The Diversity Of Use Of Neotropical Palms

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INTRODUCTION

Within the palm family are found some of the most useful plants in the Neotropics. For the nomadic hunter-gatherer tribes of the Amazon who depend on the forest for sustenance, palms provide a wealth of products that make their existence in this ecosystem possible. The importance of palms is continually reaffirmed by the lowland farmer who, when clearing away the forest, carefully leaves the palms to be managed and harvested on a semi-permanent basis or utilized as forage and shade by his domestic animals. Even large-scale agribusiness operations find the cultivation of palms to be immensely important and profitable, as shown by the continued increase in African oil palm plantations in many Neotropical regions as well as the sustained interest in cultivating the coconut palm. The uses of palms in the Neotropics easily number in the hundreds when one considers the variety of ways they are employed in everyday life.

Despite a long history of their observation and study, their striking presence and obvious utility, palms are underrepresented in scientific collections and consequently their taxonomy is less well-known relative to other groups. A paper by Balick et al. (1982) analyzed the herbarium collections in Brazilian Amazonia and concluded that only 37.5% of the 232 currently recognized palm species in that area were represented in regional collections.

Additionally, in many cases the representation was superficial, lacking some of the most crucial diagnostic elements such as flowers and fruits.

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Much of the problem in the study of palms arises from their massive size and weight -- up to several metric tons in some species -- as well as the difficulty of collecting them. In order to secure samples of fruits or flowers it is usually necessary to fell the tree, a task which requires many hours of arduous effort.

THE DIVERSITY OF USAGE

One of the reasons palms are used so ubiquitously throughout their range is that they possess a physical construction differing from other plants, one which provides them with certain advantages for utilization. Within the stem is a series of small strands passing through a matrix of starchy ground tissue. These strands, up to 2-3 mm in diameter, comprise three parts: phloem to conduct nutrients, xylem to conduct water, and fibers that incompletely sheath the strand and offer mechanical support. The strands ring the periphery of the palm stem and account for its strength and flexible nature. Mechanically this is an efficient way to support a heavy object such as a palm.

Its durability is proven in the most powerful of tropical storms, when palm stems often survive intact while those of other plant groups are broken and scattered like toothpicks. I have witnessed the steel head of an ax chipping or breaking when used to fell a mature palm specimen, attesting to the strength of the palm stem.

Figure 1 illustrates some of the diverse ways in which palm stem can be employed, depending on the section used and product desired. Shown at the top is a house constructed with frames of palm stems, such as from the genera *Oenocarpus, Jessenia, Mauritia, Syagrus* and others as well as flooring from strips cut from the stem of *Iriartea* and *Socratea* species. Moving clockwise, an arrow point with reverse barbs for hunting is fashioned from the fibrous bundles of *Jessenia bataua* (Mart.) Burret stem, as well as a bow from wood of the same species. The stem of *Bactris gasipaes* H.B.K. is split in two, grooved on the inside of each half and bound together to make a blowgun. A one-piece blowgun is made from the slender stem of *Iriartella setigera* (Mart.) H. Wendl. which is hollowed out by removing the ground tissue with a long stick. The petiolar spines of *Jessenia bataua* are used to make the darts for blowguns -- their ends are covered with kapok affixed with a piece of thread from *Astrocaryum* species. The stems of *Orbignya* species are cut and the sugary liquid that freely flows out is collected and fermented for consumption. The starch stored in the ground tissue of *Manicaria saccifera* Gaertn. and *Mauritia flexuosa* is collected and consumed as an important carbohydrate food;

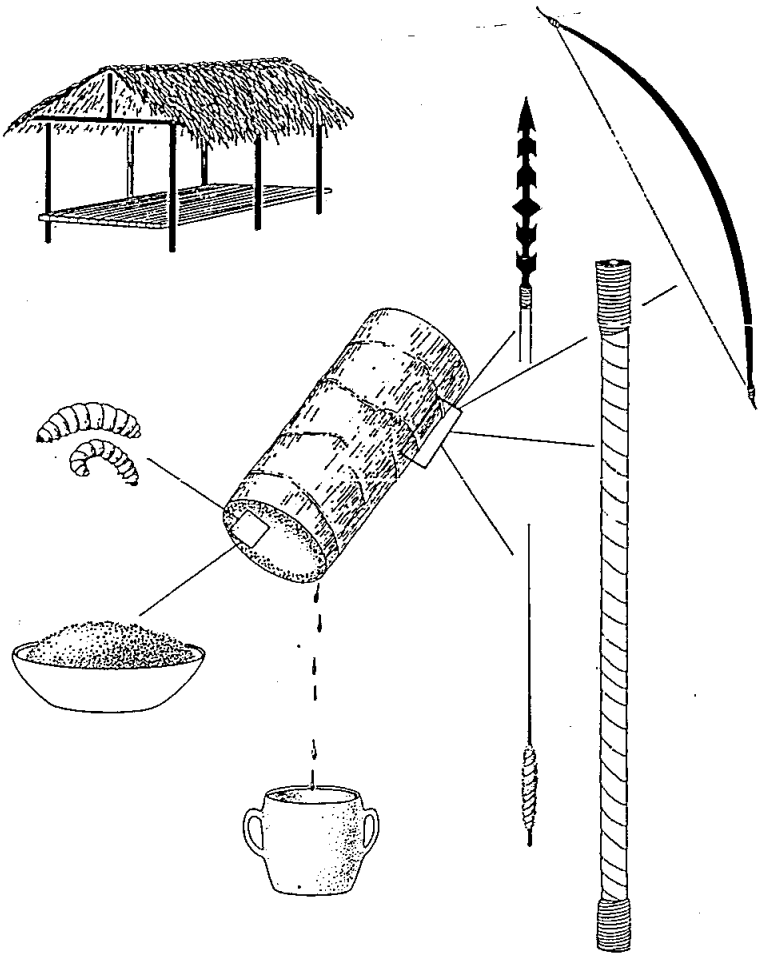

Fig. 1. Some of the many ways the palmstem is used by people. A detailed explanation of this plate can be found in the text. Drawn by Bobbi Angell.

sago is collected in a similar manner from palms in the Old World (Ruddle et al., 1978). When palms are cut, for whatever reason, a section of the cut stem is often left intact on the forest floor. Within minutes of cutting, beetles begin flying around this stem and bore into it to lay their eggs. The larvae develop rapidly and within a month or two, when they are a few inches long, the people harvest the insects which are an excellent source of protein. Such larvae, e.g., that of the weevil *Rhychophorus palmarum*, are consumed raw, fried, or boiled.

This same diversity of usage can be found for the palm leaf, due to its unique construction, variation of form, and size. Both palmate and pinnate leaves are represented in Figure 2. Beginning from the top and moving clockwise, the first diagram depicts the use of a *Manicaria saccifera* leaf as a sail for river transport along the Orinoco (Wilbert, 1980). Many kinds of palm leaves are used as thatch for houses and other structures. The Bora Indians of Peru use the seedlings of *Jessenia bataua* to treat snakebite. Leaves of *Geonoma* species are burned and used to produce a salt substitute in some areas of the Amazon. Evil spirits are believed to assume the form of some palm species, such as *Lepidocaryum tenue* Mart., and to terrorize local inhabitants. The palmito (palm heart) from *Euterpe* species as well as from other genera forms the basis for a substantial commercial export industry in both Central and South America. Filters for various indigenous preparations are made from rolled leaves of *Geonoma* species, which also serve as drinking cups. Wax from *Copernicia prunifera* (Miller) H. E. Moore is used as a medicinal plaster for treatment of wounds and other skin injuries. One of the most durable plant fibers is derived from the leaf of *Astrocaryum vulgare* Mart., which is then woven into hammocks, bags, nets and other useful items. Finally, the foam-like petioles of *Mauritia flexuosa* are bound together to make a raft for fishing.

Because palms have adapted to a great variety of habitats they are relatively abundant in Neotropical ecosystems and thus available for widespread use. Whatever tropical lowland location Indians choose to inhabit -- the seasonally inundated floodplains for cultivating its rich, fertile soil, the savannah or virgin tropical forest for hunting, the river bank for fishing or the gallery forest for hunting as well as agriculture -- palms are usually present. Survival of palms in inundated habitats is enhanced through specialized structures known as pneumatodes which allow for gaseous exchange in wet areas. De Granville (1974) distinguished two types of these structures, those which appear as rings on the root system and those which appear as small conical protrusions from the roots. He concluded that these types of pneumatodes could

Fig. 2. Some of the many ways that palm leaves are used by people. a detailed explanation of this plate is found in the text. Drawn by Bobbi Angell.

serve as stable taxonomic characters to distinguish palm species. Species such as *Mauritia flexuosa* and *Euterpe oleracea* Mart. which possess pneumatodes are able to colonize inundated environments and establish pure stands therein.

There are also specialized structures which people employ directly to their advantage. The waxy layer on the leaves of *Copernicia prunifera*, a palm which inhabits hot, exposed habitats, is the basis of a multimillion-dollar industry in Brazil involving harvest and sale of this product, known as Carnauba wax in the international trade. The wax of this palm is extremely hard and durable, of high quality, and in great demand (Johnson, 1972). Many different forms of palm spines and fibers provide protection against predators such as birds, rodents and other mammals (Uhl and Moore, 1973). People collect these materials and turn them into rope, darts, arrow points, combs, brooms and similar products. Fruits with oily outer coatings attractive to dispersal agents are also exploited by people for protein and oil. The Guacharo bird *(Steatornis caripensis)* of northern South America and Trinidad collects the fruit of the *Jessenia* palm and deposits it in caves up to an altitude of 8,000 feet where it serves as a principal food (Ingram, 1958). People also employ the fruits of this palm to produce a protein-rich beverage and high-quality edible oil.

GENERIC REVIEW

This section will consider the range of uses for selected palm genera in the Neotropics. These are gathered from the literature where cited and otherwise from personal experience through fieldwork with a number of indigenous groups, primarily the Bora Indians of Peru and Guahibo Indians of Colombia.

Acrocomia comprises some 29 species (Glassman, 1972), mostly in regions that are somewhat moist. Lleras et al. (1984) reported that four species were of interest as oilseeds: *A. aculeata, A. totai, A. antioquensis* and *A. intumescens*, the former two being of primary importance. The species are known for their spined trunks.

Acrocomia aculeata, known as macauba in Brazil holds great promise as a commercial source of oil (E. Lleras, pers. comm.) (Fig. 3). Currently there is an intensive program in Brazil to study this species and increase its utilization as an oilseed. Lleras and Coradin (1984) reported that macauba oil can be produced at a rate of 2,380 to 6,200 kg/ha with planting densities of 150 and 200 palms respectively. At the current time,

Fig. 3. *Acrocomia aculeata* in Brazil.

the actual production rate from wild stands in Brazil is about 1800 MT/year of fruit out of a potential extraction level of ca. 200,000 MT/year, or less than 1% of the extractable resource. Macauba oil contains 43.7-44.9% lauric acid, 16.5-24.6% oleic acid, 8.5-15.4% myristic acid, 7.4-7.8% caprylic acid, 6.2-15.4% palmitic acid, 2.8-5.3% capric acid and lesser amounts of linoleic and stearic acids (Lleras and Coradin, 1988).

Palm wine or toddy is made from *Acrocomia mexicana.* This is known as Vino de Coyol in Honduras. Trees are cut for harvest, the sheath bases removed from one side of the crownshaft, and a small 10 x 15 cm trough cut into the palmito. This process was studied by Balick (in prep.) in 1987; estimates of two liters of sap produced per palm per day were made. The fresh sap that forms in the trough is collected, mixed with a slight amount of sugar and fermented for 24 hours. It is then sold in a roadside stand near the urban area of San Pedro Sula (Fig. 4). Alcohol content of the fermented beverage was calculated to be 12.86%, and there was little of nutritional value contained within the beverage.

Aiphanes is a small genus, comprising some 38 species (Moore, 1973). Of these, seven are known to be cultivated (Moore, 1963). The genus *Martinezia* is considered a synonym of *Aiphanes* but the former name is often found in the literature.

Aiphanes caryotifolia is a common widely distributed species in this genus, found primarily in the lowlands of Northern South America. Patiño (1963) felt it to probably have been domesticated in pre-Colombian times, but cites no conclusive proof. It is known by various names, including "corozo" in Colombian Antioquia, "mararabe" in the Colombian Llanos, "chontaruro" in Ecuador and "Majerona" in Brazil.

It is known to be a food plant, and the fruits are consumed, including the endosperm and mesocarp. Martin and Ruberté (1979) reported that the leaves can be eaten.

Balick and Gershoff (in press) reported on their observation of the fruits being sold at a roadside market in Colombia. Fruits were purchased and analyzed for nutritional composition. These authors reported that the mesocarp contains 16,000 IU/100 g (wet weight) of Vitamin A from carotene, one of the highest amounts in the plant kingdom. This is twice the amount of Vitamin A contained in sweet potatoes and substantially more than is found in carrots. Further analysis also revealed that the protein composition of the endosperm is 37% and the protein is of a high biological value.

Attalea comprises some 34 species (Glassman, 1972). These are especially concentrated in the Northeast of Brazil, as well as widely distributed over the Northern half of South America. It is a genus that is confused taxonomically, although there has been recent progress in resolving the status of the species (Glassman, pers. comm.).

One of the more interesting uses of this genus is of *Attalea funifera* as a fiber plant. Piassava, as it is known in Brazil, is an endemic species of the Bahian forests. According to Voeks (1988) commercial exploitation of the water-resistent fiber that is extracted from the leaf began in the 1500's.

Harvest, as reported by Voeks (1988) involves the use of a sharp machete and a forked wooden ladder. The fiber, in strands ca. 4-5 m long, is cut from the rachis. Three kinds of fiber are harvested from the palm. Harvest is usually carried out once per year. In recent times trends in fiber production have included an increase in production and use, a fall in exports and an increase in use of the fiber as a thatch.

Fruits from another species, *Attalea oleifera*, are a source of edible oil, primarily of the lauric acid type. Lleras and Coradin (1988) estimated that a related species, *A. exigua*, could produce ca. 2 kg/oil per plant (pulp and kernel). Recent studies by Balick et al. (1987) described a natural hybrid between *Attalea compta* and *Orbignya oleifera*, the latter a prolific oil-yielding species. It is clear that the value of this genus as a food, fiber and oil crop is not yet fully appreciated.

Bactris is one of the largest and most widespread Neotropical palm genera, perhaps comprising some 200 species (Wessels Boer, 1965). To the taxonomist it is also one of the most confusing and poorly known. It is extremely variable in size and form but usually has spines on the leaves and trunk.

Bactris gasipaes is an important food palm in the Neotropics. Known as Pupunha in Brazil, Pejibaye in Costa Rica, Chontaduro in Colombia, Pijuayo in Peru, Pichiguao in Venezuela and peach palm in English, it is always found as a cultivated plant (Fig. 5). When found in the forest or along a river bank at a seemingly unoccupied site it is indicative of prior human occupation. The fruits are somewhat flattened-ovoid and borne in large panicles. When ripe, the fruits are harvested, boiled and eaten, tasting somewhat like roasted chestnuts. They are considered a national food in Costa Rica, commonly sold along the streets and eaten by poor and rich alike. Their nutritional composition per 100 grams edible

portion is 196 calories, 2.6 gm protein, 4.4 gm fat, 41.7 gm total carbohydrate, 1.0 gm fiber, and 0.8 gm ash. The peach palm is rich in potassium (46 mg/100 gm), Vitamin A (670 mcg/100 gm), riboflavin (0.16 mg/100 gm) and Vitamin C (35 mg/100 gm) (Leung, 1961).

The heart of this species is an excellent substitute for the wild palmito from *Euterpe* species. Because most of the once vast native stands of *Euterpe* in Costa Rica have been destroyed, the peach palm is now beginning to be cultivated for commercial production of palm hearts in that country. This species grows quickly from seed, suckers when cut, and provides a much larger heart than *Euterpe*. The major disadvantage of the peach palm is the spiny nature of the stem, although some varieties have been selected for the absence of these fierce spines. Work is underway at several regional research centers in Costa Rica and Brazil to select and further develop this palm for wider commercial use.

Among the other species of *Bactris, B. macroacantha* Mart. is used by the Bora Indians of Peru as a soporific. The round yellow fruits of this diminutive species are edible, quite sweet, and according to local belief serve to relax or make a person sleepy, depending on how much fruit has been consumed.

The Bora have a legend involving another species, *Bactris fissifrons* Mart., and the creation of the toucan. Usually when young woman have their first menstruation they are advised to eat a number of specific foods, but a young woman named Nulleh insisted on eating only the tender shoots of this palm. The spiny leaf stuck to her tongue and she could not remove it. She then turned into a toucan and flew into the forest, the leaf becoming her beak and her long hair becoming feathery plumage. When a person dies, their body lice are said to leave the corpse and go to the toucan, who then realizes a person is dead and cries for them. Thus, the toucan is an important bird to the Bora, its cry signifying death.

Euterpe is a genus of graceful palms up to 20 meters tall, with slender, solitary or caespitose trunks (Fig. 6). It is widely distributed throughout the Neotropics in a number of different habitats but is especially abundant in swampy or moist areas. Glassman (1972) lists 49 species in his checklist of American palms. There is great need for a better understanding of the taxonomy of this group as it probably should comprise far fewer species.

The most important commercial use of this genus is as a source of palmito or heart of palm. Vast natural groves of *Euterpe oleracea* in the

Fig. 5. *Bactris gasipaes* germplasm collection in Costa Rica.

Fig. 6. *Euterpe oleracea* in Colombia.

Amazon are felled to extract the young growing tip and developing leaves in the crownshaft. Each tree produces only a few segments of heart for canning and when harvested for this purpose, the rest of the tree is abandoned and wasted. While working in an extremely remote region of the Amazon Valley, I encountered a team of men who were systematically mapping large zones of *Euterpe* in the forest for commercial exploitation. When their inventory was completed, portable canning factories were to be brought in and the stands decimated in a way reminiscent of the manner in which the buffalo was hunted down only for its hide in the North American frontier.

The exploitation of palmito has become a major industry in the Neotropics and in Brazil alone some 114,408 tons were harvested in 1980, primarily from *Euterpe* species (IBGE, 1982).

The beverage known as Assai in Brazilian Amazonia is produced from the fruit of *Euterpe oleracea* .The fruit is formed in large panicles, each weighing several kilos. When ripe, the fruit turns a deep purple and the trunk must be climbed to carefully remove the panicles. The oil-rich beverage is sold at small roadside stands and produced from the mesocarp. It may be mixed with farina or occasionally with sugar. In 1980, about 60,000 tons of Assai fruit entered local commerce in Brazil, mostly from the State of Para (IBGE, 1982). Nutritional studies mentioned in Cavalcante (1977) indicate that Assai has more calories per unit than milk and twice as much fat. During one trip to the interior, I was cautioned to avoid the following "harmful combinations": Assai juice consumed with alcohol, with mango, or with juice of *Oenocarpus bacaba* Mart. Eating Assai with any of these foods was noted to have deleterious effects ranging from stomach pain to serious illness. On another occasion I was told to eat a popsicle of Assai to calm an upset stomach, which turned out to be quite effective.

Goulding (1980) in his excellent study of the relationship between the Amazon forest and fish reported that the electric eel (*Electrophorus electricus*) considers *Euterpe oleracea* a favorite food. The eels congregate at the base of these palms along riverbanks and in inundated areas where local people believe that the eels shock the trees to knock ripe Assai fruits into the water. He could not confirm the validity of this supposition, but, correct or not, people refuse to climb *Euterpe* palms in areas where eels are known to be present for fear of being killed.

The genus *Jessenia* as recognized by Balick (1980) consists of a single species, *J. bataua* which is further divided into two subspecies. The

Fig. 7. *Jessenia bataua* in Brazil.

palms in this genus are large, to 25 meters tall, with massive trunks and a solitary habit (Fig. 7).They are found in both inundated and upland regions where they often achieve predominance in an ecosystem. Known as Pataua, Seje, Ungurahui or Milpesos the fruit is harvested for human consumption throughout its range in the northern half of South America up to an elevation of about 3,500 feet. The fruit is purplish-black with a firm epicarp under which there is soft, pulpy mesocarp. The mesocarp contains a high percentage of oil, up to 50% in some cases (National Academy of Sciences, 1975). This oil is physically and chemically almost identical to olive oil. Its major fatty acid components are oleic (77.7%), palmitic (13.2%), stearic (3.2%), and linoleic (2.7%) (Balick and Gershoff, 1981).

Indians harvest the fruits when they are ripe but not yet soft to the touch. The fruits are then soaked in warm water for a few hours or overnight to loosen the epicarp. The water-fruit mixture is macerated and finally filtered to remove bits of epicarp and fibers occurring in the mesocarp. This milky beverage is then consumed alone or mixed with farina from cassava. The biological value of the protein found in *Jessenia* fruit is extremely high, comparable to that of good animal proteins and much better than most grain and legume proteins, making this beverage an excellent source of nutrition.

As previously mentioned, the durable fibers of the petiole serve as blowgun darts (when wrapped with kapok and tipped with curare arrow poison), and wood from the stem is employed as arrowpoints and for bows. The Bora Indians of Peru use the leaves of this species to construct provisional pack baskets for hunting. When an animal is killed a basket is woven in a few minutes to carry the meat back to the village. Leaves also serve as thatch for houses and for walls, room dividers and chicken coops.

The oil expressed from the mesocarp forms the basis for a cottage industry wherever the palms are found in quantity. In addition to its use as an edible or cooking oil, the Guahibo Indians of Colombia and Venezuela use the oil as a remedy for tuberculosis, cough, asthma, and other respiratory problems and as a hair tonic.

The genus *Lepidocaryum* is represented by only a handful of species in the Neotropics of which *L. tenue* and *L. gracile* Mart. are the most common. These are diminutive understory palms which grow in primary or disturbed forest. In the areas where these palms are found, they are considered the finest thatch for dwellings and other structures, lasting

many years without need of replacement or patching. The Bora Indians of Peru use *L. gracile* as a remedy for ocular infections. The thin stem, a few centimeters in diameter, is roasted until soft and the juice contained within squeezed into the eye. The curative properties are said to be similar to the effects of antibiotics.

Because some Indians of the Northwest Amazon believe that a huge monster, the Curipira, often becomes small enough to hide in the groves of these plants and takes on the form of the palm itself to terrorize and harm them, they are sometimes reluctant to gather *Lepidocaryum tenue*, even though it may be abundant and provide the best thatch (Schultes, 1974).

Mauritia is a widespread genus of some 17 species native to tropical South America and Trinidad. It comprises a number of massive-trunked palms as well as a group having smaller stems that are often covered with woody thorns. One of the most useful species is *M.* flexuosa know as Moriche in Venezuela, Aguaje in Peru and Muriti in Brazil. It is a huge palm, to 25 meters or more, and often grows in swampy or moist areas. Its costapalmate leaves are up to 4 meters long. The segments are removed from the petiole, split into several sections and used for thatch by hooking over roof crossbars. This thatch will last from 2-3 years and is, thus, of intermediate durability when compared to other palms used for thatch.

The fruits are relished wherever the palm is found. They are round or ovoid in shape, and underneath the scaly epicarp is found a yellow or orange flesh which contains 12% oil (Balick, 1979). The flesh is peeled from the stony seed and mixed with water to make a beverage or used in confections and ices. The Guahibo strain the juice from the pulpy mesocarp and allow it to ferment for 3-4 days for festivals or for drinking at night after a day's labor.

Fruits of *Mauritia flexuosa* are commonly sold in the regional markets where several different forms can be distinguished, based on fruit size, shape and color. Because the biology of this genus is not well understood, it is not clear whether these forms have taxonomic utility.

Another product of this palm which enters the regional economy is the pith from the petioles. The petioles are two meters or more in length. The foam-like pith floats and is used to cork bottles and make rafts for fishing as well as children's toys. While living amongst the Bora we were offered the use of a mattress made of split petiole segments tied together

with cord, which in fact was quite comfortable. These petioles are also sold in the Ver-O-Peso market in Belem, Brazil. One of the more curious devices I have ever seen constructed from the petioles of this species looks like a triangular crib for young children. Actually the children are made to stand along the edge of this frame and taught to walk, holding on to its edge as they meander around the center. This was said to be a common device amongst the Guahibo of Colombia.

This species also provides a useful fiber for weaving. Guahibo hammocks commonly have ornamentation woven from *Mauritia flexuosa* affixed to the sides. A high quality fiber is obtained from the leaves. According to Schultes (1977), the fiber is threadlike and white, and that of the younger leaves is stronger than that of the older leaves. In 1980, Brazil produced 614 tons of fiber from this palm, mostly in the State of Maranhao as well as a small amount in Para (IBGE, 1982).

Maximiliana consists of a single species, *M. maripa* (Corr. Serr.) Drude a tall, solitary palm to 18 meters in height (Glassman 1978a, b). It is common in northern South America and Trinidad in both well-drained and wet sites. Local names for this species include Inaja and Cucurito. The leaves, to 8 meters in length, are an excellent source of thatch. The pinnae are folded over to one side and the leaves laid on roof crossbars. The newly emerging leaves are used to weave mats, pack baskets, and walls to divide space in the characteristic, large open houses of indigenous inhabitants in the Orinoco and Amazon valleys.

The ripe fruit of this species is an excellent food. The kernel contains 60-67% fat and the mesocarp 42.1% (Eckey, 1954). In addition to local consumption, sale of the fruit has a small economic impact, appearing in markets in some lowland cities and villages throughout the range of this palm. During a stay in a Cubeo Indian village along the Rio Vaupes in Colombia, I observed the children collecting these fruits, baking them over a fire, cracking them open and consuming the oily kernels as a playtime activity. People commented that this was a common pastime of the children in this particular village, one which provided them with substantial nutritional benefit.

The Guahibo use the endocarp of this species to cap the ends of a Y-shaped device known as a silipu or siripo used to snuff Yopo, an hallucinogenic snuff made from *Anadenanthera peregrina* (L.) Spegazzini, a leguminous tree (Fig. 8). This snuff tube is inserted against the nostrils and the round seeds form a tight fit for inhaling the drug from a small wooden plate.

Fig. 8. Using snuff tube with *Maximiliana maripa* end caps.

Orbignya is a widespread genus occurring from Mexico to Bolivia, primarily at low elevations, although it also occurs in areas up to several thousand feet. A preliminary study by Glassman (1977, 1978b) suggested that some 29 species of this genus were described of which 17 ..."definitely or most probably belong to *Orbignya*". This genus is closely related to a number of other genera including *Attalea*, *Parascheelea*, *Maximiliana*, and *Scheelea*. Wessels Boer (1965) lumped these genera together under *Attalea*.

There are several economically important species in the genus *Orbignya*. One of the most important, *O. martiana* B.R., is known as Babassu in Brazil and Cusi in Bolivia. An edible oil and a charcoal used in cooking and industry are obtained from the fruit (Fig. 9). In 1980, 250,951 tons of Babassu kernels were produced in Brazil, all of which were collected from wild plants. The commercial value of this plant exceeds 60 million dollars annually, making it the largest oilseed industry in the world completely dependent on a wild source. The fatty acid composition of this oil is primarily lauric (44-46%), myristic (15-20%), palmitic (6-9%), caprylic (4.0-6.5%), and stearic (3-6%) (Eckey, 1954). At the present time there is great interest in domesticating this plant, and the Brazilian government, with the assistance of international development agencies and research organizations, is engaged in an effort to collect and document the great variation in these wild palms. A germplasm bank of these trees comprising material collected from several different countries as well as from various regions of Brazil has been developed in Bacabal, Brazil, to help accomplish the goal of domesticating this genus.

One of the local uses for the oil in lowland Bolivia is as a remedy for cough. A few drops of liquid from boiled guava leaves (*Psidium guajava* L.) are mixed with a tablespoon of this palm oil and taken four times daily to quell cough. The oil is also massaged directly onto the head for headaches and other head pains and applied once or twice daily to control dandruff. The oily kernels are burned in a flame and rubbed on the eyebrows and on other facial hair to make it darker as well as, according to local belief, increase its rate of growth. A few teaspoons of Cusi oil are said to help an ailing liver. In Brazil the oil of Babassu is mixed with sugar and used by some people as a vermifuge.

Charcoal is produced from this species by burning the residue of the fruit after the oily kernels have been extracted. Pits are dug in the ground and filled with the husks, which are then covered with leaves and

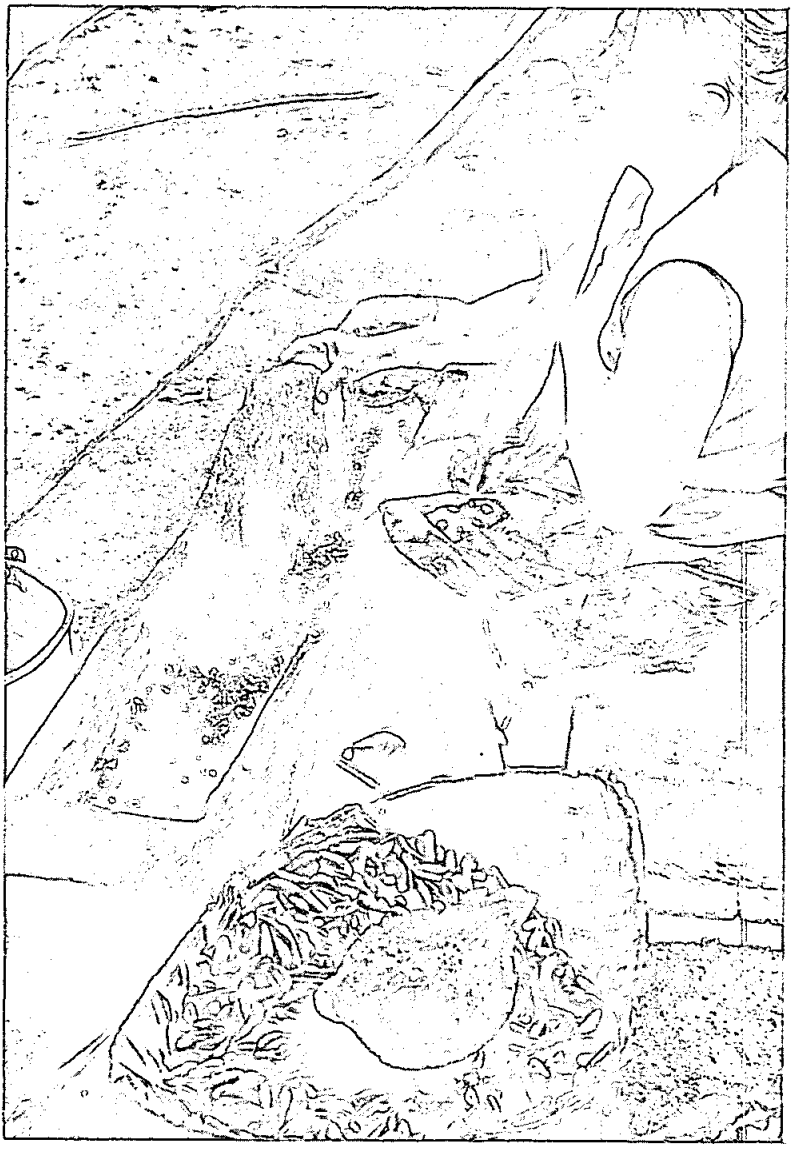

Fig. 9. Grinding fruits of *Orbignya phalerata* to make oil.

soil and ignited. After a slow burning process the charcoal is ready for local use in cooking or for sale to industry as an energy supply. In Bolivia I observed the petioles being burned in bread ovens. When questioned about this practice, people said they preferred this fuel because it burned evenly and cleanly for a long period, allowing the bread and other items to be baked to perfection. In this same area trees are commonly felled to obtain leaves for the thatch. About 500 leaves comprise the roof of a small home, measuring some 20 feet long by 10 feet wide, and 50 mature trees are felled to thatch this single dwelling.

THE IMPORTANCE OF PALMS TO INDIGENOUS GROUPS

As can be seen from the preceding section, palms provide a great diversity of useful products to the inhabitants of the Neotropics. Several recent studies among indigenous groups in this region confirm this. Balick (1988) studied the use of palms among the Guajajara and Apinayé in Northeastern Brazil. He found that 17 species were of substantial importance to these two groups. Boom (1986) studied the Chácobo Indians of Bolivia and identified 12 species of palms used by that group. Previous studies have included Anderson (1978), Balick (1979) and Beckerman (1977), who obtained similarly large numbers of palm species used by Neotropical Indians.

MEDICAL PROBLEMS RELATED TO PALMS

This paper has emphasized the beneficial aspects of the palm-people relationship through examples from a very few species. There are also detrimental aspects of this interaction. For example, Chagas' disease is an affliction of the poor and of those in areas receiving minimal medical attention. It is a major problem in Latin America, although no accurate estimate of the total number of people affected exists. In Brazil as many as eight million people may suffer from this disease. A study undertaken in Panama identified a close relationship between the insect vector of this disease and the Corozo palm, *Scheelea zonensis* Bailey (Whitlaw and Chaniotis, 1979). Of 92 randomly examined Corozo palms in the Canal Zone, all were found to harbor triatomines, the insect vectors. The presence of a Corozo palm in a particular area was positively correlated with high incidences of Chagas' disease in the human population living in the same area. Conversely, low rates of this disease were found in areas with low densities of Corozo palms. Other species of palm trees were found not to harbor these vectors.

The Corozo palm is also the home of the principal animal reservoirs of this disease: opossum, anteater and spiny rat. It is not known why these insects and animals appear in such great abundance on this palm species. However, it would seem advisable for public health workers to being a widerspread study of this disease to understand how palms may contribute to the persistence of Chagas' disease. To control the disease, it may be necessary to eliminate breeding sites for the disease vector or to limit the human populations in areas with high concentrations of the palms. This scientific study does give credence to some of the indigenous beliefs in monsters and evil spirits inhabiting palms. It helps to explain why some people consciously avoid dwelling or even walking near these species, many of which are covered with fibers and sheaths -- ideal breeding sites for detrimental insects and other harmful organisms.

CONCLUSION

I have only mentioned a few of the thousands of interactions, both beneficial and detrimental, between palms and people in the Neotropics. We should not lose sight of the fact that palms play an important role in the lives of subsistence peoples as well as those who depend on a cash economy. In 1979, Brazil reported over $100,000,000 of commerce resulting from the harvest and sale of products from six native palm genera: *Astrocaryum*, *Attalea*, *Copernicia*, *Euterpe*, *Mauritia* and *Orbignya*. Much of this economic return was realized in the poorest areas of the country and often represented a significant portion of the cash income of the persons involved. It must be realized, however, that this is not an inexhaustible resource. Destructive harvesting practices are resulting in the disappearance of the palm resource in many areas. Conservation of palms, as discussed by Johnson (1988) is an important priority for the future. However, it is certain that continuing investigation into this subject will uncover a wealth of new information and provide additional alternatives for land utilization in the tropics.

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