Palms

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THE INTERNATIONAL PALM SOCIETY, INC.

The International Palm Society

Founder: Dent Smith

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FRONT COVER

Syagrus amara, a native palm of Domica. See article by Zona et al. page 151. (Photo: A. James)

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NEWS FROM THE WORLD OF PALMS

We are saddened to learn of the deaths of two persons well known to many IPS members. August Braun and Robert Read both passed away recently. Their contributions to the world of palms are noted in their obituaries, found on pages 168 and 170 of this issue. They will be greatly missed.

On 14 May 2003 the *Times* of London reported the death of a Chusan palm, *Trachycarpus fortunei* – no ordinary Chusan palm, but one planted 152 years ago by Queen Victoria in the grounds of her country retreat, Osborne House, on the Isle of Wight in southern England, the palm thus outliving its planter by 102 years. The palm was grown from seed brought back by the famous plant collector and explorer, Robert Fortune, and presented to Queen Victoria, who planted it when it at Osborne House on 24 May 1851. It eventually reached a height of 35 feet. It survived until the spring of 2002 when it was battered by fierce north-easterly gales. A year later, the palm had not recovered and so was felled. Debs Goodenough, head gardener, plans to plant a replacement Chusan palm grown from seed from the original planting.

A recent publication suggesting a link between palms and human evolution might be of interest to IPS members. The paper, by N.J. Dominy, J.-C. Svenning and W.-H. Li, is entitled "Historical contingency in the evolution of primate color vision" (Jour. Human Evol. 44: 25–45. 2003). The authors put forth an intriguing theory that attempts to explain the variation in color vision systems found in the world's primates (lemurs, monkeys, apes, etc.), including the trichromatic vision system that we humans enjoy. They set up an evolutionary scenario in which early primates depended on palm and fig fruits for food, and the plants depended on the primates for seed dispersal. The scenario is not difficult to imagine, as palms and figs are known to ecologists as "keystone species," meaning that these species support a disproportionate amount of the fruit-eating animals in their habitats.

Dominy and colleagues envisioned a scenario in which ancestral primates with color-limited (dichromatic) vision evolved in forest habitats rich in palms and figs. The authors supposed that ancestral palms (and figs) possessed inconspicuously colored fruits, and there is evidence that dichromatic vision is advantageous for locating such fruits in low-light settings. Climatic change and deterioration led to the widespread extinction of palms in Africa and Southeast Asia, wherein evolution favored the development of trichromatic vision, as primates shifted to eating the reddish new leaves and shoots of trees.

Once primates, including the ancestors to humans, acquired trichomatic vision, the relationship between palms and primates favored palms (and figs) with brightly colored fruits. By examining the fruit colors of figs and palms in the modern floras in the Americas, Africa and Asia, the authors found some support for their theory. In regions inhabited by primates with dichromatic vision (South America, Madagascar), palms more frequently have dull colored fruits, but in Asia and Africa, where modern primates are trichromatic, the floras are rich in palms with red, orange or yellow fruits.

If Dominy and his colleagues are correct, then our ancestors acquired color vision when palms became scarce food items. Thus, the bond between palms and humans is more ancient and more intimate than we ever imagined. Having seen how eagerly IPS members snap up free seeds offered at local chapter meetings and how easily they spot ripe fruits on palms in gardens, we know that the link between palms and people remains unbroken.

THE EDITORS

Palm Leaves as Writing Material: History and Methods of Processing in Kerala

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1. Palm leaf records from Kerala.

Leaves of *Borassus flabellifer* L. and *Corypha umbraculifera* L. have long been used for the preparation of writing materials in India and other neighboring countries. They are still in use in many parts of Kerala. They are resistant to the attack of insects and are impervious to water, but the mode of preparation differs according to the species. The common forms of palm leaf writing material and their methods of preparation in Kerala are discussed in this paper.

Pre-historic men used burnt clay, stone and metals to engrave their early records. Gradually these materials were replaced by processed animal skin, silk, bark, wood and the leaves of trees. The bark of *Betula utilis* and the leaflets of palms were used as writing materials in the early days of civilization in Eastern Asia. In India the young leaves of *Borassus* were much used for writing (Royle 1855).

Palm leaflets are one of the oldest and cheapest materials used for writing. Van Rheede, in his *Hortus Malabaricus* (1678–1693), while mentioning the uses of *Corypha umbraculifera*, mentioned that the leaves were used in Kerala as parchment paper and that the leaves of this palm were quite durable. An iron stylus, with which the writing is done, cuts the upper cuticle of the leaf and hence the letters remain on the leaf. Similarly Marshal (in Blatter 1926), in his account of the coconut tree, wrote, " The leaflets are sometimes used to write upon, and the instrument employed to make the impression is an iron stylus... The leaves of the palmyra palm (*Borassus flabelliformis* L.) or talipot palm (*Corypha umbraculifera* L.) are however much more frequently employed for this purpose."

In India, Sri Lanka and Burma, *Corypha umbraculifera* and *Borassus flabellifer* have been used for writing. In India the history of writing on palm leaves dates from the famous Sanskrit scholar Paniny-rishee, who lived in the year 790 of 'kaliyuga,' i.e., approximately 4161 years ago, on the banks of the river Ganga at Arrittuwarum (now Haridwarum) (Ferguson 1888). In Sri Lanka, talipot palm leaves were adopted for writing before 900 BC (Suvatabandhu 1962). Ferguson (1888) reported the existence of 400–500 year old palmyra leaf manuscripts in Sri Lanka. The English term leaf and folio with reference to the printed word appear to be derived from palm leaf writing (Davis & Johnson 1987).

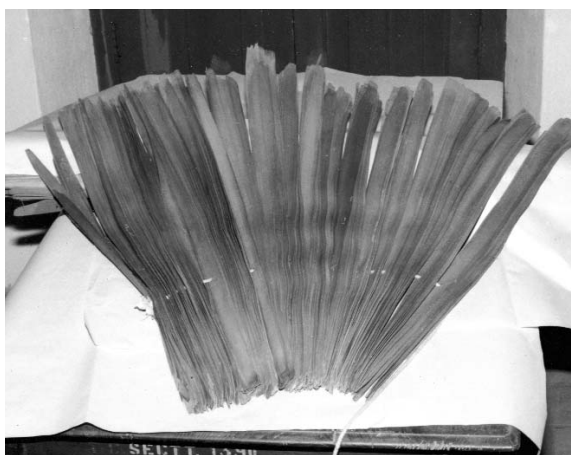
Palm leaf manuscripts in Kerala

In Kerala, the southernmost state in India, the leaves of *Borassus flabellifer* and *Corypha umbraculifera* have been used extensively for writing horoscopes, religious and Ayurvedic documents (Ayurveda is the traditional system of medicine practiced in Kerala). In the Malayalam language, the processed single rectangular palm leaflet is known as *taliola*. A manuscript contains a number of rectangular pages, or *taliolas*, threaded at each end on a string. A palm leaf book is held together with a pin through one end so that the leaves can be fanned for reading. Sometimes holes are bored through each end, and the strings are passed through them so that the leaflets can be turned over and read in sequence (Fig. 1).

Writing materials prepared from the leaflets of *Borassus flabellifer* and *Corypha umbraculifera* differ in a number of ways. In *Corypha*, leaf veins are prominent in both transverse and vertical directions forming a network-like appearance. A thick cuticle is present above the epidermis. In contrast, the leaflets of *Borassus* have a thin cuticle and prominent transverse veins. Usually *taliolas* from *C. umbraculifera* are larger and superior in quality compared with those made from *B. flabellifer*. Writing material from *C. umbraculifera* will last longer than that from *B. flabellifer*. Hence most of the surviving ancient literature is written on the leaves of *Corypha*.

The Manuscripts Library and The University of Kerala Oriental Research Institute, in Thiruvananthapuram, have a collection of more than 70,000 palm leaf manuscripts, some as old as 500 years. One of the popular works often written on palm leaf records is *Citraramayana*, an epic story of the God Rama, comprising 318 sequences. Before the middle of the eighteenth century, palm records served as religious and

2 (left). Partially processed palm leaflets (Churuna). 3 (right). Charuna, opened out.



ayurvedic documents. Afterwards they were used for fiscal documents for the conveyance of land, and issued as receipt of the land registration. Similarly, fortune tellers use small-sized palm leaf books like bound decks of cards.

The various categories of palm leaf manuscripts are *Churuna*, *Grandha* and *Ozhukku*. *Churuna* means roll of palm leaf manuscripts. They are loose sheets of palm leaves scrolled in bundles of convenient sizes after passing a cord through the holes made in the leaves. The number of sheets in each bundle varies from 500–1000. The main items in a *Churuna* are land details (*olukku*), accounts (*kanakku*), royal decrees (*thitturam*) and another form of accounts (*tirattu*). The Central Archives at Thiruvananthapuram, the capital of Kerala, has a collection of more than 13,000 *Churunas*, mostly containing pre-settlement land resource records written in Tamil and Malayalam (Fig. 2 & 3).

Grandha is a collection of palm leaf manuscripts preserved within wooden flaps. The *Grandha* consists of ancient scriptures such as Kilippattu Ramayana, Balakandam, Narayaneeyam, Mahabharatha, Hymns of Lord Siva and Krishna written in both Kannada and Malayalam scripts, and ayurveda. The historical records of Kerala are also kept as *Grandhas*.

Ozhukku is an account of the boundaries of land fixed after survey and records even the most minute details of land properties including survey number, taxes, area categories, etc. Both sides of the record consist of details regarding the description of the land, signatures of the grantor, witnesses, state administrator and *Diwan* (Prime Minister to the King of the Princely State). The palm leaf documents for the purpose of executing promising notes, land registration and ayurvedic practice are still seen in the royal houses, and they have been used for more than 600 years.

Preparation of palm leaves

Corypha umbraculifera

Corypha leaves must be taken from the plant at a semi-mature condition. The best time is four months after the emergence of the young leaf. The summer season is favored for the collection of leaflets, and some people believe that certain plants are more vigorous on the full moon day. Two traditional methods available for the preparation of *taliolas* from *C. umbraculifera* are described below.

Method. 1.

Extracted palm leaves are dried in the sun. After the leaflets are stripped from the leaf, they are cut to size, rubbed with sesame oil and kept in the shade for two to three days. Then the leaflets are boiled with rice and kept in the shade for a week. Boiling can also be carried out in water or milk with the juice of fresh turmeric until the leaflets attain the expected yellowish color. Again, oil is applied. The main advantage of this method is the removal of the acidic impurities and closing of small holes in the leaflet. By this method the leaflet will be made fire resistant and waterproof, and it will last longer.

Method. 2.

The cut leaves are kept in the shade for one or two days. Then the leaflets are removed from the leaf. The midrib of the leaflet is removed, and four or five blades are rolled together. The rolled leaves are immersed for some time in boiling water in a copper vessel. The copper ions penetrate into the leaflets, a process that increases their durability. Alternatively, the leaflets are steamed until the color changes; they are then dried in the shade.

Borassus flabellifer

Method. 1.

Even though the time of collection of leaves is the same as for *Corypha*; the processing techniques are entirely different. The cut leaves are dried in the sun until the green color disappears. The leaflets are then removed and immersed in water for a few days until a rotten smell becomes evident. Then they are dried in partial shade and cut into standard sizes for writing.

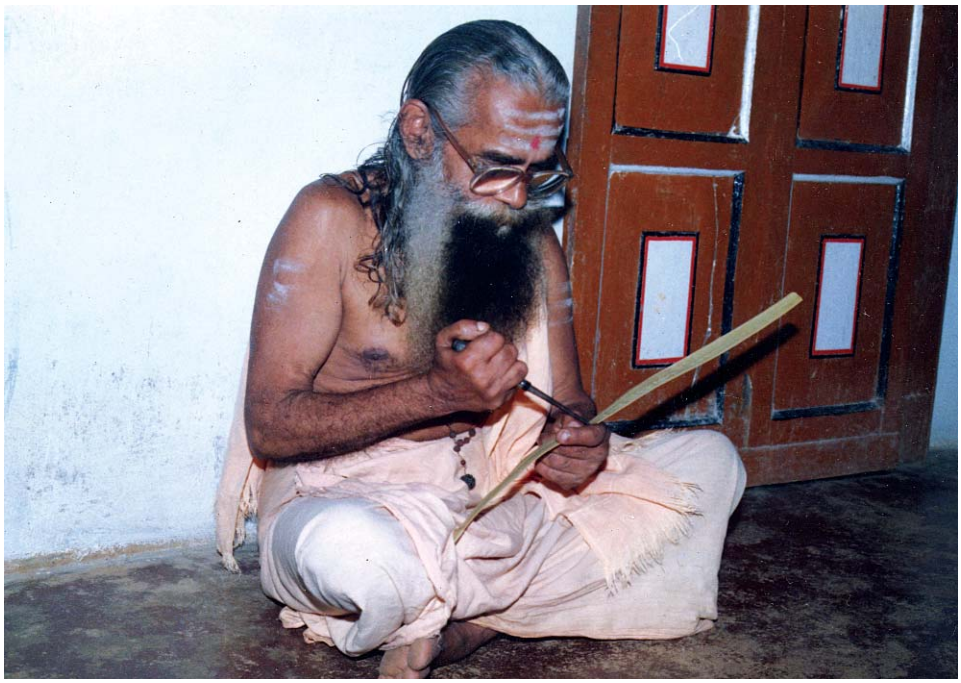
Method. 2.

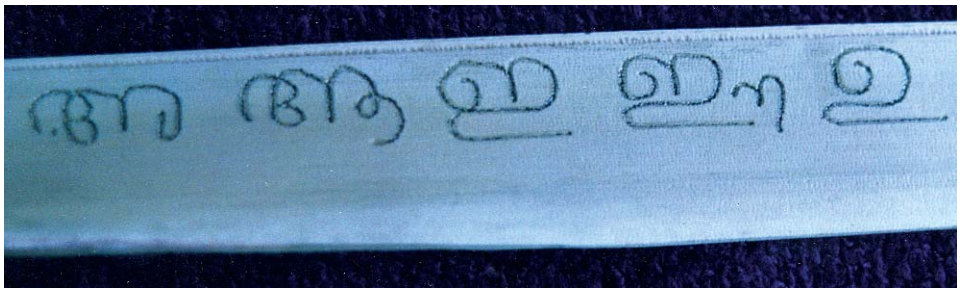
Mature leaflets are submerged in either mud or lime for three days and then dried in partial sunlight until the color changes to brown. Sometimes the fruits of *Murraya exotica* are boiled with water, and the leaflets then soaked in the cooled decoction for a day. The leaflets obtained by this technique are resistant to termites and fungi.

After processing by either method, the leaflets are cut to the required length, generally 34 × 5 cm. Both sides of the leaflets may be used for writing. If the midrib is intact, only the upper (adaxial) surface is used, leaving the lower (abaxial) surface blank. Leaves from *Borassus* are generally used for preparing horoscopes, short notes, letters, receipts, etc.

The process of writing

Writing on palm leaflets requires much practice. Those persons experienced in the art of writing are known as *Ezhuthu Assans* (*Ezuthu* = writing, *Assans* = experienced person) in the Malayalam language (Fig. 4). The stylus used for writing on leaves is





4 (top). *Ezhuthu Assans*, a specialist in the art of writing on palm leaflets. 5 (middle) . Narayam – the iron stylus. 6 (bottom). Malayalam letters engraved on the palm leaf.

known as *Narayam*. The stylus is made of iron, silver or brass. It is about 25–30 cm in length, having a bulbous middle portion for resting against the hand and tapered, pointed ends (Fig. 5).

In southern India, the common scripts used in the majority of palm leaf records are Vattezhuthu, Kolezhuthu, Sanskrit, Tamil and Kannada. The letters of the Malayalam alphabet, being rounded, are ideally suited for writing on palm leaves (Fig. 6).

Preservation of Taliolas

Periodic cleaning of the leaves with turmeric powder will decrease insect attack. Periodic removal of dust and drying in the sun also increase

the durability of palm leaves. Manuscripts exposed to a dry climate for a considerable time break at the holes made in the center for tying the leaves together. In the Archives at Thiruvananthapuram, the first step in palm leaf restoration is cleaning the leaves with a mixture of glycerin and alcohol to remove dirt. If the leaves are stuck together, they are separated by placing them in a bath of hot water (60°C) containing 5–10% glycerin. Lemon grass oil or citronella oil is then applied on the leaves to keep them flexible. Tissue paper coated with 5–10% polyvinyl acetate benzene is satisfactory for reinforcement of palm leaf manuscripts. Diethylene glycol, saffrol, olive oil or linseed oil diluted with alcohol may be used to add flexibility to dried leaves (Kishore 1985).

Modern uses

The ways by which knowledge is stored and disseminated have changed dramatically over the years, and the art of writing on palm leaves has almost disappeared. However, in many places in Kerala, Hindu children are still required to write their first alphabet on palm leaves (Fig. 7). Among adults, astrologers are the main users of palm leaves for writing horoscopes.

Acknowledgments

We express our thanks to Dr. J.K.Sharma, Director, Kerala Forest Research Institute, for providing necessary facilities and to the Director, Central Archives, Thiruvananthapuram, for giving permission to use the library and for providing some photographs.

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7. Traditional way of teaching in a pre-primary school in Kerala.

Remembrances of Kenneth C. Foster

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Ken Foster, for long an active member of the IPS and past President, died in Hawaii in 2002.

When I first became interested in palms in 1971 and joined The International Palm Society, then known simply as The Palm Society, a handful of well known personages dominated the palm scene in southern California. To a young 21-year-old college student and budding palm fanatic, the names Pauleen and Joe Sullivan, Lois and Kurt Rossten, Jim Wright, Ed Moore, Jim Specht, Mardy Darian, Burt Greenburg and Ken Foster were awe-inspiring and much revered. I held them in the highest esteem and nearly worshipped the ground they walked on. I hovered around them at meetings as they held court, trying to glean as much information as possible while listening to their pontifications and contentious debate about how best to grow palms or who had the rarest or biggest or nicest specimen. It was always entertaining and sometimes educational.

First Meeting With Ken

Ken Foster was one of the most imposing of these personages. I was saddened to hear of his death, and the news conjured up many poignant memories of him. Known simply as Ken to friends and fellow palmophiles, he had just begun a two-year term as president of The Palm Society in 1972 when I first met him.

It was August, 1972 at a grand Southern California Palm Society meeting at Mardy Darian's in Vista, California when I finally mustered up the courage to approach him and ask about palms in Guatemala. I would be driving a car to Guatemala with a college friend who was from that country, and I wanted to be sure to see as many palms as possible on my trip.

Ken had just returned from The Palm Society Biennial Meeting in Mexico City and a post-meeting excursion to Guatemala and Costa Rica. He was hobbling around in a cast because he had broken his leg at La Selva on the Costa Rican portion of his trip (See Principes 16: 134–135 (1972) for his account of this trip and accident.). He was looking up to see the palms when he took a misstep on a rain-soaked jungle path and fell, breaking his leg. Nevertheless, and in an authoritative manner, he explained in great detail where to see palms in Guatemala and especially encouraged me to visit Tikal. He also told me to obtain a copy of Paul Standley's and Julian Steyermark's *Flora of Guatemala* in which Hal Moore had provided the palm treatment. I always wondered what he thought when this 20-year-old college student with shoulder-length hair, bell-bottom jeans, and a flowery shirt shyly and hesitantly asked him for information about Guatemalan palms.

Ken's Thorough Preparation for Palm Collecting Trips

Ken would research palms before embarking on a collecting expedition. I learned from his example for future trips I would take, including several with Ken. He was thoroughly prepared. He knew exact localities where the palms grew, fruiting seasons, and local contacts to provide assistance. Not only searching the literature, Ken carried on lively correspondence with Hal Moore and other palm experts and enthusiasts who could provide information about the palms he had targeted for collection.

All this reflected his dedication and love for palms and his never-ending quest to grow as many species as possible in cultivation. I think his quest to bring new palms into cultivation was the driving force of his life. Some might think his quest was selfish and egotistical, designed primarily to gain fame and recognition. While there may have been some of this, I also know, from long conversations with him on our trips, that he had an altruistic motive as well, and sincerely wanted to advance the science and conservation of palms. He usually shared seeds and sometimes even seedlings with botanical institutions such as Fairchild Tropical Garden in Florida and Honolulu Botanic Gardens in Hawaii. Indeed, several of his New Guinea, New Caledonia, and other South Pacific collections are thriving at Ho'omaluhia of the Honolulu Botanic Gardens system.

Remarkable Palm Grower

Ken was a remarkable palm grower and perhaps unsurpassed as a germinator of palm seeds. I recall many visits to his greenhouse at his home in Yorba Linda, California and staring down into his germination chamber or sweatbox in absolute amazement. Community pots, most with germinating seeds as thick as hair on a dog's back, entirely covered the bottom of this box. All were carefully labeled and dated, and most were rare and unusual palms. He would rattle off the botanical names of these germinated seeds effortlessly, names I had never heard of but nonetheless sounded like magic to me.

1. Ken Foster in his Hawaiian garden with *Bactris militaris*, November, 2000. He grew this palm from seeds he had collected in Costa Rica.

Ken always seemed to have the rarest, choicest, and greatest number of species. Nobody could challenge or compare with him in this category. Although he was mum and discrete about his sources, we always suspected he had the best connection to the Palm Society Seed Bank and was usually at or near the head of the line when it came time to the distribution of seeds. Ken was also well connected to other palm collectors and growers, especially those in Florida, and frequently shared seeds with them.

Ken's Collecting Trips

Ken and I went to New Caledonia, Vanuatu, and Fiji collecting palms in 1977 and 1979. He visited Samoa in 1979 and Papua New Guinea twice in 1981. He had to cut short his first trip there when he fell and injured himself, not too seriously, and then returned to complete the trip after he had recovered. He had also collected in the Caribbean, Mexico and Central America, and South America.

I probably know Ken best from the time we spent together on two memorable palm-collecting trips to the south-west Pacific in 1977 and 1979. We visited New Caledonia, Vanuatu and Fiji and were responsible for introducing several palms at that time new to cultivation, including *Burretiokentia hapala*, *Cyphosperma balansae*, *Kentiopsis magnifica*, *Veillonia alba, Clinostigma harlandii* and *Veitchia spiralis*, among others. Ken even hiked up to 700 meters on Mt. Panié in New Caledonia and was able to see every palm species on the mountain, a veritable palm heaven or Shangri-La where every palmophile must make the pilgrimage at least once.

Although Ken was well prepared for these trips, he frequently fretted, had a negative outlook and discounted our chances of finding all the palms in fruit. He was the ultimate gloom-and-doom person. I am sure he was under a lot of pressure to make these trips a success, which they invariably were, because his desire to get palms into cultivation was unusually strong. He feared failure, not only because he was a true and dedicated palm lover but also he did not want to disappoint financial donors who would receive shares of seeds. Despite his frequently negative

outlook, Ken was not without his dry wit and self-deprecating and "gallows" humor on these trips, which made the hard and difficult times a little more endurable.

For example, we were in the Rivière Bleue in New Caledonia in 1977 and had spied fruits of *Campecarpus fulcitus* about 25 feet up the trunk, too high to reach it with our pole pruner or sling. Because I was younger, and perhaps more foolish and reckless, I always did the climbing. Unfortunately, this palm was leaning at a precarious angle and looked as if any added weight would bring it crashing down onto some jagged rocks. I shared my concerns with Ken and he replied, "Well, when the palm starts to fall, you can ride it down and jump off as it nears the ground, landing safely on your feet!" Say what! When I looked at him he was wearing a sly grin and chuckling to himself.

In Vanuatu on Aneityum Island searching for *Carpoxylon macrosperma*, *Veitchia spiralis* and *Clinostigma harlandii* in 1979, we had to stay in a forester's quarters. Ken's bed was a metal frame with a thin mattress. At night he rigged his mosquito netting using a spare electric cord for support. Standing back and admiring his handiwork he remarked dryly, "I hope no one plugs in this cord tonight." From then on it was known simply as "the electric bed." It mattered not that there was no electricity at the time.

He also stayed for several days with my wife and me in Hawaii in 1979 on his way to the South Pacific on a palm-collecting trip. We took him to see and collect seeds of all the species of *Pritchardia*, the native Hawaiian fan palm, on the island of Hawaii. All these trips and my time spent with him gave me an opportunity to know more about him and his passion and desire for palms. Because he was well connected in The Palm Society, he also had the latest Society gossip, which he would frequently share with me on our long walks in the forest. He swore me to secrecy!

The 1974 Biennial Meeting and Post-Meeting Trip to Colombia

As his final duties as president of The Palm Society, Ken had organized the 1974 Palm Society Biennial Meeting at Fairchild Tropical Garden in Florida and post-meeting trip to Colombia. It was the first biennial meeting I would attend and my first exposure to a wide array of tropical palms while in the company of knowledgeable palmophiles. Needless to say, the number and diversity of palms to see in South Florida overwhelmed me.

Ken had also arranged an optional side trip to the Langlois Estate in the Bahamas. One of the much anticipated palms for me to see was the Langlois' namesake, *Areca langloisiana* with its stunning orange-yellow crownshafts, which John Dransfield had just recently placed in synonymy with *A. vestiaria*, an earlier name that had priority. I clearly remember Ken standing at the edge of a small limestone depression rimmed with palmophiles staring down in wonder and amazement at the Langlois' palm and pronouncing for everyone to hear, including the Langlois, "It will always be *Areca langloisiana* to us."

The post-meeting trip to Colombia was memorable not only because we visited one of the richest palm regions in the world but also because it was the trip of lost and delayed luggage, lost people at night in a tropical rain forest, and delayed and cancelled flights. We had arrived in Cali to find that our luggage had not left Miami and we would not have it for two days. Undeterred, we set out the next day in our Sunday finest to visit Tenerife in the mountains outside Cali to view *Ceroxylon quindiuense*. I vividly remember Mardy Darian, among many others, excitedly dashing off in white dress trousers and oxfords into the forest and mud at the sight of a palm, cycad, or aroid (See *Principes* 18: 119–131 (1974) for an account of the post-meeting trip to Colombia.). The just-mentioned article displays Ken's artful photography at its best. His photograph of three *Ceroxylon quindiuense* in an onion field is exemplary.

Finally with our luggage in tow, we headed over the mountains and down to the Pacific equatorial lowland rain forest near Buenaventura. With over 400 inches (about 10 meters) of rain annually, this region is one of the rainiest spots and is one of the richest in palms in the world. With several guides our group headed into the forest at Baja Calima. Because just about everyone was stopping to collect palms or aroids, our once tight-knit group of 29 palmophiles became strung out over several hundred yards and three groups were formed, all of which eventually lost contact with each other.

I was in the front group with Ken and several others, including a guide. We had been walking in torrential rain for several hours. The rain, deep mud and obstacles in the trail, such as fallen trees, slowed our progress, as did our desire to have the other groups catch up with us. Night fell quickly and we were trapped in the rain forest without flashlights. Fortunately, we had an excellent guide who apparently could see in the dark. We formed a human chain, each of us with one hand on the person in front, like a line of circus elephants, and several hours of walking in total darkness, slipping, stumbling, and falling over roots and branches and crossing streams on slippery, moss-covered

logs, finally brought us to our destination. We were relieved to find that the other two groups had made it back safely before nightfall.

Regrouped and refreshed, we headed back to Cali the next day to find that our flight to Pasto, high up in the Andes, had been cancelled due to bad weather. It was one stroke of bad luck after another and pushed Ken's patience to the limit. Because he had planned the entire trip, he shouldered a heavy burden of responsibility over the frequent but relatively minor calamities befalling the group. His chief concern was to ensure that everyone was having a rewarding time. After consultation with the group, Ken gave permission for two small groups to break off from the main group, one going down into the Amazon to look for lowland tropical palms and the other finally flying into Pasto to search for cool tolerant, high-altitude palms. The main group returned to Buenaventura, making several stops along the way to look for palms we had missed on our first sodden excursion. After several days the three groups met up in Cali prior to returning to Florida. All the groups had been successful and the seeds of nearly 25 species of palms were shared among everyone. It was a positive end to an unusually eventful trip.

Ken's Grand Palm Sales

Because he was germinating a lot of palm seeds, Ken ended up with a lot of potted palms. Many of the palms he propagated were too tropical to grow outside in California, so he kept them in containers in his great Quonset-hut style greenhouse. This greenhouse blew down in a terrible Santa Ana wind on Christmas Eve, 1972, destroying or damaging most of the marginal and tropical palms (See *Principes* 17: 54–55 (1973) for his account of this calamity). Undaunted, Ken rebuilt a much stronger greenhouse, specially reinforced to withstand the high winds of Yorba Linda, and it seemed that in no time he had restocked it with rare and choice palms.

What would Ken do with all the palms he grew? He was an enterprising palm grower and more or less invented or pioneered the big private palm sale now so common in southern California. In the late 1970s and early 1980s Ken would have an annual sale to dispose of excess palms.

Hundreds of people attended his well advertised and promoted sales because it was the only opportunity to purchase these rare and choice palms. At Ken's signal, a conch shell horn would sound, a rope barrier drop, and a mad scramble ensued to run to the tables and grab your desired palm. Pushing, shoving and elbowing were not uncommon, and more than a few contentious debates broke out over who grabbed a palm first and was the legitimate purchaser. In the earlier sales there was no rope barrier and the buyers were allowed to stand next to the desired palm, their hand just inches away (they were not allowed to touch the palm), ready to grab it at the sound of the horn. This method worked well until some enterprising palmophile brought family, friends, and neighbor kids and positioned them next to the palms he wanted, their hands hovering just an inch from the palm and waiting to grab it at the blowing of the shell. Many buyers complained this method was inherently unfair so Ken instituted the rope barrier, theoretically giving everyone an equal shot at any palm. Because it was essentially a horse race to the palms, though, the aged, weak, and slow usually lost out.

Ken's Earlier Life and Occupation

Born October 4, 1929 in Chelsea, Massachusetts, Ken grew up in the Boston area. He majored in French horn at the New England Conservatory of Music and served four years in the U.S. Army Field Band in Washington, D.C. Ken later studied commercial photography at the Brooks Institute of Photography in Santa Barbara, California. An accomplished photographer, he used this talent and skill and his graphic arts background in publishing *The Palm Society Western Chapter Newsletter* (now *The Palm Journal*) in its early years. His high quality palm photographs have appeared in that journal and *Principes*. He even wrote an article about photographing palms (see *Principes* 12: 136–141 (1968)).

Ken was self-employed as a plant jobber in southern California, buying lining out stock of succulents and foliage plants from growers and reselling them to other nurseries. He was a frustrated palm enthusiast living in California and always extolled the virtues of southern Florida and made clear his longing to live there, so that he could grow a wider diversity of palms. He would eventually realize his dream and move to Florida in the 1980s but even there he was not satisfied. To grow his beloved palms he went even more tropical and moved to Hawaii in 1990. He worked for a commercial palm grower near Hilo and then went into business for himself as a palm consultant and later collected and sold commercial quantities of palm seeds. He bought a piece of rain forest near Hilo on the Big Island of Hawaii, and started to assemble his palm collection and plant his palms.

Ken in Hawaii

I don't know much about Ken's time in Hawaii although he told me, and I could see, that he was

at his final stop for palms. He had found his paradise, his Shangri-La. In 1998 and 2000 I spent several days with him as my guide, visiting the more important public and private palm collections in and around Hilo, Hawaii. It was a grand time because we saw palms, talked palms and reminisced about our past times (Fig. 1). He had amassed quite a collection of palms, most of which were still in containers. Somewhat frustrated, he frequently lamented to me that he was unable to plant as many palms as he wanted in his piece of rain forest around his home simply because he had insufficient time. Slowly failing health and his palm-seed-collecting business slowed or eliminated his palm-planting activity.

Ken loved palms. Few equalled and none surpassed his passion and desire to grow as many species as possible. While others may be or were more acquisitive, no one loved palms with such passion the way Ken did. Many of the palms seen in gardens in California, Florida and, especially, Hawaii are ones he introduced, and they stand proudly as the most appropriate memorials to Ken.

Photo Feature

Dates (*Phoenix dactylifera*) are one of the most important agricultural crops in the Arabian Peninsula. Wherever the water supply permits, date groves are planted and tended, adding considerably to the beauty of the landscape. Here in Wadi Tiwi in the mountains of eastern Oman, dates occupy the spring-fed valley bottoms amid the rugged limestone mountains (Photo: J. Dransfield).

Pollination in the Coco-de-Mer, *Lodoicea maldivica*

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1. in the Vallée de Mai, Praslin, Seychelles (Photo: J. Dransfield).

The coco-de-mer or double coconut is one of the world's most remarkable palms, yet there is much about its natural history that is unknown. This paper reports new findings on pollination in this famous species.

The coco-de-mer or double coconut *Lodoicea maldivica* (J. Gmelin) Pers. is one of the world's most famous palms, well known for having the largest and heaviest seed of any plant (to 20 kg) and the largest flower of any palm (Uhl & Dransfield 1987). It has been reported to have the longest leaves (to 10 m) (Beaver & Chong Seng 1992, Wise 1998) although that is exceeded by *Raphia regalis* (25 m: Hallé 1977). The status of the tree is well known with regular reliable censuses (putting the population at 16,000 in 1996; Carlström 1996) and there have been studies of population structure and recruitment (Savage & Ashton 1983, 1991). Despite this apparent familiarity the mode of pollination in the coco-de-mer remains unclear with a widespread popular belief in Seychelles that the species is wind pollinated. The few published accounts that consider its pollination remain vague: "probably by means of wind and also generalist insect pollinators" (Beaver & Chong Seng 1992). There would appear to be two main possibilities: wind pollination or insect pollination. Suggestions in favor of the former appear to be based on a perception that wind pollination is indicated by the presence of the male flowers on a massive catkin-like rachilla, the tendency for male trees to be taller than females and an apparent lack of any attractant to female flowers, although none of these characteristics is closely correlated with mode of pollination. Insect pollination is suggested by the scent of the male flowers, their high production of nectar and the attraction of animals to the male flowers (flies, bees, geckos and slugs). Although different animals perceive scent differently the presence of a detectable scent suggests that it may serve as an attractant to some animal taxa. The production of copious nectar has a more straightforward association with the attraction of pollinators. There have been no systematic studies of visitors to the flowers or the movement of pollen. Floral structure is described in detail by Uhl and Dransfield (1987), but no consideration has been given to the distribution of nectaries in the species.

Methods

The structure of flowers was determined through dissection of one fresh flower from five male trees and five female trees collected on Praslin and Silhouette islands. One female flower was producing scent at the time of collection. Repeated visits to scent-producing female flowers over a 2-day period in the Vallée de Mai (Praslin) in October 2002 allowed the duration of receptivity to be estimated.

Possible pollination mechanisms were studied by observing male and female flower for periods of 1–2 hours at 8:00–10:00 hrs, 12:00–14:00 hrs and 16:00–17:00 hrs in October 2001 and March 2002 in the Vallée de Mai, Praslin. Night observations were made on 19 March 2002 and 24 March 2003 at 20:00–22:00 hrs. Insects observed on or near the flowers were collected and identified as part of the Indian Ocean Biodiversity Assessment 2000–2005. Pollen load on potential pollinators was investigated by collecting and dry preserving ten individuals of each insect species recorded on the flowers, taking mucus samples from the dorsal surface of ten slugs by gently scraping them with a blunt scalpel and the copious mucus produced placed on a microscope slide. For insects visiting flowers particular attention was paid to insects on female flowers. It was not practical to subject potential vertebrate pollinators to microscopic examination and for these species the significance of any pollination role had to be inferred from observation.

The possibility of wind pollination was investigated by coating five microscope slides with vaseline and positioning them in a palm forest with a coco-de-mer population (Jardin Marron, Silhouette). These were left exposed to the air under a canopy of palm leaves (to minimize exposure to rainfall) for five days and then examined under a microscope. Pollen grains located in this manner were compared to fresh samples from the palm species present in the area.

Results

Floral structure

The inflorescences are interfoliar, with male flowers on a 1–1.5 m long rachilla and female flowers on an unbranched zig-zag rachilla. The male flowers are positioned in spirally arranged depressions; the bracts are leathery, each with a small bracteole. There are three unequal sepals that form a cylindrical tube, the corolla is three-lobed; there are 17–22 stamens (Uhl & Dransfield 1987, Wise 1999). Nectaries are situated on the margins of the bracts, nectar production is copious and moisture can frequently be seen on the bracts from a distance of several meters. A strong musty, sweet smell is produced from the flowers and this can be detected by observers from at least 20 m from the inflorescence. The female flowers are sessile, ovoid and sheathed by bracts, two large basal bracteoles, three imbricate, coriaceous sepals and petals. The stigma is three lobed, with 1mm lobes surrounding a central flask-shaped depression. This 2 mm deep depression is lined with sparse glands and leads into the trilobed septal nectary. The females produce a similar scent to the male flowers but only one flower is active on any tree at any one time and that for only for

a few hours of the day. The scent can only be detected by humans within 2 m. The gynoecium contains three distinctively bilobed ovaries. All scent producing female flowers have well developed, fully open stigmas and active glandular secretion in the central depression, within 12 hours of collection the stigmas had dried and shriveled, no glandular secretion was detectable and scent production had ceased. This may be an incidental result of collection rather than an indication that receptivity is really limited to 12 hours; however, the scarcity of receptive female flowers on trees suggests that receptivity is temporally limited.

Visitors to the flowers

Most mature male trees support at least one active inflorescence. The copious nectar attracts large numbers of insects, slugs and geckos. The following species have been observed feeding on nectar: honey bees (*Apis unicolor*), flies (Dolichopodidae – *Ethiosciapus* cf. *bilobats* [formerly known as *Psilopus bilobatus*] (Fig. 2), Calliphoridae – *Lucillia infernalis*), slugs (*Vaginula seychellensis*) and geckos (*Ailuronyx seychellensis, A. trachygaster, Phelsuma sundbergi* and *P. astriata*). The bees are attracted to the flowers exclusively, spending on average 5 seconds (range = 1–9, n = 50) on each flower and moving between flowers on the same inflorescence; all bees examined were coated with *Lodoicea maldivica* pollen on the underside of the thorax and abdomen. The flies (of both families) move all over the inflorescence, visiting both the flower and the nectar on the rachilla surface and spending 8–12 seconds (Calliphoridae: mean = 8, range = 2–9, n = 50; Dolichopodidae mean = 12, range = 2–13, n = 50) on each flower. Coco-de-mer pollen was located on the legs of several flies (70% of the dolichopodid *Ethiosciapus bilobatus* and 10% of the calliphorid *Lucillia infernalis*), of five *E. bilobatus* flies collected on female flowers four were found to be carrying pollen. Slugs appear to feed on the nectar to a limited extent only, feeding mainly on the flowers themselves (particularly the pollen covered stamens); pollen was found in the mucus of 20% of slugs. Geckos may be attracted to both the insects and the nectar on the male rachillae; *Ailuronyx seychellensis* and *Phelsuma* spp. have been seen feeding on both food sources. When on the rachilla *A. trachygaster* feeds predominantly on the nectar, licking the surface of the rachilla and the base of the flowers continuously for periods of up to an hour. In one case pollen could be observed being deposited on the snout of one individual of this species and in another the gecko was observed biting the flowers, resulting in the release of clouds of pollen. The pollen released in these observations fell to the forest floor within 3 m due to the lack of air movement below the tree canopy.

Geckos (*Ailuronyx trachygaster*) may be seen on the female flowers as well as the males. None of the geckos observed on the female flowers was active and it was not possible to determine whether the flowers act as an attraction to the geckos or just provide a convenient hiding place; the nectar production of the central nectary would appear to be too limited to act as a strong attractant. No other gecko species were observed on female flowers. Only female flowers producing scent were visited by dolichopodid flies (*Ethiosciapus bilobatus*); no other insect species were found on female flowers, and *E. bilobatus* is therefore the only insect species observed on both male and female flowers.

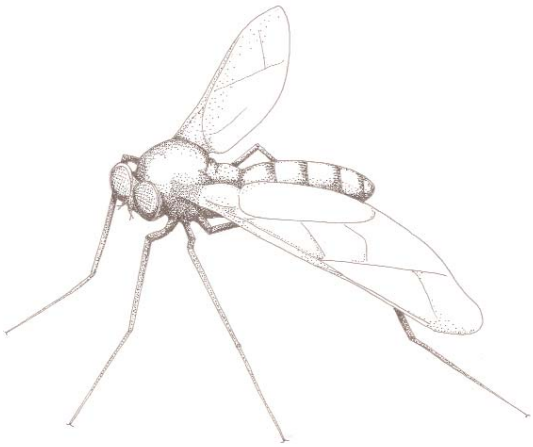
No insects could be found visiting the flowers at night so regular pollination by moths may be unlikely. Lepidoptera are notably scarce in *Lodoicea maldivica* forest and none was observed on male or female flowers. No palm pollen was collected on the vaseline coated slides.

Discussion

The male inflorescence of *Lodoicea maldivica* produces copious nectar and a strong scent, characteristics that would attract animal pollinators but would not assist wind pollination. The level of nectar production would seem to be too high for animal pollination to be merely an occasional occurrence and wind may not be a significant component in the pollination process of this species (although its occasional occurrence cannot be excluded). The strong musty scent of the male flowers is characteristic of fly pollinated species, although distinct from the rotten meat or fermenting odors that attract large calyptrate flies to terrestrial flowers, and in the field this scent is observed to be attractive to bees as well as flies.

The female flowers would appear to be structurally unsuited to wind pollination with an enclosed target area of no more than 4 mm^2; the stigmas may also be receptive for a short period of time. Although the scent of these flowers is relatively weak to human senses, it does serve to attract dolichopodid flies. These flies are highly active and readily move between trees, unlike the other animals occasionally seen on female flowers (geckos and slugs).

The scarcity of wind-dispersed *L. maldivica* pollen suggests that wind-pollination is not significant. Pollen is carried from the male flowers by all the animal groups observed on the flowers, most significantly by the bees and flies (possibly also the geckos although this could not be quantified), with only the latter moving between male and



2. The dolichopodid fly *Ethiosciapus* cf. *bilobatus* (Drawn by the author).

female flowers. Observations suggest that flies (and the dolichopodid *Ethiosciapus* cf. *bilobatus* in particular, but possibly including other families) are the main pollinators. The presence of *L. maldivica* pollen on *E. bilobatus* collected on the female flowers demonstrates that this species is capable to transferring pollen. There may also be a pollination role for some species of moths but this could not be confirmed during the limited duration night-time surveys. The attraction of other animals (bees, geckos and slugs) to the male flowers is largely a coincidental result of the high rate of nectar production. Lizards have been suggested to act as pollinators of other plant species (Whitaker 1987, Eifler 1995, Sáez & Traveset 1995, Traveset & Sáez 1997, Nyhagen et al. 2001), although few of these records demonstrate a significant pollination role. Geckos (mainly *Ailuronyx trachygaster*) may play some role in *L. maldivica* pollination but *Ailuronyx* geckos are highly territorial and movement between trees is probably not sufficiently frequent for them to be significant pollinators.

The characteristics that have led to the suggestion that the species might be wind pollinated are a consequence of phylogeny (development of condensed rachillae and flowers concealed within bracts until anthesis to protect the developing flowers, as in many palms), high investment in seed production in female trees resulting in smaller stature compared to the males (sexual dimorphism in size) and relatively subtle attractants in the female (the apparent 'lack' of scent in female flowers).

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A New Stoloniferous *Pinanga* from Peninsular Malaysia

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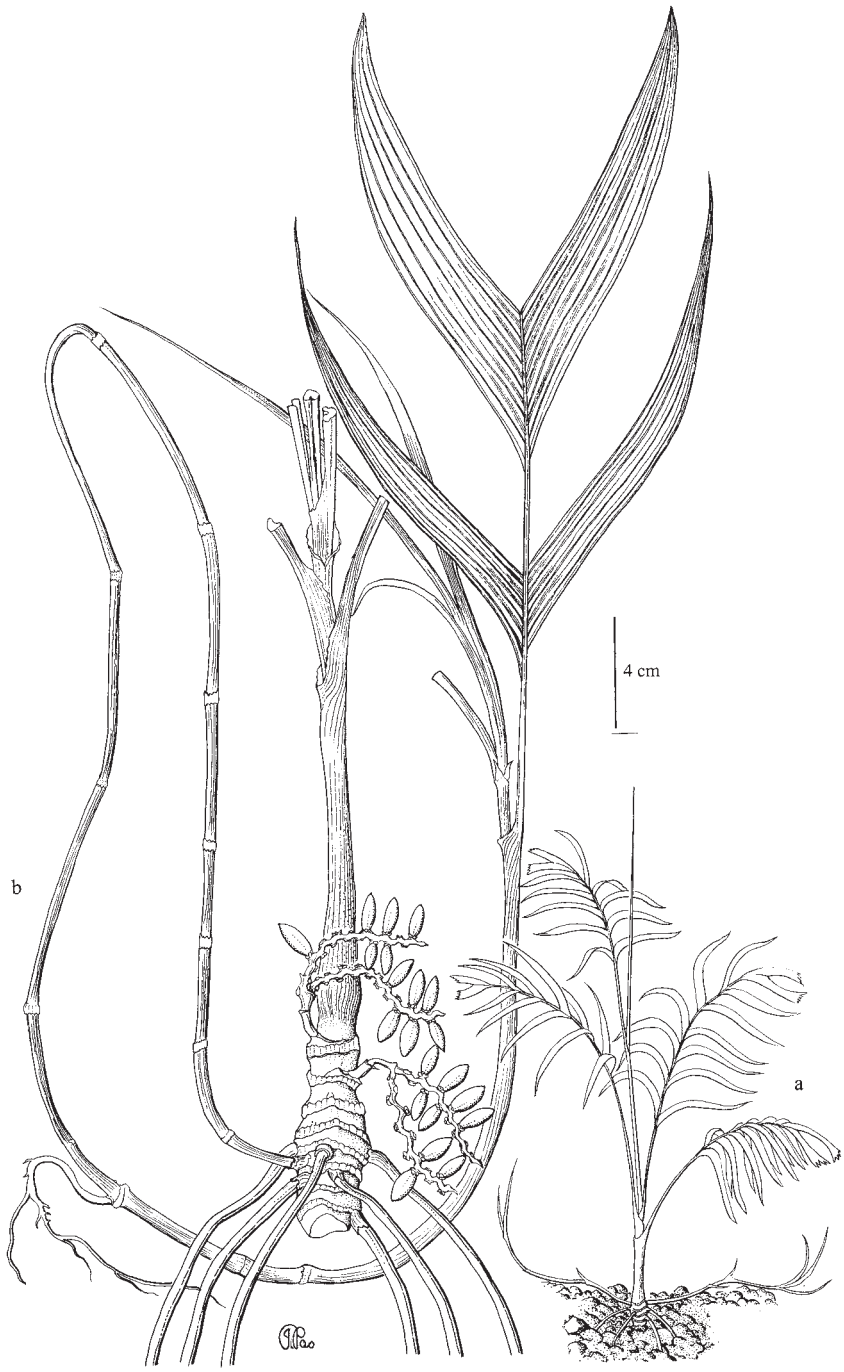
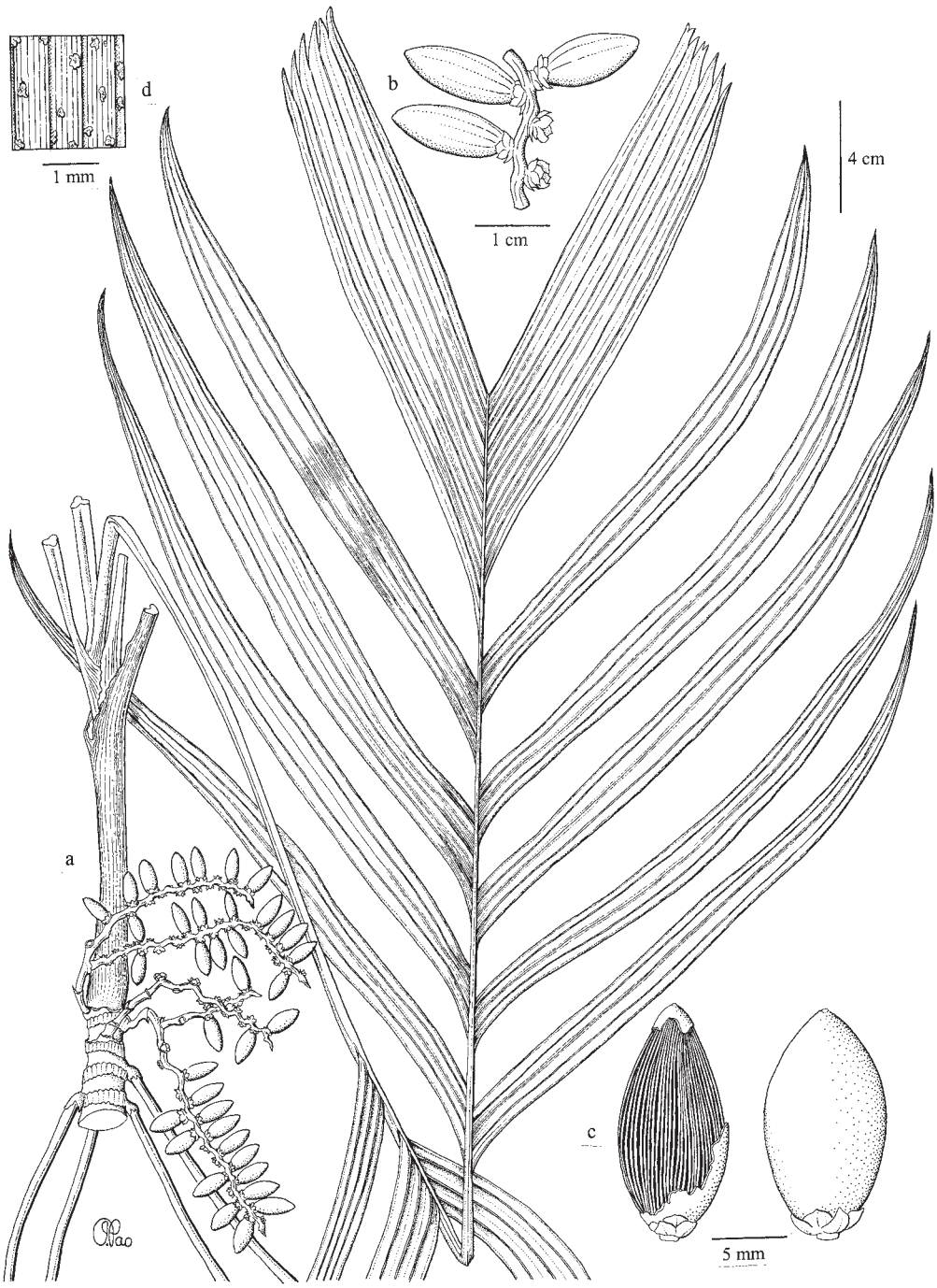
1. *Pinanga sarmentosa* in its natural habitat.

A new *Pinanga* from the Terengganu, Malaysia was discovered. This unusual species produces long stolons.



2. *Pinanga sarmentosa*. **a** habit; **b** stem with stolon. All drawn from *L.G. Saw et al. FRI 48154*, by Joseph Pao.

The palm flora of Peninsular Malaysia is relatively well worked out. Last year it came as a pleasant surprise when a collection team from the Kepong herbarium with visitors from the Fairchild Tropical Garden (Scott Zona and Carl E. Lewis) chanced upon this very unusual and elegant *Pinanga* from the Sungai Nipah Forest Reserve, Terengganu. In Peninsular Malaysia, only two other species of *Pinanga* form stolons or have long-necked rhizomes – *P. riparia* Ridley and *P. johorensis* C.K. Lim & L.G. Saw (Lim 2001). Both of these species have stolons or rhizomes just beneath the soil or, if exposed, very close to the soil. These are also large plants, often exceeding 2 meters in height.



3. *Pinanga sarmentosa*. **a** stem with frond. **b** details of rachilla with fruits. **c** fruits, with pericarp removed in one fruit showing fibres. **d**. veins of frond. All drawn from *L.G. Saw et al. FRI 48154*, by Joseph Pao.

In the new species, the stolons run loosely along the forest floor, rooting occasionally at the nodes but mainly at the suckers where the new plantlets form (Fig. 1 & 2). One population of *Pinanga capitata* Becc. on Mount Kinabalu has been reported to form stolons similar to this (Dransfield, pers. comm). However, the Terengganu palm is very different from *P. capitata*, which is a much larger species and has an inflorescence with many branches

Pinanga sarmentosa L.G. Saw sp. nov., *Pinanga tenacinervi* J.Dransf. affinis sed caule stolonifero, rachillis rubris, fructibus ellipsoideis c. 13 × 8 mm maturitate nigris vice rachillis viridibus, fructibus

fusiformibus c. 12 × 4 mm maturitate carmesinis differt. Typus: Malaysia, Terengganu, Kemaman, Sungai Nipah Forest Reserve, Sungai Nipah. *L.G. Saw, S. Zona & C.E. Lewis FRI 48154* (Holotypus KEP; isotypi FTG, K, L)

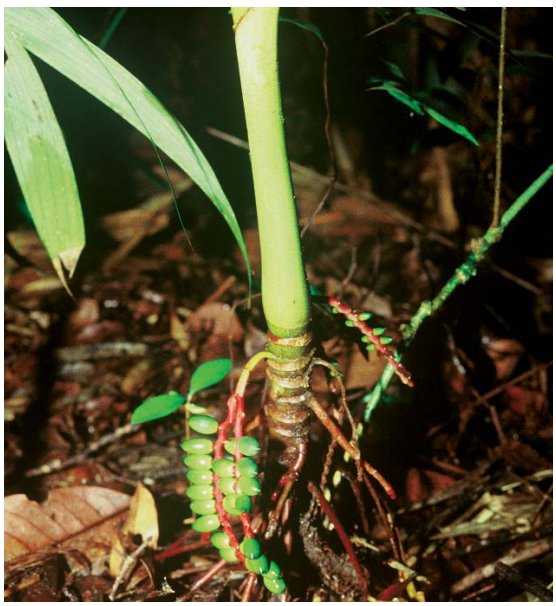
Clustering, pleonanthic, short-stemmed stoloniferous palm with long runners forming colonies of widely spaced individual stems; stems stilt rooted, to c. 20 cm high; internodes 0.5–1.2 cm, 1.0–2.3 cm diam., nodal scares conspicuous; mature stolons 80–100 cm long, creeping above the forest litter, occasionally rooting at nodes, terminating with plantlets, internodes 5–9 cm long, 2–3 mm diam. Leaves 4–5 in crown, pinnate, 70–90 cm long (including petiole), neatly abscising; sheaths tubular, 11–15 cm long, covered with scattered dark reddish brown indumentum; crownshaft well defined up to 22 cm long, 1–1.5 cm diam.; petiole 35–55 long, 0.5 cm diam., channelled adaxially, rounded abaxially, covered with scattered dark reddish amorphous indumentum; rachis slightly curving under the weight of the frond, ridged adaxially, rounded abaxially and indumentum covering similar to the petiole; blade variously divided into 2–8-fold leaflets, slightly mottled, surface dull, typically terminal leaflets with 5–8 folds, proximal ones with 2–5 folds, leaflets with pointed apical margin; leaflets 5–7 pairs, terminal leaflets 16–26 cm long, 3–6 cm wide, proximal leaflets 25–35 cm long, 1.5–5 cm wide, individual folds 0.5–1.1 cm wide; lamina covered with scattered dark reddish amorphous indumentum on adaxial surface and glabrescent abaxially; transverse veinlets inconspicuous, adaxial surface paler when dried. Infructescence infrafoliar, spreading in various directions, 9–12 cm long,; prophyll not known; peduncle bright red, terete but slightly flattened, 2–2.5 cm long, 2–3 mm diam., densely covered with amorphous caducous translucent-white and reddish brown indumentum; peduncular bracts scale-like, (1–)2, if 2 then oppositely arranged, positioned mid-way on the peduncle; rachillae 2, rarely 3 bright red, rarely spicate, regularly zigzagging with fruits distichously arranged on the ridges of the folds, ca. 3 fruits/cm, densely covered with amorphous caducous translucent-white and reddish brown indumentum. Fruits green, maturing black, ellipsoid, c. 13 × 8 mm. Seed, 12 × 5 mm, endosperm ruminate. (Figs. 1–4).

SPECIMEN EXAMINED. Malaysia, Terengganu, Kemaman, Sungai Nipah Forest Reserve, Sungai Nipah. *L.G. Saw, S. Zona & C.E. Lewis, FRI 48154* (Holotype KEP; isotypes FTG, K, L). So far, the species is only known from the type locality.

HABITAT. Lowland dipterocarp forest. The species formed scattered colonies of individuals on the upper slopes and ridges of a lowland dipterocarp forest. Here they were found in large numbers, becoming one of the common understory palms of the forest floor. Individual shoots were spaced rather widely apart. The species was absent from the lower slopes or in valleys.

NOTES. A very distinctive *Pinanga*, like no other species in Malaya. The species looks superficially like *Pinanga tenacinervis* J. Dransf. from Sarawak; however, the long stolons and the longer leaflets found in the new species distinguish it from the latter. Furthermore, *P. sarmentosa* has a thinner textured frond than *P. tenacinervis*; the former has red rachillae, ellipsoid fruits, c. 13 × 8 mm, maturing black, while the latter has green rachillae with fusiform fruits, c. 12 × 4 mm that will mature crimson (Dransfield 1980).

4. *Pinanga sarmentosa*, close-up of crownshaft and infructescence.



Acknowledgments

I thank John Dransfield for comments on this species; Joseph Pao prepared the line drawings. The project was funded under the "Palms of Malay Peninsula and Borneo Project" for the Flora Malaysiana Centre. I also wish to thank the curator of the Herbarium of the Forest Research Centre, Kuching, Sarawak for access to the type of *Pinanga tenacinervis*.

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Trachycarpus geminisectus, the Eight Peaks Fan Palm, a New Species from Vietnam

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1. *Trachycarpus geminisectus* in its natural habitat.

Trachycarpus geminisectus **is a wonderful, newly discovered fan palm from the northern part of Vietnam. In this article the authors tell the story of its discovery and describe the species, differentiating it from other members of the genus.**

To make the story of this joint expedition easier to follow, we decided to split it up between the different authors.

Martin Gibbons writes:

In August 2001 I received an email that was to lead us on another of those adventures along the *Trachycarpus* trail. It was from our friend and mentor, John Dransfield of Kew. In it he explained that a bundle of herbarium specimens collected by botanists from Missouri Botanical Garden and their Vietnamese collaborators near Ha Giang on the Chinese border in northern Vietnam in April 2000 contained a specimen apparently wrongly identified as *Guihaia* but suspected by John of being a species of *Trachycarpus*, and one that he was unable to identify. This was especially interesting. The genus, currently containing eight species, grows in an approximate band along the foothills of the Himalayas, spreading eastward into Burma, Thailand and China. Of those that are known from wild populations, the furthest west is *T. takil* in central northern India. Further east, the next is *T. martianus* in central Nepal and then *T. latisectus* in the Darjeeling area in India, *T. martianus* again in Meghalaya Province, India, *T. oreophilus* in northern Thailand, and *T. princeps* and *T. nanus* in western China. We always thought it would not be surprising to find another species in the north of Vietnam or Laos. It would simply be extending the distribution pattern further east, and suitable mountain ranges that would provide the cool climate that *Trachycarpus* needs definitely seemed plentiful in the region.

With this in mind Toby and I arranged to visit Vietnam, and made contact with Mr. Nguyen Van Du from the Hanoi Institute of Ecology and Biological Resources who was familiar with the area where our palm was collected. In October 2001 we flew to Hanoi and were met by Du and his colleague, Mrs. Phuong Anh. It was our first trip to this country and after being dropped off at the hotel, our first mission was to try the local food and beer. Both passed our rigorous testing with flying colors.

Early the next day we were collected and taken to the Hanoi Herbarium where we were invited to inspect specimens of palms collected in the area. The afternoon also passed pleasantly enough, walking around the city, admiring the French Colonial architecture, popping into shops for beautiful Vietnamese lacquer ware, and having an early supper at a roadside stall. Tomorrow we would be on our way. We were collected at 9.30am by Du, Anh and a driver, all of us squeezing into the small Russian built jeep, and we set off along a good road north-west, and out of the city.

The countryside is strongly reminiscent of southern China, and, once we had cleared the city, we passed village after village, town after town, all surrounded by endless paddy fields, tended to by peasants in traditional hats. Coconut and *Areca catechu* palms were much in evidence, but as we sped further north we began to see great numbers of *Livistona* palms, two species, one with stiff erect leaves and one with leaves elegantly drooping at the tips. Both were found in great numbers, occasionally even in mixed stands. The plants with the stiff leaves were particularly plentiful, sometimes covering entire hillsides. Their leaves were popular for thatch, and bundles of the stuff lay everywhere, awaiting collection. We finally found a tree in fruit. These were quite large, oval, lead blue in color, and we identified the tree as *L. jenkinsiana* with reasonable certainty. It is a stately and stunning tree with a tall, slender trunk, frequently clothed in the old, thorny leaf bases and with a massive crown of huge, circular fan leaves. We realized only after a while that the second species was also growing abundantly in this area. Unlike the former, which was usually found on the slopes of the surrounding hills, it seemed to prefer swampy ground and was growing along the borders of the ever-present rice paddies. They differed in their tall, straight trunks, usually smooth and gray, with only a few stubs of the leaf bases remaining near the base, and the smaller leaves with drooping leaf tips. The cherry-sized, bright blue fruits suggested it was *L. saribus* we were looking at.

Lunch was at one of thousands of wayside stalls: frog, eel, rather bony chicken and rice, washed down with Hanoi beer, which is good and cheap. We sped on through the afternoon and into the night (darkness falls at 6 pm) and eventually we arrived at Ha Giang, where we stopped at the Yen Bien Hotel, just in time for supper.

On the next day, we had to make formal application to the Forestry Department, the 'Community Office' and to the 'Foreigner Police' for permission to visit the target area. Alas, our supplications were in vain. Permission was denied. A law passed just days before our arrival prohibited foreigners from visiting districts bordering China. There was nothing to be done but wave goodbye to our three new friends as they drove off in the jeep to cover the remaining 30 miles to Bat Dai Son, the site of the 'new' *Trachycarpus*. Meanwhile, we cooled our heels for two days in Ha Giang, waiting impatiently for their return.

Nguyen Van Du continues:

After an entire day waiting for travel permission from the provincial government of Ha Giang for

Martin and Toby without result, we decided that Phuong Anh and I should go on to Bat Dai Son on our own, leaving Martin and Toby at the hotel. Accordingly, at 10 am, after getting a letter of introduction from the Ha Giang forest department, our jeep headed north from Ha Giang town in the direction of Quan Ba district. It was about 45 km from Ha Giang to Quan Ba and was quite a good road except for several kilometers of road works. We reached Quan Ba district at 12:30 and took lunch at a popular roadside restaurant. We knew from past experience that from here on the road ahead was bad, but quite how bad we did not realize. It was paved with rocks and was really in a terrible state, with huge potholes impeding our progress. We had to stop for half an hour while our driver labored to engage four-wheel drive. Because the previous night there had been heavy rain, the road was very slippery, all the more so because it was clay. Soon afterwards, we had to stop again; the engine was overheating, and we had to collect water from the nearby river to top up the radiator. In all it took us 3 hours to cover 25 km, the car climbing and jumping up and down over the rocky road. Finally, we reached Bat Dai Son and visited the office of the 'Population Committee.' Here, we met the president and vice president of the committee, along with two policemen from Quan Ba. After a few words of greeting I stated the purpose of our visit. They warned us that since this commune bordered China the security was strictly controlled but seemed satisfied after checking our documents. That night, we took a meal with the commune staff and had a drink with them. The meal was very simple – two pork dishes and cabbage soup – but even so I knew that this was a special meal for guests; the life of these mountain people is very tough. We had a nice time with them and they were very friendly. Since Phuong Anh was the only woman there, each local wanted to drink a toast with her. Luckily her drinking capacity was quite good, though we couldn't drink too much as tomorrow would be a hard day, and went to bed earlier than usual.

Next morning we got up at 6 o'clock and had a quick breakfast. Though it promised to be a nice day it turned out densely foggy and our departure was delayed till 7am when we left with two local guides. Because the Population Committee was located on the top of a hill at 769 m alt., we had to begin by descending 500 m before we could start to climb. Since it was foggy, the trail was even more wet and slippery. Furthermore, the mountain was very steep; we climbed up step by laborious step. On the way, we saw big trees of *Caryota* sp. growing scattered on the rocky ridges.

At 11 am, we reached the village of Thong Hoa Long ('Foggy Valley'). We saw many *Trachycarpus* growing near the houses. Our guides said that the tree was called 'Trong,' meaning fiber tree. They said it had been brought from the wild and cultivated for the trunk fibers to make back-basket straps. It seemed that every tree had been stripped; all were bare with conspicuous internodes.

We asked our guide whereabouts the previous expedition had collected the unidentified *Trachycarpus*. He said that there were some in Chong To Tien ('mountain with some flat places'), about 2 km away. I took out the binoculars and looked closely at the mountain. We could see one palm tree near the top of the closest peak, but no others, either because of the fog, or perhaps they were too short to appear above the surrounding vegetation.

We decided to try for the tree we could see. Before leaving the village we took many pictures of the cultivated palms in the village and their habitat, using Martin's and Toby's cameras. The mountain here was steeper than any other I have climbed. Mrs. Phuong Anh could not climb by herself and several times I stopped to help her. The ridge was very wet, with small trees of *Cupressus*, *Tsuga*, *Rhododendron*, Lauraceae, *Rosaceae* and *Melastomataceae* and there were plants of *Paphiopedilum* and other orchids. We even found another species of palm, probably a young *Plectocomia*. Finally, near the top, we reached the palm tree. It grew out from the rock on the northeast ridge at about 1300 m altitude (Figs 1, 2). It looked very strong, as its stem was about 2 m tall and 25 cm in diameter, including the fibers. We took many pictures of it with three different cameras. Unfortunately, there was no inflorescence or fruit on the tree, only some old fruits on the dried inflorescence branches, but we collected two leaves as herbarium specimens. Near the palm we found one young tree and two seedlings, which we collected for growing.

We were very happy to have reached the palm tree and descended the mountain on the other ridge. In contrast, it was very dry and easier to get down. We got back to the Population Committee again at 4 pm. After reporting the work to the committee and saying goodbye to them, we turned back to Ha Giang. We knew that Martin and Toby would be anxious for our return.

Toby Spanner writes:

Du and Anh arrived back at our hotel after dark, exhausted but happy. The entire back of the jeep was filled with leaves and other palm parts, some collected at the site on Chong To Tien, some

2. *Trachycarpus geminisectus*, leaf sheath.

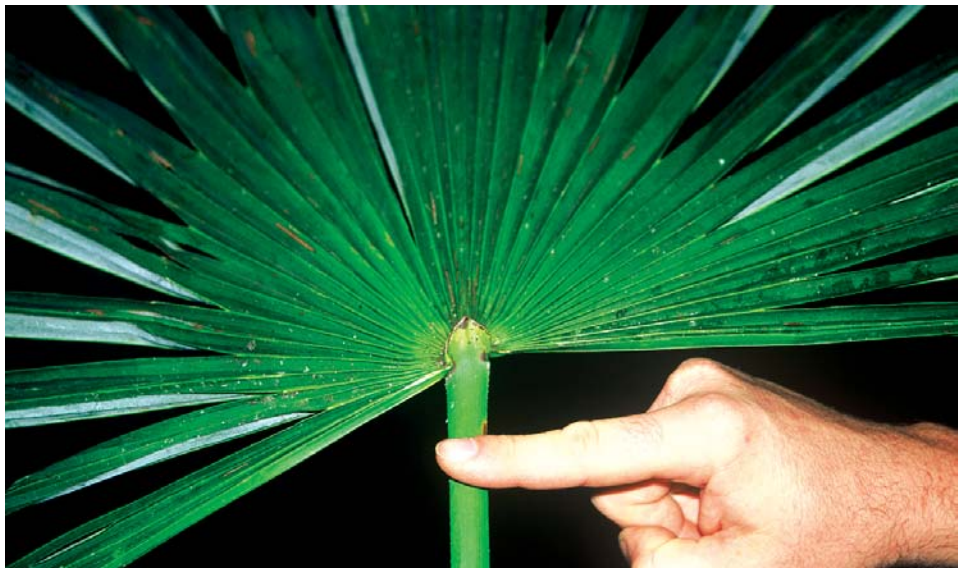
collected in the Village below, and a few more alongside the road to Bat Dai Son. Of course we could not wait to have a closer look at the specimens and immediately spread everything out on the pavement right in front of the hotel entrance. As I was taking a closer look at the material, my heart sank. These plant parts looked identical to those of our well-known friend *Trachycarpus fortunei*, just as popular here in Vietnam as it is in China for the durable fibers that clothe the trunk. One large leaf and a small plant, however, looked different. Du and Anh pointed out that these were the specimens collected on Chong To Tien. The big leaf appeared very leathery and durable as well as unusually large compared to that of *T. fortunei*. The lower surface was covered with a thick, whitish waxy layer. After looking at the leaf for a while, I realized that all of the 40 segments were joined in pairs for their entire length, appearing as if there were only 20, which gave the leaf a very bold and bulky appearance. The leaves on the small plant, a juvenile of perhaps 1 m (3 ft.) tall overall, showed the same characteristics. Of particular interest to us were also the fibers of the leaf bases as they differ quite dramatically within the genus and provide easy clues for the identification of various species. Martin noted that this *Trachycarpus* had the thickest and sturdiest fibers of any *Trachycarpus* we had ever seen (Fig. 3). They were fairly short, stiff, very coarse and robust and of a dark brown color. We all agreed that the plants on Chong To Tien had not much in common with the *T. fortunei* growing around the villages, and that it probably was a plant new to science, later to be confirmed in the herbaria at Hanoi and Munich based primarily on the 1999 and 2000 collections of Averyanov, Harder, Hiep et al. borrowed from Kew.

Trachycarpus geminisectus Spanner, Gibbons, V. D. Nguyen & T. P. Anh, **sp. nov.**

T. principi Gibbons, Spanner & S. Y. Chen similis sed trunco brevi, vaginis foliorum fibris grossissimis compositis lamina grande in ca. 20 segmentis geminatis profunde incisa, floribus fragrantis differt. Typus: VIETNAM. Ha Giang, Quan Ba, Bat Dai Son, *Gibbons, Spanner, T.P. Anh & V. D. Nguyen, GSAD 01* (holotypus HN, isotypi K, MO).

Solitary, unarmed, dioecious fan palm; trunk erect, 1–2 m tall, densely clothed in persistent, fibrous leaf-sheaths, ca. 25 cm diameter. Leaves 10–12, forming a spreading, very open crown, marcescent leaves forming a loose skirt around the trunk; leaf-sheath fibrous, very coarse, dark brown, persistent, dotted with a few pale brown scales, exposed part of sheath divided into stiff, wiry threads; petiole ca. 85 cm, slender, c 1.4 cm wide and 0.9 cm high near middle, very robust, stiff, flat above, triangular in cross section, with a broad yellow stripe below, orange towards the base, glabrescent, margins minutely toothed; hastula small, ca. 1.5 cm long, triangular, petiole slightly extending into the blade below to form a weak costa; leaf-blade palmate, 3/4 to 4/4 orbicular, ca. 85 cm long from hastula, ca. 130 cm wide, very leathery, dark, glossy green above, thick whitish waxy below (Figs 4, 5), transverse veinlets barely visible, deeply and regularly divided for more than 3/4 its length into ca. 40 rigid, stiff, linear segments, joined for their entire length in groups of 2 or rarely 3, slightly tapering from 2/3 their length from the hastula towards the apex, arranged in one plane, producing a nearly flat leaf profile; central segments ca. 85 cm long, 4 cm wide at middle (i.e. ca. 8 cm for a typical double segment), with a very thick and prominent midrib beneath, lateral segments gradually more narrow and shorter, to c 50 × 1.5 cm, apex of segments acute-notched, shortly bifid. Inflorescences few, interfoliar, branched to 3 orders. Male inflorescence short, ca. 50 cm long; peduncle short, oval in cross section; peduncular and inflorescence bracts keeled, base tubular, inflated distally, slightly tomentose, apex acuminate; rachis bracts similar to peduncular bracts; rachillae short, 3–6 cm long,

3. *Trachycarpus geminisectus*: Toby Spanner holds a young plant, showing the white undersurface of the leaf.



4. *Trachycarpus geminisectus*: upper surface of the leaf.

thin; flowers densely arranged, subtended by minute bracteoles, globose, ca. 3 mm in diameter, yellow, fragrant; sepals ovate-triangular, 2 mm long, briefly connate at base; petals oblong-orbicular, twice as long as sepals; stamens 6, exceeding the petals; filaments slightly ventricose; anthers saggitate, blunt; pistillodes about half the length of stamens. Female inflorescence long, robust, stiff, spreading; peduncle oval in cross-section, prophyll 2-keeled, long, tubular; peduncular and rachis bracts, keeled, long, tubular, apex acuminate; rachillae 7–13 cm long, fleshy, yellowish in fruit; flowers globose, 2–3 mm diameter, yellow, fragrant, usually solitary, subtended by minute bracteoles, sepals 2 mm long, orbicular; petals oblong-orbicular, 2.5–3 mm long; staminodes very small; carpels ventricose with a short, conical style. Fruit shortly stalked, reniform, wider than long; epicarp thin, black, with a white bloom; mesocarp thin; seed reniform, wider than long; endocarp very thin; endosperm homogeneous. Germination remote-tubular, eophyll simple, narrow, plicate. (Figs. 1–4).

DISTRIBUTION: Vietnam, Ha Giang province (Quan Ba district) and Cao Bang province (Bao Lac district); in primary closed or secondary, low, wet, mossy mixed cloud forest on steep slopes and

along remnant karst limestone ridges, at 1100–1600 m a.s.l. (Back Cover, Fig. 1); co-occurring with conifers such as *Cupressus*, *Taxus*, *Nagea*, *Pseudotsuga*, broadleaf trees like *Rhododendron*, several Lauraceae and Rosaceae spp. Palms such as *Plectocomia*(?) and large *Caryota* have been observed close-by. Even though it has not been observed there yet, it seems very likely that *T. geminisectus* also occurs in similar habitats just across the border in China's Guangxi province.

CONSERVATION STATUS: With the meager data available at this moment, no precise assessment is possible. Apparently it is very common on some ridges within its distribution area. Its habitat is steep and nearly inaccessible and because the plant has no uses, human interference is minimal. However, it seems that this species could be at risk because of a scattered distribution and through hybridization influence from *T. fortunei*, which is cultivated in nearby villages. It apparently does not occur in any protected area.

CULTIVATION: For lack of propagating material, *Trachycarpus geminisectus* has not yet been introduced into cultivation. There are no plants of this species outside its native habitat. We believe however, that because of its very ornamental large leaves with wide segments and its supposed resistance to cold, it would be a highly desirable landscaping plant for temperate and subtropical areas alike.

SPECIMENS EXAMINED: VIETNAM. Cao Bang prov., Bao Lac distr., municipality Dinh Phung, Nam Linh ridge (N 22°47′ E 105°49′), 15 April 1999, *P.K.Loc, P.H.Hoang, Averyanov L. No CBL 1421*, *CBL 1422* (K, LE). Ha Giang prov., Quan Ba distr., Can Ti municipality, vicinities of Sing Xuoi Ho village (N 23°04′ E 104°59′), 1100-1150m a.s.l., 12 Oct. 1999, *N.T. Hiep, N.Q. Binh, L. Averyanov, P. Cribb, No NTH 3605* (K, LE). Bat Dai Son municipality, on Chong To Tien (ridge), ca. 1300 m a.s.l., (N 23°09′, E 105°00′), 6 April 2000, *D.K.Harder, N.T. Hiep, L.V. Averyanov & N.Q. Hieu DKH 5226* (K, MO); idem, Nov. 2001, *Gibbons, Spanner, T.P. Anh, V. D. Nguyen, GSAD 01* (Holotype HN, isotypes K, MO).

The specific epithet (Latin – *geminisectus*, with twin segments) relates to the fact that the leaf segments of this palm are usually joined in pairs along their entire length (Fig. 3).

NOTES: *T. geminisectus* is easily distinguished from other members of the genus by its large leaves with paired, very wide segments and short trunk with persistent leaf bases that have very coarse, wiry fibers (Fig 2). The double leaf segments, 8 cm wide, or the occasional triple segment, about 12 cm wide, represent by far the widest in the genus. Vegetatively and in floral structure, *T. geminisectus* seems most closely related to *T. princeps* Gibbons, Spanner & S. Y. Chen. As there is no recent taxonomic treatment of the genus *Trachycarpus* (but see Beccari 1931, Kimnach 1977 and Gibbons & Spanner 1998), relationships of *T. geminisectus* will be dealt with more precisely in a conspectus of the whole genus, which will appear in a later publication.

Acknowledgments

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PALM LITERATURE

EVOLUTION AND ECOLOGY OF PALMS. By Andrew Henderson. The New York Botanical Garden Press, Bronx, NY. 2002. SBN 0-89327-444-5. US$35.00. Paperback.259 pp., numerous halftone photos and diagrams.

Palms, the princes of the plant kingdom, command respect from many loyal subjects. Their royal heritage gives palms the freedom to make and follow their own sets of rules. Unraveling the complex linkages among palm morphology, ecology, and evolution is a major task that has preoccupied many prominent botanists, including Holttum, Corner, Tomlinson, Moore, Uhl, and Dransfield. Andrew Henderson follows this progression of big palm thinkers in this synthetic volume. The central thesis he develops in the Introduction and revisits in virtually every chapter, is that stem morphology has pervasive consequences for morphology of leaves and reproductive structures and therefore influences all aspects of vegetative and reproduction function. The evolutionary processes that have shaped the diversification of palm forms are viewed within the concept of heterochrony, the change in timing of rates of development and developmental sequences, as widely discussed by Gould in his 1997 book Ontogeny and Phylogeny. Related to these changes are allometric constraints that vary in their expression within and among evolutionary lines. Neither of these major concepts is new; heterochrony and allometry have been previously applied to particular aspects of palm morphology and evolution. But here they receive new life in the ways in Henderson's broad application and synthesis. His new vision enables linkages between vegetative and reproductive functions, and among growth rate, plant size and life history evolution.

Henderson returns to Moore's landmark 1973 publication on the Major Groups of Palms and their Distribution, leaving aside Moore's biogeographic focus in favor of a focus on morphology, life history, and ecology. He resurrects Moore's 15 major groups, abandoning the tribal classification later developed by Moore and published in Genera Palmarum by Uhl and Dransfield (1987). Henderson splits Moore's Cocosoid group into spiny and non-spiny groups for a total of 16 groups. Molecular-based phylogenetic studies suggest that 13 of these major groups are monophyletic; Coryphoids, Arecoids, and Nonspiny cocosoids are considered to be polyphyletic. A complete phylogenetic assessment of palms is not yet possible, and it is quite likely that the topography of Henderson's landscape will undergo some seismic shifts in the next decade.

Following the introduction, Henderson begins with two chapters on palm stem morphology and an analysis of size and shape of palm stems. Henderson distinguishes two types of stem morphology within the family – palms with internodal elongation and palms lacking internodal elongation. The former group shows more restricted variation of stem height and diameter ratios, whereas the latter group exhibits more variation in these ratios. To the extent that these groupings represent clades, Henderson posits that phyletic changes in stem growth rate can be related to phyletic variation in leaf morphology, reproductive structures, and the duration and timing of reproduction. He makes a convincing hypothesis that remains to be tested conclusively across the entire family.

The next chapter focuses on leaf morphology and arrangement, again emphasizing relationships between stem and leaf development. Henderson points out that leaf size and stem diameter co-vary in some palm genera, but not in others, a pattern that he later interprets within the context of beetle vs. bee/fly/wasp pollination syndromes. I found these trends to be intriguing, but a remarkably small number of palm genera are actually compared here. The discussion proceeds to inflorescence development and maturation in Chapter 5, which is followed by a chapter on reproductive duration. Phylogenetic hypotheses based on molecular data suggest that a shift from semelparity to iteroparity took place early in palm evolution in the Calamoid group, with a later reversal back to semelparity in the Coryphoid genera *Nannorrhops* and *Corypha*, associated with a reduction in growth rate and an extension of lifespan. Similarly, a reversal to semelparity took place in *Caryota* and *Wallichia* and some species of *Arenga* of the Caryotoid group, although in these cases the connection with slow growth rate and increased longevity is less universal.

In Chapter 7, Henderson extends the discussion of reproductive biology to phenology and breeding systems, leading to a detailed treatment of pollination in Chapter 8. These topics are strongly linked functionally as well as structurally. Henderson characterizes a set of traits associated with beetle pollinated species, including high synchrony and short duration of flowering, condensed inflorescences with closely-spaced flowers, rapid maturation with short, nocturnal anthesis, basipetal maturation, temperature elevation, protogyny, and lack of nectar production. In contract, species pollinated by bees,

flies, and wasps tend to have low synchrony and long duration of flowering, elongate inflorescences with loosely spaced flowers, slow maturation, long and diurnal anthesis, acropetal maturation, protandry, and production of sweet nectar. Henderson also proposes a generalized trade-off between growth and reproduction, such that internodal growth is often reduced following sexual maturity. He further points out that beetle-pollinated genera, such as *Bactris*, are strongly selected for conservatism in inflorescence size, whereas taxa pollinated by a greater variety of insects, such as *Sabal*, *Prestoea*, and *Aiphanes* lack these constraints on inflorescence size and also lack integration among inflorescence size, stem diameter, and leaf size.

Henderson describes fecundity and fruit maturation in Chapter 9, highlighting a general trend – species with larger stems produce more numerous, smaller fruits. The associations between palms and their fruit/seed dispersers and seed predators are detailed in Chapter 10. Henderson distinguishes two syndromes of seed dispersal in palms, the mammal/bruchid system and the bird/scolytid system. The former is exemplified by non-spiny Cocosoid palms, which have simultaneous fruit ripening and large, scented fruits, that tend to fall beneath the parent tree and are scatter-hoarded by various rodents. Seeds that are left behind are highly susceptible to predation by bruchid beetles. The bird/scolytid system, in contrast, applies to palms with sequential ripening and small fruits. Fruits are generally red or purplish black and have no noticeable scent. They attract a large number of birds, including toucans, parrots, and oil birds. Scolytid beetles are common seed predators of *Oenocarpus*, *Prestoea*, and *Euterpe*.

Henderson completes his work with a discussion of germination, contrasting characteristics of species with remote vs. adjacent modes. Palms with adjacent germination mode tend to have shorter, thinner stems with elongate internodes, higher growth rates, and smaller inflorescences and fruits. These species generally occur in moist forest habitats. This comparison is one of the few in the book that are based on species-level traits rather than traits at the generic or major group level.

I must admit, by the time I got to the end of the book, I was anticipating more than the one-page Epilogue. So much synthesis had been presented throughout the book's ten dense chapters that my head was reeling. I felt a need for a less-concentrated conclusion, so I had to go back through the book at my own pace, revisiting the conclusions at the end of each chapter. In this book, Henderson boldly went where no palm biologist has gone before. He chose to take a wide view and, as a result, has produced a major contribution that may well extend beyond the borders of the palm kingdom. It is laudable that, despite Henderson's extensive New World experience, the book includes many examples of Old World palms. The topics are covered in substantial detail, and are highly integrated throughout. The book illustrates the quantum leap in our understanding of palm evolution and diversification that has been enabled by molecular-based phylogenetic studies.

Henderson's orientation in this book is clearly more focused on evolution than ecology. Including a section on the geographic distribution of major taxa would have made the treatment more complete. Population and community ecology of palm species are not discussed. Palm ecology involves much more than interactions with animals and distributions across major biomes. Palms often reach high abundance in areas frequently disturbed by hurricanes or fires. Furthermore, canopy palm species can play an important role in plant and animal community structure, as keystone resources for frugivores and as agents of small-scale disturbance through leaf fall. Finally, palms also show complex meso-scale distribution patterns within tropical forests, suggesting affinities to particular soil and slope characteristics. It is important to understand the ecology of palms in their complex ecological matrix, rather than in manicured botanical gardens, where much of the research on their growth, morphology, and reproductive biology has been conducted.

Palm aficionados and scholars alike will appreciate the rich detail and broad synthesis achieved here (and, by the way, the Appendix is awesome). My copy will proudly take its place on the shelf between Corner's *Natural History of Palms* and Uhl and Dransfield's *Genera Palmarum*. Congratulations to the author and publisher on a job well done!

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The Native Palms of Dominica

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1. *Coccothrinax barbadensis* in the village of Tête Morne. (Photo S. Zona)

The Lesser Antillean island of Dominica in the Eastern Caribbean is home to nine indigenous palms. Recent field work by the authors brought together information on their natural history, use by local people and conservation status.

Dominica is a small island of 754 km^2 located in the Lesser Antilles, between Martinique and Guadalupe, in the Eastern Caribbean. Dominica is mountainous, and consequently, much of the natural vegetation is still intact. Because of the mountains, there is a pronounced rain shadow on the western (lee) side of the island, so it is the drier side. Dominica has a lush interior of rainforests, waterfalls, lakes, hot springs and more than 200 rivers, many of which cascade over steep cliff faces en route to the coast. The island is home to the highest mountain in the English-speaking islands of the Eastern Caribbean, Morne Diablotin, which reaches 1447 m above sea level. It is also home to a small but diverse palm flora.

The first publication dealing strictly with the palm flora of Dominica was that of Hodge (1942), who made several field trips to the island in 1937, 1938 and 1940, and who had a special interest in palms. Hodge was president of the Palm Society, the forerunner to the IPS, in 1957–1960. His account was noteworthy for its inclusion of *Geonoma hodgeorum,* newly described by L.H. Bailey, who visited the island in 1922. At the time, the known palm flora comprised seven species in five genera. Of these seven, only *Acrocomia aculeata* had been previously recorded for the island. Hodge again published an account of the palms in his flora of Dominica (Hodge 1954), in which eight species in seven genera were recorded. In this publication, the genus *Aiphanes* is recorded from the island for the first time. The next most significant palm discovery was made by R.W. Read in 1968 when he discovered an apparently indigenous population of *Pseudophoenix sargentii* growing on the western side of the island, near Mero (Read 1969). Read provided an up-dated account of the palms for Howard's flora of the Lesser Antilles (Howard 1979), in which ten species in nine genera are given for Dominica. The last-named publication included *Roystonea oleracea* as being indigenous; we believe it to be introduced and naturalized. In this current account, we follow the taxonomy of Henderson et al. (1995). The changes to the Dominican palm flora are summarized in Table 1.

Because Dominica's palms are useful indicators of the main vegetation zones (Hodge 1942) and because of their importance to the people of the island, we surveyed populations of palms on the island to assess their health and conservation status, as well as to address taxonomic questions that remain.

Methods

Field work was conducted in August, 2002. The health and well-being of palm sites in Dominica was assessed in the field using visual estimates of population size and structure. Owing to time constraints, actual counts of individual palms and a complete survey of the range of each species were not possible. Because the distributions of most palm species in Dominica are small, our results can be extrapolated to the island in general, according to the distribution and availability of habitat. Threats to palm populations were determined from field evidence, interviews with local people and discussions with Forestry personnel.

Conservation status was assigned using categories of the IUCN Red List, <http://www.iucn.org

Table 1. The palms of Dominica as treated by various authors.

Hodge 1942	Hodge 1954	Read in Howard 1979	this paper
Coccothrinax martinicensis	*C. martinicensis*	*C. barbadensis*	*C. barbadensis*
Rhyticocos amara	*R. amara*	*R. amara*	*Syagrus amara*
Acrocomia aculeata	*A. aculeata*	*A. aculeata*	*A. aculeata*
Euterpe dominicana	*E. dominicana*	*E. dominicana*	*E. broadwayi*
Euterpe globosa	*E. globosa*	*Prestoea montana*	*P. acuminata* var. *montana*
Geonoma dominicana	*G. dominicana*	*G. martinicensis*	*G. interrupta* var. *interrupta*
G. hodgeorum	*G. hodgeorum*	*G. dussiana*	*G. undata*
	Aiphanes cf. *minima*	*A. luciana*	*A. minima*
		Pseudophoenix sargentii	*P. sargentii*
		Roystonea oleracea	(omitted)

/themes/ssc/redlists/ssc-rl-c.htm>. It should be noted that the categories assigned apply only to the species as they occur in Dominica. The global category of threat is not known for most of the species.

Results

Coccothrinax barbadensis – Latannyé, Natannyé, Balyé, Silver Thatch Palm

As a result of over-exploitation for the manufacture of brooms, *Coccothrinax barbadensis* has become very uncommon in the wild, restricted to small, inaccessible sites away from major human populations. In fact, more palms appear to exist in cultivation in the village of Tête Morne than in the forest we surveyed near the village (Fig. 1). This is a case where domestication may save this species from complete extirpation.

We saw no evidence of seedling regeneration at the survey site, although the palms flower and fruit. The absence of seedlings cannot be explained. Based on the fact that populations of this palm are likely to be reduced by 50% over the next three palm generations due to actual or potential levels of exploitation, the category of Endangered is assigned to *Coccothrinax barbadensis* in Dominica. Although the category of threat is not known with certainty outside of Dominica, we are aware of reports of dwindling populations of this palm in St. Lucia and Barbados, also as a result of over-exploitation.

The leaves of *Coccothrinax barbadensis* are widely used in several communities along the windward side of Dominica, and this is one of the two most widely used species of indigenous palm on the island. The healthy mature leaves of juvenile, sub-adult and adult palms are used for making brooms for household use, and this activity provides an important source of income for villagers in the south-east and extreme north of the island (the local name "Balyé" is also the Creole word for broom). The sword leaves are used for making hats, while place mats and coasters are fashioned from the expanded leaves.

Coccothrinax barbadensis is reported from Puerto Rico, the Lesser Antilles, Trinidad and Tobago, the Virgin Islands and an island off the coast of Venezuela (Henderson et al. 1995).

Euterpe broadwayi – Palmist (Fig. 2)

This palm is relatively common at sites above 750 m elevation. Much of the extent of its occurrence lies within the Northern Forest Reserve, and the Morne Trois Pitons and Morne Diablotin National Parks. We found abundant evidence of seedlings and juveniles at the site we visited in the heights of Morne Rachette, a finding that suggests the palms are reproducing and regenerating. We assigned this palm to the category of Lower Risk—least concern

The Dominican population of this species was previously thought to represent an endemic species, *Euterpe dominicana* L.H. Bailey (Tab. 1). Henderson and Galeano (1996) synonymized the name under *E. broadwayi*, a species that also occurs in Trinidad, Tobago, Grenada and St. Vincent. Oddly enough, Henderson and Galeano reported that *E. broadwayi* usually has clustering stems and is rarely solitary. All of the individuals observed by us had solitary stems.

In Dominica, the edible bud of *E. broadwayi* is referred to as "chè-palmis" which literally means "heart of Palmist." The leaves of this palm are used in some of the north-eastern villages for broom-making.

Geonoma interrupta var. *interrupta – Yanga*

As with the preceding species, *Geonoma interrupta* var. *interrupta* (Fig. 3) is common at the site we visited, which lies above 750 m elevation. It too grows in areas that lie within the Northern Forest Reserve, the Morne Diablotin National Park and the Morne Trois Pitons National Park. We found abundant evidence of seedlings and juveniles at the site, a finding that suggests the palms are reproducing and regenerating. We categorized it as Lower Risk – least concern.

Although we encountered thousands of seedlings, a very small percentage survives to adulthood. We were unable to ascertain what factor(s) caused mortality of seedling palms of this species, although the foraging activities of feral pigs may play some role. This species is described by Henderson et al. (1995) as solitary or clustering with few stems. Our observations confirm that this palm is weakly clustering. Clearly, reproductive potential is both sexual via seeds and asexual via suckering.

A second species of *Geonoma*, *G. undata*, occurs at high elevations in Dominica. We were unable to visit these sites and assess its conservation status. Outside Dominica, *Geonoma undata* occurs in Central and north-western South America. *Geonoma interrupta* var. *interrupta* is equally widespread (Henderson et al. 1995).

Acrocomia aculeata – Glou-glou, Gouglou

This palm is confined to drier sites on the western side of Dominica. Although we found adult palms with fruits (Fig. 4), the fruits were dropping to the ground and were not being dispersed. The agent of dispersal is presumed to be animal, but animals

large enough to handle the fruits of *Acrocomia* are few in Dominica. We saw no seedlings or evidence of regeneration. Moreover, the site is heavily degraded and invaded by lemon grass or mulch (*Cymbopogon citratus*). As *Acrocomia* requires light for establishment, it is likely that the dense cover of lemon grass is preventing palm seedling growth and regeneration.

Because the extent of occurrence is estimated to be less than 100 km², because the number of

Facing page:
2 (upper left). *Euterpe broadwayi* at Morne Rachette Heights in the Northern Forest Reserve. (Photo S. Zona). 3 (upper right). *Geonoma interrupta* var. *interrupta* growing in a remnant patch of forest at Syndicate. (Photo S. Zona). 4 (lower left). *Acrocomia aculeata* at Canefield. (Photo A. James). 5 (lower right). *Syagrus amara*, near Morne Espagnol. (Photo A. James).

This page:
6 (below). *Aiphanes minima* at San Sauveur, on the east coast. (Photo K. Maidman). 7 (right, top). *Pseudophoenix sargentii* in the hills above Mero. (Photo A. James). 8 (right, bottom). *Prestoea acuminata* var. *montana* shrouded in mist near Freshwater Lake, above Roseau. (Photo S. Zona).

mature adults is expected to decline and because regeneration is prevented by lemon grass, the assigned category is Critically Endangered.

The pulp and kernel of the fruits of *A. aculeata* are eaten as a snack in Dominica, and the fruits can sometimes be purchased at the fresh produce market in Roseau.

This species is the most widespread of Dominica's palms. It grows from Mexico, through Central America and the Caribbean to much of South America (Henderson et al. 1995).

Syagrus amara – Kokoyé, Overtop Palm

Upon seeing these palms growing above the surrounding forest at Morne Espagnol, we knew how *Syagrus amara* (Fig. 5) acquired the common name "overtop palm." Mature palms easily rise above the low, seasonally dry forest in which they grow. We found no evidence of seed dispersal for *Syagrus*, so as with the preceding species (*Acrocomia*), we are concerned that the animal dispersal agent is missing or rare. Most seeds fall below the parent tree, but establishment and regeneration cannot occur in dense shade. Young plants were found in gaps in the forest. Disturbance of the forest by local people, who harvest wood for fuel, is probably beneficial for the palm, as long as the level of disturbance remains small.

Syagrus amara is one of the two most commonly utilized native species of palm on Dominica. The "straw" made from the boiled spear leaves of this palm are used for making hats, ladies' purses and side bags, as well as bottle wraps.

Because we estimate that more than 1000 mature adults of this palm remain on the island and because this population is relatively stable, we assign the category of Lower Risk – least concern.

Syagrus amara occurs in a few islands of the Lesser Antilles, viz. Martinique, Guadeloupe and St. Vincent, in addition to Dominica (Henderson et al. 1995).

Aiphanes minima – Gwigwi, Macaw Palm

This palm is confined to the wetter side of island; however, even there (Fig. 6), *Aiphanes minima* is uncommon, despite prolific seed production. Local people explained that seedlings and young plants are actively removed from trails, plots, and adjacent lands because the palm is dangerously spiny. Based on the limited area of occupancy and the active threat to the palms from humans, we assign the category of Endangered.

We recently encountered populations of *Aiphanes* in the rain forests in the heights of Bense Village in the Northern Forest Reserve, and have learned of populations on Morne Turner Ridge in the Morne Diablotin National Park, at Stonefield in the Northern Forest Reserve, as well as on Morne Frazer. The palms are significantly less spiny and the trunks are more slender and shorter. The leaflets of seedlings, juveniles and adult palms do not bear spines. The average diameter at breast height (dbh) of 44 palms from two populations combined from Bense Heights was 7.4 cm, whereas the average dbh from 20 of the more spiny and larger palms at San Sauveur was 13.9 cm (maximum encountered dbh was 18.7cm).

These populations of the less spiny and more slender palms may represent a second species of *Aiphanes* in Dominica, although a recent monograph of the genus (Borchsenius & Bernal 1996) recorded only one species of *Aiphanes* from the Caribbean (excluding Trinidad). Alternatively, this population may represent a different morphological form of the highly variable *A. minima*. Its conservation status is unknown (Data Deficient [DD]), but if it is less spiny, it may not be actively removed by local people.

The ripe fruits of the larger and more spiny *Aiphanes* palm are eaten as a snack by children in the San Sauveur area.

Aiphanes minima is also known to occur in Hispaniola, Puerto Rico, Martinique, St. Lucia, St. Vincent and Barbados (Borchsenius & Bernal 1996).

Pseudophoenix sargentii – Buccaneer Palm

Pseudophoenix still occurs in the hills above Mero (Fig. 7), just as Read (1969) said they did. The palms at this site, the only site for the species in Dominica and the Eastern Caribbean, are under active study by Dominica's Forestry Division (James 2003). Although the range is not large, recent surveys of the palm population have documented over 3000 individuals of varying ages in several subpopulations (but fewer than 150 adults). Seed production is good and seed dispersal has been observed. Seedlings are well represented, an observation suggesting that the population as a whole is in good health (although certain subpopulations may not be in equilibrium).

Threats to the population include brush fires in disturbed areas invaded by lemon grass (*Cymbopogon citratus*) and housing construction; however, subpopulations in less disturbed woodland appear to be more secure. As the population is restricted in its area of occupancy and the number of mature adults is less than 250, we assign the category of Endangered.

In the 1960s, the spear leaves of *P. sargentii* were harvested by a small group of ladies, and the "straw" made from the dried, stripped leaves was used for hat-making (James 2003).

Dominica is the eastern-most and southern-most site for *Pseudophoenix sargentii*. Elsewhere, it is found in Mexico, Belize, Cuba, Florida, the Bahamas, Hispaniola and the island of Navassa (Zona 2002).

Prestoea acuminata var. *montana – Palmist moutayn*

The site in which we observed the palm (Fig. 8), Freshwater Lake, within the Morne Trois Pitons National Park, is protected and an important watershed for the city of Roseau. We were unable to assess regeneration for this palm, although seed production was high. Elsewhere in the Caribbean, *Prestoea acuminata* var. *montana* is a pioneer species. Under natural conditions, it rapidly colonizes landslides and tree fall gaps, and it is unable to regenerate in shade. This is a palm that benefits from disturbance (Frangi & Lugo 1998). We were unable to determine whether the Freshwater Lake area had suitable regeneration sites for this palm; however, natural disturbances (landslides, hurricanes) are likely sufficient for the maintenance of this palm. We classified it as Lower Risk – least concern.

This variety is also found in Cuba, Hispaniola, Puerto Rico and many islands in the Lesser Antilles (Henderson & Galeano 1996).

Discussion

Although the palm flora of the island is small, the taxonomic composition is diverse, with only one genus, *Geonoma*, represented by more than one species. The diversity in the floristic composition reflects Dominica's position in the Caribbean, midway along the arc of volcanic islands comprising the Lesser Antilles. Not surprisingly, elements in the palm flora include those from the northern Caribbean, such as *Coccothrinax* and *Pseudophoenix*, and those from Central and South America (*Aiphanes, Euterpe, Geonoma, Prestoea, Syagrus*). The palm flora of Dominica is an aggregation of genera and species that migrated to the island from both the north and south.

Our conservation assessment of Dominican palms placed the nine taxa in the following IUCN categories:

Extinct: 0 species
Extinct in the Wild: 0 species
Critically Endangered: 1 species (*Acrocomia aculeata*)
Endangered: 3 species (*Coccothrinax*, *Aiphanes*, *Pseudophoenix*)
Vulnerable: 0 species
Lower Risk: 4 species
Data Deficient: 0 species (but see comments under *Aiphanes minima*)
Not Evaluated: 1 species (*Geonoma undata*)

The threats to palms in Dominica were identified as habitat loss, competition with exotic species (viz. *Cymbopogon citratus*), and over-exploitation. Loss of dispersal agents may also figure in the decline of some species, including the critically endangered *Acrocomia aculeata*.

Acknowledgments

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Tracking Down Alcide d'Orbigny's Chonta Palm in Bolivia

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***Astrocaryum chonta* was first described and named based on material collected in Bolivia. In this article, the author attempts to refind the palm in its type locality.**

The famous French naturalist-traveller, Alcide d'Orbigny, was born two hundred years ago and visited South America from 1826 to 1833, collecting 160 mammals, 860 birds, 115 reptiles, 166 fishes, 980 mollusks, 5000 insects and 3000 plants, as well as many fossils and geological pieces for the National Museum of Natural History in Paris (Gioda & Roux 2002). He finally held the chair of palaeontology of this institution and was 55 years old when he died on 30th June 1857. Philosophers of the Enlightenment period in the 18th century deeply influenced d'Orbigny as a studious teenager. Jean-Jacques Rousseau's writings and the myth of the noble Savage in particular drove the still young New World explorer to observe Amerindians' customs and habits fervently. The importance of the palms in their daily life could not escape him.

The palms collected by d'Orbigny were studied by Martius (1844) who named and described 34 new species, among them *Acrocomia totai*, *Attalea princeps*, *Euterpe precatoria*, *Geonoma brongnartii*, *G. jussieuana*, *G. orbigniana*, *Iriartea lamarckiana* (= *Dictyocaryum lamarckianum*), *Oenocarpus tarampabo*, *Trithrinax chuco* (= *Chelyocarpus chuco*), *Astrocaryum huaimi* and A. *chonta*. According to Glassman (1972), 18 of the 34 type specimens were still conserved at Paris Herbarium, while the others were impossible to locate.

A type specimen is a plant voucher collected from a single individual and designated as the standard for a species name. An identification obtained from a comparison with the type material is generally more reliable than one matched from descriptive words, or even a drawing. The loss or the destruction of a type specimen generates confusion that can baffle the taxonomist. The problem remains solvable when the collector provides good data on the locality where the material was collected. Looking for a species in the type locality is usually successful, and taxonomists proceed in this way to complete data or to collect new material when the type is no more available.

Dealing with *Astrocaryum* taxonomy I had to observe the type of *Astrocaryum chonta* (*d'Orbigny 15*). Some fruits collected by d'Orbigny are still conserved in the carpotheca (fruit collections) in Paris Herbarium and labeled "F628, *Astrocaryum chonta* Martius, palmier chonta, Santa Cruz, M. d'Orbigny." Leaf parts and flowers were not found.

Then, in June 1995, I successfully tracked down the chonta palm in the Bolivian forests where d'Orbigny had first reported it.

What I knew of d'Orbigny's chonta palm

According to Martius (1844), the species was first collected by Pavón in Peru – "*in Peruvia lecta est a*

1. *Astrocaryum chonta* (1 – juvenile; 2 – adult) and other palms in an idyllic Amazonian landscape by d'Orbigny.

Pavonio, cujus specimen, floribus destitutum, nunc in Herbario cl. amici Barker Webb conservatur" (collected in Peru by Pavón, specimen without flower, now conserved in Barker Webb's herbarium).

We found it in the lower Ucayali valley in the Peruvian Amazon (Kahn & Millán 1992). It commonly grows on periodically flooded alluvial soils, where forms dense stands (Kahn & Granville 1992). The characters of the pistillate flower –

calyx cupular, corolla twice as long as calyx, staminodial ring membranous, low in the corolla, free at margin, minute 6-denticulate – as well as those of the fruit and perianth, correspond very well with the description by Martius and to the detailed drawings of staminate and pistillate flowers and of fruit.

Astrocaryum chonta (Fig. 1) is a medium-sized, single stemmed palm, reaching up to 15 m in height. The leaves are up to 7 m long with about 100 pairs of pinnae regularly arranged in one plane. The inflorescence and infructescence are erect between leaf bases. The fruit is elongate-obovate with the pericarp covered in hairs; the mesocarp is usually floury and not very fleshy at maturity. D'Orbigny, however, noted that the fruit had a very fleshy mesocarp at maturity. This contradictory point will be discussed below.

The ecology of the palm was reported by d'Orbigny in the following terms: "La chonta des habitans de Santa Cruz de la Sierra croît, par cantons seulement, au plus épais des bois humides, tant au bord des rivières, que loin de celles-ci dans les forêts inondées." (The chonta of the inhabitants of Santa Cruz de la Sierra grows only in patches, deep in the heart of the wet forests, on river margins as well as, far from these, in flooded forests).

Searching fruitlessly for the chonta palm in Bolivia

The locality on d'Orbigny's specimen label refers to "Santa Cruz" only. Nevertheless, d'Orbigny's comments after the description of *Astrocaryum chonta* by Martius provide more information on the region where he saw the palm. He wrote: "Je l'ai vue principalement aux environs de Bibosi, près de Santa Cruz (Bolivia), au pays des sauvages Guarayos, entre les provinces de Chiquitos et de Moxos, sur les bords des rivières, près de Loreto (Moxos) et sur le cours du Piray." (I have mainly seen it in the area around Bibosi, near Santa Cruz (Bolivia), in the region of the Guarayos savages, between Chiquitos and Moxos provinces, on riverbanks, near Loreto (Moxos) and along the river Piray).

The name Bibosi is no longer used on the current maps. It was found on an old map, spelt as Vivosi, at a place currently called Montero, a small town at about 60 km north of Santa Cruz. Driving through Montero by the main street I noted a small refreshment stall called "Vivosi bar" as if to confirm that I was on the right way to the chonta palm. The landscape had been drastically disturbed since d'Orbigny's stay in the region; the deep forests had disappeared and sugar cane fields seemed to stretch out endlessly. A small group of three *Astrocaryum* palms was finally found growing near a small stream.

And finding a relative species at Bibosi

I did not find *Astrocaryum chonta* near Montero. The species found – also called "chonta" in the region – was *Astrocaryum gratum* Kahn & Millán. Parts of a leaf and a dry inflorescence still bearing abortive pistillate flowers were collected (*Kahn & Moussa* 3592, CEN). The pistillate flower is characterized by the calyx ovoid to pear-shaped, clearly longer than the corolla; it cannot be confused with that of *A. chonta*, the calyx of which is cupular and clearly shorter than the corolla. *Astrocaryum gratum* was described from Madre de Dios, Peru. This species is also frequent in Beni, Bolivia.

Astrocaryum chonta was found again in the region of Santa Cruz. I identified material of this species (*Nee 36034*, BH; *Saldias sn*, NY) collected in 1988 and 1989 in Amboro National Park near Ichiola by Rio Saguayo, about 200 km air distant from Montero. The fact that d'Orbigny did not distinguish the two species during his stay in Santa Cruz is not at all surprising. Both species were unknown to botanists when d'Orbigny visited those regions of South America, and their habit is similar enough to make a non-specialist mistake one for the other. How could he have distinguished them? He collected material of *Astrocaryum chonta* and probably assumed that all the chonta palms growing in the region belonged to a single species. The fruits conserved in Paris Herbarium as well as the flowers and fruit drawn by d'Orbigny undoubtedly belong to *Astrocaryum chonta*. It cannot be excluded, however, that observations from both species have been mixed in his comments. As he noted for the fruit of the chonta palm: "son fruit [...] est pourvu d'une pulpe charnue, jaune d'un goût très sucré, mais d'une saveur peu agréable ; on ne le mange pas dans le pays" ("its fruit [...] has a fleshy, yellow pulp, with a very-sweet taste, but the flavor is not very agreeable; it is not eaten in the country"). This description corresponds better to the fruit of *Astrocaryum gratum* than that of *A. chonta*, the mesocarp of which is somewhat floury and not so fleshy. Furthermore his drawing of the adult palm bearing a slightly pendent bunch with yellowish ripe fruits is more reminiscent of *A. gratum* than of *A. chonta*.

Moreover *Astrocaryum chonta* and *A. gratum* both grow in wet areas. They differ in their ecology in a way perhaps too subtle to be caught by a generalist, as d'Orbigny was in respect to botany and plant ecology. The former species is strictly

located on alluvial soils regularly flooded by rivers, while the latter species is found on seasonal swamp borders, as well as on poorly-drained sandy soils. The presence of two *Astrocaryum* species within a region in two adjacent ecosystems, respectively, is rather common. This is the case in wet forests on low terraces in the lower Ucayali valley in Peru where *Astrocaryum javarense* grows close to swampy areas within a few hundred meters of dense stands of *Astrocaryum chonta*, these located on the alluvial riverbanks.

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PALM LITERATURE

AN ENCYCLOPEDIA OF CULTIVATED PALMS. Robert Lee Riffle and Paul Craft. Timber Press, Portland, Oregon, USA. 2003. ISBN: 0-88192-558-6. US $49.95, hard bound, color dust jacket. pp. 528.

I always open a new book or other publication about palms with much excitement and anticipation about what I will find inside. I am always hoping for the perfect palm book, one that will provide an easily accessible, accurate, informative, descriptive, concise and well illustrated account of palms.

I was very pleased when I opened and skimmed through *An Encyclopedia of Cultivated Palms*. It is clearly the best popular account of palms to date. Comprehensive in its coverage, it is lavishly illustrated with over 900, for the most part, good quality, color photographs and has text describing nearly 900 species of palms. Slightly more than 500 of these species are illustrated with photographs.

The book has a preface and brief introduction and then presents the photographs, all grouped together from pages 21 through 240. Text describing the genera and species covers pages 241 through 476. Closing the book are a pronunciation guide to botanical names, landscape lists where species are grouped by cultural requirements and use, notes on seed germination, an imperial/metric conversion chart, a briefly illustrated glossary, a bibliography, a list of where the photographs were taken, and an index of botanical and common names.

Our knowledge of palms is vastly and rapidly expanding and a number of popular palm books have come out over the last 15 years or so. With few exceptions, each book has improved on the previous one. So I think we are moving in the right direction, and *An Encyclopedia of Cultivated Palms* continues this trend.

Unfortunately, there are a few errors in identification of some of the palms in the photographs. Because this book will be much read, it is important to have the photographs properly identified. These are the errors or other likely problems I noted:

Plate 41. This palm is *Areca catechu*, not *A. latiloba* as captioned, because the stem is too robust and leaves are too upright and rigid.

Plate 42. The palm captioned as *Areca latiloba* is probably not an *Areca* because the leaf sheath margins are fibrous and too open. Regardless, the correct name for *A. latiloba* is *A. montana*.

Plate 104. Although captioned as *Bactris militaris*, this palm is probably *B. neomilitaris*, a recently named species of similar appearance that differs in floral and fruit details, has whitish spines on the underside of the leaf rachis, is on the opposite side of Costa Rica and is easier to collect than *B. militaris* and whose seeds have been widely distributed.

Plate 111. Captioned as *Basselinia gracilis*, this palm looks like a *Pinanga* because of the united apical segments with toothed apices. It is probably one of the Philippine species.

Plate 114. Because of the several, well spaced, conspicuous primary branches, whitish color, and spreading nature of the inflorescence, the palm captioned as *Basselinia velutina* is probably *B. favieri*.

Plate 131. The specific epithet "*aethiopium*" is misspelled. It should be *aethiopum*.

Plate 133. Captioned as *Borassus flabellifer*, this palm is probably *Bismarckia nobilis* because of its intensely silver-gray leaves.

Plate 173. Due to the jagged leaflet apices, the palm captioned as *Calyptrocalyx hollrungii* is a *Veitchia* or *Drymophloeus* or in another genus of the *Ptychosperma* group.

Plates 200-202. Captioned as *Caryota maxima*, this palm is *Caryota gigas* or *C. obtusa* because the leaves are tightly clustered in a spreading crown at the top of the trunk.

Plate 229. The palm captioned as *Chamaedorea graminifolia* is *C. schippii*.

Plate 240. Due to the numerous, stiffly upright rachillae and elongated stem with short internodes, the palm captioned as *Chamaedorea radicalis* is *C. elegans*.

Plate 358. Because the peduncle is as long as the branched part of the inflorescence, the palm captioned as *Drymophloeus subdistichus* is probably *D. pachycladus*.

Plate 367. While I am not sure of the correct name of this palm, it is not *Dypsis ceracea*, which has moderate stems with abundant white wax and leaves with neatly grouped leaflets.

Plate 431. Captioned as *Gronophyllum ramsayi*, this palm is a species of *Archontophoenix*, perhaps *A. purpurea*, because of the leaflets in one plane, colored crownshaft, and basally flared trunk.

Plate 436. Due to the fruits clustered at the base of the rachillae, this palm captioned as *Gulubia microcarpa* is a species of *Areca*.

Plate 533. I doubt that the palm pictured is *Licuala triphylla*, as captioned, because the folds of the leaf segments and the teeth at the tips are too large and coarse.

Plate 601. Because of the clustered pinnae and spiny petioles, this palm cannot be *Neonicholsonia watsonii* as it is captioned. It is likely to be a species of *Bactris* or a *Calamus*.

Plate 660. By virtue of their spines, these fruits are of *Astrocaryum*, not *Phytelephas* as captioned.

Plate 668. This palm is not *Pinanga caesia*, as captioned. It is not even a *Pinanga* because of the absence of a crownshaft and the terminal leaflets lack toothed apices. It may be *Oenocarpus*, *Welfia*, or some Madagascar palm.

Plate 769. Although this palm is cultivated in California and Florida as *Rhapis laosensis*, it might be another species because its leaf has only a few segments.

Plate 780. This palm is certainly not a *Roystonea*, as captioned, but is probably a *Veitchia* or another member of the *Ptychosperma* group because of its jaggedly toothed leaflet tips.

Plate 786. Not *Roystonea regia* as captioned, this palm is likely to be *Wodyetia bifurcata* because of the large, orange-red fruits.

Plates 808 and 809. Although both are captioned as *Salacca zalacca*, there are some substantial differences between the two in habit and in length and color of petioles and spines, suggesting they are different species. The palm in Plate 808 may be an *Astrocaryum*.

Plate 866. Captioned as *Synechanthus fibrosus*, this palm is *Chamaedorea pinnatifrons* because of the broadly sigmoid leaflets and short infructescence with small, yellow fruits.

While the photos are nearly all of good to excellent quality, several are underexposed and a few are not sharp, indicating improper focus or printing error. One frustrating aspect of other popular palm books was that photographs frequently only illustrated small, juvenile palms of some species (sometimes with just a leaf or fruits), which tells us next to nothing about the plant. This practice occurs about 15 times in *An Encyclopedia of Cultivated Palms*. A good example is the palm in Plates 55 and 56. While this palm could well be *Arenga brevipes*, as captioned, it could also be a *Wallichia*. It is a good example of a photo of a juvenile palm that does not present diagnostic features.

In some instances the photographs are superfluous. It is probably unnecessary to have three photographs illustrating the habit of one species, for example, with *Adonidia merrillii*, *Aiphanes minima* and *Livistona rotundifolia*, among others. Eliminating one or two of these would free up valuable space for photographs of special features helpful in identifying the palm or for adding additional species.

While less expensive to print, gathering all the photographs in one continuous section of the book is annoying because it requires the reader to page back and forth between the text and photographs. The lack of detailed information in the captions about where the palms were photographed was also annoying. One must page back to the section on photo locations near the end of the book (even here information for some photographs was lacking).

My feeling about the text is that it is overly long and verbose although generally well written. Frequently the reader must wade through a long paragraph to find critical information about height or leaf size, for example. By employing a more abbreviated format, perhaps with critical information in bold or italics, these species accounts could have been shortened and tightened up considerably, thus leaving the prose for instances when the abbreviated format is inadequate, such as describing differences between similar-looking, easily confused species or other characters or features of particular importance.

Much of the cultural information in the species accounts is redundant. Nearly all palms do best in a well drained soil with abundant organic matter and regular irrigation. Likewise, most medium to large, solitary palms can be effectively used in the landscape as a single specimen or as groups of three or more individuals of varying height. Similarly, most understory palms need shade and protection from the wind, especially those with large, undivided leaves. These recommendations and similar information common to most species could easily have been included in an expanded section in the introduction or in a separate section on selection and culture of landscape palms.

Although synonyms appear in the index, the book would have benefited greatly with the more common synonyms listed with each species. For example, if one desires to know the synonyms of *Chamaedorea elegans*, it is necessary to scroll down the entire listing of *Chamaedorea* entries. Even then, though, synonyms of *C. elegans* listed under other genera will be missed.

Some categories in the landscape listings at the back of the book are useful, such as those that list palms for a particular function. However, I question the validity of other lists, such as

drought, alkaline, and salt tolerant and water-loving species. There is little research-based information supporting the composition of these lists. Anecdotal information can be valid or wildly inaccurate. If the authors had access to research-based information, they should have referenced it in the bibliography.

The notes on seed germination at the back of the book could have been shortened and tightened up significantly. Each genus listing informs the reader to see the notes under one of about 10 other genera. The eight pages devoted to this section could have been easily reduced to a brief discussion and table or list format without losing content.

Much of the saved space from these suggestions would have let the authors expand the brief introduction to include significantly more information about palm biology and selection, culture, and management of these plants in the landscape. Conspicuous by its absence is information about planting, irrigation, nutrition, pest and disease management, and some other pertinent cultural practices. A book that will be so popular and widely read should contain this information.

In summary, *An Encyclopedia of Cultivated Palms* has no peer in the world of popular palm books, and should be on the shelf of everyone who has an interest in palms. By all means, buy it!

DONALD R. HODEL
University of California
Los Angeles, California

CLASSIFIED

Palm Research in 2002

COMPILED BY
ANDREW HENDERSON
New York Botanical Garden, Bronx, NY 10458

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Evolution and Ecology of Palms. ANDREW HENDERSON. 2002. New York Botanical Garden Press. ISBN 0-89327-444-5. 259 pages. Price $35.00.

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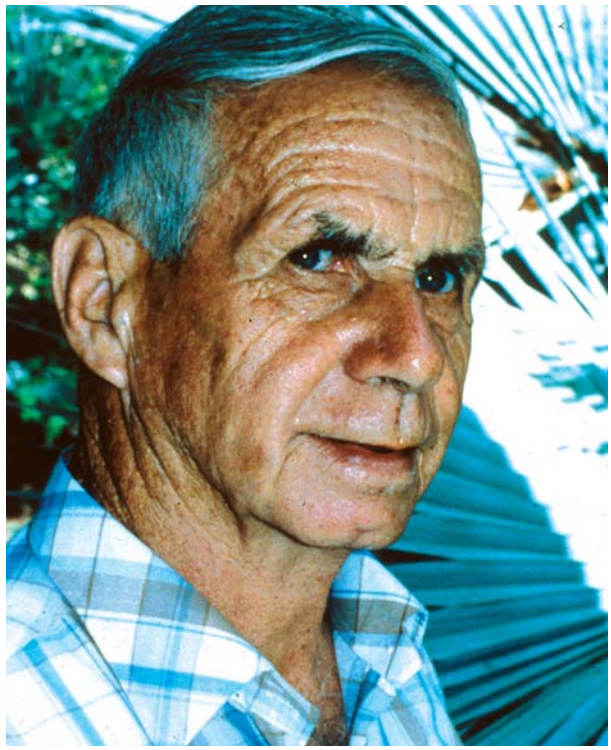
OBITUARY

August Braun Allenspach (1921–2003)



August Braun (Photo: Bruno Manara).

To describe the work and the life of August Braun is not an easy job; it is probably as difficult as describing his complex and often cryptic personality. Those who knew and appreciated him were from the beginning highly impressed by his immense professional capacity and his great love for Venezuela and its flora. From his arrival in Venezuela in 1951 he was keenly interested in the tropical vegetation and particularly by the palms, which at that time were rather poorly known. August felt a special fascination for the beauty of the native palm species and he carried out countless studies on germination and cultivation, all of them with the purpose of promoting their cultivation among gardeners, botanical gardens and private collectors.

Today the work of August Braun can be visually appreciated through the current magnificence of the Caracas Botanical Garden, one of the most diverse and best planned gardens in South America. The palm collection alone contains more than 200 species from all over the world. His countless field trips and the cultivation of ever more valuable palms covered a span of almost 40 years; however, this did not hinder the development of a prolific scientific output that included up to 12 books, all of them beautifully illustrated, and 12 articles in botanical journals. Thus, his background as gardener was never a limitation for the crucial influence of his studies on the current ecological, morphological and taxonomic knowledge of Venezuelan palms. A short introduction to the impressive life and work of August was published in 1999 in *Acta Botanica Venezuelica* (22: 1–44).

The love that he always felt for Venezuela and its flora can be only described with his own words "Venezuela is the country that I could never leave, for more than a half century it offered to me all possibilities to be happy. Switzerland was my first homeland, the one that gave me my educational basis; Venezuela is my second homeland, the one that gave me all for my professional and personal development." His friends and pupils regret the death of August and paid homage during the burial of his ashes in the fields of the Caracas Botanical Garden, his home and definitively favorite place on this planet.

Fred Stauffer
Zürich

Photo Feature – *Nypa fruticans*

This palm, the lone species from an ancient lineage, demonstrates its unique reproductive characters. The showy catkin-like male inflorescence and the clustering carpels of the female flower produce a large, tightly packed head of fruit reminiscent of a satin-finished wood carving. A mangrove palm that prefers warm, humid tropical regions, *Nypa* relies on saltwater not only to provide its heavy moisture requirements but to distribute its floating seeds. Although the *Nypa* reproduces prolifically in Asia and the western Pacific, Montgomery Botanical Center in Miami, Florida, is the only place in the USA reporting successful propagation of the plant.

Mary Andrews
Montgomery Botanical Center, Miami , Florida, USA

OBITUARY

ROBERT WILLIAM READ (1931–2003)

Dr. Robert (Bob) Read of Naples, Florida, died 15 July 2003, of complications from pneumonia and heart disease. He was 71 years old.

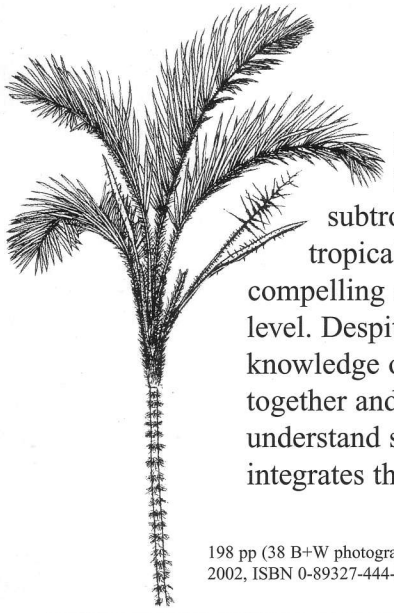
Dr. Read, botanist, author and longtime member of the International Palm Society, was borne in Woodbury, New Jersey in 1931. He graduated in 1958 from the University of Miami. At Cornell University he studied under Dr. H.E. Moore and earned his M.S. degree; his thesis was a taxonomic study of the genus *Pseudophoenix*. He received his Ph.D. in Jamaica at the University of the West Indies in 1968; the genus *Thrinax* was the topic of his dissertation.

Dr. Read worked at Fairchild Tropical Garden in Coral Gables, Florida, from 1961 to 1965, and in 1968 he became a member of the botany staff at the National Museum of Natural History of the Smithsonian Institution in Washington, D.C., where he remained until his retirement in 1989. He studied palms in Cuba, Hispaniola, Jamaica, Costa Rica, Mexico, Sri Lanka, Bahamas and Hawaii, and described several new species including *Coccothrinax inaguensis*, *C. jamaicensis*, *C. proctorii* and *Colpothrinax cookii*. Some of his other publications discussed seedling culture, pollen storage, palm chromosomes and palm ecology. In 1980, Dr. Hermilo Quero named *Coccothrinax readii* from the Yucatan Peninsula, Mexico, in Dr. Read's honor.

His other botanical interests included orchids and bromeliads, and in fact, he described many new species of bromeliads, based on the collections at the Smithsonian. During his tenure at Fairchild Tropical Garden, he established the herbarium, taught classes on bromeliads, palms and flowering vines, and testified in a court case in San Antonio, Texas. Read was called as an expert witness in a case brought by the city of San Antonio against a landscape contractor who sold cold-tender *Washingtonia robusta* palms to the city when the contract specified *Sabal*. When the palms were subsequently killed by cold weather, Read testified that the palms were *Washingtonia*, not *Sabal*, and the city won its case.

Bob Read as a scientist contributed to the greater understanding of the family of palms; as a grower he enjoyed the creation of both his own garden and a new botanical garden in Naples, Florida; as a friend he shared generously his love of all plants. He will be missed.

LIBBY BESSE
Sarasota, Florida, USA



EVOLUTION AND ECOLOGY OF PALMS

Andrew Henderson

Palms are among the most abundant, diverse, and economically important families of plants found in the tropical and subtropical regions of the world. The large number of species, tropical habitats, and diversity of palms combine to produce a compelling subject for the study of evolution and ecology at the family level. Despite their appeal and economic importance, there is limited knowledge of many aspects of the family. In this work, Henderson brings together and analyzes the relevant literature and data in an attempt to understand something of the evolution and ecology of the palm family, and integrates this disparate knowledge into a cohesive whole.

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