The Dissertation Committee for Maria Grace Fadiman certifies that this is the approved version of the following dissertation:

Fibers from the Forest:

Mestizo, Afro-Ecuadorian and Chachi Ethnobotany of *Piquigua (Heteropsis ecuadorensis,* Araceae) and *Mocora (Astrocaryum standleyanum,* Arecaceae) in Northwestern Ecuador

Committee:

_____
William E. Doolittle, Co-Supervisor

_____
Francisco L. Pérez, Co-Supervisor

_____
Beryl B. Simpson

_____
Gregory W. Knapp

_____
Kenneth R. Young

_____
Bradley C. Bennett

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by

Maria Grace Fadiman, B.A., M.A.

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I would like to dedicate this work to Dr. Bill Doolittle. His interest and support has been central to my time here.

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Fibers from the Forest: *Mestizo*, Afro-Ecuadorian and Chachi Ethnobotany of *Piquigua (Heteropsis ecuadorensis,* Araceae) and *Mocora (Astrocaryum standleyanum,* Arecaceae) in Northwestern Ecuador.

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This dissertation explores the uses of two tropical rainforest plants by three different people living in one common area. The setting is the Mache-Chindul Ecological Reserve in northwestern Ecuador, an environmentally sensitive area and hot spot of biodiversity. The two plants are *Heteropsis ecuadorensis,* Araceae, and *Astrocaryum standleyanum,* Arecaceae, known locally as *piquigua* and *mocora*, respectively. They are used principally for their fibers. The three people are the indigenous Chachi, and two ethnically distinct groups of colonists, *mestizos* and Afro-Ecuadorians.

Previous studies in ethnobotany have looked mainly at indigenous people's use of wild plants. This study is significant in that it not only examines the practices

of an indigenous people who have lived in the area for centuries, but it compares their activities to those of two different groups of relative newcomers.

The issues of culture and conservation versus economics and development are explored in regard to non-timber forest resources. Collection of plant materials as well as their use is investigated, particularly in regard to resource sustainability and the potential for generating income. Plant densities, population structures, growth rates, and edaphic characteristics are examined. Findings of this study challenge some long-held notions about specific peoples' attitudes toward and use of the environment. Most importantly, this dissertation finds recent interlopers may have a greater conservation ethic than do the indigenous people. Implications are discussed.

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CHAPTER I
INTRODUCTION AND CONTEXT

This research has two main goals. The first and most important goal is to explore the uses of *piquigua (Heteropsis ecuadorensis,* Araceae), and *mocora (Astrocaryum standleyanum,* Arecaceae) by *mestizos,* Afro-Ecuadorians and indigenous people of Ecuador. Looking at resource use can be a valuable way to learn more about peoples' relationship to their surroundings. A comparative study facilitates understanding of different peoples' conservationist practices. The other goal is to explore the possible use of these plants as non-timber forest products in economic development. By dealing with the broad issues of humans in relationship to the biophysical environments, this study in inherently geographic (Alberts 1997). By focusing specifically on the relationship between plants and people, this is a study in ethnobotany (Balick and Cox 1977).

Two broad categories have emerged within ethnobotany, one is utilitarian the other is theoretical or philosophical (Bennett 2002; Berlin 1992). Traditionally, environmental scientists fall into the utilitarian camp, studying the uses of plants identified scientifically. Alcorn (1995) discusses the baseline for this kind of study. She writes that there is an applied goal for humans to develop new plant-derived products. Social scientists involved in ethnobotany often work from the philosophical

side, and emphasize the human dimension of the relationship. They look at rules and categories that order the universe of plant use and classification (Balée1994; Berlin 1992; Ford 1994).

As established as these two perspectives are, scholars are increasingly trying to incorporate both of these approaches in their studies. Davis (1991:342), who has studied plants as an anthropologist and as a botanist, wrote that the discipline of ethnobotany is expanding to include "…an intellectual perspective that views both the plants and their utilization as but a metaphor for understanding the very cognitive matrix of a particular society." Geography, by including the physical and cultural worlds, encompasses both of these views.

From within the discipline of geography and utilizing the practices of ethnobotany, I address the question of how to balance forest conservation with resource utilization. A key issue here is resource use among and between groups. This includes looking at reality in comparison to commonly held perceptions about groups and forest resource use and conservation. Any people living in forested lands can act as protectors, destroyers, or both. This study explores the commonly accepted theory that colonists are more detrimental to the forest than are indigenous people (Browder 1995; Nepstad et al. 1992). It also explores the lines of thought that little difference exists in resource use between groups (e.g., Alvard 1993; Heinrich 1997; Sierra 1999), and that indigenous practices have intense landscape altering potential or impact (Davis 1996; Denevan 1992; Johnson 1989; Mann 2002).

I address these issues by looking at how three ethnic groups in northwestern Ecuador use two particular rain forest plants. Two of the groups are colonists, one *mestizo* and one Afro-Ecuadorian. The third is an indigenous group known as the Chachi. I look specifically at how these people use two different fibrous plants in the Mache-Chindul Ecological Reserve.

SIGNIFICANCE

This study is significant, partly because of its geographical location. The Mache-Chindul Ecological Reserve in northwestern Ecuador encompasses forest considered to be in one of the hot spots of biodiversity. This area is of particular importance not only because of its high biodiversity, but also because so little of the forest remains. Thus, protection of this area and sustainable resource use by its residents are goals of both development and conservation organizations working in the area. The two subject plants of this study, a palm and a hemiepiphyte--a plant that germinates on the forest floor, grows up a support, produces feeder roots and then loses its initial growing stem's connection to the ground (Croat, 1988, Madison 1977; Putz and Holbrook 1986)-- can be collected in such a way that the plants continue to grow after harvested parts have been removed. In principle, these materials can be used sustainably as commercial non-timber forest products (NTFP). Whether or not they can be used for economic gain, an understanding of the use of these plants is important in order to gain insight into the peoples' use of their surroundings.

Furthermore, in certain instances these plants may already be helping to maintain a balance between forest conservation and people's use of their resources. The significance of this study includes a better understanding of the people and the resources in the Mache-Chindul Ecological Reserve. This includes the people's culture, perceptions, ethnicity, and conservation practices.

Understanding the people, who live on the land, is crucial for any kind of conservation success. Various researchers support the inclusion of local knowledge for effective conservation practices (Bennett 2002; Castillo 1992; Plotkin 1992; Posey 1992a; Redford et al. 2003; Voeks 1997,1998; Young and Zimmerer 1998). One way to look at plant use and extraction is in terms of NTFPs. Part of this assessment is to determine if they are economically advantageous and can be collected sustainably. This study provides data on the current and future commercial value, and how collectors extract these resources. And, equally important, this study looks at obstacles that may prevent people from pursuing economic gains from these materials. In the latter case, efforts should then be taken to prevent the species' depletion, and not expend energy and effort on trying to promote them as profitable NTFPs.

This dissertation adds to the growing body of ethnobotanical literature about NTFPs, which researchers in the discipline are requesting (Boot and Gullison 1995; Godoy et al. 1993; Godoy and Bawa 1993; Gould et al. 1998; Hoffman 1997; Nepstad and Schwartzman 1992; Peters 1994; Plowden 2002; Schmink, et al. 1992;

Shanley et al. 2002). In these requests, special emphasis is placed on increasing knowledge about less studied areas of the world (Godoy et al. 1993; Godoy and Bawa 1993). This work provides previously unrecorded information from a part of Ecuador, the northwest, in which far fewer studies have been conducted compared to other Ecuadorian regions, such as the Amazon and the Andes.

Most importantly, this research explores and determines the non-monetary value of *piquigua* and *mocora* for the *mestizos,* Afro-Ecuadorians and Chachi. These plants are central to the ways of life of all these resident groups of the Mache-Chindul Ecological Reserve. Independently of economic benefit, these people place great importance on *piquigua* and *mocora.* It is crucial to understand these inhabitants' plant use in order to understand their lives in the context of resource use (Balick and Cox 1997; Bennett 2002; Minnis 2000; Posey 1992b; Voeks 1997, 1998). As cultures continue to change and evolve, much of this knowledge is being lost. In order to have a record of how these people currently live in regard to their surroundings, descriptive studies need to be conducted today (Balick and Cox 1997; Cox 1999; Plotkin 1992; Schultes 1998; Voeks 1997; 98).

This dissertation focuses on weaving crafts, especially basketry. Basketry can be considered a focal artifact in analyzing the material culture of a people. Woven containers not only tell of artistic style, but also the use of the article, and about the people who utilize and weave this product. It is particularly important to capture information about basket-weaving cultures today, because in many areas it is a dying

craft (Joyal 2003). Furthermore, baskets are most often made from materials collected from wild species, and as Joyal (2003) writes, "A synthesis of basketry ecology will lead to a better understanding of the relationship of baskets and weavers to the traditional management and conservation of wild-harvested plant resources". This work does pay particular attention to the collection of these wild materials.

The plants on which this dissertation focuses are important. *Piquigua* is significant, because it is in the widely used genus, *Heteropsis,* and is one of the most important wild plants in the reserve. Because this genus has species in other parts of Latin America that are also widely used, scholars are interested in how to best manage this genus (Salick 2002). This plant has never been studied in the Mache-Chindul Ecological Reserve. *Mocora,* although recognized for its basketry uses in Panama and for numerous articles in other parts of Ecuador, has similarly yet to be studied in the Mache-Chindul Ecological Reserve. Moreover, for both plants, emphasis has not been placed on different ethnic uses, as it is in this study.

This dissertation provides an example of different ethnic groups' forest use. Much emphasis has been previously placed on indigenous forest use. This study expands the understanding of land utilization to include newer immigrants. As colonists are continuing to occupy forested reserves, it is becoming increasingly important to better understand how immigrants utilize the land on which they settle. Specifically, studies of resource use are particularly pertinent. Furthermore, in reference to the Chachi, the plant resource studies that have concentrated on this

indigenous group, focused on their use of the Panama hat palm, *Carludovica palmata*, Cyclanthaceae. Little focus has previously been on this indigenous group's use of other fibers (Alarcón 2000; Barrett 1994; Bennett 2002).

This dissertation also challenges some previously held notions about resource use by indigenous people and colonizers. In so doing, it better illuminates the reality of the people who live in the area and their actual practices. How to incorporate the people who live within a reserve to achieve conservation goals is a challenge with which governments and conservationists are working throughout Latin America and the world (Southgate 1998). This research serves as a case study of an ecological reserve and how the people within it live with their surroundings. These insights may extend beyond the borders of these specific groups, and this region, to forest dwellers in reserves worldwide.

STUDY PLANTS

Fibers are important worldwide for domestic use, and many have a large market potential (Duke 1992; Padoch 1987). Climbing plants, such as those in the family Araceae and erect plants, such as those in the family Arecaceae, are both important life forms that provide fiber and other products for humans throughout the world. They are particularly important in the tropics, and lend themselves to being utilized as NTFPs.

Climbing Plants

Throughout the world people find climbing plants useful (Phillips 1991). The fact that there are studies that concentrate solely on a group's use of climbing plants demonstrates their ethnobotanical importance. Examples of studies focusing on climbing plants include: Paz y Miño et al. (1995) on the ethnobotany of the vines for the Siona-Secoya Indians, and Bennett's (1992b) on the use of lianas and epiphytes by the Shuar, both in the Ecuadorian Amazon. Researchers consider climbing plants found in numerous families important, and one family that figures prominently is the Araceae (Bennett 1992b; Bown 1988; Mayo et al. 1997). *Heteropsis* emerges as an important genus in many studies of useful plants (Acero-Duarte 1982; Alarcón2000; Barrett 1994; Davis and Yost 1983; Glenboski 1983; Hoffman 1997; Madison 1979; Milliken, et al. 1986; Milliken and Albert 1997; Paz y Miño, et al. 1995; Plowden 2002; Salick 1992) although only a few ethnobotanical studies have been conducted on *Heteropsis ecuadorensis*. However, as will be seen, this species is important to groups living in lowland forested regions of Ecuador (Alarcón 2000; Barrett 1994).

Erect Plants

Discussions of useful plants in the tropics typically include erect plants, often palms. Not only are palms an integral part of natural ecosystems, but they also have many human uses (Bennett and Hicklin 1998; Bennett et al. 2002; Corner 1966; Balick 1988; McCurrach 1960; Moore 1973b). Some of the most common palm

products are vegetable oil, wax, coconuts, and dates. Additionally, there are many lesser-known yet important uses, such as baskets, blowpipes, bows, clothing, construction material, drinks, dyes, fiber, flour, food, fuel, hammocks, loincloths, mats, magic, medicines, paper, perfume, resins, oils, ornaments quivers, starch, stimulants, vegetable ivory, and waxes (Balick 1986; McCurrach 1960; Moore 1973b; Pedersen 1991; Schultes 1990; Tomlinson 1990).

Various studies address the ethnobotany of palms in the genus *Astrocaryum* (Balick 1988; Bernal 1992; Boom 1988; Borgtoft Pedersen 1994; Dahlgren 1944; Duke 1970; Gómez, et al. 1996; Jensen 1997; Jensen and Balslev 1995; Pedersen 1991; Pedersen and Balslev 1992; Schultes 1974; Vormisto 2002; Wheeler 1970) and scholars have also looked at the ethnobotany specifically of *Astrocaryum standleyanum* (Acosta Solis 1944,52; Bernal 1992; Borgtoft Pedersen 1994; Bustos-Gómez 1994; Dahlgren 1944; Duke 1970; Forero Pinto 1980; Galeano and Bernal 1987; Henderson et al. 1994; Palacios Santa Maria 1993; Patiño 1977; Pedersen and Balslev 1992; Runk 2001; Usma et al. 1996; Warner 1996). Although this species is an important resource to all households in the Mache-Chindul Ecological Reserve, no previous research has examined the utilization of *Astrocaryum standleyanum* by different people living in one area.

NON-TIMBER FOREST PRODUCTS

In looking at ways to balance forest utilization and preservation, this study is in part situated within the larger concept of sustainable forest use**.** Considering both the benefits and drawbacks of non-timber forest products (NTFPs) provides a framework in which to look at people's use of *piquigua* and *mocora* in Ecuador. Experts consider deforestation to be a major environmental crisis (Anderson 1990a; Barbier and Burgess 2001; Myers 1988; Prance 1997; Sierra and Stallings 1998; Southgate 1998; Zhang et al. 2001). Deforestation in humid tropical zones is particularly detrimental because the vegetative biomass stores the majority of the available nutrients. Thus, the soil can become depleted when people clear the land (Myers 1988; Turner 2001; Whitmore 1998). Loss, however, is not limited to soil fertility. Forest clearing reduces the germplasm that is useful for food crops, pharmaceuticals, and industrial materials (Peters, et al. 1989; Poore 1973). Beyond geochemical cycling and biodiversity, deforestation also affects the people who live within this ecosystem. Forest residents lose the environment to which their culture is best adapted (Anderson 1990a).

Deforestation has several interrelated causes. It can, for example, be the result of a deliberate effort to increase a country's income. The difficult economic situation in Ecuador (EIU 2002), has lead both the government and local people to look toward any resources that can boost their incomes. Ecuadorians often look to their raw

materials as export items. Consequently, tropical timber has become a lucrative business, providing income and jobs in a country that has little of both. In the 1970s, timber became an important commodity in northwest Ecuador (Carrasco 1988) and logging has since been steadily increasing (Sierra 1998; 1999; INEFAN 1998). Local households do much of the tree cutting in the Esmeraldas region. This activity provides one of the few opportunities to earn money.

People often have conflicting interests concerning forested areas. Logging and conservation are the interests that most often come into contention. Interested parties are exploring ways to preserve landscapes through a balance of conservation and utilization (Pérez 1998). Many conservation and development organizations are now searching for forest products that can provide economic incentive for long-term preservation of ecosystems (Anderson 1990b; Nepstad and Schwartzman 1992). A phrase that many organizations working with development, conservation, and business have adopted is "sustainable resource use" (Brooks 1993). An example of this is non-timber forest products (NTFP). These are "all biological materials other than timber which are extracted from forests for human use" (NTFP 2002). NTFPs provide a popular model for sustainable forest use, because they can potentially reconcile people's need to earn an income while still maintaining a relatively healthy ecosystem (Anderson 1990b; Anderson and Ioris 1992; Browder 1989; Nepstad and Schwartzman 1992; Prance 1989; Shanley et al. 2002). The general trend in the 1970s and 1980s of linking development and conservation added impetus to NTFPs

(Schmink et al. 1992). In the late 1980s, the concept of NTFPs became particularly popular after the murder of Chico Mendes, a Brazilian rubber tapper leading a movement to protect forests from cattle ranchers (Godoy and Bawa 1993; Nepstad and Schwartzman 1992). The economic value of NTFPs then began to be studied seriously, with one of the initial important works being conducted by Peters, Gentry, and Mendelsohn (1989), looking at the economic value of NTFPs from a one-hectare plot in lowland Peruvian rainforest.

Today, the importance of NTFPs has gone beyond economics and ecology. Plants provide the basis for forest dwellers' material culture and are intrinsically linked to these people's culture. This is crucial when looking at conservation. With any effective kind of preservation, conservationists need to understand the people living on the land with which they are working (Bennett 2002).

PROS AND CONS OF NTFPS

The concept of non-timber forest products has both advantages and disadvantages. In one way, the concept of NTFPs has appeal because interested parties can potentially gain what they want from the forest. Typically, marginalized groups in rural communities can collect, use, and sell their own goods, thus playing an active role in the forest and their own conservation (Hall and Bawa 1993; Prance 1997). Because many of these people already rely on forest goods, the concept of working with NTFPs is familiar to local residents (Balée 1994; Bennett 1992a; Duke

1992; Godoy and Bawa 1993; Padoch 1987). Humans have long been a part of the ecosystem and evidence suggests that some, and perhaps all, tropical forests have been long been historically altered by people (e.g. Colfer 1997; Balée 1994; Denevan 1992).

As well as having conceptual and cultural value, NTFPs can offer an economic incentive, which is a powerful agent. The maintenance of forest functions such as carbon storage, maintenance of water and nutrient cycles, diversity, and conservation of cultural heritage are somewhat abstract, but market value is a concept more readily understood by most people (Gillis 1992; Godoy, et al, 1993; Nepstad and Schwartzman 1992; Prance 1997; Sinha and Bawa 2002). NTFPs show economic potential, with numerous studies proving that it can be more economically viable to use a forest for NTFP collection instead of cutting it down for timber (Allegretti 1990; Anderson 1990b; Balick and Mendelsohn 1991; Nations 1992; Nepstad and Schwartzman 1992; Peters et al. 1989; Plotkin and Famolare 1992; Prance 1997; Shanley et al. 2002). Some proponents envision moderate amounts of goods being sold, generating relatively small economic returns (Anderson 1990b; Gentry 1992a: Shanley et al. 2002). Others, however, see larger scale profits at the country level (Padoch 1987), and some even look internationally (Bennett 2002).

Although NTFPs show promise, there are drawbacks to this concept as well. Long-term commercial harvest has ecological, social, and economic limitations (Pendleton 1992). One of the main concerns is the danger of overexploitation by over

harvesting target species (Bennett 2002; Coomes 2003; Godoy et al 1993; Godoy and Bawa 1993; Gould et al. 1998; Hall and Bawa 1993; Hoffman 1997; Nations 1992; Nepstad, et al. 1992; Sinha and Bawa 2002). Over-collection can affect the resource at the level of the individual plant, population, and species (Bennett 1992a). Furthermore, the impact of over collection can affect not only the resource, but the surrounding forest as well (Anderson 1990b; Hall and Bawa 1993; Nepstad, et al. 1992). Although economic benefits increase with high demand, so does the potential for over harvesting (Hanson 1992). Thus NTFP exploitation may only be sustainable in areas where there are low human population densities. Clearly this limits the strength of NTFP use as a widespread solution to deforestation (Homma 1992).

As well as affecting plant communities, NTFP extraction can have dramatic results on human populations. A product can become so popular that the market encourages its cultivation in plantations. Crop plantations can work well. However, they can also lead to pest infestation, soil depletion, and the clearing of forested land in order to plant the crop (Berry 1978; Southgate and Whitaker 1994). If a group becomes dependent on plantation products that then fail, they not only lose income, but they lost forest from which they could have gathered other products.

Furthermore, success of an NTFP can also lead to a bust through synthetic substitution. The product may become so popular that companies learn to produce the material themselves. In this situation, they then would not have to purchase the materials from forest collectors. The people, who had been gathering, would then no

longer be able to rely on that NTFP as a source of income. When people have developed an economy surrounding the collection of an item, there is economic disruption when that avenue is no longer available. Similarly, this livelihood can attract so many people to collect and process the product that it encourages colonization into the very areas that conservation groups are trying to protect (Homma 1992; Southgate 1998). Even if the area colonized is not one of environmental interest, it can still cause complete community dislocation. This kind of social disruption occurred with the rubber trade (Padoch and de Jong 1990). As happened with influential NTFPs such as rubber, it should always be remembered that the danger of violence is a possibility (Davis 1996).

Marketing and balancing income distribution for NTFPs can be complicated. There are many people involved, and the power structure is not equal. The person earning the least is generally the collector and, in many cases even the middlemen earn little (Hall and Bawa 1993; Padoch 1992). Furthermore, assessments by Godoy and Bawa (1993) about how much money can be earned, raise doubts that participants are gaining as much as various studies have estimated.

There are numerous reasons for these economic weaknesses: the basic inadequacies of the market (Bennett 2002; Padoch and de Jong 1989; Southgate 1998), the trends of booms and busts (Homma 1992), and the difficulties in transporting materials and goods (Homma 1992; Padoch and de Jong 1989; Southgate 1998). Also, because tropical forests are so heterogeneous, many plants of the same

species grow at a considerable distance from each other. Because of the time and energy required to travel between plants, collectors can find it difficult to obtain enough material to make it worth their effort. Collectors are usually so economically destitute that they will choose the activity that generates the most income for their effort, often regardless of destructive results. Thus, in certain circumstances, local people may not choose to collect NTFPs (Browder 1995).

In order to overcome the barriers that NTFPs face and to take advantage of the benefits, collection and processing need to occur within a system that integrates local plants and products with good ecological management (Bennett 1992a; 2002). More research needs to be conducted along these lines (Godoy et al. 1993; Godoy and Bawa 1993; Nepstad and Schwartzman 1992).

To increase NTFP success, the biological and social sciences need to pursue case studies that focus on extractive economics and the existing and potential uses of tropical forest and fauna (Butler 1992; Gould et al. 1998; Hoffman 1997; Plowden 2002; Schmink, et al. 1992). Studies should determine if a material is useful, marketable, and can be collected sustainably (Boot and Gullison 1995; Godoy et al. 1993; Godoy and Bawa 1993; Gould et al. 1998; Peters 1994; Shanley et al. 2002).

Relatedly, scientists also need to carefully assess the reality of the economic potential of each NTFP (Bennet 1991; Coomes 2003; Plowden 2002). Looking at the market includes analyzing transportation, availability, seasonality, and the role of middlemen (Gould et al. 1998; Padoch 1987; Southgate 1998). Of these, location and

transportation are crucial to the success of an NTFP. If a location is close enough to a market, or there is efficient transportation, then there is much more potential that item will do well. However, if the distance is too far, and transportation is not adequate, then there is little chance of success (Bennett 2002; Shanley et al. 2002; Southgate 1998). Researchers can properly evaluate species most effectively by combining local and scientific knowledge (Bennett 2002). Godoy et al. (1993) mention that future studies should concentrate on understudied kinds of NTFPs and geographic locations (Godoy et al. 1993). An important and understudied aspect of plant use, according to Toledo (1995), is craft making. This can be particularly illuminating with basketry (Joyal 2003). Furthermore, it is equally important to discover if a plant is not a good NTFP, so that energy and time is not wasted on poor candidates.

In addition to economics, the non-market value of NTFPs should be part of all studies (Bennett 2002; Nepstad and Schwartzman 1992). The importance of learning about the ethnobotany of plant material should not be limited to its obvious economic contributions. As Bennett (2002:294) writes, "While the natural biota yields material provisions for market economies, it has even greater significance for traditional cultures, who collect and directly use biological resources." Although domestic use does not produce income, it can lessen the need for disposable cash; locals can make certain articles for themselves. These people then have fewer items that they need to purchase. Non-market value can also indirectly lead to a better understanding of

market value. A possible outcome of looking at plants in this way, can lead to the discovery of new, previously unexploited market items.

Also, since everyone is not tied to a market economy, another advantage of studying plant use beyond the interest of economic return is that researchers better understand the culture of the people with whom they are working. Balick and Cox (1996) wrote that plants are the basis of material culture, and are a central part of understanding people. As conservationists are paying attention to the ethical rights of people who live from the land to maintain their own cultures, understanding these people's culture through plant use is crucial (Bennett 2002). In order to work out feasible conservation plans, scholars must realize that ethnobotany is part of who locals are and how they interact with their land (Fondoun and Manga 2000). As a way to learn about culture, material elements are particularly important. Joyal (2003) discussed the specific importance of baskets not only as source of income, but also as material expressions of culture. The importance of a plant or plant-derived product to a people's owns culture can be far more significant than what could ever be expressed in monetary terms (Bennett 2002).

This dissertation is an ethnobotanical study of the use of two study plants used by the three groups of people living within one understudied area. Following a description of the study area and the subject people, subsequent chapters deal with research methodology, basic ethnobotany of the two plant families and genera,

peoples' use and collection of the plants in and around the Mache-Chindul Ecological Reserve, current growth and densities of both plants, and conclusions.

CHAPTER II
STUDY AREA

ECUADOR

Ecuador is a country measuring 283,560 km^2 bounded by Colombia on the north, Peru on the south and east, and the Pacific Ocean on the west. Additionally, an archipelago, the Galapagos Islands, is located about 1,000 km to the west in the Pacific Ocean is part of Ecuador. Ecuador, extending between 1° 27' N, 5° S, and 77° 30' W, lies across the equator, the location for which it is named (Figure 2.1). The mainland can be divided into three ecological zones: the coast, the sierra and the Amazon. The coastal zone is about 150 km wide, extending approximately 1,000 km from the Gulf of Guayaquil to the south, and to the city of San Lorenzo in the north. The highest elevations in this region are the mountain summits that are mostly between 400 and 600m in elevation with a few isolated peaks above 800m. Two mountain ranges comprise the sierra, the Eastern and the Western cordilleras, both containing numerous active and dormant volcanoes. The highest elevation is Mt. Chimborazo at 6,267 m. The Oriente, or the Amazon, covering 130,000 km^2, lies to the east of the Andes and is characterized by high rainfall, dense vegetation and an extensive river system. The rivers in the area culminate in the Amazon River, for which the region is named (Knapp and Caviedes 1995; Neill 2003; Whitten 1965; Zendrón 1997).

Figure 2.1. Map of study country, Ecuador.

Location

The Mache-Chindul Ecological Reserve is located principally in the province of Esmeraldas with its southernmost part extending slightly into the province of Manabí (Figure 2.2). 111,000 hectares were designated as this Ecological Reserve in 1996 (INEFAN 1998). Located in the northwest of Ecuador, Esmeraldas has borders with the provinces of Carchi, Imbabura, Pichincha, and Manabí to the east and south. In the west the Pacific Ocean borders the province, and to the north Colombia (West 1957; Whitten 1974). Topographically, the reserve stretches from the northern slopes of the western cordilleras and then grades into an alluvial delta, with two large river basins, the Esmeraldas in the south and Santiago in the north (Figure 2.3) (Novoa 2001; Zendrón 1977).

Two local mountain ranges, the Mache and the Chindul, are the features for which the reserve is named. These ranges parallel the Pacific coast, covering the southwestern part of the Esmeraldas province and the northern part of the Manabí province (Aguirre et al. 2000). The reserve is located between 79º 30' and 80º 15' W and 00º 45' N and 00º 30' S (Aguirre et al. 2000; Gavilanes et al. 2000; INEFAN 1996, 1998). Within the government reserve, the Ecuadorian NGO, Fundación Jatun Sacha owns and manages the private 1,400-hectare Bilsa reserve (INEFAN 1996, 1998).

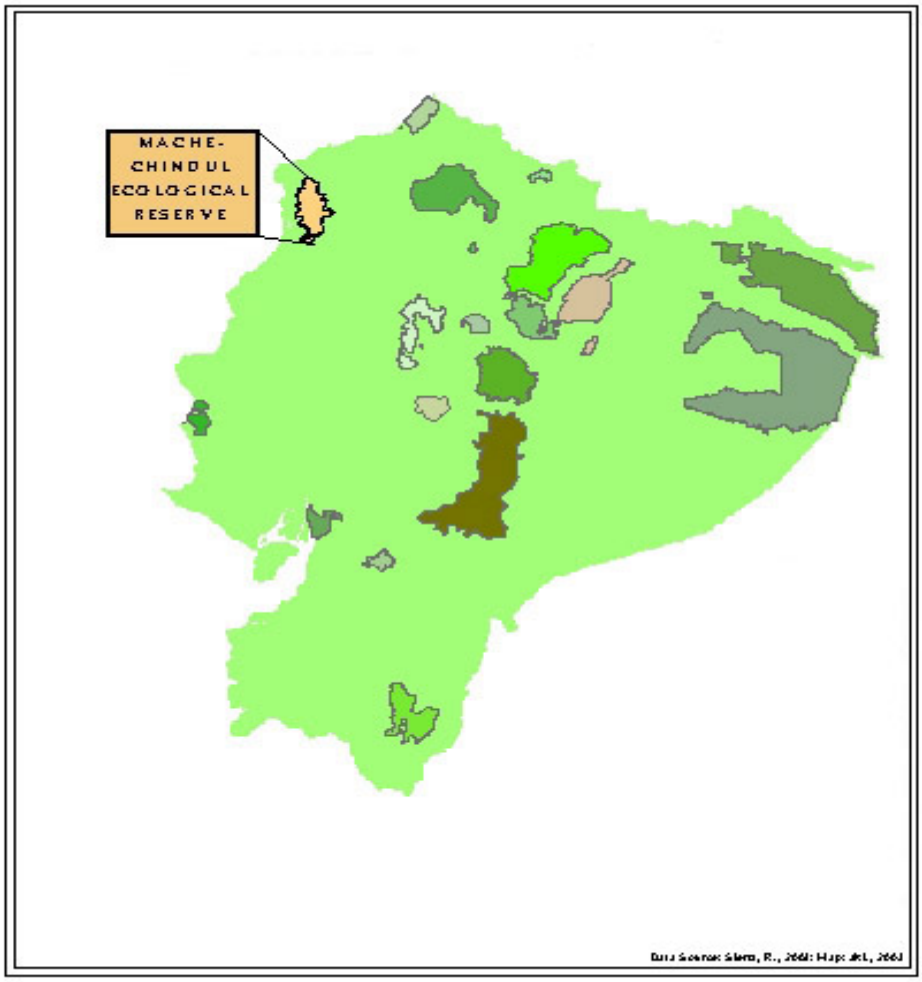

Figure 2.2. Protected areas in Ecuador with the Mache-Chindul Ecological Reserve highlighted.

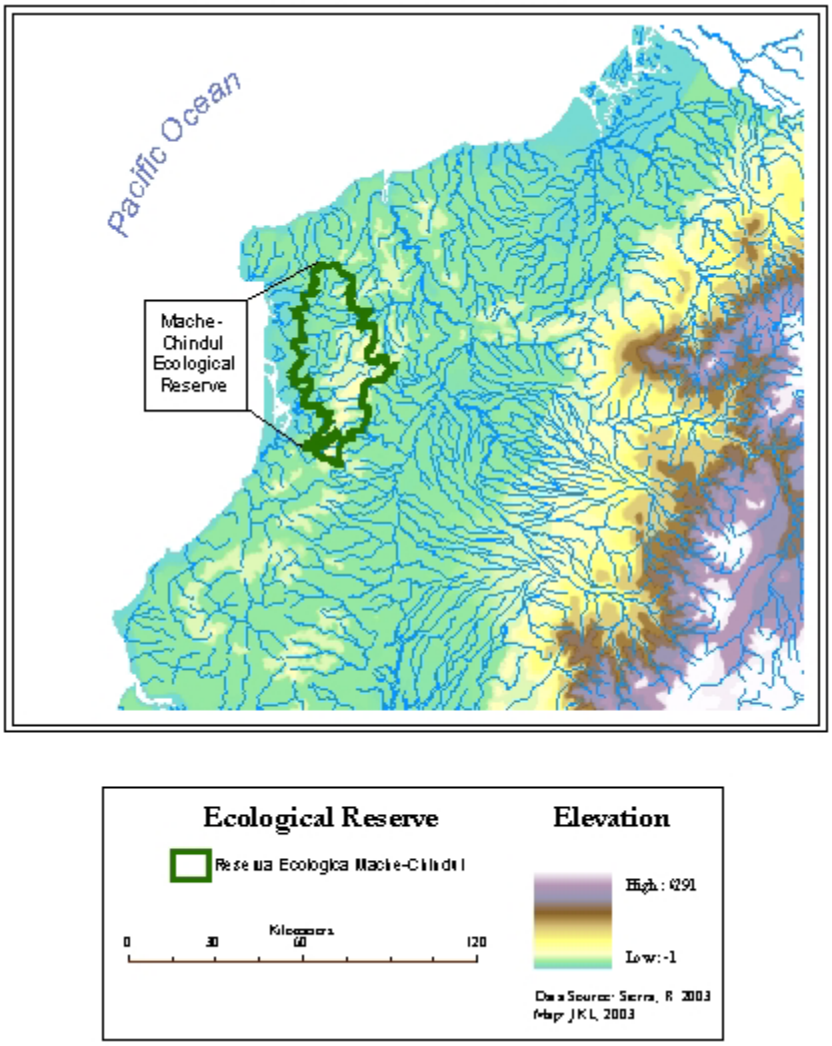

Figure 2.3. Topography and major river systems of northwestern Ecuador with the Mache-Chindul Ecological Reserve highlighted.

CLIMATE AND TOPOGRAPHY

Esmeraldas is a humid area (Foster 1992; Sierra 1994). Between 2,000 and 3,000 mm of precipitation fall in the region each year. Much of this rain occurs between January and May, with the least amount falling between August and November. However, even during what are called the dry months, the atmospheric humidity averages 90%, and the land lies under an almost constant, low, cloud cover. A fairly constant temperature between 23 and 25 °C characterizes the tropical humid climate in the reserve. Temperature extremes can range from a low of 18° to a high of 36°C. Temperatures vary only slightly with elevation. Topographical relief ranges from 0 to 800 m, with undulating topography (Acosta-Solís 1977; Aguirre et al. 2000; Cañadas 1983; Dodson and Gentry 1978; Gavilanes et al. 2000; INEFAN 1996,1998; Winckell 1997; West 1957; Wolf 1975).

VEGETATION

The forest type for most of this area is considered lowland rainforest, characterized by tall, dense and evergreen vegetation. The canopy height is usually at least 30 meters (Acosta-Solís 1977; Aguirre et al. 2000; Comercio 2001; Dodson and Gentry 1978; Faber-Langendoen and Gentry 1991; Gavilanes et al. 2000; Gentry 1992b; Harling 1979; INEFAN 1996; Neill 2003). The forest above 700 m is cloud

forest, with an abundance of mosses, lichens, and epiphytes (Aguirre et al. 2000; Gavilanes et al. 2000; Gentry 1992b).

This area is of particular importance because of its high biodiversity. Regional experts consider this forest to be an extension of the Chocó in Colombia, one of the hot spots of biodiversity (CI 1992; Dodson and Gentry 1978, 1991;Gentry 1982; Myers 1988; Sierra 1994). Researchers also consider these western forests to have high degrees of endemism (Dodson and Gentry 1991; Foster 1992; Gentry 1992b: INEFAN 1996; Sierra 1994; Whitten 1974). Although the proportion of endemic plants in this region may be less than the initial 20% recorded by Gentry (1989) and Gentry and Dodson (1991), numerous endemic plants do grow in the region (Neill 2003). In 2000, the count was 538 endemic plant species (Valencia et al. 2000). Various endemic birds and mammals also live in this area (Almendáriz and Carr 1992; Emmons and Albuja 1992; Parker 1992). Furthermore, although similar to the Chocó, there are numerous species growing in this area that are endemic to Ecuador (Valencia et al. 2000).

The forest cover is not continuous. Some patches can be as large as 1,400 hectares, while others can be only a few hundred square meters. Forested areas are usually interspersed with homes and fields. Some tropical researchers believe that conserving even the small forest fragments that still stand in western Ecuador could protect large numbers of endemic species (Dodson and Gentry 1991; Faber-Langendoen and Gentry 1991; Gentry 1977).

The soils in western Ecuador on which these forests grow are mostly alluvial and volcanic (Dodson and Gentry 1991). In the Mache-Chindul Ecological Reserve they are in the order Alfisols, and the suborder udalfs (SECS 1986). They have a high, sticky, red to yellow clay content, especially on the steeper parts with better draining darker soils in the flatter areas (Acosta-Solís 1977; Aguirre et al 2000; Cañadas 1983; CDC 1995; Gomez 1989; INEFAN 1996; Wolf 1975). The soils in the area are quite acidic, with a pH 4.9-5.3, and are low in potassium and phosphorus (Gentry 1992b).

CHAPTER III
ETHNOHISTORY

Three groups of people live in and around the Mache-Chindul Ecological Reserve. These are *mestizo* colonists, Afro-Ecuadorian colonists, and indigenous Chachi people. For each group, I describe their history of arrival to the region and their daily life. The latter includes aspects of livelihood, home construction, language, religion, education, government and land tenure. These descriptions are based on personal observations, many of which have also been noted by other researchers whose work I use for cross-reference purposes. For additional information about the Afro-Ecuadorians see Alarcón (2000), Díaz (1978), Galeano (1996), Ribadeneira (1986), Speiser (1985, 1991), West (1952,1957), Whitten (1965, 1974), and Zendrón (1997); for the Chachi see Carrasco (1983), Barrett (1994), Benitez and Garcés (1990), Maldonado (1988), Medina (1992,1997), and Mitlewski (1989); and for the *mestizo*s see Alarcón (2000) and INEFAN (1996,1999).

Most of the research on the Chachi and Afro-Ecuadorians in Esmeraldas focuses on those communities living along the Cayapas River. Although I spent time in this northern area with both these people, and also with the Central Chachi living along the Canandè River, my descriptions focus on the Southern Chachi along the Viche River who live directly within the study area of the Mache-Chindul Ecological

Reserve and its immediate surroundings. Where appropriate, I note areas in which there are noticeable distinctions between the people in these three zones.

AFRO-ECUADORIAN HISTORY

Along the coastal region west of the Andes, from southern Panama through northern Ecuador, Afro-Ecuadorians comprise the majority of the population (West 1952; Whitten 1974). The ancestry of this group begins with Africans whom the Spaniards brought to Latin America through the slave trade. Beginning in the 1500s, traders brought people of African heritage to Latin America both directly from Africa, and from Europe where the slaves had already worked. To reach South America, they entered through the port of Cartagena (Colombia), in those days called Nueva Granada. The Europeans brought slaves principally to work in the gold mines, but the slave owners used some of the Africans for sugar plantations as well (West 1952; Whitten 1974; Novoa 2001).

In the Esmeraldas province, the commonly accepted history of the local Afro-Ecuadorians begins with an account by the traveler Miguel Cabello Balboa in 1583 (2001). Although disputed by Whitten (1965), various works cite this history as a plausible theory (Chiriboga 1992; Díaz 1978; Naranjo 1986; Novoa 2001; Rivera 1986; Savoia 1988; Villaquirán 1990; West 1957; Zendrón 1997). Cabello Balboa wrote that the first Africans to arrive in the region came on a slave ship that wrecked on the Esmeraldas coast in 1553. There were 20 to 23 slaves, 17 men and 3 to 6

women who escaped into the forest. They mixed with local indigenous people, whom researchers think were the Campaces or the Tiguas. Alonso de Illescas, a powerful individual who had already worked as a slave in Europe, led this group and developed their own nation. This free mixed community began to lose power in the 1800s, and the Afro-Ecuadorian population in the area gradually became comprised of slaves and ex-slaves (Savoia 1988; Speiser 1991; Villaquirán 1990; Whitten 1974).

The number of Afro-Ecuadorians in Esmeraldas increased because of the migration of escaped slaves from the local mines in Playa del Oro on the Cayapas River, mines in Colombia, haciendas in highland Ecuador, and those freed by their masters (Novoa 2001; Speiser 1985; West 1957; Whitten 1974). Throughout the years of slavery in the Esmeraldas region, there always lived a combination of free (either from the free communities or ex-slaves) and enslaved Afro-Ecuadorians (Whitten 1974). The number of Afro-Ecuadorians in the area increased even more in 1821 when Spain passed a law gradually emancipating slaves. In 1851 slavery was officially abolished and larger migrations of freed slaves coming from the mining areas in Colombia entered Ecuador. Some ex-slaves continued to work the mines in order to have jobs, while others were still virtually enslaved, working off debts for themselves and their parents (West 1952; 1957). The current Afro-Ecuadorian population in Esmeraldas now contains limited remnants of the free mixed race (Whitten 1974). The Afro-Ecuadorians were some of the first colonists to arrive in the Mache-Chindul Ecological Reserve. They came from the Canton of Esmeraldas, and

are relatively few, with only about three communities (Alarcón 2000; INEFAN 1996,1999).

CHACHI HISTORY

Approximately 7,600 Chachi live in the Esmeraldas province (Medina 1997). Various related Chibchan speaking people apparently lived in the region when the Spaniards arrived. In addition to the Chachi, these included the Coaiquer, Sindagua and the Chupa (West 1957), Niguas, Yumbos, Campaces, Lachas and Lalabas (Novoa 2001). The Chachi, the best-known surviving group in the area, often called Cayapas (now considered derogatory), lives between the Andes and the Pacific Ocean. Although their history is not well documented, most researchers agree that they were originally from the highlands, living on the western slopes of the Andean Cordilleras, near to Ibarra. The Chachi history or mythology is that they fled from either the Inca or the Spanish invasion. This group arrived at another highland site referred to as Pueblo Viejo. Pueblo Viejo is supposed to be located in the eastern foothills of the Andes, near the Santiago River.

It is theorized that after abandoning this site (the date is unknown), the Chachi migrated to the lowlands. They first settled along the Cayapas River in the canton of Eloy Alfaro, in what is now called the "northern zone". This is the largest area of Chachi habitation today, with approximately 5,000 Chachi living in 30 communities. In this area the villages are interspersed with numerous Afro-Ecuadorian

communities. From this site, in the 1940s some Chachi migrated into what is now called the "southern zone" in the canton of Muisne, now home to approximately 1,000 Chachi. These communities are San Salvador along the Sucio River, Balzar on the Cojimes River, and Río Bravo along the Viche River. Río Bravo is a few hours walk from one of the few Afro-Ecuadorian communities in this area. The last group to move, migrating to what is now called the "central zone" in the canton of Quiñenede in the 1960s, now number approximately 1,200 people. They live along the Canandé River, in the communities of Naranjal, Agua Clara, Nampi, Guayacana, and Las Pavas (Alarcón 2000; Barrett 1994; Benitez and Garces 1990; Carrasco 1983; INEFAN 1996, 1999; Maldonado 1988; Medina 1997; Naranjo 1986; Novoa 2001; Sierra 1994; West 1957).

***MESTIZO* HISTORY**

As is the case with *mestizos* throughout Latin America, *mestizos* living in the Esmeraldas region of Ecuador have European and indigenous ancestry. The *mestizo*s who now live in the Mache-Chindul Ecological Reserve migrated mostly from the provinces of Loja and Manabí. In both cases, they began to move in during the 1950s, searching for available land to farm. *Mestizo*s still continue to colonize the area. Some of the first settlers decided that the conditions were too difficult, and returned to their original provinces, selling their cleared land to newcomers. However, most people who have come to the region, stayed (INEFAN 1996,1999).

LIVELIHOOD: AFRO-ECUADORIAN, CHACHI AND *MESTIZO*

Although the Afro-Ecuadorians, *mestizos*, and Chachi all live in distinct villages, their livelihoods are similar. They are based on subsistence farming, supplemented by gathering forest resources and fishing. The most important food source that they grow is plantain (*Musa* spp., Musaceae). For the Chachi, the men help clear the fields, and sometimes plant, but care, harvest and transport to the house are the responsibility of the women. Chachi women carry plantain bunches with a tumpline (forehead strap) that they make from the main vein of the plantain leaf, while laying the plantains on the leaf blade laid on their backs. *Mestizo*s and Afro-Ecuadorians carry the harvest on their shoulders, and the work is less gender divided. *Mestizo* and Afro-Ecuadorians usually eat plantains boiled, baked or fried, while the Chachi most often eat them boiled and then pounded into balls or patties.

*Mestizo*s and Afro-Ecuadorians devote much time to rice production, while the Chachi grow little. The Chachi will sometimes trade their handicraft work for rice with the neighboring Afro-Ecuadorian communities. Those groups that do grow rice use a wooden mortar and pestle to hull the grain (Figure 3.1). Other food stuffs that all three groups plant are, cacao (*Theobroma* sp., Sterculiaceae), coffee (*Coffea arabica*, Rubiaceae), corn (*Zea mays,* Poaceae), peanuts (*Arachis* sp., Fabaceae), squash (*Cucurbita* sp., Cucurbitaceae), sugar cane (*Saccharum* sp., Poaceae), sweet banana (*Musa* sp., Musaceae), yucca (*Manihot esculenta,* Euphorbiaceae). They also

have fruit trees, some of which are guanábana (*Anona muricata,* Annonaceae), chirimoya (*Annona cherimola,* Annonaceae), breadfruit (*Artocarpus atilis,* Artocarpaceae), and the palms of tagua, (*Phytelephas macrocarpa,* Arecaceae) coconut (*Cocos nucifera,* Arecaceae), and Mocora (*Astrocaryum standleyanum,* Arecaceae).

Figure 3.1. Afro-Ecuadorian colonist using a wooden mortar and pestle to separate rice hulls from grain.

The agricultural technique, sometimes termed slash and mulch (West 1952; Whitten 1974) involves clearing the forest, and then planting. They leave almost all the cut material in the field, sometimes burning just the largest trees. They then allow the rotting material to help fertilize the fields. They do not plow or hoe, using sticks

and machetes to make holes in which to plant seeds. They clear the area a little more thoroughly to plant rice.

The *mestizo*s and Afro-Ecuadorians have raised planting beds, as do some of the Chachi. This is a practice found throughout Pacific lowland agricultural communities (Whitten 1974;West 1957). The beds are small gardens of annuals, herbs and chilies, grown on soil-covered platforms five to ten feet above the ground (Figure 3.2). The elevated platforms protect the plants from leaf cutter ants and chickens.

Figure 3.2. Raised planting bed.

For animal husbandry, all three groups raise chickens, ducks, sometimes turkeys, horses, and pigs. Some *mestizos* and Afro-Ecuadorians have a few head of cattle. The *mestizo*s and Afro-Ecuadorians have a limit on the number of pigs that they may raise, determined by their own community votes. The Chachi have not decided on a limit, and tend to have more for each household than do the colonists. Individuals within all three groups sometimes have guinea pigs, a custom adopted from the highlands. Each home will also have at least one dog, and sometimes cats. To supplement their household meat, they hunt. This is often an opportunistic activity, carrying their guns with them while pursuing other activities (Figure 3.3). They most often hunt agouti, toucans, guan (wild tree turkey), spiny rats and opossum.

Fishing is also an important activity amongst these people. The way that all three groups fish is to is to use a woven circular weighted nylon throwing nets. The *mestizo*s and Afro-Ecuadorians throw while standing knee deep in the river, while the Chachi also throw from canoes. Additionally, all groups use machetes to directly hit fish. If they can obtain a hook, they will also use a line. The Chachi differ from the others in that they will also throw long harpoons with forked metal ends to spear their aquatic prey, and they weave fish traps.

Figure 3.3. *Mestizo* man holding a toucan that he has just hunted with his gun while walking to his fields to harvest squash.

Most of the settlers in the Mache-Chindul Ecological Reserve region are outside of the cash economy, selling only a little cacao and coffee, and some vegetable ivory (tagua). However, the latter is generally too heavy to transport for sale. In most of the Chachi communities, they have at least one store. In Río Bravo it is a community run store, started by an NGO. It provides rice, sugar, candy, lentils, toilet paper, matches and salt. Most of the *mestizo* and Afro-Ecuadorian communities

do not have stores. Shops are organized to provide supplies as opposed to generating income. In an effort to increase capital within the Chachi community, because they are not restricted by the reserve rules, they cut and sell trees to logging companies. For outside work, the Chachi occasionally work for banana companies and the *mestizo*s and Afro-Ecuadorians will sometimes leave their communities to work for oil palm plantations.

HOUSE CONSTRUCTION

All three groups build raised houses, making the floor from split bamboo or palm stems, and thatching the roofs with palm. The *mestizo*s and Afro-Ecuadorians usually have multi-level homes, always constructing external walls and inside dividers separating cooking and sleeping areas (Figure 3.4). The Chachi build single level structures, rarely having internal dividers (Figure 3.5). Originally the Chachi homes were all open, and now they only build outside walls when their homes are located in the central section of their community. All use notched bamboo ladders to enter their homes and for the colonists to move between floors. All three groups cook on raised clay hearths, with the Chachi placing river rocks permanently in the clay on which to place pots. The Afro-Ecuadorians in the northern province do this as well. In the Mache-Chindul Ecological Reserve region, the colonists place stones loose in the hearth, and sometimes form small pits in the clay in which to bake food.

Figure 3.4. Colonist home built with multi-levels and walled in sides.

Figure 3.5. Chachi home built with one story and open sides.

Plants and flowers hang in various containers outside almost all *mestizo*, and most Afro-Ecuadorian homes. Furthermore these groups plant ornamentals in their yards. All three groups keep the area directly around the house cleared (most likely to protect the area from snakes), although the Chachi rarely have ornamental vegetation. All three groups' houses line the rivers, giving them access to water for washing, cooking, drinking, bathing and fishing. In the Mache-Chindul Ecological Reserve, although all groups used to travel by canoe, the Chachi are those who have maintained this form of transportation and the art of canoe construction (Figure 3.6). In the northern province along the large Cayapas River, the Afro-Ecuadorians also still travel by canoe.

Figure 3.6. Chachi children playing in a canoe that is being repaired.

The homes of all three groups house neolocal families. These were originally distributed out of eyesight of each other. The *mestizo*s and Afro-Ecuadorians still live considerable distances from each other, the closest neighbors being relatives. Although some Chachi houses are still set apart, many are now more clustered, especially around their schools and soccer fields. This may be in part due to the missionary activity, a part of which includes centralizing communities. Additionally, the government and NGO programs encourage more centralized organization as well.

The *mestizos* and Afro-Ecuadorians sleep on raised beds covered with *Astrocaryum* palm mats (Figure 3.7), and the Chachi sleep on the floor with *rampira* (*Carludovica palmata,* Cyclanthaceae) mats (Figure 3.8). The Afro-Ecuadorians in the northern zone also use bark blankets (*damagua*) that they beat into cloth-like sheets. All three groups often have a homemade hammock in the house, which they use only for daytime relaxing and to rock their babies.

Religion, Language, Government and Education

For the most part, people in the region practice Catholicism. Some have converted to the various protestant denominations whose missionaries work in the area. There are few churches in the area but most families have small Catholic shrines in their homes. Much syncretism exists in Chachi communities, mixing their original animistic religion with Christianity. In one of the central Chachi communities, Naranjal, a permanent Catholic Church has traditional cotton belt-like weavings leading up from a canoe to the feet of a statue of Virgin Mary.

Figure 3.7. *Astrocaryum standleyanum* mat on a colonist's raised bed.

Figure 3.8. Chachi sleeping mat made from *Carludovica palmata* (Cyclanthaceae).

Throughout the church are placed traditional baskets made of *Carludovica palmate,* instruments used in traditional ceremonies line the back of the room, and painted scenes of hunting and fishing decorate the walls below the stations of the Cross (Figure 3.9). The Chachi have their traditional ceremonial and meetinghouse across from the church. In Río Bravo and in the northern communities, there were fewer established Catholic structures. Missionaries seem to come and go with more frequency, not having the time to construct and maintain churches. In most Chachi communities, they celebrate many events such as weddings and Christmas time celebrations with a mixture of Christian and native customs.

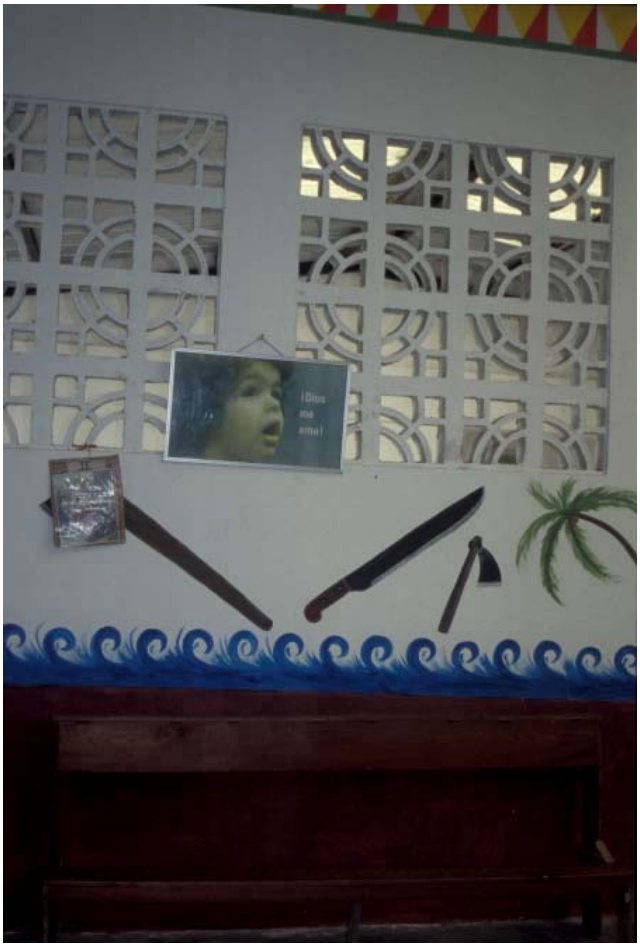

Figure 3.9. Chachi church in Naranjal. Traditional painted scenes beneath Christian pictures.

The Chachi traditionally kept their hair long, men wore wide shirts with stripes, women wore skirts with no shirt, and both genders painted their faces and bodies (Barrett 1994; Benítez and Garcés 1990; Medina 1992). The men now wear their hair short; no longer paint themselves, and both genders dress in western clothes. Although some Chachi women will still wear their chests bare, especially the older generation, this practice is becoming less frequent. Generally, people consider

the Afro-Ecuadorians to be, for the most part, culturally Hispanic. Some still maintain a few traditional customs from Africa, one of which is the practice of playing drums and marimbas and wearing white at funerals (Whitten 1974).

The Chachi have their own form of government, with an elected Federation President (previously a hereditary governor) who is in charge of the law, most often dealing with crimes against social order. Some communities still mete out punishment with the *cepo*, two wooden boards with a hole through which the perpetrator places his or her foot. The accused remains in the public eye for a period of time that the president determines. Depending on the crime and the community, they may also be publicly whipped. These punishments are most often to reprimand infidelity or premarital relations**.** Many communities, such as Río Bravo, no longer use the *cepo.*

Education differs between the Chachi and the *mestizo* and Afro-Ecuadorian communities. The Chachi schools always have teachers, and the support of government funding. Schooling in many Chachi communities is through high school. For the *mestizo*s and Afro-Ecuadorians in these rural communities, they are often unable to hire teachers, and schooling stops at the sixth grade. In the Afro-Ecuadorian town of Chivas, the 2000-2001 school year started before the community could hire a teacher. Many of the colonist communities must pay the teacher out of their own pockets for the first few years of the school's establishment. When possible, various non-Indian students will take advantage of the Chachi schools. In Río Bravo, a *mestizo* family moved into the village so that their children could receive an

education. In the northern area, the Chachi's Afro-Ecuadorian neighbors also attend many of the Chachi schools, especially high schools.

Chachi schools are bilingual. The Chachi children speak Cha'paalachi as their first language, and learn Spanish when they start school. In the northern region, where there is the most contact between the Chachi and the Afro-Ecuadorians, the latter speak some Cha'paalachi, especially the children who attend the Chachi schools. Most Chachi men speak Spanish as well as Cha'paalachi, and some women are beginning to speak Spanish as well.

Land Tenure

Land tenure differs slightly between the groups in and around the Mache-Chindul Ecological Reserve. The federal government has granted Chachi communal title to their lands, with most Chachi families having approximately 50 hectares for their farms. However, they still have to protect their land from squatters. One day during one of my visits to Río Bravo, all the village men took their guns to remove forcibly some families who were squatting on Chachi land. Although there is still some confusion about their involvement with the reserve, according to the Chachi, they chose to not include their lands in the Mache-Chindul Ecological Reserve.

The land rights of *mestizo* and Afro-Ecuadorian colonists' are less well defined than they are for the Chachi. The colonists settled available land, with firm but unwritten property lines. With the formation of the reserve, they had to obtain title legally to their land. Most were able to do so, although some are still technically

squatting. Most *mestizo*s and Afro-Ecuadorians have between 10 and 80 hectares per family. They tend to cultivate part of the land, leaving patches in forest, especially near the rivers (INEFAN 1996,1999).

DIFFERENCES AND SIMILARITIES

Through living a rural existence in the same ecosystem all three groups are basically similar in livelihood, housing and material culture. However, when focusing on the details of how these groups pursue similar activities, differences do arise. The most notable are between the Chachi and the colonists, while the *mestizos* and Afro-Ecuadorian colonists are more similar to each other. Most of the similarities and variations arise from how much adherence they have with Hispanic culture. The Chachi are less European oriented, while the colonists encompass more of these old world traditions. Examples of specific areas in which the two groups differ are the Chachi's preference for canoe travel, carrying articles with tumplines, eating boiled foods without salt, strict gender divisions in agricultural labor, little large animal husbandry, speaking Cha'paalachi, open house construction, fewer ornamental plants, sleeping on the floor, and using their own government. The colonists on the other hand, choose horses and walking, carry baskets on their backs, eat fried and baked foods with salt, both genders work together in the field, strive to raise cattle, speak Spanish, close in their homes, raise ornamental plants, sleep on raised beds, and derive leadership from the federal government and its officials. These differing

cultural characteristics help to provide a background of these people when looking at the specific differences in how these two groups use *piquigua* and *mocora.*

The distinct history of each group affects how they live today. The Afro-Ecuadorians, whether from free or enslaved ancestors, have had a long history of contact with the Spanish. The *mestizos*, who are ethnically part Spanish, clearly maintain many European oriented customs. The Chachi, on the other hand, although having been in contact for much of their history, have not lived in proximity to Spaniards and those of their descent, and thus have not experienced the extensive culture sharing, as have both groups of colonists.

The contact that the Chachi are now having with mainstream Ecuador both encourages them to maintain their traditional lifestyle and opens doors for change. The less important role of agriculture to the Chachi, compared to the colonists, exhibits this phenomenon. In every colonist home in which I stayed, my hosts were eager to show me their fields. While I was with the Chachi, they did not express interest in presenting their crops. Also, the Chachi grow fewer kinds of foods than the colonists. Although they do farm, they did not identify themselves as farmers to me. One Chachi said to me "We weren't farmers before." They still heavily depend on hunting and fishing. Part of the reason why they have not had to fully adopt farming as their only means of subsistence is through their relationship with Hispanic society. The national government has granted them areas of land that are much larger than those to which the colonists have access. Thus, the Chachi can continue to

depend on products that the forest and rivers still provide in a way that the other two groups cannot. However, this also includes the sale of logging rights, bringing them into the cash economy, and thus presumably facilitating future change.

Other areas in which they receive government and NGO aid are in their stores and schools. This allows them to stay in their communities for purchasing articles, and to continue to speak Cha'paalachi in school. However, at the same time, this increases access and desire for more western goods for which cash is necessary. Also, in the bilingual schools in addition to maintaining their traditional language, they also learn Spanish. Furthermore, through the construction of a government built central school and soccer field, community oriented NGO projects, and missionary efforts, Chachi can rely on outside help. These assets also change the community structure. Many residents now build their houses closer together than they used to. This location change is partly due to missionaries, another result of which is that the Chachi are becoming increasingly more Christian. This is particularly evident in the syncretic decorations and bilingual ceremonies in the church. Thus, the differences that exist between the Chachi and colonists that stem from the Chachi's separation from the Spanish, are now both being diminished and maintained through the Chachi's increased contact with Hispanic Ecuadorian society. This study explores these issues further through their use of specific resources. Because the colonists are tied more closely to Hispanic society, which is known for its destructive treatment of

the environment since the discovery of the Americas, it would be logical to hypothesize that the colonists would be less environmentally aware than the Chachi.

CHAPTER IV
METHODS

This ethnobotanical study emphasizes ethnograhic techniques, while incorporating some ecological data collection. In various works focusing on how to conduct ethnobotanical studies, authors explain both components (e.g., Alexiades 1992; Cotton 1999; Martin 1995). Ethnographic techniques inform of the people, and how they contextualize plant use. Using ecological techniques provides data about population structure and growth rate of the plants. These data provide insight into the survivorship and regeneration in the forest and the fields around homes (Alexiades 1996; Martin 1995). Various studies employ this combination of methodologies (e.g., Godoy and Bawa 1993; Godoy et al. 1993).

ETHNOGRAPHIC METHODS

For this study I conducted interviews with 26 families: 11 *mestizo*, nine Afro-Ecuadorian, and seven Chachi families. Although this is a relatively small sample size, since many people in the communities do not weave, this represents more of the weaving population than of the population as a whole. I conducted these interviews over a one-year period from December 2000 to December 2001. The *mestizo* people with whom I worked live in the communities of Cuadrado, Perrera, Tigrillo, and San

Pedro. The Afro-Ecuadorian informants were from the community of Chivas. And finally, the Chachi informants live in the community of Río Bravo (Figure 4.1). [1]

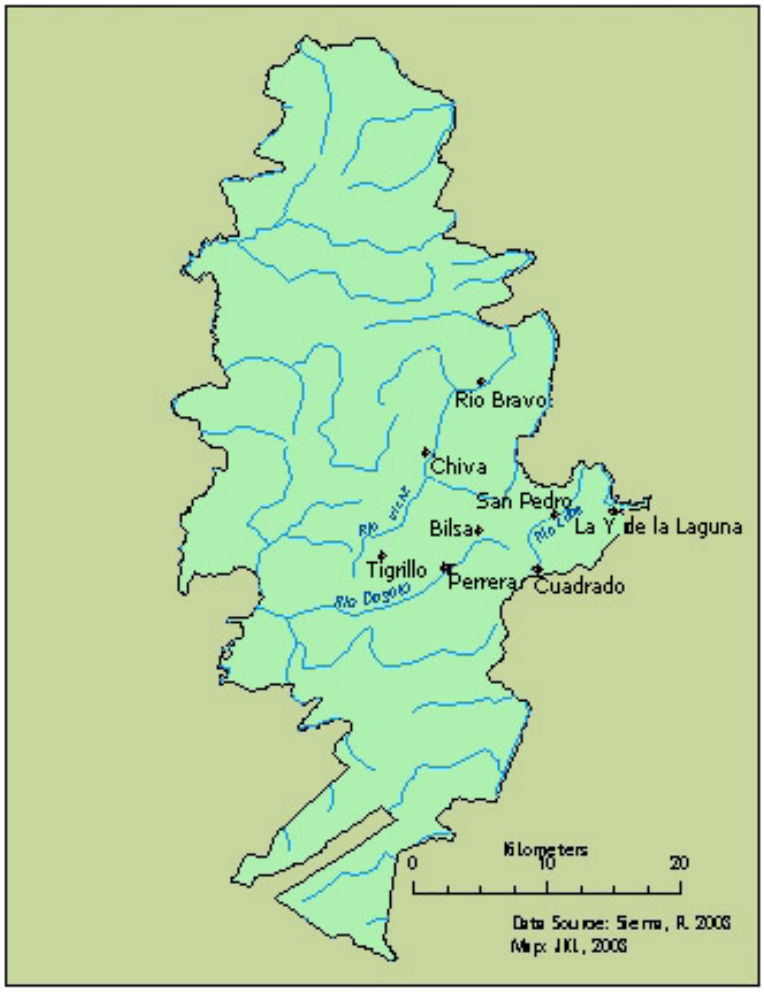

Figure 4.1. Location of study communities within the Mache-Chindul Ecological Reserve.

In 2000, there were 31 communities, 760 families and about 6,000 people in the 111,000 hectar reserve. Three of these are Chachi communities, three Afro-

[1] All of the names of the communities and informants have been changed to protect the integrity of the communities and individuals who participated in this study.

Ecuadorian, and 25 *mestizo*. I visited with more *mestizo* families than Afro-Ecuadorian or indigenous families as they make up the bulk of the population in the reserve. Criteria for choosing communities included location that was within two days walking distance from Bilsa (a research station owned and operated by Fundación Jatun Sacha an Ecuadorian conservation nongovernmental agency or, NGO). Also, I needed initial contacts so that locals would be open to housing and working with me. Bilsa provided these contacts with the *mestizo* and Afro-Ecuadorian communities. Bilsa did not have guides who could take me to an indigenous community. However, the residents of Chivas offered to take me to the Chachi community of Río Bravo. Thus, I chose this latter community as my sample group for the Chachi of the reserve.

I also visited the Chachi communities of Cuesta Bonita on the Cayapas River, Manzana on the Canandé River, and the Afro-Ecuadorian community of San Gabriel on the Cayapas River. Although these last three communities are outside of my study area, I made these visits and interviews to understand the communities with whom I work within a larger context. In certain aspects, my results appear to be representative of these communities as well.

In San Pedro, Perrera, Chivas and Río Bravo, I was invited to community meetings in which I described my study and asked permission to work in the community. I also conducted group interviews within these communities. Within these same villages I then worked and lived with select families. I chose households in which there was at least one skilled weaver. In Cuadrado and Tigrillo I worked

only with individual families, because there were fewer weaving families. Additionally, to evaluate the current and possible market situation, which is necessary if one is to include an economic component (Cotton 1999; Godoy et al. 1993; Martin 1995; Padoch 1987), I worked with sellers and buyers. I interviewed three raw material buyers and sellers in the town of Quiñende (25km, one day trip from Bilsa), two finished product vendors in Quiñende, three in Esmeraldas (55km, two day trip from Bilsa), three in Monte Cristi (220km, two day trip from Bilsa) and one in Borbón (110, km two day trip from Bilsa). To understand all phases of production, I also interviewed workers in two small furniture factories in Monte Cristi (Figure 4.2).

Most interviews were semi-formal or informal and did not involve a structured set of questions (Bernard 1995). I worked principally with the weavers within the families. However, as many people do some artisan work, or at least are usually present when the activity takes place, whoever was present in the home or on the walk frequently, joined in the discussion. We discussed weaving details and processing in the home, and collection in the forest and field. When I spoke with sellers and merchants, I visited them in their place of business. Although the main informant in these situations was the person who owned the business, usually there were spouses, workers and friends who also joined in the discussion. This aided in giving consensus to the information I received (Reyes-García et al. 2003; Heinrich et al. 1998).

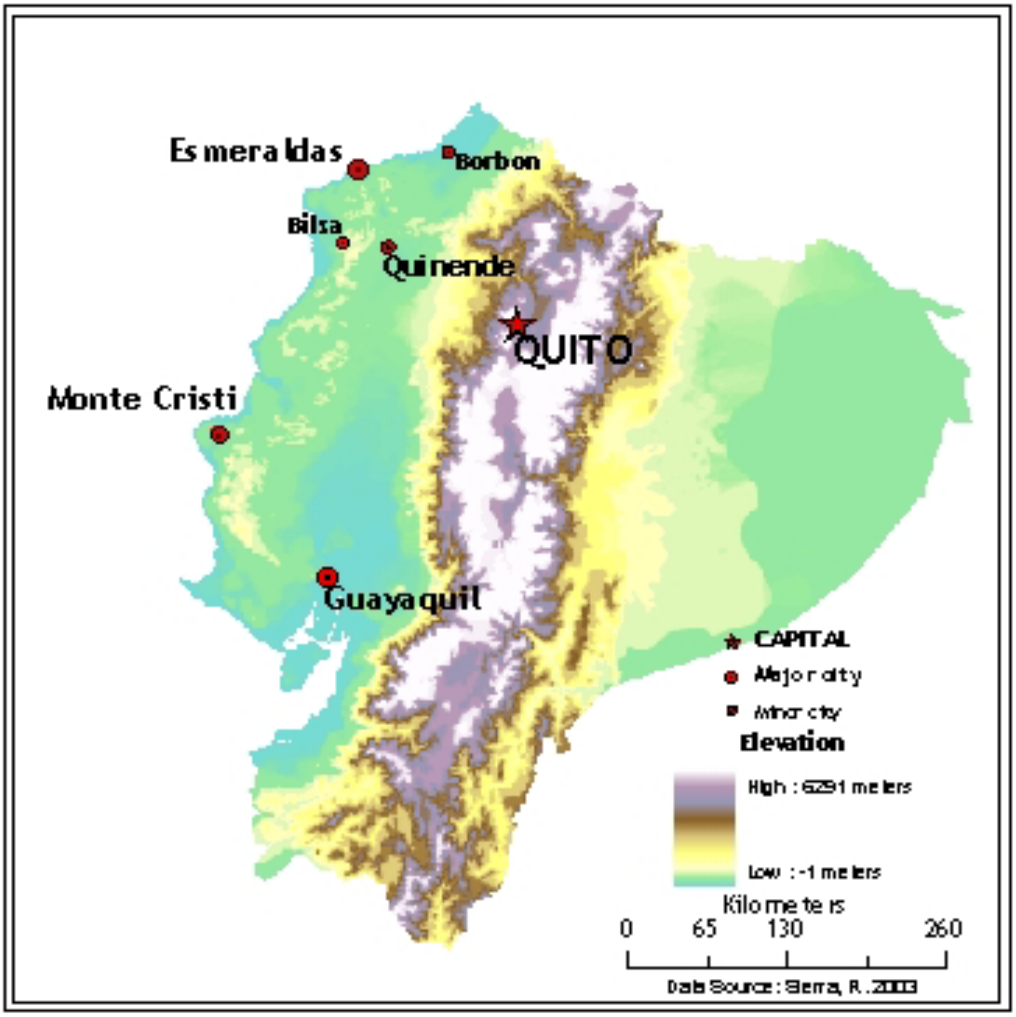

Figure 4.2. Map of the market cities for *piquigua* and *mocora* products.

To determine the most important forest fiber plants, initially I observed what families used in their homes. I then followed up with verbal confirmation of the inhabitants' own ranking of which plants were most central to their livelihood. I gleaned a basic understanding of the weaving, processing, and collection through interviews concerning these activities. In subsequent visits, we discussed the entire process of plant use, while they engaged in each aspect of the utilization. I helped with some weaving and processing of material, and accompanied them on collecting trips, engaging in some aspects of participant observation (Bernard 1995). This helped me to not only understand the process better, but also to realize the difficulties involved in all parts of the endeavor.

All interviews were carried out in Spanish. I used Chachi interpreters with those Chachi who spoke only Cha'paalachi. In the latter case I did run the risk of having the interpreters' opinions enter into the translation (Bernard 1995; Martin 1995). Throughout the study period, I lived with various families. This added invaluable casual discussion and observation about the entire process, enhancing the information I gathered from the more structured interviews.

VEGETATION AND SOIL SAMPLING

In order to obtain data that provide insight into the population structure and density of the hemiepiphyte and the palm I utilized standard vegetation sampling methods (Brower et al. 1998). I recorded size and densities for the palm, and densities

and growth rate for the hemiepiphyte[2]. Sample plot locations were chosen on the basis of where people collect materials. Most plots were within a one-hour walk from the informant's home, and were between 300 and 400m in elevation. For the palms, I measured plants on seven plots in mature forest, and seven in fields and fallow forest. This allowed me to see the difference in density and population structure between the two different forest types. For the hemiepiphyte, I measured 10 plots in primary forest. These were also chosen for their importance as collection sites for weavers. For the hemiepiphyte, plots were measured only in mature forest because the plant grows almost exclusively in the shade of trees. For both plants, each plot extended 20m x 50m with the longest side extending down slope. This plot size is comparable to other studies on vines, lianas, epiphytic and scandent plants (e.g., Bennett 1986; Nabe-Nielsen 2001; Putz 1984; Young 1993; Young and León 1991), and for palms (e.g., Pedersen 1994; Runk 2001; Vormisto 2002). I divided each plot into ten, 10x10 meter subplots in order to keep the work organized (Martin 1995), marked each subplot with flagging tape, and numbered the plots with aluminum tags nailed to the trees with rust proof nails.

In order to look at the resource production and regeneration of the palm, *Astrocaryum standleyanum*, I first classified the plants into three growing stages

[2] Many studies also include statistically tested aspects of plant growth that provide necessary information to theorize about the sustainability of plant harvesting. Such data were originally proposed for this study, but given the more ethnographic emphasis that the project developed during data collection, these ecological data were not included. More ecologically focused studies should probably be conducted in the future.

(Sullivan et al. 1995). Seedlings had leaves only, the plant measuring up to 1.5 m. Juveniles had stems present and leaves with no reproductive growth. The category of mature plants included those palms that had stems, leaves, and flowering and/or fruiting structures. With these data, a basic population structure table could be constructed. As a way to compare resource abundance between communities and forest types, the density of palms was recorded in each plot. To record the density of *Heteropsis ecuadorensis* roots, on each tree I counted every drop and trunk root of *H. ecuadorensis* root that I could see from the ground. I could then compare the plant's density between different ethnic groups' land.

As with various studies focusing on hemiepiphytes (Hoffman 1997; Plowden 2002), I look at the growth rate of *Heteropsis ecuadorensis.* Over a six-month period, I recorded stem and root growth data in two permanent plots. These plots are located in the community of San Pedro. The voucher specimens of the hemiepiphyte (Voucher #059) and the palm (Voucher #060) are housed in the National Herbarium, Quito (QCNE). Experts in the herbarium identified both species.

In order to better understand the habitat in which *Piquigua* grows, soil samples were collected from places in which *piquigua* was found growing, and at least 20 m away from these sites, where it was not growing. Using a machete or a shovel, holes up to 20 cm deep were dug, and soil samples were collected from the top two horizons. Samples from greater depths were not collected, because *Piquigua* roots remain fairly shallow. Horizon differentiations were determined by color;

depths were measured and recorded. The samples were dried, stored in zip lock bags, and analyzed by the Soil, Water and Forage Testing Laboratory at Texas A&M University.

PLANTING EXPERIMENTS

In order to look into the possibility of cultivating *Heteropsis ecuadorensis*, I made collections of the hemiepiphyte and did an experimental planting. I cut five stems at an angle with a machete from mature forest. They were chosen from two different growing stages. Some were from those that extend out horizontally along the ground searching for support, and the other ones were from stems that were already climbing trees. I carried them back to the station, and then placed the cuttings in bags of soil. The soil was collected from decomposing trees in the forest. I watered the plants, and propped them against a tree. During the night there was light rain, and sun the following day. They were stored under partial cover, and planted at 3:00 the next day, July 22, 2001 on the Bilsa preserve property**,** on the left side of its "white trail" in the "Botanical Garden." I chose this area because it was easily accessible and facilitated the monitoring of plant growth. I also chose this spot because of its apparent similarity to places where the plant naturally grows, although in this area no other *H. ecuadorensis* grew. I planted the cuttings in depressions 15 cm deep, surrounding them with soil in which they had been stored. I tied them all to the stilt

roots of a *pambil (Irartea deltoidea*, Arecaceae) with flagging tape. I chose this particular trellis, because I saw many roots growing on *pambil* in the wild.

Five individuals were planted. Plant #1 was the growing end of a stem as it grew up a tree. This was planted with the cut end into the ground. The soil in which it was planted is dark brown for about 7 cm and then beige clay. Plant #2 was the growing tip of a stem measuring about 50cm with two aerial roots extending down. The cut end of the stem and the roots were placed in the soil. Plant #3 was the growing tip with the upward extension measure about 50cm. This was planted on the uphill side of the support palm, with the cut end in the soil. Plant # 4 was the growing tip of a stem planted on downhill side of palm. Plant #5 was the growing tip of a stem that had been crawling along the forest floor was put under the soil until the last emergent aerial root. The root was placed under the soil with 30cm of stem extending above ground.

CHAPTER V
PIQUIGUA (*HETEROPSIS ECUDORENSIS*, ARACEAE) DESCRIPTION

This description of *piquigua, Heteropsis ecuadorensis* Sodiro (Araceae) (syn.: *Heteropsis rimbachii* K. Krause) is based mostly on my own observations and on the most recent published description by Sodiro (1908). Araceae, a family of herbaceous Monocotyledons familiar to many because of their role as houseplants, are now being recognized for their economic and scientific value (Bown 1988; Croat 1988; Mayo et al. 1997). The family contains 109 genera and 2830 species, (Judd et al. 2000) with about half of these being epiphytic or hemiepiphytic climbers (Croat 1979; Gentry 1993; Grayum 1990; Madison 1977; Mayo et al. 1997). The genus *Heteropsis* Kunth has species that are evergreen climbing plants with woody fibrous roots. Although there have been some shifts in classification since Engler's (1878) description, Mayo et al. (1997) places it in the family Araceae, subfamily Monsteroideae, tribe Heteropsidieae. *Heteropsis* is a neotropical genus, with 13 species, all of which occur in Latin America (Croat 1988; Dodson and Gentry 1978)

HETEROPSIS ECUADORENSIS

Location and Habitat

Heteropsis ecuadorensis is endemic to Ecuador, growing in the Pacific Coastal and Amazonian rainforests (Figure 5.1) (Although listed as growing in the

Amazonian rainforest, there is some debate as to whether or not this actually occurs (Valencia et al. 2000)). It grows in elevations from 1-2000 m (Jørgensen and León-Yánez 1999; Missouri Botanical Garden 2002; Valencia et al. 2000). It is usually found in mature forest, requiring high shade and moisture. If the forest is cleared around it, *piquigua* can live for a few years on isolated trees. It grows in patches throughout the forest, most often on slopes, near to rivers or creeks. Informants agree that *piquigua* grows better in areas that are warmer, and slightly drier than other locales. I found this to be true in my experience. In the warmer lower areas, at 300 m, I found thick roots growing in dense communities. Plots that I measured in the colder higher elevations, 600m, did contain a few plants. However, in comparison to the lower elevations, these *piquigua* were fewer in number, the roots were thinner, and each plant was spaced far apart from each other.

Root

Heteropsis ecuadorensis is a secondary hemiepiphyte, germinating on the forest floor and then growing up trees (primary hemiepiphytes begin growth as epiphytes and then produce feeder roots). It later becomes detached from the ground when the juvenile stem and roots rot. Hemiepiphytes produce a few short anchor roots, attaching it to the tree. They then send down long slender feeder roots that grow down to the forest floor and re-establish contact with the soil (Figure 5.2) (Croat, 1988; Madison 1977; Putz and Holbrook 1986).

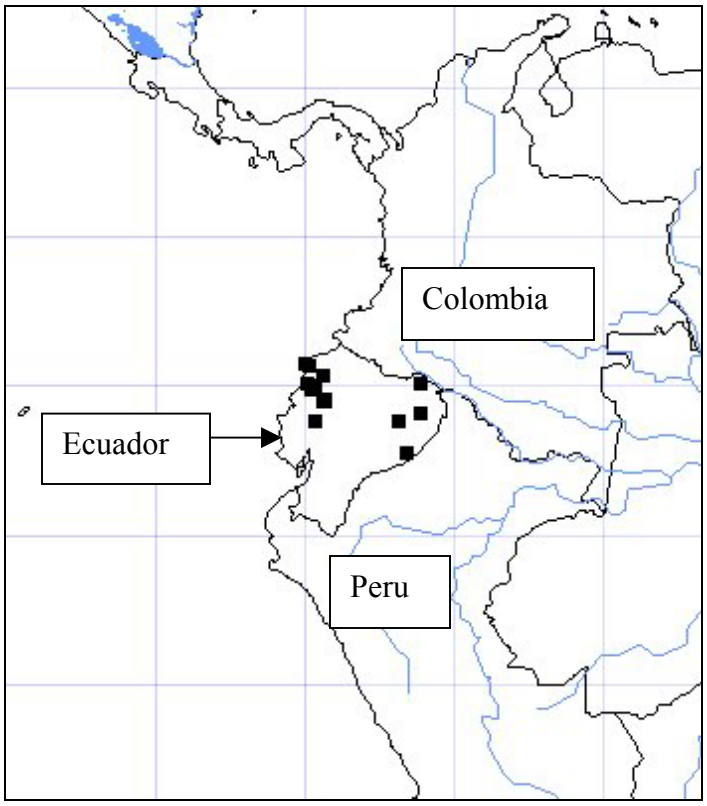

Figure 5.1. Map of *piquigua (Heteropsis ecuadorensis)* distribution. Currently only found in Ecuador (after Missouri Botanical Garden 2003).

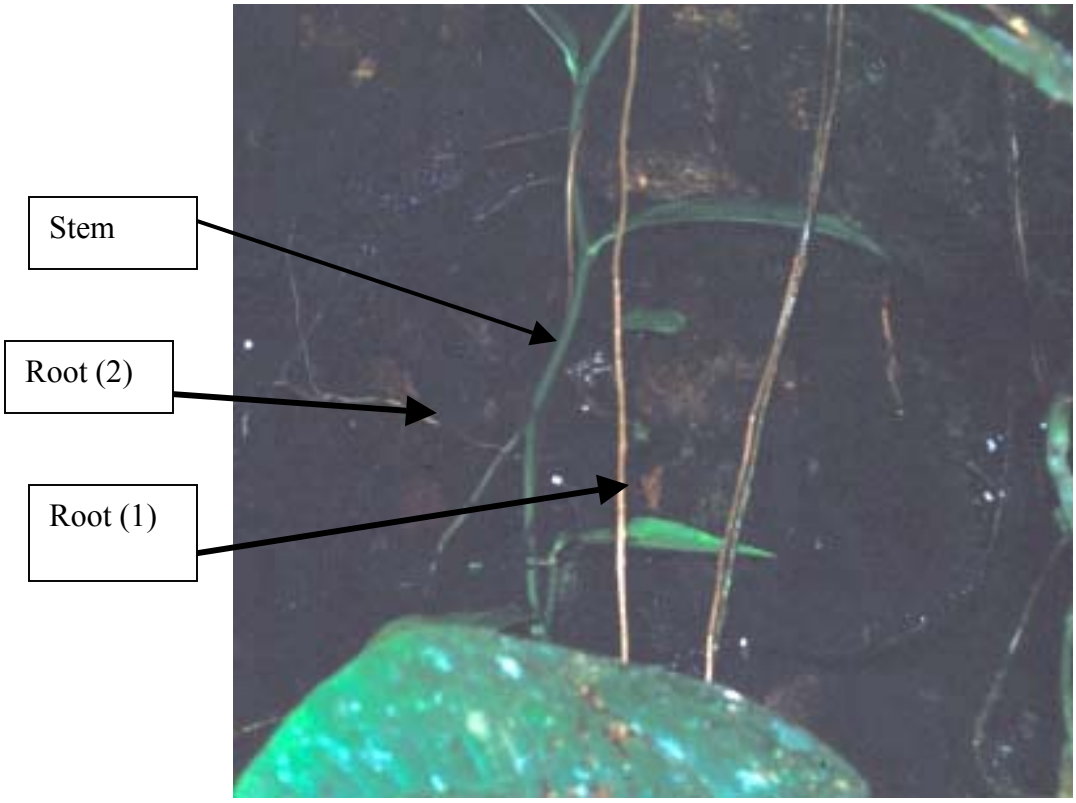

Figure 5.2. Stem growing up a tree trunk. *Piquigua* root growing down a tree trunk (Root 1). A new root growing horizontally extending from the left side of the stem (Root 2).

The aerial roots when young are a light beige color, turning to a darker brown as they mature. A new root will emerge from a place in the old root where it was damaged. These are referred to as nodes (Figure 5.3). The long slender feeding roots are gravitropic and negatively phototropic. They absorb water and dissolved nutrients. These feeder roots may dangle freely away from the trunk, or they can also adhere to the trellis structure. Once they reach the substrate, they branch out and form a small network in the soil (Carlquist 1991; Dahlgren et al. 1985; Grayum 1990; Hinchee 1981; Madison 1977; Wilder and Johansen 1992). Stems will sometimes return to the

ground and crawl along the forest floor until they find a new host tree to climb, as with *Heteropsis flexuosa* (Hoffman 1997).

Figure 5.3. New root emerging from a damaged area on the original root.

Stem

Because seeds of secondary hemiepiphytes germinate on the ground and the plant matures in the trees, they need mechanisms for both terrestrial crawling and tree climbing. The stems are initially skototropic, growing toward shade, and then when reaching a vertical surface they produce leaves and begin to grow upwards towards the light (Figure 5.2) (Ray 1992; Strong and Ray 1975).

Climbing plants generally have long slender internodes that are incapable of self-support, and thus need to have a trellis for vertical growth (Ray 1992; Strong and Ray 1975). *Heteropsis ecuadorensis* petioles are spaced 3-4 mm apart with

convoluted bases. As its climbing mechanism, *Heteropsis ecuadorensis* uses flat self-adhesive tendrils. Two opposite filaments emerge on either side of the stem. The climbing shoot is bright green, with darker green shiny leaves.

Leaf

Heteropsis ecuadorensis leaves are subcoriaceous oblong-lanceolate, alternate simple leaves arranged in flat rows along both sides of the stem (Figure 5.4). As with other *Heteropsis* species (Ray 1987), *H. ecuadorensis* blades are smaller when searching for a host and then become more expanded as the stem begins to grow up the tree.

Figure 5.4. *Piquigua* leaves growing out from the stem.

Inflorescence and Infrutescence

The inflorescence of *Heteropsis ecuadorensis* is a terminal unbranched fleshy cylindrical, 3-4 mm long spike (spadix) bearing flowers, borne terminally. A single bract, the spathe, subtends the spadix. Flowers are numerous, bisexual, small, sessile, and lack floral bracts. They are spirally arranged, tightly packed, and yellow in color. Most flowers bloom in November, and the majority of the fruits reach their peak in late December. The infrutescence is composed of berries, green when immature, and yellow when ripe. The fruit is usually found in the mid to upper canopy.

CONCLUSION

People have used the Araceae family for generations. The strong flexible roots of *Heteropsis ecuadorensis* not only provide nourishment for the hemiepiphyte, allowing it to live far from the soil from which it obtains sustenance, but are also used by people as well. The roots found in the genus *Heteropsis* provide lashing and weaving material for rural communities and a fiber from which to make furniture for urban settlements. Those in the region of Mache-Chindul Ecological Reserve find the roots of *Heteropsis ecuadorensis* invaluable for their everyday needs.

CHAPTER VI
PIQUIGUA USE

Ethnobotany, by definition, involves understanding the uses of various plants. Accordingly, peoples' perceptions of plants are important. When the selected *mestizo*, Afro-Ecuadorian, and Chachi families of the Mache-Chindul Ecological Reserve were asked what is the most important product coming from the forest surrounding their homes, the most common response was the hemiepiphyte *piquigua, (Heteropsis ecuadorensis,* Araceae). Barrett (1994) also writes that *piquigua* is the most important weaving material that the Chachi use. Respondents in my study explained its importance in terms of durability and water resistance. The root is simply more durable and more water resistant than all other readily available weaving materials.

Following a general description of Araceae ethnobotany, this chapter examines in detail people's use of *piquigua* in the Reserve. Emphasis is placed first on how all three groups use the root similarly, and second on how the groups use the root differently. Discussion focuses on (1) the woven articles, (2) the preparation of materials for weaving, (3) weaving techniques, (4) methods of collection, (5) instances of cultivation, (6) other forms of management, (7) alternative materials, and (8) markets, both local and external.

ARACEAE ETHNOBOTANY

Araceae use includes medicine, cordage, lashing, food, dart and fish poison, art, basketry, fish traps and nets, hammocks, construction, dye, soap, ritual drink, insecticide, water source, cosmetics, glue and fuel (Bennett 1992b; Davis and Yost 1983a; Glenboski 1983; Hettinger and Cox 1997; Hoffman 1997; Paz y Miño et al. 1995; Phillips 1991). Although many of these uses are for those living in rural tropical areas, Araceae use is also prevalent in urban temperate regions. In these settings, people commonly adorn homes, offices and public spaces with aroids (Bown 1988; Mayo et al. 1997). Furthermore, there is increasing interest in their medicinal aspects on the part of pharmaceutical companies (Phillips 1991). One example is *Epripremnum pinnatum,* which is being tested for its potential in treating cancer (Chen and Turner 1998).

Basketry

The aerial roots of hemiepiphytic Araceae are used extensively for basketry, particularly those of *Heteropsis*. People usually remove the epidermis before weaving. Some examples include *H. ecuadorensis* by the colonists and the Chachi in Ecuador (Alarcón 2000; Barrett 1994), *H. oblongifolia* by the Amuesha in Peru (Salick 1992), the Siona- Secoya in Ecuador (Paz y Miño et al. 1995), and the Shuar in Ecuador (Bennett 1992b), *H. flexuosa* by the Yanomami in Brazil (Milliken and Albert 1997), and the people of Guyana (Hoffman 1997), *H. spruceana* by villagers in Brazil (Madison 1979) and the Tukuna in Colombia (Glenboski 1983) and *H.*

jenmani by groups in Colombia (Acero-Duarte 1982), *H.* spp. by the Waimiri in Brazil (Milliken et al. 1986) and *H.* spp. by the Waorani in Ecuador (Davis and Yost 1983). The importance of Araceae for basketry material is not limited to *Heteropsis*, and extends beyond Latin America. Some examples are found in communities in Tonga that weave ceremonial baskets out of *Epripremnum pinnatum* aerial roots (Hettinger and Cox 1997).

Cordage

Another important use of aerial aroid roots is as strong flexible lashing material (Davis and Yost 1983; Paz y Miño et al. 1995; Phillips 1991; Plowman 1967). Again, the genus *Heteropsis* features prominently in this kind of utilization. *H. spruceana* is an important source of tying material in the Brazilian Amazon for use as lashing material (Mayo et al. 1997). *H. flexuosa* was one of the most important species used in the lashing of roof materials in the construction of a Yanomami roundhouse (Milliken and Albert 1997). The Siona-Secoya use *H. oblongifolia* for house construction (Paz y Miño et al.1995), as do the Amuesha in Peru (Salick 1992), and the Shuar in Ecuador (Bennett 1992b). *Heteropsis jenmani* is used for lashing purposes in Colombia (Acero-Duarte 1982). *H*. spp. is used for tying palm roof material to the beams in Brazil (Milliken et al. 1986), and the Chachi, *mestizos* and Afro-Ecuadorians in western Ecuador use *H. ecuadorensis* for this purpose as well.

Medicine

People in various parts of the world use different parts of aroid species internally and externally for stings, parasites, burns, nasal congestion, colds, toothaches, skin complaints, and contraception (Bennett 1992b; Bown 1988; Knecht 1980; Madison 1979; Mayo et al. 1997; Phillips 1991).

Food

Araceae serves as an important food source throughout the world. Most often people consume the tuberous species. Some aroids comprise the staple diet, such as in Polynesia where they eat *Alocasia macrorrhiza*, *Cyrtosperma chamissonis* and most notably, taro (*Colocasia esculenta*) (Lee et al. 2001; Mayo et al. 1997; Plowman 1967). This latter is also consumed in Oceania (Yen 1993), Africa (Knecht 1980), South America (Plowman 1969), the West Indies, Southeast Asia, and Japan (Bown 1988). Aroids that also serve as a food crop are *Arisaema triphyllum* in North America (Plowman 1969), and *Xanthosoma sagittifolium* in South America (Bown 1988; Plowman 1969), commonly called *malanga* (Simpson and Ogorzaly 2001) and in Ecuador, c*amacho* (Gentry 1993). Aroid leaves are also used to cover food when cooking (Bennett 1992b). Some people consume aroid fruit, such as the Waorani in Ecuador (Davis and Yost 1983).

Ornamental

Aroids are probably best known to people in temperate regions for their use as ornamentals. Because most terrestrial aroids grow on the forest floor, and are shade

tolerant, they make ideal indoor plants. Also, their distinctive, waxy, inflorescences have made them important in the flower trade. An example of such is the sale of *Anthurium* blooms, which are major products of the Hawaiian Islands (Bown 1988; Mayo et al. 1997).

***PIQUIGUA* ARTICLES MADE IN THE MACHE-CHINDUL RESERVE.**

Baskets

The most common and widespread items made from *piquigua* in the Mache-Chindul region are baskets. Baskets are found in every home. Weavers make baskets in two styles, distinguishable by their distinctive pattern. One type of basket (and weave) is called "*regular*." It is a simple plaited weave with rigid elements, and is made by passing an active fiber alternately over one passive fiber and under the next (Figure 6.1) (Adovasio 1977; Barrett 1994). The second type of basket in called a "*chalo"* or *"canasta de ojo."* This type of basket is characterized by a more open weave, involving large hexagonal spaces (Figure 6.2) (Adovasio 1977; Barrett 1994).

Almost everyone in the region is accomplished at making *regular* baskets. All three groups make *regular* baskets that are relatively small, measuring less than 15 cm in diameter. The *mestizos* and Afro-Ecuadorians make *regular* baskets only of that size. The villagers use these containers primarily to store foods such as potatoes, and onions. Being hung from the rafters, these baskets offer protection from rats.

Figure 6.1. Simple weave *piquigua* basket hanging in a colonist's kitchen.

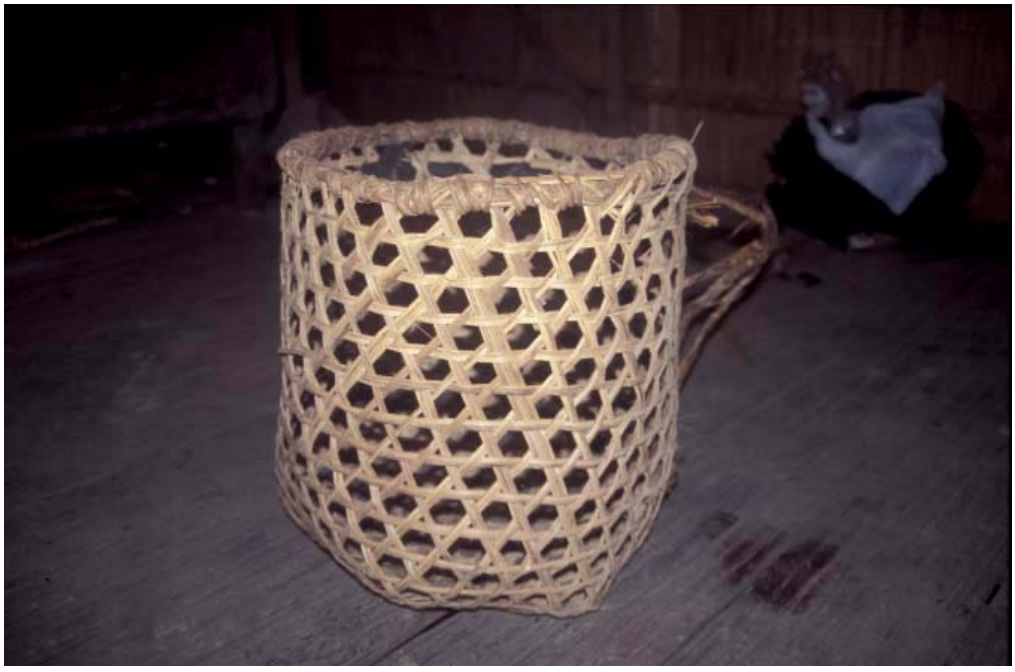

Figure 6.2. *Chalo* style basket woven with the hexagonal spaces in the weaving design.

In addition to making small baskets, the Chachi also weave large *regular* baskets, measuring more than 30 cm in diameter.

The Chachi use these larger baskets principally for portage. In addition, the Chachi weave different shapes with this simple plaited weave. This Chachi creativity may stem from the fact that Chachi women also use the petiole of *rampira, Carludovica palmata* (Cyclanthaceae). *Rampira* is the same plant from which people use the leaves to weave panama hats. The Chachi rely on the petioles of *rampira* for many articles in their homes, and have already developed a variety of shapes and sizes with this other material.

All three groups make the larger *Chalo* baskets, using these baskets for carrying heavier items for longer distances. These baskets serve in harvesting crops (Figure 6.3).

Figure 6.3. *Mestizo* man harvesting citrus and placing them into his *piquigua* basket.

Furthermore, they sometimes place a plastic container inside the basket to facilitate water portage from the river. Because the *chalo* weave is strong, stiff, and more durable than the simple weave, the basket maintains its shape, and porters can strap them onto their horses without bruising what they carry.

However, the most common way to carry the baskets is on people's backs. The *mestizo*s and Afro-Ecuadorians tie plastic rice sacks onto the basket for shoulder straps, carrying them like backpacks. The Chachi will weave these same kinds of straps out of the plant itself. Interestingly, only Chachi men carry the baskets in this way. Chachi women weave a tumpline, and carry the basket strapped across their forehead (Figure 6.4).

Figure 6.4. Chachi girl carrying basket with a woven tumpline.

Brooms and Other Articles

Piquigua brooms, although less overtly prized than the baskets, sit against the wall of almost every home I entered (Figure 6.5). These sweeping devices last from two to three years, and do not rot when used with water for cleaning. Hat making is a craft to which skilled *mestizo* and Afro-Ecuadorian artisans devote themselves (Figure 6.6). These same people weave bottle covers; tightly woven carrying cases to protect bottles from breaking (Figure 6.7). They will then weave on a shoulder strap, and carry it like a canteen. Other articles community informants mentioned, but that I did not see, are hammocks and mats.

Figure 6.5. *Piquigua* broom in a colonist's home.

Figure 6.6. Hats made from *piquigua.*

Figure 6.7. Partially woven *piquigua* bottle cover.

The Chachi also weave containers to store plates and silverware. Most notably they also weave fans. The Chachi weave decorative fans (to stoke their cooking fires) out of two materials, *piquigua*, and also *rampira (Carludovica palmata*, Cyclanthaceae) (Figure 6.8). The popularity of the fans extends beyond the community. The neighboring Afro-Ecuadorian communities trade rice for fans. If the Chachi have enough *piquigua*, they prefer to weave the fans out of the root. They say that a *C. palmata* fan will last about six months, and a *piquigua* fan will last for at least two years.

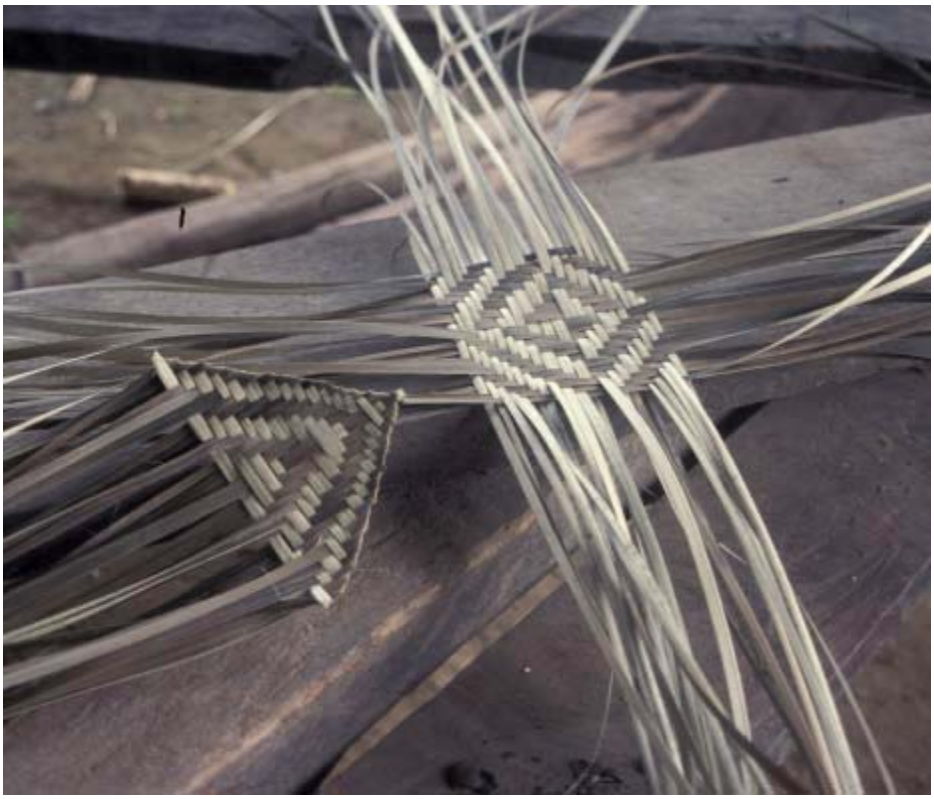

Figure 6.8. Chachi fan woven from *rampira* (*Carludovica palmata).*

Finally, invaluable to all three groups is a use that does not require weaving at all. This is as lashing material. The villagers tie together balsa log rafts, fences, sugar cane presses (Figure 6.9), roofing material, livestock, and fish traps. One informant summed it up by saying, “It is our nail.”

Figure 6.9. Sugar cane press tied with *piquigua.*

MATERIAL PREPARATION

Piquigua preparation begins with the removal of the epidermis in lengthwise strips. The weavers flex the root and peel the epidermis away by pinching it with their fingers and pulling strips off. Occasionally, people will leave the epidermis on the root for weaving, but many people say that this is rough and ugly. I saw only one basket with this outermost layer intact. It was for sale in the town of Quiñende.

The second step in the preparation of the material is to split the root longitudinally into at least two lengthwise strips by pulling it apart from one end towards the other. Other groups who use *Heteropsis* for weaving split the root similarly (Hoffman 1997). With a knife the weaver makes a small cut at one end of the root. They then take hold of the end of each cut half and pull them apart so that the root is torn from end to end. If it is a thick root, then they can divide it into more than two pieces. They will cut these in slices along the diameter, and then across subsequent parallel lines. The Chachi almost always split each root into more than two strips, making each one thin and flat, resembling the strips of *Carludovica palmata.* The Chachi also have a slightly different technique when splitting the root. They hook one end on to their toes to anchor it (Figure 6.10). Moreover, with a knife, they will remove the small hairs that splinter off after the epidermis has been removed. These same methods have been noted for Chachi throughout their distribution (Barrett 1994).

Figure 6.10. Chachi woman preparing *piquigua* with the use of her toes.

The preparation of material for hats requires little material, but each piece demands much attention. After removing the bark, the weavers split each root into eight pieces, in this case cutting it into pie-like triangles. To smooth the outer edges of the root and to make each piece uniform in size, one artisan punches six

progressively smaller holes into a tuna can lid. He then pulls each piece of fiber through the holes progressively from the largest to the smallest opening (Figure 6.11).

Figure 6.11. *Piquigua* weaver using a tin can lid with different size holes to smooth the material.

Weak points in the root occur where a new root grows out of an older root (nodes), usually where the original root has been damaged. Weavers cut nodes out with a knife or a machete. Often, if the pieces are too small after having cut out the nodes, these *piquigua* pieces will be used to make brooms. For best results, all of the

preparation and weaving is completed when the root is fresh, making it less likely to break. However, the root will stay supple for about two to three months, if unpeeled and stored in the shade. After the processor has removed the epidermis, the material will dry out after about two weeks. After prolonged storage, they will then soak it in water to increase flexibility before preparation begins. Also, the Chachi will soak the roots for a day or more before using them for lashing.

WEAVING

Once processed, the villagers weave *Piquigua* into a number of items, each requiring special techniques.

Regular Baskets

To make the simple basket center, weavers lay nine strips down in an interwoven box and then weave with simple plaiting, curling the sides up when the bottom is the size that they want. When finishing, weavers leave four fingers length of the passive strips unwoven. They then create a rounded top rim by bending these over, and tying them down with the active piece. The Chachi sometime use a rough wooden comb to press the fibers tightly together, while the other groups did not use tools of any kind.

Chalo Baskets

Starting with 23 pieces, each about one meter long, weavers lay the prepared roots in a series of criss crossing x's, holding the pieces in place with their toes. They

refer to each extending piece as a "foot." Each foot consists of two, three or four roots laid together side by side, each group acting as a single passive element (Figure 6.12) (Adovasio 1977, Barrett 1994). The more numerous the ply, the stronger the basket is. The flat inside part of the split root faces the ground. The weaver will eventually turn these over as they weave so that the curved parts make up the outside of the finished basket. Weavers then take the active piece, called the "mother," weaving under and over the passive pieces two times around the x's. At the end of the second time around, they flip the woven part over, and pull up so that the basket starts to have an upward curve. Weavers then take the basket off the floor, and sit up to weave. Eventually they tie off the top in the same way as with the regular weave.

Figure 6. 12. *Mestizo* weaving a *piquigua chalo.*

Brooms

To make the ever-present brooms, weavers measure a root four hands length long, split it down the middle, and string it between two walls. They then fold smaller pieces, about a foot long each, over the long section, tying each one on with the piece itself (Figure 6.12).

Figure 6.13. *Mestizo* making a broom with *piquigua.*

After they have filled the long piece, they then spiral the fringe around a stick, which serves as the broom handle, and tie it at the bottom. (Figure 6.14)

Figure 6.14. Close up of the knotted *piquigua* spiraled around the broomstick of a typical broom.

A less common broom consists of a piece of wood, about a foot long, with three rows of holes carved with a knife. With a stick, they press short pieces of *piquigua*, about five inches long, into each hole (Figure 6.15).

Figure 6.15. Broom head into which the first *piquigua* pieces are being placed.

Figure 6.16. Less common broom head with a hole carved into the wood into which the long broom handle is placed.

Hats

To weave hats, weavers measure 8-15 strands; 80 cm long each, and lay them on the ground in a square, holding them with their toes. The villagers then weave with a long active piece ("mother") four times around, under and over two at a time. The weaver then begins to weave under and over each one separately, in a simple plait, including the end of the "mother," making a total of 17-31 "feet." After weaving the initial circle, the weaver places the hat on a mold, tying the bottom part tight where the brim will start (Figure 6.17). Then weaving from the crown to the brim, the villager folds the ends under and ties them with the *mother*.

Figure 6.17. *Piquigua* hat being woven on a mold.

Time

Most people weave in their spare time. Rarely is an article completed in one sitting. Most weavers say that it takes two days to make a basket from start to finish. The weaver spends one day looking for the material, and another day to peel it, split it, and then weave it. However, these two days may be spread over a week or a month. They say that the regular baskets can be made in one sitting. The Chachi can make small items such as fans, after material preparation, in about one-half hour.

Weaving Knowledge

Most *mestizo*s and Afro-Ecuadorians have learned how to weave from watching either a friend or a family member. They acquired knowledge through their own personal interest and motivation, not because someone was encouraging them to do so. The majority of the colonists seemed to have learned how to weave before they arrived to the Mache-Chindul Ecological Reserve area. Although there are exceptions, in general, many children do not express an interest in learning how to weave. Some elders say that the younger generation is not weaving because there is not enough material. Others say that the children complain that the initial position of being bent over is too uncomfortable. This trend differs in the most part with the Chachi. Most weavers learned from their mothers, and most are continuing to weave. However, although this phenomenon may be linked to ethnicity, it also may be somewhat dependent on proximity to cities. In some Chachi communities that are closer to urban centers, such as Naranjal, fewer children are learning to weave.

Gender

Within the communities, people usually consider the women to be the weavers in all three groups. However, despite this image, in the *mestizo* and Afro-Ecuadorian communities more men than women weave with the *piquigua*. Although both sexes weave, it was mentioned that boys should learn more than girls, because they can collect the root more easily. Both men and women say that they need a man to collect the material either for them or with them. Some also mentioned that

because the material is hard, rough on the fingers and the initial weaving position is uncomfortable, it is an easier task for men than for women.

On the other hand, for the Chachi, the gender division is sharper. In almost every case, it was just the women who weave, as is also noted by Alarcón (2000). Although men may know how to weave, the women do almost all of this work. Men have other artisan activities such as making canoes and weaving fishnets. They also are actively involved in using the root as lashing material.

COLLECTING

The collection of materials is an important aspect of any ethnobotanical study (Martin 1995). It is crucial to see how the collectors obtain their material, and to assess the effects of collecting on plant growth and mortality (Bennett 1992a; Boot and Gullison 1995; Peters 1994). Collecting requires cutting the root at ground level with a machete, and then with both hands, grabbing and pulling until it falls to the ground from the branches (Figure 6.18). Skilled collectors snap the root in such a way so that the stem does not come down as well. Once it is removed from the tree, they roll it into a wheel and carry it home over their shoulder (Figure 6.19).

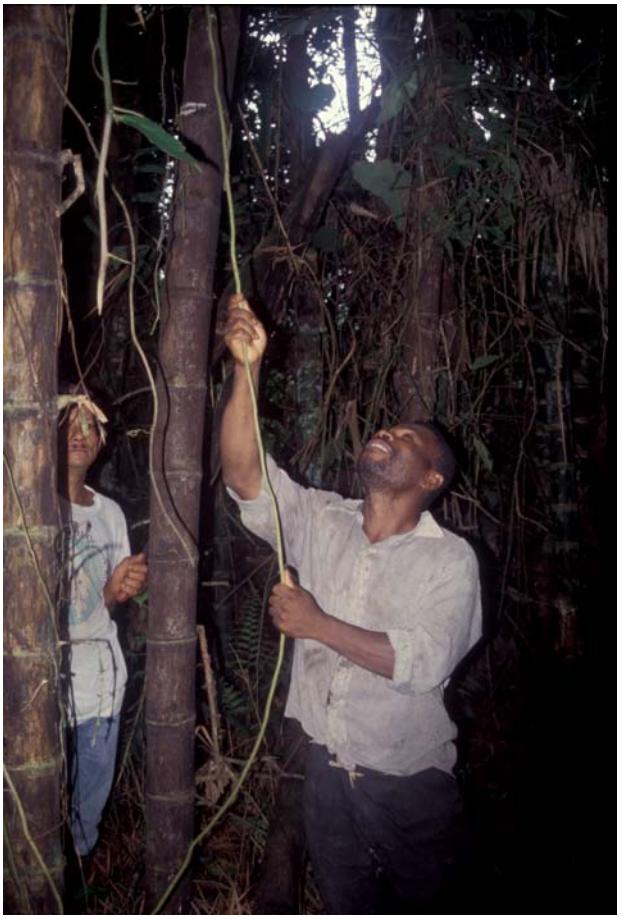

Figure 6.18. Afro-Ecuadorian and *mestizo* collecting *piquigua.*

Figure 6.19. Child carrying *piquigua* from the collection site to her home.

Maturity and Quality

Collectors take care to cut mature, well rooted roots. If the root is too young the fibers split. Although thickness is not a determinate for maturity, collectors prefer the roots with larger diameters. Most importantly, thick roots are stronger, and each

one has the potential to be split into more weaving strips. The roots that grow down away from the trunk are preferred for weaving over those that attach themselves to the tree. As Hoffman (1997) also found with *Heteropsis flexuosa*, the latter are often twisted and have a larger number of nodes. The loose hanging ones tend to be straighter and have fewer imperfections. Weavers reserve the thin, twisted, and knotted roots to make brooms, baskets of lesser quality, and for lashing. There are however, some people who prefer the thin, more manipulative roots, for the weaving of delicate hats.

Collection Location

Piquigua roots grow in patches throughout the forest, and all three groups know of specific areas where they can collect. From the people I interviewed, it appears that the *mestizo*s and Afro-Ecuadorians will sometimes even search out a particular plant. The Chachi know areas as well, but their seeking out of locations was slightly different. They appeared to be less specific, especially of individual plants. This may be because of the fact that they have more forest from which to collect and they can afford to be less exact in their collecting practices. All groups locate areas where *piquigua* grows while pursuing other activities in the forest. They will then return to those places to collect at a later date.

Collection Dates

Most of the families with whom I spoke mentioned the importance of collecting during certain times each month, in reference to the lunar cycle. All three

groups emphasized that they must collect during the young moon, and possibly at the full moon, but not when the moon is waning. They say if collected when the moon is receding, the root will be difficult to pull for collection, break easily when weaving, and will quickly dry out. If collected during the correct phase of the cycle, the epidermis is softer and easier to remove. To collect in relation to the lunar cycle appears with various ethnic groups. Examples include palm collection in Costa Rica (Joyal 1994) and Mexico (Joyal 1996). Despite the importance placed on the timing, most people admitted that they collect whenever they need the material. The majority of collectors said that a new root will reach the soil in approximately six months, and that it needs to mature in the ground for a few months before it can be collected.

Collection Time and Distance

All three ethnic groups agreed that it takes approximately one day to collect enough material for a basket, not including the time spent discovering where it grows. Many people have a few *piquigua* plants on their own land, often about one-half hour away. However, because the plants are scarce, people will often travel to neighboring lands to collect as well. In theory, neighbors should not take resources from each other's land. However, people seem to understand that this happens, and make allowances for such behavior. In the case of the Chachi, there are communal lands from which weavers can collect. It is common to walk between two and four hours to a collection site. Since they collect on an "as needed" basis, each collecting trip varies from the others. A common complaint among all groups is that they have to walk

further today than in times past to obtain the material. Clearly the supply is diminishing, a point to be discussed later.

Resource Preservation

Given its increasing scarcity, the colonists were particularly conscious about protecting this valuable resource. As mentioned earlier, they exercise control in harvesting, to prevent pulling down the stem. On one occasion, I witnessed a mother scolding her inexperienced children for pulling too roughly and endangering the stem. On another occasion, I watched a man make a ladder out of surrounding trees, so that he could reach up higher on the root and better control the connection to the stem.

Mestizos and Afro-Ecuadorians also make a point of leaving a sufficient number of roots growing from each stem, so that the plant still maintains adequate connection to the ground and will continue to send down future roots. The extra care that the villagers show during *piquigua* collection appears to demonstrate the importance and the scarcity of the hemiepiphyte. This is not, however, how they collect all forest materials. For example, after delicately gathering *piquigua*, I watched a man harvest a less important plant by cutting down the tree on which was growing.

Piquigua buyers are also conscious that the collectors need to leave the stem intact, and preserve growing roots. Buyers say that when collectors sell the roots, they usually collect little by little until they have enough to bring to the buyer. This prevents them from denuding an area all at one time. This is also a result of a paucity

of material. The Chachi with whom I spoke, although they sometimes discussed the importance of these factors, were more zealous in their collecting. They pulled with less caution, and pulled many more down at one time.

AVAILABILITY

Resource Availability

All three groups complain that the *piquigua* supply is diminishing, and as mentioned earlier, they now have to walk further than before to collect what is available. They say that this is a result of decreased habitat, because of logging and agricultural expansion, coupled with increased numbers of people using the resource. Alarcón (2000) also notes the lack of *piquigua* in the northern Chachi communities, and Barrett (1994) writes that there is a scarcity of the hemiepiphyte, because so many people in the regions where it grows are using it. Once a landowner confided that he was waiting for a specific root to mature, only to discover that it was stolen. Another collector boldly wrote his name on the root to claim it, although it was not even on his property.

It appears that the scarcity of *piquigua* extends beyond this region. People claim that more roots still grow along the banks of the Cayapas River. However, a Chachi family took me to look for *piquigua* along this river, and we found only one plant. It is difficult to discern if there is a minimum expanse of forest necessary for the hemiepiphyte, as the plants studied grew in forest patches of varying size.

Market Availability

In addition to the locals making baskets, some of the sellers outside of the area are also experiencing difficulties in obtaining the goods and materials. The main markets for *piquigua* material and articles in Ecuador are Esmeraldas, Borbón, Monte Cristi, Quiñende and Guayaquil. In Monte Cristi, an artisan town in which they sell *piquigua* goods, the stores and artisans previously obtained their materials from the region of Manabí. These vendors claim that now there is not enough forest to provide *piquigua*, so they buy it from the further away province of Esmeraldas. The sellers in Quiñende, Esmeraldas and Monte Cristi all say that deforestation is the key reason for the difficulties in obtaining the materials. Buyers complain that they will go to communities to buy material, and will sometimes return with empty trucks.

MANAGEMENT

Plant management, an increasingly important aspect of ethnobotanical studies (Turner 1998), is often a less obvious aspect than other parts of people's plant use. In this case, villagers said that they did not practice any kind of plant management for *piquigua*. Respondents would typically respond to a question regarding *piquigua* management by saying: "It is born in the forest, it grows in the forest, and then we collect it." For the most part, this appears to be the reality. However, slightly contradicting these statements, through observation, I witnessed a few specific instances in which people were actively managing the plant. One man, when he saw

a *piquigua* root that was dropping down into the creek, pulled it onto the bank, and buried the growing tip into the soil. Another time, while walking through a *piquigua* patch, a woman absently removed a stick that was putting weight on a climbing stem that was growing between two trees. On a different occasion, this same woman saw a stem dangling from a tree, and tied it securely to the trunk with another plant.

Another form of management involves leaving trees that have *piquigua* on them in the field when farmers clear forest. These cultivators say that the *piquigua* will only grow for a few years without the surrounding forest, but that it is worth it to save a tree that has *piquigua* on it for at least for that amount of time. Furthermore, one *mestizo* family in San Pedro has an area of forest that they cleared right up to the area where a *piquigua* patch grows. These farmers scouted the land beforehand, not wanting to clear where the hemiepiphyte is present. They organized their forest cutting and field planting and production around the location of *piquigua* (Figure 6.20). Clearly, managing for the plant itself can involve larger scale conservation oriented management of an entire section of forest.

Figure 6.20. Land cleared for planting is depicted in the left of the photograph. Intact forest is on the right, protected because of the *piquigua* growing there.

CULTIVATION

In order to make collecting easier and to provide more of a scarce resource, people sometimes cultivate useful plants. However, in the Mache-Chindul Ecological Reserve region most collectors show resistance to pursuing this activity. Collectors do not cultivate *piquigua*, and say that it cannot be planted. However, I did encounter a few instances of cultivation, albeit on the low end of the husbandry spectrum. One *mestizo* man who earns his livelihood from farming, also considers himself a *piquigua* artisan and is attempting to plant the hemiepiphyte. He makes hats, bottle covers, and baskets for his own use, and to sell when he can. He complained of a lack of *piquigua* near his home, so he decided to plant some *piquigua* in proximity to his house.

He collected 12 stems from a mature forest, approximately two hours walk from his home. He partially cleared a small area for cultivation, leaving enough trees present so that the area remains mostly shaded. About 1.5 m from each tree, he curved a meter of stem with an emerging aerial root into a semicircle. He placed both cut ends of the stem and the tip of the root in the soil. He then weighted it down with rocks (Figure 6.21). In one case, the middle section of the stem became brown and shriveled, but one end continued to grow. He maintains a one-meter area cleared around each plant.

As creative as his efforts are, it is still too early to tell if the plants will provide sufficient roots for weaving. After four months, only five plants were still growing. Detailed data about growth regimes, maturation rates, flower production, and aerial root development, are lacking.

Figure 6.21. *Mestizo* planting a *piquigua* plant.

Another person who is doing some *piquigua* planting is a *mestizo* from another community. He planted stems in both mature and secondary forest as experiments to see how they would progress under approximately natural conditions. He placed a stem that he had found fallen in the forest, next to the river. He also planted a stem in proximity to a tree near his house, in an area that is almost completely cleared. He discussed plans to plant *piquigua* on the edge of his fields and

mature forest, on the side where the trees still grow. Yet another instance of planting involves a *mestizo* woman who came across a fallen stem, and decided to stick it in the ground at the base of a tree. It is still growing up that tree.

In addition to the evidence of present-day planting of *piquigua*, I also found reference to past cultivation. One informant presumes that the previous owner of his land planted the *piquigua* found growing on his property. He maintains this idea because *piquigua* is not known to grow naturally in the area. While looking at this particular plant, my assistant decided that he too could plant *piquigua*. He the cut a piece of stem and carried it home to plant in his forested land. Results of his attempt remain unknown at this time.

Clearly, a thorough understanding of the plant and its habitat is important for successful cultivation. None of the five stems I planted on the Bilsa Reserve property survived. Although this was a small experiment with limited results, it adds to the knowledge surrounding *piquigua* cultivation. This is apparently the first time that a researcher has attempted to plant *piquigua.* From my own attempts to cultivate the plant, I know firsthand and full-well that it is complicated. Although I chose an area that was similar to areas where I had seen it growing in the wild, clearly that was not enough. It may be that soil conditions were not adequate for growth. Perhaps the parts of the plant that I chose were not ideal. Furthermore, how I planted the stems could have been inappropriate. This experiment can be used for future research when looking at what factors are involved in the successful cultivation of *piquigua.*

ALTERNATIVE MATERIAL

Although in numerous situations many plants can be used to serve a similar function, often, only one plant can be utilized for a specific need, and no alternative exists. For *piquigua,* collectors all said that any other material is inferior to *piquigua*. However, because *piquigua* is not always available, there are other materials that they can and do use. Some informants said that the replacements are not worth it, and that if they do not have *piquigua*, then they would prefer not to have the article. Barrett (1994) notes that the Chachi will use different climbing plants as a replacement, but the Chachi did not mention this to me.

Although not common, people sometimes use plastic strips as a substitute for *piquigua*. There were a few plastic baskets for sale in Quiñende, but I did not witness any *mestizo*s using them. I saw one Afro-Ecuadorian woman mixing plastic with *piquigua* in her baskets. She said that she included the other material, because she does not have enough *piquigua*. Although still fairly minimal, the most plastic use that I witnessed was with the Chachi (Figure 6.22). The plastic strips come from the banana companies in La Union, Santo Domingo, and Guayaquil. The distributors ship banana boxes flat, bound with strips of yellow plastic. When the boxes are assembled, the company cuts the plastic off the stack of boxes, and discards it. The Chachi, when they occasionally work on banana plantation for day wages, gather up the plastic strips and bring them to their homes. There, they weave the material into baskets. The

plastic is strong, and the Chachi say that they will use plastic or *piquigua,* whichever material is more available. The Chachi also constantly compare *piquigua* to their more commonly used material, *Carludovica palmata,* Cyclanthaceae. They claim that it is easier to collect and work with the *C. palmata*, but that *piquigua* lasts much longer when they go to the trouble to collect and weave it.

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Figure 6.22. Chachi woman holding a basket made from plastic obtained from a banana plantation.

MARKET

Although the farmers and Chachi are for the most part outside of the cash economy, a small market for woven goods does exist within and between

communities in the region. However, the majority of the buying and selling of raw *piquigua* and commercial items occurs mostly in larger towns.

Community Market

In general, the residents of the Mache-Chindul Ecological Reserve communities collect and weave the root for their own personal use. However, there are those who demonstrate more skill and interest in weaving than others. Various weavers will even buy baskets from someone else to save themselves the trouble of collecting and weaving. Thus, there exists a limited amount of buying and selling of *piquigua* articles between members of the same community, and sometimes with neighboring villages as well. Still, they sell few articles. One of the main weavers sold five *chalos* last year. When weavers do sell to each other, most often someone has commissioned the article. Bartering is common within the communities, and people will usually trade a chicken for a basket. When sold, a large *chalo* costs from $3.00 to 4.00, and small simple plaited baskets can be sold for $1.00 to 2.00. However, weavers are more likely to give the latter as gifts, or informal repayment for favors. They also sell brooms from $1.00 to 2.00, but these are also more likely to be given as gifts.

Approximately five years ago, in the central town of the Y, one of the two store owners who buys raw cacao, coffee and corn, also bought the raw root material from the locals. He had people in town weave baskets, which he then sold for $4.00. Farmers, who would not purchase raw material, sometimes bought woven articles.

However, this store owner no longer buys the material, saying that people use for themselves whatever they find. There is not enough extra to bring in to him.

There does exist a small business for the large *chalo*s in a few stores in the cities of Quiñende and Esmeraldas. A three-ply strength basket costs $5.00, and a two-ply costs $3.00. People within the cities weave these baskets. Store owners will also buy brooms for about 80 cents each, and sell them for about a dollar.

The NGO, Jatun Sacha, attempted to market handicraft items from the rural Mache-Chindul Ecological Reserve communities. Representatives picked up the goods from the weavers and sold them in the capital, Quito. However, the project terminated because the transport damaged the materials, and the articles began to mold during the lag time from when they were woven to the time that they were picked up for transit.

Although the Chachi do engage in some selling, this aspect of their artisan work remains minimal. They sell few baskets to each other because the majority knows how to weave themselves. Sporadically, one of them will go to Quiñende or Esmeraldas, and sell baskets on the street for about $4.00 a piece. More commonly, they will trade baskets and fans for rice with the neighboring Afro-Ecuadorian and *mestizo* communities. An example of opportunistic sales occurred while I was with the Chachi. A *mestizo* from a neighboring community asked for a decorative *piquigua* basket to be made, for which he would pay $1.00. Every once in a while,

groups in nearby towns will ask the Chachi community to weave a large number of baskets for special events.

Hats

Although few people sell hats, a small market for such items exists. One man makes and sells the hats for $6.00 to 7.00 in the Quiñende streets. He also markets items to people from nearby communities. Following the concept in economic geography of "value added," he does not sell the raw material, because it weighs more, and he can earn more money with the lighter, more valuable woven article. In Monte Cristi, various stores sell hats. There is a small store in Borbón that sells articles almost exclusively made from *piquigua,* mostly bags, small baskets, and hats. Most pieces cost from $1.00 to 5.00.

Raw Material

A successful market for the raw material of *piquigua* exists in various cities, one of which is Quiñende (Figure 6.23). The Mache-Chindul communities rarely participate in this part of the market, because they do not have enough material, and they are unable to efficiently transport what they do have. In Quiñende, merchants sell the raw material for commercial furniture and broom making (Figure 6.24). *Piquigua* furniture is durable and popular throughout Ecuador. Furniture makers construct pieces by wrapping the root around metal or wooden frames in decorative patterns. The high quality furniture root sells for $17.00 to 24.00 per 100 pounds. The

root sellers buy it from the farmer for about $15.40 to16.00. Roots with knots sell for less, about $14.00, with the buyer purchasing these from farmers for $12.00 to13.00.

Figure 6.23. Raw material ready for sale in town of Quiñende.

Figure 6.24. *Piquigua* furniture made for sale in the town of Monte Cristi.

Material Transport

Depending on whether buyers go to collectors, or if collectors bring *piquigua* to market, prices fluctuate to some degree. Some buyers will rent a car to pick up the material, costing them $60.00 each day. These buyers have harvesters whom they regularly visit, and who will have the materials waiting. One dealer drives out about every two weeks, and buys however much is available. He sometimes can return with a full truck, and sometimes an empty vehicle. Other farmers go to vendors, most often by horse and then bus.

The *piquigua* sellers often transport the raw material to the factories, renting trucks, and paying people to load and unload the material. These vendors say that it costs them about $3.00 to transport 500 pounds. *Piquigua* dealers can sell material from $1.00 to 6.00 over the buying price, and sell so much at one time that they make a profit. The prices vary accordingly if the furniture makers come to the town to buy the material.

Material Origin

Piquigua that is sold in western Ecuador comes from various areas, depending on the town in which it is sold. In Quiñende and Monte Cristi, buyers purchase it from the collectors north of Esmeraldas: San Mateo, Borbón, Montalvo, Muisne, Atacames, Chontadura, and San Francisco. *Heteropsis ecuadorensis* also grows in eastern Ecuador, in the Amazon region. However, the distance to that source is too great for people to travel from Esmeraldas and Manabí. Collectors tend to bring in the raw material on the weekends, and seasonally when they are not harvesting other crops. These farmers bring more of the material in during July and January than they do in other months. From February through June they bring less, because *piquigua* will keep in the forest and not rot, and they have to tend to other crops as soon as they are ready. Partially because of the seasonal nature, the raw material vendors do not deal exclusively with *piquigua*. They also sell other raw materials such as corn, rice, and coffee in order to earn their livelihood.

Material Destination

Although in the Borbón area, Chachi and Afro-Ecuadorians will buy small amounts of raw material that marketers bring down river in canoes, in Quiñende, commercial furniture makers are the exclusive purchasers of raw *piquigua*. These businesses buy as much material as is available.

Furniture

Because *piquigua* furniture lasts for approximately 20 years, prices on the commercial market remain high. The furniture made in Monte Cristi is of a lesser quality than that made in Guayaquil. A medium quality set of a sofa, two chairs and a table costs $320, and large chairs go for $60 a piece. A set of furniture high quality furniture costs $600, some large chairs costing $150 a piece.

Weavers produce larger pieces either in factories or in the back of their stores. Store owners purchase some of the smaller pieces, such as sets of shelves and small tables and trunks, from artisans in the countryside. An example of the pricing on a set of shelves is that the store owner buys the piece for $20.00. He then sells this piece for $25.00. Most of the buyers who come to the stores are Ecuadorians.

SUMMARY

Piquigua is an important plant resource in the Mache-Chindul Ecological Reserve. Articles and lashing material made from *piquigua* can be found in every home. The roots of the hemiepiphyte are strong, water resistant and pliable enough to

manipulate into desired weavings. Its use is extensive. It can potentially be collected sustainably because gatherers harvest a renewable part of the plant. However, the stress of collection on the plant can affect its fitness, which would lead to lower reproduction and higher mortality. A small market does exist for raw *piquigua*. Whether the market will become an important economic opportunity for these people is debatable. There exists the barrier of transportation, and the possibility of over collecting. However, there is the possibility of this non-timber forest product generating income if collected sustainably. A small market for the woven goods exists. Perhaps more importantly, because of people's personal interest in the root, some families are already protecting the forest in which it grows. The fact that a family is organizing their land management around *piquigua*, indicates the importance of this plant. For effective conservation it is important to note how people make their own choices about land use and land protection, without outside influence. Clearly, the importance of a single species can help to protect forested areas, as it has with the land in San Pedro. Thus, the role of *piquigua* in these people's lives is already helping to maintain a balance between protecting a forested area while supporting the people who live there.

In summing up the differences and similarities between the different groups' *piquigua* utilization, all three groups exhibit the same basic use for, and preparation of, the material. However, some differences do emerge between the colonists and the Chachi. The majority of these seem to come from the Chachi's extensive use of

another fiber material, *rampira*, *Carludovica palmata* (Cyclanthaceae). The Chachi are skilled artisans with *rampira*, and most of the Chachi design differences in *piquigua* weaving from colonist weaving resemble the Chachi's *rampira* design. These style variations are demonstrated by the fact that the Chachi split the root into strips that resemble the flat pieces of *rampira*. The variation in size and type of baskets is like those they make with *rampira*. Additionally, although the Chachi prize *piquigua*, it is less important to them than for the colonists. The fact that I witnessed more plastic with the Chachi appears to have less connection with culture and tradition, but with proximity to the banana plantations and access to the material.

That the Chachi collect less carefully than the colonists may be because they have more land from which to collect, and thus feel that the resource is less threatened. Moreover, it may stem from the fact that they have communal lands, and thus there is not a sense of collecting an owned resource with which one should be frugal.

Because all Chachi women with whom I spoke have some skill with *rampira,* there is less trading and buying and selling of baskets between them. Most families can always make themselves a *rampira* basket if they need a container, albeit of lesser durability than those of *piquigua*. The fact that more Chachi children weave in Río Bravo may also be because weaving is a more common tradition in all families. This appears to work in conjunction with their remote location without access to other kinds of activities. As mentioned, in the town of Naranjal, a Chachi town with a road

and closer to a city, not all children continue to weave. As women are the main weavers with *piquigua* in the Chachi communities, this again stems from their role as weavers with *rampira*, and also because gender roles are more differentiated in various aspects of their culture. This can be seen with the fact that women do all of the plantain management and harvest, while the men hunt and fish. In looking at these three groups' use of *piquigua*, one can see some of the potential as an NTFP, understand the non-market value, and also better understand how these three different ethnic groups use and collect both similarly yet with certain crucial variations.

CHAPTER VII
PIQUIGUA GROWTH RATE, DENSITY, AND EDAPHIC CONDITIONS

When looking at the plant use of any group of people, it is important to understand the plant itself. Knowing the growth rate can be useful when trying to determine if a plant can be collected sustainably. If it regenerates quickly enough to keep from being depleted, then it has possibilities for sustainable production. Looking at the density of plants between different locations can help in determining spatial variability. Furthermore, understanding the edaphic conditions where specific plants grow and do not grow can be particularly useful when exploring the possibility of cultivation.

GROWTH RATE

Looking at the growth rates of the stems and the roots show the speed at which *piquigua* can replace itself under collection pressures. All roots and stems in the permanent plot in San Pedro that were still elongating were measured. This resulted in the measuring of eleven aerial roots and three stems. A mark was made on the root or the stem, and the length from that point to the growing tip was measured each month. Given the time constraints of this study, these measurements were taken from August to December, a time when there is little rain. Future studies should look at growth between January and July, the rainy season. As with most hemiepiphytes,

little noticeable change was found in the diameter of the roots and stems measured. However, there was notable change in the length of both the roots and the stems. The average growth rate of a root is 4.4 cm per month with a standard deviation of 1.17 cm, and stem growth is 33.3 cm per month, with a standard deviation of 12.3 cm.

The information from this study, which is similar to Plowden's (2001) findings that *Heteropsis* spp. roots had a growth rate of 76.6 + 5.3 cm per year and Hoffman's (1997) data that *Heteropsis flexuosa* can grow at about 3.1 cm per month, provides an example of the growth rate of *Heteropsis ecuadorensis.* With increased studies on the growth rate of *piquigua* more detailed assessments can be made about the sustainability of harvesting *piquigua.*

DENSITY

The availability of any plant resource is a function of the species' density and distribution. Furthermore, in order to understand why people collect either destructively or conservatively it is important to know how the resource availability differs between the groups. Accordingly, in the case of *piquigua* it is important to know the density within lands belonging to each ethnic group. Ten (10) plots, each measuring 20 m x 50 m (1000 m^2) were surveyed. These plots are distributed throughout the communities of the three different ethnic groups. A total of 624 *piquigua* roots were found with an average density of 62.4 per 1000 m^2. The density of the *piquigua* is much higher in the Chachi community than it is in either the

mestizo or the Afro-Ecuadorian communities. The density in the Chachi community is 105.5 per 1000 m^2, compared to the density in the mestizo land of 57.6 per 1000 m^2 and the Afro-Ecuadorian is 36 per 1000 m^2 (Figure 7.1).

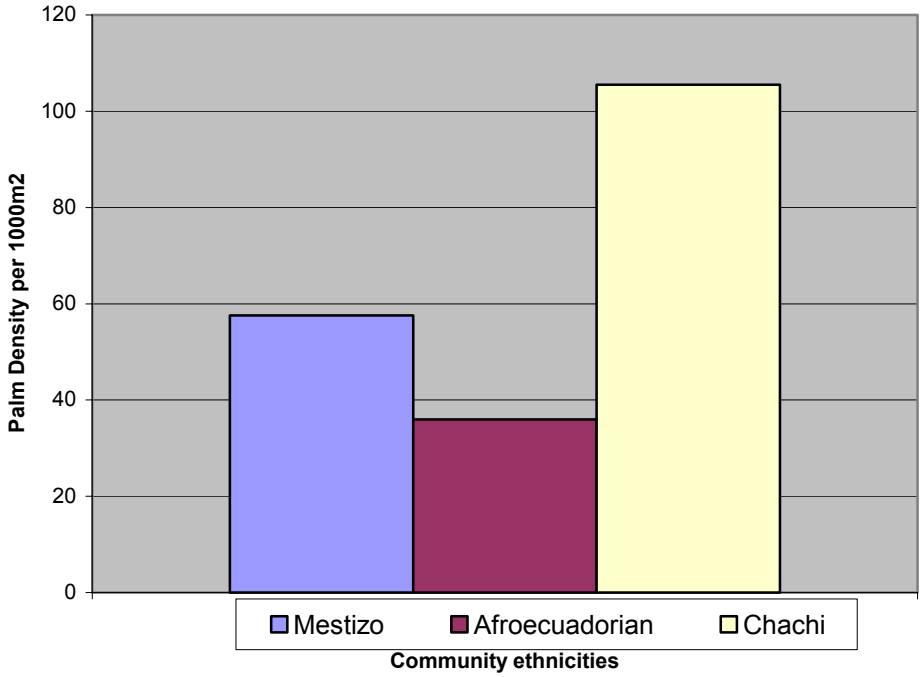

Figure 7.1. Histogram showing the *piquigua* density by ethnic community location.

There exist various possibilities of why a notably higher density of roots was found on the Chachi land than on that of the colonists. One is that the Chachi use *piquigua* less than the colonists, so there is less collection pressure on the resource. Also, the Chachi have more land than the colonists, so it may be easier for the species

to regenerate and find appropriate habitat for climbing, flowering and fruiting. Furthermore, the Chachi land, although technically the same kind of forest may have some unmeasured environmental differences that make it more conducive to *piquigua* growth. Perhaps the conditions in the Chachi plots encourage the plants to send down more roots. This last possibility would warrant further research to determine the possibility of a subtle environmental influence on *piquigua* growth and reproduction.

SOILS

In order to determine if edaphic conditions may be a factor in influencing the spatial distribution of *Piquigua,* soil samples were collected and analyzed. Samples were analyzed for pH, nitrogen, phosphorus, potassium, calcium, magnesium, and sulphur. The samples were grouped into the community areas from which they were collected, and divided into pairs (areas with and without *piquigua* growth). For comparative purposes (Table 7.3) Group A is the Mestizo community of San Pedro. Group B is from the Chachi Community of Río Bravo. Group C consists of samples taken from the community of Pambilar, in a semi-cleared plot of land. No *piquigua* grow naturally in this locale, but it is an area in which a local farmer is currently cultivating *piquigua*. The paired samples in this third case are from the soils where the plants survived, and from where they did not survive. Because of both limitations in time and funding, only a small number of samples could be collected and analyzed.

Results and interpretations, therefore, should be considered only as tentative and suggestive, rather than definitive.

Table 7.1. Soil Comparison.

Soil samples paired from where *piquigua* grows and where it does not. Group A and B are in primary forest, and group C is from an area where *piquigua* has been planted. The pairs in group C are from there the *piquigua* lived or died. Each element is represented in Parts Per Million (ppm).

Soil Sample	Root	Depth	pH	N	P	K	Ca	Mg	S
A/Etelvina									
EC-01 # 6	Present	0-3cm	6.6	14	24	411	5803	439	16
EC-02 # 6	Present	3-9cm	NA	5	18	292	3692	486	30
EC-03 # 21	Absent	0-3cm	6.7	69	11	381	3646	473	27
EC-04 # 21	Absent	3-10cm	6.4	19	5	280	2047	333	15
B/Río Bravo									
EC-05 # 11	Present	0-2cm	6.3	53	33	228	5136	480	27
EC-06 # 11	Present	2-8cm	6.3	11	11	69	2550	291	12
EC-07 # 12	Absent	0-0.5cm	6.3	38	20	240	4488	870	13
EC-08 # 12	Absent	0.5-8cm	5.2	12	8	120	3221	986	28
C/ Pambilar									
EC-09 # 15	Cult/Alive	0-2cm	5.4	54	19	81	350	44	69
EC-10 #15	Cult/Alive	2-15cm	5.6	15	5	18	49	7	257
EC-11 # 16	Cult/ Dead	0-2cm	4.4	38	28	74	164	39	123
EC-12 # 16	Cult/Dead	2-15cm	4.3	80	35	97	128	38	126

Samples from groups A and B, for both upper and lower horizons, are remarkably similar, suggesting that soils may have minimal influence on *piquigua*.

However, closer inspection reveals a couple of interesting and possibly important differences. Using qualitative as well as quantitative data provided by the soils lab, samples extracted from a locale with *piquigua* in group A had low and very low levels of nitrogen, whereas those taken from areas without the plant, had very high, and moderate levels of nitrogen. This finding suggests that *piquigua* may be a heavy consumer of soil nitrogen. Curiously however, similar samples from Group B do not show this trend, indicating that the relationship between *piquigua* and soil nitrogen may be quite complex and worthy of further, more-detailed study.

In both group A and group B, phosphorus is noticeably more abundant than in Group C, in both lower and upper horizons. Samples from a locale with roots are described as moderate, whereas those from the locale without roots are described as moderate to very low. This presents the possibility that *Piquigua* requires a high amount of phosphorus for successful growth. Finally, the data for sulphur are the most inconsistent of the eight samples collected from the four locales, and the two depths, as no pattern is discernable. If anything can be concluded from this, it is that sulphur is in no way a factor affecting the growth *piquigua*.

In looking at soils from group C, the areas in which *piquigua* is cultivated, few differences were found between soils in which *piquigua* survive, as opposed to where it does not. In general, substrate in this semi-cleared location differs from soils in which the forest that has not been recently cleared. Soils in group C are on the whole much different than those in group A and B. This is to be expected due to

clearing and cultivation on these soils. These differences are most apparent in regards to the fact that the pH, potassium, calcium and magnesium are markedly lower, and that sulphur is considerably higher. Also, the nitrate nitrogen does not differ between where *piquigua* survives as compared to where it does not. One possible explanation for this disparity may lie in the density of *piquigua*. In group C, few *piquigua* were recorded and these could not have consumed much soil nitrogen. In contrast, *piquigua* in groups A and B are quite dense and capable of depleting this reserve.

In sum, looking at the growth rate of the root, 4.41cm per month and 33.33 cm for the stem, one can better understand how quickly this plant can grow. The fact that the density of *piquigua* is higher in the Chachi area adds information about how much resource the indigenous people have in comparison to the colonists. And, on the basis of this very limited study, it appears that there is a positive correlation between the growth of *piquigua* and soils with high levels of phosphorus. There may be a correlation with nitrogen, but it could be concealed by the possibility that this plant may be a heavy consumer of this nutrient. These results clearly indicate that on the relationship between this plant and soils additional research is warranted, especially if it is ever to be cultivated successfully.

CHAPTER VIII
MOCORA (*ASTROCARYUM STANDLEYANUM*, ARECACEAE) DESCRIPTION

Palms have proven to be useful plants because they are highly productive, with abundant fruit and foliage, and can be collected in sustainable manners (Colfer 1997; Kahn and Granville 1995). This chapter provides a brief descriptive overview of *Astrocaryum standleyanum*, based in part on existing literature and in part on personal field observations in the Mache-Chindul Ecological Reserve.

ASTROCARYUM STANDLEYANUM

Location and Habitat

The genus *Astrocaryum* has 50 species distributed from Mexico south to Brazil and Bolivia (Kahn and Granville 1995; McCurrach 1960; and Moore 1987). *Astrocaryum standleyanum* L.H. Bailey (Arecaceae) occurs along the Pacific slope in Costa Rica (Puntarenas), the Atlantic slope of Panama (Canal Area, Panama, San Blas), the Pacific lowlands of Colombia (Antioquia, Chocó, Cauca, Valle, Nariño) and Ecuador (Esmeraldas, Pichincha) (Balslev and Barford 1987; Croat 1978; D'Arcy 1987; Galeano and Bernal 1987; Henderson, et al. 1995; Skov 1997). (Figure 8.1) *Astrocaryum standleyanum* grows most commonly in lowland rainforests on poorly drained soils, usually below 200 m elevation (Henderson et al. 1995), but can be found up to 500 m (Pedersen 1994). In Colombia, it has been noted growing in

periodically inundated forest (Galeano and Bernal 1987; Usma et al. 1996). It also is common on flat, periodically inundated areas in Pacific Colombia (Galeano and Bernal 1987).

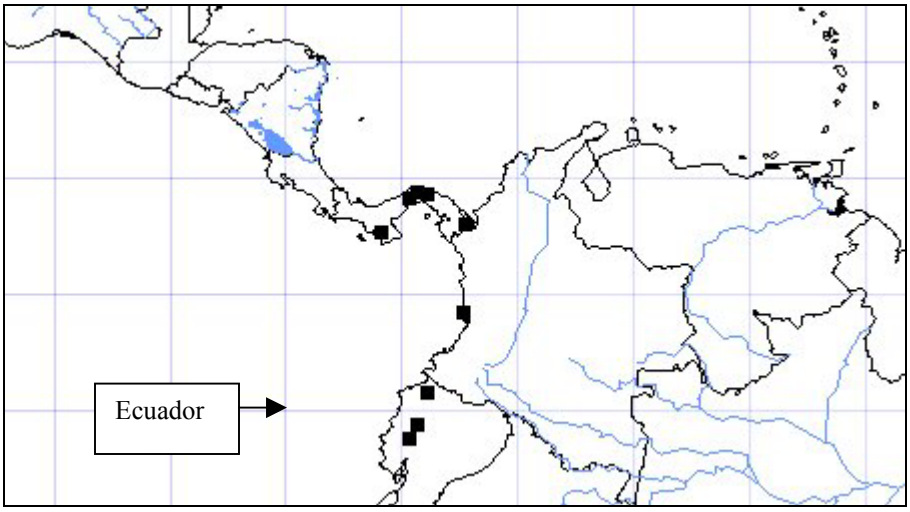

Figure 8.1. Distribution map of *mocora (Astrocaryum standleyanum)* (Missouri Botanical Garden 2003).

In Barro Colorado (Panama) Croat (1978) and De Steven et al. (1987) found *A. standleyanum* growing more commonly in younger, than in older forests, and in the latter they most commonly were growing in steep ravines. The species appears to grow most abundantly in the low coastal mountains in the province of Manabí. In Ecuador it can live in humid conditions in the north, and also in the south where there is a more seasonal climate. It usually lives where there is an average temperature of approximately 25 °C (Pedersen 1994).

Astrocaryum standleyanum remains in many fields, primarily because people commonly conserve it on their property (Henderson, et al. 1995; Pedersen 1994). Furthermore, although it regenerates most successfully in primary forest, it can also regenerate in the shade of agroforestry systems (De Steven, et al. 1987). I saw *A. standleyanum* growing in fields, and seedlings emerging in areas with almost no shade. Those that I observed in mature forest were most often growing on ridges.

Germination can occur up to three years after seed dispersal, as the hard endocarps can persist on the forest floor for several years (Smythe 1989; Wright et al. 1999). Seedlings produce entire leaves for several years, before developing into a basal rosette of compound leaves. This latter stage may persist for 20 years or more before stem growth begins. Leaf growth then remains fairly constant throughout the year, with a slight decline during the dry season. There appears to be a higher survivorship for those seedlings that germinate further away from the parent plant, growing out of the way of falling fronds and spathes from the parent (De Steven et al. 1987).

Stems and Leaves

Astrocaryum standleyanum has a solitary, medium sized, stout, subcanopy stem 8-15 m tall and 16-22 cm diameter. Flattened spines that may reach 20 cm in length, protect the trunk, the rachis, and the leaflets (Figure 8.2)

Figure 8.2. Spines covering *mocora* stem.

The mature leaves are pinnately compound, about 3-4 m long. They usually number from 11 to 20, and spread horizontally with a slight curve. The leaves are green on the adaxial side, and whitish-grayish, on the abaxial side. There are approximately 100-105 leaflets per side, growing in an irregularly arranged pattern, and spreading into different planes (Figure 8.3) (Croat 1978; Galeano and Bernal 1987; Henderson, et al. 1995; Pedersen 1994; Runk 2001).

Figure 8.3. *Mocora* palm leaves (Juvenile).

Inflorescence and Infrutescence

The inflorescence stands erect among the leaves, becoming pendulous when bearing fruit. *Astrocaryum standleyanum* is monoecious, with 3-7 flowering branches each year. The peak flowering time is during the rainy season (De Steven et al. 1987; Usma, et al. 1996). The fruits are oblong, 3-6 cm long and 2-3 cm diameter. They have a small beak at the tip. They are orange colored, almost smooth, with a fleshy orange mesocarp. Approximately 400 fruits grow on each raceme (Figure 8.4) (Galeano and Bernal 1987; Smythe 1989; Wright et al. 1999).

Dispersal

Various small animals and birds disperse the seeds (Hoch and Adler 1997; Smythe 1989). Some animals appear to be both predators and dispersers. However, this may aid in the survival of the species. An example is the agouti that eats and also buries *Astrocaryum* seeds. This interaction appears to work favorably for the palm, because those seeds that the agouti buries germinate better than the seeds left above ground. Because the rodents remove the pericarp before burial, they may be increasing viability through ridding the seed of invertebrate larvae (Smythe 1983). The majority of the predators and dispersers tend to be small mammals, including rabbits (*Sylvilagus brasiliensis,* Leporidae) (Pedersen 1994), spiny rats *(Proechimys semispinosus.* Echimyidae) (Hoch and Adler 1997; Smythe, et al. 1996), red tailed squirrels *(Sciurus granatensis,* Sciuridae) (Glanz 1984; Glanz, et al. 1996), and agoutis (*Dasyprocta punctata*, Dasyprocta) (Smythe 1983). Some monkeys and other

mammals eat the mesocarp and discard the seeds. These include spider monkeys (*Ateles geoffroy,* Cebidae), howler monkeys (*Alouatta palliata,* Cebidae), kinkajous (*Potos flavus,* Procyonidae), and coatis (*Nasua narica,* Procyonidae) (Enders 1935; Giacalone-Madden, et al. 1990; Smythe, et al. 1996), however some monkeys act as predators as well such as white face capuchin monkeys (*Cebus capucinus,* Cebidae). Other seed predators include bruchid beetles (Smythe 1989; Wright 1990).

Figure 8.4. Ripe *mocora* fruit raceme hanging from palm.

CHAPTER IX
MOCORA USE

When looking at which plants are most important ethnobotanically, palms inevitably arise as one of the most prominent families in the lowland tropics (Corner 1966; Balick 1988; McCurrach 1960; Moore 1973). According to the *mestizo* and Afro-Ecuadorian colonists in the Mache-Chindul Ecological Reserve one of the plants they recognized as particularly important is the palm *mocora* (*Astrocaryum standleyanum*). Every colonist whom I interviewed used *mocora*. The indigenous group, the Chachi, also speak of the palm's importance, but among those interviewed plays a lesser role in their daily lives than in those of either the *mestizos* or Afro-Ecuadorians. Although this palm is central to the people who live in and around the reserve, it has not been studied before in this area.

Following is a general description of Arecaceae ethnobotany, and then specifically of *Astrocaryum* ethnobotany. Because palm use is so extensive throughout the world, especially in the tropics, and cannot be covered completely in a work such as this, I provide some examples of certain palms and their uses within the most common utilization categories. This chapter then examines in detail how all three Ecuadorian groups use the species *Astrocaryum standleyanum,* both similarly and differently. Discussion focuses on; (1) woven articles, (2) preparation of the materials for weaving, (3) weaving techniques, (4) methods of collection, (5) instances of cultivation, (6) other forms of management, (7) and markets, both local and external.

Borgtoft Pedersen (1994) has completed a thorough work up of *mestizo*s' *mocora* use in the coastal plains of northwest Ecuador, based mostly in Calceta, and Runk (2001) has a treatment of the Wounaan and Emberá *mocora* basket weavers in Panama. My work complements these previous treatments. I look at a completely different use from the basketry in Panama. I also look further into mat weaving amongst the three different ethnic groups, which is distinct in many ways from the treatment of the commercial weavers of the *mestizo* group in Calceta, Manabí, Ecuador.

ARECACEAE ETHNOBOTANY

Weaving and Basketry

People frequently use palms for weaving material in tropical areas (Anderson et al. 1991). A few examples of palms used include *Sabal mexicana* (Caballero 1995) and *Cryosophila stauracantha* (Fadiman 1997) to make hats in the Yucatan, Mexico. In Florida, people used *Sabal palmetto* for basketry and fans (Robinson 1947) and in Namibia people make baskets from *Hyphaene petersiana* (Sullivan, et al. 1995). The Apinayé and the Guajara use fiber from *Bactris* spp. to make fish traps, and use *Mauritia flexuosa* and *Mauritiella armata* to make baskets (Balick 1988).

Brushes and Brooms

Indigenous people in Colombia use fiber from the leaves of *Leopoldinia piassaba* for ropes and brooms (Schultes 1974). In North America, although not a

major use, people have historically used palms for brushes and brooms. *Sabal palmetto* produces fiber from the "boots," the growth surrounding the terminal bud. People also gather this material from *Borassus flabellifer*. Beginning in the 1900s, companies in Florida developed a successful industry in brush making from this fiber. Because the fiber remained stiff in hot water, breweries, creameries and citrus factories used them to clean their cooking vats (Robinson 1947).

Thatch

Palm thatch is one of the most common ways that rural tropical peoples roof their homes. Various indigenous groups in northwest Amazon consider *Lepidocaryum tenue* to be the best thatching material (Schultes 1974). Other examples of people using palms for thatch include the Bolivian Chácabo with *Oenocarpus mapora*, *Euterpe precatoria*, and *Scheela princeps* (Boom 1988), Hondurans (Johannessen 1963) and Belizeans with *Orbignya cohune* (McSweeny 1995), Mexicans with *Sabal mexicana* (Caballero 1995), and *Sabal uresana* (Joyal 1996), Florida's Seminoles with *Sabal palmetto* (Bennett 1997) and various South Asians with *Nypa fruticans* (Davis 1988).

Construction

In various lowland tropical areas many people use palms for construction materials. Two examples include *Irartea deltoideae* in Ecuador and *Socratea exorrorhiza* in Colombia (Schultes 1974). For furniture, the well-known rattan, (*Calamus* spp.) has been used successfully in Asia (Davis 1988; Dransfield 1988). A

less known construction palm is *Sabal palmetto*, used for docks in Florida. The stems of the palm are immune to a detrimental water mollusk that bores into many woods used in salt water (Robinson 1947).

Food

Palms provide various consumptive items, usually from their fruits and young stem. The latter is referred to as the "heart." One of the best-known fruits that people consume worldwide is the fruit from *Cocos nucifera*, the coconut (Schultes 1974). Oil is another edible material that people collect from palm fruit, such as *Astrocaryum murumuru* (Balick 1985; Lleras and Coradin 1988). Other palms from which people consume fruits, unripe endosperm, and fermented alcoholic beverages include *Orbignya phalerata, Euterpe precatoria, Bactris gasipaes* (Schultes 1974*), Mauritia flexuosa, Mauritiella armata, Attalea maripa, Oenocarpus distichus* (Balick 1988*), Jessenia bataua* in the Amazon (Boom 1988), *Orbygnia cohune* in Central America (Johannessen 1963), *Arenga pinnata* in Asia (Davis 1988), and *Hyphaene petersiana* in Namibia (Sullivan, et al. 1995).

Some examples of palm heart include *Arenga pinnata* and *Borassus flebellifer* for various Indonesians (Davis 1988), and *Orbignya cohune* for Belizeans (McSweeny 1995). Starch is another important food that palms provide from their trunks. Some examples include *Metroxylon sagu* and *Arenga microcarpa* in South Asia (Davis 1988), and *Acromia* spp. in Central America (Sauer 1969).

Jewelry

Many palm seeds have hard endocarps that people use to make beads and other decorative items. The most famous are the palms that people refer to as vegetable ivory, such as *Phytelephas aequatorialis* in Ecuador (Runk 1998) and *Euterpe oleracea* in Brazil (Balick 1988).

Medicine

Although not the main use, people do use some palms for medicine. One example is the Guajara of Brazil who use *Desmoncus polyacanthos* fruit to cure stomach ache, and who make a tea of leaves of *Geonoma pohliana* and the fruit of *Oenocarpus distichus* to treat hepatitis (Balick 1988). Also, the Chácabo in Bolivia treat fever with the sap of *Oenocarpus mapora* (Boom 1988), and groups in Southeast Asia use the juice of the young shoots of *Nypa fruticans* to cure herpes (Davis 1988). Furthermore, *Serenoa repens* fruits are being used to treat benign prostatic hyperplasia in North America (Bennett and Hicklin 1998)

Religion

A less tangible, albeit important use of palms, is their role in religion. The use most familiar to Christians is for Palm Sunday, during which people use palm fronds of various species to decorate their homes and establishments (Robinson 1947; Schultes 1974). Palms also figure prominently in religions other than Christianity. A few examples include Judaism, Islam, Hinduism, and Amazonian religions. The date palm, *Phoenix dactylifera,* was an important plant for ancient Greeks. They

dedicated it to Apollo. It is a symbol of Islam, and for the Jews it has become symbolic of Jerusalem. *Boras flabellifera* and *Corypha umbraculifera* figure prominently in Hindu tradition in India, and in the Amazon, various palms such as *Mauritiella cataractarum* and *Bactris pyrenopglyphis* are a part of animistic rituals (Schultes 1974). Palms can also be an important part of harvest festivals, such as the Shuar in the Amazon use *Bactris gasipaes* (Bennett et al. 2002).

ASTROCARYUM ETHNOBOTANY

Fiber

One of the main uses of *Astrocaryum* fiber for Amazonian people is for making hammocks, bags, and fishing nets. They collect, dry, split and twist the young leaves into strands for weaving. *Astrocaryum chambira* is most commonly used in this way by groups such as the Siona (Wheeler 1970), the Bora (Vormisto 2002) the Quichua, Waorani, Cofán, and Secoya (Bernal 1992; Borgtoft Pedersen 1991; Gómez et al. 1996; Jensen and Balslev 1995; Jensen 1997; Pedersen and Balslev 1992), and peasants in Peru (Coomes 2003). In Colombia, various indigenous groups use *Astrocaryum vulgare* to weave their hammocks (Schultes 1974). People use the fiber of various species of *Astrocaryum* to make fish lines and rope (Dahlgren 1944). The Chácabo in Bolivia use *Astrocaryum aculeatum* for basketry, and consider this their most important palm (Boom 1988).

Food

Although not their most common use, *Astrocaryum* species do provide a source of nourishment. Various tropical lowland groups drink the immature endosperm from immature fruits of *Astrocaryum chambira* (Jensen and Balslev 1995). The Quichua in Ecuador drink endosperm from *A. murumuru* and *A. aculeatissimum* (Pedersen and Balslev 1992), and also eat the fruit and heart of *A. aculeatissimum* (Jensen and Balslev 1995). The Chácabo in Bolivia consume *A. aculeatum* and *A. huicungo* fruits (Boom 1988). The Apinayé and the Guajara eat the endosperm from *A. vulgare*, the ripe fruit from *A. munbaca* and both the fruit and the heart of *A. campestre* (Balick 1988). Various groups sell fresh fruits from *A. vulgare* in markets along the Amazon River (Bernal 1992). Siona children eat the fruit from *A. jauari*, and the adults use it for fish bait (Pedersen and Balslev 1992). The seedlings from the latter are also edible (Duke 1970).

Moreover, some species appear to be particularly high in oil content. Brazil had a small palm oil industry at Barcelos on the Rio Negro using some *Astrocaryum* species (Dahlgren 1944). *A. murumuru A. aculeatum* and *A. vulgare* are a few species that have been used in oil production for decades (Balick 1985; Lleras and Coradin 1988).

Woody Materials

Some lowland tropical groups use *Astrocaryum* stems for construction purposes. These groups utilize the hard trunks by scraping off the spines for upright

beams, and by extracting wood for bows and arrows (Dahlgren 1944; Duke 1970). One species in particular, which the Chácabo of Bolivia favor for bows and arrowheads, is *A. aculeatum* (Boom 1988). Also, some groups use small slivers of *A. tucuma* for their blow darts (Dahlgren 1944). The Apinayé and Guajara of Brazil use the spines of *A. vulgare* to weave the fringes on their hammocks (Balick 1988).

Jewelry

Various people utilize hard *Astrocaryum* seeds to make jewelry. Usually, this consists of making various kinds of beads. The Apinayé and the Guajara in Brazil use seeds of *A. campestre* to make necklace beads (Balick 1988). The Siona use *A. jauari* (Pedersen and Balslev 1992), and *mestizos* in Ecuador use *A. standleyanum*.

Medicine

Although *Astrocaryum* is rarely considered medicinal, there are reports of indigenous Brazilians using a tea of *A. campestre* leaves for venereal disease (Balick 1988).

MOCORA (*ASTROCARYUM STANDLEYANUM*) ETHNOBOTANY.

Mats

The most common use of *mocora* in the Mache-Chindul Ecological Reserve is for mat weaving. Most *mestizos* and Afro-Ecuadorians in the Mache-Chindul Ecological Reserve region sleep on *mocora* mats. Furthermore, in a few *mestizo* homes, they also hang *mocora* mats on the walls to prevent wind and moisture from

entering through the cane or bamboo structures. The Chachi also sleep on mats, although they are less often made of *mocora*, but from the petioles of *Carludovica palmata, rampira* (Cyclanthaceae). Although the Chachi say that they prefer *mocora*, because it is softer, they are more accustomed to weaving with *rampira*, and the material is easier to collect and prepare. For the Chachi, more people made *mocora* mats in the past. Residents told me that ten years ago one would find *mocora* mats in most homes. Now, only those who consider themselves artisans continue to use this fiber. In the Chachi community adjacent to the reserve, Río Bravo, only two families currently weave with *mocora*.

Baskets

While no group in the Mache-Chindul Ecological Reserve makes the sewn *mocora* baskets from the leaves as in Manabí (Borgtoft Pedersen 1994) or the coiled baskets like in Panama (Runk 2001), various *mestizo*s make storage baskets from the midribs of the leaflets. *Mestizo* families use them to hold light kitchen items, with children being the most common weavers of these simple and useful containers.

Cordage and Brooms

Although not a common use, the Chachi use dried leaf fiber of *mocora* as string to hang mosquito netting. They also use braided *mocora* ropes, tying these to the hammock so that they can rock their babies from afar. Furthermore, the Chachi sometimes tie *mocora* leaflets to together to make brooms.

Food

All three groups in the area suck on the sweet mesocarp of the *mocora* fruit. This fruit consumption has been noted in various works with people who live near the palm (Borgtoft Pedersen 1994; Galeano and Bernal 1987; Pedersen and Balslev 1992). The Afro-Ecuadorians also eat the endosperm. When ripe, this inner layer hardens to the consistency of coconut meat, which is why they call it 'coco'. Some Afro-Ecuadorians, living slightly outside the study area, in San Miguel, say that they cook this inner part to mix with food as they do with coconuts. According to Barford and Balslev (1988) the Chachi also eat this inner part, referring to it as *Poca-Chi*. Another part of the palm that all groups consume is the palm heart. They eat this when they have already felled and killed a palm for leaf use.

Jewelry

In one community, I witnessed a man who uses the hard endocarp of the *mocora* seed to make rings. This man most often sells them outside the community, or gives them as special gifts within it. Patiño (1977) also recorded the seeds as providing material for jewelry making.

Hammocks

Although commonly made in Calceta (Borgtoft Pedersen 1994), and mentioned by my informants as another article they make, I did not see any palm hammocks in *mestizo* or Afro-Ecuadorian homes. All of their hammocks are made of nylon. I came across one *mocora* hammock for sale in the town of Monte Cristi. The

only *mocora* hammock that I did encounter in a home, was a partially woven piece in a Chachi house in Río Bravo. The man who was weaving it is the husband of one of the prominent weavers in the community. Barford and Balslev (1988) were also told that the Chachi use *mocora* for hammocks, but they reported not seeing any.

Construction, Coiled Baskets, Belts and Hats

Although I did not witness the use of *mocora* for construction, coiled baskets, belts or hats, these are *mocora* articles that people in other areas make. Some people scrape the stems of spines and use the cleaned stems for support beams in house construction (Duke 1970; Forero Pinto 1980; Galeano and Bernal 1987; Henderson et al. 1994; Patiño 1970). The Wounaan use the stem for bows and arrows (Duke 1970; Runk 2001), and some make fishing rods out of this portion of the plant (Dahlgren 1944).

Depending on coiled baskets made from *mocora* leaves for personal use and sale are Colombian groups of the Chocó (Bernal 1992; Bustos-Gómez 1994; Palacios Santa Maria 1993), and the Wounaan and Emberá of Panama (Runk 2001). *Mocora* has been identified as the material for basketry in various works (Bernal 1992; Palacios Santa Maria 1993; Patiño 1977; Usma et al. 1996; Warner 1996), and for hats in Colombia (Forero Pinto 1980). In Manabí, particularly Calceta, people make hammocks, hats, and belts, and in Esmeraldas mats (Acosta Solís 1944, 52; Borgtoft Pedersen 1994).

MATERIAL PREPARATION

Spine and Midrib Removal

After collectors bring the palm materials home, the entire family removes the spines from the outer margins of the leaflets. They take off this sharp material by running a knife up the edge, removing the outermost portion of material from both sides of each leaflet. Then, with their fingers, they pinch the midrib from the top of the leaflet, slip their thumbnail underneath, and slide it to the base of the leaflet, separating the midrib from the leaflet blade (Figure 9.1, 9.2). They then break this off higher than the base, so that the leaflet still remains intact at the bottom.

Drying and Storage

Weavers and their families hang the leaflets over a line to dry, straddling the leaflets on the still intact base (Figure 9.3). The leaflets dry for approximately one week. The Afro-Ecuadorians I interviewed said that it is better to dry materials in the shade so that the sun does not bleach the color. *Mestizos* dry them in the sun when it shines, and in the shade when it rains (Figure 9.4). Since the *mestizos* only use one color,

Figure 9.1. *Mocora* weaver removing the midrib from the leaflet.

Figure 9.2. Close up of colonist removing the midrib from the *mocora* leaflet.

bleaching is not a concern. The material is then ready for use. One Chachi household adds an additional step. In this home, the weavers twist the dried leafletsinto small ropes in order to make hammocks. After collection, the leaves must be processed and dried within a few days or they will rot. Once dried, the weavers can store the material for up to four months in the rafters of the house.

Figure 9.3. Close up of *mocora* leaflets hung on the line to dry.

Figure 9.4. Hanging *mocora* leaflets from spear and adjacent leaves in Afro-Ecuadorian home.

Cooking

Most families do not cook the material, but one family of particularly skilled weavers places it in boiling water for a minute, before they put it out to dry. They claim that this makes if softer, and they can thus make a finer weave.

This process differs from the palm preparation in Calceta. According to Borgtoft Pedersen (1994), the weavers in Manabí always cook the fiber, bleach it with sulphur, cut fibers into equal lengths, and then braid them into long ropes that they sew together. This also differs from Panama hat makers, who peel away the upper epidermis and mesophyll, using only the lower epidermis. These weavers then soak, dry, and bleach the material in sun. They then split and twist the fibers, like

groups do with *Astrocaryum chambira* in the Amazon (Jensen and Balslev 1995; Runk 2001; Wheeler 1970).

WEAVING

*Mestizo*s and Afro-Ecuadorians living in the Mache-Chindul Ecological Reserve each have their distinct style of weaving mats. The *mestizo*s weave a twill or diagonal plait, creating a herringbone pattern (Figure 9.5). The Afro-Ecuadorians have a simple or plain plait, making a checkered pattern (Figure 9.6) (Adovasio 1977). Also, the material they use differs slightly from each other. *Mestizo*s use only the spear leaves, those that are most recently emerged, and not yet open (Figure 9.7), while the Afro-Ecuadorians also utilize the recently opened leaves that grow on either side of the spear leaf. Afro-Ecuadorians say that they can obtain more material from each palm, and can create a design with the two different colored materials. The spear leaf is beige, and the more mature leaves are green, emphasizing the checkered pattern. One *mestizo* from Esmeraldas, married to an Afro-Ecuadorian woman wanted his wife to learn the Manabí style, because it is "softer and takes fewer leaves". The Chachi mats I saw were woven in the Afro-Ecuadorian style, which may have been woven in the community, or obtained through trade with their Afro-Ecuadorian neighbors.

Figure 9.5. *Mestizo* herringbone pattern of weaving *mocora.*

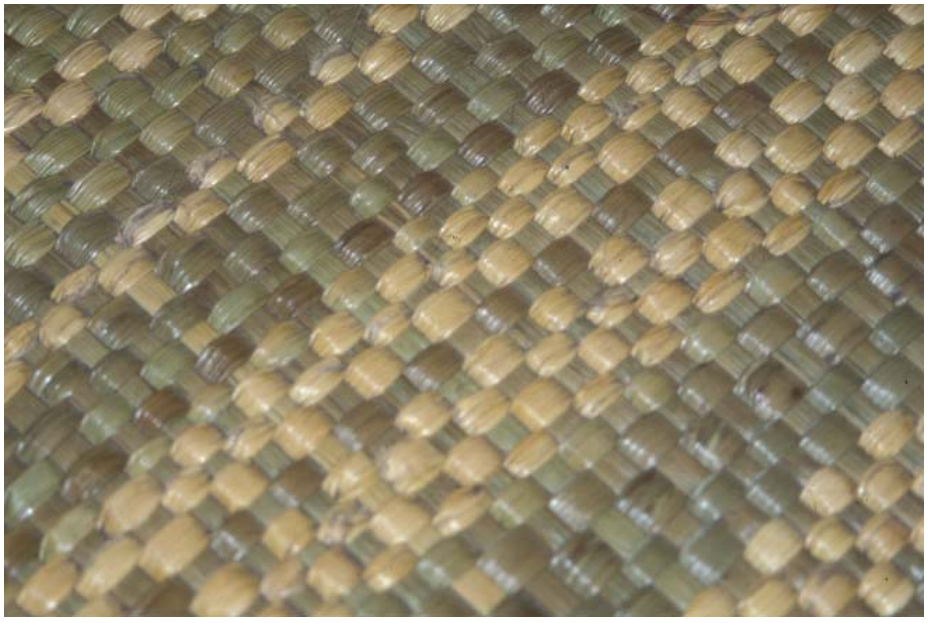

Figure 9.6. Afro-Ecuadorian checkered pattern of weaving *mocora.*

Figure 9.7. Recently emerged *mocora* spear leaf.

The first step in weaving for both groups is to hook the uncut base of numerous dried leaflets over a board, and then to weave down (Figure 9.8). They add in rows of leaflets as they go. When finished weaving, the artisan removes the board. The unwoven ends of the leaflets that extend out from the sides that were attached to the board are either trimmed and left as a border, cut at an angle to make a zig zag

design (Figure 9.9) or are tucked under and woven into the mat as a 90 degree selvage (Adovasio 1977).

Figure 9.8. *Mocora* mat attached to the weaving board at the top of the photograph.

Figure 9.9. *Mocora* mat border cut at an angle.

Ironed

Both mat styles can have one further variation that weavers refer to as *planchada* (ironed). Weavers take a block of wood with a piece of metal or smooth rock placed in the end, over which they will then pull the fiber taught. Weavers then fold the flattened leaflet over so that it is doubled, and then run it over again. They then use these softer flatter fibers to weave the mat. Only those that see themselves as artisans, or are going to sell a mat with the request that it be ironed, use the material in this way.

Leaf Quantity and Mat Duration

*Mestizo*s use the leaflets from four spear leaves for a double size mat. The Afro-Ecuadorians and Chachi use approximately six leaves, a mixture of spear and recently opened leaves, for the same size mat. In all three groups, people say that mats will last up to five years. Almost every response included the stipulation that this length of time was without the occurrence of children urinating on the article.

Time

Colonists take approximately one week to finish a mat if they work on it consistently. However, this is an activity that they typically pursue in conjunction with their other responsibilities. The Chachi can make a mat in four days. All groups agree that one would need to add in a few extra days for ironing. The Chachi say that it takes two weeks to weave a hammock.

Weaving Knowledge

The Afro-Ecuadorians and *mestizo*s generally acquire weaving knowledge through their own interest, learning by watching an experienced friend or a family member. It is not a skill that seems to be consciously passed from one generation to the next within families. In one family, even though the mother weaves, her daughter learned to weave from a friend. This daughter then was the one to teach her sisters the skill. Many weavers learned the craft only after they arrived to the region. Within many colonist communities, no one in the family knows how to weave, and they obtain mats from those who do.

Although I observed few Chachi weaving *mocora*, those who knew how said they had learned from a parent, and that their children are learning to weave from them. Although the Chachi still see *mocora* weaving as a strong tradition, they also say that ten and twenty years ago many people knew how to weave *mocora* well, and that their grandparents had the "real" knowledge.

Gender

For the all three groups, both men and women harvest the leaves, and everyone in the family prepares the material. It is almost exclusively the women who weave the mats. However some male colonists know how to weave, but they will usually teach their wives, so that the women can do the weaving. Chachi men in general do not weave with any material, except to make the nylon fishing nets. However, the one *mocora* hammock I did see in a Chachi home was the product of the family's patriarch. Perhaps he was the weaver of this kind of product because this activity resembles the male dominated job of weaving fishnets.

MIDRIB BASKET WEAVING

To make midrib baskets the weavers place 40 midribs on the floor, in pairs, lined up parallel to each other. Then, they take 20 more pairs, and use these as the active agent. They weave each active agent under and over the passive agents. The active agents are also parallel to each other creating a simple plait square (Figure 9.10) (Adovasio 1977). It is an open weave, leaving 3 cm space between each pair.

The weaver then pulls the four unwoven edges, consisting of the ends of the strips, up towards the center. They twine *mocora* leaflets over the separate ribs, uniting them into four bunches. The weaver then crosses these over each other and tie them together with another piece of *mocora* leaf, making a cross handle (Figure 9.11).

Figure 9.10. *Mestizo* boy weaving a *mocora* midrib basket.

Figure 9.11. *Mocora* midrib basket with a cross handle.

JEWELRY MAKING

Most people discard the seeds after eating palm fruit. However, one man, Don Jesus, has a small ring making business. After he dries the seed, he then cuts off both ends of the seed with a small saw or a machete. Carefully, he scrapes the hairs from the outside of the seed with a small knife or with a machete (Figure 9.12), and scrapes out the endosperm, leaving the naturally hollow circle of the seed. With a rough sheet of sand paper, and then a smoother one (each sheet costs 50 cents and can make 20 rings) he sands the outside to make it smooth. Don Jesus then scrapes the cut edges with his knife to round them over. As a final touch, he rubs the ring on a wooden board to make it shine. It takes about fifteen minutes to make a simple ring

(Figure 9.13). He can also cut pendants from the seed, and sometimes he sands an entire seed, punching a hole through it with a nail, so that it can hang on a necklace.

Figure 9.12. Ring maker scraping the outside of a cut *mocora* seed in preparation for a ring.

Figure 9.13. Finished ring made from a *mocora* seed.

COLLECTING

Methods

Weavers collect *mocora* using two distinct methods. For the colonists, when the palm is still considered short, not having reached a height higher than approximately 3 meters, they remove only the desired leaves by pressing a pole with a chisel blade attached at the end against the base of the leaf. They also use this same pole to cut down entire racemes of fruit (Figure 9.15).

Figure 9.14. Cane pole with a metal chisel on the end for harvesting *mocora* fronds and fruit.

Figure 9.15. Colonist cutting *mocora* fruit raceme with pole and blade.

However, when a plant is too tall to use the pole, collectors fell the entire palm (Figure 9.16), and then remove the leaves with a machete. The Chachi say that they almost always cut down the palms, because it is too difficult to avoid the spines in any other way. They also fell palms in order to collect fruit. All three groups remove the leaflets from the rachis in the field, gathering the leaflets into a bundle to carry home (Figure 9.17).

Figure 9.16. Colonist felling *mocora* palm that is too tall to harvest with the pole and blade.

Figure 9.17. Colonist removing leaflets from a *mocora* rachis in the field.

As mentioned, the *mestizo*s collect only the spear leaves, while the Afro-Ecuadorians also collect the two recently opened leaves that grow on either side. All groups usually collect enough material to use for a mat on which they are working, and store whatever is left over in the rafters. Most homes in which *mocora* weavers live always have some dried material in the house.

Harvesting techniques are similar to those used in Manabí (Borgtoft Pedersen 1994). In Panama, the Wounaan and the Emberá usually fell the entire plant (Runk 2001). Other collection methods recorded for *mocora*, which the people in Mache-Chindul Ecological Reserve do not employ, are climbing an adjacent tree in order to reach over and cut the fronds (Jensen and Balslev 1995), and in Panama, to scrape the

spines from the stem, and nail small planks into the trunk to climb the stem (Runk 2001).

Location

Most colonists prefer to collect from palms that they have left growing in their fields. They choose these palms, because the plants are closer to the home. Some people claim that the quality is better, because the leaves grow well in the open sunshine. Weavers also say that they have more palms on the farm than in the forest. One woman said that she would collect from a neighbor's farm, before going to the forest to collect. Colonists all agree that they will collect from the forest if there is no available *mocora* material in the fields. The Chachi differ in this respect, always stating that they will go to the forest to collect. Chachi farmers do not leave *mocora* standing in their fields with the same frequency, as do the colonists.

Time and Distance

Colonists often make trips exclusively to collect *mocora*. Although I was not able to test this idea, all three groups agree that the best time to collect is during the waning moon, because the material is softer. Even so, few activities are carried out as completely separate endeavors. Once in their fields, the farmers typically do other chores. However, because the leaflets constitute a full load, it is hard to carry back anything else. It can take from ten minutes to an hour to find the palm, and then it requires a half hour to an hour to collect the material. Most often they will collect on one day, and then prepare the material the next day.

AVAILABILITY

Weavers from different ethnic backgrounds perceive the availability of palm resources differently. Colonists are confident they have access to a sufficient quantity of *mocora*. The one exception is the *mestizo* village of Perrera, where the resource is scarce. The Chachi also complain about a lack of material. These indigenous people talk of having had plenty in the past, but that now it is difficult to find. In Río Bravo, few *mocora* palms grow in proximity to the homes. In Loma Linda, on the Cayapas River, it takes half hour by canoe and then two hours walking to arrive at the one palm that a woman knew of growing in her fallow field.

MANAGEMENT

The most common form of management that the colonists practice is to leave palms in the fields. The farmers allow these plants to continue growing when they clear the forest for their farms. As one *mestizo* woman says, "You would be crazy to cut it down." The colonists say that they leave *mocora* so that they will have access to the leaves. This also is the practice of those in Manabí, who also maintain it for shade in agroforestry systems (Borgtoft Pedersen 1994). The protection of species, by leaving them standing in otherwise cleared and planted fields, has been part of many agricultural systems, including those in North America (Doolittle 2000), and specifically leaving palms in fields is common practice in lowland swidden

agriculture (Padoch 1987). As mentioned, the Chachi say that sometimes they leave *mocora* standing when they clear forest for fields, but that because of the spines, they will just as often cut them down.

CULTIVATION

Cultivation, which among other things includes the planting of an organism, (either by seed or transplantation) (Doolittle 2000), is rarely practiced in regard to *mocora* in the Mache-Chindul Reserve. Although I did not witness the activity, one *Mestizo* family claims to scatter the fruits in order to propagate palms. One *mestizo* farmer in the town of Perrera, Don Javier, cultivates *mocora* by both planting seeds and transplanting. During the waning moon, Don Javier plants ripe seeds. However, because predators, such as agouti, find and consume the planted seeds, he enjoys more success by transplanting seedlings. He gathers seedlings from his secondary forest area and brings them to his field where he is cultivating a mini plantation. He plants the seedlings amongst his corn, cutting away weeds that spring up around them. Each seedling is placed six feet from each other. Each planted area usually contains 20 seedlings. In eight months the ten-centimeter high seedlings start growing mature leaves with spines. Don Javier eventually plans to cultivate a one-hectare plot solely with *mocora*.

The fields into which Don Javier is putting *mocora* are those farthest from his house, in order to protect his children from stepping on the palm spines. He is currently planting them on a ridge, although he says that they are easier to collect if growing on a slope. The reason why he plants *mocora* is that he wants to provide himself with a constant source of material, possibly to start a *mocora* fiber business and also to extract oil from the seeds. Oil is one of the few commodities that they do not produce on the farm, and an item on which all households spend scarce cash. Additionally, while I was measuring a plot, one of my assistants collected about ten seedlings about ten centimeters high, carrying them home to plant them on his own farm.

MARKET

Given that all colonists sleep on mats, but they all do not weave them, some amount of exchange occurs between people within communities. Even for those people who can weave, some would still prefer to buy mats from more skilled weavers. Mat makers tend to charge between $4.00 to 8.00 for a double size mat. More commonly exchange occurs through trade. Neighbors will often trade one or two chickens for a mat. Those people who weave mats for sale, do so only when commissioned. A few people mentioned that they would go to towns such as Quiñende to sell, but this is rare.

A few mats were observed for sale in the towns of Quiñende, Esmeraldas, and Monte Cristi (Figure 9.18). Most of these were the ironed variety with some dyed strips woven at various intervals. All were of the *mestizo*, herring bone weave. The prices are higher than within the communities. Store owners charge $6.00 for a single, and $12.00 for a double size mat. All of these mats are brought in from Manabí, usually Calceta. One hammock in Monte Cristi, sold for $25.00. It was woven with the *mocora* in twisted cords, like the Chachi hammock in Río Bravo. There is not a market for *mocora* goods within Chachi communities, because the Chachi usually sleep on *rampira* mats.

I saw no raw material for sale in any of the towns that I visited. This is different from what Borgtoft Pedersen (1994) described for Manabí, where vendors sell the raw material to families who braid the material into bands. These families sell the braids to weavers, or use the strands themselves to make hats and furniture. Although in Calceta the market is mostly local, some products are exported to Peru and Japan. *Mocora* has apparently been an important commodity for Ecuador, beginning in 1892 when it was included in a list of Ecuadorian exports (Borgtoft Pedersen 1994). The one man who makes rings sells them to travelers at the Bilsa Reserve. Although I did not see *mocora* jewelry for sale elsewhere, I did see markets in Quito, selling similar rings for one dollar each.

Figure 9.18. *Mocora* mat for sale in the town of Quiñende

SUMMARY AND CONCLUSIONS

Weaving

The most notable difference in *mocora* use among ethnic groups is that the Chachi do not use the material as much as do colonists. Currently, the Chachi hardly utilize *mocora* at all. All of the Chachi with whom I dealt say that they prefer the softer *mocora* mats to those they make of *rampira*, but that it is the previous generation who knew how to weave. Thus, they recognize the material as having been more important in the past than now, although it is still important for certain products. However, the Chachi's established skill and dependence on *rampira,* which is easier to weave, collect and prepare, makes them less dependent on other fibers. Furthermore, the Chachi culture was centered at Pueblo Viejo, in the eastern highlands slopes of the Andean Cordillera, where *Astrocaryum standleyanum* does not grow. Their more common use of *rampira* for basketry as well as mats also explains why they do not make the midrib baskets. The Chachi, when they weave any material, tend to pursue the activity in a more focused way and at a faster rate than the colonists. This may be because weaving is almost a constant activity in Chachi homes, while it is a more separate activity for the colonists. Thus, reported weaving time of *mocora* was less for the Chachi than for the colonists. It is interesting to note that the only male who I saw weaving *mocora* happens to be from a Chachi community.

Another difference in weaving is style distinctions between the *mestizo*s and Afro-Ecuadorians. Each design stems from the weaver's place of origin, and each group maintains its own style, and does not weave the other. The Afro-Ecuadorian style is from Esmeraldas whereas the *mestizo* style is from Manabí. That the Chachi mats I witnessed in all of their communities were in the Esmeraldas style may be because the Chachi have had more contact with the Afro-Ecuadorians who were the first to colinize the area and to live in proximity to the indigenous people.

Harvest and Availability

The Chachi have less material close to their homes available to them than do the colonists. The paucity of material may result from the fact that the Chachi harvest the palm in such a way that they cannot use the plant again, and because this group does not preserve *mocora* in their fields. This lack of palm protection may be a function of their thinking of the forest, and not the fields, as their main collecting ground. Additionally, they have more unfarmed land at their disposal. Finally, they have less reason to keep *mocora* standing, because this material is less central to their lives than it is to the lives of the colonists.

Perrera residents, the only other weavers who complain of a lack of material, respond to this situation by not cutting down palms, even when collecting. Perrera residents are more careful in their resource use because they have limited *mocora*. Additionally, these people have constant contact with the conservation organization of Fundación Jatun Sacha, Bilsa. This affiliation may affect their practices, and/or

how they choose to speak to outsiders about them. In either case, one can clearly see that the assumption often made that colonists use the forest in a more destructive way than indigenous people, in this specific instance, proves to be false.

Market

Economically, *mocora* is an important palm (Borgtoft Pedersen 1994). However, although the market is strong in areas such as Calceta and its surrounding villages, the selling of mats appears to have limited economic influence for the residents of the Mache-Chindul Ecological Reserve. The transport of the mats factors strongly, because they are cumbersome, and roads are muddy for half the year. Furthermore, the danger of damage to woven articles is a constant threat. Volunteers at Bilsa Biological Reserve, attempted to create an artisan program, but the goods meant for sale were bent and moldy before they reached their destinations.

The Chachi's lack of selling, even between each other, is because families can weave. Additionally, although they may prefer a *mocora* mat, they will more likely weave their own out of *rampira* when they need a new article.

Fruit

Although the residents of the Mache-Chindul Ecological Reserve do use some of the *mocora* fruit, other unexploited possibilities may exist. One opportunity to explore could be a larger jewelry market. This could be successful, because there is already a niche in Quito. Rings sell for one dollar each. They cost almost nothing to make and can be made in about 15 minutes. Thus, this means that they can provide a

high profit margin. Furthermore the product is easy to transport. Another avenue that can be explored is *mocora* oil. Some colonists boil the fruit, and then skim the oil that rises to the top of the water when the pot cools. Because it has oligeanous fruits, *mocora* could be used as a greater source of oil than is currently the case with other palms (Bernal 1992; Galeano and Bernal 1987; Jensen 1997; Patiño 1977). Balick (1985) noted that other *Astrocaryum* species have been used commercially for oil, so *mocora* oil could potentially be an item for sale. Even only for personal use, local oil production could help locals save the money that they currently spend on oil from the store. Furthermore, an additional use can be to use the fruit as fodder for animals. Peccaries feed on them, thus it seems that pigs also could (Jensen and Balslev 1995). Some lowland groups already experiment with this activity (Henderson et al. 1994).

NTFP

Whether they are leaves or fruits, people use only the regenerating parts of *Mocora.* Thus, the plant is a potentially sustainable non-timber forest product. Also, the fact that collectors leave the rachis on the ground next to the palm after leaflet removal, means that the rachis decomposes and the nutrients this provides for the soil can help in the continued growth of the palm (Borgtoft Pedersen 1994). However, if this palm is to be collected in a sustainable way, collectors can only obtain materials with a pole and blade. Clearly the other method of collection, felling palms, destroys the resource. Borgtoft Pedersen (1994) claims that the harvesting of every other leaf does not hurt overall growth and reproduction of palms. And perhaps leaf reduction

may increase palm growth, such as with the species *A. mexicanum* (Mendoza, et al. 1987). In order to address the unsustainable harvest practices, a project could be started in Ecuador, not unlike one that exists in Colombia. Fundación de Educación Superior and Artesanía de Colombia are actively promoting the use of poles and blades as a way to collect leaves (Runk 2001).

Agroforestry

Agroforestry, interplanting of crops more permanent plants that provide useful materials, can be an environmentally sound practice. It often works well in maintaining soil fertility, because in certain ways it mimics natural successional cycles in forest clearings (Southgate 1998). In looking at maintaining *mocora* populations, integrated cultivation can be encouraged. Native palms can grow well in environments to which other plants may not be well suited (Balick 1985). *Mocora* leaves grow to maturity in full shade, secondary forest, and agroforestry systems. Given that *mocora* grows well in fields when left after clearing, more concentrated efforts could be employed to increase their cultivation as part of farm systems. In some countries, such as Panama, people are already adding them to artisan material gardens (Runk 2001). Planting seeds is feasible (Jensen 1977), given Smyth's (1989) finding that buried seeds germinate better than those left on the surface. Furthermore, transplanting is a viable option, as there are various places where seedlings grow abundantly in the forest. Don Javier's transplants serve as an example in which the plants are growing well. However, certain obstacles may have to be overcome.

Borgtoft Pedersen (1994) transplanted *mocora* in Loma Seca, Ecuador, but his seedlings were slow to grow. He hypothesized that this may have been because of a lack of mychorrizae, which he thinks can be rectified by bringing more of the original soil with the seedling.

Mocora also lends itself well to being incorporated into fields, because it does not require pesticides or fertilizer (Borgtoft Pedersen 1994). In agroforestry systems *mocora* could serve as shade for crops and help to prevent soil erosion (Jensen and Balslev 1995). To aid *mocora* use in agroforestry systems, programs can be implemented such as those in Panama, where the national environment authority wrote a brochure on how to plant *mocora*, and has expressed interest in establishing germination beds and gardens. Also in Panama, Proyecto Manejo de Cautivales y Productos no Maderables is interested in showing how many years the palms need before they can be harvested (Runk 2001)

Resource Preservation

As noted by Borgtoft Pedersen (1994), and my data, *mocora* can be harvested sustainably. When collecting palm resources with the pole and chisel method, both colonists and Afro-Ecuadorians have a clear preservation sentiment. These people make a point to cut only every other spear leaf. The two groups collect in this way, because of the understanding that it will maintain the palms' growth, which will continue to provide them with material well into the future. However, as mentioned, contradicting this careful resource use, both the colonists and Afro-Ecuadorians will

cut down the entire palm when it is more convenient. The Chachi differ from the colonists in that they almost always cut down palms, and do not mention any preservation strategy.

Given that *mocora* has strong regenerative power, and a wide distribution (Borgtoft Pedersen 1994), this is an abundant resource that can possibly provide people with even more advantages than the palms already do. Independently of economics, the colonists in the Mache-Chindul Ecological Reserve already place great importance on this resource, recognizing it as one of the central factors contributing to their way of life. Understanding the collection, weaving and use of these *mocora* articles, aids in developing a better understand of these three groups' practices regarding resource use.

CHAPTER X
MOCORA DENSITY AND POPULATION STRUCTURE

MOCORA IN MATURE AND SECONDARY FOREST

The availability of any plant resource is a function of the species' density and distribution. Accordingly, in the case of *mocora*, it is important to know these conditions in both mature and secondary forest. Fourteen (14) plots, each measuring 20 m x 50 m (14,000m^2) were surveyed. These plots are distributed throughout the communities of the three different ethnic groups. A total of 181 *mocora* palms were found, with an average density of 12.9 per 1000 m^2. At 131 individuals, seedlings represent the majority of the palm population. Juveniles number 30, and mature trees account for 21 of the palms recorded (Table 10.1 and Figure 10.1).

Table 10.1. Data on how many palms and in what stage of growth they are found in 14, 1000m^2 plots from *mestizo,* Afro-Ecuadorian, and Chachi villages.

Plots	Seedling Number	Juvenile Number	Mature Number	Total N
Mature Forest	75	5	12	92
Secondary Forest	56	24	9	89
Total	131	29	21	181

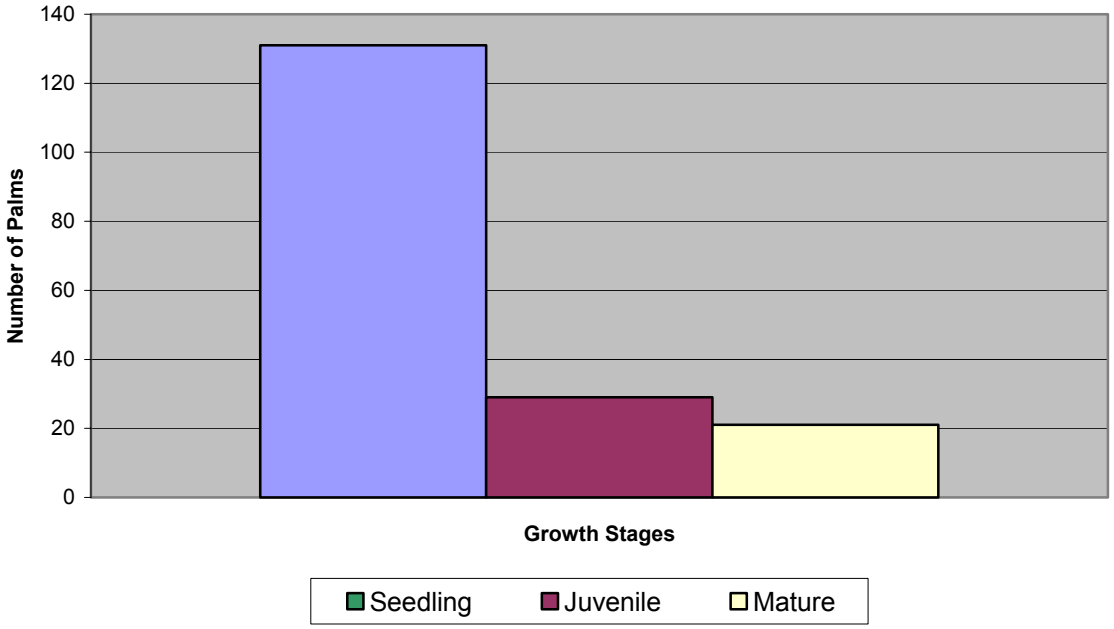

Figure 10.1. Histogram of the composite palm population structure from the 14 plots sampled.

The population structure between mature and secondary forest appears to be somewhat similar. The one notable difference is that there are more juvenile palms in the secondary forest. However, total number of palms is almost the same (Figures 10.2 and 10.3).

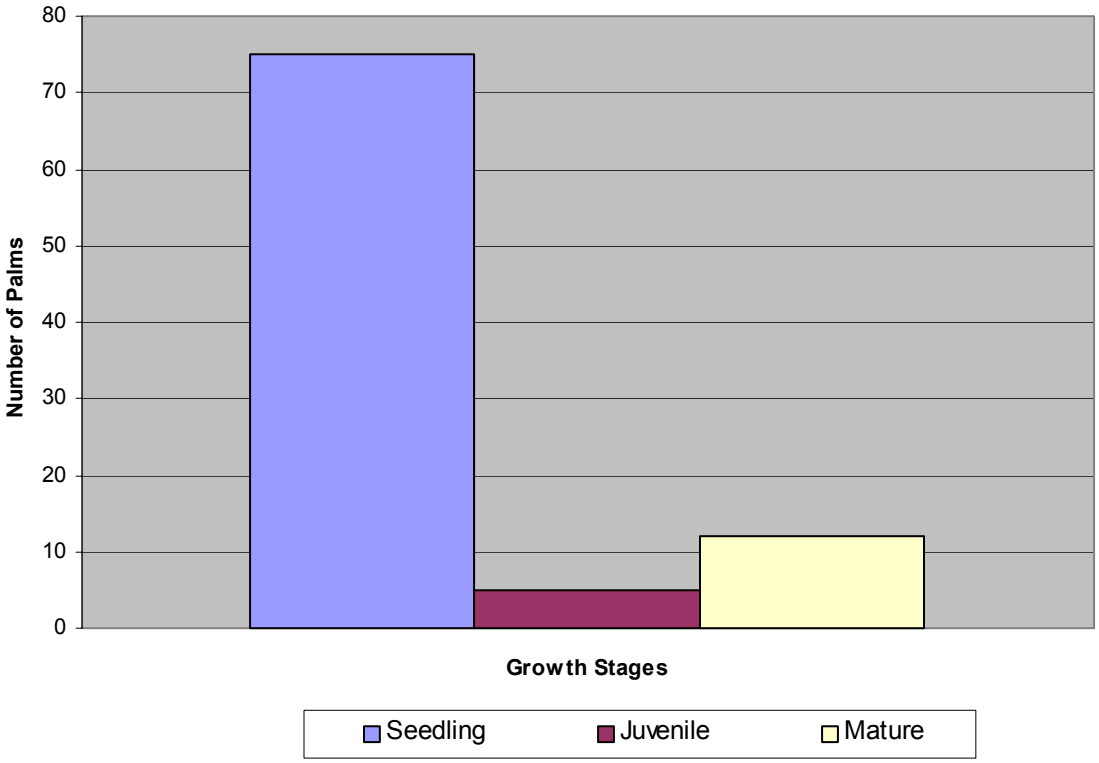

Figure 10.2. Histogram of palm population structure from mature forest.

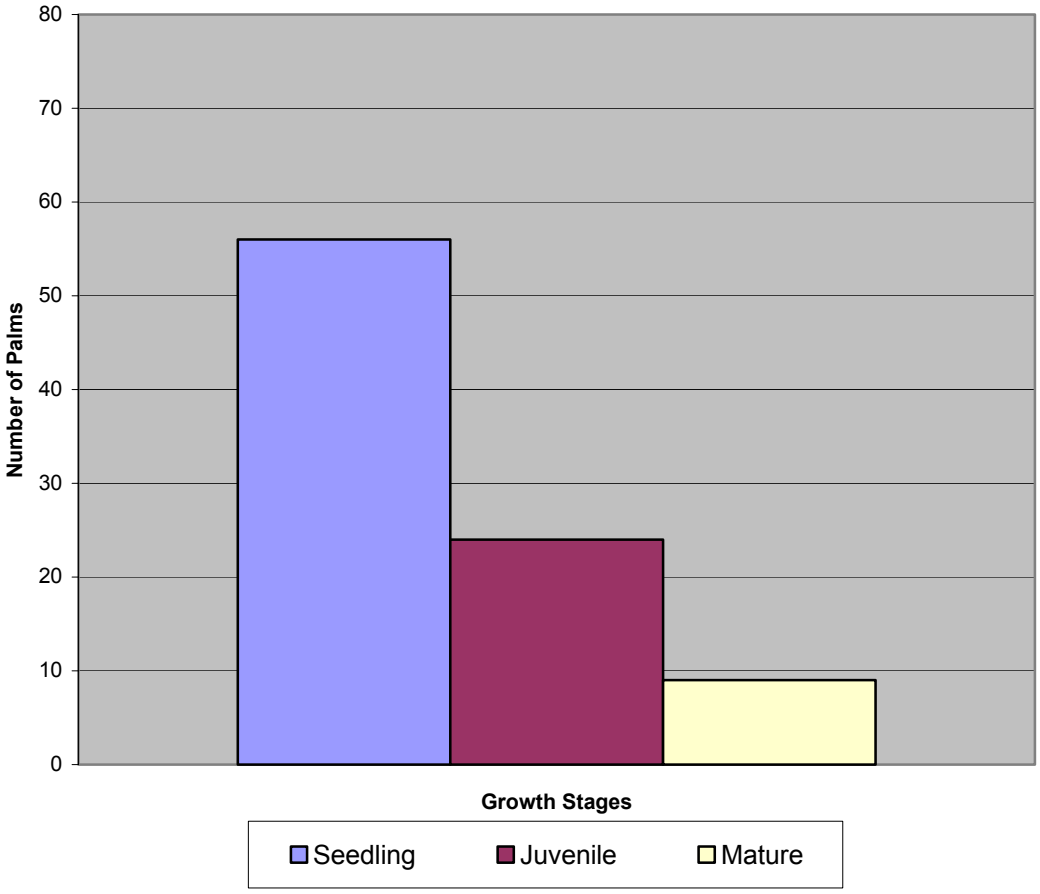

Figure 10.3. Histogram of palm population structure from secondary forest.

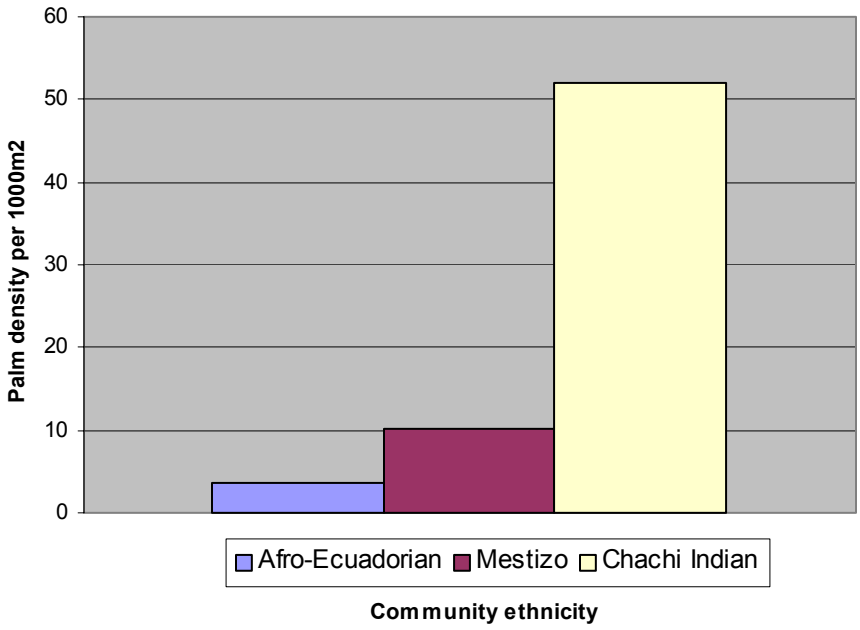

Figure 10.4. Histogram showing the density of palms in Afro-Ecuadorian, *mestizo* and Chachi land

Interestingly, in looking at total palm numbers in relation to the communities (Table 10.2), the indigenous group, the Chachi, have a far higher number per plot, than do either the *mestizo* or Afro-Ecuadorian colonists. The density per $1000m^2$ is higher in the Chachi community than it is in either the *mestizo* or the Afro-Ecuadorian communities. The density per $1000m^2$ in the Chachi community is 52 compared to the

density in the *mestizo* land of 10.1 and the Afro-Ecuadorian is 3.6 (Table 10.2 and Figure 10.4).

DISCUSSION

There exist various possibilities to explain why a notably higher density of palms was found on the Chachi land than on that of the colonists. One is that the Chachi use the palm less than the colonists, so there is less collection pressure on the resource. Also, the Chachi have much more land, thus the natural populations may have more opportunities to maintain themselves. Furthermore, the Chachi land, although technically the same kind of forest may have micro-environmental differences that are poorly understood but more conducive to palm growth. This last possibility would seem to warrant future research to determine the probability of environmental influence on the palms' growth and reproduction.

Although the population structures are similar between primary and secondary forest, from speaking to farmers, it appears that the majority of the currently growing mature palms in secondary forest are remnants of the original primary forest. These are individual plants that farmers protected and allowed to grow. However, because all three growth stages are represented in secondary forest, and even more juveniles in the secondary forest, there appears to be a high probability that the current seedlings will also grow to maturity in secondary and cleared fields. Borgtoft Pedersen (1994)

also reported a similar situation. In two agroforestry plots, he found a population distribution similar to that noted above. His areas consisted of one 24 m x 40 m plot, and one transect of 10 m x 60 m. Although the numbers varied greatly between his two plots, the first having 673 and the latter 11, his overall information matches what I recorded. Given data from both Borgtoft Pedersen and my surveys, it appears that *mocora* palms work well in agroforestry, and can be incorporated into more sustainable farming systems. If weavers continue to collect prudently, *mocora* appears to be a reliable resource on which people can depend for their own use, and possibly for increased marketing as well.

CHAPTER XI
CONCLUSIONS

This dissertation explores tropical forest utilization through the case study of two useful plants, *piquigua (Heteropsis ecuadorensis,* Araceae), and *mocora (Astrocaryum standleyanum,* Arecaceae), for three different ethnic groups, *mestizo*, Afro-Ecuadorian, and Chachi, in the Mache-Chindul Ecological Reserve of northwest Ecuador. These two plants provide useful material, act as central factors in the material culture of the reserve's residents, and may play a role in forest conservation. Additionally, my findings challenge some commonly accepted ideas about ethnic differences in resource use.

This study provides an example of how different ethnic groups use resources. Accordingly, its findings are applicable to other areas in Latin America, and the tropical world as a whole. Worldwide, conservationists set aside areas for preservation and then need to address the people living and depending on these same lands. This kind of study is particularly crucial in areas where logging is one of the main forms of industry, as it is in Ecuador (Sierra 1999). Because timber extraction can be destructive (Anderson 1990a; Myers 1988), conservationists and developers are looking for alternative forms of cash income that are obtained more sustainably. Non-timber forest products (NTFP) are a possible option (Anderson 1990, Anderson and Ioris 1992; Browder 1989; Nepstad and Schwartzman 1992; Prance 1989).

PIQUIGUA* AND *MOCORA

The two resources on which this study focuses, *piquigua*, *Heteropsis ecuadorensis* (Araceae) and *mocora, Astrocaryum standleyanum* (Arecaceae) provide fiber and are important tropical NTFPs.

Piquigua

Araceae, considered an important family (Bown 1988; Croat 1988; Mayo et al. 1997), contains *piquigua*, a hemiepiphyte that all three groups, *mestizo,* Afro-Ecuadorian, and Chachi use for basketry, brooms and cordage. This plant is highly prized among the communities, because the aerial roots are strong and water resistant. Although there is a market for the raw root, the economic gain for the studied communities is minimal. However, the residents do save money by making articles they would otherwise have to purchase.

Furthermore, there is a market for the woven goods. Although it is small, it might be increased through eco-tourism, and is worthy of further study. Because *piquigua* can be harvested sustainably, and possibly cultivated, it can serve as a candidate for further research as an NTFP. Regardless of economics, the hemiepiphyte is currently central to the Mache-Chindul Ecological Reserve resident's way of life. Because of this people are protecting remnants of forest in which it grows. Conservation is already a result of people using *piquigua.* It is important for conservationists to take note of what motivates people to conserve without any

outside influence. Clearly the importance of *piquigua* in this family's life is providing the incentive to preserve mature forest. This activity is the primary goal of numerous activists in the region.

Mocora

Palms are important NTFPs in many tropical regions (e.g., Balick 1988), and *mocora* is a species that is a particularly important resource in this area. The most prevalent use is for mat weaving. There exists a limited market for this product, but the main importance is derived from residents' personal use. Additionally, there are useful aspects to this plant such as *mocora* fruits are a product that people can further exploit. The fruits produce oil that might be marketable. Other palms produce profitable returns from their oil (Bernal 1992; Galeano and Bernal 1987; Jensen 1997; Patino 1977), including the genus *Astrocaryum* (Balick 1985).

Given that its leaves and fruit can be collected sustainably, this palm is a potentially beneficial NTFP. Although it is not currently endangered, care must be taken not to over harvest, as has occurred in the province of Manabí (Borgtoft Pedersen 1994). *Mocora* can be incorporated into agroforestry systems, because it grows well in cleared areas. Since the population structure remains similar in primary and secondary forest, there is reason to think that it can be encouraged in both areas. Seedlings of this species can be planted in the understory of crops, and when mature, the adults can provide shade for other crop plants, and help prevent soil erosion (Jensen and Balslev 1995).

FUTURE MARKET POSSIBILITIES

Although both *piquigua* and *mocora* seem to have limited market possibilities currently, future possibilities could rise in the region. Important factors in marketing are the spatial relations, particularly distance to market (Bennett 2002). These spatial concerns could be addressed by looking at close selling venues for the region. The community of the "Y" is a meeting point for the colonist communities. And although the Chachi rarely frequent the town, they also have access to this village. The small lake near the Y called "La Laguna," is beginning to attract tourists. A small lodge has been built, and people come to spend the night. They swim in the lagoon and guides take them to see a bat cave. This is also being promoted for domestic tourism (Comercio 2001). Additionally, volunteers and eco-tourists coming to stay at the Bilsa Reserve often spend a night at the lagoon on their way in or out of the reserve. Although there are numerous drawbacks to eco-tourism (Southgate 1998), these travelers are potential buyers of the woven goods.

Another potential market to be tapped is in the community of Perrera. People living in the community have an agreement with the Bilsa Reserve to provide an ecotourism experience. Bilsa brings groups of volunteers, classes and tourists to the village. Bilsa has helped the community build a lodge where guests stay. The visits include introduction to the local way of life and waterfall hikes. The times that I went to Perrera, a few locals would sell necklaces, which the visitors eagerly purchased.

The last few times that I went, a half-woven *mocora* mat was hung on the lodge wall. The locals placed this on the wall for decoration and to promote interest in their crafts. Certainly people from Perrera, and other neighboring communities could sell *piquigua* and *mocora* goods in this and other venues. In outlining these economic opportunities I am not trying to propose a large-scale market scheme. However, I am presenting possibilities that could bring in small amounts of income for people who have almost none.

The Chachi, although not directly involved in these two areas, could be included. The Bilsa Reserve would like to have more contact with this indigenous group, and the Chachi expressed to me the desire to sell their baskets if they had a market. Examples do exist of indigenous people selling their goods, encouraging the opportunity to maintain their own culture. Both the Otavaleños in Ecuador and the Kuna in Panama have been successful in promoting their crafts in international markets (Bennett 2002). Indeed, the northern Chachi became successfully involved in international marketing when researchers Brad Bennett and Patricia Terrack imported baskets to be sold as part of a Chachi exhibit at the Fairchild Botanical Garden (Bennett 2002). The Chachi do have possible access to overseas transport through the organization Federation of Chachi Centers of Ecuador (FECCHE) that is located in the port city of Esmeraldas. However, the limitation still exists at this point for a solid international buyer.

Location is not the only factor that needs to be addressed when looking at market possibilities. Clearly, the amount of resource available is crucial for success. Although there is probably not enough *piquigua* growing in this region to become part of the raw material market, weavers could make small tourist items using little material. All groups already weave small baskets. Some people in the area are already experimenting working with miniatures. One woman wove me the gift of a miniature *chalo*, complete with tiny shoulder straps. Although this would be altering the emphasis that the weavers currently have on weaving functional size containers, it could provide some income without having to cut many more roots.

For *mocora*, the regular full size mats could also be sold in this location, in addition to the seed rings. Using the seeds for jewelry can provide a small income. The rings that locals make are light and easy to transport to market areas. Also, unlike the woven articles, there is little risk of damage to the article during the journey. The market for palm rings already exists in Quito and other tourist areas, thus providing a possible outlet for selling these goods. Care would have to be taken not to over harvest the fruits for the rings, as this would deplete the natural regeneration in the forest and fields that occurs now.

These market opportunities may be too small to make much of a difference in these people's lives. Furthermore, transportation even to the Y may be too far for some of them. Additionally, an infrastructure of how to sell the goods would also

have to be established. Even so, this is a possible small market that could be made more available to the locals.

ETHNIC COMPARISONS

In comparing use and collection between the three ethnic groups, the main differences are between the colonists and the indigenous people. It is important to remember the size of the samples, and when I refer to ethnic groups I am discussing the results that I found only from the people I interviewed. In looking at the differences in forest resource use, the principal contrast is that the Chachi use the *piquigua* and *mocora* to a lesser extent than do the colonists, and the indigenous people collect these two specific resources in a less sustainable way. The Chachi are more reckless, in that they tear the root and sometimes the down without paying particular attention to its regeneration. For the *mocora,* the Chachi usually chop down the entire palm for leaf and fruit collection, and also when clearing for their fields. On the other hand, the colonists collect consciously, making an effort to maintain the growth of both *piquigua* and *mocora.*

These findings, although initially surprising to me, fall into a category of research in which various authors have questioned the concept that indigenous people are inherently conservationist in nature. Examples include two articles, which discuss the pre-Colombian indigenous mark on the landscape as a result of opportunistic land use and large populations of indigenous people. Denevan (1992) in "The Pristine

Myth: The Landscape of the Americas in 1492" argues that the landscape may have reflected more effects from humans when only the indigenous people populated the Americas than in 1750 after the Spaniards had arrived. Denevan writes that: burning practices created and maintained grasslands and forests dominated by fire-loving species, indigenous hunting and habitat modification changed the wildlife species composition, extensive agriculture, homes, roads and ceremonial structures created a humanly constructed built environment, in some instances leading to soil erosion, and that rainforests have long been altered. The last idea is a position now supported by many people in the field (e.g., Balée1989; 1994; Colfer 1997). Mann (2002), in a nonscientific publication has also made a convincing argument that pre-Colombian indigenous people have affected the landscape more than previously had been believed. His conviction that land was greatly altered by pre-Colombian new world inhabitants is so strong that he ends his article by writing that if people wanted to restore the landscape to how it looked before the Spanish invasion they would have "…to find it within themselves to create the world's largest garden (53)."

These last two examples provide a general historical context in which to place my results about Chachi land use. In order to look at the reality of indigenous land use, it is also helpful to discuss Johnson's (1989) piece on the Amazonian group, the Machiguenga. This provides an in-depth example of one Indian group's current relationship with the environment. Johnson believes that although the Machiguenga do have only a minimal impact on their environment, this is not the result of a

conscientious attitude towards nature. Their light effect stems from their maintaining a low population density, and lack of advanced technology. Johnson does allow for some element of forest protection as a result of Machiguenga culture. For example, this group does not kill certain species because of taboos. However, these people do not adhere to these protective measures because of conscious conservation intention. Another group, the Siona-Secoya community of Shushufindi in northeastern Ecuador, consistently deplete areas of cedar trees (*Cedrela odorata)* for canoes and palms for thatch. When the resource declines, they move the village (among other reasons) instead of trying to maintain the resource in their current location (Vickers 1988).

As I hypothesize with the Chachi, Johnson writes that the Machiguenga are living below carrying capacity and this allows immediate cost-benefit analysis to determine their resource use. Johnson writes "It does not occur to them (the Machiguenga) to manage nature to ensure future availability. People invest in resource management when they must do so in order to survive at an adequate subsistence level (221)." Yost, an anthropologist who has lived among the Woarani came to similar conclusions about the Waorani. He explained to Davis (1996) that: "Harming the forest is an impossible concept for them. In a world of abundance, the word 'scarcity' has no meaning (294)." Thus, the fact that the colonists are more conscientious about collecting these plants may stem more from material availability than conservation attitudes connected to ethnicity.

Because my analysis relied on only two plants, around which there are specific circumstances, I am not able to make sweeping statements about the conservation ethic of the Chachi, as did Johnson about the Machiguenga. However, I can say that these indigenous people do collect at least two species in a less sustainable manner than do their non-indigenous counterparts. However, I do not mean to imply that they are inherently more destructive. Below I outline the reasons why the different groups' collecting patterns may differ from each other. Differences appear to depend more on the availability and importance of a resource, rather than on an inherent adherence to or lack of conservation ethics.

Furthermore, a reason central to the differences in land use is the fact that the Chachi have more land from which to collect. Additionally, there is a higher density of *piquigua* and *mocora* growing on Chachi property. Thus, more of the resource is available to the indigenous people. Because they do not have the same need to conserve, it is logical that the Chachi would expend less energy in preserving these plants. Thus, the Chachi who have more land, higher material density, and use these two resources less than the colonists, have little reason to expend energy in collecting more sustainably. This holds true to Johnson's statement "It (resource management) is not to be expected where access to abundant resources exist (221)."

Adding the sense of abundance, the Chachi do not rely on these plants as heavily as do the colonists. One of the most important reasons why the Chachi may collect in a less careful manner is that they rely more heavily on *rampira*,

Carludovica palmate Ruíz and Pavón (Cyclanthaceae), commonly known as the Panama hat palm. They use the petioles to weave baskets and mats. The Chachi do say that *piquigua* is stronger and lasts longer for baskets, and that *mocora* is softer for mats. However, this group is more accustomed to *rampira* and finds it easier to collect and work. Thus, because the study plants do not play a central role in Chachi livelihood, this group has fewer reasons to be concerned about these plants' reproduction.

As with the Chachi's apparent lack of conservation ethic because of abundant resources, the colonists' preservationist attitude may come from a present need coupled with a history of lack. The colonists have come to this area because there was not enough land on which to farm in their previous homelands. Because these more recent arrivals have already had to leave an area as a result of resource depletion, the colonists may have more consciousness about preserving the forest, or at least these species, than the indigenous people of the region who have never experienced this lack.

Another contributing factor to the differences in collecting practices could be that the NGOs that work in the area concentrate on Chachi economics. Contrastingly, the few NGOs that work with the colonists emphasize the environment. Most NGOs for the Chachi begin programs such as chicken houses, traditional cloth belt weaving projects, local banks run by the women and stores that provide basic foods and fuels. On the other hand, the NGO help that the colonists receive concentrates on using the

forest sustainably and trying to encourage a conservation ethic. Also, in first creating the reserve, much effort was put forth to convince the colonists living in the area that logging was not a long-term solution to meet their needs. Thus, the colonists have learned from various external forces concepts about not wasting resources.

Another outside influence, that may affect the differences in how the Chachi and colonists look at their own resources, is that the Chachi receive governmental help. The Ecuadorian government provides funds to build their schools, hire teachers, and provide medical care. Some Chachi schools have concrete floors, which is considered a luxury in this region. Thus, these Indians can rely on resources other than those they find around them. The colonists however, receive little governmental help. They build their own schools, some with wooden floors, but most are of dirt. Furthermore, many communities still have to pay their children's teachers out of pocket. Perhaps because the colonists cannot depend on aid outside of their own communities, they are forced to take care with all that they do have.

So, in this particular situation, the assumption that colonists are more destructive than Indians to the land proves not to be the case. Further illustrating this point, logging practices follow this same trend. Colonists have agreed not to log, choosing to be part of the reserve. On the other hand, the Chachi communities have signed agreements with logging companies. These practices are not limited to the Chachi near the Mache-Chindul Ecological Reserve, but also in the northern part of

Esmeraldas. Along the Cayapas River Chachi are now becoming more involved in timber extraction than they had been previously (Sierra 1999; Bennett 2002).

Additionally, the southern Chachi communities, such as Naranjal, are also actively engaged in logging. Ironically, when in Naranjal, I stayed in the building left by a conservation NGO. The NGO had finished their project and left the house with the community to use as they chose. They used this building for researchers, such as myself, and also to house the loggers and their chainsaws. Thus, resource use may be defined less by ethnicity, and more by need and opportunity. Some studies are finding that ethnicity is becoming less of a defining factor, and that common ways of living are making more groups similar to each other (Sierra 1999).

The fact that the Chachi harvest more destructively than the colonists and are actively logging their forests, should not be used to denigrate indigenous practices. Rather, this information indicates that the Chachi, and other indigenous groups such as the Machiguenga and the Waorani, function under the same set of human instincts and motivations, as do most people. This reality can serve indigenous people, colonists, and forests in two ways. Initially, conservation, human interest, development and government groups can organize their programs more effectively when they understand the motivations and activities of the people with whom they are working. The myth of the hyperreal Indian is not an advantageous image to the people living in forested regions (Posey 1992b; Ramos 1992). Although numerous indigenous groups do try to benefit from these expectations by dressing in traditional

indigenous regalia (not always their own) (Ramos 2001), indigenous groups should not be held to different standards of behavior than other people because of their ethnicity. Nor should help in any way be denied to them, because they do not live up to a mythical ideal of comportment (Posey 1992b; Ramos 1992). Despite the limitation in scope, my study can help to portray both the colonists and the Chachi for who they are and how they function. Reality can help conservationists and other interested parties effectively target programs that benefit the real people who live on the land, and the land itself.

Secondly, realizing that in certain instances newer immigrants are actually more environmentally conscious than indigenous people in the same area may reduce some of the criticism that colonists traditionally receive (Browder 1995; Nepstad et al. 1992), or at least questioning (Almeida 1992) about their forest practices. An example of this kind of judgment is with the NGO representation of immigrant farmers in the Petén. In Sundberg's work (1998) these recent arrivals are considered "'inappropriate' forest dwellers" that are represented as "destructive, desperate individuals who do not think about their future (89)." The government also attributes the Petén's landscape changes to the arrival of migrant farmers. These opinions were formed based mostly on the immigrants practice of slash and burn agriculture, a common practice amongst many forest dwelling groups (Sundberg 1999).

Perhaps colonists could be more included by local NGOs and governments as are the Chachi. I am not arguing that colonists are more environmentally conscious

than indigenous people, nor that colonists use the forest carefully in every way in Mache-Chindul Ecological Reserve. In fact they have many destructive practices, such as clearing the land for farming, logging until recently, and have unknown collecting habits of other forest resources not explored in this work. An example is the *mestizo* mentioned earlier who collected *piquigua* and *mocora* carefully, but felled an entire tree to collect a less important climbing plant. However, I am saying that they are at least as important in the reserve as are the indigenous groups who currently receive more benefits than the colonists.

In looking at the case study of these three groups' use of two forest resources in a highly biodiverse ecological reserve, market and non-market value, sustainable collection practices and possibilities, and how ethnic differences do not always break down as expected, are better understood. In looking at the future of these two resources, more research is necessary on the growth of *piquigua* and *mocora.* This information is crucial in order to better understand how collection affects their regeneration. This would be especially useful, as the *Libro Rojo* (Valencia et al. 2000) has not yet determined if *Heteropsis ecuadorensis* is endangered. This status is an important aspect to understand when looking at use and collection of any plant species. Also, further research can look more closely at the amount of material that is used for lashing, as opposed to baskets, to better understand how much material each family needs. Additionally, further research can include *mestizo,* Afro-Ecuadorian, and Chachi use of other commonly utilized plants. In order to see if the trends

discovered with colonists and the Chachi in this study hold true for other plants and resources, further studies need to be conducted.

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VITA

Maria Grace Fadiman was born in Palo Alto, California on July 4, 1969, the daughter of James Fadiman and Dorothy Fadiman. After completing her work at Menlo School, Atherton , California in 1987, she entered Vassar College in Poughkeepsie New York. She received the degree of Bachelor of Art from Vassar College in May 1991. In September 1995 she entered the Graduate School of Tulane University. She received her Master of Art, in May 1997. In September 1998 she entered the Graduate School of The University of Texas at Austin.

Permanent Address: 810 A. West 32nd St., Austin, Texas 78705

This dissertation was typed by Maria Fadiman