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Nigel Smith

Palms and People in the Amazon

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To the memory of Hilgard O'Reilly Sternberg (1915–2011)
Brazilian geographer, mentor, and inspiring teacher who introduced me to the Amazon in 1970 during a summer field course

Preface

I have undertaken field work in the Amazon since 1970. Most of the field work has been conducted in the Brazilian portion of the basin, but I have also visited parts of Amazonia in Peru, Bolivia, and Venezuela. The Amazon Basin is vast, so this ethnobotanical survey of palms is by no means exhaustive. And my field work has been mostly with rural people of mixed ancestry, or who no longer speak any native language. I have only visited a few indigenous groups – the Assurini at Posto Trocara along the lower Tocantins, a few families of Saterê-Maué living outside their reserve in the watershed of the Maués, Shipibo villages at San Francisco and Nueva Cajamarca along the Ucayali visits to several Tukano and Tuyuka communities along the Uaupés and Tiquié Rivers, and a couple of Kichwa communities along the Alto Pastaza in Ecuador – and then only for brief periods. For information on the use of palms by indigenous peoples, I have therefore relied heavily on published sources. Appendix 2 lists indigenous groups mentioned in the text and summarizes their locations.

I have not had a research project to specifically study the ethnobotany of palms. Rather I have made field notes and taken photographs of palms during the course of other research endeavors stretching over four decades. A large number of organizations have funded my field work in Amazonia or provided logistical support since 1970 which enabled me to gain an appreciation for the importance of palms in the lives of rural people. The list of organizations that have funded or provided logistical support for my field work in Amazonia includes, in chronological order: The Center for Latin American Studies, University of California, Berkeley; Museu Paraense Emílio Goeldi, Belém; Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus; Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA), Belém, Macapá, and Manaus; World Bank Research Committee; the John D. and Catherine T. MacArthur Foundation; the Gordon and Betty Moore Foundation; the National Geographic Research Committee; ProNaturaleza, Lima and Iquitos, Peru; Instituto Mamirauá in Tefé; Instituto Socioambiental in São Paulo and São Gabriel da Cachoeira; and the Fulbright Council for International Exchange of Scholars. My findings and opinions expressed in this book are my own, however, and are not necessarily endorsed by any of the above organizations.

For years, Andrew Henderson of the Institute for Economic Botany at the New York Botanical Garden has helped me sort out the identity of some Amazonian palms based on my photographs as well as to better understand their distributions and habitats. Voucher specimens were collected for only a few of the palms examined here because it can be difficult and very time consuming to obtain authorizations to obtain biological specimens. I did, however, receive authorization to obtain plant specimens in the Peruvian Amazon with the collaboration of Rodolfo Vásquez (Appendix 1). Rodolfo Vásquez, a Peruvian plant taxonomist, accompanied me in the field and sent one of his assistants on several trips I made to the Pacaya-Samiria National Reserve in Loreto, Peru, and his help was indispensable in identifying of some of the lesser known palms of the region.

The taxonomy of palms, as with many other botanical families, is periodically revised and some genera of palms I was familiar with during the early days of my field work, such as *Orbygnia* and *Scheelea*, are no longer recognized. Plant taxonomists usually make few if any ethnobotanical observations when they gather specimens for herbaria, and few ethnobotanists or ethnographers working in Amazonia systematically gather voucher specimens. While reading informative ethnographies I was often frustrated when turning to a page with a spectacular photograph of a communal house (*maloca*) thatched with palm fronds only to discover that the authors do not even mention the common name of the palm used for thatch, let alone give the scientific name.

Several individuals have helped me arrange field trips in Amazonia, or have taken the trouble to read parts of this manuscript. In Brazil, Eduardo Neves at the Museum of Archaeology and Ethnography at the University of São Paulo was a valued colleague and counterpart during my four month Fulbright Award in Brazil in 2012. Dr. Neves kindly invited me to visit the archaeology field school near Tefé which was ably administered by one of his students, Jacqueline Belletti. Jacqueline helped me organize several field excursions in the Tefé area. Angela Steward and her husband Rafael Santos at the Instituto Mamirauá did the same for me in the Tefé region in 2012. Helena Lima of the Museu Paraense Emilio Goeldi and her husband Bruno Moraes introduced me to the fascinating prehistory of the Urubu River where I visited various archaeological sites with them in 2010 and 2012. Carlos Durigan of the Fundação Vitoria Regia in Manaus kindly organized and accompanied me on a field trip to the Jaú National Park along the lower Rio Negro in 2012. Pieter van der Veld of the Instituto Socioambiental invited me to spend 3 weeks in the Upper Rio Negro region, mainly along the Tiquié River, a wonderful opportunity for me to learn some of the culture of the Tuyuka and Tukano. Charles Clement of the Instituto Nacional de Pesquisas da Amazonia (INPA) in Manaus kindly commented on a draft of the peach palm chapter.

In Peru, Walter Wust, a Peruvian naturalist and superb photographer helped organize numerous field trips to the Andes and Amazon region during the 2003–2006 period. I learned much from his photographic expertise. Professor Augusto Oyuela-Caycedo of the Anthropology Department at the University of Florida graciously invited me to participate in a reconnaissance of the northern part of the Pacaya-Samiria National Reserve in Loreto in 2010 and also allowed me to borrow many books from his extensive collection of ethnographic literature on Amazonia.

In Bolivia, Lois “Lucho” Jammes, a French bush pilot, flew me several thousand kilometers over many parts of the Bolivian Amazon in 2005 in his canvas-bodied, single-engined plane that had a window I could open for unobstructed shots. His many contacts at landing strips and towns in the region were enormously helpful.

In Ecuador, I am particularly grateful to Stéphen Rostain of the Instituto Francés de Estudios Andinos for helping arrange a field trip for me in September 2013 to the Alto Pastaza where I was ably assisted by his Ecuadorian colleague Carlos Duche.

I would also like to thank Cicero Cardoso Augusto, Coordinator of the Geoprocessing Department at the Instituto Sociambiental (ISA) in São Paulo, Brazil, for providing the map of the Amazon Basin.

Gainesville, FL, USA Nigel Smith

Contents

Palms and Cultural Landscapes 1

Palms are ubiquitous in Amazonia, in both upland and floodplain environments. Approximately 150 palm species are native to the region, and palm diversity increases as one approaches the Andes (Balslev et al. 2011; Kahn et al. 1988; Kristiansen et al. 2011). However, new palms species have recently been discovered and described, especially in the genus *Geonoma*, a diminutive palm used extensively to thatch buildings, so the total is likely to be much higher.

The cultural uses of 56 palm species are reviewed here, but this survey is by no means exhaustive. In the rainforests of northwestern South America, at least 194 palm species are used (Macía et al. 2011). Of the 98 palms native to the American tropics that are found in the Colombian Amazon, 77 have at least one recorded use (Mesa 2011: 18). And in just two watersheds in the foothills of the Andes in western Amazonia, the Pastaza and Madidi, some 38 palms have 38 different uses (Paniagua-Zambrana et al. 2007). At least half of the palms found in Amazonia are probably exploited to varying degrees. Although I focus on Amazonia, mention is also made of the uses of palms that also occur in the Orinoco Basin and the Guianas.

Of all the plant families represented in the diverse habitats of the Amazon, palms are arguably the most important economically and culturally. Indeed, in the Uaupés watershed in northwestern Amazonia, palm fruits are second only to manioc as a source of food for indigenous people (Reichel-Dolmatoff 1997: 281). In addition, many other palms provide materials for construction, handicrafts, hunting gear, and folk medicines. Several palms in Amazonia have more than a dozen uses. The fruits of several dozen palm species are consumed regularly in rural areas and some of them are also sold in urban markets, regionally, nationally, and even internationally.

Palms are a conspicuous feature of Amazonian landscapes, whether one is traveling along rivers, highways, or traversing immense savannas. Palms are among the most common trees found in many environments in Amazonia and the Guianas (Steege et al. 2013). Indeed, palms are so numerous that outside visitors to the region have often remarked on their beauty and bounty. During the

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mid-eighteenth century, João Daniel, a Jesuit missionary and a keen observer of natural history and people's customs, was impressed with the splendor of palms he observed during his 16 year sojourn in the Brazilian Amazon:

> Among the most admirable trees in the vast forests of the Amazon, and indeed in all of the Americas, are the palms and for this reason merit the applause of us all (Daniel 2004: 513)

The American naturalist, Herbert Smith, a student of the renowned geologist C. F. Hartt, made two trips to the Brazilian Amazon in the 1870s and was particularly impressed with the quantity, diversity, and splendor of palms in the Amazon estuary:

> straight up from the water the forest rises like a wall–dense, dark, impenetrable, a hundred feet of leafy splendor. And breaking out everywhere from the heaped up masses are the palm-trees by thousands. For here the palms hold court; nowhere else on the broad earth is their glory unveiled as we see it (Smith 1879: 81).

Nikolai Vavilov, the boundless Russian plant explorer, crop breeder and biogeographer, was so impressed with the abundance of palms during his visit to the eastern Amazon in 1933 that he remarked "But most amazing are the banks of the Amazon with their splendid vegetation and, most of all, the variety of palms. This is, in the fullest sense of the word, a kingdom of palms" (Vavilov 1997: 142).

Nineteenth century explorers and naturalists noticed not only the prominence of palms but their cultural significance as well. For example, Clements Markham, a geographer who explored the headwaters of several affluents of the Amazon, made the following observation in the Tambopata river valley, an affluent of the Upper Purus: "There is a great variety of palm-trees some useful from the hardness and excellence of their timber, others from their leaves, others from their edible fruits, and all remarkable for their grace and beauty" (Markham 1861). Alfred Russel Wallace, a Victorian naturalist who was hot on the trail of Darwin regarding ideas about the origin of species, also remarked on the prominence of palms in the natural history and lifeways of the Amazon. Best known for his classic works *The Malay Archipelago* and *A Narrative of Travels on the Amazon and Rio Negro,* Wallace also devoted an entire book to Amazonian palms and their cultural importance: *Palm Trees of the Amazon and Their Uses*. In this rare work in which several new species are described, Wallace captures eloquently the intimate relationship between people and palms in the Amazon:

> Suppose then we visit an Indian cottage on the banks of the Rio Negro, a great tributary of the river Amazon in South America. The main supports of the building are trunks of some forest tree of heavy and durable wood, but the light rafters are formed by the straight cylindrical and uniform stems of the Jará palm. The roof is thatched with large triangular leaves, neatly arranged in regular alternate rows, and bound to the rafters with sipós or forest creepers; the leaves are those of the Caraná palm. The door of the house is a framework of thin hard strips of wood neatly thatched over; it is made of the split stems of the Pashiúba palm. In one corner stands a heavy harpoon for catching the cow-fish; it is formed of the black wood of the Pashiúba barriguda. (Wallace 1853: 9–10).

Wallace goes on to describe uses of ten other palm species for such items as blowguns, presses for manioc dough, drinks, and fresh fruit for eating. And today, it is still common to find the products of half a dozen wetland palms in the homes of river dwellers.

Mauritia palm (*Mauritia flexuosa*) and açaí (*Euterpe oleracea*) are the two most valuable species of wild fruits in Amazonia with respect to nutrition and trade. Mauritia palm stands out as the single most important wild fruit in western Amazonia both in terms of food and the creation of jobs, whereas açaí is the most valuable palm at the mouth of the Amazon. But many other palms, although not so prominent in commerce, still play a vital role in the lives of millions of people in the Amazon and other parts of northern South America, both in rural areas and in towns and cities (Balslev 2011). Palm fruits also contribute indirectly to the diet of rural and urban folk through fish and game animals that eat the fruits. For example, collared peccaries (*Pecari tajacu*) and white-lipped peccaries (*Tayassu pecari*), among the most important game animals in Amazonia, feed on 25 and 37 palm species, respectively (Beck 2006).

Wetland palms with edible fruits, such as Mauritia palm, açaí, and yarina (*Phytelephas macrocarpa*), frequently form extensive groves, thus providing abundant harvests. Locals have even coined terms for these productive palm swamps. In Peru, for example, aguaje (*Mauritia flexuosa*) groves are called *aguajal*, whereas in Brazil, stands of the palm are known as *buritizal* or *miritizal*. Açaí groves are called *açaízal* in Brazil, whereas yarina stands in Peru are called *yarinales*. Some of these immense "orchards" owe their existence in whole or part to human agency. Of the 500 or so palm species in South America, locals manage at least 96 of them (Bernal et al. 2011). How many palms species are managed by rural people in the Amazon is not known, but it must be in the dozens. Many of the species profiled here are under some degree of management by rural inhabitants.

People have been rearranging the biological furniture in Amazonia for a very long time (Balée 2010a, 2013). When people first entered the region is not known, but the first human footprints were surely made at least 20,000 years ago. Foraging bands probably began dispersing across South America during the late Pleistocene between 23,000 and 12,000 years ago (Ab'Sáber 2001). Groups of hunters and gatherers likely penetrated Amazonia from various directions, both along water courses, through the forest, and by walking across savannas because the climate was drier during the Pleistocene. It is possible that humans were in the Amazon Basin even before 23,000 years ago; C14 dates from caves in Chile and Northeastern Brazil suggest people had spread widely in South America some 33,000 years ago (Dillehay and Collins 1988). Although some contest those earlier dates, it is quite possible that people had settled in Amazonia tens of thousands of years ago. And palms were surely useful to those early hunters and gatherers as a source of food, weapons, and fronds for creating lean-to shelters.

Many of early inhabitants of the Amazon arrived when sea levels were lower because so much water was tied up in giant ice sheets in more northerly and southerly latitudes. Some, if not most, of their camps and shell mounds were downed when the ice sheets retreated at the close of the last ice age. Sea level off the coast of Brazil only reached its present level some 5,000 years ago (Ab'Sáber 2001). As the sea level began rising at the close of the Pleistocene, the Amazon was backed up forming a vast floodplain, and the same happened to the lower courses of its tributaries. So evidence of settlement by hunters and gatherers along the rivers of Amazonia has been largely lost.

These early inhabitants may have been small in numbers, but they nevertheless began altering the landscape by enriching campsites and trails with useful species, especially fruit and nut trees. And hunters and gatherers torched savannas to facilitate hunting. Then as people started cultivating crops, landscape changes were even more dramatic as large areas were transformed into a mosaic of secondary forest in various stages of succession. Many of the fallows were managed to obtain useful products long after annual crops were harvested.

The fingerprints of such activity often persevere, even when the cultural group that wrought such changes has since moved on or disappeared. Palms are particularly conspicuous in this regard (Balée 1988; Goulding and Smith 2007). Stands of several palms, such as *Euterpe oleracea*, *Astrocaryum vulgare* and *Mauritia flexuosa* are often indicators of abandoned settlements (Lisboa 1997). Dramatic evidence of such changes can be seen in the extensive patches of anthropogenic soils, ridged fields, and orchards of economic plants. Amazonian Dark Earths (ADE), known as *terra preta do índio* in Brazil, are the former sites of indigenous settlements and typically contain pottery or potsherds and often lithic materials as well (Balée 1993: 148; Lehmann et al. 2003; Smith 1980; Woods et al. 2009). Many such sites are located in the Central Amazon, along the Amazon River and its tributaries (Heckenberger et al. 1999; Heckenberger and Neves 2009; Neves 2007; Neves and Peterson 2006), but they are also found in inland areas all over the basin (Kern et al. 2003; Schmidt et al. 2014).

As the forest is peeled back by the expanding agricultural frontier in Amazonia and more archaeologists are fanning out into hitherto remote areas, increasing numbers of ADE sites are being unmasked. ADE sites contain soil darkened with charcoal from house fires and are rich in nutrients, particularly phosphorus, through the disposal of kitchen and human waste. Several economic plants are considered indicator species of ADE sites, including such palms as bacaba (*Oenocarpus bacaba*), caiaué (*Elaeis oleifera*), mucajá (*Acrocomia aculeata*), inajá (*Attalea maripa*), murumuru (*Astrocaryum murumuru*), patauá (*Oenocarpus bataua*), tucumã (*Astrocaryum aculeatum*, *A. vulgare*), and urucuri (*Attalea phalerata*).

In addition to dark earth, other vestiges of Amerindian occupation are found in many parts of the Amazon, including raised fields and geoglyphs (Rostain 2013: 6; Saunaluoma 2012; Saunaluoma and Schaan 2012; Schaan 2010; Schaan et al. 2012). Some of the engineered landscapes are occupied by useful palms. The Amazon, then, is far from virgin.

At the mouth of the Amazon, palms are also prominent on mounds in the savannas that cover much of the eastern half of Marajó Island. Some of these mounds are relic sand dunes, or have formed by other natural means such as the banks of abandoned water courses. Others, though, are artificial, made by indigenous peoples in the past. Tucumã (*Astrocaryum vulgare*), marajá (*Bactris major*), jacitara (*Desmoncus polyacanthos*), and urucuri (*Attalea phalerata*), are among the palms found on mounds (*tesos*) on Marajó, and all of them have economic uses from fruit to fiber (Miranda 1903). It thus seems likely that the woods on such mounds are at least partially anthropogenic. Another clue to the man-made origins of the vegetation on such mounds is that they contain other fruit-bearing plants that are useful to rural inhabitants of the island today (Smith 2002).

Landscape transformation is brought about deliberately and inadvertently. Deliberate re-arranging of the vegetation includes planting the seeds of useful wild plants around settlements and in cultivated fields. As those fields, villages, and home sites are abandoned the forest returns, but it is not the same as before. It has been enriched with useful species. Palms are prominent in this process, particularly *Mauritia flexuosa*, *Euterpe oleracea*, and *E. precatoria*.

Another way that humans have increased the abundance of palms in some areas is through fire. Several palms, including babaçu (*Attalea speciosa*), tucumã (*Astrocaryum aculeatum* and *A. vulgare*), and mucajá (*Acrocomia aculeata*) tolerate fire and because many rural people practice slash-and-burn agriculture such species often proliferate. It so happens that fire-tolerant palms also provide a variety of useful products from fruit or nuts to twine and thatch. So although they are “weedy”, they are not necessarily a nuisance. When Amazonia experienced a drier climate during the mid-Holocene (8,000–4,000 years ago), some of the forest was replaced by sun-loving species of *Cecropia*, suggesting that people cleared patches of remnant forests to plant crops and torched savannas to drive game (Mayle and Power 2008).

Many areas of the Amazon may appear “pristine”, but they are actually old regrowth forests or mosaics of orchards within a forest matrix. Diseases introduced by Europeans wiped out at least 95 % of the indigenous population of the lowland Neotropics by 1650; the recovering forests acted as a significant carbon sink, contributing to the Little Ice Age that struck Europe between 1550 and 1750 (Dull et al. 2010).

Forest islands found in some savannas in Amazonia have been created by people in pre-Columbian times and this process continues today. In the Llanos de Moxos in Bolivia, for example, indigenous cultures created extensive earthworks such as causeways and mounds for planting crops and to provide dry land for their villages which have subsequently been colonized by forest (Mayle et al. 2007). And in the transition zone between forest and savanna in the Upper Xingu and Tocantins, the Kayapó are still creating patches of forest in grasslands that are stocked with useful trees and bushes (Anderson and Posey 1985; Posey 1983). Forests in other parts of the American tropics have also been re-assembled by different groups of people over an extended period of time. In the Sierra Nevada de Santa Marta in northern Colombia, for example, the woods cloaking some of the slopes and ridges have been characterized as an “archaeological forest” (Oyuela-Caycedo 2010). And a Venezuelan anthropologist considers indigenous peoples of the Orinoco and Guiana highlands as “agents for creative disturbance”, rather than destroyers of the environment (Zent and Zent 2004).

For some time, the prevailing idea among ecologists has been that people degrade the rainforest whenever they start living there, reducing its biodiversity and even driving some plants and animals to the brink of extinction (Terborgh

2004). Few would deny that some of today's land use activities in the region, such as clearing forest for large-scale cattle and soybean operations and the construction of hydro-electric dams on major rivers, have destroyed vast tracts of forest. And the setting aside of some parts of the Amazon Basin for ecological or biological reserves is certainly warranted. Yet the earlier inhabitants of the region did not trigger such large-scale destruction; rather they enhanced biodiversity, as has been documented in eastern Amazonia (Balée 1993, 1998; Posey 1998). Many of today's megaprojects are actually riding roughshod over revamped landscapes crafted to enhance the sustainability of food producing systems. And these are not just relict landscapes, an echo of the past creativity of long-disappeared chiefdoms. The sculpturing of nature is still going on, and Amazonian palms are testament to that creative process.

How much of Amazonia's forests are anthropogenic is not known. But judging by the large number of chiefdoms in the region at the time of contact with Europeans, it is large (Cleary 2001). And people, both indigenous and mestizos, continue to alter the forest and other vegetation in the region. The archaeologist Michael Heckenberger, who has helped elucidate the prehistory of the Upper Xingu, captures this idea succinctly: "The Xinguano landscape is a fully "saturated" anthropogenic landscape, with virtually no place that is not touched and molded by human hands" (Heckenberger 2005: 251). A growing number of scholars familiar with the historical ecology of Amazonia consider many of the landscapes in Amazonia as domesticated (Clement and Junqueira 2010; Erickson 2006). One archaeologist has coined the expression "domestication of landscape" when speaking of Amazonia (Erickson 2008), while another has posited the question "Pristine forests or cultural parkland?" (Heckenberger et al. 2003).

The notion that large areas of Amazonia are cultural artifacts of past and present human activities may seem a little odd, but it is by no means unique. Landscapes in other regions, both temperate and tropical, have been shaped to varying degrees by people. Aborigines in Australia managed landscapes through the selective use of fire and transplanting in tropical, subtropical, and temperate parts of the country (Gammage 2011: 3). When I was a college student at Berkeley, I was awestruck by Ansel Adams' stunning photographs of Yosemite Valley in California which he took in 1924. I thought they were the very epitome of what wilderness was, or should be. I was influenced no doubt by the writings also of John Muir describing his forays into the Sierra Nevada Mountains, including Yosemite. But then I learned that native peoples had been setting fires on the floor of Yosemite Valley for a long time and that the landscapes that Adams had photographed were in fact partly cultural.

Research on cultural forests and engineered landscapes in Amazonia has revealed the hand of man on the region's vegetation in a wide array of habitats from upland forests to seasonally flooded savannas all across the region from Ecuador (Rival 1998), to the Rio Negro watershed (Alarcón and Peixoto 2008; Guix 2005), the Upper Xingu (Posey 1998; Heckenberger 2005), the Amazon estuary (Anderson et al. 1995; Muñiz-Miret et al. 1996; Weinstein and Moegenburg 2004), to the eastern fringes of the Amazon rainforest (Balée 1989, 1993; Balée and

Gély 1989). Palms are found in most upland and wetland environments, and their numbers, densities, and distributions have often been altered by human agency.

Palms are so useful in Amazonia that several species are in various stages of recruitment as cultivated crops. Peach palm (*Bactris gasipaes*) emerged as a fully-fledged crop long before the arrival of Europeans in the New World, but others are well on their way to becoming crops, including *Mauritia flexuosa* and *Euterpe oleracea*. Plant domestication is a process that may start with the sparing of trees during land clearing and progress to the care of spontaneous seedlings in home gardens and fields, and ultimately the deliberate planting of seeds and selection of desirable varieties. Then there are "camp followers" that arise, often in groves, as a result of fire; such plants are not deliberately cared for, but thrive on their own because of the altered conditions created by humans.

A number of different frameworks for analyzing plant domestication have been proposed with varying degrees of complexity (Pickersgill 1969; Rindos 1984; Ucko and Dimbleby 1969). Some classifications only consider a plant as domesticated when deliberate breeding has occurred, that is altering the genotype as well as the phenotype. Others consider a plant domesticated if it is simply cultivated. Furthermore, plant domestication is often seen as a linear progression from a wild plant to a fully domesticated crop with various stages in between.

In many parts of Amazonia, however, some fruit trees, including several palms, appear to have fallen in and out of "domestication" as settlement sites have been abandoned. The late Claude Lévi-Strauss captured this state of affairs in his usual eloquent prose: "It is not always easy to distinguish between wild and cultivated plants in South America, for there are many intermediate stages between the utilization of plants in their wild state and their true cultivation" (Lévi-Strauss 1952). And a century ago, the Swiss-Brazilian Jacques Huber, a botanists who worked out of the Goeldi Museum in Belém, declared that in Amazonia especially it can be hard to designate a fruit tree as truly wild since so many are at various points along a transition from wild to domesticated (Huber 1904).

Many of the early classifications of plant domestication were based on research on temperate crops, particularly cereals. Two classifications have been developed by scientists working in tropical America. In his studies of plants in Mexico, Robert Bye (1993) considers three broad categories: *gathering* (plant products that are simply collected in the wild), *incipient domestication (*minor tending to plants that arise spontaneously as a result of human activity), and a*gricultural domestication* (farming that involves the creation of fields and selection of varieties). Charles Clement and collaborators (Clement 1999; Clement et al. 2010), working out of the central Amazon, propose a more fine-tuned classification: *wild*; *incidentally co-evolved* (which encompasses plants that exploit areas disturbed by humans); *incipiently domesticated* (modest selection but phenotypes still within the range found in wild populations); *semi-domesticated* (significant modification by human selection through management); and *domesticated* (crop with reduced genetic variability which can only survive in human-created environments).

However, the term "domestication" can be problematic. Charles Clement, an agronomist who works at the National Institute for Amazonian Research (INPA) in

Manus splits the hair into incipient domestication, semi-domesticated, and domesticated. Peter Bellwood, an Australian archaeologist, argues that domesticated plants that are found at archaeological sites have some recognizable degree of phenotypic change from the wild type, but that does not imply that the plant cannot survive without human intervention (Bellwood 2005: 13).

While the work of Bellwood, Bye, and Clement has helped sharpen thinking on the manner in which people incorporate plants into their cultures, I am going to adopt a different, perhaps more flexible taxonomy of plant domestication. *Wild* palms are those in which little or no human intervention in their location or density is obvious. Palms that are *spontaneous in cultural settings* include species that are favored by fire, or whose seeds are dispersed by animals or humans. In the latter case, people often toss seeds on the ground after eating the fruit, and some of them sprout. Birds and mammals often disperse certain palms seeds into clearings in the forest where crops are grown, either in fields or home gardens. The final category I am going to use is simply *planted*. Palms that are planted include those for which large fruit forms have been selected over time, such as peach palm (*Bactris gasipaes*) and those that are simply planted with no apparent selection of varieties. Interestingly, the Achuar of the Ecuadorian Amazon classify all plants, other than weeds, growing in their fields as *aramu* (that which is planted in the earth). That encompasses seeds and seedlings, including palms, brought from the forest (Descola 2013: 15).

The fruits of some palms in the Amazon are gathered in the wild, from trees that have arisen spontaneously in fields, as well as from trees planted in home gardens. I have discarded the term incipient domestication because it implies that a plant is on course to full domestication when many of the fruit trees in Amazonia never seem to proceed to planting and selection of new genotypes. I also avoid the term domestication because it can mean different things to different people; for some it implies selection of varieties and many mean that the plant has become wholly dependent on people for propagation.

Carl Sauer (1952) was one of the first scholars to suggest that crop domestication occurred in the tropics earlier than temperate regions. In the humid tropics, fruit and nut trees have played an important role in people's diet for a long time, and many of them have entered the domestication process at various times. The significance of tree domestication has tended to be overlooked, even in the tropics. However almost a century ago, Wilson Popenoe (1920) recognized that fruit and nut trees in the Neotropics have had their distributions and characteristics changed by human agency for millennia, and these ideas reverberated in the mid to late twentieth century in the works of Seibert (1948) on rubber and its near relatives (*Hevea* spp.), and Johannessen (1966a) and Clement (1988, 1989, 1992) on peach palm (*Bactris gasipaes*).

Acrocomia aculeata

2

English: Macaw palm, grugru palm
Bolivia: Totaí; korondía (Sirionó)
Brazil: Mucajá, macaúba, coco babão, bocaiúva, côco de catarro; maka-djiup (Kayabí), roi (Kayapó), roy rak (Krahò), pinawa (Tapirapé)
Colombia: Corozo, tamaco
Paraguay: Mbocayá, coqueiro de catarro; pikáde (Ayoreo)
Venezuela: Corozo

Status: Spontaneous in cultural settings

Fig. 2.1 *Acrocomia aculeata* palm in fruit. Clusters may contain as many as 400 fruits. Santa Rosa de Yacuma, Beni, Bolivia, 5-28-05

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Acrocomia aculeata has a strong affinity with humans. It is found mostly in disturbed habitats, such as second growth in forested areas or savannas that are periodically burned to promote forage for cattle. Mucajá, as the upland palm is known in the Brazilian Amazon, tolerates fire and thus often proliferates in the vicinity of villages and in abandoned fields. Also referred to as macaúba in Amazonas and Mato Grosso, *A. aculeata* is never found in mature forest. This begs the question: where is it found "naturally"? My guess is that its numbers and range expanded during dry climatic cycles in the Amazon and diminished when more humid conditions returned. And when the forest re-occupied formerly more open, drier areas, such as savannas, it was humans who opened up more space for the fire-resistant palm. Mucajá prefers areas with a pronounced dry season, such as central, eastern and southern Amazonia and its numbers have certainly increased over the last several thousand years.

This decorative palm is one of the more widespread Neotropical palms, ranging from Mexico, where it is known as coyol, south to Argentina, as well as the Antilles (Henderson 1995: 162, Zona et al. 2003). Coyol is thought to have been cultivated 7,000 years ago in the vicinity of Teotihuacan, a vast ceremonial and administrative complex in the central valley of Mexico (Tapia 1992). I saw the palm in fruit in the rain shadow area of northwestern Dominica in December 2012. Some authorities suggest that people introduced the palm into Central American from South America in precontact times (Morcote-Rios and Bernal 2001). It has been suggested that the Mayans may have been responsible for introducing the palm to various parts of Mexico and Central America (Scariot 1998), but an earlier civilization in Mexico, the Olmecs, were using the fruits at least 4,700 years BP as evidenced by the discovery of *Acrocomia aculeata* nuts in an archaeological site (Pool 2007: 74).

Fig. 2.2 Mucajá singed but not killed by a fire set on the perimeter of a village. Fire-tolerant tucumã (*Astrocaryum vulgare*) palms can be seen in second growth in the background. These palms are growing on an archaeological site. Pontão, Lake Canaçari, near Silves, Amazonas, Brazil, 9-21-10

The solitary palm has distinctive feathery fronds emanating in radial fashion. On occasion, however, the palm occurs in dense stands, such as at km 82 of the Belém-Paragominas highway, likely an artifact of human occupation of the area. Indeed, the Munduruku of the Upper Tapajós believe that groves of the palm on patches of scrub savanna in interfluvial areas of their territory were planted by their ancestors (Frikel 1978). The Munduruku were allies of the Portuguese during the colonial period and once had widely scattered settlements, such as along the Maués River where one of their villages was named Mucajá-tuba, which means the place of the mucajá palm (Agassiz and Agassiz 1896: 306). Also in the nineteenth century, the Yorkshire botanist Richard Spruce observed that mucajá palms in the interior of Pará State, Brazil, were only found in open situations near dwellings, and he considered them to have been planted (Spruce 1871). Although most *Acrocomia aculeata* are not planted, they are nevertheless "social" palms, whose lives are tightly bound to human affairs. Over a century ago, the American botanist Orator Fuller Cook considered the palm an indicator of human disturbance in Central America (Cook 1909: 12).

Fig. 2.3 Girl gathering mucajá fruits in her village. Pontão, Urubu River near Silves, Amazonas, Brazil, 10-11-12

The palm is typically spared when clearing sites for home gardens or fields, and even pasture, because cattle also relish the fruits, as near Figueirópolis in Mato Grosso, Brazil. Cattle ingest the entire fruit, later defecating the seeds and thus serving as dispersal agents for the palm (Yamashita 1997). Another reason why the palm is typically spared is because the fruits are fed to pigs, such as in the community of Lontra along the Pedreira River some 60 km northeast of Macapá, Amapá. *Acrocomia aculeata* also arises spontaneously in home gardens. When a farmer on the outskirts of San Ignacio in the Llanos de Moxos region of the Bolivian Amazon was asked how totaí (as the palm is known in Bolivia) turned up in his home garden he responded "*nasce, no mas*" (it just comes up by itself).

The round fruits, the size of small plums, are generally gathered from the ground because the trunk is adorned with slender spines. The spines of *Acrocomia aculeata* command respect, and with good reason: they can penetrate deeply into the body and break off. One 11 year-old boy in Paraguay lived for 7 years with a 6.3 cm piece of spine from the palm that had penetrated his heart; surgeons removed it successfully after he began to develop symptoms of cardiac distress (Lugones et al. 2009).

Rather than wait for the fruits to fall, boys will sometimes use catapults to dislodge the fruits which are born in clusters some 5–10 m above ground. Fruits brought down in this manner may not be fully ripe, so they are smacked together to soften the pulp. Although most of the fruits are consumed locally, they turn up occasionally in markets, such as in Alenquer, Pará. In central, southern, and eastern Amazonia, several indigenous groups also relish the pulp, including the Jurúna of the Upper Xingu (Oliveira 1970) and the Kamayurá in Mato Gross (Oberg 1953: 17).

Fig. 2.4 Girl eating a mucajá fruit that she has gathered from the ground. Pontão, Urubu River near Silves, Amazonas, Brazil, 10-11-12

Yellow-green when ripe, the fruits are not damaged when they fall to the ground because the skin is tough and there is only a thin layer of mesocarp surrounding the single seed. Although mucajá fruits contain rather paltry amounts of pulp, they are nevertheless relished, especially by youngsters, who peel the fruits to ingest the oily pulp. Furthermore, mucajá fruits during the dry season when few other wild fruits are available. The slippery texture of *Acrocomia aculeata* fruits accounts for the common name for the palm in the eastern part of the Bragantina zone along the coast of Pará: coco babão (the drooling coconut). In some areas, such as near

Itapiranga, a small town on the north bank of the Amazon River downstream from Itacoatiara, locals make juice from the fruits. Called *vinho de mucajá*, the juice is unfermented despite its name (*vinho*), which translates as wine. In the Brazilian Amazon, many fruit juices are dubbed *vinho* even though they are not alcoholic. The Tapirapé who live in the Araguaia watershed in eastern Amazonia boil the fruits to soften the pulp which is then cooked in water to make a refreshing nut-flavored drink (Baldus 1970: 193). The Kayabí of the Upper Xingu mix the pulp with honey to make porridge (Ribeiro 1979: 122). The nut casing also finds uses in some areas. The Kayapó, for example, string the endocarps on to necklaces (González-Pérez et al. 2013).

Oil is extracted from the nut in some parts of the Amazon, and occasionally sold in markets, such as the Mercado Campesino in Trinidad, Bolivia. The kernel oil is reputed to be especially good for making soap and has properties similar to African oil palm (*Elaeis guineensis*), the latter widely planted in tropical forest regions and a cause of major deforestation in some areas (Balick 1979; Cavalcante and Johnson 1977). Large African oil plantations are found in several parts of Amazonia, including Pará state in Brazil and on the outskirts of Coca along the Napo River in Ecuador. Perhaps it might make more sense to investigate the feasibility of planting a native palm in the region to produce vegetable oil for biodiesel and other purposes. Locals in the community of Murumuru at the edge of the Amazon floodplain a few kilometers downstream from Santarém mix the oily pulp with rice to make a creamy porridge (*mingau de mucajá*).

Much of the Murumuru community is located on sizeable anthropogenic black earth (*terra preta do índio*), and mucajá palms are common on that site, formerly occupied by indigenous people. Mucajá is often associated with Amazon Dark Earth (ADE) sites in the Brazilian Amazon (Balée 1988; Hiraoka et al. 2003). I have seen the palm on numerous ADE sites particularly in villages and small towns near Santarém, such as Belterra, Juriti, and Arapixuna. The palm is also a conspicuous fixture of vegetation on ADE sites near Caxiuanã along the lower Anapú River in Pará. Mucajá is also a prominent feature of abandoned Xinguano settlements on ADE sites in the Upper Xingu (Heckenberger et al. 2007) and is a "camp follower" par excellence,

This widespread palm plays an important role in the survival of the rare blue-throated macaw (*Ara glaucogularis*). This endangered macaw eats the fruits of *Acrocomia aculeata* on forest islands in seasonally-flooded savannas on the Llanos de Moxos in the Bolivian Amazon, thereby possibly dispersing the seeds. These colorful macaws, once the target of illicit pet traders, also excavate cavities in dead *A. aculeata* palms to raise their broods (Jordan and Munn 1993). The bill of the world's largest parrot, the hyacinth macaw (*Anodorhynchus hyacinthinus*) is powerful enough to crush the endocarp and eat the nut (Bates 1863a: 133).

This useful palm surfaces occasionally in indigenous mythology. The Waurá, who inhabit an affluent of the Upper Xingu, tell the story of a tapir who lives in a lake and eats the fruits of the palm, as well as a porridge made with the cooked fruits of another palm, *Mauritia flexuosa*. The tapir eats a repast of these palm fruits before making love, including to a woman of the Mató tribe. One day, a little boy catches them in flagrante and reports his observation to the husband of the Mató woman. The cuckolded husband then ambushes the tapir to exact revenge (Schultz and Chiara 1971). Tapirs sometimes feature in amorous encounters in indigenous legends because the males have an enormous penis.

Aiphanes aculeata 3

English: Ruffle palm, coyure palm
Bolivia: Cocos rura; cajna (Tsimané)
Brazil: Pupunha, pupunha brava, chica-chica
Colombia: Mararay, corozo, cubarro
Peru: Shicashica, quindio
Venezuela: Macaguita, marará, corozo

Status: Wild, planted

Fig. 3.1 *Aiphanes aculeata* in fruit in a home garden. Puente Cumbaza, Tarapoto, San Martin, Peru, 9-1-04

This spiny palm which furnishes an edible pulp as well as savory nuts, thrives in forest along the Andean foothills from Bolivia north to the mountainous coast of

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