The Ethnobotany of the Mestizo People of Suni Miraño, Peru

by

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Abstract

The present invasion and depletion of the Peruvian forest continues to erode the traditional knowledge accumulated in the Amazon Basin. Many Indigenous cultures have flourish in the Amazon Basin for at least the last 3,000 years (Lathrap, 1970) while Mestizo culture began approximately 500 years ago, with the arrival of European and other Old World explorers. The richness in biological and cultural diversity of Amazonia forest has inspired many fundamental ethnopharmacological studies on the botany and chemistry of hallucinogenic used in healing practices. These studies have provided us with some information on disease and etiology (Kampinnen, 1988); the uses of medicinal and magical plants (Luna, 1984) and on diet and acculturation (Holmes, 1992). However, many gaps still remain.

This research incorporates ethnobotanical field research and laboratory research on the medicinal plants used by Mestizo in Suni Miraño, Peru. Ethnobotanical information on 54 medicinal plants was documented, and 31 crude extracts of some selected plants were submitted to microbiological assays to test for antibiotic and antifungal activity. Included is a description of some illnesses as perceived by Mestizo, diagnosis, etiologies, the patient's role, and how some of the healing procedures are implemented. This information may allow for the explanation and understanding of illness causality, distribution, and treatment/dosage efficacy in medicine as practiced by Amazonian Mestizo.

A large number of Amazonia Mestizo communities are dependent on their traditional medical knowledge as their only source of health care. This medical knowledge has been associated with a long tradition of curanderismo and sorcery among Mestizo. It has played a key role in the administration of traditional medicine. Mestizo traditional knowledge, which in some cases may have been adapted from extinct or endanger indigenous cultures (Phillips and Gentry, 1993) has been enhanced by the high capacity of people's mobility in the Amazon flooded forests.

Mestizo healer use entheogens, plant able to generate god within it (Ruck, 1979), to interact with the spirit of the forest and receive medical knowledge. This wisdom is embedded in the oral tradition. The rapid depletion of the Peruvian forest by timber companies, oil drilling, agriculture and settlement project is causing serious implications to traditional medical systems and is deteriorating the quality of life in general. The complexity of forest ecosystems provides a significant number of plants used in the formulation of traditional remedies, the loss of these ecosystems will take away the foundation of traditional knowledge and the only medical resources of Aboriginal and Mestizo peoples in Amazonia.

Amazonian Mestizo can be assisted in their efforts to achieve the formulation of future management policies for natural resources use, and in the development of sustainable models seeking to provided health, shelter, clothing and food to their communities.

Table of Contents

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Chapter 1

Background

General Introduction

The present invasion and depletion of the Peruvian forest continues to erode the traditional knowledge accumulated in the Amazon Basin. Tropical forests have provided natural resources to a diversity of cultures. The forest has stimulated human intellectual and spiritual growth providing vision and inspiration to those searching to understand the nature of the forest. Powerful and complex forest-people relationships have emerged and resulted in unique cosmologies, traditions, and cultures reflecting our understanding of the surrounding environment.

Indigenous cultures have flourished in the Amazon Basin for the last 3,000 years (Lathrap, 1970), while the Mestizo culture began about 500 years ago, with the arrival of Europeans. Geographical and cultural marginalization followed by the rapid development of urban societies have encroached on both Indigenous and Mestizo peoples. The "validity" of their traditional knowledge continues to be questioned by "modern" society. However, the degree of ethnocentrism and skepticism differ in some Western societies.

The term "traditional knowledge" has a long history of being non-scientific. However, "traditional medicine" and "Traditional Ecological Knowledge" (TEK) has recently received more attention. The interest comes not only from scholars, but governments, Non Government Organizations (NGO's), and Indigenous and Mestizo groups interested in preserving their natural environment, traditions, and life styles. For example, the Miamiraua Reserve in Brazil, is a conservation unit of 4,300 square miles using the full participation of local Indigenous and Mestizo populations in the conservation and management of the reserve. This has shown promising initial results (Howard, 1995).

Many urban societies, such as those of Iquitos in north east Peru, have become highly dependent on non-timber forest products (NTFP's), but little efforts are being made to curb the present rate of destruction of the flooded forest. Tropical forests continue to supply with medicine, food, minerals, precious woods, precious stones, natural fibers and a large number of raw materials to urban societies worldwide. The unregulated use of natural resources is endangering these life-rich ecosystems and with

them, people and their cultures. Sustainability programs may offer some viable solutions to this problem. However, in over-populated areas where irresponsible management of natural resources is already common, sustainability may be difficult to achieve.

After five centuries of bi-directional assimilation in Amazonia, resistance to acculturation by Native and Mestizo has decreased, especially among the youth who are less interested in learning about and keeping their cultures alive. However, traditional medical systems remain one of the strongholds of Mestizo culture. Based on the knowledge of natural products (mainly plants), traditional medicine continues to play a major role in the treatment of illnesses and in achieving balanced spirituality. Furthermore, some traditional healing practices used by Mestizo medical treatments may be compare to psychiatric treatment in Western medical practices.

The Mestizo inhabiting the flooded forest surrounding Iquitos are the repository of a large pool of TEK. Ecological understanding of the seasonal fluctuations in the Amazon Basin, such as the flood phenomena, has allowed Mestizo to coexist with the Amazonian ecosystem using the forest resources in some sustainable way.

A large number of Mestizo communities are strongly dependent on traditional remedies as their only source of treatment for illnesses. Medical clinics, usually in small towns, are commonly limited in supplies and trained medical personnel. In most cases, only basic care and disinfectants, antibiotics, pain killers, and anti-diarrhea medication are available. The consultation fee and the cost of Western medicines make access to medical services inaccessible for the majority of forest dwellers.

The Mestizo traditional knowledge, which in some cases may have been adopted from extinct or endangered Indigenous cultures (Phillips, 1993) has been enhanced by the high capacity of people's mobility within the flooded forest. Amazonia internal migration has enriched the transferring of traditional knowledge. At the same time, it has facilitated the arrival of modern drugs and basic technologies into some villages decreasing the interest in traditional medicine, and increasing the appeal for western goods.

Healing practices such as the use of magical plants (Feo, 1992; Luna, 1984a; Schultes, 1992a; Cordy-Collins, 1982; Hiroaka, 1985) and the uses of tobacco, are very common among Amazonian Mestizo. These practices spread throughout the Amazon Basin a long time ago. Mestizo healing practices rely on the help of the spirits of the forest, or "supays", the powers obtained from "magical"

plants and animals, traditional remedies, and the observation of strict diets. The combination of these magical elements and natural products allow healers to provide medicines and treatment.

The richness in biological and cultural diversity of the South American tropical forest has inspired many fundamental ethnopharmacological on the botany and chemistry of hallucinogens (Schultes,1990; Schultes, 1992a; McKenna, 1984), shamanism and healing practices among Amazonian Mestizo (Luna, 1984a) and Pre-Columbian Ethnobotany in the Amazon Basin (Towle, 1961). Uses of medicinal plants have been well documented in studies of Indigenous peoples in the Amazon Basin (Arenas, 1987; Macrab, 1988; Bisset, 1989; Quentin-Leclercq, 1990; Schultes, 1990; Schultes, 1992a). Some particular plant species - most of them containing alkaloids- have been found to have mind-altering effects and have been suspected as the basis of early magico-religious rituals (Ruck, 1981; Hirschmann, 1987). Important entheogen plants, described as "god generated within" (Ruck, 1979), widely used in Amazonia are: toe (*Brugmansia aurea*), Chiric sanango (*Brunfelsia grandiflora*) (Schultes, 1992a; Lamb, 1985; Luna, 1984a; Barrera Caraza, 1994) and ayahuasca (*Banisteriopsis caapi)* (Luna, 1984b; Luna, 1991; Dobkin de Rios, 1970) these plants are used in Mestizo healing practices. The use of some entheogens in traditional medicine may have led to the discovery of new medicinal plants and to the improvement of the treatment/dosage relationship.

Ethnobotanical studies of Amazonian Mestizo have provided some information on their traditional medicine and healing practices. Examples are, description of disease and etiology among Mestizo (Kamppinen, 1988); Mestizo uses of medicinal and magical plants (Phillips, 1993; Feo, 1992; Schultes, 1990; Schultes, 1992a) and Mestizo diet and acculturation (Holmes, 1992). Many gaps still remain. Documentation of ethnobotanical and ethnomedical knowledge is very valuable to cultural groups who continue to practice traditional medical systems for health improvement and self-care in their communities (Khunlein, 1986).

Infectious Diseases in Peru

The most common health problems faced by the Mestizo community of Suni Miraño are infectious diseases, gastroenteritis, internal parasites and respiratory diseases. The higher incidence of infectious diseases in developing countries has been well documented by the World Health Organization

(WHO, 1995a). Health problems in Peru are associated with poverty, overpopulation, poor sanitation practices, and socio-political conditions.

In 1995, Peru reported 23,887 cases of cholera (WHO, 1995e). Phasiolasis, caused by *Phaseola hepatica* is the most well-known river fluke infection. It is also one of the most important parasites affecting mammals, including humans, and continues to be a major problem (WHO, 1995h). In 1993, 29% of the world cases of human plague were reported in Peru alone. By the end of 1994, a total of 1299 cases were diagnosed, with 62 deaths and a case fatality rate of 4.8% (WHO, 1995 ; PAHO, 1995).

Five major diseases kill over eight million people every year in developing countries such as Peru. These are pneumonia, diarrhea, measles, tetanus, and whooping cough. Measles alone kills "more children every year than all the world's wars and famine put together" (United Nations, 1994).

Peru continues to suffer from other major health problems such as tuberculosis (WHO, 1995i), yellow fever (WHO, 1995b), leprosy (277 cases reported in Peru 1995 (WHO, 1995f). AIDS (1176 cases in 1994; WHO, 1995d) and epidemic dengue hemorrhagic fever (EDHF) (1,830 cases WHO, 1995g). These diseases continue to spread in other countries of the region (PAHO, 1993) and the effectiveness of our drug arsenal against them continues to diminish.

The Peruvian Amazon

Estimates from bio-climatic data suggest that world tropical forests formerly covered around 14.5 million km^2. The area of remaining forests is approximately 7.5 million km^2 .Western Amazonia is one of the largest and main deforestation fronts in the world. In 1991, world tropical deforestation reached 1,879,500 km^2 each year. Western Amazonia contributed to this figure by cutting down 3% of the 200,000 km^2 of the remaining forest (Myers, 1993). It is clear that as long as there are substantial forests available and a progressive human demand upon them, the annual amount of deforestation will have a tendency to increase.

Some of the factors accelerating the destruction of the Peruvian rainforests are the rapid expansion of road networks installed by timber companies, oil drilling enterprises, planned agriculture programs, and settlement projects. Slash-and-burn agriculture, a common practice by millions of landless rural people (about 31% of national population) is causing great damage to the forest due to its intense

and non-traditional use. The ultimate result of these practices is the degradation of the environment, and consequently the quality of life and health in general.

The complexity and interdependency of forest ecosystems provides a significant number of plants used in the formulation of Indigenous and Mestizo traditional remedies. In an effort to cope with present conditions of deforestation and displacement from collecting grounds, some Mestizo healers use purchased pharmaceuticals like antibiotics and chemotherapeutical agents. In some Mestizo communities, traditional and western healing practices perform equivalent rather than complimentary functions. The implications of deforestation upon traditional medicine are serious. The loss of these particular ecosystems will take away the foundation of traditional medicine, the forest itself.

Drug Resistance of Infectious Organisms

Antimicrobial drug resistance is perhaps one of the most alarming threats among the problems presented by emerging infections. This problem is well documented in the United States where levels of drug resistance in both community-acquired (e.g. multi-drug-resistance to *Streptococcus pneumonia)* and nosocomial (e.g. vancomycin-resistance *Enterococci)* infections continue to rise, and could be leading us into a "post-antibiotic" era (PAHO, 1995).

Although, less documented, detection of significant levels of antimicrobial resistance is increasing in Latin America where over 20% of infections caused by *S. pneumoniae* have shown diminished susceptibility to penicillin. Other resistance-developing organisms spreading in Latin America are *Shigella, Salmonella typhi* and a chloroquine and sulphadoxine-pyremethanine combination resistant *Plasmodium falciparum* endemic to some regions in South America (PAHO, 1995).

Drug susceptibility results for *Mycobacterium tuberculosis* isolates were reported for 81.7% of persons with positive cultures in 1994. Eight percent of cases were resistant to at least isoniazid, and 2.2% were resistance to at least isoniazid and rifampicin (WHO, 1994).

Some of the conditions that strengthen the evolution of antimicrobial resistance are the prevailing practices throughout Latin American countries are:

- over-the-counter sale of antibiotics and frequent self medication
- overcrowding and suboptimal infection control practices in many hospital
- minimal regulations of antibiotic usage outside or within the hospitals
- scarce documentation of clinical trial results for newer antibiotics
- almost nonexistent surveillance and reporting of microbial resistance patterns

(PAHO, 1995).

In 1995, about 25 million people died of infections and parasitic diseases. About four fifths of them were in developing countries (United Nations, 1995). Statistics of cumulative mortality from intestinal parasites in Peru between 1965 and 1990, show a mortality of 571,000 people and 76.6 % were children under 5 years of age (PAHO, 1991). In any given country, anti-infective drugs account for 3-25% of all prescriptions. This is between 6% and 21% of the total market value of drugs, and up to 50% of the drug budget in hospitals (WHO, 1995c). The health and economic gap between developing and non-developing countries must be reduced or these problems will continue to increase without proper research and international strategic policies.

The evaluation of medicinal plants used by Amazonian Mestizo to treat infectious diseases may provide alternatives treatments to counter-attack the development of drug resistance. Ethnopharmacological studies will continue to contribute to this effort and encourage viable solutions to the medical problems of the Amazon Basin. Microbial resistance continues to spread all over the world and now poses a serious problem not only to patients but also to carriers. There is always a risk of generating resistant mutants and unexpected side-effects from the use of antibiotics. Until we developed new techniques of dealing with microorganism infections it will be necessary to continue the search of new sources of potent bacterial growth inhibitors. Screening of some selected medicinal plants used by Mestizo people may provide us with "leads" for the discovery of new potential pharmaceutical agents.

There is an urgent need to aid Amazonian Mestizo communities in their transition into the 21st century. The rapid depletion of forest resources is the main cause of environmental degradation and economic and health deterioration in tropical countries. Traditional management practices can be integrated in the development of highly productive agroforestry systems not only to provide the basis of

ecologically and economically viable system capable to provided with resources such as food and medicine. Traditional farming, gathering strategies and the preparation of food and medicinal plants are skills to be learned from Mestizo people.

Understanding human relationships to their surrounding environments continues to be a vital necessity for the survival of the tropical forests. This study provides an overview of the culture and traditional medicine of Mestizo people, an ethnobotanical description of their plant lore, and a screening for antibiotics and antifungal properties of some selected medicinal plants.

The Amazon forest survival challenge is not simply to integrate the results of traditional experience and field work results into data base resources, but to conceive sustainable systems in stewardship between scientists, industry and communities. Land title adjudication to Indigenous and Mestizo people and the implementation of education and training programs also warrant immediate attention.

Chapter 2

The Mestizo of Suni Miraño: A Cultural Overview

Introduction

Indigenous peoples in Amazonia are those who recognize their tribal origins and maintain their traditional lifestyle, Mestizo are usually no longer associated with a particular tribe and live on the river banks by fishing, hunting and small-scale slash-and-burn agriculture (Howard, 1995). Amazon forests have been home to a number of Indigenous groups. In the last 3,000 years, over 42 major Indigenous cultures have inhabited the Amazon Basin. Among those were the Mite, Tutishcainyo (ca. 200 B.C.), the Cache, Inoqui, Napo and Piripitinga (ca. 1500 A.D.), the Arawakan and Tupi Guaranian (1500 A.D.). Today, the Shipibo, Yaguas, Cocomas, Orejones and Ushuar peoples are some of the Indigenous groups remaining in the Amazon Basin. The longest archaeological succession and the largest sites in Amazonia have been found within the floodplains and the largest wet savannas. Smaller archaeological sites occur along some headwater of the Napo river. The discovery of scattered non-riverine sites suggests that small groups of nomadic people have occupied the Amazon Basin (Lathrap, 1970).

The Aztecs and Incas were two of the best known civilizations during the Age of the Spanish Conquest. These two civilizations occupied small geographical areas in the tropical forests of Central America and the Andes Mountains of Peru. Other Indigenous groups inhabiting tropical Latin America were the Araucanians, Arawaks, Caribs, Chibchas, Chichimecas, Ge, Guarani, Mapuche, Otami, Maya, Quibaya, Taino, Tepanecs and Tupi (Burkholder, 1990). Overall, the Indigenous population of Latin America may have reached 35 million to 45 million by 1492. This was a large population compared to the 7 million in the Iberia peninsula, which was divided into five independent kingdoms: Portugal, the Crown of Aragon, Granada, Navarre and Castilla (Phelan, 1967).

By the year 1500, more than 350 major tribal groups, 15 distinct cultural centers and more than 160 linguistic stocks could be found in Latin America (Burkholder, 1990). Many of these groups depended primarily on agriculture for subsistence. However, sedentary agriculture was mastered only in Central America and the Andean Region. In Amazonia, most Indigenous groups were nomadic and relied on fishing, hunting, gathering and minimum agriculture for subsistence.

The culture inherited from Amazonian ancestors is present among today's forest inhabitants. The largest segment of the forest population is the Mestizo. The traditional knowledge of Amazonia Indigenous peoples is shared by millions of people around the world in the form of medicine, food, arts, music, instruments, technology and sciences. By 1942, Amazonian Indigenous plant knowledge had provided Western cultures with cassava, tapioca, cocaine, quinine, rotenone, and curare (La Barre, 1942). With the tools of Western science, hundreds of new forest products have been made available in the last 50 years. Balick and Mendelson (1995) have estimated the total value of the tropical forests (based on pharmaceutical richness) to be worth about $147 billion to human society. Though this is a conservative and utilitarian estimate, it illustrates the potential of the Amazonian Basin's remaining tropical forest.

In Amazonian cosmologies, everything is conceived to be animated. Plants, animals, rivers, lakes, rocks, the earth, the sun and the moon, are personified and considered capable of interacting with humans (Panduro, 1994). This is expressed in the Quechua prayer: "Tayta Inti (Sun) is our father and Mama Killa (Moon) our mother. Pacha Mama is Mother Earth; Amaru is the river, the water of life; ... and Wammani, Illa, and Mallhu Kuntur are the messenger spirits, the visible signs of man's communion with the infinite cosmos" (Palomino, 1993). Time, people and their relationships with the forest have produced specialized knowledge allowing Indigenous peoples and Mestizo to enjoy and endure in Amazonia. However, the strong forces of acculturation continue to transform Amazonian Indigenous and Mestizo cultures into fragile and endangered ones. The loss of forest cultures is a major threat to the integrity of the forest itself, and a major loss to society at large.

The first European contact with Indigenous Amazonians occurred about 450 years ago. Some attempts were made during the 19th century to exploit and colonize parts of the Peruvian Amazonia, but little permanent settlement was achieved. The Los Andes Mountains provided geographic isolation for Amazonian Indigenous peoples, most areas remained in the hands of Indigenous populations (Dickenson, 1989). However, rumors of an affluent Indigenous culture located in the interior of northern South America encouraged a rush of exploration. Gonzalo Pizarro, Governor of Peru, advocated and provided capital for the initial survey of the Amazon Basin which has been described as one of the most spectacular odysseys in the Age of Discovery. There were 200 Spaniards and several thousand "Indians" (both Indigenous and Mestizo peoples) aboard the expedition which left Quito in 1541 (Phelan, 1967). This

was the beginning of a series of intrepid and unsuccessful explorations, such as those of Phillip Von Hutten, Francisco de Orellana, Lope de Aguirre and Pedro de Ursua. They all went in search of "El Dorado," a city made of gold and located somewhere in the Lower Amazon (Dickenson, 1989; Burkholder, 1990).

Mestizo

In Peru, Mestizo as a descriptive term appeared shortly after the arrival of the first European explorers and colonizers of Amazonia (Lathrap, 1970). The contact with Indigenous populations resulted in Mestizo biological and cultural entities (Bernard, 1992). Initially, the word Mestizo may have been associated with the stereotype of "Indians" or "half-Indians" who spoke Spanish, wore European clothes, practiced some form of Christianity and did not retain solid relationships with an Indigenous village (Phelan, 1967). Persistent prejudice in Spanish colonies against Indigenous peoples caused most Mestizo to obscure their heritage and emphasize their Spanish blood. The eighteenth-century Spanish colonial government sold "certificates of whiteness" to Indigenous peoples and Mestizo who mastered the Spanish language and culture sufficiently to make enough money to afford such a certificate (Weatherford, 1988). The majority of Mestizo were engaged in agriculture, ranching, domestic service, mining or occupations requiring manual labor. Today, Mestizo are the main labor force in Amazonia.

Most Mestizo communities along the major Amazonian rivers were established during the famous "Rubber Boom", which began around 1870 and lasted until World War I. During this period, many settlers came to the area to seek their fortune in the rubber trade (Dobkin de Rios, 1970). Without the help of Mestizo, colonization of the flood plains of the tropical rainforest would have been impossible (Weatherford, 1988).

The Amazonian Mestizo are a group with a broad range of origins, such as European, Black, Asians, and Arab (Burkholder, 1990; Stross, 1974). They constitute recent and old migrants of the Andes and the flooded forest, including those colonists of more than 30 years in the regions that were historically linked to Indigenous cultures. Amazonian Mestizo do not consider themselves to be "Indians," but instead Peruvians. The terms "Indian" and "Mestizo" not only designate cultural, linguistic or biological

individual in Peru, but also designate social class. Three major racial divisions are defined in Peru Indigenous, White, and Mestizo (Lipp, 1989). Mestizo populations in Northeast Amazonia have grown at an unprecedented rate, and more communities continue to be established along the river banks and lagoons.

Suni Miraño

Iquitos it is surrounded by small towns (caserios), which spread along the banks of the Amazon River, its tributaries and many seasonal and permanent lakes (see Appendix C: photo 1). These towns are linked by communal boats, which serve as public transit system traveling along the river regularly (see Appendix C: photo 2). Iquitos is the largest urban community in northeastern Peru and a large percentage of its population are Indigenous and Mestizo. Suni Miraño is located about 40 km northeast of Iquitos (see Appendix B: Map 2).

Although the community of Suni Miraño has acquired Western clothing, an outboard motor, shotguns and radios, giving the appearance of considerable acculturation, most of their subsistence activities have remained essentially traditional. Crops are still grown by shifting cultivation (Holmes, 1992). Mestizo subsistence strategies are still based on a combination of activities, including fishing, gathering traditional foods and hunting, but farming is most common among communities because it provides the bulk of food needs and cash income (Hiroaka, 1985, 1985a, 1986). There is little consumption of domestic animals and processed foods or drinks, although chickens are raised for sale in nearby markets. Sustenance of traditional living practices, adapted to the unique structure of the flooded rainforest, have made it possible for these people to succeed in a stressful environment.

Suni Miraño is a typical Mestizo village comprised of about twenty raised huts arranged around the seasonal lake, Suni Miraño (see Appendix C: photo 3 and 4, and Appendix B: Map 3). This lake is connected to the Napo river, a large tributary to the Amazon river, during the flooded season. The annual rise and fall of the river levels present particular problems to the people. Fish leave the main channels and penetrate the flooded forest where they feed and spawn. Fish disperse and are much more difficult to catch than when they are concentrated in the diminishing rivers and creeks during the dry season (Holmes, 1992).

Suni Miraño is surrounded by water, lowland forest and some highland forest. During the flooding season, there are no roads into this community and even during the dry season, only a few local trails are open. Canoes are the main way of transportation among Mestizo (see Appendix C: Photo 5). Sometimes larger canoes are propelled by a small gasoline engine, called "peque-peque." Small motorized aluminum boats are not common in the area, but are occasionally spotted. Communication services and utilities are absent. The closest small town to Suni Miraño is Mazan, a community of about 1000 people (see Appendix C: Photo 6).

Plants Used in Housing Construction

The houses, or "tambos," are distributed about 50 to 100 metres apart and are built using 15 to 20 different plant species from the surrounding forest (Duke, 1994). The structural design provides good ventilation because most of the houses have no permanent walls, with the possible exception of some smaller areas, such as the kitchen (see Appendix C: Photo 7).

Waterproof roofs are made with the leaves of **"Irapi,"** *Lepidocaryum tessmannii* (Araceae) which will last for 5 to 10 years. A very skilled and laborious weaving is used to ensure proper drainage, to secure the leaves and to regulate ventilation. The floors are high above the ground, in most cases about two metres, depending on the proximity to the water. This provides some protection against predators, especially at night. "**Huacaprona**," *Iriartea deltoidea* (Aracaceae) is preferred for the construction of floors (Duke, 1994). A floor made with *I. deltoidea* is very flexible but strong and water-repellent. The depletion of *I. deltoideae* is becoming a concern in many Mestizo communities. Some communities like Suni Miraño and Urco Miraño, are guarding their collecting grounds to prevent outsiders from utilizing the scarce resources within their territories.

In general, no nails or wires are used in house constructions. Instead, the strong and flexible roots and stems of "**tamshi**," *Heteropsis jenmmanii* Oliv. (Araceae), are used to tie the structure together (Chagnon, 1968; Duke, 1994). If nails are available, they are used to strengthen main corners or to reinforce particular points. Nails cannot penetrate some hardwoods once they are dry (e.g., "**fierro caspi**," or "**Huacapu**," *Minquartia guanensis*) and they rust very rapidly in the forest. The houses are designed to withstand rain, heat, humidity and to serve as a dock during the flooded season. They can be

easily modified in an emergency, such as, a quick flood. In this case, a new floor could be built in a very short time.

Mingas, Communal Work

Historically, the "mita," or colonial forced labor draft, provided Indigenous workers to the Spanish miners on a rotational basis. The system was adopted from the Inca precedent of social organization for communal work. In Peru, this system was imposed on the Indigenous population in 1571. Independence from Spain officially abolished the "mita," but Peru continued to collect Indigenous taxes, which was their most reliable fiscal resource at that time (Burkholder, 1990).

Today, festive parties or "mingas" are a type of communal work among Mestizo. If help is needed for a particular task, a member of the community invites neighbors to work together (see Appendix C: Photo 8). The host family provides guest laborers with food and drinks, particularly "masato," (a fermented drink made from cassava) fish and sometimes roasted wild meat such as "**anuje**", or agouti (*Dasyyprocta variegata).* Usually, these tasks are related to agriculture and construction (e.g., building houses, clearing a forest plot for planting). The most important incentive for farmers to participate in cooperative work groups rather than hiring laborers is to save money (Chibnick, 1989). This type of communal work allows the members of the community to accomplish agricultural tasks that otherwise will be extremely difficult. It also reinforces the cohesion in the community.

Everybody participates in the mingas, men, women and children. In some cases there will be division of labour among the sexes (see Appendix C: Photo 9). There are also verbal rules to be followed and in some cases attendance is recorded. An example of communal work involves the maintenance of a trail commonly used by Suni Miraño, the neighboring Yawuas of Urco Miraño and the village Bello Horizonte. It is estimated that 150 families could participate in 3 to 4 days of communal work.

Land Tenure

Presently, rural Mestizo communities are under great socio-economic pressure. There is a general lack of rural development in Mestizo communities and only minimum access to health care and education systems. The system of community forest and lakes reserves in the Peruvian Amazones have

become a local alternative for the development of sustainable use of tropical forest. In 1992, the Iquitos region of the lowland Peruvian Amazon contained about 44 documented villages and inter-villages forests and lake reserves. Seven communities out of these 44 were Indigenous communities, the rest were Mestizo (Ruiz, 1994). Urco Miraño, is one of the seven Indigenous lake reserves (310 ha) having tribal control of their territories. They are good neighbors with the community of Suni Miraño and share the use of common trail in the highland forest (see Appendix B: Map 2)

The Peruvian government began granting Indigenous groups some control over their own territories in 1975 and Suni Miraño achieved recognition by the provincial government in 1994, when land titles were adjudicated to the residents (see Appendix B: Map 3). The establishment of the Izula Biological Reserve, in Suni Miraño was a major factor in obtaining rights to the land. Some land was adjudicated as communal property and small lots were distributed to each household. This approach to land tenure may help to create the basis of sustainable conservation policies in Peru.

In general, the problems that Mestizo and Indigenous communities are facing are similar. However, the right to the land and resource tenure is not usually granted to Mestizo populations. Most small Mestizo communities have no ownership of the land. These settlements could be forcibly removed by the government at any time, although this is not very likely. For Mestizo, the opportunities to achieve land ownership have always been limited by financial resources. Today, land and resource assessments, mapping, biological diversity inventories and fees are required by the government in order to adjudicate land titles to Mestizo communities. The system of land adjudication for Indigenous peoples differs from that applied to Mestizo.

Farming and Gathering

The acculturation of Amazonia continues to be a challenge to those with a desire to continue living in their traditional ways. Adaptation to new stresses in their culture results in changes to their traditional diets. Modern diets become appealing, and substitution of traditional subsistence strategies by the consumption of foreign foods has been documented (Holmes, 1992). In Suni Miraño, the small amount of circulating cash limits the dependence and amount of non-traditional foods consumed. Bread and soft drinks are items included in their new diets. These foods are obtained occasionally from the local market in Mazan, which is the largest and closest town to Suni Miraño. Non-timber forest products

collected by the residents of Suni Miraño usually end up in this market. Only a few of them will venture into Iquitos markets.

Hunting patterns have been affected by the introduction of firearms. Even though firearms are an expensive option, they are usually preferred (Alvard, 1993). The community of Suni Maraño possesses a single gun which is shared (see Appendix C: Photo 10). Hunting and fishing provides about 20% of their calories and most of the protein and fat in their diet. Pursued prey are peccary, *Tayassu tajaca;* spider monkey, *Ateles paniscus*; Agouti, *Dasyprocta variegata* and smaller animals such as squirrels and birds. Dogs are very useful helpers to the hunters.

Cassava (*Manihot sp.*) and plantain (*Musa sp.*) are staple foods throughout Amazonia. These two supply the bulk (70%) of the calories in Mestizo diet. Cassava can be processed into a flour paste and stored for many years in the form of flour (Dole, 1978). It can then be made into many byproducts such as "masato," an alcoholic drink made through fermentation (Lathrap, 1970; Rogers, 1965). Cassava and rice are grown mainly for local consumption (see Appendix C: Photo 11), with the occasional surplus being sold at nearby markets (e.g., the town of Mazan) where other food items may be purchased.

The diet of Mestizo of Suni Miraño includes fish, rice and occasionally wild meat. The diet is complemented with fruits from informal gardens such as caimitos (*Chrysophyllum caimito*), bananas (*Musa* sp.), guavas (*Psidium guava*), passion fruit (*Passiflora* sp.) and other plants gathered from the forest.

Indigenous villagers practice swidden or shifting (slash-and-burn) agriculture, the predominant form of agriculture in tropical forests. High elevation forests are cut, burned and the soil is planted, principally with bitter manioc, *Manihot esculenta.* The soil is cleared once or twice during the growing season and is never tilled. Since soil fertility is low and crop yields drop with each successive year of cultivation, the cutting and planting of new ground is done annually or bi-annually.

Fishing

The low-lying topography of the Amazon Basin and the seasonal distribution of precipitation are the reasons for the vast extension of periodically inundated flood plains that accompany the river system of the Amazon (Saloj, 1974), (see Appendix C: Photo 12). The Basin is located between the Brazilian shield and the Andean foothills (Dumont, 1992; Lathrap, 1970). Fishing is most common during the

flooded season. This is due to the limited fishing during this season and the large density of migrating, seasonal fish. The role of fish in seed dispersal and plant distribution in Amazonian forest ecosystems have attracted the interest of biologists (Gottsberger, 1984; Goulding, 1980, 1993; Kubitzki, 1985). Amazonian fishing strategies have been adapted to these fluctuations. Small to medium-sized nets are cast from the shore of a lake and small rivers in order to funnel fish swimming upriver along the shoreline into the trap (Holmes, 1992). Young boys use spears to catch small fish, especially during the migration of the "palometa," *Mylossoma duriventris,* around mid-july. Finally, the use of plant poisons in fishing has a long tradition in Amazonia. According to the local people, this easy method of fish-poisoning or stunning fish to facilitate their capture was extensively used in the past.

Fish poisoning is still sporadically used around the area of Suni Miraño, but mainly in the dry season when fish concentrate in small pools and rivers (Holmes, 1992). The use of fish poisons is forbidden by the Peruvian government. However, "Barbasco," *Lonchocarpus sp.*, is still used in some isolated areas. It was also identified in the field by some residents of Suni Miraño, but is not commonly used by them.

The community of Suni Miraño has developed its own fishing regulations for the sustainable management of their stock. Of particular concern is the survival of their stock of "paiche" *Arapaima giga.* In many other villages, communal fishing regulations are becoming. Other important fish species of high commercial value are "Gamitama," *Colosoma macropomu; "Corvina," Plagioscion squamosissimus.* Minor species, but abundant year round are "Boquichico," *Prochilodus nigricans;* "Palometa," *Mylossoma duriventris;* "Lisa," *Schizodon fasciatus;* and "Ractacara," *Curimata vittata* (Cortez, 1992).

Chapter 3

Ethnopharmacology

Introduction

Ethnopharmacology is an interdiciplinary field dealing with the observation, identification, description and experimentation of plant constituents, and the medicinal effects of Indigenous drugs (Holmestedt, 1983). Its main objectives are to rescue and document important medicinal heritage, and to chemically evaluate and investigate the agents employed in medicinal practices of Indigenous peoples.

Peruvian medicinal plants continue to provide pharmacologically active compounds, e.g. orientin an anxiolytic (anti-anxiety) compound and fraxetin an analgesic, have recently been isolated from Huanarpo, *Jatropha ciliata* (Okuyama, 1996). Several species of *Jatropha* are used throughout Amazonia as a purgative, emetic, anesthetic, and to treat headaches and infections. In Brazil, the leaf juice of *Jatropha curcas* mixed with sulfur powder, is applied to *Streptococcus* infected wounds (Duke, 1994).

This research incorporates ethnobotanical field research and microbiological assays to test for antibiotic and antifungal activity in the medicinal plants used in Suni Miraño. Included is a description of some illnesses as perceived by Mestizo including diagnosis, etiologies, how the patient role is carried out, and how some of the healing procedures are implemented. This information may allow for explanations and understanding of illness causality, distribution, and dosage/treatment efficacy in medicine as practiced by the Mestizo.

Medicine in Peru

Historical Overview of Peruvian Medicine

In the last 500 years, Christianity has been a major influence in the assimilation of Indigenous peoples and in the suppression of their traditional medicine and healing practices. The practice of curanderismo, in particular, has been associated with sorcery, witchcraft, magic and evil. Records show that about 70% of the books circulating in the sixteenth- and seventeenth-century in the Spanish New World dealt with religious matters (Hampe-Martinez, 1993). Most of this literature was used to reinforce Catholicism among Europeans and to colonize Indigenous minds.

The medical knowledge in colonial society was based chiefly on the classical Greek compendium of Dioscorides, which circulated in the Spanish version edited by Andres de Laguna. As a complementary work, the *Historia medicinal* by the Sevillan physician Nicolas Monardes promoted the medical use of American plants, and herbs (Hampe-Martinez, 1993). However, most of the medico-religious Indigenous practices were condemned and banned by the Church.

Traditional Medicine

The use of traditional medicine, such as teas, poultices, tonics, and other remedies prepared from many plants is widespread in Amazonia and its surrounding countries. Among Amazonian Mestizo, curanderismo plays a key role in the delivery and transmission of traditional medical systems and Indigenous philosophies. Curanderismo continues to be the nucleus of Mestizo traditional medicine. Medical knowledge has been orally deposited and entrusted to curanderos, midwives, and in a moderate quantity among the general Mestizo population (Caraza, 1994). Healers and midwives offer medical services to their communities as the only alternative to public health programs.

Traditional Botanical Systems

Knowledge of medicinal plants is embedded in oral tradition. In Indigenous and Mestizo cultures, traditional knowledge has accumulated and been passed on in different ways. The holistic view of the cosmos is fundamental in Indigenous philosophies. In the last 3,000 years, the use of traditional medical systems based mainly on the use of plants as medicines, has restored health to millions of peoples. Figures representing the ceremonial seat of the religious practitioner, similar to the seats used by *ayahuasca* drinkers today in the Ecuadorian and Peruvian Amazon basin, have been excavated in the Ecuadorian Amazon basin (Naranjo, 1979). These figures attest for the antiquity of some of the traditional healing practices used in Amazonia today.

Folk taxonomy is essential in the transmission of ethnobotanical knowledge. A specialized area of knowledge among healers is the recognition of the local flora, which may involve many species and subspecies. Anatomical and physiological plant characteristics are deeply rooted in folk taxonomic approaches. These may include the recognition of pigments, resins, bark colors and textures, odours and flavours. Understanding of the physical environment, growth habits of medicinal plants and their

association with other plants or animals provides the healer with very strong tools that allow him or her to make use of the gifts offered by the forest.

Traditional Collection of Medicinal Plants

In Amazonian cosmology each plant, animal, lake, river, rock, and place have a "mother," an origin and a protector at the same time. In some cases, "mother" may refer to a zoomorph being or a powerful animal (e.g., a jaguar, a boa, or a dolphin) (Huayambao, 1994). A healer may have particular geographical areas where he/she prefers to collect the plant material for use in medicinal preparations. Some particular picking grounds in the forest are sacred. When collecting and harvesting medicinal plants the collector must ask the plant's mother for her permission. In this context, tobacco offerings and/or a prayers to the guardian spirits of the forest is a necessity (Pipa, 1994). With the loss of traditional knowledge this plant-human relationship continues to be diminishing.

Curanderismo

Curanderismo practices have played key roles in the diagnosis of illnesses, development of traditional medications, and in the flourishing of preventive medicine. It also provides an alternative treatment for particular psychopathological conflicts. Curanderismo plays a remarkable role in the administration of traditional medicine. Some Mestizo healing practices are associated with the spirits of the forest and the use of "magical" plants. These allow the "curanderos," or healers to communicate directly with powerful beings (Luna, 1991; Schultes, 1992a; Schultes, 1990; Luna, 1984a).

The Healers

Healers live a multidimensional life: son or daughter, spouse, parent, hunter, and agricultural worker. The role of a therapist is added as another dimension. There are many specialties among the practitioners of traditional medicine. Some of these special practitioners are: sopladores (tobacco blowers), hueseros (bone specialist), hierberos (use of herbaceous plants), pulsadores (diagnosting by palpation), paleros (the remedies used are made from barks or wood), and ayahuasqueros (using ayahuasca as part of the treatment or healing session).

Healers are able to penetrate sacred areas (i.e. la cocha muerta, a lake near Suni Miraño). Local villagers believe that a giant boa is the "mother" of this lake, thus this is a very dangerous place. In Suni Miraño only Maximo Huayambao, the "curaca," a healer with special powers, can risk to go there. Other people are too scared to visit. Healers can communicate with the dead ones, the spirits of the forest, and transform themselves into animals and natural phenomena. More importantly, they can recognize the causes of illnesses and know the medical procedures and healing practices to cure them. The administration of proper dosages is a key in the practice of traditional medical system.

Healers recognize the force of evil influencing the sick person, family and communities, and fight to control them by using smoke, prayers, songs and conjuring. A large segment of Mestizo communities continues to depend on the traditional practitioners. It is crucial to understand the philosophies and practical solutions offered by traditional medical systems. This will include etiologic beliefs, diagnoses, practitioner-patient relationship, treatment repertoires and perception of the body (Finkler, 1994) and will help to promote health and welfare programs based on the already existing traditional knowledge in Mestizo societies.

Medical Practices of Healers

Resorting to the traditional medical systems is a daily reality to millions of people in developing countries. These traditional medical practices are well adapted and engraved in their culture. If not free of charge, the costs of these medical services are within the financial and economical limits of the users (Labadie, 1986). The healer may accept a variety of payments such as food, clothing, help with agricultural tasks or money. Healers enjoy great esteem and exert a positive moral influence over the people. They are able to cure, counsel on domestic problems and predict certain events affecting individuals or the whole community.

Non-physiological Illnesses

Some of the causes of illnesses in Mestizo culture are of non-physiological origin. Resorting to magic is often considered to be indispensable in the treatment of these disorders. If evil is involved, there will be a need for a sorcerer, a specialist who knows how to deal with evil spirits. A sorcerer may impose

a curse on people indicated by their clients who desired it because of rivalry, hate-satisfaction or revenge (Whiton, 1976).

Some of the non-physiological illnesses are emotional upset, "**susto**" (Khon, 1992) which is caused by fright and is manifested by indigestion, gallstones and nausea. "**Pujo**," is the result of contamination by exposure to heat or cold, or "bad air" (Cachique, 1994). The terms "**air**" or "**manchari**" is applied to earaches, cold, headaches, and vomiting (Kiev, 1968; Kamppinen, 1988). "**Mal de ojo**" is manifested by fever, diarrhea and vomiting due to contact with ritually unclean people (see Migliore, 1981; Trotter, 1981). It is necessary to understand the nature of these problems and the techniques used by healers when dealing with them. This will be important in deciding on an approach to the data collection and data analyses (Kiev, 1968).

Healing Practices

The techniques and practices to treat these illnesses vary in different communities. However, almost all healers blow tobacco smoke at the patient. The use of sugarcane alcohol is very common practice in healing sessions. This is not for pleasure but for cleaning the mouth, prophylactic purposes and for plant preparations (Naranjo, 1979). Power songs to control the spirits, "**icaros**," and mouth suction to extract the evils are other powerful techniques use by healers. Small children are considered to be more susceptible to non-physiological sickness.

There are spirits in the forest that can cause harm. Sometimes, evil people may inflict harm by means of the evil spirits embodied in plants and animals (Naranjo, 1979). These illnesses are recognized by healers by symptoms not ordinarily grouped together in Western medicine.

Magic and Mestizo Traditional Medicine

Magical elements provide Mestizo communities with a feeling of confidence and optimism, especially in cases where there is a large incertainty about the result. The use of magic is important in circumstances where success has emotional significance to the group. Magic is used to control the unforeseen and dangerous that cannot be eliminated by empirical techniques available to the group (Simmons, 1953).

Being a healer and dealing with magic involves a number of dangerous risks. First, healing practices involve the regular use of entheogenic plants and there are no studies available on the long term effects of these substances. Second, the attack of powerful sorcerers who are able to harm others by means of spells is always a concern. Third, occasionally there is the potential for revenge by people who may make the healer responsible for the suspicious death of one of their relatives. However, healers are usually highly respected community leaders with fixed ideas, illiterate but endowed with much wisdom, skills and experiences in individual community health care (Simmons, 1953).

In urban settings, healers are considered to be a "pest" to the health system and a threat to society. This idea has received support by many western researchers who consider traditional medicine an unscientific approach. Partnership with traditional healers, to understand and learn from their medical universe and their healing system is imperative. Special attention must be given to the medicinal plants already in use. There is an urgent need for the development of training programs and orientation of Mestizo trainees so they can acquire special skills regarding the practice of traditional medicine. Researchers in the field should also engage local people with good knowledge of the flora and socio-cultural situation as field assistants.

Use of "Magical Plants" in Healing Practices

Mestizo healers claim to derive healing skills and powers from certain "plant-teachers," which are often psychoactive (Luna, 1984a). **Camalonga**, *Thevetia peruviana,* Apocynacecae, is a highly poisonous plant used for this purpose. A special brew is consumed over a one week period. A strict diet and complete isolation will be required. During this period plants will talk to you, guide you in the administration of traditional medicine, and tell you how, when, and why to use them (Huayambao, 1994).

A well-known magical plant used among Mestizo healers is "**ayahuasca**." The drink is prepared mainly from *Banisteriopsis caapi,* a member of the Malpighiaceae, containing monoamine oxidase-inhibitors like harmine and other alkaloids (McKenna, 1984), (see Appendix C: Photo 13). The most frequent ayahuasca additive is the tryptamine containing "**chacruna**" (*Psychotria viridis),* (see Appendix C: Photo 14). Other admixture plants are used as additives, i.e., "**toe**," (*Brugmansia* sp.*).* Ayahuasca uses among Native peoples have been well documented by many Amazonia researchers e.g. study on the

monoamine oxidase inhibitors, phytochemical and ethnopharmacological investigation (McKenna, 1984); medical anthropological analysis of healing practices (Dobkin de Rios, 1970); ethnobotanical description (Schultes, 1990; Luna, 1984b).

Ayahuasca as a sacred drink was commonly used in the past, in ceremonies and rituals (Panduro,1994). Today, it is used for medicinal purposes, divination, and spiritual cleaning among Indigenous and Mestizo people (Duke, 1994; Fobes Brown, 1988; Luna, 1984a; Luna, 1991; Schultes, 1990; Khon, 1992). *B. caapi* is semicultivated by witches, healers, and "ayahuasqueros." Around the area of Suni Miraño it is usually collected from the forest. In urban settings such as Iquitos, recreational uses of ayahuasca are offered to satisfy the curiosity of tourists. This commercial activity is an indicator of degradation of ayahuasca traditional uses. Recreational uses ignores traditional healing principles and spiritual aspects involved in sacred practices.

An ayahuasca session may last between four to six hours and takes place in the evening. Those under the effects of ayahuasca experience vomiting, sweating, dizziness, diminished physical coordination and hallucinations before falling into a deep sleep. Healers make tobacco offerings and sing "**icaros**", powerful songs and may prescribe plant preparations as post-treatment to the sick. Some Mestizo people describe the effects of ayahuasca as "ver peliculas," to watch movies. This description refers to the ability of visualize things and places never seen before while under the effects of the vine (Acho, 1994; Cachique, 1994).

Western Views of Traditional Medicine

Evaluation of Traditional Pharmacopoeia

Western pharmacology is defined as the science and the art that deals with the collection, preparation and standardization of drugs, the synthesis of chemical compounds having medicinal value, and the analysis and standardization of medicines. To evaluate ethnopharmacological and health systems from this view, it will be necessary to standardize the quality of ingredients and manufacturing processes, elaboration of criteria and methods for quality control, and the establishment of the rational relationship between the chemistry of the plants and the biological and therapeutic activity. The development of field

work protocols and methodologies, international policies on intellectual property rights, and the incorporation of applied scientific research into the field of ethnobotany will be also a challenge.

In modern societies, removed from nature and surrounded by high technology, the utilization of medicinal plants is not of similar importance as in countries where traditional medicine exists as the principal relief of illnesses and suffering (Penso, 1980). Furthermore, within Western legal codes, the activities of the sorcerer are illegal, and the term witchdoctor has a derogatory meaning.

A fundamental difference between Western knowledge and Indigenous knowledge is the holistic view of a fully animated cosmos. Just 100 years ago, in the absence of technology, our previous generations greatly benefited from and highly depended on traditional medical systems. Our knowledge as a result of science and technology is not unchangeable but an approximation which still respected as the truth (McCormick, 1993). The principles of traditional medicine have relatively changed over thousands of years, although they have continuously evolve. Indigenous cosmologies maintain that traditional knowledge is alive and evolving. Traditional knowledge is the language of the mother nature.

Today, close to six billion humans continue to benefit from these and many other gifts from the forest and the treasures of traditional knowledge. Amazonia has given the world some of its most important economic plants: the Para Rubber-tree (*Hevea brasilensis),* the Pineapple (Ananas comosus), Vavao (*Theobroma cacao),* Cassava (*Manihot esculenta),* Curare (*Chondodendrum tomentosum)*, and many others (Schultes, 1992b). Hundreds of natural products are available for potential use, but the integration of traditional knowledge and western science is urgently needed.

Chapter 4

Methods and Results

Introduction

The intimate relationships between people and plants have been the bases of many Indigenous philosophies. In many Indigenous cultures, plants, such as *Zea mays* (corn), *Phaseolus sp.* (beans), *Lophophora williamsii* (peyote), *Banisteriopsis caapi* (ayahuasca), *Datura inoxia* (datura), and fungi such as *Psylocibe caerulescens* (landslide mushroom) and *Amanita muscaria* (fly agaric) have played essential roles in the spirituality and health of the people.

Ethnobotanical and ethnomedical information of 54 plant species used by the Mestizo population of Suni Miraño is presented here. Medicinal uses, illnesses treated, form of preparation, dosage, diets, and taxonomic and vernacular names are included. Traditional medicine and traditional ecological knowledge was collected through formal and informal conversations and open interviews with healers and other adult participants, and during collecting trips, and communal meetings. See Appendix A: Table 1.

The plant material and voucher specimens were collected in the summer of 1994. They were taxonomically identified by Eduardo Jovel and Juan Ruiz, a staff technician with the Herbarium Amazonense, Universidad de la Amazonia Peruana, Iquitos, Peru. Plant material for chemical analysis was air dried in the shade, while in the field and was sent to Iquitos for appropriate storage. Voucher specimens were later deposited at the Herbarium of the Botany Department of The University of British Columbia, and the Herbarium Amazonense of the Universidad Peruana in Iquitos.

In this description lowland forest (bahio or tahuampa) refers to flooded forests during the rainy season. Highland forests (altura) refers to forests which do not flood. The change in altitude from the bahio to the altura is about 40-60 meters. However, there is a substantial difference in the range of products obtained from both areas.

Collection of Plants and Ethnobotanical Information

Information presented here was compiled through general conversations and informal interviews with healers, midwives, elders and other member in the community with knowledge in self-medication and the use of medicinal plants. Whenever possible, the conversations were recorded with the approval of the contributor. Some plants were obtained directly from the healer, Don Maximo Huayambao and Midwife, Luzmila Rengifo (see Appendix C: Photo 15). Others were collected during walks through the forest while accompanied by members of the communities of Suni Miraño and Bello Horizonte. During these walks the following collaborators and guides assisted: Elsibiades Pinedo Panduro (see Appendix C: Photo 16), Carlos Rios Rojas (see Appendix C: Photo 17), Rosa Manuyama Icahuate (see Appendix C: Photo 18), Manuel Acho, Jose Acho, Jose Rodriguez Vela, Antonio Prieto (field assistant), Siberiano Perez Pipa and Juan Ruiz, a technician with the Herbario Amazonense, University Nacional de la Amazonia Peruana, Iquitos. Plants were identified by their vernacular names by healers and local people. The information gathered included plant local names, abundance, part used, recipes, dosage and the personal experiences of users (see Appendix A: Table 1). Information on curative powers, magical plant relationships and methods for preparation and administration was noted.

Extracts and Disk Preparation

Methanolic extracts of 37 medicinal plant species used in Peruvian Mestizo traditional medicine were examined for antibacterial and antifungal activities against *Escherichia coli DC10*, *Staphylococcus aureus* K147 Ms (methicillin resistant), *Staphylococcus aureus* Mr (methicillin sensitive), *Pseudomonas aeruginosa* H188, *Bacillus subtilis*, and *Candida albicans*. These organisms are in Dr. Neil Towers' bacteriological collections, Botany Department, at The University of British C Columbia,.

Biological activity against these organisms was carried out in the light and in the dark. The activities of many natural products (e.g. polyynes or furanocoumarins) require UV light to display activity, while others may lose their bioactive properties when exposed to light (Wat, 1980).

Bioassay Methods

The plant material was air-dried and ground in a Wiley mill using a 2 mm screen. Three hundred grams of ground material was extracted with 300 ml of methanol followed by three washes of

100 ml of methanol over 24 hours. The combined extracts were filtered, evaporated using a Rotovap and then resuspended in methanol to make a 10 ml solution. Antibiotic bioassays were performed employing the disk diffusion method using Mueller-Hinton agar (Difco). Paper disks (6 mm) were impregnated with 10 ul of methanolic extract and the solvent was allowed to evaporate.

An inoculum of each bacterial strain was suspended in 3 ml of nutrient broth and incubated overnight at 37^0 C. The overnight cultures were diluted 1/10 with nutrient broth to a density of 10^9/ul. The aqueous suspensions of the cultures were spread on the plates with cotton swabs. The prepared disks were placed on the inoculated agar plates which were prepared in duplicate. One plate was exposed to long wave UV light for 2 hours at room temperature. The irradiation was provided by a group of four Sylvania F20T12-BLB lamps which gave a measured incident energy of 5 W/m^2 and a maximum output of 350 nm. The other plate was kept in the dark. All plates were incubated at 37^0 C and examined after 18 hours(Hudson, 1991). The zones of inhibition around each disk were measured and recorded (see Appendix Photo 20). Samples showing zones of inhibition of microbial growth only on irradiation were recorded as phototoxic (+). Those samples with zones of inhibition both in light and dark were reported as antibiotic. A larger zone of inhibition in light-treated samples compared to those maintained in the dark was considered to be enhanced activity (Towers, 1987; Wat, 1980; Bolhmann, 1973). Results are presented in Table No. 2 (see Appendix A: Table 2)

Ethnobotanical Information

Plants are listed alphabetically by family. The scientific name is followed by the herbarium number:

Amaranthaceae

Chenopodium ambrosioides L. (SM0086)

Chenopodium ambrosioides (**Paico**) is a small upright herb about 40 cm tall which is not abundant in the highland forest but is common in lowland forests and disturbed areas. The whole plant is made into a tea. Depending on the concentration it can be used as an effective intestinal antiparasite or as a purgative. Sometimes the tea is mixed with pineapple juice. The seeds are prepared into a special soup

which has an unpleasant odor. This is given mainly to children. *C. ambrosioides* is considered to be highly nutritious and a good tonic to improve intelligence.

For the treatment of wounds, a half ounce of **paico** leaves is macerated with a spoonful of salt. The ground mixture is then wrapped with banana leaves and cooked over the fire for ten min. This warm paste is applied directly on wounds and wrapped with a piece of cloth. **Paico** is also considered a good antinflamatory. The tea is said to be good to "despejar la mente," or to clear the mind.

Monoterpenes occur in the essential oils (Pare, 1993). Other chemical compounds found in this plant are: the flavone glycoside, 4'-0-demethylabrectorin-7-O-alpha-L-rhamnopyranoside-3'-O-beta-D-xylopyranoside (Kamil, 1992).

Anacardiaceae

Spondias mombin L. (SM0003)

Spondias mombin (**Ubos**) is a tree which can reach 40 to 50 metres in height and 1-1.50 metres in diameter at breast height (dbh). It grows in both lowland and highland forests, but is becoming scarce everywhere. A reddish sap exudes when the trunk is tapped, and it is thought to cause blindness. The bark is boiled in water and used for vaginal douches to treat infections and for ovarian cancer. A quarter cup of the bark infusion should be taken every morning, a half hour before meals. Also, the tea made from the bark is recommended as a tonic for post-abortion or post-surgery.

S. mombin preparation for ovarian cancer includes *Heisteria pallida* "**chuchuasa**", *Oryctantus sp.* "**suelda con suelda**" and *Remijia peruviana* "**chuyachaqui caspi**." The additives are used to promote a quicker cicatrization. In the case of infections, *Abuta grandiflora* is added to the mixture to enhance its antimicrobial strength. A person undergoing treatment should abstain from having sexual intercourse.

S. mombin mixed with fresh *Heisteria pallida* (**chuchuhuasa**) is used to treat wounds that will not heal. The mixture is boiled in water and then used to wash the wound. Then, ubos is ground, toasted, made it into a fine powder, and applied directly onto the wound.

Caffeoyl esters have been isolated from the leaves of *S. mombin* and these have showed antiviral activity against Coxsackie and Herpes viruses. The esters were characterized as 2-O-Caffeoyl-(+)-allohydroxycitric acid and chlorogenic acid butyl ester. Also, ellagatannins, geraniin and galloylgeraniin have shown pronounced antiviral activity against both viruses (Couthout, 1992).

Annonaceae

Unonopsis floribunda Diels. (SM0069)

Unonopsis floribunda **(Icoja)** is a small tree with a smooth reddish bark. Alcoholic maceration of the bark is used to massage areas affected by arthritis and/or rheumatism. Tea from the boiled leaves is used for bronchitis and diarrhea. The wood is used in construction.

Annonaceae

Guatteria pteropus Benth. (SM087)

Guatteria pteropus **(zorro caspi, cara huasca)** is an abundant, medium sized tree. A maceration of the bark using "aguardiente", sugarcane alcohol, diluted in water creates a special tonic for those suspected to be anemic. The tonic is also used to relieve pain caused by arthritis. The sap is considered to be toxic by the people of Suni Miraño. The wood is used in construction.

Alkaloids and tannins have been found in several species of *Guatteria* (Schultes, 1990). Also, alpha asarone, a chemical with hypocholesterolemic properties, and inducing sister-chromatid exchange have been isolated from *G. gomorra* (Morales, 1992).

Annonaceae

Duggetia tessmannii RE (SM005)

Duggetia tessmannii **(tortuga caspi)** is a medium sized tree with green syncarpic fruits. It is common in the lowland forest. The bark is boiled in water or macerated in alcohol. Both preparations are used as antiseptics, and to provide relief from arthritic aches. The bark and wood are very flexible and are used for basketry. The fruit is edible.

Many members of the Annonaceae family have been submitted to chemical analysis, and a large number of bioactive compounds have been isolated. A phytochemical understanding of the family has

provided leads to the selection of plants for submission to pharmacological analysis. A partial list of the known chemistry is offered below.

Apocynaceae

Tabernaemontana vanheurickii Muell.-Arg. (SM0088)

Tabernaemontana vanheurickii (**ucho sanango**) is a small tree reaching about 7 metres in height with pale yellow flowers. It grows along small ravines in the highland forest and is considered to be scarce. As with other Apocynaceae, *T. montana* produces a white latex. The bark is scraped with a machete to remove epiphytes growing on it, and then it is immersed in water for 30 minutes. A cup of this infusion is drunk to stop vomiting.

A hot tea is used to relieve sore throats and colds. It is also considered to be a good diuretic. The bark is used to prepare "ligados," a type of bath. A large quantity of the hot bark decoction is placed in a big container, which the person suffering from kidney infection will sit in. This treatment should be repeated three times over a period of a week. The bark is also used as a mild anesthetic and is believed to be an aphrodisiac. The ingestion of preparations made from *Tabernaemontana* may cause drowsiness in some people. Many alkaloids have been reported from this genus e.g. O- Acetylvallesamine is the main alkaloid found in *Tabernaemontana divaricata* (Dagnino, 1993). The analgesic coranaridine and 3-(2-oxopropyl) coranaridine have been isolated form *Tabernaemontana pandacaqui* (Okuyama, 1992).

Apocynaceae

Himatanthus sucuuba (Spruce) Woods (SM0070)

Himatanthus sucuuba (**bellaco caspi**) is a tree that can reach more than 50 metres in height and 2 metres in diameter at breast height (dbh). The reddish resin of bellaco caspi is tapped from the tree and is used as a painkiller, as an anesthetic, and to treat external infections. Local application of the resin is preferred. The sap must be left on the treated area until it dries out and sloughs off by itself. The sap is diluted in warm water and used as a purgative. This preparation must be drunk while warm. Also the sap is used in the preparation of poultices to treat fractured bones.

During childbirth the uterus may drop from its normal position. To alleviate this condition a mixture (combinado) is prepared by combining *Clusia sp.* **(renaquilla)**, *Cissus sicyoides* **(sapohuasca)**, *Campsiandra comosa* **(huacapurana)**, *Spondias mombin* **(ubos)**, *Heisteria pallida* **(chuchuasa)**, *Oryctantus sp* **(suelda con suelda)**, and *Bidens pilosa* **(amor seco)**. A small cup of this tea is recommended three times per day, during three days. Vaginal douches require the same preparation and they should be done twice a day . A diet accompanies this treatment and should be observed for a minimum of a week: no pork or chili pepper should be eaten. Any contact with water should be avoided, and no heavy work should be performed (Huayambao, 1994). Tikunas use the fresh latex on wounds and Waoranis use it to treat warble fly infections (Schultes, 1990).

Apocynaceae

Couma macrocarpa Barb. (SM0089)

Couma macrocarpa **(leche caspi)** is a medium sized tree growing in the highland forest and is considered rare in the area of Suni Miraño. *C. macrocarpa* has been exploited for its sap, which is used in boat construction as a glue. The sap can also be used as an emergency food, but should not be consumed in large quantities. The fruits are eaten by monkeys. When used as medicine, a tea is prepared from the bark and is used to treat diarrhea. Also, a bark infusion is used in vaginal washes to treat uterine cancer (Huayambao, 1994)

Aracaceae

Euterpes precatoria Mart. (SM0071)

Euterpes precatoria **(chonta, huasahi, palmito)** is a palm of about 30 cm diameter and 20 metres tall found growing in the highlands forest. The roots are prepared into an infusion which is used to regulate the kidneys functions. The infusion is drunk instead of regular drinking water for a period of 9 days. The fruits are edible and are use to make an alcoholic drink called "chicha". The palm hearts which are sold locally, are used in salads. The extraction of palm hearts requires the whole palm to be cut down and this appears to be the main reason for its current endangered status (Ruiz, 1994; Pipa, 1994).

Araceae

Heteropsis jenmannii Oliv. (SM0010)

Heteropsis jenmannii (**tamshi delgado** or **huasitamshi**) is a vine 10 to 15 metres long, and 5 cm. in diameter. The fresh green bark is boiled in water to prepare a concoction, which is used to treat asthma and gall stones. A small cup of the concoction is drunk every morning for nine days. For vomiting and diarrhea, adults drink one cup and children take 2 tablespoons of the bark concoction three times per day (Panduro, 1994).

Relief from insect bites may be obtained by crushing the green bark and applying it directly to the bite. Also, tea made from the bark is used to relieve the pain caused by bites or stings. However, the ingestion of *H. jenmannii* may cause diarrhea (Rengifo, 1994).

H. jenmannii is a much favored construction material because it replaces the use of nails very effectively. The vine is easily handled when fresh and it is used as rope to hold poles and rafters together e.g. in house construction. Once *H. jenmannii* is dried, it becomes a highly resistant and lasting material. The intense usage of tamshi may be endangering the sustainability level of this species. Local residents agree that "it is not easy to find tamshi today" (Cachique, 1994).

Araceae

Phylodendron solimoesense A.C. Smith. (SM0011)

Phylodendron solimoesense (**huambe**) is a vine climbing up to 25 metres into the forest canopy of the highland forest. It has a bark with small wart-like bumps. A clear liquid is collected from *P. solimoesense* by cutting one metre sections and draining it into a container. A cup of this fresh liquid three times a day is recommended to treat "pulsario," or colic.

Huambe produces a yellow, sticky sap which can be used as an anesthetic. The sap is applied locally for toothaches. Mestizo believe the vine should be collected during early morning hours, because the amount of resin produced varies during the day. Liquid and sap are more abundant if collected during the new moon. Also, the cut should be made from the side where the sun is hitting the vine.

Asclepiadaceae

Blepharodon mucronatum *Decke* (SM0013)

Blepharodon mucronatum (**flor de seda**) is a small vine with yellow flowers and green pods. It is found growing along the water in the lowland forest. A poison is made by infusion or water decoction of the flowers and leaves. However no uses were indicated.

Bignoniaceae

Jacaranda copaia Aubl. (SM0072)

Jacaranda copaia (**huamansaman, ashpingo, chichicara caspi**) is one of the most common lowland forest, second growth species. It is also one of the few genera with pinnate leaves in the Bignoniaceae family (Gentry, 1993). The bark is boiled in water under low a fire to a concentrated decoction, which is topically applied to relieve itching. An alcoholic bark maceration is also used to relieve itching. Fresh leaves are macerated in water or sugarcane alcohol (aguardiente) and directly applied on dermatomycotic infections (carachas), to dry up infected sores. A decoction of fresh leaves is used to wash infested wounds and cold sores.

J. copaia has veterinary uses among the Mestizo. The leaves are crushed into a paste which is used as an insecticide. The paste is rubbed on chickens to control "piojos de gallinas" or chicken lice. However, this practice is more common around the Marañon area where *J. copaia* is known as **huangana caspi** (Panduro, 1994). Although the leaves of *J. copaia* have a bitter taste, it is one of the preferred trees of leafcutter ants (Howard, 1990). The wood has low water resistance, but is still used in house construction for floors, rafters, and roofs.

Ursolic acid from the epicuticular waxes of *Jacaranda decurrens* has shown toxicity and feeding deterrence toward *Schizaphis graminum* (Varanda, 1992). Leishmanicidal and trypanocidal activities have been reported from *Jacaranda cuspidifolia* (Fournet, 1994).

Bignoniaceae

Mansoa alliacea (Lam.)

Mansoa alliacea (**ajo sacha**) is a liana with a "unique garlic-like vegetative odor, and with gland-fields both between petioles and at petiole apices, a unique combination (Gentry, 1993)." A preparation to treat rheumatism is made by taking one half kilogram of the plant, pounding it , and mixing it in a quarter bottle of sugarcane alcohol. This is stored for three days. For twenty days, a treatment of one spoonful three times per day is taken (Rengifo, 1994).

A bath of *M. alliacea* is used to clean "manchari," a nervous conditions resulting from "terror or a sudden surprise" (Cachique, 1994). The cleansing practice is performed by a "soplador," a healer specialized in controlling manchuri with the use of tobacco blowing. Other medicinal plants are used and administered during and after the healing session. **Ajo sacha** is used as a charm plant to bring good luck.

Burseraceae

Protium nodulosum Swart.

Protium nodulosum (**copal**) can reach 15 to 20 metres in height. The bark is very thin and has a typical reddish color. The bark has been used in the preparation of an antiabortive substance. To avoid miscarriage, a combination of *P. nodulosum* (resin), *Bactris gasipaes* (roots), and *Capsicum sp.* (fruit) is prepared. This preparation is administered as a tea, three cups per day (Rengifo, 1994). Only one tree was reported in Suni Miraño in the property of the midwife Luzmila Rengifo.

Cecropiaceae

Cecropia sciadophylla Mart. (SM0090)

Cecropia sciadophylla (**setico**) is a very abundant tree that grows along the riverbanks in the lowland forest. The petiole can reach 40-50 cm long. The bark is scraped and immersed in water. A mucilagenous substance is then released into the water. This mixture is warmed up and given to pregnant women just before child delivery to induce labor contractions. The same preparation can be used to relieve sore eyes, which may refer to an eye infection. In this case, a piece of clean cloth is soaked in the solution and placed over the eyes. For bleeding gums, a tea is used to rinse the mouth. This should be

done at least twice a day for five days or longer if needed. The tea made from the bark is used as a tonic to enhance liver functions, and to dissolve kidney stones.

Olacaceae

Heisteria pallida Engl. (SM0091)

Heisteria pallida (**chuchuasa, shushuasha**) is a tree exploited mainly for its wood. The bark is prepared in a variety of ways, some of which make very popular drinks in Peru. Most preparations have medicinal attributes. The bark is macerated with sugarcane alcohol or wine, and is used as a post-partum tonic. One pound of bark is boiled in 2 litres of water. The concoction is strained, and mixed with a one quarter bottle of sugarcane alcohol, and stored for 10 days before it is ready to be used . **Chuchuasi** is good for "somebody that looks pale," possible symptoms of anemia. An alcoholic maceration of the bark is used to wash infected wounds, and is considered to be effective in reducing high fever.

H. pallida is combined with *Tabernaemontana vanheurickii* (**usho sanango**) and *Brunfelsia grandiflora* (**chiric sanango**) to make a tonic. This drink is specially prepared for men "to keep the body warm," meaning to increase sexual potency (Rengifo, 1994; Panduro, 1994). Sometimes this tonic is given to those suffering from hernias.

H. pallida extract has an effect on egg laying and hatching of the tick, *Boophilus microplus* (Williams, 1993). A trimeric propelargonidin derivatives from the stem bark has been isolated (Dirsch, 1993).

Clusiaceae

Symphonia globulifera L.f. (SM0092)

Symphonia globulifera (**chullachaqui caspi**) is a large tree with stilt roots and with pagoda style branching (Gentry, 1993). It is rare around Suni Miraño, and is only found growing in the highland forest. The latex is very yellowish and is used to make a vaginal wash to treat malignant tumors. A tonic is prepared from the bark by alcoholic maceration. The fruit is edible and dispersed by bats (Gentry, 1993). The roots are used to prepare a tea for colds.

Euphorbiaceae

Hura crepitans L. (SM0022)

Hura crepitans (**catahua blanca**) is a large tree with a spiny trunk, and ovate leaves with noticeable secondary veins (Gentry, 1993). The pale brown resin is considered to be highly poisonous. In the past it was used to poison fish, but in Suni Miraño this is not a common practice anymore. Collecting the sap is a dangerous task. The latex is caustic enough to blind a person (Ruiz, 1994; Rodriguez, 1994). In Suni Miraño the wood is used in construction.

Euphorbiaceae

Mabea nitida Spruce & Benth. (SM0023)

Mavea nitida (**yacuchapana, shiringuilla**), a large tree about 30 m tall and 70 cm in diameter at breast height (dbh) with a reddish-brown bark, is used to treat infected wounds and lacerations. An alcohol maceration and water infusion of the bark are the most common forms of preparation. The seeds are collected for their oil, which is extracted and used to prevent hair loss. Kubeo Indians use the oil to care for the hair The resin is collected and topically applied in case of herniated testicles. The wood is used in general construction (Duke, 1994).

Euphorbiaceae

Jatropha curcans L. (SM0093)

Jatropha curcans (**piñon**) is commonly found growing in along the river banks of the lowland forest. The sap and bark are used to prepare a purgative. Some people may react with intense diarrhea to this purgative. A common remedy to counter-attack this effect is the ingestion of green plantain. *J. curcans* is also used for hemorrhoids, and "paitco rojo" a herpes-like infection that can extend all over your body, probably shingles.

Fabaceae

Bauhinia guianensis Aubl. (SM0029)

Bauhinia guianensis(**escalera de motello** or **monkey ladder**) is a large liana with a twisted, strong, and pale-greenish corky bark. It grows mainly in the highland forest. The leaves are found mainly at the top of the vine, high in the canopy.

B. guianensis has been used to treat pellagra blanca (vitiligo), a skin disorder that causes the formation of white patches of skin. The bark is used to make a tea, which is cooked until it gets an intense reddish color. Sometimes *B. guianensis* combined with 50% *Abuta grandiflora* (**abuta**) bark to enhance the potency of the preparation (Pipa, 1994; Huayambao, 1994). Lectins (BPA) have been found in *Buahinia purpurea* (Kasper, 1994).

Fabaceae

Ormosia macrocalyx Ducke (SM0026)

Ormosia macrocalyx (**huyruro**) is a very commom tree of the lowland forest. The leaves are crushed in water to prepare a sedative tea. The seeds are considered to be toxic, and are not consumed. Instead, these are used to make necklaces, crafts and to decorate baskets.

Fabaceae

Cedrilinga catanaeiformis (Ducke) Ducke (SM0075)

Cedrilinga catanaeiformis (**tornillo, huyra caspi**) is a very large tree that continues to be used in carpentry, boat construction and is also commercialized as lumber. The bark of *Cedrilinga* is used to prepare a bath to treat rheumatism. Also, it is regarded as a good anti-inflammatory.

Fabaceae

Parkia velutina Benoist (SM0074)

Parkia velutina (**cutana, pachaco**) is a tree 20 to 30 metres tall with a rough and bumpy yellowish-brown bark. **Cutana** is an emergent spreading crowned and bat-pollinated tree (Gentry, 1993). It is considered scarce around Suni Miraño. A bark infusion or decoction is used to wash chronic wounds.

The bark is burned and ground, and the powder is applied to open wounds to prevent infections and help stimulate healing. During the dry season exudates of *Parkia* seedpods are heavily used by tamarins, capuchin monkeys, and gray woolly monkeys (Peres, 1991). Hypoglycemic activity has been reported from *Parkia speciosa* (Jamaluddin, 1994). A lectin with hemagglutinating activity has been isolate from *Parkia javanica* (Utarabhand, 1995).

Fabaceae

Erythrina glauca Willd. (SM0024)

Erythrina glauca (**amasiza** or **asasurana**) is a medium sized tree growing in the lowland forest although not commom. *E. glauca* has red flowers, brown pods, and a yellowish and thorny bark. A bark alcoholic infusion is used to relieve headaches and a decoction of the leaves is used as a purgative and to treat kidney inflammation (Panduro, 1994).

To obtain narcotic and relaxing effects, about 250 grams of fresh leaves are boiled in water, left to cool over night, and a half of glass per day for 7 days is consumed. Fresh decoction are always preferred (Rengifo, 1994).

Beads are made out of the seeds and used in crafts and decorations. The seed infusion is used to treat a condition known as a "**pucahungoi**," a red patch in the body (Cachique, 1994), possibly a fungal infection.

Fabaceae

Campsiandra comosa Benth. (SM0077)

Campsiandra comosa (**huacapurana**) is a large tree reaching 40 metres in height and about 2 metres bdh (diameter breast height). The tea prepared from the bark is used to prevent post-partum infections, to treat diarrhea, and to relieve headaches. In combination with *Brossimum acutifolium* (**tamamure**) *C. comosa* is used to raise the body temperature and to treat high chills resulting from fever. Also, combined with *Heisteria pallida* (**chuchuasa**), and *Swartzia polyphylla* (**cumaceba**) it is used to treat arthritis and rheumatism. The bark is macerated in alcohol and allowed to ferment for 3 days. One cup of this preparation is taken every morning for 15 days.

Fabaceae

Cassia reticulata Willd. (SM0085)

Cassia reticulata (**retama**) is a common medium sized shrub with bright yellow flowers and green pods which usually grows by the water in the lowland forest. A tea prepared from the flowers, is drunk to regulate liver functions. The recommended treatment is one cup of tea three times per day, for 9 days. The tea is also good for nasal congestion and sinusitis.

Fresh leaves are crushed and rubbed on insect bites. A tea made from the leaves is used for intestinal infections and as a purgative. The fresh leaves are boiled with **guisador** (*Curcuma longa*) and **Oje** (*Ficus sp.*), this preparation is used to treat herpes-like sores and hepatitis (Huayambao, 1994; Acho, 1994, Rengifo, 1994). **Retama** leaves are roasted, mixed with tobacco, and made into a powder which is applied to wounds that are "hard to heal" (Huayambao, 1994).

Fabaceae

Swartzia polyphylla A.DC. (SM0094)

Swartzia polyphylla (**cumaceba**) is a medium sized bush with yellowish flowers which is common in the lowland forest. To prepare a post-partum tonic, one half kg of bark is ground and mixed with one cup of sugarcane alcohol and one cup of honey. Two spoonful are taken in the morning for 15 days (Rengifo, 1994). In the case of bone fractures, *S. polyphylla* is combined with *Oryctanthus sp.* (**suelda con suelda**) and administered as daily water (Rodriguez, 1994).

For colds, a tea made of a combination of *Campsiandra comosa* (**huacapurana**), *S. polyphylla,* and *Mansoa alliacea* (**ajo sacha**) is recommended. 5,2',4'-Trihydroxy-7 methoxyisoflavanone (dihydrocajanin) has been isolated from *S. polyphylla.* This compound has been shown to posses antibacterial activity. Other isoflavanones which have been identified are dihydrobiochanin A, ferreirin, and darbegioidin (Osawa, 1992).

Lecythidaceae

Cariniana decandra Ducke (SM0095)

Cariniana decandra (**cachimbo**, **tahuari**, or **papelillo caspi**) is a tree found in the lowland and high forests. A tea made from the bark is used in the treatment of high fever and colds. A bark alcoholic infusion is used in the preparation of an anticancer remedy (Huayambao, 1994). The wood is used to build canoes and in house construction. In the past, the bark was used as rolling paper to smoke tobacco. The seeds of *C. micrantha* are predated upon by *Cebus apella,* the brown capuchin monkey (Peres, 1991).

Lecythidaceae

Couroupita subsessilis Pilger (SM0096)

Couroupita subsessilis (**ayahuma**) is large tree which grows in the lowland forest. It has globose, coliflorus fruit with small seeds embedded in the pulp, and a hard woody exocarp (Gentry, 1993). *C. subsessilis* is used as a charm to remove bad luck. During the new moon, **ayahuma** maybe rub on dogs so they can become good hunters. The bark can be used to treat throat infections. *C. subsessilis* has a long history of firewood exploitation. The bark peels in strips that are commonly use as a rope (Gentry, 1993).

Linaceae

Roucheria punctata Ducke (SM0097)

Roucheria punctata (**tigri caspi**) is a medium to large sized tree, typically with a small narrow buttress, and common in the lowland. The flowers are white and small, and the leaves are shiny with parallel venation (Gentry, 1993). The bark is boiled in water until the solution becomes cocoa colored. In the case of *R. punctata*, it is believed that older bark is best. The concoction is used to dry up herpes-like sores. The alcoholic maceration of the bark can be used as a concentrate to prepare a tea used for rheumatism. One cup per day is recommended. The resin, which is obtained by tapping the tree, is directly applied on herpes-like sores. Two spoonfuls of resin can be diluted in two litres of water to treat diarrhea. Children must take three teaspoons per day while adults require one cup per day.

Menispermaceae

Abuta grandifolia Mart. (SM0038)

Abuta grandiflora (**abuta**) is a large tree with very thick bark. It is common in the highland forest but it is also found in the tahuampa. The concoction made from the bark is used to treat uterine infections, as a diuretic, and as a purgative. In combination with *Antodiscus sp.* (**tahuari**) it is used for diabetes and rheumatism.

Dammara-20,25-dien-3-beta,24-alpha-diol has been isolated from *A. racemosa*. This compound has been proven to be a natural repellent of the ant *Acromyrmex octospinosus* (Hammond, 1990).

Moraceae

Artocarpus altilis Park. (SM0098)

Artocarpus altilis (**pan del arbol**) is a medium sized tree growing in the lowlands forest. The resin is mixed with sugarcane alcohol and used for tuberculosis. No cooking is needed. The dosage recommended is one cup per day for 20 days. The resin is also used to make a paste for fractured bones. The seeds from the fruit are an excellent food for chickens and pigs. A tea made from the leaves is used to treat diabetes, a quarter of a leaf is enough to make a cup. 125I- BFL lectin, a tumor antigen has been isolated from *A. altilis* (Hussain, 1990) and Jacalin, a lectin was obtained from *Artocarpus heterophyllus* (Kabir, 1994).

Myristicaceae

Iryanthera macrophylla (Benth) Warb. (SM0065)

Iryanthera macrophylla (**cumala colorada**) is one of the most abundant dioecious trees in Central Amazonia (Gentry, 1993). The resin is used to treat paico, a herpes-like blister condition, and is applied directly onto the sores. Two types of paico are recognized: paitco blanco and paitco rojo, the latter being more aggressive. A tea made from the bark is used for diarrhea and sore throats. *I. tessmannii* is used in Iquitos for diarrhea (Duke, 1994). The wood is used in construction

Myristicaceae

Osteophloeum platyspermun (A.DC.) Warb. (SM0064)

Osteophloeum platyspermun **(cumala blanca)** is a scarce tree which may reach an average 40 metres in height 120 cm in dbh, and usually growing in the highland forest. *O. platyspermun* plays a very special role in the healer's initiation ceremonies. A tea made from the dried leaves is used to treat asthma. For colds and cough, a tea is prepared by diluting the sap in warm water. The bark can be used to treat colds and coughs using an alcoholic infusion.

Myrtaceae

Mirciria dubia (HBK) Mc Vaugh.

Mirciria dubia **(camu camu)** is a medium sized tree which grows in the lowland forest. It has reduced inflorescence and small leaves. It has become rare in the area due to the high use of the wood for construction. The fruits, known to be rich in vitamin C, are collected, pounded, and strained, and water is added to make a drink. It is given to children and adults as a tonic. It is also used to treat "pulsario," a type of colic.

Olacaceae

Minquartia guianensis Aubl. (SM0048)

Minquartia guianensis **(huacapu)** is a tree found in the lowland forest. The leaves are pounded and applied while fresh on contusions and lacerations. When fasting is prescribed, a tea made from the bark of **huacapu** is administered. One half glass (a single dose) is taken early in the morning while the fasting lasts. As a purgative, it must be combined with other plants. *M. guianensis* may cause diarrhea and vomiting to some people. The wood is highly valued for its resistance and strength. Triterpenes, lichexanthone, and an acetylenic acid have been isolated from *M. guanensis* (El-Seedi, 1994).

Piperaceae

Peperomia rubea Trel. (SM0052)

Peperomia rubea **(lancetilla)** is a herbaceous plant 10 to 20 cm tall, which is very common in Suni Miraño, especially around disturbed areas. The whole plant is made into a tea that is used to treat

high fever. Intestinal infections and cholera are treated by preparing a "ligado," a warm decoctions to sit and bathe oneself in (Rengifo, 1994). A concentrated concoction (reduced by ¾ of its volume by boiling) of the leaves is used for earaches. Two drops are applied in the affected ear (Rodriguez, 1994)

Piperaceae

Pothomorphe peltatum Miq. (SM0099)

Pothomorphe peltatum (**santa maria** or **santa mata**) is a very common herb that grows year round in the lowland forest. The large heart shaped leaves are used to prepare a tea good for bronchitis. The maceration of stems and leaves is used for fevers, infections, and inflammations. This is a species that has magical effects and is used to cause impotency in males, usually as revenge for infidelity. Pentatol A, pentatol B, and pentatol C have been isolated from *P. peltatum;* all three exhibited anti-HIV-1 activity (Gustafson, 1992).

Portulacaceae

Portulaca oleracea L. (SM00100)

Portulaca oleracea (**verdolaga**) is a prostrate herb, commonly found in disturbed areas and not abundant in the highland forest. The whole plant is used to prepare a tea used for diarrhea and to regulate the liver functions. *P. oleracea* combined with *Cymbopogon citratus* (**yerba luisa**) is used to prepare a bath for high fever. Alcoholic maceration of the stems and leaves is used as an antimycotic.

The leaves are a nutritious food rich in omega-3- fatty acids, and antioxidants such as alpha-tocopherol, ascorbic acid, beta-carotene and glutathione (Simopoulos, 1992).

Rubiaceae

Psychotria viridis R.&P. (SM0057)

Psychotria viridis (**chacruna**, **yage**) is a medium sized tree usually found in the highland forest. The leaves are boiled and a tea is made to treat fever. It is most common use is as an enhancer in the preparation of **ayahuasca**, a preparation made from *Baniptereopsis caapi*. The secretions along the venations produce a black pigment that is used to dye fibers such as those used to make chambira, a type of rope (Ruiz, 1994; Acho, 1994; Payes, 1994).

Calycanthine, a neurotoxin, has been isolated from *Psychotria sp*. The drug is considered a very powerful convulsant poison but very little is known about its mechanism of action (Adjibade, 1991).

Rubiaceae

Uncaria guianensis (Aubl.) (SM0098)

Uncaria guianensis **(uña de gato)** is a widely known vine throughout Amazonia. *U. guanenesis* grows in the lowland and highland forests. Due to its high demand in the markets, national and international, *Uncaria* is becoming scarce as noted by the residents of Suni Miraño. Its uses are numerous, but the main claims are its effectiveness against cancerous tumors and liver problems. Its properties as a good general tonic are very well recognized by most Peruvians. The whole vine can be used, but the bark is preferred. The bark is boiled in water over a very gentle fire. After the infusion has been strained and filtered, sugarcane alcohol is added. It is then stored for one week.

When used for liver problems, a small cup of the preparation is administered every morning for 20 days. For cancer patients, the treatment is on going and associated with other medicines and diets. The collectors drink the sap contained inside the vine. It is said to be a good tonic and should be collected early in the morning.

Rhynchophylline, an alkaloid with cardiovascular activity acts on L-type Ca-2+ channel has been isolated from *U. rhynchophylla* (Wang,1994).

Rubiaceae

Calycophyllum spruceanum (Benth.) (SM0099)

Calycophyllum spruceanum **(capirona de altura)** is a large tree, 40 to 50 metres in height, which is usually found growing in the highland forest. The bark is easy to peel and resembles that of *Eucalyptus*, although, it is green. A tea made from the bark is used to wash infested wounds. Vaginal washes are prepared by boiling a one half kilogram of bark in water for an hour. As a malaria tea, *C. spruceanum* is combined with *Potalia amara* **(curarina)** and flor amarilla (probably a member of the Asclepidaceae). A condition called "pellagra negra" is treated by preparing a bath of *Capirona*

decorticans (**capirona de altura**) and *Heisteria pallida* (**chuchuasa**). Toasted and powdered bark is directly applied to "difficult to heal" infections (Huayambao, 1994).

Rubiaceae

***Simira rubescens** (Benth.)* (SM00101)

Simira rubescens (**puca quiro**) is a midcanopy tree growing in the highland forest. The bark oxidizes to a reddish color once it is exposed to the air. The fruit is large, black, and round, and splits into four valves (Gentry, 1993). An infusion from the leaves is used to prepare a bath to treat skin infections. The bark is also used in different plant combinations. The wood is generally used in construction and crafts. A dye is obtained from the bark and used in basketry (Ruiz, 1994).

Solanaceae

Solanum kioniotrichum (SM0059)

Solanum kioniotrichum (**yawuito** or **yawua**) is a large bush growing in the lowland forest that can reach 5 metres in height and 50 cm in dbh. The leaves have thorns along the veins. The juice and pulp from the mature fruit is directly applied to treat acne. Sometimes the fruit is mixed with *Hura crepitans* (**catahua**) resin to treat difficult to heal and pernicious infections. The juice, wich is said to act like agua oxigenada (hydrogen peroxide), is used to make a preparation for bronchitis (Rengifo, 1994; Rodriguez, 1994).

Solanaceae

Solanum mammosum L. (SM0066)

Solanum mammosum (**tinctona**) is a small shrub with small purple flowers, and round bright yellow fruits found commonly in the low land forest. It has a very wide geographic distribution in tropical America. The inside of the fruits is applied directly to external fungal infections. The leaves, with thorns on the bottom side, are used to prepare a bath for rheumatism. For allergies, an alcoholic maceration from the leaves is applied all over the body, at least three times. The paste, made from the broiled fruits is also used to dry tumors, a term usually referring to difficult to heal and lasting infections.

Solanaceae

Solanum sessiliflorum Dun (SM00102)

Solanum sessiliflorum **(cocona)** is a large bush that can reach 5 to 7 metres in height with large purple flowers. It is common in the low land forest. The fruits, which are edible and a good source of vitamin C, are heated up and directly applied on infections. These should be covered with a bandage. It acts as a good antiseptic and will dry up the infected area. The juice from young leaves can be used to reduce pain caused by burns (Rengifo, 1994; Huayambao, 1994; Rodriguez, 1994).

Solanaceae

Physalis angulata *L.* (SM00103)

Physalis angulata L. **(mullaca)** is a small and common herb growing in both lowland and highland forests. The whole plant is macerated with sugarcane alcohol and combined with *Heisteria pallida* **(chuchuasi)** or fresh fruit juices. No cooking is necessary. The fresh preparation is given to women suffering with "terciana," or postpartum infection. A small cup 3 times per day is taken for 7 days. The root is used to prepare an antimalarial combination. The fruits are used for "comezon" or itching, a type of fungal infection. Trypanosomatid flagellates have been found to colonize the fruits of *P. angulata* (Kastelein, 1990).

Compounds have been isolated from *P. angulata:* antineoplastics such as physallins B and F inhibited the growth of several types of leukemia cells (Chiang, 1992, 1993), withanolide T (Moiseeva, 1990), and withangulatin A, a topoisomerase II inhibitor (Chen, 1992).

Verbenaceae

Lantana camara L. (SM00104)

Lantana camara **(tunchi albaca** or **zorro albaca)** is a weedy sub-shrub found in the lowland forest, mainly in disturbed areas. It has fleshy, purple berries, yellowish-red flowers, and small prickles on the branches (Gentry, 1993). The leaves and stems are boiled and a bath is prepared to relieve itching caused by allergies or insect bites. The whole plant is used to prepare a tonic, a blood purifier, which in higher concentration can be used as a mild sedative.

Antimalaria and insecticidal activity was found in the root bark of *L. camara* (Stein, 1990). Essential oils have been isolated from the leaves, twenty-one out of 28 constituents of the two have been characterized (Singh, 1991). Reduction of the cellular and humoral immunity due to *L. camara* toxicity has been reported (Ganai, 1991).

Violaceae

Leonia glyvicarpa

Nina caspi, *Leonia glycicarpa* (**Violaceae**), is a medium size tree with a thin brownish bark that peels very easily. The underside of the leaves have a typical grayish color. In Amazonia, the leaves of the most common species in the genus *Leonia* tend to be rather light green with a paler central area. The flowers are inconspicuous and actinomorphic (Gentry, 1993). Around the area of Iquitos , the fresh leaves are warmed in the sun and used as poultices and emollients for abscesses, tumors and phlegm (Duke, 1994).

The Runa people of the Upper Napo use *L. glycicarpa,* known to them as "**tamia muyu yurac**", to treat mumps. The patients run around the tree repeating: "anjunchi, anjunchi, muyura" while somebody throw fruits of *L. glycicarpa* at them (Khon, 1992).

The fruits are primitive, couliflorous and their typical scars can be seen in the trunk (Gentry, 1993). The pulp of the fruit is sweet and edible and is used to treat hemorroids. The seeds are sometimes used to treat pulmonary diseases, and in some areas of Brazil it is known as "trapiarara" (Duke, 1994).

Leonia glycicarpa is one of the most commonest Amazonian trees (Gentry, 1993). Six species of *Leonia* have been reported in South America (Gentry, 1993). The inner bark, or cambium, is widely used throughout Amazonia by Indigenous and Mestizo people as a charm to acquire excellent hunting skills, and to receive protection from the spirits of the forest (Panduro, 1994).

When used for this purpose, the inner bark is tied to the wrist and should be worn for about 24 hours. A burning sensation develops after three or four hours. Big blisters form in the area in contact with the skin. These blisters increase in size when exposed to sunlight. The burn is equivalent to a second degree burn. After a week the blisters dry out and only a brown scar remains and this may last for some years.

Vitaceae

Cissus sicyoides L. (SM00105)

Cissus sicyoides (**sapohuasco**) a vine is found in the lowland forest. Its adventitious roots allow it to climb into the canopy or to lie prostrate on the forest floor. A white resin is tapped from the trunk and used as an antiseptic. This is especially effective to treat difficult infections. The bark of the roots is macerated in sugarcane alcohol and stored for 2 days. One cup per day is administered for 15 days. A tea made from the leaves used for internal and external hernias

Anti-inflamatory activity in carageenan-induced edema in rats and mice has been shown from methanolic extracts of *Cissus trifoliata* (Perez, 1993).

Zingiberaceae

Curcuma longa L.

The tubers of *C. longa* are used as a food seasoning. The rhizomes are pounded in water and a tea is prepared and used for hepatitis. Curcumin, a major component of turmeric, inhibited platelet aggregation induced by arachidonate, adrenaline and collagen. *C. longa* has been used in the treatment of gastric ulcer (Kositchaiwat, 1993) and chronic superficial gastritis (Chen, 1992; Wu, 1992).

Light is a destructive agent of curcumin, specially promoting tuber loss of color (Martins, 1994). The polysaccharides ukonan A, ukonan B, ukonan C with reticuloendothelial system-potentiating activity have been reported (Gonda, 1990).

Bioassay Results

Research on the ethnobotany of Mestizo people in Suni Miraño in 1994, documented 54 plant species used for medicinal purposes. Some cultural data on traditional healing and etiology was also collected. Of these 54 species, 31 were submitted to antibacterial and antifungal assays in the presence and absence of UV light and a number of species were shown to be active. The results of the bioassays are presented in Appendix A: Table 2.

Among the Mestizo of Suni Miraño, the parts of plants most commonly used are bark, leaves, roots, fruits and seeds (in decreasing frequency of use). The use of bark is related to the accessibility and year round supply. Plant remedies uses more common as decoctions for internal use, thus this being the primary form of drug administration. The most common diseases or complaints treated by Mestizo healers can be group into the following categories: ailments of the digestive tract, general pain, dermatological and bronchiopulmonary disorders and inflammations (in descending order of importance).

Out of 31crude plant extracts tested, 23 showed antibiotic activity. Five extracts were effective against *C. albicans*. Eleven extracts were found to be phototoxic (+), and 21 showed enhanced activity when exposed to UV light (see Appendix A: Table 2). The 54 plants included in this study belong to 18 families. Members of the Fabaceae represent more than 32% of the species documented. Members of the Apocynaceae, Solanaceae and Rubiaceae showed antibacterial activity.

The activity of some secondary metabolites are tremendously enhanced by light and may be important in defense. In this study, light-mediated activity was found in *Curcuma longa,* Zingiberaceae; *Guatteria meliodora* and *Parkia betulina,* Fabaceae: *Unonopsis floribundia,* Annonaceae; and *Minquartia guianensis,* Olacaceae (Tonneson, 1993; Martins, 1994; Bolhmann, 1973). This photoactivity may be correlated with the presence of polyynes and furanocoumarins in these families (Towers, 1987; 1984; Hudson, 1989). *Maclura tinctoria* (Fabaceae), *Guatteria meliodora* (Moraceae), and *Urtica magellanica* (Urticaceae) also showed phototoxicity but there are no reports of photochemical compounds in these particular genera.

Chapter 5

Conclusion

The loss of biological diversity has been the topic of hundreds of papers in the last decade. This loss in biodiversity is matched by the decrease in Indigenous cultures and populations. The tropical forest of Western Amazonia is one of 14 world deforestation fronts (Myer, 1993). Human impact tends to be greater in such areas of high population densities and high levels of resource utilization. Efforts to curb the destruction of pristine tropical forest are highly ignored by societies that are less directly effected by this destruction. Few people are aware that the forest cannot be cut until all people living within it are driven out. And that this been true throughout the last century. One Indigenous tribe per year has disappeared from Brazil since 1990: 90 of 270 groups have already been lost. Economic greed continues to represent an enemy to the tropical forest, especially in countries with an economic and technological disadvantage.

In the last century, traditional systems held by Indigenous and other traditional societies began to receive some attention from Western scholars. As humans, we have surpassed the earth's carrying capacity and with the misuse of technology we have caused great damage to the world's natural resources. The rainforests have become an important focus of attention due to their rich diversity. Paradoxically, this level of biodiversity is opposite to the economic wealth of countries owning large tracts of Amazonian Forest. The lack of biotechnology in countries such as Peru limit further investigation and development of raw plant materials. Instead, traditional capitalist structure of "development" continues to provide these "raw" natural resources (dead or living biological material) to be developed by countries with a higher degree of technology. In the area of pharmaceuticals, there is a need to develop a stronger legal basis for individuals, institutions or countries to claim any share of the financial benefit of drug discovery. However, all participants must have a clear understanding of the implications of the use of knowledge and mutual obligations. These may include the creation of conservation and plant propagation programs, transfer of technology, publications and confidentiality, access to data and material in community language and development of intellectual property agreements (Mays, 1996). In exchange for genetic material and cultural information, the terms of compensation must be considered. Royalties as well as scientific training should be offered to communities, thus enabling the source country to more efficiently

manage their natural resources. Improved genetic material should also be accessible to the community, especially food and medicine material.

The nature of the Western economic system both allows and demands ownership and property rights on living things. However, this position has been under high scrutiny among many scholars as the consequences of such rights are becoming controversial and dangerous. Concentration of wealth based on the private ownership of genetic material is a simplistic economic measure of the value of life.

In order to adequately conserve and promote the great diversity of the world's resources, countries must engage in partnerships and cooperate with one another. The process is long and involves a multidiciplinary team effort between laboratory research as well as field research. Economically and technologically disadvantaged countries possess invaluable Indigenous knowledge, but lack the financial support necessary to protect their biodiversity. There is risk of losing both cultural and biological diversity

Dramatic changes have occurred in he life style of Amazonian Indigenous and Mestizo people due to European influence during the last 500 years. In many communities, less TEK may have been transmitted from one generation to the next than is believed. In the rapidly changing modern society, documentation of TEK is invaluable. TEK will then be available for future generations to develop conservation strategies and promote sustainable resource management and cultural pride.

Despite centuries of increased exposure to Western medicine and decades of rapidly expanding development in Amazonia, Mestizo people continue to use medicinal plants as their strength in their search for good health. The market for medicinal plants has experienced a steady increase worldwide in the last 15 years. There are about 1.5 billion people using traditional medical systems, most of them in Third World countries.

Ethnomedical collections are valuable to the understanding and utilization of natural products among Indigenous and Mestizo peoples. The approaches in the search of new drugs have been summarized into six different plant collection and selection strategies: (1) locally random, (2) taxonomic, (3) ethnomedical, (4) phytochemical, (5) information-based and (6) serendipity (Sojearto, 1996). Plants with physiologically active properties remain an exceptional reserve for the pharmaceutical industry. Of all the flowering plants, 15-17% have been studied for their medical potential (Soejarto, 1995). The success of this approach to drug discovery deserves higher recognition. Medicinal plants are the

"backbone" of traditional medicine (Farnsworth, 1994). Focusing attention on those plants is the most effective way of identifying plants that contain bioactive compounds (Schultes, 1994).

Many "pharmacological leads" to discovery of new drugs have come from ethnobotanical information collected from Indigenous and Mestizo Amazonian populations. However, this only represents a fraction of the ethnopharmacological potential of Peruvian flora. Since 1975, Napralert, a U.S. data base at the University of Chicago, has provided ethnopharmacological, biochemical and medical information on plants being research around the world. Compound collections and combinatorial chemistry libraries are now available. These have been helpful tools to avoid repetition of ethnopharmacological research, increasing the chances of success.

"Natural products include all products derived from natural resources, namely plants, animals, microbe and mineral sources with actual or potential use or value to humanity" (Soejarto, 1996; Baker, 1996). Natural product chemistry, complemented by ethnopharmacology, has provided leads for the discovery of new biological and medicinal agents. This biological evaluation approach has changed tremendously in the last decade, mainly due to technological reasons (e.g., automated bioassays capable of handling tens of thousands of samples in one week). Future pharmacological analyses are needed in conjunction with the collection of traditional knowledge to provide new strategies which will benefit both local and international communities.

The majority of tropical forests are being depleted because their wealth has been disregard and the lack of integration of sustainable resource management. For example, most medicinal plants marketed in Iquitos are wild species i.e. uncultivated. The increasing harvesting in some areas creates potentially environmental threat wich ultimately lead to impoverishment of human health.

The development of an awareness in biodiversity and the potential achievement of sustainable environments have stimulated new philosophies and international conventions for a better use of natural resources e.g. the United Nations Law of the Sea Convention (LOSC), The World Heritage Convention, Agreement on Trade related aspects of intellectual property rights (Baker, 1996). Natural product chemistry is emerging as part of new alternative health programs found primarily in developing countries.

The United Nations Convention on Biological Diversity in 1992 recognized the sovereign right of every country to its native resources. This has led to the promotion and creation of new legislation and policies regulating the use, collection and bioprospecting of genetic material (e.g., Cameroon, see Jato,

1996; Ecuador, see Villacres, 1996; Malaysia, see Chung 1996; Phillipines, see Madulied, 1996). In some cases, such as Peru, environmental policies and conservation strategies are almost non-existent or difficult to enforce due to a lack of economic support and scientific expertise. This situation leaves room for unscrupulous exploitation of natural resources by opportunistic investors and the multinational pharmaceutical companies.

A large number of Mestizo communities in the Iquitos area desire such provisions as basic health care, quality education, roads, electric power, and clean water. Although this is the direct responsibility of government agencies, financial resources and political will to assist rural communities is limited. The system of community forest and lakes reserves in the Peruvian Amazon has become a local alternative for the development of sustainable use of tropical forests in the hope to improve living conditions.

A portion of the field work of my ethnobotanical study contributed toward preparing of documentation demanded by the Ministry of Agriculture, Peru, concerning the granting of land titles to the community of Suni Miraño, including communal land, individual titles and the Izula Biological Reserve (initated by the efforts of Dr. Jose Cabanillas, a Peruvian physician and my collaborator in the field research). This research is necessary to aid communities such as Suni Miraño in the development and formulation of future management policies for natural resource use, and the development of sustainable models seeking to provide health, shelter, clothing and food. In order to increase the return from the non-timber products, Mestizo living in biological reserves will have to diversify their products to provide significant alternatives to deforestation. It will be only when Mestizo communities see that these activities directly benefit them that they will become interested in sustainability.

Population pressure, pervasive poverty, unequal distribution of traditional farmlands, inequitable land-tenure systems and inadequate attention to sustainable agriculture are exasperating the health problems in Western Amazonia. These problems can only be confronted by restructuring national and international policies of the agencies concerned (Myers, 1993). Indigenous and Mestizo people can be assisted in this effort through the support of their organizations, the achievement of land ownership, the implementation of sustainable development programs and, most recently, the attempts of these communities to enter the market economy more on their own terms. There are concerns that integration of forest products with the world market is not a sensible course of action for those interested in limiting environmental degradation.

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Appendix A: Tables

Table 1. Medicinal Plants Used by the Mestizo People of Suni Miraño

Table 2. Bioassay Results of Selected

Table 1: Medicinal Plants used by Mestizo People of Suni Mirano

Scientific Name	Family	Vernacular Name	Ailments/Treatments	Part Used	Form of Preparation
Chenopodium ambrosioides L.	Amaranthaceae	Paico	Intestinal parasites, tonic, wounds	whole, seed	tea
(SM0086)					
Spondias mombin L.	Anacardiaceae	Ubos	Ovarian cancer, vaginal infections, post-abortion	bark	infusion, tea
(SM0003)					
Unonopsis floribunda Diels.	Annonaceae	Icoja	Arthritis, bronchitis, rheumatism, diarrhea	bark	maceration
(SM0069)					
Guatteria pteropus Benth.	Annonaceae	Zorro caspi	Vitamins, tonic	bark	tea, infusion
(SM087)					
Duguetia tessmannii Fries.	Annonaceae	Tortuga caspi	Pain, aches, antiseptic	bark	infusion, maceration, tea
(SM005)					
Tabernaemontana vanheurckii Muell.-Arg.	Apocynaceae	Ucho sanango	Rheumatism, sore throat, colds, anesthetic	bark	tea, infusion
(SM0088)					
Himatanthus sucuuba (Spruce) Woods.	Apocynaceae	Bellaco caspi	Painkiller, anesthetic, dry tumors, purgative	sap	local application.
(SM0070)					
Couma macrocarpa Barb.	Apocynaceae	Leche caspi	Diarrhea	bark	tea
(SM0089)					
Euterpe precatoria Mart.	Arecaceae	Chonta	Kidney problems	root	tea, infusion
(SM0071)					
Heteropsis jenmannii Oliv.	Araceae	Tamshi delgado	Asthma, gall stones, diarrhea, insect bites	whole	tea
(SM0010)					
Philodendron solimoesense A.C. Smith	Araceae	Huambe	Colic, anesthetic for toothache	bark, sap	infusion, local application
(SM0011)					
Blepharodon mucronatum Decne	Asclepiadaceae	Flor de seda	Poison	flower, leaf	infusion
(SM0013)					
Jacaranda copaia Aubl.	Bignoniaceae	Huamansaman	Itching, infected wounds, colds, fever,	flower, leaf, root	tea, decoction, maceration
(SM0072)					

Table 1: Medicinal Plants used by Mestizo People of Suni Mirano

Scientific Name	Family	Vernacular Name	Ailments/treatments	Part Used	Forms of Preparation
Protium nodulosum Swart..	Burseraceae	Copal	Antiabortive	bark	tea
Cecropia sciadophylla Mart. (SM0090)	Cecropiaceae	Setico	Help in child delivery, bleeding gums, kidney stones	bark, sap	tea, infusion
Heisteria pallida Engl. (SM0091)	Celastraceae	Chuchuasi	Hernia, postpartum tonic, rheumatism, diarrhea	bark	maceration, infusion
Symphonia globulifera L.f. (SM0092)	Clusiaceae	Chullachaquicaspi	Tonic, cancer	bark	tea
Hura crepitans L. (SM0022)	Euphorbiaceae	Catahua blanca	Infected wounds, dry tumors, insect bites	sap	direct application
Mabea nitida Spruce and Benth. (SM0023)	Euphorbiaceae	Yacuchapana	Infection	bark	maceration, infusion
Jatropha curcas L. (Sm0093)	Euphorbiaceae	Piñon	Purgative, paitco, expectorant, fevers, hemorrhoids	sap, bark	local application, tea
Bauhinia guianensis Aubl. (SM0029)	Fabaceae	Escalera de motello	White pelagra	bark	tea
Ormosia macrocalyx Ducke (SM0026)	Fabaceae	Huyruro	Sedative	leaf	tea
Cedrilinga catanaeformis (Ducke) Ducke (SM0075)	Fabaceae	Tornillo	Antirheumatic, antiinflamatory, for aches.	bark	infusion
Parkia velutina Benoist (SM0074)	Fabaceae	Cutana, pachaco	Disinfectant, wash wounds	bark	decoction, dry powder
Erythrina glauca Willd. (SM0024)	Fabaceae	Amasiza	Narcotic, headache, purgative, kidney inflammation	bark, leaf	tea, infusion
Campsiandra comosa Benth. (SM0077)	Fabaceae	Huacapurana	Rheumatism, postpartum tea, fevers	bark	tea, maceration, bathe

Table 1: Medicinal Plants used by Mestizo People of Suni Mirano

Scientific Name	Family	Vernacular Name	Ailments/treatments	Part Used	Form of Preparation
Cassia reticulata Willd.	Fabaceae	Retama	Intestinal infections, purgative, wounds, paitco	flower	tea, local application
(SM0085)					
Swartzia polyphylla A.DC.	Fabaceae	Cumaceba	Postpartum tonic, colds	bark, leaf, root	tea, maceration, bathe
(SM0094)					
Cariniana decandra Ducke	Lecythidaceae	Cachimbo	Cancer, high fever	bark	tea, infusion
(SM0095)					
Couroupita subsessilis Pilger	Lecythidaceae	Ayahuma	Throat infection	bark, leaf, root	tea, infusion
(SM0096)					
Roucheria punctata Ducke	Linaceae	Tigri caspi	Diarrhea, rheumatism, paitco	bark	tea, infusion
(SM0097)					
Abuta grandiflora Mart.	Menispermaceae	Abuta	Diuretic, uterus infections, diabetis	bark	tea, maceration
(SM0038)					
Artocarpus altilis Park.	Moraceae	Pan del arbol	Diabetes, fractured bones, tuberculosis	bark, root	infusion, tea
(SM0098)					
Iryanthera macrophylla (Benth.) Warb.	Myristicaceae	Cumala colorada	Paitco, herpes-like blisters	bark, sap	tea, maceration, topic
(SM0065)					
Osteophloeum platyspermun (A.DC.) Warb.	Myristicaceae	Cumala blanca	Asthma, colds, and coughing	leaf, sap, bark	infusion, tea
(SM0064)					
Minquartia guianensis Aublt.	Olacaceae	Huacapu	Purgative, contusions, lacerations	sap, bark	infusion, tea
(SM0048)					
Peperomia rubea Trel.	Piperaceae	Lancetilla	Earache, intestinal infections, colera	leaf, sap, bark	infusion, tea
(SM0052)					
Pothomorphe peltatum Miq.	Piperaceae	Santa Maria	To cause male impotency, fever	leaf	tea, infusion
(SM0099)					
Portulaca oleracea L.	Portulacaceae	Verdolaga	Diarrhea, fever, liver problems, antimycotic	bark	tea, bathe
(SM00100)				leaf, sap	maceration, tea

Table 1: Medicinal Plants used by Mestizo People of Suni Mirano

Scientific Name	Family	Common Name	Ailments/Treated		
Psychotria viridis R. et P. *(SM0057)*	Rubiaceae	Chacruna	Fever, add to ayahuasca	leaf	tea
Uncaria guianensis (Aubl.) Gmelin *(SM0098)*	Rubiaceae	Uña de gato	Tumors, cancer, liver problems, tonic	whole plant	tea, infusion, maceration
Calycophyllum spruceanum (Benth.) Hooker fil. ex K. Schumann *(SM0099)*	Rubiaceae	Capirona de altura	Infected wounds, black pellagra, vaginal infections	fruit, leaf	tea
Simira rubescens (Benth.) Bremekamp ex Steyermark *(SM00101)*	Rubiaceae	Puca quiro	Skin infections	flower	maceration, local application
Solanum kioniotrichum Bitter ex Macbride *(SM0059)*	Solanaceae	Yawuito	Antibacterial, acne, bronchitis	leaf, stem	local application
Solanum mammosum L. *SM0066)*	Solanaceae	Tinctona	Antimycotic, dry tumors, antirheumatic	stem, leaf	tea, maceration
Solanum sessiliflorum Dun. *(SM00102)*	Solanaceae	Cocona	Antiseptic, burns, to dry tumors	fruit, leaf	fresh, local application
Physalis angulata L. *(SM00103)*	Solanaceae	Mullaca	"Terciana" or postpartum infection, itching	sap, leaf, fruit	tea, maceration
Lantana camara L. *(SM00104)*	Verbenaceae	Tunchi albaca	Rheumatism, itching, allergies, sedative, tonic	bark, leaf	infusion, local application
Cissus sicyoides L. *(SM00105)*	Vitaceae	Sapohuasco	Antiseptics, dry tumors, fractures, hernias	leaf	decoction, maceration

Table 2: Bioassay Results of Selected Plants

Organisms			*P.a.*	*S.a.* MR	*S.a.* MS	*B.s.*	*E.c.*	*C.a.*
Treatment			Dark/light	Dark/light	Dark/light	Dark/light	Dark/light	Dark/light
Controls								
8, Methoxypsoralen (1mg/ul)			0/0	*0/1.3*	*0/1.5*	*0/1.3*	*0/1.1*	-
Methanol (95%)			-	-	-	-	-	-
Gentamicin (1mg/ul)			1.0/1.1	0.7/0.7	0.9/1.0	0.8/0.9	0.7/0.7	-
Amphotericin B (2.5 mg/ul)			-	-	-	-	-	*0.5/0.5*
Family/Species (Voucher No.)	Category	Part Used						
Anonaceae								
Duggetia tessmannii (SM005)		Bk	-	-	-	-	-	-
Unonopsis floribundia (SM0069)	1,3	Bk	-	-	-	0/0.8	-	-
Apocynaceae								
Himathantus sucuuba (SM0070)	1	Sap	0.7/0	-	-	0.9/1.3	-	-
Araceae								
Phylodendron solimoesense (SM0011)	1,2	St	-	0.9/0.9	1.2/1.5	1.1/1.4	-	1.0/1.0
Heteropsis jenmannii (SM0010)	1	Wh	-	0.8/0.7	0.9/1.0	-	-	-
Euterpes precatoria (SM0071)		Rt	-	-	-	-	-	-

Table 2: Bioassay Results of Selected Plants

Bignonaceae								
Jacaranda copaia (SM0072)	1	Bk	-	-	-	0.7/1.0	-	-
Organisms			***P.a.***	***S.a.*** MR	***S.a.*** MS	***B.s.***	***E.c.***	***C.a.***
Treatment			Dark/light	Dark/light	Dark/light	Dark/light	Dark/light	Dark/light
Family/Species (Voucher No.)	**Category**	**Part Used**						
Elaeocarpaceae								
Sloanea terniflora (SM0020)	1	Bk	-	***0.8/0.9***	***1.1/1.0***	***1.1/1.1***	***0.9/0.9***	-
Euphorbiaceae								
Mabea nitida (SM0023)	1	Bk	-	0.8/0.8	0.8/0.8	0.8/1.0	-	-
Hura crepitans (SM0022)		Bk	-	-	-	-	-	-
Fabaceae								
Guatteria pteropus (SM0087)	1,3	Bk	-	-	-	0/0.8	-	-
Parkia velutina (SM0074)	1,3	Bk	-	-	0/0.7	-	-	-
Cedrelinga catanaeformis (SM0075)	1	Bk	0.7/0.7	1.1/1.5	1.0/1.0	1.0/1.0	-	-
Ormosia macrocalyx (SM0026)		Lv	-	-	-	-	-	-
Hymenaea oblongifolia (SM0076)		Bk	0.7/0	1.0/1.0	1.0/1.0	1.0/1.0	-	-

Table 2: Bioassay Results of Selected Plants

Organisms			*P.a.*	*S.a.* MR	*S.a.* MS	*B.s.*	*E.c.*	*C.a.*
Treatment			Dark/light	Dark/light	Dark/light	Dark/light	Dark/light	Dark/light
Family/Species (Voucher No.)	Category	Part Used						
Campsiandra comosa (SM0077)		Bk	-	-	-	-	-	-
Cassia reticulata (SM0085)		Fl	-	-	-	-	-	-
Menispermaceae								
Abuta grandiflora (SM0038)	1	Bk	-	-	-	1.0/0.9	-	-
Moraceae								
Maclura tinctorea (SM0062)	1,3	Bk	-	0.7/0.7	0/1.2	0/0.7	-	-
Naucleopsis amara (SM0063)	1	Bk	-	-	0.7/0.7	0.9/0.9	-	-
Myristicaceae								
Osteophloeum platyspermun (SM0064)	1	Bk	-	0.9/0.9	-	0.9/0.9	-	-
Iryanthera macrophylla (SM0065)	1	Bk	0.8/0.8	1.0/1.0	1.0/1.0	0.9/1.0	-	-

Table 2: Bioassay Results of Selected Plants

Organisms Treatment			*P.a.*	*S.a.* MR	*S.a.* MS	*B.s.*	*E.c.*	*C.a.*
			Dark/light	Dark/light	Dark/light	Dark/light	Dark/light	Dark/light
Family/Species (Voucher No.)	**Category**	**Part Used**						
Myrtaceae								
Myrciria floribundia (SM0046)	1,2	Bk	-	0.9/1.3	1.3/1.7	1.2/1.1	-	1.0/1.1
Olacaceae								
Minquartia guianensis (SM0048)	1	Bk	*0.9/0.9*	*0/1.2*	*1.8/1.9*	*1.6/1.9*	-	-
Solanaceae								
Solanum mammosum (SM0066)	2	FL	-	-	-	-	-	*0.8/0.8*
Solanum kiniotrichum (SM0059)		Fl	-	-	-	-	-	-
Urticaceae								
Urtica magallanica (SM0067)	1,3	Lv	-	-	*0.8/1.0*	*0/1.1*	-	-
Violaceae								
Leonia glycicarpa (SM0031)	1,2	Bk	-	1.5/1.5	1.4/1.4	1.4/1.2	-	0.8/1.1

Table 2: Bioassay Results of Selected Plants

Organisms Treatment			*P.a.* Dark/light	*S.a.* MR Dark/light	*S.a.* MS Dark/light	*B.s.* Dark/light	*E.c.* Dark/light	*C.a.* Dark/light
Family/Species (Voucher No.)	**Category**	**Part Used**						
Zingiberaceae								
Curcuma longa (SM0068)	**1,3**	**Rt**	**0/2.2**	**0.7/0.9**	**0/0.8**	**0.8/1.3**		

Category: 1 antibiotic; 2 antifungal;
3, phototoxic
Part extracted: Wh, whole plant; Bk, bark; Lv, leaves; Fl, flowers; Rt, roots; St, stem

Organisms: P.a., *Pseudomonas aeruginosa H188; Staphylococcus aureus Mr (methicillin resistant); Staphylococcus aureus Ms (methicillin sensitive); B.S. Bacillus subtilis; E.c.,Eschericha coli DC10; C.a. Candida albicans*

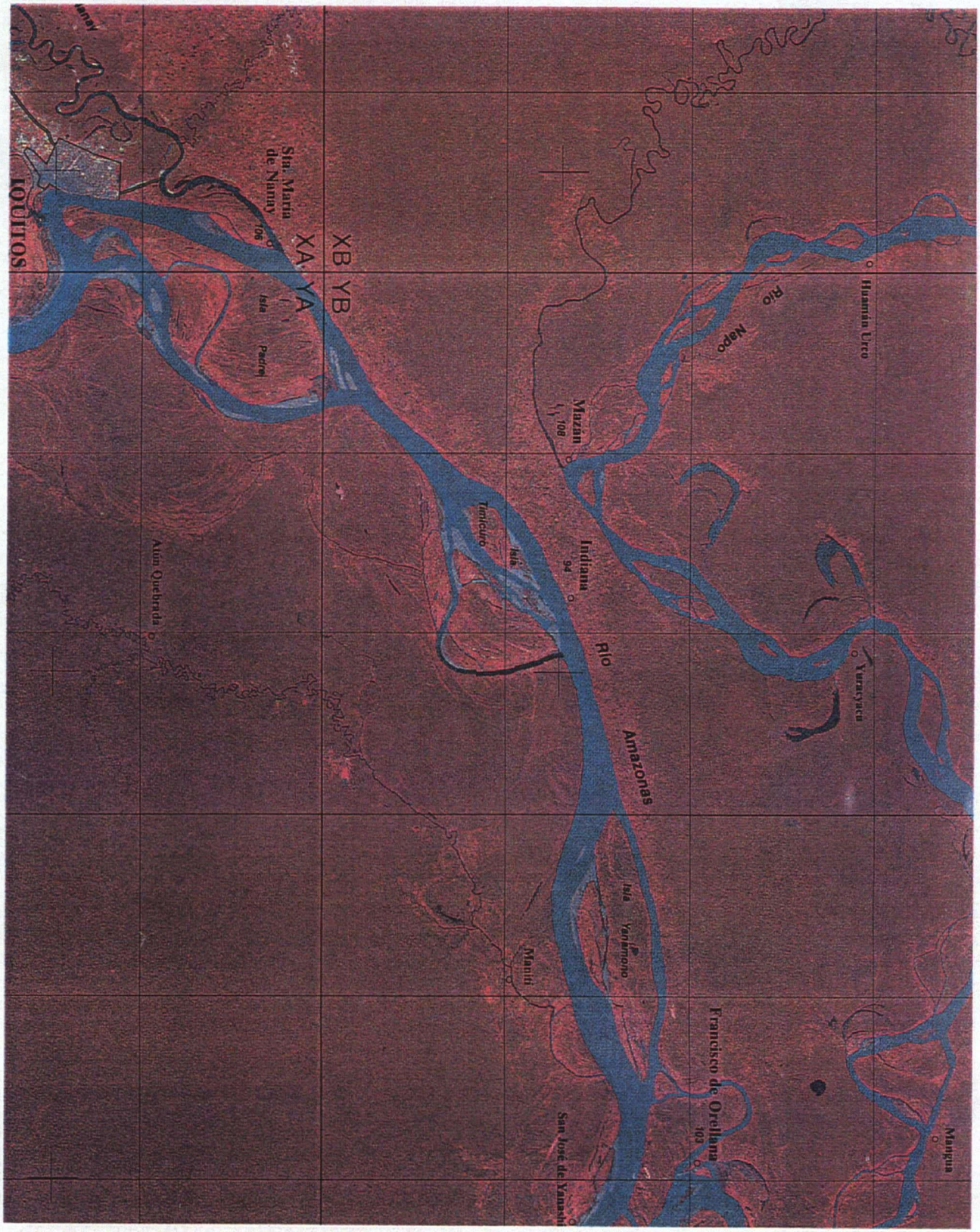
Appendix B: Maps

Map 1. South America

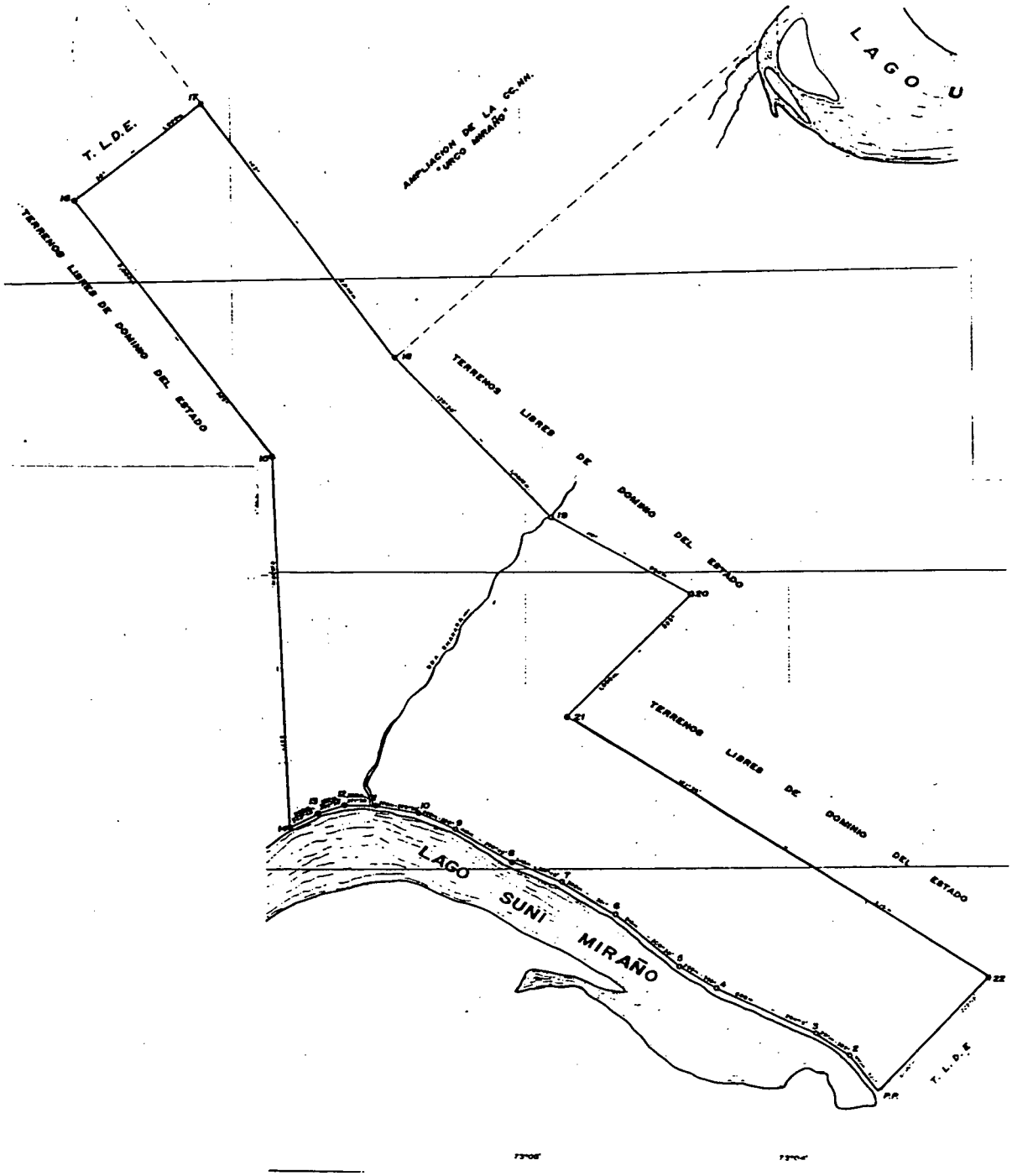
Map 2. Iquitos and surrounding areas

Map 3. Suni Miraño

Map 1: South America



Map 2: Iquitos and surrounding areas



Map 3: Suni Miraño

Appendix C: Photos

1.Mestizo community along the banks of the Amazon river, near Iquitos

2. The communal boats, a public transport system covering most of the flooded forest

3. Mestizo people of Suni Miraño

4. Mestizo people of Suni Miraño

5. In Amazonia dugout canoes are essential for Mestizo, specially in the flooded season

6. Town of Mazan, about eight kilometers southwest from Suni Miraño, is the closest market for the people of Suni Miraño.

7. Typical Mestizo house, Suni Miraño. Stilts are used to keep the structure above the ground and the water level.

8. "Minga" in Suni Miraño. Communal work is usually a one or two days task, but it may involve a large labor force.

9. Suni Miraño women participating in a agricultural "minga"

10. Francisco Shuña Cumari takes care of the only shotgun in the community.

11. Cassava, *Manihot sculenta,* is the main source of carbohydrates in Amazonia and a staple for the Mestizo of Suni Miraño

12. Flooded forest around Suni Miraño.

13. Manuel Acho, during an ayahuasca preparation, pounds the stems of *Banisteriopsis Caapi*

14. Manuel Acho adding leaves of **"chacruna,"** *Psychotria viridis,* to the ayahuasca preparation

15. Midwife, Luzmila Figueroa Rengifo

16. Elder, Alcibiades Pinedo Panduro

17. Elder, Carlos Rios Rojas

18. Disk bioassay showing growth inhibition areas

Photo 1. Mestizo community along the banks of the Amazon River, near Iquitos.

Photo 2. Communal boat, a public transport system covering most of the flooded forest.

Photo 3. Mestizo people of Suni Miraño.

Photo 4. Mestizo people of Suni Miraño.

Photo 5. Canoes are the main way of transportation among Mestizo.

Photo 6. The town of Mazan, about 8 km southwest of Suni Miraño, is the closest market to Suni Miraño.

Photo 7. Typical Mestizo house, Suni Miraño. Stilts are used to keep the house above the ground and flood level.

Photo 8. **"Minga"** in Suni Miraño. Communal work usually ensures a large labor force.

Photo 9. Suni Miraño women participating in an agricultural minga

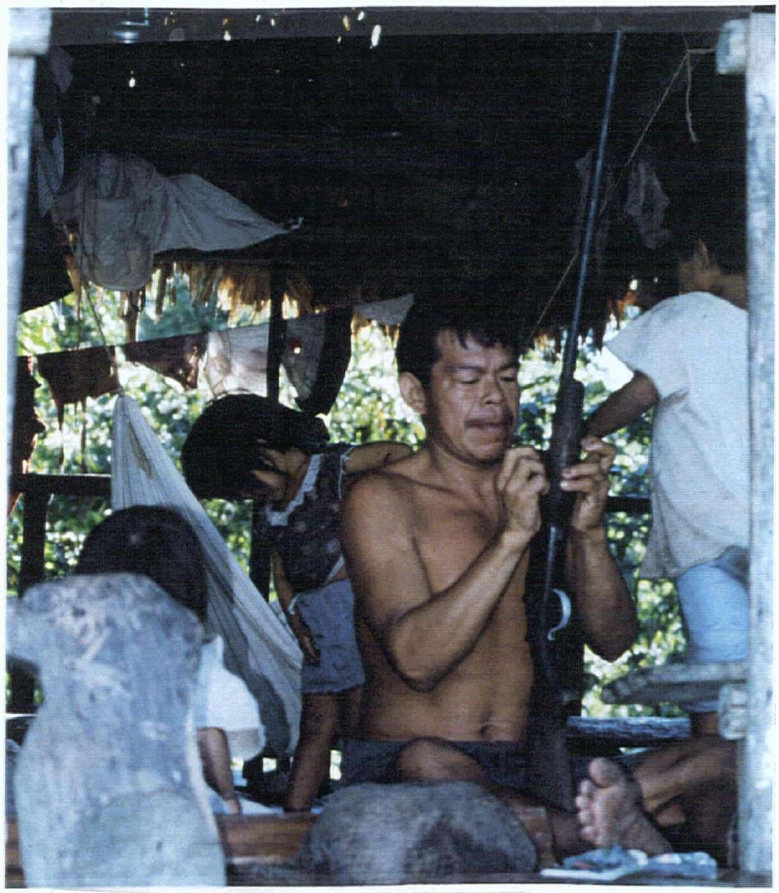


Photo 10. Francisco Shuna Cumari maintains the only shotgun in the community of Suni Miraño.

Photo 11. Cassava, *Manihot sculenta*, is the main source of carbohydrates and a staple food in Suni Miraño.

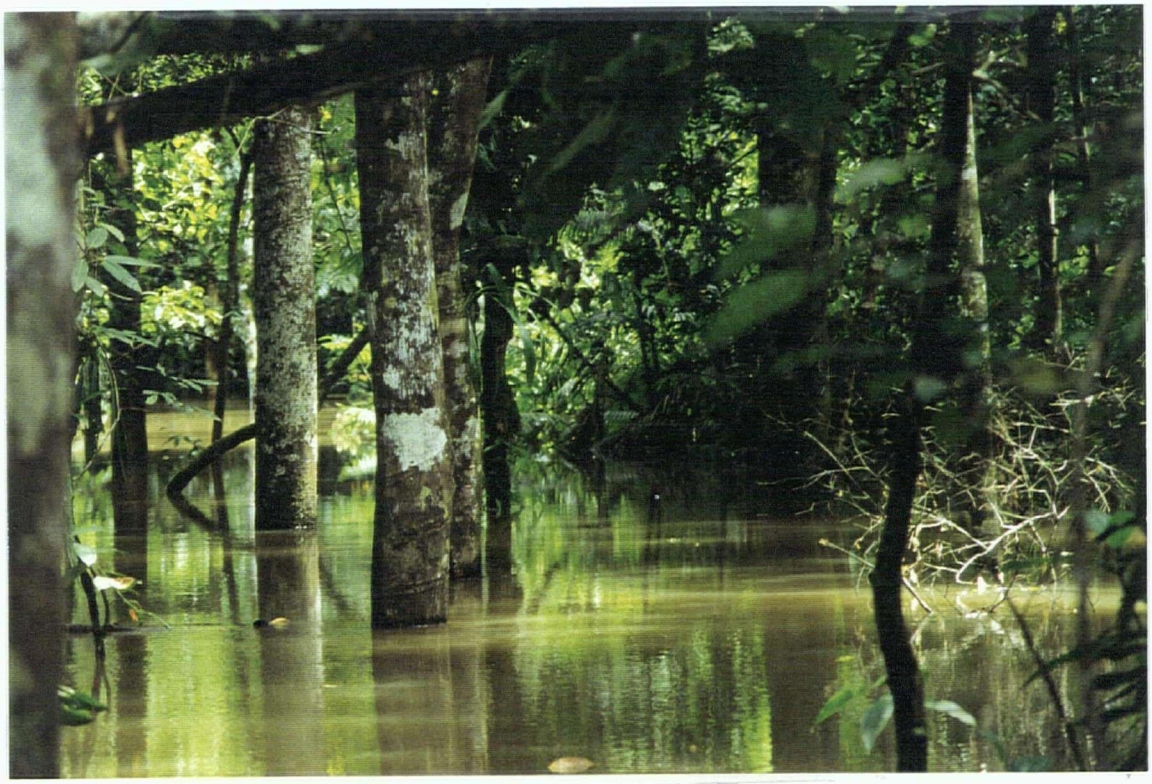


Photo 12. Flooded forests around Suni Miraño

Photo 13. Manuel Acho, during an ayahuasca preparation, pounds the stems of *Banisteriopsis caapi*

Photo 14. Manuel Acho adding leaves of **"chacruna"**, *Psychotria viridis*, to the ayahuasca brew.

Photo 17. Elder, Carlos Rios Rojas

Photo 18. Elder, Rosa Manuyama Icahuate

Photo 15. Elder and midwife, Luzmila Figueroa Rengifo and her grandchildren.

Photo 16. Elder and community leader, Elsibiades Pinedo Panduro.

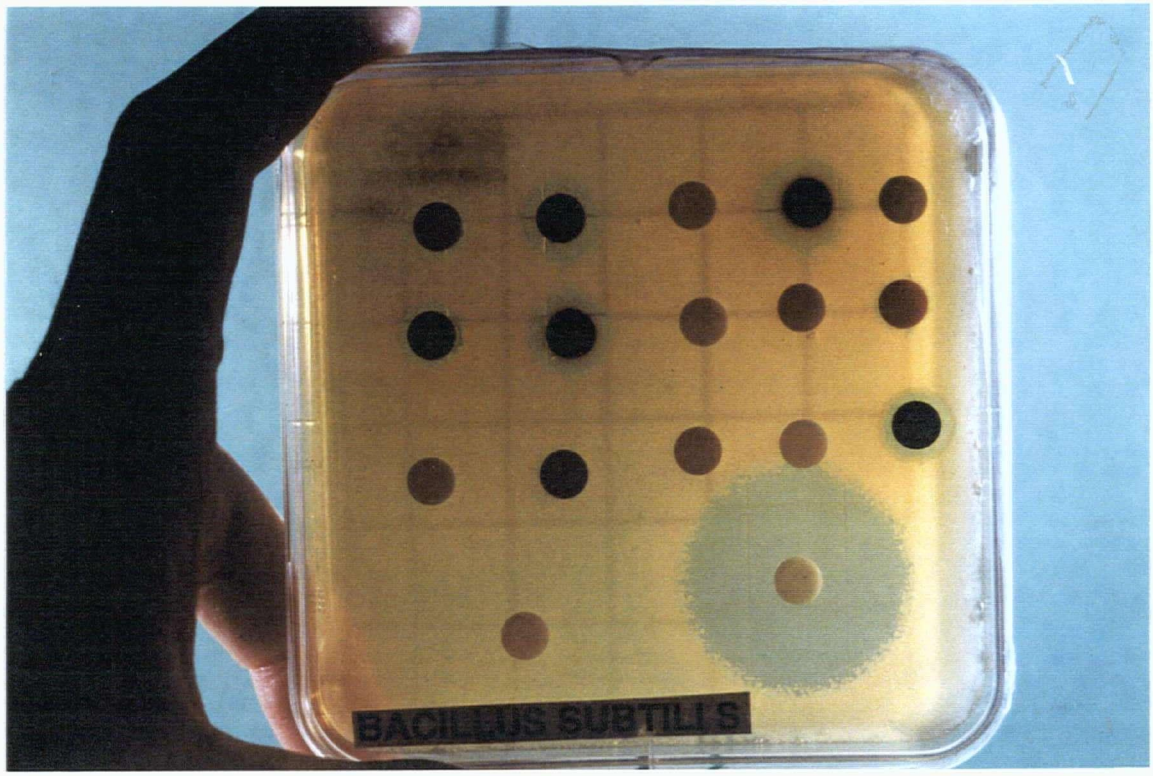


Photo 19. Disk bioassay showing growth inhibition areas