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Contents for July

Cover Picture

Pauleen Sullivan, Vice President of The International Palm Society, in one of her gardens, *Hedyscepe canterburyana* and *Trithrinax acanthocoma* in the background. See pp. 124–128.

PRINCIPES

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Astrocaryum confertum, an Enigmatic Costa Rican Palm Rediscovered

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Reference to the palm now known as *Astrocaryum confertum* H. A. Wendl. ex Burret first appeared as an enigmatic note in Hemsley's *Biologia Centrali-Americani* (1885), an early compendium of Middle American biota. The reference reads "*Astrocaryum polystachyum* Wendl. ined?, Costa Rica, Rio Sarapiqui (Wendland) Hb. Kew." The name has never been validly published. Nonetheless, the name was taken up by Standley (1928), who saw neither the palm nor specimens. The Kew specimen was seen by Bailey (1933) who recognized it as distinct from *A. standleyanum* Bailey and put it aside for further study. In his monograph of the genus *Astrocaryum*, Burret (1934) described *Astrocaryum confertum* based on a Wendland collection and credited the name to Wendland. The holotype is not among Wendland's collections at GOET, and was presumably destroyed at B during World War II, along with most of Burret's material. The Kew specimen cited above is presumably an isotype. Its label lacks "Mai" and "Eingeborenenname zurubre," data which are in Burret's original description and must have appeared on the label of the holotype.

Since the time of Burret *A. confertum* has been referred to in the literature by Dahlgren (1936), based on Burret (1934) and the questionable citation by Standley (1928), Loomis (1939), and Glassman (1972), based on Dahlgren. Standley (1937) reports *A. confertum* from Costa Rica, but the description actually seems to refer to *A. alatum* Loomis ("plants 2–3 m, fruits globose, forming dense, pendent panicles"), a species not described until 1939. An herbarium search at A, BH, CAS, CR, DUKE, GH, F, K, MO, PMA and US has turned up no modern collections definitely referable to *A. confertum*. A photograph at BH taken by Langlois in 1945, of a palm from "between San Miguel and La Virgen," Costa Rica, is almost certainly *A. confertum*. *Moore 6634* (BH), "between Corazon de Jesus and La Virgen, Prov. Heredia, Costa Rica," is probably *A. confertum*. It consists of juvenile leaves only, but the collection notes and the locality are indicative of *A. confertum*.

In recent literature, a tall spiny palm of the genus *Astrocaryum* from the wet lowlands of northeastern Costa Rica has been treated as *A. standleyanum* (Moore 1973, Hartshorn and Poveda 1983, Chazdon 1985). These reports are problematic to workers familiar with *A. standleyanum* from Panama or southwestern Costa Rica who have seen the *Astrocaryum* from northeastern Costa Rica. *A. standleyanum* has a long, pendant infructescence, whereas the infructescence of the northeastern Costa Rican plant is stiffly erect and much shorter. There is no voucher specimen of *A. standleyanum* or of *A. confertum* at BH or DUKE from the Atlantic slope of Costa Rica. While preparing a treatment of the palms for Flora Costaricensis, Grayum encountered the name *A. confertum*, based on a collection

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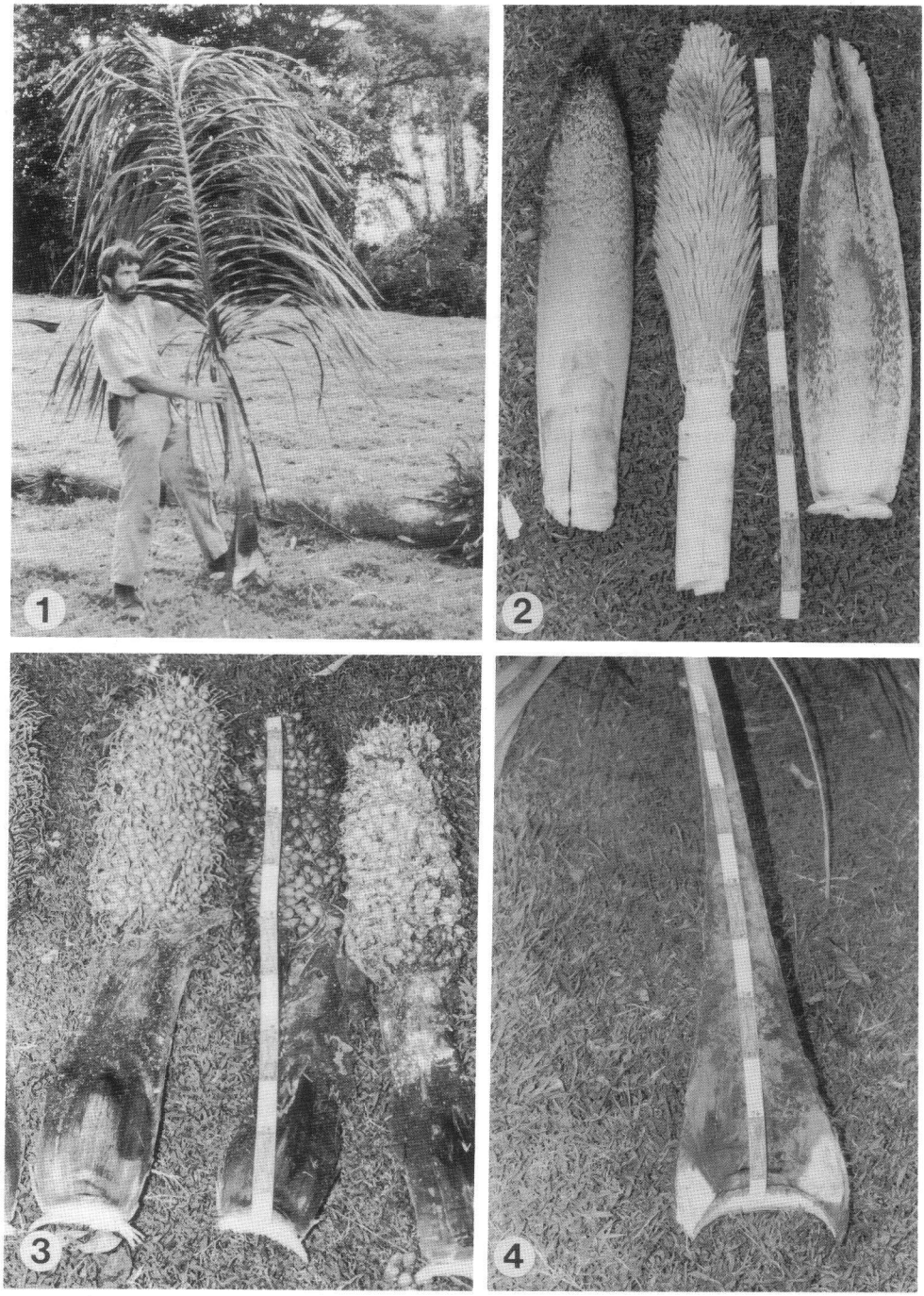
from northeastern Costa Rica. With this background in mind, we recently searched the wet lowlands of northeastern Costa Rica to locate *Astrocaryum confertum* and verify that it is distinct from *A. standleyanum*.

We observed *A. confertum* at Finca El Bejuco, near the type locality, but felt it inappropriate to collect such a massive plant on the tiny reserve. A suitable individual was located in the same region near La Virgen, a *campesino* was hired to cut the palm down, and *A. confertum* was collected for the first time in 129 years. *Astrocaryum confertum* was subsequently collected in Limon Province, Costa Rica, and San Blas, Panama. The palm is here fully described and illustrated (Figs. 1–4) for the first time based on the isotype from K and the three recent collections.

Astrocaryum confertum *H. A. Wendl. ex Burret*, Die Palmengattung *Astrocaryum*, Feddes Repert. Spec. Nov. Regni Veg. 35: 136–138, 1934. Type: Costa Rica, Heredia, along the Rio Sarapiqui, May 1857, *Wendland s.n.* Holotype ?B (destroyed); isotype K!

Astrocaryum polystachyum H. A. Wendl. Biologia Centrali-Americani, Botany III, 414, 1885.

Stem solitary, 10.8–17.2 m tall to the lowest leaf base, 14–20 cm dbh, profusely spiny on the internodes, spines to 17 cm long. Leaves 5–12; sheath 55–60 cm long, 15–26 cm wide, 8 cm thick, spiny outside; petiole 70–80 cm long; rachis 290–350 cm long with 114–123 pinnae per side. Inflorescence interfoliar, straight, erect in flower and in fruit, closely appressed to the stem; peduncle 30–37 cm long from insertion of the prophyll to insertion of the peduncular bract; prophyll 10–11 cm wide at base, 16–17 cm wide at middle, 80–82 cm long; outer surface of prophyll brown with scattered, flattened black spines 15–20 mm long mixed with abundant 4–7 mm long brown, rather soft, hairlike spines; inner surface of prophyll yellowish with scattered black spines and few brown spines; margins and apex paper thin; bract rotting away with age; peduncular bract 93–98 cm long, tapered to a thick, flattened point, 30 cm broad at center when open, mounted obliquely on the peduncle, heavily spiny in distal half, less so proximally; outer surface minutely brown-furfuraceous, clothed in flattened, black spines 6–43 mm long, also with round, white spines 3–9 mm long; inner surface smooth, white, waxy; rachillae numerous, 13–19 cm long, bearing triads of 2 staminate flowers and 1 pistillate flower in the proximal portion, and staminate flowers only in the distal portion; triad bearing portion of rachillae 6–9.5 cm long, densely hirsute with long unbranched trichomes; triads distant, subtended by 3 unequal bracts 5–10 mm long; staminate portion of rachillae 7–10 cm long, with axis elaborated into a continuous, glabrous, smooth green sheet in which staminate flowers are half immersed in bud; each staminate flower subtended by a narrow, flat, awl-shaped bract 4–6 mm long; bract filamentous at apex with capillary hairs; staminate flowers with 3 sepals, these long triangular, laciniate at the tip, united briefly at the base, 1.5–2 mm long, white to purple; petals 3, valvate, 4–6 mm long, purple in distal half, glabrous; stamens 6, filament 3–4 mm long, purple in distal half, white proximally; anthers versatile, united in upper half, free below, dehiscing introrsely, yellow and exserted from the petals at anthesis; pistillode minute, 3-lobed; staminate flowers of triads with 6 stamens, slightly smaller than the upper staminate flowers, possibly fertile; pistillate flowers white, the sepals and petals united into 2 concentric tubes; staminodial ring cup-shaped with purple rim, 1–2 mm deep, minutely 6-lobed; sepals 11–15 mm long, 4–6 mm wide, 3-lobed at apex, the lobes profusely and minutely laciniate; tube covered in flat brown, lanceolate hairs amid a tangle of arachnoid pubescence, finely vertically striate with-



1–4. *Astrocaryum confertum*, bars equal 10 cm., *de Nevers & Hammel 7820*. 1. Leaf, and epiphyte covered trunk. 2. L. to R., peduncular bract, young inflorescence, and prophyll. 3. Infructescences. 4. Leaf base.

out, the inner surface smooth; petals united, tubular, 11–15 mm long, the pubescence identical to that of the sepals, 3-lobed, the lobes laciniate; ovary elongate, 10–14 mm long, 3–4 mm wide at base, minutely pubescent; stigmas 3, 1–2 mm long, spreading; fruit orange, 3.3–3.7 cm long (including narrow, pointed stigmatic residue 4–7 mm long), 1.8–2 cm wide, minutely and impalpably spinescent; pulp sweet, fibrous, 2–3 mm thick; endocarp very hard, black, 1–1.3 mm thick; endosperm white, homogeneous; seed ovoid, 2.5 cm long, 1.5 cm wide.

Common Names: "zurubre" Costa Rica (Burret 1934); "coyolillo" Costa Rica, "pina-pina" Panama (Standley 1928); "coyolito" Costa Rica (Dahlgren 1936); "pejiballe de montana" Costa Rica (*Stevens & Montiel 24624*).

Specimens Examined: Costa Rica. Heredia: along the Rio Sarapiqui, 1857, *Wendland s.n.* (K! isotype); 5 km SW of La Virgen, 250 m, 10′23″N, 84′10″W, 4 June 1986, *de Nevers & Hammel 7820* (CAS, CR, MO). Limon: Cerro Coronel, E of Laguna Danto, 20–170 m, 10′41″N, 83′38″W, "pejiballe de montana," 15 Sept. 1986, *Stevens & Montiel 24624* (CR, MO). Panama. Comarca de San Blas: Cerro Obu, 400 m, 9′23″N, 78′48″W, 24 June 1986, *de Nevers & Herrera 8000* (CAS, MO, PMA).

Astrocaryum confertum is known only from specimens from the Atlantic slope of Costa Rica and Panama, between 20 and 250 m. It is probably much more common than these meager gatherings indicate, but is rarely collected because of its size, armature and wet forest habitat. We suspect it will eventually be found to range from Nicaragua to the Colombian Chocó in wet forests of the Atlantic slope. Although *A. confertum* and *A. standleyanum* occur within a few kilometers of each other on the Atlantic slope of San Blas, Panama, they occur in different forest types: *A. standleyanum* in Tropical Moist Forest (Holdridge et al. 1971) and *A. confertum* in Tropical Wet Forest. In Costa Rica *A. confertum* is known only from the Atlantic slope, and *A. standleyanum* only from the Pacific slope, both mainly in Tropical Wet Forest.

Astrocaryum confertum is broadly similar to *A. standleyanum* in habit, fruit, and the structure of the rachilla. *Astrocaryum alatum* Loomis and *A. mexicanum* Liebm. are distinctive in their shorter stature, the disposition of the pistillate flowers, staminodes adnate to the corolla, and longer spines of the fruits. The four Central American species of *Astrocaryum* can be separated using the following key:

1. Fruits leathery, unarmed or with small scalelike spines; pistillate flowers produced on rachillae, below the staminate flowers; main axis of inflorescence without flowers; plants 5–17 m tall; leaf bases cleanly deciduous, the trunks armed with rings of stout spines 2
   2. Infructescence erect, straight; fruits 3.3–3.7 cm long, with small scalelike spines; seed 2.5 cm long; staminate flowers half sunken in the rachilla, stamens included ..... *A. confertum*
   2.′ Infructescence pendant, the peduncle recurved; fruits 4–4.6 cm long, glabrous; seed 3.2 cm long; staminate flowers not immersed, stamens exserted ..... *A. standleyanum*
1.′ Fruits conspicuously armed; pistillate flowers produced on main axis of inflorescence, rachillae staminate; plants 1.5–6 m tall; leaf bases persistent or deciduous 3
   3. Leaf bases deciduous, the trunk armed with stout spines; fruits broadest at center, gradually tapered to the tip ..... *A. mexicanum*
   3.′ Leaf bases persistent on the spineless trunk; fruits obovate, flat-topped, with persistent, apiculate stigma ..... *A. alatum*

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Note added in proof. Additional specimen examined: Panama. Comarca de San Blas: El Llano-Carti Rd. km 16.6, 9′19″N, 78′55″W, 350 m, 1 June 1985, *de Nevers & Herrera 5818* (MO, PMA). Inflorescence warm, flws. yellow, visited by *Trigona* bees and *Cyclocephala* beetles (87 beetles seen).

Principes, 32(3), 1988, pp, 95, 100

LETTERS

March 4, 1988

Dear Natalie,

I hope you received the flowers and pinnae in FAA with no trouble. The herbarium sheets should be coming along in a few days. All in all the trip to Costa Rica and Panama was a fabulous success. We gathered much good material for the *Chamaedorea* book.

Unfortunately, my happiness with the success of the trip must be tempered due to a disturbing situation that we came across in Panama. I thought you would want to hear of it. When I was in Panama in April, we came upon a locale near El Valle that had abundant populations of several chamaedoreas, including two extremely ornamental species, *C. pumila* and *C. amabilis*. A rough survey indicated that there were 100–200 of the former and well over a 100 of the latter in this one small area. Upon my return in December, I was dismayed to find only about a half dozen plants of each, the understory in this area having been almost completely denuded of these species! My Panamanian guide told me that in November an American who has frequented Panama several times in the last year or two to gather palms was in El Valle and hired this Panamanian to collect 1,500 of the *C. pumila* and an untold but probably lesser amount of *C. amabilis* at this locale. At one point in my searching in December I came upon a pile of cut leaves of *C. pumila* in the bottom of a ravine. The pile was large, over several yards across with well over a 1,000 leaves in it. The Panamanian guide told me that this was where the plants were cleaned and prepared for shipment for the American. The populations of these two species at El Valle are just about non-existent now. These two species are unofficially listed as endangered in Costa Rica and since they have never before been reported for Panama, their status there is unknown.

A similar situation occurred not far from El Valle at El Cope where, upon my initial and only visit in December, I could not find either of two highly ornamental chamaedoreas and only a few plants of a third previously reported to be at this location. Again, as in El Valle, the forest floor had been pretty well cleaned out of chamaedoreas. My Panamanian guide's description of the collection methods used by the American at El Cope matched that given me by my other guide at El Valle.

Cont. on p. 100.

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Growing Palms in the New Orleans Area

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Before the great 1962 freeze (11° F), New Orleans residents were able to grow a great many tropical plants and palms including the date palm (*Phoenix dactylifera*), the dwarf date palm (*Phoenix roebelenii*), queen palm (*Syagrus romanzoffiana* [*Arecastrum romanzoffianum*]), arenga palm (*Arenga engleri*) and others. Practically all date palms were killed—only about eight or nine survived. All of the dwarf date palms died and virtually no replanting occurred. *Syagrus romanzoffiana* were all killed but residents here continued to replant up until the severe freeze on Christmas Eve of 1983 (17° F) after which time very few people have replanted. *Arenga engleri* was only sparsely planted but the author has seen no new plantings.

However, there are a number of both pinnate and palmate palm species that are commonly grown here in this metropolis that withstood the infrequent freezes and survived. The more common ones include: our native *Sabal minor*, *S. palmetto*, *S. mexicana* (*S. texana*), *Washingtonia filifera*, *W. robusta* (approximately 75–85% of the *W. robusta* were freeze killed in 1983), *Trachycarpus fortunei*, *Chamaerops humilis*, *Livistona chinensis*, *Phoenix canariensis* and *Butia capitata*. Some of the less frequently seen palms which have survived include: *Rhapidophyllum hystrix*, *Brahea armata*, *Rhapis excelsa*, *Phoenix reclinata*, and *Chamaedorea microspadix*.

In the following paragraphs are cultural recommendations that I feel have proven successful here in New Orleans.

Transplanting and Planting

The best time of year to transplant or plant palms is during the spring and summer months (end of April through August). The soil is warm and this allows the plant time to make vigorous root growth (Donselman 1981, Doughty 1980, Evans 1981, Jordahn 1956, Midcap and Black 1976, Mowry 1957).

In the past it has been generally believed that once palm roots have been cut, the roots would die and new regenerative roots would replace the severed ones. Research in Florida by Donselman and Broschat (1984a), however, has shown that this myth is not true for all palms.

According to the researchers, cabbage palm (*Sabal palmetto*) must regenerate new roots after root decapitation. Conversely, queen palm (*Syagrus romanzoffiana*) will often regenerate new root tips if the roots are cut 2–3 feet from the trunk. As a result of the research it would be best to obtain as large of a root ball as possible when transplanting palms. An exception to this is cabbage palm (*Sabal palmetto*). Roots may be cut to within one foot of the trunk. However, root pruning six to eight weeks prior to transplanting is advised to allow time for new root regeneration near the trunk. At the time of transplanting, one third to one half of the older fronds should be removed to reduce water loss by transpiration. Also the ring of leaves immediately next to the bud should be removed to alleviate pressure on the bud. The remaining leaves should be gathered around the new emerging leaf and tied in place.

This practice not only reduces transpirational losses but also protects the bud. Rough handling of the palm or severe vibrations during transport can break the tender bud causing death several months later. It is important to replant the palm as soon as possible after digging and never allow the roots to dry (Donselman and Broschat 1984b).

Another antiquated horticultural practice is to fill the planting hole with peat moss, pinebark, manure, etc. This practice is no longer recommended for palms or any other woody trees and shrubs because by using these additives the immediate environment around the roots is altered and death may result (Donselman 1981; Donselman and Broschat 1984b; Whitcomb 1983, 1986). If an entire bed area is to be prepared (fifty square feet or larger) for raised bed purposes or to remove heavy clay soils, then a good bed mixture recommendation consists of ⅓ sharp sand, ⅓ finely ground pine bark mulch and ⅓ good garden soil or potting soil (Doughty 1980).

One should dig a hole twice as wide and just deep enough to accommodate the root ball. The palm should then be placed into the hole but planted at the same depth as was growing previously. However, an exception to this is cabbage palm (*Sabal palmetto*). It may be planted deeper in the soil to help stabilize the tree. In the next step one should partially fill around the root ball with well prepared backfill originally taken from the hole and watered thoroughly so as to expel any air pockets (Donselman and Broschat 1984b; Evans 1981; Whitcomb 1983, 1986).

It is best to make a saucerlike depression over the root system to hold a greater quantity of rain or irrigation water so as to soak into the root system thoroughly. The saucerlike depression should then be covered with a mulch such as rice hulls, cypress mulch, pine bark or pine needles to help conserve moisture and to discourage weeds (Donselman 1981, Donselman and Broschat 1984b, Evans 1981).

The plant should be given a final soaking to mat-down the mulch and to firm-up the soil. It is also important to keep the soil evenly moist to a depth of 6–8 inches during the first several months by watering every 4–5 days when there is no rain.

Bracing the palm may be necessary for a tall plant, but the braces should never be nailed directly into the trunk. Palms to my knowledge do not have the ability to heal wounds, therefore nail holes or other injuries invite disease pathogens. An insulated collar made of wood or metal can be used to support the trunk or rope can secure the plant in place (Donselman and Broschat 1984b). The supports may be removed after eight months.

Fertilization

For vigorous healthy palms fertilization is recommended. In the past, organic fertilizers such as composted manures, tankage or sewage sludge have been recommended and may still be used but the cost may exceed chemical fertilization. From 10 to 25 lbs. may be needed for proper fertilization of large palms (Mowry 1957, Knapp 1961).

Chemical or inorganic fertilization is easier and less expensive. It is more efficient because it reacts faster and becomes available to plants more quickly. Granular fertilizers with nitrogen, phosphorous and potassium percentages such as 15-5-10, 16-4-8 or 12-4-8 may be used at a rate of ½ to ¾ lb. per 100 square feet of root spread. Fertilizer application should be made in mid-April and again in mid-June. The method of application for granular fertilizers should consist of broadcasting the fertilizer from the base of the trunk outward to several feet beyond the margins of the leaf canopy. One should irrigate thoroughly after fertilization so as to reduce fertilizer burn of turfgrass or palms (Donselman and Broschat 1984b, Doughty 1980).

In New Orleans, injections of liquid fer-

tilizer 6–10 inches into the soil is also recommended. This practice not only provides fertilizer to the palm but more importantly aids in soil aeration which is essential to proper uptake of water and minerals by roots. Rates are given on soluble or suspended fertilizer packages or one may have a professional arborist perform the job.

Tree "spike" fertilizers may be used but are expensive and tend to concentrate the fertilizer in relatively small areas of the root zone. However, research done by Donselman and Broschat (1984b) indicated that broadcast fertilization appeared to be the best method.

Pruning

Pruning consists of actually grooming the plant, which involves removing the leaves or inflorescences as they become senescent and unsightly. One should definitely not decapitate a palm below the crown or below the leaves in an attempt to reduce the height of the plant. Doing so will kill a palm.

Sometimes freezing weather will impart injury to all the leaves and possibly the bud. One should not hurriedly remove the plant. Some palms may take up to two growing seasons to regenerate new growth (Doughty 1980). One should look for new growth in the center of the crown. If this growth is not apparent by August of the following year, then removal would be advised. However, if new regenerative growth is observed, one should then remove all the necrotic leaves, fertilize and irrigate as needed.

Propagation

The majority of palm species are propagated by seed (Koebernik 1966, Basu and Mukherjee 1972, Odetola 1987). However, some palms may be propagated by separation of offshoots from the main trunk. An example of this is *Phoenix dactylifera*. A few other palms may be propagated by division of root-clumps where multi-trunked species exist. An example of this is *Chamaerops humilis*.

Propagation by seed is probably the easiest way to increase palm numbers. The following is a step-by-step procedure for propagation of palm seeds.

(1) Palm seeds should be planted as soon as they are ripe (Poole and Conover 1974, Read 1962). Seeds of some species are relatively short-lived and some others begin to lose their viability in two to three weeks or longer.
(2) The seeds should be soaked in water and the fleshy seed coat removed to accelerate germination (Schmidt and Rauch 1982, Donselman and Broschat 1984b, Nagao et al. 1980).
(3) To enhance germination, thick, hard seed coats can be scarified or scraped (Doughty et al. 1986, Nagao et al. 1980). Scarification allows water and gases to pass through the seed coat thus hastening germination.
(4) The seeds should be planted in a sterilized soil medium (Doughty 1980, Read 1962). Many soil mixes are commercially available including the soilless mixes, or one may plant seeds in a mixture containing one half peat moss and one half sand or any combination of peat moss, sand, perlite or vermiculite. If one has but a few seeds, they may be planted in individual containers, but if a quantity of seeds are to be planted, the use of flats or entire planting beds, employing sterilized medium, would be recommended. Another good recommendation would be to plant the seeds as deeply as the thickness of one seed.
(5) Freshly planted seed should be provided with bright light, high humidity, moist soil conditions and a temperature between 80° and 95° F. The use of bottom heat is also recommended (Poole and Conover 1974, Hull 1976, Read 1962, Nagao et al. 1980).
(6) The germination time of palm seeds

varies with the species. *Trachycarpus* (windmill palms), *Washingtonia*, *Phoenix* (date palms) and *Chrysalidocarpus* (areca palms) will germinate in about 4–8 weeks, whereas palms such as *Chamaedorea* and *Butia* may take from 3–7 months (Koebernik 1966, Basu and Mukherjee 1972).

(7) When the spear leaf (first leaf) is 2–4 inches long, the palm seedlings should be immediately transferred into individual containers. The plants may be planted in the landscape from April through August when 2–3 feet tall, but it is best to provide protection from direct sun and high winds until the plants are well established (Broschat and Donselman 1984, Doughty 1980).

Questions often arise as to how to plant a coconut. Although coconuts do not grow outdoors in New Orleans, it is customary for one of the Mardi Gras Krewes to give coconuts away along the parade route on Mardi Gras day. People consider this to be a valuable souvenir and use it in the home as decoration. Months after Mardi Gras day, I receive phone inquires from the public asking what to do with the germinating coconut. My reply is that the coconut palm is not recommended for outdoor culture in the New Orleans area. However, many people find it challenging to plant and grow one. For best results select a large container 8–12 inches in diameter. Fill it with a good potting soil or one of the soilless mixes. Place the coconut on its side and bury it to only about one half its thickness leaving the upper portion fully exposed. Leave it outdoors during the spring, summer and fall, providing ample water and fertilizer but bring it indoors during the winter.

Plant Pests

On occasion palms fall under attack from insects and diseases here in New Orleans. Common insect problems include scale, caterpillars, mealybugs, and other leaf eating beetles. Termites can also attack the trunk of older palms.

To control scale and mealybugs, the application of Orthene or a summer oil spray is recommended in June or whenever the insect is evident. Malathion can also control these pests. To control caterpillars and other leaf-eating beetles, Sevin and Orthene are effective. For caterpillars alone a biological control such as Dipel, Biological Worm Control or Thuricide is suggested. To control termites Dursban should be applied to the trunk and ground. Whatever the insect problem may be, the problem should be eradicated before it becomes a severe infestation.

A few leaf spot diseases may attack palms in this area and can be controlled by spraying with Benlate, Daconil 2787 or Zineb as soon as the leaf spot is detected. However, diseases usually are not severe in the New Orleans area other than possibly root rots.

Although the total number of palm species that can be grown in New Orleans is relatively small, the few that can be certainly provide a semi-tropical atmosphere to this area of the country. Even though New Orleans is considered temperate, palms enhance and beautify areas of the city to the extent that some visitors actually feel as if they have visited a semi-tropical paradise.

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Note: Mention of a commercial product or pesticide trade name is done with the understanding that no discrimination is intended and no endorsement is given by the Louisiana Cooperative Extension Service.

LETTERS (*cont. from p. 95*)

The situations at El Valle and El Cope were remarkably similar. In both cases, Panamanians reported that an American who has come several times in the last year or two arrived in November and hired collectors to go out into the forest and collect seeds and plants in large quantities of certain palms, *Chamaedorea* among them, and all highly ornamental. The American would return a day or two later to gather the seeds and plants. In both cases, it seems to be wholesale destruction of these palms in their habitat.

Not only have these palms been pretty well wiped out in these two areas but the local people there have been "primed" by this business and are looking for other native plants that they can now sell.

I don't know what, if anything, can be done about this. The rationale that it's better to collect this material than to see it destroyed when the forest is cut and burned over by natives does not necessarily stand up. Much of the material will die in transport or later under cultivation due to exacting growth requirements not recognized by the grower. These are not commercially viable species that can be cultured easily under varying growth regimes. This is to say nothing of the ethics involved with wholesale stripping of these plants from the forest. I suppose it's simply a commentary on the sad state of the human species and the world's resources.

DONALD R. HODEL

Principes, 32(3), 1988, pp. 101–114

New and Rare Understory Palms from the Península de Osa, Costa Rica, and Adjacent Regions

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ABSTRACT

Recent botanical expeditions to the Península de Osa and adjacent regions of southwestern Costa Rica have led to the recognition and characterization of two rare and poorly known species of understory palms, as well as two species new to science. Two enigmatic *Chamaedorea* species originally described by Hermann Wendland, *C. brachyclada* and *C. tenella*, are briefly recharacterized and reported from Costa Rica for the first time. *Desmoncus stans* and *Geonoma scoparia* are described as new. All four species are illustrated with photographs, and complete specimen citations are provided.

The Península de Osa, at the southwestern corner of Costa Rica in the Provincia de Puntarenas, is the last stronghold for primary lowland wet forest on the Pacific slope of this small Central American country. The impressive forests of this region, which have been described as "by far the most exuberant in Central America" (Hartshorn 1983), are by now world famous not only for the abundance of wildlife they harbor, but also for their floristic diversity. The flora of the Osa is further notable in comprising a relatively high percentage of endemic species and species not otherwise known from Costa Rica, and shows a surprisingly strong affinity with the flora of the Chocó region of Colombia, far to the south (Hartshorn 1983).

We have collected, photographed and studied three of the four species discussed in this paper in the unprotected yet still relatively intact (as of March, 1986) forests lying between Rincón de Osa and the valley of Laguna Chocuaco, at the northeastern corner of the Península de Osa. The number of permanent human residents in this region has increased rapidly in recent years, and, accordingly, so has the rate of deforestation. We can only hope that these rare palms and many other plant species of comparable interest will be adequately protected within the boundaries of nearby Corcovado National Park, which occupies roughly half of the peninsula. Thus, our excitement at having encountered these rare species must be tempered with our concern for their future survival in the wild state.

Species New to Costa Rica

Two rare species of *Chamaedorea* originally described by Hermann Wendland, *C. brachyclada* H. A. Wendl. and *C. tenella* H. A. Wendl., are here discussed and reported from Costa Rica for the first time.

Hermann Wendland, Director of the Royal Gardens at Herrenhausen, Hannover, Germany, from 1870 until his death in 1903 (Wittmack 1903), is a special figure in Central American botany. A skilled gardener as well as a respected taxonomist, Wendland had a particular fondness for large monocots such as palms, Araceae, and Cyclanthaceae. During his travels through Central America (Guatemala, El Salvador, and Costa Rica) in the years

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1856 and 1857, Wendland concentrated on making herbarium specimens and living collections of these intractable plants, which even today are frequently ignored by general collectors. As a result of this pioneering work, many familiar species in these groups are typified by Wendland specimens.

Most of Wendland's new species were ultimately described by other authors. Heinrich Wilhelm Schott, Wendland's counterpart and mentor at the Schönbrunn Gardens in Vienna, described most of Wendland's Araceae; today, there is hardly an aroid genus in Central America without a species called *wendlandii*. Wendland's Cyclanthaceae material was never worked up, although he collected most of the species in the areas he passed through. His palm collections were treated by various authors: *Geonoma* by Richard Spruce; *Bactris* by Max Burret; *Chamaedorea* by Udo Dammer and André Guillaumin.

Wendland himself had a lifelong interest in the genus *Chamaedorea*, and described many new species, though not from his own collections. As a well known personage at one of the most prominent gardens in Europe, he carried on a lively correspondence and seed-exchange not only with other European institutions, but also with botanists and collectors actively working in the tropics (such as Hartweg, Ortgies, and von Warscewicz, in the New World). Wendland described numerous species of *Chamaedorea*, especially in the early part of his career, from plants cultivated from such sources.

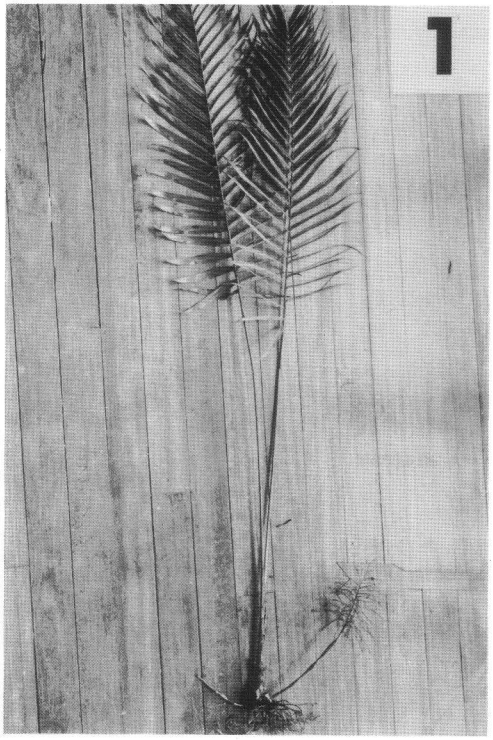
Although several of Wendland's *Chamaedorea* species are familiar at least in name (*C. ernesti-augusti*, *C. geonomiformis*, *C. pygmaea*), others have remained enigmatic for a variety of reasons. His descriptions were often published in obscure German-language journals; some of the descriptions are too brief, and most are unaccompanied by illustrations. Often the country of origin was unknown and, in a few cases, fertile material had not been seen. Worse yet, Wendland's original "holotype" collections (now housed at the University of Göttingen, West Germany) disappeared early in the present century, and did not resurface until 1969 (Wagenitz 1972). The early dates of these Wendland names make them difficult to ignore, since they would usually have priority over competing synonyms.

Some light can now be shed on two of Hermann Wendland's enigmatic *Chamaedorea* species. By coincidence, *Chamaedorea brachyclada* and *C. tenella* were published in the same article (Wendland 1880), at a comparatively late date, and with detailed descriptions. By further coincidence (or perhaps there is a connection), these are also the only two Wendland *Chamaedorea* species for which the first author has been unable to locate verifiable type material at GOET. Both species are rare and endangered throughout their ranges, and should be seriously considered for protection under CITES and other appropriate statutes. The smaller species of *Chamaedorea* in general are considered choice ornamental subjects, and are much sought after by rapacious and acquisitive commercial collectors, some of whom show no hesitation to completely extirpate wild populations for their own selfish purposes.

Chamaedorea brachyclada *H. A. Wendl.*, Gartenfl. 29: 101. 1880. TYPE: Unmounted, unlabeled specimen annotated as "HOLOTYPUS?" by M. H. Grayum, 23 July 1987 (neotype, GOET). Figures 1, 2.

Additional Specimens Examined. COSTA RICA. PUNTARENAS: vicinity of Las Cruces Botanical Garden (along Río Jaba, S of San Vito de Coto Brus), *de Nevers 7763* (CAS, MO); *Grayum et al. 3351, 3352, 3365* (MO); *Maas & McAlpin 1387* (U); *Moore 9995* (BH); Finca Salsipuedes, San Vito, *Hobbs 0583CR-102* (CR).

Distribution and Phenology. Chamae-



1. *Chamaedorea brachyclada* (*de Nevers 7763*, male plant). 2. *Chamaedorea brachyclada* (*de Nevers 7763*), closeup of inflorescence.

dorea brachyclada is currently known in the wild only from southern Costa Rica, in the vicinity of San Vito de Coto Brus, at elevations of 1,100–1,400 m, in primary forest and disturbed primary forest. It probably also still occurs in adjacent Panama, although Chiriquí has been as extensively deforested as the Coto Brus region of Costa Rica, and suitable habitats must be scarce. Clearly, this must be regarded as an extremely threatened palm species.

Fertile collections of *Chamaedorea brachyclada* have been made from May through July.

Discussion. Chamaedorea brachyclada was described by Wendland from a single female plant, raised from seed collected in Chiriquí, Panama. It seems to have disappeared from cultivation shortly thereafter, and from the literature as well. The species was included by Bailey (1943b) in the *Flora of Panama;* however, no further collections were reported. Indeed, it apparently has not been recollected in Panama to this day. However, *C. brachyclada* can now be reported as locally common in the very restricted patches of forest remaining in the vicinity of the Las Cruces Botanical Garden, south of San Vito de Coto Brus, near the Panamanian (Chiriqui) border in southern Costa Rica. The species has recently been reintroduced to cultivation in Southern California, via seed from this population (D. Hodel, pers. comm.).

The Las Cruces palm is a very striking species, easily recognized by its acaulescent habit, pinnately compound leaves with narrow, scarcely sigmoid pinnae, and basal inflorescences with numerous (40–70), short and very slender, spreading rachillae. The male inflorescence (Fig. 2), not previously described, is similar to the female

3. *Chamaedorea tenella* (*Croat & Grayum 59766A*, male plant). 4. *Chamaedorea tenella* (*Croat & Grayum 59766B*, female plant).

inflorescence. We readily keyed this palm out to *C. brachyclada* in the *Flora of Panama*, then consulted the original description, which agreed in all details.

During a recent trip to GOET, the first author discovered an unmounted, unlabeled specimen of the same species as the Las Cruces palm, mixed in a sheet with extraneous material and filed in Wendland's herbarium with other collections lacking labels. This specimen is in all likelihood the original, holotype collection of *Chamaedorea brachyclada*, although there is no way to be absolutely certain of this, or even of conveniently referring to the specimen. Even so, it establishes that Wendland had material of the Las Cruces species at his disposal, and removes any lingering doubts that the name *Chamaedorea brachyclada* H. A. Wendl. is correctly applied to it.

To obviate any suspicions that the GOET specimen may not represent the holotype, it has here been designated as the neotype.

Chamaedorea tenella *H. A. Wendl.*, Gartenfl. 29: 103. 1880. TYPE: Provenance unknown: *Kreuzpointner 1188*, 14 Apr 1888 (neotype, M). Figures 3, 4.

Additional Specimens Examined. COSTA RICA. PUNTARENAS: Rincón de Osa, *Mata 501* (CR); between Rincón de Osa and Rancho Quemado, ca. 10 km W of Rincón-Puerto Jiménez road, *Croat & Grayum 59766A*, *59766B* (MO); ridge between Río Riyito (valley of Laguna Chocuaco) and Quebrada Banegas, S of Cerro Rancho Quemado (ca. 7 km W of Rincón de Osa), *Grayum et al. 7558* (MO); hills above Palmar Norte, 1,800 ft., *Moore*

6526 (BH). SAN JOSE (?): forêts de San Marcos, 200–250 m, *Tonduz 7973* (BR).

GUATEMALA. IZABAL: mixed rainforest on calcareous slope and on open field at its base, 13 km E of jct. of CA 9 and road to San Felipe, 60 m, *Harmon & Fuentes 1911* (MO).

PROVENANCE UNKNOWN: *Hort. Kew 4/81* (K).

Distribution and Phenology. In Costa Rica, *Chamaedorea tenella* is mainly known from the northeastern corner of the Península de Osa, where it occurs sparingly in primary forest on slopes and ridges. There are two additional collections from somewhat further north, and it is probable that the species is of general distribution in the remaining lowland primary forests on the Pacific slope of southern Costa Rica. It appears to be strictly a lowland palm, occurring only below about 600 m.

C. tenella also occurs in the Atlantic lowlands of Guatemala and southern Mexico. The few Mexican collections of known provenance, not seen by us, are mainly from the Los Tuxtlas/Catemaco area of Veracruz (at 500–800 m) and some regions of Chiapas (Aguilar Amar 1986). It must be considered a rare and endangered species throughout its range.

The bicentric geographic distribution of *Chamaedorea tenella* may seem unusual, but, in fact, has numerous parallels in groups with which we are familiar. In Araceae, for example, *Philodendron popenoei* Standl. & Steyerm. (T. Croat and M. Grayum, unpubl. data) and *Anthurium cubense* Engl. (Croat 1983) have similar distribution patterns. Moreover, at least two other species of *Chamaedorea*, *C. arenbergiana* H. A. Wendl. and *C. tepejilote* Liebm., appear to be disjunct from the Atlantic slope of Mexico and northern Central America to the Pacific slope of southern Central America.

Flowering material of *Chamaedorea tenella* has been collected in Costa Rica in March, and fruiting material in February and May. The sole Guatemalan collection, a fruiting specimen, was made in February.

Discussion. Chamaedorea tenella was described by Wendland from cultivated material introduced from Mexico by Ortgies. An ornamental, dwarf species with simple leaves, *C. tenella* was already rare in cultivation by the turn of the century (Dammer 1904), and, like *C. brachyclada*, has since all but vanished from the annals of horticulture and systematic botany. We now take the unusual step of resurrecting this name for a palm we have collected in the Península de Osa, and which may be generally distributed in what remains of the lowland forests of southern Costa Rica.

We had originally intended to describe the Osa *Chamaedorea* as a new species, and had included with it a collection (*Harmon & Fuentes 1911*, MO) from the Atlantic lowlands of Guatemala. These specimens agree *inter se*, and differ from all other dwarf, simple-leaved *Chamaedorea* species described from Central America, in the following characteristics: a clearly caulescent habit, with relatively long (1.5–2.4 cm) internodes; stiff, glossy leaves with obscurely toothed margins; inflorescences of both sexes spicate (unbranched) and borne on slender, wiry peduncles; and relatively large (0.8–1.3 cm diam., dried), glossy fruits. Although our material keyed roughly to *Chamaedorea geonomiformis* H. A. Wendl. in the *Flora of Guatemala* (Standley and Steyermark 1958), the latter comprises taller plants, with longer and broader leaves and branched staminate inflorescences (see original description of Wendland 1852, or the English translation of Dammer 1904). The holotype of *C. geonomiformis* (GOET!) differs in other details as well, and we felt amply justified in rejecting this epithet for the entity under discusison.

Chamaedorea tenella is not treated in the *Flora of Guatemala*; presumably, any specimens that might have been seen by the authors were included in a broadly

circumscribed *C. geonomiformis*. We did not consider the name as potentially applicable to the Osa palm until chancing upon a specimen (*Kreuzpointner 1188*) so identified at M. The latter specimen matches the recent Osa and Guatemala collections in all respects, and all of this material agrees in all important details with Wendland's description of *C. tenella* (there is some variation in the degree of marginal serration of the leaf-blades; however, we do not regard this as significant at the species level).

It is extremely likely that Kreuzpointner's plant came from the same source as Wendland's material, or, indeed, even from Wendland himself. The label gives no such indication; however, the collection was made in the same country, and only a few years following the publication of Wendland's description. Since Kreuzpointner's specimen is, moreover, well prepared and representative of our concept of *Chamaedorea tenella* (and, more importantly, of Wendland's concept), we have chosen to designate it as the neotype (no material of this species having been located at GOET).

Complete descriptions of the preceding two *Chamaedorea* species will be presented in a forthcoming treatment of the Palmae for *Flora Costaricensis* (W. C. Burger, ed.).

Species New to Science: Desmoncus

The remarkable new species of *Desmoncus* described below was first collected by Guillermo Mata Ulloa, of Guadalupe de Goicoechea, Costa Rica, in 1964:

Desmoncus stans *Grayum & de Nevers*, sp. nov. TYPE: Costa Rica. Puntarenas: 7 km W of Rincón de Osa, ridge between Río Riyito and Quebrada Banegas, 8°41′N, 83°32′W, 200–300 m, *de Nevers et al. 7760* (holotype, MO; isotypes, CAS, CR, NY). Figures 5–8.

Planta caespitosa; caules infirme stantes, nunquam scandentes, 2–2.5 m alti; petiolus 5.5–12 cm longus; petiolus et rhachis spinis rectis 0.6–4.5 cm longis sparsim armata; rhachis folii 18–41 cm longa, in filamentum gracile inerme 1.3–14 cm longum apice prolongata; lamina pinnata pinnis in quoque latere 3–7; pinnae pro parte maxima 11–19 cm longae, 3–5 cm latae, anguste ellipticae, ad apicem piliferae vel cirrhosae; prophyllum 13–15 cm longum vagina folii prominenter exsertum; pedunculus ca. 19–22 cm longus; pedunculus et bractea pedunculi inermis; bractea pedunculi 13–18.5 cm longa, ca. 2 cm lata ubi expansa, ad pedunculum supra medium et ca. 2–4 cm subter inflorescentiam affixa; inflorescentia spiciformis, 6–12 cm longa, rhachillae nullae; triens infima inflorescentiae floribus aggregatis ternis, flos femineus unus cum floribus masculinis duobus; trientes superae inflorescentiae solum flores masculinos ferentes; bracteae florum scariosae, margine remotiuscule villoso-dentatae; flores masculini calyce scarioso, 1–1.8 mm longo, calyci florum femineorum simili; flores masculini petalis tribus, lanceolatis, cremeis, in aestivatione imbricativis, 6–9 mm longis, 1.5–2 mm latis; antherae ca. 2 mm longae, basi sagittatae, basifixae, filamentis ca. 1 mm longis; flores feminei petalis connatis per duos longitudinis trientes, pisinis, ca. 3 mm longis; staminodia sex, linearia, minuta; fructus maturi scarlatini, obovoidei, 1.9–2.1 cm longi, 1.4–1.6 cm lati.

Plants cespitose with 3–5 stems, these 2–2.5 m tall, 5–12 mm in diameter, erect or leaning on surrounding vegetation. Leaves 4–7; sheath tubular 21–29 cm long, with remote, straight spines ca. 5–6 mm long; petiole arising 7–13 cm below the apex of the sheath, channeled above, 3–4 mm diameter, 5.5–12 cm long; petiole and rachis closely brownish-pannose, with 1–12 dark brown, straight, somewhat flattened spines 0.6–4.5 cm long; lamina pinnate with pinnae 3–7 per side, mostly 11–19 × 3–5 cm, narrowly elliptic, nar-

5. *Desmoncus stans* (*Grayum et al. 8115*); apex of leaf, showing unarmed filamentous extension (barely visible) of rachis. 6. *Desmoncus stans* (*Grayum et al. 8115*); unopened inflorescence, showing long peduncle, with peduncular bract (thickened portion) inserted distally.

rowly acute at the base, long-acuminate to piliferous or cirrhous at the apex, the margins somewhat undulate; midrib of pinnae below with 0–2 straight spines to ca. 1.5 cm long; rachis 18–41 cm long, extending beyond the pinnae as a slender, naked filament 1.3–14 cm long (occasionally bearing a terminal reduced pinna).

7. *Desmoncus stans* (*Grayum et al. 8115*); opened inflorescence (past anthesis), showing spicate (unbranched) rachis. Note undulate pinna margins. 8. *Desmoncus stans* (*Grayum et al. 8115*); mature fruits (note persistent peduncular bract).

Inflorescences axillary, produced from 15 cm above the ground to the stem apex; prophyll 13–15 cm long, exserted 5–13 cm from the leaf sheath; peduncle ca. 19–21.5 cm long; peduncular bract 13–18.5 cm long, attached well above the middle of the peduncle and ca. 2–4 cm below the spadix, striate when dry, unarmed,

expanding to ca. 2 cm wide at anthesis, whitish within, with a rather flattened apex ca. 1.5–3 cm long, persistent to the fruiting stage; rachis of inflorescence 6–12 cm long, spicate (unbranched); proximal third of rachis with triads of 1 pistillate and 2 staminate flowers; central third with pairs of staminate flowers; distal third with solitary staminate flowers; floral bracts scarious, the lower ca. 1 × 2.5–3 mm, the upper ca. 1.5 × 1 mm, the margins villose-toothed. Staminate flowers with the calyx 1–1.8 mm long, the sepals scarious, with prominently thickened veins externally, connate into a trilobed cup; petals 3, distinct, imbricate, cream-colored, lanceolate, mostly 6–9 mm long and 1.5–2 mm wide, basally adnate to the receptacle; stamens 6, erect, arising from the receptacle, filaments ca. 1 mm long, anthers ca. 2 mm long, sagittate at the base, basifixed; pistillode minute. Pistillate flowers with calyx as in staminate flowers; petals light green, connate in a prominently veined, ovoid cup enveloping the ovary, apically trilobed to ca. ⅓ the distance to the base, 3 mm long, persistent and spreading open in fruit; staminodes 6, linear, minute, basally adnate to the petals; stigmas 3, linear, sessile, ovules 3, basal, only one developing. Ripe fruits (*Grayum et al. 8115*) bright red, obovoid, 1.9–2.1 × 1.4–1.6 cm; endocarp marked with radiating fibers, rather thin; endosperm homogeneous.

Additional Specimens Examined. COSTA RICA. PUNTARENAS: Rincón de Osa, *Mata 483* (CR); cultivated in Las Cruces Botanical Garden, ca. 4 km SE of San Vito de Coto Brus, *Grayum et al. 8115* (MO, CR).

Distribution and Phenology. Desmoncus stans is known in the wild only from the type locality, in primary forest on slopes and ridges between the valley of the Quebrada Banegas and that of the Río Riyito (Laguna Chocuaco), at the northeastern corner of the Península de Osa, Costa Rica. Elevations in this region are in the 200–300 m range. Here it is locally common.

Interestingly, we encountered, immediately after our discovery of *Desmoncus stans* on the Osa, two healthy clumps of this species (correctly identified to genus!) in cultivation on the grounds of the Las Cruces Botanical Garden. This site, previously discussed under *Chamaedorea brachyclada*, is located at about 1,100–1,200 m elevation, on the Pacific slope of mainland Costa Rica just opposite the Península de Osa. Although it is not uncommon for plant species to span the elevational and geographical range between San Vito and the Osa, we have been unable to locate natural populations of *D. stans* in the forests adjacent to the Garden, and the species is apparently not native in the immediate vicinity of Las Cruces. To the best recollection of the Garden's founder and patriarch, Mr. Robert G. Wilson, his material was originally collected on the Atlantic coast! We have as yet seen no herbarium material from the Atlantic slope of Costa Rica, but this sort of disjunction is quite plausible and is seen in many other plant species.

Desmoncus stans, currently known to occur naturally in only one small, unprotected area, must be regarded as an extremely threatened species.

Our single wild collection of *Desmoncus stans*, which is slightly pre-anthesis, was made in late May. Mata's original collection, representing a fruiting individual, is from early January. Plants in cultivation at the Las Cruces Botanical Garden were at anthesis and bore ripe fruits in early March.

Discussion. Desmoncus is a notorious genus among palm specialists in that a great many species have been described on the basis of relatively few dried (and sometimes sterile) specimens, with little or no understanding of the actual biological entities in the field. Nevertheless, we feel confident in describing *D. stans* as new,

since it exhibits a unique combination of several highly unusual features.

Desmoncus stans is remarkable in lacking all the vegetative features normally serving to distinguish *Desmoncus* from the closely related genus *Bactris*: the new species comprises erect, self-supporting, altogether non-scandent understory plants that never develop spines or retrorse hooks (representing modified pinnae and properly termed "acanthophylls") on the filamentous extension of the leaf rachis. A scandent habit and the possession of acanthophylls are so fundamental to the generic concept of *Desmoncus* that most generic keys (Standley 1920, Macbride 1936, Bailey 1943b, Standley and Steyermark 1958, Wessels Boer 1971, Read 1979, Moore and Chazdon 1985, Galeano and Bernal 1987) allude to these features alone, omitting any reference to floral or fruit differences between *Desmoncus* and *Bactris*.

According to contemporary circumscriptions of *Desmoncus* (e.g., Galeano and Bernal 1987, Uhl and Dransfield 1987), *D. stans* is also highly unusual in having unarmed peduncular bracts, and unique in its spicate inflorescences (Fig. 7) and, perhaps, its prominently exserted prophylls. Thus, although the new species strikes one immediately as a *Desmoncus* on the basis of "gestalt" characteristics, our assignment of it to that genus appears to require some defending.

The filamentous extension of the leaf rachis (Fig. 5) in the new species might be adduced as evidence that we are dealing with a *Desmoncus*, even in the absence of acanthophylls; this feature occurs regularly, however, in species of unrelated genera, such as *Geonoma seleri* Burret (MHG, pers. observ.), and at least occasionally in some *Bactris* (e.g., *Ocampo 1895*, CR; species unknown).

Fortunately, however, *Bactris* and *Desmoncus* do exhibit important floral differences (Uhl and Dransfield 1987) that permit an objective and unequivocal assignment of the new species to the latter genus. Especially significant in this regard are the distal insertion of the peduncular bract and the basifixed, erect anthers with stamen filaments erect in bud.

Actually, in spite of most recent characterizations of *Desmoncus*, it turns out that none of the "aberrant" features of *D. stans* is unique within the genus; rather, it is the possession of all these features in combination that delimits the new species. *Desmoncus prostratus* Lindm., from the Mato Grosso (holotype S!), also lacks acanthophylls; in fact, this species may be nonscandent as well, according to the original description (Lindman 1900), in which the word "arbuscula" (a small tree) is used to describe the habit. *Desmoncus prostratus* differs from *D. stans* in many respects, however, most notably in its branched inflorescence. An unidentified *Desmoncus* from Goyaz Province, Brazil, represented by *Glaziou 22278* (BR, G), likewise lacks acanthophylls, but differs from *D. stans* in having curved spines on the leaf rachis, a densely spiny peduncular bract and a branched inflorescence.

An unidentified *Desmoncus* from Bahia, Brazil, represented by *Lewis & de Carvalho 813* (K), has unarmed peduncular bracts, but differs from *D. stans* in having acanthophylls and a branched inflorescence. Finally, *Desmoncus vacivus* L. Bailey, as represented by *Tessmann 5236* (G) from Amazonian Peru (det. Medeiros-Costa), has a spicate inflorescence; however, it possesses acanthophylls and has curved spines on the leaf rachis.

Due to its exclusive possession of straight rather than curved spines, *Desmoncus stans* is here assigned to Burret's (1934; see also Bailey 1943a) section *Orthacanthium* (his other section, *Campylacanthium*, is characterized by having curved prickles). Although we had considered erecting a new section for this aberrant species, the other exceptional species discussed in the preceding paragraphs argued against any modification of the existing infrageneric classification of *Desmoncus*.

In spite of being, all things considered, the most anomalous *Desmoncus* yet described, *D. stans* is surprisingly unprepossessing in the field. Had the Osa population not been in fertile condition during our most recent visit, we would undoubtedly have passed the plants over as juveniles of some more typical (i.e., high-climbing) species, as was presumably done during several previous excursions to the same site. Could these plants, indeed, simply be precociously flowering juveniles that would ultimately become scandent? We consider this exceedingly unlikely. The Las Cruces clones have been in cultivation there for about 10 years, and are thriving, flowering and setting fruit. However, they show absolutely no tendency toward climbing, nor toward the production of modified terminal pinnae.

Certain typically scandent (as adults) species of *Desmoncus* are known to have a free-standing juvenile stage (e.g., in the Amazon basin; A. Henderson, pers. comm.). Thus, the small stature and nonscandent habit of *Desmoncus stans*, as well as the production of inflorescences to near ground level, suggest that neoteny may have played an important role in the evolution of this species. Under this scenario, these unusual features would have to be regarded as derived within the genus. Other characteristics (lack of modified distal pinnae, unarmed peduncular bracts, spicate inflorescences, etc.) may be subject to the same considerations.

By virtue of its erect habit, manageable size, relative spinelessness and showy fruits (Fig. 8), *Desmoncus stans* is highly suitable for cultivation as an ornamental; it may well be the only species of its genus in this category.

Geonoma

The following distinctive *Geonoma*, which we first encountered in the Osa in October, 1984, represents an undescribed species which had not been previously collected:

Geonoma scoparia *Grayum & de Nevers*, sp. nov. TYPE: Costa Rica. Puntarenas: 7 km W of Rincón de Osa, ridge between Río Riyito and Quebrada Banegas, 8°41′N, 83°32′W, 200–300 m, *de Nevers et al. 7757* (holotype, MO; isotypes, CAS, CR). Figures 9, 10.

Caulis solitarius, gracilis, ca. 1.5–3 m altus, usque 0.9 cm diametro; petiolus 21–59 cm longus; lamina semper trijugata, late ovata; rhachis laminae 27.0–31.5 cm longa; pinnae late sigmoideae, 14–26 cm longae, 4.9–9.5 cm latae; prophyllum ca. 6–8 cm longum; bractea pedunculi prophyllum subaequilonga, extus ferrugineo-pannosa; pedunculus ca. 2.3–3.8 cm longus; inflorescentia paniculata, 16–22 cm longa, 21–38 cm lata; rhachillae inflorescentiae tenuissimae, minute exasperatae, ca. 0.5 mm diametro, 8.5–11 cm longae, apice aristatae; foveae florales distantes, quam rhachillae latiores, bilabiatae, intus glabrae, orificio ca. 1.2 mm lato; labium superum foveae angustum obsolescensque, labium inferum vade emarginatum vel acute retusum; flores masculini ca. 2 mm longi; stamina sex, loculus antherarum valde inflexis; flores feminei ca. 1.5 mm longi, tubo staminodiorum apice crenato; fructus maturi nigri, subglobosi, in sicco ca. 5 mm diametro, tessellati.

Stems slender, solitary, ca. 1.5–3.0 m tall, 0.9 cm diam. Leaves consistently trijugate, 19 counted on one plant; petiole (including sheath) 21–59 cm long, channeled adaxially, rounded abaxially; sheath 7–11 cm long (⅙–⅓ total length of petiole); lamina broadly ovate in outline, the pinnae broadly sigmoid, ca. 14–26 × 4.9–9.5 cm (the proximal pair narrowest), the primary ribs ca. 23–27 (6–8 per pinna), diverging from the rachis at an angle of 50–58° on the two distal pairs of pinnae, 73–75° on the proximal pair, prominent and narrowly raised adaxially, convex abaxially; rachis 23.0–31.5 cm long and essentially glabrous. Inflorescences infrafoliar, paniculate, 16–22 cm long, 21–38

9. *Geonoma scoparia* (*de Nevers et al. 7757*); apical portion of plant, showing trijugate leaves and a single infructescence. 10. *Geonoma scoparia* (*de Nevers et al. 7757*); closeup of infructescence with fruits. Note three immature inflorescences above, still enclosed in prophylls.

cm wide; prophyll ca. 6–8 cm long at maturity, ca. 1.5–2 cm wide; peduncular bract about equalling the prophyll, thinner, closely brownish-pannose externally; peduncle ca. 2.3–3.8 cm long; rachis 3.5–6.5(–8.0) cm long, usually not well distinguished; lower branches 4–7-branched into very slender rachillae ca. 0.5 mm wide and 8.5–11 cm long; rachillae glabrous but with the axes minutely tuberculate-roughened, reddish at anthesis and especially in fruit, awn-tipped (the awns variously curved or bent, 0.9–1.8 cm long), with distantly separated pits ca. twice as thick as the rachillae; pits bilabiate, the upper lip narrow and obsolescent, the lower lip shallowly emarginate to sharply retuse, the orifice ca. 1.2 mm wide, glabrous within. Staminate flowers (*Croat & Grayum 59888*) ca. 2 mm long, the petals and sepals subequal; stamens 6, the filaments connate to nearly halfway up; anther locules strongly inflexed, the sterile base ca. ⅓ the total length. Pistillate flowers (*Croat & Grayum 59767*) ca. 1.5 mm long, the petals slightly exceeding the sepals and staminodial tube (the latter being subequal); staminodial tube crenate. Ripe fruits black, subglobose and ca. 5 mm in diameter when dry, the surface tessellate.

Additional Specimens Examined. COSTA RICA. PUNTARENAS: ridge between Quebrada Banegas and Río Riyito, ca. 7 km W of Rincón de Osa, *Grayum et al. 4088* (MO); along ridge between Rincón de Osa and Rancho Quemado, ca. 10 km W of main Rincón-Puerto Jiménez road, *Croat & Grayum 59767* (MO); along road between Chacarita and Rincón de Osa, 10 km W of Chacarita, *Croat & Grayum 59888* (MO).

Distribution and Phenology. Geonoma scoparia is known only from our four

collections, three of which are from the northeastern corner of the Península de Osa between the valley of Quebrada Banegas and the Río Riyito (Laguna Chocuaco). The fourth collection (*Croat & Grayum 59888*) is from the area at the head of Golfo Dulce, along the new road connecting Rincón de Osa with the Carretera Interamericana at Chacarita.

All collections are from slopes and ridges in primary forest, between 100 and 300 m elevation. *Geonoma scoparia* is not a common species; the plants seem to be few and widely scattered. We have had difficulty finding specimens even during concerted searches in areas where the species is known to occur, and three of our four collections are, as a result, unicates.

Confined as it is to a small and unprotected area, and being rare even within that area, *Geonoma scoparia* is probably the most gravely endangered of the four palm species discussed in this paper.

Flowering collections of *Geonoma scoparia* have been made in March (at the peak of the dry season) and October (at the peak of the rainy season); the single fruiting collection was made in late May.

Discussion. Geonoma scoparia (Fig. 9), with its delicate and intricately branched, broomlike inflorescences (Fig. 10), does not resemble any other species known from Costa Rica. The new species will key out roughly to *Geonoma deversa* (Poit.) Kunth in the generic monograph of Wessels Boer (1968). It differs markedly from that species, however—most notably, vis-à-vis the aforementioned key, in its non-verticillate floral pits. *Geonoma deversa* (which occurs sympatrically with *G. scoparia*) differs additionally in having the secondary veins immersed above, a longer (5–15 cm) peduncle, thicker (1.5–2.5 mm) inflorescence rachillae and larger (3 mm) male flowers.

Geonoma gastoniana Glaziou ex Drude, a Brazilian species, also seems to agree rather well with *G. scoparia*; the inflorescences of the former species are, however, larger in every respect: the peduncle is about 10 cm long, and the rachillae are much longer (20–25 cm) and thicker (1 mm) than in the new species.

Actually, the new species is probably most closely related to *Geonoma tenuissima* of Ecuador, posthumously described by Harold E. Moore, Jr. (1982) and apparently the last palm species to have been described by that venerable and prolific authority. The inflorescence of the latter species bears a striking resemblance to that of *G. scoparia*; *G. tenuissima* differs, however, in its cespitose habit, simple leaf blades and truncate staminodial tube. Additional, less significant differences include a more clearly defined inflorescence rachis, primary veins depressed or weakly raised above, pits with a prominent upper lip and an entire lower lip, and shorter apical rachillar setae.

Another seemingly close relative of *Geonoma scoparia* is an undescribed central Panamanian mid-elevation species, represented by the following specimens (at MO) determined as "*Geonoma* sp. nov." by H. E. Moore: *Hammel 3459* (Prov. Coclé); and *Nee 11252* (Prov. Veraguas). Although likewise possessing an inflorescence similar to that of *G. scoparia*, this species differs in its cespitose habit, leaf blades divided into many narrow pinnae, and truncate staminodial tube. In addition, it has somewhat longer prophylls and peduncles, and a more definite inflorescence rachis.

Geonoma scoparia and the two species just discussed are here assumed to be intimately related, and to form a natural group within *Geonoma*.

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My Forty-Two Years as a Palmophile

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My palmophilic affair began at about age ten, when I saw Tarzan pictures at the movies. Naturally, at the time, I didn't know anything about palms, but was fascinated with the jungle scenes. Back then, movies were made in California, so I probably was looking at howeias, washingtonias, and arescastrums. I was captivated with the tropics and vowed to live in Africa when I grew up. The fact that I froze in the New York City winters and did not enjoy snow even as a child may have had some influence in my young love affair with the lands of constant warmth.

Adding to my interest were stories that my father told me about his homeland, the tropical island of Puerto Rico. I was particularily impressed that broad-leaved trees remained green during the winter. After turning twenty, I had an opportunity to visit Puerto Rico and actually see palms and other tropicals. As expected, the coconut palm proved to be my favorite.

The first plant I ever purchased was a palm, *Chrysalidocarpus lutescens*. It thrived in New York (indoors) until it was brought to California and was over-examined by the state agriculture inspectors. Need I say more? As yet, I had no knowledge whatsoever of tropical plants, only that I loved the varied exotic shapes and colors of them and the climate they represented.

As a young adult, my childhood vow to move to Africa was modified to live in California, Arizona, Florida, or Puerto Rico. In 1961, my wife, two young children and I arrived in California to live in the tropics, or so I thought. Frankly, I expected Los Angeles to be more like San Juan and Miami, and was somewhat shocked and disappointed with the cool, dry California version of the tropics. For a number of years, my wife and I debated whether to stay here or move to Florida or Puerto Rico. Economics won out—we stayed.

When we purchased our home in Orange County, seven miles from the beach, I had no idea that I would become a full fledged fanatical plantaholic or how to deal with the climate variations of the area. My first project was to landscape my 60′ × 105′ (20 m × 30 m) corner lot. When visiting nurseries, I naturally selected the common varieties of tropical plants available at the time. This included ferns, palms, citrus, ficus, and various aroids. My first spring and summer plantings proved to be much more than just enjoyable and satisfying. I often got up at 5:30 A.M. and worked until 9:00 P.M. planting and landscaping. Despite my sunup to sundown "hobby," it wasn't long until I once again became completely enthralled with the "jungle" and began reading everything I could find pertaining to the tropics. While searching the library shelves, I came across Desmond Muirhead's book on palms. I concluded that I must like palms, since I was already growing about 21 species. I joined The Palm Society which turned out to be one of the best decisions of my life and have always been grateful to Dent Smith, our founder.

My first Palm Society meeting was at the Los Angeles County Arboretum in August 1966. That meeting left me somewhat confused because of all the botanical names. It wasn't until attending the next meeting at Ed Moore's home in San Diego

that I became a true palmologist. His gardens were incredible and full of rare palms. The following year turned out to be the most exciting, adventurous year of my life. I became completely involved in learning, reading, germinating, planting, and collecting palms, and building a 9′ × 12′ × 7′ (3 m × 4 m × 2 m) high plastic greenhouse. After visiting Pauleen Sullivan in Ventura and Jim Specht, I became determined to build a large two story greenhouse somewhat like theirs.

In 1969, I obtained a permit to build an 18′ high 20′ × 30′ (3 m × 7 m × 10 m) greenhouse attached to my single story house. Fiberglass was used for the ceiling and clear plastic for the sides. In an attempt to duplicate the tropics, I installed misters on the ceiling so that when activated, a fine mist would descend onto the plants below. It gave the incredibly authentic feeling of being transported to the rain forests. Unfortunately, I soon discovered the ill effects of minerals in our Colorado based water. Every palm turned from luscious green to chalky white as a result of the minerals becoming deposited on the leaf surfaces. I spent hours rubbing off the powder and polishing each leaf of every plant. The mister heads soon become clogged, requiring me to climb an 18′ (6 m) ladder to clean the system. After a year of unclogging misters and cleaning leaves, I had enough. The system was dismantled and moved closer to ground level.

Not long after building the greenhouse, I planted *Verschaffeltia splendida*, *Phoenicophorium borsigianum*, and *Cyrtostachys renda* in the ground. The *Verschaffeltia* was about 12′ high when I layed down a mulch of cow manure which apparently was too strong. The next day, my three most prized palms were dead. Not until this year have I been able to grow those same three species to respectable sizes.

As some of the rare or tropical seedlings started to grow in size, I began to plant some outdoors. I remember, in particular, planting *Veitchia joannis* next to the wall on the south side of the house. Several years later, I related that fact to David Barry, one of the pre-eminent palm pioneers. He outrightly proclaimed that it was impossible and insisted *Veitchia* wouldn't grow in California. Jim Specht, another palm pioneer, was more encouraging by commenting that it might live until it reached the eave of the house. As it was, the palm didn't pay attention to either one of them. It grew to have over two feet of bare trunk above the roof of the house, and would still be there, I'm sure, had not a tree branch fallen on the trunk of the *Veitchia* and sheared it in half!

As time went on, my palm fever worsened. My wife found that the palms started to encroach more and more onto the lawn area. As trees begin to multiply in number and grow taller, lawn grass no longer flourished in the diminished light. Likewise, newly acquired sun-loving palms refused to thrive in my shaded garden. In search of new places to grow palms, I started to invade the neighborhood.

I noticed that the tree planted by the city in the parkway was ugly in every respect. So, I cut it down to make room for a palm. My panic-stricken wife was sure that city officials would lock me up and throw away the key. When no one came for me, I planted another palm and then another. After several years, over thirty palms grew at various intervals down the parkway strip. Finally, city personnel made an appearance, and not only approved my landscaping, but allowed me to plant palms in the entire neighborhood circle. I also convinced them to plant arecastrums (now *Syagrus romanzoffiana*) on the main street and to add *Archontophoenix* along a main thoroughfare and in city parks.

For a number of years, I needed another greenhouse better exposed to sunlight. The only place that qualified was on top of my house. I built a geodesic dome greenhouse

and mounted it on the roof. It is about 10′ across and 7′ high and is used to start seeds and push along small tropical palms.

Two years ago, I decided to tear down my ageing two story greenhouse, build another, and correct all the original mistakes. The new one has a cement foundation, sliding glass patio doors, and glass walls. It was a lot harder for me to build because I had to tear down the old one, and found that panes of glass are harder to handle than flexible, unbreakable plastic. Besides, I was 16 years older!

In addition to landscaping the new greenhouse, I also removed all the grass in the front parkway strip, conditioned the soil, and planted additional palms, cycads, and ferns among lava rock boulders. I also provided a means of protecting the area from hot, dry winds by building a moveable lattice structure. It can be put up when the winds blow and later removed when the winds abate. Future projects will be to build a waterproof deck adjacent to my two story family room and to erect a solar room addition.

During the last twenty years, I have planted out *Neodypsis decaryi* and *Ceroxylon* only to have lost several of them. I have continuously tried to grow these two species but none has yet reached five feet in height. I would not be so persistent except other Palm Society members in the area have great success with them. However, I have had good luck with viable seed from my *Caryota urens* and *Areca catechu* which has its roots in the greenhouse and its crown growing through the roof, exposed to the open sky. I hope to soon have seed from my *Ptychosperma elegans*, *Coccothrinax dussiana*, *Chrysalidocarpus madagascariensis* var. *lucubensis*, and *Copernicia alba*.

In the two story greenhouse, I have *Verschaffeltia*, *Licuala grandis*, a 7′ tall *Zombia* which I will also try to let grow through the roof. Also growing here are *Heterospathe negrosensis*, *Cocos nucifera*, *Rhapis humilis*, clumping pinanga, and *Chrysalidocarpus cabadae*. Outside in the garden, my tallest palms are *Washingtonia robusta* and *Caryota urens*, about 60′ (30 m) tall. I trim the leaves on the Mexican fan palms myself, and up there, they seem a lot taller. I look forward to planting *Jubaeopsis caffra* next spring, and have saved a special place for it.

At this time, I have ground planted over 250 palms, and my biggest problem is space. I not only collect palms, but rare ferns, fruit trees, cycads, and aroids. How to house all these plants and try to make it aesthetic is no small task. It would be impossible if I lived in the true tropics where plants might grow too fast and too large. So, I am lucky to live in California, after all.

Some day, we are hoping to spend part of the year in the tropics and part of the year in California. That way, we'll have the best of both worlds.

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Mass Destruction of Phoenix loureirii in South India

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Phoenix loureirii Kunth is a palm with beautiful feathery leaves and very few thorns. It is distributed between 200–2,000 m altitudes (Gamble 1967) on the hills forming the Western and Eastern Ghats of South India. Grassy, steep slopes are its favorite habitat. The trunk grows up to a height of 3.5 m and a thickness of 25 cm. Many sucker shoots are formed at the base. Flowering starts even while the stem is barely visible and continues for several years. From germination to the onset of flowering, about 10 years elapse. The growth of the stem is rather slow. About 16–20 leaves are produced per year. Judging from this and counting the persistent leaf bases, one can estimate a specimen 3 m tall to be 60 years in age. In the undisturbed condition the cool grassy slopes support dense formations of this palm. The flowering season starts in January and clusters of edible orange-red fruits turn violet-black on ripening in the months of July and August. Seedlings are found especially in the crevices and depressions harboring a layer of soil. Deep cracks in the rocks offer favorable rooting spots. A mat of fibrous roots anchors the palm firmly to the substratum besides acting as a medium for the retention of soil and associated mosses, liverworts, and grasses. Entire slopes of hilly terrain often show pure formations of *P. loureirii*. Until recently, the palm was relatively undisturbed in its natural habitat. However, an alarming trend of destruction continues to be witnessed as human exploitation of the species rapidly increases and threatens its very existence. Even though the leaves were traditionally plaited into mats, the main cause of worry is the broom industry that thrives on the leaves of *P. loureirii*. With ever increasing demand from cities and towns, tons of foliage are being removed from the hills. Another equally disturbing aspect has been the practice of burning down the hillsides for the cultivation of cardamom, coffee, tea, potatoes, and bananas.

A reconnoitoring survey conducted by the authors revealed that the destruction of *P. loureirii* is almost universal in the state of Tamilnadu forming a large chunk of Peninsular India. The southern districts of Madurai, Anna, Kamaraj, Tirunelveli, Salem and Periyar have many hill ranges with *P. loureirii*. Situated 80 km from the city of Madurai, the Palni Hills alone account for several thousand acres of forest land inhabitated by this species. The Sirumalai Hills in Anna District also harbor vast stretches of slopes with *P. loureirii*. On the Eastern Ghats, the Kolli Hills (Salem Dist.), Javadhu Hills (N. Arcot Dist.) and the Tirupathi Hills (Andhra Pradesh) ranges show many natural populations of this species.

In all the districts mentioned above, the broom industry based on foliage of *P. loureirii* thrives prosperously. The technique of making brooms is simple. The leaves are cut while still tender and pliable, half way along the rachis, and left to dry in the sun. The feathery terminal parts are

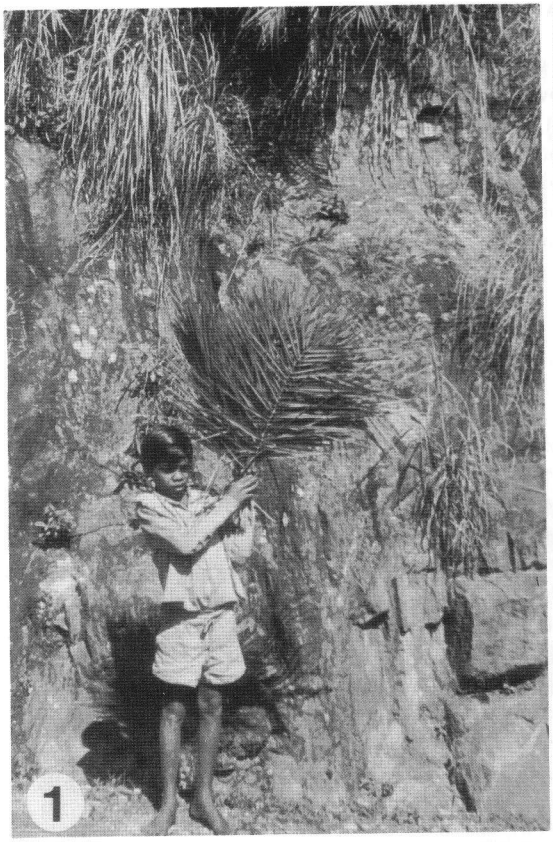
tied together by their rachises after grooming the laminal strips. This is followed by trimming the tips with a flat sachet to the required length (Fig. 2). The brooms last for 3 or 4 months under ordinary domestic use. However, if used as a brush for white-washing masonry structures, the wear and tear are considerable and the broom may last only a few days. After its useful life the brooms may be burned as fuel. When dried, the dark green foliage turns pale green and then pale khaki in color. The lacy texture of the pliable laminal parts of the leaflets is admirably suited for broom making. The bunches of pruned leaflets are tied with fibers prepared from the petiole of palmyrah leaves. The binding of the pruned leaves is practiced as an art by broom makers.

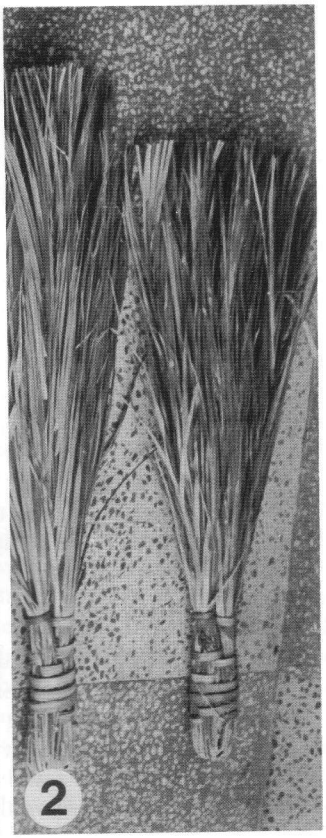
The leaf gatherers come from various villages dotting the hills and adjoining plains. Boys, girls, women and men of all ages are engaged in leaf gathering for the broom industry (Fig. 1). The cut leaves are packed up in small bundles and carried off as headloads to villages where they are pruned and left to dry in the sun. Often, large collections of leaf material are seen left drying in the sun around farm houses. The finished product is transported on all available modes: headloads, bullock carts, bicycle or lorry (Fig. 3). Headload carriers may be seen in "caravans" leading to weekly village markets known as "shandies." The price of a broom varies from a rupee to one rupee and fifty cents. To make one broom nearly 10 leaves are destroyed. At this rate, to make a cartload of brooms 1 or 2 acres of hillsides would be denuded. In the absence of monitoring agencies, the total volume of business in brooms remains unknown though formidable. However, there is reason to believe that this cottage industry involves transactions to the tune of several millions of rupees for the entire state. The broom plant, *Aristida cetacea* Retz., a grass (Poaceae), was so overexploited in the past 50 years that it has become a rarity. A broom of this species would cost more than that made of *P. lourerii* leaves. Another type of broom made from coconut leaflet midribs is also a commodity of commercial value. However, this is not used for the cleaning of fine dusty floors in houses but it is reserved for coarse work. It is gratifying, however, that coconut leaves are available in sufficient quantities for the community's requirement. It must also be mentioned that only yellowing, old leaves falling from trees are used in this case. The damage done to *P. loureirii* is of another kind causing destruction of the species. In this case, leaves are cut at the prime of their functional life.

Allotment of hillside lands for cultivation of crops and vegetables appears to be much more devastating in regard to *P. loureirii* than other native species. We had many occasions to watch the practice of burning of the vegetation on hillsides for cultivation. The tongues of flames raging on hillsides are seen several miles away during dark nights. Whole formations of *P. loureirii* become charred (Figs. 4,6,7) as the undergrowth and grass are set on fire. It is a pathetic sight to watch the green clusters of *P. loureirii* get scorched to black remains. Often the charred trunks provide charcoal for the traditional household oven. Once destroyed by fire the species never seems to come back as the soil is used extensively for raising cash crops.

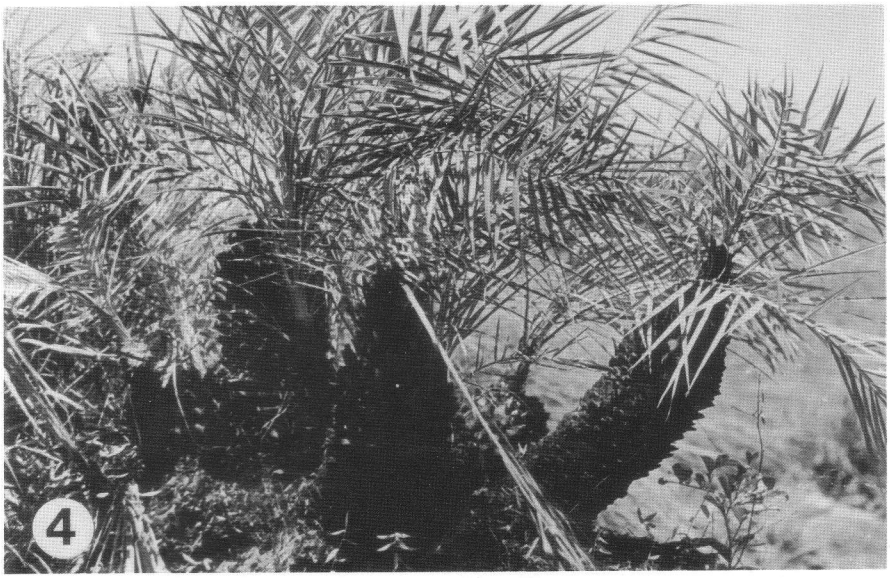
On the Pulney and Sirumalai Hills an ancient, anthropologically interesting tribal people (Paliar) live as nomads in the forests. Cabbage of *P. loureirii* is one of their favorite dishes.* Surprisingly they do not appear to have caused severe damage to the species over hundreds of years of their existence. Inquiries show that these tribes extract cabbage from the oldest trunk in a clump but do not disturb the root stock or the offshoots. Extraction from 2 or 3

* Medicinal values are attributed to the cabbage of *P. loureirii* and because of this plant collectors are attracted to this species.





1. A village boy with a bunch of leaves of *Phoenix loureirii* for making brooms. 2. Brooms made of pruned leaves of *P. loureirii*. 3. A village trader with a bundle of brooms on a bicycle.



4. A stand of *P. loureirii* showing charred trunks, the effect of burning vegetation on hills for cultivation. 5. A view of the natural habitat of *P. loureirii.* The palms are almost hidden among grasses.

shoots is sufficient to meet the requirements of a family of four tribal people for a day. They also collect honey, tubers of *Dioscorea,* and wild fruits to supplement their diet. The ripe fruits of *P. loureirii* are also eaten as a delicacy. It is said that the tribal population has remained small over the years without modern methods of population control.

The recent large scale planting of Euca-

6. Another view of burned landscape with a few scorched plants of *P. loureirii*. 7. After complete burning, charred stumps of *P. loureirii* are seen among remains of other vegetation reduced to ashes.

lyptus for paper pulp industry also adversely affects the natural formations of *P. loureirii*. As the *Eucalyptus* trees grow, the surrounding areas become denuded. Grasses and weeds disappear; the mosses, ferns and liverworts dry up exposing the clumps of *P. loureirii*. Ultimately, the latter are also eliminated. This is an instance showing the deleterious effect of exotics on natural populations.

As a result of partial burning, abnormal shoots are produced on charred specimens of *P. loureirii*. It remains to be studied how permanent these effects are going to be in the future. Stunted palms which survive the blaze are ugly and malformed.

Destruction of *Phoenix loureirii* and grass cover leads to loss of water retention and soil erosion. In August 1986 we observed water trickling from natural slopes with undisturbed grass and *P. loureirii*, whereas the slopes prepared for cultivation were very dry. This was a live demonstration of ecological damage. The fibrous roots of *P. loureirii* not only hold the rocks and soils, preventing landslides, but also help in the retention of humus along with grass roots, mosses and lichens. In the interspaces between *P. loureirii* clumps, a number of herbaceous species, bryophytes and ferns thrive very well. All these species are destroyed by burning.

At the present rate of destruction the species might become very rare by the turn of the century. It is also natural to expect its total extinction in many parts of the peninsula in another decade. The reasons for this foreboding are not difficult to seek. The one single factor against this species is that no one has ever thought of replanting it or restoring the balance of nature while demand for cultivatable land is increasing. The conservationists seem to be unaware of the problem. Press and media in the state are not even concerned with such marked destruction of a species which should be preserved for all time. In the picturesque Palni Hills, one more important component (*P. loureirii*) of the natural ecosystem is being destroyed, paving the way for further deterioration. *Bentinckia condapanna*, a beautiful endemic palm, became extinct in this area just a decade back. It may be mentioned in parenthesis, that another species, *P. farinifera*, occurring on the plains has been very considerably reduced by overexploitation of its stem and stems of the palmyra palm, *Borassus flabellifer*, have also been exploited for brick kilns as already highlighted by Davis (1985). Devoid of its vital component, *P. loureirii*, the future of grass ecosystems of the Western Ghats looks bleak.

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Principes, 32(3), 1988, pp. 124–128

The California Spotlight: Pauline Sullivan

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For many members residing in Southern California, The International Palm Society is nearly synonymous with Pauleen Sullivan. An ardent Society supporter, Pauleen is often associated with the ubiquitous mobile Bookstore, through which members may select and purchase a variety of reading and learning material. But Pauleen's personal interest in palms extends far beyond her Bookstore activities and her position as Vice President of the International Palm Society. The following conversation highlights a few of the facets of this multi-talented lady.

How did your involvement with palms come about?

I was always interested in tropical plants, even as a child. All types. But my husband, Joe, didn't care about plants at all until I came down with polio in 1950. I had plants outside my window while I was confined to my bed. After we built our house in Ventura in 1949, we had tried to make the yard look like a tropical garden. While confined in the hospital, I kept telling Joe, "You've got to take care of my plants; you can't let them die." So, naturally, he began watering and looking after them. By the time I came home from the hospital, he had become so enthusiastic about the tropical plants, that he said I would never have to take care of them again. He said I had lost my hobby to him! Of course, I couldn't take care of any plants because I was in bed for almost a year. Joe got so involved with growing tropical plants, that soon all he could think about was going into the nursery business. At about that point, he really began to like the palms. So Joe quit his job and we started a nursery in Ventura. It was called The Tropical Garden; we raised only tropical-effect plants, and Joe started collecting palms. Once, we visited Tetley's Nursery in Corona. When Joe saw all the palms there, and walked underneath the tall *Washingtonia*, he decided we needed more land to grow more palms. We hunted around, and found about an acre and a quarter of land; this is where the Tonga apartments are now. We planted palms there, and sold them as they grew up. Joe wanted more land for more palms. Finally, we ended up with fourteen acres, and we planted 45,000 palms there. That was in the mid 1950's. And at that time, we really had not heard of any Palm Society.

Well then, how did you become a member?

We joined in 1956, just after it was started. How we found out about it? Well, I was in the hospital in Ventura, and then after that, I went to a rehabilitation center for polio patients in Santa Monica to learn how to survive as a "handicapped" person. I would be down there during the week, and Joe would come down to pick me up and bring me home for the weekend. Friday nights, after he picked me up, we would go over to Dave Barry's place, and look at his plants. Dave was one of the earliest members, and he was the one who told us about The Palm Society. So that was how we joined.

1956! Thirty years as a member.

Thanks to Dave Barry, we were able to start collecting other palms to go with the *Washingtonia*, *Phoenix reclinata*, are-

castrums (*Syagrus romanzoffiana*) and *Trachycarpus* we were growing on our land. Things like that. Those palms were still fairly uncommon in our area back then. This was before all the palm nurseries started popping up out in the desert.

After we started our nursery, we found out that it wasn't so easy to make a living selling only tropical plants. We found that we needed to carry more of an assortment of plants. Luckily, we were also into landscaping. At that time, there was no classification as "landscape architect," but my husband was a licensed landscape contractor and designed landscapes to help the nursery income along. During the week I would run the nursery and do landscape designing for him while he was out with his crew. On the weekends, we both worked at the nursery. The hours were long and it was hard to make a living.

After a while, an inventory tax law came out which affected nursery plants. At first we were taxed on only the ones in containers, but later we got a new assessor in Ventura, and he came over and told us that we would have to pay a tax on all the palms we had in the ground. About 50,000 palms, plus the ones we had in cans. I said we could not afford to do that; it was an impossibility. I told the assessor we would have to go out of business, and he said he would be "lenient" on us for that year. We began selling our palms at a reduced price if people would come out and dig their own. In this way, we got rid of nearly all of them. This was in 1969. A few years later a large nursery challenged the law in court and won. Now there is no inventory tax on plants in the ground.

So we got out of the palm nursery business, but I stayed interested in palms as a hobby. During the time with the nursery, my husband was getting seeds of the rarer palms and raising them up, just like I do now. But back then we were not able to get nearly as many seeds as the Seed Bank gets today. In one year we were lucky to receive maybe ten packages of rare seed.

The grounds around your apartment buildings display a really exciting variety of palms. Did you design the landscapes?

Yes, and I designed the whole building for the Tonga apartments. When we bought the other buildings, we tore out the landscaping and replanted the places with palms. Most of the palms around the apartments came from our nursery. It took a bit of time to do all this. It was 1964 when I landscaped the other buildings with palms we had raised. It was not a very fast process, as I am still planting palms.

How did the memorial garden (for Mr. Joe Sullivan) at Ventura College get started? It's really an interesting collection.

John Tallman, Vice Chancellor of the Ventura College district, Vice President of the Northern California Chapter of the International Palm Society, and now an ardent palm grower had just moved down here from Washington State. On his way to the college each day, he started to admire palms growing in Ventura. This led him to our door. John said he would like to start a botanical garden at the college and asked my husband's help. Joe said sure, he would help. He showed John around our places, explaining how he grew palms from seed and gave John some palms to help get the garden started. A few months later, while we were on a "palm seed collecting" trip in Indonesia, my husband died suddenly.

It seems like you are always at Palm Society meetings.

I attend every one.

Can you explain how the Palm Society Bookstore got started?

At the Palm Society meetings in 1973, different members kept coming over to me and asking where to get "Palms of the World." Most book stores, I guess, had

trouble supplying it. I asked my husband if we could go ahead and buy copies of the book, for me to sell at the meetings. He said okay, and the monies we made were given to the local chapter. That was how the Bookstore actually got started. Later came "Supplement to Palms of the World," and we were able then to sell two palm books at the meetings. After a while, the Board of Directors of The International Palm Society decided that the "store" was a beneficial feature, and I was asked to sell palm books on a regular basis to all members. The Bookstore now has 29 books and five palm papers.

Do you fertilize your palms regularly?

Yes. I fertilize everything almost once a month, unless I use a slow release fertilizer that lasts for about four months. I fertilize right up to the end of November, then stop for December and January, and start up again near the end of February. I believe in giving the palms a lot of water. I try to attend to each palm individually.

Let's embark on an armchair tour. Can you recall some of the palm-filled places you have visited?

I've been lucky enough to visit New Guinea, Sulawesi, Borneo, Brazil, Australia, Singapore, the Philippines, Thailand, Colombia, Central America, and Mexico. I love travelling, especially to places with lots of palms. The South Pacific is beautiful, with islands like Tahiti, Fiji and Samoa. On our 30th wedding anniversary my husband took me to the island of Tonga. I particularly enjoy the Asian countries. The people are nearly always friendly and helpful. But the two locations which really stand out in my mind are Malaysia and the areas around the Amazon. Those places are filled with native palms, many species, growing everywhere.

In addition to the gorgeous Pinanga, Licuala *and* Ptychosperma *growing in your yard, which uncommon palms have you grown successfully outdoors, here in Southern California?*

Well, I believe the *Ceroxylon* at the apartments is probably the tallest and oldest in the U.S. We planted it in 1967, a seedling with two leaves, and now it is around twenty-five feet tall. I have beautiful mature specimens of *Hedyscepe canterburyana* and *Lepidorrhachis mooreana* from Lord Howe Island. Both are fruiting. I never get tired of looking at my *Euterpe edulis*, and then there is cute little *Chamaedorea tuerckheimii* (the potato chip palm). My favorite palm is always the one I'm looking at, as I love them all.

Advice for new Palm Society members?

Listen to other members talk about their successes and their failures. Then try it out for yourself. Some of the members have been growing palms for quite a while, and they have a lot of knowledge to offer. But always remember things may work differently for you.

How many genera or species of palms are in your collection?

I have no idea. I don't count them. I just enjoy them.

You have one of the largest Jubaeopsis caffra *palms in California. How did you acquire such a fantastic specimen?*

Dave Barry had that palm. It was planted in an office building complex next door to Dave's nursery. The palm had been there for a number of years, and was really sort of sad-looking. My husband wanted to buy it from Dave. Dick Palmer also wanted to buy it. And, Mardy Darian was interested in getting it, too. This was about fifteen years ago, in the early 70's. Finally, Dave decided to split up the palm. There were three healthy divisions growing, and Dave offered to sell one to each of the three men. They had to dig it themselves, and

they drew straws to see who got first choice. My husband drew the first-choice straw. The largest offshoot sold for $200.00, and the other two were $150.00 each. These plants were about three feet tall at the time. So we brought ours home and planted it, and it has grown very well.

You have been involved in more than one potentially dangerous situation while travelling in other countries?

I think one of the scariest things to happen on a trip was in Sumatra. We had been driving in a landrover for six hours or so, heading for an area which had some unusual palms. John Dransfield had written to us, and had given us directions to a location in the Medan area. Very few people spoke English there, but we had an English-speaking guide with us. But the driver of our landrover could not speak English, and after driving for about six hours, he suddenly stopped. In the middle of nowhere, really. Our guide told us we had to get out, walk to a river up ahead, and travel in a canoe over some rapids. The canoe could only hold one person at a time, and you had to hold on to a rope while you went across the rapids. I asked the driver, "How am I supposed to go across the rapids in a wheelchair?" We had no idea this was going to happen, since we had been told there would be no problem getting to the area. But here was a problem. Since we had come this far already, we decided that my husband would cross the rapids, and I would wait near the landrover. So my husband and the guide left, and I stayed behind with the driver, who spoke no English. It was very hot and humid, and they took me out of the truck and put me under a tree. Well, as soon as my husband and the guide left, our driver took off. Just drove away. So there I was alone in Sumatra with no guide, no car, and no husband. Pretty soon, one after another, some local boys came out of the jungle and stood around looking at me and my wheelchair. Then they began touching the wheelchair. I counted about thirty people surrounding me, and at that point I began to get really scared. I was almost in tears. Then I remembered that I had brought my camera with me, and I started taking pictures of the boys. They knew what a camera was and liked having their pictures taken. I think this helped a lot. Soon the novelty of my being there wore off, and everyone left. But I was nervous for awhile! To think this was the way I celebrated my birthday!

Sounds like it was a close call.

Well, I guess maybe it was. Another time, on the Amazon, we were in a little boat, again with an English-speaking guide. We would rent this tiny boat, which was about two feet wider than my wheelchair, and travel up the Amazon and into the tributaries. When we saw a spot that looked good for palm collecting, we would pull the little boat up to the bank, and my husband would go look for the plants. The guide would go with Joe, and I was always left in the boat. So there I was again, alone, and this Indian pulled up next to me in his canoe. He just sat there and looked at me, while I looked at him. Then he left, but he came back with another Indian in a second canoe. The two canoes pulled up, and both Indians sat there and stared at me. I kept saying "palma, palma," pointing up to the land where we had seen peach palms (*Bactris gasipaes*) growing. All of a sudden, one native's face lit up. He called out to someone in the jungle, and it turned out to be his son, who brought me peach palm seeds. Later on, my husband returned with no seeds, and there I was with a cluster of seeds without leaving the boat. In fact, I have one of those peach palms growing outside in Ventura. It's over fifteen years old. So that episode worked out okay, but it was sort of scary for a few moments.

Then there was the time Lois (Rossten)

and I were in New Guinea. Dr. Fred Essig had written us on where to see the palms in New Guinea, along with the "do's and don'ts." He said a restaurant in Lae, called *Rosie's* had the best Chinese food he had ever tasted, but we should not go there or anyplace at night in New Guinea as it was too dangerous for two white women to be out on the streets. Hungry for Chinese food, we decided nothing could go wrong if we had our hotel manager call a taxi and tell the cabbie to take us to *Rosie's*. After dinner we would ask Rosie to call a cab to take us back to the hotel. The cabbies didn't speak English. We got in the taxi at our hotel heading for *Rosie's*. As we got closer to *Rosie's* every street corner was crammed with restless, idle men. Then we saw *Rosie's* with a big sign on the door CLOSED MONDAYS. Petrified, we tried to tell our non-English speaking cabbie to take us back to our hotel. He kept smiling and nodding and then headed in the opposite direction from where our hotel was. Lois and I clutched each other's hand and waited for the worst. Suddenly he pulled up in front of another hotel across town. Well, we got that hotel manager to tell our driver to take us back to the hotel where he'd picked us up.

You have supported The Palm Society in so many ways—as Secretary for eight years, Vice President, Member of Board of Directors, Chapter Chairperson, Bookstore Manager—and you have coordinated a number of fund-raising functions, including a drive to help finance the publication of Genera Palmarum.

I feel that The Palm Society is a very worthy organization. It's a good cause, and I try to help out whenever I can.

Then it's safe to assume that you favor increased palm planting?

Of course! As the rain forests disappear throughout the world, The International Palm Society will play an important part in preserving and planting palms, so that future generations can enjoy these exciting, beautiful plants.

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Itaya Revisited

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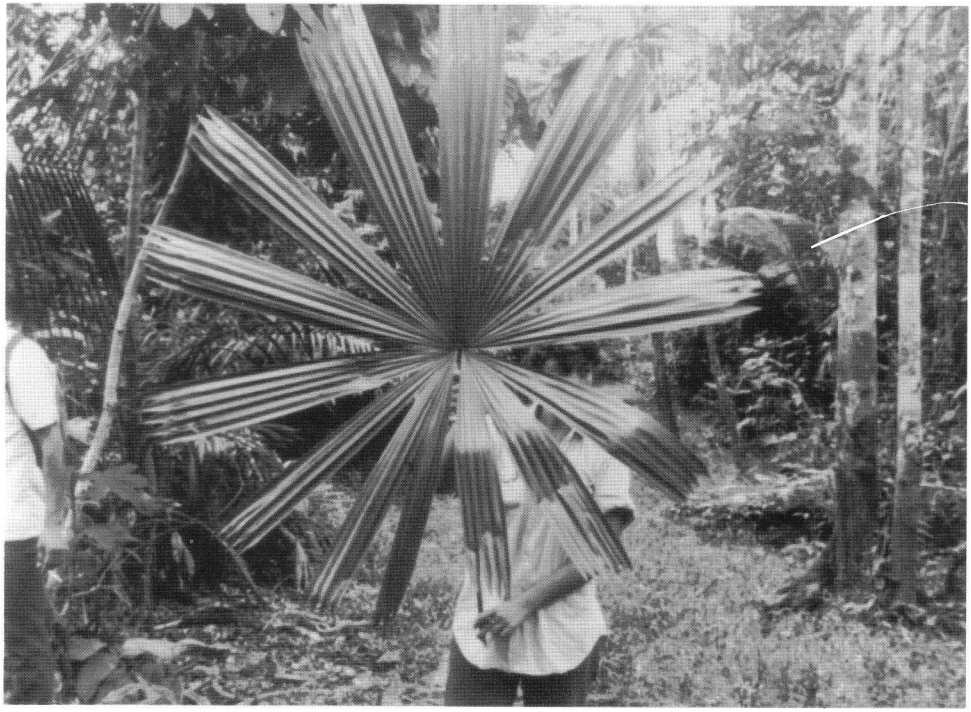
From April to June 1960 Harold Moore collected palms in Peru. On 13 May he travelled by boat from Iquitos up the Río Itaya to a place called Varadero de Omaguas. Here there is a short overland trail which connects the Itaya to the Río Amazonas. While crossing this trail Moore found a small, fan-leaved, coryphoid palm. Although the palm was not flowering he thought it belonged to the genus *Chelyocarpus*. Local people occasionally used the leaves of the palm for thatching, and called it "falso bombonaje" (bombonaje is the name usually given to the Panama hat plant, *Carludovica palmata*, in the Cyclanthaceae). Later, when Moore was back in Cornell and writing his report on the trip, he called the coryphoid palm from the Río Itaya *Chelyocarpus wallisii*.

Moore returned to the Río Itaya twice, on 5 March 1967 and 20 December 1974. On the 1967 trip he found the "falso bombonaje" in flower. Moore realized that it could not be a *Chelyocarpus*. The sepals and petals were connate and there were numerous stamens and a single carpel. Furthermore, the petiole was split near the base. None of these characters usually



1. Leaf of *Itaya amicorum* from Santa Maria del Ojeal.

2. Inflorescence of *Itaya amicorum*. Note split petiole at bottom left of picture.

occurred in *Chelyocarpus*, and in 1972 Moore described the palm as a new genus, *Itaya*, and called the species *I. amicorum*.

For several years thereafter *Itaya amicorum* was only known from the type locality. In a 1977 paper on the conservation status of palms Moore wrote the following of *I. amicorum*, ". . . the species is still known from fewer than 100 individuals in what constitutes, essentially, a single population adjacent to a clearing." Fortunately we now know that the range of *Itaya* is much wider than Moore supposed. In 1973 the species was collected on the Brazilian side of the Río Yavari, approximately 200 km east of the type locality. This river forms the frontier between Peru and Brazil.

In January 1988 I visited Iquitos. The original population of palms still grows on the Río Itaya, and seems to be reproducing and more or less intact. However, the forest in the area is being destroyed. Juan Ruiz, a botanist from the Herbario Amazonense in Iquitos, also showed me a second population at Santa Maria del Ojeal on the Río Sinchicuy, a small tributary of the Amazonas, and about 70 km northeast of the type locality (Fig. 1).

Itaya amicorum is probably relatively common in a restricted region of eastern Peru. It is similar to, and confused with, *Chelyocarpus*. There are at least two species of *Chelyocarpus* in the Iquitos region, but the two genera can easily be distinguished in the field by the petiole. In *Itaya*, the petiole and sheath are split near the base (Fig. 2), while in *Chelyocarpus* they are not. This is the same vegetative character which distinguishes *Thrinax* from *Coccothrinax*.

As far as I know *Itaya* is not in cultivation. Quite a number of seeds were apparently taken to Iquitos recently and

planted, but failed to germinate. The habitat of the palm is tall lowland rainforest below 300 m elevation. Rainfall is over 2,500 mm per year, and there are year round high temperatures. The palm seems to grow in poorly drained acidic soils, often near streams. It is to be hoped that this interesting and attractive palm can be brought into cultivation.

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BOOKSTORE

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LETTERS

Dear Dr. Uhl:

As a member of The International Palm Society and president of the Quail Botanical Gardens Foundation, I would like to make some clarification to the report of the Biennial published in the January 1987 *Principes*.

Ski Torzeski designed and helped build the first phase of the water feature at Quail Botanic Gardens in the early 1970's. But that was the extent of his involvement. Last year the second increment was completed under the aegis of the Foundation as designed by Paul Mahalik, also a Palm Society member. A fund raising campaign is now underway to accumulate monies for the design and construction of the final increment, which will increase Mr. Torzeski's original concept threefold.

Sincerely,

RICHARD A. POEDTKE

Dear Dr. Uhl,

Would it be possible to print the following inquiry in *Principes*.

At my place on the Island of Hawai'i, I have a *Licuala grandis* palm which stays alive and puts out a frond or two each year but doesn't grow much, despite various attempts at fertilization, etc. I was wondering if any reader would know what is missing. I'd be grateful, since the tree is growing in an open garden inside my house, and its puniness dismays me.

DR. CHARLES JAMES R. BAILEY
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