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Ecology and Uses of *Parajubaea torallyi* in Bolivia

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In the Province of Vallegrande, Department of Santa Cruz, Bolivia, grows a little known palm, *Parajubaea torallyi* (Mart.) Burret, called "palma de zunkha," (also spelled "zunca"), pronounced "soon kah", which in Quechua means "beard" and refers to the petiole fibers. Quechua, the official language of the Inca Empire, is spoken from northern Argentina to southern Colombia; it is one of the main languages of Bolivia.

The "zunkha" is a very important plant for the peasants who have utilized it for centuries, but irrational exploitation is putting it in danger of extinction as it is rare within its restricted native range.

Origin and Botany

Moraes and Henderson (1990) summarized the taxonomic data on *Parajubaea torallyi* and the possibly conspecific *P. cocoides* Burret of Colombia and Ecuador, but very little has been published on the ecology or uses. Cardenas (1970) gave a description of this palm in the Department of Chuquisaca, where it is called "janchi coco," referring to the tough fibrous material ("janchi," Quechua) left when the endosperm ("coco," Spanish) is eaten. Cardenas was familiar with the palm; when the Botanical Garden in Cochabamba was being developed and some native trees were being sought for the principal avenue of the garden, seeds of *P. torallyi* were brought from Chuquisaca. These trees have grown well, but have not flowered; in December, 1990, they were suffering from the severe drought in the Cochabamba valley. By 1993 some had begun to flower. Cárdenas also visited the palm stands of Chuquisaca (Soroma and Pasopaya) and saw some plants cultivated at the monastery of Santa Teresa in Cochabamba and in the central park of the Jesuit College of the Sacred Heart in Sucre; however, the origin and age of the palms were not known.

In Cardenas' important treatise on the useful plants of Bolivia (Cardenas 1989), *Parajubaea*

torallyi is again mentioned, but apparently the author was unaware of another major use of the palm—for the fibers. A native of the town of Vallegrande, Rafael Peña (1822–1901) does not mention the edible fruits but refers to the use of the strong fibers of the "palmera zunca" for ropes, baskets, brooms, and coarse cloth in his *Flora Crucena* (Peña 1976: 292–293), first published in 1901. Uses are also listed in Balslev and Moraes (1989), based on recent information from the Vallegrande area.

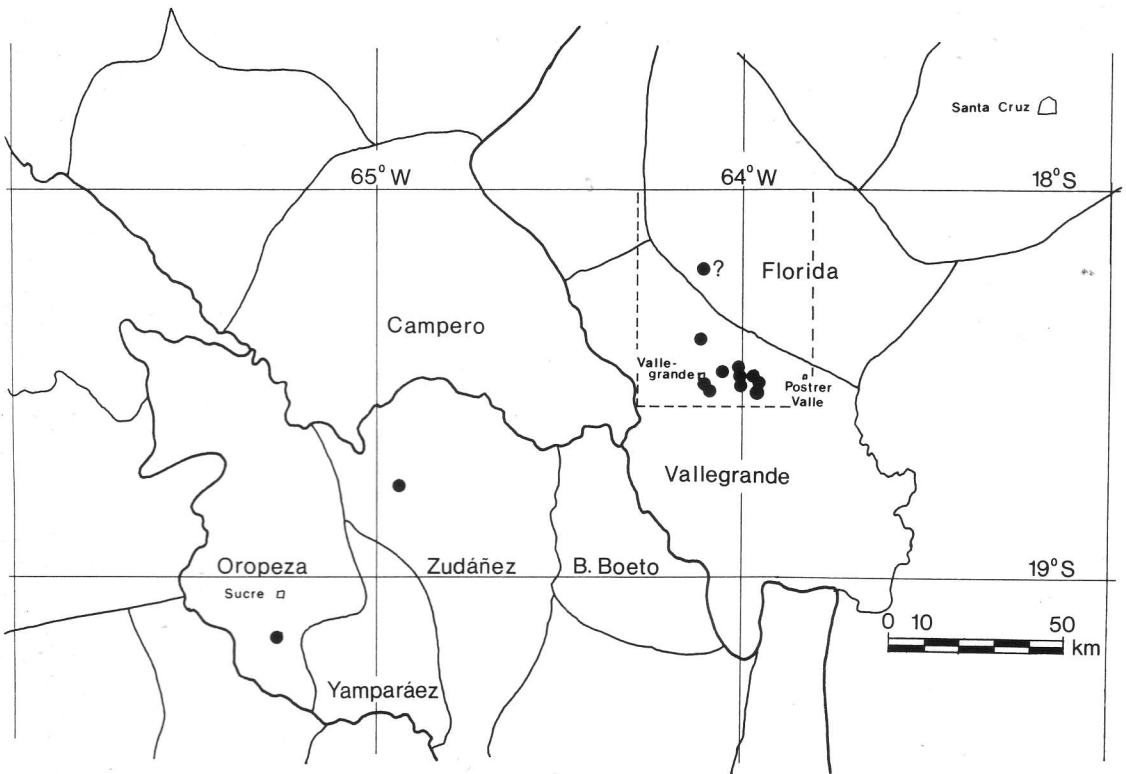
Distribution and Ecology

This palm is restricted to the northern Department of Chuquisaca (Provinces of Oropeza and Zudáñez) and the western Department of Santa Cruz (Province of Vallegrande and possibly Province of Florida). It is possible that it occurs in the Department of Cochabamba (Province of Campero) and south of the localities shown in Figure 1, but there is little likelihood that it occurs further west, north, or east because suitable habitats are lacking.

Parajubaea torallyi is endemic to south-central Bolivia at altitudes from 1,800 to 2,500 meters, where it inhabits the dry temperate forests. The dry season lasts from June through October and often longer. In July and August frosts often occur at night. *P. torallyi* should prove to be one of the more frost-resistant palms, at least in dry climates; it would probably be well adapted to mediterranean localities. Seeds from Vallegrande are being provided to the International Palm Society's Seed Bank.

The known localities in the Vallegrande region are numbered as in Figure 2. Most of the localities consist of a very few cultivated trees, and most of the wild populations are small or severely endangered.

1. *Quebrada del Zorro*. 18°30'S, 64°06'W, alt. 2,040 m. M. Nee & I. Vargas 38349 (K, LPB,



1. Known distribution (solid dots) of *Parajubaea torallyi* in Department Chuquisaca (Provinces of Oropeza and Zudáñez) and Department Santa Cruz (Provinces of Vallegrande and Florida). Area in dotted lines enlarged in Fig. 2.

NY, MO), *I. Vargas 101* (LPB, USZ, Jard. Bot. Santa Cruz).

The "quebrada" is a small stream valley with a recently abandoned farmhouse. There are three large "zunkha" palms over 100 years old, and another recently fell down. In a thicket of the giant reed *Arundo donax* L. there is abundant regeneration of the palm where the seedlings are protected from fires and grazing by cattle. It is reassuring to see the vigorous regeneration if these precautions are taken. A young tree on the other side of the stream is shown in the cover photograph.

About 100 meters to the south there are three large trees, over 100 years old in a brushy pasture on a gentle slope. A fourth one was cut down a few years ago to make a telephone pole. No illustration is provided here.

2. *San Antonio, on road from Vallegrande to Guadalupe. 18°30'S, 64°06'W, alt. 2,040 m.*

There are two very large and one smaller tree east of the road and one west of the road. These are cultivated trees, but there is some regeneration

in the orchards and gardens. There may be three more trees east of the road in a ravine.

3. *Guadalupe. 18°33'S, 64°05'W, alt. 2,000 m.*

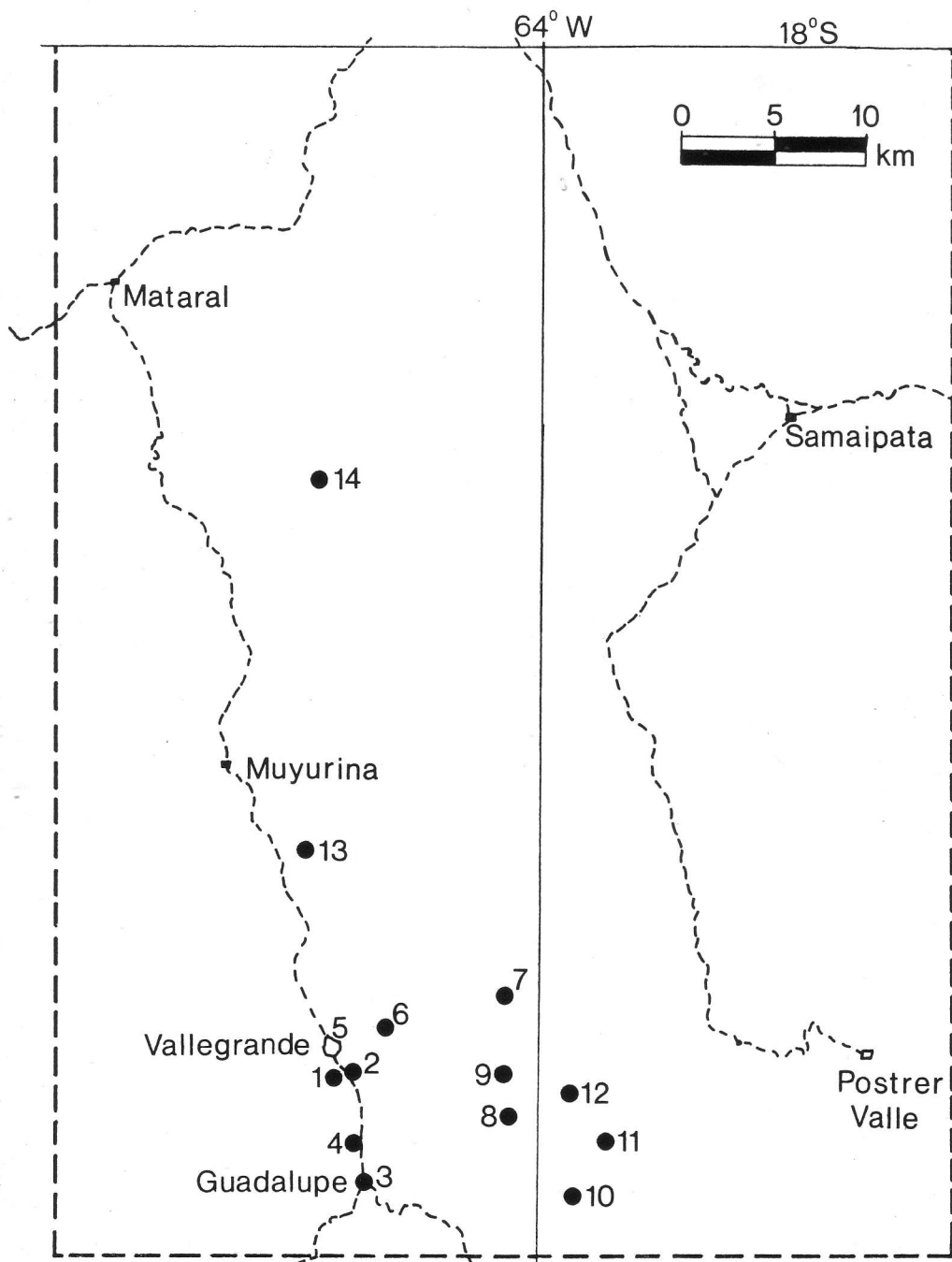
There are three large cultivated trees here which were said to be brought many years ago from trees to the west (upstream from) locality 1.

4. *Quebrada Huasacana. 18°32'S, 64°06'W Cañada alt. 2,050 m.*

There is a cultivated tree, about 15 years old, brought from San Blas (localities 7, 8, and 9) and another small tree brought from upstream from locality 1.

5. *Vallegrande. 18°29'S, 64°06'W, alt. 2,000 m. M. Nee et al. 36245 (AAU, Jard. Bot. Santa Cruz, K, MO, NY).*

This single young tree flowers and fruits abundantly. It grew spontaneously in about 1974 from discarded seeds which had been brought into the town for eating. It is very healthy, growing in the backyard of a house, in an area now used for domestic animals. There are a few other young trees in Vallegrande, also having sprouted from discarded seeds.



2. Locations of *Parajubaea torallyi* in the Vallegrande region. Numbers as in text.

This collection and the previous ones are from the broad semi-arid valley of Vallegrande. The “zunkha” palm may never have had natural populations here, for the trees are either cultivated or probably so. The following collections are from natural populations.

6. *Cañada Arteaga*, 3 km NE of Vallegrande. 18°28'S, 64°05'W, alt. 1,960 m.

According to one informant, in the *Cañada de Arteaga*, there was formerly a palm grove, but today there are only two very tall plants. This “cañada” (ravine) was formerly called San Jose

de las Palmas, then later called Canada de Vargas, and nowadays it is known as Canada de Arteaga, these latter two based on surnames of local people.
7. *Rio San Blas*. 18°S, 64°01'W, alt. 1,850–2,000 m.

The palm is very rare on the west side of the river (only two trees), but there are many small plants on the east side. "Corocera" is the name given here to the palms that produce fruits ("corozo" is the name for the fruit), but they have all been cut down and there is only a single large palm left.

8. *Rio San Blas—Rio Rodeo*. 18°31'S, 64°01'W, alt. 1,800–1,900 m.

There are only small trees in this population.

9. 18°30'S, ca. 64°00'W, alt. 1,800–1,900 m.

There are many trees in the quebradas here.

10. *Rio Piraymirí*. 18°33'S, 63°59'W alt. 1,800 m. M. Nee et al. 36179 (AAU, LPB, Jard. Bot. Santa Cruz, MO, NY, US).

There are only ten young trees in a steep valley, 1 km upstream from Juntas de Guaricongas.

11. *Mataralcito*. 18°32'30"S, 63°57'30"W, alt. 2,150 m. A. Henderson et al. 760 (LPB, NY, USZ), M. Moraes et al. 1,048 (LPB, NY, USZ), I. Vargas 230 (LPB, USZ, Jard. Bot. Santa Cruz).

This population includes a number of larger trees which have footholds carved in the trunks so that the "zunkha" fibers can be harvested without felling the tree. Petioles up to the flowering nodes are harvested so no fruits are being formed. No regeneration was seen here although the conditions are probably favorable. The habitat here is much wetter than the previous locations and the degraded forest includes *Podocarpus parlatorei* Pilger, *Cedrela odorata* L. and *Tipuana tipu* (Benth.) Kuntze.

12. *Alto El Palmar*. 18°31'S, 63°59'W, alt. ca. 1,900–2,000 m.

There are said to be many "zunkha" palms in this area and they have probably been exploited for more than a century.

13. *Abra Quina-Quina*. 18°25'S, 64°07'W, alt. 1,850–1,950 m.

These are scattered trees in this steep canyon and some regeneration. There are said to be both *Parajubaea* and *Ceroxylon* at a locality called "Palmas Amarillas" two km east of here.

14. *Quebrada La Palma*. 18°13'S, 64°08'W, alt. ca. 1,700–1,800 m.

There are said to be "zunkha" palms at this locality.

Numerous localities in the Vallegrande area

have "palma" or "palmera" in the name indicating the presence of some palm. Some areas probably contain or have contained *Parajubaea*, while others probably have a species of *Ceroxylon* (not identified in Balslev and Moraes 1989) which grows in cloud forests on the ridges in this region.

Method of Propagation

The fruits of *Parajubaea torallyi* fall to the ground at maturity and are transported by animals or water in the vicinity of the plant, where many of them germinate. It is also common to see palms growing on slopes and even on the tops of the hills or cliffs, where neither wind nor water could have carried them. The local peasants believe that these palms come from nowhere, that they are born from the ground itself. We have observed that rats and squirrels like to eat the fruits of this palm; they may be the disseminators of the seeds, carrying them to their holes or nests where they later germinate. Germination requires about 17 months. People who have tried to transplant these palms have not had success.

Form of Exploitation

The "palma de zunkha" has four parts that are exploited. The fiber and leaf products are seen for sale in the Vallegrande marketplace but are not usually exported to the larger cities.

1. The fibers ("zunkha").

The "zunkha" is the fiber of the sheathing petiole base. The fiber can easily be extracted by cutting the base of the petiole and unwrapping the "zunkha." A single petiole produces an interwoven, tough, coarse, light brown fibrous mat measuring more than a meter in length and 50 cm in width at the base (cover photo). The petioles are cut one by one, starting at the lowest and proceeding upwards until the lower living leaves are reached and the fibers become white and are too tender for use. This tree had not been harvested for two or three years, and 37 leaves were removed at once, indicating that about 12 to 18 leaves may be produced each year on a vigorous young tree. Harvesting can be done each year and at any season. Fiber over a few years old on the tree is too weathered or rotten for use, but the fiber can be stored for fifty years if kept inside in a dry place because no insects attack it.

Formerly the "zunkha" was harvested by cutting down the trees, as it is much easier to cut

off the petioles when the tree is on the ground, but little by little extermination threatened the groves. Some people have become aware of this problem and now harvest the leaves by climbing the trees, either by ladders or by cutting footholds into the trunk. Unfortunately, the petioles subtending the flowering and fruiting inflorescences are usually harvested and the intensively exploited trees produce no fruit even though they themselves are not harmed by the harvesting.

a. Ropes ("sogas"). Twisted "zunkha" fiber ropes of different sizes and thicknesses have many uses in the region—to tie up farm animals, to tie gates in pastures—because they are resistant to decay when used outside and are not attacked by insects or gnawing animals.

The rope is made by two people. One person holds the loose end of the growing rope and from a pile of prepared fiber continuously adds small strips 3–4 cm wide by inserting them into the end of the rope with his other hand (Fig. 3). The second person periodically twists the rope by twirling a wooden paddle with a stick through it (the "tarabilla," Fig. 4).

To make a thicker rope, the rope is doubled, the "tarabilla" attached to the doubled end, and the strands are twisted around one another while the second person keeps the loose ends untangled. An additional strand can then be twisted around the other two to make an even thicker rope. Finally, loose projecting fibers are removed with a knife.

b. Mattresses ("colchones"). The "zunkha" fibers are arranged to form a mattress and then tied through with a string of the same fiber. These mattresses are of different sizes and thicknesses and are ideal for sleeping, being cool and very durable.

c. Pads ("capachos"). These are made in the same manner as the mattresses but are smaller and are used on pack animals to avoid injury to their backs when they are carrying irregular loads. Sometimes the pad is covered with a wool bag or sack to keep it from becoming deformed or damaged.

2. The leaves and leaflets.

a. Twine ("kheswa"). This is a small rope twisted from the tough leaflets of mature leaves from the palm. The leaves are removed one day before being worked up so the leaflets become softer and can be twisted more easily. A number of leaflets are torn from the midrib. Two strands are twisted in opposite directions between the open palm and the leg, and then the two strands are



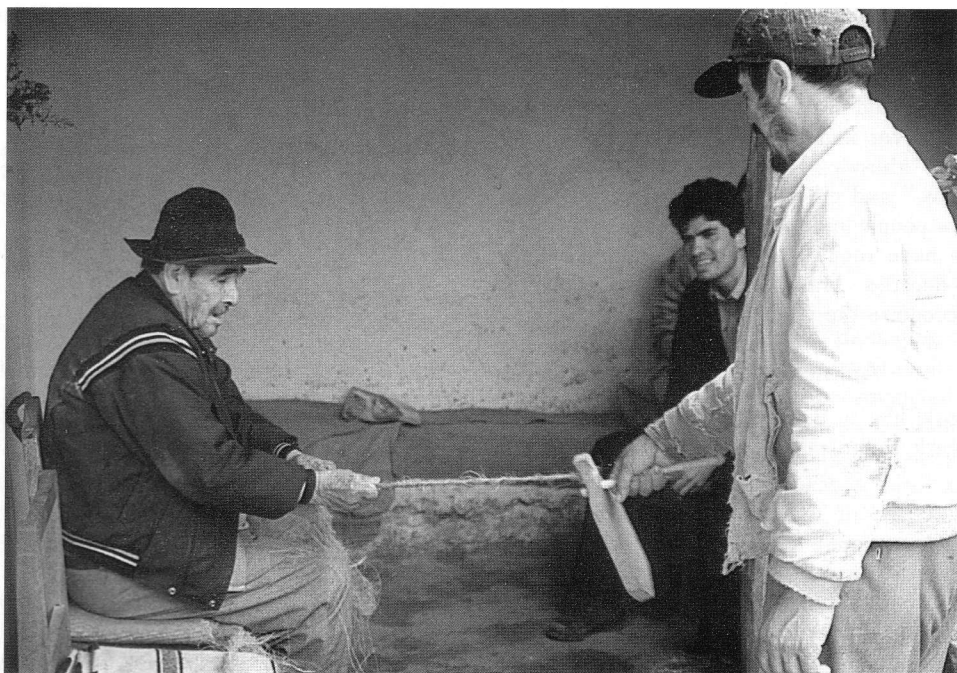
3. Adding "zunkha" fibers to a rope. Senor Bernabe Vargas of Huasacana, 92 years of age, who has been making "zunkha" fiber ropes for 80 years.

twisted together. Additional leaflets are inserted periodically.

The "kheswa" ropes are very strong, but are smoother and softer than those made from the fibers; they have many uses, such as tying up small farm animals.

They have also been the principal twine used to tie the "canahueca" stems during construction of the roofs of houses, because of their durability and resistance to insect attack. The "cañahueca" (literally "hollow cane") is the useful large Old World grass, *Arundo donax* L., early introduced into the New World and which now grows in dense colonies in many parts of mid-elevation Bolivia. Where available, it is widely used for roofing; the clean dry stems are laid in a single layer above the beams, lashed together by twine, covered by clay, and the roof tiles are then arranged on top.

b. Fans ("phukunas"). Those are used to fan the embers of the kitchen fire. They are made from pieces of the leaf with all the leaflets from



4. Twisting the "zunkha" fibers into a rope with the "tarabilla."

one side bent over and interwoven with those of the opposite side to form a stiff fan. In the Guarani-speaking zone of the eastern and southern Vallegrande region, this same sort of fan made from the leaves of another species of palm ("motacú," *Scheelea princeps* (Mart.) Karst.) is called a "baquitú."

c. *Baskets ("canastos")*. These baskets are made from the several pieces of leaf, with the midrib split and only the leaflets on one side left; these are woven into elegant receptacles which serve for carrying and storing food or different objects. In Guarani this type of basket is called "jasaye" and is made from "motacú" leaves.

3. The kernel ("corozo").

The "zunkha" palm grows very slowly. When it reaches a good size it flowers continuously and produces much fruit. Pollination is by insects.

The fruits are ovoid, 3–5 cm long, and are covered by a yellow, fibrous-corky mesocarp, inside which there is a hard endocarp or "corozo" which contains the sweet, oily, agreeable-tasting whitish endosperm. The fruit falls to the ground when mature and is chewed by cattle and hogs who do not always succeed in breaking the hard stone. Only some rodents such as squirrels and rats are able to break into the stone.

The fruit is much utilized by the peasants who eat the endosperm after breaking the stone on rocks. Some people use the endosperm to make candy or mix it with maize for tortillas. The fruit could very well be used to extract an edible oil, but this is not done at present.

4. The "palmito" and forage.

The "palmito" is the edible tender apical part of the stem and very young leaves; it is very much appreciated. Cattle are very fond of the tender leaflets ("palma vara" or "cogollo"), and browsing retards the growth of the plant. Another destructive practice is to fell trees for the leaves for Palm Sunday processions.

Conclusions

Much research and detailed evaluation of this palm still need to be carried out. Production of the "zunka" fiber and the fruits has not been evaluated, and the economic potential of this palm is not well known.

The University Gabriel Rene Moreno, through the Natural History Museum "Noel Kempff Mercado," is interested in further mapping the distribution of the "zunkha" palm in the Department of Santa Cruz.

We are encouraging the peasants to cultivate the palm as an ornamental plant in farms and gardens, and in the parks, plazas, and streets of Vallegrande and nearby villages. We also are trying to recover and preserve the art of making "sogas," "kheswas," "colchones," "phukunas," "canastos," and other utensils, an art known to very few people in an area where sisal and plastic articles have rapidly replaced the "zunkha" in recent decades. Many people nowadays do not even recognize the palm itself.

Acknowledgments

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The International Palm Society will hold its 1995 Board Meeting on October 26-29, 1995, in the Sarasota and Tampa area of Florida. Further details will be given in later issues of *Principes*.

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