MEDICINAL PLANTS AND SHAMANISM IN THE AMAZON VARZEA

by

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Abstract

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A study on medicinal plants and shamanism has been carried out in the Peruvian Amazon floodplain (varzea) in the vicinity of Iquitos. Shamans in the village of Tapirillo about seventy kilometers from Iquitos city have been interviewed. In the same area a distribution inventory of the plants available has been done to verify what are the plants that varzea shamans use in their healing practice. The research indicates that varzea shamans use about 36% of the plants of varzea territory where they live while the other 64% of the plants comes from areas other than varzea. In conjunction similar study has been

carried out with Iquitos shamans to verify if differences occur between the practices of city and varzea shamans. The findings indicate that shamans in both areas have the capability to satisfy the healing needs of the community even if different plants are used. Distribution inventory has been carried out not only in the floodplain (varzea) but also in upper dry land (terrafirme).

The study has been conducted also to verify the possible use of plants in substitution of *Psychotria viridis* highly responsible for hallucination in the preparation of the ayahuasca drink.

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CHAPTER 1

Introduction

Area and the people

The area of this study is the Peruvian Amazon in the surroundings of Iquitos, a major city with a population of over 300,000 people (Luna, 1991). Over time people have migrated to this area, an area very active during the rubber boom, in search of job opportunities either in the lumber industry, in the petroleum industry or in other industries based on natural resources. This vast multitude of people has generated an interesting social structure where influences of many cultures are combined and mixed together. The richness of plants from the surrounding forests and the belief in local healing practices, quite different from the conventional western tradition, has resulted in the people of Iquitos being associated with *ayahuasca* and shamanism.

People who live along the river (*riberenos* or *caboclos)* have always had opportunities to mix with incoming groups. Riberinos (Luna, 1991) include the descendants of detribalized Amazonian Indians, the offspring of Amazonian-European and Amazonian-African unions, and the descendants of early immigrants from different areas of the Amazon basin including Brazil, Peru' and other Andean countries. Western missionaries either did not understand the cultures of the region or they preferred to disregard it.

Even when western religion was imposed these indigenous people were able to preserve their original beliefs over time. The original belief is practiced even now by the riverbank people who are called *mestizo* (mixture of Indian and white), small farmers, and poor people of urban centers, mixed with Spanish or Portuguese and occasionally with people from African descendants.

These people believe in a cosmology (Sullivan, 1988) that is the result of a combination of supernatural powers found in forest, underwater, and underground that intervene in the life of human beings sometimes causing illness.

This rich culture is not so abundant where opportunities for cultural exchanges are absent or nearby for native people who live in inland. This is the result of a lack of waterways for transportation that cannot facilitate communications, commercial activity and any other activity that may enhance cultural exchange. Even in this scenario shamanism is also a driving force in the daily life of the people in these communities.

The practice of shamanism and the use of a drink prepared from a plant extract that induces hallucination called "ayahuasca" are well spread in Iquitos. Many factors such as the interest generated in ayahuasca either by local people or by outsiders, and different environmental conditions for plants available in the low land areas (floodplains) along the Amazon River called "varzea" and for plants available in the dry inland called "terrafirme" have recently changed the scenario from that of the past.

Shamans are more organized and skillful in the healing practice because some shamans have their own garden where all the plants that are required for medicinal purpose are planted and eventually grow. Shamans who do not grow their plants, such as shamans living in the city, buy plants from places where they are available. Because some plants that are used in the preparation of ayahuasca, like *Psychotria viridis,* are not naturally available in the varzea area, they have recently been transplanted in an area close to the city to satisfy the demand of shamans that live in the area (Personal communication from Pinedo reporting field observation in Muyuy Island that is close to Iquitos).

Shamanism in floodplains or varzea is different from shamanism in inland or terrafirme because different environmental conditions have different impacts on plants' growth. The two major plants used in *ayahuasca* preparation, *Psychotria viridis* and *Banisteriopsis caapi,* (mostly responsible for hallucination) are missing in the varzea regions, and shamans in the area have been conditioned by this inconvenience.

Since the market demand for hallucinogenic plants is growing and because of an overwhelming activity of ayahuasca ceremonies varzea shamans find it convenient to have easy access to the plants that they need if they are grown close to them.

There are indications in the literature (Luna, 1984a & 1984b) that other plants may have been used by shamans - during their healing practice - in substitution for the original ones to induce hallucination. Therefore it would be of interest to study and compare shamanism in varzea to shamanism in terrafirme land. An attempt should be made to understand how the new market demand for hallucinogenic plants has an impact on the environment where these plants have been transplanted.

The drink Ayahuasca

There is evidence that for millennia people have used certain plants to induce altered states of consciousness. Narajio (Schultes, 1995) indicated that seeds found in deep strata date back (by radioactive carbon studies) to between 8440 and 8120. B.C. Quite often these psychoactive plants were used during rituals, ceremonies and healing practices. While there is information available concerning many psychoactive plants and derivative substances as having been used by people for a long time, it has been only for the last 50 years that a powerful drink called ayahuasca has gained considerable attention from researchers.

The definition of ayahuasca according to "Vocabulario Regional del Oriente Peruano" (Castonguay, 1990) is "soga de muerto" which means "rope of dead" and comes from "quechua" language to indicate a particular vine from which a hallucinogenic drink is made. This drink is capable of inducing vision and also acts as a laxative and as an anesthetic substance. Recently the word ayahuasca has gained popularity in areas not related to academia, for example Ott (1994) says that *"ayahuasca tourism"* is quite well spread in the Amazon region. Ayahuasca tourism it is indeed a new trend for people willing to taste a new experience in the Amazon world. The scientific community identifies ayahuasca as a drink made from a mixture of several plants that induce altered states of consciousness.

In the Peruvian Amazon the word ayahuasca has been associated not only with the drink itself, but also with one (*Banisteriopsis capii,* Malpighiaceae) of two main plants used to prepare the drink. Rivier & Lindgreen indicate (1971) that this practice is typical of mestizos (mixed American Indian and Spanish or Portuguese). These two plants have been often associated together in the local folklore, as it is also indicated in the book by Luna 'Ayahuasca Visions' (1991) that has pictures of many paintings related to visions generated after ayahuasca drinking. In this book the painting Vision #3 *'ayahuasca and chacruna'* represents two snakes, one black with yellow, orange and blue spots, that comes out from ayahuasca vine, surrounded by a yellow aura; another snake, the chacruna, releases from its mouth violet colored radiation surrounded by blue rays and penetrates the first snake. This symbiosis indicates that the two plants must be fused together to produce the hallucinatory effect. Ayahuasca is referred to *Banisteriopsis capii,* Malpighiaceae and cachruna is referred to *Psychotria viridis,* Rubiaceae.

This particular drink was unknown to Europeans until just over a century and half ago. The first report of Ayahuasca is presented by Villavicencio (1858) in his book concerning the geography of Ecuador in 1858. The drug is reported to be from a vine used by Zaparos, Angateros, Mazanes and other natives of the Rio Napo Basin, for purposes related to their social life: for example "to foresee and to answer accurately in difficult cases" or "to ascertain, when a relative is sick, what sorcerer has put a curse"...

A few years earlier, in 1851, Richard Spruce, a British explorer, discovered that the Tukanoan tribe of the Rio Uaupes in Amazonian Brazil used to take a liana called *caapi* to become intoxicated. Spruce identified the liana (vine) as coming from a newly identified species of the Malpighiaceae called *Banisteria caapi.* Later on due to a more accurate botanical study the plant was transferred to the genus *Banisteriopsis.* Spruce provided information about the ceremony that he attended but did not fulfill completely the experience of intoxication because he "…scarcely dispatched one cup of the nauseous beverage, which is but half the dose"…. Spruce (1873) collected voucher specimens that were sent to Kew Gardens in England (Ott, 1994). Later in 1853 Spruce found that the Guahibo Indians of the upper Orinoco of Columbia and Venezuela "…not only drink an infusion, like those of the Uaupes (native tribe located in the area of his exploration), but also chew the dried stem"… In 1857 in the Andes of Ecuador, Spruce discovered that the Zaparo Indians used a narcotic called ayahuasca and thought that as the "…identical species of the Uapes, but under a different name"…

After Spruce other researchers (Hombolt, 1816-1831), like Von Martius, Orton, Crevaux and Koch-Grunberg, referred to this drink as *ayahuasca, caapi, yaje* and with other names used in a very large area of the Amazon comprised by Peru, Bolivia, Columbia, Ecuador and Brazil. Additional information came from White's work (1922) in Bolivia in and a publication by Morton (1931) of notes made by botanist Guillermo Klug researching in the Putumayo area in Columbia.

Misunderstanding due to incorrect identification of the plant (Schultes, 1970) occasionally generated confusion such as the article published by a missionary among the Jivaros in 1890 when plant material from *Datura* was assigned to *Banisteriopsis,* or when *Banisteriopsis* was identified as a species of *Aristolochia.* Since ayahuasca was first discovered it has generated interest particularly for its magic flavor not only by botanists but also by chemists, anthropologists, ecologists, pharmacologists and physicians. The literature on this topic is abundant and more than four hundred sources are listed in the bibliography of Ott's book (1994) on ayahuasca.

Phytochemical study

Phytochemical studies to identify the compounds responsible for hallucinations is first conducted in 1905 by Rafael Zerda Bayon (Carvajal & Acuna, 1941), a Colombian pharmacist who isolated from a *yaje'* potion a substance that was called telepathine. Fisher Cardenas (1923) isolated the same material from a similar *yaje'* potion but he thought that it was from *Aristolochia.* As indicated by Carvajal & Acuna (1941) in 1927 Raymond-Hamet isolates from *Banisteria caapi* the equivalent of telephatine, which was called *yajeine,* and in 1928 Louis Lewin isolated *banisterin* from *yaje'* material; other researchers provided new insight and among them Elger, Keller & Gottauf, and Wolfes & Rumpf isolated harmine. Chen & Chen confirmed the presence of harmine in 1939, and Hochstein & Paradies do the same in 1957.

From 1960 the knowledge of botany and chemistry of plant hallucinogens greatly improved (McKenna, Luna & Towers, 1984), not only due to the efforts of researchers, but also by the advanced technology that provided more sensitive equipment to perform material examination. In 1965 (Ott, 1994) Poison (Carvajal & Acuna, 1941) isolated N, N-dimethyltryptamine (DMT) from leaves of *Banisteriopsis rusbyana* and in 1968 a phytochemical analysis was carried out on the material collected by Spruce about a century before which confirmed the presence of harmine. In 1970 Schultes stated that "...to my knowledge, leaves of *Psychotria* and *Banisteriopsis rusbyana* are never used alone"...which indicated that the addition of other material shows that ayhauasca is not only taken to induce hallucination, but that the function is more complex due to its composition.

Rivier and Lindgren (1971) carried out extensive ethnobotanical and chemical investigations. The authors indicated that several other plants may be mixed with the Ayahuasca during its preparation and may change the hallucinogenic properties of the drink.

The concluding remarks were the following:

a) The drink is prepared basically from *Banisteriopsis caapi* (Malpighiaceae) and *Psychotria viridis* (Rubiaceae).

b) Occasionally other additives are added to the decoction, which could contain chemicals that might alter the hallucinogenic effect of the drink.

c) *Banisteriopsis caapi* contains mainly harmine, harmaline, tetrahydroharmine and harmol and 6-methoxytryptamine.

d) Psychotria viridis and Psychotria carthaginensis contain dimethyltriptamine (DMT) with traces of monomethyltryptamine and 2-methyl-1,2,3,4-tetrahydro-beta-carboline.

e) Quantitative and qualitative analysis done for the first time shows that DMT, harmine, harmaline, and tetrahydroharmine are found in ayahuasca drink and the relative concentration of each compound is different in *Psychotria v.* and *Banisteriopsis c.*

Rivier and Lindgren indicated that an Indian, after drinking a portion of Ayahuasca of 200 ml, has taken an average of 30 mg of harmine, 10 mg of tetrahydroharmine and 25 mg of dimethyltryptamine.

In 1978 Schultes and Hoffman in recapitulating ayahuasca history indicated that harmine and harmaline probably inhibit monoamine oxidase (MAO). It is known that this enzyme decomposes biogenic amines that generate accumulation of epinephrine and norepinephrine in the organism.

Pharmacognosy

The pharmacognosy of ayahuasca can be summarized as follows:

a. harmine, harmaline and harman betacarboline are strong inhibitors of enzyme monoamine oxidase (MAO) (Udenfriend,1958).

b. MAO can oxidize or decompose compounds that like (tryptamine) can reach and make the brain impaired.

c. MAO breaks down DMT in the digestive system before reaching the brain.

d. The pharmacological mechanism of ayahuasca activity can be identified as betacarbolines inhibiting MAO and allowing therefore DMT to be absorbed and transferred to the brain.

Plants used in *ayahuasca* preparation

Because of many parameters the study of ayahuasca is quite complex. It is helpful to regroup data and summarize ideas. In 1986 McKenna and others list approximately one hundred species of about 40 families. In 1994 Ott suggested that the ayhauasca plants should be broken down into three different groups: non psychoactive plants and presumably containing therapeutic additives, "stimulant" plants and "visionary" plants.

Non psychoactive plants apparently enhance the efficiency of the drink. Prance & Kullunki (14) indicated in 1984 that four of the five most effective anti-rheumatic plant medicines in Amazon are known as ayahuasca additives. McKenna et al (1986) indicate that: " the contribution of most of the admixtures to the pharmacological activity of ayhauasca is at this time a mystery". Ott instead reported in a personal communication with Miller (1994) that amazonian shamans in self-experiment are known to bioassay unfamiliar plants by adding them to ayahuasca.

Shamans (personal communication with shaman Don Francisco) like to try new plants as well as methodology when they prepare this drink. Many factors are considered such as the availability of different plants in different seasons, different procedures in the preparation such as cooking time and as well as the administration to different patients with different needs.

Stimulant plants have soporific or sedative effects. In 1990 Schultes and Raffault reported that additives were used to give strength to deal with ayahuasca.

Visionary plants have hallucinatory capability and they are divided in 4 groups and are capable of enhancing the visionary activity of the drink:

1 *Nicotiana sp.* (Solanaceae) contains nicotine that is a "plant teacher" according to Schultes and Raffault (1992).

2. *Brugmansia sp.* (Solanaceae) contains tropane alkaloids. According to El-Iman & Evans (1990), nothing is known about the interaction of these alkaloids, especially scopolamine or hyoscine and hyoscayamine with ayahuasca betacarbolines.

3. *Brunfelsia sp.* (Solanaceae) contains scopoletin, (vernacular name *chiric-sanango)*. The chemistry is obscure and only coumarin and scopoletine were identified.

4. *Psychotria sp.* (Rubiaceae), vernacular name chacruna, Peru', and *Banisteriopsis sp.* (Malpighiaceae) vernacular name ayhauasca, Peru', and all other plants containing tryptamine and tryptamine derivatives.

Luna stated (1984) that "...all psychoactive plants are considered potential teachers"... This is quite a controversial topic in the Iquitos area because the meaning of the words "vision", "hallucination", plant teaching is very blurred and some shamans disagree on the interpretation. Luna in fact, stated that the shamans in the Iquitos area he "...worked with do not agree whether all "plant teachers" produce visions...."

Luna also indicated that the bark of the following trees can be added to ayahuasca one at a time: *capirona (Calychophyllum spruceanum* Kook, Rubiaceae) is added to *ayahuasca* and *capirona negra (Capirona decorticans* Spruce, Rubiaceae*)*. These plants are considered to "teach medicine."

Natural Products Alert (Napralert) in 1997 reported that *Calychophyllum spruceanum* was used as haliucinogen when added to the ayahuasca (Banisteriopsis-psychotria) beverage and that *Capirona decorticans* (Rubiaceae) is used for hallucinogenic effect during shamanic training.

<u>Purpose of the study</u>

It has been reported by Luna (1984) that shamans in Iquitos area may have substituted *Psychotria v.* - that is very rich in alkaloids - with other plants. Luna indicated that shaman Don Aleandro reported to have used the shoots of *Tryplaris surinamensis,* Polygonaceae, (vernacular name *tangarana)* instead of chacruna *(Psychotria viridis)* as an additive to Ayahuasca with positive results. This is very interesting.because if the effects of ayahuasca are primarily due to DMT perhaps the shoots of tangarana contain a similar component.

Napralert indicated that *Calychophyllum s.* and *Capirona d.* have hallucinogenic activity. These two plants are selected by shamans called *paleros* (*palo*=pole) who use plant material from these trees in substitution of *Psychotria v.*. These shamans prepare a drink with hallucinogenic properties called "*brebaje palo*".

The use of vernacular names by local people limits the classification and identification of species of the Rubiaceae family. For example local people use the vernacular name capirona *(Peru')* and *Pau mulato (Brazil)* to identify several kinds of "capironas".

The difference between *Calychophyllum s.* and *Capirona d.* (Boom & Campos, 1991) is that *Calychophyllum s.* is mainly found in a varzea (floodplains) environment and *Capirona d.* (20) is mainly found in a terrafirme environment

Taxonomic studies indicate that there are two species of *Calychophyllum,* which are *Calychophyllum spruceanum* and *Calychophyllum megistocaulum* and one species of *Capirona.*

Local people identify *Calychophyllum s.* with Capirona del bajo and *Capirona d.*with Capirona de altura. Shamans identify with Capirona de altura three different species in relation to the location where they grow: riverbank or black water river (*barranco)*, backswamp (*bajal)* and swamp *(tahumpa)*.

Amazonian people identify plants in general by the color of the bark, the shape of the leaf, growth patterns and the effect of the drink from the plant material.

Most rural Amazonians, because of the multiple application and economic values of these plants, tend to protect, plant and manage these species. These plants have seeds that are wind or water dispersed, and are fast growing and able to compete with pioneer species. These plants are readily available and because they have a therapeutic effect are used probably by the shamans in the ayahusca mixture.

There is literature that offers abundant material on shamanism. Eliade (1974) provides the most informative guide on this topic. However, it is of interest to investigate and to understand how shamanism is practiced in the modern age. It is quite possible that the changes in the shamanism practices occur because of the changes in the social and cultural structure of the area and also because of environmental conditions. This investigation attempts to determine how shamanism is practiced in varzea by the local healers. Because the varzea region is subject to changes in the path of the Amazon River attention was focused also on the adaptation that shamans are forced to make with respect to the geography of the region. The study on the practice of varzea shamanism was compared to shamanism in terrafirme and in the city where it may be practiced under diffeent circumstances. Since the use of the ayahuasca drink in the Iquitos area is often related to shamanic practices part of the investigation will be directed toward establishing how the ayahuasca drink is considered in the *varzea* area.

Local plants and local shaman practices will be the objects of this research.

Research objectives

This study has two main objectives:

One: investigate varzea shamanism in the varzea area along the Amazon River in the vicinity of Iquitos from the following points of view:

1. How is shamanism practiced in varzea?
2. What are the plants and methodology used in varzea shamanism?
3. How is varzea shamanism changing and adapting to the environment?
4. What is the difference between city shamanism and varzea shamanism?

Two: investigate if shamans substitute other plants that have the same hallucinogenic effect for Psychotria v. in the preparation of the ayahuasca drink.

This investigation is aimed toward determining for the Iquitos region and surroundings the following:

a. distribution of plants of interest to shamans in varzea
b. distribution of plants of interest to shamans in terrafirme and city area
c. interview of shamans in the varzea area
d. interview of shamans in the terrafirme and city area

CHAPTER 2

Varzea: history of the land, water and people

Exploration of Amazonia

Sioli (1984) stated that no other country or landscape on earth has impressed foreign visitors, conquerors, priests, settlers and scientists like the Amazon region since its discovery because of its scenery, the extent and luxuriance of its forest, the richness of its fauna and the size and amount of its water.

The Spanish and Portuguese "*Conquistadors*", priests and other emissaries were totally bound to the natural Amazonian waterways they followed on their expeditions. Since the first expeditions, the first one by Don Francisco de Oreliana (February 1541) reported by Frey Gaspar de Carvajal (Cited from: Carvajal, Rojas & Acuna, 1941) and the second one by Pedro Teixera (1637-38) reported by Alfonso de Rojas and by P. Cristobal de Acuna, S. J. (Carvajal, Rojas & Acuna, 1941), the Amazon River (Rio de la Amazonas) was not only a subject of observation and study, but also the only possible way to pursue the exploratory journey.

Acuna provided information about the origin, length and width of the river, but also about the land use of the Amazonian varzea by the natives.

Additional expeditions followed, such as the one by Pedro Teixeira, and the pilot of Teixeira's fleet, Capitao Bento da Costa, (4) who designed the first map of Amazonia (Adonias, 1963). P. Samuel Fritz, S. J. between 1689 and 1691 provided more maps (Gickhlorn, 1943), while Alexandre Rodrigues Ferreira between 1783 & 1792 (Ferreira, 1971) provided anthropogeography documentation of the area. (In 1971 The Brazilian Federal Council of Culture published a reprint). Alexander von Humboldt (1816-1831) started an exploration of the Amazon with a new approach and described what he saw with the objective of finding "the laws which wind the uniting bond round a multitude of isolated facts". Other works to be mentioned related to expeditions in the Amazonia were by Von Spix and Von Martius 1823-1831 (6. Spix & Martius), by Bates (9. Bates, 1982) who spent eleven years (1848-59), by Wallace (10 Wallace, 1889) and by Spruce (11 Spruce, 1908). Geological investigations started with C. F. Hartt, followed by Orville a Derby (12) Katzer) and F. Katzer.

Paul le Cointe (15) published detailed writing on the geography, botany, phytochemistry and zoology of Lower Amazonia (1922, 1939, 1945, 1947). The studies focused not only on the main bed of the river, but also on sidearms (paranas), shore-lagoons (lagos de varzea) and the edges of the non-floodable higher terrafirme and the alluvial floodplain of varzea.

Other studies were of relevance: the series of studies presented in the "Boletin do Museu Paraense Emilio Goeldi" (16. -1894-1956) and also additional works, such as maps and (Projecto Radam-Radambrasil, 1972-1977).

A turning point in understanding the relationship between the different elements that must be taken into account to explain the complexity of all the living organisms of the Amazon River was made in 1912 by the Swiss anatomist Hans Bluntschli during his stay in the interior of the Peruvian Amazon.

After World War II the Instituto Agronomico do Norte (at present: Centro de pesquisa Agronomicas dos Tropicos Umidos) at Belem-Para became the leading Institute for research in Brazilian Amazon. Today, the Institute National de Pesquisas da Amazonia at Manaus-Amazonas, Brazil has taken over the heritage of a long tradition of research in the Amazonia region. Meggers (1984) using carbon 14-dates on ceramics found along the Amazon and tributaries indicates that the material is of the post Christian era. Changes are not noticeable because most of the areas are still unexplored, or occur rapidly because site along varzea are affected by erosion or deposition of silt.

From the beginning of the Christian era the fossil record provided more information and it is possible to notice the difference between the varzea and the terrafirme. Large settlements, different social groups, division of labor and authority exercised by the chief are the main characteristics of varzea. Small villages with agriculturalists expert in pottery making and headed by chiefs without power of coercion characterized terrafirme.

It is difficult to assess the number of people in the region before European invasion. According to Meggers three factors cannot be ignored: 1) the impact of extermination by invaders, 2) the number of population indicated by the first settlers 3) the natural resources available and the productivity associated to it.

The information available at the present time (Deneven, 1976) is that the average per square kilometer is 0.2 persons in terrafirme and 14.6 persons in *varzea*. It appears clear that varzea, which represents only 2% of the area is the environment more desirable for people, where terrafirme, which is 98% of the Amazon region, is not so appealing. It appears then that the vast majority of the people prefer to live in the varzea area where, after adaptation to water level fluctuation, they can benefit from the abundance of natural resources.

Despite its different and interesting characteristics, varzea has never been subject to extensive study. In December 1994 in Macapa, Amapa, Brazil a Symposium (Varzea, 1999) was held "...to bring together researchers and policy experts from different groups in order to share ideas and information on the sustainable development and conservation of the resources of Amazon floodplain lands and waters".

<u>The Amazon and varzea</u>

The Amazon region (1) with its 7,050,000 square km of land contributes to the greatest river system on earth, which is collected by the Amazon River and is discharged into the Atlantic Ocean with the annual average of 175,000 cubic meters per second. The river, 6518 km long, has near Iquitos (area of this research) a width of 2 km and it is about 100 mt above sea level at low-water season. The current of the lower Amazon River is strong, approximately 0.5-1.0 m per second at low water and twice that during flooding. Because of the strong current, the Amazon River moves a considerable bottom load of mostly fine to coarse sand and also suspended inorganic and organic matter, mostly fine silt and clay particles that turns the water turbid and yellowish. This material is of great significance for life in the river and for the formation of its landscape.

For several months the annual floods inundate the vast flood plain of the middle and lower Amazonia, which covers 50,000 to 60,000 square km. It is covered by a specific forest type and also in some areas by floodable grasslands as well. The deepest parts of the varzea are occupied by shore-lagoons ("lagos de varzea"), shallow, but big, which expand and shrink with the water. The alternation of dry season to rainy season makes the *varzea* an "amphibious " landscape, with very peculiar conditions for plant, animal and human life.

The Amazonian lowlands are not uniform: Sioli (1986) divides them in three types: the upper, the middle and the lowest one. The upper Amazon Basin, mostly plain land, from the foothills of the Andes east and northeast, to the confluence of the Rio Negro, characterized by endless meanders and frequent oxbow lakes. The middle Amazon basin, a narrow west-east directed furrow between the borders of the Guyana shield in the north and the central Brazilian shield in the South, is characterized by lower courses of the tributaries transformed into well-developed "mouth bays" (Sioli). The lowest, easternmost section of the basin contains the funnel estuaries of the Amazon where the river is divided into several arms.

The Solimoes-Amazon in its middle basin grows into a huge river, which does not meander. The landscape is different from the one of the southwestern rivers. The latter meanders in a wide-stretching uniform land without major distinction between the area close to the river and the higher land behind the lower Amazon flow in a valley of 20-100 km width, which forms the edge of the terrafirme, the higher, never floodable land of tertiary deposits (barreiras).

Most of the bottom of a valley filled with an alluvium of relatively recent Andean origin now forms the vast floodlands of the Amazon, its varzea, which is made of different substratum from the one of the terra firme beyond. Where the water moves in a landward direction, it becomes 'decanted' and contains less fine particles.

The water that moves from the terrafirme to varzea does not carry much suspended matter and therefore the contribution of organic and inorganic materials is very limited. However the Amazon River constantly transforms and rebuilds its riverine landscapes, eroding some places and sedimenting in some others.

Ecology of Varzea

Amazonian rivers rich in suspended solids are called "whitewater" rivers (Sioli, 1984), The pH value is between 6-7 (Junk, 1984) and according to Furch et al. (1982) whitewaters are carbonate waters, with a high percentage of alkali-earth metals. Most whitewater rivers develop large floodplains called varzea. The combination of high concentrations of mineral nutrients and sediments is responsible for a high productivity of both aquatic and terrestrial phases, in comparison to the adjacent non-floodable land and the terrafirme. People have always exploited this peculiarity for crop production, farming and fisheries. According to Junk, despite the abundant limnological information on the varzea area, studies on the terrestrial phase are limited. Climate in the area for the most part is constantly hot and humid, while precipitation, despite different intensity in different regions shows abundant activity in the first part of year (rainy season) with a substantial reduction in the second part (dry season).

The origin of the recent floodplains in the Amazonian rivers, according Sioli is influenced by global change of sea level during the glacial periods. According to Fairbridge (1961) the sea level fluctuated as much as 130 meter several times before water was locked up in great glaciers. During these periods the rivers cut deep valleys into the soft sediments of Amazonia. During the interglacial periods, the sea level increased and rivers were stopped up, and the current velocity was reduced and sediments were deposited.

Whitewater rivers with high sediment load filled their valley quickly and varzea was formed. In the last 5000 years the increase of sea level was very moderate and the entire landscape became more stable. However additional adjustments in the landscape do occur over time. Sedimentation most likely took place in the lower reaches of the floodplain where permanent varzea lakes exist than in the upper reaches.

Clearwater and blackwater rivers have low sediments loads and their valleys are not filled with sediments. Their lower courses are very broad and deep and sometimes called *ria-lakes* or *lagos de terra firme* (Brazil). The two types of rivers are different from white water rivers with respect to sediments not only in quantity but also for quality. While clear water and black water rivers transport sandy and kaolinitic material, sediments of whitewater rivers additionally contain illite that releases potassium, an important mineral nutrient, and monomorillonite, that has a higher ion exchange capacity than the kaolinitic material. Both minerals are responsible for the high fertility of *varzea* when compared with the surrounding *terra firme* and the floodplains of blackwater and clearwater rivers.

Also sedimentation and erosion can be so intense, that islands appear or disappear in short time.

Varzea Morphology

The deposition of sediment varies. Some rivers meander through the sediments. Sometimes the waters of the Amazon River fork and make channels that surround islands of roughly lenticular shape. Meanders have a slow development, because of the hard lateritic material in the river, the adjacent non-floodable terrafirme and the high velocity of current. Therefore the deposition of sediment is uneven. Floodplain lakes can be formed (Hutchinson, 1967), as "U" turn (oxbow), in abandoned channels, on lateral embankment (levee) designed to prevent the flooding of a river, on depression caused by uneven aggradation. All these features are responsible for short or long term changes; short term changes are related to water-level fluctuations during the year while longterm changes are related to river activity that modifies the environment via erosion and sedimentation.

Flora on the varzea varies and is related to several factors like age of existence, current flow, texture and rate of sedimentation and periodicity of flooding. Several phases are indicated by Junk:

1. During the terrestrial phase (the dry season) the flora is made up of herbaceous plants. These will eventually be replaced during the rainy season by aquatic ones. Floating aquatic microphytes will also compete with phytoplankton for light and nutrients.

2. Later on, tough aquatic and semi-aquatic perennial grasses become established, requiring a dry period of several months and a reduction of current velocity. When water is high the higher parts of the point bars and lateral embankments give rise to trees.

3. Subsequently trees become established and grasses are eliminated

4. Finally a tall forest is established in the floodplain and the herbaceous plants are forever eliminated.

Prance (1979) classifies Amazonian forest subjected to inundation, into seven different types, depending on when and how often flooding occurs and on the quantity of nutrients and sediments in the water. These types are:

1. Seasonal varzea-forest flooded by white water rivers with regular year cycle
2. Seasonal "igapo'"-forest flooded by blackwater and clear water rivers with regular year cycle
3. Mangrove forest flooded by saltwater tides twice daily
4. Tidal varzea-forest flooded by freshwater backed up from tides twice daily
5. Permanent whitewater swamp forest
6. Floodplain-forest on low-lying ground, with irregular rainfall, usually located in the upper reaches of the rivers
7. Permanent "igapo'"- blackwater forest

Prance (1979) and also other researchers provide information on the trees found in the varzea forest and *Calychophyllum spruceanum* (Benth) Hook. f. The authors mention (Rubiaceae).

Varzea Chemistry

Varzea lakes have a mixed composition of water that originates from main rivers rich in mineral nutrients and with neutral pH and from tributaries from the non-floodable terra firme and rainfall poor in nutrients and with acid pH. Also the environment plays a major role, because of biotic and abiotic factors such as uptake and discharge of substances by living organisms, or sedimentation and decomposition of chemicals. Generally the entire water chemistry depends on the great water level fluctuation that controls all the factors of the system.

According to Hutchinson & Loffler (24) varzea lakes should be considered oligomictic (water poorly mixed) during high water and polymictic (water well mixed) during low water. Recycling of chemicals occurs mostly when the water is shallow and the action of the wind can facilitate movement and oxidation of the components.

Temperature gradients of 2 to 4 degrees Celsius may occur especially during the daytime in different stratification layers of water that becomes stable during high water. Temperature increase not only decreases the solubility of oxygen, but also increases the consumption of oxygen because of higher decomposition rates. In varzea lakes, during the high water, organic material and detritus from terrafirme vegetation is decomposed, and also less oxygen is produced by phytoplankton. Therefore the best condition for a high quantity of oxygen in the water exists when the water raises from the lowest level. The raising of the water level can generate current that removes stagnant water in some areas and affect the life of the ecosystem. The lack of oxygen makes plants react in different ways such as their developing aerenchymatic tissue with large intercellular air space, or pneumatophores - special respiratory organs - or reducing general metabolic activity.

Adaptations of plants to fluctuation in water level

The constant change between terrestrial and aquatic phases is a major challenge to the life of plants. It is therefore extremely important for plants to find ways to compensate this unbalanced situation in order to survive in difficult time.

When the water level increases, macrophytes have more surface area available, but the use of this limits penetration of light rays and so the euphotic zone becomes very limited and light cannot go beyond 4 meters from the surface. Plants must therefore find an adaptation suitable to the living conditions: for example they can be disconnected from the lake bottom and float on the water surface, or they can increase the length so the leaves are exposed at water surface, while the roots are planted steadily in the sediments.

Growth and reproduction occur very fast because plants must exploit the favorable conditions at the maximum capacity. During the dry season plants survive as seeds or spores or with the development of particular terrestrial forms otherwise terrestrial vegetation develops very fast and colonizes the land.

The same adaptation of macrophytes is also found for trees and bushes. Trees that live in the lower parts of the flooded area need two to three months for colonization, and they can also resist long term inundation (e.g. two or three years) without major loss. After four years of constant flooding trees can also die. Some trees lose their leaves while others are capable of keeping them under the water.

Dispersal of seeds occurs either during the flood period when water can transport them to other locations or because fish can eat seeds that will be dispersed in some other places as body waste. Due to the complexity of this living environment it appears that it is very difficult to separate aquatic species from terrestrial plants.

Varzea productivity

When the water level rises, the river flows on the floodplain and brings a lot of nutrients, both inorganic and organic, that affect the living organisms present there. Studies done on aquatic macrophytes indicate that, at times, the biomass of macrophytes can increase up to 3000% per month. It appears also that all the nutrients are taken from the bottom of the water or from inorganic particles located around the floating roots. This has been verified (Howard-Willams & Junk, 1976) particularly for nitrogen and phosphorus.

Varzea decomposition

During the dry season, when the water level drops, some plants move into the river and become part of its foodwebs. Although most of the plants dry on the beaches or the exposed bottom of lake, they will decompose and become a source of nutrients for the terrestrial vegetation. This process continues until a balance is established which is somehow controlled by the terrestrial phase with good aeration of soil and presence of organisms that can use the decomposed material.

Floodplains and the varzea in particular are areas of transition between lands so that all the living organisms that are depending on it experience constant changes that affect their ecological parameters.

With respect to nutrients the varzea can be considered as a combination of lake (which is a closed system) and river (which is an open system): nutrients are transported from the river to the floodplain and therefore enter the *varzea* foodweb. There is subsequently a return of the nutrients to the river as organic material such as aquatic plants, detritus or other decomposed organic material.

The transfer of nutrients made by macrophytes between the terrestrial and aquatic phase is very significant, because it can cause abundant accumulation when the balance is reached.

Due to this continuous alternation of the terrestrial and aquatic phases, Brown and Lugo (Meggers, 1984) indicated that varzea appeared to be similar to mangrove systems, even if the latter could develop into a steady system that would not return to the terrestrial phase. Also the lack of sedimentation, as it occurs for mangrove systems, can lead to a climax community. The sedimentation rate is higher near the main channel and lower in remote areas. In the latter, since transport of sediments is so modest, the soil surface level can be lowered by consolidation of sediments resulting from the weight of overlying deposits. When this occurs the system can reach equilibrium in a short time and remain constant for long time.

It is possible that a varzea can develop into a forest community but at the same time (although on a modest scale) a varzea can develop into a swamp community where the effect of the water level is reduced and constant water logging of the soil is granted. As a consequence, a change of the physical appearance of the area can occur and an accumulation of organic material can give rise to floating islands.

Utilization of Varzea

It is possible that the abundance of fertile alluvial soils and the high quantity of fish and other aquatic plants has made varzea a coveted area for people eager to settle down permanently. Varzea can be used at full capacity for agriculture and the raising of animals, but it is wise to remember that high productivity is dependent upon regular flooding. Any activity that limits water-level excursion has a substantial impact on the productivity of the system; therefore, inappropriate control measures of the flood activity can reduce the benefit from the varzea. Irrigation can be useful in a place and drainage unavoidable in another one. It is possible that agriculture and livestock can compete with fisheries, because fish use varzea to deposit eggs, to feed and to hide in certain conditions.

When varzea is compared to terrafirme with respect to productivity and resources it appears that varzea offers more to the native people living along the banks of the Amazon.

Agriculture on terrafirme has to face the same challenge that natural vegetation faces with soil condition and climate. Soil must be minimally exposed to sunrays or to run off and it is necessary to recapture the maximum quantity of nutrients. The remedy is practice shifting cultivation or slash-and-burn (small areas in forest are cleared by cutting trees and leaves and branches are burnt and these materials release nutrients that will be utilized by the new crops).

The varzea must also adjust to water level change as well as to climate conditions as terrafirme but there is no human intervention because the water naturally carries nutrients.

Adaptation to varzea and terrafirme

People in different areas use terrafirme as resources in different capacities and the number of plants that are considered for their need is various. Also, the slash and burn technique, even if vastly practiced, is done by people using criteria that take into consideration several parameters, such as the size of plots, selection of plots, method of clearing vegetation, length of exploitation and length of fallow.

Archeological and ethnohistorical studies indicate that native settlements along varzea are bigger and last longer than in terrafirme. The average time spent in a specific location by people living in terrafirme is five years. People move either when land suitable for establishing a garden is no longer fertile or because other social events occur such as death of community members.

In both systems, the major resources are wild and cultivated plants, game and fish and among them, varzea provides abundant wild rice, which grows in lakes and is used to make wine and bread. Research to compare the harvests of maize, bitter and sweet manioc and rice from terrafirme and varzea indicated that productivity in terra firme is reduced about 50%, while in varzea no change is detected (Irion, 1978).

The better return from cultivation in varzea is obtained only through careful monitoring of the water level, and therefore crops must be planted as soon as possible when water levels drops so that harvest can occur before the level of water increases again.

Utilization of amazonian terrafirme and varzea

Sioli (1984) indicated that the impact of modern civilization on the Amazon Region and consequences related to it can be understood only from knowledge of the previous use of it. It appears evident that the impact of humans in the past was quite modest in comparison to the big projects that are proposed and materializing at the present time. Man lived in the Amazon for millennia, and the major human impact was hunting and collecting which, in addition to natural or man made fires, may have caused modest changes in this huge area.

According to Irion (1978) a major misunderstanding that was accepted since the first description of the Amazon by Alexander von Homboldt was the consideration that the soil of this region was extremely fertile. Later on, Irion stated that it was discovered that the soil of terrafirme is one of the poorest on earth in antithesis with varzea that continuously replenishes its nutrient contents. Nutrients in terrafirme were extracted from the soil a long time ago during years of wet, warm climate. What is available now is coming from the living biomass of the forest and this is recycled through the generations of its organisms. Nevertheless, in addition to hunting and collecting, natives practiced agriculture. To have access to soil small areas of forest were cut down and burned. Nutrients were collected in the ashes and were available for the soil so crops could grow. Because of the chemical nature of soil rich in kaolinite, which has low absorption capacity, nutrients could not be retained in the soil. They were instead leached out by the continuous action of rain. Under these unfavorable circumstances the soil became spoiled and weeds and shrubs took over.

Even if moving to another place was feasible natives instead chose to change crop when nutrients for the previous crops were exhausted. As a result shifting cultivation follows slash-and-burn and new crops are planted. This technique is still practiced in areas with small populations. However, such practices do not appear to be increasing over time and where "modern development projects" are not likely to occur.

When natives abandon the location where crops cannot grow any more, nutrients are carried inward from the surrounding areas either by wind or by animals and their excrement so that the soil can recuperate and give rise to a secondary forest. Shifting cultivation is a viable solution that can ameliorate the natives' difficult time in obtaining resources from a depleted soil. On the contrary when modern development projects take place, when clearing of thousands of square kilometers occurs, most of the time the damage to forest can be without remedy.

Compared to terrafirme varzea has no problem in maintaining nutrient levels that are constantly provided by water flow. Therefore people concentrate and settle down close to the bank of the river.

It is possible that the arrival of Europeans may have had an impact on *varzea* richness of resources. However if this occurred no severe damage was caused.

Consequences of development projects in terrafirme

The projects of large deforestation in terrafirme and replacement with artificial savannah, e.g.: pastures, land, annual crops, e.g. sugarcane and plantations (mostly monocultures) are not obviously beneficial to the forest. The idea that one forest can be substituted for another seems to neglect the fact that a forest is a complex ecosystem where many organisms are related together and is not simply the sum of individual entities.

Sioli (1) composed a list of factors that should be considered prior to the execution of development projects in the Amazonian forest:

1. Circulation and reserves of nutrients.

When the deforested area increases in size the central part is more and more separated from the remaining forest and therefore the ashes from burning cannot be washed into the surrounding forest and replenishing is no longer available and the loss of nutrients is irreversible.

2. Surface erosion.

The dense canopy of the forest protects the soil from the strong impact of heavy rain. Leaves, especially large ones, intercept raindrops that can reach the soil with lower speed. Otherwise leaves convey the water via their branches to the trunk and so water reaches the soil very gently. Planted grasses (pastures) cannot protect the soil from the impact of the cattle and second by drying up during the dry season. The sod is open and the bare soil is heated and dried up by solar radiation. When the rainy season begins, water erodes the soil and washes it onto creeks and rivers.

3. Soil compactation and changes in surface run-off.

The pressure exercised by cattle on the planted grasses compresses the soil and prevents penetration of rainwater into it. If the area that has been cleared is large recovery is very difficult.

4. Climatic changes

When the forest clearing is extensive, the rate of vapor transpiration changes and this affects the entire water cycle. The warm air mass that evaporates will be moved in the direction of the wind and eventually will condense and be transformed into rainfall in a different area far from its origin.

5. Regime and sediment load of the rivers.

Rainwater change affects the regime of the rivers. Floods and low water levels will increase in amount. Surface erosion during a rainy season will increase the accumulation of sediment load in the rivers, which will affect the aquatic life and also river navigation.

6. Global effect.

It has been estimated that the carbon removed from the atmosphere and stored in the biomass of amazonian forest is approximately 20% of the carbon dioxide in the earth's atmosphere. When an artificial savannah substitutes a rain forest only 20% of the original amount of fixed carbon is retained in the new vegetation; therefore the other 80% that remains is transformed into carbon dioxide and enters the atmosphere causing an increase of about 16%. The ocean absorbs half the amount and the other half contributes to increase the greenhouse effect.

Sioli (1984) summarized all the effects of terrafirme developments as follows:

1. Interruption of the continuous closed circulation of nutrients through generations of organisms of the forest ecosystem.
2. Loss of the nutrients exclusively contained in the living biomass of the forest
3. Decreased regional recycling of rainwater

4. Reduced annual rainfall

5. Accentuated seasonal rainfall (longer, more severe dry seasons)

6. Dying-off of eventual forest reserves left for conservation

7. Increased soil-erosion

8. Increased surface run-off

9. Accelerated rise of river levels with the onset of the rainy season

10. Lower river levels during the dry seasons

11. Greater instability of the regime of the rivers

12. Increase of sediment load of the rivers

Consequences of development projects in varzea

'Projeto *Varzea*' has been discussed for a long time. The project favors the removal of the "shore-dam forest" and the construction of dikes along the banks of the Amazon River. In doing so, the varzea area can be protected by annual inundation and converted into many small body of water (polders) suitable for planting crops and served with controlled irrigation. When this is accomplished the 'amphibious' ecosystem stability is compromised: the original shore-dam forest, floodable grasslands, macrophytes and 'floating meadows' will be destroyed. Additional consequences include high rises of the water level and strong side-erosion by the current of the river. Dam construction has a major effect on fish fauna: the Amazon River is natural habitat to a great variety of fish species, which at the time of reproduction migrate between varzea and its affluents or between their headwaters and their blackwater river (seasonal igapo'). When dams are built fish migration is compromised and it is possible that fish cannot adapt properly to the new lacustrine conditions generated by dam construction.

Varzea Forestry

The huge amount of water capable of generating flooding for up to "300 days a year, with water level exceeding 16 meters along the major rivers" (Peters, Varzea 1999) is accountable as the primary resource for all the people living along its banks.

Despite the fact that *varzea* constitutes only 2% of the total area of the Amazon basin (Varzea, Intro. 1999) it still plays a major role in the life of the habitants of the area. Biological productivity is very abundant in *varzea*, where flora and fauna find congenial habitats, even if different ecosystems coexist in a very limited area. Some areas favor existence to species that otherwise could have been lost. Varzea has been important to natives for a long time for all the resources provided. Because of the continuous replenishing of nutrients every year the alluvial soil is very fertile and many plants are available for the population of the area. Since the population is highly concentrated along the water, more than in terrafirme, there is a great demand to exploit all the resources of varzea but this must be done carefully to avoid possible overexploitation.

The alternation of rainy and dry season creates an environment where living organisms must establish an adequate rhythm to survive and maximize all the available resources. Seeds must germinate and plants grow before the water level is too high and seedlings, after the first year of adaptation, must be capable of adapting to water excursion in the following years. This flexibility is available only for some plants and therefore when varzea is compared to terrafirme we realize that only a few plants can survive in floodplains. On the other hand, because the number of plant species is limited, plants that survive in varzea reproduce in great number and the count per hectare is very high.

The area is also different in appearance from terrafirme. Varzea has a lower and discontinuous canopy, high percentage of large diameter trees, and the quantity of shrubs and plants that make the under story is very limited. This environment favors the collecting done by natives who can easily locate plant resources and reach them by boat during much of the year; these conditions make varzea an essential survival element for the Amazonian people.

Logging is one of the most important sources of profit that is generated from the exploitation of the forest. Timber is a very profitable font of income and over time different trees have been cut for this purpose. While it is clear that timber can generate substantial revenue, on the other hand it is safe to say that exploitation of the forest done in a non-sustainable way can reduce and finally completely deplete all the available resources.

Logging in Amazon floodplains

Timber cutting in the Amazon forest has been practiced for over 300 years (Irion, 1978). This activity fluctuated in intensity in response to the world market: from the sixteenth to nineteenth century wood was cut in the Amazon and shipped to Europe. Later on the demand was modest and wood was no longer of primary importance. Revamping in demand has been recently noticed at the end of this century because of diminishing timber stocks in Southeast Asia (Albernaz et al., 1999). The timber industry is diversified according to equipment (small and medium sawmills and laminated wood factories) availability and the return appears to be substantial in relation to the capital invested.

Anderson (1999) has indicated for example that logging of *Virola surinamensis,* (Myrysticaceae) is done manually in the Amazon estuary area during the rainy season (January-June) when high floodwaters favor transport of logs. Cutting of trees is quite challenging because removal of forest resources must be constantly monitored to avoid an irreversible deficiency. In fact it has been forecast that without appropriate control the reserve of *Virola s.* could be exhausted in approximately forty years.

Albernaz & Ayers reported from research on the middle Solimoes area that logging is quite active and done during the rainy season. Tree cutting is very intense when the floods are very high because it is possible to easily reach areas that could not be penetrated in low flood season. From this study it appears that the price has increased substantially for the same material in two consecutive years. From a list of about 50 species ten are indicated as the most exploited and *Calychophyllum s.* was in fifth position the first year and in third position the following one. Data indicate that for hardwoods the volume of this tree extracted from the forest has been the most important by volume for that category. It appears that *Calycophyllum*

s. replaces *Cedrelinga odorata*: (Meliaceae) and *Platymiscium ulei*, (Papiionaceae) which has disappeared from the market.

New research on Amazon floodplains

As indicated by Nepstad (1994) the scientific community has oversimplified studies done on the Amazon for a long time. It was widely accepted that terrafirme is fragile, poor of soil nutrients, easily destroyed by people and unable to provide crops on regular basis. Instead varzea has been considered extremely fertile, favored by floods activity and capable of high return due to abundant quantity of nutrient rich sediments. According to Nepstad recent studies indicate that the separation between terrafirme and varzea is built on simple classification: it appears that about one third of terrafirme forests pumps water from deep soils during dry season, and this allows plants to survive till the rainy season. Also deep mycorrhizal systems favor absorption of nutrients stored deep in the ground. The effect of slash and burn is not so severe and forests can grow again even after repetitive disturbances. In addition a more accurate evaluation of sediments indicate that events like fire or droughts were not imported by European invaders, who certainly had an impact on the environment, but occurred a long time before. Therefore terms such as "fragile " or "pristine "should again be reconsidered.

Steady agriculture, after clearing of terrafirme, is also possible as indicated by Mattos M. M & C. Uhl (1994).

The Amazon is a very unstable river; it constantly changes its path and therefore the impact on the area where it runs through is very significant. Because the majority of people of the forest live along the edge of the river, when direction changes occur they are forced to make proper adjustment to survive under the new conditions.

A study done by Kalliola et al. (1999) on the Amazon River from the confluence of the rivers Ucayali and Maranon to the downstream end of Isla de Iquitos, which covers about 140 km, provided insights on the dynamic of the river and its channel axis migration from 1972 to 1993. The results of this investigation indicated alternation of change and stability with no evidence that the Amazon has an inclination to unidirectional migration. The channels in this area, which at the widest point make a belt about 12 km wide, go through size and shape alterations that sometimes are repetitive. Both soil erosion and sediment deposition have substantial impact on the life of the riberenos that are used to adapting their life to the conditions of the river and eventually are forced to relocate their homes to survive.

Kalliola (1999) indicated that the shifting of the Amazon River, which results in changes of the floodplain, has a strong influence as to where people live. Small islands are very unstable and their life span is very limited, so consideration on the use of their resources must be carefully planned: the major part of larger islands instead consists of areas that have survived at least half a century. Exploitation of floodplains under this condition is quite challenging. Because sustainable production must be ecologically and also economically rewarding it appears evident that investment and decision-making are both very challenging. An unprecedented change of the river path can compromise hard work and high expectation from the floodplains.

Challenge should not discourage people to make rewarding use of Amazonian Floodplains. Ohly & Junk (1999) suggested ways to obtain appropriate return from these areas where conflicts may arise between different users and between people who are in favor of conservation and those who are not. Farming and milk production should be done on levees possibly close to markets, clear cutting of the forest should be done only at elevation above 24-25 mt, while areas below this value could be used for timber extraction and native pastures. Areas below 21-22 meter could be used as additional grazing area for cattle either from terra firme or from varzea ranches.

The Amazon River, in its continuous readjustment to what Kalliola et al (33) called "capricious Amazon", has been modified not only by the river but also by the action of people. The human influences on varzea landscape are very significant, (Pinedo, 1991) and agriculture indicates clearly how this activity can induce ecological changes in these floodplains. Natives in Napo-Amazon, "riberenos", prefer varzea to terrafirme for growing crops both for personal use and for sale. Studies were done to quantify the impact of rice and jute cultivation and sedimentation and vegetation patterns on floodplains after abandonment. They indicate that, with respect to plant community development, there is no significant change in species composition on the backslopes of levees where jute (*Urena lobata*) was planted, although there is significant change in silt bars where rice (*Orzyva sativa*) was planted. It appears indeed that on backslopes after abandonment the same vegetation that appears in undisturbed areas can grow again, while in silt bars, after rice production abandonment different vegetation appears. This observation indicated that the impact of human activity plays a major role on the ecosystem resulting in effects that can be detected over time.

The evidence from the archeological work of Roosevelt (1999) indicated that prior to European conquest the Amazonian people had already extensively practiced agriculture on a large scale. This has been indirectly associated to some technique that was observed recently by Padoch and Pinedo-Vasquez (1999) in reviewing preliminary results of the Projeto Varzea. It is possible that techniques such as raising land levels by managing and accelerating the process of silt accumulation, modifying natural drainage channels, or farming on extensive platforms were the same as used by farmers of the pre-conquest age. However, evidence from digging indicates that varzea soils had characteristics similar to the area under the Projecto Varzea study.

Roosevelt (1999) in her recapitulation of 12,000 years of human interaction with the environment of the amazonian flood plains indicated that researchers traditionally looked at Amazonia as a natural formation resulting from the interaction of climate history, ecological succession and natural selection. The minimum impact of humans on the forest was considered so critical that the fragile forest could have been compromised. The archeological work does not support this assumption, and probably few areas can realistically be considered "virgin". A new study of the Amazon indicated that despite the fact that poor soil predominates it is still suitable for cultivation and nutrients are not washed out but blocked by chelation (formation of an heterocylic compound having a central metallic ion attached by covalent bonds to two or more non metallic atoms in the same molecule) and later released by mulching (covering the ground around plant).

Amazonia has to be the subject of research and certainly in the future additional findings will provide new insights to this unique part of the earth. At the present time we can say, as indicated by Roosvelt (1999) that the floodplain or varzea makes up the largest area of good-quality, well watered soils of the Amazon region and this represents a significant resource for the people living in this area.

CHAPTER 3

Floodplains (varzea) distribution of plants

Materials and methods

This researcher has conducted a survey in Tapirillo, Peru' a small village of about 100 people on the Amazon River, approximately 50 km from Iquitos. The area selected for this work is flat and no noticeable slope has been detected. The vegetation is about uniform and no specific gaps were noticed with alternation of shady areas. This work has been conducted with the assistance of native people living in the area of the research. Local shamans have participated in this project with the support of additional informants. This investigation has been conducted during the dry season in the month of early July. At this time of the year the level of the Amazon River is usually at its lowest and the area is not affected by flood. Shamans have provided the ethnobotanical information on the plants and therefore the name of each plant has been originally recorded in the vernacular name. Subsequentially, cross-reference has been done using different sources. The shamans have not provided during this stage of the work any information about the use or medicinal value of the material observed. Twelve quadrats

20x20 mt were analyzed. Quadrats were very close one to the other but overlapping was carefully avoided. A cutting point was set at 10 cm DBH.

Table 1

Varzea quadrats (12) distribution (by scientific name)

No./scientific name	family	qty	vernac. name
Quadrat n.1 (9 species for total of 24 individuals)			
1. *Calychophyllum s.*	Rubiaceae	4	capirona bajo
2. *Couroupita g.*	Lecythidaceae	2	ayahuma
3. *Crataeva t.*	Capparidaceae	5	tamara blanca
4. *Inga sp*	Fabaceae	3	shimbillo
5. *Manilkara b.*	Sapotaceae	2	quinilla
6. *Poeppigia p.*	Fabaceae	2	cedro pashaco
7. *Rheedia g.*	Clusiaceae	1	charichuelo
8. *Triplaris s.*	Polygonaceae	2	tangarana
9. *Unidentified*		3	fapina
Quadrat n.2 (13 species for total of 31 individuals)			
1. *Brosimum r.*	Moraceae	2	palisangre
2. *Calychophyllum s.*	Rubiaceae	3	capirona bajo
3. *Campsiandra spp.*	Fabaceae	2	huacapurana
4. *Couroupita g.*	Lecythidaceae	2	ayahuma
5. *Crataeva t.*	Capparidaceae	5	tamara blanca
6. *Genipa a.*	Rubiaceae	1	huito
7. *Guatteria sp*	Annonaceae	2	carahuasca
8. *Leonia g.*	Violaceae	3	tamara
9. *Manilkara b.*	Sapotaceae	1	quinilla
10. *Maquira c.*	Moraceae	3	capinuri
11. *Rinorea r.*	Violaceae	3	limoncillo
12. *Rollinia sp*	Annonaceae	2	anonilla
13. *Unidentified*		2	huapina
Quadrat n.3 (18 species for total of 34 individuals)			
1. *Anaxagorea spp.*	Annonaceae	1	espintana
2. *Calychophyllum s.*	Rubiaceae	4	capirona bajo
3. *Campsiandra sp*	Fabaceae	2	huacapurana
4. *Couroupita g.*	Lecythidaceae	2	ayahuma
5. *Crataeva tapia*	Capparidaceae	3	tamara blanca
6. *Eschweilera sp*	Lecythidaceae	1	machimango
7. *Himatanthus s.*	Apocynaceae	2	bellaco caspi
8. *Leonia g.*	Violaceae	2	tamara
9. *Macoubea g.*	Apocynaceae	1	loro micuna
10. *Manilkara b.*	Sapotaceae	1	quinilla
11. *Maquira c.*	Moraceae	4	capinuri
12. *Mouriri sp*	Melastomataceae/	3	lanza caspi

13.	*Poeppigia p.*	Fabaceae	1	cedro pashaca
14.	*Rheedia g.*	Clusiaceae	1	charichuelo
15.	*Rinorea r.*	Violaceae	1	limoncillo
16.	*Sloanea sp*	Elaeocarpaceae	1	cepanchina
17.	*Swartzia p.*	Fabaceae	3	cumaceba
18.	*Unidentified*		2	fapina

Quadrat n.4 (17 species for total of 32 individuals)

1.	*Alchornea t*	Euphorbiaceae	1	zancudo caspi
2.	*Anaxagorea sp*	Annonaceae	1	espintana
3.	*Brosimum g.*	Moraceae	2	huayra caspi
4.	*Brosimum r.*	Moraceae	1	palisangre
5.	*Calychophyllum s.*	Rubiaceae	2	capirona bajo
6.	*Campsiandra sp*	Fabaceae	2	huacapurana
7.	*Eschweilera sp*	Lecythidaceae	1	machimango
8.	*Guatteria sp*	Annonaceae	2	carahuasca
9.	*Licaria c.*	Lauraceae	2	muena
10.	*Macoubea g.*	Apocynaceae	1	loro micuna
11.	*Maquira c.*	Moraceae	6	capinuri
12.	*Rheedia g.*	Clusiaceae	1	chiarichuelo
13.	*Swartzia p.*	Fabaceae	2	cumaceba
14.	*Triplaris s.*	Polygonaceae	3	tangarana
15.	*Uncaria t.*	Rubiaceae	1	paraguayo
16.	*Unidentified*		2	cotobara
17.	*Unidentified*		2	fapina

Quadrat n.5 (18 species for total of 32 individuals)

1.	*Alchornea t.*	Euphorbiaceae	1	zancudo caspi
2.	*Anaxagorea sp*	Annonaceae	2	espintana
3.	*Bombax m.*	Bombacaceae	2	punga
4.	*Calychophyllum s.*	Rubiaceae	3	capirona bajo
5.	*Cecropia m.*	Cecropiaceae	1	shiari
6.	*Eschweilera sp*	Lecythidaceae	2	machimango
7.	*Genipa a.*	Rubiaceae	1	huito
8.	*Jacaranda c.*	Bignoniaceae	1	huamansamani
9.	*Licaria c.*	Lauraceae	2	muena
10.	*Macrolobium a.*	Fabaceae	1	pasha quilla
11.	*Manilkara b.*	Sapotaceae	2	quinilla
12.	*Maquira c.*	Moraceae	3	capinuri
13.	*Mouriri sp*	Melastomataceae/	1	lanza caspi
14.	*Sloanea sp*	Elaeocarepaceae/	3	cepanchina
15.	*Spondias m.*	Anacardiaceae	3	ubos
16.	*Triplaris s.*	Polygonaceae	2	tangarana
17.	*Unidentified*		1	churo caspi
18.	*Unidentified*		1	cotobara

Quadrat n.6 (16 species for total of 35 individuals)

1. *Alchornea d.*	Euphorbiaceae	2	palometa huayo
2. *Alchornea t.*	Euphorbiaceae	2	zancudo caspi
3. *Calychophyllum s.*	Rubiaceae	3	capirona bajo
4. *Couroupita g.*	Lecythidaceae	1	ayahuma
5. *Crataeva t.*	Capparidaceae	1	tamara blanca
6. *Eschweilera sp*	Lecythidaceae	2	machimango
7. *Guatteria sp*	Annonaceae	4	carahuasca
8. *Hamelia p.*	Rubiaceae	3	yutubanco
9. *Macrolobium a.*	Fabaceae	2	pasha quilla
10. *Maquira c.*	Moraceae	7	capinuri
11. *Mouriri sp*	Melastomataceae/1		lanza caspi
12. *Rinorea r.*	Violaceae	1	limoncillo
13. *Triplaris s.*	Polygonaceae	2	tangarana
14. *Unidentified*		1	churo caspi
15. *Unidentified*		2	fapina
16. *Unonopsis sp*	Annonaceae	1	icoja

Quadrat n.7 (10 species for total of 30 individuals)

1. *Brosimum r.*	Moraceae	2	palisangre
2. *Calychophyllum s.*	Rubiaceae	4	capirona bajo
3. *Crataeva t.*	Capparidaceae	8	tamara blanca
4. *Eschweilera sp*	Lecythidaceae	2	machimango
5. *Guatteria sp*	Annonaceae	3	carahuasca
6. *Jacaranda c.*	Bignoniaceae	1	huamansamani
7. *Maquira c.*	Moraceae	5	capinuri
8. *Swartzia p.*	Fabaceae	1	cumaceba
9. *Unidentified*		2	churo caspi
10. *Unidentified*		2	timareo

Quadrat n.8 (14 species for total of 34 individuals)

1. *Bombax m.*	Bombacaceae	2	punga
2. *Brosimum r.*	Moraceae	2	palisangre
3. *Calychophyllum s*	Rubiaceae	2	capirona bajo
4. *Cecropia m.*	Cecropiaceae	2	shiari
5. *Cecropia s.*	Cecropiaceae	1	cetico
6. *Chlorophora t.*	Moraceae	3	insira
7. *Clusia r.*	Clusiaceae	3	renaquilla
8. *Guatteria sp*	Annonaceae	2	carahuasca
9. *Inga sp*	Fabaceae	1	shimbillo
10. *Licaria c.*	Lauraceae	4	muena
11. *Maquira c.*	Moraceae	3	capinuri
12. *Unidentified*		3	timareo

13.	*Unidentified*		4	fapina
14.	*Xylopia p.*	Annonaceae	2	yahuarachi *caspi*

Quadrat n.9 (15 species for total of 34 individuals)

1.	*Alchornea d.*	Euphorbiaceae	2	palometa huayo
2.	*Calychophyllum s.*	Rubiaceae	4	capirona bajo
3.	*Cecropia m.*	Cecropiaceae	3	shiari
4.	*Crataeva t.*	Capparidaceae	2	tamara bianca
5.	*Erythrina a.*	Fabaceae	1	huayruro amasisa
6.	*Ficus i.*	Moraceae	2	oje'
7.	*Guatteria sp*	Annonaceae	2	carahuasca
8.	*Inga sp*	*Fabaceae*	*1*	*shimbillo*
9.	*Licaria c.*	Lauraceae	4	muena
10.	*Maquira c.*	Moraceae	4	capinuri
11.	*Poeppigia p.*	Fabaceae	2	cedro pashaco
12.	*Triplaris s.*	Polygonaceae	1	tangarana
13.	*Unidentified*		1	casha muena
14.	*Unidentified*		2	timareo
15.	*Unidentified*		3	fapina

Quadrat n.10 (10 species for total of 31 individuals)

1.	*Bombax m.*	Bombacaceae	3	punga
2.	*Calychophyllum s.*	Rubiaceae	2	capirona bajo
3.	*Chlorophora t.*	Moraceae	5	incira
4.	*Erythrina a.*	Fabaceae	2	huayruro amasisa
5.	*Inga sp*	Fabaceae	3	shimbillo
6.	*Licaria c.*	Lauraceae	1	muena
7.	*Poeppigia p.*	Fabaceae	3	cedro pashaco
8.	*Rollinia sp*	Annonaceae	1	anonilla
9.	*Triplaris s.*	Polygonaceae	3	tangarana
10.	*Unidentified*		8	timareo

Quadrat n.11 (11 species for total of 30 individuals)

1.	*Bombax m.*	Bombacaceae	2	punga
2.	*Brosimum r.*	Moraceae	2	palisangre
3.	*Calychophyllum s.*	Rubiaceae	5	capirona bajo
4.	*Chlorophora t.*	Moraceae	4	incira
5.	*Licaria c.*	Lauraceae	5	muena
6.	*Poeppigia p.*	Fabaceae	2	cedro pashaco
7.	*Tabernaemontana s.*	Apocynaceae	1	lobo sanango
8.	*Triplaris s.*	Polygonaceae	2	tangarana
9.	*Unidentified*		3	fapina
10.	*Unidentified*		3	timareo
11.	*Xylopia p.*	Annonaceae	1	yahuarachi caspi

Quadrat n.12 (10 species for total of 25 individuals)

1. *Calychophyllum s.*	Rubiaceae	2	capirona bajo
2. *Cecropia m.*	Cecropiaceae	2	shiari
3. *Guatteria sp*	Annonaceae	2	carahuasca
4. *Hamelia p.*	Rubiaceae	1	yutubanco
5. *Inga sp*	Fabaceae	2	shimbillo
6. *Licaria c.*	Lauraceae	4	muena
7. *Maquira c.*	Moraceae	6	capinuri
8. *Spondias m.*	Anacardiaceae	3	ubos
9. *Triplaris s.*	Polygonaceae	2	tangarana
10. *Xylopia p.*	Annonaceae	1	yahuarachi caspi

(Note: The total number of all the individuals in the twelve quadrats is 372)

Table 2

Varzea distribution for all 12 quadrats (by scient. name)

No./scient. name	family	qty	vernac.name
1. *Alchornea d*	Euphorbiaceae	4	palometa huayo
2. *Alchornea t.*	Euphorbiaceae	4	zancudo caspi
3. *Anaxagorea sp*	Annonaceae	4	espintana
4. *Bombax m.*	Bombacaceae	9	punga
5. *Brosimum g.*	Moraceae	2	huayra caspi
6. *Brosimum r.*	Moraceae	9	palisangre
7. *Calychophyllum s.*	Rubiaceae	38	capirona bajo
8. *Campsiandra sp*	Fabaceae	6	huacapurana
9. *Cecropia m.*	Cecropiaceae	8	shiari
10. *Cecropia s.*	Cecropiaceae	1	cetico
11. *Chlorophora t.*	Moraceae	12	insira
12. *Clusia r.*	Clusiaceae	3	renaquilla
13. *Couroupita g.*	Lecythidaceae	7	ayahuma
14. *Crataeva t.*	Capparidaceae	20	tamara blanca
15. *Erythrina a.*	Fabaceae	3	huayruro amasisa
16. *Eschweilera sp*	Lecythidaceae	8	machimango
17. *Ficus i. a*	Moraceae	2	oje'
18. *Genipa a.*	Rubiaceae	2	huito
19. *Guatteria sp*	Annonaceae	17	carahuasca
20. *Hamelia p.*	Rubiaceae	4	yutubanco
21. *Himatanthus s.*	Apocynaceae	2	bellaco caspi
22. *Inga sp*	Fabaceae	10	shimbillo
23. *Jacaranda c.*	Bignoniaceae	2	huamansamani
24. *Leonia g.*	Violaceae	5	tamara
25. *Licaria c.*	Lauraceae	2	muena
26. *Macoubea g.*	Apocynaceae	2	loro micuna
27. *Macrolobium a.*	Fabaceae	3	pasha quilla
28. *Manilkara b.*	Sapotaceae	6	quinilla
29. *Maquira c.*	Moraceae	41	capinuri
30. *Mouriri sp*	Melastomataceae/	5	lanza caspi
31. *Poeppigia p.*	Fabaceae	10	cedro pashaca
32. *Rheedia g.*	Clusiaceae	3	charichuelo
33. *Rinorea r.*	Violaceae	5	limoncillo
34. *Rollinia sp*	Annonaceae	3	anonilla
35. *Sloanea sp*	Elaeocarepaceae/	4	cepanchina
36. *Spondias m.*	Anacardiaceae	6	ubos
37. *Swartzia p.*	Fabaceae	6	cumaceba

38.	*Tabernaemontana s/*	Apocynaceae	1	lobo sanango
39.	*Triplaris s.*	Polygonaceae	17	tangarana
40.	*Uncaria t.*	Rubiaceae	1	paraguayo
41.	*Unonopsis spp*	Annonaceae	1	icoja
42.	*Xylopia p.*	Annonaceae	4	yahuarachi caspi

Note:

1. The following six plants could not been identified with scientific name. The total quantity of each of these plants is indicated after the name: casha muena (1), churo caspi (4), cotobara (2), fapina (19), huapina (2), timareo (18). The total number of individuals not identified is 46.
2. The total number of all individuals listed is 326+46=372 as indicated at the end of part 1).

Table 3

Varzea distribution for all 12 quadrats (by family name)

No./family/no of sp/species		qty	vernac. name
1. Anacardiaceae/1	*Spondias m*	6	ubos
2. Annonaceae 5	*Anaxagorea sp*	4	espintana
	Guatteria sp	17	carahuasca
	Rollinia sp	3	anonilla
	Unonopsis sp	1	icoja
	Xylopia p.	4	yahuarachi caspi
3. Apocynaceae 3	*Himatanthus s.*	2	bellaco caspi
	Macoubea g.	2	loro micuna
	Tabernaemontana s.	1	lobo sanango
4. Bignoniaceae 1	*Jacaranda c.*	2	huamansamani
5. Bombacaceae 1	*Bombax m.*	9	punga
6. Capparidaceae/1	*Crataeva t.*	24	tamara blanca
7. Cecropiaceae 2	*Cecropia m.*	8	shiari
	Cecropia s.	1	cetico
8. Clusiaceae 2	*Clusia r.*	3	renaquilla
	Rheedia g.	3	charichuelo
9. Elaeocarepaceae/1	*Sloanea sp*	4	cepanchina
10. Euphorbiaceae/2/	*Alchornea d.*	4	palometa huayo
	Alchornea t.	4	zancudo caspi
11. Fabaceae 6	*Campsiandra sp*	6	huacapurana
	Erythrina a.	3	huayruro amasisa
	Inga sp	10	shimbillo
	Macrolobium a.	3	pasha quilla
	Poeppigia p.	10	cedro pashaco
	Swartzia p.	6	cumaceba
12. Lauraceae 1	*Licaria c.*	22	muena
13. Lecythidaceae/2/	*Couroupita g.*	7	ayahuma
	Eschweilera sp	8	machimango
14. Melastomataceae/1	*Mouriri sp*	5	lanza caspi
15. Moraceae 4	*Brosimum g.*	2	huayra caspi
	Brosimum r.	9	palisangre
	Chlorophora t.	12	insira
	Ficus i.	2	oje'
	Maquira c.	41	capinuri
16. Polygonaceae/1	*Triplaris s.*	17	tangarana
17. Rubiaceae 4	*Calychophyllum s.*	38	capirona bajo
	Genipa a.	2	huito

		Hamelia p.	4	yutubanco
		Uncaria t.	1	paraguayo
18.	Sapotaceael	*Manilkara b.*	6	quinilla
19.	Violaceae 2	*Leonia g.*	5	tamara
		Rinorea r	5	limoncillo

Table 4

Varzea cross refernce with vernacular name listed first

No./vernac name	scient, name	family
1. anonilla	*Rollinia sp*	Annonaceae
2. ayahuma	*Couroupita g.*	Lecythidaceae
3. bellaco caspi	*Himatanthus s.*	Apocynaceae
4. capinuri	*Maquira c.*	Moraceae
5. capirona bajo	*Calychophyllum s.*	Rubiaceae
6. carahuasca	*Guatteria sp*	Annonaceae
7. cedro pashaco	*Poeppigia p.*	Fabaceae
8. cepanchina	*Sloanea sp*	Elaeocarepaceae
9. cetico	*Cecropia s.*	Cecropiaceae
10. charichuelo	*Rheedia g.*	Clusiaceae
11. cumaceba	*Swartzia p.*	Fabaceae
12. espintana	*Anaxagorea sp*	Annonaceae
13. huacapurana	*Campsiandra sp*	Fabaceae
14. huamansamani	*Jacaranda c*	Bignoniaceae
15. huayra caspi	*Brosimum g.*	Moraceae
16. huayruro amasisa/*Erythrina a.*		Fabaceae
17. huito	*Genipa a.*	Rubiaceae
18. icoja	*Unonopsis sp*	Annonaceae
19. insira	*Chlorophora t*	Moraceae
20. lanza caspi	*Mouriri sp*	Melastomataceae
21. limoncillo	*Rinorea r.*	Violaceae
22. lobo sanango	*Tabernaemontana s.*	Apocynaceae
23. loro micuna	*Macoubea g.*	Apocynaceae
24. machimango	*Eschweilera sp*	Lecythidaceae
25. muena	*Licaria c.*	Lauraceae
26. oje'	*Ficus i.*	Moraceae
27. palometa huayo	*Alchornea d.*	Euphorbiaceae
28. palisangre	*Brosimum r.*	Moraceae
29. paraguayo	*Uncaria t.*	Rubiaceae
30. pasha quilla	*Macrolobium a.*	Fabaceae
31. punga	*Bombax m.*	Bombacaceae
32. quinilla	*Manilkara b.*	Sapotaceae
33. renaquilla	*Clusia r.*	Clusiaceae
34. shiari	*Cecropia m.*	Cecropiaceae
35. shimbillo	*Inga sp*	Fabaceae
36. tamara blanca	*Crataeva t.*	Capparidaceae
37. tamara	*Leonia g.*	Violaceae
38. tangarana	*Triplaris s.*	Polygonaceae
39. ubos	*Spondias m.*	Anacardiaceae
40. yahuarachi caspi/*Xylopia p.*		Annonaceae

41. yutubanco *Hamelia p.* Rubiaceae
42. zancudo caspi *Alchornea t.* Euphorbiaceae

Summary of the survey

Varzea plant distribution provides the following information:

- Forty-two (42) different plant species have been identified with scientific and vernacular name. Six (6) plants have been identified only with the vernacular name. Total of all plants is 42+6=48.
- Nineteen (19) different families have been identified.
- The total number of individuals in all twelve quadrats is 372.
- The average number of individuals per quadrat is about 31.
- The total number of *Calychophyllum s.* in all the twelve plots is 38.
- The average number of *Calychophyllium s.* per quadrat is 3.16%

The percentage of *Calychophyllum s.* among all the species is about 10.21%.

CHAPTER 4

Dry land (terrafirme) plant distribution

Materials and methods

A survey has been carried out in an inland (dry) area called "El Triunfo" about 46 km from Iquitos on the road (carretera) to Nauta. This investigation has been carried out with the assistance of local shaman Don Francisco (shaman #10) who has provided particular support with area selection and data collection. The area of study is mostly flat and the biodiversity is highly noticeable. This work has been conducted during the dry season in the month of early July. Plant material has been originally recorded in vernacular name. Cross-reference has been done using different sources. Twelve quadrats 20x20 mt have been analyzed. Quadrats have been selected close to each other but overlapping has been carefully avoided.

Table 5

Terrafirme quadrat distribution (by scientific name)

No./scient. name	family	qty	vernac. name
Quadrat No.1 (50 species for total of 66 individuals)			
1. *Aspidosperma n*	Apocynaceae	1	remo caspi
2. *Bouganvillea s.*	Nyctaginaceae	1	papelillo
3. *Brosimum p.*	Moraceae	1	manchinga
4. *Capirona d.*	Rubiaceae	1	capirona altura
5. *Carapa g.*	Meliaceae	1	requia
6. *Casearia s.*	Flacourtiaceae	2	ucho caspi
7. *Cedrelinga c.*	Fabaceae	1	cedro masha/tornillo
8. *Chimarrhis w.*	Rubiaceae	1	yerno prueba
9. *Chrysophyllum p.*	Sapotaceae	1	caimitillo
10. *Copaifera r.*	Fabaceae	3	copal
11. *Cordia a.*	Boraginaceae	1	ajos kiro
12. *Couepia c.*	Chrysobalanaceae/	1	supay ocote
13. *Couma m.*	Apocynaceae	1	leche huayo caspi
14. *Couroupita g.*	Lecythidaceae	1	ayahuma
15. *Dipteryx sp*	Fabaceae	1	shiuhuaco
16. *Erythrina p.*	Fabaceae	2	huayruro
17. *Eschweileira sp*/	Lecythidaceae	2	machimango
18. *Euterpe p.*	Arecaceae	1	chonta/huasai
19. *Ficus i.*	Moraceae	1	oje'
20. *Ficus sp*	Moraceae	3	renaco
21. *Helosis g.*	Balanophoraceae/	1	aguajillo
22. *Hevea g.*	Euphorbiaceae	1	shiringa
23. *Inga sp*	Fabaceae	1	shimbillo
24. *Jessenia b.*	Arecaceae	3	hungurahui
25. *Lacistema a.*	Flacourtiaceae	1	trompo huayo
26. *Lepidocaryum t.*/	Arecacae	1	irapay
27. *Licaria c.*	Lauraceae	1	muena
28. *Macrolobium a.*	Fabaceae	1	pashaco
29. *Orbignya p.*	Arecaceae	1	shapaja
30. *Otoba sp*	Myristicaceae	1	aguanillo
31. *Phytelephas m.*	Arecaceae	1	yarina
32. *Podocarpus o.*	Podocarpaceae	3	aceitillo
33. *Remijia p.*	Rubiaceae	3	chullachaqui caspi
34. *Sapium m.*	Euphorbiaceae	1	shiringa rana
35. *Simarouba a.*	Simaroubaceae	1	marupa'

36.	*Socratea e.*	Arecaceae	3	pona
37.	*Spondias m.*	Anacardiaceae	1	ubos
38.	*Swartzia p.*	Fabaceae	1	cumaceba
39.	*Swietenia m.*	Meliaceae	1	aguano
40.	*Talisia sp*	Sapindaceae	1	virote huayo
41.	*Tetragastris p.*	/Burseraceae	1	lacre
42.	*Triplaris s.*	Polygonaceae	1	tangarana
43.	*Unidentified*		1	chonta caspi
44.	*Unidentified*		1	huicungo
45.	*Unidentified*		1	supay caspi
46.	*Unidentified*		1	vara caspi
47.	*Unidentified*		1	yana caspi
48.	*Unidentified*		2	remoucho
49.	*Unonopsis sp*	Annonaceae	1	icoja
50.	*Urera b.*	Urticaceae	1	mari mari

Quadrat No.2 (55 species for total of 93 individuals)

1.	*Abuta sp*	Menispermaceae	1	abuta caspi
2.	*Aparisthmium c.*	Euphorbiaceae	2	yana vara/uschaquiro
3.	*Aspidosperma n.*	Apocynaceae	1	remo caspi
4.	*Attalea t.*	Arecaceae	3	conta
5.	*Bothriospora c.*	Rubiaceae	1	afasi caspi
6.	*Brosimum a.*	Moraceae	2	tamamuri
7.	*Brunfelsia c.*	Solanaceae	2	chiri caspi
8.	*Campomanesia l.*	Myrtaceae	1	palillo
9.	*Capirona d.*	Rubiaceae	1	capirona altura
10.	*Caryodaphnopsis f.*	/Lauraceae	1	achuni moena/moena
11.	*Casearia s.*	Flacourtiaceae	2	ucho caspi
12.	*Cecropia sp*	Cecropiaceae	3	cetico
13.	*Cedrelinga c.*	Fabaceae	3	cedro masha/tornillo
14.	*Chrysophyllum n.*	/Sapotaceae	2	quinilla
15.	*Cordia a.*	Boraginaceae	2	ajos kiro
16.	Croton p.	Euphorbiaceae	1	topillo
17.	*Erisma c.*	Vochysiaceae	1	quillo sisa
18.	*Ficus i.*	Moraceae	1	oje'
19.	*Ficus sp*	Moraceae	3	renaco
20.	*Gleospermum s.*	Violaceae	1	tamarillo
21.	*Heisteria i.*	Olaceaceae	1	yutubanco
22.	*Helosis g.*	Balanophoraceae/	3	aguajillo
23.	*Himatanthus s.*	Apocynaceae	1	bellaco caspi
24.	*Hura c.*	Euphorbiaceae	1	catahua
25.	*Hymenea sp*	Fabaceae	3	azucar huayo
26.	*Iriartea d.*	Arecaceae	2	huacrapona
27.	*Jessenia b.*	Arecaceae	3	hungurahui

28.	*Lacistema a.*	Flacourtiaceae/1		trompo huayo
29.	*Leonia g.*	Violaceae	1	tamara
30.	*Licaria c.*	Lauraceae	1	muena
31.	*Macoubea g.*	Apocynaceae	1	loro micuna
32.	*Macrolobium a.*	Fabaceae	3	pashaco
33.	*Maquira c.*	Moraceae	1	capinuri
34.	*Minquartia g.*	Olacaceae	2	huacapu
35.	*Mucoa d.*	Apocynaceae	1	yahuarhuayo blanco
36.	*Otoba sp*	Myristicaceae	1	aguanillo
37.	*Phytelephas m.*	Arecaceae	4	yarina
38.	*Scheelea b.*	Arecaceae	3	shebon
39.	*Simira t.*	Rubiaceae	3	huacamayo caspi
40.	*Swartzia l.*	Fabaceae	1	acero shimbillo
41.	*Swartzia p.*	Fabaceae	2	cumaceba
42.	*Swietenia m.*	Meliaceae	2	aguano
43.	*Tabebuia c.*	Bignoniaceae	1	tahuari negro
44.	*Tapirira g.*	Anacardiaceae	1	wira caspi
45.	*Triplaris s.*	Polygonaceae	3	tangarana
46.	*Unidentified*		1	birote caspi
47.	*Unidentified*		1	llausahuarca
48.	*Unidentified*		1	piede vieja
49.	*Unidentified*		1	shuni caspi
50.	*Unidentified*		1	tingana
51.	*Unidentified*		1	trueno caspi
52.	*Unidentified*		3	acetuna caspi
53.	*Virola f.*	Myristicaceae	1	caupuri
54.	*Virola s.*	Myristicaceae	3	cumala
55.	*Zanthoxylum sp*	Rutaceae	1	alcanform

Quadrat No.3 (47 species for total of 67 individuals)

1.	*Acotea sp*	Lauraceae	1	anis muena
2.	*Anaxagorea b.*	Annonaceae	3	carahuasca
3.	*Apuleia l.*	Fabaceae	1	ana caspi
4.	*Bertholetia e.*	Lecythidaceae	2	castana
5.	*Brosimum a.*	Moraceae	1	tamamuri
6.	*Brunfelsia c.*	Solanaceae	2	chiri caspi
7.	*Bursera g.*	Burseraceae	1	carana
8.	*Calophyllum b.*	Clusiaceae	2	alfaro moena
9.	*Capirona d.*	Rubiaceae	2	capirona altura
10.	*Caraipa t.*	Clusiaceae	3	brea caspi
11.	*Cariniana d.*	Lecythidaceae	1	cachimbo
12.	*Caryocar sp*	Caryocariaceae	2	alamendro
13.	*Cavanillesia u.*/Bombacaceae /arbol del tambor		1	puca lupuna

14.	*Chrysophyllum p.*/Sapotaceae		1	caimitillo
15.	*Cordia a.*	Boraginaceae	2	ajos kiro
16.	*Cordia n.*	Boraginaceae	1	anallo caspi
17.	*Ficus i.*	Moraceae	1	oje'
18.	*Gnetum n.*	Gnetaceae	1	bala huayo
19.	*Guazuma u.*	Sterculiaceae	1	bolaina
20.	*Himatanthus s.*	Apocynaceae	1	bellaco caspi
21.	*Licania t.*	Lauraceae	1	canela moena
22.	*Licaria c.*	Lauraceae	1	muena
23.	*Lindackeria p.*/Flacourtaceae		1	casha huayo
24.	Lindernia c.	Scrophulariaceae/1		aretillo
25.	*Maquira c.*	Moraceae	1	capinuri
26.	Minquartia g.	Olacaceae	3	huacapu
27.	*Moronobea c.*	Clusiaceae	1	asufre caspi
28.	*Muntingia c.*	Eleaocarpaceae	1	yumanasa
29.	*Myroxylum b.*	Fabaceae	1	balsamo caspi
30.	*Phytelephas m.*	Arecaceae 4	yarina	
31.	Rollinia sp	Annonaceae	1	anonilla
32.	*Sanchezia p.*	Acanthaceae	2	antara caspi
33.	*Scheelea b.*	Arecaceae	3	shebon
34.	*Simarouba a.*	Simaroubaceae	1	marupa'
35.	*Siparuna g.*	Monimiaceae	1	asna huayo
36.	*Swartzia p.*	Fabaceae	1	cumaceba
37.	*Swietenia m.*	Meliaceae	1	aguano
38.	*Terminalia i.*	Combretaceae	4	almendrillo
39.	*Theobroma c.*	Sterculiaceae	1	cacao
40.	*Theobroma s.*	Sterculiaceae	1	macambillo
41.	*Trema m.*	Ulmaceae	1	atadijo
42.	*Unidentified*		1	alaro moena
43.	*Unidentified*		1	anushi
44.	*Unidentified*		1	aya humillo
45.	*Unidentified*		1	bolatilla
46.	*Unidentified*		1	mullo caspi
47.	*Warscewiczia c.*/Rubiaceae		1	bandera caspi

Quadrat No.4 (11 species for total of 25 individuals)

1.	*Aspidosperma s.*	Apocynaceae	1	quillobordon
2.	*Astrocaryum c.*	Arecaceae	1	chambira
3.	*Brunfelsia c.*	Solanaceae	5	chiri caspi
4.	*Capirona d.*	Rubiaceae	1	capirona altura
5.	*Faramea sp*	Rubiaceae	1	caballo sanango
6.	*Lepidocaryum t.*	Arecacae	4	irapay
7.	*Rinorea r.*	Violaceae	6	cafecillos
8.	*Tabernaemontana sp*/Apocynaceae		3	uchosanango

9. *Unidentified*		1	altar caspi
10. *Unidentified*		1	supay chacracaspi
11. *Unidentified*		1	supay chullacaspi

Quadrat No.5 (28 species for total of 37 individuals)

1. *Alibertia e.*	Rubiaceae	1	huitillo
2. *Brosimum r.*	Moraceae	1	palisangre
3. *Caesalpinia f.*	Fabaceae	1	cedro
4. *Capirona d.*	Rubiaceae	1	capirona altura
5. *Capsicum f.*	Solanaceae	1	charapilla
6. *Clarisia b.*	Moraceae	1	capinuri altura
7. *Couma m.*	Apocynaceae	3	lechehuayo /caspi
8. *Crax sp*		1	paujil caspi
9. *Ficus e.*	Moraceae	1	cauchillo
10. *Ficus i.*	Moraceae	1	oje'
11. *Hevea g.*	Euphorbiaceae	1	shiringa
12. *Lacmellea l.*	Apocynaceae	1	chicle huayo
13. *Ladenbergia m.*	Rubiaceae	2	cascarilla
14. *Macrolobium a.*	Fabaceae	1	pashaco
15. *Maytenus m.*	Celastraceae	1	chuchuashi
16. *Minquartia g.*	Olacaceae	3	huacapu
17. *Remijia p.*	Rubiaceae	2	chullachaqui caspi
18. *Rheedia g.*	Clusiaceae	1	charchiuelo
19. *Sapium g.*	Euphorbiaceae	1	caucho masha
20. *Sloanea sp*	Elaeocarpaceae	1	cepanchina
21. *Socratea e.*	Arecaceae	3	pona
22. *Triplaris s*	Polygonaceae	1	tangarana
23. *Unidentified*		1	coaba
24. *Unidentified*		1	coscarilla
25. *Unidentified*		1	yana caspi
26. *Unonopsis sp*	Annonaceae	2	icoja
27. *Virola f.*	Myrysticaceae	1	caupuri
28. *Virola s.*	Myristicaceae	1	cumala

Quadrat No.6 (32 species for total of 42 individuals)

1. *Anaxagorea b.*	Annonaceae	1	espintana
2. *Astrocaryum c.*	Arecaceae	3	chambira
3. *Brosimum g.*	Moraceae	1	huayra caspi rojo
4. *Brosimum p.*	Moriaceae	1	chimicua
5. *Brunfelsia g.*	Solanaceae	1	chiric sanango
6. *Capirona d.*	Rubiaceae	1	capirona altura

7.	*Capsicum f.*	Solanaceae	1	charapilla
8.	*Caraipa g.*	Clusiaceae	1	aceite caspi
9.	*Ceiba s.*	Bombacaceae	1	huimba
10.	*Chrysophyllum n.*/Sapotaceae		1	quinilla
11.	*Chrysophyllum p.*/Sapotaceae		1	caimitillo
12.	*Copaifera r.*	Fabaceae	3	copal
13.	*Couepia c.*	Chrysobalanaceae/1		supay ocote
14.	*Couroupita g.*	Lecythidaceae	1	ayahuma
15.	*Diplotropis p.*	Fabaceae	1	chonta kiro
16.	*Euterpe p.*	Arecaceae	1	chonta/huasai
17.	*Ficus i.*	Moraceae	1	oje'
18.	*Ficus sp*	Moraceae	1	renaco
19.	*Iriartea d.*	Arecaceae	1	huacrapona
20.	*Jessenia b.*	Arecaceae	1	hungurahui
21.	*Minquartia g.*	Olacaceae	1	huacapu
22.	*Oenocarpus sp*	Arecaceae	1	cinamillo
23.	*Orbignya p.*	Arecaceae	1	shapaja
24.	*Phytelephas m.*	Arecaceae	3	yarina
25.	*Remijia p.*	Rubiaceae	1	chullachaqui caspi
26.	*Simarouba a.*	Simaroubaceae	2	marupa'
27.	*Swartzia l.*	Fabaceae	1	acero shimbillo
28.	*Swartzia p.*	Fabaceae	1	cumaceba
29.	*Tabebuia c.*	Bignoniaceae	1	tahuari negro
30.	*Unidentified*		1	yana caspi
31.	*Virola f.*	Myristicaceae	1	caupuri
32.	*Virola s.*	Myristicaceae	4	cumala

<u>Quadrat No.7 (29 species for total of 45 individuals)</u>

1.	*Anaxagorea b.*	Annonaceae	2	espintana
2.	*Apeiba a.*	Tiliaceae	1	llausa kiro
3.	*Aspidosperma n.*	Apocynaceae	2	remo caspi
4.	*Astrocaryum h.*	Arecaceae	1	huicungo
5.	*Bouganvillea s.*	Nyctaginaceae	1	papelillo
6.	*Capirona d.*	Rubiaceae	1	capirona altura
7.	*Cedrelinga c.*	Fabaceae	1	cedro masha/tornillo
8.	*Ceiba samauma*	Bombacaceae	2	huimba
9.	*Chimarrhis w.*	Rubiaceae	1	yerno prueba
10.	*Chrysophyllum n.*/Sapotaceae		1	quinilla
11.	*Copaifera r.*	Burseraceae	4	copal
12.	*Duguetia sp*	Annonaceae	1	tortuga caspi
13.	*Eschweileira sp*/Lecythidaceae		1	machimango
14.	*Euterpe p.*	Arecaceae	2	chonta/huasai
15.	*Ficus i.*	Moraceae	1	oje'
16.	*Iryanthera t.*	Myristicaceae	1	pucuna caspi

17.	*Jessenia b.*	Arecaceae	1	hungurahuai
18.	*Orbignya p.*	Arecaceae	1	shapaja
19.	*Phytelephas m.*	Arecaceae	1	yarina
20.	*Remijia p.*	Rubiaceae	2	chullachaqui caspi
21.	*Spondias m.*	Anacardiaceae	6	ubos
22.	*Swartzia p.*	Fabaceae	1	cumaceba
23.	*Tetragastris p.*/Burseraceae		2	lacre
24.	*Triplaris s.*	Polyghonaceae	1	tangarana
25.	*Unidentified*		1	achuni caspi
26.	*Unidentified*		1	avilla
27.	*Unidentified*		1	perfume caspi
28.	*Unidentified*		2	sapote renaco
29.	*Unonopsis sp*	Annonaceae	3	icoja

Quadrat No.8 (39 species for a total of 51 individuals)

1.	*Aparisthmium c.*	Euphorbiaceae	1	yana vara/uschaquiro
2.	*Astrocaryum c.*	Arecaceae	1	chambira
3.	*Bothriospora c.*	Rubiaceae	1	afasi caspi
4.	*Brosimum p.*	Moraceae	1	chimicua
5.	*Caesalpina f.*	Fabaceae	1	cedro
6.	*Capirona d.*	Rubiaceae	1	capirona altura
7.	*Caraipa g.*	Meliaceae	1	aceite caspi
8.	*Carapa g.*	Meliaceae	1	requia
9.	*Carludovica p.*	Cyclanthaceae	1	bombonaje
10.	*Caryodaphnopsis f.*/Lauaraceae		4	achuni moena/moena
11.	*Cavanillesia u.*/Bombacaceae		1	puca lupuna/arbol del tambor
12.	*Cedrelinga c.*	Fabaceae	2	cedro masha/tornillo
13.	*Copaifera r.*	Fabaceae	1	copal
14.	*Euterpe p.*	Arecaceae	1	chonta/huasai
15.	Faramea sp	Rubiaceae	1	caballo sanango
16.	*Ficus i.*	Moraceae	2	oje'
17.	*Helosis.g.*	Balanophoraceae/1		aguajillo
18.	*Hymenea sp*	Fabaceae	1	azucar huayo
19.	*Lepidocaryum t.*/Arecaceae		1	irapay
20.	*Licania h*	Chrysobalanaceae/1		casha rana
21.	*Lindernia c.*	Scrophulariaceae/1		aretillo
22.	*Minquartia g.*	Olacaceae	1	huacapu
23.	*Orbignya p.*	Arecaceae	6	shapaja
24.	*Otoba sp*	Myristicaceae	1	aguanillo
25.	*Podocarpus o.*	Podocarpaceae	1	aceitillo
26.	*Remijia p.*	Rubiaceae	1	chullachaqui caspi
27.	*Rheedia g.*	Clusiaceae	1	charichuelo
28.	*Siparuna g.*	Monimiaceae	1	asna huayo

29.	*Socratea e.*	Arecaceae	1	pona
30.	*Terminalia c.*	Combretaceae	1	almendro
31.	*Tetragastris p.*/	Burseraceae	2	lacre
32.	*Trema m.*	Ulmaceae	2	atadijo
33.	*Unidentified*		1	achuni caspi
34.	*Unidentified*		1	campa huayo
35.	*Unidentified*		1	casha caspi
36.	*Unidentified*		1	cashimbo
37.	*Unidentified*		1	catana
38.	*Unidentified*		1	puca caspi
39.	*Virola f.*	Myristicaceae	1	caupuri

Quadrat No.9 (34 species for a total of 37 individuals)

1.	*Aspidosperma n.*	Apocynaceae	2	remo caspi
2.	*Bothriospora c.*	Rubiaceae	1	afasi caspi
3.	*Capirona d.*	Rubiaceae	1	capirona altura
4.	*Caraipa g.*	Clusiaceae	1	aceite caspi
5.	*Carapa g.*	Meliaceae	1	requia
6.	*Caryodaphnopsis f.*/	Lauraceae	1	achuni moena /moena
7.	*Cedrelinga c.*	Fabaceae	1	cedro masha/tornillo
8.	*Ceiba s.*	Bombacaceae	1	huimba
9.	*Copaifera r.*	Burseraceae	1	copal
10.	*Couepia c.*	Chrysobalanaceae/	1	supay ocote
11.	*Couma m.*	Apocynaceae	1	leche huayo/caspi
12.	*Cyphomandra h.*	Solonaceae	1	asna panga
13.	*Euterpe p.*	Arecaceae	3	chonta/huasai
14.	*Ficus i.*	Moraceae	1	oje'
15.	*Hevea g.*	Euphorbiaceae	1	shiringa
16.	*Hymenea sp*	Fabaceae	1	azucar huayo
17.	*Jessenia b.*	Arecaceae	1	hungurahui
18.	*Macrolobium a.*	Fabaceae	1	pashaco
19.	*Minquartia g.*	Olacaceae	1	huacapu
20.	*Orbignya p.*	Arecaceae	1	shapaja
21.	*Phytelephas m.*	Arecaceae	1	yarina
22.	*Piper sp*	Piperacae	1	cordoncillo
23.	*Sapium g.*	Euphorbiaceae	1	caucho masha
24.	*Sapium m.*	Euphorbiaceae	1	shiringa rana
25.	*Scheelea b.*	Arecaceae	1	shebon
26.	*Tabebuia c.*	Bignoniaceae	1	tahauri negro
27.	*Tetragastris p.*	Burseraceae	1	lacre
28.	*Tovomita sp*	Clusiaceae	1	chullachaqui colorado
29.	*Unidentified*		1	achuni caspi
30.	*Unidentified*		1	asna caspi
31.	*Unidentified*		1	avilla

32.	*Unidentified*		1	chuchara caspi
33.	*Unidentified*		1	sapote renaco
34.	*Virola s.*	Myristicaceae	1	cumala

Quadrat No.10 (36 species for a total of 53 individuals)

1.	*Acotea sp*	Lauraceae	3	anis moena
2.	*Apuleia l.*	Fabaceae	2	ana caspi
3.	*Aspidosperma n.*	Apocynaceae	1	remo caspi
4.	*Astrocaryum c.*	Arecaceae	1	chambira
5.	*Brosimum g.*	Moraceae	1	huayra caspi rojo
6.	*Brosimum r.*	Moraceae	1	palisangre
7.	*Campomanesia l.*	Myrtaceae	1	palillo
8.	*Capirona d.*	Rubiaceae	1	capirona altura
9.	*Caraipa g.*	Clusiaceae	1	aceite caspi
10.	*Cariniana d.*	Lecythidiaceae	1	cachimbo
11.	*Cedrelinga c.*	Fabaceae	1	cedro masha/tornillo
12.	*Ceiba s.*	Bombacaceae	1	huimba
13.	*Chrysophyllum c.*/Sapotaceae		1	caimito
14.	*Chrysophyllum n.*/Sapotaceae		1	quinilla
15.	*Copaifera p.*	Fabaceae	1	copaiba
16.	*Copaifera r.*	Fabaceae	4	copal
17.	*Couma m.*	Apocynaceae	2	leche huayo/caspi
18.	*Couepia c.*	Chrysobalaneceae/2		supay ocote
19.	*Couroupita g.*	Lecythidaceae	3	ayahuma
20.	*Eschweileira sp*/Lecythidaceae		1	machimango
21.	*Euterpe p.*	Arecaceae	2	chonta/huasai
22.	*Ficus i.*	Moraceae	1	oje'
23.	*Hevea g.*	Euphorbiaceae	1	shiringa
24.	*Micrandra s.*	Euphorbiaceae	1	shiringa masha
25.	*Minquartia g.*	Olacaceae	1	huacapu
26.	*Otoba sp*	Myristiaceae	1	aguanillo
27.	*Phytelephas m.*	Arecaceae	2	yarina
28.	*Remijia p.*	Rubiaceae	1	chullachaqui caspi
29.	*Socratea e.*	Arecaceae	3	pona
30.	*Swietenia m.*	Meliaceae	1	aguano
31.	*Terminalia i.*	Combretaceae	2	almendrillo
32.	*Tetragastris p.*/Burseraceae		2	lacre
33.	*Unidentified*		1	puca luna
34.	*Unidentified*		1	sapote renaco
35.	*Unidentified*		2	achuni caspi
36.	*Virola f.*	Myristicaceae	1	caupuri

Quadrat No.11 (35 species for a total of 42 individuals)

1. *Acotea sp*	Lauraceae	1	anis muena
2. *Aspidosperma n.*	Apocynaceae	1	remo caspi
3. *Astrocaryum c.*	Arecaceae	2	chambira
4. *Brosimum p.*	Moraceae	1	chimicua
5. *Brunfelsia c.*	Solanaceae	1	chiri caspi
6. *Capirona d.*	Rubiaceae	1	capirona altura
7. *Caraipa g.*	Clusiaceae	1	aceite caspi
8. *Cavanillesia u.*	Bombacaceae	1	puca lupuna/arbol del tambor
9. *Ceiba s.*	Bombacaceae	1	huimba
10. *Copaifera r.*	Fabaceae	1	copal
11. *Cordia a.*	Boraginaceae	1	ajos kiro
12. *Couepia c.*	Chrysobalanaceae/1		supay ocote
13. *Couma m.*	Apocynaceae	2	leche huayo caspi
14. *Crysophyllum p.*/Sapotaceae		2	quinilla
15. *Erythrina p.*	Fabaceae	1	huayruro
16. *Euterpe p.*	Arecaceae	1	chontahuasai
17. *Ficus i.*	Moraceae	1	oje'
18. *Ficus sp*	Moraceae	1	renaco
19. *Heisteria I*	Olaceaceae	1	yutubanco
20. *Orbignya p.*	Arecaceae	1	shapaja
21. *Phytelephas m.*	Arecaceae	2	yarina
22. *Remijia p.*	Rubiaceae	2	chullachaqui caspi
23. *Rheedia g.*	Clusiaceae	1	charichuelo
24. *Socratea e.*	Arecaceae	3	pona
25. *Swartzia l.*	Fabaceae	1	acero shimbillo
26. *Swartzia p.*	Fabaceae	1	cumaceba
27. *Terminalia c.*	Combretaceae	1	almendro
28. *Tetragastris p.*/Burseraceae		1	lacre
29. *Unidentified*		1	avilla
30. *Unidentified*		1	canela
31. *Unidentified*		1	nispero
32. *Unidentified*		1	tingana
33. *Unidentified*		1	vara caspi
34. *Virola f.*	Myristicaceae	1	caupuri
35. *Virola s.*	Myristicaceae	1	cumala

Quadrat No.12 (35 species for a total of 42 individuals)

1. *Acotea sp*	Lauraceae	1	anis moena
2. *Apuleia l.*	Fabaceae	1	ana caspi
3. *Capirona d.*	Rubiaceae	1	capirona altura
4. *Caraipa g.*	Clusiaceae	1	aceite caspi

5.	*Caryodaphnopsis f.*	/Lauraceae	1	achuni moena /moena
6.	*Chrysophyllum p.*	Sapotaceae	11	caimitillo
7.	*Copaifera r.*	Burseraceae	2	copal
8.	Cordia a.	Boraginaceae	4	ajos kiro
9.	*Cordia n.*	Boraginaceae	1	anallo caspi
10.	*Couepia c.*	Chrysobalanaceae/	1	supay ocote
11.	*Couma m.*	Apocynaceae	1	leche huayo/caspi
12.	*Couroupita g.*	Lecythidaceae	1	ayahuma
13.	*Crysophyllum n.*	/Sapotaceae	1	quinilla
14.	*Diplotropis p.*	Fabaceae	1	chonta kiro
15.	*Euterpe p.*	Arecaceae	2	chonta/huasai
16.	*Ficus i.*	Moraceae	1	oje'
17.	*Heisteria i.*	Olaceaceae	1	yutubanco
18.	*Hura c.*	Euiphorbiaceae	1	catahua
19.	*Jessenia b.*	Arecaceae	3	hungurahui
20.	*Ladenbergia m.*	Rubiaceae	1	cascarilla
21.	*Lepidocaryum t.*	/Arecacae	1	irapay
22.	*Macrolobium a.*	Fabaceae	1	pashaco
23.	*Orbignya p.*	Arecaceae	1	shapaja
24.	*Phytelephas m.*	Arecaceae	1	yarina
25.	*Remijia p.*	Rubiaceae	1	chullachaqui caspi
26.	*Sapium m.*	Euphorbiaceae	1	shiringa rana
27.	*Swartzia l.*	Fabaceae	1	acero shimbillc
28.	*Terminalia c*	Combretaceae	1	almendro
29.	*Tetragastris p.*	/Burseraceae	1	lacre
30.	*Triplaris s.*	Polygonaceae	1	tangarana
31.	*Unidentified*		1	avilla
32.	*Unidentified*		1	casha vara
33.	*Unidentified*		1	tingana
34.	*Virola f.*	Myristicaceae	1	caupuri
35.	*Virola s.*	Myristicaceae	1	cumala

Table 6

Terrafirme distribution of all 12 quadrats (by scientific name)

No./scientific name	family	qty	vernac.name
1. *Abuta sp*	Menispermaceae	1	abuta caspi
2. *Acotea sp*	Lauaraceae	6	anis moena
3. *Alibertia sp.*	Rubiaceae	1	huitillo
4. *Anaxagorea b.*	Annonaceae	3	espintana
5. *Anaxagorea b.*	Annonaceae	3	carahuasca
6. *Aparisthmium c.* uschaquiro	Euphorbiaceae	3	yana vara
7. *Apeiba a.*	Tiliaceae	1	llausa kiro
8. *Apuleia l.*	Fabaceae	4	ana caspi
9. *Aspidosperma n.*	Apocynaceae	8	remo caspi
10. *Aspidosperma s.*/	Apocynaceae	1	quillobordon
11. *Astrocaryum c.*	Arecaceae	8	chambira
12. *Astrocaryum h.*	Arecaceae	1	huicungo
13. *Attalea t.*	Arecaceae	3	conta
14. *Bertholetia e.*	Lecythidaceae	2	castana
15. *Bothriospora c.*/	Rubiaceae	3	afasi caspi
16. *Bouganvillea s.*/	Nyctaginaceae	2	papelillo
17. *Brosimum a.*	Moraceae	3	tamamuri
18. *Brosimum g.*	Moraceae	2	huayra caspi rojo
19. *Brosimum p.*	Moraceae	3	chimicua
20. *Brosimum p.*	Moraceae	1	manchinga
21. *Brosimum r.*	Moraceae	2	palisangre
22. *Brunfelsia c.*	Solanaceae	10	chiri caspi
23. *Brunfelsia g.*	Solanaceae	1	chiric sanango
24. *Bursera g.*	Burseraceae	1	carana
25. *Caesalpina f.*	Fabaceae	2	cedro
26. *Calophyllum b.*	Clusiaceae	2	alfaro moena
27. *Campomanesia l.*/	Myrtaceae	2	palillo
28. *Capirona d.*	Rubiaceae	13	capirona altura
29. *Capsicum f.*	Solanaceae	2	charapilla
30. *Caraipa g.*	Clusiaceae	6	aceite caspi
31. *Caraipa t.*	Clusiaceae	3	brea caspi
32. *Carapa g.*	Meliaceae	3	requia
33. *Cariniana d.*	Lecythidaceae	2	cachimbo
34. *Carludovica p.*	Cyclanthaceae	1	bombonaje
35. *Caryocar sp*	Caryocariaceae	2	alamendro

36.	*Caryodaphnopsis f.*/	Lauraceae	7	achuni moena moena
37.	*Casearia s.*	Flacourtiaceae	4	ucho caspi
38.	*Cavanillesia u.*/	Bombacaceae	3	puca lupuna/arbol del tambor
39.	*Cecropia sp*	Cecropiaceae	3	cetico
40.	*Cedrelinga c.*	Fabaceae	9	cedro masha/tornillo
41.	*Ceiba s.*	Bombacaceae	6	huimba
42.	*Chimarrhis w.*	Rubiaceae	2	yerno prueba
43.	*Chrysophyllum c.*/	Sapotaceae	1	caimito
44.	*Chrysophyllum n.*/	Sapotaceae	8	quinilla
45.	*Chrysophyllum p.*/	Sapotaceae	4	caimitillo
46.	*Clarisia b.*	Moraceae	1	capinuri altura
47.	*Copaifera p.*	Fabaceae	1	copaiba
48.	*Copaifera r.*	Burseraceae	17	copal
49.	*Cordia a.*	Boraginaceae	10	ajos kiro
50.	*Cordia n.*	Boraginaceae	2	anallo caspi
51.	*Couma m.*	Apocynaceae	10	leche huayo/caspi
52.	*Couepia c.*	Chrysobalanecae/	7	supay ocote
53.	*Couroupita g.*	Lecythidaceae	6	ayahuma
54.	*Crax sp*		1	paujil caspi
55.	*Croton p.*	Euphorbiaceae	1	topillo
56.	*Cyphomandra h.*	Solonaceae	1	asna panga
57.	*Diplotropis p.*	Fabaceae	2	chonta kiro
58.	*Dipteryx sp*	Fabaceae	1	shiuhuaco
59.	Duguetia sp	Annonaceae	1	tortuga caspi
60.	*Erisma c.*	Vochysiaceae	1	quillo sisa
61.	*Erythrina p.*	Fabaceae	3	huayruro
62.	*Eschweileira sp*/	Lecythidaceae	4	machimango
63.	*Euterpe p.*	Arecacae	13	chonta/huasai
64.	*Faramea sp*	Rubiaceae	2	caballo sanango
65.	*Ficus e.*	Moraceae	1	cauchillo
66.	*Ficus i.*	Moraceae	12	oje'
67.	*Ficus sp*	Moraceae	8	renaco
68.	*Gleospermum s.*	Violaceae	1	tamarillo
69.	*Gnetum n.*	Gnetaceae	1	bala huayo
70.	*Guazuma u.*	Sterculaceae	1	bolaina
71.	*Heisteria i.*	Olaceaceae	3	yutubanco
72.	*Helosis g.*	Balanophoraceae/	5	aguajillo
73.	*Hevea g.*	Euphorbiaceae	4	shiringa
74.	*Himatanthus s.*	Apocynaceae	2	bellaco caspi
75.	*Hura c.*	Euiphorbiaceae	2	catahua
76.	*Hymenea sp*	Fabaceae	5	azucar huayo
77.	*Inga sp*	Fabaceae	1	shimbillo
78.	*Iriartea d.*	Arecaceae	3	huacrapona
79.	*Iryanthera t.*	Myristicaceae	1	pucuna caspi
80.	*Jessenia b.*	Arecaceae	12	hungurahuai
81.	*Lacistema a.*	Flacourtiaceae	2	trompo huayo

82.	*Lacmellea l.*	Apocynaceae	1	chicle huayo
83.	*Ladenbergia m.*	Rubiaceae	3	cascarilla
84.	*Leonia g.*	Violaceae	1	tamara
85.	*Lepidocaryum t.*/Arecacae		7	irapay
86.	*Licania h.*	Chrysobalanaceae/1		casha rana
87.	*Licania t.*	Lauraceae	1	canela moena
88.	*Licaria c.*	Lauraceae	3	muena
89.	*Lindackeria p.*	Flacourtaceae	1	casha huayo
90.	*Lindernia c.*	Scrophulariaceae/2		aretillo
91.	*Macoubea g.*	Apocynaceae	1	loro micuna
92.	*Macrolobium a.*	Fabaceae	7	pashaco
93.	*Maquira c.*	Moraceae	2	capinuri
94.	*Maytenus m.*	Celastraceae	1	chuchuashi
95.	*Micrandra s.*	Euphorbiaceae	1	shiringa masha
96.	*Minquartia g.*	Olacaceae	12	huacapu
97.	*Moronobea c.*	Clusiaceae	1	asufre caspi
98.	*Mucoa d.*	Apocynaceae	1	yahuarhuayo blanco
99.	*Muntingia c.*	Eleaocarpaceae	1	yumanasa
100.	*Myroxylum b.*	Fabaceae	1	balsamo caspi
101.	*Oenocarpus sp*	Arecaceae	1	cinamillo
102.	*Orbignya p.*	Arecaceae	12	shapaja
103.	*Otoba sp*	Myristicaceae	4	aguanillo
104.	*Phytelephas m.*	Arecaceae	19	yarina
105.	*Piper sp*	Piperacae	1	cordoncillo
106.	*Podocarpus o.*	Podocarpaceae	4	aceitillo
107.	*Remijia p.*	Rubiaceae	13	chullachaqui caspi
108.	*Rheedia g.*	Clusiaceae	3	charchiuelo
109.	*Rinorea r.*	Violaceae	6	cafecillos
110.	*Rollinia sp*	Annonaceae	1	anonilla
111.	*Sanchezia p.*	Acanthaceae	2	antara caspi
112.	*Sapium g.*	Euphorbiaceae	2	caucho masha
113.	*Sapium m.*	Euphorbiaceae	3	shiringa rana
114.	*Scheelea b.*	Arecaceae	7	shebon
115.	*Simarouba a.*	Simaroubaceae	4	marupa'
116.	*Simira t.*	Rubiaceae	3	huacamayo caspi
117.	*Siparuna g.*	Monimiaceae	2	asna huayo
118.	*Sloanea sp*	Elaeocarpaceae	1	cepanchina
119.	*Socratea e.*	Arecaceae	13	pona
120.	*Spondias m.*	Anacardiaceae	7	ubos
121.	*Swartzia l.*	Fabaceae	4	acero shimbillo
122.	*Swartzia p.*	Fabaceae	7	cumaceba
123.	*Swietenia m.*	Meliaceae	5	aguano
124.	*Tabebuia c.*	Bignoniaceae	1	tahauri negro
125.	*Tabernaemontana sp*/Apocynaceae/3			uchosanango
126.	*Talisia sp*	Sapindaceae	1	virote huayo
127.	*Tapirira g.*	Anacardiaceae	1	wira caspi
128.	*Terminalia c.*	Combretaceae	3	almendro

129.	*Terminalia i.*	Combretaceae	6	almendrillo
130.	*Tetragastris p.*/Burseraceae		10	lacre
131.	*Theobroma c.*	Sterculaceae	1	cacao
132.	*Theobroma s.*	Sterculiaceae	1	macambillo
133.	*Tovomita sp*	Clusiaceae	1	chullachaqui colorado
134.	*Trema m.*	Ulmaceae	3	atadijo
135.	*Triplaris s.*	Polygonaceae	7	tangarana
136.	Unonopsis sp	Annonaceae	6	icoja
137.	*Urera b.*	Urticaceae	1	mari mari
138.	*Virola f.*	Myristicaceae	7	caupuri
139.	*Virola s.*	Myristicaceae	11	cumala
140.	*Warscewiczia c.*/Rubiaceae		1	bandera caspi
141.	*Zanthoxylum sp*	Rutaceae	1	alcanform

Note

The following 38 plants could not be identified with scientific name. The total quantity of each of these plants is indicated after the name:

alaro moena, altar caspi, anushi, asna caspi, aya humilio, birote caspi, bolatilla, campa huayo, canela, casha caspi, casha vara, cashimbo, catana, chonta caspi, chuchara caspi, coaba, coscarilla, huicungo, llausahuarca, mullo caspi, nispero, perfume caspi, piede vieja, puca caspi, puca luna, shuni caspi, supay caspi, supay chacracaspi, supay chullacaspi, trueno caspi (all 1 each); remoucho (2), vara caspi (2), acetuna caspi (3), tingana (3), yana caspi (3), avilla (4), sapote renaco (4), achuni caspi (5).

The total number of all individuals listed is 544+56=600.

Table 7

Terrafirme distribution of all 12 quadrats (by family name)

No./family/species	/sci. name	qty	vernac.name
1. Acanthaceae 1	*Sanchezia p.*	2	antara caspi
2. Anacardiaceae/2	*Spondias m.*	7	ubos
	Tapirira g.	1	wira caspi
3. Annonaceae 5	*Anaxagorea b.*	3	espintana
	Anaxagorea b.	3	carahuasca
	Duguetia sp	1	tortuga caspi
	Rollinia sp	1	anonilla
	Unonopsis sp	6	icoja
4. Apocynaceae 8	*Aspidosperma n.*	8	remo caspi
	Aspidosperma s.	1	quillobordon
	Couma m.	10	lechehuayocaspi
	Himatanthus s.	2	bellacocaspi
	Lacmellea l.	1	chicle huayo
	Macoubea g	1	loro micuna
	Mucoa d.	1	yahuarhuayoblanco
	Tabernaemontana sp	3	uchosanango
5. Arecacae 12	*Euterpe p.*	13	chonta/huasai
	Lepidocaryum t.	7	irapay
	Astrocaryum c.	8	chambira
	Astrocaryum h.	1	huicungo
	Attalea t.	3	conta
	Iriartea d.	3	huacrapona
	Jessenia b.	12	hungurahuai
	Oenocarpus sp	1	cinamillo
	Orbignya p.	12	shapaja
	Phytelephas m.	19	yarina
	Scheelea b.	7	shebon
	Socratea e.	13	pona
6. Balanophoraceae/1	*Helosis g.*	5	aguajillo
7. Bignoniaceae 1	*Tabebuia c.*	1	tahauri negro
8. Bombacaceae 2 /arbol del tambor	*Cavanillesia u.*	3	puca lupuna
	Ceiba s.	6	huimba
9. Boraginaceae 2	*Cordia a.*	10	ajos kiro
	Cordia n.	2	anallocaspi

10.	Burseraceae/3	*Bursera g.*	1	carana
		Copaifera r.	17	copal
		Tetragastris p.	10	lacre
11.	Caryocariaceae 1/	*Caryocar sp*	2	alamendro
12.	Cecropiaceae/1	*Cecropia sp*	3	cetico
13.	Celastraceae/1	*Maytenus m.*	1	chuchuashi
14.	Chrysobalanaceae/2/	Licania h.	1	casha rana
		Couepia c.	7	supayocote
15.	Clusiaceae/6	*Calophyllum b.*	2	alfaro moena
		Caraipa g.	6	aceitecaspi
		Caraipa t.	3	breacaspi
		Moronobea c.	1	asufre caspi
		Rheedia g.	3	charchiuelo
		Tovomita sp colorado	1	chullachaqui
16.	Combretaceae/2	*Terminalia c.*	3	almendro
		Terminalia i.	6	almendrillo
17.	Cyclanthaceae/1/	*Carludovica p.*	1	bombonaje
18.	Elaeocarpaceae 2/	*Sloanea sp*	1	cepanchina
		Muntingia c.	1	yumanasa
19.	Euiphorbiaceae 7/	*Hura c.*	2	catahua
		Aparisthmium c. /uschaquiro	3	yanavara
		Croton p.	1	topillo
		Hevea g.	4	shiringa
		Micrandra s.	1	shiringa masha
		Sapium g	2	cauchomasha
		Sapium m.	3	shiringa rana
20.	Fabaceae 13	*Apuleia l.*	4	ana caspi
		Caesalpina f.	2	cedro
		Cedrelinga c. /tornillo	9	cedro masha
		Copaifera p.	1	copaiba
		Diplotropis p.	2	chontakiro
		Dipteryx sp	1	shiuhuaco
		Erythrina p.	3	huayruro
		Hymenea sp	5	azucar huayo
		Inga sp	1	shimbillo
		Macrolobium a.	7	pashaco
		Myroxylum b.	1	balsamo caspi
		Swartzia l.	4	acero shimbillo
		Swartzia p.	7	cumaceba
21.	Flacourtaceae/3/	*Lindackeria p.*	1	casha huayo
		Casearia s.	4	uchocaspi
		Lacistema a.	2	trompohuayo
22.	Gnetaceae 1	*Gnetum n.*	1	bala huayo

23.	Lauraceae 4	*Caryodaphnopsis f.*	7	achunimoena
	moena			
		Licania triandra	1	canela moena
		Licaria c.	3	muena
		Acotea	6	anis moena
24.	Lecythidaceae	4/Bertholetia e.	2	castana
		Couroupita g.	6	ayahuma
		Eschweileira sp	4	machimango
		Cariniana d.	2	cachimbo
25.	Meliaceae 2	*Caraipa g.*	3	requia
		Swietenia m.	5	aguano
26.	Menispermaceae	1/*Abuta sp*	1	abuta caspi
27.	Monimiaceae/1	*Siparuna g.*	2	asna huayo
28.	Moraceae/10	*Brosimum a.*	3	tamamuri
		Brosimum g.	2	huayracaspi
		rojo		
		Brosimum p.	3	chimicua
		Brosimum p.	1	manchinga
		Brosimum r.	2	palisangre
		Clarisia b.	1	capinuri
		altura		
		Ficus e.	1	cauchillo
		Ficus i.	12	oje'
		Ficus sp	8	renaco
		Maquira c.	2	capinuri
29.	Myristicaceae/4/	*Virola s.*	11	cumala
		Iryanthera t	1	pucuna caspi
		Otoba sp	4	aguanillo
		Virola f.	7	caupuri
30.	Myrtaceae 1	*Campomanesia l.*	2	palillo
31.	Nyctaginaceae/1/	*Bouganvillea s.*	2	papelillo
32.	Olacaceae 1	*Minquartia g.*	12	huacapu
33.	Olacaceae 1	*Heisteria i.*	3	yutubanco
34.	Piperacae 1	*Piper sp*	1	cordoncillo
35.	Podocarpaceae1	*Podocarpus o.*	4	aceitillo
36.	Polygonaceae/1	*Triplaris s.*	7	tangarana
37.	Rubiaceae 9	Alibertia	1	huitillo
		Bothriospora c.	3	afasicaspi
		Capirona d.	13	capirona
		altura		
		Chimarrhis w.	2	yerno prueba
		Faramea sp	2	caballo
		sanango		
		Ladenbergia m.	3	cascarilla
		Remijia p.	13	chullachaqui
		caspi		

		Simira t. caspi	3	huacamayo
		Warscewiczia c.	1	bandera caspi
38.	Rutaceae 1	*Zanthoxylum sp*	3	alcanform
39.	Sapindaceae/1	*Talisia sp*	1	virote huayo
40.	Sapotaceae/3	*Chrysophyllum c.*	1	caimito
		Chrysophyllum n.	8	quinilla
		Chrysophyllum p.	4	caimitillo
41.	Scrophulariaceae/1/	*Lindernia c.*	2	aretillo
42.	Simaroubaceae/1/	*Simarouba a.*	4	marupa'
43.	Solanaceae/4	*Brunfelsia c.*	10	chiri caspi
		Brunfelsia g.	1	chiric sanango
		Capsicum f.	2	charapilla
		Cyphomandra h	1	asna panga
44.	Sterculiaceae/3/	*Guazuma u.*	1	bolaina
		Theobroma c.	1	cacao
		Theobroma s.	1	macambillo
45.	Tiliaceae 1	*Apeiba a.*	1	llausa kiro
46.	Ulmaceae 1	*Trema m.*	3	atadijo
47.	Unidentified/1	*Crax sp*	1	paujil caspi
48.	Urticaceae/1	*Urera b.*	1	mari mari
49.	Violaceae/3	*Gleospermum s.*	1	tamarillo
		Leonia g.	1	tamara
		Rinorea r.	6	cafecillos
50.	Vochysiaceae/1	*Erisma c.*	1	quillo sisa

Table 8

Terrafirme crossrefernce with vernacular name listed first

No./vernac.name	scientific name	family
1. abuta caspi	*Abuta sp*	Menispermaceae
2. aceite caspi	*Caraipa g*	Clusiaceae
3. aceitillo	*Podocarpus o.*	Podocarpaceae
4. acero shimbillo	*Swartzia l.*	Fabaceae
5. achuni moena	*Caryodaphnopsis f*	Lauraceae
6. afasi caspi	*Bothriospora c.*	Rubiaceae
7. aguajillo	*Helosis g.*	Balanophoraceae
8. aguanillo	*Otoba sp*	Myristicaceae
9. aguano	*Swietenia m*	Meliaceae
10. ajos kiro	*Cordia a*	Boraginaceae
11. alcanform	*Zanthoxylum sp*	Rutaceae
12. alfaro moena	*Calophyllum b.*	Clusiaceae
13. alamendro	*Caryocar sp*	Caryocariaceae
14. almendrillo	*Terminalia i.*	Combretaceae
15. almendro	*Terminalia c.*	Combretaceae
16. ana caspi	*Apuleia l.*	Fabaceae
17. anallo caspi	*Cordia n.*	Boraginaceae
18. anis moena	*Acotea sp.*	Lauraceae
19. anonilla	*Rollinia sp*	Annonaceae
20. antara caspi	*Sanchezia p.*	Acanthaceae
21. aretillo	*Lindernia c.*	Scrophulariaceae
22. asna huayo	*Siparuna g.*	Monimiaceae
23. asna panga	*Cyphomandra h.*	Solonaceae
24. asufre caspi	*Moronobea c.*	Clusiaceae
25. atadijo	*Trema m.*	Ulmaceae
26. ayahuma	*Couroupita g.*	Lecythidaceae
27. azucar huayo	*Hymenea sp*	Fabaceae5
28. bala huayo	*Gnetum n.*	Gnetaceae
29. balsamo caspi	*Myroxylum b.*	Fabaceae
30. bandera caspi	*Warscewiczia c.*	Rubiaceae
31. bellaco caspi	*Himatanthus s.*	Apocynaceae
32. bolaina	*Guazuma u.*	Sterculaceae
33. bombonaje	*Carludovica p.*	Cyclanthaceae
34. brea caspi	*Caraipa t.*	Clusiaceae
35. caballo sanango/*Faramea sp*		Rubiaceae

36.	cacao	*Theobroma c.*	Sterculaceae
37.	cachimbo	*Cariniana d.*	Lecythidaceae
38.	cafecillos	*Rinorea r.*	Violaceae
39.	caimitillo	*Chrysophyllum p.*	Sapotaceae
40.	caimito	*Chrysophyllum c.*	Sapotaceae
41.	canela moena	*Licania t*	Lauraceae
42.	capinuri	*Maquira c.*	Moraceae
43.	capinuri altura/*Clarisia b.*		Moraceae
44.	capirona altura/*Capirona d.*		Rubiaceae
45.	carahuasca	*Anaxagorea b.*	Annonaceae
46.	carana	*Bursera g.*	Burseraceae
47.	cascarilla	*Ladenbergia m.*	Rubiaceae
48.	casha huayo	*Lindackeria p.*	Flacourtaceae
49.	casha rana	*Licania h.*	Chrysobalanaceae
50.	castana	*Bertholetia e.*	Lecythidaceae
51.	catahua	*Hura c.*	Euphorbiaceae
52.	cauchillo	*Ficus e.*	Moraceae
53.	caucho masha	*Sapium g.*	Euphorbiaceae
54.	caupuri	*Virola f.*	Myristicaceae
55.	cedro	*Caesalpina f.*	Fabaceae
56.	cedro masha/tornillo/*Cedrelinga c.*		Fabaceae
57.	cepanchina	*Sloanea sp*	Elaeocarpaceae
58.	cetico	*Cecropia sp*	Cecropiaceae
59.	chambira	*Astrocaryum c.*	Arecaceae
60.	charapilla	*Capsicum f.*	Solanaceae
61.	charchiuelo	*Rheedia g.*	Clusiaceae
62.	chicle huayo	*Lacmellea l.*	Apocynaceae
63.	chimicua	*Brosimum p.*	Moraceae
64.	chiri caspi	*Brunfelsia c.*	Solanaceae
65.	chiric sanango	*Brunfelsia g.*	Solanaceae
66.	chonta/huasai	*Euterpe p.*	Arecacae
67.	chonta kiro	*Diplotropis p.*	Fabaceae
68.	chuchuashi	*Maytenus m.*	Celastraceae
69.	chullachaqui caspi/*Remijia p.*		Rubiaceae
70.	chullachaqui Colorado/*Tovomita sp*		Clusiaceae
71.	cinamillo	*Oenocarpus sp*	Arecaceae
72.	conta	*Attalea t.*	Arecaceae
73.	copaiba	*Copaifera p.*	Fabaceae
74.	copal	*Copaifera r.*	Burseraceae
75.	cordoncillo	*Piper sp*	Piperacae
76.	cumaceba	*Swartzia p.*	Fabaceae
77.	cumala	*Virola s.*	Myristicaceae
78.	espintana	*Anaxagorea b.*	Annonaceae
79.	huacamayo caspi/*Simira t.*		Rubiaceae
80.	huacapu	*Minquartia g.*	Olacaceae
81.	huacrapona	*Iriartea d.*	Arecaceae
82.	huayra caspi rojo/*Brosimum g.*		Moraceae

83.	huayruro	*Erythrina p.*	Fabaceae
84.	huicungo	*Astrocaryum h.*	Arecaceae
85.	huimba	*Ceiba s.*	Bombacaceae
86.	huitillo	*Alibertia sp.*	Rubiaceae
87.	hungurahuai	*Jessenia b.*	Arecaceae
88.	icoja	*Unonopsis sp*	Annonaceae
89.	irapay	*Lepidocaryum t.*	Arecacae
90.	lacre	*Tetragastris p.*	Burseraceae
91.	leche huayo/caspi/*Couma m.*		Apocynaceae
92.	llausa kiro	*Apeiba a.*	Tiliaceae
93.	loro micuna	*Macoubea g.*	Apocynaceae
94.	macambillo	*Theobroma s.*	Sterculiaceae
95.	machimango	*Eschweileira sp*	Lecythidaceae
96.	manchinga	*Brosimum p.*	Moraceae
97.	mari mari	*Urera b.*	Urticaceae
98.	marupa'	*Simarouba a.*	Simaroubaceae
99.	muena	*Licaria c.*	Lauraceae
100.	oje'	*Ficus i.*	Moraceae
101.	palillo	*Campomanesia l.*	Myrtaceae
102.	palisangre	*Brosimum r.*	Moraceae
103.	papelillo	*Bouganvillea s.*	Nyctaginaceae
104.	pashaco	*Macrolobium a.*	Fabaceae
105.	paujil caspi	*Crax sp*	Unidentified
106.	pona	*Socratea e.*	Arecaceae
107.	pucalupuna/arbol del tambor/*Cavanillesia u.* Bombacaceae		
108.	pucuna caspi	*Iryanthera t.*	Myristicaceae
109.	quillo sisa	*Erisma c.*	Vochysiaceae
110.	quillobordon	*Aspidosperma s.*	Apocynaceae
111.	quinilla	*Chrysophyllum n.*	Sapotaceae
112.	remo caspi	*Aspidosperma n.*	Apocynaceae
113.	renaco	*Ficus sp*	Moraceae
114.	requia	*Carapa g.*	Meliaceae
115.	shapaja	*Orbignya p.*	Arecaceae
116.	shebon	*Scheelea b.*	Arecaceae
117.	shimbillo	*Inga sp*	Fabaceae
118.	shiringa	*Hevea g.*	Euphorbiaceae
119.	shiringa masha	*Micrandra s.*	Euphorbiaceae
120.	shiringa rana	*Sapium m.*	Euphorbiaceae
121.	shiuhuaco	*Dipteryx sp*	Fabaceae
122.	supay ocote	*Couepia c.*	Chrysobalanecae
123.	tahauri negro	*Tabebuia c.*	Bignoniaceae
124.	tamamuri	Brosimum a.	Moraceae
125.	tamara	*Leonia g.*	Violaceae
126.	tamarillo	*Gleospermum s.*	Violaceae
127.	tangarana	*Triplaris s.*	Polygonaceae
128.	topillo	*Croton p.*	Euphorbiaceae

129.	tortuga caspi	*Duguetia sp*	Annonaceae
130.	trompo huayo	*Lacistema a.*	Flacourtiaceae
131.	ubos	*Spondias m.*	Anacardiaceae
132.	ucho caspi	*Casearia s.*	Flacourtiaceae
133.	uchosanango	*Tabernaemontana sp*	Apocynaceae
134.	virote huayo	*Talisia sp*	Sapindaceae
135.	wira caspi	*Tapirira g.*	Anacardiaceae
136.	yahuarhuayo blanco/	*Mucoa* d.	Apocynaceae
137.	yana vara/uschaquiro/	*Aparisthmium c.*	Euphorbiaceae
138.	yarina	*Phytelephas m.*	Arecaceae
139.	yerno prueba	*Chimarrhis w.*	Rubiaceae
140.	yumanasa	*Muntingia c.*	Eleaocarpaceae
141.	yutubanco	*Heisteria i.*	Olaceaceae

Summary of the survey

Terrafirme plant distribution provides the following information:

- One hundred and forty one (141) different plant species have been identified with the scientific and vernacular name. Thirty-eight (38) plants have been identified only with vernacular name. Total number of species is 141+38=179.
- Fifty (50) different families have been identified.
- The total number of individuals in all twelve quadrats is 600.
- The average number of individuals per quadrat is about 50.
- The total number of *Capirona d.* in all the twelve plots is 13.
- The average number of *Capirona d.* per quadrat is 1.08%.
- The percentage of *Capirona d.* among all the individuals is 2.16%.

CHAPTER 5

Varzea shamans' interviews

Part 1: Method of research.

The books by Martin (1995, #84) and Alexiades (1996, #85) provide ample guidelines for ethnobotanical investigation. While the methodology for collecting information can be handled by researchers in various ways and the protocol in selecting informants has been discussed by Kemp & Allen (1984), Berlin (1992), Boster (1986), and Posey (1992), ethical issues, on the contrary, impose limitations when an investigation is carried out.

The relationship with informants and other community members becomes a paramount issue when a researcher is doing fieldwork and compensation and protection of intellectual property rights must be observed. Several researchers have addressed ethical issues and among them are Cunningham (1996), Boom (1990), and Posey (1991).

Considerable care was taken to carry out this research in the appropriate fashion. Compensation was negotiated in advance for any service and an amount was established by an appropriate *liaison* with knowledge of the research topics and local culture as well as the objective and requirements of the researcher. Under this guidance interviews with shamans were arranged in the most comfortable environments according to schedules discussed with them to avoid interfering with their daily activities. Therefore interviews were mostly conducted after dinner when shamans have more free time to be engaged in conversation. An informant was part of the entire process to facilitate the understanding of points where the meaning of the Quechua language may be difficult to be absorbed. Compensation was granted as monetary remuneration and no objection was made regardless of whether the money provided was local or U.S. dollar.

Particular attention was given to the interview to avoid preconceived ideas, stereotypes or other forms of bias that could interfere with objective information (Werner and Shoeple, 1987, #92). No specific plan was prepared for the protocol interview. The *liaison* informant contacted shamans in advance to ascertain their availability and willingness to participate in this research. Shamans were notified of the purpose of this interview (university thesis) and the subject (medicinal plants and ayahuasca). Shamans were asked to talk about medicinal plants and ayahuasca, but no pre-established question was used. Therefore, an open question such as "what do you know about this plant?" or an indirect question such as " Is this plant good for construction only?" was not considered as part of the interview. Also direct questions such as "what does this plant cure?" or closed question such as "is this plant an antirheumatic?" was used sparingly or not at all.

The *liaison* informant facilitated the conversation that was recorded - after permission was granted - on tape. The interview was conducted in an informal or semistructured fashion, where the shaman, even if aware of the situation, could communicate in complete freedom to the interviewer. No pressure was used to induce the shamans to talk more than what they would have been inclined to do. Sometimes the interview was conducted in a circle with several community members and among them more than one shaman was present. In one case a shaman that originally had declined to participate, later changed his mind and came back for an interview.

Data was registered manually on paper and with a tape recorder. The names of the plants were registered using the vernacular name (Quechua language) and later were translated into the binomial nomenclature. In addition, notes were reviewed with particular respect to the linguistic meaning of words that - despite the fact that translation was straightforward - nevertheless it could generate discrepancy and confusion when the same word has a different meaning in different languages and culture.

It is worthy to introduce a few major concepts related to the context of the information collected from the shamans' interviews in order to clarify the meaning of some words that may appear in their conversation. Shamanism is a word with large latitude of understanding and interpretation.

According to Eliade (1964), who extensively wrote about shamanism the best definition to assign to this word is "the technique of ecstasy". Langdon (1992) indicates that Eliade's work is the first attempt to combine several ethnographic sources to describe shamanism by which the soul is believed to leave the body and ascend to the sky or descend to the underworld.

The connection between reality and the supernatural is a key element in understanding the activity of shamans. The multiple functions of community leaders that was assigned to shamans in the past appears at the present time to be more limited to the healing purpose. However the importance of being connected to the supernatural remains essential. Sullivan (1988) in his study of orientation to meaning in

South American religions indicates that present shamanism is a symbolic imitation, repetition, or approximation of the original one. Luna (1984) indicated that in the Iquitos area *mestizo* (mixture of Indian and white) shamans used to refer to themselves as "vegetalistas" since they derived their knowledge and personal power from plants. Many indigenous groups of the Upper Amazon claim to acquire their healing skills and power from certain "plant-teachers" -often psychoactive - believed to have a "mother" (madre). Therefore they believe that the knowledge comes from the plants themselves and the senior shaman is only a mediator that transmits the information protecting the novice from the attack of sorcerers or evil spirits and indicating the proper conditions so transmission is possible.

Western culture attributes physical causes to diseases, whether or not clearly diagnosed, while native folklore attributes it to supernatural causes. In this context the function of the shaman is to have access to the supernatural world to know about it and provide a cure for the patients.

Luna in fact stated that illness is generally conceived as the product of an animated source, either human or spiritual and is generated by intrusion of pathogenic phenomena, soul loss, contamination or breaching of a taboo. He also stated that it is possible that shamans indicate concepts that may appear confusing for the listeners but this area is quite blurred and discrepancies may occur. It is not very clear, for example, if both patient and shaman use the same drink at the same time to facilitate the healing process.

Luna indicated also that some plants as well as ayahuasca belong to a group of plants called "doctor" *(doctores)*.

It should also be noted that the shamans who were interviewed quite often use the word "*purga*" which in English means to purge (to clear, cleanse, purify). The researcher has observed that drinking ayahuasca can induce either vomiting or diarrhea and probably the laxative effect should be associated to the word purga.

Part 2 - Observations

Shaman #1: Don Santiago

Don Santiago says that there is a difference between a *purga* and a medicinal plant. A medicinal plant is used to cure disease and a *purga* is used for teaching, that is "the mothers and the spirits" of the the "purgas" that tells what medicine will cure. Therefore, before you cure the sick person you must take a *purga* to know what medicine must be used to cure the sick person.

1. *Artocarpus altilis* (Park.) Fosb., Moraceae (pandisho or pan del arbol)- It is a medicinal plant used against hernias. Resin is used raw mixed with aguardiente: half a bottle of aguardiente and half a bottle of resin. No diet is required.
2. *Aspidosperma excelsum*, Apocynaceae (remocaspi)- The bark is cooked and used for rheumatism. No diet is required.
3. *Banisteriopsis caapii* (ayahuasca), Malpighiaceae. It is used to prepare the ayahuasca drink as follows: *Banisteriopsis caapii* (ayahuasca) and *Psychotria viridis* (chacruna) are chopped. Three hundred and fifty (350) leaves of *Psychotria* are used. Before the two plants are cooked pure tobacco (mapacho) is spread on the pot. Later

on *Psychotria viridis* is put in the pot and *Banisteriopsis caapii* on top of it. This procedure is repeated three times. The mixture is cooked from 7 am to 2 pm and then later is cooked for two more hours. This drink is taken the same day it is prepared. There is no diet. It is possible to mix ayahuasca with *Calliandra angustifolia* (bobinsana) or with bijahuillo (unidentified). No diet is required.

4. *Bombax munguba,* Bombacaceae (punga)- The bark only is used from the form called "*colorada*". It is used against arthritis. It is prepared with aguardiente (liquor) and *Swartzia sp.* (cumaceba). No diet is required.
5. *Brosimum guianensis,* (Aubl.) Huber., Moraceae (huayracaspi). It is used for terminal cancer. Resin is put on the affected area or is taken as drink. No diet is required.
6. *Brugmansia sp.,* Solaneceae (Toe')- It is a strong "purga" prepared with seven leaves mixed with leaves of *Mansoa alliacea,* Bignoniaceae (ajos sacha) and *Petivera alliacea,* L., Phytolaccaceae (mucura) and *Citrus limon, Rutaceae* (lemon). Diet: one day without salt. It is also used for rituals.

7. *Brunfelsia grandiflora subsp. Shultesii,* Solanaceae (chiricsanango). It is taken raw as resin or vine for cold. Eight days of diet is required.

8. *Calliandra angustifolia,* Leguminoseae (bobinsana). Leaves are cooked and the preparation is taken as a drink for cold. It is a strong "purga". Diet is observed as follows: no salt for eight days and no butter for a month.

9. *Calycophyllum spruceanum,* Rubiaceae (capirona del bajo). Only the bark of capirona negra is used. Only the part of the bark that faces sunrise is taken. It is cooked without anybody looking at it. Diet is observed for 8 days, and during this time it is prohibited to take salts and fats but you can take selected fish such as *Prochilodus nigricans* (boquichico), *sardine* (sardina), *Plagioscion auratus,* and *P. squamosissimum* (corbina). It is used also to cure wounds. There are three "forms": black, yellow and white. Only the yellow one is used. It can also be used raw.

10. *Citrus limon,* (L.) Burm., Rutaceae (limon); It is used mixed with *Brugmansia* (toe').

11. *Clidemia hirt,* (L.) D. Don., Melastomataceae (mullaca). It is used for the lungs. The complete root is

cooked and is taken as a drink (agua del tiempo). No diet is required.

12. *Clusia rosea,* Clusiaceae (renaquilla)- There are two types of preparation: cooked and raw. When cooked it is used against hernias, when raw it is used against pain of the reproductive organs (mal del vientre de la mujer). Diet must be observed for three days.

13. *Dieffenbachia sp.,* Araceae (patiquina)-It is used mixed with *Hura c.* (catahua).

14. *Eleuterine bulbosa,* (Miller) Urb., Iridaceae (yahuar piri piri)- It is used mixed with *Erythrina* (huayruro).

15. *Erythrina spp.,* Fabaceae (huayruro). Black (negro) and red (rojo) are used. They are "*purgas medicinales*" and are used according to illness, such as strong pain. Only the bark is used (cooked) and specifically for hemorrhage. Plant material is cooked with a soup of *Cyperus sp.,* Cyperaceae (yuara piripiri) till it becomes completely red. No diet is required.

16. *Himatanthus sucuuba,* (Spruce) Woods, Apocynaceae (bellacocaspi)- The resin is mixed and put as a cream on the affected area or tumor. It can be used raw. No diet is required.

17. *Hura crepitans,* L., Euphorbiaceae (catahua)- It is mainly used against misfortune. (mal beneficado

comunemente llamado mal de gente). Only the bark is used and it is cooked in a pan. It is mixed with *Dieffenbachia sp.* (patiquina negra) and three well cooked aquatic plants called *huamas.* There are two types of *Hura crepitans:* black (negra) and white (blanca). Only the black is used. No diet is required.

18. *Mansoa alliacea,* Bignoniaceae (ajos sacha). It is a medicinal plant used for colds and flu. It is prepared as follows: leaves are chopped and then some lemon is spread on top. It is used against misfortune (serve para votar la saladera, i.e. mala suerte). The root is cooked and is used as a hot drink for rheumatism. The trunk also can be used. Eight days diet is required: no salt or fat is allowed.

19. *Maquira coriacea,* (Karst.) C.Brg., Moraceae (capinuri)- Only the raw resin is used for tumors, wounds and also for pain of the reproductive organs (vientre). It is used with aged wine or aguardiente. No diet is required.

20. *Maytenus macrocarpa,* (R. & P.) Briq. Celestraceae (chuchuhuasa). Bark or trunk is taken. It is refined and given to handicapped people. It is cooked with honeybee. Diet: one month without butter "de *concho*" (residuo de la bebida) and eight days without salt.

21. *Petivera alliacea,* L., Phytolaccaceae (mucura). It is used mixed with *Brugmansia* (toe').

22. *Remijia peruviana,* Standl. Rubiaceae (cullachaqui caspi). Raw bark or part of the trunk is used after it is cooked. It is taken pure or with *Heistieria pallida* (chuchuhuasca). It is used for serious illness (enfermedades matinees). Diet is required.

23. *Swartzia polyphylla,* A. DC. Fabaceae (cumaceba). It is used mixed with *Pseudobombax* (punga).

24. *Tabernaemontana spp.*, Apocynaceae (ucho sanango). Raw resin or vine is used as a tonic to fortify the body. Diet is required.

25. *Triplaris surinamensis,* Polygonaceae (tangarana). There are two types: white (blanca) and black (negra). The bark is chopped and cooked. It is used for arthritis. It is chopped with *Swartia sp.* (cumaceba) *and Psycothria viridis* (chacruna). No diet is required.

NOTE: Don Santiago says that both *Banisteriopsis c.* (ayahuasca) and *Psychotria v.* (chacruna) are not found in varzea because this area affected by flood does not allow the growth of these two plants.

Table 9

Summary of all the plants used by Don Santiago

Plant name	part-	prep	use	initials
1. *Artocarpus a.*	resin	raw	hernia	SS
2. *Aspidosperma e.*	bark	cook	rheumatism	SS
3. *Banisteriopsis c.*	bark	cook	hallucination	SS
4. *Bombax m.*	bark	raw	arthritis	SS
5. *Brosinum g.*	resin	raw	term. cancer	SS
6. *Brugmansia sp.*	leaf	chop	hallucination	SS
7. *Brumfelsia g.*	resin	raw	cold	SS
8. *Calliandra a.*	leaf	cook/raw	cold	SS
9. *Calychophyllum s.*	bark	cook/raw	wounds	SS
10. *Citrus l.*	fruit	juice	hallucination	SS
11. *Clidemia h.*	root	cook	lungs	SS
12. *Clusia r.*	resin	cook/raw	hernia	SS
			fem.repr.org	SS
13. *Dieffenbachia sp.*	/leaf	cook	hallucination	SS
14. *Eleuterine b.*	bark	cook	pain killer	SS
			hemorrage	SS
15. *Erythrina sp.*	fruit	cook	pain killer	SS
			hemorrhage	SS
16. *Himatanthus s.*	resin	raw	tumor	SS
17. *Hura c.*	bark	cook	hallucination	SS
18. *Mansoa a.*	leaf	cook	hallucination	SS
	root	chop	rheumatism	SS
19. *Maquira c.*	resin	raw	tumor/wound	SS
			fem.repr.org.	SS
20. *Maytenus m.*	bark/trunk	cook	multiple use	SS
21. *Petiveria a.*	leaf	chop	hallucination	SS
22. *Remijia p.*	bark/trunk	raw	cold	SS
23. *Swartzia p.*	bark	raw	arthritis	SS
24. *Tabernaemontana sp.*	/resin/	raw	tonic	SS
	vine	raw	tonic	SS
25. *Triplaris s.*	bark	cook	arthritis	SS

Cross reference with vernacular name listed first

vernacular name	Plant name	Family name
1. ajos sacha	*Mansoa a.*	Bignoniaceae
2. ayahuasca	*Banisteriopsis c.*	Malpighiaceae
3. bellacocaspi	*Himatanthus s.*	Apocynaceae

4. bobinsana	*Calliandra a.*	Leguminosae
5. capinuri	*Maquira c.*	Moraceae
6. capirona	*Calychophyllum s.*	Rubiaceae
7. catahua	*Hura c.*	Euphorbiacae
8. chiricsanango	*Brumfelsia g.*	Solonaceae
9. chuchuhuasa	*Maytenus m.*	Celestraceae
10. chullachaquicaspi	*Remijia p.*	Rubiaceae
11. cumaceba	*Swartzia sp.*	Fabaceae
12. huayracaspi	*Brosinum g.*	Moraceae
13. huayruro	*Erythrina p.*	Fabaceae
14. lemon	*Citrus l.*	Rutaceae
15. mucura	*Petiveria a.*	Phytolaccaceae
16. mullaca	*Clidemia h.*	Elastomataceae
17. pandishol	*Artocarpus a.*	Moraceae
18. patiquina	*Dieffenbachia sp.*	Aracaceae
19. punga	*Bombax m.*	Bombacaceae
20. remocaspi	*Aspidosperma e.*	Apocynaceae
21. renaquilla	*Clusia r.*	Clusiaceae
22. tangarana	*Triplaris s.*	Polygonaceae
23. toe'	*Brugmansia a.*	Solonaceae
24. uchosanango	*Tabernaemontana sp*	Apocynaceae
25. yahuarpiripiri	*Eleuterine b.*	Iridaceae

Shaman #2: Don Alipio

1. *Banisteriopsis caapi,* Malpighiaceae (ayahuasca) is mixed with *Psychothria v.* (chacruna) *Nicotiana t.,* (tobacco) *and Zantoxyllum sp.* (alcanfor). It is prepared from 7 am to 2 pm and then is filtered and cooked again. It is drunk in a small plate, which has been painted with a substance called "*cumaca*". It is used for hallucination and it is a very strong "purga" that teaches medicine. It is used for the stomach. No diet is required.
2. *Calychophyllum spruceanum,* Rubiaceae (capirona del bajo) is used for colds and is mixed with the bark of seven other plants. Among them: *Tabebuia sp.,* Bignoniaceae (tahuari) and turare (unidentified). It is used with *Hymenaea sp.,* Fabaceae (azucarhuayo) and aguardiente to cure pellagra. The bark is scraped and it is taken as drink. "*Para el patico*" it is rubbed on the tongue. It is used to cure wounds. No diet is required.
3. *Ficus sp.*, Moraceae (renaco). There are three types: 1) romel renaco, 2) millo renaco 3) renaquilla. They are prepared together: they are cooked until they get "color" and then mixed with *Heisteria p.* (chuchuhuasa) and some aguardiente. This preparation is put in separate bottles so it is well preserved. It is used for pain of the

reproductive organs (para el vientre) and later that part of the body is washed with *Heisteria p.* (chuchuhuasa). No diet is required.

4. *Heistria pallida,* Olacaceae (chuchuhuasa). It is used mixed with *Clusia r.* (renaquilla). No diet is required.
5. *Hymenaea sp.,* Fabaceae (azucarhuayo). It is used mixed with *Calycophyllum s.* (capirona). No diet is required.
6. *Mansoa alliacea,* Bignoniaceae *(Ajos sacha)*. It is used for cold and against "bad luck". No diet is required.
7. *Minquartia guianensis,* Olacaceae (Huacapu). It is used as purgative for swelling. It is prepared at dawn. The surface of the bark is removed and then is chopped in warm water and then filtered again. You can drink two cups and then after 10 minutes drink warm water. Then a banana is cleaned and fried (no burning, no scraping but only chopping). It is taken without sugar. Diet is observed as follows: no garlic, no butter.
8. *Nicotiana sp.,* Solonaceae (Tabaco)- It is a strong *"purga"*. Tobacco is chopped several times and then is mixed with *Thevetia peruviana,* Apocynaceae (camalonga) and *Zanthoxyllum sp.,* Rutaceae (alcanpor) and it is slowly sipped. No diet is required.

9. *Tabebuia sp.,* Bignonaceae (tahuari). The drink is for colds and for generic pain of the body. No diet is required.

10. *Thevetia peruviana,* Apocynaceae (camalonga). It is used mixed with *Banisteriopsis c.* (ayahuasca mixture) and *Nicotiana t.* (tabaco). No diet is required.

11. *Zanthoxylum sp.,* Rutaceae (alcanfor). It is used mixed with *Banisteriopsis sp.* (ayahuasca mixture). No diet is required.

Table 10

Summary of all the plants used by Don Alipio

Plant name	part-	prep	use	initials
1. *Banisteriopsis c.*	bark	cook	hallucination	CG
			stomach	CG
2. *Calychophyllum s.*	bark	cook	pellagra	CG
3. *Ficus sp.*	resin	cook	fem.repr.org.	CG
4. *Heisteria p.*	bark	cook	fem.repr.org.	CG
5. *Hymenaea sp.*	bark	cook	pellagra	CG
6. *Mansoa a.*	leaf	raw	cold/bad luck	CG
	root	cook		CG
7. *Minquartia g.*	bark	cook		CG
8. *Nicotiana t.*	leaf	cook	hallucination	CG
			stomach	CG
9. *Tabebuia sp.*	bark	cook	pellagra	CG
10. *Thevetia p.*	leaf	raw	hallucination	CG
			stomach	CG
11. *Zanthoxyllum sp.*/leaf		cook	hallucination	CG
			stomach	CG

Cross reference with vernacular name listed first

vernacular name	Plant name	Family name
1. ajossacha	*Mansoa a.*	Bignoniaceae
2. alcanpor	*Zanthoxyllum sp*	Rutaceae
3. ayahuasca	*Banisteriopsis c.*	Malpighiaceae
4. azucarhuayo	*Hymenaea sp*	Fabaceae
5. camalonga	*Thevetia p.*	Apocynaceae
6. capirona bajo	*Calychophyllum s.*	Rubiaceae
7. chuchuhuasa	*Heisteria p.*	Olacaceae
8. huacapu	*Minquartia g.*	Olacaceae
9. renaco	*Ficus sp*	Moraceae
10. tabaco	*Nicotiana t.*	Solanacea
11. tahuari	*Tabebuia sp.*	Bignoniaceae

Shaman #3 - Don Arturo

Arturo says that to know more about this subject it is necessary to take a "*purga*" that is used to teach. A medicinal plant is used to cure the sick person. When you take a *purga* you get dizziness; all the spirits of that plant induce you to listen to the song called *icaro*. Songs can cure different types of illness. Each *purga* has a different type of song.

1. *Banisperiopsis caapi,* Malpighiaceae (ayahuasca) to get strength is mixed with *Psychothria v.* (chacruna) in relation to the condition of the patient. It is mixed also with *Couroupita guainensis,* Lecythidiaceae (ayahuma) and *Theobroma cacao,* Sterculaceae (cacao) to make the ayahuasca mixture stronger. The bark of each plant, according to the knowledge of the shamans, is mixed with ayahuasca. The mixture is cooked for 12 hours and then is cooled and then cooked again for 15 minutes. During this time it is mixed with *Nicotiana tabacum* (tobaco), then is cooled again and finally this medicine is ready for use. It may be used for different purposes and also a song (icaro) can be added. The quantity is measured in a small container and finally the drink is taken. Five minutes later it is possible to experience pain: First there can

be an ear disturbance, and then you can see, like in a movie, by using concentration, everything that you try to see. For some reason, if you want to see your relatives, it is mixed with *Brugmansia sp.,* Solonaceae (toe'). It is used to see or to talk to relatives you personally cannot talk to. No diet is required.

2. *Brugmansia sp.,* Solanaceae (toe') is used mixed with *Mansoa alliacea* (ajos sacha). No diet is required.
3. *Calycophyllum spruceanum,* Rubiaceae (capirona del bajo). It is a medicinal plant and not a purga. No diet is required.
4. *Couroupita guainensis,* Lecythidiaceae *(ayahuma).* It is used mixed with *Ayahuasca mixture.* No diet is required.
5. *Mansoa alliacea,* Bignoniaceae (ajos sacha). It is mixed with *Petiveria alliacea* Phytolaccaceae (mucura) and *Ocimum micranthum* Lamiaceae (albahaca) and *Brugmansia sp.* Solaneceae (toe'). The mixture is used for treatment of different diseases such as cold, impotency, arthritis, and stomach burn and against bad luck. This plant is prepared with water. All these plants are put in a container and the leaves are chopped; later *Nicotiana t.* *(*pure tobacco, *mapacho)* is added and put in another container to be used for healing. No diet is required.

6. *Nicotiana tabacum,* L., Solanaceae *(*pure tobacco, *mapacho)*. It is used mixed with *Mansoa alliacea* (ajos sacha) No diet is required.
7. *Ocimum micranthum,* Lamiaceae (albahaca). It is used mixed with *Mansoa alliacea* (ajos sacha). No diet is required.
8. *Petiveria alliacea,* Phytolaccaceae (mucura). It is used mixed with *Mansoa alliacea* (ajos sacha). No diet is required.
9. *Saccharum officinarum,* Poaceae (cana da azucar, sugarcane*)* derivatives (miel de abeja and acid of miel de abeja*) are* for elderly people with calcium deficiency and is taken every morning for 15 to 20 days, until they feel better. It is also recommended for male impotency. No diet is required.
10. *Swartzia polyphylla,* Fabaceae (cumaceba). It is for elderly people with calcium deficiency and is taken every morning for 15 to 20 days until they feel better. It is also recommended for male impotency. No diet is required.
11. *Theobroma cacao,* Sterculaceae (cacao). It is used mixed with the ayahuasca mixture. No diet is required.
12. *Tynnanthus panurensis,* (Bur.) Sandwich., Bignoniaceae (Clavohuasca). It is for elderly people with calcium deficiency and it is taken every morning for 15 to 20

days, until they feel better. It is also recommended for male impotency. No diet is required.

13. *Zingiber officinalis Roscoe* Zingiberaceae (ajengibre or gengibre). For old people with calcium deficiency every morning for 15 to 20 days, until they feel better. It also recommended for male impotency. No diet is required.

(Note: Unidentified (?) Murare It is for elderly people with calcium deficiency and it is taken every morning for 15 to 20 days until they feel better. It is also recommended for male impotency. No diet is required.

Table 11

Summary of all the plants used by Don Arturo

Plant name	part-	prep	use	initials
1. *Banisteriopsis c.*	bark	cook	hallucination	SP
2. *Brugmansia sp.*	leaf	cook	hallucination	SP
3. *Couroupita g.*	bark	cook	hallucination	SP
4. *Mansoa a.*	leaf	raw	cold/impotency	SP
			arthritis	SP
			stomach/bad luck	SP
5. *Nicotiana t.*	leaf	cook	hallucination	SP
			multiple use	SP
6. *Ocimum m.*	leaf	cook	multiple use	SP
7. *Petiveria a.*	leaf	cook	multiple use	SP
8. *Psychothria v.*	leaf	cook	hallucination	SP
9. *Saccharum o.*	fruit	cook	calcium deficit	SP
			male impotency	SP
10. *Swartzia p.*	bark	cook	calcium deficit	SP
			male impotency	SP
11. *Theobroma c.*	leaf	cook	hallucination	SP
12. *Tynnanthus p.*	bark	cook	calcium deficit	SP
			male impotency	SP
13. *Zingiber o.*	fruit	cook	calcium deficit	SP
			male impotency	

Cross refernce with vernacular name listed first

vernacular name	Plant name	Family
1. ayahuasca	*Banisteriopsis c.*	Malpighiaceae
2. toe'	*Brugmansia sp.*	Solaneceae
3. ayahuma	*Couroupita g.*	Lecythidaceae
4. ajos sacha	*Mansoa a.*	Bignoniaceae
5. tabaco	*Nicotiana t.*	Solanaceae
6. albahaca	*Ocimum sp*	Lamiaceae
7. mucura	*Petiveria a.*	Phytolaccaceae
8. chacruna	*Psychothria v.*	Rubiaceae
9. miel de abeja	*Saccharum o.*	Poaceae
10. cumaceba	*Swartzia p.*	Fabaceae
11. cacao	*Theobroma c.*	Sterculaceae
12. clavohuasca	*Tynnanthus p.*	Bignoniaceae
13. ajengibre	*Zingiber o.*	Zingiberaceae

Shaman #4 - Don Carlos Manuel

1. *Alchornea castaneifolia,* Euphorbiaceae (Hiporuro). It is very strong and is taken pure because it may cause headache and vomiting. The bark is scraped and the collected material is taken and filtered with fabric (with "glandula de wingo maduro"); later it is mixed and then cooled. It is used for colds. No diet is required.
2. *Aspidosperma excelsum,* Apocynaceae (remocaspi)- The bark is removed from the side of the plant that is facing sunrise and sunset. Also two roots are taken, washed and cooked and used to treat muscle disease. No diet is required.
3. *Banisteripsis caapi,* Malpighiaceae (ayahuasca). It is used for the ayahuasca mixture. It is prepared where nobody can see it and where nobody urinates. Ayahuasca is mixed with *perfume* to increase the strength of the healing process. People can drink it two or three times and after they take water. Do not drink this mixture (purga) in excess. No diet is required.
4. *Bixa orellana,* Bixaceae (achote rojo). It is used mixed with *Mauritia flexuosa,* L. f., Arecacae (aguaje). No diet is required.

5. *Calycophyllum spruceanum,* Rubiaceae (capirona del bajo). It is stronger than the other straight trees called "*palos*". It is more efficient than *Iriartea deltoidea* Arecaceae (huacaprona). There is more water in the bark than inside the tree. It is prepared with water accumulated in the cut stem of *Musa,* Musaceae fruit (agua del tiempo del platano manzana). It is used for diarrhea. For chronic diarrhea it is dried and mixed with two capsules of a chemical substance called "quemicitina". No diet is required.

6. *Canna indica,* Cannaceae (achira). It is used mixed with *Mauritia flexuosa,* L. f., Arecacae (aguaje). No diet is required.

7. *Ceiba pentandra,* Bombacaceae (lupuna). The bark is removed from the side of the plant that is facing sunrise and sunset. Later pure tobacco is put on it from a cigar (mapacho) either lit or extinguished, so no "purga" will cause harm. No diet is required.

8. *Citrus paradisi,* MacFadyn, Rutaceae (toronja). The juice of four or five fruits is boiled and then is given to women who do not menstruate. The seeds of *toronja* are used in conjunction with the seeds of *Inga edulis,* Fabaceae (guaba) and they are either crushed or grated. No diet is required.

9. *Couroupita guaianensis,* Lecythidiaceae (ayahuma). It is used mixed with *Ficus sp.* (renaco). No diet is required.

10. *Ficus sp.,* Moraceae (renaco). There are three types: simple, renaquilla, yaco renaco. It is used for venereal diseases and it can be mixed with the fruit of *Couroupita guaianensis* (ayahuma) *and Genipa americana,* Rubiaceae (huito). It is squeezed to obtain half a liter of liquid and the fresh (not cooked) liquid is suspended on the roof of the house for eight days. It is used for headaches. No diet is required.

11. *Genipa americana,* Rubiaceae (huito). It is used and mixed with *Ficus sp.* (renaco). No diet is required.

12. *Inga edulis,* Fabaceae *(guaba)*. The seeds are used mixed with *Citrus l.* (toronja). No diet is required.

13. *Iriartea deltoidea,* Arecaceae (huacaprona). It is used mixed with *Mauritia flexuosa,* L. f., Arecacae (aguaje). No diet is required.

14. *Macrolobium acaciefolium,* (Benth) Benth., Fabaceae (pashaco). An extract from the bark is obtained in warm water so the "spirit" of the plant is not killed. The extract is used against misfortune (mala suerte). No diet is required.

15. *Mauritia flexuosa,* L. f., Arecacae (aguaje). It can induce sleepiness. Two or four roots are grated and

exposed to the sun for 3-4 hours until they become sort of a liquid like liquor. You must have faith in what you are doing. Before drinking this liquid is mixed with 10-15 seeds of *Bixa orellana*, Bixaceae (achiote rojo) and *Canna indica*, Cannaceae (achira) mixed with a chemical substance used as disinfectant called "creolina". (It should be drunk once only when the moon is green). It is mixed with *Otoba parvifolia*, Myristicaceae (aguajillo) or *Iriartea deltoidea*, Arecaceae (huacaprona) to cure swelling of the intestines. No diet is required.

16. *Maytenus sp.*, Celastraceae (chuchuhuasi). The bark is scraped and put in *aguardiente* (cane liquor). Ten drops of *Citrus l.*, Rutaceae (lemon) are added. It is used for arthritis. No diet is required.

17. *Musa sp.*, Musaceae (platano manzana). Water accumulated in the cut stem is used mixed with *Calycophyllum spruceanum*, Rubiaceae (capirona del bajo). No diet is required.

18. *Otoba parvifolia*, Myristicaceae (aguajillo). It is used mixed with *Mauritia flexuosa*, L. f., Arecacae (aguaje). No diet is required.

19. *Spondias mombin*, L., Anacardiaceae (Ubos). The bark is taken and cooked with some salt until it becomes thick and only the juice is put on wounds. To properly cure the

open wounds the bark is roasted ubtil it becomes coal. Later it is ground until it becomes a powder that is then put on the area affected. No diet is required.

Table 12

Summary of the plants used by Don Carlos Manuel

Plant name	part-	prep	use	initials
1. *Alchornea c.*	bark	cook/raw	cold	MS
2. *Aspidosperma e.*	bark	raw	muscle	MS
3. *Banisteriopsis c.*	bark	cook	hallucination	MS
4. *Bixa o.*	seed	cook	intestine	MS
5. *Calychophyllum s.*	bark	cook	diarrhea	MS
6. *Canna i.*	seed	cook	intestine	MS
7. *Ceiba p.*	bark	raw		MS
8. *Citrus l.*	juice	cook	menstruation	MS
9. *Couroupita g.*	fruit	crush	headache	MS
			sex. disease	MS
10. *Ficus sp.*	fruit	crush	headache	MS
			sex. Disease	MS
11. *Genipa a.*	fruit	crush	headache	MS
			sex. Disease	MS
12. *Inga e.*	seed	crush	menstruation	MS
13. *Iriartrea d.*	root	cook	intestine	MS
14. *Macrolobium a.*	bark	cook	bad luck	MS
15. *Mauritia f.*	root	cook	intestine	MS
16. *Maytemus sp.*	bark	raw	arthritis	MS
17. *Musa sp.*	fruit	raw	diarrhea	MS
18. *Otoba p.*	fruit	cook	intestine	MS
	seed	crush		MS
19. *Spondias m.*	bark	cook	wounds	MS

Cross refernce with vernacular name listed first

vernacular name	Plant name	Family
1. achiote rojo	*Bixa o.*	Bixaceae
2. achira	*Canna i.*	Cannaceae
3. aguaje	*Mauritia f.*	Aracaceae
4. aguajillo	*Otoba p.*	Myristicacae
5. ayahuasca	*Banisteriopsis c.*	Malpighiaceae
6. ayahuma	*Couroupita g.*	Lecythidiaceae
7. capirona bajo	*Calychophyllum s.*	Rubiaceae
8. chuchuhuasi	*Maytemus m.*	Celastracae
9. guaba	*Inga e.*	Fabaceae

10.	hipururo	*Alchornea c.*	Euphorbiaceae
11.	huacaprona	*Iriartrea d.*	Aracaceae
12.	huito	*Genipa a.*	Rubiaceae
13.	lupuna	*Ceiba p.*	Bombacaceae
14.	pashaco	*Macrolobium a.*	Fabaceae
15.	platano	*Musa spp.*	Mysaceae
16.	remocaspi	*Aspidosperma e.*	Apocynaceae
17.	renaco	*Ficus sp*	Moraceae
18.	toronja	*Citrus p.*	Rutaceae
19.	ubos	*Spondias m.*	Anacardiaceae

Shaman #5 - Don Ramirez

1. *Artocarpus altilis,* (Park.) Fosb., Moraceae (pandisho).It is used to prepare a "purga". It is used to cure hernias. It is mixed with half a bottle of aguardiente in a bottle of "milk of Artocarpus" (leche de pandisho). One small glass or cup is taken every day in the morning. Whatever is left is put on the affected area.
2. *Aspidosperma excelsum,* Benth., Apocynaceae (remocaspi). It is used to prepare a "purga". The bark is used to cure diseases that cannot be cured with other purgas.
3. *Banisteriopsis caapi,* Malpighiaceae (ayahuasca). It is prepared with *Psychothria viridis* (chacruna). *Banisteriopsis c.* is prepared before it is put in the pot; *Psychotria v.* is added later, and it is boiled for 3 hours. This purga is prepared in a quiet place where nobody can see how it is prepared. It is boiled for 8 hours and then is ready to drink. The ayahuasca mixture is drunk during the night in a silent place. There is no diet. Ayahuasca is taken mixed with *Calliandra a.* (bobinsana) and *Calathea lutea,* Marantaceae (bijao), which is a very special plant used to prepare this purga. Three hundred and fifty leaves of *Psychothria v.*

(chacruna) are collected and added to *Banisteriopsis c.* (ayahuasca). This purga is used to see something that people are interested to know. Under hallucination it is possible to see who threatens his own life, if somebody stole something, or some member of the family that is far away. It is similar to seeing a movie or having a vision during your altered state of consciousness (mareacion). When this occurs, whoever gives the drink must sing a song (icaro) until the effect is over. It is a pure purga used to clean your stomach.

4. *Bombax munguba,* Bombacaceae (punga) is used to prepare a "purga". It is a medicinal plant. The bark (punga colorada) is used to cure arthritis. It is prepared with *Swartzia sp.* (cumaceba) and aguardiente. The bark is scraped and the juice is taken, cooked, and preserved for 8 days in an attic. After 8 days it can be taken. This purga requires a special diet. There is a diet for each purga.

5. *Brosimum guianensis sp.,* Moraceae (huayracaspi). It is used to prepare a"purga". It is a medicinal plant to cure cancer and to cure women with reproductive organ problems. It is drunk pure and is put on the affected part of the body.

6. *Brugmansia sp.*, Solonaceae (toe'). It is used to prepare a "purga". Seven leaves are collected and mixed with the leaves of *Mansoa alliacea, Bignoniaceae* (ajos sacha), *Petiveria alliacea*, Phytolaccaceae (mucura) and *Citrus l.* (lemon) and is drunk. Diet is a half a day without salt. When taken pure it is possible to see, like in a movie, everything that happened in people's lives, or if somebody stole something or bad luck. It generates strong dizziness.
7. *Brunfelsia grandiflora* subs. Shultesii, Plowman, Solanaceae (chiricsanango). It is used to prepare a"purga". It is used to cure arthritis. The vine (soga) is prepared raw and scraped. The mixture is placed in a small plate with water and then is drunk.
8. *Calathea lutea,* (Aubl.) G.F.W. Meyer, Marantaceae (bijao). It is used mixed with *Banisteriopsis c.* (ayahuasca) and with *Hura crepitans,* L., Euphorbiaceae (catahua).
9. *Calliandra angustifolia,* Leguminoseae (bobinsana). It is used to prepare a "purga". It is taken after it is cooked and it is a strong juice. The drink is taken to make the sick person's body stronger. Diet must be observed for 8 days without salt and 30 days without butter for women. It is mixed with ayahuasca.

10. *Calycophyllum spruceanum*, Rubiaceae (capirona del bajo.). The bark is removed from the part facing sunrise and sunset. It is well chopped and cooked where nobody can see it. A diet without salt for 8 days is required. It is used to cure wounds, infection, burns, cut and to cure pellagra. *Calycophyllum* (capirona negra) is grated raw from the bark and is taken as a juice. There are three types of "Calycophyllum": 1) yellow, 2) white and 3) black.

11. *Citrus limon,* Rutaceae (lemon). It is used mixed with *Hura crepitans,* L. Euphorbiaceae (catahua) and *Brugmansia sp.,* Solonaceae (toe').

12. *Clidemia hirta,* (L.) D.Don., Melastomataceae (mullaca). It is used to prepare a "purga". It is used to cure tuberculosis. When the water is boiling the root is added and then the flame is lowered. When it is cooked it is given to the sick person and is taken as a substitution for water every day until the patient is cured.

13. *Dieffenbachia sp.,* Araceae (patiquina). It is used mixed with *Hura crepitans,* L., Euphorbiaceae (catahua).

14. *Eleutherine bulbosa,* Iridaceae *(yuaharupiripiri).* It is used mixed with *Erythrina peruviana,* Krukoff, Fabaceae (huayururo).

15. *Erythrina peruviana,* Krukoff, Fabaceae (huayururo). It is used to prepare a "purga". There are two types of this: black and red. It is used to cure all diseases in the body. It is a medicinal plant and a purga. The fruit is used to cure hemorrhages and it is cooked with the pulp of *Eleutherine bulbosa* (yahuar piripiri). It is well cooked and then is given to the sick person.

16. *Euterpe precatoria,* Arecaceae (huasai). It is used mixed with *Maquira coriacea* (Karst.) C.Berg. Moraceae (capinuri).

Ficus sp., Moraceae (renaco). It is used to prepare a"purga". There are two types of preparation: 1) cooked for 12 hours for people affected by hernias and 2) raw for women who have pain of the reproductive organs. They must take a bath after they take the drink. Diet must be observed for 8 days.

18. *Himantanhthus succuba,* (Spruce) Woods, Apocynaceae (bellacocaspi). It is used to prepare a "purga". It is a medicinal plant to cure cancer that appears as an abscess.

19. *Hura crepitans,* L. Euphorbiaceae (catahua). It is used to prepare a "purga". This plant is a purga and also a medicinal plant. It is used to cure witchcraft (brujeria). The bark is removed and is mixed with

Dieffenbachia sp. (patiquina) and three aquatic plants called "huamas", and it is well boiled and later put on the body. It can be prepared also with a local fish dish (patarasha) wrapped with the leaf of *Calathea lutea, Marantaceae* (bijao), Mansoa (ajos sacha), garlic, *Citrus l.* (lemon) or grapefruit and is put on the body. It is also used to cure cancer. *Hura crepitans* can be dangerous. Three species exist: white, yellow and black.

20. *Mansoa alliacea,* (Lam.) Gentry, Bignoniaceae (ajos sacha). It is used to prepare a "purga". Garlic from the forest is a "purga" that cures all diseases. Usually leaves and bark are used for arthritis. Leaves are chopped and some lemon is added. The root is used to cure rheumatism and a diet without salt must be observed for 8 days. It is also used mixed with *Hura c.* (catahua) and *Brugmansia sp.*, Solonaceae (toe').

21. *Maquira coriacea* (Karst.) C.Berg. Moraceae (capinuri) is used to prepare a "purga". It is a medicinal plant used for wounds and cancer in the reproductive organs of women. Preparation: this resin is prepared with aged wine or with a tonic (tonico saludable) for women and also is prepared with punga huasi (unidentified).

22. *Maytenus spp.,* Celastraceae (chuchuhuasi). It is used to prepare a "purga". It is used for handicapped people.

Diet is observed as follows: 8 days without salt and 30 days without butter and sex. It is used to cure broken bones, blood and venereal disease. It is prepared as follows: the bark of the tree is scraped and is cooked the entire day and then aguardiente is added.

23. *Petiveria alliacea*, Phytolaccaceae (mucura). It is used mixed with *Brugmansia sp.*, Solonaceae (toe').

24. *Psychothria viridis*, Rubiaceae (chacruna). It is used mixed with *Banisteriopsis c.* (ayahuasca).

25. *Remijia peruviana*, Rubiaceae (chullachaquicaspi). It is used to prepare a "purga". It is taken raw. The quantity is measured with a small plate. One drink is used to cure illness. A strong diet is required, and this purga is used for a long time. The purga itself says how long people are supposed to diet.

26. *Swartzia sp.*, Fabaceae (cumaceba). It is used mixed with *Bombax m.*, Bombacaceae (punga) and also with *Triplaris surinamensis*, Polygonaceae (tangarana).

27. *Tabernaemontana sp.*, Apocynaceae (ucho sanango). It is used to prepare a "purga". It is taken raw after the vine (soga) is scraped and mixed with water to fortify the body.

28. *Triplaris surinamensis*, Polygonaceae (tangarana) is used to prepare a "purga". It is used for arthritis. The

form indicated as black (tangarana negra) is mixed with the bark of *Swartzia sp.* (cumaceba). This medicine is boiled. It can be prepared raw with *Swartzia sp.* and honeybee and is given to the sick person.

Table 13

Summary of all the plants used by Don Ramirez

Plant name	part-	prep	use	initials
1. *Artocarpus a.*	resin	raw	hernia	RE
2. *Aspidosperma e.*	bark	cook	term illness	RE
3. *Banisteriopsis c.*	bark	cook	halluciation	RE
			stomach	RE
4. *Bombax m.*	bark	cook	hallucination	RE
			arthritis	RE
5. *Brosimum g.*	resin	cook	tumor	RE
			fem.repr.org	RE
6. *Brugmansia sp.*	leaf	cook	hallucination	RE
7. *Brunfelsia g.*	vine	raw	arthritis	RE
8. *Calathea l.*	leaf	cook	hallucination	RE
9. *Calliandra a.*	leaf	cook	cold	RE
10. *Calychophyllum sp.*	/bark	cook	wounds/infect.	RE
			pellagra	RE
11. *Citrus l.*	leaf	cook	hallucination	RE
12. *Clidemia h.*	root	cook	tuberculosis	RE
13. *Dieffenbachia sp.*	/bark	cook	cancer	RE
14. *Eleutherine b.*	fruit	cook	hemorrhage	RE
15. *Erythrina p.*	fruit	cook	hemorrhage	RE
16. *Euterpe p.*	resin	cook	tumor	RE
17. *Ficus sp.*	resin	cook	hernia	RE
		raw	fem.repr.org.	RE
18. *Himathanthus s.*	/resin	raw	tumor	RE
19. *Hura c.*	bark	cook	cancer	RE
			witchcraft	RE
20. *Mansoa a.*	leaf/bark	cook	arthritis	RE
21. *Maquira c.*	resin	cook	tumor	RE
			fem.repr.org	RE
22. *Maytenus sp.*	bark	cook	blood/bone	RE
			sex. Disease	RE
23. *Petiveria a.*	leaf	cook	hallucination	RE
24. *Psychotria v.*	leaf	cook	hallucination	RE
25. *Remijia p.*	bark	raw	hallucination	RE
26. *Swartzia sp*	bark	cook	arthritis	RE
27. *Tabernaemontana sp.*	vine	raw	fortify body	RE
28. *Triplaris s.*	bark	cook	arthritis	RE

Cross reference with vernacular name listed first

vernacular name	Plant name	Family
1. ajos sacha	*Mansoa a.*	Bignoniaceae
2. ayahuasca	*Banisteriopsis c.*	Malpighiaceae
3. bellacocaspi	*Himathanthus s.*	Apocynaceae
4. bijao	*Calathea l.*	Marantecaceae
5. bobinsana	*Calliandra a.*	Fabaceae
6. capinuri	*Maquira c.*	Moraceae
7. capirona	*Calychophyllum s.*	Rubiaceae
8. catahua	*Dieffenbachia sp.*	Araceae
9. catahua	*Hura c.*	Euphorbiaceae
10. chacruna	*Psychotria v.*	Rubiaceae
11. chuchuhuasi	*Maytenus sp*	Celastraceae
12. chullachaquicaspi	*Remijia p.*	Rubiaceae
13. ciricsanango	*Brunfelsia g.*	Solanaceae
14. cumaceba	*Swartzia p.*	Fabaceae
15. huasai	*Euterpe p.*	Arecaceae
16. huayracaspi	*Brosimum g.*	Moraceae
17. huayruro	*Erythrina p.*	Fabaceae
18. lemon	*Citrus l.*	Rutaceae
19. mucura	*Petiveria a.*	Phytolaccaceae
20. mullaca	*Clidemia h.*	Elastomataceae
21. pandisho	*Artocarpus a.*	Moraceae
22. punga	*Bombax m.*	Bombacacae
23. remocaspi	*Aspidosperma e.*	Apocynaceae
24. renaco	*Ficus sp*	Moraceae
25. tangarana	*Triplaris s.*	Polygonaceae
26. toe'	*Brugmansia sp*	Solanaceae
27. uchosanango	*Tabernaemontana sp*	Apocynaceae
28. yuaharupiripiri	*Eleutherine b.*	Iridaceae

Table 14

Summary of all the plants used by varzea shamans (It would include plants from areas other than varzea where quadrat study was done).

Plant name	part-	prep	use	initials
1. *Alchornea c.*	bark	cook/raw	cold	MS
2. *Artocarpus h.*	resin	raw	hernia	SS
Artocarpus h.	resin	raw	hernia	RE
3. *Aspidosperma e.*	bark	cook	rheumatism	SS
Aspidosperma e.	bark	cook	term.illness	RE
Aspidosperma e.	bark	raw	muscle	MS
4. *Banisteriopsis c.*	bark	cook	hallucination	CG
			stomach	CG
Banisteriopsis c.	bark	cook	hallucination	SP
Banisteriopsis c.	bark	cook	hallucination	RE
			stomach	RE
Banisteriopsis c.	bark	cook	hallucination	SS
Banisteriopsis c.	bark	cook	hallucination	MS
5. *Bixa o.*	seed	cook	intestine	MS
6. *Bombax m.*	bark	cook	hallucination	RE
			arthritis	RE
Bombax m.	bark	raw	arthritis	SS
7. *Brosimum g.*	resin	cook	tumor	RE
			fem.repr.org	RE
Brosinum g.	resin	raw	termin. cancer	SS
8. *Brugmansia sp.*	leaf	chop	hallucination	SS
Brugmansia sp.	leaf	cook	hallucination	SP
Brugmansia sp.	leaf	cook	hallucination	RE
9. *Brumfelsia g.*	resin/vine	raw	cold	SS
Brunfelsia g.	vine	raw	arthritis	RE
10. *Calathea l.*	leaf	cook	hallucination	RE
11. *Calliandra l.*	leaf	cook/raw	cold	SS
Calliandra l.	leaf	cook	cold	RE
12. *Calychophyllum s.*	/bark	cook	pellagra	CG
Calychophyllum.s.	/bark	cook	diarrhea	MS
Calychophyllum s.	/bark	cook	wounds	RE
			pellagra	RE
			infection	RE
Calychophyllum s.	/bark	cook/raw	wounds	SS
13. *Canna i.*	seed	cook	intestine	MS
14. *Ceiba p.*	bark	raw		MS
15. *Citrus l.*	fruit	juice	hallucination	SS
Citrus l.	leaf	cook	hallucination	RE
16. *Citrus p.*	juice	cook	menstruation	MS

17.	*Clidemia h.*	root	cook	lungs	SS
	Clidemia h.	root	cook	tuberculosis	RE
18.	*Clusia r.*	resin	cook	hernia	SS
			raw	fem repr.org.	SS
19.	*Couroupita g.*	bark	cook	hallucination	SP
	Couroupita g.	fruit	crush	headache	MS
				sex. disease	MS
20.	*Dieffenbachia sp.*/bark		cook	cancer	RE
	Dieffenbachia sp./leaf		cook	hallucination	SS
21.	*Eleutherine b.*	cream	cook	pain killer	SS
				hemorrhage	SS
	Eleutherine b.	fruit	cook	hemorrhage	RE
22.	*Erythrina p.*	fruit	cook	pain killer	SS
				hemorrhage	SS
	Erythrina p.	fruit	cook	hemorrhage	RE
23.	*Euterpe p.*	resin	cook	tumor	RE
24.	*Ficus sp.*	resin	cook	fem.repr.org.	CG
	Ficus sp.	fruit	crush	headache	MS
				sex. disease	MS
	Ficus sp.	resin	cook	hernia	RE
			raw	fem repr.org	RE.
25.	*Genipa a.*	fruit	crush	headache	MS
				sex. disease	MS
26.	*Heisteria p.*	bark	cook	fem.repr.org.	CG
27.	*Himatanthus s.*	resin	cream/raw	tumor	SS
	Himatanthus s.	resin	raw	tumor	RE
28.	*Hura c.*	bark	cook	cancer	RE
				witchcraft	RE
	Hura c.	bark	cook	hallucination	SS
		resin	capsule		
29.	*Hymenaea sp.*	bark	cook	pellagra	CG
30.	*Inga e.*	seed	crush	menstruation	MS
31.	*Iriartrea d.*	root	cook	intestine	MS
32.	*Macrolobium a.*	bark	cook	bad luck	MS
33.	*Mansoa a.*	leaf	raw	cold/bad luck	CG
		root	cook		CG
	Mansoa a.	leaf	cook	hallucination	SS
		root/trunk/chop		cold/rheum.	SS
	Mansoa a.	leaf/bark	cook	arthritis	RE
	Mansoa a.	leaf	raw	stomach/cold	SP
				bad luck	SP
				arthritis	SP
				male impotency	SP
34.	*Maquira c.*	resin	raw	tumor/wound	SS
				fem.repr.org.	SS
	Maquira c.	resin	cook	tumor	SS
				fem.repr.org	RE

35.	*Mauritia f.*	root	cook	intestine	MS
36.	*Maytemus sp.*	bark	raw	arthritis	MS
	Maytenus sp.	bark/trunk/cook		multiple use	SS
	Maytenus sp.	bark	cook	blood/bone	RE
				sex. disease	RE
37.	*Minquartia g.*	bark cook			CG
38.	*Musa sp.*	fruit	raw	diarrhea	MS
39.	*Nicotiana t.*	leaf	cook	hallucination	CG
				stomach	CG
	Nicotiana t.	leaf	cook	hallucination	SP
				multiple use	SP
40.	*Ocimum m.*	leaf	cook	multiple use	SP
41.	*Otoba p.*	fruit	cook	intestine	MS
42.	*Petiveria a.*	leaf	chop	hallucination	SS
			cook	multiple use	SP
			cook	hallucination	RE
43.	*Psychotria v.*	leaf	cook	hallucination	SP
	Psychotria v.	leaf	cook	hallucination	RE
44.	*Remijia p.*	bark	raw	hallucination	RE
	Remijia p.	bark	raw	cold	SS
		trunk	cook		SS
45.	*Saccharum o.*	fruit	cook	calcium defic.	SP
		seed	crush	male impotency	SP
46.	*Spondias m.*	bark	cook	wounds	MS
47.	*Swartzia p.*	bark	cook	calcium defic.	SP
				male impotency	SP
	Swartzia p.	bark	raw	arthritis	SS
	Swartzia p.	bark	cook	arthritis	RE
48.	*Tabebuia r.*	bark	cook	pellagra	CG
49.	*Tabernaemontana sp.*/vine		raw	tonic	SS
		resin	raw		SS
	*Tabernaemontana sp.*vine/raw			fortify body	RE
50.	*Theobroma c.*	leaf	cook	hallucination	SP
51.	*Thevetia p.*	leaf	raw	hallucination	CG
52.	*Triplaris s.*	bark	cook	arthritis	SS
	Triplaris s.	bark	cook	arthritis	RE
53.	*Tynnanthus p.*	bark	cook	calcium defic	SP
				male impotency	SP
54.	*Zanthoxylum sp.*/leaf		cook	hallucination	CG
				stomach	CG
55.	*Zingiber o.*	fruit	cook	calcium defic.	SP
				male impotency	SP

Part 3 - Analysis

The varzea shamans' interviews provide material to analyze how shamans practice their healing craft. Plants are collected from different places and used for different purposes. The following plants have been divided in groups according to particular characteristics:

A) plants used by varzea shamans (55) for their healing practice

B) plants used by varzea shamans (15) that are found in varzea

C) plants used by varzea shamans (40) not found in varzea

D) plants listed in varzea inventory (27) not used by varzea shamans

E) plants in common (24) in varzea and terrafirme inventory

F) plants used by varzea shamans (11) in common in varzea and terrafirme inventory

A) Varzea shamans use fifty-five (55) plants (see page 132) for therapeutic use. Fifteen (15) plants are found in the varzea area where they live while the other forty (40) are from a different origin other than varzea where the distribution study was done. Different parts of the plant are used such as leaf, bark, vine, resin, fruit, seed, juice or root. Plant material can be given to the patient as cooked or raw as juice, tea, cream, in capsule either alone or mixed with one or more plants. Different plants have different therapeutic activity and some plants have more than one therapeutic use.

Table 15

B) The following is the list of all fifteen (15) plants found in varzea that are used by varzea shamans. The chart indicates the plant by scientific vernacular name, the medicinal value and the shaman that uses the plant.

Varzea plants (15) used by varzea shamans and cure

No./Scientific name/	cure	sham
1. *Bombax m.*	arthritis/hallucination	RE
Bombax m.	arthritis	SS
2. *Brosimum g.*	fem.reprod.org./tumor	RE
Brosinum g.	terminal cancer	SS
3. *Calychophyllum s.*	diarrhea	MS
Calychophyllum s.	pellagra	CG
Calychophyllum s.	wound	SS
Calychophyllum s.	wound/pellagra/infection	RE
4. *Clusia r.*	hernia/fem.repr.org.	SS
5. *Couroupita g.*	hallucination	SP
Couroupita g.	headache/sex. disease	MS
6. *Erythrina a.*	pain killer/hemorrhage	SS
Erythrina a.	hemorrhage	RE
7. *Genipa a.*	headache/sex. disease	MS
8. *Himatanthus s.*	tumor	SS
Himatanthus s.	tumor	RE
9. *Inga sp*	menstruation	MS
10. *Macrolobium a.*	bad luck	MS
11. *Maquira c.*	tumor/fem.repr.org	RE
Maquira c.	tumor/wound/fem repr.org.	SS
12. *Spondias m.*	wound	MS
13. *Swartzia p.*	calcium defic./male impotency	SP
Swartzia p.	arthritis	SS
Swartzia p.	arthritis	RE
14. *Tabernaemontana sp*	tonic	SS
Tabernaemontana sp	fortify body	RE
15. *Triplaris s.*	arthritis	RE
Triplaris s.	arthritis	SS

Table 16

B₁) The following list is the alphabetical cross-reference of all the cures of the fifteen (15) plants found in varzea used by varzea shamans. The fifteen plants can be used for twenty (20) different health problems. Also, if the therapeutic use is made with different plants each time the information is indicated on an individual line.

Use(20)of varzea plants (15) used by varzea shamans

No./use	scient.name	vernac.name	sham
1. arthritis	*Bombax m.*	punga	RE
arthritis	*Bombax m.*	punga	SS
arthritis	*Swartzia p.*	cumaceba	RE
arthritis	*Swartzia p.*	cumaceba	SS
arthritis	*Triplaris s.*	tangarana	RE
arthritis	*Triplaris s.*	tangarana	SS
2. bad luck	*Macrolobium a.*	pashaco	MS
3. calcium defic.	*Swartzia p.*	cumaceba	SP
4. diarrhea	*Calychophyllum s.*	capirona	MS
5. fem.repr.org.	*Maquira c.*	capinuri	SS
fem.repr org.	*Maquira c.*	capinuri	RE
fem.repr.org.	*Brosimum g.*	huayracaspi	RE
fem.repr.org.	*Clusia r.*	renaquilla	SS
6. fortify body	*Tabernaemontana sp*	uchosanango	RE
7. hallucination	*Bombax m.*	punga	RE
hallucination	*Couroupita g.*	ayahuma	SP
8. headache	*Couroupita g.*	ayahuma	MS
headache	*Genipa a.*	huito	MS
9. hemorrhage	*Erythrina a.*	huayruro	RE
hemorrhage	*Erythrina a.*	huayruro	SS
10. hernia	*Clusia r.*	renaquilla	SS
11. infection	*Calychophyllum s.*	capirona	RE
12. male impotency	*Swartzia p.*	cumaceba	SP
13. menstruation	*Inga sp*	guaba	MS
14. pain killer	*Erythrina a.*	huayruro	SS
15. pellagra	*Calychophyllum s.*	capirona	CG
pellagra	*Calychophyllum s.*	capirona	RE

16.	term.cancer	*Brosinum g.*	huayracaspi	SS
17.	tonic	*Tabernaemontana sp.*	uchosanango	SS
18.	tumor	*Brosimum g.*	huayracaspi	RE
	tumor	*Himatanthus s.*	bellacocaspi	RE
	tumor	*Himatanthus s.*	bellacocaspi	SS
	tumor	*Maquira c.*	capinuri	RE
	tumor	*Maquira c.*	capinuri	SS
19.	sex. disease	*Couroupita g.*	ayahuma	MS
	sex. disease	*Genipa a.*	huito	MS
20.	wound	*Calychophyllum s.*	capirona	RE
	wound	Calychophyllum s.	capirona	SS
	wound	*Maquira c.*	capinuri	SS
	wound	*Spondias m.*	ubos	MS

Table 17

C) The following is the list of all forty (40) plants not found in varzea that are used by varzea shamans. The chart indicates the plant by scientific name, the medicinal value and the shaman that uses the plant.

Plants not from varzea (40) used by varzea shamans and cure

Scient/vernac.name	use	sham
1. *Alchornea c.*	cold	MS
2. *Artocarpus h*	hernia	SS
Artocarpus h.	hernia	RE
3. *Aspidosperma e.*	rheumatism	SS
Aspidosperma e.	terminal illness	RE
Aspidosperma e.	muscle	MS
4. *Banisteriopsis c.*	hallucination/stomach	CG
Banisteriopsis c.	hallucination	SP
Banisteriopsis c.	halluciation/stomach	RE
Banisteriopsis c.	hallucination/laxative/blood	SS
Banisteriopsis c.		MS
5. *Bixa o.*	intestine	MS
6. *Brugmansia sp.*	hallucination	SS
Brugmansia sp.	hallucination	SP
Brugmansia sp.	hallucination	RE
7. *Brumfelsia g.*	cold	SS
Brunfelsia g.	arthritis	RE
8. *Calathea l.*	hallucination	RE
9. *Calliandra l.*	cold	SS
Calliandra l.	cold	RE
10. *Canna i.*	intestine	MS
11. *Ceiba p.*		MS
12. Citrus l.	hallucination	SS
Citrus l.	hallucination	RE
13. *Citrus p.*	menstruation	MS
14. *Clidemia h.*	lungs	SS
Clidemia h.	tuberculosis	RE
15. *Dieffenbachia sp.*	cancer	RE
Dieffenbachia sp.	hallucination	SS
16. *Eleutherine b.*	pain killer, hemorrhage	SS
Eleutherine b.	hemorrhage	RE

17.	*Euterpe p.*	tumor	RE
18.	*Ficus sp.*	fem.repr.org.	CG
	Ficus sp.	headache/sex. disease	MS
	Ficus sp.	hernia/fem.repr.org.	RE
19.	*Heisteria p.*	fem.repr.organs	CG
20.	*Hura c.*	cancer,witchcraft	RE
	Hura c.	hallucination	SS
21.	*Hymenaea sp.*	pellagra	CG
22.	Iriartrea d.	intestine	MS
23.	Mansoa a.	cold/bad luck	CG
	Mansoa a.	hallucination/cold/rheumatism	SS
	Mansoa a.	arthritis	RE
	Mansoa a.	cold,male impotency/bad luck	SP
		arthritis/stomach	SP
24.	*Mauritia f.*	intestine	MS
25.	*Maytemus sp.*	arthritis	MS
	Maytenus.sp.	multiple use	SS
	Maytenus sp.	blood/ sex. disease/ bone	RE
26.	*Minquartia g.*		CG
27.	*Musa sp.*	diarrhea	MS
28.	*Nicotiana t.*	hallucination,stomach	CG
	Nicotiana t.	hallucination/multiple use	SP
29.	*Ocimum m.*	multiple use	SP
30.	*Otoba p.*	intestine	MS
31.	*Petiveria a.*	hallucination	SS
	Petiveria a.	multiple use	SP
	Petiveria.a.	hallucination	RE
32.	*Psychotria v.*	hallucination	SP
	Psychotria v.	hallucination	RE
33.	*Remijia p.*	hallucination	RE
	Remijia p.	cold	SS
34.	*Saccharum o.*	calcium defic/male impotency	SP
35.	*Tabebuia r.*	pellagra	CG
36.	*Theobroma c.*	hallucination	SP
37.	*Thevetia p.*	hallucination,stomach	CG
38.	*Tynnanthus p.*	calcium impot/male impotency	SP
39.	*Zanthoxylum sp.*	hallucination,stomach	CG
40.	*Zingiber o.*	calcium deficiency/stomach	SP

Table 18

C_1) The following list is the alphabetical cross-reference of all the cures of forty (40) plants not found in varzea used by varzea shamans. The forty plants can be used for twenty-nine (29) different purposes.

Non varzea plants (40) used by varzea shamans

No./use	scient.name	vernac.name	sham
1. arthritis	*Brunfelsia g.*	chiricsanango	RE
arthritis	*Mansoa a.*	ajos sacha	SP
arthritis	*Mansoa a.*	ajos sacha	RE
arthritis	*Maytemus sp.*	chuchuhuasi	MS
2. bad luck	*Mansoa a.*	ajos sacha	SP
bad luck	*Mansoa a.*	ajos sacha	CG
3. blood	*Banisteriopsis c.*	ayahuasca	SS
blood	*Maytenus sp.*	chuchuhuasi	RE
4. bone fracture	*Maytenus sp.*	chuchuhuasi	RE
5. calcium defic.	*Saccharum o.*	miel de abeja	SP
calcium defic.	*Zingiber o.*	ajengibre	SP
6. cancer	*Dieffenbachia sp.*	catahua	RE
cancer	*Hura c.*	catahua	RE
7. cold	*Alchornea c.*	hipururo	MS
cold	*Brumfelsia g.*	chiricsanango	SS
cold	*Calliandra l.*	bobinsana	RE
cold	*Calliandra l.*	bobinsana	SS
cold	*Mansoa a.*	ajos sacha	SP
cold	*Mansoa a.*	ajos sacha	SS
cold	*Mansoa a.*	ajos sacha	CG
cold	*Remijia p.*	chullachaquicaspi.	SS
8. diarrhea	*Musa sp.*	platano	MS
9. fem.repr.org.	*Ficus sp.*	renaco	CG
fem.repr.org.	*Heisteria p.*	chuchuhuasa	CG
fem.repr.org.	Ficus sp.	renaco	RE
10. hallucination	*Banisteriopsis c.*	ayahuasca	RE
hallucination	*Banisteriopsis c.*	ayahuasca	CG
hallucination	*Banisteriopsis c.*	ayahuasca	SP
hallucination	*Banisteriopsis c.*	ayahuasca	SS
hallucination	*Brugmansia sp.*	toe'	RE
hallucination	*Brugmansia sp.*	toe'	SP

	hallucination	*Brugmansia sp.*	toe'	SS
	hallucination	*Calathea l.*	bijao	RE
	hallucination	*Citrus l.*	lemon	RE
	hallucination	*Citrus l.*	lemon	SS
	hallucination	*Dieffenbachia sp.*	patiquina	SS
	hallucination	*Hura c.*	catahua	SS
	hallucination	*Mansoa a.*	ajos sacha	SS
	hallucination	*Nicotiana t.*	tabaco	CG
	hallucination	*Nicotiana t.*	tabaco	SP
	hallucination	*Petiveria a.*	mucura	RE
	hallucination	*Petiveria a.*	mucura	SS
	hallucination	*Psychotria v.*	chacruna	SP
	hallucination	*Psychotria v.*	chacruna	RE
	hallucination	*Remijia p.*	chullachaquicaspi	RE
	hallucination	*Theobroma c.*	cacao	SP
	hallucination	*Thevetia p.*	camalonga	CG
	hallucination	*Zanthoxylum*	alcanphor	CG
11.	headache	*Ficus sp.*	renaco	MS
12.	hemorrhage	*Eleutherine b.*	yahuarpiripiri	RE
	hemorrhage	*Eleutherine b.*	yahuarpiripiri	SS
13.	hernia	*Artocarpus h.*	pandisho	SS
	hernia	*Artocarpus h.*	pandisho	RE
	hernia	*Ficus sp.*	renaco	RE
14.	intestine	*Bixa o.*	achote rojo	MS
	intestine	*Canna i.*	achira	MS
	intestine	*Iriartrea d.*	huacaprona	MS
	intestine	*Mauritia f.*	aguaje	MS
	intestine	*Otoba p.*	aguajillo	MS
15.	laxative	*Banisteriopsis c.*	ayahuasca	SS
16.	lungs	*Clidemia h.*	mullaca	SS
17.	male impotency	*Mansoa a.*	ajos sacha	SP
	male impotency	*Saccharum o.*	miel de abeja	SP
	male impotency	*Tynnanthus p.*	clavohuasca	SP
	male impotency	*Tynnanthus p.*	clavohuasca	SP
18.	menstruation	*Citrus l.*	toronja	MS
19.	muscle	*Aspidoderma e.*	remocaspi	MS
20.	not specified	*Nicotiana t.*	tabaco	SP
	not specified	*Maytenus sp.*	chuchuhuasa	SS
	not specified	*Ocimum m.*	albahaca	SP
	not specified	*Petiveria a.*	mucura	SP
21.	pain killer	*Eleutherine b.*	yahuarpiripiri	SS
22.	pellagra	*Hymenaea sp.*	azucarhuayo	CG
	pellagra	*Tabebuia r.*	Tahuari	CG
23.	rheumatism	*Aspidoderma e.*	remocaspi	SS
	rheumatism	*Mansoa a.*	ajos sacha	SS
24.	stomach	*Mansoa a.*	ajos sacha	SP
	stomach	*Thevetia p.*	camalonga	CG

	stomach	*Banisteriopsis c.*	ayahuasca	RE
	stomach	*Nicotiana t.*	tabaco	CG
	stomach	*Zanthoxylum sp.*	alcanfor	CG
	stomach	*Zingiber o.*	ajengibre	SP
	stomach	*Banisteriopsis c.*	ayahuasca	CG
25.	term.illness	Aspidoderma e.	remocaspi	RE
26.	tuberculosis	*Clidemia h.*	mullaca	RE
27.	tumor	*Euterpe p.*	huasai	RE
28.	sex.disease	*Ficus sp.*	renaco	MS
	sex.disease	*Maytenus sp.*	chuchuhuasi	RE
29.	witchcraft	*Hura c.*	catahua	RE

(Note: Banisteriopsis is part of the ayahuasca drink while *Ceiba p.* and *Minquartia g.* do not have a specified therapeutic value.)

Table 19

D) The following is a list of plants found in varzea but not used by varzea shamans. The total number of these plants is twenty seven (27) which is equal to the difference between forty two (42), total number of plants listed in varzea inventory, less fifteen (15), the total number of plants listed in varzea inventory used by varzea shamans. These plants have either medicinal value or commercial value according to the Amazonian Ethnobotanical Dictionary by Duke and Vasquez (1994).

Varzea plants (42-15=27) not used by varzea shamans

No.	Scient name`	vernac.name	use
1.	*Alchornea d.*	palometa huayo	n/a
2.	*Alchornea t.*	zancudo caspi	diarrhea/construction
3.	*Anaxagorea b.*	espintana	rheumatism/construction
4.	*Brosimum r.*	palisangre	construction
5.	*Campsiandra a.*	huacapurana	rheumatism/diarrhea malaria
6.	*Cecropia s.*	cetico	gums bleeding, heart
7.	*Cecropia m.*	shiari	construction
8.	*Chlorophora sp*	incira	n/a
9.	*Crataeva t.*	tamara blanca	toothache/arthritis stomach rheumatism/tonic
10.	*Eschweilera sp.*/machimango		handcraft
11.	*Ficus i.*	oje'	vermifuge/rheumatism anemia/intest. parasite
12.	*Guatteria sp.*	carahuasca	contraceptive
13.	*Hamelia p.*	yutubanco	inflammation/fever/sore rheumatism/diarrhea vermifuge/cancer/malaria

			constipation/dermatosis erysipelas/jaundice syphilis /headache scurvy/analgesic
14.	*Jacaranda c.*	huamansamani	construction/bronchitis fever/rheumatism/wound cold/pneumonia/infection cathartic/emetic/sore syphilis/tootache
15.	*Leonia g.*	tamara	pulmonary diseases abscess/tumor
16.	*Licaria c.*	muena	construction
17.	*Macoubea g.*	loro micuna	lung
18.	*Manilkara b.*	quinilla	kidney tone/construction
19.	*Mouriri g.*	lanza caspi	sore/construction
20.	*Poeppigia* p.	cedro pashaco	sore/construction
21.	*Rheedia g.*	charichuelo	construction
22.	*Rinorea r.*	limoncillo	wasp sting/construction
23.	*Rollinia sp.*	anonilla	n/a
24.	*Sloanea sp.*	cepanchina	construction/handcraft
25.	*Uncaria sp.*	paraguayo	inflammation/rheumatism contraceptive/ diarrhea tumor/cancer/cirrhosis gonorrhea//gastric ulcer
26.	*Unonopsis sp.*	icoja	arthritis/bronchitis/ rheumatism/diarrhea malaria/lung disorders contraceptive
27.	*Xylopia p.*	yahuarachi caspi/construction	

Note: *Hamelia p., Jacaranda c., Uncaria sp.*and *Unonopsis sp.* have multiple use)

Table 20

Varzea plants (27) not used by varzea shamans (According the Amazonian Ethnobotanical Dictionary by Duke and Vasquez)

Use	scientific name	vernacular name
1. abscess	*Leonia g.*	tamara
2. analgesic	*Hamelia p.*	yutubanco
3. anemia	*Ficus sp.*	oje'
4. arthritis	*Crataeva t.*	tamara blanca
arthritis	*Unonopsis sp.*	icoja
5. bronchitis	*Jacaranda c.*	huamansamani
bronchitis	*Unonopsis sp.*	icoja
6. cancer	*Hamelia p.*	yutubanco
cancer	*Uncaria sp.*	paraguayo
7. cathartic	*Jacaranda c.*	huamansamani
8. cirrhosis	*Uncaria sp.*	paraguayo
9. cold	*Jacaranda c.*	huamansamani
10. constipation	*Hamelia p.*	yutubanco
11. contraceptive	*Guatteria sp.*	carahuasca
contraceptive	*Uncaria sp.*	paraguayo
contraceptive	*Unonopsis sp.*	icoja
12. dermatosis	*Hamelia p.*	yutubanco
13. diarrhea	*Alchornea t.*	zancudo caspi
diarrhea	*Campsiandra a.*	huacapurana
diarrhea	*Hamelia p.*	yutubanco
diarrhea	*Uncaria sp.*	paraguayo
diarrhea	*Unonopsis sp.*	icoja
14. emetic	*Jacaranda c.*	huamansamani
15. erysipelas	*Hamelia p.*	yutubanco
16. fever	*Hamelia p.*	yutubanco
fever	*Jacaranda c.*	huamansamani
17. gastric ulcer	*Uncaria sp.*	paraguayo
18. gonorrhea	*Uncaria sp.*	paraguayo
19. gums bleeding	*Cecropia m.*	cetico
20. headache	*Hamelia p.*	yutubanco
21. heart	*Cecropia m.*	cetico
22. infection	*Jacaranda c.*	huamansamani
23. inflammation	*Hamelia p.*	yutubanco
inflammation	*Uncaria sp.*	paraguayo
24. intest.parasite/	*Ficus sp.*	oje'

25.	jaundice	*Hamelia p.*	yutubanco
26.	kidney stone	*Manilkara b.*	quinilla
27.	lung disorders	*Unonopsis sp.*	icoja
28.	lung	*Macoubea g.*	loro micuna
29.	malaria	*Campsiandra a.*	huacapurana
	malaria	*Hamelia p.*	yutubanco
	malaria	*Unonopsis sp.*	icoja
30.	pneumonia	*Jacaranda c.*	huamansamani
31.	pulmo disease	*Leonia g.*	tamara
32.	rheumatism	*Campsiandra a.*	huacapurana
	rheumatism	*Crataeva t.*	tamara blanca
	rheumatism	*Ficus sp.*	oje'
	rheumatism	*Hamelia p.*	yutubanco
	rheumatism	*Jacaranda c.*	huamansamani
	rheumatism	*Uncaria sp.*	paraguayo
	rheumatism	*Unonopsis sp.*	icoja
33.	scurvy	*Hamelia p.*	yutubanco
34.	sore	*Hamelia p.*	yutubanco
	sore	*Jacaranda c.*	huamansamani
	sore	*Mouriri sp.*	lanza caspi
	sore	*Poeppigia p.*	cedro pashaco
35.	stomach	*Crataeva t.*	tamara blanca
36.	syphilis	*Hamelia p.*	yutubanco
	syphilis	*Jacaranda c.*	huamansamani
37.	tonic	*Crataeva t.*	tamara blanca
38.	toothache	*Jacaranda c.*	huamansamani
	toothache	*Crataeva t.*	tamara blanca
39.	tumor	*Leonia g.*	tamara
	tumor	*Uncaria sp.*	paraguayo
40.	vermifuge	*Ficus sp.*	oje'
	vermifuge	*Hamelia p.*	yutubanco
41.	wasp sting	*Rinorea r.*	limoncillo
42.	wound	*Jacaranda c.*	huamansamani

Table 21

E) Plants in common in varzea and terrafirme

Scientific name	family	vernac.name
1. *Anaxagorea sp*	Annonaceae	espintana
2. *Brosimum g.*	Moraceae	huayra caspi
3. *Brosimum r.*	Moraceae	palisangre
4. *Cecropia s.*	Cecropiaceae	cetico
5. *Couroupita g.*	Lecythidaceae	ayahuma
6. *Erythrina a.*	Fabaceae	huayruro amasisa
7. *Eschweilera sp.*	Lecythidaceae	machimango
8. *Ficus i.*	Moraceae	oje'
9. *Himatanthus s.*	Apocynaceae	bellaco caspi
10. *Inga sp*	Fabaceae	shimbillo
11. *Leonia g.*	Violaceae	tamara
12. *Licaria c.*	Lauraceae	muena
13. *Macoubea g.*	Apocynaceae	loro micuna
14. *Macrolobium a.*	Fabaceae	pasha quilla
15. *Maquira c.*	Moraceae	capinuri
16. *Rheedia g.*	Clusiaceae	charichuelo
17. *Rinorea r.*	Violaceae	limoncillo
18. *Rollinia sp.*	Annonaceae	anonilla
19. *Sloanea sp.*	Elaeocarepaceae	cepanchina
20. *Spondias m.*	Anacardiaceae	ubos
21. *Swartzia p.*	Fabaceae	cumaceba
22. *Tabernaemontana s.*	Apocynaceae	lobo sanango
23. *Triplaris s.*	Polygonaceae	tangarana
24. *Unonopsis sp.*	Annonaceae	icoja

Table 22

F) Plants used by varzea shamans found in varzea and in terrafirme

No/Scient. name	vernac. name	use	sha
1. *Brosimum g*	huayracaspi	fem.repr.org.	RE
		tumor	RE
Brosinum g.	huayracaspi	terminal cancer	SS
2. *Couroupita g.*	ayahuma	hallucination	SP
Couroupita g.	ayahuma	headache	MS
		sex. disease	MS
3. *Erythrina a.*	huayruro	hemorrhage	RE
Erythrina a.	huayruro	pain killer	SS
		hemorrhage	SS
4. *Himatanthus s.*	bellacocaspi	tumor	RE
Himatanthus s.	bellacocaspi	tumor	SS
5. *Inga sp*	guaba	menstruation	MS
6. *Macrolobium a.*	pashaco	bad luck	MS
7. *Maquira c.*	capinuri	tumor	RE
		fem.repr.org.	RE
Maquira c.	capinuri	tumor/wound	SS
		fem.repr.org.	SS
8. *Spondias m.*	ubos	wound	MS
9. *Swartzia p.*	cumaceba	arthritis	RE
Swartzia p.	cumaceba	arthritis	SS
Swartzia p.	cumaceba	calcium deficit	SP
		male impotency	SP
10. *Tabernaemontana sp.*	uchosanango	tonic	SS
Tabernaemontana sp.	uchosanango	fortify body	RE
11. *Triplaris s.*	tangarana	arthritis	RE
Triplaris s.	tangarana	arthritis	SS

Part 4 - Discussion

The varzea inventory was made in the Tapirillo area about seventy kilometers from Iquitos city. Tapirillo is a small village on the Amazon River with a population of a few hundred people. The major concentration of houses surrounds a big field used for recreational activities. A school is also available for this community. Some houses are separated from the village but are not very far and can be easily reached by walking. The population appears to be healthy and nourishment deficiency was not detected. It is safe to say that the shamans activity is not overwhelming.

The average age of shamans is between forty-five and fifty five years. From the conversion it appears that they have been practicing their skill for a long time.

The varzea inventory indicated that forty-two (42) different plants are available in the study area. From the interview with the shamans it appears that the total number of plants mentioned for healing is fifty-five (55). Fifteen (15) plants appear both on the shamans interview list (55) and on the varzea inventory (42). The fifteen plants represent about 35.7% of the varzea inventory.

The shamans' spectrum instead is 55 plants. Therefore if 15 plants are deducted from this number it appears that forty (40=55-15) plants come from other areas, most likely from dry land (terrafirme). The percentage of these plants of different origin than varzea would be about 72.7% of the entire varzea shamans repertory, while the percentage of the fifteen plants from varzea would be the balance which is about 27.3%.

It can be speculated that shamans over time have mastered their knowledge only on certain varzea plants and have been satisfied with the result of these fifteen plants for healing people. However, varzea shamans expand their repertory of plants more than seventy percent to areas outside of varzea.

The fifteen plants are used to cure twenty different diseases. Six diseases (arthritis, female reproductive organs, headache, tumor, venereal diseases and wounds) are cured by more than one plant.

Two different shamans use ten plants for the same purpose while three different shamans use one plant for the same purpose. Most likely shamans in the area are not isolated but share their knowledge and probably do not compete with each other. Seven plants out of fifteen is about half of the plants available and suggests that shamans share information and cooperate to the benefit of the community. Some shamans provide a longer list of plants longer (sometimes double of others), and this probably indicates that the knowledge is different and some shamans have been practicing for a longer time.

In the Tapirillo area there is no report that shamans have readily available plants used for hallucination or intoxication in a ritual ceremony like ayahuasca. Don Santiago says that the water in flood area like varzea do not allow growth of *Banisteriopsis c.* and *Psychotria v.* which are that is the main ingredients for the ayhauasca mixture. These plants must be found outside the village.

The study in the area was conducted to elicit only genuine information from shamans, particularly to obtain the list of plants used in their healing craft. No question was presented that could have limited the sincerity of the answer. It is possible that the needs of the village are satisfied by the local shamans who live there and also understand that contact with the city is guaranteed every day by boat and villagers have access to the city of Iquitos if they want to have different treatment.

According to the Amazonian Ethnobotanical Dictionary by J. Duke and R. Vasquez nine (9) cures (arthritis, cancer, cold, diarrhea, headache, lung, rheumatism, stomach, tumor) are in common between non varzea plants used (40) by shamans and varzea plants not used (27) by shamans. This overlapping may indicate that varzea shamans disregard these plants because their knowledge is already sufficient to cover the needs of the patients.

It is quite strange instead to discover that varzea shamans lose the opportunity to provide thirty different treatments that cannot be provided with the plants of their repertory. These plants could be really helpful for important diseases. While it is fair to say that this is a speculation built on the information of The Amazonian Etnobotanical Dictionary and therefore this is the result of information gathered from different sources in the Amazonian area near Iquitos, nevertheless it should be indicated that the shamans who were interviewed did not mention these plants at all. The power of healing would be greatly expanded to more areas to the benefit of the community.

It should also be said that mistakes can alter the objectivity of the study, but this would not be clearly sufficient to explain a large number of plants ignored by shamans.

It should be remembered that Iquitos is a major hub in the Peruvian Amazon and therefore people who live along the river try to move and settle down in the city. But it is also true that people who do not succeed because the life in the city is too hard come back to the village from where they came originally. This flow of people is constant and this facilitates exchange of culture at any level. It is possible therefore that plant information could also be shared in these circumstances.

Why then do varzea shamans not take advantage of this possibility instead of looking somewhere else to obtain plants for their practice? It is possible that a lack of time for an activity that is fading out could be the answer. It is well known that the new generations are not interested in preserving this plant lore; there is no indication that the new generations are interested in pursuing shamanism. Shamans interviewed are all over 40 years old and none of them said that somebody in the family could continue this activity in the future; also no young person was present at the time of the interview. It is sad to say but it appears that this part of indigenous culture does not have long future ahead.

The plant inventory indicates that there are twenty-two (22) plants in common in varzea and terrafirme inventories. Varzea shamans use eleven (11) of these plants for their healing practice. It appears that varzea shamans have in common only a small fraction or about 15% of the total (141) plants. Since the inventory of terrafirme is limited to a specific area in the surrounding of Iquitos two points should be considered: 1) either the biodiversity in the area is so rich that different areas close to Iquitos still have many different plants or 2) that varzea shamans have resources very far from the city of Iquitos that are very different from the ones available close to them in the varzea area where they live. It is difficult at the present time to anticipate if varzea shamans will explore the possibility to verify if the varzea plants that have been neglected by them can be considered for possible application in their healing craft.

CHAPTER 6

Iquitos shamans' interviews

Part 1 - Methods of research

The interviews of Iquitos shamans were conducted with the same general guidelines of the interview of varzea shamans. The books by Martin (1995, #84) and Alexiades (1996, #85) have been used for this purpose.

Particular attention was given to the relationship with the shaman and an informant has always been involved in this activity. For this task a city informant was selected with extensive knowledge not only of the scientific subject of the investigation but also of the practice and understanding of urban shamanism. Fair compensation was discussed in advance for any service and the amount of money provided was accepted without objection or disappointment. Sometimes people were paid with local currency and sometimes with U. S. dollars.

Sometimes shamans were interviewed without notification and kindly permission for this intrusion of privacy was requested in proper fashion. The purpose of the interview was stated clearly and also the remuneration for this help. After permission and acceptance was granted, the interview was conducted.

The informant was actively involved in the interview to facilitate the understanding of points where the meaning of the local terminology causes difficulty to foreigner.

Shamans were asked to talk about medicinal plants and ayahuasca. Some general questions were prepared in advance, such as "How long have you practiced this activity?" or "Can you talk about ayahuasca? " or "What are the plants that are used for healing?" Shamans were not pressured at all to obtain any answer; proper time was granted and the interview was conducted with complete respect of their privacy.

The main purpose of this research was to collect genuine information that could be analyzed and interpreted properly for the scope of this research.

The conversation was recorded on tape after permission was granted and data were registered on paper. Plant vernacular names were registered with vernacular name to be later translated into the scientific nomenclature.

The major points about shamanism and other terms related to this practice were discussed briefly in the methodology applied to the varzea shamans interview.

The following shamans live in the city of Iquitos where they practice their healing skill.

Part 2. - Observations

Shaman #6 Don Erasmo

Don Erasmo has been working with ayahuasca for 25 years. He says that ayahuasca is used as hallucinogen to see and to clarify things that somebody desires to see. *Banisteriopsis c.* (ayahuasca) is mixed with other plants. Don Ersasmo does not own a botanical garden and therefore he goes to the forest to obtain plants. If the ayahuasca mixture is strong the healing power is strong. Ayahuasca is good for all diseases but it has never been tested for AIDS.

All the plants used by Don Erasmo are indicated as follows:

1. *Alchornea castaneifolia,* Euphorbiaceae (ipururo) leaf or bark
2. *Aspidosperma excelsum,* Apocynaceae (remocaspi) bark
3. *Banisteriopsis caapi,* Malpighiaceae (ayahuasca)
4. *Brugmansia sp.,* Solanaceae (toe' blanco) leaf
5. *Brunfelsia sp.,* Solanaceae (chiricsanago) leaf
6. *Campsiandra sp.,* Fabaceae (huacapurana) bark
7. *Ceiba pentandra,* Bombacaceae (lupuna) bark

8. *Couropita guainensis,* Lecythidaceae (ayahuma) fruit or bark

9. *Hura crepitans,* Euphorbiaceae (catahua)

10. *Inga sp.* Fabaceae (guaba) leaf or bark

11. *Psychotria stenostachya.* Rubiaceae (yage')

12. *Swartzia sp.* Fabaceae (cumaceba) bark

Table 23

Summary of all the plants used by Don Erasmo

Plant name	part-	use	sham
1. *Alchornea c.*	leaf/bark	not specified	BD
2. *Aspidosperma e.*	bark	not specified	BD
3. *Banisteriopsis c.*	bark	hallucination	BD
4. *Brugmansia sp.*	leaf	not specified	BD
5. *Brunfelsia sp.*	leaf	not specified	BD
6. *Campsiandra sp.*	bark	not specified	BD
7. *Ceiba p.*	bark	not specified	BD
8. *Couroupita g.*	bark/fruit	not specified	BD
9. *Hura c.*		not specified	BD
10. *Inga sp.*	leaf/bark	not specified	BD
11. *Psychotria s.*	leaf	not specified	BD
12. *Swartzia sp.*	bark	not specified	BD

Cross reference with vernacular name listed first

vernacular name	Plant name	Family name
1. ayahuasca	*Banisteriopsis c.*	Malpighiaceae
2. ayahuma	*Couroupita g.*	Lecythidiaceae
3. catahua	*Hura c.*	Euphorbiacea
4. chiricsanango	*Brunfelsia sp.*	Solanaceae
5. cumaceba	*Swartzia sp.*	Fabaceae
6. guaba	*Inga c.*	Fabaceae
7. huacapurana	*Campsiandra sp.*	Fabaceae
8. ipururo	*Alchornea c.*	Euphorbiaceae
9. lupuna	*Ceiba p.*	Bombacacae
10. remocaspi	Aspidosperma e.	Apocynaceae
11. toe' blanco	*Brugmansia sp.*	Solanaceae
12. yage'	*Psychotria s.*	Rubiaceae

Shaman # 7 Don Cristobal

Don Cristobal has been working with ayahuasca for 47 years and he prepares it at home. He does not own a botanical garden but he buys plants instead. He says "Ayhauasca is a plant (*vegetal*) that teaches many things". It is a "medicine" (medicina) that teaches if someboby wants to learn by dieting. Ayhauasca is mixed with other plants. It depends on the healer. Don Cristobal mixes ayahuasca only with *Psychotria v.* (chacruna) or as alternative with *Brugmansia sp.* (toe' blanco).

The difference between *Brugmansia sp.* (toe' blanco) and *Teliostachyia lanceolata* (toe' negro) is that the first is used to cure while the second one is used for witchcraft (brujeria).

Ayahausca is very good for rheumatism. *Psychotria v.* (chacruna) is responsible for vision, while *Banisteriopsis c.* (ayhauasca) causes only dizziness.

The following plants have been indicated by Don Cristobal during the interview:

1. *Banisteriopsis caapi,* Malpighiaceae (ayhauasca)
2. *Psychotria viridis,* Rubiaceae (spilanthus ? chacruna) leaf

3. *Brugmansia aurea,* Solanaceae (toe' blanco)(sometimes) leaf
4. *Teliostachyia lanceolata,* Acanthaceae (toe' negro)

Table 24

Summary of all the plants used by Don Cristobal

No/Scientific name	part-	use	sham init
1. *Banisteriopsis c.*	leaf	not specified	TL
2. *Brugmansia a*	leaf	not specified	TL
3. *Psychotria v.*	leaf	not specified	TL
4. *Teliostachya l.*	leaf	witchcraft	TL

Cross reference with vernacular name listed first

vernacular name	Scientific name	Family name
1. ayahuasca	*Banisteriopsis c.*	Malpighiaceae
2. toe' blanco	*Brugmansia a.*	Solanaceae
3. chacruna	*Psychotria v.*	Rubiaceae
4. toe' negro	*Teliostachya l.*	Acanthaceae

Shaman #8 - Don Jose'

Don Jose' is from the Saint Martin area and he has been using ayahuasca for 52 years. He took it the first time when he was twelve and started working when he was eighteen. He spent four years in the forest dieting (which is eating regularly without salt). Don Jose' does not have a botanical garden and he takes the plants from the forest. He explains the word ayahuasca (aya=soga, huasca=muerto, soga del muerto) "rope of the dead". Don Jose' says that the secret of ayahuasca is endless and every day we learn something new.

1. *Banisteriopsis caapi, Malpighiaceae* (ayahuasca) *is used* as a remedy to heal. It is an intermediate to know the illness and understand the plants that are required to cure. *Ayahuasca* is mixed with *Psychotria v.* (chacruna also called samiruca), and if this is not available *Psychotria stenostachya* (yage') is used, because without these plants ayahuasca has no strength. In addition *Brugmansia sp.* (toe') and *Tabernaemontana sp.* (sanango) are used, but it can be dangerous since these plants can affect the blood with bruises on the skin. *Psychotria v.* (chacruna) is washed and gently added when *Banisteriopsis c.* (ayahuasca) begins to boil. It is cooked for eight

hours. Actually this mixture is like caramel. Don Jose' says that "*ayahuasca* cures 350,000 diseases with the same preparation". Ayahuasca is used to cure drug addiction (marijuana, cocaine).

When ayahuasca is mixed with other plants a major diet is required. Sometimes a chemical compound called "creolin" is used or *Nicotiana tabacum* (tobacco), roots of *Euterpe sp.* (huasai), resin of *Hura c.* (catahua), or *Brugmansia a.* (toe'). It is not recommended to eat hog (cerdo) meat.

2. *Psychotria viridis,* Rubiaceae (chacruna) is mixed to *ayahuasca*. When *Psychotria v.*is used alone patients must diet 24 hours, and 3 days if they eat hog meat.
3. *Psychotria stenostachya,* Rubiaceae (yage') is mixed to ayahuasca.
4. *Brugmansia sp.,* Solanaceae (toe') is mixed to ayahuasca.
5. *Euterpe sp.,* Arecaceae (huasahi) is mixed to ayahuasca.
6. *Hura crepitans,* Euphorbiaceae (catahua) is mixed to ayahuasca.
7. *Nicotiana tabacum,* Solanaceae (tobacco) is mixed to ayahuasca.
8. *Tabernaemontana sp.* Apocynaceae (sanango) is mixed to ayahuasca.

Table 25

Summary of all the plants used by Don Jose'

Plant name	part-	prep	use	sham
1. *Banisteriopsis c.*	leaf	cook	all diseases	PA
2. *Brugmansia sp.*	leaf	cook	all diseases	PA
3. *Euterpe sp.*	root	cook	all diseases	PA
4. *Hura c.*	resin		all diseases	PA
5. *Nicotiana t.*	leaf	cook	all diseases	PA
6. *Psychotria v.*	leaf	cook	all diseases	PA
7. *Psychotria s*	leaf	cook	all diseases	PA
8. *Tabernaemontana sp.*	leaf	cook	all diseases	PA

Cross reference with vernacular name listed first

vernacular name	Plant name	Family name
1. ayahuasca	*Banisteriopsis c.*	Malpighiaceae
2. catahua	*Hura c.*	Euphorbiacxeae
3. chacruna	*Psychotria v.*	Rubiaceae
4. huasahi	*Euterpe sp.*	Arecaceae
5. sanango	*Tabernaemontana sp.*	Apocynaceae
6. tobacco	*Nicotiana t.*	Solanaceae
7. toe' blanco	*Brugmansia sp.*	Solanaceae
8. yage'	*Psychotria s.*	Rubiaceae

Shaman #9 - Don Humberto

Luna (1984, #18& 19) reported from his conversation with Don Emilio that he indicated that there are always some shamans that have more knowledge than him. These shamans are plant "specialists" called "vegetalistas" (plant specialists) or "paleros" (from "palo", a Spanish word meaning pole), who have taken very strong drugs from trees and dieted. Quite often the concept of palero is associated with that of a witch. That is because the temptation to use evil power is stronger the more it is learned..."

Don Humberto, who is 53 years old has been working for 35 years, has started because his father was a landlord. He is a doctor (medico naturista) who has a clinic with many beds, and owns authorization of the Health Department of the City and additional licenses. He does not work with "ayahuasca", but with a drink called "brebaje palo" that contains alkaloids. "Palo" means straight tree and the drink is made with combination of bark of different straight trees. Shamans who use this procedure are called "paleros" (from palo), therefore Don Humberto is a "palero".

Don Humberto indicates that brebaje palo is used to acquire concentration to practice spiritual healing. This drink is used in proper concentration in accordance to illness. A special song (icaro) is utilized during the ceremony, while the patient is sleeping. Later the patient awakes from the bed and rests on it. Don Humberto's work lasts 4 hours starting at ten in the night according to the number of patients. This drink cures all diseases. Don Humberto uses bark of the following plants:

Brebaje palo is prepared in equal part (about 20 grams/each) with pieces of bark of different trees that grow in the forest. Usually between 10 and 12 pieces of bark are used, which means that between 10 and 12 different trees are used in this procedure.

In addition to bark other possible combinations are available: for example *Nicotiana tabacum* (tobacco) is used to facilitate dizziness. Leaf called "hoja brava" (?) is used for infection and pain. Roots of *Euterpe sp.* (huasahi) are used to cure cancer.

Brebaje palo is prepared with plants from the forest (monte bravo?) and can cure all the diseases such as, heart, head, brain or eye diseases.

The drink is used to cure AIDS. Bark of *Citrus - grapefruit-* (toronja) and leaves of *Bixa orellana.*

(achiote) are used. Don Humberto says that he has cured two people, one 35 and one 21 years old, and a boy 8 years old. He also has cured the drug addicted.

Don Humberto has cured more than twelve drug addicted with water of *Bixa orellana* (agua de achiote) and roots of *Eryngium foetidum* (sacha culantro), which purifies blood and stomach, and leaves of *Crescentia cujete* (tutumo) to stop appetite.

For gastritis leaves of *Bixa o.* are used; 15 leaves are boiled in one liter of water for 10 minutes for 3 days. Also *Eryngium f.* is used.

Don Humberto explains that the brebaye palo is taken during a particular procedure where the master of ceremony holds a "shapaya" (musical instrument) and begins reciting some lines of a prayer. Also Don Humberto sings one of the icaros that are used during the ceremony. People make a circle and the patients take a position in the middle of the table that is 10 cm high. The master of ceremony takes position in a part of the circle. He can practice his skill for 10, 30, 40 or 50 people.

Don Humberto says that the vast majority of shamans are "ayahuascqueros" that use the drink palo. Some use one *palo* only: *Remijia peruviana* (chullachaqui caspi),or *Tabernaemontana sp.* (sanango).

If a person wants to cause damage to somebody it is possible to put in *ayahuasca* small pieces of *Astrocaryum chambira* (chambira), leaves of *Phytelephas macrocarpa* (yarina), *Teliostachya lanceolata* (toe negro) and leaves of *Hura crepitans* (catahua). Shamans who practice witchcraft are called "maleros".

The following list indicates the plants discussed by Don Humberto:

1. *Aspidosperma excelsum,* Apocynaceae (remo caspi)
2. *Astrocaryum chambira,* Arecaceae (chambira)
3. *Bixa orellana,* Bixaceae (achote)
4. *Brosimum acutifolium,* Moraceae (tamamuri)
5. *Brosimum guianensis,* Moraceae (huayra caspi)
6. *Brosimum rubescens,* Moraceae (palisangre)
7. *Calliandra augustifolia,* Fabaceae (bubinzana)
8. *Calychophyllum spruceanum,* Rubiaceae (capirona negra)
9. *Calychophyllum spruceanum,* Rubiaceae (capirona roja)
10. *Capsicum frutescens,* Solanaceae (charapilla)
11. *Carapa guianensis,* Meliaceae (requia)
12. *Caryodendron orinocense, Euphorbiaceae* (metohuayo)
13. *Citrus paradisi,* Rutaceae (toronja)
14. *Cordia alliodora,* Boraginaceae (ajos kiro)
15. *Couroupita guianensis.* Lecythidaceae (ayahuma)
16. *Crescentia cujete,* Bignoniaceae (tutumo)

17. *Eringium foetidum*, Apiaceae (sacha culantro)

18. *Eschweilera spp.*, Lecythidaceae (machimangua)

19. *Euterpe precatoria*, Arecaceae (huasahi)

20. *Hura crepitans*, Euphorbiaceae (catahua)

21. *Hymeanea sp.*, Fabaceae (azucar huayo)

22. *Mezilaurus sp.* Lauraceae (itauva)

23. *Minquartia guianensis*, Olacaceae (huacapu)

24. *Nicotiana tabacum*, Solanaceae (tobacco)

25. *Phytelephas macrocarpa*, Arecaceae (yarina)

26. *Remijia peruviana*, Rubiaceae (chullachaqui caspi)

27. *Simira rubescens*, Rubiaceae (puca quiro)

28. *Swartzia polyphylla*, Fabaceae (cumaceba)

29. *Tabebuia sp.*, Bignoniaceae (tahuari amarillo)

30. *Tabebuia sp,*. Bignoniaceae (tahuari negro)

31. *Tabernaemontana sp.*, Apopcynaceae (sanango)

32. *Teliostachyia lanceolata*, Acanthaceae (toe' Negro)

33. *Terminalia spp.*, Combretaceae (almendro)

Table 26

Summary of all the plants used by Don Humberto

No/Scientific name	part-prep	use	sham
1. *Aspidosperma e.*	bark cook	all diseases	HS
2. *Astrocaryum c.*	leaf cook	witchcraft	HS
3. *Bixa o.*	leaf cook	drug addiction	HS
4. *Brosimum a.*	bark cook	all diseases	HS
5. *Brosimum g.*	bark cook	all diseases	HS
6. *Brosimum r.*	bark cook	all diseases	HS
7. *Calliandra a.*	bark cook	all diseases	HS
8. *Calycophyllum s./c.n.*	bark cook	all diseases	HS
9. *Calycophyllum s./c.r*	bark cook	all diseases	HS
10. *Capsicum f.*	bark cook	all diseases	HS
11. *Carapa g.*	bark cook	all diseases	HS
12. *Caryodendron o.*	bark cook	all diseases	HS
13. *Citrus p.*	bark cook leaf	AIDS	HS
14. *Cordia a.*	bark cook	all diseases	HS
15. *Couroupita g.*	bark cook	all diseases	HS
16. *Crescentia c.*	leaf cook	drug addiction	HS
17. *Eringium f.*	leaf cook	drug addiction	HS
18. *Eschweilera sp.*	bark cook	all diseases	HS
19. *Euterpe p.*	root cook	cancer	HS
20. *Hura c.*	leaf cook	all diseases	HS
21. *Hymenaea sp.*	bark cook	all diseases	HS
22. *Mezilaurus sp.*	bark cook	all diseases	HS
23. *Minquartia g.*	bark cook	all diseases	HS
24. *Nicotiana t.*	leaf cook	hallucination	HS
25. *Phytelephas m.*	leaf cook	witchcraft	HS
26. *Remijia p.*	bark cook	all diseases	HS
27. *Simira r.*	bark cook	all diseases	HS
28. *Swartzia p.*	bark cook	all diseases	HS
29. *Tabebuia sp./t.a.*	bark cook	all diseases	HS
30. *Tabebuia sp./t.n.*	bark cook	all diseases	HS
31. *Tabernaemontana sp.*	cook	all diseases	HS
32. *Teliostachya l.*	leaf cook	witchcraft	HS
33. *Terminalia sp.*	bark cook	all diseases	HS

Notes:

1. "all diseases" indicates that the plant is a part of a mixture that can cure any disease.

Cross reference with vernacular name listed first

vernacular name	Scientific name	Family name
1. achote	*Bixa o*	Bixaceae
2. ajos quiro	*Cordia a.*	Boraginaceae
3. almendro	*Terminalia sp.*	Combretaceae
4. ayahuma	*Couroupita g.*	Lecythidaceae
5. azucar huayo	*Hymenaea sp.*	Fabaceae
6. bubinzana	*Calliandra a.*	Fabaceae
7. capirona negra	*Calycophyllum s.*	Rubiaceae
8. capirona roja	*Calycophyllum s.*	Rubiaceae
9. catahua	*Hura c.*	Euphorbiaceae
10. chambira	*Astrocaryum c.*	Arecaceae
11. charapilla	*Capsicum f.*	Solanaceae
12. chullachaqui caspi	*Remijia p.*	Rubiaceae
13. cumaceba	*Swartzia p.*	Fabaceae
14. huacapu	*Minquartia g.*	Olacacee
15. huasahi	*Euterpe p.*	Arecaceae
16. huayracaspi	*Brosimum g.*	Moraceae
17. itahuba	*Mezilaurus sp.*	Lauraceae
18. machimangua	*Eschweilera sp.*	Lecythidaceae
19. metohuayo	*Caryodendron o.*	Euphorbiaceae
20. palisangre	*Brosimum r.*	Moraceae
21. puca quiro	*Simira r.*	Rubiaceae
22. remocaspi	*Aspidosperma e.*	Apocynaceae
23. requia	*Carapa g.*	Meliaceae
24. sacha culantro	*Eringium f.*	Apiaceae
25. sanango	*Tabernaemontana sp.*	Apocynaceae
26. tahuari amarillo	*Tabebuia o.*	Bignoniaceae
27. tahuari negro	*Tabebuia c.*	Bignoniaceae
28. tamamuri	*Brosimum a.*	Moraceae
29. tobacco	*Nicotiana t.*	Solanaceae
30. toe' negro	*Teliostachya l.*	Acanthaceae
31. toronja	*Citrus l.*	Rutaceae
32. tutumo	*Crescentia c.*	Bignoniaceae
33. yarina	*Phytelephas m.*	Arecaceae

Table 27

Summary of all the plants used by Iquitos shamans

No/Scientific name	part	prep	use	sham
1. *Alchornea c.*	bark		not specified	BD
	leaf			BD
2. *Aspidosperma e.*	bark		not specified	BD
Aspidosperma e.	bark	cook	all diseases	HS
3. *Astrocaryum c.*	leaf	cook	witchcraft	HS
4. *Banisteriopsis c.*				BD
Banisteriopsis c.	leaf		not specified	TL
Banisteriopsis c.	leaf		all diseases	PA
5. *Bixa o.*	leaf	cook	drug addiction	HS
6. *Brosimum a.*	bark	cook	all diseases	HS
7. *Brosimum g.*	bark	cook	all diseases	HS
8. *Brosimum r.*	bark	cook	all diseases	HS
9. *Brugmansia sp.*	leaf		not specified	BD
Brugmansia sp.	leaf		not specified	TL
Brugmansia sp.	leaf	cook	all diseases	PA
10. *Brunfelsia sp.*	leaf		not specified	BD
11. *Calliandra a.*	bark	cook	all diseases	HS
12. *Calycophyllum s.*/n.	bark	cook	all diseases	HS
Calycophyllum s./r.	bark	cook	all diseases	HS
13. *Campsiandra sp.*	bark		not specified	BD
14. *Capsicum f.*	bark	cook	all diseases	HS
15. *Carapa g.*	bark	cook	all diseases	HS
16. *Caryodendron o.*	bark	cook	all diseases	HS
17. *Ceiba p.*	bark		not specified	BD
18. *Citrus l.*	bark	cook	AIDS	HS
	leaf			HS
19. *Cordia a.*	bark	cook	all diseases	HS
20. *Couroupita g.*	bark		not specified	BD
	fruit			BD
Couroupita g.	bark	cook	all diseases	HS
21. *Crescentia c.*	leaf	cook	drug addiction	HS
22. *Eringium f.*	leaf	cook	drug addiction	HS
23. *Eschweilera sp.*	bark	cook	all diseases	HS
24. *Euterpe p.*	root	cook	cancer	HS
Euterpe p.	root	cook	all diseases	PA

25.	*Hura c.*		not specified	BD
	Hura c.	leaf cook	all diseases	HS
	Hura c.	resin	all diseases	PA
26.	*Hymenaea sp.*	bark cook	all diseases	HS
27.	*Inga sp.*	leaf bark	not specified	BD
28.	*Mezilaurus sp.*	bark cook	all diseases	HS
29.	*Minquartia g.*	bark cook	all diseases	HS
30.	*Nicotiana t.*	leaf cook	hallucination	HS
	Nicotiana t.	leaf cook	all diseases	PA
31.	*Phytelephas m.*	leaf cook	witchcraft	HS
32.	*Psychotria s.*	leaf	not specified	BD
	Psychotria s.	leaf cook	all diseases	PA
33.	*Psychotria v.*	leaf/cook	all diseases	PA
	Psychotria v.	leaf	not specified	TL
34.	*Remijia p.*	bark cook	all diseases	HS
35.	*Simira r.*	bark cook	all diseases	HS
36.	*Swartzia p.*	bark	not specified	BD
	Swartzia p.	bark cook	all diseases	HS
37.	*Tabebuia sp.*	bark cook	all diseases	HS
38.	*Tabebuia sp.*	bark cook	all diseases	HS
39.	*Tabernaemontana sp.*	bark cook	all diseases	HS
	Tabernaemontana sp.	leaf cook	all diseases	PA
40.	*Teliostachya l.*	leaf	witchcraft	TL
	Teliostachya l	leaf cook	witchcraft	HS
41.	*Terminalia sp.*	bark cook	all diseases	HS

Part 3 - analysis

The analysis of the Iquitos shamans' interviews indicate that there are seven (7) groups of plants that should be considered:

1) plants used (41) by Iquitos shamans for their healing practice

2) plants in common (9) in Iquitos shamans use and varzea distribution

3) plants in common (23) in Iquitos shamans use and varzea shamans use

4) plants used (18) by Iquitos shamans that are not used by varzea shamans

5) plants in common (23) in Iquitos shamans use and terra firme distribution

6) terrafirme plants (6) in common used by Iquitos and varzea shamans

7) plants used (32) by varzea shamans not used by Iquitos shamans

Table 28

A) The following list is the alphabetical cross-reference use/plant name of the forty-one (41) plants indicated by Iquitos shamans.

Use/Cure(7) of plants (41) used by Iiquitos shamans

No./cure	scientific name	vernac name	sha
1. AIDS	*Citrus l.*	toronja	HS
2. all diseases	*Tabernaemontana sp.*	sanango	PA
all diseases	*Aspidosperma e.*	remocaspi	HS
all diseases	*Banisteriopsis c.*	ayahuasca	PA
all diseases	*Brosimum a.*	tamamuri	HS
all diseases	*Brosimum g.*	huayracaspi	HS
all diseases	*Brosimum r.*	palisangre	HS
all diseases	*Brugmansia sp.*	toe' blanco	PA
all diseases	*Calliandra a.*	bubinzana	HS
all diseases	*Calycophyllum s.*	capirona n	HS
all diseases	*Calycophyllum s.*	capirona r.	HS
all diseases	*Capsicum f.*	charapilla	HS
all diseases	Carapa g.	requia	HS
all diseases	*Caryodendron o.*	metohuayo	HS
all diseases	*Cordia a.*	ajos quiro	HS
all diseases	*Couroupita g.*	ayahuma	HS
all diseases	*Eschweilera sp.*	machimangua	HS
all diseases	*Euterpe p.*	huasahi	PA
all diseases	*Hura c.*	catahua	HS
all diseases	*Hura c.*	catahua	PA
all diseases	*Hymenaea sp.*	azucar huayo	HS
all diseases	*Mezilaurus sp.*	itahuba	HS
all diseases	*Minquartia g.*	huacapu	HS
all diseases	*Nicotiana t.*	tobacco	PA
all diseases	*Psychotria s.*	yage'	PA
all diseases	*Psychotria v.*	chacruna	PA
all diseases	*Remijia p.*	chullachaqui caspi	HS
all diseases	*Simira r.*	puca quiro	HS
all diseases	*Swartzia p.*	cumaceba	HS
all diseases	*Tabebuia sp.*	tahuari amarillo	HS
all diseases	*Tabebuia sp.*	tahuari negro	HS
all diseases	*Tabernaemontana sp.*	sanango	HS

all diseases	*Terminalia sp.*	almendro	HS
3. cancer	*Euterpe p.*	huasahi	HS
4. drug addiction	*Bixa o.*	achote	HS
drug addiction	*Crescentia c.*	tutumo	HS
drug addiction	*Eringium f.*	sacha culantro	HS
5. hallucination	*Nicotiana t.*	tobacco	HS
6. not specified	*Ceiba p.*	lupuna	BD
not specified	*Swartzia p.*	cumaceba	BD
not specified	*Hura c.*	catahua	BD
not specified	*Banisteriopsis c.*	ayahuasca	TL
not specified	*Alchornea c.*	ipururo	BD
not specified	*Aspidosperma e.*	remocaspi	BD
not specified	*Brugmansia sp.*	toe' blancc	BD
not specified	*Brugmansia sp.*	toe' blanco	TL
not specified	*Brunfelsia sp.*	chiricsanango	BD
not specified	*Campsiandra sp.*	huacapurana	BD
not specified	*Couroupita g.*	ayahuma	BD
not specified	*Inga sp.*	guaba	BD
not specified	*Psychotria s.*	yage'	BD
not specified	*Psychotria v.*	chacruna	TL
7. witchcraft	*Astrocaryum c.*	chambira	HS
witchcraft	*Phytelephas m.*	yarina	HS
witchcraft	*Teliostachya l.*	toe' negro	HS
witchcraft	*Teliostachya l.*	toe' negro	TL

Some Iquitos shamans claim that plants can cure all diseases. These plants are usually part of a mixture. Since it is difficult to establish the activity of each single plant, The Amazonian Ethnobotanical Dictionary by Duke and Vasquez has been used as a general guide to list all the possible uses of the plants (41) indicated by Iquitos shamans.

Medicinal use (79)

abortive teas, abscesses, after birth, alopecia, antiemetic, antipyretic, antiseptic, antispasmodic, arthritis, atherosclerosis, bronchial asthma, bronchitis, bruise, bug bite, cancer, cold, colite, cough, decongestant, depurative, dermatitis, dermatoses, diabetes, diaphoretic, diarrhea, dislocation, diuretic, douches, dysmenorrhea, dyspnea, emetic, flu, fortify body, hallucination, headache, hemorroides, hemostatic, hernia, herpes, hypertension, indisposition, infection, inflammation, intestinal problems, laxative, liver, lung, malaria, male infertility, mange, muscle pain, mycoses, nausea, obesity, orchitis, parasite, pharyngitis, pneumonia, poison, purgative, rheumatism, skin infection, skin, snakebite, sores, sprain,, stomach, syphilis, throat, tonic, tooth infection, toothache, tumor, vasoregulatory, venereal .disease, vermifuge, witchcraft, wound, yellow fever.

<u>various: (4)</u>

construction, handcraft, ornamental, fruit edible.

Table 29

B) Comparing plants used by Iquitos shamans (41) to varzea plants (42) survey

If the list of the forty-one (41) plants indicated by Iquitos shamans is compared to the forty-two (42) plants listed in varzea distribution it appears that nine (9) plants are in common:

No./scientific name	family	vernac. name
1. *Brosimum g.*	Moraceae	huayra caspi
2. *Brosimum r.*	Moraceae	palisangre
3. *Calychophyllum s.*	Rubiaceae	capirona bajo
4. *Campsiandra sp.*	Fabaceae	huacapurana
5. *Couroupita g.*	Lecythidaceae	ayahuma
6. *Eschweilera sp.*	Lecythidaceae	machimango
7. *Inga sp.*	Fabaceae	shimbillc
8. *Swartzia p.*	Fabaceae	cumaceba
9. *Tabernaemontana s.*	Apocynaceae	lobo sanango

Table 30

C) Comparing plants used by Iquitos shamans (41) plants used by varzea shamans (55)

If the list of forty-one (41) plants indicated by Iquitos shamans is compared to the list of the fifty-five (55) plants used by varzea shamans it appears that twenty-three (23) plants are in common. It should be noticed that the *Brosimum g.*, *Calychophyllum s.*, *Couroupita g.* and *Swartzia p.* can be found in varzea. (See varzea study distribution).

No.	Scientific name	Family	vernac. name
1.	*Alchornea c.*	Euphorbiaceae	ipururo
2.	*Aspidosperma e.*	Apocynaceae	remocaspi
3.	*Banisteriopsis c.*	Malpighiaceae	ayahuasca
4.	*Bixa o.*	Bixaceae	achote rojo
5.	*Brosimum g.*	Moraceae	huayra caspi
6.	*Brugmansia sp.*	Solanaceae	toe' blanco
7.	*Brunfelsia sp.*	Solanaceae	chiric sanango
8.	*Calliandra a.*	Fabaceae	bobinsana
9.	*Calycophyllum s.*	Rubiaceae	capirona negra
10.	*Ceiba p.*	Bombacaceae	lupuna
11.	*Citrus p.*	Rutaceae	toronja
12.	*Couroupita g.*	Lecythidaceae	ayahuma
13.	*Euterpe p.*	Arecacae	huasahi
14.	*Hura c.*	Euiphorbiaceae	catahua
15.	*Hymenaea sp.*	Fabaceae	azucarhuayo
16.	*Inga e.*	Fabaceae	guaba
17.	*Minquartia g.*	Olacaceae	huacapu
18.	*Nicotiana t.*	Solanaceae	tobacco
19.	*Psychotria v.*	Rubiaceae	chacruna
20.	*Remijia p.*	Rubiaceae	chullachaqui caspi
21.	*Swartzia p.*	Fabaceae	cumaceba

22.	*Tabebuia o.*	Bignoniaceae	tahuari amarillo
23.	*Tabernaemontana s.*	Apocynaceae	lobo sanango

Table 31

D) Plants used by Iquitos shamans (18) not used by varzea shamans

The following chart shows the plants indicated by Iquitos shamans that are not used by varzea shamans. The total number is the difference between the total number of plants used by Iquitos shamans (41) less the number of plants that both varzea and Iquitos shamans have in common (23), which is eighteen (41-23=18).

No/scient. name	vern.name	use	sham
1. *Astrocaryum c.*	chambira	witchcraft	HS
2. *Brosimum a.*	tamamuri	all diseases	HS
3. *Brosimum r.*	palisangre	all diseases	HS
4. *Campsiandra sp.*	huacapurana	not specified	BD
5. *Capsicum f.*	charapilla	all diseases	HS
6. *Carapa g.*	requia	all diseases	HS
7. *Caryodendron o.*	metohuayo	all diseases	HS
8. *Cordia a.*	ajos quiro	all diseases	HS
9. *Crescentia c.*	tutumo	drug addiction	HS
10. *Eringium f.*	sacha culantro	drug addiction	HS
11. *Eschweilera sp.*	machimangua	all diseases	HS
12. *Mezilaurus sp.*	itahuba	all diseases	HS
13. *Phytelephas m.*	yarina	witchcraft	HS
14. *Psychotria s.*	yage'	not specified	BD
Psychotria s.	yage'	all diseases	PA
15. *Simira r.*	puca quiro	all diseases	HS
16. *Tabebuia sp.*	tahuari negro	all diseases	HS
17. *Teliostachya l.*	toe' negro	witchcraft	TL
Teliostachya l.	toe' negro	witchcraft	HS
18. *Terminalia sp.*	almendro	all diseases	HS

(<u>Note:</u> These plants are used for four (4) different purposes: all diseases, drug addiction, not specified, witchcraft. Therefore it is not possible to assign medicinal value to these plants according to the indication of Iquitos shamans.)

Table 32

E) Iquitos shamans plants (23) in common with terrafirme distribution survey

If the list of plants (41) used by Iquitos shamans is compared to the list of the terrafirme distribution inventory twenty-three (23) plants are found in common.

No/scientific. name	vernac.name	use	sham
1. *Aspidosperma e.*	remocaspi	not specified	BD
Aspidosperma e.	remocaspi	all diseases	HS
2. *Astrocaryum c.*	chambira	witchcraft	HS
3. *Bixa o.*	achote	drug addiction	HS
4. *Brosimum a.*	tamamuri	all diseases	HS
5. *Brosimum r.*	palisangre	all diseases	HS
6. *Brosimum.g.*	huayracaspi	all diseases	HS
7. *Brunfelsia sp.*	chiricsanango	not specified	BD
8. *Capsicum f.*	charapilla	all diseases	HS
9. *Carapa g.*	requia	all diseases	HS
10. *Cordia a.*	ajos quiro	all diseases	HS
11. *Couroupita g.*	ayahuma	not specified	BD
Couroupita g.	ayahuma	all diseases	HS
12. *Eschweilera sp.*	machimangua	all diseases	HS
13. *Euterpe p.*	huasahi	cancer	HS
Euterpe p.	huasahi	all diseases	PA
14. *Hura c.*	catahua	not specified	BD
Hura c.	catahua	all diseases	HS
Hura c.	catahua	all diseases	PA
15. *Hymenaea sp.*	azucar huayo	all diseases	HS
16. *Inga sp.*	guaba	not specified	BD
17. *Minquartia g.*	huacapu	all diseases	HS
18. *Phytelephas m.*	yarina	witchcraft	HS
19. *Remijia p.*	chullachaquicaspi	all diseases	HS
20. *Swartzia p.*	cumaceba	not specified	BD
Swartzia p.	cumaceba	all diseases	HS
21. *Tabebuia sp.*	tahuari negro	all diseases	HS
22. *Tabernaemontana sp.*	sanango	all diseases	HS
Tabernaemontana sp.	sanango	all diseases	PA
23. *Terminalia sp.*	almendro	all diseases	HS

Table 33

F) Terrafirme plants used in common by varzea and Iquitos shamans

No/scientific name	vernac.name	use	sha
1. *Brosimum r.*	palisangre	all diseases	HS
2. *Brosimum g*	huayracaspi	all diseases	HS
3. *Couroupita g.*	ayahuma	all diseases	HS
4. *Eschweilera sp.*	machimangua	all diseases	HS
5. *Swartzia sp.*	cumaceba	all diseases	HS
6. *Tabernaemontana sp.*	sanango	all diseases	HS

Table 34

Plants used by varzea shamans (32) not used by Iquitos shamans

No/Scientific name	vernac.name	use	sha
1. *Artocarpus h.*	pandisho	hernia	SS
Artocarpus h.	pandisho	hernia	RE
2. *Bombax m.*	punga	hallucination	RE
		arthritis	RE
Bombax m.	punga	arthritis	SS
3. *Calathea l.*	bijao	hallucination	RE
4. *Canna i.*	achira	intestine	MS
5. *Citrus l.*	lemon	hallucination	SS
Citrus l.	lemon	hallucination	RE
6. *Clidemia h.*	mullaca	lungs	SS
Clidemia h.	mullaca	tuberculosis	RE
7. *Clusia r.*	renaquilla	hernia	SS
		fem.repr.org.	SS
8. *Dieffenbachia sp.*	patiquina	cancer	RE
Dieffenbachia sp.	patiquina	hallucination	SS
9. *Eleutherine b.*	yahuarpiripiri	pain killer	SS
		hemorrhage	SS
Eleutherine b.	yahuarpiripiri	hemorrhage	RE
10. *Erythrina p.*	huayruro	pain killer	SS
		hemorrhage	SS
Erythrina p.	huayruro	hemorrhage	RE
11. *Ficus sp.*	renaco	fem.repr.org.	CG
Ficus sp.	renaco	hernia	RE
		fem.repr.org.	RE
Ficus sp.	renaco	headache	MS
		sex disease	MS
12. *Genipa a.*	huito	headache	MS
		sex. disease	MS
13. *Heisteria p.*	chuchuhuasa	fem.repr.org.	CG
14. *Himatanthus s.*	bellacocaspi	tumor	SS
Himatanthus s.	bellacocaspi	tumor	RE
15. *Iriartrea d.*	huacaprona	intestine	MS
16. *Macrolobium a.*	pashaco	bad luck	MS
17. *Mansoa a.*	ajos sacha	cold/bad luck	CG

	Mansoa a.	ajos sacha	cold arthritis	SP
			impotency	SP
			bad luck/stomach	SP
	Mansoa a.	ajos sacha	hallucination	SS
			cold/rheumatism	SS
	Mansoa a.	ajos sacha	arthritis	RE
18.	*Maquira c.*	capinuri	tumor/wound	SS
			fem.repr.org.	SS
	Maquira c.	capinuri	tumor	RE
			fem.repr.org.	RE
19.	*Mauritia f.*	aguaje	intestine	MS
20.	Maytemus sp.	chuchuhuasi	arthritis	MS
	Maytenus sp.	chuchuhuasi	multiple use	SS
	Maytenus sp.	chuchuhuasi	blood/bone	RE
			sex. disease	RE
21.	*Musa sp.*	platano	diarrhea	MS
22.	*Ocimum m.*	albahaca	multiple use	SP
23.	*Otoba p.*	aguajillo	intestine	MS
24.	*Petiveria a.*	mucura	hallucination	SS
	Petiveria a.	mucura	multiple use	SP
	Petiveria a.	mucura	hallucination	RE
25.	*Saccharum o.*	miel de abeja	calcium defic.	SP
			male impotency	SP
26.	*Spondias m.*	ubos	wounds	MS
27.	*Theobroma c.*	cacao	hallucination	SP
28.	*Thevetia p.*	camalonga	hallucination	CG
			stomach	CG
29.	*Triplaris s.*	tangarana	arthritis	SS
	Triplaris s.	tangarana	arthritis	RE
30.	*Tynnanthus p.*	clavohuasca	calcium defic.	SP
			male impotency	SP
31.	Zanthoxyllum sp.	alcanphor	hallucination	CG
			stomach	CG
32.	*Zingiber o.*	ajengibre	calcium defic.	SP
			male impotency	SP

Note - The plants used by varzea shamans (32) but not used by Iquitos shamans have twenty three (23) different applications:

Arthritis, bad luck, blood, cancer, cold, calcium deficiency, diarrhea, female reproductive organs, hallucination, headache, hemorrhage, hernia, intestine, lungs, male impotency, multiple use, pain killer, rheumatism, stomach, tuberculosis, tumor, venereal diseases, wound.

Comparing the use of plants indicated by Iquitos shamans to varzea shamans

When the thirty-four uses of the fifty-five plants used by varzea shamans are compared to the 79 uses - according to the Amazonian Ethnobotanical Dictionary guide - of the forty-one plants used by Iquitos shamans it appears that the following eighteen (18) uses are in common: cold, diarrhea, fortify body, hallucination, headache, hernia, infection, intestine, laxative, lung, male infertility, muscle, rheumatism, stomach, tonic, tumor, venereal diseases, and wound. This represents about 52% of the total of varzea shamans and about 28% of the Iquitos shamans. Therefore it can be said that Iquitos shamans have a bigger range of possible use than varzea shamans.

Part 4 - Discussion

The interviews of Iquitos shamans were conducted under particular circumstances. Due to logistics problems it was not easy to find shamans available each time. Making an appointment was not always possible and therefore sometimes the interview was very short. Shamans were interviewed either at home or in their office where their patients come for assistance.

Iquitos shamans have a long experience as healers. Don Cristobal has been working for forty-seven years. Even twenty-five years that is the time indicated by Don Erasmo is a remarkable long period.

Three shamans live in the central part of the city while Don Humberto lives in the periphery. He is a palero and has a license from the city to practice in his office. This shaman appears to be the most open and successful in his activity since many patients come to him. Don Humberto does not work with ayahuasca *(Banisteriopsis c.)* but with other plants and appears to be the most knowledgeable about plants. His list has thirty-six different names. His office is always filled with patients who go there to be cured. He is also the only one who provided more detail about plant preparation and ceremony procedure. It was reported (Luna, 1984) that paleros have a very good knowledge of plants.

The *ayahuasca* drink was the major topic of conversation because Iquitos shamans are very involved in this practice. Don Humberto is the only shaman who does not work with ayahuasca but with brebaje palo. This drink is a combination of more than ten pieces of bark of different trees. We may speculate that because Don Humberto claims that this drink can cure all diseases the combination of ten different plant extracts makes a unique blend. It is almost impossible to assign the medicinal value to each plant not only because each plant may have different chemicals, but also because the preparation process, like cooking, can cause chemical reactions among the chemical compounds and new substances can be generated. It would be very interesting to conduct phytochemical investigation to establish the nature of the drink called "brebaje palo."

According to Iquitos shamans their expertise can be successful in drug addiction and AIDS treatment. As mentioned before varzea shamans do not mention anything about this issue. It is possible that Iquitos shamans, since they live in the City, are exposed to problems that are not so common in the life of the village people. The interaction and the conversation with the city shamans was faster and shorter compared to the shamans' interview. The city environment is different from varzea and the life pace is different. Don Humberto's office could be compared to a major busy health care center of a big city, while varzea shamans could be compared to doctors operating in rural areas.

The knowledge of plants is different from one shaman to the next, but this was noted also with varzea shamans and it is understandable. Every shaman has his own repertory and operates on that knowledge. Shamans who use the *ayahuasca* drink support the common knowledge that the key ingredient for this mixture is the combination of *Psychotria v.* with *Banisteriopsis c.* They also agreed on the fact that other plants are used in addition to change the effect of the drink. No shaman indicated detail about the preparation and the place where the drink is prepared.

Shamans provided information that appears quite interesting for investigation. Luna (1984) - for example - indicated that a shaman used *Triplaris s.* in substitution of *Psychotria v.* that has the most powerful hallucinogenic compounds. Don Cristobal indicated that *Brugmansia sp.* (toe') can be used in substitution of *Psychotria v.*. It is well known that *Brugmansia sp.* is very powerful; Luna (1984) stated that only two leaves can be added to the ayahuasca mixture. The strong power of *Brugmansia sp.* was also reported by Schultes and Hoffman (1970). Don Jose confirmed also that if ayahuasca has no strength *Brugmansia sp.* (toe') and *Tabernaemontana sp.* (sanango) are used in addition. It would be very interesting to pursue research in this direction to verify this statement.

No information was collected about possible use of land where plants used for healing could grow. Shamans have to rely on plants purchased from different sources and locations.

Shamans indicated that dieting is highly required prior to treatment in order to be cured. It is possible to speculate that some chemical compounds present in the plant preparation might interfere in the healing process with the general condition of the patient. It is also possible that shamans have experienced cases where either the patients had side effects or the treatments were inefficient. It is also possible that dieting is considered good for any condition because the body has the opportunity to rest and relax and therefore can be more receptive to the treatment. Psychological impact should not be undervalued: patients may think that following a diet will increase their chance for recovery. Indeed diet appears to be a major issue to obtain positive results.

The average knowledge of ayahuasqueros (shamans who use ayahuasca) is more concentrated on *ayahuasca* while paleros have extensive knowledge on many plants. It is possible to speculate that because of the myth that surrounds ayahuasca more people are interested in ayahuasca than in other beverages, such as brebaje palo.

Some points should be considered in relation to the mathematical calculations and related table before conclusions are made about Iquitos shamans' activity. The numbers and percentages should be considered as general indications. This study was not intended to establish statistics and to issue a final statement. Like many other human activities shamanism is changing due to many factors that can change the evaluating parameters every day. Error and misunderstanding is possible, and the linguistic cross-reference is always challenging. What has been primarily considered is to try and understand how shamans relate to their environment and how shamanism evolves over time because of new facts and events that change the life of the people such as the Amazon River does to them. The following are some conclusions:

Forty-one plants have been reported as used by Iquitos shamans, but only seven different uses are indicated. Many plants, particularly the ones indicated by Don Humberto are classified as capable of curing all diseases. Scientifically it is debatable to accept this. It is possible as stated before that the several plants together make a cocktail with multiple effects, but the mystery remains about the chemicals that have the curative effect. It would also be interesting to conduct a major research on *brebaje palo* to find out more about the possible combination and effect of different plant material. Since the number of patients waiting was very high it is safe to say that Don Humberto's skill is in aemand among the community and is well appreciated.

The forty-one plants indicated by Iquitos shamans have been compared to the forty-two plants of varzea distribution. It was found that nine plants are in common and nine different uses are in common: *cancer, diarrhea, hallucination, laxative, lung, multiple use, rheumatism, venereal diseases* and *witchcraft*. Among these plants *Calychophyllum s.* (capirona bajo), *Campsiandra sp* (huacapurana), *Couroupita g.* (ayahuma), *and Tabernaemontana s.* (lobo sanango) have multiple effect. This may indicate that the information has been either received in the city of Iquitos or shamans have the opportunity to move around and improve their plant knowledge in different areas far from the city such as varzea. It is difficult to say if this knowledge is an old or new acquisition. Boat service between city and villages is provided almost once a day and therefore shamans can move easily from one place to another.

Eschweilera sp. (machimangua) listed in varzea inventory but not used by varzea shamans is indicated instead by Don Humberto as one of the plants used in preparation of the drink called "brebaje palo". According to the Amazonian Ethnobotanical Dictionary by Duke and Vasquez *Eschweilera sp.* has no medicinal value since this plant is reportedly used for construction (poles, beams, decks). It is possible to speculate that either the authors of the book have no information about the medicinal use of the plant or that the knowledge of shamans is so diversified and constantly changing that it is not possible to track down the evolutionary process of their healing skill. It is also virtually impossible to assess the chemical action of the compounds of *Eschweilera sp.* when the mixture is cooked.

When the fifty-five plants used by varzea shamans are compared to the forty-one plants indicated by Iquitos shamans it appears that twenty-three plants are in common: Four plants can be found in varzea. Since Iquitos shamans indicate nine plants from varzea inventory while in the above comparison only four from varzea are in common, it appears that varzea shamans do not pay too much attention to the plants around them or Iquitos shamans have a better knowledge of the plants even if they grow far from the city.

Varzea shamans use thirty-two plants not indicate by Iquitos shamans and it is safe to say that these plants are located in areas other than the areas where Iquitos shamans' plants grow. This represents more than about half of the entire medicinal inventory of varzea shamans. It is a major difference between varzea and Iquitos shamans. It is not easy to find an explanation for that. Many plants mentioned by varzea shamans are easily available to them and not to Iquitos shamans or Iquitos shamans have a different method of plant selection. It is also fair to say that shamans built their knowledge and repertory of plants to cure patients in accordance with the circumstances; if shamans have sufficient plants to cover the vast majority of illness, there is no necessity to explore other plants when their healing skill is already satisfactory.

Iquitos shamans use eighteen plants (41-23=18) that are not used by varzea shamans and may be the medicinal value of these plants compensate for the medicinal value of the twenty-three different plants indicated by varzea shamans. Unfortunately varzea shamans are more accurate in defining the medicinal value of plants while Iquitos shamans are less specific and quite often claim that plants can cure any disease.

To establish a more satisfactory range of the Iquitos shamans' plants medicinal value The Amazonian Ethnobotanical Dictionary by Duke and Vasquez has been used as a general guide and a list of seventy-nine different therapeutic uses has been assigned to the forty-one plants used. Also other commercial use has been assigned to some plants. As a comparison, using only the information reported by varzea shamans (without using the Amazonian Ethnobotanical Dictionary) only thirty-four therapeutic uses have been assigned to the fifty-five plants used by varzea shamans.

When the thirty-four uses of the fifty-five plants used by varzea shamans are compared to the 79 uses - according to the Amazonian Ethnobotanical Dictionary guide - of the forty-one plants used by Iquitos shamans it appears that the following eighteen (18) uses are in common: cold, diarrhea, fortify body, hallucination, headache, hernia, infection, intestine, laxative, lung, male infertility, muscle, rheumatism, stomach, tonic, tumor, venereal diseases and wounds. This represents about

52% of the total of varzea shamans and about 28% of the Iquitos shamans. Therefore it can be said that Iquitos shamans have a bigger range of possible use than varzea shamans.

Iquitos shamans do not show any sign of their special skill and have conventional jobs they attend every day. It is quite possible that time for exploring new healing avenues is not available and therefore no evolution in their skill is possible. In addition, only thirteen of the thirty-one plants species that are used by the Iquitos shamans are found in the vicinity of the Iquitos. They were listed in the terrafirme inventory conducted about thirty km from the city.

It is interesting to note that Iquitos shamans, when they refer to the ayahuasca drink, attribute to the mixture multiple healing. Don Saboya indicated the same fpr his drink prepared with bark of different plants (brebaje palo).

Urban shamanism appears to be the result of many factors that have influence on the city life. Iquitos life is quite hectic compared to the life in the villages along the Amazon River. The patient that goes to the city shaman is similar to the patient in our city. While it is true that the use of native people medicine is linked to different factors, such as money, culture, distrust in technology or others, it should be noticed that the service provided in the city is a city-style service; patients go to the doctor and wait for treatment, that, as indicated by city shamans cure all the disease. Shamans in the city appear disconnected from the plant material used in their healing practice.

The use of plants for multiple purposes leads one to think that the there is sort of a rush in this practice meant to satisfy more people at the same time. Shamans in the village seem to be part of the natural forest setting and more connected to the plant environment. The plant knowledge seems more specific for each individual disease and it is safe to say that they know their patients better since they live in the same small community. The population in some villages can be about one hundred people or less, while Iquitos city is about 300,000. The shaman-patient relationship can be very different in the two different environments.

The impact of ayahuasca drink and the interest generated among people who come from other areas and countries has probably changed the figure of the urban shaman even if it is well known that ayahuasca ceremonies are also conducted in locations out of the city surroundings and in particular setting.

CHAPTER 7

The plant inventory conducted in terrafirme has been compared with the plants used by varzea shamans and also with the plants used by Iquitos shamans.

PART 1

When the terrafirme plant inventory is compared to the varzea shamans plant inventory it appears that in the list of 141 plant species 119 are not found in common (see table 35).

When the terrafirme plant inventory is compared to the plants used by varzea shamans it appears that in the list of the varzea shamans plant inventory (55 plants) only 22 (141-119=22) are found in common (see table 36).

When the plants used by varzea shamans are compared to the plants in common with terrafirme plant inventory it appears that 33 plants (55-22=33) are not found in common (see table 37).

PART II

When the terrafirme plant inventory is compared to Iquitos shamans plant inventory it appears that in the list of 141 plant species 123 are not found in common (see table 38).

When the terrafirme plant inventory is compared to the plants used by Iquitos shamans it appears that in the list of 41 plants only 18 (141-123=18) are found in common (see table 39).

When the plants used by Iquitos shamans are compared to the plants in common with terrafirme inventory it appears that 23 plants 41-18=23) are not found in common (see table 40).

Table 35

When the terrafirme plant inventory is compared to the varzea shamans plant inventory it appears that in the list of 141 plant species 119 are not found in common.

No/Scientific name	Family	vernac. name
1. *Abuta sp*	Menispermaceae	abuta caspi
2. *Acotea sp.*	Lauraceae	anis moena
3. *Alibertia sp.*	Rubiaceae	huitillo
4. *Anaxagorea brachycarpa*	Annonaceae	espintana
5. *Anaxagorea brevipes*	Annonaceae	carahuasca
6. *Aparisthmium c.*	Euphorbiaceae	yanavara uschaquiro
7. *Apeiba a.*	Tiliaceae	llausa kiro
8. *Apuleia l.*	Fabaceae	ana caspi
9. *Aspidosperma n.*	Apocynaceae	remo caspi
10. *Aspidosperma s.*	Apocynaceae	quillobordon
11. *Astrocaryum c.*	Arecaceae	chambira
12. *Astrocaryum h.*	Arecaceae	huicungo
13. *Attalea t.*	Arecaceae	conta
14. *Bertholetia e.*	Lecythidaceae	castana
15. *Bothriospora c.*	Rubiaceae	afasi caspi
16. *Bouganvillea s.*	Nyctaginaceae	papelillo
17. *Brosimum a.*	Moraceae	tamamuri
18. *Brosimum p.*	Moraceae	chimicua
19. *Brosimum p.*	Moraceae	manchinga
20. *Brosimum r.*	Moraceae	palisangre
21. *Brunfelsia c.*	Solanaceae	chiri caspi
22. *Brunfelsia g.*	Solanaceae	chiric sanango
23. *Bursera g.*	Burseraceae	carana
24. *Caesalpina f.*	Fabaceae	cedro
25. *Calophyllum b.*	Clusiaceae	alfaro moena
26. *Campomanesia l.*	Myrtaceae	palillo
27. *Capirona d.*	Rubiaceae	capirona altu
28. *Capsicum f.*	Solanaceae	charapilla
29. *Caraipa g.*	Clusiaceae	aceite caspi
30. *Caraipa t.*	Clusiaceae	brea caspi
31. *Carapa g.*	Meliaceae	requia
32. *Cariniana d.*	Lecythidaceae	cachimbo
33. *Carludovica p.*	Cyclanthaceae	bombonaje
34. *Caryocar sp.*	Caryocariaceae	alamendro

35.	*Caryodaphnopsis f.*	Lauraceae	achuni moena moena
36.	*Casearia s.*	Flacourtiaceae	ucho caspi
37.	*Cavanillesia u.*	Bombacaceae	puca lupuna arbol del tambor
38.	*Cecropia sp.*	Cecropiaceae	cetico
39.	*Cedrelinga c.*	Fabaceae	cedro masha tornillo
40.	*Ceiba s.*	Bombacaceae	huimba
41.	*Chimarrhis w.*	Rubiaceae	yerno prueba
42.	*Chrysophyllum c.*	Sapotaceae	caimito
43.	*Chrysophyllum n.*	Sapotaceae	quinilla
44.	*Chrysophyllum p.*	Sapotaceae	caimitillo
45.	*Clarisia b.*	Moraceae	capinuri altura
46.	*Copaifera p.*	Fabaceae	copaiba
47.	*Copaifera r.*	Burseraceae	copal
48.	*Cordia a.*	Boraginaceae	ajos kiro
49.	*Cordia n.*	Boraginaceae	anallo caspi
50.	*Couepia c.*	Chrysobalanecae	supay ocote
51.	*Couma m.*	Apocynaceae	lechehuayo/caspi
52.	*Crax sp*		paujil caspi
53.	*Croton p.*	Euphorbiaceae	topillo
54.	*Cyphomandra h.*	Solonaceae	asna panga
55.	*Diplotropis p.*	Fabaceae	chonta kiro
56.	*Dipteryx sp.*	Fabaceae	shiuhuaco
57.	*Duguetia sp.*	Annonaceae	tortuga caspi
58.	*Erisma c.*	Vochysiaceae	quillo sisa
59.	*Eschweileira sp.*	Lecythidaceae	machimango
60.	*Faramea sp.*	Rubiaceae	caballo sanango
61.	*Ficus e.*	Moraceae	cauchillo
62.	*Ficus i.*	Moraceae	oje'
63.	*Gleospermum s.*	Violaceae	tamarillo
64.	*Gnetum n.*	Gnetaceae	bala huayo
65.	*Guazuma u.*	Sterculaceae	bolaina
66.	*Heisteria i.*	Olaceaceae	yutubanco
67.	*Helosis g.*	Balanophoraceae	aguajillo
68.	*Hevea g.*	Euphorbiaceae	shiringa
69.	*Iryanthera t.*	Myristicaceae	pucuna caspi
70.	*Jessenia b.*	Arecaceae	hungurahuai
71.	*Lacistema a.*	Flacourtiaceae	trompo huayo
72.	*Lacmellea l.*	Apocynaceae	chicle huayo
73.	*Ladenbergia m.*	Rubiaceae	cascarilla
74.	*Leonia g.*	Violaceae	tamara
75.	*Lepidocaryum t.*	Arecacae	irapay
76.	*Licania h.*	Chrysobalanaceae	casha rana
77.	*Licania t.*	Lauraceae	canela moena
78.	*Licaria c.*	Lauraceae	muena

79.	*Lindackeria p.*	Flacourtaceae	casha huayo
80.	*Lindernia c.*	Scrophulariaceae	aretillo
81.	*Macoubea g.*	Apocynaceae	loro micuna
82.	*Micrandra s.*	Euphorbiaceae	shiringa masha
83.	*Moronobea c.*	Clusiaceae	asufre caspi
84.	*Mucoa d.*	Apocynaceae	yahuarhuayo blanco
85.	*Muntingia c.*	Eleaocarpaceae	yumanasa
86.	*Myroxylum b.*	Fabaceae	balsamo caspi
87.	*Oenocarpus sp.*	Arecaceae	cinamillo
88.	*Orbignya p.*	Arecaceae	shapaja
89.	*Phytelephas m.*	Arecaceae	yarina
90.	*Piper sp.*	Piperacae	cordoncillo
91.	*Podocarpus o.*	Podocarpaceae	aceitillo
92.	*Rheedia g.*	Clusiaceae	charchiuelo
93.	*Rinorea r.*	Violaceae	cafecillos
94.	*Rollinia sp*	Annonaceae	anonilla
95.	*Sanchezia p.*	Acanthaceae	antara caspi
96.	*Sapium g.*	Euphorbiaceae	caucho masha
97.	*Sapium m.*	Euphorbiaceae	shiringa rana
98.	*Scheelea b.*	Arecaceae	shebon
99.	*Simarouba a.*	Simaroubaceae	marupa'
100.	*Simira t.*	Rubiaceae	huacamayo caspi
101.	*Siparuna g.*	Monimiaceae	asna huayo
102.	*Sloanea sp.*	Elaeocarpaceae	cepanchina
103.	*Socratea e.*	Arecaceae	pona
104.	*Swartzia l.*	Fabaceae	acero shimbillo
105.	*Swietenia m.*	Meliaceae	aguano
106.	*Tabebuia c.*	Bignoniaceae	tahauri negro
107.	*Talisia sp*	Sapindaceae	virote huayo
108.	*Tapirira g.*	Anacardiaceae	wira caspi
109.	*Terminalia c.*	Combretaceae	almendro
110.	*Terminalia i.*	Combretaceae	almendrillo
111.	*Tetragastris p.*	Burseraceae	lacre
112.	*Theobroma s.*	Sterculiaceae	macambilio
113.	*Tovomita sp*	Clusiaceae	chullachaqui colorado
114.	*Trema m.*	Ulmaceae	atadijo
115.	*Unonopsis sp.*	Annonaceae	icoja
116.	*Urera b.*	Urticaceae	mari mari
117.	*Virola f.*	Myristicaceae	caupuri
118.	*Virola s.*	Myristicaceae	cumala
119.	*Warscewiczia c.*	Rubiaceae	bandera caspi

Table 36

When the terrafirme plant inventory is compared to the plants used by varzea shamans it appears that in the list of the varzea shamans plant inventory (55 plants) only 22 (141-119=22) are found in common.

No/scientific name	Family	vernac. name
1. *Brosimum g.*	Moraceae	huayra caspi rojo
2. *Couroupita g.*	Lecythidaceae	ayahuma
3. *Erythrina p.*	Fabaceae	huayruro
4. *Euterpe p.*	Arecacae	chonta/huasai
5. *Ficus sp.*	Moraceae	renaco
6. *Himatanthus s.*	Apocynaceae	bellaco caspi
7. *Hura c.*	Euiphorbiaceae	catahua
8. *Hymenea sp.*	Fabaceae	azucar huayo
9. *Inga sp.*	Fabaceae	shimbillo
10. *Iriartea d.*	Arecaceae	huacrapona
11. *Macrolobium a.*	Fabaceae	pashaco
12. *Maquira c.*	Moraceae	capinuri
13. *Maytenus m.*	Celastraceae	chuchuashi
14. *Minquartia g.*	Olacaceae	huacapu
15. *Otoba sp.*	Myristicaceae	aguanillo
16. *Remijia p.*	Rubiaceae	chullachaqui caspi
17. *Spondias m.*	Anacardiaceae	ubos
18. *Swartzia p.*	Fabaceae	cumaceba
19. *Tabernaemontana sp.*	Apocynaceae	uchosanango
20. *Theobroma c.*	Sterculaceae	cacao
21. *Triplaris s.*	Polygonaceae	tangarana
22. *Zanthoxylum sp.*	Rutaceae	alcanform

Table 37

When the plants used by varzea shamans are compared to the plants in common with terrafirme plant inventory it appears that 33 plants (55-22=33) are not found in terrafirme inventory.

No/scientific name	vernacular name
1. *Alchornea c.*	hipururo
2. *Artocarpus c.*	pandisho
3. *Aspidosperma e.*	remocaspi
4. *Banisteriopsis c.*	ayahuasca
5. *Bixa o.*	achote rojo
6. *Bombax m.*	punga
7. *Brugmansia sp.*	toe'
8. *Brumfelsia sp.*	chiricsanango
9. *Calathea l.*	bijao
10. *Calliandra l.*	bobinsana
11. *Calychophyllum s.*	capirona
12. *Canna i.*	achira
13. *Ceiba p.*	lupuna
14. *Citrus l.*	lemon
15. *Citrus l.*	toronja
16. *Clidemia h.*	mullaca
17. *Clusia r.*	renaquilla
18. *Dieffenbachia sp.*	catahua
19. *Eleutherine b.*	yahuarpiripiri
20. *Genipa a.*	huito
21. *Heisteria p.*	chuchuhuasa
22. *Mansoa a.*	ajos sacha
23. *Mauritia f.*	aguaje
24. *Musa sp.*	platano
25. *Nicotiana t.*	tabaco
26. *Ocimum m.*	albahaca
27. *Petiveria a.*	mucura
28. *Psychothria v.*	chacruna
29. *Saccharum o.*	miel de abeja
30. *Tabebuia r.*	tahuari
31. *Thevetia p.*	camalonga
32. *Tynnanthus p.*	clavohuasca
33. *Zingiber o.*	ajengibre

Table 38

When the terrafirme plant inventory is compared to Iquitos shamans plant inventory it appears that in the list of 141 plant species 123 are not found in common.

No/Scientific name	family	vernac. name
1. *Abuta sp*	Menispermaceae 1	abuta caspi
2. *Acotea sp.*	Lauraceae	anis moena
3. *Alibertia sp.*	Rubiaceae	huitillo
4. *Anaxagorea brachycarpa*	Annonaceae	espintana
5. *Anaxagorea brevipes*	Annonaceae	carahuasca
6. *Aparisthmium c.*	Euphorbiaceae	yana vara uschaquiro
7. *Apeiba a.*	Tiliaceae	llausa kiro
8. *Apuleia l.*	Fabaceae	ana caspi
9. *Aspidosperma s.*	Apocynaceae	quillobordon
10. *Astrocaryum c.*	Arecaceae	chambira
11. *Astrocaryum h.*	Arecaceae	huicungo
12. *Attalea t.*	Arecaceae	conta
13. *Bertholetia e.*	Lecythidaceae	castana
14. *Bothriospora c.*	Rubiaceae	afasi caspi
15. *Bouganvillea s.*	Nyctaginaceae	papelillo
16. *Brosimum p.*	Moraceae	chimicua
17. *Brosimum p.*	Moraceae	manchinga
18. *Brunfelsia c.*	Solanaceae	chiri caspi
19. *Bursera g.*	Burseraceae	carana
20. *Caesalpina f.*	Fabaceae	cedro
21. *Calophyllum b.*	Clusiaceae	alfaro moena
22. *Campomanesia l.*	Myrtaceae	palillo
23. *Capirona d.*	Rubiaceae	capirona altu
24. *Caraipa g.*	Clusiaceae	aceite caspi
25. *Caraipa t.*	Clusiaceae	brea caspi
26. *Cariniana d.*	Lecythidaceae	cachimbo
27. *Carludovica p.*	Cyclanthaceae	bombonaje
28. *Caryocar sp*	Caryocariaceae	alamendro
29. *Caryodaphnopsis f.*	Lauraceae	achuni moena moena
30. *Casearia s.*	Flacourtiaceae	ucho caspi
31. *Cavanillesia u.*	Bombacaceae	puca lupuna arbol del tambor
32. *Cecropia sp.*	Cecropiaceae	cetico

33.	*Cedrelinga c.*	Fabaceae	cedro masha tornillo
34.	*Ceiba s.*	Bombacaceae	huimba
35.	*Chimarrhis W.*	Rubiaceae	yerno prueba
36.	*Chrysophyllum c.*	Sapotaceae	caimito
37.	*Chrysophyllum n.*	Sapotaceae	quinilla
38.	*Chrysophyllum p.*	Sapotaceae	caimitillo
39.	*Clarisia b.*	Moraceae	capinuri altu
40.	*Copaifera p.*	Fabaceae	copaiba
41.	*Copaifera r.*	Burseraceae	copal
42.	*Cordia n.*	Boraginaceae	anallo caspi
43.	*Couepia c.*	Chrysobalanecae	supay ocote
44.	*Couma m.*	Apocynaceae	leche huayo /caspi
45.	*Crax sp*		paujil caspi
46.	*Croton p.*	Euphorbiaceae	topillo
47.	*Cyphomandra h.*	Solonaceae	asna panga
48.	*Diplotropis p.*	Fabaceae	chonta kiro
49.	*Dipteryx sp.*	Fabaceae	shiuhuaco
50.	*Duguetia sp.*	Annonaceae	tortuga caspi
51.	*Erisma c.*	Vochysiaceae	quillo sisa
52.	*Erythrina p.*	Fabaceae	huayruro
53.	*Faramea sp*	Rubiaceae	caballo sanango
54.	*Ficus e.*	Moraceae	cauchillo
55.	*Ficus i.*	Moraceae	oje'
56.	*Ficus sp.*	Moraceae	renaco
57.	*Gleospermum s.*	Violaceae	tamarillo
58.	*Gnetum n.*	Gnetaceae	bala huayo
59.	*Guazuma u.*	Sterculaceae	bolaina
60.	*Heisteria i.*	Olaceaceae	yutubanco
61.	*Helosis g.*	Balanophoraceae	aguajillo
62.	*Hevea g.*	Euphorbiaceae	shiringa
63.	*Himatanthus s.*	Apocynaceae	bellaco caspi
64.	*Hymenea sp.*	Fabaceae	azucar huayo
65.	*Inga sp.*	Fabaceae	shimbillo
66.	*Iriartea d.*	Arecaceae	huacrapona
67.	*Iryanthera t.*	Myristicaceae	pucuna caspi
68.	*Jessenia b.*	Arecaceae	hungurahuai
69.	*Lacistema a.*	Flacourtiaceae	trompo huayo
70.	*Lacmellea l.*	Apocynaceae	chicle huayo
71.	*Ladenbergia m.*	Rubiaceae	cascarilla
72.	*Leonia g.*	Violaceae	tamara
73.	*Lepidocaryum t.*	Arecacae	irapay
74.	*Licania h.*	Chrysobalanaceae	casha rana
75.	*Licania t.*	Lauraceae	canela moena
76.	*Licaria c.*	Lauraceae	muena
77.	*Lindackeria p.*	Flacourtaceae	casha huayo

78.	*Lindernia c.*	Scrophulariaceae	aretillo
79.	*Macoubea g.*	Apocynaceae	loro micuna
80.	*Macrolobium a.*	Fabaceae	pashaco
81.	*Maquira c.*	Moraceae	capinuri
82.	*Maytenus m.*	Celastraceae	chuchuashi
83.	*Micrandra s.*	Euphorbiaceae	shiringa masha
84.	*Moronobea c.*	Clusiaceae	asufre caspi
85.	*Mucoa d.*	Apocynaceae	yahuarhuayo blanco
86.	*Muntingia c.*	Eleaocarpaceae	yumanasa
87.	*Myroxylum b.*	Fabaceae	balsamo caspi
88.	*Oenocarpus sp*	Arecaceae	cinamilio
89.	*Orbignya p.*	Arecaceae	shapaja
90.	*Otoba sp.*	Myristicaceae	aguanillo
91.	*Piper sp.*	Piperacae	cordoncillo
92.	*Podocarpus o.*	Podocarpaceae	aceitillo
93.	*Rheedia g.*	Clusiaceae	charchiuelo
94.	*Rinorea r.*	Violaceae	cafecillos
95.	*Rollinia sp.*	Annonaceae	anonilla
96.	*Sanchezia p.*	Acanthaceae	antara caspi
97.	*Sapium g.*	Euphorbiaceae	caucho masha
98.	*Sapium m.*	Euphorbiaceae	shiringa rana
99.	*Scheelea b.*	Arecaceae	shebon
100.	*Simarouba a.*	Simaroubaceae	marupa'
101.	*Simira t.*	Rubiaceae	huacamayo caspi
102.	*Siparuna g.*	Monimiaceae	asna huayo
103.	*Sloanea sp*	Elaeocarpaceae	cepanchina
104.	*Socratea e.*	Arecaceae	pona
105.	*Spondias m.*	Anacardiaceae	ubos
106.	*Swartzia l.*	Fabaceae	acero shimbillo
107.	*Swietenia m.*	Meliaceae	aguano
108.	*Talisia sp.*	Sapindaceae	virote huayo
109.	*Tapirira g.*	Anacardiaceae	wira caspi
110.	*Terminalia c.*	Combretaceae	almendro
111.	*Terminalia i.*	Combretaceae	almendrillo
112.	*Tetragastris p.*	Burseraceae	lacre
113.	*Theobroma c.*	Sterculiaceae	cacao
114.	*Theobroma s.*	Sterculiaceae	macambillo
115.	*Tovomita sp.*	Clusiaceae	chullachaqui colorado
116.	*Trema m.*	Ulmaceae	atadijo
117.	*Triplaris s.*	Polygonaceae	tangarana
118.	*Unonopsis sp*	Annonaceae	icoja
119.	*Urera b.*	Urticaceae	mari mari
120.	*Virola f.*	Myristicaceae	caupuri

121.	*Virola s.*	Myristicaceae	cumala
122.	*Warscewiczia c.*	Rubiaceae	bandera caspi
123.	*Zanthoxylum sp.*	Rutaceae	alcanform

Table 39

When the terrafirme plant inventory is compared to the plants used by Iquitos shamans it appears that in the list of 41 plants only 18 (141-123=18) are found in common.

No.	*Scientific name*	*family*	*vern.name*
1.	*Aspidosperma n.*	Apocynaceae	remo caspi
2.	*Brosimum a.*	Moraceae	tamamuri
3.	*Brosimum r.*	Moraceae	palisangre
4.	*Brosimum g.*	Moraceae	huayra caspi rojo
5.	*Brunfelsia g.*	Solanaceae	chiric sanango
6.	*Capsicum f.*	Solanaceae	charapilla
7.	*Carapa g.*	Meliaceae	requia
8.	*Cordia a.*	Boraginaceae	ajos kiro
9.	*Couroupita g.*	Lecythidaceae	ayhuma
10.	*Eschweileira sp*	Lecythidaceae	machimango
11.	*Euterpe p.*	Arecacae	chonta/huasai
12.	*Hura c.*	Euiphorbiaceae	catahua
13.	*Minquartia g.*	Olacaceae	huacapu
14.	*Phytelephas m.*	Arecaceae	yarina
15.	*Remijia p.*	Rubiaceae	chullachaqui caspi
16.	*Swartzia p.*	Fabaceae	cumaceba
17.	*Tabebuia c.*	Bignoniaceae	tahauri negro
18.	*Tabernaemontana sp*	Apocynaceae	uchosanango

Table 40

When the plants used by Iquitos shamans are compared to the plants in common with terrafirme inventory it appears that 23 plants 41-18=23) are not found in common.

No/Scientific name	vernacular name
1. *Alchornea c.*	ipururoi
2. *Astrocaryum c.*	chambira
3. *Banisteriopsis c.*	ayahuasca
4. *Bixa o.*	achote
5. *Brugmansia sp.*	toe' blanco
6. *Calliandra a.*	bubinzana
7. *Calycophyllum s.*	capirona negra
8. *Campsiandra sp.*	huacapurana
9. *Caryodendron o.*	metohuayo
10. *Ceiba p.*	lupuna
11. *Citrus l.*	toronja
12. *Crescentia c.*	tutumo
13. *Eringium f.*	sacha culantro
14. *Hymenaea sp.*	azucar huayo
15. *Inga sp.*	guaba
16. *Mezilaurus sp.*	itahuba
17. *Nicotiana t.*	tobacco
18. *Psychotria s.*	yage'
19. *Psychotria v.*	chacruna
20. *Simira r.*	puca quiro
21. *Tabebuia sp.*	tahuari amarillo
22. *Teliostachya l.*	toe' negro
23. *Terminalia sp.*	almendro

CHAPTER 8

Focus on *Calycophyllum s.*, *Capirona d.*, *Triplaris s.* and Ayahuasca

Introduction

Part of this research was conducted to study *Calychophyllum sp.* and *Capirona d.*, both of the Rubiaceae family, in relation to the Ayahuasca mixture. It is well known (Ott, 1994) that over two hundred plants have been indicated by researchers in the preparation of ayhausca. Some plants have been investigated in detail and specific properties have been assigned. It is common knowledge (Ott, 1994) that the two major plants of the ayahuasca preparation are *Banisteriopsis c.* and *Psychotria v.*, but other plants can play major role in this Amazonian beverage.

Napralert (NAtural PRoducts ALERT - College of Pharmacy at the University of Illinois, Chicago - report dated July 8, 1997), with reference to Luna (1984, a) indicated that *Calychophyllum spruceanum* is "used as an hallucinogen, added to ayahuasca (Banisteriopsis-Psychotropic) beverage" and with reference to Luna (1984, b) *Capirona decorticans* is "used for hallucinogenic effect during shamanism training".

Luna actually indicated (1984, a) referring to *Calychcphyllum spruceanum* that "the bark" of this tree "can be added to ayahuasca", and (1984, b) referring to *Capirona decorticans,* that it "can be added to ayahuasca beverage". These plants according to Luna "teach medicine". It is not very clear if these plants have hallucinogenic activity by themselves or in conjunction with ayahuasca. It is fair to say that, because ayahuasca beverage is so complex in the chemical dynamic of its compounds, it is possible that there are plants that have compounds, not yet identified, that may induce hallucination alone or modify their chemical structure when added to the ayahuasca beverage.

Luna (1984, b) - referring to *Triplaris surinamensis* - indicated also that a shaman "reported that he had used the shoots of this plant instead of chacruna *(Psychotria viridis)*, as an additive of ayahuasca with positive results".

Don Humberto in the interview conducted for this study on *Calychophyllum s.* and *Capirona d.* indicated that he does not work with ayahuasca (Banisteriopsis c.) *or* chacruna *(Psychotria v.)*. He indicated instead that he uses the barks of several trees (palos) and *Calychophyllum s.* is included in his list. Don Humberto stated that some "ayahuasqueros" (shamans who work with ayhauasca) use only one "palo" (big tree)."....algunos (ayahuasqueros) utilizan un solo palo...": such as *Remijia peruviana* (chullachaquicaspi) *or Brunfelsia sp.* (chiric sanango). This indicates that *Psychotria v.* is not used.

Don Cristobal indicated that he mixes *ayahuasca* only with *Psychotria viridis* (chacruna) or as alternative with *Brugmansia* (toe' blanco).

Luna (1991) in his description of the painting "Vision 1: Preparation of Ayahuasca" by Pablo Amaringo reported that"...ayahuasca liana (vine, ndr.)...is climbing up a capirona tree *(Calychophyllum spruceanum)*..." The painting in fact shows the liana around the reddish *Calychophyllum s.* and this combination may indicate a connection between them not only physically but also when they both are used in the preparation of the hallucinogenic drink ayahuasca.

All these observations may generate interest to verify if alternatives are available to *Psychotria viridis,* that contains N,N-dimethylthryptamine (DMT), one of the strongest compounds responsible for hallucination. It is possible to speculate that both *Calychophyllum spruceanum* and *Capirona decorticans* are used by shamans in substitution of *Psychotria viridis.*

Local people identify both *Calychophyllum spruceanum* and *Capirona decorticans* with the same vernacular name capirona. Capirona del bajo is for *Calychophyllum spruceanum* and capirona de altura is for *Capirona decorticans*.

Napralert indicated that the dried leaves of *Calychophyllum candidissimum* in_Guatemala are used to cure fever, wounds, ulcers, bruises and sores, for skin eruptions and for erysipelas. Instead in Peru the bark of *Calychophyllum spruceanum* is used as a hallucinogen added to Ayahuasca (Banisteriopsis-Psychotria) beverage. Napralert indicated also that both plants have antibacterial activity but no chemical compound has been found yet.

With respect to *Capirona* Napralert indicated that *Capirona decorticans* (part is not specified) is "...used for hallucinogenic effect during shamanic training. A diet of cooked plantain and smoked fish followed during use. May be taken with *ayahuasca* beverage (*Banisteriopsis caapi* plus *Psychotria viridis* decoction)".... There is no indication about biological activity, while it has been reported that the two isoquinoline alkaloids cephaline and emetine have been identified.

Botanists have paid particular attention to *Calychophyllum s.* and *Capirona d.* since confusion was created about them. The scientific identification is not always in accordance with the definition used by native people who identify the species with the common name "capirona" In the Peruvian Amazon what botanists call *Calychophyllum s.* is called locally capirona del bajo (varzea) and *Capirona decorticans* is called capirona de altura (terra firme).

The taxonomic history of *Capirona* is provided by Kirkbride (1985) who indicated Spruce as the first to identify the genus *Capirona* based on a collection made in the area of Tarapoto, Peru' in 1855. Karsten in 1860 presented the same genus again as *Monadelphanthus* based on a collection made in the llanos of eastern Columbia.

In volume I of Index Kewensis (Jackson, 1893) *Capirona boiviniana* Baillon is listed. In 1912 Ducke collected near the Rio Trombetas, Brazil the second species of *Capirona* which he called *Capirona huberiana* and published in 1922. In 1914 Benoist collected the same species in French Guiana and called it *Capirona leiophloea*.

In 1934 Bremekamp presented *Capirona surinamensis,* which according to Kirkbride is the same as *Capirona leiophloea*. Standley presented in 1936 *Capirona Loretoa* (Peru') and in 1940 *Capirona erythtoxylon* which Kirkbride indicates as a member of the genus *Pogonopus Klotzsch*.

Steyermark introduced in 1964 another species *Capirona wurdacki*.

The genus *Capirona* is found in the Amazon valley, in the plains (llamos) of Columbia and the eastern Guianas. Kirkbride presents two species, *Capirona decorticans* (Spruce), the type, and *Capirona leiophloea*.

Capirona decorticans is found in the western end of the Amazon valley, both north and south of the Amazon river up to the plains of Columbia where they meet the Andes. On the north it is found along the Casiquiare canal and the Orinoco river. In the eastern end of the Amazon in the state of Para', Brazil it is found only south of the Amazon river.

Capirona leiophloea is found in Surinamese and French Guiana, in the state of Para', Brazil, both north and south of the Amazon River and on the south side it is abundant in the lower drainage of the Rio Tapajoz.

Since *Capirona* was reported by Spruce (1857) it has been placed in the *Rubiaceae* family, tribe *Cinchoneae*, and associated with those genera that have aestivation of the corolla and one calyx lobe sometimes expanded into a large colored foliar organ.

From research conducted by Boom and Campos (1991) it appears that both *Calychophyllum* and *Capirona* have been found in terra firme forest of the Brazilian Amazon. As indicated by the two authors *Capirona decorticans* "ecologically it prefers primary terra firme forest, but also is known from disturbed areas."

Harling and Andersson (1994) in Flora of Ecuador, using as a guide the results of Taylor (Ann. Missouri Bot. Gard.), classified *Calychophyllum* and *Capirona* with the following breakdown with respect to both tribes *Cinchoneae* and *Calycophyllacae*:

Tribe 1. Cinchoneae

1. Capirona Spruce

Capirona is a monotypic genus found in Surinam, French Guiana and the Amazon Basin.

1. Capirona decorticans Spruce

- *Capirona decorticans* type Spruce (Peru', 1855)
- *Monadelphanthus floridus* Karsten type Karsten (Columbia, 1860)
- *Capirona Duckei* Huber in Ducke
- *Capirona leiophloea* Benoist type Wachenheim (French Guiana, 1913)
- *Capirona Huberiana* Ducke type Ducke (Brazil, Para', 1922)

- *Capirona surinamensis* Bremekamp type Forest Bureau (1829)
- *Loretoa peruviana* Standley type Klug (1936)
- *Capirona Wurdackii* Steyermark type Wurdack & Adderley (1964)

Tree to 40 m tall and 45 (-100) cm dbh. Vernacular names "*capirona" (spanish); "indi caspi", "lluchi caspi" (Quichua); "oyuwae" (Auca).*

Tribe 2. Calychophylleae

1. Calychophyllum DC.

Calychophyllum is a neotropical genus of about nine species and is found in the Amazon Basin and the Guianas.

1. Calychophyllum megistocaulum (Krause)

- *Remijia megistocaula* Krause type Weberbauer (Peru', 1908)
- *Calychophyllum acreanum* Ducke type Ducke (Brazil, Acre, 1935)

Tree to 45 m tall and 50 cm dbh. Vernacular name "*capirona*".

2. Calychophyllum Spruceanum (Bentham)

- *Eukylista Spruceana* Bentham type Spruce (Brazil, Para' 1853)

Tree to 40 m tall and 100 cm dbh. Vernacular name "*capirona*", "*capirona roja*", *capirona negra*".

Harling and Andersson (1994) gave a different interpretation to the information provided by Kirkbride about *Capirona*. One of the authors indicated that *Capirona leiophloea* should be considered a synonym of *Capirona decorticans*

Harling and Andersson also indicated that *Capirona decorticans* is "locally common in floodplain forest". It should be noticed that Boom and Campos indicated that *Capirona decortican* "ecologically, prefers primary *terra firme* forest, but also is known from disturbed areas." Since the study was done in Brazil and not in Ecuador it is possible that the different location can explain this difference.

Also, Harling and Andersson referred to Irvine (Irvine DI-527, in sched.) and indicated that *Capirona* "...is dependent on clearings and other large light gaps for regeneration". It is used for firewood and also for construction.

As indicated by Junk (1984) the variety of plants of "*varzea*" depends on the age of its existence, current texture of sediments, sedimentation rate and the periodicity of flooding". The substantial excursion of water in some areas of the Amazon basin has significant impact on the local vegetation. When the water retreats and the terrestrial phase takes place, low-lying areas are colonized by herbaceous plants that will be replaced by aquatic ones when the water rises again. Competition for nutrients and light between floating aquatic macrophytes and phytoplankton occurs for a while. Then when the appropriate conditions are available, like a long dry period and reduction of current velocity during high level, the tough aquatic and semiaquatic perennial grasses become established. At the same time grasses are eliminated. Finally a tall floodplain forest is established and herbaceous plants completely disappear.

Seasonal varzea-forest is mostly found in Central Amazonia (Junk, 1984) and is characterized by regular annual cycles of white-water rivers. Close to the non-floodable land there is often a transition to seasonal *igapo'*-forest, that is flooded by regular annual cycles of black-water and clear-water rivers. This transition occurs because of the influx of acid and nutrient-poor terrafirme water. *Calycophyllum spruceanum* appears to be among the trees and shrubs that may be considered typical of a seasonal varzea-forest.

Part 1 Methods of research

The purpose of this research is to collect information about the plants in varzea and terrafirme and to compare the finding. Also particular attention has been put in to locate *Calychophyllum s.* and *Capirona d.* species. This project was carried out in two different locations as indicated hereafter:

1.) A varzea ethnobotanical inventory was carried out in the Tapirillo area, about 50 km from Iquitos going by boat upstream along the Amazon River. Tapirillo is a small village of about 100 people spread along the riverbank of the Amazon River. Twelve 20x20 m plots were analyzed.

2.) A terrafirme ethnobotanical inventory was carried out in (comunidad) El Triunfo about 46 km from Iquitos on the road (carretera) to Nauta. Twelve 20x20 m lots were analyzed.

The area that was examined for terrafirme ethnobotanical inventory is located about 46 km from Iquitos. The impact of deforestation due to road construction and timber usage has been noticed by Torres (77), but there is no evidence that this effect is extended for from the edge of the road.

The area of study both in varzea and terrafirme was selected as following:

Twelve quadrats of twenty by twenty meter (20x20) in each area were selected about adjacent each other. Overlapping of one quadrat with the adjacent one was carefully avoided to eliminate inventory error. Only trees with DBH (diameter breast height) bigger or close to (10) ten cm were considered.

The collection of this information was possible with local shamans' support and cooperation.

Part 2 Observations

The inventory was conducted in varzea and in terrafirme on equal surface area. Twelve square plots of four hundred (20x20) square meters were analyzed. One hundred and forty-two different species were identified in terrafirme for a total of six hundred individuals while forty-two different species for a total of three hundred and seventy-two individuals were identified in varzea.

The percentage of *Capirona d.* is about two percent in terrafirme and the percentage of *Calychophyllum s.* is about ten percent (see table 41).

TABLE #41

Comparing *Capychophyllum s* and *Capirona d.*

location	Number of plots	Number of species	Total in-dividuals	Percentage
Terrafirme	12	141	600	About 2% *Capirona d.*
Varzea	12	42	372	About 10% *Calychophy llum s.*

Table 42

Local people identify *Capirona d.* with capirona de altura and *Calychophyllum s.* with three different forms of "*capirona*" that are capirona del bajo blanca, capirona del bajo negra and capirona del bajo roja. These differences are indicated in the table below:

Phenotypes and Varieties

(according to the vernacular name)

Capirona decorticans	*Capirona de altura*
Calychophyllum spruceanum	*Capirona del bajo blanca* *Capirona del bajo negra* *Capirona del bajo roja*

Part 3 - Analysis

Summary of the varzea survey

Varzea plant distribution indicated that forty-two (42) different plant species from nineteen (19) different families were identified. The total number of individuals in all twelve quadrats is 372. The average number of individuals per quadrat is about 31.

The total number of *Calychophyllum s.* in all twelve plots is thirty-eight (38) with an average number of 3.16% per quadrat. The percentage of *Calychophyllum s.* among all the species is about 10.21%.

Summary of the terrafirme survey

Terrafirme plant distribution indicated that one hundred and forty-one (141) different plant species from fifty-one (51) different families were identified.
The total number of individuals in all twelve quadrats is 600. The average number of individuals per quadrat is about 50.
The total number of *Capirona d.* in all the twelve plots is 13 with an average number of 1.08% per quadrat. The percentage of *Capirona d.* among all the individuals is 2.16%.

The area selected for varzea investigation is not too close to the riverbank, nevertheless the disturbances generated by the change of river path have influence in all the territory adjacent to the bank of the river. Geological study of the activity of the Amazon River (80) indicated that various factors such as origin, erosion and recombination affect the composition of surface sediments. The result is a mosaic of sediments with horizontal and vertical impact in the region where they settle down. Plants that establish themselves in this area are influenced by this river activity when sediments bring important nutrients to the soil.

It is quite possible that plants like *Calycophyllum s.* find, despite the disturbances generated by the river activity, the optimal condition for growth and development. Most rural Amazonians, because of multiple application and economic value, protect, plant and manage these species. These plants have seed that are wind or water dispersed, are fast growing and are able to compete with pioneer species. Therefore, these plants are readily available and probably this is one of the reasons why shamans use them in the ayahusca mixture.

Capirona d. is not represented in big quantity in the same surface area as *Calychophyllum s.*. The individual ratio *Capirona:Calychophyllum* is 13:38 or 1:2.92 while the ratio per total quadrats is 2.16:10.21 or 1:4.72. These data indicate that *Calychophyllum s.* is available in more quantity when compared to *Capirona d.*.

Calychophyllum s. has the advantage of being big and therefore its competition with pioneer species is facilitated.

Part 4 - Discussion

It is well known that the varzea area is affected by water fluctuation. Even if the varzea inventory was conducted in area that is not extremely close to the bank of the river, it is safe to say that disturbances generated by the change of the river path have influenced all the territory adjacent to the bank that is affected. Geological studies on the activity of the Amazon River (Linna, 1993) indicated that various factors as origin, erosion and recombination affect the composition of surface sediments. The result is a mosaic of sediments with horizontal and vertical impact in the region where they settle down. Plants that establish themselves in this area are influenced by this river activity when sediments bring important nutrients to the soil. It is quite possible that plants like *Calycophyllum s.* find, despite the disturbances generated by the river activity, the optimal condition for growth and development.

It is challenging to establish an accurate percentage in ethnobotanical investigation and as it has been pointed out by Boom and Campos (1991), sometimes "…1-ha (hectare) sized plots are certainly inadequate in the Central Amazon to give the impression of tree species diversity…"

The varzea survey indicated that forty-two (42) species were counted in the same area (20x20x12) of 4800 square meters. This means that in one hectare at least ninety species should be found.

The terrafirme survey indicated that one hundred and forty-one (141) species were identified in the total (20x20x12) area of about 4800 square meters. This means that in one hectare (or 10,000 square meters) at least two hundred and ninety (290) species should be found. This value is very close to what is reported by Gentry (1988a) who indicated that in the Loreto area the average number of species counted (DBH) in one hectare is 300.

Calychophyllum s. (Delprete, 1996) "...is easily recognized by its reddish brown exfoliating in long vertical stripes and exposing the inner deep-green layer"...."the wood of *Calychophyllum s.* is white and of good commercial value." This tree abundantly occurs in the varzea area where the best conditions for survival are found. The water excursion is not obstacle to the growth of *Calychophyllum s.* that likes wide spread area for growth and development. Seedlings easily grow close to the edge of the river even if the tree is found also in the inland close to the riverbank.

Calychophyllum s. appears outstanding among the other trees and usually is found in a cluster making a small community of the same individuals. As it is well known, varzea soil is very rich in nutrients and probably this is why this tree finds varzea a convenient habitat. *Calychophyllum s.* requires ample area with abundant light for survival. Because light is a matter of essence, seedlings transplanted in shaded areas have limited chance of survival. Reproduction is mainly provided by seed dispersion made by the river when the water is at the maximum velocity and pressure. In this condition seeds are carried away by the current and spread along the riverbank.

Luna in his description of the painting "Vision 1: Preparation of Ayahuasca" by Pablo Amaringo stated that"…*ayahuasca* liana…is climbing up a "capirona" tree *(Calychophyllum spruceanum)*…" The painting in fact shows the liana around the reddish *Calychophyllum s.* and this combination may indicate that the author wants to highlight the connection between this plants not only physically when connected to the ground but also when they both are used in the preparation of the hallucinogen drink ayahuasca.

Capirona decorticans has greenish exfoliating bark (Harling and Andersson) and occurs in terrafirme. The trunk of *Capirona d.* is straight as *Calychophyllum s.* and local people call them "palo" which indicates this characteristic of both plants. *Capirona d.* prefers land forest where it finds the appropriate environment for growth and reproduction. The soil is very poor of nutrients but in exchange no flood disturbs the area. Indeed local people call this plant capirona de altura (hills) to differentiate it from *Calychophyllum s.* that is called capirona del bajo. In contrast with *Calychophyllum s., Capirona d.* is not abundant, is not found in isolated areas and is not even grouped in clusters with individuals of the same species. *Capirona d.* is found in areas with many other plants and where competition for survival can be very strong. It is part of the forest canopy and does not have the privilege like *Calychophyllum s.* of being embraced by abundant sunlight. *Capirona d.* is located in the shaded area of the forest. The leaves of *Capirona d.* are bigger than the ones of *Calychophyllum s.,* and this probably indicates the necessity to increase the surface area for photosynthesis in an environment where sunlight must be shared with many other plants. Seedling survival is very difficult and regeneration itself does not occur easily. *Capirona d.* flowering is not a seasonal event: it does not happen every year. A substantial drop of temperature is required and in the Iquitos area this happens by the end of June every four or five years. Regeneration may occur when seeds are dispersed by wind but no growth is available in areas where flood may occur. Due to its nature "the capricious Amazon" as pointed out by Kalliola and others (1999) may affect substantially the future of these plants. Because of its continuous direction change the river can bring flood in terrafirme areas and vice versa. Over time this change will force plants to either die or to readjust to the new condition.

From the two surveys on *Calychophyllum s.* and *Capirona d.* it appears that the first one represents 10% of the entire plant population, while the second one only 2%. Therefore it would be easier for local people and particularly shamans to locate and use *Calychophyllum s.* more than *capirona d.* if these plants can be used in substitution for *Psychotria v.* in the ayahuasca preparation. Also, varzea shamans could have easy access to this tree, since it has been already used for other medicinal purpose such as to cure pellagra, wounds or diarrhea.

From the varzea shamans' interviews there was no indication that these two plants have either hallucinogenic effect or can be used in substitution of *Psychotria v.*.

Capirona d. appears to be more difficult to be considered because the varzea environment does not favor easy flowering and reproduction and is therefore not easily found. Even in this case no indication from varzea shamans' interviews has corroborated the possibility of the use of this plant in substitution of *Psychotria v.* in the ayahuasca preparation.

CHAPTER 9

Phytochemistry

Introduction

A phytochemical investigation was carried out to look for the presence of the alkaloid dimethyltryptamine (DMT) in *Calycophyllum spruceanum* and *Capirona decorticans* (Rubiaceae). These species are used in the preparation of the *ayahuasca* mixture in the surroundings of Iquitos, Peru'. Luna (1984) indicated that "...a common theme in shamanic literature...all psychoactive plants are considered potential teachers...", which means that these plants teach medicine to shamans. Among the plants that teach medicine Luna (1984) indicated *Capirona decorticans* Spruce and *capirona negra*. The Napralert (NAtural PRoducts ALERT) report dated July 8, 1997, with reference to Luna (1984), indicated that *Calychophyllum s. and Capirona d.* are used in the Peruvian Amazon to induce hallucination during shaman training. [1] *Calycophyllum spruceanum* (Rubiaceae) bark has been used in Peru' as hallucinogen, when added to the ayahuasca (Banisteriopsis-Psychotria) beverage, Napralert #M05165 The healing practices of a Peruvian Shaman. Luna E., J Ethnopharmacol 11 2: 123-133, 1984

English Perhonkatu 00100 Finland -2) *Capirona decorticans* (Rubiaceae), part not specified is used in Peru' for hallucinogenic effect during shaman training. A diet of cooked plantain and smoked fish is followed during use. May be taken with the ayahuasca beverage *(Banisteriopsis caapi* and *Psychotria viridis* decoction*)* Napralert #T08133 "The concept of plants as teachers among the Mestizo shamans of Iquitos", Northeastern Peru. Luna, L E: J. Ethnopharmacol 11 2: 135-156 (1984) Perhonkatu Helsinki 00100 Finland). It is worthy to note that these two articles do not suggest that these plants are added to *ayahuasca* mixture as an hallucinogen.

It is known that N,N-dimethylthryptamine (DMT),is highly responsible for hallucination since it competes with the neuroreceptor serotonin in the brain. It is found in high concentration in *Psychotria viridis* (Rubiaceae) that is one of the major ingredients used to prepare the drink. The study hypothesis is that shamans in the Iquitos area use *Calycophyllum s. species* and *Capirona d. species,* easily available in that area, because they contain the same alkaloid DMT found in *Psychotria viridis.* Research is also extended to *Triplaris surinamensis* (Polygonaceae) which, as reported by Luna (1984), is used in the same area in substitution of *Psychotria viridis.*

History

The earliest written report of ayahuasca (Schultes, 1970-1971) appeared in the 1858 Geography of Ecuador by Villaviciencio. Spruce (1908) may have been the first European to indicate that the Tukanoan tribes of the Rio Uapes in Amazonian Brazil used a liana called *caapi* (later identified as *Banisteriopsis caapi* (Malpighiaceae) to induce intoxication. In 1923 the first phytochemical work on "yaje'" (which is another name for ayahuasca) was carried out by the Colombian Fisher-Cardenas, who isolated alkaloid crystals which he called telepathine, and many additional studies followed after it, which were facilitated by the use of new equipment and technology. An extensive ethnobotanical and chemical investigation was made by Rivier and Lindgren (1971) who indicated that the drink was prepared basically from *Banisteriopsis caapi* (Malpighiaceae) containing harmine, harmaline, tetrahydroharmine, traces of harmol and 6-methoxytryptamine and *Psychotria viridis* (Rubiaceae) containing dimethyltryptamine (DMT), harmine, harmaline and tetrahydroharmine.

Schultes and Hoffman (1973) in the recapitulation of ayahuasca (Botany and Chemistry of Hallucinogens, 1973) indicated that the hallucinogenic effects of ayahuasca may be the result of the combined activity of harmine and its derivatives with dimethyltryptamine tryptamine and other tryptamine derivatives that were found in certain admixtures. It is also possible that the monoamine oxidase (MAO) inhibitors harmine and harmaline may enhance the effects of tryptamines. Also Udenfriend (1958) indicated that the betacarbolines harmine, harmaline and harman are potent inhibitors of monoamine-oxidase (MAO).

This enzyme functions in the digestive system to oxidize, or decompose, compounds with an amine group, like tryptamines such as dimethyltryptamine (DMT), which, when taken orally, could make their way to the brain and cause severe damage. MAO catalyzes the oxidative deamination of biogenic monoamines including tyramine, tryptamine, serotonin, norepinephrine, dopamine and other monoamines.

When DMT is taken orally in conjunction with the betacarbolines, that inhibit the MAO enzyme, DMT is not oxidized and therefore can pass the blood brain barrier. Because the chemical structure of DMT is very similar to serotonin, which is a neurotransmitter, DMT can interfere with serotonin and take its position in the neurotransmitter receptor, and in doing so, hallucination occurs. Therefore, in order to have hallucination it is necessary that both plants that contain DMT and plants that contain betacarbolines or plants that eventually contain both of them are present in ayahuasca mixture

The plants used in the preparation of ayahuasca can be divided into three major groups in relation to function: a) plants that are not psychoactive and presumably are therapeutic additives, b) stimulants and c) plants responsible for hallucination (Ott, 1994). So far it is known that approximately over two hundred species have been reported as being used in the preparation of the drink, but approximately half of them have not been phytochemically studied. Laboratory analysis indicated that 67 species of 11 families contain MAO inhibiting betacarbolines and 62 species of 11 families contain tryptamine alkaloids and that *Psycothria viridis* contains the highest quantity of DMT that is highly responsible for hallucination (Ott, 1994 and McKenna, 1995).

Napralert indicated that *Calycophyllum spruceanunm* and *Capirona decorticans* are used for hallucinogenic effect during shaman training. Since *Psychotria v.* is very rich in the DMT alkaloid highly responsible for hallucination, this study is meant to verify if shamans in the Iquitos area use *Calycophyllum s.* and *Capirona d.* called respectively with the vernacular name capirona del bajo and capirona de altura that are easily available in that area in substitution of *Psychotria v.*. Therefore this research was aimed to determine the presence or absence of DMT alkaloid in these two plants.

History of DMT

Cordell (1994) stated that "the history of alkaloids is almost old as civilization". Humankind has used drugs containing alkaloids for millennia, but it has been only in the last century, with the help of advanced technology, that these compounds were isolated and identified. Harborne (1983) claimed that the number of alkaloids known is about 5500, and we may say that by now the number is bigger.

Hochstein and Paradies (1957) were the first to connect DMT with ayahuasca, but as pointed out by Ott (1994), they did not produce botanical vouchers and therefore there are doubts about the plant source.

In 1969 Agurell isolated DMT in *Virola theiodora*. Der Marderosian et al. (1970) isolated DMT in a potion containing *Banisteriopsis c.* stems and *Psychotria v.* leaves prepared on the Rio Curanja of the Peruvian Amazon. The researchers were able to isolate in this drink called "nixi pae" (ayahuasca?) in a typical dose of 240 ml about 30 mg of DMT. Later on in 1972 Rivier and Lindgren provided additional information about the quantity and presence of DMT in the "ayahuasca drink". Much research has been done about the use of DMT (55) (not only associated with ayahuasca) to verify its psychoactive property.

Characteristics of DMT

Synthesis of N,N-dimethyltryptamine was done by Manske (1931) and then by Speeter (1954). Fish (1955) isolated DMT in *Anadenanthera peregrina* and Agurell (1969) in *Virola theiodora*. In competition with serotonin this compund shows affinity for 5-HT receptors in the central nervous system. DMT shows hallucinogenic properties and it is considered a drug of abuse with controlled legal status.

Two considerations can validate the significance of this study. The first consideration is related to the ethnobotanical value of this compound found in plants. The study of shamanism can be enriched when additional information is provided. Shamans use plants with specific purpose each time. The presence of a compound in plants can justify the use of a specific plant, while at the same time the substitution of a plant in place of another can generate questions about the chemistry of the second one.

It is known that shamans use certain plants in a certain area for a long time. If instead plants are used in substitution of others, many questions originate like whether the active compounds of the first plant are found in the second one. The ecosystem plays a major role in this scenario and we start to understand that the shamanism in varzea may be different from shamanism in terrafirme, and that shamanism in rural areas may be different from the shamanism in urban areas. It is well known that DMT in *Psychotria viridis* is highly responsible of hallucination in the *ayahuasca* drink, but we cannot limit it to this compound only in this plant. We can either find DMT in other plants or find a similar substance in other plants with the same hallucinogenic effect.

The second consideration is related to the potential benefit of this study when an interdisciplinary approach is taken. Because the structure of DMT is very close to the structure of the neurotransmitter serotonin, DMT study can provide information useful in studying the function of the brain. The interest in hallucinogenic agents has always caused controversial debate. Schultes (1970) indicated that there is a possible usefulness "…in experimental or even therapeutic psychiatry and also for possible tools in an explanation of the biochemical origins of mental abnormalities." Grieco and Bloom (1981) stated that "…there is evidence that they represent a valuable adjunct to psychotherapy, especially when psychotherapy is viewed from a learning perspective. Hallucinogens can enhance the capacity for experimenting in humans (Aaronson and Osmond, 1970), can facilitate learning in animals (e.g. Bignami, 1972) Rouse and Frank, 1974) and have been shown in well controlled studies to be safe and effective therapeutic adjuncts."

DMT Distribution

Cordell (1994), following the classification by Hegnauer (1963) that lists three groups of alkaloids, located DMT among the protoalkaloids that are simple amine with amino acid nitrogen not on the heterocyclic ring.

Taylor (1964) indicated that indole alkaloids occur most frequently in the family Apocynaceae and to a lesser extent in the Asclepiadaceae, Loganiaceae, and Rubiaceae. Schultes and Hoffman (1980) indicated the presence of DMT in three species of *Virola*: (i.e) *theiodora, calophylla* and *rufula, in Anadenanthera pergrina, Banisteriopsis rusbyana, Psychotria viridis;* Rivier and Lindgren (1971) in *Psychotria carthaginensis*. Ott (1994) indicated that DMT has also been found in other plants such as *Justicia pectoralis, Phalaris arundinecea and P. tuberosa, Acacia confusa,, A. maidenii, A. nubica, A. phlebophylla, A.*

polyacantha, Anadenanthera excelsa, A. colubrina, Desmanthus illinoensis, D. caudatum, D. gangeticum, D. gyrans, D. pulchellum, Lepedeza bicolor, Mimosa hostilis, M. scabrella, M. tenuiflora, Mucuna pruriens, Petalostylis labicheoides, Banisteriopsis muricata, Diplopterys cabrerana, Osteophloem platyspermum, Virola calophylloidea, V. carinata, V. divergens, V. elongata, V. melinonii, V. multinervia, V. pavonis, V. peruviana, V. rufula, V. sebifera, V. theiodora, V. venosa, Testulrea gabonensis, Erigonium sp., Psychotria carthaginensis and P. viridis, Limonia acidissima, Vepris ampody, Zanthoxylum arborenscens and Z. procerum.

DMT detection and biosynthesis

Vickery & Vickery (1981) indicated that the classification of alkaloids is related to their molecular structure and biosynthetic pathways. DMT appears to be generated through the shikimic acid pathway. Alkaloids occur in nature as organic salts and therefore they have to be separated as freebase with an organic solvent. As Stahl (1965) indicated indole alkaloids (such as DMT) are difficult to detect because they appear in small concentration and because they are not stable.

Even if Raffauf advised to be cautious about possible false positive and false negative results for alkaloid reaction, Martello and Farnsworth (1962) and Euler and Farnesworth (1962) provided extensive data about reagents and screening procedure for alkaloid detection. Indoles give a specific color when appropriate reagents are used. DMT can be unmasked (Dawn et al., 1982) with Van Urk-Salkowski reagent prior to two-dimensional TLC on silica gel plates.

Prior to specific analysis like Van Urk-Salkowski testing plant material with other reagents, such as Draggendorff, Mayer and Elrich, is suggested. Even if not specific they can confirm the presence of alkaloids.

Euler & Farnsworth suggested (1962) that the criteria to consider in alkaloids detection are: a simple procedure, rapid and with minimal equipment needs; a procedure that allows detection of low concentrations of alkaloids in small samples; a procedure that utilizes highly sensitive and selective alkaloid detecting reagents; a procedure well defined and reproducible.

Part 1 - Materials and methods

Research was conducted at the Laboratory of Chemical Engineering and Laboratory of Organic Chemistry of the State University of Peruvian Amazon (Universidad Nacional de la Amazonia Peruana (UNAP) Facultad de Ingenieria Quimica, and Facultad de Quimica Organica) in Iquitos, Peru.

a. plant material

The plant material used for the investigation - obtained with the assistance of shamans - was selected from *Calycophyllum s., Capirona d. Psychotria v., Triplaris s.* Different parts of the plant such as leaf, bark, small and big branches have been studied (see table 43).

Table 43

No/Scient. name	vernacular name	part
1. *Calycophyllum s.*	capirona bajo amarilla	bark
2. *Calycophyllum s.*	capirona bajo amarilla	leaf
3. *Calycophyllum s*	capirona bajo blanca	bark
4. *Calycophyllum s.*	capirona bajo blanca	leaf
5. *Calycophyllum s.*	capirona bajo negra	bark
6. *Calycophyllum s.*	capirona bajo negra	leaf
7. *Capirona d.*	capirona altura	big branch
8. *Capirona d.*	capirona altura	bark
9. *Capirona d.*	capirona altura	leaf
10. *Capirona d.*	capirona altura	sm.branch
11. *Psychotria v.*	chacruna	leaf
12. *Triplaris s.*	tangarana blanca	bark
13. *Triplaris s.*	tangarana blanca	leaf
14. *Triplaris s.*	tangarana colorada	bark
15. *Triplaris s.*	tangarana colorada	leaf
16. *Triplaris s.*	tangarana negra	bark
17. *Triplaris s.*	tangarana negra	leaf

b. chemical compounds extraction

Extraction has been conducted according to Kiang Douglas procedure (see table 44).

Table 44

Kiang Douglas Procedure

Plant material is:

1. moistened with dilute base

2. extracted with chloroform

3. concentrated

chloroform partition is done

with hydrochloric acid

two phases

chloroform | acid/salt

(alkaloid) test with:

a) Dragendorff

b) Elrich

c. select reactives

A preliminary investigation to establish the best reactive for alkaloid identification was conducted on different samples containing chemical groups typical of indole alkaloid structure such as caffeine, cysteine, indole-3-acetic acid (IAA), tryptophan and also on *Hydrastis Canadensis*.

Dragendorff, Elhrich and Mayer reactives were used for their ability to react with alkaloids or material containing alkaloids. Extraction was made using Wall or Kiang-Douglas method (see table 45).

d. testing for alkaloids

Subsequently after extraction plant material was tested with Ehlrich, Mayer and Draggendorff reactive. Van Urk-Salkowski reaction was used as final test to verify the presence of DMT.

e. procedure

Two (2.0) grams of plant material of each sample were put in a beaker. A solution of ammonium hydroxide in a ratio of 1:9 with water (1 ml $NH4OH$ + 9 ml$H20$) was prepared. Plant material in the beaker was moistened with solution of ammonium hydroxide and stir with spatula. After five minutes (5) fifty ml (50) of chloroform was put in the beaker for extraction one (1) hour. Later material was filtered into a new flask and then transferred into a separator funnel set on a stand. Fifty ml (50) of 2N hydrochloric acid solution was added in the separator funnel. Funnel was shaken twice and vent open each time. After few minutes the two phases were clearly visible: chloroform phase on the bottom and acidic phase on top. The two phases were separately collected in two different flasks and pH was measured.

On a rack three empty test tubes were put on the first row and additional three on the second row. Material from the flask containing the acid solution was transferred into the tubes on the first row and material from the chloroform phase was transferred on the second row. Tubes were marked as follows: #1a, #1b and #1c on row one and #2a, #2b and #2c on row two. Dragendorff reactive was added on tube #1a and #2a, Ehlirch reactive on tube #2a and #2b and Mayer on #3a and #3b. In addition, to compare the result of the test tube, material in the same order was micro-pipetted on TLC paper and marked the same way.

Thin layer chromatography

Two dimensions thin Layer Chromatography investigation was carried out to verify DMT presence and was performed according to the indication by Dawn, Mulvena & Slaytor (71). First (dimension) solution was prepared with chloroform, methanol and ammonia (0.088 ml) in ratio 80:15:1. About 48 ml (40:7.5:0.5 ml.) were transferred and closed in bottle. Second (dimension) solution was prepared with N-butanol, and ammonia (0.088 ml) in ratio 20:1:1. Forty-four ml. (40:2:2 ml) were transferred and closed in bottle. Two different tanks about 20x25 cm (chromatography chamber) were set in a hood with rectangular filter paper about 18x23 inside. Then the two solutions were separately put in the two tanks.

Part 2 - Observations

The following plants have been selected for this study: *Capirona decorticans, Calycophyllum spruceanum, Psychotria viridis* and *Triplaris surinamensis*. Plant material was divided according to the classification that local shamans use in the area. Therefore *Calycophyllum s.* was classified as capirona floodplain yellow, white and black (capirona del bajo amarilla, blanca and negra). *Triplaris surinamensis* was classified as white, colored and black tangarana blanca, colorada and negra). *Capirona d.* is identified as capirona of upper land (capirona de altura). Plant material was represented as leaf, bark and branches of different sizes. Seventeen different samples of plant material were studied (See table 43).

Dragendorff, Elhrich and Mayer reactive were used for their ability to react with alkaloids or material containing alkaloids. Extraction was made using Wall or Kiang-Douglas method. Cysteine reacted positive to Dragendorff and IAA, tryptophan and *Hydrastis canadiensis* reacted positive to Elhrich. All the other samples reacted negative (see table 45).

Table 45

Results of testing Dragendorff, Elhrich and Mayer reactive

No.	sample name	extract	phase	Drag	Elh	Mayer
1a	caffeine extract	Wall		neg.		
1ba	caffeine extract	Kia-Doug	chlorof	neg.		
1bb	caffeine extract	Kia-Doug	acid	neg.		
2	caffeine standard		methanol	neg.		
3	cysteine		chlorof	pos.		
4	IAA			neg.	pos.	neg
5	Tryptophan		methanol	neg.	pos.	neg
6a	*Hydrastis c.*	Wall		neg	pos	neg
6b	*Hydrastis c.*	Kiang-Dcug		neg	pos	neg

Table 46

Results with Dragendorff Elhrich and Mayer reactive

Total number of samples analyzed is seventeen (17) and all of them tested negative with Dragendorff and Mayer reactive. Only *Psychotria v.* tested positive (blue color) with Ehlrich reactive while all the other samples tested negative.

No/Scient. name	vernacular name	part	Drag	Ehl	Mayer
1. *Calycophyllum s.*	capi/ba amarilla	bark	neg	neg	neg
2. *Calycophyllum s.*	capi/ba amarilla	leaf	neg	neg	neg
3. *Calycophyllum s*	capi/ba blanca	bark	neg	neg	neg
4. *Calycophyllum s.*	capi/ba blanca	leaf	neg	neg	neg
5. *Calycophyllum s.*	capi/ba negra	bark	neg	neg	neg
6. *Calycophyllum s*	capi/ba negra	leaf	neg	neg	neg
7. *Capirona d.*	capirona altura	big bra	neg	neg	neg
8. *Capirona d.*	capirona altura	bark	neg	neg	neg
9. *Capirona d.*	capirona altura	leaf	neg	neg	neg
10. *Capirona d.*	capirona altura	sm.bra	neg	neg	neg
11. *Psychotria v*	chacruna	leaf	neg	blue	neg
12. *Triplaris s.*	tangarana blanca	bark	neg	neg	neg
13. *Triplaris s.*	tangarana blanca	leaf	neg	neg	neg
14. *Triplaris s.*	tangarana colorada	bark	neg	neg	neg
15. *Triplaris s.*	tangarana colorada	leaf	neg	neg	neg
16. *Triplaris s.*	tangarana negra	bark	neg	neg	neg
17. *Triplaris s.*	tangarana ngra	leaf	neg	neg	neg

All the plant materials were tested for DMT with Van Urk reactive using thin layer chromatography technique. This reactive is highly selective and is used to unmask DMT structure. Leaf and bark were analyzed. Seventeen (17) samples were investigated and all of them, with the exception of *Psychotria v.*, tested negative. *Psychotria v.* (leaf extract) appeared blue on the chromatographic paper and this confirmed the presence of DMT (see table 47).

Table 47

Results of Two dimension TLC Van Urk Reactive

No/Scient. name	vernacular name	part	VAN-URK
1. *Calycophyllum s*	capi/ba amarilla	bark	neg
2. *Calycophyllum s*	capi/ba amarilla	leaf	neg
3. *Calycophyllum s*	capi/ba blanca	bark	neg
4. *Calycophyllum s*	capi/ba blanca	leaf	neg
5. *Calycophyllum s*	capi/ba negra	bark	neg
6. *Calycophyllum s*	capi/ba negra	leaf	neg
7. *Capirona d.*	capirona altura	big bra	neg
8. *Capirona d.*	capirona altura	bark	neg
9. *Capirona d.*	capirona altura	leaf	neg
10. *Capirona d.*	capirona altura	sm.bra	neg
11. *Psychotria v.*	chacruna	leaf	POS
12. *Triplaris s.*	tangarana blanca	bark	neg
13. *Triplaris s.*	tangarana blanca	leaf	neg
14. *Triplaris s.*	tangarana colorada	bark	neg
15. *Triplaris s.*	tangarana colorada	leaf	neg
16. *Triplaris s.*	tangarana negra	bark	neg
17. *Triplaris s.*	tangarana ngra	leaf	neg

Part 3 - Analysis

The three plants, *Capirona d.*, *Calychophyllum s.* and *Triplaris s.* were considered in this research and *Psychotria v.* was added as reference. Simple tests were done, prior to plant material examination, to verify the validity of the reagents. Caffeine was used as a first trial and was extracted with the Wall and Kiang Douglas technique and tested with Dragendorff reagent used to detect alkaloids and the result was negative together with caffeine standard, but the result was positive when Dragendorff was used against cysteine.

It is known that not all the reagents to identify alkaloids are good for all alkaloids and therefore for the following test Ehlrich and Mayer reagents were added to Dragendorff. As indicated by Martello & Farnsworth (1962) in a scale from 0 to 3 different alkaloids give different reaction with different reagents. The addition of Ehlrich gave positive reaction with indole-3-acetic acid and tryphtopan which is considered the precursor of tryptamine alkaloids and therefore of DMT. Questionable result appeared with the Mayer reagent: reaction with TLC paper took place and crystal formation appeared each time.

To support the validity of the Ehlrich reagent *Psychotria v.* extract was tested and result was positive: a green blue circle was clearly visible on the TLC paper. An additional test was done with *Hydrastis canadiensis* root extract (golden seal) but the result was negative since none of the three reagents, Dragendorff, Ehlrich or Mayer, gave significant color change on the TLC paper.

After the technique was standardized all plant material previously identified (17 samples total, table 1) was tested with Dragendorf and Ehlrich reagents. Mayer was discarded due to interaction with the TLC paper base and crystal formation. Tests with Dragendorff were always insignificant (mild yellowish color), and therefore it was considered unsatisfactory for identification of alkaloids in the plant material under investigation. The Ehlrich reagent quite often gave a greenish-gray reaction with the vast majority of samples, but it was not considered sufficient to ascertain alkaloid presence.

Additional examination was required for identification of DMT alkaloid and therefore a specific test was done to verify the presence of this compound (71). Two dimensional TLC investigation was carried out on silica gel plate and Van Urk-Salkowski reagent was used because of two advantages: 1) easy detection for very small quantities, and 2) ability to give different colors for different indole derivatives. Most of the tryptamine derivatives give a strong blue color.

The first test was done with *Psychotria v.* only and the result was positive for the acid fraction. Although the *Rf* (distance from the line base) was slightly different from the reference standard, two blue spots were easily identified. Results were negative on the chloroform fraction. A second test was done on *Calycophyllum s.* (capirona del bajo amarilla) but the results were negative for both fractions. A third test was done for several other samples (acid fraction) of capirona del bajo and the results were negative. A forth and final test was conducted for *Psychotria v.*, *Calycophyllum s.* and *Triplaris s.* (acid fraction) and the result was positive for *Psychotria v.* only.

Part 4 - Discussion

The positive reaction of *Psychotria v.* with Ehlrich reagent was not sufficient to establish that a reaction occured specifically between DMT and Ehlrich reagent. It is possible that compounds similar to DMT may react with the Ehlrich reagent.

The negative reaction of the Ehlrich reagent with extracts of the plant material suggested that the alkaloids are present in *Psychotria v.* but they are absent in all the samples of the other plant extracts under investigation.

The two dimensional TLC examination that tested positive for *Psychotria v.* (acid fraction) confirmed not only the presence of alkaloids but also the nature of it. In fact the blue color is mostly related to indole alkaloids (e.g. tryptamine derivatives) and DMT is such an alkaloid.

The two dimensional TLC examination that tested negative for all the plant materials (acid fraction) suggested that it is difficult to prove the presence of DMT in this plant material.

The negative results of extraction from *Triplaris s.* (tangarana) suggested that the information provided by Luna (1984) where shamans supposedly substituted *Triplaris s.*

for *Psychotria v.* for hallucinogenic properties bears furher investigation.

Because the presence of DMT was not confirmed in the plant material under investigation, it is unlikely that hallucinogenic activity related to this compound can occur.

The field investigations in Tapirillo (varzea) and Iquitos City (terrafirme) supported the previous finding. No shaman in Tapirillo confirmed that *capircna d.* is used to induce hallucination, instead it was confirmed that this plant has medicinal value only.

Because the presence of DMT in *Calycophyllum s.* and *Capirona d.* cannot be established and because shamans do confirm that these plants have only medicinal value hallucinogenic activity can be ruled out.

CHAPTER 10

Ayahuasca and ayahuasca tourism

Don Francisco - Shaman #10

Part 1: Method of research.

The interview with Don Francisco mainly followed the guidelines used to interview varzea and Iquitos shamans. Some questions were presented only in the final part of the conversation.

Part 2 - Observation

Don Francisco indicated that *Maytenus m.* (Celastraceae), *Swartzia p.* (Fabaceae) and *Tynnanthus p.* (Bignoniaceae) are used for rheumatism and arthritis. The preparation of these plants is done by maceration of bark and the extract is put in bottles.

Psychotria v. (chacruna) and *Banisteriopsis c.* (ayahuasca) are the main plants used in the preparation of the ayahuasca drink. The two plants used separately produce no specific effect. It is the combination of the two that induce hallucination. The name "chacruna" assigned to *Psychotria v.* explains this dependency: *Psychotria v.* is the helper to *Banisteriopsis c.* and only when these two plants are combined the state of altered consciousness can be reached.

Psychotria v. leaves are very much in demand, and the price on the market is about fifty sols (about $25 per kilogram). There are many people interested in attending or participating in the ayahuasca ceremony and booking is done in advance at the local hotels in the city and shamans are in contact with them. Don Francisco referred that there is competition among shamans because people who participate in the ceremony have to pay for this service that generates substantial source of incoming.

The preparation of the ayahuasca drink is done according to the situation: for "normal" conditions *Psychotria v.* and *Banisteriopsis c.* are used together. As a "secondary" preparation *Brunfelsia sp.* (ciric sanango) is added to induce dizziness with shivering (para sentir la mareacion con frio). There are several forms of "Psychotria" (such as shintiro chacruna, huambisa chacruna, luciero chacruna, supay chacruna, huarmi chacruna, buquero chacruna, yana chacruna).

The following plants (that Don Francisco calls "palos") can be added to the normal preparation: *Brugmansia sp.* Solanaceae (toe'); ***Nicotiana tabacum,*** Solanacee (tobacco); *Tabebuia sp.* Bignoniaceae (tahuari'), *Couroupita* *guianensis,* Lecythidiaceae (ayahuama); *and Remijia peruviana,* Rubiaceae (chullachaquicaspi).

Several forms of ayahuasca exist: saia ayahuasca produces different sensations, other types are cielo ayahuasca, trueno ayahuasca, tampana ayahuasca, luciero ayahuasca, yana ayahuasca (black negra), rajo ayahuasca, yacuruna ayahuasca. The most common ayahuasca used in the area is cielo ayahuasca. In different areas there are different ayahuasca, for example liana ayahuasca is used in Lamas (department of S. Martin about 100 kilometers northeast from Iquitos).

Varzea (bajo) ayahuasca is called ampi ayahuasca (also called tahuampa). It is very poisonous and is used to kill worms. Sometimes it is used for unethical purpose to cause damage to people (sorcery).

Ayahusaca drink preparation is done normally combining *Banisteriopsis* [ayahuasca = soga del muerto - aya = muerto (dead) and soga = liana (vine) vine of the dead] and *Psychotria* (chacruna = cha=hermana=sister or helper and cruna = mujer=woman).

The plants indicated by Don Francisco are listed on table 47.

Table 47

No/Scient. name	family	vernac.name	sha
1. *Banisteriopsis c.*	Malpighiaceae	ayahuasca	FM
2. *Brugmansia sp.*	Solanaceae	toe'	FM
3. *Brunfelsia sp.*	Solanaceae	ciricsanango	FM
4. *Couroupita g.*	Lecythidiaceae	ayahuama	FM
5. *Maytenus m.*	Celastraceae	chuchuhuasi	FM
6. *Nicotiana t.*	Solanacee	tobacco	FM
7. *Pachira sp.*	Bombacaceae	punga	FM
8. *Psychotria sp.*	Rubiaceae	chacruna	FM
9. *Remijia p.*	Rubiaceae	chullachaquicaspi	FM
10. *Swartzia p.*	Fabaceae	cumaceba	FM
11. *Tabebuia sp.*	Bignoniaceae	tahuari'	FM
12. *Tynnanthus p.*	Bignoniaceae	clavohuasca	FM

Part 3 - Analysis

Don Francisco is a shaman that has been practicing his craft since he was sixteen years old and his grandmother has been his mentor. He belongs to the native group of Capanahuas that can be reached by boat from Iquitos in five or six days. He speaks Spanish, the native dialect and also understands some English. Several years ago he was able to build and organize his ethnobotanical garden. This complex of sixty hectares (about 148 acres) is located about 25-30 kilometers from Iquitos city.

Don Francisco stated that this land was pristine rainforest. His garden consists of several hundred species of medicinal plants including trees, lianas and herbs. About fifty percent of the plants are native species that were originally found when the garden was established, while the other fifty percent is represented by a collection coming from different Amazonian regions. The objectives of this garden are to promote education, conservationism, sustainability and improve the sense of community for the people of the area. In this complex it is also possible to attend an ayahuasca ceremony. All the plants that are used by Don Francisco are from his ethnobotanical garden.

Don Francisco stated that taking the ayahuasca drink is quite challenging. Nobody knows what the reaction will be in the body of people who take the drink the first time, therefore the combination of only two plants is sufficient. There are also different types of "*psychotria*" and before trying different ones it is important to verify the reaction of the body after being exposed to the drink the first time. Trying a combination of several plants is definitely discouraged for the neophytes. Don Francisco stated that with one leaf only you can cure and with one leaf only you can die (con una hoja pueds curarte y con una hoja puedes morir…"). In order to experience different types of the *Ayahuasca* drink (eventually stronger ones) the body must be trained slowly. The following "*psychotria*" (chacruna) are not used the first time:(huambisa chacruna, supay (demon) chacruna, huarmi chacruna, yana chacruna or liana(negra) chuacruna. Luciero chacruna is instead used. Also *Brugmansia spp.* Solanaceae (toe'), *Nicotiana tabacum,* Solanacee (tobacco), and *Brunfelsia sp.* Solanaceae (ciricsanango) are not recommended the first time. After two or three times, when it is known how the body reacts to the drink, then these plants can be used to prepare a stronger potion.

Don Francisco emphasized that whoever was interested talking ayahuasca must do that step by step: it is a self-discovery journey. Not everybody has the same reaction and not everybody is prepared physically and psychologically to this event. Sometimes people (tourists) would come and ask to take a strong ayahuasca but Don Francisco would refuse to do so because would be the wrong way to have this experience. It is possible that unpredictable reactions could occur because the concentration of different plants was wrong and therefore this would have an impact on the drinkers. Don Francisco said that one day an ayahuasca researcher (who wrote books on hallucinogen plants) came to him and asked to try all the ayahuasca drinks in a short period of time. Don Francisco told him that this was not possible to do within such a limited time. He suggested that many things should not be mixed together because the chemistry of reaction could be complex. Some plants have a secondary effect on the body. The reaction of the body to the ayahuasca drink can be devastating: Don Francisco referred that a woman who took the drink under the guidance of a famous shaman (this researcher has seen an advertisement for this shaman in magazines and on the web promoting ayahuasca ceremony) was unconscious for two days. Most likely the mixture was wrong or the concentration of the plant material was wrong. Don Francisco referred that the woman took three doses during the ceremony and the reaction was overwhelming.

Duke and Vasquez (1994), indicated that a shaman called Don Antonio warned that there were bad ayahausqueros in Iquitos who have sent some gringo initiates home as "basket cases."

This event clearly confirms what was stated before: ayahuasca must be tested the first time with a normal dose and nothing more. Don Francisco suggested that an ayahuasca ceremony should be approached by people with respect and also shamans should be serious about what they are doing. Don Francisco claimed that the shaman who provided three doses to the woman who lost consciousness, instead of singing icaros (special songs that facilitate hallucination) engaged the audience by singing pop music.

Don Francisco also stated that learning about ayahuasca was a long procedure. He said that somebody who was training with another famous shaman came to him to continue his training, but according to his judgment this person knew nothing.

People who take the drink have different visions. Every time somebody takes the drink they have different visions.

Diet is required to weaken the body. Diet comes from the word *"dia"* and is done to purify the body. Diet is the essence for treatment. If you do not diet, you get nothing (Si no haces dieta, no haces nada). It takes at least three months to learn how to diet in different intervals: butter, sugar, salt, sexual activity must be stopped. For example the first time the diet is done for eight days, then for four days all that is forbidden can be taken in small amount, then again diet for another eight days and so on for a total of three months.

Plant material is collected early in the morning. Don Francisco explained that the reason is because during the night plants are recharged with "energy" by the nocturnal atmosphere that surrounds them. This "energy" that flows like blood in the body is moving down towards the roots into the ground during the day. Also the position of the sun is critical during collection. The sun energy is very important. If a shaman decides to collect bark from a big tree such as *Pachira a.* (punga) the first selection is where the sun goes down and the second selection is where the sun goes up.

Part 4 - Discussion

The interview with Don Francisco was probably one of the most important during this study. The researcher attended an ayahuasca ceremony to verify directly all the information provided by other shamans or indicated in literature. Drinking ayahuasca can be a powerful experience.

Don Francisco is an example of this new form of shamanism that is growing in some areas of the Amazonian region. He could be described as a bridge between the city of Iquitos with tourists coming to try the magic drink and the forest with extensive knowledge of both environments. His knowledge of plants appears to be extremely wide and many details about ayahuasca have been indicated during the interview.

The information collected is rich with details and also his criticism about shamans' misbehavior is remarkable. Don Francisco indicated that when his garden originated it had only fifty percent of the total plants available now. It is possible that the additional plants that were introduced in the garden had particular medicinal value. It would be interesting to study in a different time, the impact of the new environment for these new plants and if these plants somehow change from the original form.

If varzea shamans are compared to Iquitos shamans or shamans who are connected to the city of Iquitos it appears that the shamanism connected to the city has been modified to satisfy the demand of the tourists eager to drink ayahuasca.

CHAPTER 11

Conclusion

Before a final conclusion is given it is worthy to remember that the information registered is always questionable. The abundant literature on this topic shows many discrepancies because the meaning assigned to the words is not the same. Ayahuasca can be *Banisteriopsis c.* or the drink itself. *Capirona d.* for local people can be capirona del bajo or de altura, while for botanists it can be either *Calychophyllum* or *Capirona decorticans*, Yage' can be ayahuasca drink, but it can be *Banisteriopsis c.* or *Psychotria v.* for others. Shamans sometimes say that a plant is a purga and sometimes it is a medicinal plant and so on, therefore whatever was written is the way it was reported. Also other controversial point is that some researchers (Mabit, Campos and Arce, 1992 # 96) indicated that *Banisteriopsis c.* and not *Psychotria v.* is responsible for hallucination.

The research for this project was focused on two major points:

a. explore varzea shamanism and its relation with ayahuasca at the present time.

b. verify the possibility of using other plants in substitution of *Psychotria v.* in the preparation of the ayhauasca mixture.

The two topics are interconnected and conclusions are made relating one topic to the other.

Shamanism is constantly changing and a lot of attention is coming from outside the community where shamanism is practiced. Researchers are interested in capturing the value of these "*archaic techniques of ecstasy*" (Eliade, #86) more than the offspring of the old generation. A new environment created new interest and different needs that are sometimes in conflict with old traditions. The lifestyle of Iquitos City and the impact of the media are too strong to be ignored. Varzea shamans must be aware of this. Nevertheless the old lore is still alive and the interviews with them indicated that their knowledge is highly valuable.

The data collected should be considered for general evaluation. The shamans indicated that only 15 plants, from the inventory conducted in varzea in relation to the ecology of *Calychophyllum s.*, are used from the list of 42 plants identified in the area. Despite the fact that about twice as many as the number of the plants used are ignored a more accurate observation reveals that the plants that are considered neglected are instead not easily available and therefore shamans prefer to rely on more affordable plants. This indicates a good understanding of natural resources.

Also the 15 plants selected have about twenty different uses, while the other 40 plants that shamans get from areas other than varzea can be used for twenty-nine different uses. This indicated also that the 15 plants are very valuable to cover a spectrum of multiple cures.

Varzea shamans use a total of 55 plants for their healing practice; 22 are in common with the plants listed in the terrafirme distribution inventory. Iquitos shamans use a total of 41 plants and 18 are in common with the terrafirme distribution inventory. It can be said that both Varzea and Iquitos shamans rely on plants from terrafirme.

Varzea shamans did not mention anything related to AIDS or drug addiction that are health problems more spread in urban area.

It appearesthat there is a close relationship among shamans of the same village and competition is not detectable. Seniority due either to the age or to the years of healing practice plays a major role. Iquitos shamans appear to be more involved in ayahuasca or other hallucinogenic drinks such as brebaje palo more than varzea shamans. The demand for healing of the city population is different from the demand of the "*riberenos*". The more relaxed atmosphere of the village may indicate that life along the Amazon River is somehow less stressful and competitive than in the city. Shamans that are connected to the city seem to be more competitive and aware of this, particularly with respect to the ayahusca practice. Don Francisco referring to a shaman highly involved with *ayahuasca* ceremony, was very critical about his behavior that is far apart from the traditional mystique of the ceremony, He said in English that this person is a "*showman*" and not a *shaman*.

The description of ayahuasca preparation is very well detailed but varzea shamans did not indicate any alternative plants to substitute for *Psychotria v.*. No varzea shaman indicated that uses or that he has heard about somebody that uses *Calychophyllum s.* or *Triplaris surinamensis* in substitution of *Psychotria v.* It is safe to say therefore that the information found in the Napralert report and Luna (1984 a & b) deserves additional research. (As of today Napralert has been contacted to verify if new finding would be available about phytochemical analysis of *Calycophyllum s., Capirona d. and Triplaris s.* but no additional information has been provided different from the one provided at the beginning of this research).

Also it should be stressed again that the information from natives requires sensitive screening. Misunderstanding due to the language barrier and to different cultures plays its role in any fieldwork and some questions have been avoided to eliminate pressure and possible discomfort to the person interviewed, but sometimes it has been very difficult to draw a line for the sake of truth.

Generally speaking, varzea shamanism is quite efficient but in Tapirillo area ayahuasca does not appear to be used very often. It also should be reminded that Tapirillo is a very small village and most likely strangers are only researchers, scholars or students and not tourists. Without any doubt there is no room for ayahuasca tourism in this place.

Varzea shamans prepare ayahusca mainly with *Banisteriopsis c.* and *Psychotria v.* and others plants can be added to it. No varzea shaman confirmed the use of *Calychophyllum s.* or *Triplaris s.* in substitution of *Psychotria v.*. Can *Psychotria v.* be substituted with other plants? And if so, which one and why?

It was indicated that *Psychotria v.* is a major ingredient to induce hallucination in the ayahuasca preparation. It is therefore extremely important to have this plant easily available. Don Santiago says that he has to go to Iquitos to get this plant to prepare ayahuasca. Don Francisco has his own botanical garden and *Psychotria v.* has been planted there to satisfy the need for it in the ayahuasca ceremony.

Shamans need *Psychotria v.* in large quantity; Don Santiago and Don Ramirez indicated that they need 350 leaves each time the drink is prepared. *Psychotria v.* is a small tree (shrub) and 350 leaves have a substantial impact on each individual when they are removed. Don Francisco stated that small shrubs can be sold for about 60-70 dollars each and this is also quite expensive for the living standard of people in the region. The demand for *Psychotria v.* leaves is very high and the price to participate in an ayahuasca ceremony starts at about 60-70 dollars. This has been advertised in brochure for people that want to try this amazonian beverage.

The personal communication provided by Pinedo (85) that *Psychotria v.* has been transplanted in area close to the city (such as Muyuy island) is quite understandable and fits quite well with what has been recently called "ayahuasca tourism".

Why then is there ayahuasca tourism? It is an interesting phenomenon that has developed in the last few years that could be considered a new cultural trend for people in research of new spiritual experiences. It is based on the assumption that via the ayahuasca experience it is possible to achieve a better personal understanding in relation with nature. The word tourism is associated to the fact that there is a variety of services supported by advertisement and web pages promoting trips to the Amazonian region to experience the ayahuasca beverage.

Ethical issues must be considered prior to taking ayahuasca because this drink induces hallucination and some people could look at it in a pejorative way. There are cultural-religious concerns because some people like the group of Santo Daime in Brazil use the drink as part of their religious practice. Also there are legal issues or legal because somebody in the past had a patent for *Banisteriopsis c.* and this caused concern and anger among the native people. In addition, *Psychotria v.* contains the molecule DMT that is considered illegal drug and classified schedule II.

Nevertheless, it should be said, that besides the personal impact due to the preparation technique, ayahausca experience is very powerful and the impact on one who tries this drink cannot be underestimated.

It is well known that the interest in this experience is growing more and more. Maybe it is not just a new trend but a sincere desire to search for answers to questions that our background, culture or lifestyle cannot satisfy. In the future a better understanding should be available.

This researcher was informed by local people that there is an attempt to prepare ayahuasca and sell it in bottle like any other liquor. This is only a rumor since shamans claimed they prepare fresh ayahuasca each time it is used in a ceremony.

It appears from this study that there is a big demand for ayahausca and therefore for the plants that are involved in this preparation. The first contact with shamans provided some indication for this possibility: Don Humberto uses palos in substitution for both *Psychotria v.* and *Banisteriopsis c.* and he mentioned *Calychophyllum s.* that is a palo. He also stated that some ayahuasqueros use only one palo with *banisteriopsis-ayahuasca* and *Psychotria v.* is not a palo but a shrub. Don Cristobal mixes ayahuasca only with *Psychotria v.* (chacruna) or as alternative with *Brugmansia sp.* (toe' blanco).

The possible substitution of other plants for *Psychotria v.* has been one the objects of this research. *Calychophyllum s.* and *Triplaris s.* was considered, in particular along with *Capirona d.* because they are easily available and therefore could be the ideal substitution for *Psychotria v.* which is commercially more expensive to obtain. Also like *Psychotria v., Calychophyllum s.* and *Capirona d.* are in the same Rubiaceae family that is rich of alkaloids like DMT that is highly responsible of hallucination.

Despite the fact that varzea shamans indicated that they never have used or heard of anybody using these plants in substitution for *Psychotria v.* plant material was collected from these three plants and compared to *Psychotria* v. as reference. Testing for alkaloids was quite challenging because different reactives for different alkaloid molecules gave different results. The first positive result with the Elhrich reactive for *Psychotria* v. and negative for the other plants was not considered sufficient to confirm the presence of DMT alkaloids. Instead the two dimensional TLC examination that tested positive for *Psychotria v.* (acid fraction) confirmed not only the presence of alkaloids but also the nature of it. In fact a blue color is mostly related to indole alkaloids (e.g. tryptamine derivatives) and DMT is such an alkaloid.

The same TLC test was negative for all the other plants, suggesting that it is difficult to prove the presence of DMT. Therefore, since the presence of DMT is not confirmed in the plant material under investigation, it is unlikely that hallucinogenic activity related to this compound can occur. This would give an answer to the second subject of the study that was to verify if *Calychophyllum s.*, *Capirona d.* and *Triplaris s.* can be considered as a substitution for *Psychotria v.*.

What is the final conclusion of this work? According to Don Jose "...the secret of ayahuasca has no limit, every day we learn something new..." (el secreto del ayahuasca es interminable, cada dia se aprende una cosa nuova).

ADDITIONAL CONSIDERATION AND SUGGESTION

What should be said in addition about ayahausca with respect to this research?
Practical consideration like fear of exploitation from industrialized countries limits research particularly in areas like phytochemistry, because native people feel that

in the event of an important scientific discovery on their land there is no benefit for them. Native people claim their property rights on plants that grow on their land. While science theoretically should have no boundaries it is impossible to forget that there are policies that must be respected.

If ayahuasca tourism generates income for local people this should be accepted by everybody since these native people need a better life condition and whatever they gain is reinvested in the local economy.

The discrepancy of scientific information that may be generated in collecting information, particularly when related to local healing practice, should be evaluated using a different perspective by westerners used to treat health problem with a quick fix.

A remarkable interest has been generated by other areas of research associated with the use of hallucinogens such as ayahuasca. Mabit, Campos and Arce (1992) indicated in the summary of their work that the ayahuasca beverage with its purgative and psychotropic effect represents the main axis of Shamanism in the amazonian region. They stated also that studies confirmed the beneficial effect of the drink in treating drug addiction. But above all the effect of the drink is due not to active principles betacarbolines and tryptamines, but to the psychosomatic condition of the patient, the natural surroundings and other factors involving the therapist.

Several authors (Prance, 1991, DeSmet, 1995, Schultes, 1995) proposed that a multidisciplinary approach should be used in the study of ethnobotany and therefore research in this area should be carried out in accordance with this message.

As indicated by De Smet (1995) "...scientific studies on ritual psychoactive drugs may have an impact on medical care in Western society..." It is true that unfortunately the use of hallucinogens in western culture is often considered in a pejorative way, while among other people with different cultures the use of plants as hallucinogens has always been an essential element of their believing and surviving (Taussing, 1987).

The study of hallucinogenic plants might lead (De Smet, 1995) to improving knowledge about substance abuse and the ability to use this knowledge to offer help and assistance to abusers. In addition, research in this area can provide new pharmacological tools for neurochemical research: harmaline from *Banisteriopsis* has turned out to be a selective inhibitor of the monoamine oxidase (MAO) enzyme.

Also it is possible to discover synthetic substances with potential therapeutic properties (specific agonists of the central gamma amino-butirric acid GABA-ergic system from the fly agaric constituent muscimol), and prove that it is the best time to reevaluate the study of hallucinogens for therapeutical purpose (Grieco and Bloom, 1981).

Recently several authors from different fields (Callaway in biochemistry, Mash in neurology, Strassman in psychiatry, Abraham in neuropsychopharmacology) have conducted studies on the relation between hallucinogens and the brain and the results suggest pursuing this direction.

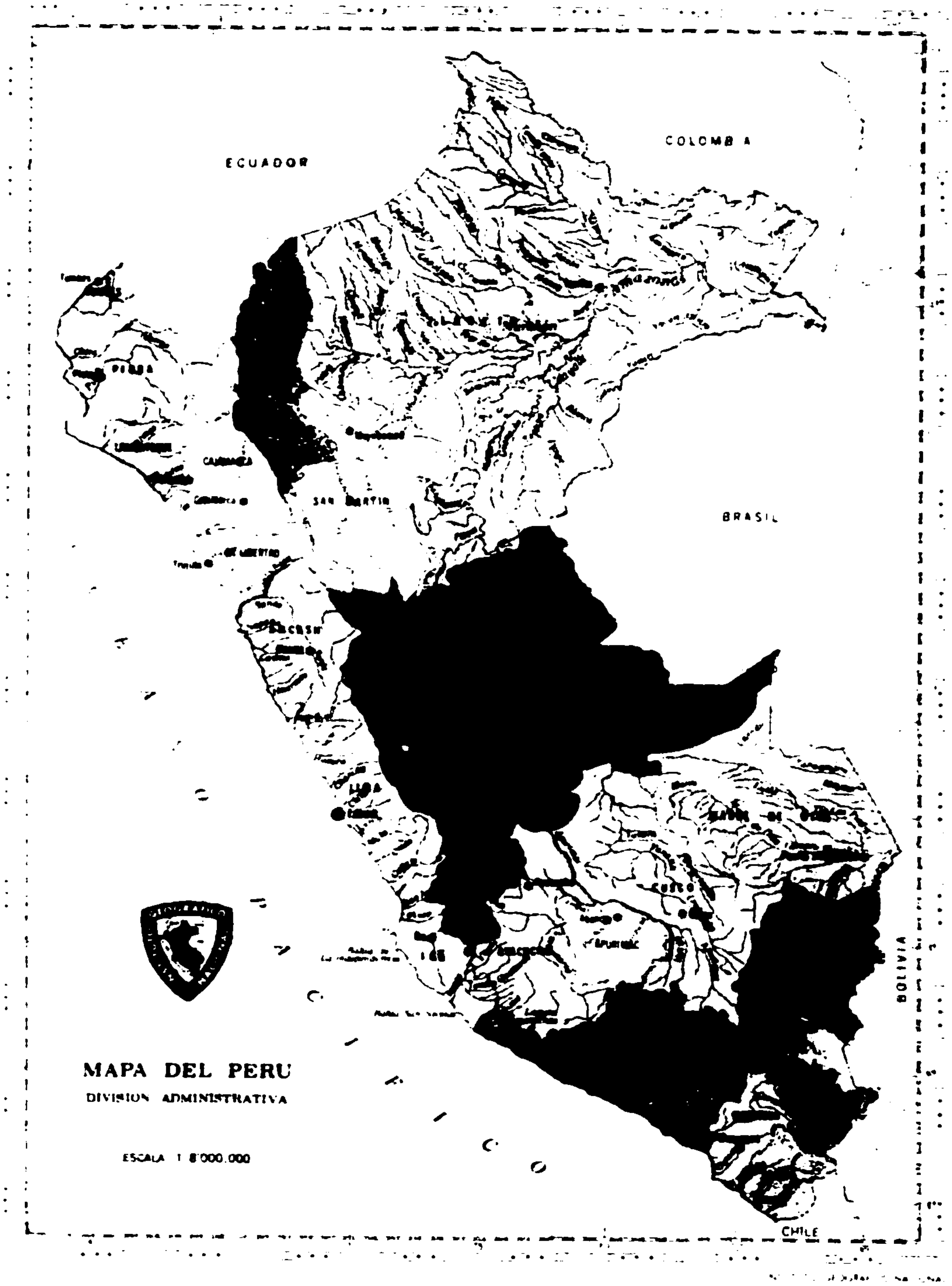
Callaway et al. (1994) indicate that platelet serotonin uptake sites increase in drinkers of ayahuasca. Also from Callaway et al. (1996) is the report that an "analytical procedure for the rapid detection of harmala could be of use to the forensic toxicology, especially in cases of unexplained serotonin syndrome in which consumption of illicit drugs is suspected. Mash (Miami University) has begun phase I studies of Ibogaine (an alkaloid from *Tabernanthe Iboga* used in Gabon as part of the Bwiti cult) to cure drug addiction.

Due to the molecular similarity between DMT and serotonin, research on hallucinogens should be helpful to better understand the complexity of the neurotrasmitters. As indicated by Strassman (1995) the current research in psychopharmacological studies utilizing hallucinogens has increased and DMT has been administered since late 1960. De Smet (1995) indicated in fact that"...methodologically, the only conclusive way to distinguish between pharmacological and psychological actions is the cross-over double-blind design. The subject receives the test drug and a dummy drug (placebo) on two different occasions, and neither the subject nor the investigator knows at the time of administration which drug is being taken". If at times we have substantial evidence that the placebo effect is the right answer to our question, "What cured the patient?" We have to look more closely at the interrelation between the neural system and immune system, since it has been confirmed (Felten, 1993) that the two "talk to each other", and it would be interesting to further explore the areas of psychoneuroimmunology.

APPENDIX

List of maps

List of pictures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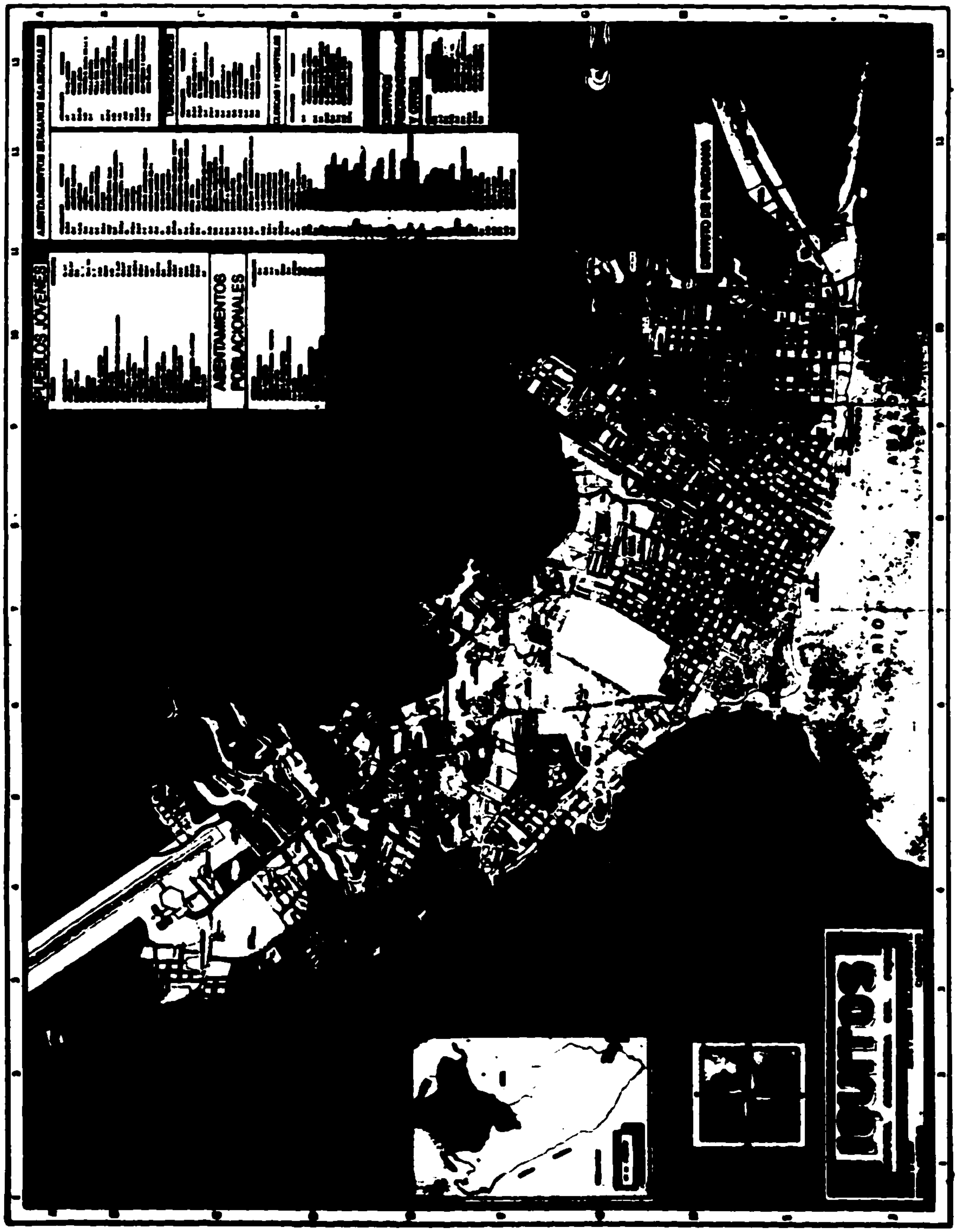
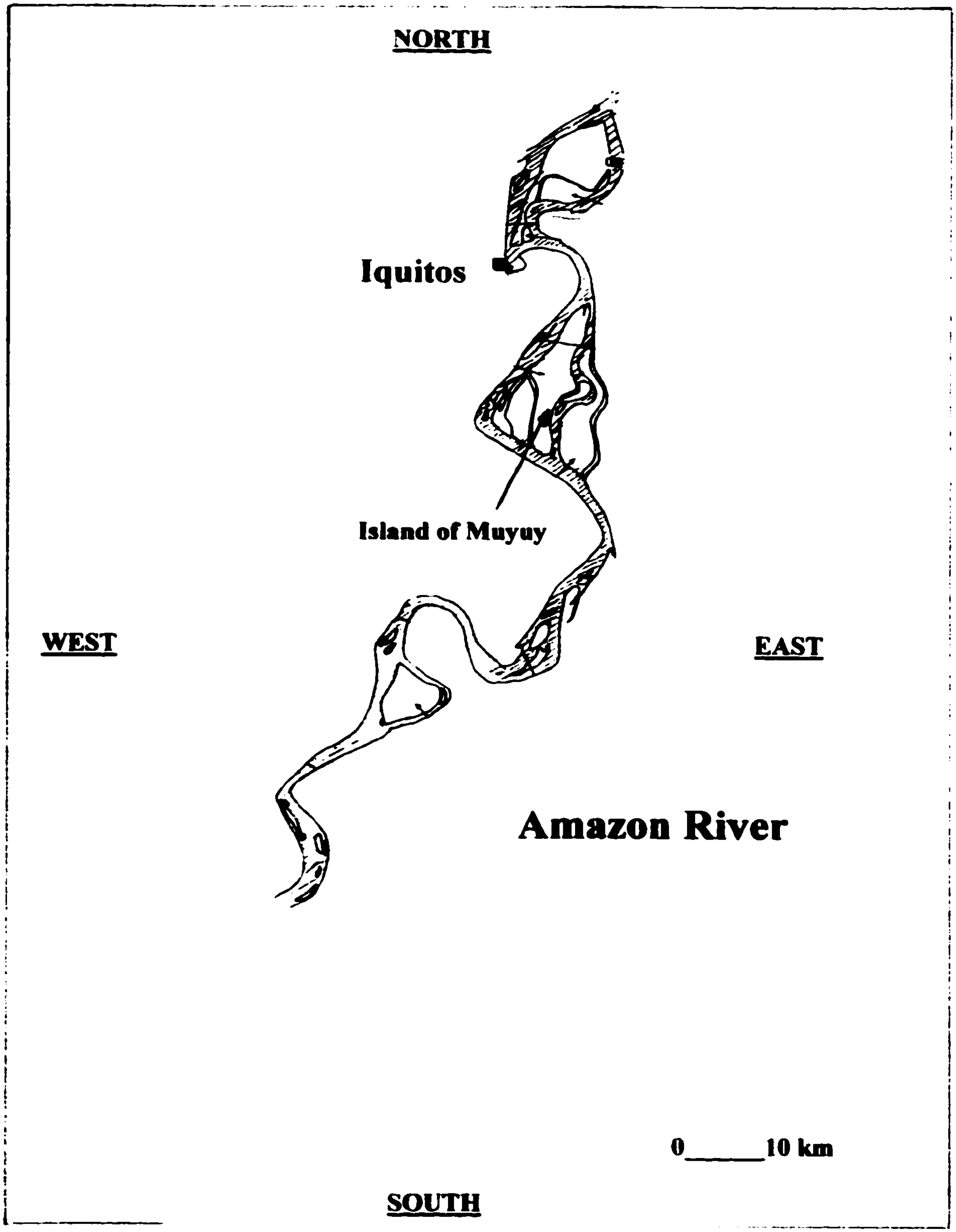


Map of Iquitos



Area of research

Iquitos
(From the Amazon River)

Dry season
(Close to Iquitos)

Dry season
(Close to Iquitos)

Transportation on the Amazon River

Erosion caused by the Amazon River

Village on the Amazon River

House of natives at Tapirillo (varzea)

Calychophyllum spruceanum - top (varzea)

Calycophyllum spruceanum - bottom (varzea

Psychotria viridis - leaves (terrafirme

Psychotria viridis - flowers (terrafirme)

Psychotria viridis - berries (terrafirme)

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