

Principes, 41(3), 1997, pp. 148–157

Rattans and Rheophytes—Palms of the Mubi River

WILLIAM J. BAKER

Department of Botany, Plant Science Laboratories, University of Reading, Whiteknights, P.O. Box 221, Reading, Berkshire, RG6 6AS, United Kingdom

The island of New Guinea holds some of the greatest botanical mysteries left on earth. It is a place where vast tracts of rain forest still stand in an unexplored and impenetrable landscape, where Asia meets Australia in a melting pot of fantastic biological diversity. Although this uncharted paradise seems somewhat distant now, with the help of my field notes and, no doubt, a little imagination, I shall attempt to tell a few tales of my first field trip to collect palms in New Guinea.

As is the case for many plant groups in New Guinea, the palms of the island are very poorly known. This is a result of the severe lack of botanical collections from the region, principally due to the inaccessibility of most parts of the island, coupled with the old bugbear that general collectors do not like making specimens of bulky plants such as palms. Enough said! Although there have been several specialist palm collectors active in New Guinea, there is still a dearth of material in herbaria. Thankfully, a number of palm botanists are taking a strong interest in the palms of New Guinea and the situation should change. Recently, I was fortunate enough to be asked to spend two months studying rattan diversity in Papua New Guinea (PNG), the eastern half of the island, as part of a larger rattan project at the Royal Botanic Gardens, Kew funded by the European Union. Naturally, I was more than happy to oblige and consequently spent January and February 1996 indulging in some of the most exciting plant exploration that I have experienced so far.

I do not intend to give every detail of the trip, but rather an account of some particularly excellent collecting that I enjoyed while I was a guest of the Worldwide Fund for Nature (WWF) project in the Kikori basin. As part of the packed program very kindly organized for me by Tanya Leary of WWF, it was arranged that I should spend three days based at Kantobo in the Southern Highlands

where I would collect around the Mubi river. Having already spent a week being flown around Mount Bosavi by helicopter, courtesy of WWF, I didn't think things could get any better, but I was wrong.

Accompanied by my field assistant, Lawrence Kage, I was driven by car from the WWF base at the Chevron oil camp at Moro along the road that follows the main pipeline from the oil wells around Lake Kutubu in the Southern Highlands to the coast in Gulf Province where the pipeline continues to a marine terminal outside the mouth of the Kikori river. Only an hour out of Moro, we were halted by a flood on the road and were just on the point of turning back when we made radio contact with our hosts in Kantobo who agreed to meet us on the other side of the flood. Having ferried our gear across the rather unappealing, tepid water, we were met by Pameru, a wizened old man with dreadlocks and a serious lust for life, who drove like a lunatic, although he could only just reach the steering wheel, along the limestone road to a point where a path led into the forest. There we met porters who helped us carry our gear down to a launch on the Mubi river. Pameru, being somewhat multitalented, took control of the boat and, having introduced us to the villagers at Kantobo, set off to take us some 15 minutes downstream to the lodge where accommodation had been arranged.

As I relaxed in the knowledge that we were *actually* going to reach our destination, I took more notice of my surroundings. Either side of the broad river, whose turbid waters flowed calmly, but swiftly, magnificent forest rose from the alluvial flats along the banks clothing the limestone hills behind. Along the river margins, some ubiquitous New Guinea tree palms, or *limbuns*, to use the PNG pidgin term, could be seen. *Metroxylon sagu*, the sago palm, grew gregariously in large

quantities, which is fortunate, as the local people are dedicated and enthusiastic sago eaters. Here and there, flowering specimens could be seen, spreading their massive candelabras of inflorescences high above the foliage. These individuals are quite useless to the local people as the energy required for this reproductive effort exhausts the edible starch, which is stored in the trunk of the palm before flowering. It is nevertheless an impressive sight. Groups of *Gulubia costata*, the most common of all the robust tree palms in New Guinea, were frequent. It is readily distinguished by its spherical crown of straight leaves with drooping leaflets, although this character is not reliable as it is shared by some species of *Gronophyllum*, *Rhopaloblaste*, and *Cyrtostachys*. The presence of a brush-like inflorescence narrows the options down to *Gulubia* and *Gronophyllum* and, although probability suggests that the palm in question is *Gulubia costata*, a closer look at the flowers is needed to be certain. Among the *gulubias*, a few individuals were spotted with large, spreading inflorescences which I tentatively identified as *Cyrtostachys peekeliana*. Striking among these typical pinnate palms was the bipinnate *Caryota rumphiana*, a robust member of the fish-tail palm genus, which is common throughout the island.

Disembarking at a bend in the river, we were led along a board walk through the bush to the lodge. As we approached, I was distracted from rattan spotting when a hitherto distant rumbling noise became gradually louder, up to the point where it was difficult to communicate with anyone unless they were standing close by. Arriving at the lodge, I walked to the edge of the river bank to find myself on a cliff a hundred feet above the river, which was now hurling itself over a great precipice into a deep limestone gorge. Equally awe-inspiring was the forest, which towered above the gorge on the opposite side, presenting a fantastic view of the different layers of vegetation that appeared to be sewn together by rattans and lianas of various kinds. This was the dramatic beginning of Wassi Falls, possibly the most spectacular chain of waterfalls to be seen in New Guinea.

During that evening, we made plans for the next

few days of fieldwork. Lawrence visited Kantobo village to gain permission from the landowners to collect in the area. Unlike most other countries, PNG has retained traditional land rights and it is vital to talk to the local landowners before doing anything on their property. The following day, two guides from the village joined us for our first day collecting around the falls and this proved to be extremely productive. I found six species of *Calamus*, including three that I had not come across before. Although this number may not be as high as that which one might find in, say, most sites in Borneo, it was certainly a good score for PNG. Unsurprisingly, the widespread *Calamus holbrunghii* was present. I encountered this species in every locality that I visited and was very much bewildered by the variation that it displayed. For example, some individuals bristled with numerous black, triangular spines, which would penetrate my thick leather gloves as I tried to make a specimen, but others were totally unarmed on the sheath. An extensive study is needed before any meaningful taxonomic entities can be identified within this complex. Another particularly interesting rattan found in the area was *Calamus humboldtianus*. It had an altogether peculiar feel about it with its large leaflets, leathery and somewhat hooded, crowded on a disproportionately short rachis with a long petiole. The most remarkable feature was a structure known as an ocrea, which is an extension of the leaf sheath above the insertion of the petiole. Although ocreas occur in many rattan genera, they are a great speciality of New Guinea *Calamus* species. The ocrea of *C. humboldtianus* is one of the most spectacular, reaching a length of 80 cm or more. It is blackish purple in color with numerous collars of soft, fine spines.

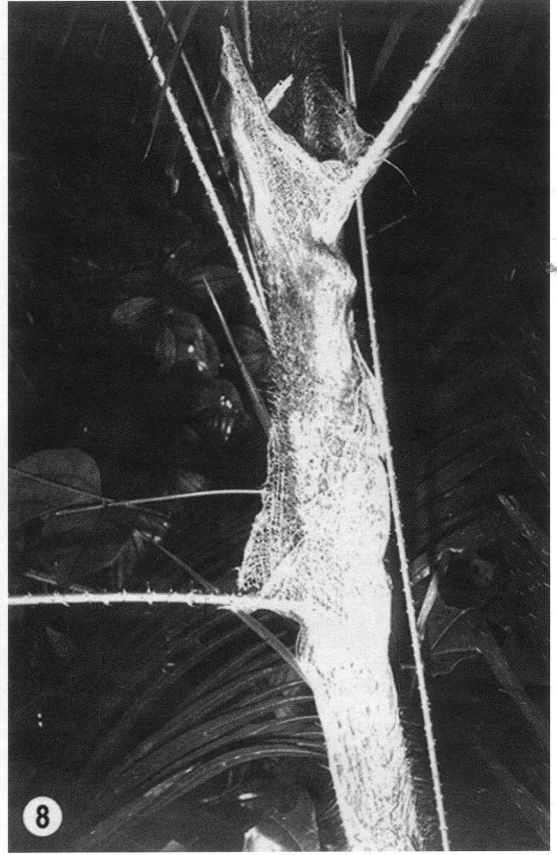
Several small palms grew in the undergrowth. A slender *Areca* related to *A. novo-hibernica* was common, as was a species of *Calyptrocalyx*, which I had already found in abundance around Mt. Bosavi. The latter was a particularly ornamental palm. Its regularly pinnate leaf was an exquisite copper shade on emergence and bore elliptic leaflets whose apices were drawn into fine pendent drip tips. A very dwarf *Gronophyllum* of the type previously known as *Nengella* was also present,

1. An unidentified *Gulubia* species growing in abundance on karst limestone along the Mubi river. 2. An as yet unidentified species of *Orania*. 3. *Caryota rumphiana*, the black palm, one of the most abundant palms in New Guinea. 4. *Heterospathes macgregorii* growing as a rheophyte on the banks of the Mubi river.





5. *Heterospathe macgregorii*: infructescence with ripe fruit. 6. The village of Kantobo.



7. *Calamus reticulatus*: habit. 8. Close-up view of the stem of *Calamus reticulatus* showing the netlike ocrea.

but scarce. It has been identified tentatively as *G. flabellatum* on account of its entire leaf, but a thorough revision of the group is required before we can be certain of the standing of this species.

After an unpleasantly close encounter with a death adder, we came to a point where the trail dropped over the edge of the gorge. I was told it led to a viewpoint from which the biggest of the falls could be seen. Reluctantly easing myself over the edge of the cliff, I staggered and slipped down the mudslide that called itself a path. A heavy mist thrown up by the furious water swirled around, providing ideal conditions for mosses and liverworts, which thrived in the sodden atmosphere. Eventually we reached a ledge where the vegetation cleared to reveal a waterfall of epic proportions, apparently known as Beaver Falls, an ample reward for the effort required to reach the spot. Although the river constantly belched up great clouds of mist that obscured the view, I could make out a large, but willowy tree palm with

beautiful arching leaves clinging to a ledge on the side of the chasm, but there was no hope of making out enough detail to identify even the genus.

Having recovered from the exertions of the waterfall trail, I decided that the following day would be conducted in a more leisurely fashion. A local man named Benedict brought his dugout canoe to the lodge early in the morning and so we started a wonderful day of collecting along the banks of the Mubi river. We made our first stop only a few minutes after setting off as I had noticed clumps of a rattan that grew almost in the river itself. When I managed to get close to the rattan, I could see that it possessed an ocrea quite unlike anything I had come across in any *Calamus* species, and yet the presence of a flagellum, a climbing whip attached to the leaf sheath, indicated that it *had* to be a *Calamus*. Above the petiole, the sheath extended to form a loose fibrous tube around the next leaf sheath. As this vegetable stocking reached the top of the next leaf sheath,

it was stretched by the petiole and the flagellum to form a net funnel. This feature would have been remarkable on its own, but even more amazing was its similarity to the ocrea of the Bornean rattan, *Korthalsia jala*, to which *Calamus* is quite unrelated. This curious palm was readily identified from the literature as *C. reticulatus*, on account of this distinctive feature.

Benedict was extraordinarily proud of the palms that grew on his land and he was quite adamant that I should collect black palm, *Caryota rumphiana*. In his guide to palm-collecting techniques, Dransfield (1986) notes that "the unhurried careful collection of a majestic palm can be immensely satisfying." I take his point, but, frankly, I draw the line at the genus *Caryota*, a genus that not only creates difficulties by possessing massive and particularly complex leaves, but adds insult to injury by producing a vile irritant juice in its fruits in particular. Evidently, these sentiments have echoed down the decades of palm collecting in New Guinea as, despite being one of the commonest tree palms on the island, very few complete herbarium specimens have ever been made of the species. As I was plucking up courage to tell Benedict that I did not want to make a specimen of black palm, a fine fruiting specimen came into view from the boat. Feeling a sudden pang of guilt, I knew that I had to face up to my taxonomic responsibilities. However, there were bonuses for being so conscientious. A massive male specimen of *Calamus humboldtianus* was growing on a tree next to the fated *Caryota* and we made some marvelous specimens from it, complete with inflorescences. This rattan proved to be just as bizarre in reproductive form as it was in vegetative structure. The inflorescences were not quite mature, but were unusual in that the rather papery primary bracts were not tubular, but had split longitudinally, not unlike the genus *Daemonorops*, to reveal highly congested rachillae with the flowers arranged in a very disorderly fashion, not distichously as is more usual in male rachillae of *Calamus*. Nearby there was also a very accessible specimen of *Korthalsia* in bloom. One should never pass up the opportunity to make an easy collection of *Korthalsia*. In general, members of the genus flower high in the canopy where the stem may be branched. More often than not, the great effort required to disentangle the rattan and bring it to the forest floor results in the snapping of the stem. Two species are described from New Guinea, *K. brassii* and *K. zippelii*, but the distinc-

tion between the two is so unclear that we have been unable to identify with confidence any of the specimens that have come to Kew from New Guinea.

Having collected around the black palm, it was impossible to ignore the inevitable any longer. Although the gratuitous felling of a palm is deplorable, it was obvious that, in this case, it would be impossible to make good specimens of this very poorly known species without being destructive. Thankfully, *Caryota rumphiana* is so common that the loss of one individual would not affect the local population. Benedict brought out his axe, which, ironically, had a beautiful shiny handle made of black wood from the very palm that we were about to cut down. As he chopped through the trunk, I noticed that the black outer wood gave way to a white pith, which apparently can serve as an inferior source of sago. Eventually, the palm yielded and crashed to the forest floor. Once on the ground, the massive bipinnate leaves seemed even more enormous than they had when held high. We set to work, trying to generate a compact, yet informative specimen. Even with the help of four men, and a dose of their excellent sense of humor, the job took nearly two hours. Having completed the specimen, I must confess to feeling extraordinarily self-righteous and, yes, I admit that there was a tinge of the satisfaction that Dransfield mentioned. However, the palm got its own back later on as I extracted seed from some of the riper fruit. I managed quite successfully to cover myself with irritant juice, not realizing until it was far too late when the most intense and excruciating burning itch swept from my finger tips, over my hands, and onto my arms. Revenge was sweet for the black palm that day.

Returning to the canoe, we headed for one of the minor creeks that flowed into the Mubi river. Near the confluence, we stopped so that I could watch a villager making sago. Stepping ashore, we found a young teenager from Kantobo who turned out to be one of Benedict's cousins. The poor girl became intensely embarrassed as her heavy task turned into a spectator sport. I was led to the spot in the sago swamp where the girl had single-handedly felled a massive sago palm and split off the outer wood to reveal the starch-loaded pith inside. She demonstrated how she extracted the pith using a short axe with a relatively long cylindrical wooden head tipped with iron. She chopped furiously but accurately, shaving strips of pith from the trunk, reducing it to fine particles. Having



placed the chippings into a large, woven fiber bag, the girl returned to the river bank where she had set up a contraption, which consisted primarily of a palm crownshaft, probably from *Gulubia costata*, and which had been cured over a fire and formed into a large basin shape. The basin was restrained by bamboo pegs so that it would keep its shape when filled with water and a small platform made from *Metroxylon* petioles was set up over it. She placed the bag on the platform and, using another crownshaft basin, poured a large volume of river water into the bag. As it drained out, she folded over the top of the bag and firmly squeezed out the remaining water with her feet, repeating the process a number of times, fetching more water from the river, then pouring and squeezing it through the sago pith. I could still see no sign of the sago itself, but before I had a chance to doubt the method, Benedict barked an order at the rather submissive young woman who crouched by the side of the crownshaft basin. She plunged her hands through the water, which had turned a curious orange color, and, lifting them, brought up a huge clod of congealed starch that had been washed out of the pith. This was raw sago, the staple diet of the vast majority of New Guinea's lowlanders. I was extremely impressed, but was sharply reminded by Benedict that this was woman's work and it in no way could compare to, say, house building, which was a distinctly male task and one which was considerably more strenuous, at least in Benedict's eyes. Although I begged to differ, I did not dare to voice an opinion as it was not my position to comment on the rights and wrongs of the social hierarchy in New Guinea. However, it is true that the rural communities that I experienced in PNG were very much male-dominated. Kantobo was particularly conservative, still maintaining the traditional village layout of a central long house for men only, which is surrounded by smaller houses for the women and children. It is considered to be very unwise for a man to have too much to do with women or young children as they are likely to cast a spell on him or cause him to fall ill. I was advised by some of my companions that the method of sago-making that had been demonstrated to me was a very bad one as the girl had stepped over the sago, which would almost

certainly poison any man who ate it. It would be far better for her to squeeze the sago pith with her hands, I was told.

Leaving the now red-faced young woman to her arduous task, we paddled into a narrow creek, which led to a small patch of swamp forest. The mud was thick, but this did not deter the growth of a particularly aggressive, yet handsome species of *Calamus*. Its sheaths were a rusty orange shade and were armed with a dense mass of hairy spines. Most *Calamus* species possess a peculiar swelling below the petiole, the geniculus or knee, the function of which is unknown, but it has been suggested that it might contribute to the climbing habit. In this case, the knee was absurdly swollen and was fringed with more offensive spines. During the preparation of specimens, casualties were sustained and the forest echoed with the blue language of indignant palm collectors at work.

Near the base of a soaring limestone cliff, which inhibited any further progress, a slender *Calyptrocalyx* grew. Although it was no horticultural beauty, it was interesting to me as it possessed two spikes within a single prophyll, whereas all other species that I had encountered bore solitary spikes only. We have not attempted to name any of the *Calyptrocalyx* species that were collected. Although names undoubtedly exist for some of the species, as yet we understand little or nothing about the species boundaries and it seems that there are many taxa yet to be described. This wonderful genus is crying out for taxonomic attention.

As we returned to the forest, Benedict started to explain that when the river is high, especially in July, it is possible to canoe through the swamp forest. Suddenly, I realized that several of the palms that we had collected must be adapted to, and perhaps even are dependent on, seasonal flooding. Certainly the *Calamus* and the *Calyptrocalyx* that we had just collected must enjoy wallowing in mud, but whether or not they qualify as true rheophytes is questionable as they appear not to be adapted to tolerating flowing water. *Calamus reticulatus*, on the other hand, may be considered to be a true rheophyte. It grows only on the very margins of the river, according to my local informants, where it often forms thickets. The leaflets are narrow and are very flexible so would offer

←

9. *Metroxylon sago* grows abundantly in the valley of the Mubi river. 10. Chopping up the pith of a felled sago palm to make sago. 11. Washing out starch from the pith with water. 12. Removing sago from water.

little resistance to fast-flowing water, which might uproot a more resistant rattan.

On our third day of collecting on the Mubi river, we were to be picked up at the pipeline road after lunch, but there was enough time for Pamero to take us upstream towards Gobe village. I was told there would be places where *Calamus reticulatus* could be collected in flower, so that was our mission for the day. We headed straight for Gobe as we were venturing off Kantobo territory and would need permission from the local landowners. Beyond Kantobo, the landscape changed as the river narrowed and the limestone cliffs began to rise very close to the river bank. We often came across islands in the middle of the river whose margins were dense with *Calamus reticulatus* thickets. There were small groups of *Gulubia costata* growing in the increasingly narrow alluvial strip. Behind these, growing gregariously high on top of the limestone hills was another species of *Gulubia* (or possibly *Gronophyllum*), which I recognized as being the same as the tree palm that I had seen clinging on to the side of Beaver Falls. With its very long, wiry trunk and its arching leaves, it was an outstandingly elegant palm. Nearby, close to the river, grew a fabulous *Orania* with almost distichous, somewhat glaucous leaves. It was immensely tantalizing to see how much more could be done if I had more time, although I suspect that attempting an assault on the jagged karst to collect the *Gulubia* would have been an unpleasant and dangerous if not an impossible task.

We reached Gobe village and received permission from the residents who were typically bemused by my work. We headed back downstream and stopped at Mabogo island where *C. reticulatus* grew abundantly and a fertile collection was easily made. Before we left, I was told that I could see a local burial site on the island if I was interested. It all seemed a little macabre, but it was also the kind of cultural experience that one should not miss. The Gobe villagers took me to a nearby spot where the limestone rose vertically once again and there they showed me a row of skulls perched on a ledge under a cliff. These, I was told, were village commoners from Gobe, but on top of a higher ledge, a chief's burial could be seen. We scrambled up on top of a large boulder and there in the gloom was a pile of bones, which obviously included the remains of more than one person as there were three skulls. One belonged to the chief and the second to his wife who had

died later. However, the third skull was that of the pig that had been part of the funeral feast that had taken place at Gobe to honor the chief. By placing the leftovers with the chief's body, his spirit would not feel excluded from the celebrations. I approved thoroughly of this tradition, although I doubted it would go down well at home. Among the bones were a variety of artifacts that the chief had cherished: kina, or shell money, and shell bangles, both highly prized commodities from the coast, wooden arrows, now rotting, but with wallaby bone heads persisting, and an iron axe head and a safety razor that had been gifts from missionaries.

Returning to the boat, our final task was to visit a nearby island where a slender tree palm had been spotted from the boat. Although the water flowed swiftly, we managed to land on the tiny island, which was barely big enough to accommodate us. The margin of the island was dominated by the elegant palm that grew to only two meters and bore somewhat recurving pale green leaves. Its moderate spreading inflorescences were weighed down with bright red fruit. Although this was a pretty enough palm, the really remarkable thing about it was that it grew on an island, which, even at this time of relatively low water, barely rose above the surface of the Mubi river. I was told that the water is often high enough to submerge the island and can be considerably higher at times of flood and yet here were mature, fruiting palms growing on apparently dry land. The only possible conclusion was that this palm was genuinely rheophytic and with its resilient trunks and its flexible leaves with narrow leaflets it was obviously well adapted to this niche. This palm has been identified as *Heterospatha macgregorii*. It is also known from collections further downstream on the Kikori river.

Sadly, our collecting trip on the Mubi river came to an end, albeit on an exciting note. It was frustrating to have been unable to collect all the wonderful palms that we saw, but perhaps this provides an excuse for a return visit. The difficulties we have experienced in identifying and understanding many of the specimens that I collected further emphasizes the need for critical evaluation of all aspects of New Guinea palms, including their taxonomy, ecology, conservation, and ethnobotany. An enticing prospect indeed!

Acknowledgments

I am grateful to the European Union for funding this fieldwork and to John Dransfield and the Royal Botanic Gardens, Kew for generous advice and support. Tanya Leary and the WWF Integrated Conservation and Development Project in the Kikori basin provided fantastic logistical support without which the entire exercise would have been unthinkable. Lawrence Kage was a stalwart and entertaining field assistant as were my other

companions from Kantobo and Gobe. I am also very grateful to Tim Utteridge who made the early stages of the project so enjoyable; sadly, he was unable to join me on the Mubi river. Finally, many thanks to Max Kuduk, Geoff Stocker, and the staff of PNG Forest Research Institute at Lae.

LITERATURE CITED

- DRANSFIELD, J. 1986. A guide to collecting palms. *Ann. Missouri Bot. Gard.* 73: 166–176.

Principes, 41(3), 1997, p. 157

LETTER

Dear John and Natalie,

When we last met, I told you that my *Pigafetta* (!?) had bloomed. Talking to the “old timers” from the Palm Society, it seems that this blooming was the first time recorded in South Florida.

Five separate male inflorescences emerged in late August 1995 and within two weeks, two completely opened and flowered. The other three never fully developed. Larry Noblick came over to our garden one stormy afternoon and in the middle of a lightning storm, we took a complete voucher for the Herbarium at FTG (Noblick & Migliaccio #5074).

The plant flowered this summer (1996), again holding two inflorescences while several others never fully developed.

The palm was originally given to me in April 1989 by Howard Waddell of Miami, a fellow palm collector. The seeds had come from the IPS Seed Bank the previous year. I planted the palm that September in a deep pocket of marl on the NE side of my yard—the only available sunny and wind protected space at the time. It was three-feet tall overall when the December 1989 freeze hit, but protected by the sunny wall of the house and an eight-foot tall Surinam Cherry hedge. It showed little damage other than some minor leaf spotting.

In August 1992, that part of our house took the brunt of Hurricane Andrew and the “Pig” was blown over and blasted by 175 mph flying gravel from my neighbor’s roof. The palm lay on the

ground at a 45° angle for several weeks after the hurricane before I got around to removing it. Much to my surprise, it was pushing out several new leaves! With the assistance of the neighbors, we wrapped the still-spiny crown in some blankets and propped it up with a tripod of boards. The roots had reanchored the palm at a bit of an angle, so we were hesitant to damage them by propping the tree completely vertical. Since that time the trunk has grown vertically above the curve. I suspect that the weight of the crown, like a coconut, has had something to do with this less-than-desirable curving growth habit.

Many local growers have told me to be ready to lose the “Pig” in the next freeze and this past winter we had numerous cold and wet days with temperatures in the low 40’s and one night of 33° in my shadehouse. However, the *Pigafetta* showed only tattered leaves. As a result of last winter, I lost a *Coccothrinax ekmanii* and my 15 foot tall *Gulubia costata* has only barely recovered. Therefore, I’m optimistic that “Pig” will be around long enough to contribute pollen to a flowering female somewhere in South Florida (albeit via “artificial insemination”).

CHRIS MIGLIACCIO, ASSOCIATE PROFESSOR
Department of Natural Sciences
Miami-Dade Community College/Wolfson Campus
300 NE Second Avenue
Miami, FL 33132
Phone: (305) 237-3269
email: cmigliac@mdcc.edu