Potential Harvest of *Desmoncus polyacanthos* (Arecaceae) in the Peruvian Amazonia

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People extract the stems of *vara casha* (*Desmoncus polyacanthos*) for weaving baskets and sieves and for tying various items (Henderson et al. 1995). The most common *vara casha* products in Iquitos are seats and backing for arm chairs, rocking chairs and sofas (Henderson & Chavez 1993, Hübschmann et al. 2007). The stems are sturdy and flexible as well as resistant to decay, and furniture made from it can last 25–30 years (Hübschmann et al. 2007). These characteristics make *vara casha* a substitute for "rattan," the stems of Old World climbing palm belonging to subfamily Calamoideae. This paper discusses the population structure and potential harvest in Peru.

Desmoncus polyacanthos Martius is distributed from east of the Andes in Colombia, Venezuela, Trinidad, Ecuador, Peru, Brazil and south to Bolivia (Henderson et al. 1995, Henderson 1995). It is called *vara casha* by the inhabitants of the Peruvian Amazon, *jacitara*, *titara* and *espera-ai* in Brazil, *bejuco alcalde*, *enredadera*, *yasitara* in Colombia, *kamawarri* in the Guyanas, *bambakka*, *bamba maka* in Surinam and *voladora* in Venezuela (Henderson et al. 1995). In Peru it is found in the Departments of Cuzco, Madre de Dios (Tambopata), San Martín (Mariscal Cáceres), Ucayali (Coronel Portillo), and Loreto (Maynas,

Requena) (Kahn & Moussa 1994, Henderson et al. 1995). The species occurs on river banks, in lowland forest, forest gaps, secondary forest, along forest margins and in disturbed places and open areas (Kahn & Moussa 1994, Henderson et al. 1995, Henderson 1995, Goulding & Smith 2007). *Vara casha* is a liana, and it can often form very dense thickets; the stem is flexible and climbs into the mid-layer of the forest by means of reflexed grapnels (modified leaflets) that arise from the leaf tip.

Methodology

Field work was carried out near Lake Sahuasupay, located in the lower Ucayali river, approximately 6 km from the town of Jenaro Herrera (73°40' W; 4°55' S), in the Province of Requena, Region of Loreto, at 130 m above sea level The climate of the zone is warm and humid, with a monthly average temperature of 25.9 ºC ± 2 ºC, an annual precipitation of 2715 mm and the annual evaporation of 566 mm, with a monthly relative average of 47 mm (Kvist & Nebel 2001). The soils are entisols, with horizon A between 5–10 cm and horizon B with clay content that exceeds 50%, with increasing proportion of sand with increasing depth (Nebel et al. 2001). The vegetation that surrounds the lake is typical seasonally flooded alluvial forest, including high *restinga* and low *restinga*, influenced by human agricultural practices (Lamotte 1990). The most common plant families are Moraceae, Fabaceae, Euphorbiaceae and Annonaceae.

From May 2004 to April 2006, 50 contiguous 10 m by 10 m plots were laid out in two types of habitat: low *restinga*, subject to the seasonal flooding of the Ucayali river for three to four months and to a maximum depth of six meters, and high *restinga*, subject to the seasonal flooding of the Ucayali River for one to two months and to a maximum depth of 0.20 m (Fig. 1).

The population structure of *vara casha* was determined by censusing the number of individuals in the seedling, juvenile and adult stages. An individual plant was considered to be a seedling if it was derived from a seed, had a single stem and was not connected to a second individual; a juvenile was defined as a plant that had multiple stems but not sufficiently developed for harvest; and finally, adult, if the plant had several mature stems along with sprouts of new stems developing from rhizomes.

The potential harvest was estimated by counting the number of green, mature and woody stems in an adult individual, and the yield was estimated by measuring the length and weight of the stems.

According to local inhabitants, a stem is classified as "mature" and ready for harvest when it is flexible and can withstand any angle of bending; in addition, these mature stems are light to dark brown and in certain cases almost black in color, the leaf sheaths usually come off easily in the hands and the basal part of the plant generally does not possess spines.

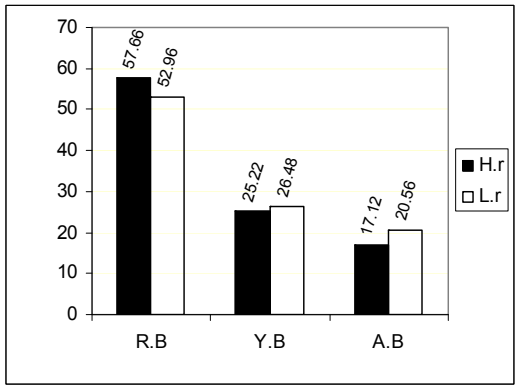
For the phenological study 15 adult individuals were selected at random and marked in each type of habitat, and monthly observations of these plants were taken for three years.

Results and discussion

During the study 355 individuals were inventoried with 2,141 stems/0.5 ha in low *restinga*; 111 individuals with 508 stems/0.5 ha in high *restinga* (Table 1).

The number of individuals/10 m^2 recorded in low *restinga* (X=7.08; sd=4.09), was significantly greater than the number found in high *restinga* (X=2.32; sd=1.34) (Mann-

1. *Desmoncus polyacanthos* in a seasonal flooding area of the Peruvian Amazonia. Photo: Cesar Delgado.



2. Population structure in low and high restinga habitat. RB = Seedling; YB = Juvenile and AB= Adult stages.

Whitney p<0.001). Comparing the stem data, we found that the differences are even stronger between low *restinga* (X= 42.54, sd=44.98) and high *restinga* (X=10.16, sd=20.85). Similar results were observed in a preliminary study carried out in the Yanayacu river, basin of the Marañon (Delgado, unpublished).

The population structure in both types of habitat is similar, with levels of regeneration of the plants that vary between 52.96 to 57.66% (Table 1, Fig. 2). This result suggests that the species has strong regenerative capacity, which will help sustain its survival in the future. From the total number of inventoried adult individuals, 20.76% had mature and harvestable stems in high *restinga* and 21.63% in low *restinga*, with the rest at green and woody stages (Table 2). In both types of habitat percentages of woody stems are greater than other stages, which suggests under-exploitation of this resource. On the other hand, the high percentage of woody stems present in high *restinga* could be present because of a satisfactory supply of the product also occurs in low *restinga* (which is closer to where people live), and thus makes it unnecessary for people to travel greater distances to collect *vara casha*. Extractors will always harvest products that are easily available, demanding less time and effort. Hübschmann et al. (2007) reported that people extract *vara casha* for the furniture industry in many places near Iquitos, and travel to places as close as half-an-hour away to harvest it.

A greater yield of stems was observed in low *restinga*, with 3901.4 m and 148.54 kg, whereas in high *restinga* we measured 913.5 m and 41.38 kg (Table 3). The yield percentages in weight and usable length were similar in both types of habitat, with stem percentages being between 70.39 and 73.6% of the length, and between 75.24 and 79.58% of the weight in high and low *restinga* respectively. The longer period during which *vara casha* is flooded seems not to affect the development of stems, nor their quality.

Phenology.

Vara casha starts its flowering period in September and finishes in February, with major peaks of production in December and January, when the river Ucayali is at its high water mark. The fruiting period begins in April and finishes in July, during the period when the river is at its lowest level. In 2006 we observed a second fruiting period between October and November. This behavior perhaps was in response to the irregular flood of the river that occurred in 2006. The fruits are ellipsoid or globose and wine-red or yellow-orange. The development of the inflorescence lasts 25 days and of the fruit 34 days, making a total of 59 days.

Conclusions

Vara casha is a species with great potential for the continued development of the industry using non-timber forest products (NTFPs) in the Peruvian Amazon. The population structure and large percentage of woody stems demonstrate that the species is currently under-utilized with no existing threats of over-exploitation. Our findings reported here for the preference of *vara casha* for low *restinga*, its phenological behavior and other ecological data, can provide a foundation for efficient sustainable harvest of this species on a large scale.

Table1. Population structure in low and high *restinga* habitat. Number of individuals (percentage of population).

Habitat	Seedlings	Juveniles	Adults	Total of individuals	Total of stems
High *restinga*	64 (57.7%)	28 (25.2%)	19 (17.1%)	111	508
Low *restinga*	188 (52.9%)	94 (26.5%)	73 (20.6%)	355	2141

Table 2. Adult individuals with mature and non-usable stems.

Habitat	Adults with usable stems	Green stems	Mature stems	Woody stems	Total of stems
High *restinga*	05 (26.3%)	91 (31.5%)	60 (20.8%)	138 (47.8%)	289
Low *restinga*	30 (41.1%)	778 (52.1%)	323 (21.6%)	392 (26.3%)	1,493

Table 3. The yield percentages in length and usable weight stems.

Habitat	Total length of stems, m	Usable length, m	Total weight of stems, kg	Usable weight, kg
High *restinga*	1,241	913.5 (73.6%)	55.70	41.38 (75.2%)
Low *restinga*	5541.87	3901.4 (70.4%)	186.64	148.54 (79.6%)

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