

ARUMÃ FIBER: USE AND MANAGEMENT OF *ISCHNOSIPHON POLYPHYLLUS* (MARANTACEAE) BY ARTISANS IN NOVO AIRÃO, RIO NEGRO, CENTRAL AMAZON, BRAZIL.

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INTRODUCTION

The arumã vegetable fiber, genus *Ischnosiphon* (Marantaceae), is used by various riverside and indigenous populations in the Amazon region of Brazil in the fabrication of objects used in the cultivation of manioc such as various types of baskets, strainers, fans, and presses for manioc (FOIRN / ISA 2000; McCann 1993; Projeto Fibrarte 2000). Some of these objects, through the creation of handicrafts made with arumã, also represent an important alternative source of income for the communities of the Amazon region and are indispensable in the subsistence economy of the Baniwa indigenous group of the Içana river (Projeto Fibrarte 2000; Shepard *et al.* 2001).

For this paper *Ischnosiphon polyphyllus*, a species of arumã which grows in flooded areas, was studied. This herbaceous, medium-sized plant, which can reach a stem height of seven meters (Nakazono 2000), is found in the Negro river basin from the upper Orinoco river, along the length of the Amazon river to the mouth in the Atlantic Ocean (Anderson, 1977).

In the Negro river basin this species occurs in “igapós”, or forests which are subjected to annual cycles of flooding (Junk *et al.* 1989) because of the overflow associated with black- and clear-water rivers (Prance 1980).

In the municipality of Novo Airão, which is located 150 kilometres from Manaus in the state of Amazonas, the areas in which this species are found cover the islands of the river archipelago which make up the Anavilhanas Ecological Station (AES), as well as the *igarapé*³-streams. The city of Novo Airão is located on the Right Bank of the Negro River and across from the middle portion of the AES. In these environments, the terrestrial and aquatic phases of the igapós are popularly characterised as the “dry” and “full”⁴ stages of the rivers, respectively.

The Artisans’ Association of Novo Airão (AANA) uses arumã to weave, various types of baskets, presses for manioc, strainers, and “tupé”⁵. The species *Ischnosiphon polyphyllus* is used in the fabrication of the mats, the craft most frequently produced by the artisans of the association.

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3. Regional name given to small tributaries of larger rivers.

4. “dry and full” relate to the Amazonian summer and winter. These stages vary according to each year’s climate conditions. Generally, however, the dry stage takes place between September and April, and the full season between May and August.

5. Tupé is a floor mat, that is rectangular or square and is made of strips of arumawoven to form different “tramas,” or designs.

These plant forms tufts composed of various stems in different stages of growth, with an average of 80% mature, or older and reproductive, stems per tuft (Nakazono 2000). Both mature and young stems are used for the production of mats, but the extraction of young stems represented only 4% of the total number of stems extracted in 18 collections carried out by AANA (Nakazono 2001), since these stems are used only to make the border of the mats.

Traditionally, the artisans collect arumã from the islands of the AES, where the extraction of natural resources is not permitted. This had generated conflicts with IBAMA, the Brazilian Institute of the Environment and Renewable Natural Resources, since access to natural resources is necessary for the subsistence of the local population, but their entrance into the Ecological Station is illegal.

Besides the EEA, Novo Airão is almost entirely surrounded by Conservation Units like the Jaú National Park, the Environmental Protection Areas of the Right Bank of the Negro River, and the Waimiri-Atroari Indigenous Reserve (Management Plan for the Anavilhanas Ecological Station, 1999).

With the objective of lessening these conflicts AANA, along with the Fundação Vitória Amazônica (FVA), searched for negotiation alternatives with IBAMA. The result of this negotiation was the elaboration of a preliminary plan for arumã management. Based on preliminary information about the ecology of *Ischnosiphon polyphyllus* and the traditional knowledge of the collectors and artisans who were most experienced with extraction, the sites where arumã occurs in the *igarapé*-streams around Novo Airão were mapped and initial criteria for the extraction of stems were determined. The objective of the arumã management is to make the extraction of the plant possible while guaranteeing the renovation and regeneration of the natural populations, thereby causing minimal environmental impact, and at the same time provide the necessary supply of the resource used in handicrafts, which is an important economic alternative for the families of artisans who reside in the municipal seat of Novo Airão.

MANAGEMENT OF ARUMÃ IN THE IGARAPÉS

Mapping of the areas where arumã occurs

In order to carry out the collections and implement the management system, the husbands of several artisans formed a group of AANA collectors. In November of 2000, the collectors chose the *igarapé*-streams in which to manage arumã. Some of these areas had previously been used for the extraction of this plant.

Currently the group is composed of two collectors who are responsible for the extraction of arumã for AANA. The process of capacitating of the associates is being implemented, and we believe that this is essential in expanding the range of people interested in the extraction activities in the field. The activities of the technical team of FVA, in regards to the collection of data on the densities of the plant in the extraction locations and the demarcation of areas of extraction and previously monitored zones, are always carried out in the presence of the current collectors.

The selected *igarapé*-streams, Dinheiro, Dinheirinho and Sucurijú 2, are located approximately 19 kilometres from Novo Airão. For the collectors the trip, made in a wooden canoe with 4 horse-power motor, takes between three and four hours from Novo Airão to the areas of the *igarapé*-stream where the arumã is found.

To carry out the mapping of the *igarapé*-streams around Novo Airão with the potential for arumã management, 21 spots were sampled with Global Positioning System (GPS) (Fig. 1). The study was done according to information provided by the collectors Carlito and Moisés about their knowledge of the presence of arumã in several *igarapé*-streams. This knowledge was based on *in situ* observation as well as on information from residents and friends of the collectors.

2. Locations of extraction in “arumanzals”

“Arumanzals”, are concentrations of arumã in *igarapé* – stream and occur in a zone delimited by the depth of the flooding that these streams are subjected to once a year. This zone varies from 1.5 to 4 meters in depth. The depth diminishes closer to the headwater of the *igarapé* – stream as the elevation of the land increases. The measure of depth in the location was obtained based on watermarks visible on some trees. This mark represents the highest level the water reached during the aquatic phase, that is, the maximum depth of flooding in that location.

Parcels were demarcated in the streams selected for the extraction of stems, with the size of the plots varying according to the characteristics of each *igarapé* – stream.

3. Density and composition of the tufts of arumã in managed areas

Estimates of density in the locations that would be managed were completed before the study by the collectors of AANA began. To realise the study, plots were sampled and the number of tufts and stems counted. In the same way it was possible to describe the behaviour of the distribution of the plant in relation to the distance of the channel from the *igarapé* – stream; a greater abundance of arumã closer to the channel was verified (Fig. 2 and 3).

The categories of stems utilised for extraction and for the study of density of arumã in were classified in the following manner:

A) For the extraction the definitions were:

Mature stem: stem with leafy branches at its extremity.

Young stem (“eye”): a young stem, almost mature, without leafy branches at its extremity, and with the red base of the stem located under the soil. This stem is more flexible, and as there is no need to cut it once it is easily pulled from the soil.

B) To carry out the density study, standardisation was done in the following manners:

Sprout: young stem without branching (formation of branches and leaves) at its extremity, with a height of up to one meter.

Young stem (“eye”): young stem with more than one meter in height without leafy branching at its extremity and with the red base of the stem located under the soil.

Thin Mature: a thin stem with branching at its extremity, with a stem height of more than one meter, and with a base height diameter (BHD) less than or equal to 1.5 cm.

Mature: Stem with branching at its extremity and with a BHD or more than 1.5 cm.

The thin mature stem is not harvested because it cannot be used in the production of handicrafts. This stem was classified in order to obtain information in the streams about the density of the stems that probably will not be extracted.

There remains one category of mature stem, or “burned” stem, which is a spotted stem that cannot be used in the production of handicrafts.

4) Criteria for the extraction of stems by tuft

There are three principal criteria for the extraction of the stems from the tuft, according to the collectors:

“Pull out one stem per tuft”.

“Pull out half of all the mature stems” (in the case of an odd number of stems, the collectors rounded up).

“Not even one stem can remain in the tuft, or the minimum is two”.

The collectors standardise the cutting of the stems at approximately 30-cm from the soil, at the same time marking and protecting the harvested tufts.

“When a cut scrapes the ground the point of the knife pierces the stump and bothers the other stems, and the same thing with the *maniva*, the potato is cut; it kills the *maniva*, if it’s cut everything dies. If you leave 30 cm of the arumã only this dries and the rest isn’t bothered” (Carlito).

The decision to cut 50% of the mature stems per tufts is due to the fact that this number is more easily assimilated by the collectors during practice in the field: half of all mature stems in the tuft.

According to data on impact obtained by Nakazono (2000), the results of the growth and production of the new stems after cutting are very similar between 30% and 50% harvest intensities, with both intensities differing 80% to 100% from the cut. Also according to this study, even with a negative impact on the tufts seen after one year of growth a 50% extraction rate was considered the best alternative to be studied along with the activity of the collectors, where a harvest cycle of three years was initially foreseen (10/2000).

5) Extraction period during the hydrological cycle of the rivers

The period of extractive activity was determined by the collectors in agreement with the residents of the community close to the *igarapé*-streams, in order to obtain authorisation for the collection of arumã from the association.

In this way, it was established that the extraction of the plant stems will occur only during the “dry” phase of the *igarapé*-streams. According to the residents and fishermen of the region, the arumanzals serve as shelter for shoals of fish (usually say “schools of

fish”) during the “full” phase of the igapós. And based on the experience of the collectors, “arumã which is cut below the water does not sprout again” (Carlito).

PRELIMINARY RESULTS OF THE EXTRACTIVE ACTIVITY ACCORDING TO THE ARUMÃ MANAGEMENT

Since February of 2002, the management initiated by AANA has been implemented in two *igarapé*-streams, Dinheiro and Dinheirinho. In the first, the collectors have already explored all the areas demarcated for management; the areas on the left bank of the stream remain to be explored.

Of the total area of the arumanzal demarcated for arumã management in each *igarapé*-stream, 5% were designated as control areas without stem extraction.

The estimates of the arumã stock (tufts and stems) were calculated for each stream before the AANA collections began. No distinction was made between the density of thin mature and mature stems, as only the mature stems are of interest for handicrafts. Based on these density estimates, it was possible to estimate the percentage of stems extracted from the Dinheiro and Dinheirinho *igarapé*-streams from the beginning of the collection activity in these areas. No collections have taken place yet in the Sucurijú 2 *igarapé*-stream (Tab. 1).

The areas harvested during the “dry” period in 2000 were monitored, one year after extraction. This data was being prepared for analysis.

Table 1. Estimates of the density of mature stems (M) and thin mature stems (TM) in the areas marked for the extraction of arumã in the Dinheiro, Dinheirinho, and Sucurijú 2 *igarapé*-streams, and the total number of mature stems collected, from October of 2000 until February of 2002, by the Artisans’ Association of Novo Airão (AANA).

Streams	Extraction Area (hectares)	Stem Density M	Stem TM	Density M	Stems Collected
Dinheiro	11.3	302,614	160,680	27,065	
Dinheirinh	13.7	199,969	129,740	7,000	
o Sucurijú 2	6.7	41,710	42,924	-----	

Based on the determination of a harvest of 50% of the mature stems per tuft, we estimate a density of 151,307 and 99,984 mature stems available for extraction in the Dinheiro and Dinheirinho *igarapé*-streams, respectively.

The quantity of mature stems extracted in the Dinheiro and Dinheirinho *igarapé*-streams represent only 18% and 13.5%, respectively, of the density of mature stems available for extraction in the locations used for collections in these *igarapé*-streams.

In relation to the logistics of the arumã collections in the *igarapé*-streams, during the “dry” period the trips to these locations become fairly difficult due to the impossibility of navigating the deep part of the *igarapé*-streams due to a lack of water. The artisans will have to organise themselves ahead of time if they don’t want to find themselves without raw materials for production during the period of extreme dry.

DISCUSSION

The management system for arumã, which has been implemented since October of 2000 is a pilot initiative and stimulator of activities, which utilise non-timber forest products, based on extractive practices with “good management” principles⁶.

The character of the herbaceous and clonal plant of arumã is a factor which permits the extractive activity based on management, which can be controlled and adapted throughout the ongoing research process.

The positive influence of the nature dynamic of forest clearings and clearings produced by manioc cultivation on the growth and abundance of these plants (Hoffman 2001; McCann 1993; Nakazono 2000; Shepard *et al.* 2001), confirms the observed evidence of a greater abundance on the shores of *igarapé*-streams, where there is a greater availability of light coming from the opening of the canopy caused by the channel of the stream (see figures 2 and 3). Of the three streams studied Dinherio, Dinheirinho, and Sucurijú 2, an average percentage of tufts and mature stems on the banks (4m²) of 36% and 55% has been verified, respectively.

In relation to the flooding, the strip where floods reach a depth of 1 to 4 meters and where “aramunzals” occur in the *igarapé*-streams matches the distribution of arumã on the flooding gradient in the Ecological Station of Anavilhanas (AES), where the plant is found at between 2 and 4 meters of depth. According to Nakazono (2000), the tufts that occur in this gradient do not show significant differences among themselves in the growth of stems, though it is within this flooding gradient that the greatest abundance and frequency of the species occurs, and as such, the greatest adaptability of the plant in this flooding gradient.

Besides this, the presence of ponds can be found along the length of the “igapós”, occurring on average 30 to 40 m from the shore, depending on the size of the *igarapé*-stream.

These ponds create very humid conditions that are favourable to the establishment of some plants, such as arumã. The maintenance of these locations is associated with the rainfall regime that can, with only one day of rain, maintain the humidity of the ponds for approximately three days.

In the islands of the AES this phenomenon doesn't occur, since the igapós are only flooded during a specific period, from April to September, when the rivers are full. In the *igarapé*-streams, besides the aquatic phase of the igapós, the humidity of the land is more consistent, favouring the growth and maintenance of populations of arumã in these environments.

The preliminary results presented in this paper show that the practice of extraction of arumã by AANA is a low-impact activity, since the percentage of the plant remaining in the environment after the extraction is high. Some factors that explain this low percentage of extraction can be highlighted:

6. “Good management” is defined here as the promotion of forest management in an environmentally- adequate, socially-beneficial, and economically-viable manner (Forest Stewardship Council).

The first monitoring, carried out in January of 2002, verified the low exploitation of stems on the shores of the *igarapé*-streams. This might be due to the fact that these areas are usually flooded, making the extraction of stems in these areas (which are flooded depending on the rains) difficult. This observation implies that the areas where the greatest densities of arumã are concentrated are under-utilised for extraction, explaining in part the low percentage of exploitation.⁷

Besides the category of thin mature stems, there is also the mature “burned” type which is not collected. The “burn” is spots of a dark colour along the length of the stem, caused by the presence of “cauxi”⁸ which burns the stem. Cauxi can also cause the installation area to rot and ruin the raw material for the handicrafts. The abundance of these stems varies between *igarapé*-streams, and it is not known for certain what is the primary factor, which favours the occurrence of these stems. One of these causes may be the amount of time the cauxi is attached to the stem, so there could be a relation with age; more mature stems might be the most burned. The amount of sunlight might also influence this factor: “The sun burns the stem when it falls on top of the cauxi” (Carlito and Moisés). This is easy to observe because of the lack of young burned stems.

There were areas in the zones marked for management which were not used, since the concentration of the plant in these areas was low. In the two first *igarapé*-streams where work was carried out, Dinheiro and Dinheirinho, the activity is much more recent compared with the prior practices of the collectors, which traditionally occurred primarily in the islands of the AES. The extraction of stems was done in lower quantities, usually by families. A higher percentage of stems were extracted because there was no concern about the benefits of using the delimited areas for management. With this practice, the collectors now have to take advantage of the entire “arumanzal” area.

In relation to the conservation of the species in the environment fact that stems which are not of interest to the artisans remain in the tufts, as well as, and the low percentage of extraction of the mature stems, is a guarantee of the preservation of arumã in the natural environment. The selective cutting of the stems might be favouring the regeneration of new stems in favourable environmental conditions, such as locations with ponds and a greater incidence of light. Based on the analysis of data obtained from the monitoring of the plants used in the management throughout the length of the development of the research associated with the extractive activity, and the empirical knowledge of the collectors with the new system being implemented we can obtain more accurate conclusions, for the perfection of the management system and verify the validity of the expected three-year cycle of cutting.

However, keeping in mind the number of *igarapé*-streams currently used by the collectors and the implication of the low number of stems used, it is important that

7. In the Dinheiro, Dinheirinho and Sucurijú 2 streams the following were observed:

- The area of 2 m from the channel of the stream represents the average percentage of tufts and mature stems equal to 36% and 55%, respectively.
- The area from 2 m to 12 m of distance from the channel of the stream represents an average percentage of tufts and mature stem equal to 17% and 19%, respectively.

8. Spongy, composed of silicone spikes, which fix to the plants during periods of flooding.

search for other locations for extraction is intensified, since the necessity of a greater number of tufts will require a greater area.

A complimentary pilot experiment in planting arumã in a stream near Novo Airão was implemented to verify the viability of the expansion of this planting in the natural environments of the *igarapé*-streams.

FINAL CONSIDERATIONS

The adjustments necessary for strengthening the management of raw material production should be understood by all associates and incorporated in the relationship between the association and the people and communities interested in participating in this process. This understanding involves both the biological and physical aspects of extraction in each environment, as well as the organisation of production and commercialisation of handicrafts by the association. The integration of ecological, social, cultural and economic aspects will help promote the most adequate support to the sustainability of the artisanal activity.

The pilot experiment in arumã management by AANA is very important as it promote an economic alternative using handicraft based on vegetal fibers directly to local families. The group should be empowered through a higher level of awareness, based on their activity of arumã extraction, and will be more able to claim their land use rights on the territories they normally work on. They will also be more able to support changes in the environmental laws to their adequacy to the local reality.

This non-timber forest product activity can serve as a model of good management practice to other communities, in the region and in other tropical forest regions.

The entire requirement must be better understood and incorporated into the product prices to enhance their value, and enhance the value of handicraft as a traditional activity that can help nature and cultural conservancy.

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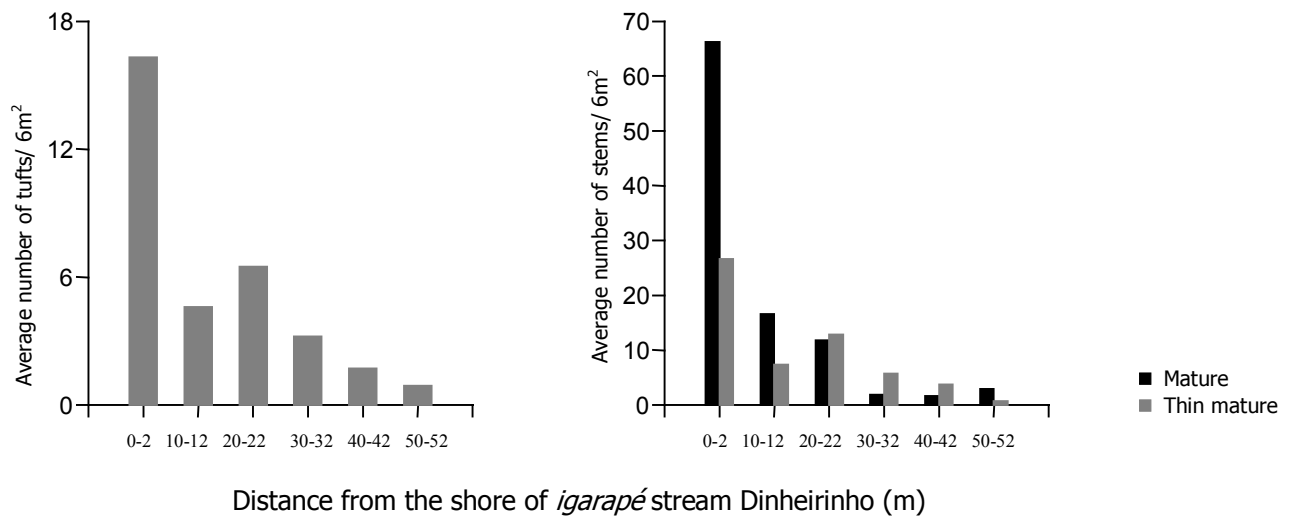
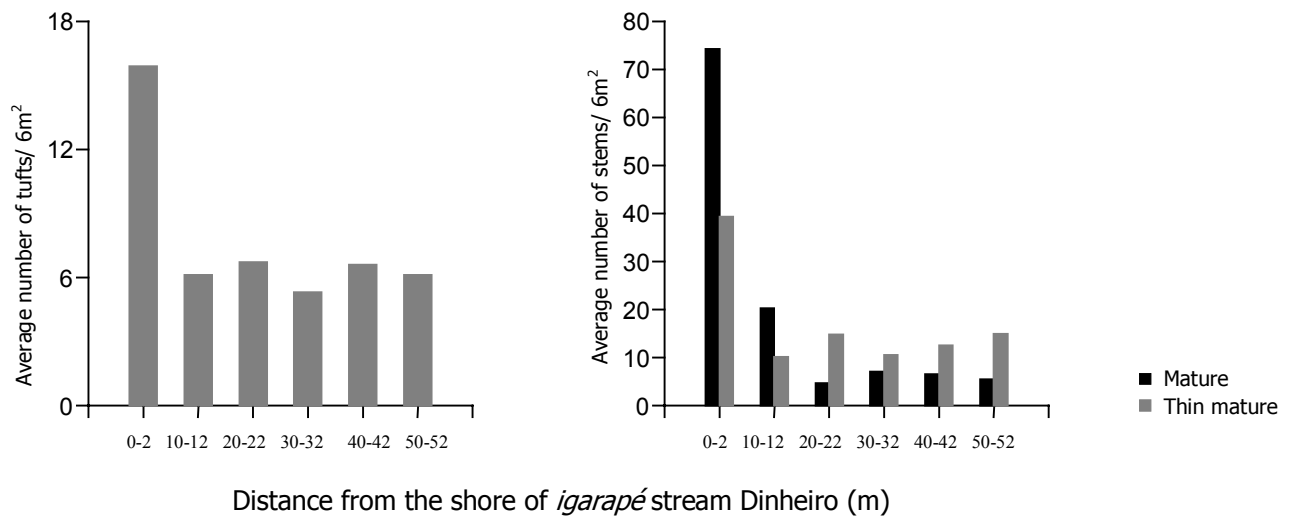
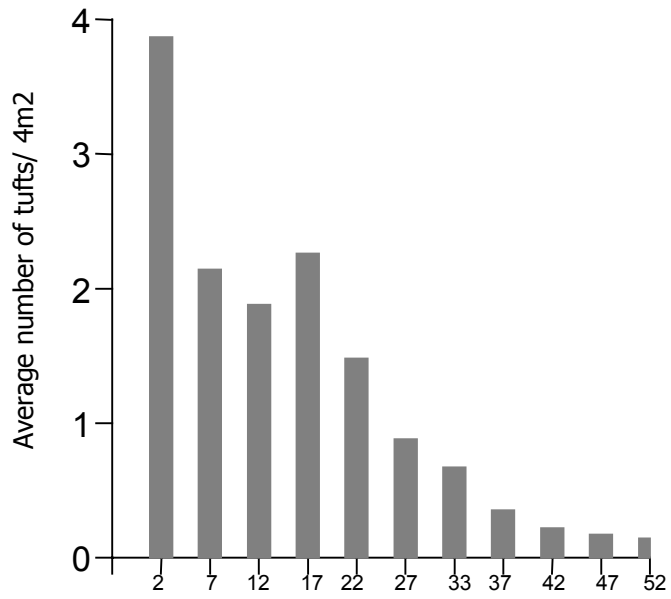
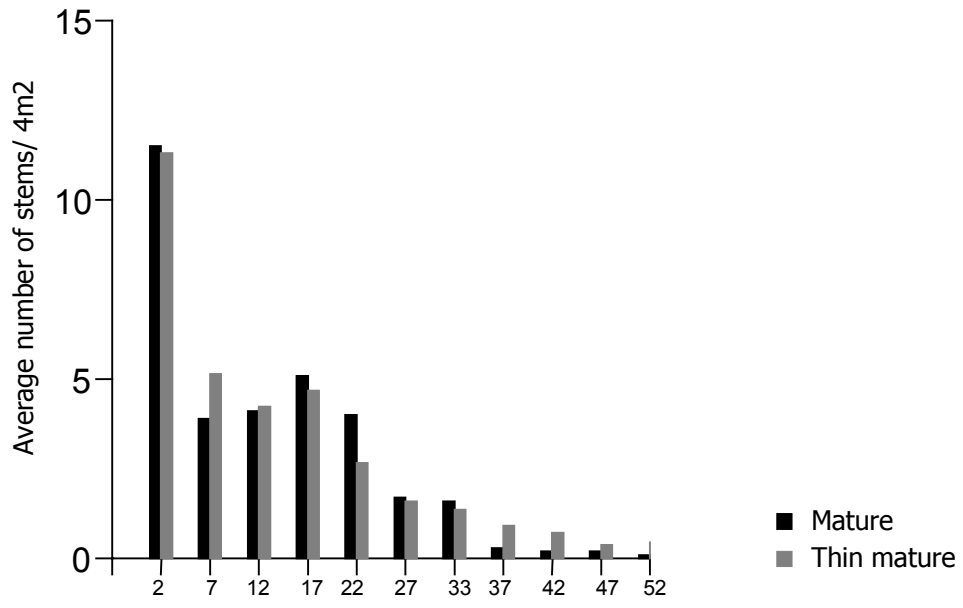


Figure 2. Average number of tufts, mature and thin mature stems in 6 areas of 6m² distributed throughout the “igapó”, according to the distance from the shore of stream to solid ground. These areas were sampled in 20 plots (3 x 52 m) distributed in the Dinheiro stream and 17 in the Dinheirinho stream.



Distance from the shore of *igarapé* stream Sucurijú 2 (m)

Figure 3. Average number of tufts, mature and thin mature stems in 11 areas of 4m² distributed throughout the “igapó”, according to the distance from the shore of stream to solid ground. These areas were sampled in 30 plots (2 x 52 m) distributed in Sucurijú 2 stream.

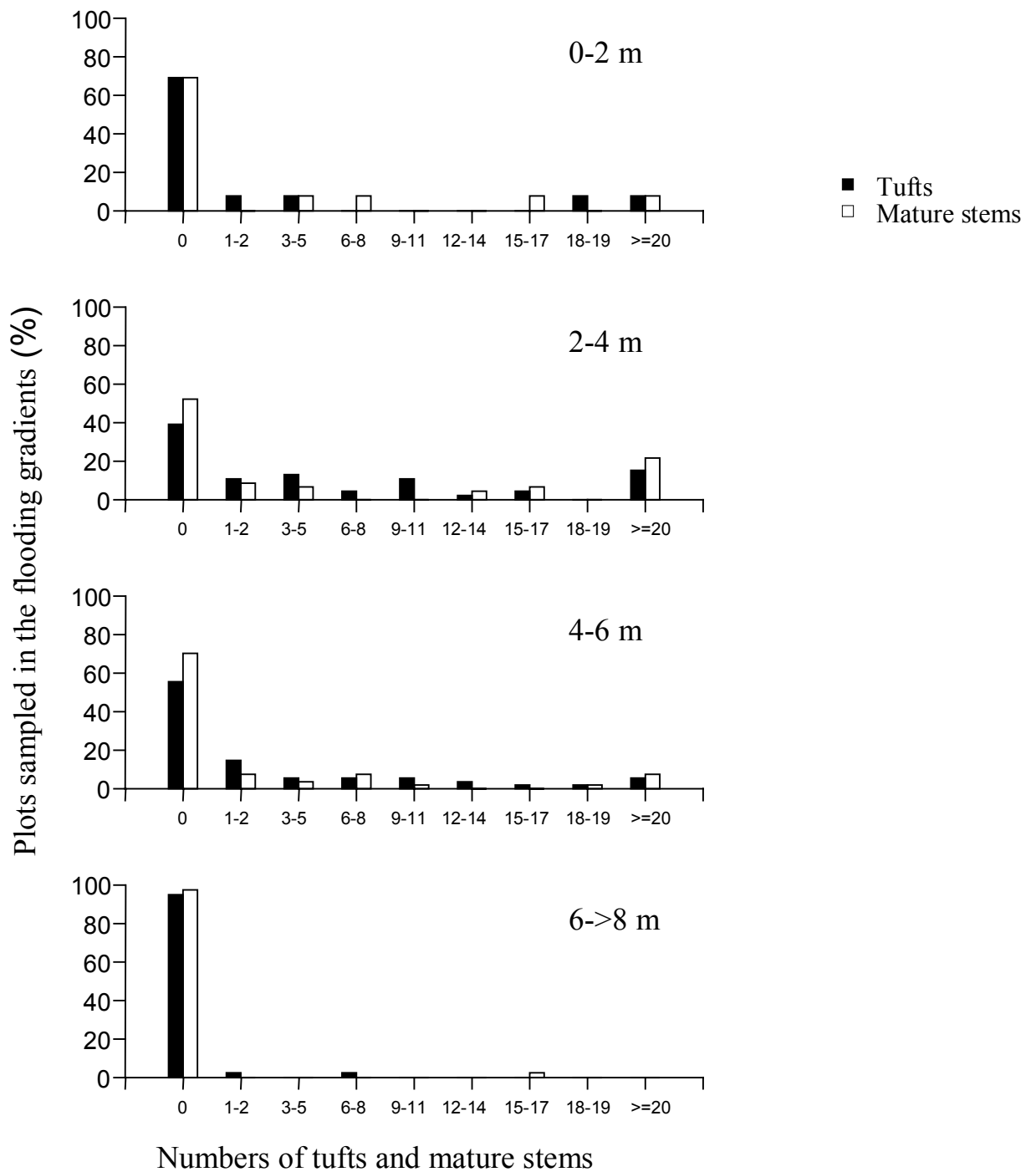


Figure 4. Frequency of the plots sampled in the gradients (G) of flooding depth in the “igapós” of the Anavilhanas islands (G1=0-2m; G2=2-4m; G3=4-6m; G4=6-8m or >8m), in relation to the classes of the number of tufts and mature stems.

