as that described by Tomlinson (1961) for other palms with pneumathodes. Initially, part of the outer mechanical tissue is replaced by a meristematic tissue producing a mass of lobate cells with verrucose thickened walls (Figs. 3-5, 4-10, and 4-11). When growth terminates in the pneumatorhiza, the epidermis in contact with the aerenchyma breaks and the aerenchyma that forms the main part of the body is exposed to the environment. There are thin-walled tubular idioblasts (raphide-sacs) in the aerenchyma (Fig. 4-12). Raphide clusters also appear in parenchymatous cortical cells.

Fungal hyphae (endotrophic mycorrhiza?) were observed inside the cells of epidermal, cortical, and vascular tissues of the roots. Edmisten (1970) cited ectotrophic mycorrhiza for this species and suggested that the fungus-root associations act as nutrient traps.

→

3. *Prestoea montana* (1) diagrammatic representation of a mother root in cross section with air chambers in the cortex and longitudinal section of young pneumatorhiza with root cap; (2) young pneumatorhiza with root cap, aerenchyma developed from the outer cortex and intact epidermis; (3) the epidermis is smashed and the aerenchyma partly exposed to the environment; (4) mature pneumatorhiza with aerenchyma exposed and partially sloughed off, the vascular cylinder is externally visible; (5) detail of the epidermis, fibrous outer cortex and lobate aerenchyma cells. Shading: as Metcalfe and Chalk (1950), the aerenchyma is indicated with a fine mesh, the outer cortex with oblique lines, and the exodermis with dots.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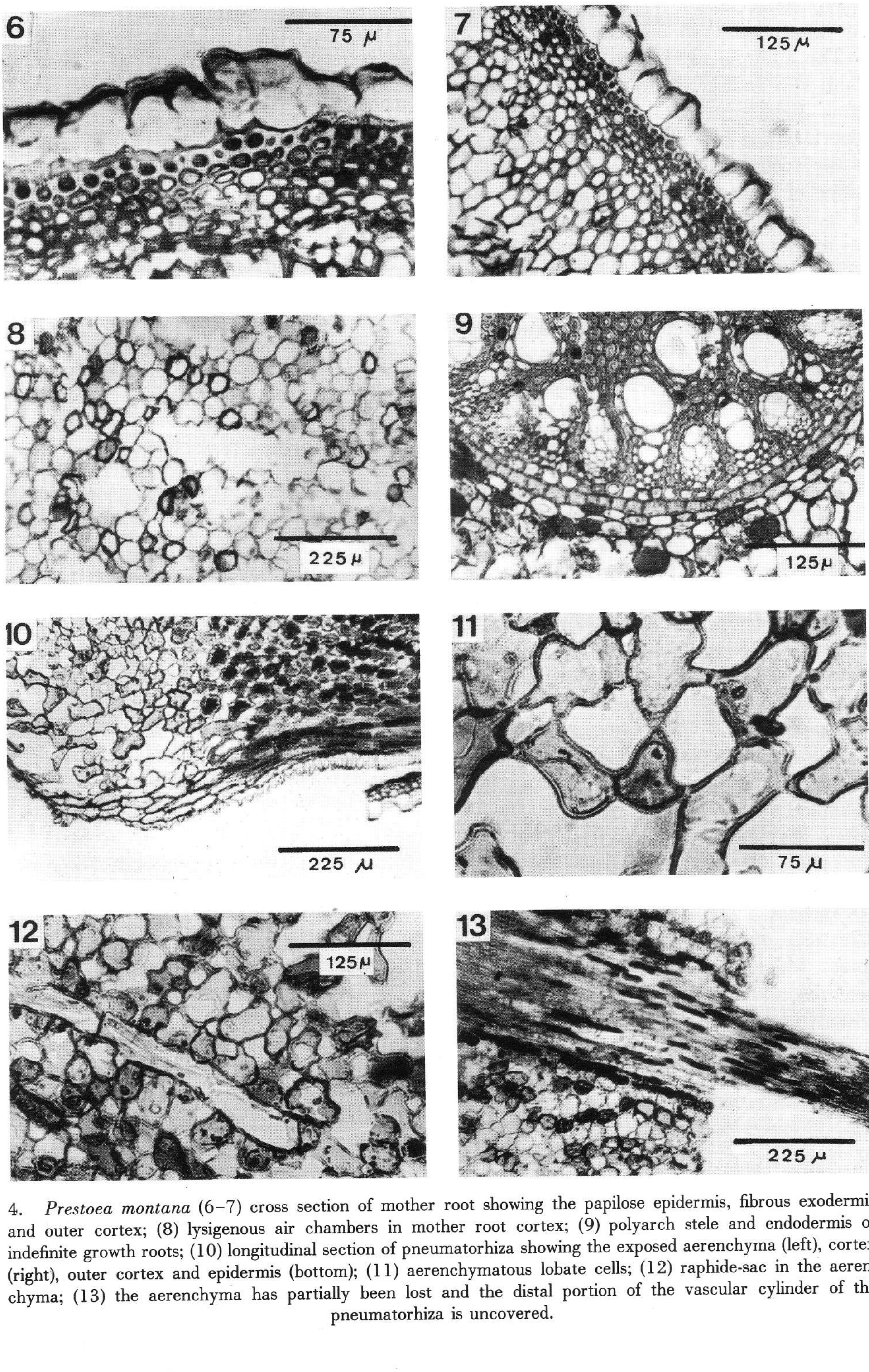

4. *Prestoea montana* (6–7) cross section of mother root showing the papilose epidermis, fibrous exodermis and outer cortex; (8) lysigenous air chambers in mother root cortex; (9) polyarch stele and endodermis of indefinite growth roots; (10) longitudinal section of pneumatorhiza showing the exposed aerenchyma (left), cortex (right), outer cortex and epidermis (bottom); (11) aerenchymatous lobate cells; (12) raphide-sac in the aerenchyma; (13) the aerenchyma has partially been lost and the distal portion of the vascular cylinder of the pneumatorhiza is uncovered.

Discussion

The anatomical examination of Sierra Palm stilt roots and pneumatorhiza confirms field observations and literature reports on the potential role of these organs in the ecology of the species. The abundance of air spaces and the arrangement of tissues reflect their role in facilitating gas exchange. Because the palm is usually found in anaerobic or swampy soils, the gas exchange function of its adventitious roots is critical to its tolerance in saturated soils. The fact that pneumatorhiza are mostly found under swampy conditions support this suggestion (Tomlinson 1961, Oldeman 1969, De Granville 1974). In one instance in which a stand of palms was chronically flooded above the adventitious roots (the flooding was caused by the damming of a river by a landslide), all palm trees died probably because of asphyxiation (Frangi, personal observation, in Espiritu Santo River, 800 m altitude). This event also lends support to the observation that the height of adventitious root growth on palms is above the high water level mark on trees.

A proposed ecological role of stilt roots is in providing support to the tree in the unstable soils that result from the combination of steep slopes, water saturation, and on stream banks, acute flows. Although this is a debatable function (Dransfield 1978), there are reports of *Prestoea montana* surviving conditions under which most trees fell over before reaching maturity for lack of anchorage (Anonymous 1953). Finally, the thick root mat formed by palms at the surface of the soil, may be a significant factor in nutrient cycling and controlling sheet erosion in the wet and steep environment where they grow.

Acknowledgments

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LITERATURE CITED

ANONYMOUS. 1953. Thirteenth Annual Report. Tropical Forest Experiment Station, Puerto Rico. Caribbean Forester 14(1–2): 1–33, January–April.

BANNISTER, B. 1970. Ecological life cycle of *Euterpe globosa* Gaertn. *In:* Odum, H. T., and R. F. Pigeon (eds.). A Tropical Rain Forest, Chapter B-18: B299–B314, U.S.A.E.C., TID 24270.

BEARD, J. S. 1949. The Natural Vegetation of the Windward and Leeward Islands. Oxford Forestry Memoirs No. 21, The Clarendon Press, London.

DE GRANVILLE, J. J. 1974. Aperçu sur la structure des pneumatophores de deux éspèces des sols hydromorphes en Guyane. Cah. ORSTOM, sér. Biol. 32: 3–22.

DRANSFIELD, J. 1978. Growth forms of rain forest palms. *In:* Tomlinson, P. B. and M. H. Zimmermann (eds.). Tropical Trees as Living Systems, Cambridge Univ. Press, London-New York-Melbourne. p. 247–268.

EDMISTEN, J. 1970. Survey of mycorrhiza and nodules in the El Verde Forest. *In:* Odum, H. and R. F. Pigeon (eds.). A Tropical Rain Forest, Chapter F-2: F15–F20, U.S.A.E.C., TID 24270.

FRANGI, J. L. 1983. Las tierras pantanosas de la montana puertoriquena. p. 233–247. *In:* Lugo, A. E. (ed.). Los bosques de Puerto Rico. U.S. Forest Service (ITF)-Departamento de Recursos Naturales, E.L.A. de Puerto Rico. Puerto Rico. 322 p.

——— AND A. E. LUGO. Vegetation Structure and Carbon, Phosphorus, and Water Dynamics of a Subtropical *Prestoea montana* Floodplain Forest. Institute of Tropical Forestry (in preparation).

METCALFE, C. P. AND L. CHALK. 1950. Anatomy of the Dicotyledons. Clarendon Press, Oxford.
OLDEMAN, R. A. A. 1969. Étude biologique des Pinotiéres de la Guyane Française. Cah. ORSTOM, sér. Biol. 10: 3–18, décembre.
STEHLÉ, H. 1945–46. Forest types of the Caribbean islands. Caribbean Forester. Suppl., Vols. 6 and 7.
TOMLINSON, P. B. 1961. Palmae. *In:* Metcalfe, C. P. (ed.). Anatomy of the Monocotyledons, II. Clarendon Press, Oxford.
———. 1979. Systematics and ecology of the Palmae. Ann. Rev. Ecol. Syst. 10: 85–107.
YAMPOLSKY, C. 1924. Pneumathodes of the oil palm. Amer. J. Bot. 11: 502–512.

Principes, 29(1), 1985, p. 19

NATURAL HISTORY NOTES

Germination of Washingtonia filifera Seeds Eaten by Coyotes

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The coyote, *Canis latrans*, is considered to be the prime dispersal agent of the desert fan palm, *Washingtonia filifera* (Henderson 1974, Vogle and McHargue 1966). In the fall, the fruits are eaten and the seeds passed intact in their droppings. In regions where palm oases occur, coyote droppings are abundant and conspicuously laden with palm seeds. Bullock (1980) found that a large (87%) percentage of these seeds would germinate. However, no mention was made of sample size nor was any control lot established.

On March 5, 1982, two hundred fan palm seeds were collected at the Simone grove in Thousand Palms Oasis, Riverside County, California. One hundred of these seeds were removed from coyote droppings. The second hundred were collected on the surface in the same general area and were considered a control group. The pericarp was removed from all the seeds though it had been digested away on 94 of the seeds consumed by coyotes. Removing the pericarp increases the probability of germination (Bullock 1980). On March 6, the seeds were planted in moist sand, 2 cm deep, and kept outside. They were watered one hour every day with an automatic sprinkling system.

Seedlings were first observed on May 1, and the last seedlings emerged on June 16. Sixty-three of the seeds which passed through coyote intestinal tracts germinated as compared with just 34 of the controls. If it is assumed that all of the seeds had an equal probability of germinating prior to being eaten, then this experiment suggests that *W. filifera* seeds have a greater chance (85%) of germinating if they are consumed by coyotes.

The precise digestive action responsible for the increased germination success is not known.

This evidence further supports the assertion that the coyote is a capable disseminator of fan palm seeds.

LITERATURE CITED

BULLOCK, S. H. 1980. Dispersal of a desert palm by opportunistic frugivores. Principes 24(1): 29–32.
HENDERSON, R. 1947. Palms of the Carrizo country. Desert Magazine 10(6): 19–22.
VOGLE, R. J. AND L. T. MCHARGUE. 1966. Vegetation of California fan palm oases on the San Andreas Fault. Ecology 47: 532–540.

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Aiphanes acaulis, a New Species from Colombia

GLORIA GALEANO-GARCES[1] AND RODRIGO BERNAL-GONZALEZ[2]

Recent explorations for palms in northwestern Colombia have revealed several novelties, one of which, an interesting stemless species of *Aiphanes*, is described here as new to science.

Aiphanes acaulis Galeano & Bernal sp. nov. (Fig. 1)

Palma solitaria acaulis. Pinnae utrinque 18–30 regulariter in eadem planitie insertae, lineares vel angustissime cuneatae. Spadix simplex. Antherae subquadraticae. Pistillodium inerme.

Solitary, acaulescent. Leaves 8–10: sheath 11–16 cm long, 1 cm wide, fibrous, densely covered abaxially with irregular, dark brown scales and with purplish-brown, less than 0.5 mm long bristles, usually with a few black, flat spines; petiole 12.5–50 cm long, with an indumentum of scales and bristles like that of the sheath, rarely armed with spines; rachis 42–75 cm long, adaxially ridged, densely covered with purplish-black, to 5 mm long bristles, and occasionally with scattered, slender, bicolor, to 2 cm long bristles, abaxially with scaly indumentum like that of the sheath and with inconspicuous, brown, flat, very short (ca. 0.2 mm) bristles; pinnae 18–30 on each side, regularly inserted, horizontally arranged in one plane, linear or very narrowly cuneate, 1-nerved, plicate along secondary veins, truncate and praemorsely toothed at apex, the upper margin produced into a cauda to 4 cm long, the apical pinnae narrowly cuneate, obliquely truncate at apex, 1–3 nerved, all pinnae glabrous above, the midnerve armed with 1–3 slender, bicolor, to 2 cm long bristles, glabrous below or with very short, purplish-black bristles scattered on surface and veins; basal pinnae 7–24.5 cm long along the upper margin, 0.7–2.1 cm wide, central pinnae 10.8–27 cm long, 1.7–2.5 cm wide, apical pinnae 6.5–15.5 cm long, to 5.6 cm wide at apex. Inflorescence spicate: prophyll 16–26 cm long, 7–11 mm wide, linear, unarmed adaxially, densely covered abaxially with irregular brown scales and with very short, appressed, purplish-brown bristles; peduncular bract 37.5–94 cm long, unarmed, with scattered, appressed, short, brown hairs; peduncle 12–88 cm long, with scattered, very short, purplish-brown bristles; spike 15–31 cm long, densely covered with very short brown bristles; flowers purple, sunken, the pistillate ones distributed along the proximal half or so, each with two staminate flowers above, the distal half with male flowers only. Staminate flowers 1.5–2.5 mm diam., broader than high: sepals imbricate, cucullate, membranaceous, glabrous; petals glabrous, connate for half their length, the lobes ovate; anthers nearly square, pistillode minute, 3-gibbous. Pistillate flowers slightly larger: sepals broadly imbricate, glabrous; petals valvate, glabrous; gynoecium ovoid, minutely verruculose, without bristles or spines; staminodial tube toothed. Fruit unknown.

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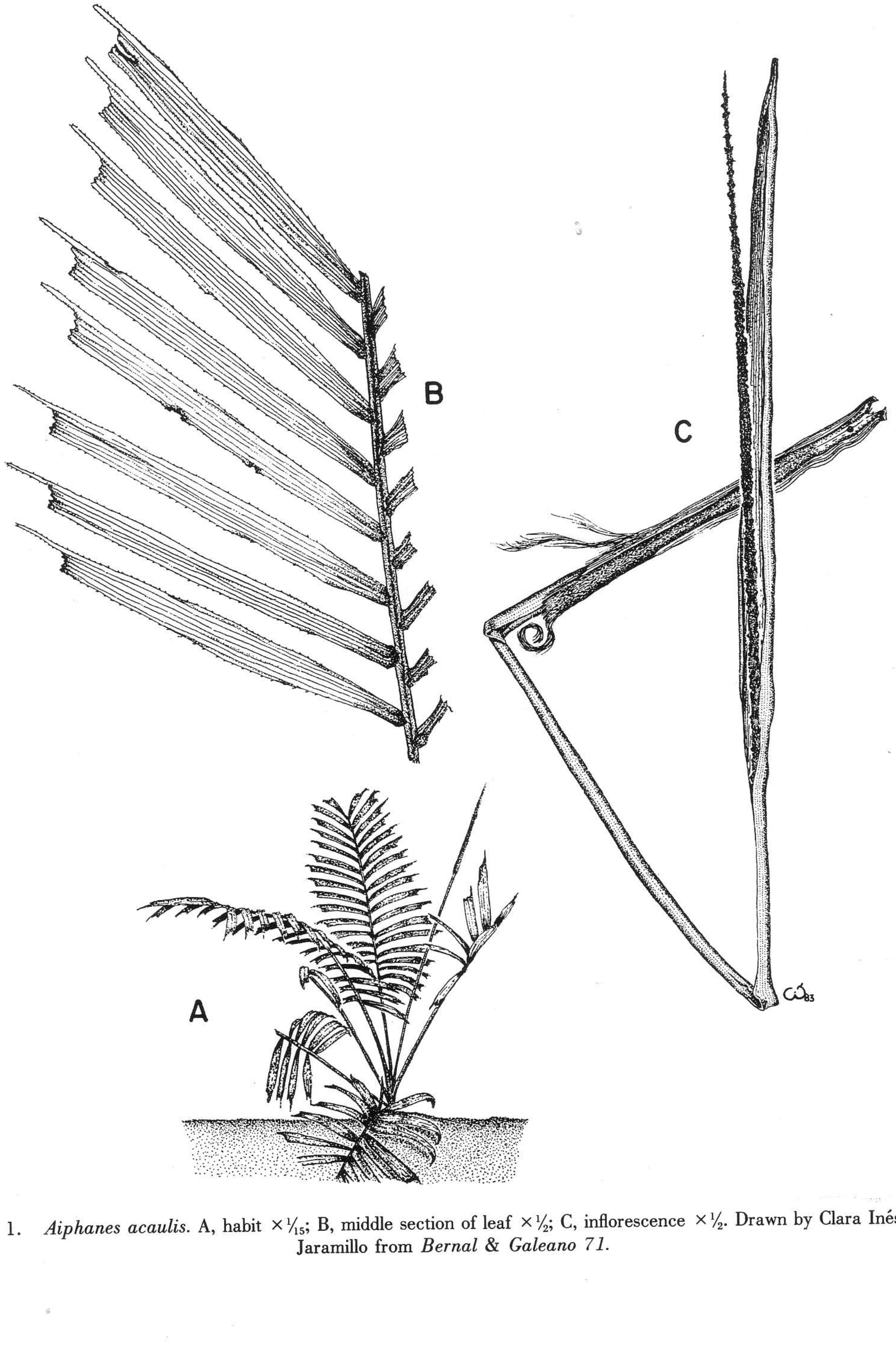

1. *Aiphanes acaulis.* A, habit ×1/15; B, middle section of leaf ×1/2; C, inflorescence ×1/2. Drawn by Clara Inés Jaramillo from *Bernal & Galeano 71.*

Specimens examined: COLOMBIA, DEPARTAMENTO DEL CHOCO: Municipio de El Carmen, vereda El Doce (carretera Medellín-Quibdó, km 151), río Atrato, margen izquierda, 700 m alt., enero 5, 1980, *Bernal & Galeano 71* (COL, holotype; HUA, K, isotypes), *72* (COL, HUA); Municipio de Quibdó, Corregimiento de San Francisco de Ichó, río Ichó, margen derecha, 150 m alt., julio 11, 1981, *Galeano & Bernal 454* (COL, HUA, K).

Aiphanes acaulis is a very characteristic species; it is readily distinguished from the remaining species by the acaulescent habit, the linear or very narrowly cuneate pinnae and the unbranched inflorescence. In the habit and shape of pinnae it recalls *Aiphanes tessmannii* Burret (1932), from Peru, but the latter has an inflorescence with many branches.

This species appears to be very uncommon, and only two small populations have been located in the cited regions, although several areas of northwestern Colombia have been explored in search of palms.

Although some variation exists between both known populations, particularly in size of leaves and inflorescence, there is no doubt that they are conspecific.

Besides *A. acaulis,* only two species have a spicate inflorescence; both of them are known only from Colombia. *Aiphanes simplex* Burret has clustered stems 2–4 m high, and its leaves bear 11–16 cuneate pinnae on each side; the other species, *A. macroloba* Burret, has leaves simple or with 3–4 pinnae on each side, and the blade is beset above with very characteristic long, soft bristles, scattered along the veins.

Two further species, described with an unbranched inflorescence, deserve a more detailed discussion and will be the subject of another paper. These are *A. chocoensis* A. Gentry and *A. monostachys* Burret. The former has proved to be a synonym of *A. macroloba*: comparison of the holotype of *A. chocoensis* with topotypes of *A. macroloba* leaves no doubt as to the identity of both species. *A. monostachys,* on the other hand, was based on a mixed collection, which included the inflorescence of *A. macroloba,* as we will prove elsewhere. Both species were described from the same locality and both have been rediscovered there. The true *A. monostachys* has an inflorescence with 15–28 rachillae. An emended description of *A. monostachys* will be provided in the forthcoming paper.

LITERATURE CITED

BURRET, M. 1932. Die Palmengattungen *Martinezia* und *Aiphanes*. Notizbl. Bot. Gart. Berlin 11: 557–577.

Correction of Phone Number for Wild Panama Trip

For the trip to Panama with John O. Wild the correct phone number is (612) 331-7221; not area code (606) as given in *Principes* 28(4): 188, October 1984.

Principes, 29(1), 1985, pp. 23–30

Effects of Gibberellin on Fruit of Date Palm: A Review

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Gibberellin (GA) is one of the important plant growth regulators involved in various physiological processes of growth and development. Many kinds of plants have been found to be affected in various ways by gibberellin. Most commonly vegetative growth has been stimulated causing increases in the length of stems and the height of plants. Early flowering and improved fruit set have been reported. In a few instances seedless (unpollinated) fruit has been produced and in some cases size and shape of the fruit change.

Role of Endogenous GA

Plants, including the date palm (*Phoenix dactylifera* L.), synthesize natural gibberellin for the regulation of various developmental activities. Leshem and Ophir (1977) studied the differences in the endogenous level of gibberellin activity in male and female partner of date palm. The female partner invariably manifested higher endogenous GA-like activity. This trend was consistent but marked seasonal fluctuations in both free and glycosidic bound GA were observed and declined with anthesis. While a clear correlation exists between female growth and high GA activity in this species the switch from vegetative to generative growth in both male and female may be associated with a lower relative proportion of endogenous GA in a specific multi-hormonal complex, presumably required for flower induction.

Exogenous Application of GA

Exploratory experiments were begun in 1958 to find out what gibberellin would do to dates if applied exogenously (Table 1). Several possibilities were considered by Nixon (1959) and other researchers when GA_3 was applied to fruit of different date palm cultivars at different flowering and fruiting stages and at various concentrations. A seedless date, approaching the pollinated one in quality, would be highly desirable. Increase in size and change in time of ripening without sacrifice of quality might be beneficial under some conditions. The fruit stalks of some cultivars are too short, thick and stiff to permit proper handling of the bunches; this is particularly true of the late bunches of *Medjool* cultivar. Interesting results were obtained by Nixon (1959) and several other researchers (Ketchie 1967, 1968, Abd-Elrahman 1974, Bandok 1975, Clor et al. 1975, Samara 1978, Mohammed et al. 1983) from the studies concerning exogenous application of GA_3 and its influence on various physical characteristics and chemical constituents of date palm fruit (Tables 2 and 3). This paper reviews the research which has been carried out by different researchers to study the effects of GA_3 on fruit of date palm.

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Effects of GA on Physical Characteristics of Fruits and Seeds

Size. Nixon (1959) reported that at the time of ripening, treated fruit was longer than untreated fruit of the *Deglet Noor* variety, but the effect on length of other varieties was variable. The breadth of treated fruit was less than that of untreated fruit except in the *Deglet Noor* variety at the lower range of concentrations. Applications of gibberellic acid within a few weeks after the opening of the spathe had more effect on size of fruit than those made later. In both fruit and seed of *Deglet Noor* dates gibberellin in the higher concentrations produced an increase in length at the expense of breadth.

Shabana et al. (1975) and Mohammed et al. (1983) found no significant change in the size of GA-treated fruits except for *Zahdi* fruits treated with GA at 50 ppm, whereas Mawlood (1980) obtained significant increases in the length and diameter of *Samani* and *Zaghloul* cultivars as a result of GA_3 treatment at 50 ppm. Differential effect of GA_3 on size of fruit could be due to varying response of cultivars and difference in the time of application of GA_3.

Weight. GA_3 at suitable concentration on pollinated bunches produced larger fruit than on controls and unpollinated bunches produced fruit equal in size to that of the controls (Ketchie 1967). Furthermore, Ketchie (1968) found that the application of 50 and 100 ppm GA_3 at the time of pollination thinned the fruit without decreasing the weight per bunch below that of the hand thinned. Shabana et al. (1975) and Mohammed et al. (1983) failed to find any significant increase in the weight of GA_3-treated *Zahdi* and *Sayer* fruits except in *Zahdi* at 150 ppm, and Hussein et al. (1976) even recorded a decline in the dry weight of GA_3-treated fruit of *Barhee* cultivar.

Color. Gibberellic acid applied to the fruit when it was about half size had more effect on coloring. Fruit treated at this stage never acquired a pronounced *Khalal* color and application of GA_3 (500 and 1,000 ppm) within a few weeks after the pollination partially inhibited the acquisition of *Khalal* color in *Deglet Noor* and *Medjool* fruit (Nixon 1959). Delay in the coloration of *Samani* dates was noticed by Marie and Bandok (1974) after GA_3 treatment at 400 ppm. Furthermore delay in the loss of green color was greater when GA_3 was applied at the early stage of fruit development. Similarly, Hussein et al. (1976) observed that in untreated *Barhee* fruits coloring commenced 7–15 days earlier than GA_3-treated fruits. However, GA_3 had no effect on color development of *Samani* and *Zaghloul* dates (El-Azzouni et al. 1975) and Mawlood (1980) even recorded retardation in the color development of both *Samani* and *Zaghloul*.

Unpollinated *Deglet Noor* dates when treated with GA_3 within a few weeks after the opening of the spathe, did not acquire as much pink color as untreated ones. *Deglet Noor* fruit treated when about two months old and about ½ inch long acquired still less pink color, instead much of it retained a greenish cast.

Ripening. The effect on ripening of unpollinated dates of gibberellin applied to the fruit within a few weeks after the opening of the prophyll was not pronounced (Nixon 1959). There was a tendency for the treated fruit of the *Deglet Noor* to shrivel prior to ripening and was especially noticeable at the higher concentrations. In some instances this gave a final appearance of slightly earlier ripening. Gibberellin applied to the fruit when it was about half size had more effect on ripening than that applied earlier. Unpollinated *Deglet Noor* fruit treated when half-grown ripened earlier than untreated fruit, but the behavior of the former was somewhat abnormal because of premature shrivelling. Pollinated fruit treated when half-grown ripened slightly later than

Table 1. Exogenous application of GA_3 to fruit of several date palm cultivars at different flowering and fruiting stages and at varying concentrations.

Cultivar	GA_3 Application				
	Investigator	Plant Part	Time	Concentration	Form
Deglet Noor Halawy	Nixon (1959)	Flower, fruit and fruit-stalk	Before and just after pollination	10–1,000 ppm	Liquid spray and lanolin paste
Khadrawy	Nixon (1959)	Flower, fruit and fruit-stalk	Half-size fruit	10–1,000 ppm	Liquid spray and lanolin paste
Medjoor	Nixon (1959) Ketchie (1967, 1968)	Flower, fruit and fruit-stalk	Half-size fruit	10–1,000 ppm	Liquid spray and lanolin paste
Barhee	Nixon (1959), Hussein et al. (1976)	Flower, fruit and fruit-stalk	Half-size fruit	10–1,000 ppm	Liquid spray and lanolin paste
Samani	Marie and Bandok (1974), El-Azzouni et al. (1975), Mawlood (1980)	Flower, fruit	Before and just after pollination	25–200 ppm	Liquid spray
Zaghloul	Marie and Bandok (1974), El-Azzouni et al. (1975), Mawlood (1980)	Flower, fruit	Before and just after pollination	25–200 ppm	Liquid spray
Sayer	Benjamin et al. (1975), Shabana et al. (1975), Mohammed et al. (1983)	Fruit	During slow period of fruit development	50–150 ppm	Liquid spray
Zahdi	Benjamin et al. (1975), Shabana et al. (1975), Mohammed et al. (1983)	Fruit	During slow period of fruit development	50–150 ppm	Liquid spray
Sewy	Samara (1978)	Flower, fruit	Full bloom and 60 days later	50–100 ppm	Liquid spray

untreated fruit of the *Deglet Noor*, *Medjool* and *Barhee* cultivars.

Ketchie (1968) reported that fruit bunches of *Medjool* when sprayed with 100 ppm GA_3 at the time of pollination matured earlier than the fruit on hand-thinned bunches. Application of GA_3 to the fruit of *Samani* and *Zaghloul* cultivars delayed maturity and ripening (Marie and Bandok 1974, El-Azzouni et al. 1975). Hussein et al. (1976) in *Barhee* and Samara (1978) in *Sewy* also reported delayed maturity and ripening of GA_3-treated fruits.

Parthenocarpy. A female date inflorescence which receives no pollen normally develops some parthenocarpic or seedless fruit. When pollinated, only one of the three carpels of a date flower normally develops but when unpollinated, one or all three carpels may develop; differences in this respect are apparently largely a matter of cultivar. Fruit without seed is usually smaller and narrower than fruit

Table 2. Effects of exogenous application of GA_3 on various physical characteristics of date palm fruit.

Investigator	Physical Characteristic					
	Size (Length, Diam.)	Weight	Color	Ripening	Parthenocarpy	Thinning
Nixon 1959	Fruit length increased	—	Inhibited color change	Unpollinated fruits ripened early and shrivelled, pollinated fruits ripened late	Induced single seedless carpel development	—
Ketchie 1967, 1968	—	Large fruit no reduction in weight	—	Unpollinated fruits ripened early and shrivelled, pollinated fruits ripened late	Produced seedless dates	Fruits thinned
Marie and Bandok 1974	—	—	Delayed loss of green color	Delayed maturity	—	—
El-Azzouni et al. 1975	—	—	Retarded color change	Delayed maturity	—	—
Shabana et al. 1975	Unaffected	Unchanged	—	—	—	—
Hussein et al. 1976	—	Decline in wt.	No effect on color development	Delayed maturity and ripening	—	—
Samara 1978	—	—	—	—	Seedless dates	—
Mawlood 1980	Increase in length and diameter	—	Retarded color development	—	—	—
Mohammed *et al.* 1983	Unaffected	Unchanged	—	—	—	—
Clor et al. 1975	—	—	—	—	Seedless dates	—

Table 3. Effects of exogenous application of GA_3 on various chemical constituents of date palm fruit.

Investigator	Chemical Constituent							
	Moisture	Soluble Solids	Sugars	Acidity	Amino Acid	Tannin	Protein and Indole	Enzymes
Abd-Elrahman 1974	Not affected	Not influenced	—	Not influenced	—	—	—	—
Bandok 1975	—	—	Unaffected/ declined	—	Reduction	Unaffected	—	—
Benjamin et al. 1975	Not affected	Not influenced	Increased	—	—	—	—	—
Clor et al. 1975	Reduction	Decreased	—	—	—	—	—	—
Hussein et al. 1976	Significantly increased	Decreased	Unaffected/ decreased	Increased	—	—	—	—
Samara 1978	—	Decreased	Reduction	Increased	—	—	—	—
Mawlood 1980	Not affected	Decreased	Reduction	Increased	Increased	Increased	Increased	Decreased
Mohammed 1983	Not affected/ slightly increased	Not influenced	Increased	—	—	—	—	—

with seed, and when three carpels develop each is smaller than one that develops by itself.

Nixon (1959) reported that aqueous sprays of gibberellin applied to unpollinated *Deglet Noor* flowers within a few days of the opening of the prophyll stimulated the development of all three carpels in a large proportion of the flowers instead of the single carpel that normally develops in this cultivar either with or without pollination. But only a single carpel developed when gibberellin was applied five weeks later to *Deglet Noor* inflorescences. In some instances the three carpels that developed from one *Deglet Noor* flower shrivelled before reaching full development, but a large proportion of them attained a size almost equal to that of the single unpollinated carpels, although they differed in shape. Multicarpel development did not occur in the *Medjool* in which single seedless carpels develop somewhat as in *Deglet Noor*. In the *Barhee*, *Halawy* and *Khadrawy* cultivars, the development of all three carpels of unpollinated flowers is common, but when gibberellin was applied during the period of receptivity to pollen, a large percentage of single seedless carpels developed.

Application of GA_3 at 25, 50 and 100 ppm to unpollinated and pollinated flowers produced seedless dates, but application to unpollinated bunches produced significantly higher numbers of seedless dates than when applied to pollinated bunches (Ketchie 1967). Seedless dates were induced by Clor et al. (1975) when non-viable pollen and GA_3 were applied to the inflorescences. Samara (1978) found that application of GA_3 at 50 or 100 ppm at full bloom and/or 60 days later induced seedless *Sewy* dates.

Thinning. Effect of GA_3 as a chemical thinning agent on date palm was tested by Ketchie (1967, 1968). Application of 50 and 100 ppm GA_3 to *Medjool* date bunches at the time of pollination thinned the fruit without decreasing weight per bunch below that of the hand-thinned.

In addition to the beneficial effects of GA mentioned above there were some adverse effects on fruit and fruitstalk of date palm. Nixon (1959) reported that the application of gibberellin increased the normal curvature of fruitstalks but also resulted in so much undesirable spiral twisting that there was a complete turn of 360° in several instances. Furthermore, gibberellin appeared to increase the susceptibility of *Deglet Noor* dates not only to shrivel as previously mentioned but also to checking and blacknose.

Effect of GA on Chemical Constituents of Fruit

Moisture. GA does not seem to enhance the moisture content of dates. Abd-Elrahman (1974) noticed that the treatment with GA_3 at 25 and 100 ppm had no significant effect on the moisture content of *Samani* and *Zaghloul* dates. Clor et al. (1975) also recorded a reduction in the moisture content of *Zahdi* dates from 17.33% to 14.77% as a result of GA_3 treatment at 50 ppm. In another experiment (Benjamin et al. 1975, Mohammed et al. 1983) fruits of both *Zahdi* and *Sayer* cultivars, when treated with GA_3 at 50, 100 and 150 ppm showed a pattern of moisture content quite similar to that of control at different developmental stages. At harvest time only some GA_3-treatments increased moisture in both *Zahdi* and *Sayer* dates.

On the contrary, Hussein et al. (1976) obtained significant increases in *Barhee* dates by applying GA_3 at 100, 250, 500 and 1,000 ppm. However, Mawlood (1980) did not find any difference due to GA_3 treatment in moisture content of fruits of *Samani* and *Zaghloul* cultivars.

Sugar. Bandok (1975) reported that the GA_3 at 200 ppm lowered total sugars while no major differences occurred either in reducing or non-reducing sugars in *Samani* cultivar. Although GA_3 at 50, 100, 150 ppm had no influence on the sugar accumulation pattern at different developmental stages in both *Zahdi* and *Sayer* cultivars, the total and reducing sugar contents in *Zahdi* were appreciably higher in GA_3-treated fruits than control (Benjamin et al. 1975, Mohammed et al. 1983). The maximum sucrose contents of GA-treated fruits of both *Zahdi* and *Sayer* cultivars was lower than control except for treatment at 50 ppm in *Zahdi.* Hussein et al. (1976) on the contrary, recorded a decrease in the percentage of reducing and total sugars, while sucrose remained unaffected by the treatment of GA_3 at 100, 250, 500 and 1,000 ppm. The reduction in total sugars owing to the application of GA_3 (50 and 100 ppm) is also confirmed by Samara (1978) and Mawlood (1980).

Soluble solids. In general, GA (50, 100, 150 ppm) does not have pronounced influence on the total soluble solids (TSS) of *Zahdi* and *Sayer* dates at different developmental stages (Abd-Elrahman, 1974, Benjamin et al. 1975, Mohammed et al. 1983) except for low TSS value at 150 ppm treatment at harvest time. It appears that GA exerts a negative effect on TSS content of dates. Clor et al. (1975) and Samara (1978) reported that GA_3 at 50 ppm decreased TSS in fruits of *Zahdi* and *Sewy.* Likewise low percentage of TSS in unpollinated dates has been obtained by Samara (1978) and Mawlood (1980) after GA_3 treatment at 50 ppm. With the increase in GA_3 concentration, there is a corresponding decrease in the TSS content of dates (Hussein et al. 1976).

Acidity. GA_3 seems to promote acidity in dates. Abd-Elrahman (1974) failed to obtain any significant influence of GA_3 treatments at 25 and 100 ppm in fruits of *Samani* and *Zaghloul* cultivars. On the contrary, Hussein et al. (1976) found enhancement in the acidity of dates due to GA_3 application at 500 and 1,000 ppm. This is in agreement with the results of Samara (1978) who recorded higher acidity value when GA_3 at 50 or 100 ppm was applied to the seedless dates. Mawlood (1980) also confirmed that GA_3 increases the acidity of both seedy and seedless dates.

Amino acid. Not much is known about the effect of GA_3 on the amount of amino acids in dates except for few reports. Bandok (1975) stated that GA_3 at 200 and 400 ppm reduces the total free amino nitrogen in *Samani* fruit either during the growth and development or at harvest time whereas Mawlood (1980) found that GA_3 (50 ppm) increases the amino acids of both *Samani* and *Zaghloul* cultivars.

Tannin. No major differences in tannin content could be observed between fruits treated with GA_3 at 50–400 ppm at different intervals from pollination and untreated ones (Bandok, 1975). But Mawlood (1980) obtained increases in the tannin contents of both *Samani* and *Zaghloul* after GA_3 treatment.

Information on the influence of GA_3 on protein, indole contents and enzymatic activity is meager. Mawlood (1980) reported that GA_3 increases protein content and indole contents of both *Samani* and *Zaghloul* dates and decreases the invertase and PG enzymes activity.

Conclusion

An account of results of the various investigations presented in the paper leads to the conclusion that the effect of gibberellin on date palm fruit varies with different cultivars, time, form, and concentration of GA_3 application. Although GA_3 does not show promotive influence on fruit size and weight, it could be used to delay ripening, to induce thinning, and to produce seedless fruit, if needed. The general influence of GA_3 application on various chemical constituents such as moisture, TSS, and sugar is non-promotive, however, acidity seems to be promoted by GA_3 application. Information on the effect of GA_3 application on other chemical constituents, for instance, amino acid, tannin, protein, indole content and enzymatic activity is rather scanty and needs further research. Also, there is a need for research on the mechanism of gibberellin action in the fruit of the date palm. Analysis of endogenous gibberellin at various fruit developmental stages is an interesting area for future research.

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Literature Cited

Abd-Elrahman, M. H. 1974. Studies on physiological and physical changes in the fruit of some date varieties after maturity. M.Sc. Thesis, Cairo Univ. (in English with Arabic summary).

Bandok, A. Z. 1975. Physiological studies on artificial ripening of some date fruits. Ph.D. Thesis, Ain Shams Univ., Cairo (in English with Arabic summary).

Benjamin, N. D., H. R. Shabana, B. A. Al-Ani, M. A. Clor, K. S. Jawad, and A. M. H. Shaibani. 1975. Effects of some growth regulators on the depressed period of development and physico-chemical changes during different stages of ripening in date fruit. I. A-Chemical changes (soluble solids, sugars), and moisture content in fruits of *Zahdi* and *Sayer* cultivars. Palm and Date Res. Tech. Bull. No. 1/75. 20 pp. (Arabic Summary).

Clor, M. A., N. D. Benjamin, H. R. Shabana, and B. A. Al-Ani. 1975. Seed and fruit development of *Phoenix dactylifera* as influenced by type of pollination and some growth substances. In the Third International Palm and Dates Conf., Baghdad, 30 Nov.–4 Dec., 1975 (in Arabic with English summary).

El-Azzouni, M. H., M. T. Kabeel, E. T. Bakr, E. I. Bakr, and M. H. Abd-Elrahman. 1975. Effect of pre- and post-harvest application of some growth regulators on two date palm varieties *Samani,* and *Zaghloul.* Annals. Agri. Sci. Moshtohor. 4: 213–220.

HUSSEIN, F., S. MOUSTAFA, AND F. EL-SAMARAIE. 1976. Effect of gibberellic acid on yield, ripening and fruit quality of "Barhee" dates grown in Saudi Arabia. Egyptian J. Hort. 3(2): 197–207.

KETCHIE, D. O. 1967. Tests of chemicals for thinning and producing seedless "Medjool" dates. Date Growers Inst. Ann. Rept. 44: 5–6.

———. 1968. Chemical tests for thinning Medjool dates. Date Growers Inst. Ann. Rept. 45: 19–20.

LESHEM, Y. AND D. OPHIR. 1977. Differences in endogenous levels of gibberellin activity in male and female partners of two dioecious tree species. Annals of Bot. 41(172): 375–379.

MARIE, N. AND A. Z. BANDOK. 1974. Date fruit response to gibberellic acid and ethephon. Egyptian Hort. 1(1): 89–90.

MAWLOOD, E. A. 1980. Physiological studies on fruits development of *Samani* and *Zaghloul* date palm cultivars. Ph.D. Thesis, Cairo Univ. (in English with Arabic summary).

MOHAMMED, S., H. R. SHABANA, AND N. D. BENJAMIN. 1983. Response of date fruit to gibberellic acid application during slow period of fruit development. Principes, submitted for publication.

NIXON, R. W. 1959. Effects of gibberellin on fruitstalks and fruit of date palm. Date Growers Inst. Ann. Rept. 36: 5–7.

SAMARA, N. R. E. 1978. Physiological studies on date fruits, M.Sc. Thesis, Ain Shams Univ., Cairo (in English with Arabic summary).

SHABANA, H. R., K. S. JAWAD, N. D. BENJAMIN, AND B. A. AL-ANI. 1975. Effect of some growth regulators at depressed period of development on the physical properties of *Zahdi* and *Sayer* cultivars. *In* Second Scientific Conf. Baghdad, 6–11 Dec. (in Arabic with English summary) 16 pp.

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A New Pritchardia from South Kona, Hawaii

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In 1960, while clearing land in Kapua and Papa in South Kona, Hawaii, Mr. George Schattauer came across several specimens of an elegant, tall fan palm of the genus *Pritchardia* previously not known to occur in that area of Hawaii. Recognizing the significance of his discovery, Mr. Schattauer left the palms standing in the cleared areas of the forest. In 1969 and 1970 Mr. Schattauer sent fruits of these palms to Mr. Paul Weissich, director of Honolulu Botanic Gardens. Upon seeing the relatively large fruits and noting the description and locality of the palms he realized that they could not be associated with any known species. Mr. Weissich alerted me to these palms while I was doing field work on the island of Hawaii in 1976 under the auspices of the Pacific Tropical Botanical Garden. Mr. Schattauer took me to see these palms, and I was able to collect fallen fruits, inflorescences, and leaves. I had the opportunity to visit the palms on several occasions during the next four years and make further collections. Finally in 1980 I visited the palms for the last time in the company of the late Dr. H. E. Moore, Jr. (see Hodel 1982). From field observations and examination of herbarium material I have ascertained that these palms represent a new species of *Pritchardia* as was alluded to in an earlier paper (Hodel 1980).

Pritchardia schattaueri D. R. Hodel, **sp. nov.** (Fig. 1).

Arbor ad 30(40) m alta, caudice 30 cm diametro, cortice non suberosa; folia circa 30, petiolis arcuatis ad 205 cm longis, laminis lucidis, apicibus segmentorum pendulis; inflorescentiae tenues, 2–4 axibus ad 175 cm longis, bracteis juventute tomento longo pallido infuscatio tectis; fructus magnus globosus vel obovoideus, 3.0–5.5 cm longus.

Typus: Hawaiian Islands, *H. E. Moore, Jr., D. R. Hodel, J. R. Judd, III,* and *R. H. Phillips 10570* (holotypus BH).

Single stemmed, tall, unarmed, pleonanthic, hermaphrodite palm to 30(40) m tall, 30 cm in diameter, cortex gray, longitudinally grooved but not corky. Leaves ca. 30, forming a spherical crown, sometimes old leaves persistent and forming a short skirt; petioles elongate, arching, to 205 cm long, to 27 cm wide at base, to 5 cm wide at tip, densely tawny-woolly below, glabrous above, margins long fibrous; ligule to 7 cm long, to 2.5 cm wide, hemispherical; blade glossy, not stiff, to 155 cm long, 170 cm wide, central undivided part to 105 cm long, left and right lateral segments from apex to base of blade progressively shorter while divided portions of these lateral segments progressively longer, central segments to 5.5 cm wide at point of disjunction becoming progressively narrower towards base, segment tips pendulous, blade green and glabrous above and greenish below, underside moderately covered with pale brown, elliptic to circular scales; dense woolly tomentum extending from underside of petiole onto blade and along ridges of segment folds. Inflorescence branched, with 2–4 axes from the base, each terminating in a panicle, slender and more or less pendulous, 120–175 cm long, 3.5–4.0 cm

Fig. 1. *Pritchardia schattaueri*, type locality, Papa, South Kona, Hawaii.

wide at base; individual axes 100–140 cm long, 1.0–1.5 cm in diameter; panicle 24–32 cm long, to 34 cm wide, lowest panicle branches composed of 3–5 branchlets to 17 cm long, middle branches composed of 1–2 branchlets, 12–16 cm long, upper branches simple to 12 cm long, lower panicle branchlets 4 mm in diameter, upper panicle branchlets 1 mm in diameter; prophyll and peduncular bracts not seen, new bracts covered with rather long, light brown tomentum, bracts long-lanceolate in shape, lower bracts to 60 cm long, terminal bracts 20–30 cm long, bracts 5 in number (excluding prophyll and peduncular bracts), progressively shorter from lower to terminal bract. Calyx green, shading to yellow-green apically, barrel-shaped, 3-toothed, 6 × 4 mm; filaments 6, 1.5–2.5 mm long, filament base orange, exserted 2.0–2.5 mm beyond calyx, 3 mm in diameter, filament ring 5 mm long; anthers 3.0–3.5 × 0.5 mm; ovary 3.5 mm long, 1.5 mm wide, style 2.5–3.0 mm long, slightly triangular in cross section. Fruit brown to black with brown spots when mature, variable in shape and size, globose to obovoid 3–5 × 3–4 cm; exocarp 0.5 mm thick, mesocarp variable in thickness from 1.5–6.0 mm at base, 1.3 mm in middle, to 10 mm thick at pedicel end, more or less fibrous or slightly corky, endocarp 1.0–1.5 mm thick; seed globose, 2.0–2.5 cm long and wide, or subglobose, 1.6 × 1.8 cm; embryo lateral or sub-basal, cylindrical, 3.5 × 1.5 mm.

Distribution: Known in the wild from only twelve individuals occurring in partially cleared, disturbed, mixed *Metrosideros* forest from 600–800 m altitude, Lands of Papa, Honomalino, and Kapua, South Kona on the island of Hawaii.

Specimens Examined: HAWAIIAN ISLANDS, Hawaii, District of South Kona, Lands of Papa, Ho'omau Ranch, ca. 750 m altitude, partially cleared, disturbed, mixed *Metrosideros* forest, 19 June 1980, *H. E. Moore, Jr., D. R. Hodel, J. R. Judd, III,* and *R. H. Phillips 10570* (holotype, BH); type locality, 1 April 1976, *D. R. Hodel* and *J. R. Judd, III 169* (PTBG); Lands of Kapua, in *Macadamia* nut orchard that was formerly *Metrosideros* forest, 30 March 1973, *L. E. Bishop* and *G. McDonough 1832* (UH).

Cultivated: Wahiawa Gardens of Honolulu Botanic Gardens, Honolulu, Hawaii, HBG 70.042 and HBG 69.698, 8 June 1983, *R. Kariel s.n.*

Vernacular Name: lo'ulu. This name was applied to all species of *Pritchardia* in Hawaii and is still popularly used today. *Hawane* was the name for the edible, immature fruits of the various *Pritchardia* spp. in Hawaii.

Pritchardia schattaueri is named for Mr. George Schattauer of Kona, Hawaii who discovered the palms, recognized their significance, and brought them to the attention of others. His fondness of Hawaiian plants and interest in preserving the flora and fauna of Hawaii deserve recognition.

Seeds of *Pritchardia schattaueri* were sent to The Palm Society Seed Bank in 1976 as *Hodel 169.*

Habitat: R. schattaueri grows on gently sloping, rocky, well-drained soils. Average annual rainfall is about 200 cm with a majority of this falling from April through September. Although they now occur in open spaces and fully exposed, *P. schattaueri* must be considered a palm of the forest since before being cleared the area was covered by forest dominated by *Metrosideros collina.* The height of the forest canopy was approximately 30 m as evidenced by the present day remnant stands of *Metrosideros collina.* The height of *P. schattaueri,* 30–40 m, indicates that it was at least a canopy dweller if not an emergent of the mature forest. Other associated species include *Freycinetia arborea, Psychotria hawaiiensis, Xylosma hawaiiense, Myrsine lessertiana, Tetraplasandra hawaiiensis, Pisonia brunoniana, Antidesma platyphyllum, Cibotium chamissoi,* and *Sadleria cyatheoides.*

The distribution of *P. schattaueri* is somewhat of an enigma. Ten of the twelve individuals occur within 400 m of each other in Papa while the remaining two are several kilometers distant in Honomalino and Kapua. The more or less same type of forest found in these areas extends in a band with some degree of uniformity for a distance of approximately 50 km to the north along the west sides of Mauna Loa and Hualalai. Yet *P. schattaueri* is absent from this large forested area which apparently is a very suitable environment for its growth and development. Although several cultivated individuals of *P. affinis* occur near old Hawaiian homesites near this area, why *P. schattaueri* has not been reported is perplexing.

Of the five other named species of *Pritchardia* on the island of Hawaii, *P. schattaueri* is apparently most closely related to *P. beccariana* but differs in the less ramified panicle, more slender inflorescence axes, more deeply divided leaves, and pendulous rather than stiff tips of the leaf blade segments. *P. schattaueri* differs from *P. eriostachya, P. lanigera,* and the probably extinct *P. montis-kea* in the lack of thick woolly tomentum covering the bracts and panicles, the more slender inflorescence axes, the more ramified panicle, and more slender rachillae. It differs from *P. affinis* in the pendulous tips of the leaf blade segments, longer and more slender inflorescence axes, larger fruits and a woody rather than corky texture to the cortex of the trunk.

The survival of *P. schattaueri* in the wild is certainly doubtful. Although all the trees comprising the population are mature and several produce fruit regularly, their habitat is so altered or disturbed that regeneration is nonexistent. Of the twelve remaining individuals, ten occur in pastureland where grazing cattle and wild pigs crush or eat fallen or sprouted seeds. One of the remaining twelve is located in a commercial *Macadamia* nut orchard where extraneous plant growth in orchard rows is discouraged. The last occurs in very disturbed, weedy *Metrosideros* forest remnants where weed growth and grazing wild animals prevent regeneration while a proposed housing development threatens the survival of the mature specimen. *P. schattaueri* should be given the official status of very rare, very local, and endangered according to the criteria outlined by Fosberg and Herbst (1975).

It is my observation that several of the specimens are approaching the end of their natural life. Their crowns are much reduced, being only hemispherical not spherical in shape. Flower and fruit production is minimal and these palms have a generally unthrifty appearance. Until these trees are afforded protection from grazing cattle, wild animals, weed growth, and land development, their future as a viable, existing, wild population is doomed.

Animal-proof fencing around key individuals of the population and a weed management program within these enclosures until regeneration is resumed may offer a solution. In addition, seeds could be collected, seedlings germinated and grown in a nursery until of suitable size, and then replanted within the animal-proof enclosures. This may prove to be beneficial and expedient to the regeneration process. It is hoped that the naming of this palm will help to publicize its precarious existence and result in efforts to protect and enhance its survival as a viable, wild population.

Acknowledgments

Several individuals and institutions have assisted me in this study. In addition to discovering these palms and bringing them to the attention of others, George Schattauer was instrumental in making arrangements for me to visit the palms. William Theobald and Timothy Flynn of Pacific Tropical Botanical Garden, Peter Hyypio of L. H. Bailey Hortorium, and Gerald Carr of the University of Hawaii lent herbarium material while Rachel Kariel of Honolulu Botanic Gardens sent material from cultivation. Paul Weissich inspired my interest in *Pritchardia* and alerted me to the existence of these palms. James R. Judd, Jr. was very supportive of my efforts in pursuing studies of *Pritchardia* on Hawaii. James R. Judd, III was a very selfless companion in the field for many a happy and memorable day in Kona. Lastly, my wife, Marianne, tolerated my preoccupations for extended periods with grace and understanding. All deserve my sincere appreciation.

LITERATURE CITED

FOSBERG, F. H. AND D. HERBST. 1975. Rare and endangered species of Hawaiian plants. Allertonia 1: 1–72.

HODEL, D. 1980. Notes on Pritchardia in Hawaii. Principes 24: 65–81.

———. 1982. Hal's last palms. Principes 26: 135–137.

PALM LITERATURE

GENTRY, A. H. 1981. New species and a new combination in *Palmae, Theaceae, Araliaceae, Apocynaceae,* and *Bignoniaceae* from the Chocó and Amazonian Peru. Ann. Missouri Bot. Gard. 68: 112–121.

Aiphanes chocoensis A. Gentry is described from the Chocó region, in Western Colombia. Although the author revised Burret's (1932) synopsis of the genus, and even criticizes it, he nevertheless overlooked *Aiphanes macroloba* Burret, a species described there, and which appears to be identical to *A. chocoensis.* Both type localities are less than 140 kilometers apart. A formal reduction of *A. chocoensis* A. Gentry to synonymy under *A. macroloba* Burret will be made elsewhere.

RODRIGO BERNAL-GONZALEZ

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Principes, 29(1), 1985, pp. 35–40

NEWS OF THE SOCIETY

Biennial Meeting 1984 San Francisco

We were off to a great start this 14th Biennial, with a wine and cheese party sponsored by the Northern California Chapter of the International Palm Society at Marine Memorial Hotel in San Francisco. It was difficult to hear a word that was said but the tasty cheese and gourmet dishes concocted by Greg Lynn were extra special and our hosts' enthusiastic welcome outdid the roar of too many people talking at once.

The next morning, August 4, we boarded our bus for a tour of San Francisco, Golden Gate Park, and Mission San Francisco de Asis established in 1776. The view, overlooking the bay, of Alcatraz, the San Francisco skyline, and the Golden Gate bridge always takes away my breath.

Late that afternoon we toured Jack Dane's garden. It is a tiny walled-in area, beautifully landscaped with palms and groomed to perfection. Cocktails and food were served. To see the table heavy with cheese, fruits, tasty viands of every description and then to partake was waistline shattering. Jack has many rare palms, including *Chuniophoenix,* several New Caledonian genera, and a collection of exquisite miniature *Rhapis* in a small greenhouse attached to his two-story house. He is a master at using every conceivable centimeter of space.

Sunday, August 5, found us busing to Dunsmuir House, a great big mansion of Revised Colonial architecture, built by Dunsmuir with inherited monies from lumber and coal industries in Scotland. Though he didn't live long to enjoy it, the house and grounds are now maintained by the historical trust for others to enjoy. A huge *Washingtonia* on the grounds has been there so long that its seedlings are creating a forest of little *Washingtonia* and Inge Hoffmann is establishing more palms in the gardens. Under a pretty canopy on the lawn, we were served coffee and very tasty cakes.

On to Warren Dolby's garden in Oakland, for a cold buffet luncheon and champagne. We flatland Floridians wonder how Warren can keep from sliding down his cliff garden of many levels, with paths leading to each and with palms strategically placed to grab on to when one starts sliding. Special attractions were a large *Parajubaea,* a beautiful *Caryota urens,* and *Rhopalostylis sapida* and *R. baueri.* But how did you get them there, Warren? His neighbor also opened a very pretty garden for us to tour.

Then on to our bus to view the palms at the University of California, in Berkeley (they've grown, oh so much, since my last visit) and to hear Dr. Robert Read of the Smithsonian talk about *Chamaedorea.* Very interesting but there is much work to be done on the genus.

The next day, we toured Marin County. In Muir Woods National Monument, we saw the groves of coastal redwood—the tallest trees in the world. Even palm enthusiasts were stricken silent by their magnificence, and as we walked along the trails, we saw several deer. During the lunch hour, we strolled around the bayside village of Sausalito.

Our next stop was Dr. Herbert Weber's, a small garden with *Chamaedorea, Trachycarpus,* and *Phoenix* around a pool. The most impressive of his palms was a thick-trunked *Rhopalostylis.* The refreshments Herb served were lavish: cream cheese and salmon spread for tiny bagels, delicious chocolate cake, tarts, plums, melons, assorted cookies and punch. Palm folks are a well-fed lot.

We again crossed the Golden Gate bridge noting the splendid view of San

Francisco which had been blotted out by fog on our trip over. That misty, cool fog comes and goes. A quick change of clothing and we were soon in the Golden Gate Park Conservatory being served drinks and assorted cheeses and pâté by members of the San Francisco Garden Club. We were surrounded by large hanging baskets of gorgeous tuberous begonias displaying every shade from deep red to purest white and walked through other rooms of this large glass house to admire a tall *Livistona chinesis*, a beautiful *Cryosophila warscewiczii*, tall clumps of *Rhapis humilis* and many other palms, all thriving under glass in cool San Francisco.

Tuesday, August 7, we went to Sacramento and toured California's historic capitol. We were impressed by the beautiful trees and palms in the 40-acre Capitol Park. Trees from nearly every part of the world had been planted in the early nineteen-hundreds. A beautiful avenue of *Washingtonia* was out front and other big palms were scattered throughout the park.

Then we drove to Dr. Bernard Kitt's garden. His house is a two-story building on a lake. Here we were served a sumptuous lunch, topped off with chilled pears from a wheelbarrow. An island just off shore has been planted by Dr. Kitt with *Washingtonia*, *Trachycarpus* and *Arecastrum*. Gorgeous! Bits of bread were tossed into the lake and flotillas of ducks came from the island and the far reaches of the lake.

Next we drove to Winters, California, to see Greg Lynn's garden. Several years ago, Greg bought an old house and has restored it, all the while planting many palms and all sorts of other plants in the hard clay soil which the constant sun and water from irrigation make very fertile. Now Greg has the finest collection of palms in the Sacramento area. It includes several species of *Brahea* and *Sabal*, as well as *Butia* and *Jubaea*. California has a diversity of climate and soils but palm lovers always manage to find palms to fill the niches. Barbecued ribs and chicken along with roast corn, salads and fruit ended the day with a feast to remember.

On August 8 we drove to Oakland, where in Oakland's Lakeside Park, members of the Northern California Chapter have established a palm garden (see Fig. 1) and had made special efforts to have it ready for dedication at the Biennial. The collection of more than 80 species is impressive and included *Archontophoenix cunninghamiana*, *Arecastrum romanzoffianum*, several *Brahea*, *Butia*, *Ceroxylon hexandrum* and *C. quindiuense*, *Juania australis*, *Jubaea chilensis*, *Parajubaea cocoides*, several species of *Phoenix*, and *Wallichia disticha*. Following a light luncheon, a short business meeting was held at the Oakland Garden Center, enlightened by Inge Hoffmann's humorous account of the labor that resulted in the new garden. In his remarks Warren Dolby concluded "We've come a long way, baby!"

The banquet was held at the Marine Memorial Hotel. Outgoing president Richard Douglas introduced the new officers and was presented with a palm print by Phil Elia for so successfully guiding us during the past two years. Dr. John Dransfield, Royal Botanic Gardens, Kew, England closed the evening with slides depicting a recent trip to China and the discovery of a new fan palm.

August 9 was the last day of a splendid biennial. We boarded BART to ride to Dick Douglas' in Walnut Creek. How his palms have grown since last we saw them in 1982. I especially liked *Trachycarpus wagnerianus* and several unusual forms of potted *Chamaerops*. *Sabal* "Riverside" was elegant, in flower on his front lawn, and *Trithrinax campestris*, a large *Nannorrhops ritchiana*, and large *Butia* and *Arecastrum* accented the back garden. All the palms looked very healthy and many were in fruit. Dick's specialty is hybridizing *Chamaedorea* and he has some beauties. No longer does that huge oak stand alone. Under its wide spreading branches and among the palms we sat down to lunch at attractively laid tables and another very successful Biennial came to a close. We'll long remember Northern California hospitality. Forty-two caught a Quantas flight to Sydney, Australia, that evening, but that's another story.

GERTRUDE COLE

1. Two views of the new palm garden in Lakeside Park, Oakland. A. The walk, flanked on the left by *Archontophoenix cunninghamiana* with *Ravenea glauca* beyond; B. *Parajubaea cocoides* dominates another planting. Photos by Garrin Fullington.

Highlights of the 1984 Post-Biennial Australia Tour

Forty-three American members of the International Palm Society departed California following the San Francisco Biennial Meeting and flew to Sydney, Australia, to begin a sixteen day botanical adventure. The group was large but this never caused any problems for us, thanks in great measure to the efficiency of the Australian tour companies and our hard-working Australian hosts.

Sydney presented us with its finest winter weather—warm sunshine and crisp, cool air. We were met at the airport at 6:30 AM by a group of local Palm Society members, and for the next four days they took us all under wing both as a group and individually to show us the area's finest palms, gardens, and hospitality. We enjoyed the gardens of members Ken Veness, Bob Paisley, Ian Daly, Bettie Hart, and David Simpson, as well as gardens of other non-member palm growers. Of course the magnificent Sydney Botanic Garden was one of the foremost attractions as well. Although the late winter weather seems exactly like late winter in northern California, the summers in Sydney provide enough heat and moisture to grow some surprisingly tropical palm species. We saw mature *Roystonea*, *Arenga pinnata*, and *Chambeyronia*, for instance, in the same area with *Parajubaea cocoides* and *Ceroxylon*. The Lord Howe Island palms grow to perfection in the Sydney climate and are in evidence everywhere. We observed the local native palm, *Livistona australis*, in many magnificent stands, as well as some native *Archontophoenix cunninghamiana*.

Our bountiful barbeque lunch at Bob and Nessie Paisley's home and the heaping platters of lobsters, prawns, and oysters at David and Alice Simpson's home will never be forgotten. We were all very grateful to these hosts and especially to Bob Paisley and Nicholas Heath for their part in making arrangements for us. It is interesting that the local tour company representative, also a palm grower, found our group to be so congenial and spirited that she decided to join the Palm Society.

We had only an overnight stop at Townsville in Queensland on our way north, but the local members there used the occasion to arrange a wonderful poolside barbeque at our hotel for us. They even carried in large potted specimen palms to add to the atmosphere. Here in Townsville we began to taste the tropics; our hotel was on a beach with coconut palms. But the late winter coolness brought out the sweaters and jackets late in the evening.

The following morning, in a series of shuttle flights in small aircraft, we moved farther north to Dunk Island. Here the tropics swallowed us in with full glory. The island is a national park with a plush resort. The hiking trails took us along coconut-shaded beaches, over mountain slopes covered with rain forest including great stands of *Ptychosperma elegans*, *Archontophoenix alexandrae*, *Calamus* sp., *Linospadix* sp., *Licuala ramsayi*, and *Arenga australasica*. The resort area is planted with many exotic palms as well as native ones, and we were delighted to learn that these had come from our very own seed bank some years ago. The present head gardener, David Irvine, was very helpful to us in giving plant information, and also is now a new Palm Society member.

Our rain forest adventures began in earnest after flying on to Cairns. We enjoyed three ambitious day-long outings led by Tony Irvine and Lou Gatti in a convoy of nine four-wheel-drive vehicles which was joined by four or five more vehicles belonging to local members and members from Townsville and Brisbane. Our first such outing, north to Cape Tribulation, took us through stands of *Normanbya normanbyi*, *Licuala ramsayi*, great climbing *Calamus* of several species, and tall *Archontophoenix*. Our second outing, into the Herberton mountain range, was exciting to say the least. We began by ascending the coastal mountains through magnificent stands of *Cycas media*; we visited some scenic spots of natural beauty, then we entered an overgrown track on which we spent many hours working our way through magnificent rain forest, using a chain saw to cut our way through many places. Around us were great clumps of *Laccospadix australasica*, and beautiful species of *Linospadix* and *Calamus*. Darkness fell and we seemed as far from civilization as we could get. At length we came to a washed-out bridge over a ravine. We took ten vehicles, inch by inch, over this barrier with the right wheels on a remaining concrete beam, and the left wheels on a log! But we saw our goal at last by flashlight and headlight beam—magnificent specimens of "*Oraniopsis appendiculata*." This palm was formerly *Orania*, but has now been determined to be in the ceroxyloid palms. It certainly resembles the South American *Ceroxylon*, having large feathery, whitish fronds, on a slender, ringed trunk.

Our third such outing was up Mt. Lewis, noted among palm buffs for its purple crown-shaft *Archontophoenix* sp. which we saw in abundance, great stands of "*Oraniopsis*" a tall single-trunk form of *Laccospadix*, and several species of *Linospadix*, including one with large undivided leaves and almost no petiole. The climatic conditions in these mountain areas made those of us from the cool San Francisco area excited by the palm possibilities because of the similar cool, damp conditions. Tony Irvine was a limitless store of botanical information for us during all these outings. His enthusiasm and exuberance kept us all going in good spirits for hour after hour.

Between these four-wheel-drive outings we had good times snorkeling on the Great Barrier Reef, visiting nurseries and gardens in the Cairns area, and enjoying the markets of the city and nearby mountain art colonies. Tony Irvine's tableland garden was full of fascinating specimens of plants of all types for our examination. Cairns Palm Society member, John Covacevich, opened his garden and nursery to us for an enjoyable visit, following which we visited the beautiful Cairns Botanical Garden and were surprised by a reception by the Mayor and City Council of the city of Cairns, who spoke to us and welcomed us in front of TV cameras and radio and news personnel. The garden has a large collection of mature tropical plants. The city of Cairns itself is outstanding in its use of palms, both native and exotic, in plantings along streets, in the parks, and around public buildings. The native *Livistona muelleri* has been left in natural stands in places, where it is extremely attractive.

Our last full day took us south of Cairns to visit the Mission Beach area, another area of dense rain forest, just onshore from Dunk Island. Here were magnificent stands of *Licuala ramsayi*, unfortunately being threatened by development, the northernmost stand of *Livistona drudei*, large specimens of *Arenga australasica*, more *Calamus* species, *Hydriastele wendlandiana*, and forests of *Archontophoenix alexandrae*. We were also delighted by the rare sight at close hand of a cassowary with a chick. Member Carl Goodrick showed us through his beautiful garden at Babinda, an area of constant high rainfall which produces fantastic growth rates in the palms. We also visited the Dawes family's huge palm nursery which sits in a magnificent setting in a clearing in the tall rainforest.

After these rich and exciting days our group disbanded at Cairns to head for home, New Zealand, Lord Howe Island, or other points in Australia.

GARRIN FULLINGTON

News of the Chapters

News from Texas

On 21 July 1984 members of the Houston Area Chapter enjoyed an annual picnic at the home of Bonnie and Erwin Ruhland.

Six members, the Ruhlands, the Cains, and the Erdmanns attended the Biennial Meeting of The International Palm Society in San Francisco, August 2–9, and reported it a huge success. A donation of $500 from the Chapter was presented by Jim Cain and warmly received by the Committee of the Revolving Publications Fund.

A September meeting was scheduled for the home of Horace and Cynthia Hobbs to hear about Horace's work on *Chamaedorea* with Dr. Robert Read at the Smithsonian Institution, Washington, D.C.

BONNIE RUHLAND

News from South Florida

It had to be next to the biggest palm sale ever! Fairchild Tropical Garden always presents a beautiful setting for our annual fall sale held in 1984 on 3–4 November. The weather was delightful—a little on the warm side—and seekers of rare and lovely palms rushed in as the gates opened. Total receipts were over $39,000, just a little under the 1983 sale, but a lot of palms are now finding new homes to beautify. Educational exhibit chairman Scott MacGregor amassed a wealth of displays on palm products, native palms, palm literature, palm weaving, and a collection of palm paintings by Lee Adams. Leonard Goldstein was responsible for the very informative booklet distributed to all. Next spring a second sale will be held at Flamingo Gardens in Brevard County.

GERTRUDE COLE

News from Southern California

On Sunday 16 September the Chapter held a plant sale and meeting at Ventura College, Ventura, CA. The sun was shining and the temperature a breezy 85; the 40 members that attended found the Joe Sullivan Palm Garden developing beautifully. Pauleen Sullivan had available the "hard-to-find" palm books. A sale provided many tables of palms including some rare ones for low prices and with a silent auction earned over $700 for the Chapter. The most popular plant was a dwarf green coconut.

After the sale an informal meeting and discussion in a college classroom featured John Tallman who talked about new equipment, and Don Hodel who is now an environmental horticulturist at the University of California. Don discussed his study of "leaning crowns" of *Howea forsteriana.*

DON SANDERS

BOOKSTORE

A MANUAL OF THE RATTANS OF THE MALAY PENINSULA (J. Dransfield 1979, 270 pp.) $25.00
COCONUT PALM FROND WEAVING (Wm. H. Goodloe 1972, 132 pp.) 3.95
CULTIVATED PALMS OF VENEZUELA (A. Braun 1970, 94 pp. and 95 photographs.) 4.50
FLORA OF PANAMA (Palms) (R. E. Woodson, Jr., R. W. Schery 1943, 122 pp.) 17.00
FLORA OF PERU (Palms) (J. F. MacBride 1960, 97 pp.) 8.00
FLORIDA PALMS, Handbook of (B. McGeachy 1955, 62 pp.) 1.95
HARVEST OF THE PALM (J. J. Fox 1977, 244 pp.) 16.50
INDEX TO PRINCIPES (Vols. 1–20, 1956–1976, H. E. Moore, Jr., 68 pp.) 3.00
MAJOR TRENDS OF EVOLUTION IN PALMS (H. E. Moore, Jr., N. W. Uhl 1982, 69 pp.) 6.00
PALMS (A. Blombery & T. Rodd 1982, 192 pp., 212 colored photographs) 25.00
PALMS IN AUSTRALIA (David Jones 1984, 278 pp., over 200 color photographs) 25.00
PALMS FOR THE HOME AND GARDEN (L. Stewart 1981, 72 pp., some color) 10.95
PALMS OF THE LESSER ANTILLES (R. W. Read 1979, 48 pp.) 8.00
PALMS OF MALAYA (T. C. Whitmore 1973, 132 pp.) 16.95
PALMS OF SOUTH FLORIDA (G. B. Stevenson 1974, 251 pp.) 7.95
PALMS OF THE WORLD (J. C. McCurrach 1960, 290 pp.) 19.00
PALM SAGO (K. Ruddle, D. Johnson, P. K. Townsend, J. D. Rees 1978, 190 pp.) 7.50
SECRET OF THE ORIENT DWARF *Rhapis excelsa* (L. McKamey 1983, 51 pp.) 3.95
SUPPLEMENT TO PALMS OF THE WORLD (A. C. Langlois 1976, 252 pp.) 25.00
THE GENUS PTYCHOSPERMA LABILL. (F. B. Essig 1978, 61 pp.) 5.50
THE INDIGENOUS PALMS OF NEW CALEDONIA (H. E. Moore, Jr., N. W. Uhl 1984, 88 pp.) 12.00
THE INDIGENOUS PALMS OF SURINAME (J. G. W. Boer 1965, Part of Flora, 172 pp.) 42.00
THE MAJOR GROUPS OF PALMS AND THEIR DISTRIBUTION (H. E. Moore, Jr., 1973, 115 pp.) 4.50
THE MINIATURE PALMS OF JAPAN (U. Okita, J. L. Hollenberg 1981, 135 pp.) 19.95
THE PALM FLORA OF NEW GUINEA (F. B. Essig, 1977, 46 pp.) 6.50

PALM PAPERS (Postage Included)

FURTHER INFORMATION ON HARDY PALMS (J. Popenoe 1973, 4 pp.) 1.25
NOTES ON PRITCHARDIA IN HAWAII (D. Hodel 1980, 16 pp.) 2.00
RARE PALMS IN ARGENTINA (reprint from *Principes*, E. J. Pingitore 1982, 9 pp., 5 beautiful drawings) 2.75
PALMS—ANCESTRY AND RELATIONS (B. Ciesla 1979, a chart) 6.00
PALMS FOR TEXAS LANDSCAPES (R. Dewers & T. Keeter 1972, 3 pp.) 1.25
THE HARDIEST PALMS (J. Popenoe 1973, 4 pp.) 1.25

The palm books listed above may be ordered at the prices indicated plus $1.25 extra per book to cover packaging and postage. (California residents please add 6% sales tax.) Foreign checks must be in US dollars and payable on a USA bank. In some countries it is possible to send International Money Orders through the Post Office. Send check payable to The International Palm Society to Pauline Sullivan, 3616 Mound Avenue, Ventura, CA 93003, U.S.A. ALL SALES FINAL.

Principes 29(1), 1985, p. 42

WHAT'S IN A NAME?

Avoira (a vóy ra) is a Latinization of the vernacular name recorded by Aublet and taken up by Giseke.

Barkerwebbia (bár kerr wéb ee a) commemorates Philip Barker Webb (1793–1854) a wealthy British botanist who bequeathed his herbarium to the Grand Duke of Tuscany and the city of Florence, where it formed the core of the Florence Herbarium.

Catis (káy tis) is derived from *kata* (Greek—downward), referring to the drooping leaflets characteristic of *C. martiana* (= *Euterpe oleracea*).

Chrysallidosperma (críss al id oh spérm a) combines the Greek *chrysallis* (a crysalis) with *sperma* (a seed), the seed of the palm bearing a resemblance to a crysalis (see Principes 7:107).

Cryosophila (cry oh sóf ill a) is highly problematic. Blume based his new name on the species *Corypha nana* published by Humboldt, Bonpland, and Kunth, Blume taking up their suggestion that *Corypha nana* did not perhaps belong in *Corypha*. Most subsequent authors have assumed that the name is derived from the Greek *cryo* (ice) and *phila* (loving), but if this were so, we would perhaps expect Blume to have used *Cryophila* rather than *Cryosophila*. Kuntze suggested that the spelling should be *Criosophila* from *crios* (a goat) and *phila* (loving) but this seems absurd. Blume states "palma humilis in calidissimis Regni Mexicani observata"—a low palm growing in the hottest parts of the Mexican Kingdom. Was this a joke—a plant from the hottest regions being ice loving? If we turn to Humboldt, Bonpland, and Kunth, we find "crescit in calidissimis Regni Mexicana, in summo monte Cuesta de los Pocuelos inter Acapulco et Masatlan, alt. 230 hexap."—it grows in the hottest parts of the Mexican Kingdom on the top of the mountain Cuesta de los Pocuelos between Acapulco and Masatlan, at 230 fathoms altitude (i.e., 1380 feet—scarcely high enough for ice). Could it be that Blume had a lapsus mentis and mistranslated "calidissimis" as "coldest"? Blume's name is valid and is used by many a palm lover, but we still have no reasonable explanation of its meaning.

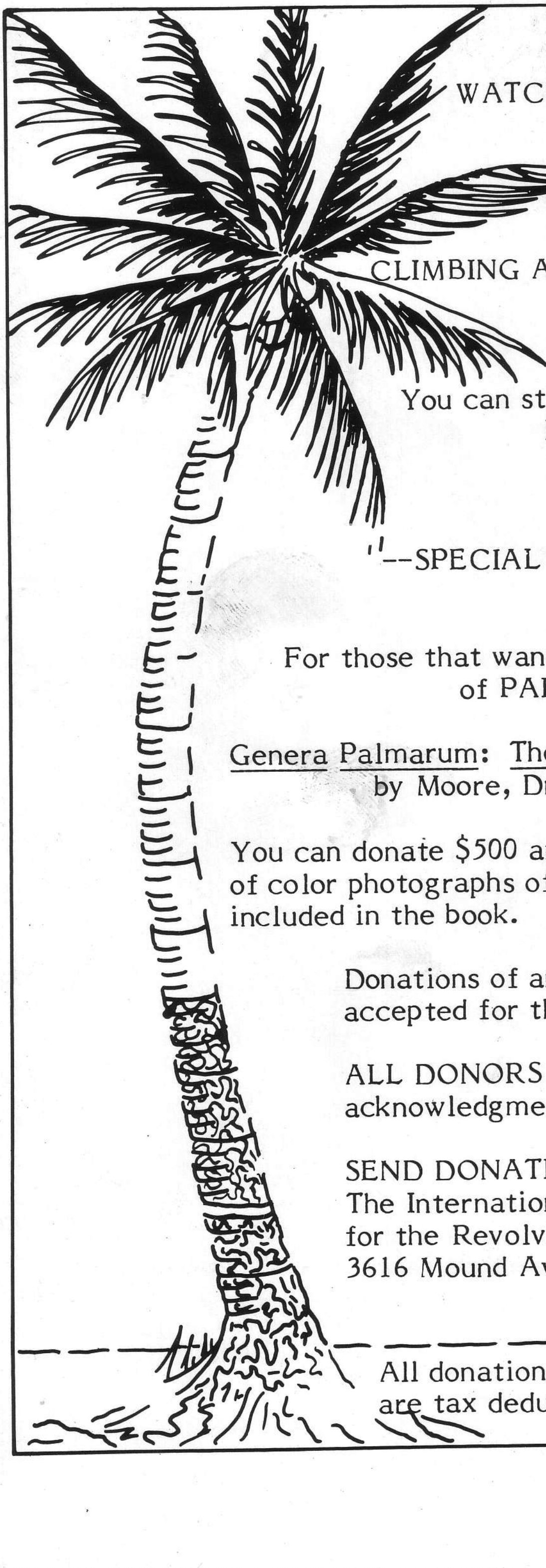
Kerriodoxa (kerry oh dóx a) combines the Greek *doxa* (glory) with the name of the most important collector of Thai plants. Arthur Francis George Kerr (born 1877 at Kinlough, N.W. Ireland, died 1942 in Kent, England) went to Thailand as a physician in the service of the Government of Siam, and from 1921–1931 was in charge of the Botanical Section, Ministry of Commerce, during which period he collected plants throughout Thailand.

Raphia (ráff ee a) has nothing to do with needles or sharp points (from the Greek *rhapidos*—a rod) as suggested by many authors, but is, quite simply, a latinization of the Malagasy local name for *Raphia farinifera*—*raffia*, *rofia* or *ruffia*.

Wallichia (wall ićk ee a) honors Nathanial Wallich (1786 Copenhagen, Denmark, 1854 London, England) who in 1807 was appointed Danish Medical Attaché at Serampore, Bengal and later became Superintendent of the East India Company's Garden at Calcutta. He was the author of many important early botanical publications dealing with the flora of India, and his large herbarium is housed at Kew.

JOHN DRANSFIELD
NATALIE W. UHL

1. A perfect corona formed by a tall *Livistona australis* in the Kebun Raya, Bogor, Java. Photo by Arnold Newman.



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