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Wodyetia bifurcata in the Melville Range, Queensland, Australia. See pp. 152–167.

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Hyphaene petersiana Amongst Animals in the Heartland of Africa

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Africa, with its vast northern spread of the Sahara, hardly qualifies as the continent most sought out by palm collectors. But it has other attractions, of course, which make it well worth visiting.

Africa is the indigenous source of one of the world's most interesting palm genera, namely, *Hyphaene*, which has some 35–40 species dispersed mostly over Africa.

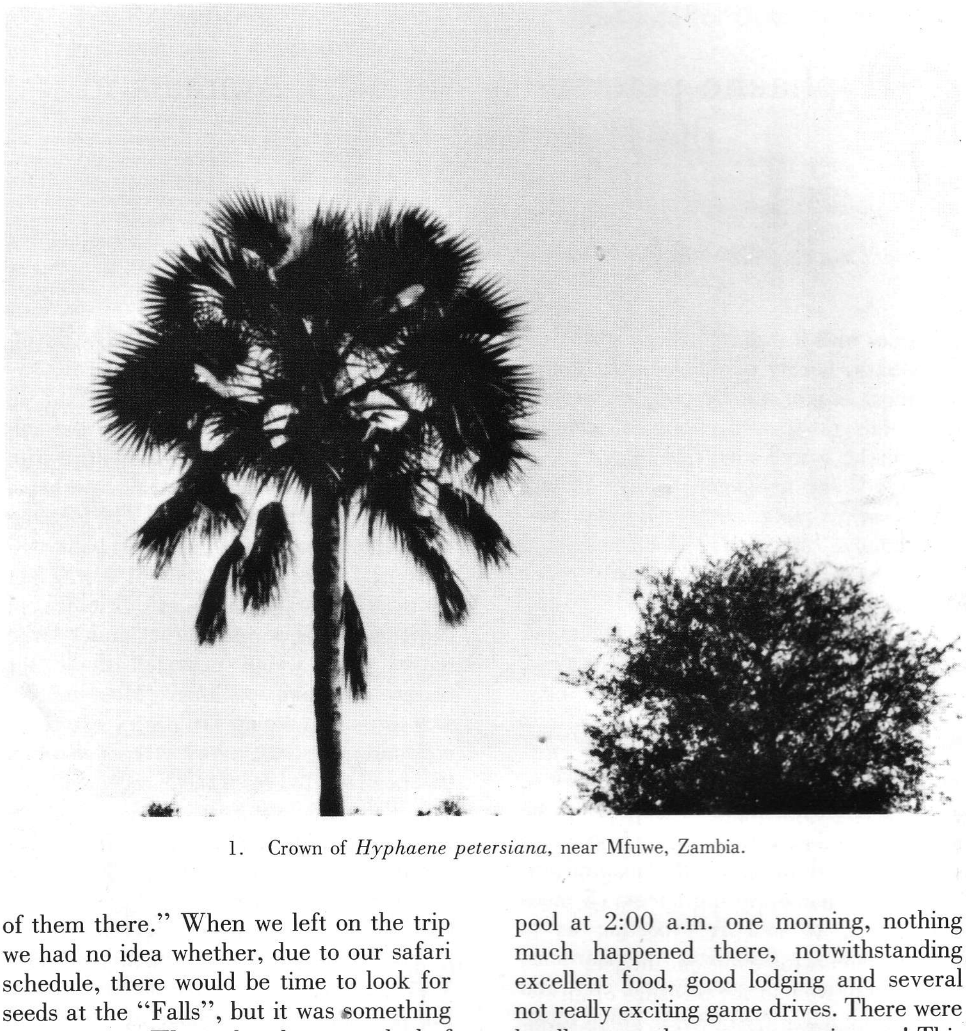
Our safari went into Zimbabwe, Zambia and Botswana. Some of the trip was easy, some of it rough, and frankly we saw more animals than palms.

We were in Harare, Zimbabwe (formerly Salisbury, Rhodesia) one day before going on safari. It was our privilege to be met there by Ian Turner, who devoted his attention to showing us the magnificent plantings at home, Spring Farm, 15 miles from town, as well as escorting us to nearby Evanrigg Botanical Aloe Gardens, Harare Botanical Gardens in the city, and through the palm-lined streets which make Harare attractive. Listed in order of their numbers, the three palms most frequently seen in landscaping the city streets, only the last native to the area, are (1) *Washingtonia robusta*, (2) *Arecastrum romanzoffianum* and (3) *Phoenix reclinata*. The Harare Botanical Gardens contain over 100 acres devoted mostly to native Zimbabwean trees and plants with many specimens of the beautiful *Hyphaene petersiana** (here labelled *H. benguellensis* var. *ventricosa*). The garden is yet to be developed to its potential.

It was in Ian Turner's gardens that we viewed the largest and most beautiful collection of palms we saw on the entire trip. They were even more notable, perhaps, for Ian's collection of cycads. The location of Spring Farm seemed ideal for palm cultivation. It is at an elevation of 4,000 feet with rich, well-drained soil, ditches of diverted spring water flowing under large native trees which provided shade for undercover palm specimens. Most impressive to us was seeing Ian's very extensive collection of palms, many species of which had been started from seeds received from The Palm Society Seed Bank as well as exchanges with members. He had *Chamaedorea* from Las Cruces, *Neodypsis lastelliana* (obtained from M. Darian, of California) and species of *Livistona* which he got from Palm Society member Maria Walford-Huggins, in Australia, and so on. Ian is a long-time member of The Palm Society, and, unfortunately, the only one still residing in Zimbabwe following the political upheavals there. Earlier there were others.

Before leaving Miami (July 8, 1982) we had talked with Dr. John Dransfield regarding palms in the area. He advised, "Mel, you can find *Hyphaene petersiana* at Victoria Falls. There are large stands

* Editors' note: The nomenclature and taxonomy of *Hyphaene* is very complicated. Although *H. ventricosa* is perhaps the most easily identified species and has been well known under this name, it should correctly be named *H. petersiana*.



1. Crown of *Hyphaene petersiana*, near Mfuwe, Zambia.

of them there." When we left on the trip we had no idea whether, due to our safari schedule, there would be time to look for seeds at the "Falls", but it was something to anticipate. We explored a great deal of south central Africa before our itinerary got us to the "Falls" to look for palms. Meanwhile, we came across them as we went along.

From Harare we flew to Kariba and its huge lake which borders Zimbabwe and Zambia. In small craft we flew over the lake to Bumi Hills, a safari destination of some renown, where we got an introduction to what might be ahead. But other than the episode of the elephant that climbed the hill on which our lodging was perched and plunged into the swimming pool at 2:00 a.m. one morning, nothing much happened there, notwithstanding excellent food, good lodging and several not really exciting game drives. There were hardly any palms—not even in pots! This disenchanted your author.

Our small, low-flying aircraft took us to Mfuwe, in Zambia, where we were ensconced for several days. The Mfuwe Lodge has good living quarters, excellent food and the best game drivers we experienced. And here, not far from the airstrip where we landed, we first saw the palm we were looking for. *Hyphaene petersiana* is a handsome tree (Fig. 1) and should be sought out and dispersed as an ornamental much more widely than it is today. After experiencing some cold nights

2. Walking safari into the bush, Norman Carr in right foreground.

in Africa (we were there in winter and at elevations of some 4,000 to 6,000 feet) we believe *H. petersiana* could very well survive outside tropical and subtropical areas. Fairchild Tropical Garden, in Miami, has a specimen for everyone to see.

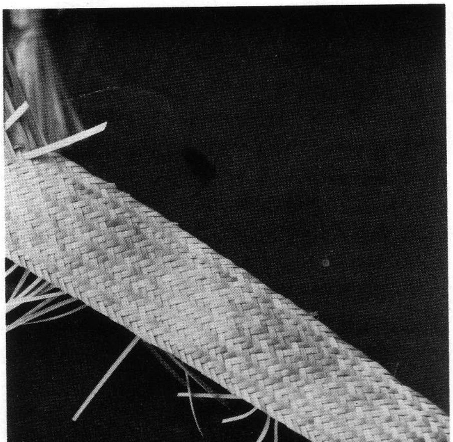
At Mfuwe we had the pleasure of meeting Norman Carr (naturalist, guide, and author) whose wisdom about things African is invaluable. He headed up our treks into the bush aboard safari Land Rovers and afoot. The treks afoot were hazardous and had to be accompanied by a gunbearer—just in case! (Fig. 2).

But how do you collect viable seeds of *H. petersiana*? It wasn't as easy as one might imagine. Early at Mfuwe Lodge we discussed this with Norman Carr, who was unperturbed and said, simply, "The seeds are easy to collect and we shall bring them in for you." Well, collecting was, in a way, very simple. No tree climbing involved. One just picks the seeds out of elephant dung which is widely dispersed over the area (see small chunks on ground in Fig. 2). Norman Carr told us, "If you want viable seeds it's best to get them from fresh elephant dung. They are more likely to germinate."

No doubt but what Norman Carr is right. *H. petersiana* fruit is larger than a golf ball, but not quite tennis-ball size. The seed itself resembles a golf ball, perfectly round and very hard. The round shape distinguishes *H. petersiana* from other species of *Hyphaene*, most of the fruits of which are more pear- or heart-shaped, or otherwise. We will have more to say about elephants and their contributions later on.

Like all palms, *Hyphaene petersiana* has its practical side. The chief of a village we visited personally demonstrated his weaving skills with strips from fronds of

3. Chief of Zambian village weaves *H. petersiana* strips.



4. Finished woven mat.

this palm (Figs. 3,4). The people were very friendly as they showed us their life-style and permitted us to photograph them.

Within two miles of the Mfuwe airport, going to or from the Lodge, there is a large indigenous stand of *Hyphaene petersiana.* They were beautiful in front of clouds and fruiting above us (Figs. 5,6). Also in this area we found specimens, but no stand, of *Borassus aethiopum.* The characteristic bulge in the trunk is well illustrated in Figure 7.

The safari went on to Botswana in small, low-flying aircraft over the Kalahari Desert. Looking down on the thread-like elephant trails, a few palms were the only prominent living things in an arid, ocher landscape which stretched from horizon to horizon.

For two nights we were in a "tented" camp (Fig. 8). The safari here was excellent. We had a superb tracker (Fig. 9) who pursued the animals and helped us find palms. Again we found evidence of

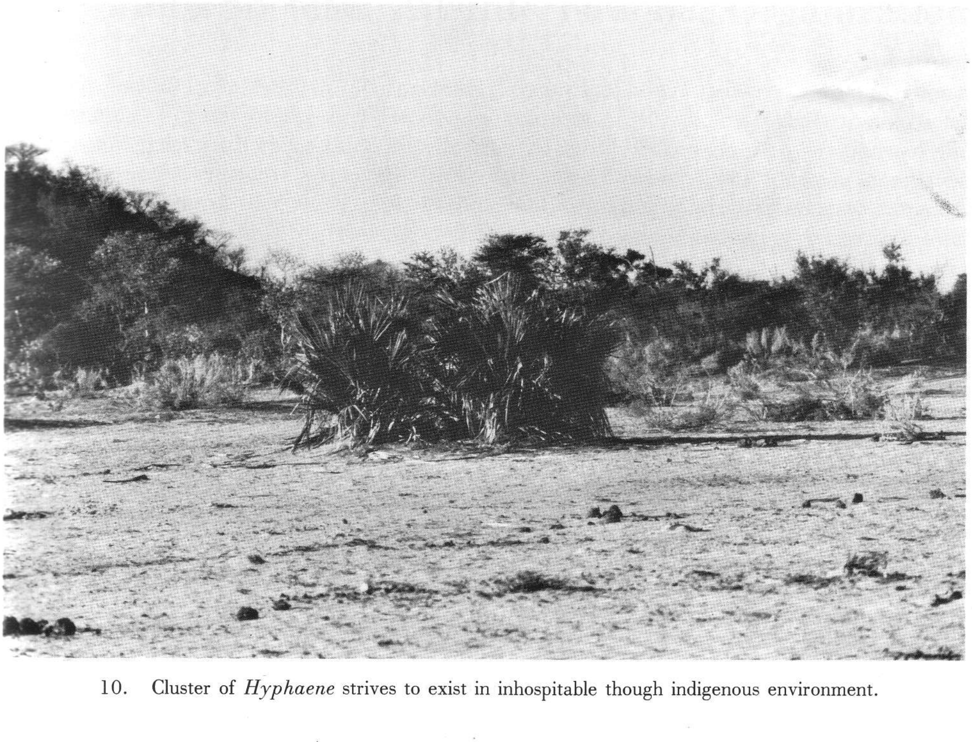
5. *Hyphaene* forefronts the clouds.

6. *Hyphaene* in fruit.

7. *Borassus aethiopum* with characteristic bulge in trunk.

8. Tented camp, Botswana.

9. Our safari tracker fronts large herd of hippos in their habitat.



10. Cluster of *Hyphaene* strives to exist in inhospitable though indigenous environment.

11. An impressive section of Victoria Falls, Zimbabwe.

12. *Hyphaene* along Zambezi River.

the elephant's proclivity for procreation as well as for destruction. A very tall *Hyphaene petersiana* loomed up in the far distance and we asked our guide to head for it. He did, and we collected a few fallen fruits. But no other mature palms were visible in any direction. Yet, in one utterly dry and uninteresting area we spotted a sturdy little cluster of palms rising up through the parched soil (Fig. 10). How did the elephants miss chewing up this little clump of *Hyphaene*, which they undoubtedly sired in the first place?

The safari wound down as we returned to Victoria Falls. Remember that Dr. Dransfield earlier had said we would find *Hyphaene petersiana* at the Falls. He was so right for the area is loaded with them.

While there were many things to do here, one of the most rewarding was an overflight of the Falls in a small plane to capture a "limited" view (Fig. 11). The width of the Falls is too great to get all of it into a single picture. Africa for several years has had severe drought, yet it is estimated that 120 million gallons of water per minute run over the falls. From above we could see palms towering all over the area. Closer views, as we cruised the Zambezi River above the falls, show them lining the river banks and populating islands that dot the river (Fig. 12). In this area, *Hyphaene petersiana* is numerous as well as handsome.

But palm lovers will find no profound solace in a quest for palms in the heartlands of Africa. *Hyphaene* is worth going after, but one might better have something else in mind.

Principes, 27(4), 1983, p. 151

The Palm Society: An International Organization

Palm Society members can take pride in the fact that theirs is indeed an international organization. Perusal of the first twenty-six volumes of *Principes* reveals that articles have come from authors in thirty-five foreign nations. Broken down by regions of the world, Latin America, as expected, leads with contributions from fourteen countries: Argentina, Bahamas, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Honduras, Jamaica, Mexico, Paraguay, Surinam, Trinidad, and Venezuela. Ranking second is Asia with a total of ten countries: India, Indonesia, Iraq, Japan, Malaysia, Philippines, Singapore, Sri Lanka (Ceylon), Thailand, and the U.S.S.R. The European region follows with six of its nations: Austria, Denmark, France, Germany, Netherlands, and the United Kingdom. Four African countries are thus far represented: Ghana, Libya, Nigeria, and South Africa. Last of all is Australia, representing Oceania. In future years we can look forward to other nations being added to this already impressive listing. It is entirely fitting that, beginning with the final issue of 1982, the cover of *Principes* bears the phrase "an international organization."

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Principes, 27(4), 1983, pp. 152–157

The Search for Wodyetia, The Foxtail Palm

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Our expedition, consisting of co-worker Don Fitzsimon and myself, left Atherton on the 17th November 1982 in a 4-wheel drive vehicle loaded with provisions, camping gear, collecting gear, and a Canadian canoe. Our aim was to find populations of a palm, believed to be a new genus that had been discovered in the Bathurst Bay area (lat: 14°16′S, long: 144°27′E), some 510 km northwest of Atherton. We also wanted to inspect populations of a species of *Livistona*, in the past often considered to be *L. benthamii*, occurring near Cooktown and the Kennedy River.

Our departure time was chancey, as November is often associated with heavy storms in north Queensland. These storms could prevent us from reaching our destination or prevent us from leaving it. On the first day we camped west of Cooktown on the Endeavour River North Branch. Near Cooktown we noticed some seedlings of the *Livistona* but they were few and far between. One was 5 meters tall, with a stem 2 meters high. They were growing in a heavy gray loam, in the driest part of the stream valley, with *Bombax ceiba* and *Eucalyptus tessellaris*. Here the velocity of the river in flood is low enough to enable seedlings to establish. In the open and semi-closed forests surrounding the stream valley we noticed another palm, *L. muelleri*.

The Endeavour River North Branch is a minor stream and seemed a likely spot for the *Livistona*, but there was no sign of it. The stream is lined with a semi-deciduous mesophyll vine forest, which changes abruptly to open forest beyond the overflow area. The only palms seen along this stream were *Archontophoenix alexandrae* and *Ptychosperma elegans*.

The next day we returned to the main branch of the Endeavour River near the Cooktown airport, but could not find any adult *Livistona* after much searching along the river and near the airport. Fortunately I had a freshly cut seedling leaf with me and showed it to the airport manager; when we asked if he knew of any adult palms in the area, he remembered seeing some "soft leaf palms" at Barrett Creek, a small tributary of the Endeavour River Right Branch, about 3 km N.E. of the N.W. corner of the airport. Arriving at the creek we were delighted to see prolific stands of the *Livistona*, with individuals up to 30 meters tall.

The creek is lined with mangroves and tides elevate the water table daily. A thin band of rain forest separates the mangroves from surrounding open forest. The *Livistona* occurs predominantly within the rain forest community, but enters the margins of the mangrove and open forest communities. On the rain forest–open forest boundary, it comes into contact with *L. muelleri*. Prominent trees in the rain forest are *Melaleuca leucadendron*, *M. quinquenervia*, *Dillenia alata*, *Buchanania arborescens*, and *Pongamia pinnata*. Other palms present are *Archontophoenix alexandrae*, *Ptychosperma elegans*, and *Licuala ramsayi* (Fig. 2A). The soil is a heavy clay loam, with some silt present, but sand content is low.

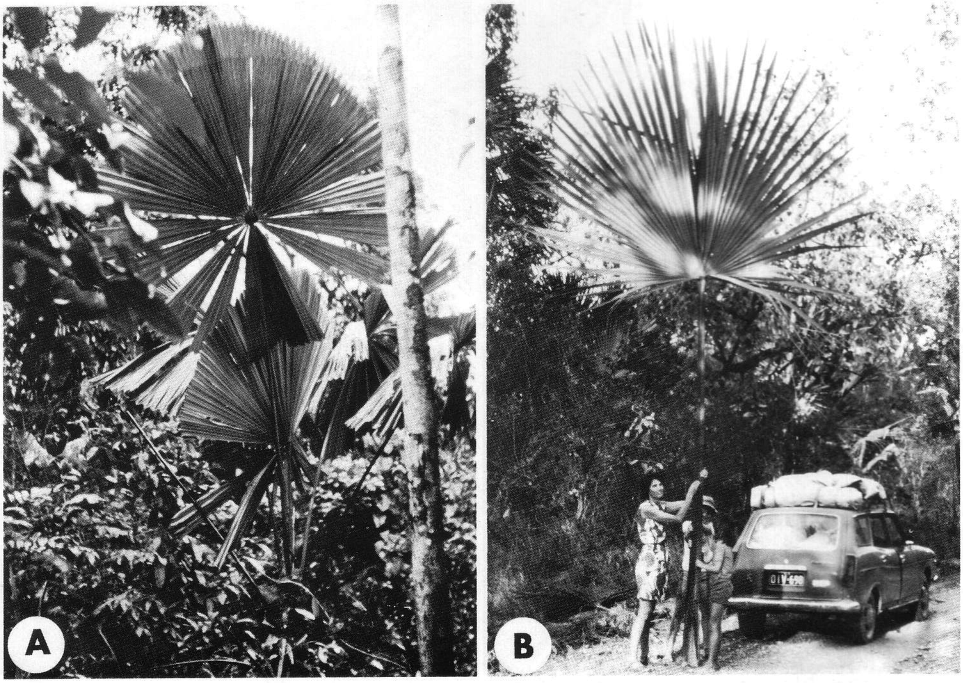
Inspection of the *Livistona* revealed

1. *Livistona* species for comparison. A. *L. drudei*, Hen Camp Creek near Bruce Highway, about 2.5 m tall. Note broad palman and more or less pendulous segment tips. B. *L. benthamii*, Swamp Creek near Claudie River, about 2.5 m tall. Note small palman and stiff, slender segments. C. *L.* sp., Cooktown Fan Palm, Barret Creek, ca. 2.5 m tall. Note broad palman and stiff segment ends.

that it is not *L. benthamii* nor *L. drudei*, but instead a new species. When plants 2–3 meters tall of all three species are compared (Fig. 1A–C), leaf segments of the new species are broader and the fused area of segments is larger than that of *L. benthamii*. Its leaves are larger than those of *L. benthamii* and *L. drudei*. In plants 3–6 meters tall the leaves are generally larger than those of adult plants 10–30 meters tall, whereas the reverse is the case for *L. benthamii* and *L. drudei*. After measuring and processing the *Livistona* material, we left early in the afternoon on our way towards Bathurst Bay. We passed through a basaltic region near Rose Creek, a tributary of the Endeavour River North Branch. Here we saw *Arenga australasica*, growing in the rain forest. We camped overnight at Morgan River and noticed *Archontophoenix alexandrae* there. The soil lining the stream is a sandy silt clay loam which is extremely soft when wet; its texture would have made the river impassable, except for numerous stones that had been carted in and deposited on the stream bed at the road crossing.

The next day we managed to drive 156 km, including 40 km out of the way, when we took a wrong turn shortly after Jeannie River and ended up in a mining camp. No palms were seen in this dry stretch of our journey. We camped in a eucalypt woodland at the junction of the Bathurst Bay and Wakooka Creek Tracks, 42 km from our destination.

It took 9 hours to drive to Bathurst Bay, because of some problems in finding the right track, about 5 km after setting off, due to previous activities of geologists.



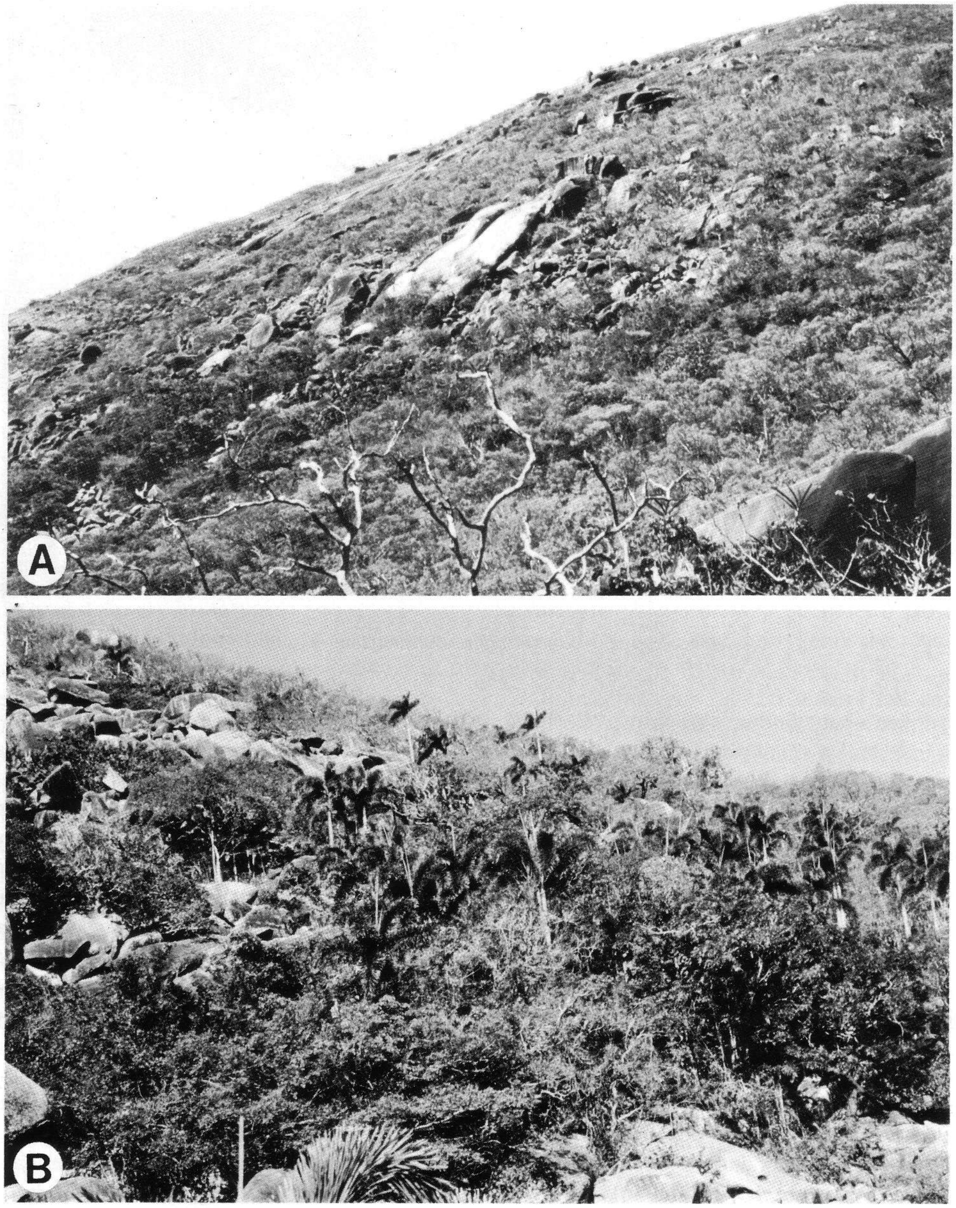
2. Two palms encountered on the trip. A. *Licuala ramsayi*, Wyruri Holding near Babinda, ca. 4 m tall. B. Leaf of *Corypha elata*, held by Helen, Marc, and Sophie Irvine at Cabbage Tree Creek, 33 km N.W. of Laura.

On the way in we passed small stands of *Corypha elata* (Fig. 2B), a fan palm with huge leaves some 3 meters across.

At Bathurst Bay we camped on the lee-side of the beach dune underneath a *Manilkara kauki* tree, which is prized for its nutritious fruit by Aboriginals and Torres Strait Islanders. Immediately inland of the dune are large salt flats. Scattered stands of mangroves line water depressions within these flats. About 2 km inland the Melville Range rises to some 620 m above sea level. This range runs north–south and consists of huge granite boulders, exposed by the erosion of a former soil mantle. There were no palms nor any fresh water near our camp site.

Next morning we decided to canoe 7 km across the bay to St. Paul's Hill and search the valley behind, in the Melville Range. This valley was very dry in its broadest part, but as we neared its head, at the foot of the granite boulders, pools of fresh water appeared in the stream. Rain forest, together with dense populations of *Archontophoenix alexandrae* line the stream, but there was no sign of our mystery palm. After lunch we returned to our canoe and systematically pulled into shore to explore each creek on the way back to camp. I trailed a fishing lure from the canoe and within 5 minutes had caught two Trevally fish for our evening meal. We had walked some 30 km and canoed about 17 km during the day, but had not seen our palm.

The next day we canoed 5 km southwestwards across the bay to the main creek system of the area. It is densely lined with mangroves and upstream has salt flats near its banks. The terrain seemed unlikely, but as the "likely areas" on the first day had proved unproductive, we decided to inspect the area at first hand. As we left



3. A. Large granite boulders in the Melville Range, habitat of *Wodyetia bifurcata*. B. *Wodyetia bifurcata* growing among granite boulders.

the sea and beach behind we suddenly canoed into an almost non-flowing channel, separating the dense mangroves on either side. The silence here was striking. We could almost hear it, but once again we failed to find the palm.

We had explored for two days without success and were puzzled and becoming

4. Seedlings of *Wodyetia bifurcata* transplanted from the wild.

worried about finding the palm. "Perhaps it only had a small population, as we were led to believe? Perhaps individuals were somewhere among the *A. alexandrae* populations that we had already explored?" These possibilities seemed unlikely, but where was the palm in this rather dry region?

On the third morning we decided to walk to the foot of the ranges behind our camp and cut across the heads of the creek systems as they emerged from the granite boulders. We worked our way some 6 km southwards into a valley which drained into the main mangroves that we had explored previously. The country became drier and the weather hotter. Midday neared with still no sign of our quarry. Don was beginning to feel the heat and mentioned that the country was becoming less and less suitable for palms. I agreed, but said that I would like to reach the main creek ahead before turning back.

Within meters of saying this, I looked towards the rocky hillside above (Fig. 3A) and immediately jumped with delight. In the boulders, 50 meters above us, was a solitary individual of the palm with bright orange-red fruit. I was ecstatic, while Don, feeling hot and weary, exclaimed "Way up theeear!" Realizing that he needed a rest, I suggested that we walk around the foot of the ridge immediately beside us and have lunch before climbing to the palm. As we rounded the ridge we were delighted to see that the palms had come down to us into the head of an open forest creek, the bed of which was dry.

Excited, I suggested that Don should rest in the shade of an overhanging rock, while I inspected the next small ridge. Past this ridge a small creek occurred, lined with dense closed forest consisting of *Melaleuca leucadendron*, *Dillenia alata*, and *Myristica insipida*. I found flowing water 500 meters upstream. Here, *A. alexandrae* palms dominated the scene. Their presence indicated that permanent water was near, but our mystery palm "Wodyetia" was absent from this moist closed forest scene. As I emerged from this gully, I disturbed a large wild boar. Fortunately he decided to retreat, although he was not altogether happy about doing so. I climbed the next short, rather steep ridge and overlooked the main creek some 800 meters distant. It was an open forest creek and had scattered individuals of *Wodyetia* along its banks. Looking up at the hills to the east I could see among the boulders, thousands of *Wodyetia*, ascending to the ridge tops some 400 meters above sea level (Fig. 3B).

I returned to Don. We had lunch and then made a collection of leaves and fruiting branches by climbing to the top of adjacent boulders which brought us near the crowns of the palms. We made our way back to camp aiming to return the next day to make more detailed collections and take photographs.

Processing the immediate collection took some time out of the fourth day, but we eventually returned to the palm populations. We completed our work by 6:30 p.m. and commenced the 4 km walk back to camp, laden with palm fruit, fronds, flowering branches, fruiting branches, and collections of other plants associated with palm. Unfortunately we ran out of daylight and spent two hours groping in the dark through scrub and woodland trying to find our way back. Creek gullies were impenetrable depths of deep darkness. The steepness of their edges could not be assessed. Progress became nightmarish. Finally we staggered out on to a salt flat, not far from the sea. We rested for 5 minutes and then made our way to the beach dune. Here we realized that we were 2 km west of our camp, but progress was much easier, as we staggered back laden, tired, and hungry.

The next day a National Parks Ranger visited us via helicopter. We told him about the palm populations, of which he was unaware. After leaving us he flew over the range and with his aid, we were able to establish that *Wodyetia* is virtually confined to the southern half of the Melville Range and the populations are all within the boundaries of the Melville National Park.

Upon leaving Bathurst Bay we travelled 157 km northwestwards to the Kennedy River at Lakefield. We inspected the *Livistona* growing there and confirmed it to be the same species as that at Barrett Creek near Cooktown. Isolated storms were now occurring in the area, but fortunately did not affect our route back to Atherton. Thus ended a successful palm expedition, with one new genus and one new species.

Wodyetia grows 6–15 meters tall and can be recognized by its slightly bottled, light grey stem, its whitish crownshaft, and its arching fronds with the leaflets crowded together, so that the whole frond resembles a green foxtail (see pp. 158–167). Seed germinates in 2–3 months, but sporadic germination continues for 12 months under glasshouse conditions. Early seedling growth is concentrated into establishing a strong root system, while the first leaf remains a spear for several months. Consequently seed is best sown in deep pots (Fig. 4). One-year-old seedlings are very hardy and will grow in full sunlight. Recently a seedling in the 4-leaf stage has survived two frosts during which the temperature reached 1° C in Atherton.

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Wodyetia, A New Arecoid Genus from Australia

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ABSTRACT

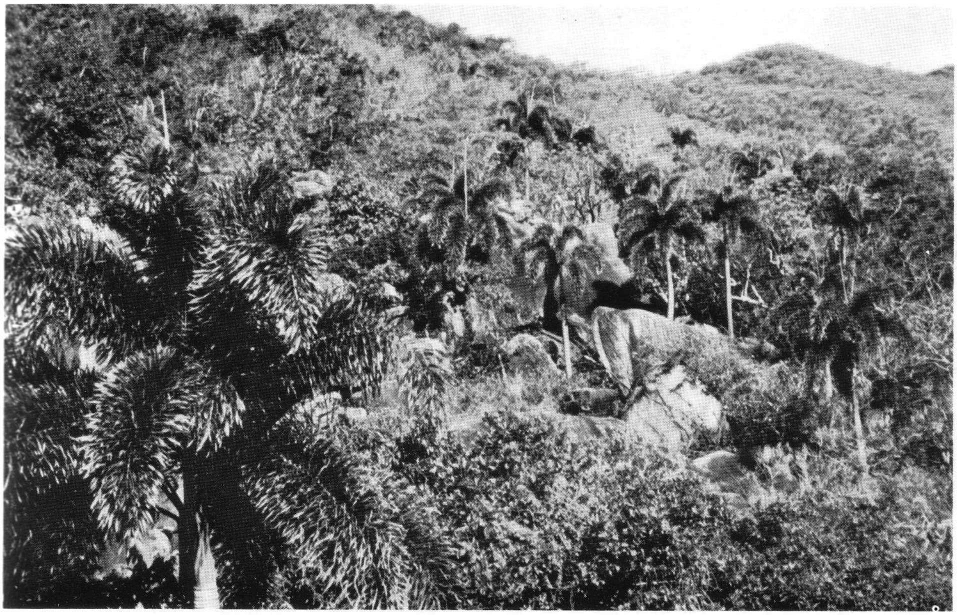
Wodyetia (wad-yetia), a new monotypic genus from Melville Range, N.E. Queensland, Australia, is described. It belongs to the Ptychosperma alliance.

The palm, *Wodyetia* (pronounced "wad-yetia") was well known to the Aboriginal people of the Bathurst Bay area. Within the territory of Clan 6, of the Flinders Island's language-owning group (see Chase & Sutton 1981), there was a regular dry season camp in a valley, immediately below the main area where the palm occurs, among the granite boulders of the Melville Range (Fig. 1). The palm was not known as *Wodyetia* by these people. Wodyeti ("wad-yeti") was their name clearly intended for Johnny Flinders, the last surviving, male Aboriginal with traditional knowledge of the area, who died in 1978 at about 78 years old. Wodyeti acted as an anthropological and linguistic informant for researchers such as Chase and Sutton. His people were persuaded to move from the area by the Queensland government and consequently their cultural association with the area lapsed.

After the disappearance of the Aboriginals the palm remained in the hills, unknown to European botany. In 1968, two foresters, Peter Stanton and Bernie Hyland, were surveying the Melville Range, searching for rainforest areas. Stanton noticed the palm in the distance and commented that it appeared different, but there was no time to take a closer look.

On August 17, 1975, Hyland (now a botanist with the Division of Forest Research C.S.I.R.O.), while pig-shooting on a holiday at Bathurst Bay, found himself beneath one of the palms in an open forest creek. He noticed the conspicuous outer endocarp fibers on the ground. These he had seen earlier on the beach, and was curious about their origin. He thereupon made the first botanical collection, consisting of fruit remnants and a portion of an old tattered leaf. He noted the fruit as reddish, with a height of 5.5 cm, and diameter of 3 cm, and regarded it as similar to *Normanbya*. This fragmentary collection was the author's first knowledge of the palm. It was difficult to make a great deal out of the old leaf portion, but the distinctive forking of the endocarp fibers was reminiscent of the forking of the endocarp of *Archontophoenix*, except that fibers were about 3–10 times as large. On August 20, 1978, Hyland revisited the area and made a much better collection, consisting of an aged green leaf, leaf sheath, and an infructescence with orange-red fruit about two-thirds mature. These collections were made in a locality probably 1–2 km downstream from a major population of the palm, of which the collector was apparently unaware, as he had searched for one and a half days to find the palm again.

The second collection enabled the author to dispel any association with *Archontophoenix*. It was quite obviously a member of the *Ptychosperma* alliance and it seemed to be a new genus. It was



1. A group of *Wodyetia bifurcata* growing among granite boulders in the Melville Range.

not until November 1981 that the author was able to organize an expedition with a co-worker, Don Fitzsimon, to visit Bathurst Bay and make detailed collections of the palm (see pp. 152–157). Since the fruit was immature in August, it was decided that October or November would be the best time to visit the area and as events turned out, November was ideal to obtain mature fruit and flower buds up to two-thirds mature. These collections, together with the 1978 collection (*B. Hyland 9757*), form the basis of the description of the genus *Wodyetia* and its only known species *W. bifurcata*.

Members of the Ptychosperma alliance are characterized by having pinnate leaves, pinnae with apices mainly praemorse or obliquely praemorse, leaf sheaths forming a distinct tubular crownshaft, inflorescence infrafoliar, occurring at the base of crownshaft and a panicle enclosed by two bracts—a prophyll and a peduncular bract. Flowers are very immature when the bracts open, are not sunken in the rachillae and occur in triads on at least proximal parts of rachillae, with a female in the center and a male on each side. Male buds are more or less symmetrical, with hard navicular valvate petals, broadly imbricate sepals and stamens mostly numerous (rarely as few as nine), with erect filaments. The fruit is fleshy, ovoid-globose, with stigmatic remains apical or nearly so; the seed is terete, angled or grooved in cross section, enclosed by the complex, sclerenchymatous endocarp. The endosperm is homogeneous or ruminate, and the embryo basal or sub-basal. (Adapted from Essig 1977, 1978 and Moore 1957, 1979.)

Currently eight genera are recognised in the alliance—*Ptychosperma*, *Ptychococcus*, *Brassiophoenix*, *Balaka*, *Drymophloeus*, *Veitchia*, *Normanbya*, and *Carpentaria*. *Wodyetia* becomes the ninth genus and in Australia, the fourth member of the alliance to be represented. *Carpentaria* and *Normanbya* constitute two other monotypic genera, endemic to Australia,

Table 1. Differences between Wodyetia *and* Normanbya.

Wodyetia	*Normanbya*
1. Stems slightly bottled, 6–15 m tall.	1. Stem long, slender, not bottled, 12–30 m tall.
2. Primary pinnae regularly arranged.	2. Irregular.
3. Central primary pinnae divided into 11–17 segments.	3. Divided into 7–9 segments.
4. Segments linear, margins ribbed.	4. Linear-cuneate. Only 2 outermost pinnae with outer margin ribbed.
5. Pinnae glossy green above, pale flat green with a faint whitish sheen below, due to densely crowded white punctuations in lamina surface, woolly white scales absent.	5. Flat green above, white below, due to a tangled dense mass of woolly white, threadlike scales over lamina surface. Punctuations beneath wooly white scale.
6. Scales on leaf rachis, lacerate-peltate, and ramenta chafflike.	6. Scales ramentaceous.
7. Stamens 60–71.	7. Stamens 24–40.
8. Filaments slender, lacking scales.	8. Filaments stouter with brownish scales, longitudinally arranged.
9. Stylode of staminate flowers slender, curving gradually, not markedly kinked.	9. Stylode markedly kinked, usually at least once, mostly twice.
10. Stylode lacking scales.	10. Stylode with brownish scales.
11. Stigmodes at top of stylode with 4–5 erect papillae throughout bud stages.	11. Stigmode broadly flattened throughout bud.
12. Pistillode with rugose surface.	12. Pistillode smooth.
13. Calyx lobes of staminate buds more broadly imbricate, with edges of lobes turned more inwards.	13. Less imbricate, outer calyx lobe with a thicker hooded apex.
14. Stigmatic lobes in ⅓ mature pistillate buds, 4–5 times smaller than in ⅓ mature *Normanbya* buds.	14. Stigmatic lobes 4–5 times larger in ⅓ mature female buds.
15. Staminodes 6.	15. Staminodes 3.
16. Stigmatic remains merge gradually into body of mature fruit, 8–10 mm long.	16. Stigmatic remains occur on an abrupt shoulder at top of mature fruit, 3–4 mm long.
17. Outer endocarp of fruit with conspicuous, strongly forking, flattened, tough black fibers, forking 1–4 times.	17. Outer endocarp with inconspicuously forked, thin, terete, straw-colored fibers forking 1–4 times, but at first glance appear as vertically straight parallel fibers.
18. Integument thick, firm, but soft 1.0–1.2 mm.	18. Integument very thin.
19. Raphe branches wavy, slightly depressed, longitudinally tending, with some forking.	19. Raphe branches forming an irregular loose cellular network, slightly depressed.
20. Endosperm homogeneous.	20. Endosperm ruminate.
21. Habitat: Granite boulder woodland upper parts of open forest creeks. Annual rainfall approx. 1,400–1,600 mm, seasonally concentrated with severe dry season significant usually for about 6 months.	21. Habitat: Moist complex and simple Mesophyll vine forest. Annual rainfall 3,000 mm. Significant rainfall in most months of year, seldom a dry of more than 40 days.

while *Ptychosperma* is represented by two species.

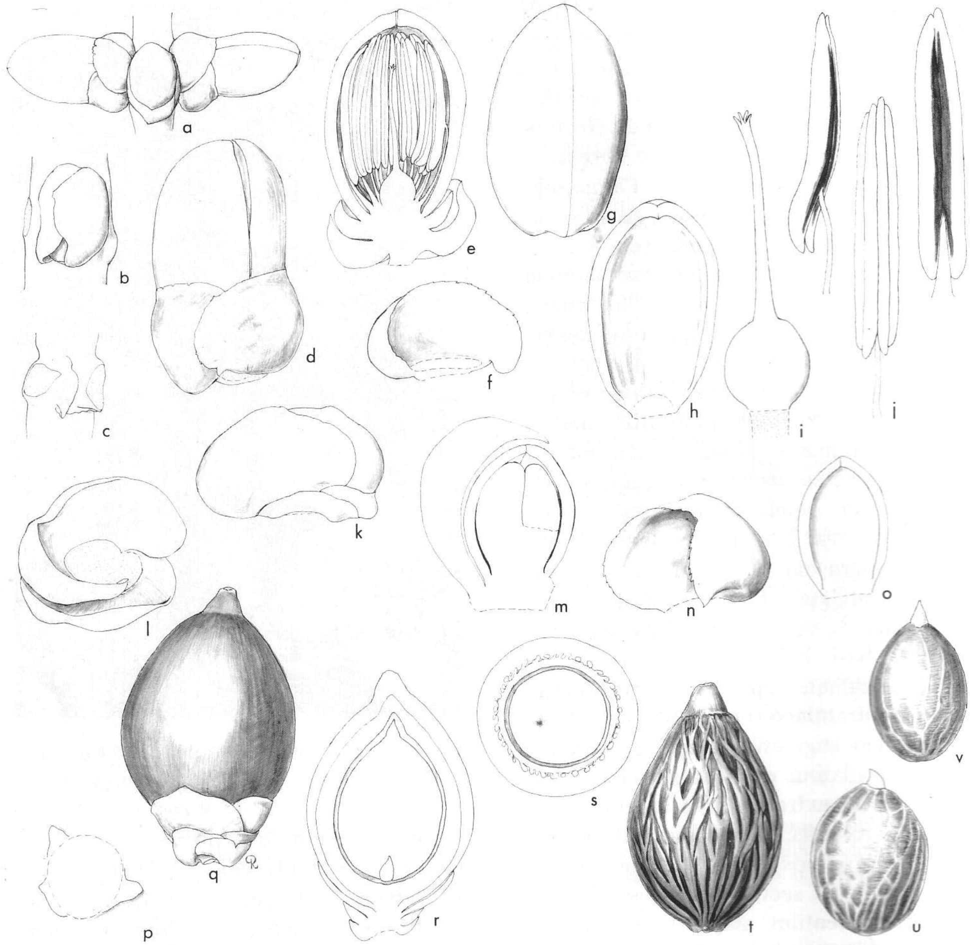
In fruit characters (Figs. 3,5B), *Wodyetia* appears closest to *Normanbya*, *Carpentaria*, *Veitchia* and *Drymophloeus*, but is distinct from all four. Essig (pers. comm. 1982) stated that both *Carpentaria* and *Wodyetia* have flat strongly forking fibrovascular bundles in the endocarp and a ring of fibrovascular bundles in the mesocarp. In *Normanbya* the bundles are purely fibrous. In leaf characters *Wodyetia* is closest to *Normanbya* (see Table 1). It is separated from all other genera in the alliance except *Normanbya* by having numerous secondary pinnae developed by longitudinal division of primary pinnae, producing virtually parallel bipinnation (Fig. 4C,D). *Carpentaria* has only a few pinnae that appear to show this effect, while in *Veitchia* and *Drymophloeus* this effect seems to be absent.

Wodyetia Irvine gen. nov. Palma solitaria, pleonantha, monoecia, ad affinitatem Ptychospermatem pertinens. Pinnae secunde divisae, illae sectionis mediae folii multis segmentis, parallelisque, linearibus, apicibus truncate vel oblique praemorsis. Inflorescentia infra folia basi vaginae, paniculate in 4 ordines ramificans. Flores praecipue triadibus, pistillato medio. Gemma staminata oblonga, apice obtuse, 2 vel 3 bracteis parvis, subtenta; sepala 3, imbricata; petala 3, valvata; stamina numerosa (60–71); pistillodium lageniforme, stigmodio 4–5 papillis erectis. Gemma pistillata 2 bracteis parvis subtentis; sepala 3, imbricata; petala 3, apice valvata, basi imbricata; staminodia 6, minima; stigmata 3, paene sessilia. Fructus maturus aurantiaco ruber, globoso-ovoideus, vestigio stigmatis apicale in corpore fructus gradatim; endocarpium complexum 2 stratis, extra fibris conspicuis valde 1–4–plo furcatis, complanatis tenacibus atris, infra fibris horizontalibus tectis. Semen teres in sectione transversali media; integumentum aliquantum crassum ramis raphis sparsis leviter impressis; endospermium homogeneum, embryone basali.

Type species. **W. bifurcata** Irvine. Solitary, pleonanthic, monoecious palm, 6–15 m tall; stem smooth, unarmed, with annular leaf scars (Fig. 2). Leaves reduplicately pinnate, the pinnae further divided (Fig. 4C,D) into parallel segments (or at least extremely deeply lobed, parallel to the long axis of the pinnae); sheath tubular, elongate, green with greyish white bloom over surface, splitting opposite the petiole as the leaf ages and is shed; rachis and petiole with greyish white to brown, lacerate-peltate, fringed scales and chaff-like ramenta; petiole elongate, adaxially

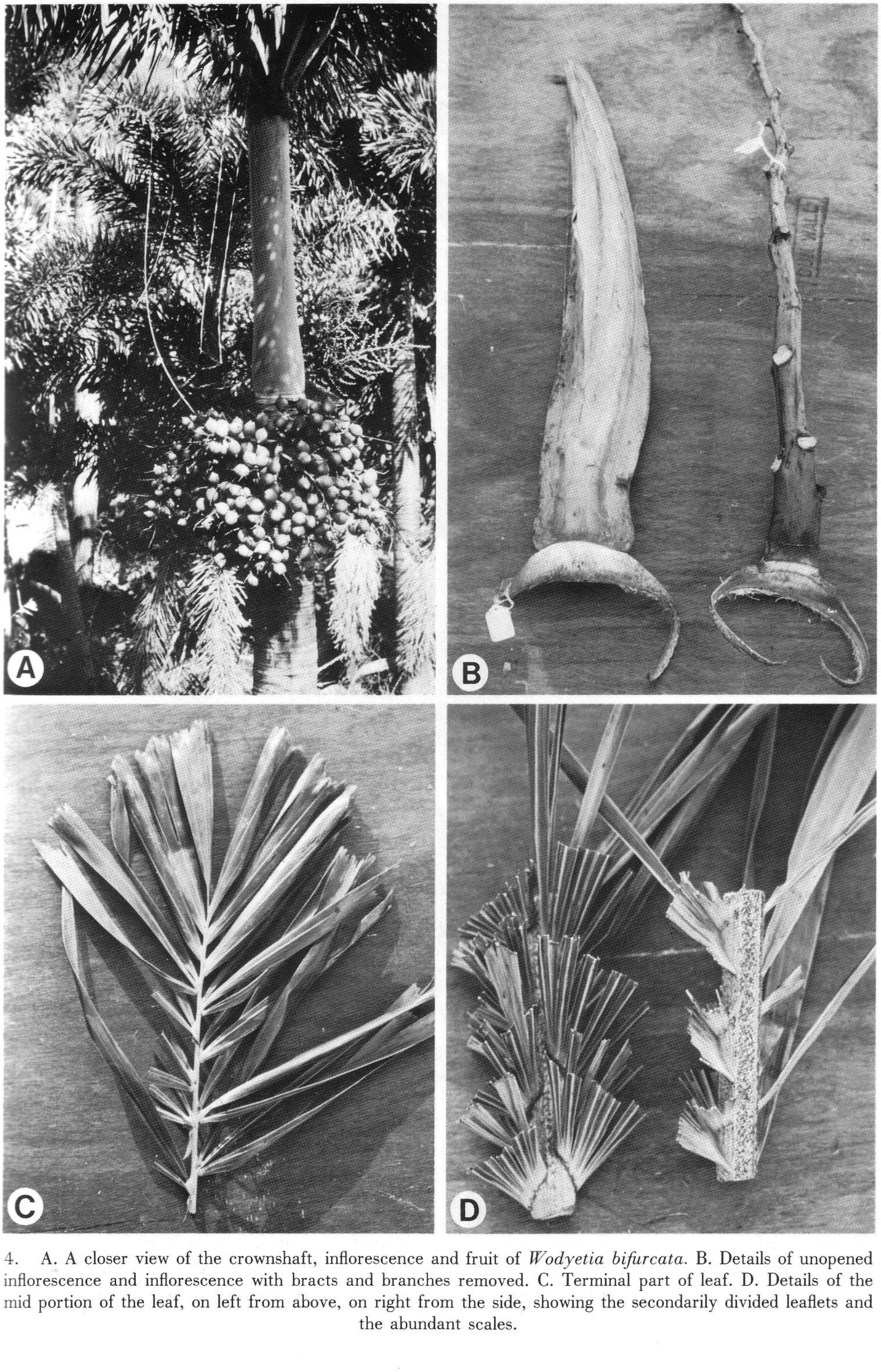
2. Note the slightly bottled trunk and highly plumose leaves of *Wodyetia bifurcata*.

flattened, distally and proximally shallow, concave, abaxially convex; young leaves with dense scale pattern on woolly white background; rachis gradually becoming angled adaxially towards the tip, slightly convex or flattened abaxially; leaf profile oblong-elliptic, primary pinnae mostly divided into numerous, linear segments, most of which have one main vein, some with 2–4 veins, margins with thickened ribs, apices lacerate, praemorse or obliquely praemorse, with two to several fine teeth or divisions, the odd apex nearly acute-acuminate; terminal pinnae single or paired, not conspicuous against other pinnae in the field, slightly cuneate with praemorse or slightly oblique praemorse apices. Inflorescence infrafoliar, paniculate (Figs. 4,5A) with 4 orders of branching in the proximal third, reduced distally to 2 orders, with single terminal axis; peduncle

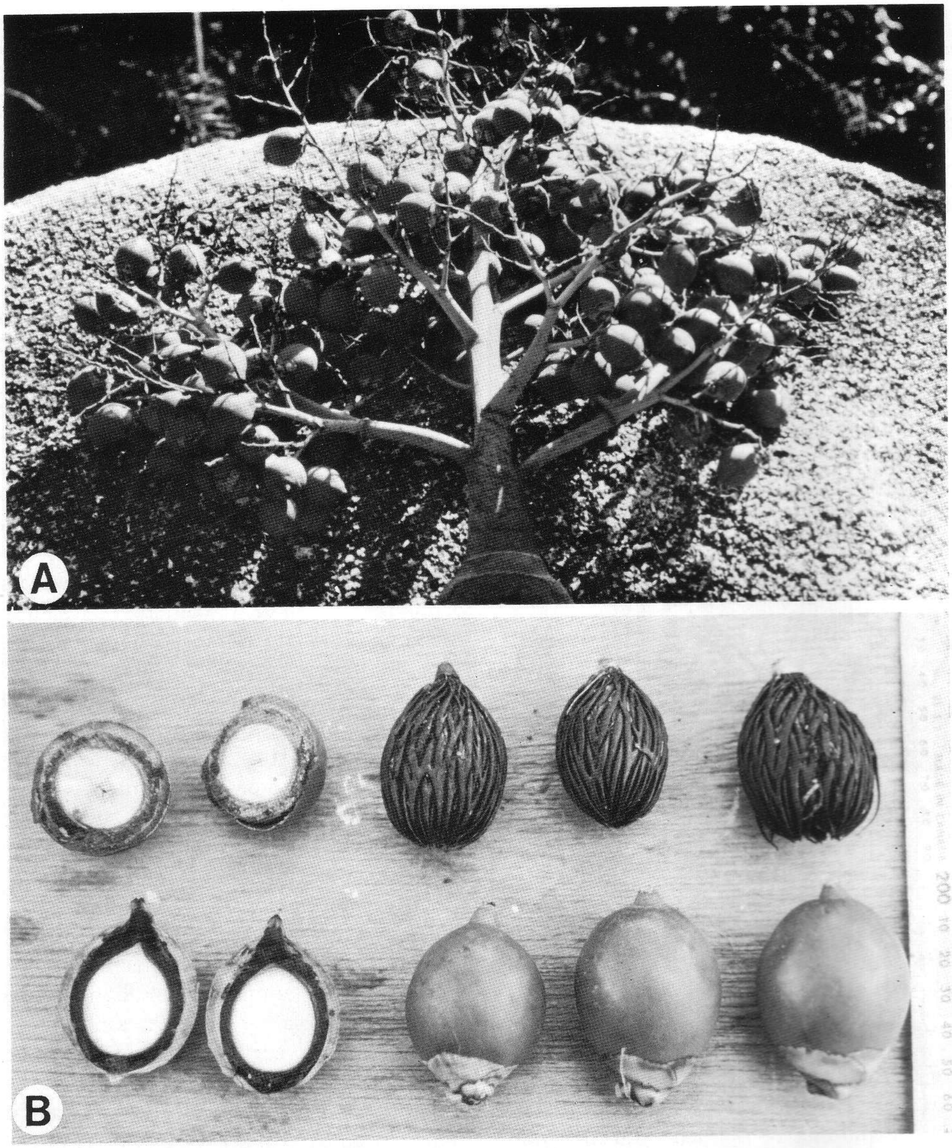


3. *Wodyetia bifurcata*, details of flowers, fruit, and seed. a, portion of rachilla with a triad of flowers ×1.5; b, staminate flowers removed, pistillate bud enclosed by bracts ×4; c, a pair of staminate flowers removed from distal part of a rachilla leaving scars and bracts ×4; d, staminate bud ×3; e, vertical section of staminate bud ×3; f, staminate sepal ×3; g, staminate bud, sepals removed ×3; h, staminate petal, interior view ×3; i, pistillode ×6; j, stamen in three views ×6; k, pistillate bud and two basal bracts ×3; l, bracts from base of pistillate flower ×6; m, vertical section pistillate flower ×6; n, pistillate sepal ×3; o, pistillate petal interior view ×6; p, fruit in basal view ×1; q, mature fruit ×⅔; r, fruit in vertical section ×⅔; s, fruit in cross section ×⅔; t, outer endocarp showing large forking fibers ×⅔; u, seed lateral view ×⅔; v, seed dorsal view ×⅔.

much shorter than the rachis, axes green, appearing glabrous but with small loose clusters of small brown scales around bases of buds; prophyll (Fig. 4B) attached at base of peduncle, completely enclosing peduncular bract and flower buds at emergence, caducous, dorsiventrally flattened, not keeled; peduncular bract attached close to prophyll, completely surrounding bud at emergence, caducous; second peduncular bract small, caducous; other peduncular bracts very small, represented by sunken lines or scars, the 5th or 6th scar subtending the first branch; rameal bracts extremely small, acute or wavy wrinkled; flowers numerous, borne on ra-



4. A. A closer view of the crownshaft, inflorescence and fruit of *Wodyetia bifurcata*. B. Details of unopened inflorescence and inflorescence with bracts and branches removed. C. Terminal part of leaf. D. Details of the mid portion of the leaf, on left from above, on right from the side, showing the secondarily divided leaflets and the abundant scales.



5. A. Infructescence of *Wodyetia bifurcata*. B. Details of the mature fruit; note the broad, bifurcating fibers of the endocarp on the upper right.

chillae in triads of 2 outer staminate flowers and a central pistillate flower (Fig. 3a–c), reducing distally to paired or solitary staminate flowers; staminate bud bullet-shaped with rounded apex (Fig. 3d–i), subtended by 2 or 3 small narrow, imbricate bracts; sepals 3, free, imbricate, rounded, gibbous, margins finely fimbriate, enveloping nearly half of corolla when buds near maturity; petals 3, free, valvate, hard; stamens many (60–71), filaments not inflexed in bud, anthers dorsifixed, versatile, linear-lanceolate, usually unevenly sagittate at base and slightly bifid at apex; pistillode lageniform, swollen at base, surface rugose; stigmode with 4–5 erect papillae or lobes throughout bud stages. Pistillate buds shorter than staminate (Fig. 3k–o), conic-ovoid, subtended by 2 small narrow, curved, imbricate bracts; sepals 3, imbricate, rounded, gibbous, margins finely fimbriate; petals 3, valvate distally, imbricate basally; staminodes 6, very small, deltoid, with very short filaments, surrounding base of pistil; pistil conic-ovoid, unilocular, uniovulate; stigmas 3, virtually sessile, with slightly rounded apices. Fruit (Fig. 3p–t) orange-red at maturity, globose-ovoid, with apical stigmatic remains forming a conical beak, sloping gradually into fruit body; exocarp thin, with very short, stout fibers immediately under the thin orange-red epidermal layer; mesocarp fleshy, orange-yellow when ripe, thin with central bank of fibers running longitudinally through flesh, some forked, the flesh filling grooves between the distinctive, thick, strong, flattened fibers of the outer endocarp (Fig. 3t), these forking 1–4 times, conspicuous in surface view of endocarp; endocarp complex with an inner layer of horizontal fibers. Seed (Fig. 3u,v) terete in median cross section; integument rather thick, firm but soft, the raphe branches sparse, slightly impressed; endosperm homogeneous, embryo basal. Germination adjacent ligular; eophyll simple, bilobed, apices oblique-acute.

Wodyetia bifurcata Irvine sp. nov. Palma compta 6–15 m alta, caule 20–25 cm diametro, aliquanto lageniformi. Pinnae primariae regulares 90–107, in sectione medio folii 14–17 segmentis divisae; pinnae terminales binatim vel singularis; segmenta 765–950, supra nitida, viridia, infra pallidioria, hebetate-viridia, nitore dilute-albido propter punctuationes numerosas, parvas, albidas, densas, in sicco pellucidas. Gemma staminata filamentis squamis destitutis stylodio leviter curvato, squamis destitutis. Fructus maturus cum calyce 60–65 mm longus, sine calyce 49–57 mm longus, 27–37 mm latus, vestigio stigmatis 8–10 mm longo. Semen ca. 32 × 22 mm. Typus: Australia, Queensland, *Irvine 2184* (holotypus QRS; isotypi BH, K).

Stem light grey, slightly bottle-shaped, 6–15 m tall, 20–25 cm diam. Leaves 6–10 in the crown, 2.6–3.2 m long; petiole and rachis greenish, adaxially with greyish white, mostly brownish lacerate-peltate scales, abaxially mostly with fringed scales, chafflike ramenta and some lacerate-peltate scales; young leaves densely covered with scales; leaf sheath tubular, 80–120 cm long, light green with greyish white bloom; petiole 29–42 cm long, 5.0–5.6 cm wide, 2.5–3.5 cm deep, adaxially flattish distally, slightly concave proximally, abaxially convex, primary pinnae regularly arranged, 90–107, in patterns each side of rachis such as 50/49, 53/54, 44/46, 50–1 terminal–48, mostly divided into numerous secondary segments, parallel to long axis of the pinnae; segments in 2 leaves from different collections numbered 765 and 950, arranged in patterns of 387–1–377 and 480–470 each side of rachis; proximal 1–4 primary pinnae sometimes entire or divided into 1–4 segments; number of segments increasing towards mid-rachis, the primary pinnae nos. 18–24, divided into 11–17 segments, primary pinnae 25–30 divided into 14–11 segments, segments reduced distally with near-terminal pinnae having 3–1 divisions; lamina glossy light green above, paler flat green with faint whitish sheen below; larger pinnae 45–70 cm long, 2.0–4.8 cm wide (midpart); terminal pinnae 12–24 cm long, 2.4–4.0 cm wide at apex, single or paired, slightly cuneate. Inflorescence 75–112 cm long, with 4 orders of branching, 26–31 main laterals plus terminal; rachis light green, scales not conspicuous, but small scattered clusters of flat brown scales occur around bases of buds; peduncle 8–13 cm long, 4.0–4.5 cm wide, 2.0–2.5 cm deep, with 5–6 caducous bracts subtending the first lateral; prophyll ca. 60 cm long immediately prior to splitting, peduncular bract 1 ca.

58 cm long, peduncular bract 2, 1.4 cm long, 3.5 cm wide at base, 1.1 cm wide at shoulder, with short acute apex 2 mm long; other peduncular bracts very small, 1–3 mm long, 3.0–3.2 cm wide; rameal bracts extremely small, either acute or wrinkled wavy tissue. Staminate buds 11 mm long at two-thirds maturity, sepals 5–6 × 3–4 mm; petals cream-green, 9.8–10 × 5 mm; anthers 5.5–6.0 mm long; pistillode lageniform, 8 mm long, base rugose, stylode 5 mm long. Pistillate buds, with sepals 5–6 × 3–4 mm in ⅓–½ mature buds; staminodes 6, small, deltoid with very short filaments at base of pistil; stigmas 3 virtually sessile, apices slightly rounded. Infructescence (mature fruit stage) 75–115 cm long, peduncle 8–13 cm long, 4.8–6.6 cm wide, 2.5–3.0 cm deep, light green. Fruit 49–57 × 27–37 mm, excluding calyx but including remnant stigma, 8–10 mm long (which merges gradually into body of fruit), 60–65 mm long with calyx; mesocarp, 2.5–3.0 mm thick. Seed terete, ca. 32 × 22 mm, embryo 5 mm long at maturity. Eophyll simple bilobed, light glossy green above, pale flat green below, apices oblique truncate-acute. Seedlings 40–60 cm tall, with simple and pinnate leaves, primary pinnae undivided, arranged in patterns of 2/2, 3/2, 3/3 each side of rachis; larger simple bilobed leaflets 17 cm long, lobes 2.1–2.2 cm wide (midlobe), 3.2 cm wide through base of V, apices oblique praemorse; pinnate leaves 36–44 cm long, terminal pinnae 12.5–13.5 × 2.2–2.4 cm (midlobe), apices oblique praemorse; lateral pinnae ca. 14.0 × 1.7 cm (midpart), apices aristate and/or oblique praemorse; proximal pinnae 11.5–15.7 × 1.1–2.3 cm, apices aristate; pinnae glossy light green above, flat pale green with faint white sheen below. Seedlings around 1 m tall, with most primary pinnae each divided into 3 cuneate secondary pinnae, apices praemorse or obliquely praemorse, with distal edge extended into a point 1–2 cm beyond apex; leaves 71–80 cm long, petiole 18–21 cm long, roundish in cross section, with a thin longitudinal groove adaxially, green with slight grey bloom and widely scattered grey-brown scales, which are dense on young leaves; primary pinnae arranged in patterns of 9/9 each side of rachis; proximal pinnae nos. 1–3 divided into 1–3 segments, mid primary pinnae each divided into 3 segments, distal pinnae reduced to 1, terminal pinnae paired; larger secondary pinnae 10.0–11.5 × 5.0–5.7 cm (midpart), 8.3–8.5 cm wide across apex. Seedlings around 2.5 m tall, with most primary pinnae each divided into around 8 cuneate segments; leaves 1.7–1.75 m long, petiole 40–50 × 1.6–1.7 cm, 1.4–1.5 cm deep, flattish, adaxially slightly channeled, abaxially convex, white bloom on both surfaces, with grey-brown scales denser abaxially; primary pinnae in patterns each side of rachis, 25–1–26 and 26–1–26 (terminal pinna single), hence 52 and 53 primary pinnae in all; proximal primary pinnae nos. 1–3 each divided into 1–7 segments, mid primary pinnae each divided into 7–8 segments, distal primary pinnae divided into 3–1 segments; larger segments 21–22 × 2.2–3.0 cm wide (midpart).

Distribution: Australia, N.E. Queensland, confined to the southwest, south and southeast sides of Melville Range, latitude 14° 17′ S, longitude 144° 28′ E. *Irvine 2184* (holotype QRS; isotypes BH, K), *Hyland 8369, 9757* (QRS). Habit/Ecology: *Wodyetia* occurs in open woodland communities consisting of rain forest elements in coarse, loose granite sand, among huge granite boulders, with the main canopy being the palms themselves. Other tree species associated with it are low forms of *Ficus obliqua, F. benjamina* (semi-creeping), *Buchanania arborescens, Polyalthia nitidissima, Myristica insipida, Diospyros reticulata* var. *ferrea, Cryptocarya bidwilli*, and vines *Capparis* sp., *Cissus* sp. It extends 1–2 km, downstream, along open forest creeks at the foot of the granite boulder hills. Here it may be found amongst *Eucalyptus polycarpa*, *E. drepanophylla*, *Cochlospermum gillvrayei* and *Bombax ceiba* forest. It appears to be absent from dense closed forest communities in the area. In these communities the palm *Archontophoenix alexandrae* is a prolific upper canopy species. Altitude range is 60–400 m a.s.l. Climatic conditions have a strong seasonally dry component, with drought stress likely to be significant for six months of the year. Annual rainfall is reckoned to be about 1400–1600 mm, confined mainly to 3–4 months of the year, December–March (Summer Wet). Mature fruit is present in October–December, open flowers are likely to be found in December–February. Seed germinates in 2–3 months, coinciding with the wet season, but sporadic germination continues for at least 14 months.

Key Characters of Wodyetia bifurcata Irvine: Stem slightly bottle shaped (Fig. 2), primary pinnae regularly arranged, divided into as many as 11–17 segments. Margins of segments ribbed. Stamens 60–71, filaments and stylodes lacking scales. Mature fruit orange-red, ovoid-globose, 49–57 mm long, 27–37 mm wide, excluding calyx, but including remnant stigma 8–10 mm long. Mesocarp flesh orange-yellow when ripe. Outer endocarp with strongly forking, flattened, tough black fibers. Seed terete, around 32 mm long, 22 mm wide. Seed "shell" covered with wavy, slightly depressed, longitudinally tending fibrous lines, some forking. Endosperm homogeneous.

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Septal Nectaries of Asterogyne martiana and Other Palmae

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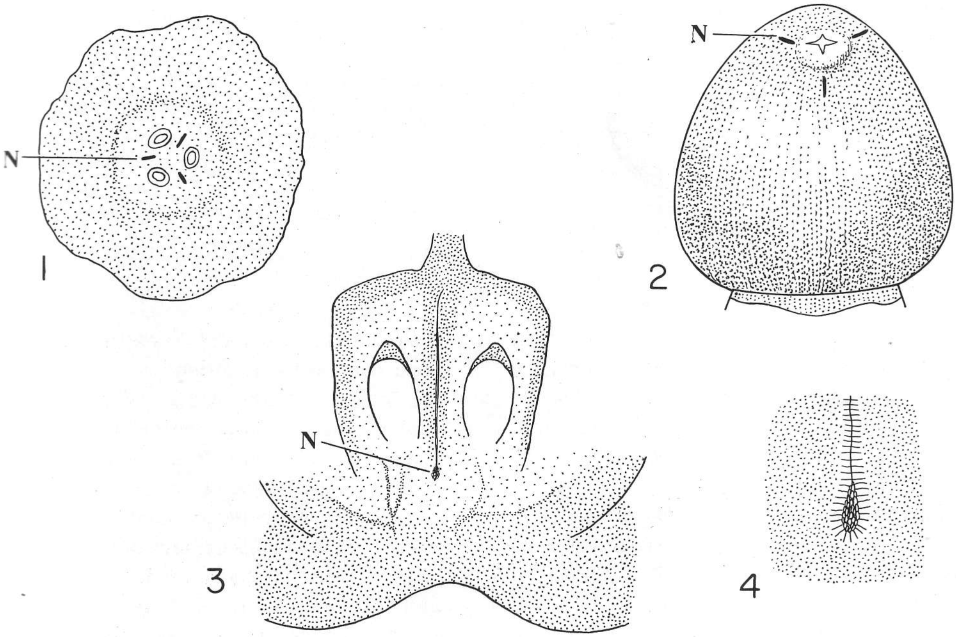
In angiosperms nectaries occur in or on a diversity of reproductive structures, including inflorescence axes, peduncles and pedicels, bracts and bracteoles, fruits, and, most commonly, flowers, where they occur variously on the receptacle, floral tube, perianth, androecium (both filament and anther, and also staminodia), and gynoecium (ovary, style, and even stigma) (Daumann 1970, Fahn 1979, Schmid 1982). Gynoecial nectaries, the most common type of floral nectary, comprise (1) surficially located nectaries of various types, and (2) generally internally located septal nectaries that occur in the septal radii of ovaries (Fig. 1) and that represent intercarpellary cavities resulting from the lack of fusion of the adjacent walls of carpels. Septal nectaries are absent from dicotyledons but are the most common nectarial type in monocotyledons (Daumann 1970, 1974; Schmid 1982).

Although septal nectaries of monocotyledons have received considerable morphological and anatomical attention (for reviews see Daumann 1970, Fahn 1979, and Schmid 1982), for some reason the structure and function of septal nectaries of palms have been particularly enigmatic. For example, Drude (1877: 623, 1887: Fig. 29) clearly described and figured inner septal nectaries in *Borassus flabelliformis* but was totally mystified as to their nature and function. Later Bauch (1911) in a "physiological anatomical" study of palm flowers described (but did not figure) inner septal nectaries in *Cocos nucifera* (see Figs. 1,2) and *Latania loddigesii* but, incredibly for a student whose dissertation was reviewed by Haberlandt (1914, 1924), the main advocate of physiological plant anatomy, interpreted the nectaries as air canals. Bauch's and Drude's inability to recognize the septal nectaries of Palmae as such was then perpetuated in the surveys by Al-Rawi (1945) and Bosch (1947), both of whom cited Bauch and Drude. Bosch (1947) interpreted the septal nectaries of *Hyphaene coriacea* as evidence for a modified apocarpous gynoecium in the context of the peltate carpel theory (see Guédès & Schmid 1978). Fortunately, other workers on Palmae (see Table 1) have correctly interpreted the structure and function of their septal nectaries.

Many palms apparently are wind-pollinated (see literature review in Schmid, 1970*b*) and so, not surprisingly, lack nectaries. Very little, however, is known about the anatomy and morphology of the septal and non-septal nectaries of palms. The main detailed study is that of Daumann (1970), who examined anatomically the flowers of 12 species in 11 genera* and found *Rhapis excelsa* (*R. flabelliformis*), *Caryota mitis*, *Chamaedorea oblongata*, *Chrysalidocarpus lutescens*, *Ptychosperma macarthurii*, and "*Pinanga lepida*" (name never published) to lack nectaries, *Chamaerops elegans* (*C. humilis*) and "*C. macrocarpa*" to have androecial nectaries, *Trachycarpus fortunei* (*T. excelsus*) to have superficial gynoecial,

* Daumann's nomenclature given in parentheses has been updated.



1–4. Figures 1, 2. Morphology of inner septal nectaries (labelled N) in ovary of pistillate flower of *Cocos nucifera* in transection (Fig. 1) and surface view (Fig. 2), the latter showing openings of nectaries to exterior. Figures 3, 4. Morphology of outer septal nectaries (labelled N) in ovary of bisexual flower of *Livistona* sp. in non-median (see Daumann 1970: 576) longisections, Figure 4 showing an enlargement through region of nectar-secreting cells at bases of carpels. (Redrawn from Brown 1938, with permission of the American Philosophical Society.)

non-septal nectaries, *Livistona humilis* (see Figs. 3,4) and *Sabal minor* (*S. adansonii*) to have outer septal nectaries, and *Cocos nucifera* (Figs. 1,2) to have inner septal nectaries. Daumann (1970: 575–578) described in some detail for Palmae not only the morphology of their nectaries, but also anatomy, including mode of nectar secretion. The works of Uhl & Moore (1971, 1977) on various palm genera (see Table 1) and Narayana (1937) on *C. nucifera* are also noteworthy, but these works concentrate more on morphological than on anatomical features of septal nectaries.

Septal nectaries seem to be the most common nectarial type in Palmae (Schmid, unpublished literature survey). Table 1 summarizes the occurrence of septal nectaries in palms, as determined from especially the anatomical literature. This table should be consulted for the variety of morphological types already known for Palmae.

In 1970 I described the reproductive morphology and pollination biology of *Asterogyne martiana* from two sites in Costa Rica, La Selva and Osa (see Schmid 1970*a*, *b*). Uhl and Moore (1977) provided additional, mainly anatomical information on the same species, including some details on nectarial anatomy. Their anatomical studies and those now reported are based on collections that I made in Costa Rica in 1968 (Schmid 1970*a*). I provide here additional data on the morphology and histology of the inner septal nectaries of *A. martiana* since they seem representative of those of many other palms (see Table 1).

Table 1. Literature Reports of Septal Nectaries in Palmae.[a]

I. Outer septal nectaries only (inner septal nectaries lacking); nectar secretion in several outer grooves (furrows)[b] lying in septal radii of ovary: *Livistona* ⚥ (Brown 1938—see Figs. 3,4; Daumann 1970), *Sabal* ⚥ (see also Part IIA2 below) (Daumann 1970).

II. Inner septal nectaries only; outer septal grooves,[b] if present, not nectar-secreting; nectar secretion only in the cavities lying internally in septal radii of ovary.[c]

A. Outer septal grooves (furrows)[b] absent from compound ovary or lower style.

1. Openings of nectaries in or near base of ovary; *Corypha* ⚥ (Moore 1973: 54, Uhl & Moore 1971).
2. Openings of nectaries near middle of ovary: *Geonoma* ♀ (Uhl & Moore 1971), *Hyophorbe vaughanii* ♀ (see also Part IIA4 below) (Uhl 1978), *Sabal* ⚥ (see also Part I above) (Moore 1973: 54, Uhl & Moore 1971).
3. Openings of nectaries in or near top of ovary or in base of style: *Arenga* ♀ (Moore 1973: 67, Uhl & Moore 1971), *Asterogyne* ♂♀ (Schmid 1970a, and this study—Figs. 5,6; Uhl & Moore 1977), *Borassus* ♀ (Drude 1877, 1887: Fig. 29), *Cocos* ♂♀ (Bauch 1911; Brown 1938—see Figs. 1,2; Daumann 1970; Narayana 1937), *Hyophorbe* ♂ (Uhl 1978), *Hyphaene* ♀ (Bosch 1947), *Latania* ♀ (Bauch 1911, Moore 1973: 54, Uhl & Moore 1971).
4. Openings of nectaries in middle or top of style: *Butia* ♂♀ (Silberbauer-Gottsberger 1973, Uhl & Moore 1971), *Hyophorbe* ♀ (excl. *H. vaughanii* ♀—see Part IIA2 above) (Uhl 1978), *Paralinospadix* ♀ (Uhl & Moore 1971), *Ptychosperma* ♂♀ (Al-Rawi 1945, Uhl 1976, Uhl & Moore 1977).

B. Outer septal grooves (furrows)[b] present on compound ovary or lower style, but not nectar-secreting, with subcategories (1) through (4) as above—no literature reports for Palmae.

[a] This morphological classification of septal nectaries is modified from the systems of Daumann (1970) and especially Schmid (1982). Palmae have only superior ovaries, and thus the classification given here excludes possibilities for half-inferior and inferior ovaries (for which see Schmid 1982). Studies of Palmae have generally concentrated on the pistils of pistillate flowers rather than on the pistillodia of ← staminate flowers, in those taxa possessing unisexual flowers.

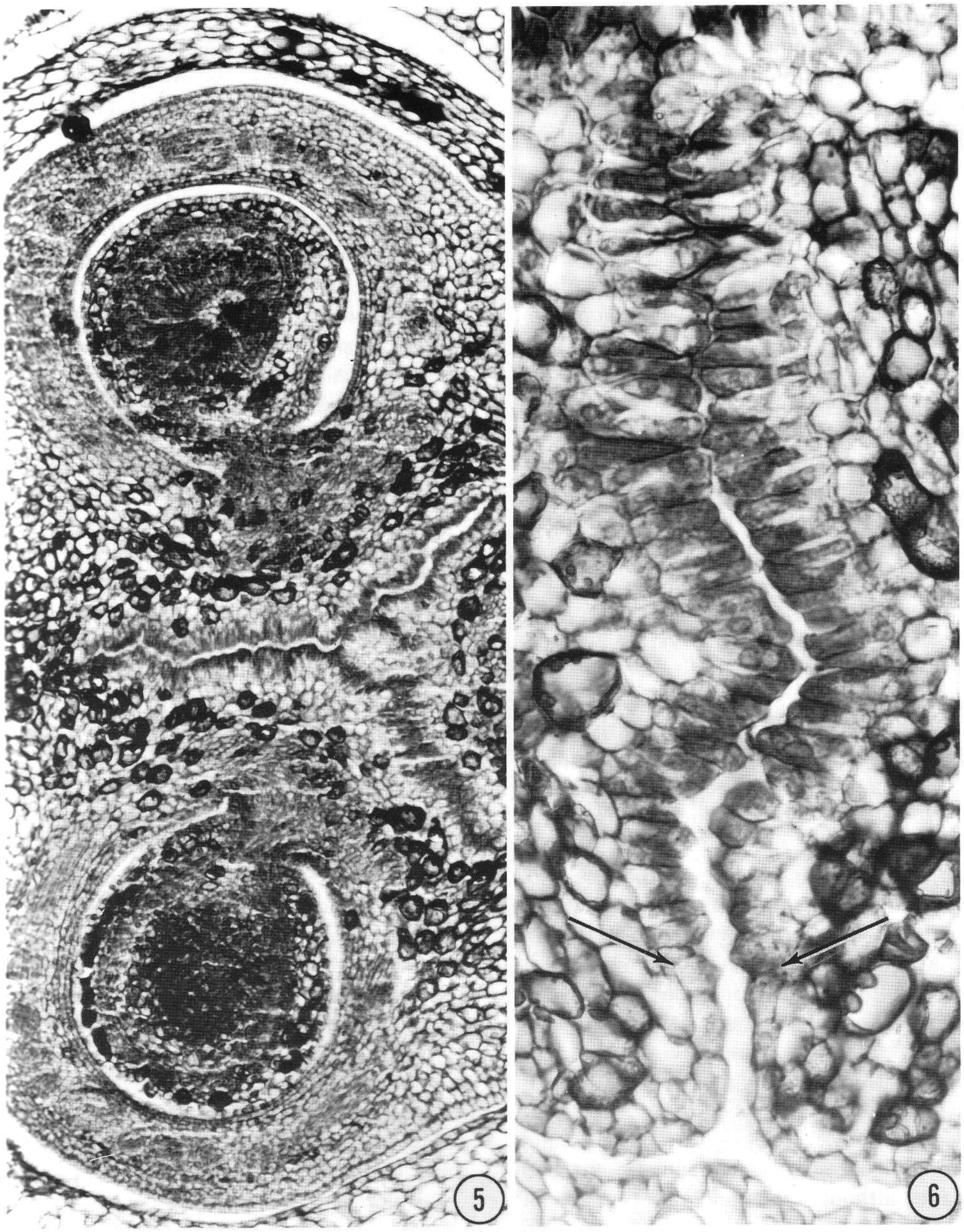
[b] As defined in Schmid (1982), septal grooves (furrows) occur in the main nectar-secreting parts of compound ovaries and have an appreciable depth; shallow septal depressions (indentations) as in *Sabal mexicana* or *Latania verschaffeltii* (Uhl & Moore 1971: Figs. 4,6) are not regarded as grooves for classificatory purposes. In addition, only septal grooves below (proximal to) the insertion of openings of the septal nectaries are of significance since more distally located grooves would not be effective in channelling nectar to the base of the flower.

[c] *Socratea exorrhiza* ♂ has a "small septal nectary," but the mode of nectarial opening was not indicated by Uhl & Moore (1980). *Ravenea madagascariensis* ♀ and *Ceroxylon* sp. ♀ have septal cavities that apparently are not secretory (Uhl 1969) and thus are not septal nectaries.

Standard anatomical techniques were used to prepare flowers of *Asterogyne martiana* for study (Schmid 1972, 1978). Although its flowers are rather tanniferous (Figs. 5,6), bleaching of sections on slides with Stockwell's solution (Schmid 1977) proved unnecessary. My anatomical observations are based on sections of 5 staminate and 5 pistillate flower buds or open flowers.

Floral morphology and anatomy of the unisexual flowers of *Asterogyne martiana* are detailed in Schmid (1970*a*, *b*) and Uhl and Moore (1977). Staminate flowers each have 3 separate sepals, 3 basally connate petals, 6 stamens with the filaments basally united into a short tube that is weakly adnate to the petals, and a small, tripartite rudimentary pistil (or pistillode) about 2 mm long. Pistillate flowers each have 3 separate sepals, 3 basally united petals, 6 very prominent staminodia that are basally connate and strongly adnate to the petals, and a short, trilocular, triovulate ovary surmounted by 3 fused, elongate styles with 3 papillate stigmas that are recurved at anthesis.

Both staminate and pistillate flowers of *Asterogyne martiana* produce copious amounts of nectar (Schmid 1970*a*, *b*). Since the inner septal nectaries in the



5, 6. Transections (somewhat oblique) of inner septal nectary in a pistillate flower bud (near anthesis) of *Asterogyne martiana* showing a triradiate common nectarial cavity in mid-region of ovary (Fig. 5) and, about 100 μm distally near top of ovary, one of the three nectarial openings to exterior (Fig. 6), the undulate slit in Figure 6 being the distal part of the nectarial arm at the 9:00 position in Figure 5. A petal-staminodial tube is external to the ovary in each figure. The nectary consists of only epidermal tissue lining each side of the nectarial cavity. The arrows in Figure 6 separate the nectar-secreting, columnar cells of the nectary proper (above arrows) from the non-nectar-secreting, rather isodiametric cells of the nectarial canal that leads to the opening. Note the tannin cells in vicinity of nectary (Fig. 5) and nectarial opening (Fig. 6) and the transfer-cell nature of the nectar-secreting cells (see text). ×131, ×426.

gynoecia of the flowers of both sexes are morphologically and anatomically very similar, only the nectaries of the pistillate flowers are described and figured here (Figs. 5,6).

Unlike the ovary of *Cocos nucifera*, which has three separate septal nectaries in its mid-region (Fig. 1), the superior ovary of *Asterogyne martiana* has in its mid-region a triradiate, moderately undulate (but non-labyrinthine) common nectarial cavity (Fig. 5). Such diverse nectarial patterns result from different degrees (more versus less, respectively) of ontogenetic fusion of adjacent carpellary walls during the development of the gynoecium. Distally in the gynoecium of *Asterogyne* the common nectarial cavity separates into three canals that open to the exterior in the top of the ovary (Fig. 6). The nectarial openings are slitlike, with a vertical extent of about 250 μm on the ovarian surface. Uhl & Moore (1977: 183) reported the nectarial openings as occurring "near the base of the ovary," but they clearly occur in the top of the ovary in my material.

Anatomically, the nectary of *Asterogyne* consists of only epidermal tissue lining each side of the nectarial cavity (Fig. 5). In some places the epidermal cells of the nectary are apposed, so that an actual nectarial cavity is not evident (Fig. 5). The significance of this is unknown, but it may simply be a factor of observations on slightly "immature" nectaries since mainly flower buds just before anthesis were sectioned. However, judging from the histological features described below, the septal nectaries of *Asterogyne* are "mature" and already secreting nectar while in the bud stage, although my field observations of nectar secretion were made only on open flowers (Schmid 1970*a*, *b*). Generally in both septal and non-septal nectaries nectar secretion begins in the bud just prior to anthesis and then lasts for the life of the flower (Daumann 1970, 1974; Fahn 1979, Schmid 1982).

The nectar-secreting epidermal cells of *Asterogyne* are of the columnar type, all the nectarial cells in Figure 5 being secretory. In Figure 6 arrows separate the nectar-secreting, columnar cells of the nectary proper (above the arrows) from the non-nectar-secreting, rather isodiametric cells of the nectarial canal that leads to the opening (at the bottom of the figure). It might be noted that some definitions of "nectary," for example, that of Daumann (1970), would not consider the nectarial canal as part of the septal nectary, but for reasons elaborated in Schmid (1982) I prefer to do so.

The cells of the nectary of *Asterogyne* have thin walls and a very thin cuticle (Figs. 5,6). The dark staining of the outer parts (i.e., by the cavities) of the nectar-secreting, columnar cells in both Figures 5 and 6 is suggestive of wall ingrowths of transfer cells, that is, cells with wall ingrowths specialized for the short distance transport of materials (Cutter 1978). The dark staining, apparently transfer-cell wall regions in Figures 5 and 6 are very similar to ones depicted in light micrographs in Cutter (1978: 230) and Schnepf (1964). Transfer cells, it might be noted, have been demonstrated at the ultrastructural level in both septal and non-septal nectaries of a number of plants (Cutter 1978, Fahn 1979, Schmid 1982, Schnepf 1964). In *Asterogyne* the transfer-cell nature of the cells becomes more apparent proximally in the nectary (compare Figs. 5 and 6).

As noted above, the septal nectaries of *Asterogyne* are strictly epidermal and so lack vascular tissue and other subepidermal components (Figs. 5,6). Placental vascular tissue, however, occurs in the proximity of the nectary on the non-septal radii (Fig. 5). In addition, dark-staining, apparently tanniferous cells surround, but do not occur in the nectaries (Figs. 5,6). Presumably the tannin cells in the vicinity of the nectary in Figure 5 and the nectarial opening in Figure 6 are protective against insect predators, as suggested by

Uhl & Moore (1973, 1977) for *Asterogyne* and other palms. I did not observe any crystals or silica in my floral material. Uhl (1976, 1978, pers. comm. 1978; Uhl and Moore 1971, 1977, 1980), who has examined flowers of many Palmae, has never seen tannins, silica, or crystals in their septal nectaries, although these materials often occur close to the nectaries.

Light and electron microscopic studies have revealed that septal and non-septal nectaries secrete nectar by several diverse modes (Cutter 1978; Daumann 1970, 1974; Fahn 1979; Schmid 1982; Schnepf 1964). Daumann (1970) found that of the 106 genera of monocotyledons with septal nectaries that he studied, 94.3% of the genera had nectar secretion through the cell wall and cuticle (if present), the latter either remaining intact and in place or else variously separating from the cell wall and sometimes becoming torn. Daumann (1970) found that all four genera and six species of palms for which he had data (he had none for *Cocos nucifera*) secreted nectar through the cell wall and an undisrupted cuticle. This also seems to be the mode of nectar secretion in *Asterogyne* since the thin cuticle of its septal nectaries appears intact not only in sections of buds near anthesis, but also in sections of open flowers. Unfortunately, there is no other information on mode of nectar secretion in palms, and absolutely no ultrastructural studies of palm nectaries.

Judging from the limited published information available, the septal nectaries of *Asterogyne martiana* and other palms (references in Table 1) conform to the morphological and anatomical stereotypes of septal nectaries of monocotyledons in general as elaborated in Daumann (1970), Fahn (1979), Schmid (1982), and Schnepf (1964). Clearly, however, the number of published studies on septal nectaries of Palmae is very small (Table 1). A detailed comparative survey of the morphology and anatomy of the septal and non-septal nectaries of many representatives of Palmae would thus be highly desirable and no doubt would be invaluable in providing correlations of structure and function (sensu Carlquist 1969, Schmid 1978, Uhl and Moore 1973, 1977).

ACKNOWLEDGMENTS

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Principes, 27(4), 1983, pp. 175–181

An October Sunday in Birmingham

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If you lived in Birmingham, Alabama and invited a friend, even a horticulturally inclined one, to spend an hour or two on an October Sunday afternoon driving around to admire palms, he would say, "Hey! You're nuts! There aren't any palms in Birmingham." And he'd be almost right. Almost. We will take that drive shortly.

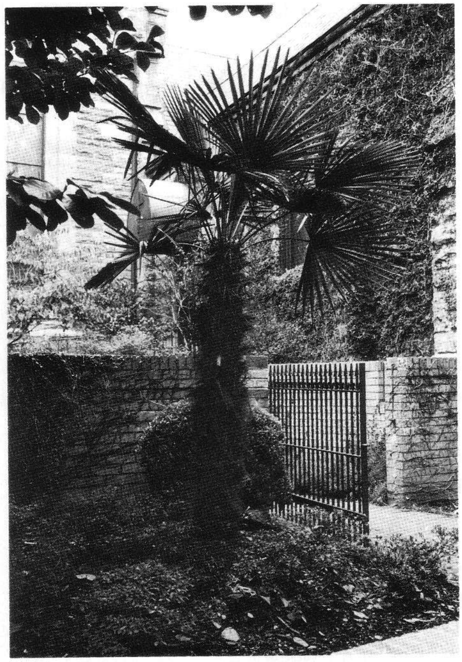
First, Birmingham lies at what appear to be the northern reaches of U.S. Horticultural Zone 8 with winter temperatures normally reaching 10–20° F and several times most winters reaching a single digit. The first killing frost normally occurs about November 11 and the last about March 19. It has long been the opinion of this native Birminghamian and palm fancier that this is the coldest place on earth to be so far south. Consider sunny, palm-infested San Clemente, California at a similar latitude. My thoughts on this matter were forever set in concrete when in January 1982, the U.S. Weather Bureau here recorded the following official low temperatures: January 10, 1° F; January 11, −2° F; January 17, −1° F. Considerably lower temperatures were unofficially recorded in the area on these dates as might be expected. Strangely, on January 19 an official record high for that date of 74° F was set barely 48 hours after −1° F. This is palm country?

It should be readily apparent from the foregoing that palm culture in Birmingham will have limitations to say the least. But be of good cheer! All is not lost. It is my happy privilege to report that specimens of *Sabal palmetto* (cabbage palm), *Sabal minor*, *Trachycarpus fortunei* (windmill palm) and *Rhapidophyllum hystrix* (needle palm) survived the past winter unprotected; and that specimens, although small, of *Butia capitata* (jelly palm), *Chamaerops humilis* (Mediteranean fan palm) and *Washingtonia* (sp. uncertain) survived with minimal protection. Unfortunately, I must also report in fairness that some unprotected adult specimens of *S. palmetto* and *T. fortunei* were killed and that one beautiful cluster of four large *T. fortunei* was sawed off at the ground by its owner in late spring apparently because the leaves were all dead and despite the fact that each trunk was actively throwing out fresh flower stalks. It should be mentioned that virtually all leaves were killed on all specimens of *S. palmetto* and *T. fortunei* and that in *T. fortunei* the initial sign of survival was the growth of a fresh flower stalk. Leaves followed. These remarks concluded, it is almost time to begin our October Sunday drive to view the survivors. Where history of a particular specimen is known, it will be given. Fortunately, after initial suspicion and incredulity, all owners seemed happy to reveal what they could of their palms and all were proud of them. Now, the setting for our drive.

The past Thursday and Friday were dreary with badly needed soaking rains which cleared the air and somehow, despite the season, greened the dry-brown early fall motif. Saturday has seen clearing weather. This Sunday afternoon, October 10, is mostly sunny, humid and warm with a current temperature of 81° F. Let's get going.

Our first stop is at the Birmingham

1. *Sabal palmetto* at Botanical Gardens.



3. Windmill palm in church gardens.

Botanical Gardens where we see a large, thick-trunked specimen tagged *Sabal palmetto* (Fig. 1). Garden records state that this plant came from California as a seedling, was planted in the western area of Birmingham years ago, for some reason thrived, and in 1976 was transplanted to its current site. It certainly has been completely unprotected since that time, it flowers and fruits profusely, and its seeds germinate readily. There is speculation that this tree may be a *Sabal palmetto-S. mexicana* hybrid, and somehow, despite the records, there is a nagging feeling that the early history of this specimen is suspect. Nonetheless, it is clearly a *Sabal* which has survived a $-2°$ F night.

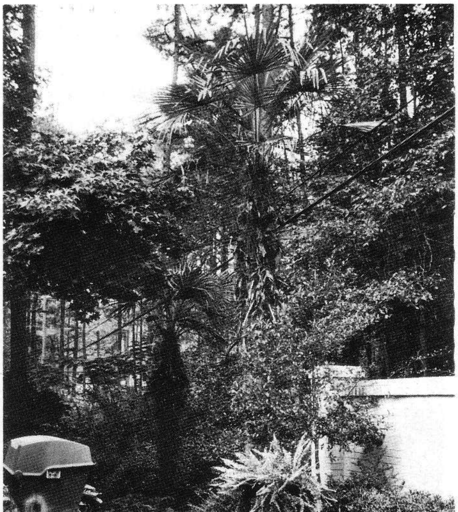
2. *Sabal minor*, also at the Gardens.

While here at the Gardens, we should also note that *Sabal minor* (Fig. 2) flourishes. These plants seem to suffer minimal leaf damage; they flower and fruit annually, and their seeds germinate readily. Time to move on.

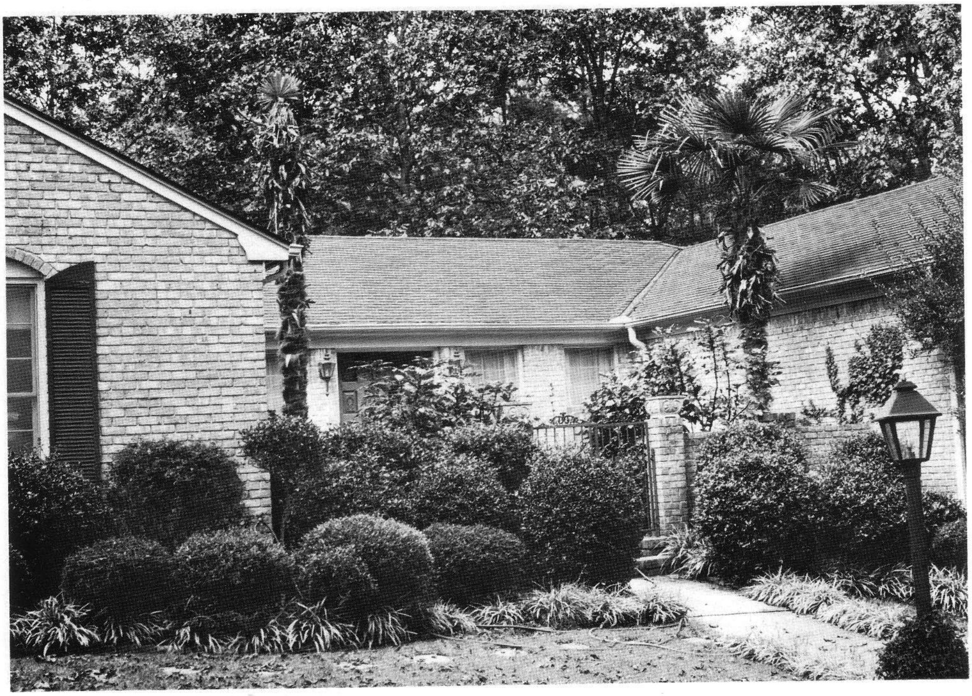
We have headed north into downtown Birmingham to the courtyard garden of a large Episcopal church where, as in Figure 3, we see this relatively small *T. fortunei*. This specimen was planted in the garden "a number of years ago," was moved within the year before the January 1982 deep freeze to its present location, and, despite no protection and its recent

4. Needle palm on Southside.

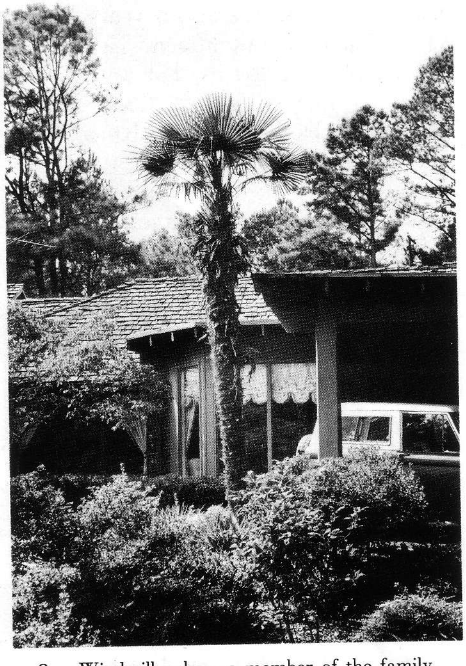
5. Cabbage palm—its blanket went off last winter.



6. Windmill palms—into the power lines.



7. Windmill palms—plant on left just beginning to recover.



8. Windmill palm—a member of the family.

move, seems to have survived handily. We must now head southeast to near Avondale Park.

Here we see a large *R. hystrix* (Fig. 4) which has been prospering for years. Rumor has it that this specimen is the only one remaining of three originally at this location; the other two were destroyed in the name of "progress" during construction of an apartment building. This plant and all other known needle palms in town suffered no apparent injury from the cold, their leaves seeming to survive normally. Now south to the suburbs.

We are in Mountain Brook, a lovely residential area where reside the remainder of our palms. The cabbage palm in Figure 5 was planted as a modest specimen by its current owner in its present location about 17 years ago. Initially this plant was protected by a plastic covered wooden frame in winter, but as it grew it became more difficult to protect. After

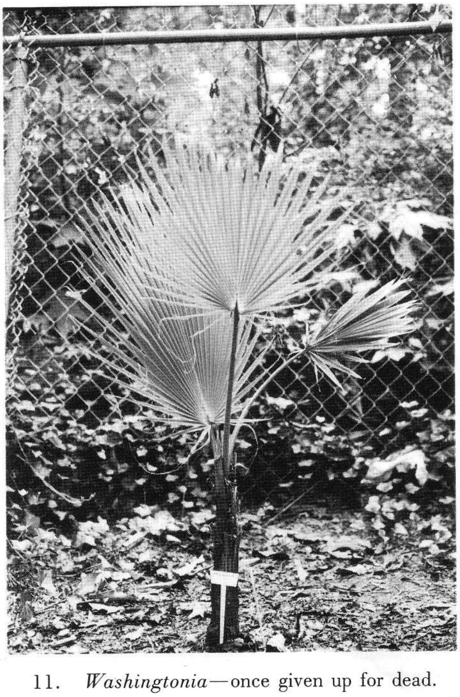
9. Small *Butia capitata.*

some time it could not be framed so it was simply wrapped entirely in plastic. This eventually became difficult until only its crown of leaves could be wrapped. In winter now its trunk is wrapped in an electric blanket, the blanket is wrapped in plastic, and the leaves are unprotected. The blanket is turned on in November and left on until spring. During our January 1982 deep freeze, an ice storm resulted in a power outage over the coldest period and the blanket was off for five days. All the leaves died and the first signs of life did not appear until early July. The owner confided that had the tree not survived, it would nevertheless have been allowed to remain because of the pleasure it had afforded over the years. On to Cherokee Bend, also in Mountain Brook.

In a side courtyard we see two large, handsome *T. fortunei* (Fig. 6). Their current owner has been in the home only two years, but he knows that the plants have been there in excess of ten years and, in all likelihood, about fifteen. These trees lost all of their leaves, but now appear quite restored to health. They pose a peculiar problem for the Alabama Power Company tree crews, unused to trimming palms, as they inexorably grow into the lines. On to Dunbarton, another area of Mountain Brook.

At this home, in a beautifully planted front courtyard, we see two large *T. fortunei* (Fig. 7). As is perfectly obvious, one plant is far happier than the other. Both were planted as approximate four foot specimens by the current owner some 14 years ago. They have never been protected. It is uncertain why one tolerated the cold so much better than the other in view of their obvious similarity in size. Small leaves are just now making their appearance in the plant on the left. Hopefully it will recover. Next stop, the Knollwood section of Mountain Brook.

10. Mediterranean fan—suckering only.



11. *Washingtonia*—once given up for dead.

It's another beautifully situated *T. fortunei* (Fig. 8). According to its owner, this specimen was planted when small near its present location, but beneath the portico. It grew to the roof and approximately five years ago had to be moved to its present location. As with the other windmills, it lost all its leaves this winter, first grew a flower stalk, and then began to grow leaves. Although it is considered "a member of the family" by the owner, it has never been protected in winter. We must now move to our final stop in the Redmont area of Mountain Brook.

Here, in a side yard, we see lovingly-cared-for (by me), tiny plants of *Butia capitata* (Fig. 9), *Chamaerops humilis* (Fig. 10), and *Washingtonia* (sp. uncertain) (Fig. 11) which, with the help of lots of leaves about their stems and some flimsy, often windblown and torn plastic over their tops, survived. All leaves were killed and in the case of the Mediterranean fan, the original small trunk was killed also, the new growth sprouting as suckers. Not pictured, but in the same yard, are several veteran needle palms which survived unaffected; a young windmill, an adult cabbage, several seedling *Sabal minor*, and a *Washingtonia filifera* grown from seed; all facing their first winter outdoors here. With luck, hopefully all will survive for another tour another fall afternoon.

Now our drive is over and it's plain to see: there are indeed palms to enjoy in Birmingham!

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BOOKSTORE

Principes, 27(4), 1983, pp. 182–183

PALM LITERATURE

KAPLAN, DONALD R., NANCY G. DENGLER, AND RONALD E. DENGLER. The mechanism of plication inception in palm leaves: problem and developmental morphology. Canadian Journal of Botany 60: 2939–2975. 1982.

DENGLER, NANCY R., RONALD E. DENGLER, AND DONALD R. KAPLAN. The mechanism of plication inception in palm leaves: histogenetic observations on the pinnate leaf of *Chrysalidocarpus lutescens*. Canadian Journal of Botany 60: 2976–2998. 1982.

KAPLAN, DONALD R., NANCY G. DENGLER, AND RONALD E. DENGLER. The mechanism of plication inception in palm leaves: histogenetic observations on the palmate leaf of *Rhapis excelsa*. Canadian Journal of Botany 60: 2999–3016. 1982.

These three papers represent a landmark in the understanding of the structure of the palm leaf. For over a century and a half a controversy has raged as to whether the folds or plications of palm leaves originate by differential growth or by splitting involving a process of cell separation. It must be emphasized that in the formation of the leaflets splitting does indeed occur. The formation of the folds and the division of the leaf into segments or pinnae are separate processes in leaf development.

The first paper presents the problem and evaluates the extensive literature, explaining the contributions and as far as possible the reasoning behind each author's conclusions. The second two papers present new information obtained by scanning electron microscopy, by very thin sections made possible by embedding leaf primordia in plastic, and by transmission electron microscopy. In both a pinnate leaf (*Chrysalidocarpus lutescens*) and a palmate leaf (*Rhapis excelsa*), the authors found no evidence of splitting nor of any sort of cell separation. The folds originate by upgrowth of ridges, by actual folding of the meristem.

This work has important implications for developmental biology as a whole as the next paper explains.

KAPLAN, DONALD R. The development of palm leaves. Scientific American 249: 98–105. 1983.

The new research on palm leaf development is considered in relation to developmental processes in other plants and in animals. The compound leaves of plants usually develop from either differential growth or selective cell death. Palm leaves are unusual in that both processes are involved in their formation.

Drs. Nancy and Ronald Dengler have prepared a special article on their research for *Principes*. Look for it in January 1984. We also expect to have Dr. Kaplan comment further on the significance of leaf form and development in palms in a future issue.

BRANNTON R. AND JENNET BLAKE. A lovely clone of coconuts. New Scientist 98: 554–557. 1983.

It has not been easy to clone the coconut and the oil palm but the authors consider that the future is now promising. Genetic engineering may soon allow "breeding" within a test tube. The problem of distributing clonal plants to many small growers will require government assistance, however.

NATALIE W. UHL

SAGO RESEARCH IN PAPUA NEW GUINEA. Discussion Paper No. 44, 97 pp. Institute of Applied Social and Economic Research, Boroko, Papua New Guinea. 1982.

Three papers comprise this publication which deals with sago starch, from *Metroxylon sagu*, as food among indigenous peoples of Papua New Guinea. "A review of recent and needed sago research," is provided by Patricia K. Townsend; "Sago for food in a changing economy," by Louise Morauta; and "Nutritional status of a sago-eating community in the Purari delta, Gulf Province," by Stanley J. Ulijaszek. These papers provide useful new information on one of the most important geographic areas of sago starch utilization.

DENNIS JOHNSON

PALM BRIEF

Palm Symbolism*

RAFAEL M. MOSCOSO

The palm is a symbol of victory, immortality and happiness. Among the ancients it was an emblem of constancy, patience and fecundity. The Roman Catholic church has a long tradition of using palm leaves on Palm Sunday,[1] to commemorate the victorious entry of Jesus Christ into Jerusalem. In earlier times, pilgrims who returned from the Holy Land were called palmers because of the palm leaves they carried back with them.

Palm leaves adorn many coats of arms such as that of the Dominican Republic which features one crossed with a laurel branch to represent victory. The coat of arms of the University of Santo Domingo also includes a palm leaf, in this instance crossed with an olive branch to symbolize liberty and glory. As a symbol of immortality, it is often used as an ornament on monuments and tombs. Two bronze palm leaves decorate the pedestal of the statue of Christopher Columbus, erected in the park bearing his name in the city of Santo Domingo. The palm leaf has also been taken as an emblem of virginity; in popular festivals it is a symbol of happiness. In 1930, for the first time in the country's history, the royal palm was chosen as a political symbol by the Dominican Party, which was founded by President Trujillo.

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* Translated from the Spanish. This passage is extracted from the author's book *Palmas Dominicanas.* 82 pp. Universidad de Santo Domingo, Ciudad Trujillo, 1945. It deals with native and introduced palms and is illustrated with photographs. The author was Director of the Institute of Botany of the Dominican Republic when the work was published. Dennis Johnson, Field Editor.

[1] In Spanish Palm Sunday is *Domingo de Ramos,* literally "Branch Sunday"; the reference to a palm being assumed. In Portuguese and French the day is designated in the same way; however, in Italian and German, the equivalent of the noun for palm is utilized. The palm in question is, by tradition, the date palm. In countries where that palm is not cultivated, leaves of other feather palms are used as acceptable substitutes on Palm Sunday. Field editor's note.

Principes, 27(4), 1983, p. 184

WHAT'S IN A NAME?

Calospatha (cal oh spáy tha) is built up from the Greek *kalos* (beautiful) and *spatha* (bract), and indeed, the inflorescence bracts are of extraordinary form and elegantly armed with spines.

Eugeissona (you guy só na) is derived from the Green *eu* (good) and *geisson* (cornice of a roof), alluding to the use for thatch of the leaves of *E. tristis* Griffith, the first species to be described. In fact, the leaves of *E. tristis* do not make a very durable thatch and they are primarily used for temporary shelters in the forest. Griffith regarded the generic name as neuter, but Beccari used feminine endings for the species he described; currently *Eugeissona* is regarded as feminine.

Licuala (lih quáhl a) is a latinization of the native name 'leko wala', supposed to have been used for *L. spinosa* in Makasar, Celebes.

Livistona (liv i stóne a) honors Patrick Murray, Baron Livingstone, who laid out a garden on his estate at Livingstone, west of Edinburgh, with more than a thousand different species, at some time before 1680. These plants were used as the foundation of the Edinburgh Botanic Garden.

Metroxylon (met rócks ill on) combines the Greek *metra* (pith) with *xylon* (wood or tree)—the tree with well-developed pith, i.e., filled with sago.

Myrialepis (mir ee a léap iss) is derived from the Greek *myrioi* (very many) and *lepis* (scale), in reference to the countless minute scales of the fruit, the most important diagnostic feature.

Normanbya (nor man bée a) is named after Sir George Augustus Constantine Phipps, Second Marquis of Normanby (1819–1890), Lieutenant Governor of Nova Scotia 1858–1863, Governor of Queensland 1871–1874, Governor of New Zealand 1874–1879, and Governor of Victoria 1879–1884.

Ophiria (oh feár ee a) is named after Mount Ophir (Gunung Ledang) in Johor, Malaysia, where the genus was first collected. A second Mount Ophir (Gunung Talakmau) occurs in West Sumatra. The genus is now regarded as a synonym of *Pinanga*.

Orania (or aín ee a) commemorates F. G. L. Willem van Nassau, Prince of Orange (Oranje) and Crown Prince of the Netherlands (1792–1849).

Pholidocarpus (foll i doh cár pus) is a rather inappropriate name, being a combination of the Greek *pholidos* (scale) and *carpos*, latinized to *carpus* (fruit). The fruit in this genus is not really scaly but covered in low corky warts.

Pholidostachys (foll i doh stáck iss) similarly combines *pholidos* (scale) with *stachys* (an ear of wheat or, in botanical usage, a spike) in reference to the pit bracts on the rachillae.

Seaforthia (sea fórth ee a) commemorates Francis Mackenzie Humberston, Lord of Seaforth and Mackenzie (1754–1815). During 1800–1806 he was Governor of Barbados and was responsible for sending a large collection of living plants to Aylmer Bourke Lambert in England.

JOHN DRANSFIELD
NATALIE W. UHL

CLASSIFIED

NOTICE

Chapters can obtain a list of names of the new members in their areas by writing The Palm Society, Inc., P.O. Box 368, Lawrence, Kan. 66044.

Errata

Page 55, column 1, paragraph 2, line 1, 1855 *to read* 1885.

Page 61, column 2, paragraph 1, line 12:
"*Areca nenga sumatrana* Scheff." *to read* "*Areca nenga δ sumatrana* Scheff."

Page 69, column 2 (under "Excluded Species"), paragraph 2, line 2–3 (in bold letters):
"=Nenga calophylla (Lauterb. & K. Schum.) Becc." *to read*
"=Nengella calophylla (Lauterb. & K. Schum.) Becc."

Page 69, column 2, paragraph 7, line 2 (in bold letters):
"=Areca novohibernica" *to read* "=Areca novo-hibernica."

NEWS OF THE SOCIETY

News of The South Florida Chapter or Oh, My Aching Back

The South Florida Chapter has committed itself to its largest undertaking ever. In planning for the annual Palm Show and Sale November 5–6, 1983, it was proposed that every effort be made to get Maypan coconuts to offer to the public, because this hybrid appears to be the most desirable variety to replace the hundreds of thousands of Jamaica Tall coconuts that succumbed to lethal yellowing in South Florida. But instead of buying nuts, as originally planned, the Board of Directors took advantage of an unexpected opportunity to purchase 3–5 ft tall plants in 3-gallon containers. In fact, the Board decided to buy over 800 of the coconuts, mostly Maypan, donate 100 to the new Dade County Metrozoo in furtherance of the chapter's long-range project there, offer up to three palms each to local members, and hold the rest for the sale in November.

One obstacle was to find a secure area large enough to set up a nursery for the palms. This problem was solved with an agreement to hold the plants at the retirement village where Teddie Buhler lives. After setting aside about 125 coconuts for sale to members, the hard work started. The site chosen for the nursery is a 480 ft L-shaped swath running along a fence. The work included laying down a 7½ ft wide ribbon of plastic, repotting over 300 palms into 7-gallon pots, and setting the plants on the plastic in a carefully-staggered configuration. All of this was accomplished by a small army of volunteers in less than two days, the weekend of March 19.

However, setting up an irrigation system proved more complex than anticipated and took several days' additional work over the next week and a half. Flexible plastic tubing ½ in. in diameter was uncoiled from large rolls, placed on the rim of each container, and secured by ties to most of them. To minimize the effects of gusty wind, iron bars were hammered into the ground through 400 of the containers. A small plastic mist nozzle was tapped into the tubing above each pot. The entire system was then put on line with an existing sprinkler system.

But what looked so good on paper proved less than ideal in practice; water pressure was too low to irrigate every palm. However, under a plan devised by Stanley Kiem, the irrigation system was split into three segments, each of which was connected to a separate zone of the sprinkler system. The second time was the charm, and now 590 coconuts receive 30 minutes of mist irrigation automatically every evening.

Contributing to this very satisfying and ambitious undertaking were the following individuals: Teddie and Ted Buhler, Bobby Clement, Doug and Frances Clement, Jeff Crandall, Don Evans, Sandy and John Fish, project chairman Lenny Goldstein, Carol Graff, Bill Hemmer, Stanley and Mary Kiem, Scott MacGregor, Bruce McManus, Bob Norris, Louise Pool, Bryce and Eva Ryan, Bill Shannon, John Swisher, and Anne Throssell.

With a burst of effort the groundwork was laid. Now, with fertilizer, water, hot summer sun, and—above all—a quiet hurricane season, the South Florida Chapter can look forward to distributing hundreds of desirable, moderately-priced palms into the community in November.

In other chapter news, the service project to help landscape the Dade County Metrozoo continues to grow. The ⅓-acre on-site nursery now boasts an improved irrigation system, with eight additional rainbirds furnished by the zoo administration.

Palms for the project come from three sources:

(1) Purchases by the chapter. This year 100 Maypan coconuts were contributed.

(2) Plant donations. Members have provided a wide variety of palms, and one offer has come from as far away as Massachusetts! Members who wish to contribute palms should phone Leonard Goldstein at 305-667-4609.

(3) Seed donations. Important sources of seed are Fairchild Tropical Garden and the State of Florida Coconut Nursery. Among seeds germinated in the nursery this year are *Bismarckia*, *Hyphaene*, *Syagrus*, and Maypan and Panama Tall coconuts. Other seeds are being germinated by Louise Futch at her home.

On April 16, a dozen chapter members gathered at Metrozoo for a workday in which they mixed soil and repotted and fed virtually all of the palms in the nursery. The volunteers also moved hundreds of containers from a defunct county nursery for reuse in the palm nursery.

Once The Palm Society identifies and releases palms deemed ready for planting, the zoo landscape architect determines how and where to use them. Current plans call for planting many Maypan and Malayan coconuts around the long-awaited aviary, now scheduled to open during the last quarter of 1983.

But Metrozoo is not the sole focus of chapter service activity. The chapter is supporting palm experimentation by the State of Florida, and the Community Service Committee is engaged in ongoing evaluation of written proposals for the contribution of time, plants, or funds to a variety of palm-related projects.

LEONARD H. GOLDSTEIN

News from Texas

The Houston Area Chapter met on March 10 at the Houston Garden Center to discuss plans for the Palm Show and Sale, May 7th and 8th, and to hear a report and slide presentation of a trip to Costa Rica by Horace Hobbs. The talk featured the beautiful collections of cycads and palms in The San Jose Zoological Garden and a visit to Bob and Marie Wilson's famous Las Cruces Tropical Botanical Gardens. An all day bus trip from San Jose to San Veto provided many views of lovely rolling hills and of telephone poles made from stems of *Bactris gasipaes*, the peach palm.

A meeting on May 17th at the home of Jim and Clarice Cain celebrated the huge success of the sale. Over $2,400 resulted with 70% of the proceeds going to the growers, 20% to the Chapter and 10% to the Houston Arboretum. A contribution was made to The Houston Zoological Society in memory of Dr. Jack Staub, who for many years collected and grew palms in Houston and was instrumental in their cultivation throughout the city. The Chapter is considering donating a planting of palms to The Houston Auditorium in Dr. Staub's name. The annual picnic held on July 16th at the home of Deanne and Eric Erdmann in Pasadena, TX was a festive occasion.

ERWIN RUHLAND

Iriarteoid Palms

Andrew Henderson, New York Botanical Garden, Bronx, N.Y. 10458, is studying the systematic relationships and reproductive biology of *Dictyocaryum*, *Iriartella*, *Iriartea*, and *Socratea*. He would be grateful for seed of any of the above genera, particularly from known wild origin.

Tentative Schedule for Palm Society Biennial 1984 Northern California

Thursday, Aug. 2. Board members arrive. Informal gathering Thursday evening.

Friday, Aug. 3. Board Meeting to begin at 8:30 am. Arrival of general membership.

Friday, Aug. 3. Welcoming cocktail party (sponsored by Northern California Chapter) at Marine Memorial Hotel, 6:00 to 7:30 pm.

Saturday, Aug. 4. Depart hotel 9:00 am, tour of San Francisco. Cocktail party and garden tour at Jack Dane's at 6:30 pm.

Sunday, Aug. 5. Depart hotel 9:00 am for Dunsmuir estate. 11:30 am arrive Warren Dolby's, garden tour and luncheon. Depart 2:30 pm for U.C. Berkeley Botanical Gardens, tour of gardens and talk by Dr. Robert Read. Free evening in San Francisco. (Note: Optional cocktail party and dinner on board a cruise ship, San Francisco Bay, Aug. 5, 6, or 7, date to be announced.)

Monday, Aug. 6. Marin County tour. Leave hotel 9:00 am for Muir Woods, with tour of Ocean Beach, Presido, en route. After Muir Woods, garden tour at Herb Weber's followed by luncheon and tour of Sausalito. Free afternoon and evening in San Francisco.

Tuesday, Aug. 7. Depart hotel for Sacramento at 9:00 am. Tour of Capitol building and grounds followed by lunch at Plaza Shopping Center and browse through shops. Depart Sacramento for Grey Lynn's garden. Garden walk and cocktails/dinner. Evening free in San Francisco.

Wednesday, Aug. 8. Depart hotel for Oakland Palm Garden at 9:00 am. Tour palm garden followed by business meeting and pot luck at Oakland Garden Center. Board meeting in afternoon. Cocktail party and Palm Society banquet meeting, 6:30 pm at hotel.

Thursday, Aug. 9. Depart San Francisco on BART to arrive at Dick Douglas's 10:30 am for garden tour, cocktails/buffet luncheon. Depart Walnut Creek 2:00 pm on BART. Afternoon free to pack, rest. Depart San Francisco 7:00 pm. Sydney flight departs at 9:00 pm. Minimum of 1 hr check in before international flights.

Seed Bank News

Seeds distributed by the Seed Bank as 83-PS-87 Unknown genus have been identified as *Clinostigma* sp. aff. *C. harlandii* Becc.

The Seed Bank would like to up-date its seed donor list. If you have access to a fruiting palm and would like to donate the seed, please send your name and the name of the palm to Lois Rossten, Seed Bank, 6561 Melbourne Dr., Huntington Beach, CA 92647 U.S.A. Please do *not* send seed. You will be advised if and when the Seed Bank needs them. Shipping costs will be refunded if requested.

Principes, 27(4), 1983, pp. 189–191

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PALMS, PALMS, AND MORE PALMS

That is what the new book that Hal Moore was writing when he died is all about.

Dr. Hal Moore's lifelong study of palms and the continuation of his work by Dr. Uhl and Dr. John Dransfield are resulting in a massive 600 page book, describing all 210 genera of Palmae, which will be called "GENERA PALMARUM: The Classification of Palms." The Palm Society is going to be the co-publisher of this very important book, tentatively scheduled to be published late in 1984. Our goals are to raise between $80,000 and $90,000, to print 5,000 copies, including some illustrations in color, and in the process to create a Revolving Palm Society Publications Fund. This fund will finance future publication of new literature on palms and reprint important and unobtainable books or papers.

President Dick Douglas appointed me chairman of The Revolving Publications Fund and I am "bubbling over" with enthusiasm to raise this money. I am honored to be involved in a tribute to Hal Moore. Needless to say I can't do this alone and I am soliciting your HELP!

I am in the process of forming a committee to raise these funds. Every board member and chapter chairman is on this committee. All members are welcome to be on the committee and are urged to plan fund-raising activities for chapters and individuals with proceeds going to the Revolving Publications Fund. Some suggestions are:

1. Special palm auctions, raffles, sales and dinners.
2. Ramble sale (sell anything).
3. Garden tours and slide presentations with admission fees.
4. Major contributions from chapter funds.
5. Grants from companies or foundations.
6. Encouragement of individual contributions.

To create a personal aspect and entice individuals to give to this particular fund it was decided that the money should be kept in a separate account from the general funds of The Palm Society, Inc. and that any donations toward the publication of GENERA PALMARUM will return to the fund for other publications. I am delighted to report that the account has been opened and that we have a balance of $9,510.

All donations for the Revolving Publications Fund should be sent to The Palm Society, Inc. at the address below. Contributions to The Palm Society, Inc. are tax-deductible.

PAULEEN SULLIVAN, CHAIRMAN
THE REVOLVING PUBLICATIONS FUND
3616 Mound Ave.
Ventura, CA 93003 USA