

ANTANOSY ODYSSEY II: APPLICATION OF THE USE AND KNOWLEDGE OF
NON-DOMESTICATED MEDICINAL PLANTS ON CONSERVATION AMONG
THE PEOPLE OF MADAGASCAR

By

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To the Faculty of Washington State University

The members of the Committee appointed to examine the dissertation of LINDA MICHELLE LYON find it satisfactory and recommend that it be accepted.

Chair

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Abstract

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This research provides a comprehensive picture of the Malagasy, specifically the Antanosy's, current relationship to non-domesticated medicinal plants. Through this investigation that we hope to understand local dependence on these plant resources as a means for determining the potential need for their conservation.

First, we examine the use of the marketplace system in distribution of non-domesticated medicinal plant materials and knowledge by Malagasy vendors in Antananarivo. We also examine the role of market vendors in sustaining use of medicinal plant remedies. Second, we investigate the role of traditional medicine and healing among the Antanosy as a means of understanding their use of natural resources. Finally, we hypothesize that the Antanosy will demonstrate less reliance on traditional medicine, faith, and healers than on western medicine.

Our research methods included market surveys, interviews with specialists and non-specialists, and observation of healing rituals. A market study analysis was conducted with vendors and their clients. We were able to obtain data for one season (summer) that represented medicinal plant requirements during that time period. Data collection methods

allowed us to analyze our findings of medicinal plant use by a rural community across two years. Descriptive and multi-variate statistics were used to portray relationships in the data across gender, age and residential proximity to the forest and knowledge of medicinal plants. Finally, observation and in-depth interviews with traditional healers were used to identify the importance of healers and traditional medicine in a rural Antanosy community.

Our findings showed that exotic plants are widely used for medical treatment. If this usage increases it may decrease the pressure on native, non-domesticated, medicinal plants. Since shamans are the source for determining which exotics should be used for medical treatment, they are crucial in understanding harvest pressure put on medicinal plants. They are also a link to understanding the potential need for medicinal plant conservation.

In addition, we see evidence of incorporating some advantages of modern life (e.g. accepting western medicine, using national markets), as well as integration of traditional and modern beliefs in ways that support the continuing value of traditional culture in a changing world.

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Dedication

This dissertation is dedicated to Dinesh.

CHAPTER ONE

INTRODUCTION

Introduction

The rationale for this research stems from work I completed with the Antanosy people of Madagascar in the late 1990's. At that time, the focus of my work was in determining if integrating agroforestry techniques with Antanosy farmers' current methods would be successful at increasing agricultural productivity. I also completed an extensive study to determine what incentives would have to be in place for agroforestry to be successful.

The agroforestry project required that I understand the uses of natural resources by Antanosy farmers. I explored the uses of the forest and its products by means of an exhaustive inventory. The inventory required interviews allowing me to interact with the majority of the Antanosy people in the region where I was working. Through the inventory I not only obtained knowledge of forest product use, but gained the trust of local Antanosy people.

The inventory identified medicinal plants as forest products that people relied on to meet their everyday needs (Lyon and Hardesty 2002). Although that study described non-domesticated plants that were harvested and used locally, many of these items were also taken to regional markets for sale and trade. Given that the capital city is the economic center for the country, the ultimate use of many medicinal plants takes place in Antananarivo, the capital city of Madagascar.

In the current study, I examined the use of the market system for distributing non-domesticated medicinal plant materials and knowledge. I also addressed the role of market vendors in sustaining use of medicinal plant remedies as part of a larger investigation of

people's continuing dependence on non-domesticated medicinal plants.

I also examined the role of traditional medicine and healing among the Antanosy people as a means of understanding their use of natural resources. Past research (Lyon and Hardesty 2002) showed that medicinal plants are used by the Antanosy, but the extent of their reliance on these resources is unknown. If medicinal plant knowledge is being passed on to younger generations that might indicate continuing importance being placed on medicinal plant use by the Antanosy.

Several hypotheses about Antanosy attitudes toward and knowledge of medicinal plants were addressed. In order to measure the knowledge of specialists (*ombiasa*) compared to people not specifically trained to use plants for healing, I looked at the age and gender of plant users and the proximity of their villages to the forest. I then examined correlations between these variables and plant knowledge within this population. Specifically I wanted to know who used medicinal plants, for what and how did they use them, and what constituted using western medicine rather than medicinal plants. Finally, I wanted to identify the status of medicinal plant use and how this might influence plant harvest.

Lastly, I examined the *ombiasa*'s perspective on whether they and traditional medicine are still an important aspect of the Antanosy culture in southeastern Madagascar. Results include their views on the incorporation of western medicine into their once traditional health care practices.

The work described above, when combined with the earlier study, provides a comprehensive picture of this group's current relationship to its natural resource base. I see evidence of incorporating some advantages of modern life (e.g. accepting western medicine, using national markets), as well as integration of traditional and modern beliefs in ways that support the continuing value of traditional culture in a changing world.

People of Madagascar

Madagascar's people and culture are a unique combination of influences from East Africa, South Asia, and the Near East. Dewar and Wright (1993) claim that the Malagasy people are a 'progeny' of the Indian Ocean and have ancestors from nations throughout the Indian Ocean region except Australia. One of the most detailed historical accounts of Malagasy origins was completed by Rakotovololona (1993), suggests that the earliest visitors to Madagascar arrived during the first century AD. Historical documents claim that seventh century Arabs also used the coastal shores of Madagascar for trading posts (Kent 1970).

In the early seventeenth century, the French established trading posts along the east coast, inhospitably sharing the island with pirates who used the island as a hiding place. Shortly thereafter, the first Indonesian settlers arrived with African wives and slaves looking to establish trading networks within the Indian Ocean (Dewar and Wright 1993). These pioneers were joined by later arrivals from eastern Africa, thus making up the primary population of Madagascar. Over time these groups migrated south across the island and evolved into 18 ethnic groups.

In the 1790s, Merina (high plateau) rulers succeeded in establishing control over a major portion of the island, including the coast. The Merina acted as a ruling dynasty and nominated princes throughout the island to control coastal people including the Antanosy. Until this time the slave trade was an important aspect of the island's economy, with Madagascar acting as the trading center. Under British influence, the Merina ruler abolished slave trading from the island, receiving British financial and military assistance to help control his dynasty in return.

British influence remained strong until the French established control over the island by military force in 1895-96 (Adams 1984). The Merina dynasty was abolished, and colonial

administration continued through 1947 when a national uprising was suppressed by the French after a year of bitter fighting (Adams 1984). Soon afterward the French relinquished control over Madagascar, and the island became the Malagasy Republic with full independence in 1960.

Geographic zones

Madagascar is made up of two major floral zones, a moist Eastern region and a dry Western area, and within these are a wide range of habitats. The Eastern region covers almost half the island, extending westwards from the east coast to cover the central highlands (Harcourt and Thornback 1990). This area is thought to originally have been completely forested, but much of the forest has now been replaced by a mosaic of cultivation and secondary forest. The Western region extends from the flat plains on the west coast eastwards about 800 meters to the mountainous spine of the island. Within this rain shadow are dry deciduous forests, with a low, open canopy. The Western region is semi-arid, characterized by thickets or forests of endemic, shrubby, xerophytic vegetation (Harcourt and Thornback 1990).

Protected Areas

Madagascar possesses a network of 39 protected areas, with 5 more in the process of classification. These 44 protected areas cover a total area of around 1.4 million ha (2.3% of the total land area of Madagascar), and are divided into 9 national parks (5 existing, and 4 under creation), 11 nature reserves and 24 special reserves, all terrestrial. The first protected areas were 10 nature reserves created in 1927 that aimed to protect representative ecosystems. Access was strictly limited to authorized scientific researchers and government officials. In the 1950s, 15 special reserves were created to exclude human interference, although limited local traditional use was sometimes permitted. All protected areas were

created by individual ministerial decrees, although local authorities may have been involved in boundary delineation (Durbin 1990).

Another type of protected area within Madagascar is the classified forest. This protected area was created to provide buffer zones for the national parks. Combined, these areas protect 15% of Madagascar's natural forests (World Bank 1996). Use of classified forests is forbidden, except for harvesting certain traditional forest products. However, in several classified forests, concessions have been granted to allow charcoal making and collection of fuelwood (Harcourt and Thornback 1990). Since the primary function of forest reserves is economic, their protected status is not necessarily permanent.

Madagascar's first national parks were created in 1958 and 1962, and included designated recreation areas for tourists, environmental education programs for the local people and limited local traditional use of the natural resources within the parks' boundaries.

This research was conducted in the Tsitongambarika classified forest, a mixed secondary and dense rain forest that is part of the coastal strip of southeastern Madagascar (Direction des Eaux et Forêts and Conservation International 1993) (Figure 1). The forest is actually delineated into two connected sections, the more southern Parcel I and Parcel II. Parcel I was created in 1965 with 9,530 hectares reserved to act as a buffer for the larger and more unique area of the now named Andohahela National Park (Direction des Eaux et Forêts and Conservation International 1993). In 1970, the Malagasy Ministry of the Environment enlarged the reserve by establishing Parcel II which included another 38,930 hectares to the north as they felt Parcel I was not an adequate buffer for the large and heavily visited forests of Andohahela (Direction des Eaux et Forêts and Conservation International 1993).

Historical land appropriations

In order to comprehend the basis for current local use of natural resources in Madagascar it is necessary to understand historical land appropriations. Archeological evidence reveals an assemblage of hierarchical political formations in the Merina dynasty that controlled Madagascar in the late seventeenth and early eighteenth centuries. Although a contested theory, archeologists Wright and Rakotoarisoa (1997) propose that the Antanosy tribe developed simple village societies into several class-organized chiefdoms during this time. Heads of these chiefdoms were Antanosy appointed by the Merina ruler. A particularly large chiefdom began approximately 25 km north of the present city of Fort Dauphin and extended its rule roughly 100km to the north.

This stratified organization allowed chiefs to direct ‘warfare’ against invading tribes from elsewhere. Given increasing attacks by these tribes, the Antanosy did not experience expansive population and economic growth during this time (Wright and Rakotoarisoa 1997). Archeologists explain that the Antanosy maintained this pattern throughout the 19th century, lacking the power brought by extensive lands to develop into more complex states (Kootak 1972).

Research suggests that the lack of territorial expansion and political organization during this time might also have been due to constant dividing up of territories (Wright and Rakotoarisoa 1997). The more land available to a chiefdom, the more power (in the form of resources) it had over other tribes. Yet Rakotoarisoa (1997) suggests that this constant changing of territorial boundaries prevented the Antanosy’s institutionalization of their traditional tenure system.

Rakotoarisao (1997) further explains that an organized and systematic sharing of natural resources among the Antanosy had yet to be agreed upon. History illustrates how a

constant flux of new rulers and shifting chiefdoms never allowed for a consistent agreement on natural resource use. Natural resource management among the Antanosy has evolved to a collaborative use of forest products and resources, including medicinal plants. Outsiders have referred to this as a land tenure system although there does not appear to be a word or phrase in the Antanosy language that refers to it specifically.

Within the research area there appears to be an informal land tenure system. It has been defined by scientists as bundles of individual rights that determine the use and ownership of particular resources (Lynch and Alcorn 1994). Within the informal land tenure system a collective group of individuals or a family group may own a resource (e.g. land), but individuals outside these groups may have ownership of a part of this resource (e.g. trees on the land). Often, informal land tenure exists within a formal (legal) land tenure system or might override such a system depending on the stability and enforcement of the formal system.

Individual tenure restrictions or limitations are based on individual natural resources (Lyon and Hardesty 2002). The harvesting of lumber from the forest has different restrictions than harvesting medicinal plants from the same area. In national parks, formal land tenure does not allow for large quantities of lumber to be removed from a park. Tree bark, leaves, and seeds may be removed. People living on the periphery of national parks or reserves may legally harvest entire herbaceous plants from the park not protected by law.

Plant and plant-part harvesting for personal use or sale goes almost unmonitored or controlled in any formal way in Madagascar. The choice of how and what to harvest is left up to the person doing the harvesting. People who sell plants receive very little financial reward for their effort for several reasons. First, plants may be widely available forcing prices down. There may be many people selling the same plants, again keeping the market

price low. Quite possibly the exchange system for getting plants to larger markets keeps the local profits down due to relatively to distant markets and transportation costs. Regardless of the reasons, people must sell many plants to make a profit. Given these conditions, sustainable harvesting may not be financially attractive to harvesters.

Health Care

The degradation of the natural environment in Madagascar appears to affect the health of local people. Rakotoarisoa (1997) explained that traditional medicine based on plants is no longer an efficient solution, because fewer useful species are still available. Throughout the French colonialization, the Malagasy were required to use Western medicines for treatment of illnesses as all aspects of traditional healing were banned. This included diagnosis by an *ombiasa* and use of medicinal plants for healing. Currently, people often purchase costly medicines from government subsidized clinics to treat their ailments rather than use medicinal plants.

The medical dispensary and clinic nearest to our study site in southeastern Madagascar is in Ehazoambo, approximately four kilometers away. Through this clinic vaccinations for tuberculosis, diphtheria, whooping cough, and other diseases are available at a decreased cost for infants and children under 5, yet this cost is still very expensive for most families (Lyon 1999). Before the arrival of this dispensary in 1997, people were only able to purchase medicines at full cost in the market or from another villager who might have extra medicine. Another option for medical care requires that people travel 35 km by bus to a hospital in Fort Dauphin or Manambaro.

The medicines available at dispensaries are usually imported from Europe, and villagers believe that these were, for certain ailments, more reliable than their own medicinal plant remedies. Yet few villagers reported buying them even at subsidized prices (Lyon

1999). People only visited the dispensary or hospital for more serious illnesses, such as yellow fever or malaria, or when they could afford hospital prices for medical care.

Past studies among the Antanosy have shown that people rely on *ombiasa* to advise them on health care. Shamanism is the belief that certain individuals can influence spiritual entities for the benefit or harm of clients (McClenon 1993; Eliade 1972). Among the Malagasy, *ombiasa* are often healers who rely on the spirit of their ancestors (*raza*) to provide them with the knowledge to treat health or other problems using medicinal plants.

In this study I hypothesize that there is a continuing dependence on traditional healing practices among the people of Madagascar. I theorize that this dependence can be used as a motivation for people to protect their forests. In the research area, most rural Antanosy people rely on *ombiasa* and medicinal plants for their health care needs. But is it possible that medicinal plant scarcity could be forcing people to forgo their use of plants and turn to expensive western medicines instead? Or perhaps leave their needs unmet? If this were the case, would people be willing to practice sustainable management of medicinal plants as a means to ensure their future supply?

The following chapters identify specialist (shaman) and non-specialist knowledge (local people not trained in using medicinal plants for healing) of medicinal plants. By understanding the relationship between healers, medicinal plants, and Malagasy people we might begin to comprehend the vital link between these people and their natural environment. Only by understanding this link can we begin to appreciate the effects that a changing culture might have on conservation.

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CHAPTER TWO

**NON-DOMESTICATED MEDICINAL PLANTS IN THE MARKETPLACE OF
ANTANANARIVO, MADAGASCAR**

Abstract

Non-domesticated medicinal plants provide revenue for Malagasy people. I investigate the reliance and continuing interest in traditional medicine by the Malagasy by examining the marketplace system where plants are distributed. Data was collected over the course of six weeks using several survey techniques. Vendors also recorded their sales data over the six weeks including common name of the plant sold, quantity prescribed, gender of the vendor and client, and harvest location of the plant material as understood by the vendors. Results showed that vendors sold an extensive array of medicinal plants from all over the island. Most often illnesses were treated using combinations of medicinal plants prescribed by vendors. Combinations varied by vendors' knowledge of plant use and availability of plants. The analysis also depicted a lack of understanding among vendors and their clients of the pressures placed on plant resources including little knowledge or interest in harvest pressure. This preliminary marketplace analysis has raised questions requiring further research including: First, if pressure is being placed on medicinal plants, would consumers at all levels help stop the over harvesting? Second, would they be willing to utilize alternative medicinal plants (such as non-native plants) or switch to modern medicine?

Introduction

In Madagascar, non-domesticated¹ medicinal plants have cultural economic value at both local and national levels. The capital city of Antananarivo houses more than 1.3 million of Madagascar's 16.5 million people, most from the predominant ethnic group the Merina. The Merina of the capital region are not as reliant on agriculture for their primary means of income as are people in other regions. Many are business people or work in government elected positions. This makes them dependent on others for agricultural and wild products.

An earlier study in rural southern Madagascar identified medicinal plants as forest products people relied on to meet their everyday needs (Lyon and Hardesty 2002). Although that study described non-domesticated plants harvested and used locally, many of these items were also taken to regional markets for sale and trade. Given that the capital city is the economic center for the country, the ultimate destination of many medicinal plants is Antananarivo.

Value is dependent on availability. If a plant is harvested locally, it can have a high price due to rarity and lack of alternatives for specific ailments. Alternatively, a locally grown and used plant can have a low price due to its relative abundance and minimal transport cost. Or a scarce plant might have a high price caused by its rarity. Thus, it is important to ascertain whether local people are aware of the conservation status of the plants they purchase. In a rural region, people may rely on a traditional healer (*ombiasa*)² to tell them which plant they should harvest from the wild to use in the treatment of their illness. Or the *ombiasa* may sell them a plant from his or her stock.

Once the plant material has been harvested for sale it has an economic value. People involved in the sale of medicinal plants often rely on a transport exchange system (Ngamsomsuke *et al.* 1987; Ngarmsak 1987; Dhanamitta *et al.* 1988; DeBeer and

McDermott 1989; Moreno-Black 1991; Scoones *et al.* 1992; Moreno-Black and Price 1993; Moreno-Black 1994; Moreno-Black *et al.* 1996). This involves bartering some plant material to cover the cost of an intermediary person's transportation of the plant to a market for sale. This system is extensive enough to transport plant material hundreds of miles, by varying means of transport, to a market destination. Both regional and larger city markets represent a locus of intense medicinal plant exchange (Moreno-Black *et al.* 1996; Pei 1988). If plants are transported to another region for sale, their economic value increases due to transport costs and limited supply.

The final destination of most plant material is large markets where townspeople cannot collect the plants for themselves. It is probable that townspeople have lost the knowledge to use medicinal plants and must rely on the knowledge of another person. Vendors often assume the role of doctors and pharmacists, giving them a vital position in the passing of traditional and evolving medicinal plant knowledge.

In this study, I examine the use of the marketplace system in distribution of non-domesticated medicinal plant materials and knowledge by Malagasy vendors in Antananarivo. I also address the role of market vendors in sustaining use of medicinal plant remedies. This is part of a larger investigation of people's current dependence on these plant resources.

The objectives were to: 1) describe the range of illnesses treated by medicinal plants available in the open-air market of Antananarivo; 2) identify the types of plants and amounts needed for treating particular illnesses; 3) establish whether combinations of plants are used in treatments; 4) determine knowledge of the harvest location of plants sold in the market; 5) identify any gender influences on plant sales.

Methods

Research site

This paper is based on research conducted in the capital city of Madagascar, Antananarivo, from January through February 2002. The market system in Antananarivo is made up of a variety of items sold in designated market areas spread over large sections of the city center. In the largest market in the center of town, vendors at permanent booths sell medicinal plants near the food region of the market. Most vendors sell plants all day, 7 days a week.

Overview of Methods

Surveys and interviews used in this study were similar to those used by Moreno-Black *et al.* (1996). Three different surveys were used: 1) continuous market survey, 2) informal client survey, 3) sales survey. First, a continuous market survey was used to list all of the items being sold by each vendor. Second, an informal client survey was completed where I randomly asked the clients of vendors to identify plants and their uses from those available at the vendor's stall. Finally, each vendor was asked to conduct a sales survey where he or she recorded the illnesses being treated and the plants used in the treatment. As foreigners rarely visit the food and medicinal plant areas of the market, I chose to decrease research biases by limiting my presence in the market.

In order to achieve an actual representation of what was being bought and sold at the Antananarivo market, I utilized vendors as data collectors for some aspects of the study. Vendors were compensated for the time they spent in data collection as I felt that this may have slightly decreased the time that they spent with their clients. Vendors agreed to spend one morning in training with us learning the data collection technique. During this time I explained the objectives of the study and the time commitment that would be required. I

provided the supplies necessary for their data collection (pens, notebooks, etc.) and outlined recording techniques. I finished the morning with their conducting practice interviews and data collection with one another. All 18 of the vendors from the medicinal plant section of the market agreed to take part in the study.

Data were collected daily over 6 weeks during the months of January to February 2002. This is the hot, rainy season in Madagascar with daily temperatures between 80-120 degrees Fahrenheit and high rainfall, which increases a host of illnesses including malaria. Given the short time frame that the data was collected, I realize that our results only represent medicinal plants used during one season by the people of Antananarivo. It is my hope that this study can be replicated in the future, during another season, to gain a more complete analysis of the plants needed for medicinal purposes.

An educated Malagasy man who had lived in several regions of the country assisted with the data collection. Malagasy (Merina dialect) was the language used in all of the discussions with vendors and clients. Notes were taken in English with the exception of when the vendor collected data. These data were recorded in Malagasy and later transcribed into English.

A continuous survey was used to gain an overall appreciation of the variety of plant material available throughout this section of the market. This survey was conducted only once at the onset of the research. The common names for all of the plants being sold by vendors were listed. Several samples of the market plants were given to botanists at Tsimbazaza, the national zoo and botanical garden of Madagascar, for voucher identification.

Vendors were asked if it would be possible for us to conduct an informal survey with their clients while they were purchasing products from the vendor. Although most of the vendors agreed, some were reluctant. This reluctance was respected and I did not ask again.

When allowed, I randomly asked the clients of vendors to identify plants and their uses from those available at the vendors stall. I recorded whether the plants were from the high plateau or from other nearby regions of Madagascar.

Each vendor maintained a daily journal for six weeks where he or she recorded several pieces of information including the illnesses they treated, local names of the plants used in the treatment, amount and part of plants sold for each treatment, region of the country from which the plants were originally harvested, and the gender of the person who bought the plant. Data was analyzed using a cluster analysis to determine any correlations between plants used to particular illnesses (e.g pain, infections, etc.). To do this analysis, I collapsed across healers and patients so that data sets from healers could be combined.

Each vendor was interviewed during the six week period. Information obtained from individual vendors was not shared with other vendors. Vendors were questioned as to their training as a healer or herbalist, the number of years they had worked as a medicinal plant vendor, the items they were selling, their gathering practices if any, and sales habits.

Although interviews were conducted in the market during a vendor's working hours, care was taken not to interrupt the vendor's work or impede on the private discussions between the vendor and clients. An effort was made to sit with the vendor behind the stall during the interview so as not to block potential client's view of plant displays.

There are several potential biases in our study. Although I utilized vendors for data collection, my presence in the marketplace may have discouraged clients from regular visits with the vendors. I conducted our research for only 6 weeks during one season, creating an obvious seasonal bias. The results do not represent the full diversity of what the market can offer throughout the year.

During my research, Madagascar was undergoing a contested presidential election

that greatly weakened the national economy. The supply of imported medicines in the capital city was limited as air travel was blocked. Given the economic and social unrest at the time of the study, I might have been seeing a different number of buyers than would have been seen during a more stable political period.

Results

Vendor characteristics

Of the 18 vendors that participated in our study, 16 were women and 2 were men. Vendor age and experience working with medicinal plants and diagnosing ailments varied. Two of the female vendors only had several months of experience while one 65 year old woman had worked as a vendor since she was a girl. Normally, vendors worked the same stall each day (permanent stalls in one area of the marketplace that vendors rented) whose location they inherited from a family member. They also inherited their working relationship with their predecessor's plant suppliers. None of the vendors were *ombiasa*, but relied on what they learned during an apprenticeship with their predecessor. These apprenticeships could last several years during which time the vendor's training was partly as an herbalist and partly as a business person. Once trained, most vendors relied on their trade for their entire annual income and did not have another profession.

As most of the plants were sold days to weeks after they were harvested, it was rare to find fresh plants sold for medicinal purposes. None of the vendors felt that there was a difference in medical effectiveness between fresh or dried plants. Many felt that the plants could be years old and still not lose their ability to heal.

Although it was not a goal of this study to compare changes in market sales by season, vendors explained that the species of plants and plant parts (e.g. seeds) they sold were season dependent.

Illnesses treated with medicinal plants from the open-air market of Antananarivo.

Responses differed among vendors as to whether their remedies treated the symptoms of illness or the illnesses themselves. Regardless, all of the vendors felt that their clients found some relief by using the medicinal plants prescribed by the vendor. Usually the clients asked the vendor for a plant remedy rather than self-prescribing. Fifty-two different illnesses were treated by the 18 vendors that participated in the 6-week sales inventory survey. Illnesses ranged from those of a less serious nature (headache and dandruff, for example) to diabetes and cancer (Table 1).

A total of 459 combinations of sales were recorded over the 6 week period, mostly (approximately 85% of sales) for treatment of adults (Table 1)³. Among these, indigestion (*vavony*) appeared to be the most common illness. The 18 vendors sold varying plant combinations 49 times over the course of the 6 weeks (19% of the total sales) to treat stomachaches. Combination remedies were sold 36 times to treat what the vendors called a malfunctioning liver (Table 2). Mostly men were treated for this illness. Vendors explained that local rum (*toka-gasy*) is widely consumed by Malagasy men and its strong alcohol content could be the main reason for ailing livers. In addition, adults were treated for malaria (*tazo*) and yellow fever (*tazovony*).

Medicinal plant combinations were purchased 31 times (7-10% of the total sales) over the 6 weeks for treating ailing babies and very young children (*tambavinjaza*). Illnesses included fevers, rashes, and lack of appetite (Figure 2). Most medicinal plant combinations were purchased as vitamin supplements and growth enhancers for young children. Most of the market clientele was working middle class able to keep their babies healthy with proper nutrition. For this reason I speculate that these parents might treat more serious illnesses with western medicine and rely on medicinal plants for other ailments.

A cluster analysis was completed to see if any correlations existed among plants used to treat similar illnesses. For example, I was looking to see if there were any plants that were always found to treat pain, infections, etc. Although plants were commonly used in combinations I was curious to see if any plants, and which ones, were a required part of the Malagasy pharmacopoeia. For the cluster analysis I collapsed across healers and patients to allow for a richer data set to be used with less interruption from other variables. The results were not significant ($P = .05$), but trends did show that particular plants were consistently prescribed across vendors to treat given illnesses. For example, stomach aches were commonly treated with a combination of plants usually including ‘afiafy’ (*Avicennia marina*) or ‘talapatrika’ (*Centella asiatica*). Although there is little scientific support that these species aid with indigestion, both contain tannins that might act as a detoxifier to the intestinal tract when consumed.

It seemed unusual for clients to buy a stock of plant material for future use. Rather they relied on that fact that they could come back to the market and get more if needed. Clients felt that if you have medicinal plants in your home you are encouraging the ancestors (*raza*) to make you ill. Therefore quantities sold are a good indicator of current need.

The quantity of plant material sold varies depending on the illness. Plant materials are sold in various quantities. Larger crushed plant material is usually sold in recycled milk cans (*kapoaka*) equivalent to 350 cubic cm. This same material in lesser quantities, and more expensive materials, are packaged and sold in plastic packets (*paquet*) usually weigh less than a gram. Material such as leaves, stems, bark and roots are rolled into bundles of about 5-10 grams. These are usually sold in piles (*toko*), of 3-4 bundles.

Depending on the illness, adults were usually required to treat themselves 3-4 times a day for a few days to several weeks with of a tisane, salve, or steam bath. For treatment of

children, the same strength and type of plant material was used, children just required less of it. Often young children required about 1/4 of an adult dosage and babies needed just a few teaspoons (if taken as a tisane).

Vendors agreed that the amount of material necessary to treat a person for a stomach ache depended on the severity of the stomach ache and other symptoms. For example, they instructed their clients to brew an herbal tea in the morning and remove the plants after about 10 minutes. This brew can then be drunk cold for 2-3 days without losing its intensity. They explained that if the person's condition does not improve after a day or two, they advise them to come back for more plants or a different combination of plants.

Are combinations of plants used in treatments?

Surveys revealed a vendor's general strategy to choose combinations of plants for specific treatments. Vendors explained that they treated most illnesses with combinations of plants rather than relying on a single plant. It was very rare for an individual plant to be given as a treatment for any illness. Although there is a basic remedy for each ailment, treatments are designed for the symptoms of a particular client and whether the person is currently taking any other medicinal plants. Vendors explained that it can be dangerous to mix particular plants together, so the plants they prescribe must be a well thought-out and practiced decision. Vendors must also consider what they have in stock. If a plant is not in stock and must be substituted, the vendor must determine what will work well with the other plants used in the treatment.

Among the 18 vendors there were 49 combinations of plants used to treat stomach aches (*vavony*) (Table 2). A combination of *Celtis gamphophylla*, (*Afiafy*), *Mystroxydon aegyptiacum* (*Fanazava*), *Harongana madagascariensis* (*Harongana*), *Cussonia bojeri* (*Tsingila*), *Lygodium lanceolatum* (*Karakarantoloha*), and *Centella asiatica* (*Talapetraka*)

was prescribed the most often by vendors for the treatment of stomach aches. *Celtis gamphophylla*, *Harongana madagascariensis*, and *Cussonia bojeri* were found most often in the various combinations of treatments. One vendor prescribed as many as 10 treatment variations for a stomach ache.

Data on where medicinal plants were harvested was collected in two different ways. During vendor interviews, interviewees were asked to give the region in Madagascar where they thought the plants they sold were harvested. Vendors explained that plant harvest was evenly distributed throughout the island.

These data were collected a second time during the sales survey. When vendors sold plants to clients, they were asked to record the name of the region where they thought the plants were harvested. Analysis showed that 65% of the plants in the market were thought to have originated on the high plateau, and the other 35% from eastern coastal regions such as Mahajunga, Tamatave, and Tolear. Without each plant being tracked, it is difficult to assume that either is correct. Rather this analysis demonstrates that the intricacies of the transport system are not completely understood by its users, or that location of origin is not of great interest to vendors or buyers. This might imply that location is not thought to correlate with quality or affect plant price.

Vendors believed that the original harvester of the plant or plant part was often an *ombiasa*, but might also be simply a person knowledgeable about plants. This person harvests in response to the average quantities requested by the ultimate buyers.

The number of individuals constituting the next level of the system depended on the distance of the plants from the market. Often one person acted as the transport system, leaving home on the high plateau to travel to the coast to purchase plants from harvesters and sell to the vendors. Or several people made up the system, each only traveling a few miles

from his or her home to buy and re-sell plants to other transport people. Often this was accomplished at regional markets where they were sure to find other transport people looking for plants to buy and resell in other markets.

Vendors did not usually travel very far to acquire their stock. Most reported traveling 2-3 miles once a week to the homes of people supplying them. Vendors bought plants on a regular basis from 1-5 people. The final link in this system is the townspeople who purchase the plant material from the vendors. Although plant prices are not studied, we feel that it is reasonable to assume that price increases as plant material gets closer to Antananarivo is a normal aspect this system.

An informal survey of vendors' clients demonstrated that most could not identify random plants that vendors asked them to name. Similarly, clients had little knowledge of where many of the plants had been harvested, even if the plants could be found growing wild on the high plateau. The most commonly recognized plant was *Celtis gamphophylla*, probably because it was the plant most commonly found in combinations prescribed to treat stomach aches, the most common ailment treated.

Gender influence on plants bought and sold at the market

Data were collected and analyzed to determine the effects of a vendor's gender on plants that were sold and bought. There were more female (n=16) than male (n=2) vendors and more females than males among the clients. The analysis revealed that women vendors appeared to have more female, than male clients (69% female and 31% male). Male vendors, however, had mostly male clients (92%). Overall, more women purchased medicinal plants, probably because women were usually the caregivers in the family. Other explanations for vendor gender preference, and prevalence of female customers, might be due to the availability of female vendors as compared to male vendors. Since female vendors

outnumbered male vendors they believed that their sheer number might influence clientele away from male vendors.

Vendors felt that gender played a role not so much in the number of plants they sold, but the types of illnesses they treated. For example, many female vendors sold plants for treatment of menstrual irregularity and other plants to increase the chances for conception. Male vendors sold plants to men to aid in men's sexual stamina. Therefore, there was some difference in the species of plants sold by men and women.

Finally, a few vendors explained that clients chose vendors who were familiar with many combinations of treatments for illnesses (*mahay raha*) and had many plants in stock (*marobe ny karazana*). Vendors felt that this was how a client could tell a very knowledgeable and experienced vendor from one with less to offer. Generally, older women tended to know more combinations of plants and were the higher selling vendors.

Discussion

The intent was to determine whether there was reliance among the Malagasy on non-domesticated medicinal plants. Overall our results showed a broad range of illnesses and symptoms that treated by medicinal plants in Antananarivo. Using several survey techniques we found that the most commonly treated ailments, such as stomach aches, were treated with varying combinations of a few plants. Moreover, combinations of plants were important in treating multiple symptoms of an illness. Mixing plants for treatment was seen as an important skill by vendors and buyers and was only done with a clear understanding of what was being combined.

The higher number of female to male vendors could be explained from a socio-economic standpoint. Most of the vendors were from a low economic class and their education was usually not beyond the primary school level. Where men in this situation

could usually find manual labor positions, women's options for working outside the home were more limited. Acquiring the skills to work as a medicinal plant market vendor provided them with a job outside of the home. Women might have also been the preferred vendor due to their natural caretaking role within the society.

Some of the most important implications of this study concern knowledge of plant harvest. Buyers could not identify medicinal plants found in the market, did not know where the plants were usually harvested, and were only aware of the uses for a particular plant if they or someone they knew had been treated with it. Although ascertaining a buyer's ability to identify plants was not an objective of this study, the results have important implications for conservation. If plant buyers are not aware of the types of plants they use, or where they come from, it is impossible for them to understand the plant's conservation status. They may be utilizing an endangered plant or a plant that is being over harvested. At the same time, the fact that people cannot recognize these plants might indicate a loss of traditional knowledge among the urban Malagasy.

Research in rural southeastern Madagascar demonstrated awareness by local *ombiasa* of the availability of medicinal plant resources (Lyon and Hardesty 2003). *Ombiasa* of all ages and abilities were able to name several plant species that can no longer be found either due to over harvest or habitat loss. Although this knowledge was not matched by villagers, most of these non-specialists were aware of the location of many commonly used medicinal plants throughout the region.

Vendors rely on medicinal plants for their income, yet many were not aware of potential pressures placed on medicinal plants because of over harvesting. This was revealed, in part, by a contradiction between data obtained from interviews with vendors and sales survey data. Vendors believed their medicinal plant resources were harvested equally

from regions around Madagascar. This contradicts with the results from their sales survey which reported that 65% of the plants they sold were believed to be from the high plateau region. This is an important point illustrating that no one is too sure where the plants come from, implying even less knowledge of effects of harvest and conservation status.

These trends and contradictions represent a possible lack of understanding among the vendors and buyers of plants as to the pressure that they themselves may be placing on forested areas. If pressure is being placed on medicinal plants, would consumers on all levels help to stop the over harvesting? Would they be willing to utilize alternative medicinal plants such as non-natives or switch to modern medicine? This study has only begun to touch on the subject of medicinal plants, but more research is necessary before conclusions can be drawn.

Future steps

This study provides a detailed marketplace analysis of the distribution of non-domesticated medicinal plant resources and their sale by Malagasy vendors in Antananarivo. Future studies should focus on the economic aspect of this system; how medicinal plant prices vary along the exchange system and the number of exchanges between plant harvest and use. The effects of this system on plant knowledge retention or loss, and conservation implications are other relevant questions. An investigation should also be done to determine if medicinal plant price increases with plant scarcity or distance to the market. Only by clearly understanding the supply and demand for medicinal plants, and the mechanisms in place for managing this exchange, can one hope to influence the concepts of sustainability that lie at the root of environmental loss in Madagascar.

Notes

1 As is outlined in the NOTES of Moreno-Black *et al.* (1996) the term non-domesticated medicinal plants is used to describe plants used for healing purposes, either ceremonial or medicinally, that are not actively managed and propagated to the extent that they would be altered genetically.

2 The term ‘ombiasa’ in Madagascar refers to a person with healing ability with the assistance of supernatural spirits in the form of *raza* (ancestors). Many Malagasy people are aware of how to employ medicinal plant remedies, but most rely on *ombiasa* to treat a particular illness.

3 In Table 1 ‘tambavinjaza’ can be translated as ‘sick child or baby’. This category represents illnesses such as fevers, rashes, and lack of appetite which were the most common for this age group.

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CHAPTER THREE

**THE STATUS OF MEDICINAL PLANT USE AMONG THE ANTANOSY OF
MADAGASCAR: IS SCARCITY A CONSERVATION INCENTIVE?**

Abstract

This research examined the use and knowledge of traditional medicine among the Antanosy people of Madagascar. Free-listing and rank-ordering were used to collect data among specialists and non-specialists over two field seasons. Using both descriptive and regression analysis the data was analyzed for trends among age, gender, dwelling proximity to the forest across knowledge of medicinal plants. Extensive interviews were also conducted with shaman to gain their perspective on plant use and reliance by the local people. The results supported trends showing older middle-aged women as the most knowledgeable gender and age group. Across all age groups, women were consistently more knowledgeable about medicinal plants, except for a few elderly men who had spent a great deal of time in the forest. There were no significant trends in dwelling location to the forest and knowledge.

Use of exotic plants (usually located in disturbed habitats in and around the villages) for medicinal purposes was very common, yet conservation of native medicinal plants was not seen as necessary. It did not appear from our findings that *ombiasa* (shaman) were using exotics as a substitute for native plants. Rather they were just utilizing plants that were commonly found in their area. Thus, the research could act as an indicator for future trends in plant conservation among the Antanosy.

Introduction

The use of non-cultivated plants¹ for medicinal purposes is not new to science. For centuries people have managed and modified the environment for pharmaceutical purposes (Frei *et al.* 2000; Alcorn 1984; Posey 1985; Frechione *et al.* 1989; Voeks 1996; Heinrich *et al.* 1998; Heinrich *et al.* 1998). Estimates have been made that 80% of the world's population still depends on medicinal plants for their primary healthcare, especially in tropical and subtropical developing countries where plant diversity is concentrated (Caniago and Siebert 1998; Luoga *et al.* 2000; Schmitt and Hamilton 2000). Yet these same plants and their role in healthcare are often threatened¹ by habitat loss and over harvesting.

The causes of biodiversity loss in Madagascar are the same as those driving the overall spiral of environmental degradation. This cycle begins with an expanding human population using inappropriate agricultural technology to exploit existing agricultural land. This forces their constant encroachment on forested areas for its conversion to new land for agriculture (Richard and O'Conner 1997). Medicinal plants located in these forested regions are destroyed as the habitat is converted for agriculture. Although the Malagasy may rely on these plants for healthcare, they may be forced to choose between feeding their families and maintaining plant habitat for traditional medicine.

International donors and conservation organizers have attempted to work with Madagascar's government to lessen the pressures on the forest. However, many of these projects have been met with little interest or resistance by the rural people who live at the frontline of conservation. This pattern does little to increase hope that Madagascar's environmental crisis will result in a positive outcome.

Another threat to traditional medicine is disappearance of knowledge surrounding the use of medicinal plants (Schmitt and Hamilton 2000; Maffi 2001). In a world where

globalization has caused the disappearance of thousands of traditional languages, the prospects for retention of medicinal plant knowledge among cultures is bleak at best. Thus, researchers must work collaboratively with indigenous cultures to record local uses of medicinal plants before the plants, and knowledge of their uses disappear forever.

This research examined the role of traditional medicine and healing among the Antanosy people of Madagascar as a means of understanding their use of natural resources. Past research (Lyon and Hardesty 2002) showed that medicinal plants are used by the Antanosy. But the extent of this group's reliance on pharmaceuticals is unknown. If medicinal plant knowledge is being passed on to younger generations it might indicate continuing importance being placed on plant use and opportunities among the Antanosy.

Several hypotheses about Antanosy attitudes toward and knowledge of medicinal plants were addressed by this research. In order to measure the knowledge of specialists (*ombiasa*) and non-specialists (people not specifically trained to use plants for healing) in their use of non-domesticated medicinal plants, I looked at the age and gender of plant users and the proximity of their villages to the forest. I then examined correlations between these variables and plant knowledge within this population.

I hypothesized that 1) people are not concerned with sustainable harvesting of medicinal plants, and 2) that people are increasingly using western medicines to meet their health care needs. Thus, conservation of non-domesticated medicinal plants may not be perceived as necessary among the local population.

Our objectives were to: 1) document knowledge of medicinal plant resources by gender, age, and village proximity to the resource; 2) identify the existence of indigenous land use types or utilitarian concepts of the environment; 3) determine indigenous attitudes and reliance on western medicines in place of medicinal plant remedies; and 4) assess

knowledge of medicinal plants and perceptions of future scarcity of medicinal plants.

Implications include what effects any medicinal plant scarcity has had on the Antanosy and opportunities to practice sustainable management of these resources.

Methods

Research background

The field research for this project was conducted between February-May 2001 and January-March 2002. All fieldwork was conducted while living among the Antanosy in one of the villages, following a 4-year period in which I lived and conducted research on the Antanosy in Tamboro as part of an assignment through the United States Peace Corps (1994-1998). This allowed me to conduct this investigation among friends and colleagues rather than an unknown group of indigenous people. In addition, my relationships among the people of Tamboro allowed me to collect what I know to be reliable data. My insight into the truthfulness of the responses comes from my prior observations and personal knowledge of informants and their trust in my research motives.

The Fokontanies of Tamboro and Akofa are located in the northwest region of Parcel 1, Tsitongambarika Classified Forest in southeastern Madagascar (24° 50'S, 46° 53'E). A *fokontany* is the lowest administrative level recognized by the Malagasy government and is usually made up of several villages or approximately 1,800 people. The *fokontanies* of Akofa and Tamboro consist of a total of 7 villages that rely heavily on the Tsitongambarika Classified Forest for their forest product needs. Villages are between 1-4 km from one another and 3-5 km from the forested region of Tsitongambarika. The majority of the people in the region are Antanosy, whose ancestors migrated from northern Madagascar to the area approximately 150-200 years ago.

In 1999, the population of Tamboro reached over 1,800 people allowing it to be reorganized as two distinct *fokontanies*. Both *fokontanies* are recognized by the *firasina* (the next level of government before the province level), and have their own elected president. Villagers were in favor of this division as two presidents give their small region a better representation at *firasina* meetings. At these meetings allocations of school funds, gravity-fed water pumps, and road construction are made to rural *fokontanies*. The villages of Mangetelo, Vohitsagnomby, Ankasimbazaha, and Fenoamy are the *Fokontany* of Tamboro. The second Fokontany is made up of Amboelengo, Tsitomory, and Akofa and is recognized as the Fokontany of Akofa.

The Fokontanies had to re-establish land ownership and water use rights among farmers whose resources were affected by the split. Primarily this affected farmers closest to where the land delineation was completed. Most of these farmers came to an agreement by sharecropping overlapping fields or resources that were the by-product of the *fokontany* split.

Research Procedures

Introductions to the presidents and local people took place immediately upon my return to the region (February 2001). During formal introductions, I requested permission from each president to conduct research in the Fokontany. Both presidents were given copies of the research permit I had obtained from the Malagasy National Park authorities. Each president was also given a copy of the questionnaire that I would use with my interviewees and the objectives for the research. Initial interviews were conducted with the presidents so that any questions they disapproved of could be modified or removed from the interview questionnaire. Neither of the presidents requested the removal or re-wording of any of our questions.

-Population Census

A population census was the first step in the research. Although a census by the Malagasy government had been completed in the Fokontanies prior to the onset of the research, I conducted a new one from which to calculate a sample size for the population in the study area. The interaction with the people in the region also gave me an opportunity to re-introduce the research on an informal basis. In addition, I compared the results of the new census to a census I completed in 1995. During the census, all households within the Fokontany were numbered and located on a hand-drawn map to clarify the layout of the Fokontany. Numbering of the households was useful for identifying particular households for interviewing. The household (also referred to as a family in this study) was based on kin relationships or marriage, relatives sharing the same house or sharing common food preparation or consumption (Durbin 1990).

Generally, the household exists within a larger family unit. The household is economically separate from the family although the sharing of work for agricultural production does occur. In Tamboro and Akofa, smaller hamlets usually comprise one family lineage. Larger villages include several lineages, sometimes of the same clan, but with each lineage maintaining its own space within the village.

Working with a guide I completed a census for all of the households and found 1,800 people living within the Fokontanies. As the population of this region in 1995 was 1,500, the new census showed a slightly higher increase than the national 3.0% average per year. A sample size was then calculated from the total number of individuals in the Fokontanies using the formula described by Krejcie & Morgan (1970) ($P=.05$) showing that 316 individuals should be interviewed.

-Interviews

By dividing the sample size across gender, it was determined that 158 men and 158 women over the age of 15 should be interviewed². My research assistants and I each interviewed 8 women and 8 men from the 7 villages to obtain a complete and randomized data set that would represent both Fokontanies. To accomplish this I interviewed a person from random households within family groups in every village. Individuals were randomly chosen for the interviews depending on who was home at the time the household was visited. Interviewers asked interviewees if they had been previously questioned so they did not overlap one another during interviews or interview the same people in a household. During interviews all conversations were in Malagasy with field notes, later transcribed in English. Tape recorders were not used due to their inappropriateness in such a very remote setting.

-Research assistants and interpreter

Three men held in good standing by the villagers and available throughout the fieldwork period were hired as assistants to conduct interviews. These consisted of a schoolteacher, a university student born and raised in the village, and a third man who was well known throughout the community. Practice interviews were held with the assistants to ensure consistency and reliability.

Although I speak and understand Antanosy, I chose to work with an interpreter for the first few weeks of interviewing to aid with more detailed interviews. The interpreter was an American Peace Corps Volunteer who had lived in the Antanosy region for two years before working with me. She was well known and appreciated by the Antanosy for her gifted use of their language. After one month, I was confident in my fluency in Antanosy and continued interviews without a translator.

-Non-specialist interviews

Non-specialists were men and women from the Fokontany of Tamboro or Akofa with no advanced knowledge or training in healing or medicinal plants. Interviews with non-specialists were conducted throughout the day at random intervals depending on the schedule of the interviewees, usually in their home.

I recorded the gender, age, and village of each interviewee. In addition, any special circumstances surrounding the medicinal plant knowledge of the interviewee (e.g. wife of an ombiasa, apprentice ombiasa, etc.) was noted.

Interviewers used a free listing data collection strategy (Bernard 1995). Free listing requires that interviewees give as much information as they can about a particular topic. Interviewees were asked to name all the plants they use for treating illnesses (Bernard 1995). The common name of the plant, the illness it is used to treat and its general location were recorded. Finally, interviewees were asked to explain what types of illnesses would prompt them to visit a medical doctor, nurse, or pharmacist or an *ombiasa* for medical treatment.

Non-specialists listed a total of 135 plants. On average people knew 2 plants, but individuals often knew 0- 20 plants. Data were categorized according to plant location (V=found in the village or within .5 km, D=found in disturbed habitats but more than .5 km from the village, F=found in the forest). The number of times each plant was listed was tallied.

This plant list was compared to a floristic inventory the senior author completed in 1998. This intensive earlier inventory identified almost 300 plant species that villagers used on a daily basis for food, medicine, firewood, construction, ceremonial purposes, etc. By comparing these lists to the 1998 floristic inventory, any changes in the plants being used for medicinal purposes could be identified.

-Ombiasa or specialist interviews

Ombiasa were interviewed as specialists in terms of medicinal plant knowledge. Although there are 7 *ombiasa* within the two *fokontanies*, only 6 were interviewed. One felt that taking part in the study might anger her ancestors (*raza*). All of the other *ombiasa* were male. Interviews with specialists were held throughout the field season as questions arose from interviews with non-specialists. Often interviews lasted over one hour and included input from the family members of each *ombiasa*. This was crucial to understanding the role of the *raza* in healer abilities, as often family members are present during *raza* visits. None of the interviews took place while the *ombiasa* was in trance with the *raza*.

A biography was composed for each *ombiasa*. Each healer was questioned as to his or her training in becoming an *ombiasa*. In an attempt to understand the specialty of each healer, maps were created delineating where each *ombiasa* completed their apprenticeship and where they lived in relation to their clients. This also indicated the distance clients were willing to travel for treatment from a particular *ombiasa*.

Using free listing (Bernard 1995), *ombiasa* were asked to list the names of all of the illnesses they treated. Plant or plant part names that were used singly or in a combination with other plants to treat illnesses were recorded. The amount of plant material and its preparation method for each illness was also recorded. Finally, *ombiasa* were asked to comment on the location and availability (in terms of scarcity) of each plant.

-Plant collection

Unrecognizable plants noted by the *ombiasa* during interviews were collected and identified by the staff of the National Botanical and Zoological Park of Tsimbazaza, Antananarivo, Madagascar. By comparing this inventory to that of Turk (1995) and Finoana (1996), it was possible to classify this inventory as exotics or endangered.

The second field season lasted from January-March 2002. Before the onset of the second field study, Fokontany presidents were again asked permission to allow the interviews and given a copy of the interview questionnaire. Upon obtaining permission, a simple ceremony was held during a Fokontany meeting to explain to villagers the objectives of the second part of our study. To ensure continuity within the study, the same research assistants were hired to help with the second round of data collection. Given the senior author's use of the Malagasy language (Antanosy dialect) to collect the previous year's data, no interpreter was used.

Non-specialist knowledge verification

A crucial and unique aspect of this research was the verification of the data collected in the first field season. The number of interviews to be conducted for the non-specialist knowledge verification was the same as that used the previous season. Thus, 317 non-specialists, not interviewed during the previous field season, were interviewed. To establish as random, yet diverse, a sample population as possible, I conducted more interviews than necessary to meet the 317 required interviews. I determined that approximately 53 men and 53 women over the age of 15 would be interviewed. Each research assistant then interviewed around 8 women and 8 men within each of the 7 villages making up the Fokontanies.

To verify data collected during the first field season, another questionnaire was created by selecting 42 plants from each of the 3 location categories (V, D and F) from the free-listing interviews. The fourteen plant species that were mentioned the most often from each location made up the new questionnaire (Bernard 1995). Responses from the initial interviews with specialists (*ombiasa*) were included in the questionnaire as many of their frequently mentioned plant species were found in the forest. Thus these results helped to make Category (C).

The 42 plants were then randomly listed to establish the new interview questionnaire. Fifteen of the most common illnesses, as reported by non-specialists during the first field season, were listed and numbered on the interview sheet to act as a reference for interviewers. The number 16 represented the “other” category for any illness that was not on the list.

Before the onset of each interview, interviewees were told that if they were not familiar with any uses of the plant in question or were not sure of the plant itself to simply respond “pass” to that plant. The interviewer simply noted this as an N/A on the questionnaire. Interviewees were asked to give the name of an illness or illnesses that could be treated with the individual plants.

Data Analysis

Specialist and non-specialist knowledge of non-domesticated medicinal plants was analyzed first using a histogram and regression analysis to determine any trends in the data. Next multi variate statistics were used to determine the influence of age, gender, or residential proximity to the Tsitongambarika Classified Forest. Data were collected over two years using different sampling and analysis methods each year. The second year’s data were intended to validate the previous year’s analysis. The two years’ data could not be analyzed together due to dissimilar collection techniques. The first year, non-specialists were interviewed using the total recall method to determine the most commonly used and recognized medicinal plants among men and women of various age groups and villages

Ombiasa/specialist interviews and forest sampling

Ombiasa were interviewed about their training, skills, and perspectives on the future of medicinal plant availability. At the completion of the interviews they were asked to take

part in an exercise where they would identify plants in the forest that had been discussed in their interviews the previous year.

In order to establish a sample area for the exercise, three 20 x 20 m quadrants were created in the forest adjacent to the Fokontanies. Quadrants were set in three areas of varied disturbance within the forest: adjacent to a foot trail near the main entrance to the forest (Plot A), approximately 100 meters from a small foot trail that deviates from the main trail (Plot B), and approximately 500 meters from the foot trail used in Plot B (Plot C). Within each quadrant 5 woody and 5 herbaceous plant species were flagged and numbered (1-10). These 30 (total) species were taken from the list of plants noted during *ombiasa* interviews. Specimens of these plants had been collected and verified by botanists at National Botanical and Zoological Park of Tsimbazaza prior to the collection of this data.

Four *ombiasa* took part in this phase of the study. Those that declined did so due to their inability to walk for long distances³. Participants were asked to walk individually through the quadrants and give the marked plant's name and any medicinal use associated with it. If an *ombiasa* was unfamiliar with a plant, this response was noted and I moved to the next plant. A research assistant was assigned to record the *ombiasa*'s responses as they worked their way through each quadrant. Data were compiled quickly at the conclusion of the exercise.

Ombiasa were then asked to walk together for a second time through the quadrants. At each plant I discussed the vernacular name they gave for the plant and its use. Because the consistency of their responses varied among plants, discussion was common among the *ombiasa* as to the confusion surrounding the many vernacular names for a plant. One *ombiasa* was known throughout the region for his broad knowledge of the medicinal uses of

plants. If an *ombiasa* felt that he had been incorrect in his identification of a plant, he often deferred to this younger colleague.

Results

Non-specialist knowledge

A histogram and regression analysis showed no significant influence of age, gender or residential proximity to the forest on plant knowledge ($P \leq .05$). A larger sample size may have yielded significant differences. Descriptive methods were then used to portray trends in the data in terms of the number of plants listed by gender and age categories. Age categories are based on cultural rites of passage into adulthood and old age. Although these categories differ for men and women (Antanosy women are seen as adults by age 15-16, men not until their early 20's), I compared similar age categories to aid with analysis. There did not appear to be any circumstance in the data, unless the interviewee was an *ombiasa* or a family member of an *ombiasa*, when men in any age group could recognize more plants than women of the same age group.

Women between 21 and 35 years were aware of up to 36 plant species, more than women of other ages. Women 20 years and younger knew at most 10 plants, whereas women 36 and older listed on average 18 plants (Table 3). Men between the ages of 21 to 35 were able to recognize uses for up to 24 plant species, whereas men 20 and younger were not likely to be aware of more than 3 plant species. Lesser numbers were found among men over 36 years where on average only 14 plants were listed (Table 3). Regression analysis did not reveal any significant relationships between residential proximity to the forest and plant knowledge ($P \leq .05$).

Among the specialists and non-specialists, 250 plants were recorded as having medicinal purposes. Among these plants 119 were identified to the species level. Based on

the IUCN Red Data Book, 67% of these 119 plants were non-native species and 33% native. Four percent of these native plants are classified as endangered (Walter and Gillett 1997). Seventy percent of the plants used by the Antanosy are found in heavy use areas (around the villages, footpaths, or agriculture fields). Thirty percent are found within forest boundaries with some overlap occurring around the periphery of the groups. Our analysis also showed that 73% of the forest plants were native and all of the endangered plants were found within this group. Only 23% of the plants found in heavy use areas were native.

The second field season's data were also analyzed to determine the effect of age, gender, or location to the forest on plant knowledge, using multi-variate statistics ($P \leq .05$). Non-specialist data were analyzed across their category (A, B, and C) using a binary logistic regression.

Analysis of Category A showed age as a significant factor as knowledge of medicinal plants appeared to increase with age across both genders (Figure 2). Gender was highly significant with females in all age groups recognizing many more plants than males. Village distance to the forest was not significant ($P = .068$).

Age was significant for Category B as well as older people were able to recognize more medically useful plant species than younger people ($P = .009$) (Figure 2). Gender was highly significant with women able to recognize many more medicinal plant species than men. Distance to the forest was not significant ($P = .277$).

People were not as nearly as aware of the uses of these forest dwelling Category C plants. Both male and female non-specialists' recognition of medicinal plants increased significantly with age (Figure 2). Older people knew more plants than younger people of both genders. Only for Category C, did older men know a greater number of species than older women. This is understandable given that many of the plants in this category were

forest dwelling and men spend more time in the forest than women. Again village distance to the forest did not appear to be significant $P = .798$).

The analysis also showed a trend in the data supporting an earlier on set of women's knowledge of the use of medicinal plants to men's abilities. Women begin bearing children at age 14 so it is not unusual for them to learn at a young age about plants to aid with menstrual cramps or irregularities, labor pains, or remedies to increase their milk production for a newborn. Often women learn of these remedies from listening to their mothers and sisters who were taught by other women.

It was also clear that women's knowledge of plants correlated with location (Figure 2). The majority of plants identified by women were located close to the village and agricultural fields, regions where women spend the majority of their time. As it is taboo (*fody*) for women to be in the forest alone, they only frequent forested areas for a short time in the morning to collect forest products with their family. Therefore, it is not unusual that the data analysis supported men as more familiar than women with plants found only in the forest.

The data analysis showed that among men there was no significant difference in their residential proximity to the forest and knowledge of medicinal plants ($P \leq .05$). The expectation was based on an assumption that people who often utilize the forest are more familiar with forest plant species. Our observations showed that male farmers frequent their agricultural fields, located in the forest and its periphery, often twice daily to tend to their fields and collect forest products. Farmers who do not own land in or near the forest only visit it infrequently to collect forest products. So why was there no correlation among males between their location to the forest and knowledge of medicinal plants?

One explanation could be linked to our findings among men's age and knowledge. I found that older men, regardless of their location to the forest, knew more plant species for medicinal purposes than younger men. This was true specifically with forest plants. Perhaps when village elders (*rangahe*) were younger and began acquiring their knowledge of medicinal plants, they spent more time in the forest than younger men of today. This would give them a broader base of plant knowledge than I would see in younger men. Perhaps villagers anticipated the separation of the Fokontany and spent the years prior to the separation learning to use the plants most accessible to them. Thus, older men may have discouraged younger men from acquiring forest plants. If this were the case, it would be normal that our results would show no change in knowledge by location, but only within age.

Our results for proximity to the forest among men and women are consistent with studies of medicinal plant use in Mexico and elsewhere. Frei et al. (1996) found that among the Zapotec and Mixe people of Mexico the majority of their medicinal plants were located in the immediate surrounding of the household. Frei et al. (1996) also found that having easy access to the resources seemed to increase people's use of the plants. A study done by Comerford (1996) in Guatemala showed that re-grown forests and intensively managed zones are more important than forested regions for medicinal plant gathering and therefore traditional medicine would not be threatened by the loss of forested areas.

Antanosy people's decision to use medicinal plants or western medicine to treat an illness was fairly straight forward. Usually they would treat themselves using medicinal plants if they had the knowledge and plants to do so, or people would seek an *ombiasa* for treatment with medicinal plants. The latter choice was based on cost and results of prior *ombiasa* treatment. If the medicinal plant remedy prescribed by the *ombiasa* was not helpful, often people would try another remedy or seek the advice of another healer. As a last resort

people would travel to the clinic in Ehazoambo for treatment. But the high cost of medicines and long distance (over 4 Km roundtrip) may explain their reluctance to visit the clinic every time they are ill. If people knew the exact cause of a serious illness, malaria for example, they almost always opted for western medical treatment. Financially secure elderly people also chose the clinic for more serious illnesses.

Ombiasa/specialist knowledge

Interviews with male *ombiasa* were crucial to understanding their perspective on whether people are increasingly using western medicines to meet their health care needs. The interviews also allowed us to obtain their perspective on whether conservation of medicinal plants was perceived as necessary among the local population.

Ombiasa rely on a combination of factors to aid them in successful healing and it was clear that there were varied levels of ability among the *ombiasa*. Experience, availability of plant material, and skills in treating a particular condition were important facets for obtaining success in healing. While all *ombiasa* were able to aid people with basic illnesses, some had an expertise in aiding women, children, or people under possession by a bad spirit (*tromba*).

Most *ombiasa* had approximately twenty family groups that relied on them. Most of these families were from the same village or Fokontany as the *ombiasa*. Sometimes, however, the clientele were from areas as far away as Fort Dauphin (35 Km). Often these relationships are established during an *ombiasa*'s apprenticeship. Following the completion of apprenticeships, people usually prefer to continue to work with the *ombiasa* even if it means traveling to another area.

Ombiasa explained that if they unsuccessfully treat a person, they would try another remedy. If they continued to be unsuccessful often that person would choose to work with another *ombiasa*. This practice was done as a type of referral without any ill feelings

between patients or ombiasa. Often *ombiasa* conferred about the illness to try and aid one another with treatment. This practice acted as a means for transfer of knowledge between ombiasa if one healer knew of a new treatment for the illness or had access to plants from outside of the region.

Ombiasa plant list

The vernacular names of plants obtained from interviews with *ombiasa* were compared to plant names listed and verified in a 1998 floristic inventory (Lyon 1999). This comparison revealed 148 plants currently being used for medicinal purposes that were not noted as being used for such purposes on the original list.

Given these results I produced two very important questions to address during the second field season. First, how are the medicinal qualities of plants discovered? Our goal was to identify the type of testing used to determine how much, or what part, of the plant is relied upon for treatment. Second, are plants discovered out of necessity (e.g. were other plants that could be used for similar medicinal purposes becoming scarce)? Given Madagascar's intense rate of deforestation, I sought to determine if plant scarcity was forcing *ombiasa* to recognize new species of plants for medical purposes.

Ombiasa quadrants

The results of the *ombiasa* forest sampling were correlated in terms of similarities of response by *ombiasa*. Results showed that *ombiasa* were much more familiar with arborous rather than herbaceous species. Within the 20m x 20m Plot A (adjacent to a foot trail not far from an agriculture field), collectively the *ombiasa* recognized 100% of the arborous species and only 40% of the herbaceous. In Plot B (100 meters off of a foot trail not near agriculture), ombiasa collectively recognized 100% of the arborous species and 60% of the

herbaceous. In Plot C (500 meters off of a foot trail not near agriculture) ombiasa collectively recognized 80% of the arborous species and 40% of the herbaceous.

Most *ombiasa* could explain a plant species medicinal use and give its vernacular name. Yet very often each *ombiasa* referred to the same plant with a different name. Or *ombiasa* named plants by describing them. One plant that was referred to by its description among all of the *ombiasa* was 'fitoravana' (*Vepris fitoravina*). *Fito* meaning the number seven and *ravana* meaning leaves which is an accurate description of the species (Finoana 1996). Although there was some variation among plant names, plant use was similar among *ombiasa* for 70% of the 30 plants.

Within the villages *ombiasa* have an expert opinion on the type, number, and distribution of medicinal plants throughout the region. None of the *ombiasa* saw it necessary to cultivate medicinal plants for convenience of collection or preservation of inventories in the future. Although the Dusun of Borneo considers cultivated herbaceous plants less potent than wild plants (Salick *et al.* 1999), the *ombiasa* in our study did not agree. They believe that cultivated herbaceous plants would have the same medical quality as wild plants, but there is no reason to cultivate the plants as there were many plants available for treatment of each ailment. In contrast to this, *ombiasa* noted that a few large tree species once used for medicinal purposes can no longer be found anywhere in the classified forest.

This was interesting when I concluded from the inventory analysis that *ombiasa* are constantly finding new medical uses for plants. The majority of these new plants are exotics found in the vicinity of the villages and other areas with disturbed soils. Thus, it seems that even *ombiasa* may be contributing to people's use of exotics for medicinal purposes rather than native plants. But what does this mean in terms of cultural and ecological conservation?

Discussion

This research focused on the Antanosy people's concern with sustainable harvesting of medicinal plants and their use of western medicines to meet their health care needs. I predicted that conservation of non-domesticated medicinal plants may not be perceived as necessary among the local population.

My research has shown that the use of medicinal plants and traditional health care is still a vital part of Antanosy society. People still look to male *ombiasa* as their primary link to health care. People still pass down medicinal plant knowledge to their children. Although this aspect of the culture could be somewhat altered by the availability of western medicines, it appears that most people are still reliant on traditional health care practices.

My analysis supported the trend that conservation of native medicinal plants was not seen as necessary among the Antanosy people involved in our study. Both medicinal plant specialists and non-specialists felt that there were enough medicinal plants available for use without fear of them disappearing. The research showed that a potential reason for this conclusion could be the use of non-native plants for medicinal purposes. *Ombiasa* were responsible for determining the treatment uses of the exotics primarily located in disturbed habitats. Once the medicinal property had been determined, non-specialists were very comfortable in self-treating. It did not appear from the findings that *ombiasa* were using exotics as a substitute for native plants. Rather they were just utilizing plants that were commonly found in their area.

People in all cultures adapt to their changing surroundings. The Antanosy adapt to their changing environment by learning to make use of naturalized exotic plant species. Because these plants do well in disturbed habitats they are usually located around the

villages. They are also, according to ombiasa, as effective in treating illnesses as native plants.

Perhaps exotics can be seen as the salvation of the rain forest and people will no longer over harvest native plant species for health care as they come to rely on exotics for treatment. This development also signifies is that it is no longer necessary to protect the rain forests to protect all medicinal plants. Perhaps there is more incentive to utilize the forest for agriculture, as it is in these disturbed habitats that exotics thrive. Indigenous people, with their amazing ability to adapt to their changing environment, may have already discovered their future direction. As outsiders change their environment, in part through the introduction of exotic plant species, the Malagasy people are left to adapt to the changes they are given.

Notes

1. Non-cultivated medicinal plants refers to any native or non-native plants found growing wild in Madagascar.
2. The Washington State University Human Subjects Board requires that all research participants be at least 15 years of age.
3. *Ombiasa* who did not participate in the study often have family members collect their forest dwelling plants for them.

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CHAPTER FOUR
TRADITIONAL HEALING IN THE CONTEMPORARY LIFE OF THE ANTANOSY
PEOPLE OF MADAGASCAR

Abstract

Traditional healers have long been thought to harbor the mysterious knowledge of the plant world. Yet given the influence of globalization on indigenous cultures, we hypothesize that the Antanosy people of Madagascar will demonstrate less reliance on traditional medicine, faith, and healers. As a case study, I present the community and healer's perspective on whether shaman and traditional medicine are still an important aspect of the Antanosy culture. This research will also present their perspectives on the incorporation of western medicine into their once traditional health care practices. Research methods included extensive interviews with the shaman (*ombiasa*) from the local community and other key informants.

I found that traditional beliefs such as taboos, spirit possession, connection to their ancestors and *ombiasa*'s healing ability remains strong and demonstrates the *ombiasa*'s continuing importance to the community. *Ombiasa* still represent a linkage between people to the afterlife, which acts as a crucial influence on their time on earth. Without the *ombiasa*, this link would not exist and their link to the ancestors, and their own future, would be gone.

Introduction

Anthropological literature describes globalization as leading to the demise of indigenous cultures worldwide (Maffi 2002). Through loss of natural ecosystems, language, traditional religion, and cultural appreciation among younger generations, knowledge once relied upon by indigenous cultures is lost. Included is the knowledge to heal had only by shaman (Winkelman 1985). Without this unique knowledge it is possible for traditional cultures to become extinct.

Of the 18 ethnic groups in Madagascar, the Antanosy are among the smallest in both population and geographical range (Figure 3). Just 362,000 Antanosy exist in a country of 16.5 million, thus making up a mere 2% of the total population (Ministerio de Educación 2003). Located in the far southeastern region of Madagascar, the majority of Antanosy people are subsistence farmers living in small, rural villages. Farmers rely on the harvests of rice (*Oriza sp.*) and manioc (*Manihot sp.*) and forest products such as honey, wild game, roof thatch, fruit, and reeds to consume or sell at weekly regional markets (Lyon and Hardesty 2002).

The social structure of the group is based on a clan system that recognizes the authority of each clan (Lyon 1999). This system is not discussed among outsiders, but is based on a caste system that was delineated by earlier generations. In this patrilocal and patrilineal society, both men and women are aware of strong taboos that govern their lives and social structure. If violated, the repercussions are thought to be severe and most people seek the help of their *ombiasa* (shaman) for counsel.

Ombiasa's traditional healing practices may be dependant on availability of native plants (Lyon and Hardesty 2002). As habitat destruction and over harvesting depletes these species, cultural knowledge may ultimately be affected. If indigenous cultures are losing

native plant species and the cultural knowledge surrounding plant use and application of remedies, an alternative source of medical treatment must be found. Often western medicines, including inoculations and antibiotics may provide an alternative.

Traditional healing versus western medicines among the Antanosy

Western medicine in the form of inoculations and synthetic drugs first arrived in Madagascar during the French colonialization (1896-1960) (CIA 2002). In 1899, children were required to be immunized against diseases such as rabies and smallpox (*Variola*). In 1917, Madagascar was the first country in the world to eradicate the smallpox virus (CIA 2002).

Today the Malagasy government works with the World Health Organization (WHO), United Nations, Institute Pasteur, and Non-Governmental Organizations (NGO's) to help subsidize health clinics throughout Madagascar. Normally these rural clinics act as a small hospital, selling western medicines, providing routine health check-ups and rustic in-patient hospital rooms. Usually understaffed, nurses or technicians manage the clinics around periodic doctor visits. Depending on funding and reliability of transport services, the clinics usually have a limited supply of medicines to treat basic illnesses including broad spectrum antibiotics, chloroquine, and various vitamin supplements. Vaccinations are administered to babies and young children although mothers are still reluctant to get their children vaccinated because of the high cost (Lyon 1999).

As health organizations utilize western medicines to wipe out disease, we have to question if this goal encourages people to discount their traditional healing practices. Are we unintentionally creating a global movement that eliminates traditional medicine? Trends in the literature explain that most indigenous cultures are changing as they are influenced and

inundated with western culture (Maffi 2002). As scientists, we must consider the role that western medicine may also be playing in the loss of indigenous health practices.

For many African countries the alternative to western medicine is traditional healing with the *ombiasa* (shaman). Although a great deal of research has been done on spirit possession in Madagascar (Sharp 1990), the reliance of the Antanosy people on healers remains unclear. We hypothesize that the Antanosy will demonstrate less reliance on traditional medicine, faith, and healers. As a case study, we present the community and healers' perspectives on whether *ombiasa* and traditional medicine are still an important aspect in the Antanosy culture of southeastern Madagascar. This research will also present their perspectives on the incorporation of western medicine into their once traditional health care practices. It is my hope that this paper will adequately represent the perspective of the male Antanosy *ombiasa* and villagers who participated in this study.

Methods

I obtained data for this paper from 1994-1998, February-May 2001, and January-March 2002 while living with the Antanosy in the adjacent Fokontanies (communities) of Tamboro and Akofa. Together these communities encompass approximately four kilometers east-west and two kilometers north-south. The villages making up the communities are only accessible by foot path and are approximately 2-3 km from the edge of a protected forest and 2-4 km from the nearest vehicle accessible road.

Several data collection techniques were used including: structured and unstructured interviews with *ombiasa*, direct observation, and participation in healing ceremonies with six Antanosy and two Antandroy shaman (N=8). *Ombiasa* were interviewed as specialists in terms of medicinal plant knowledge. In order to obtain a clear understanding of the Antanosy's reliance on traditional medicine, many in-depth interviews were conducted with

both rural and urban Antanosy during their daily activities. I took notes in English and Malagasy during each interview and later transcribed them into a computer. New interview questions were derived from themes that developed as data was transcribed. These were compiled to form a questionnaire for the following set of interviews. Interviews were held until no new possible replies could exist within the frame of questioning. This is referred to as a saturated data analysis (Strauss and Corbin 1990). Tape recorders were not used during the interviews as they might be an added distraction from the discussion. Hand-drawn maps were created using participant involvement to designate the geographic distribution of clients seeking each *ombiasa* interviewed.

Although there are 7 *ombiasa* within the study area, only 6 were interviewed. The only female *ombiasa* felt that taking part in the study might anger her ancestors (*raza*) and declined an interview. Careful investigation was done to obtain information regarding *ombiasas'* clients. The intent was to give an approximation of the possible pressures put on medicinal plant populations by the number of clients collecting or using plants from a specific area. Using this information we delineated the regions where medicinal plants were harvested.

Interviews were also conducted with two *ombiasa* from the neighboring Antandroy ethnic group in the far south of Madagascar (Figure 5). This information allowed us to compare ethnic perspectives on the use of medicinal plants for healing. Since one of the Antandroy *ombiasa* sold plants at regional markets, a sales survey of what he sold was completed with him during two regional markets in the Antandroy region of southern Madagascar.

Results

Role of the ombiasa

Among the Antanosy, the *ombiasa* is usually not a person of great wealth, western education, or political power within the village. Unlike several Amazonian cultures where the shaman is a person similar to the head-man (Bodley 1990), the *ombiasa* is a person to be primarily consult in medical problems and spirit possession situations.

Most *ombiasa* began their training in their mid-twenties or younger. *Ombiasa* do not become apprentices because of a calling or family requirement. Rather they are interested in learning to heal to help others. All of the *ombiasa* in this study apprenticed with an unrelated, older *ombiasa* who lived outside the immediate community. Some traveled up to one hundred miles for training and spent 1 to 5 years as an apprentice. Many are still in contact with their mentors in a perpetual learning relationship.

Today *ombiasa* might guide 1-5 people through an apprenticeship during their lifetime. Usually an *ombiasa* has been practicing for several years before taking on an apprentice and often the first has been referred to them by their own guide. *Ombiasa* have not seen a significant change in the number of people seeking apprenticeships or becoming healers. Apprenticeships usually begin with apprentices learning basic plant identification, remedies, how to process the plants, and application of the potential remedy. More complex combinations of plant remedies are studied after initial lessons are mastered.

The *ombiasa* that we interviewed had achieved varied levels of ability and specialty in healing. While all were able to help people with basic illnesses, some had special expertise with women, children, or people possessed by a bad spirit (*tromba*).

Most *ombiasa* had approximately twenty family groups (patrilocal structure usually consisting of 3 generations) relying on them. Most of these families were from their own

village or Fokontany. Sometimes, however, the clientele were from Fokontanies other than Tamboro. Many of the healers also had people visit them from as far away as Fort Dauphin (35km). *Ombiasa* explained that if people were unsuccessfully treated by a local *ombiasa*, they preferred to go somewhere different and be treated with different plants. In other cases, *ombiasa* said that they developed a clientele while they were apprenticing and those people wanted to continue to work with them even if it meant that travel was necessary.

Of the eight *ombiasa* in this study, their age range was from 30-75 and each had been practicing anywhere from 4-50 years. It is also important to note that all eight are also farmers earning their living primarily through rice harvests. They are only paid for their healing services if the person is cured, if not the *ombiasa* may refer the person to someone else or a doctor depending on the illness.

Doctor referrals are also a part of *ombiasa* practice. In most cases of malaria or an acute illness, *ombiasa* will refer people to clinic doctors for treatment with western medicines. *Ombiasa* explained that for many illnesses western medicines are much more effective than medicinal plants. In cases of malaria, *ombiasa* explained that their traditional treatment only focused on treating the symptoms and not the malaria itself.

During the field work for this research, a young girl became ill and did not recover under an *ombiasa's* treatment. The *ombiasa* directed the girl's family to see a doctor as he felt she had a kidney infection that he could not treat without antibiotics. The girl quickly recovered under the doctor's care and medicine. Upon her return to the village the family threw a party to thank the *ombiasa* for his referral.

Ombiasa explained that often doctors will refer their patients to *ombiasa*. Rural doctors at local clinics will refer patients to *ombiasa* if they feel unsure of their patient's

diagnosis. Doctors also stated that rural people will have more faith in their treatment if the *ombiasa* has first diagnosed the illness.

Reliance on plants for healing

Ombiasa rely exclusively on plants, and occasionally animals, for treating illnesses and spirit possession. They never give their clients western medicine claiming that they are not doctors and would not know how to prescribe such medications. Depending on the type of illness, *ombiasa* usually use a combination of plants and plant parts for treatment. They explained that because an illness often has several causes, each cause must be treated by a combination of plants. The treatment of an illness varied among healers as each was trained by different people. *Ombiasa* explained that similarities in treatment were most likely because healers had the same species of available plants.

When asked about their reliance on medicinal plants, *ombiasa* were consistent: they felt that they were healers only because of the availability of the plants. Yet none had tried, or were interested in, cultivating the plants they use for healing. They believed cultivated plants would have the same potency as wild plants, but did not see a need for cultivation. They explained that there were enough plants available in the forest and that it would be impossible for them to ever run out or even see a shortage of plant material. If they could not locate one plant, there were others that could be used (Lyon and Hardesty 2002).

Changing role of the ombiasa

An important aspect of interviews focused on the role of the *ombiasa* in the community. Most *ombiasa* and community members insisted that traditional healing was more necessary now than ever before. They explained that as the population of the region was growing (3.0% Madagascar annual growth rate) (Madagascar Country Report 2002), more *ombiasa* were needed to help care for the sick. Key informants believed that *ombiasa*

knew more remedies for illnesses now than in the past. They explained that while colonized, the French banned the use of plants for healing and the practice of traditional medicine. This ban, informants felt, deterred apprenticeships and resulted in an almost twenty year generational gap in the practice and knowledge of healing.

Andomasa is the Malagasy time frame when the French declared traditional healing illegal. This included the use of plants for ceremonial or medicinal purposes and the role of the *ombiasa*. The French military ransacked villages throughout Madagascar confiscating any medicinal plants or supplies. They then burned these items in public bonfires to scare people into accepting their authority (Lyon 1999; Dewar and Wright 1993). Although a great deal of traditional knowledge was lost during this time, many healers committed plant remedies to memory, hid their equipment from the military, and practiced in secret. It was this degree of intrusion on their way of life that led the Malagasy into battle with the French in 1947, and ultimately won them their freedom in 1960 (Lyon 1999).

This search and destroy campaign went on in all areas of Madagascar except the far southern Antandroy region of the country. The warlike nature of the Antandroy and their ability to exist in an environment where the French military could not, allowed healers to continue practicing traditional medicine.

Middleton (1999) blames the inability of the French to dominate the Antandroy on the *Opuntia* cactus. She explained that although the military attempted to overpower the Antandroy, the military's movement through the dense, spiny thickets of the Malagasy cactus (*Opuntia sp.*) and was too difficult. After several failed attempts to conquer the "people of the thorns" the military retreated (Middleton 1999). Today many remedies exist only because of the Antandroy's ability to practice traditional medicine and pass down information during that time. The Antanosy and Antandroy regions have differing climates

and vegetation, yet much of the Antanosy people's knowledge of medicinal plants was re-taught to them by the Antandroy. Furthermore, many of the Antanosy refer to the Antandroy as the most accomplished healers. This exchange of knowledge was possible because the Antandroy rely on the forests of the Antanosy to provide them with a great deal of their plant material. Some Antandroy *ombiasa* felt that the best plants for healing were found in the forests of the Antanosy.

Ancestors and altered states of consciousness

The actions of Malagasy people are determined by their past. An individual person's decisions (such as when and whom to marry, where to live, when to plant crops), are decided after a consultation with their tribal *raza* (ancestors). *Ombiasa* explained that the *raza* were not necessarily their own family members, but a group of tribal ancestors who were *ombiasa* during their time on earth. Because communication with the *raza* only exists by means of an *ombiasa*, it is imperative that each family have an *ombiasa* to guide them through their communications with their *raza*.

The *raza* who guides a family is not the same *raza* who passes on their knowledge of medicinal plants to apprentices as they begin their training as an *ombiasa*. Usually *ombiasa* and their apprentices did not have the same *raza*, but apprentices learned how to communicate with *raza* during their training.

Ombiasa rely on altered states of consciousness to communicate with *raza*. Altered states or trances are achieved through meditation and chanting the symptoms of the ill person to call the blessing of the *raza*. During the meditation, *ramy* (sap from a specific tree species), mixed with *ombi* (cattle) fat are burned to deepen the trance. Usually the sap is burned in the *ombiasa*'s dwelling with their family members present, but only the *ombiasa* use it for trance. This is because although the *raza* can only be called by the *ombiasa*, family

members must be present to help the *ombiasa* should the *raza* ask for something (e.g. particular plants, refreshments, etc). Often the *raza* will communicate directly with the *ombiasa*, but sometimes they use the *ombiasa* as a medium to communicate with the family members. When this happens it is up to the family members to later communicate the *raza*'s directions to the *ombiasa* as they will be unaware of the conversation.

Once the *raza* enters the semi-conscious mind of the *ombiasa*, small black and white seeds (*tsikidy*) are used as a medium for communication. Two to three seeds are placed in columns from north to south to represent aspects of a person's life that could be affected with illness, unhappiness, or regret. The number of seeds placed together and their location within the column allow for different interpretations. During the trance state the *ombiasa* communicates with their *raza* as to what aspect of the person's life is being affected, how it is being affected, and what should be done to aid the ill person. During the trance the *raza* explains aspects of the illness and how it is affecting the ailing person. The *ombiasa* portrays this by moving the *tsikidy* into a particular pattern which is read after the trance is finished. The *raza* will often go on to explain to the *ombiasa* what plants are necessary for treating the illness and where the plants can be found.

Most *ombiasa* rely on their ability to communicate with their *raza* as an important aid in diagnosis and treatment of the sick person. Although *ombiasa* can treat minor illnesses without communication with their *raza*, most rely on the ancestral world to aid in unclear or more serious illnesses.

Bad-tromba

Some *ombiasa* are specialists in treating particular illnesses. Others specialize in diagnosing problems thought to originate from curses. A curse can be the result of another *ombiasa* bringing "bad luck" into the life of another person (McClenon 1993). Usually this

bad luck is in the form of a sudden financial burden or the deterioration of the person's health.

Community members explained that it is possible for some *ombiasa* to utilize medicinal plants and the *raza* to cause bad events in a person's life. Yet it seemed that only a few *ombiasa* in the region were known to practice this type of medicine. During a preliminary interview, an *ombiasa* explained that their discussing bad-*tromba* implied that they were capable of it. Since none of them wanted that sort of stigma the subject was not mentioned by either of us.

Spirit possession

An important role for the *ombiasa* stems from their ability to free people of spirit possession or at least help them control the spirit. Sharp (1990) provides a very thorough account of spirit possession among the Sakalava people of northern Madagascar. Belief in spirit possession (*tromba*) throughout the island is common, not unique to one ethnic group, economic class, or gender. Among the Antanosy, spirit possession is most common among women although men also have *tromba*. One woman with 7 different *tromba* spirits told me that as women are the weaker sex it is easier for a spirit to take control of their bodies than that of a man.

Possession experience ranges from good and powerful, to a destructive, dangerous, and frightening illness (Sharp 1990). Possession by the most powerful spirits is honorable; but most people are terrified of being inflicted with bad *tromba*. Both types of *tromba* can have varying effects on the health of the possessed mediums.

Positive *tromba* spirits play an important role within the Malagasy society. Among the Antanosy, positive *tromba* spirits help, not hinder, the living. Usually positive spirits are deceased family ancestors (*raza*) who make themselves available for family consultation and

advice. These *raza* give their living family members advice about such things as crop rotation, housing location, circumcision timing, and use of medicinal plants.

Good *raza* usually choose to possess a female family member, but if the woman is not happy being chosen she can request that the *raza* choose someone else. Usually people do not mind having the *raza tromba* as they know that it is a service they are providing for their family. The woman who has had 7 *tromba* in her life only minded having one which had been a bad *tromba*. Also, whereas bad *tromba* can make the possessed person weaker, good *raza* will often tell the family members what medicinal plants to use to strengthen the possessed. When the medium suffers ill health from their possession, they often try to eradicate the spirit.

Among the Antanosy, bad *tromba* are thought to have been people who died with ill feelings towards someone else or were people who did “bad” things in their lifetime. These *tromba* are on a mission to repay the person or family members towards whom they had ill feelings when alive. They possess a person not related to them or their family. Bad *tromba* usually avoid possessing anyone they are related to as this might ultimately bring more bad luck to their own family. They attempt to make the possessed punish the victim family or individual. One woman told me that bad *tromba* can cause the possessed person to start a rumor about the victim family or individual or the *tromba* can make the possessed attempt to murder the victim. Usually difficult to eradicate or control, spirits are unpredictable and cause the possessed to become very sick. If the possessed person becomes deathly ill, the spirit will leave the ill person and move to another living person. Often the spirit moves to another female relative, perhaps a daughter, who might be physically tired or rundown from having taken care of her ill mother. The spirit becomes incapable of inhabiting another

person if it does not leave the possessed body before it dies. Therefore, family members are highly susceptible to possession if they have a possessed family member close to death.

The Antanosy view possession as an illness and *ombiasa* are believed to be very successful at performing exorcisms, thought to be the only cure for the illness. They also offer the possessed a way to control their spirit through the use of medicinal plants. Among the Antanosy this strong faith in traditional practitioners appears to be crucial in eradicating the spirit. When *ombiasa* failed to eradicate the spirit, it was thought that the possessed did not have faith in the healer, rather than their doubting the *ombiasa*'s skills.

Alternatives to ombiasa to treat bad-tromba

Throughout Madagascar exorcists and psychiatrists offer options for the possessed, but the efficacy of their treatments varies greatly. Psychiatrists tend to fail the possessed because they view possession as deviant behavior rather than an illness (Sharp 1990).

Among the possessed, the dichotomy between traditional Antanosy beliefs and other introduced religions is very evident. In Madagascar 46% of the population follows the traditional Malagasy religion, 26% are Catholic, 23% are Protestant, 2% are Muslim, and 3% are a combination of other religions (Madagascar Country Report 2002). Almost all Malagasy regardless of their faith believe they are susceptible to spirit possession, but most Catholic, Protestant, Muslim, and Hindu Malagasy believe that their faith will usually protect them. If it does occur they often blame it on their having had a lapse of faith allowing for the entrance of the spirit into their lives.

When believers become possessed, they often turn to their priest, pastor, or other spiritual leader to help them eradicate the spirit. If this is not effective, which often appears to be the case, people turn to Protestant exorcism held in a *toby* (type of church) to aid them with eradication. Here Protestant healing rituals first accept and then transform the patients'

explanations for and experiences of possession. These healing rituals view possession as an illness, not deviant behavior.

The most widely recognized *toby* in Madagascar is located in Fort Dauphin, approximately 35 km from the study site. Over 25 years old, this Lutheran-subsidized mission was originally designed to house and heal Lutherans suffering from spirit possession. Today they accept anyone and are staffed with approximately 20 nurses, teachers, pastors, and volunteers who were helped by the mission through their own possessions. A hospital, school, and bungalows are available for the possessed and family members who stay to care for them. The possessed come from all ethnic groups in Madagascar and range in age from 3 to 80 years. The mission usually treats approximately 50 people at one time at no cost to the possessed or their families. People have been treated by the mission in as little as 2 weeks or as long as 2 years. Mission staff explained that the length of time a person must undergo treatment depends on their ability to concentrate on prayer as a means of spirit eradication.

Throughout their time at the mission people are encouraged to worship. Mission staff lead the possessed through prayers 3 times a day and encourage people to worship on their own. Séances are held daily where the possessed are led as a group into the prayer area and lightly hit with white towels by the mission staff (Figure 6). This is symbolic of the spirit being beaten out of the bodies of the possessed then replaced by God. Staff murmur chants throughout the séance while the possessed cry and wail in their attempt to force the spirit out of their bodies.

Yet the staff does not claim credit for the healing. One of the pastors explained that people must focus on the good of God in order to rid themselves of the *tromba*. The mission only acts as a place for people to come to get additional support to worship, but the

eradication of the spirit must come from the person alone. By focusing on God, people will be able to force the spirit out of their bodies.

The people interviewed believe that anyone is susceptible to being possessed, including people who are not Malagasy. Many people believe that there were more cases of *tromba* now than ever before. Regardless of their religious beliefs, most people believe that *tromba* was something that would always be part of their society. The Malagasy's strong cultural belief in the power of the ancestors has not faded. Since *ombiasa* are the link to the ancestors their place within the Antanosy culture is crucial.

Syncretism

Malagasy traditional religion, as with many African traditional religions, is generally based on faith in ancient indigenous people (Ancestors) (Harris *et al.* 1994). Malagasy religious syncretism can be characterized as a seamless fusion of traditional and Christian or Muslim elements (Graeber 1998). One of the best displays of this is the Malagasy's belief in spirit possession and their treatment of bad-*tromba* using the Christian faith. It is fascinating that this culture can adopt a non-African religion while not abandoning traditional beliefs. On the contrary, it appears that some non-African religions fully support its members whose syncretism of religions is evident. An example of this is the Lutheran church's financial endorsement and full acceptance of the *toby* in Fort Dauphin. Perhaps it is the ability of the Malagasy to take what they need from various components of their past and present that allows them to retain much of their unique culture in today's changing world.

Changing perspectives on shamanism

According to the literature, the definition of shaman can mean many things depending on the society being discussed. This is very applicable to the Antanosy where an *ombiasa* is someone who acts as a spiritual guide, exorcist, or traditional healer. Winkelmann (1985) uses

cross-cultural data to examine societal variation within the shamanic role. His model designates four layers of societal development that encase the changing perspectives on shamanism.

The first role he presents is that of a shaman in a hunting and gathering society. Here shamans utilize trance states to engage in healing and divination where they have the ability to influence spiritual entities (McClenon 1993; Eliade 1972). The second category is that of shaman/healer found in societies moving from sedentary agricultural or pastoral communities. Political integration exists within these societies beyond the level of the local community.

Winkelman's (1985) third category is mediums. Usually female, these mediums use spontaneous occurring trance states as their primary method of healing. Mediums are usually part of societies practicing advanced methods of agriculture. These societies also have a well established political hierarchy that exists beyond the local community.

The fourth category in this model is that of healers. These are practitioners in advanced and postindustrial societies who are politically integrated beyond the level of the local community. Healers found in these societies and are less concerned with trance as a model of healing (Dobkin De Rios and Winkelman 1989).

Using Winkelman's model Antanosy shaman could be defined as part of the third category of medium practitioners who use trance. Although most *ombiasa* are men, they often acted as mediums for communication with the spirit world. All of the shaman experienced spontaneous occurring trance states where their spirit came forth, uninitiated by the shaman, to explain something the shaman must do in a given situation. Or they rely on the spirit of their ancestors (*raza*) to provide them with the knowledge to diagnose health or other problems using medicinal plants.

To address other aspects of Winkelman's definition of shaman as practitioners, it is clear that the Antanosy have manipulated their agricultural system to allow for year-long rice harvest. Thus, their farming abilities could be seen as an advanced state of agriculture allowing them to be seen as practitioners. This definition helps to clarify the role of the *ombiasa* among the Antanosy.

Discussion

On average twenty family groups rely on each *ombiasa* for health care. Many of these clientele are from other regions and must travel to reach their *ombiasa* of choice. *Ombiasa* also explained that the number of apprentices is adequate in meeting the demands of an increasing population. Thus, young people are still interested in learning about the uses of medicinal plants and becoming healers.

Patient referrals between doctors and *ombiasa* are an integral aspect of Antanosy life. Acceptance of western medicine to complement traditional healing allows the Antanosy to adapt to globalization while still maintaining a strong sense of their culture. This reflects the overall ability of the Antanosy to maintain a unique identity in a changing world. In most rural areas the doctors are Malagasy, but have been trained in western medicine. Perhaps because they themselves are Malagasy western and traditional medicine are allowed to complement one another. It would be interesting to determine how this balance might change if a non-Malagasy person were to act as the primary health care physician.

My research hypothesized that the Antanosy will, according to the literature from other traditional cultures, demonstrate less reliance on traditional medicine, faith, and healers from a local perspective. Yet I found that traditional beliefs such as taboos, spirit possession, connection to their ancestors and *ombiasa*'s healing abilities remain strong and demonstrate the *ombiasa*'s continuing importance to the community. *Ombiasa* still represent a linkage

between people with the afterlife, which acts as a crucial influence on their time on earth.

Without the *ombiasa*, this link would not exist and their link to the ancestors, and their own future, would be gone.

The Malagasy have become experts at utilizing syncretism to blend all facets of their culture with western influence. Their ability to do this has allowed them to utilize western medicine and religion while still maintaining their traditional practices and beliefs. Thus, the Malagasy appear to have maintained their culture simply by utilizing the best of all worlds.

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CHAPTER FIVE

THOUGHTS ON THE FUTURE

Introduction

This research was conducted to create a foundation to better understand perspectives on medicinal plant use and knowledge from an Antanosy (or in some cases Malagasy) perspective. In the introductory chapter I established a framework outlining the necessity for the research. My core chapters investigated the Malagasy peoples' use and knowledge of medicinal plants in both rural and urban settings. These chapters also attempted to identify specialist (shaman) and non-specialist knowledge (local people not trained in using medicinal plants for healing) of medicinal plants. By gaining an understanding of the relationship between healers, medicinal plants, and Malagasy people I hoped to comprehend the vital link between these people with their natural environment. In this concluding chapter I will interpret my results to explain some of the factors influencing medicinal plant knowledge, use, and need. I will also provide a future outlook for Madagascar's environmental situation.

Several important trends were found by this research. The initial chapter determined that among the urban Malagasy people in the capital city of Antananarivo, vendors play a crucial role in providing plants and knowledge of their use. On a village level, I found that traditional healing and knowledge of medicinal plants remains important to the rural Antanosy especially among mothers. Although medicinal plants are popular for treatments of ailments among the local population, knowledge of the plants lies among women of child bearing age. Within the last chapter, I showed that healers were responsible for fostering the adoption of ecological change within the culture. An example of this was their ability to identify the medicinal properties of exotic plants and incorporate them into their

pharmacopeias. As exotics continue to naturalize on the island, healers will play a crucial role in helping people adapt to their changing environment.

Does this continuing dependence on traditional healing practices signify that medicinal plants can be used as an incentive for forest conservation among the people of Madagascar? From my experience, I do not believe that they could be used as a motivation for people to protect their forests. Although Malagasy realize that medicinal plants are necessary for maintaining their culture they simply do not see a need for individual plant species or forest conservation. Currently, the Malagasy do not limit or monitor medicinal plant harvest to ensure the survival of the plant species. In fact, they utilize what plants they have nearby for convenience, not worrying about long term consequences of their actions. There is no indication among the general population we interviewed, or the *ombiasa*, that they feel it necessary to cut back on their harvest of medicinal plants to conserve them for their own, or the community's future availability.

Therefore, conservation of the forest simply to preserve medicinal plants is not feasible. Although only predictions can be made concerning the potential for forest conservation of in Madagascar, I believe that it may be possible to combine their reliance on medicinal plants as part of another conservation plan. For example, if forest conservation is being based on the need for the forests in ecotourism then a consistent supply of medicinal plants might be an added incentive to protect the forest.

My research was crucial in identifying perspectives thus far with concern to the knowledge and use of medicinal plants. Studies similar to this are needed to gain a more geographically extensive perspective about this aspect of medicinal plant conservation. Currently a proposal has been established to repeat this study in six Antanosy villages along the periphery of the Tsitongambarika Classified Forest. It is the hope of those involved that

this project will enable us to achieve more solid insight into making predictions of the conservation of medicinal plants. This research will also enable us to work with the local people to make better decisions concerning the best methods of natural resource management.

	Illness	English translation	Bought by men	Bought by women	Total
1	Vavony	Indigestion	34	15	49
2	Aty	Liver malfunction	26	10	36
3	Tambavinjaza	Weak newborns	18	13	31
4	Tazo	Malarial symptoms (headache, fever)	15	10	25
5	Tazovony	Yellow fever	17	7	24
6	Albumine	Blood in urine	12	7	19
7	Kohaka	Cough	10	9	19
8	Kibo	Stomach ache	8	10	18
9	Fery anatany	Internal hemorrhage	11	4	15
10	Diabete	Diabetes	9	5	14
11	Rein	Kidney infection	7	7	14
12	Fo	Heart attack	7	6	13
13	Maso	Eye infections	4	9	13
14	Nify	Dental problem	9	4	13
15	Volo	Hair (dull, lifeless)	4	9	13
16	Voa	Kidney stones	6	5	11
17	Farasisa	Syphilis	4	6	10
18	Tosi-dra/Fampidinava	High blood pressure	7	3	10
19	Romatisme-sotrina	Rheumatism	7	2	9
20	Tenda	Strains in back or neck	7	2	9
21	Angatra	Spirit possession	6	2	8
22	Vay	Abscess	7	1	8
23	Folaka	Sprain	6	1	7
24	Sempotra	Breathless, breathing problem	5	1	6
25	Sinus	Sinus infection	4	4	8
26	Andoha/Fandoavana	Vomiting	3	1	4
27	Bevoka	Morning sickness		4	4
28	Fivalanana	Problem with the bowels, diarrhea	3	1	4
29	Hemorroid-ipetralava	Treats hemorrhoid externally	2	3	5
30	Hemorroid-sotrina	Treats hemorrhoid internally	2	1	3
31	Sery	Cold symptoms (congestion)	1	2	3
32	Sofina	Ear infections	1	2	3
33	Cancer	Cancer	2		2
34	Havizana	Fatigue, low energy	2		2
35	Loha	Headache	1	1	2
36	Lolo	Spirit possession	2		2
37	Mampiterika	Weak body post-pregnancy		2	2
38	Manalafofona	Bad body odor		2	2
39	Mavy	Burns	2		2
40	Prostate	Prostate	2		2
41	Tambavy na bevotika	Weak body post-pregnancy		2	2
42	Tsinay	Intestinal problem	1	1	2
43	Vavony sy aty	Stomach/liver ache	2		2
44	Angadrano	Dandruff		1	1
45	Evoka	Weakness after giving birth		1	1
46	Fapatorina	Sleep aid	1		1
47	Mahabenono	No milk flow after birth		1	1
48	Mihitsabolo	Fainting		1	1
49	Mitady zazo	To help achieve pregnancy	1		1
50	Mivalan-drano	Urination problem	1		1
51	Valahana	Pain in loins		1	1
52	Vizana	Physically tired from strain	1		1
	TOTAL				459

Table 1. Illnesses treated over the 6 weeks.

Healer Number Number of Combinations Number of Species

1	6	15
2	4	13
3	4	8
5	10	14
6	1	6
7	1	9
8	1	4
9	1	6
10	1	6
11	1	5
13	2	9
14	1	5
15	1	5
16	1	4
17	1	6
18	9	16

Table 2. Combinations of plants used to treat stomach aches.

Female				Male				
Age range	n=159	Age	#	Range	n=159	Age	#	Range
15-20	50	18	6	0-10	45	19	3	0-3
21-35	56	33	22	14-36	63	37	18	3-24
36-	53	48	18	14-18	51	55	14	8-16

Age = average age of person

= average number of plants known

Range = range of plants known

Table 3. Free response plant list.

	Village	Forest Periphery	Forest
Age	.000	.000	.000
Location	.068	.277	.798
Gender	.000	.000	.000

Table 4. Regression table showing significance of response information of plant knowledge across age, dwelling location relative to the forest, and gender across plant harvest location ($P = \leq .05$).



Figure 1. Map of Madagascar showing the region of study site. Map courtesy of the General Libraries, The University of Texas at Austin.

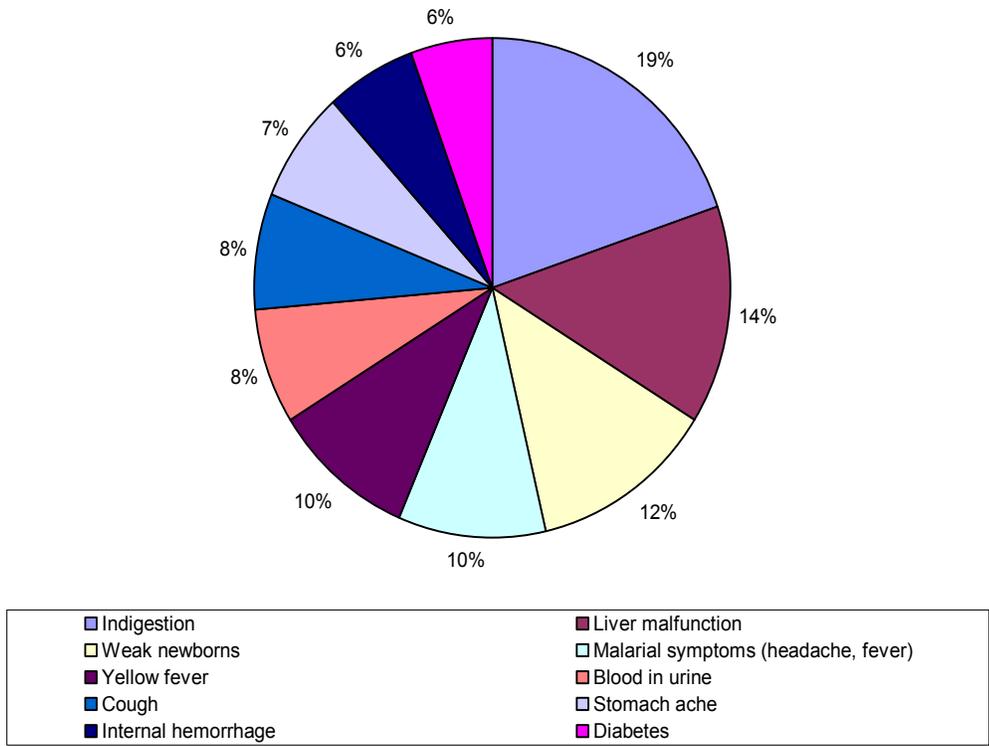


Figure 2. Illnesses that were treated over the 6 weeks.



Figure 3. Map of Malagasy ethnic groups (Dahl 1999).



Figure 4. Photograph of séance ritual in Fort Dauphin.

APPENDICES

Marketplace vendor interview questionnaire

Gender

Age

Number of years as a vendor?

How did you learn the names and uses of plants?

How did you learn how to treat illnesses with plants?

If it was as an apprentice, with whom did you apprentice, for how long, how was this apprenticeship established?

How did you come by your stall and your clientele?

Do you sell any plants or treat any illnesses that you think are unique to what other vendors can offer their clients?

Do you have a specialty?

How do you acquire your plants?

Where do your plants come from?

How did you establish your link with your plant transporters (added after the first interview)?

Do you request particular plants or just take what is available to sell?

Do you see, or have you seen, any shortages of plant material since you have been a vendor?

If so, what regions of the country do you think are seeing these shortages?

Who harvests your plant material?

Have you ever visited the areas where the plants are harvested or harvested them yourself?

Do you think that your clients know/care where the plants have come from?

Have you seen any increase or decrease in the demand for medicinal plants since you have been a vendor?

Why did you become a medicinal plant vendor?

Tamboro interviews-Season One

Village name

Gender

Age

List the number of plants that you know have medicinal uses and their uses (what they know is what they have used)

How did you learn of the medicinal properties of these plants and/or how to use them?

When you are ill, would you go to see a doctor or an ombiasa? If both for what illnesses would you visit with a doctor; ombiasa.

Where do you collect the majority of the plants that you use for medical purposes?

Tamboro interviews-Season two

Plant	Scientific name	Illness code
1. Kininy (A)	<i>Eucalyptus citridora</i>	Infant fever or cold (1)
2. Mandovitra (B)	<i>Cynodon dactylon</i>	Pregnancy (2)
3. Tsingirymitiky (B)	<i>Emilia citrina</i>	Stomachache (3)
4. Ampoly (A)	<i>Vepris</i> sp.	Sinus headache (4)
5. Kasakasa (A)	<i>Crotalaria striata</i>	Boil, skin infection (5)
6. Taritariky (A)	<i>Leptadenia</i> sp.	STD-male (6)
7. Longozohiatsy (C)	<i>Zingiber</i> sp.	STD-female (7)
8. Ambanivoa (B)	<i>Bambusa</i> sp.	Used for witchcraft (8)
9. Tsingena (C)	<i>Allophylus</i> sp.	Did not know (9)
10. Maroafy (C)	<i>Rhynchelytrum roseum</i>	Sprain, torn ligament (10)
11. Retantely (A)	<i>Caesaria</i> sp.	Cough (11)
12. Tsingiryfiry (B)	<i>Emilia citrina</i>	Teeth (12)
13. Tomboho (C)	<i>Piper betle</i>	
14. Fafara (A)	<i>Turraea sericea</i>	
15. Coeur de boeuf (B)	<i>Annona reticulata</i>	
16. Manasy-gasy (C)	<i>Ananas comosus</i>	
17. Dangoa (A)	<i>Strychnos madagascariensis</i>	
18. Tsimarefy (C)	<i>Fluggea</i> sp.	
19. Tokambatsy (B)	<i>Cnestis polyphylla</i>	
20. Goavy-ravina (A)	<i>Psidium</i> sp.	
21. Sambalahy (B)	<i>Albizia gummifera</i>	
22. Kokomba (C)	<i>Aristolochia acuminata</i>	
23. Seva (B)	<i>Buddleia</i> sp.	
24. Fataka (B)	<i>Scleria</i> sp.	
25. Famoty-be (A)	<i>Veronica pectoralis</i>	
26. Kalavelo (C)	<i>Suregada adenophora</i>	
27. Beloha (B)	<i>Cyperus prolifer</i>	
28. Nonoky (A)	<i>Ficus</i> sp.	
29. Marozaza/Tsitomboela (A)	<i>Crateva excelsa</i>	
30. Vokatra (B)	<i>Ludwigia octovalis</i>	
31. Famota (C)	<i>Polyscias</i> sp.	
32. Tonga (A)	<i>Catharanthus roseus</i>	
33. Romba/Romba-be	<i>Ocimum gratissimum</i>	
34. Totonga (B)	<i>Dioscorea pteropoda</i>	
35. Falinandro (C)	<i>Dracaena</i> sp.	
36. Hahabe (C)	<i>Asplenium</i> sp.	
37. Vahipindy (C)	<i>Hippocratea</i> sp.	
38. Basiboka/Taribash (A)	<i>Mauloutchia humblotti</i>	
39. Lendemo (C)	<i>Anthocleista madagascariensis</i>	
40. Boka (A)	<i>Heteropogon contortus</i>	
41. Sara (C)	<i>Aponogeton</i> sp.	
42. Boro (B)	<i>Kalanchoe schizophylla</i>	

Ombiasa interviews (Season one and two)

Season one

Why did you become an ombiasa?

How did you learn the names and uses of plants?

If it was through an apprenticeship, who did you learn under? Were they related to you?

Do they live in this Fokontany? Where?

How many years did you study/apprentice?

What is an apprenticeship like? Who and how is it determined when you are finished apprenticing?

Do you have someone apprenticing with you? Are they related to you?

Does anyone else in your family heal?

How did you build up your clientele? Where is your clientele from?

Do you have a healing specialty?

How do you determine how a person is ill and how to treat them?

Who is your raza? How do they help you?

When would you tell someone to see another healer or a doctor?

How do you determine the cost of your treatment?

Season two

Do you ever worry that the plants are being used up too quickly?

Are there ever been plants that have been harvested back to nothing?

What % of the treatments that you use requires seeds, flowers, or roots?

Do you worry about people using your treatments incorrectly?

Do you feel that plants need to be conserved?

Do you think it would be effective to start a medicinal plant garden for yourself?

Are there different seasons when you use different plants, plant parts, or collect plants from different parts of the forest?

Of all the plants that you know of/use, which is the most valuable and what makes it so valuable?

Where is the plant located?

What can it be used for? Preparation involved?

Are most of the plants you use employed separately or with others?

Where do you get new information about plants? (Raza? Other healers?)

Where are most of the plants you use/prescribe found?

Do you ever acquire plants not from this region? What are they used for? How do you get them?