

The Economic Use of Palms in Amazonia :

Raphia taedigera in the estuary

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Abstract

This paper presents a biogeographical and socio-economic study of the significance of *jupatí* (*Raphia taedigera*) for peasant livelihood strategies in the Amazon estuary. It engages current research interest in indigenous agroforestry systems as an alternative to deforestation in Amazonia and especially, the role of palms for providing marketable products and sustainable land use systems. While several studies illuminate the economic importance of marketing *açaí* (*Euterpe oleracea*) fruits, there is very little attention to other wetland palms, like *Raphia*, which provide valuable products to rural people but are less visible in the cash economy. Such is the case with *Raphia taedigera*, which attains its broadest areal extension in the Amazon estuary and whose petioles are used to fashion shrimp traps. Shrimp sales constitute an important income source for *ribeirinho* (*ribereno*) families in the estuary. This study presents an overview of the biogeographical range of *Raphia taedigera* in the lower Amazon, the hydrological conditions that favor its establishment, and the depth of indigenous knowledge of its use within *ribeirinho* livelihood systems.

Key words : palms, *jupatí* (*Raphia taedigera*), agroforestry, sustainable land use, Amazon estuary

I. Palms in the Economy of Amazonia

In situ forest management, based on indigenous practices, is receiving major attention as an alternative to deforestation in Amazonia. While promoting the region's ecological equilibrium, managed forests also contribute significantly to rural subsistence and income needs, (Denevan and Padoch, 1988 ; Posey and Balee, 1989 ; Anderson, 1990 ; Anderson *et al.*, 1991 ; National Research Council Committee on Sustainable Agriculture and the Environment in the Tropics, 1993). Palms form a

crucial component of Amazonian managed forests and plant associations. They contribute to biodiverse agroforestry systems while providing numerous products for a wide range of purposes that include food, beverage, medicine, construction, and handicrafts. Palms and their products are particularly important for the rural inhabitants (Balick, 1988 ; Hecht *et al.*, 1988 ; Kahn and de Granville, 1992 ; Nepstad and Schwartzman, 1992 ; Redford and Padoch, 1992 ; Henderson, 1995).

Over recent decades the market for these palm products has expanded considerably, a

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phenomenon related to changing patterns of regional as well as national demand. Regionally, the increased market for palm products is linked to the rapid urbanization of Amazonian cities. Over the past 30 years cities like Belém nearly quadrupled in population. In 1960 Belém registered some 380,000 inhabitants; by 1970 the number grew to 611,000 and by 1991, reached 1.2 million (I.B.G.E., 1977; F.I.B.G.E., 1992). Amazonian peasants, displaced from rural areas, constitute the majority of Belém's recent migrants. Their exodus to cities like Belém and Manaus has led to a growing consumer demand for palm products in the regional market. One of the leading beverages of the Amazon, made from the fruit of the *açaí* (*Euterpe oleracea*) palm, illustrates this expanded consumer demand as well as the income potential for rural people involved in its collection. An item of minor value in the regional economy in 1960, by 1986 *açaí* had become the dominant extractive product of Amazonia. In that year sales from its fruit generated US\$ 41.6 million in revenues, surpassing the US\$ 27.5 million value gained from natural rubber (*Hevea brasiliensis*), the Amazon's dominant extractive product since the 1850s (Anderson and Ioris, 1992).

Expanded consumer demand for products from Amazonian palms is also evident in national markets over the same period. One example is provided by palm hearts, purchased by high-income households as well as exporters. Until the 1970s Brazilian palm heart production was concentrated on *Euterpe edulis*, located in the Atlantic rainforest in the country's center-south. But over-exploitation of the reserves resulted in a geographic shift in palm heart extraction northward to the Amazon. By 1975, the Amazon estuary

was accounting for 96 percent of Brazil's production (I.B.G.E., 1975). By the early 1990s *açaí* palm hearts were generating over US\$ 300 mi/yr in revenue (Anderson and Jardim, 1989; Ferreira and Paschoalino, 1987; Pollak *et al.*, 1995). The figures alone from *açaí* revenues illustrate that palms are a vital component of the Amazonian economy and contribute substantially to rural household income.

Economic opportunities with palm products, moreover, are especially viable in areas where indigenous resource management practices remain intact so that agroforestry systems are encouraged. Ecological conditions favoring sustainable palm production depend on maintaining dense natural stands. While land conflicts and peasant displacement have resulted in the considerable loss of managed palm groves to deforestation and pastures, a geographical perspective on the relationship between peasant management systems, access to environmental resources and economic opportunities proves revealing. Many of the economically-valuable palm products currently marketed in the region, such as *açaí*, grow in areas of the estuary where peasant settlement remains concentrated. These are palm species that thrive on water-logged soils, experiencing daily inundation.

Thus, within the Amazonian regional economy, some of the leading marketable palm products derive from habitats characterized by complex hydrological regimes involving daily tidal flooding, low-lying terrain and high water tables. Only a few species of palms, such as *mirití* (*Mauritia flexuosa*), *açaí* (*Euterpe oleracea*), *murú murú* (*Astrocaryum murú murú*), *ubuçu* (*Manicaria saccifera*), and *jupatí* (*Raphia taedigera*), flourish under such water-logged conditions.

Two of these wetland palm forests—*açaí* and to a lesser extent, *mirití*—have attracted scientific attention due to their importance for providing marketable products and sustainable land use systems (Anderson and Ioris, 1992; Hiraoka, 1993, in press; Strudwick and Sobel, 1988). Yet, relatively little research attention has focused on wetland palms that are economically and ecologically important to the rural inhabitants, but less visible in the cash economy. This is particularly true of *jupatí* (*Raphia taedigera*), a wetland palm that attains its greatest areal extension in the Amazon estuary, and forms the basis for numerous subsistence and marketing strategies.

The objective of this paper consequently is to bring research attention to a key wetland palm of the Amazon estuary, *Raphia taedigera*. By linking ecological studies to its use among *ribeirinhos*—small scale farmers in the Amazon estuary—this article addresses the importance of situating indigenous knowledge systems and economic strategies within specific types of environmental resources. To the poor rural living along the numerous margins of estuarine channels, knowledge of how to use *jupatí* facilitates overall livelihood options.

Divided into two sections, the first part of the paper provides an overview of the palm's biogeographic range in wetland habitats as well as the ecological conditions that favor its establishment. The second section discusses *Raphia's* role in regional subsistence and livelihood strategies, drawing attention to the depth of indigenous knowledge of the palm's diverse uses.

II. Distribution and Habitat

Scientific interest in the American *Raphia*

dates to Martius, who identified the species along the Amazon estuary in 1824 (Bailey, 1935, p.40). Two features of the palm drew the attention of botanists: its egg-sized fruit that resembles a pine cone, and its long leaves. *Raphia taedigera* is the world's longest-leafed palm, with pinnate leaves reaching 15–20 meters (Correia, 1928; Allen, 1965b; Halle, 1977; Henderson, 1995). The leaves rise from a central base of three to five trunks that arch to a height of 10–20 meters (Bailey, 1935; Anderson and Mori, 1967). Individual plants flower and fruit throughout the year, with fruits weighing as much as 50 kilograms (Allen, 1965a; Devall and Kiester, 1987). The mature canes die after inflorescence, but the life of the plant is extended by suckers that spring from its base (Bailey, 1935; Myers, 1981, 1984). While the fruits produce oil, the trunk is spiny, which prevents it from being climbed like other oil palms (Moore, 1973). The pollinators of *Raphia taedigera* are as yet unknown (Francis Kahn, pers. com.).

One of the least studied of Amazonian palms, *Raphia taedigera* is established on imperfectly-drained soils in a region that includes numerous river channels (*furos*), weak currents that constantly change direction and favor alluvial deposition, as well as along the main channel of the Amazon River and its tributaries (Huber, 1959). *Raphia* vegetation formations extend along the River Pará from Breves on the southwestern portion of Marajó Island to east of Belém along the River Capim and southwards south of Cameté on the River Tocantins (Fig. 1). The palm occurs in dense stands on geologically-recent alluvial deposits along low-lying tidal (*várzea*) floodplains and tolerates a degree of salinity (Bouillenne, 1930; Allen, 1965b;

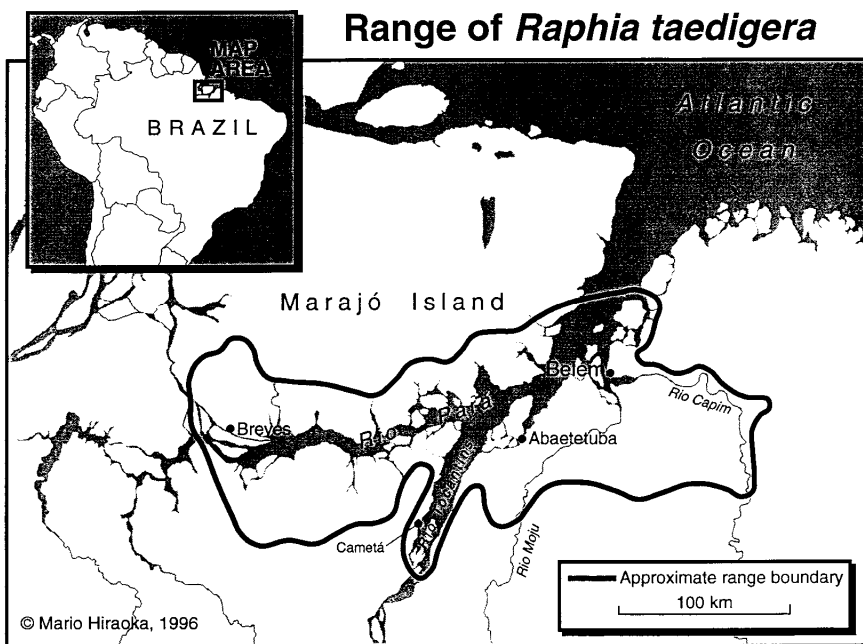


Fig. 1 Range of *Raphia taedigera*.



Fig. 2 *Raphia taedigera* is the world's longest-leaved palm.



Fig. 3 *Raphia taedigera* inflorescence occurs once when the trunk attains maturity. Subsequently, the trunk is replaced by basal suckers.

Moore, 1973 ; Henderson, 1995) (Figs. 2, 3 and 4). Fieldwork indicates that the palm thrives along floodplains of blackwater rivers

characterized by slightly acid water (like the Tocantins) and when appropriate drainage conditions exist, in imperfectly-drained inland

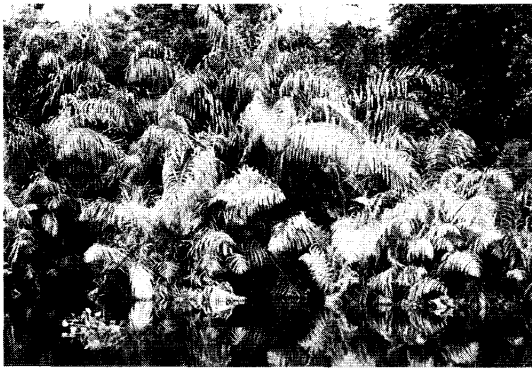


Fig. 4 Dense concentrations of *Raphia taedigera* occur along the margins of black water rivers in the Amazon estuary.

swamps.

Raphia taedigera (*jupati*) frequently occurs in association with mangroves (*Rhizophora* and *Avicennia* spp.) as well as with another economically-valued palm, *Mauritia flexuosa* (*miriti*). A recent study suggests that *Raphia taedigera* represents a climax rather than a pioneer plant community (Devall and Kiestler, 1987; *viz.* Anderson and Mori, 1967), a research question that proved important for examining Otedoh's (1977) hypothesis of the palm's introduction from Africa via the Atlantic slave trade. As Iltis and others argued, *Raphia*'s crucial role as a pioneer species on imperfectly drained soils would have facilitated within just a few hundred years the palm's establishment and distribution over the broad area it now occupies (quoted in Anderson and Mori, 1967). The hypothesis for a recent introduction of *Raphia* to the Americas is not, however, supported by palynological data from eastern Nicaragua where Urquhart (in press) establishes the presence of *Raphia taedigera* in vegetation formations more than 2,000 years ago (*viz.* Gentry, 1993).

III. Use of *Jupati* in the Regional Economy

An account by a Jesuit priest, José Vieira, written in 1654, provides an early reference to uses of *Raphia* in the Amazon region. Vieira describes the palm's petioles being woven into the cylindrical tube (*tipiti*) used to extract the juice from grated manioc tubers, an important step in rendering it palatable for human consumption (Azevedo, 1928, (i) 373–374). In 1853 the importance of *jupati* in regional livelihood systems drew the attention of the English botanist, Alfred Russel Wallace. Noting the use of the *Raphia* petiole for house construction, window shutters, boxes, baskets, bird cages, and bottle stoppers, Wallace's expedition even found it admirably suited for lining insect boxes (Wallace, 1971, p.44). A half a century later Rodrigues (1903, xxvi) noted two additional features of *jupati*: the use of the palm's fronds for thatch and the fact that the fruits were not consumed. Based on his botanical investigations earlier this century, Correia (1928) recorded the medicinal properties of *jupati* fruit, the oil serving as a balm against rheumatism and paralysis. Even though he noted that West Africans prepared a fermented drink with *Raphia* fruit, Correia (1928, p.573) did not observe similar uses of the fruit juice in the Amazon estuary. To the list of uses for the palm, Correia added the making of musical instruments from the petiole. However, in the 70 years since Correia recorded his observations, synthetics and mass produced goods have replaced many of the items made from *jupati*. But new uses of *jupati* have been devised over this time so that *Raphia* continues as an important resource among the *ribeirinhos* of the Amazon estuary.



Fig. 5 The *jupati* (*Raphia taedigera*) petioles are used mainly for the manufacture of baskets and shrimp traps.

Both fruits and petiole of *jupati* are used in the contemporary period. Women in the Breves region (Fig. 1) still extract cooking oil from the fruit's pulp. The extraction of the greenish-yellow oil, is gradually being replaced by store-bought vegetable oil. The labor-intensive extraction process and the low yield are factors causing the replacement of *jupati* oil. Between 2–3 liters of oil is obtained from a *Raphia* producing between 210–270 kg of fruit/tree, with a labor input averaging 25 hours. With the minimum wage valued at US\$ 5.00/day in 1996, the cost of producing *jupati* oil amounts to US\$ 5.00–7.00/liter. Since the retail price of soy bean or corn-based oil varies between US\$ 1.50–2.00/ liter, few individuals are willing to invest the time to process the *jupati* fruit for oil. But many *ribeirinhos*, who prefer the pleasant taste and the color of the *jupati* oil, continues to produce the domestic needs through the laborious process. The fruit also continues as an important feed to the semi-feral pigs that



Fig. 6 Fishing weirs of diverse sizes and types are made by the *ribeirinhos*.

Weirs are placed along estuarine shores or channels during the high tide to capture the fish moving with the outgoing tide.

scavenge the forest floor.

However the most widespread and economically-important use of *jupati* in the Amazon estuary today is to make a variety of utensils from the petiole (Figs. 5 and 6). The tipiti, or manioc sieve, and diverse baskets are woven from the young and flexible petioles. These instruments, made mostly for household use, do not enter the trade network. Weirs called *pari* and *camboa*, manufactured from mature petioles are widely employed in fishing. Fish trapped by placing the weirs at high tide, across small streams or along the shoreline, are retrieved at low tide. The instruments, made specifically for other *ribeirinhos*, are sold between US\$ 10.00–60.00, depending on sizes, and can contribute occasionally to the household income.

The main source of income from *jupati* petioles derives from the manufacture and sale of a shrimp trap called *matapi*. The

petioles are formed into a cylindrical instrument about 60 cm long and 30 cm across with conical ends (Fig. 5). Although its origins are unclear, *matapís* began to be widely diffused in the estuary region within the last 25 years. With increasing markets for freshwater shrimp (*Macrobrachium amazonicum*) in the estuarine cities, both *ribeirinhos* and commercial fishermen began to exploit this resource.

A market developed for *matapís* to supply the expanding demand. While households occasionally make the *matapís* for shrimping, more frequently they are purchased in the market or from another *ribeirinho* who specializes in supplying the regional market.

Abaetetuba, one of the main fluvial ports in the estuary, became one of the primary centers for the distribution of *matapís* to the Lower Amazon. As the *jupatí* petiole-based shrimp trap does not last more than three months under continuous use, a cottage industry developed in the vicinity of Abaetetuba to fulfill the needs. According to our survey, as of 1995, an estimated 350 *ribeirinho* households manufactured between 300,000–380,000 *matapís* per year to supply most of the regional needs.

Matapí-making is an important adjunct to the *ribeirinho* economy. Our sample of 12 households that emphasized *matapí* manufacture indicates that annual familial output varied from 560 to 1,340 units, with an average of 940 units. On an average, *matapí*-making contributes about 25 percent of total family income (Table 1). In such households, *matapí* manufacture represented the second major producer of income. Table 2 summarizes the present uses of *Raphia taedigera* within the region.

After *açaí* (*Euterpe oleracea*) extraction,

shrimping often provides the second-most important source of on-farm income to *ribeirinhos* dwelling along the rivers. Even among *matapí*-makers, shrimp sales represent a major source of returns (Table 1). Surveys within the *Raphia taedigera* zone indicate incomes from shrimping that annually average between US\$ 250 to \$ 300.

Shrimping is carried out by individuals of both sexes, and children begin to learn to actively participate by the time they are 6–7 years of age. A meal, made from rice bran or *babassu* (*Orbignya phalerata*), is wrapped in a perforated leaf (*Theobroma cacao*, *Ischnosiphon* spp., *Genipa americana* and *Montrichardia arborescens*) and placed inside the *matapí*, the smell enticing the shrimp to enter the conical end from which there is no exit. The *matapí* traps are set from canoes during different times of the day depending on tidal fluctuation, and are secured on plants or poles along the river's edge. After 8 to 10 hours, the shrimp are retrieved and "corralled" in larger holding pens (*viveiros*), also fashioned from *jupatí*. The shrimp can thus be kept alive for two to three days after capture, time which enables peasant households to prepare them for sale either fresh, partially-dried, or salted.

Both men and women are involved in marketing, the main harvest season occurring from March to June. While the customary common property resource systems recognize shrimping rights of individual *ribeirinho* households, the locations of the traps along the rivers are carefully guarded due to fears of *matapí* theft from passers-by and the growing incursion of commercial fishermen in the Lower Amazon as a response to rising urban demand for shrimp (McGrath *et al.*, 1993).

Table 1 Average annual income of families with emphasis on *matapí* production, Ilhas de Abaetetuba (n=12).

Activity	Income (US\$)
1. <i>Açaí</i> Production Annual output : 796.5 <i>rasas</i> ¹ Labor input : 578 hrs ² Production value : 796.5 <i>rasas</i> × US\$ 1.71/ <i>rasa</i>	1,362.01
2. Shrimping ³ Annual output : 314 kg Labor input : 157 hrs Production value : 314 kg × US\$ 0.88/kg	276.32
3. Palm Heart Extraction ⁴ Annual output : 685 units Labor input : 32 hrs Production value : 685 units × US\$ 0.03/kg	20.55
4. Basket-Making Annual output : 3,600 Labor input : 576 hrs Production value : 3,600 units × US\$ 0.06/unit	216.00
5. <i>Matapí</i> ⁵ Manufacture Annual output : 920 Labor input : 594 Production value : 920 units × US\$ 0.67/unit	616.40
Total Annual Income	2,491.28

¹ *Açaí* volume is measured locally by a container called *rasa*. A *rasa* of *açaí* weighs about 18 kg.

² Labor required to harvest an average *açaí* agroforest of 1.6 ha, 7 years of age.

³ The capture of fresh water shrimp (*Macrobrachium amazonicum*) with *matapí* made from the petioles of *jupatí* (*Raphia taedigera*), especially during the March-June season, serves as an important source of income to the small holders.

⁴ The main source of palm hearts in the Amazon estuary is the *açaí* (*Euterpe oleracea*) palm.

⁵ *Matapí* is the local name for a shrimp trap manufactured from the mature petioles of the *jupatí* (*Raphia taedigera*) palm.

Table 2 Contemporary uses of *Raphia taedigera* in the Amazon estuary.

Petiole surface	shrimp traps, fishing weirs, bird cages, window shades, skewer, toys, manioc sieve, basketry, house walls
Petiole pith	mats
Fruit	cooking oil, medicine, beverages, pig feed
Leaf/fruit compost	planting medium for ornamental plants in raised platform beds

IV. Management of *Raphia taedigera*

The past decade has witnessed a steady decline in the natural populations of *Raphia* in the eastern portion of the Amazon estuary. The reason for the declining stands of *jupati* include: over-harvesting of the petiole for *matapí* production, increasing rural population, and expanding *açaí* palm agroforests. The pressure on the palm is especially great east of the Tocantins River. In the Ilhas de Abaetetuba, for example, the petiole extraction rate surpasses the rate of regeneration, so that plants die prior to attaining fruit production. As *Raphia* trunks are solitary, premature destruction is common when petioles are subject to frequent removal.

However, *ribeirinhos* are adjusting to *jupati* declines by developing new forms of management strategies. Although the optimal sustainable harvest rate for the petioles is still unknown, local inhabitants indicate that the annual removal of 6-8 petioles do not lead to the palm's premature demise. In 1995, a petiole was valued at US\$ 0.20/unit. With a density of 35-60 trunks/ha, yielding 210-480 petioles, a yearly return from sales of *jupati* petioles of US\$ 42.00-96.00/ha is possible. Such an income potential is leading *ribeirinhos* to improve management of existing palm stands. At the time of land clearing, *Raphia* trunks are now left standing. Since pigs forage on both the mesocarp and the seed of the palm fruit, *ribeirinhos* regularly break the animals' cuspids to lessen seed predation. Management practices are likely to increase if the demands for petioles keep on expanding.

V. Conclusions

Among the wetland palms most utilized in

contemporary peasant livelihood strategies within the Amazon estuary, *Raphia taedigera* ranks in importance with *Euterpe oleracea*, *Mauritia flexuosa* and *Manicaria saccifera*. Yet despite its regional significance, *Raphia* has received little research attention. While this paper clarifies the palm's biogeographical range with daily tide-induced flooding, crucial ecological features, such as its pollinators, remain unknown.

One additional issue raised in this study of *Raphia taedigera* also merits research attention. The fact that the present uses of *Raphia* for collecting oil and shrimp traps were not recorded by earlier observers implies a long-term historical involvement with the palm by rural people of the Amazon estuary. As with other palms of the region, the shifting use historically of *Raphia* illustrates the creative ways rural Amazonians manage palm products for survival. Knowledge of palms and their products consequently provide peasant households considerable flexibility in responding to changing socio-economic circumstances.

The increasing research interest in indigenous *in situ* forest management practices in Amazonia as well as the cultural and socio-economic roles of palms in the region (Schultes, 1974; Balick, 1988; Nepstad and Schwartzman, 1992), calls for greater research attention to the significance of access to specific types of environmental resources for the maintenance of indigenous knowledge systems. The linkage between access to specific wetland resources and forms of local knowledge are illustrated clearly in the case of *jupati* use and management. Such environmental practices embedded in local knowledge provide, as this case study illustrates, the means of developing sustainable land use

practices that protect the resource with emergent income opportunities.

In this case study of one wetland Amazonian palm, *Raphia taedigera*, a final point is made. A geographic perspective has much to contribute to scientific interest in economically valuable palms. By focusing research attention on indigenous knowledge systems in specific palm environments, geographers can promote an analytical framework that integrates the land use and cultural factors regulating resource management. The approach developed in this study, for instance, reveals an oversight of previous palm studies in the Amazon. Such studies have focused on palm species that produce directly marketed products but neglected others like *Raphia taedigera* which indirectly produces valued marketable items from the shrimp traps made from its petioles.

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アマゾン河流域におけるヤシの経済的利用
—河口部における *Raphia taedigera* 種の事例—

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本論では、アマゾン河の河口部における小農が生計の維持に役立てているジュパチヤシ *jupati* (*Raphia taedigera*) の意義に関する生物地理的、社会・経済的研究について述べる。特に、最近関心のもたれている研究、すなわちアマゾン河流域における森林伐採に取ってかわる方法としての土着の農的林業システム、とりわけ市場向きの生産物を生み出すことと持続可能な土地利用システムを備えているヤシの役割に注目する。これまでの研究においては、アサイヤシ *açaí* (*Euterpe oleracea*) の実の市場における経済的有用性に着目した事例は見出せはするものの、同じ湿潤域に存在するヤシでありながら、ジュパチヤシに着目

した研究は皆無に等しい。ジュパチヤシは、土地の人々に対して数々の有用な恩恵を施しているが、換金作物としての市場性には欠ける。このような特徴を備えたジュパチヤシは、アマゾン河の河口部において最も広範囲に見出される。葉柄部の外皮は、小エビを採る道具・筒の材料に好んで使われている。小エビの販売は、河口部の河畔に住む現地人・リベリーニョの絶好の現金収入となる。本研究では、アマゾン河下流域におけるジュパチヤシについての植物地理的側面からの概観、ジュパチヤシの繁茂にとっての水文条件、リベリーニョが生計の維持に採り入れているジュパチヤシ利用に関する彼ら固有の知恵についてふれる。

キーワード：ヤシ, ジュパチ *Raphia taedigera*, 農的林業, 持続可能な土地利用, アマゾン河の河口部

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