

Madagascar's Lemurs

EXPEDITION BRIEFING



Institute for the Conservation of Tropical Environments

Dear Earthwatch Volunteers,

Welcome to the *Madagascar's Lemurs* expedition! We are excited to have you join us in our long-term study of the Milne-Edwards' sifaka, the largest of the 12 lemur species found at Ranomafana National Park. This species is a long-legged leaper and arboreal acrobat. Since 1986, we have followed four groups of sifaka and we need your help to continue this project. You will follow these animals on their daily journey from dawn to dusk, sometimes over steep hills, in search of fruit trees and young leaves. The local people consider the sifaka to be rainforest royalty, and these lemurs look noble as they casually relax and move among the branches, while we struggle to keep up on the ground.

As a professor at Duke University and now at the Stony Brook University, I have involved many students and volunteers in studying the biology of the eastern rainforests of Madagascar. In studying lemurs, I am especially interested in their social interactions, female dominance, parasites, and reproductive biology, and these data will be included in the book that I am writing. Sifaka infants are born in June and we hope for infants in at least two of our groups this year. It is true that the large carnivore, the fossa, stalks our lemurs. This arboreal viverrid has retractable claws like a cat, and more than 40% of its diet may be lemurs. These cautious carnivores are rarely seen and do not harm humans, but attack lemurs in their sleep-trees in the dark of the moon. My graduate student, Summer Arrigo-Nelson, has just finished writing a paper on the strategies that the sifaka use to avoid this stealthy beast.

Madagascar's rainforest contains more than just lemurs. Orchids may be blooming, the waterfalls are beautiful, most of our bird species can be found nowhere else in the world, and chameleons and six species of mongoose-like viverrids can be glimpsed – if you look closely for them. Remember, the trails are steep and muddy and it does rain. It can be cold and drizzly like London, so bring a rainsuit, waterproof boots, and a sweater. The little rainforest leeches can be bothersome, but not dangerous, and doubling up on your socks may help keep their numbers down.

At the research station, Raymond is the head of the sifaka research team. Our research technicians speak English, can identify all of the plants that the sifaka eat, and look forward to each year's Earthwatch teams. It would be difficult to find a team of more friendly and charming guides. Field research can be exhausting. It is always a treat when the sifaka finally fall asleep in their sleep-tree and we arrive at the research station just before dark. Then, we can have a hot drink and shower, and discuss the day with the students and researchers living at the station over dinner. However, it won't always be hard work. At the end of the two weeks, we will have a party with all of the members of our team to celebrate our new friendships and live up to the Malagasy custom of dancing until dawn.

I hope you will enjoy your stay in Ranomafana. I look forward to meeting you in the rainforest.

Sincerely,

Dr. Patricia Wright

Principal Investigator

Director, Institute for the Conservation of Tropical Environments

Madagascar's Lemurs

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GENERAL INFORMATION

PRINCIPAL INVESTIGATOR: **Dr. Patricia Wright**

POSITIONS/TITLES: 1) Director
2) Professor

AFFILIATIONS: 1) Institute for the Conservation of Tropical
Environments
2) Department of Anthropology, Stony Brook
University

CO-PRINCIPAL INVESTIGATOR: **Summer Arrigo-Nelson**

POSITION/TITLE: Ph.D. Candidate

AFFILIATION: Interdisciplinary Doctoral Program in
Anthropological Sciences, Stony Brook
University

PROJECT TITLE: **Madagascar's Lemurs:** The behavior and ecology
of rainforest lemurs

RESEARCH SITE: Ranomafana National Park

TEAM LENGTH: 15 days

TEAM SIZE: Minimum: 6 Maximum: 14

MINIMUM AGE OF PARTICIPATION: 16 *See Section 9 '*Before You Leave*' for
important information.

THE EXPEDITION

1. PROJECT OVERVIEW

Ranomafana National Park (RNP) was inaugurated in 1991 and encompasses 43,000 ha² of rainforest, which varies in altitude from 800 - 1,300 m. There are 13 species of lemur found within the park; seven are diurnal (day-active) and five are nocturnal (night-active). Six of these species are listed as endangered or critically endangered by the IUCN. As these species represent an “ancient” primate lineage (an isolated group that persisted in Madagascar, while the rest of the world changed around them) they are extremely interesting scientifically. They exhibit behavioral patterns and respond to their environment in ways that are different from monkeys and apes, their “more modern” primate relatives. They are also a high conservation priority given the fact that they are restricted geographically to the south-eastern rainforest of Madagascar. Each year more and more of this unique forest habitat is cleared to expose fertile soil for the cultivation of agricultural products. To better understand these unique creatures, and develop management plans to ensure their future survival, the Institute for the Conservation of Tropical Environments (ICTE) facilitates the research of scientists and students from Madagascar and around the world.

The PI's longest running project is the study of the behavior, ecology, and demography of the Milne-Edwards' sifaka (*Propithecus edwardsi*), which began in 1986, before the park was even legally recognized. This study is the first long-term study of a Malagasy rainforest primate species and, at 20 years, is the longest running continuous project of its kind. Behavioral observations have been taken on more than 76 individuals from four groups over a 20-year time span. 46 individuals have been captured, marked with identification collars, and released. Individual groups range from 3-9 individuals, and these individuals are followed during all 12 months of the year. To date, this study has collected many data on the behavior and ecology of this species. This information includes: infant development (Tan and Wright, 1995), life-history data such as gestation length, age of first reproduction, lactation duration (Meyers and Wright, 1993; Wright, 1995, 1999), female dominance (Arrigo-Nelson *et al.*, 2000; Pochron *et al.*, 2003), frugivory and seed dispersal (Dew and Wright, 1998; Arrigo-Nelson and Wright, 2004), and predation (Wright and Martin, 1995; Wright, 1998; Wright *et al.*, 1997; Arrigo-Nelson, 2004).

The sifaka study also helps to increase the overall understanding of the park for two important reasons. First, as the largest primate within the park, the sifaka is at particularly high risk for local extinction in light of habitat disturbance (Cowlshaw and Dunbar, 2000) and therefore serves as a good indicator species for the overall primate community at Ranomafana. Second, as these sifaka are generalists - eating leaves, fruits, and seeds - differences in the quality of the forest in different areas of the park will be indicated by differences in their diet (Dew and Wright, 1998).

Since 1996, Earthwatch volunteers have participated in research that has suggested that the overall population size of this endangered species may be declining (Pochron *et al.*, 2004). This is disturbing information because all groups that are studied live entirely within RNP and should be protected from human disturbance (aside from tourists and scientists). Predation by the fossa (the largest carnivore in the park) appears to play an important role in population size, and it is possible that the disturbance of the park's borders has increased fossa density within the park (Arrigo-Nelson, 2004). The selective logging, which occurred in the late 1980s, may also be

having an effect. Studies of habitat disturbance have shown that there is often a lag-time between the actual disturbance and the response of the animal and plant communities to this disturbance (e.g., Plumptre and Reynolds, 1994). Finally, in 2004, genetic analyses have shown that *Propithecus edwardsi* is not a subspecies of *Propithecus diadema* as previously believed, but rather a separate species (Mayor *et al.*, 2004). This new classification, combined with new surveys within and outside the park, has caused the project to revise its numbers to estimate that there are less than 30,000 Milne-Edwards' sifaka left in the world (Dunham *et al.*, 2005). To help increase understanding of these demographic changes, this project continues to collect and analyze data on *Propithecus* behavior and forest ecology.

In January 2000, this project initiated in-depth analysis of the large database that has been accumulated. It is this analysis, and the new genetic data, that have revealed the trends and patterns above and many more that now shape the project's ongoing research on the Milne-Edwards' sifaka and have caused the project staff to initiate and/or continue studies of the other lemur species within the park. One new study in which Earthwatch volunteers can participate is the research on aging in lemurs. Lemurs are known to have very long life spans for their body size; up to 32 years in captivity for some species. At RNP alone, it is estimated that sifaka may survive in the wild for up to 27 years. In this study, project staff is documenting how aging lemurs perform in the rainforest. Juvenile, prime adult, and older lemurs are being compared to determine differences in diet choices, travel heights, and activity patterns on life span. As different lemur species display different biologies and life-history patterns, it is expected that aging proceeds differently within different species. Therefore, several lemur species are part of this study. Study subjects range from the smallest lemur species within the park, the mouse lemur (*Microcebus rufus*), to the largest species, the Milne Edwards' sifaka (*Propithecus edwardsi*).

2. RESEARCH AREA

Research will be conducted within the boundaries of RNP in southeast Madagascar. The park ranges in altitude from approximately 600-1500 m and the habitat changes, with altitude, from lowland to montane rainforest. The climate of the region is variable, both seasonally and interannually, with rainfall ranging between 2500-4000 mm a year and temperatures ranging from 3-30°C (Overdorff and Wright, 2002). The forest within RNP is classified as submontane rainforest and contains more tree stems (trunks) per hectare than found in Gabon (Africa) or in most plots in the South American forests (Gentry, 1993; Schatz and Malcomber, 1997). The most common plant family is Monimiaceae (an understory group). The plant families whose trunks occupy the most area of the forest floor in Ranomafana botanical plots are *Lauraceae*, *Myrtaceae*, *Elaeocarpaceae*, *Sterculiaceae*, *Cunoniaceae*, *Moraceae*, and *Sapotaceae* (Schatz and Malcomber, 1997). Large lianas (vines) are less common than in comparable tropical forests (Schatz and Malcomber, 1997). The study site consists of a trail system 8 km² located in disturbed primary forest traversed by swift flowing streams, called the Talatakely Trail System. The tree canopy ranges from 20-25 m in height with some gaps created by selective logging, which occurred between 1986 and 1989. The mountainous terrain is steep and can be slippery, with altitude within the trail system ranging from approximately 850-1500 m (2800 - 4900 ft) above sea level and rainfall varying from 2500-4000 mm (100-155 in) annually (Overdorff, 1993; Wright, 1992; Hemingway, 1995), with most of this rain falling from December to March. The highest ambient temperatures are also recorded during these months. Average annual temperature is 21°C (70°F) with low recordings from June to September, 4-12°C (39-54°F). June and July are usually cold with periods of rain lasting five days, followed by five days of sun.

RNP's research station is known as the Centre ValBio. The Centre ValBio is located at the edge of the Namarana River, overlooking the park. Inaugurated in June 2003, this brand-new facility consists of a state of the art kitchen, hot showers, a dining hall which seats 65, administrative and research office space, an outdoor classroom, and a laboratory/classroom. Volunteers will eat their meals, attend lectures, and spend their free time at this beautiful facility. The Centre ValBio is co-managed by a consortium of institutions including the ICTE at Stony Brook University, ANGAP (the Malagasy National Parks Service), and the Universities of Antananarivo and Fianarantsoa.

Currently, the center is a 10-minute walk from the main RNP entrance at Ambodiamontana. At the main park entrance there are vehicle parking facilities, a visitor center, and a village-managed campground with campsites, toilets, snack bar, and picnic tables. The visitor center sells entrance tickets and can advise tourists about guides, as well as provide brochures and information. RNP is under the administrative jurisdiction of ANGAP. The Malagasy rainforest is a beautiful place to work and visit. The forest is spectacular, with trails running along ridges, through valleys, and along hillsides, affording easy views of all parts of the forest from the ground to the canopy. Near the research station is a gorgeous waterfall. One of the researchers' favorite things to do is sit along the stream side just below the waterfall and look up at the lemurs that frequent the area in the trees overhanging the stream, and then look down at small brightly colored frogs on the rocks by the stream. Several lemur groups have territories that include the area of the research station, so lemurs, including the brown lemur, are frequently seen at meal times. The wonderful thing about the Malagasy rainforest is that it has no poisonous snakes, few poisonous plants, and no large carnivores. The only complaint is about the blood-sucking leeches that appear when it rains. But even these annoying beasts don't carry any diseases.

The town of Ranomafana (population 1,500) is 7 km (4.3 mi) from the Centre ValBio, on the eastern border of the park. Given the strong research and tourism presence in the region, the people of Ranomafana and the surrounding villages are accustomed to the presence of foreigners. Those who have gone to school speak French and many local people speak some English, as well. The Malagasy are a very welcoming people. Both men and women are welcome at ceremonies and foreigners are rarely excluded from any event. Although the Malagasy are welcoming to visitors, they can be very conservative in their social views and behavior. Public displays of affection are rarely witnessed and village dress tends to be conservative (women do not typically wear shorts, for example, and modest bathing suits are encouraged). At all times, volunteers must remember that they represent not only Earthwatch and their country of origin, but also the research team. Volunteers are encouraged to remain aware of their surroundings and follow (imitate) the behavior of the project staff in social situations. A discussion of proper field and village etiquette is included in the project's orientation and volunteers are welcome to ask questions of the project staff as they arise.

3. PROJECT STAFF

PRINCIPAL INVESTIGATOR

Dr. Patricia C. Wright: The PI is Dr. Patricia C. Wright, Professor of Anthropology at Stony Brook University and Director of the ICTE. After spending years as a social worker and self-described housewife, Dr. Wright began her research career by studying nocturnal owl monkeys in the Peruvian Amazon. She earned her Ph.D. at the City University of New York in 1985 and took a position at Duke University that eventually led her to Madagascar. Her rediscovery of *Hapalemur simus* and simultaneous discovery of *Hapalemur aureus* in 1986 in the region that is now RNP were the catalysts for the formation of the park and establishment of the Integrated Conservation and Development Project incorporating RNP, its peripheral zone, and surrounding villages. Her research since the discovery has focused primarily on behavior, ecology, and conservation of the 13 lemur species occurring in the park; in particular, the three *Hapalemur* species and *Propithecus*. She was awarded a five-year MacArthur Fellowship for her leadership role in this research and in conservation efforts for lemurs and their habitat and has been recognized twice by the president of Madagascar (including knighthood) for her contributions to conservation and education in Madagascar. Dr. Wright developed the Fall Semester Abroad in Madagascar program run annually by ICTE and Stony Brook University. She was a faculty member of Duke University prior to her appointment at SUNY/Stony Brook in 1991. Dr. Wright was one of seven scientists profiled in the feature-length documentary film *Me and Isaac Newton*, directed by Michael Apted (*Gorillas in the Mist*, *The World is Not Enough*). Dr. Wright is a member of the National Geographic Society's (NGS) Committee for Research and Exploration and the NGS Conservation Trust. Dr. Wright speaks fluent English and French, and will be in the field for a portion of each expedition.

CO-PRINCIPAL INVESTIGATOR

Summer Arrigo-Nelson: The Co-PI is Summer Arrigo-Nelson, a graduate student and doctoral candidate in Anthropological Sciences at Stony Brook University. Her research, which has been sponsored by the J. William Fulbright Foundation and the National Science Foundation, focuses on the behavior and ecology of Ranomafana's lemur species and the way that habitat disturbance affects these populations. Summer is also the Program Coordinator and Field Liaison at ICTE, where she serves as an interface between program staff in Madagascar and the ICTE office in Stony Brook. She also coordinates the institute's Earthwatch and Study Abroad programs and works with new researchers to develop and prepare their research programs and permit requests. She has been leading Earthwatch teams since 1999 and will manage expedition logistics and aid in training, guide fieldwork, and assist in the scientific interpretation of the data collected. Summer speaks English, French and Malagasy, and will meet each team at the rendezvous point and remain with the team throughout each expedition.

RESEARCH STATION DIRECTOR

Dr. Anna Feistner: The Centre International de Formation pour la Valorisation de la Biodiversité (International Training Centre for the Study of Biodiversity) or the Centre ValBio, will serve as the center point of life at RNP. The center's director, Dr. Anna Feistner, is an animal behaviorist who earned her Ph.D. from the University of Sterling in 1989. Dr. Feistner is fluent in English, French, Italian, and German, has worked in South America, Asia, and Africa and, before joining the ValBio staff, was the Research Coordinator for Durrell Wildlife Conservation Trust. Dr. Feistner and the Centre ValBio staff will be responsible for arranging transportation from the

rendezvous site, preparing tent sites on the edge of the park, and providing volunteers with meals and activities at the ValBio.

FIELD STAFF

A graduate student from the University of Antananarivo will assist with each expedition. These students are selected from the Departments of Animal Biology, Paleontology and Anthropology, and Resource Management and will serve as scientific and cultural advisors to the volunteers. Each student has worked with foreign researchers for at least three months and speaks fluent English. They will assist volunteers in the field with data collection and lead weekend trips to explore the town of Ranomafana.

Malagasy research technicians will guide volunteers during fieldwork and data collection. They speak English and French and have been trained as parataxonomists by Dr. Wright and other researchers. All have at least six years of experience studying lemurs and have helped lead past Earthwatch teams.

DAILY LIFE IN THE FIELD

4. TEAM ITINERARY

- Day 1: Meet in Antananarivo (volunteers must arrive in Antananarivo the day before Day 1 in order to be ready to leave for Ranomafana first thing in the morning). Drive to RNP. After arriving in the late afternoon, volunteers will sign into the National Park at the park entrance and set up tents. The rest of the evening will be spent settling in and getting oriented. The team will take a walk through the forest and discuss the history of the park and the Ranomafana region. Dinner will be served at the Research Station followed by an evening welcome, introduction to field staff, and orientation lecture on the research ahead.
- Days 2 - 14: Field work in RNP. After a few training sessions, the Earthwatch team will begin data collection. Although the exact research protocol will be set by the needs of the project at the time that the teams field, a typical expedition might involve pairs of volunteers being assigned an individual sifaka to follow from dawn to dusk for five consecutive days, to collect data on the animal's feeding and social interactions. Volunteers might also have the opportunity to collect fruit under the trees where the sifaka have eaten, mark food trees and record their position using Geographic Positioning System (GPS) technology, and help conduct botanical inventories. Volunteers might also learn how to use GPS technology to map the daily ranges of the animals.
- Day 15: Departure from research site. Depart for Antananarivo by car. Volunteers can continue their exploration of Madagascar from Ranomafana or return to Antananarivo for their flight home from here. Volunteers will arrive quite late and should plan to spend the night in Antananarivo and continue their travel the next day.

As data collection takes place Mondays-Fridays, the weekend is the time to explore the town of Ranomafana or the forest in more detail. Volunteers can visit the local natural history museum and natural hot-springs pool (each has a small entry fee, which is the responsibility of the volunteer), watch or play basketball and/or soccer, hang out at the local watering holes, or attend church services. The expedition will also include a visit to the reforestation project in town and ANGAP's conservation education center.

Volunteers should consult a travel guidebook for information on local attractions. See Section 15 '*Helpful Resources*'.

5. DAILY SCHEDULE AND TASKS

Volunteers should be aware that schedules can and do fluctuate. Weather and work conditions can affect the daily schedule. Should this situation arise, your cooperation and understanding are appreciated. Additionally, with multiple projects being carried out on a variety of species,

volunteers will normally have the opportunity to participate on more than one research project during their time in Ranomafana. Therefore, although this briefing will focus on describing the base-line behavioral and ecological data that is collected on the Milne-Edwards' sifaka, volunteers might also be asked to collect data on sifaka feeding rate or infant development, help to capture, monitor, and release mouse lemurs, habituate black-and-white ruffed lemurs, document brown lemur behavior, etc.

During days in the field, everyone gets up at dawn and has a continental breakfast at the research station. Then each sub-team sets off to find the sleeping animals. Lunch is on the trail, and is usually cheese sandwiches with chocolate for dessert. It must be eaten when the animals are napping, usually around noon. The animals go to sleep around 5:00 pm, but can stay active until dark, so volunteers must always bring a flashlight with them into the forest. Once back at the ValBio, everyone has supper together, reviews the day's data collection and discusses plans for the next day, and then usually goes to sleep soon after. Earthwatch volunteers have the choice of taking half-day shifts with the lemurs and spending the other half of the day on one of the other aspects of the project, such as data entry, or spending all day with the lemurs.

6. VOLUNTEER FIELD TRAINING AND ASSIGNMENTS

The Principal Investigator and/or Co-PI will give the team a more detailed on-site project briefing when you arrive, including specific details on what types of research are currently underway at the research station.

Volunteers will receive introductory lectures on:

- (1) History of RNP and the region
- (2) Conservation biology
- (3) Primate behavior and ecology
- (4) Field methods specific to this research

These discussions and lectures will be held at the Centre ValBio in the evenings after the day's field observations and over meals. Briefings will be provided each morning or the prior evening before heading into the forest for the day's observations.

Field methods will be explained during the first day at the research site. A tour of the trail system will end with an afternoon visit with sifaka Group I, when Earthwatch volunteers will have their first opportunity to practice taking behavioral data. Field notebooks will be reviewed by the PI regularly and corrections and/or improvements discussed with the volunteers.

Earthwatch volunteers will work closely with Dr. Patricia Wright (when she is in Madagascar), Summer Arrigo-Nelson and other graduate students, ValBio researchers, and experienced Malagasy research technicians who conduct field research in the park on a daily basis. Volunteers will participate fully in all field observations of lemurs, conduct botanical inventories and phenological monitoring, and prepare the fruit and fecal samples needed for analysis. Volunteers will begin their visit by learning the methodologies employed in each area of research. Then, although all volunteers will spend some portion of the day conducting behavioral observations, project staff will try to place volunteers within the work schedule according to their research interests.

Field methods to be employed include:

- Habitat description

- Locating position using Global Positioning System (GPS) technology
- Timed behavioral observations
- Marking of food trees
- Processing of fruits
- Collection and preparation of fecal samples for hormonal analysis

Special skills and experience of volunteers (especially veterinary, botanical, natural history, and observation skills) are helpful but not necessary. Please alert the PI and Co-PI if you think that you can contribute in a specific way.

7. ACCOMMODATIONS

The expedition team will live and work with students and researchers at the Centre ValBio research station, which is approximately a 10-minute walk from the entrance to the park. Presently, everyone sleeps in tents at a camp site that overlooks the research station from the mountain above.

Volunteers should bring their own tents, lightweight sleeping bags and sleeping pads. Given the chance of rain (read: 100% probability!), a waterproof ground cloth (the size of the bottom of the tent) and tarp (large enough to hang over the tent on each side) are also a necessity. No beds, bedding, or towels are provided. A pit latrine is located at the camp-site but flush toilets and hot-water showers can be found downhill, at the ValBio. Laundry can be hand-washed in the service sink at the back of the ValBio (please do not use the sinks in the bathrooms) and should be hung at the camp site to dry. Alternatively, laundry service is available on weekdays at the ValBio for approximately \$5 a load and typically takes 2-3 days.

The ValBio offers small lockers for the storage of plane tickets, passports, cameras, etc. Electricity is available 24-hours a day at the research station (not at the tents), although currency and plug converters are needed. The hydroelectric plant distributes electricity as a 220 volt current and all outlets accept plugs with two round prongs. Although rare, power surges and brownouts can occur, so all volunteers are warned not to plug electronics directly into the wall. Surge protectors are available, just ask the Co-PI. Please note that the ValBio and PI can not be responsible for personal items. In addition to power surges, rain and humidity can easily damage electronic equipment.

8. FOOD

Food will be prepared by the cooking staff at the Centre ValBio. The head chefs have received formal cooking training and prepare hearty meals with a combination of Malagasy, French, and American flare. Volunteers will not have any responsibility for preparation or clean-up, but hearty appetites are encouraged. The energy will be needed on the trails! It should be emphasized that rice is the national staple food of Madagascar and will be the mainstay of nearly every meal.

Here is a sampling of the foods you might expect in the field. Please bear in mind that variety depends on local availability, which can vary greatly. This list is intended to provide a general idea of food types. It is very important that volunteers be flexible.

Breakfast: Bread and jam, with coffee and tea

Lunch/Dinner: A typical lunch (when in-camp) or dinner at the research station is rice and beans, steamed vegetables, omelet, fresh fruit--hearty but basic. Meat or cheese will supplement the meal from time to time. Lunch on the trail, during observations, will consist of sandwiches, chocolate, and biscuits/cookies.

Snacks/Other: Personal snack food, yogurt and fruit supplies can be carried from home or purchased at shops in the village of Ranomafana and will earn you lots of friends.

Beverages: Beer, wine, and soft drinks are available at these shops as well. Please be aware that beverages are typically sold in glass bottles and it is the responsibility of the buyer to return these bottles to the same store where purchased within 24 hours. (In Madagascar, vendors are charged a steep tax by their distributors if they lose the glass bottles.) The local vendors extend us the courtesy of taking the bottles away and we do not want to damage this relationship through carelessness.

Water: Treated drinking water is available at all times in the Centre ValBio's dining hall. This is the only water that should be used for drinking, brushing your teeth, rinsing your toothbrush, etc. Water from the taps and showers is NOT potable.

In Malagasy culture, sharing food is very important. Following in this tradition, all dinners and breakfasts will be served communally at the Centre ValBio. At these meals, stories are shared into the evening, and volunteers will be able to socialize with Malagasy research assistants, students, and visiting scientists. May-December is a very lively season, due to the convergence of many researchers, most of whom have much to discuss. In addition to recounting the adventures of the day, evenings will be an opportunity for informal lectures from these visiting students and scholars. There will be a dancing party at the end of the stay in the forest, and the team will prepare a combination of special Malagasy and Western foods for the occasion. The Malagasy tradition is to dance until dawn.

Special Dietary Requirements

Some special diets can be accommodated (vegetarian visitors are common), within limits, however, accommodating any special diets is not guaranteed and can be very difficult due to availability of local foods. Please alert your Earthwatch Expedition Coordinator to any special dietary requirements as soon as possible (e.g., vegetarian, diabetic, lactose intolerant, etc.).

Special note to vegans and strict vegetarians: Although not impossible, maintaining a vegan diet can be difficult. If the ingestion of any animal products is prohibited, we recommend that you carry with you a ready stash of backup foods (power bars, dried and dehydrated foods, etc.) for those times when acceptable foods are not available.

TRAVEL PLANNING

9. BEFORE YOU LEAVE

Passport Information

All volunteers traveling from outside the host country will require a passport, valid for at least six months beyond the dates of travel. For a listing of useful websites for passport requirements see Section 15 'Helpful Resources'.

Visa Information

All foreign visitors are required to purchase tourist visas for entry into Madagascar. A useful website for visa requirements is <http://www.embassyworld.com>, or you can visit Madagascar's embassy page directly at <http://www.embassy.org/madagascar/>.

A three month tourist visa can be purchased upon arrival at the Ivato International Airport in Antananarivo. They cost approximately US\$35 and are payable in US\$ or Euros. However, from time to time, these visas are not available and volunteers may feel more comfortable obtaining their visas before departing for the expedition.

Within the US, visas can be obtained through the Malagasy Embassy in Washington, DC (tel: +1 202 265-5525). Volunteers can contact the embassy directly for an application form or visit <http://www.visatogoabroad.com>. Volunteers will need to send the form, the application fee (approximately US\$35), a passport photo, and the passport to one of these offices for approval. Visas take approximately two weeks to process, plus mailing time.

Essential Information for Volunteers Requiring Visas

Type of Visa	You must get a TOURIST VISA .
Where to Get a Visa	Contact the nearest embassy or consulate of the country to which you are traveling to find out how to apply for your visa. Please note that this process can take weeks or more. For a list of Madagascar consulates, visit http://www.madagascar-consulate.org/embassies-world.html If you have less than 6 weeks or wish to save yourself trouble, we strongly recommend using a visa agency , which can both expedite and simplify the process. See below for a list of visa agencies.
Required Information	You will need to send your passport (valid for at least 6 months beyond your stay), a Visa Application and Immigration Form , 2 to 4 passport-size photos plus payment to the embassy or visa agency (if applicable). Please be sure that your passport is valid for at least 6 months beyond your stay.
Cost of a Visa	If obtained from the Malagasy Embassy in Washington DC, visas cost \$35.

	A visa agency will charge an additional fee (depending on the amount of time it takes to process the application), which you can inquire about directly.
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Reminder: The purpose of your visit is tourism. Foreign immigration officials do not always understand the concept of a “working vacation” or even “volunteering.” Words such as “working/volunteering,” “research” or a “scientific expedition” can raise questions concerning the country’s foreign labor laws and/or prompt questions about official scientific research permits and credentials, etc. to which volunteers on their own will not be equipped to respond. All required research permits for the project are in place and have been approved by the proper authorities.

Visa Agencies

IN THE UNITED STATES

PassportVisaExpress.com
1911 North Fort Myer Drive, Suite 503
Arlington, VA 22209
Tel: +1 888 596-6028, +1 703 351-0992
Fax: +1 703 351-0995
Email: info@passportvisaexpress.com
Website: <http://www.passportvisaexpress.com/>

US volunteers may also contact the embassy directly at:

Embassy of Madagascar
2374 Massachusetts Avenue, N.W.
Washington, DC 20008
USA
Tel: +1 202 265-5525
Fax: +1 202 483-7603

IN EUROPE

The Visaservice
Tel: +44 (0) 8708 900 185
Fax: +44 (0) 20 7278 8464
Website: <http://www.visaservice.co.uk>

Thames Consular Services Ltd
Tel: +44 (0)20 8995 2492
Fax: +44 (0)20 8742 1285
Website: <http://www.visapassport.com>

UK volunteers may also contact the embassy directly at:

The Malagasy Consulate
16 Lanark Mansions
Pennard Rd.

London W12 8DT
UK

IN AUSTRALIA

Ask your travel agency if they can send your visa application on your behalf.

Volunteers Under 18 Years of Age

Note: The project staff for the *Madagascar's Lemurs* expedition strongly prefers volunteers under the age of 18 to be accompanied by an adult. It is also requested that volunteers under 18 speak personally with Co-PI Summer Arrigo-Nelson prior to the expedition, which your Earthwatch Expedition Coordinator can arrange.

Entry to Foreign Countries

In an effort to prevent international child abduction many governments have initiated procedures at entry/exit points. Many countries require all persons under the age of 18 to have a notarized letter from all legal guardians stipulating that the person under 18 can travel unaccompanied or in the presence of only one guardian. This letter must give an explanation for why only one parent or someone other than a parent is signing the letter. For example, if one parent is deceased, only one parent has legal guardianship, or someone other than the parents are legal guardians, the letter should state that.

In addition, airlines may also have documentation requirements for unaccompanied minors. Parents of minors are responsible for checking with each airline that their child will be flying to ensure that sufficient documentation is provided. This could include a copy of a birth certificate or a notarized letter stating that the minor has his or her parent's permission to travel alone.

Note: Requirements by specific countries and airlines vary and change frequently. You **MUST** keep informed of the requirements on your own to avoid problems at immigration. If a letter is not available, the volunteer under 18 can be refused entry into the country - there is nothing Earthwatch Institute can do to help in this circumstance.

Cancellation Insurance

We highly recommend trip cancellation insurance, which will help cover your airfare if you are unable to travel. Earthwatch does not reimburse airfare or costs associated with cancelled flights. Check with your travel agent to find out how to obtain trip cancellation insurance.

Earthwatch Europe volunteers can purchase Additional Cancellation Cover for £10 as a supplement to the main premium that covers non-refundable travel expenses should your team be cancelled.

International Evacuation Insurance

The travel medical and evacuation insurance, coordinated by ISIS Assistance, is mandatory for all Earthwatch volunteers while on an Earthwatch expedition anywhere in the world. The insurance covers volunteer travel medical risk, including medical expenses and medical evacuation, while traveling with Earthwatch overseas or on an expedition within your home country. ISIS Assistance will also facilitate evacuation from the project site in the event of an emergency. Without insurance, the costs of such measures can be on the order of US\$20,000 to \$50,000.

A detailed description of the Earthwatch Volunteer Travel Medical Insurance Program policy will be sent with this briefing. *Please note that policies are specific to each Earthwatch office.

Earthwatch Institute's insurance provider, ISIS Assistance, provides a 24-hour emergency hotline for the use of insured persons under the Earthwatch program. ISIS Assistance can help with medical emergencies, doctor and hospital selection, obtaining additional medical options, or medical translation problems. ISIS Assistance is backed by International SOS and Global Medical Management, who provide emergency medical evacuation and rescue services. The Earthwatch policy certificate number is US 0113. In addition, each individual policy is identified by the volunteer's Earthwatch ID number, shown above your name on your team list.

In an emergency - If you are calling from **outside of the US**, the number to call is: +44 (20) 8762 8015. You may call this number collect/reverse charges.

In an emergency - If you are calling from **inside the US**, the toll-free number to call is: +1 888 422-4747.

Basic coverage is valid in the country of your Earthwatch expedition, and during international travel to and from your expedition. If the expedition takes place in your home country, coverage begins when your group forms for the expedition and ends when the group disbands, and is incremental to your existing health insurance. Options are available for volunteers who would like to extend the period of coverage, increase insurance amounts or purchase additional cancellation or baggage insurance.

Travel Agencies

Contact your local travel agent or use the web to find the lowest rates to make your travel arrangements. A list of suggested travel agents can be found in Section 15 'Helpful Resources.' Be sure to give your rendezvous details to your travel agent as soon as possible so they can plan your trip accordingly.

The following agency is familiar with Earthwatch projects and can assist you in making travel arrangements and booking hotels:

Martha. Aspromatis@austintravel.com
1 (800) 645-7466 ext. 3170
Austin Travel
Stony Brook University Campus
Library Plaza
Stony Brook, NY 11794
Website: <http://www.austintravel.com>

Other Advice / Information

- *Local Currency:* Ariary
- *Language:* Malagasy, although many people can also speak some French
- *International Dialing Code:* 261 (country code)
- *Electricity:* 220V, 50 Hz; 2-prong round pin attachment plug
- *Time Zone:* GMT+3
- *Personal Funds:* US Dollars, Euros, and British Pounds are all accepted in Madagascar. The Socimad kiosk in the Ivato airport in Antananarivo usually offers the best exchange rate in the country and gives the least problems in making exchanges. Therefore, it is suggested that you change your money with Sociomad in the airport, upon your arrival. Traveler's checks

are currently not accepted in Madagascar without a certified letter from your bank documenting your identity and the number of traveler's checks that you have purchased. Even then, volunteers have found it a hassle to use them. There are very few ATMs in Madagascar and cash advances on credit cards can take up to eight hours to process. Volunteers will need Ariary to pay for snacks, beer, the town pool, and souvenirs. Conservative spenders and those on a budget should plan to bring about US\$150. For those who like to shop, US\$200-\$300 should suffice. Please don't forget that you will need to pay for your ground transport, \$75 to \$125 each way in cash, either US dollars, pound sterling, Euros or Ariary. (Final price of transport depends on number of people being transported. Each vehicle seats 4-5 individuals). Credit cards will be of little use in Madagascar outside of the large hotels.

- *Additional Information:* Going through Customs can take a long time. There is no baggage storage at Ivato Airport in Antananarivo. Be cautious when visiting the colorful markets in the capital, as pickpockets can spot a tourist from quite a distance. The National Zoo and Botanical Garden (Parc Tsimbazaza), the newly reopened Queen's Palace (the Rova) and The Museum of Art and Archaeology are worth visiting in the capital.

10. HEALTH INFORMATION

Malaria

Chloroquine resistant malaria is present throughout Madagascar and malaria is frequently contracted in cities and towns. Volunteers are encouraged to discuss malaria prophylaxis with their doctors. Malarone, a relatively new drug, is the most often taken and best tolerated drug among researchers at ValBio. Although Doxycycline is also often used in Ranomafana, Malarone appears to give people better protection when traveling to other areas of the country as well. Although it works well for some people, many people report sleeplessness, night terrors, and/or hallucinations while taking Larium and it is therefore not recommended by the researchers. Thankfully, due to the park's high altitude, malaria infections are rare among researchers at the ValBio.

Routine Immunizations

All volunteers should make sure they have the following, up-to-date, immunizations required by your home country: DPT (diphtheria, pertussis, tetanus), polio, MMR (measles, mumps and rubella), and varicella (if you have not already had chicken pox).

Other standard immunizations common in some countries may also include: HIB (haemophilus influenza), pneumococcal, meningococcal, influenza, and hepatitis A and B.

Project Inoculations

The following are recommendations only. Health conditions around the world are constantly changing, so keep informed and consult your local travel health clinic, the US Center for Disease Control (www.cdc.gov) or the World Health Organization (www.who.int) websites. Medical decisions are the responsibility of each volunteer. Please consult your physician, your local Public Health Department, or the resources in Section 15 '*Helpful Resources*' for the latest health information for travelers.

	Required for Entry	Recommended for Health Reasons
Typhoid		X
Yellow Fever	X - If traveling from countries or region where it is endemic, a Certificate of Vaccination is required.	X
Hepatitis A		X
Hepatitis B		X
Meningitis		X
Japanese Encephalitis		
Rabies		There is an extremely low risk of being exposed to rabies, however as animal handling may occur on some teams, volunteers may want to consider the pros and cons
Influenza		X**

*Cholera may be present in the research area. In 1973 the WHO, recognizing that immunization cannot stop the spread of cholera among countries, deleted from the International Health Regulations the requirement of cholera immunization as a condition of admission to any country. In 1990 the WHO stated that immunization against cholera was not effective and they do not recommend it. In 1991 the WHO confirmed that certification was no longer required by any country or territory. Given the low incidence of cholera in the research area, and the lack of efficacy, cholera vaccination is not recommended.

**The CDC recommends that travelers to Madagascar (especially those at risk for complications, such as pregnant women or persons over age 65) seek advice from their medical providers regarding influenza immunization because of an influenza outbreak which occurred in the Fianarantsoa Province in 2002. However, the strains of flu in Madagascar are likely different from the vaccinations available in the volunteers' home countries. Please discuss the options with your physician or travel clinic.

Tuberculosis (TB): The World Health Organization (WHO) estimates that one third of the world's population is infected with the bacterium (*M.tuberculosis*) that causes tuberculosis (TB). Incidence of tuberculosis is higher in developing countries, particularly in Asia, Africa, the Caribbean and Latin America. In general, approximately 10% of persons infected with *M. tuberculosis* are at risk for developing active TB during their lifetimes. TB is considered highly treatable with medications that are of relatively low toxicity and cost. Volunteers returning from developing countries are encouraged to have a (PPD)-tuberculin skin-test to screen for potential infection.

These recommendations are for this project site only. Please consult your physician for guidance on inoculations if you intend to travel to other parts of the country. Inoculation requirements and suggestions are subject to change. Be sure to consult a public health organization prior to travel to ensure that you have the most current inoculation information. Please see Section 15 'Helpful Resources' for a listing of recommended health resources.

11. WHAT TO BRING

PLEASE BRING THIS EXPEDITION BRIEFING WITH YOU!

General Considerations

Do not bring more luggage than you can carry and handle on your own. We recommend that you pack a carry-on bag with an extra set of field clothing, your raingear, and personal essentials (i.e., medications) in the event that your luggage is lost and/or takes several days to catch up with you. Please consult your airline for information regarding luggage weight and bag number/size restrictions.

More expensive doesn't always mean better! Most items for this project may be purchased from discount stores such as Campmor (www.campmor.com), Sierra Traders (www.sierratradere.com), and the REI outlet at www.rei.com. And don't forget Salvation Army thrift stores for your field clothes! Please don't bring camouflage clothes as they are viewed with suspicion by the police.

The items listed below are only suggestions. Try to think about everything you touch on an average day and decide if you will need it in the forest! Keep in mind that you will only be in the field for two weeks and there are probably a lot of comforts that you can do without during this time.

Every sunny day is a laundry day! However, it is good to plan to have enough clothing to get through two weeks without doing laundry (for example, when we are on our trip). As far as clothes go (excluding underwear), I would suggest that you bring three of everything: one wet/dirty, one clean/dry, and one to put on. Plan on wearing the same clothes for multiple days.

Lightweight trousers and long-sleeved shirts are best for working. You can layer these with long underwear and t-shirts to keep yourself warm in the cool season (Teams III and IV) and cool in the warm season (Teams I and II). This also allows for effective temperature regulation according to activity level and time of day (it is often cool in the mornings when the team sets off from camp but then warms up throughout the day). Stay away from 100% cotton clothing. Synthetics and blends dry quicker and are better for your skin. If you will be on Teams III or IV, you should also bring a warm sweater, and consider bringing a lightweight hat and gloves (the fingerless ones are great for writing).

Don't bring anything you are afraid of losing or ruining. Mold can stain your clothes, you could drop your camera on a rock, etc. Family heirlooms and items of sentimental value are better left at home or kept in a plastic sealable bag! The moisture of the rainforest will quickly ruin your electrical equipment and you are always taking a risk by bringing it to Ranomafana. Bring "dry bags" or large Ziploc (plastic resealable) bags and silica crystals to keep your computers, cameras, and CD players safe.

Any health problems that affect you at home will probably follow you to Madagascar. Make sure to bring a sufficient quantity of any prescription medicine, as it may be very hard to find what you need here.

Talk to your doctor about malaria prophylaxis and other medications, but also take the initiative and check around on-line yourself. You should be aware of the side effects and any drug interactions possible before you make a choice about what medicines are right for you.

Please make sure that your toiletries are environmentally friendly.

Travel Materials - Essential

- Your Expedition Briefing (required!)
- Airline Tickets
- Credit card (for emergencies only)
- Immunization record
- Insurance documents
- Money belt
- Passport
- Photocopies of documents placed in luggage: passport, credit card, birth certificate and social security card, etc.
- Money: any cokes, beer, fancy desserts, extra trips to town, etc. need to be paid for out-of-pocket. Some extra money is also good for gifts, souvenirs and mail. It's a great place to get your holiday shopping done. We have recently had some problems getting traveler's checks cashed, so make sure that you bring at least half of your money in cash.

Camping Supplies

- Framed backpack (large) and/or duffel bags for packing
- Headlamp/large flashlight/torch: headlamps are sometimes preferred because they leave hands free for balance!
- Extra bulbs and batteries (for flashlight/torch)
- Water bottles (at least 2): hard Nalgene bottles are good because they can handle boiling water and are indestructible. Wide mouth bottles are easier to clean.
- Tent: 2-4 person, three season. Coleman (or similar) have floors made of tarp material and keep you the driest...plus, they are cheap!
- Tarps: bring a large one (several feet larger than your tent) for over your tent and a small one (the same size as the tent) for under it (or a groundcloth)
- Tent broom and pan (optional)
- Thermarest pad or similar: keeps you off of the cold, hard ground
- Sleeping bag-rated down to 20°F if you are on Teams III or IV
- Pillow and pillow cases: optional, but very highly recommended! Consider one of the inflatable ones from Campmor.
- Alarm clock (battery operated): watch alarms don't work for everyone
- Laundry bag (optional)
- Permanent "Sharpie" markers: good for labeling your stuff and you might need them for the project
- Rope/twine: to make a clothesline, for tying up your tarp, securing your bags, etc.
- Garbage bags: pack everything in them (inside your duffel bags and backpacks) for your trip to Madagascar, because your bags will probably get wet on the way to Ranomafana
- Plastic resealable (Ziploc) bags: all sized and shapes, they will keep your stuff clean and dry
- Calculator: optional, but good for shopping in the markets
- Clothespins (optional)
- Small padlocks: combination locks are good for locking your bags and your tent
- Umbrella: useful, believe it or not

Clothing/Footwear

- Rain suit: breathable waterproof materials such as GoreTex, OmniTech, etc. are good (because you won't sweat as much). However, if the material is "breathable" it also isn't 100% waterproof...no matter what they tell you in the store! Alternatively, Campmor has 100% waterproof rubber rain suits for about \$25. They are hot, but cheap!
- Hiking boots: should be GoreTex (or equivalent) lined, mid-ankle or higher for best support
- Rain boots: useful, but heavy and not necessary. If you don't bring them, consider buying gaiters to use with your hiking boots.
- Field trousers: lightweight work trousers, mesh pockets are not advised
- Field shirts: long sleeves recommended, old men's dress shirts work great
- T-shirts
- Sweater/sweatshirt - you will need one warm "jacket", fleece works great
- Village trousers: something a step up from "field grunge" for our trips to town
- Village shirt: see above
- Wool hiking socks: a tight-knit hiking sock is necessary, the leeches don't seem to like wool
- Sock liners: polypropylene liners help to keep the leeches off
- Underwear
- Sports bras: they don't really dry well, so look for lightweight ones
- Belt
- Handkerchiefs/Bandannas
- Sandals and/or sneakers (you don't want to wear your hiking boots around the ValBio or to play soccer!)
- Flip-Flops: if you want something to protect your feet while showering and going to the bathroom at night
- Baseball hat or hat with wide brim: good to keep the sun and rain out of your eyes
- Bathing suit: consider something more (rather than less) conservative
- Facecloth/flannel and towel

First Aid

There is a First Aid kit onsite, however, you should bring additional items for personal use, particularly if you might use some regularly, or would like to have supplies on hand. A personal first aid kit is also recommended if you are traveling before or after the project.

*Note from Summer: These are suggestions based on my personal experience. Please ask your doctor for further information and suggestions!

- Ace bandage/brace: if you tend to have a particular joint problem (knees, ankles, etc.)
- Advil
- Alcohol pads: good for cleaning out scratches
- Allergy medication: if you are prone to allergies
- Antibiotics: a broad-spectrum medicine is recommended in the event of infected wounds, stomach ailments, tonsillitis, etc.
- Athlete's foot cream/powder: a must
- Band-aids: several sizes suggested
- Benadryl: for allergic reactions

- Anti-itch lotion such as Calahist
- Cold medicine: the change of climate and air travel can lead to cold symptoms
- Cough syrup
- Gatorade: or rehydration salts, for bad diarrhea episodes
- Hydrocortisone cream
- Anti-diarrheal medication such Imodium AD or similar, to halt diarrhea while traveling...this is a quick fix, but NOT a treatment!
- Malaria prophylaxis: Malarone (or equivalent, talk to your doctor about the options and side effects of each)
- Mole skin: for blisters
- Multivitamins
- Neosporin: to prevent infections/help heal infected cuts
- Pepto Bismol or similar, which helps with upset stomachs/indigestion
- Cotton swabs
- Rubber gloves
- Yeast infection treatment
- Any other medications (over-the-counter or prescription) that you might need for personal conditions

Toiletries

Again, these are suggestions. Please make sure that your soaps and shampoos are biodegradable (i.e. Dr. Bronners, most Herbal Essences, etc.)

- Conditioner
- Condoms/birth control
- Contacts and solutions: bring a back-up pair of glasses, too
- Dental floss
- Eyeglass backup, if you wear contacts
- Anti-itch "Gold Bond-type" powder
- Hairbrush
- Handi-wipes, baby wipes, hand sanitizer, etc.
- Insect spray: personally, I never use it in Ranomafana!
- Kleenex
- Lip balm
- Lotion
- Mirror
- Nail clippers
- Razors
- Sewing kit
- Shampoo
- Small scissors
- Soap: I like Dr. Bronner's (it is strong and biodegradable)
- Sunscreen: if you are the type of person who likes to tan, bring two lotions - one with a low and one with a high SPF number
- Tampons/Sanitary Napkins

- Toothbrush
- Toothpaste
- Tweezers

Workday Supplies

- Binoculars (optional but recommended!)
- Compass
- Hand lens (optional)
- Knife/Leatherman: don't forget to pack it in your checked luggage!
- Small day pack
- Small flashlight/torch
- Water bottle
- Waterproof wristwatch - Timex Ironman or other with repeating 5-minute timers, are suggested

Extras

- Address book
- Batteries: bring rechargables and some alkalines as backup
- Books: we have a large library, but a new book or two will always be welcomed
- Camera and flash
- Blank CDs (bring a couple for sharing music and photos!)
- Earplugs: for light sleepers who might have a snorer in the next tent!
- Film and lead-lined film bag: the x-ray machines may ruin your photos
- Hair ties/elastics
- Language or phrase book: English/Malagasy and/or English/French
- Playing cards or small game
- Silica Gel for your electronics
- Small notebook/journal
- Stationary and envelopes
- Sunglasses
- Madagascar travel guide
- Walkman, CDs, speakers, etc.

Food Suggestions

Soda, cookies, and chocolate are available in Ranomafana, however, bring a few of your favorites, for those times when you feel like a bit of home!

- Chocolate, powdered flavored drink mixes, hard candies, etc.
- Herbs and spices: good to add variety to your rice
- Oatmeal
- Popcorn: great for when we watch movies
- Protein bars

Cultural Considerations

Local dress is fairly relaxed, but on the conservative side. In town, a nice blouse or shirt and trousers are appropriate attire. At the field site, remember the local customs are conservative.

Please don't dress in a manner that could be viewed as provocative, as it reflects poorly on the research team. If you have questions regarding protocol, ask one of the project staff. The team is a guest of the country and as such is obligated to conduct the research in harmony with the culture of the local people and with a minimum of disturbance to their daily routine.

Weather Considerations

Please take into consideration the weather conditions during your team when packing for your expedition. Climate information can be found in Section 13 '*Project Conditions*'.

As it is located in the mountains, Ranomafana is often colder than visitors expect. For Teams III and IV, the months of May-September are cool and it can be cold (especially at night when temperatures dip as low as 40°F/4°C) with frequent rain throughout the day. Volunteers are advised to bring at least two sets of work clothes so that one can be worn while the other is drying, and a warm outfit for wear at night. For Teams I and II, the rainy season lasts from December-March with rain clouds building to storms in the afternoons and there are warmer temperatures (up to 88°F/31°C in the forest) during the day. All volunteers are advised to bring waterproof hiking boots and rain suits.

12. THE READING LIST

The following books are recommended reading for those interested in preparing for the trip. They can be found in libraries, bookstores, and on-line.

Information on Traveling in the Tropics

Health Hints for the Tropics. For a copy, write to Karl A. Western, MD, editor, Tropical Medicine and Hygiene News. 6436 31st Street, Washington, D.C. 20015-2342. Single copies are approximately US\$4 each.

Madagascar Travel Information

Guide to Madagascar, 8th Edition. Hilary Bradt (2005, Globe Pequot Press, Old Saybrook, CT). An excellent introduction to the country, its culture, and its resources.

Lonely Planet Travel Guide: *Madagascar & Comoros, 5th Edition*. Gemma Pitcher and Patricia C. Wright (2004, Lonely Planet Publications).

Information on Malagasy Culture

Over the Lip of the World: Among the Storytellers of Madagascar. Colleen J. McElroy (1999, University of Washington Press)

Background Information on Madagascar's Biodiversity

Lemurs of Madagascar by Russell Mittermeier, Ian Tattersall, William Konstant, David Meyers, and Roderic Mast (1994, Conservation International, Washington, DC). The most comprehensive overview of the 50 species and subspecies of primates inhabiting Madagascar, including their distribution and conservation status.

Mammals of Madagascar by Nick Garbutt (1999, Yale University Press, New Haven).
Comprehensive with beautiful photography.

Madagascar Wildlife, 2nd Edition. Nick Garbutt and Hilary Bradt (2001, Bradt Travel Guides).

Birds of the Indian Ocean Islands by Olivier Langrand (1998, Yale University Press, New Haven).

Birds of Madagascar: A Photographic Guide by Peter Morris and Frank Hawkins (1998, Yale University Press, New Haven).

Stories of the Researchers who Work in Madagascar

The Aye Aye and I; A Rescue Mission in Madagascar by Gerald Durrell (1992, Arcade Publishing, New York) An enjoyable, easy to read book.

The Eighth Continent by Peter Tyson (2000, Perennial Press, HarperCollins books, New York).

For the Wild Places; Profiles in Conservation by Janet Trowbridge Bohlen 1993, Island Press, Washington, DC. Profiles the lives and work a handful of leaders in conservation, including Patricia Wright.

Lords and Lemurs: Mad Scientists, Kings with Spears, and the Survival of Diversity in Madagascar. Alison Jolly (2004, Houghton Mifflin).

Quammen, D. (1997) *The Song of the Dodo: Island Biogeography in an Age of Extinctions.* New York, Schribner.

Movies:

Madagascar – 2005, Dreamworks SKG

In the Wild: Operation Lemur with John Cleese – 1999, PBS

Living Edens: Madagascar, a world apart – 2000, PBS

13. PROJECT CONDITIONS

Please show this section to your physician when he/she is completing your health statement. Be sure to discuss inoculation requirements with your physician well in advance of your departure date. See Section 10 'Health Information' for inoculation information.

To the examining physician:

Your patient has volunteered to join a field research team which has specific physical demands of which you and your patient should be aware. **We need your accurate evaluation of your patient's ability to meet the conditions detailed below in order to safeguard his/her health and safety, and ensure that s/he can participate fully and effectively.**

The physical demands of field tracking and observation are great and are very challenging to many people. Volunteers are expected to be able to follow fast moving animals up and down steep wet mountain slopes, often off the trail, at roughly 3000 ft above sea level. Volunteers must be in good physical condition and possess stamina, tolerance, patience, and the ability to

maintain good humor under these difficult conditions. Rain may persist for days, and evenings can be cool. Being in good physical condition before departing home is recommended and volunteers engaged in hiking, cycling, stair climbing, and running will feel the physical demands of the trails less than their less active counterparts.

Health concerns include: intestinal parasites (giardia), malaria, typhoid fever, and hepatitis. Malaria is not prevalent in the forest since there are not many people, but it is common in the towns and malaria prophylaxis are very highly recommended. Prophylaxis should be started before arrival and continued upon your return, as recommended by your physician (don't wait for the last minute to get your prescription). Although the project cannot demand that volunteers use any particular prophylaxis, most of the researchers who visit the site use Malarone/Savarine with few or no side effects. Lariam/Mefloquine is often suggested by doctors, however many researchers at RNP have experienced serious problems, such as mood alteration, auditory and aural hallucinations, nightmares, and sleeplessness while taking this medication.

Certain vaccinations are recommended by the World Health Organization (WHO) website (www.who.int) and the US Center for Disease Control (CDC) website (www.cdc.gov/travel/index.htm). All volunteers should talk to their doctors about these recommendations before departure. The Centre ValBio has a well-supplied first-aid kit, but cannot deal with emergencies on site. Although there is a small hospital in Ranomafana, the nearest large hospital is a two hour drive from the park.

The information provided below is as accurate as possible, but please keep in mind that conditions may change once in the field and the project could potentially be more or less strenuous than the chart indicates.

	Workload/Intensity	Time (hours per day)/#of days per team
Sitting	Of short duration, when the lemurs rest	2 hrs per working day
Bending	Little	
Hiking	Often high intensity, up and down mountains	4-6 hrs per working day
Walking	Often high intensity, up and down mountains	2 hrs 10 working days; up to 4 hrs on 2 of those days
Carrying	Little	
Climbing	Little, but can occur on the steeper slopes	**

**Volunteers will be tracking both groups and individual sifaka, oftentimes from dawn to dusk over very steep and slippery terrain. The intensity of these activities may be great. The amount of time spent on the above activities will depend on the activities of the study group (or individual).

Medical Conditions of Special Concern

The demands of tracking and observation on steep wet slopes (altitudes of 3,000-4,500 ft above sea level) are challenging to most individuals. Stamina, tolerance, physical fitness, and patience are required. The weather can be rainy and cold for days at a time, especially in June and July. Volunteers should be in good physical and mental health and should not have any serious medical conditions which may require immediate medical attention (e.g., heart condition, kidney problems, etc.) given the remote location of the project. Any back, knee, foot, or hip problems would make participation in this project difficult. Volunteers should also have a good balance,

vision, and a tolerance for heat and humidity. Volunteers with breathing problems are strongly encouraged to bring inhalers or other treatment medications.

Potential Hazards

Diseases possibly occurring in Madagascar include: cholera, occasional influenza outbreaks, malaria, plague, schistosomiasis, brucellosis, filariasis, typhoid fever, hepatitis, dengue fever, tuberculosis, HIV/AIDS and giardia. Most diseases can be prevented with basic precautions. There are no venomous snakes in Madagascar. There are blood-sucking leeches, but they do not pose a health threat and carry no diseases.

Road conditions in Madagascar are generally considered poor to fair. If renting a car, a driver is provided. Road hazards include lack of vehicle safety equipment, poor lighting, poor road conditions and maintenance, fast and reckless drivers, and lack of signs. Traffic moves on the right side of the road.

Hiking hazards may include: unstable hiking surfaces; unprotected overhangs; distance/time to full medical attention; risk of sprains/strains/breaks due to falling or missteps; risk of exposure to water borne diseases (if you consume untreated water, but bottled water is readily available for purchase and treated water is available at the Centre ValBio), exposure to dangerous/territorial animals (not a threat in the forest, but please try to stay away from dogs and rats in villages), crossing fast-moving or deep waterways, encounter with annoying/allergy producing plants, etc.

In Antananarivo, sensible precautions for cities are advised: guard against pick pockets, avoid walking alone or at night, avoid displaying valuables, etc.

General Conditions

Humidity	50%	to	100%
Temperature Range:	40°F/4°C	to	88°F/31°C
Altitude	1,500 ft/500 m	to	4,500 ft/1,500 m
Rainfall	25 in/635 mm	to	100 in/2,540 mm

Research Site Climate and Terrain

As it is located in the mountains, Ranomafana is often cooler than visitors expect. It is also mountainous with steep hills and rough/uneven terrain to be traversed. In other words, volunteers should be in top condition! For Teams III and IV, the months of May-September are cool and it can be cold (especially at night when temperatures dip as low as 40°F/4°C) with frequent rain throughout the day. Volunteers are advised to bring at least two sets of work clothes so that one can be worn while the other is drying, and a warm outfit for wear at night. For Teams I and II, the rainy season lasts from December-March with rain clouds building to storms in the afternoons and there are warmer temperatures (up to 88°F/31°C in the forest) during the day. All volunteers are advised to bring waterproof hiking boots and rain suits.

Volunteers should be aware that there is at least some rain each day, and that rain often comes overnight.

14. EMERGENCIES IN THE FIELD

The research station has a well-supplied first-aid kit, but cannot deal with emergencies on site. The nearest hospital is three hour drive from the park.

Proximity to Medical Care

Nearest hospital and/or clinic	There is a doctor available in Ranomafana (7 km from the Centre ValBio) and a hospital in Fianarantsoa (60 km away), which is not up to international standards. In the event of an accident, volunteers would be transported to the Clinique Polytechnique in Antananarivo by either ground or air, depending on the situation.
Distance	10 hr by land or 2 hr by air (once plane has arrived)

15. HELPFUL RESOURCES

Project-related Websites

- The Institute for the Conservation of Tropical Environments: <http://icte.bio.sunysb.edu>. This site provides lots of background on Madagascar and Ranomafana, has a helpful guide to conducting research in Madagascar, and tons of photos, videos, and sound clips of the animals you will see.
- The Embassy of Madagascar to the US: <http://www.embassy.org/madagascar>. Search here for info on visas, background info on the country, and a link to one of the national newspapers.

Useful Visa Information

- General: <http://www.embassyworld.com>
- For Japanese citizens: http://www.rainbowt.jp/travel/visa_top.html
- For Australian citizens: <http://www.travel.com.au>
- Passport Visa Express: <http://www.passportvisaexpress.com>
- The Visaservice: <http://www.visaservice.co.uk>
- Thames Consular Services Ltd: <http://www.visapassport.com>

Travel Guidebooks and Booksellers

- Lonely Planet travel guidebooks and online travel site: <http://www.lonelyplanet.com>. Their guidebooks can be purchased from their website.
- The Rough Guide travel guidebooks and online travel site: <http://travel.roughguides.com/>

- Amazon: <http://www.amazon.com>
- Barnes and Noble: <http://www.bn.com>
- Airport Codes Worldwide: <http://www.logisticsworld.com/airports.asp>

Travel and Airline Resources

- TravelNotes.org: <http://www.1800-fly.com>
- World Travel Guide: <http://www.worldtravelguide.com>
- Cheap Flights (worldwide): <http://www.travelix.com/> or <http://www.discountair.com/>
- Airport Codes Worldwide: <http://www.logisticsworld.com/airports.asp>
- Third World Traveler - offers many links for useful travel information: http://www.thirdworldtraveler.com/Travel/Travel_Links.html
- STA Travel (US): <http://www.statravel.com>
Tel: +1 800 781-4040
- STA Travel (UK): <http://www.statravel.co.uk>
Tel: +44 (0) 1865 792800
Fax: +44 (0) 1865 792911
Email: manager.oxford@statravel.co.uk
Quote code: EWE01/02
- Wexas International (Europe): <http://www.wexas.com>
Tel: +44 (0) 20 7581 8761
Fax: +44 (0) 20 7581 7679
Email: southern@wexas.com
Quote code: EWE01/02
- UK Foreign Office travel advice: <http://www.fco.gov.uk/travel>
- Travel website for Australia: <http://www.smartraveler.gov.au>
- Uniglobe Travel (African travel): <http://www.onetravel.com/Air/AirSearch.aspx?module=Eair&DK=1000010265>
- Martha. Aspromatis@austintravel.com
1 (800) 645-7466 ext. 3170
Austin Travel (Madagascar travel): <http://www.austintravel.com>
Tel: +1 631 632-7799
Fax: +1 631 632-9228
Email: stony.brook@austintravel.com
- Frosch International Travel (African travel): <http://www.froschtravel.com>
Tel: +1 713 850-1566
+1 800 866-1623 (toll free)
Fax: +1 713 850-0027

Country Information

- Country Reports. Country information from around the world:
<http://www.countryreports.org>
- National Geographic Map Machine:
<http://plasma.nationalgeographic.com/mapmachine>
- U.S. State Department: <http://www.state.gov/>
- World Time Server: <http://www.worldtimeserver.com/> [time worldwide with GMT/UTC] or <http://worldbuddy.com>
- Currency Converter: <http://www.xe.com/ucc/>
- Telephone dialing from and to anywhere: <http://kropla.com/dialcode.htm>
- Online Unit Conversions: <http://www.onlineconversion.com>
- Worldwide Weather: <http://www.worldweather.com> or <http://www.wunderground.com>
- ATM Locator:
<http://visa.via.infonow.net/locator/global/jsp/SearchPage.jsp>
<http://www.mastercard.com/atmlocator/index.jsp>
- Heat Index (temperature, dewpoint and relative humidity):
<http://www.weatherimages.org/data/heatindex.html>
- Exhaustive List of Weather Resources:
<http://cirrus.sprl.umich.edu/wxnet/servers.html>

Health Information

- US Travel Clinic Directory: <http://www.astmh.org/scripts/clinindex.asp>
- Link to Travel Health Insurance providers: <http://www.travelhealth.com>
- Travel Health website: <http://www.mdtravelhealth.com> is a resource for healthy travel that covers country-specific risks and diseases, suggested immunizations, health recommendations, and locating a travel clinic near you.
- Center for Disease Control: <http://www.cdc.gov>
Tel: +1 800 311-3435 or +1 888 232-3228
- World Health Organization: <http://www.who.int>
- The Travel Doctor (Australia): <http://www.tmvc.com.au>
Tel: +1 300 658-844 (within AU)
- Disease Outbreaks: <http://www.who.int/csr/don/en/>
- Hospital for Tropical Diseases Healthline (UK)
Tel: 0906 1 337733 (within UK)
(calls are charged at 50p per minute)

- MASTA Travelers' Healthline (UK)
Tel: 0906 8 224100 (within UK)

THE RESEARCH

16. RESEARCH OBJECTIVES, METHODS, AND TECHNIQUES

Objectives

The goals for the next four years are to:

- (1) Carefully examine factors that might contribute to the apparent population decline of the Milne-Edwards' sifaka. Factors the project will examine include habitat disturbance, predation, the role of female dominance, ovarian steroid hormone cycles, infant development, and the role of parasites. Through a multi-variate analysis of these factors, the project will be able to isolate those factors that are driving this population decline.
- (2) Continue the long-term investigation of female dominance by looking closely at how dominance develops in infants, and understanding infant development based on sex. As female dominance is exceedingly rare among mammals, the scientific community has much to gain from the study of such a clearly female dominant species.
- (3) Further develop the botanical database through species inventories, plant identification, and phenological monitoring. These data will increase understanding of the ecological differences that exist between regions of the park and the animal communities in these regions.
- (4) Habituate new groups of sifaka on a new trail system, to determine if the population decline is a region-specific event.
- (5) Test new predictions emerging from analysis of the long-term database.
- (6) Study the parameters of aging in lemurs, including differences in diet choice, activities, and travel height in the forest.

Methods

There are 13 lemur species in nine genera occurring in RNP:

- (1) Milne-Edwards' sifaka (*Propithecus edwardsi*)
- (2) Greater bamboo lemur (*Hapalemur simus*)
- (3) Golden bamboo lemur (*Hapalemur aureus*)
- (4) Gray bamboo lemur or gentle gray lemur (*Hapalemur griseus griseus*)
- (5) Red-bellied lemur (*Eulemur rubriventer*)
- (6) Red-fronted brown lemur (*Eulemur fulvus rufus*)
- (7) Black and white ruffed lemur (*Varecia variegata variegata*)
- (8) Eastern wooly lemur (*Avahi laniger*)
- (9) Greater dwarf lemur (*Cheirogaleus major*)
- (10) Brown or rufus mouse lemur (*Microcebus rufus*)
- (11) Sportive lemur (*Lepilemur mustelinus*)
- (12) Seal's sportive lemur (*Lepilemur sealii*) *recently discovered
- (13) Aye-aye (*Daubentonia madagascariensis*)

The specific research in which volunteers will be engaged will vary from team to team, depending on researcher presence and the current needs and foci of the different projects.

However, we have outlined some of the various protocols likely to be in place during the 2005-2006 teams.

Behavioral observations will be taken on all individuals in habituated lemur groups, following the methodologies outlined below. During these follows, feces will be collected opportunistically, dried, and prepared for hormone assays at the University of Texas by Stacey Tecot. The types of foods eaten will be identified by Malagasy research technicians. Fruits will be collected, weighed, and prepared for analyses to determine nutritional composition, which will be conducted at the University of Hamburg by Dr. Jörg Ganzhorn. Botanical inventories have been conducted to document the plant composition of the forest and food availability will be monitored as described below.

Behavioral Sampling

To determine the effect of habitat disturbance on diet, data on feeding behavior will be collected from four social groups of *P. edwardsi*. Behavioral observations will be taken on all individuals in habituated lemur groups. Groups will be followed for five consecutive full-day follows (Altmann, 1974) and data will be collected on a different focal animal each day. General baseline information will be collected using point samples every five minutes. These samples will record feeding behavior (type of food, e.g., fruits, flowers, seeds or leaves, and Latin name of species of plant eaten – Malagasy research assistants will assist in plant identification), height in canopy, nearest neighbor, location within trail system and activity (i.e., resting, feeding, traveling).

During focal follows, additional data will also be collected on the social and feeding behavior of the animals that will help to determine the impact of habitat disturbance on their behavior and ecology. First, data relating to social structure will be collected using continuous sampling of focal animal subjects. All-occurrences of agonism (avoidance behavior, displacements, and aggressive interactions) will be described, along with information on the context of the interaction, the identity of all interactants, and the outcome of the interaction. These data will be used to calculate the rate of agonistic interactions and determine the relative dominance rank of individuals within each group. Second, continuous sampling of feeding behavior will allow the team to record the plant species and part being consumed and the duration of each feeding bout and determine individual feeding rates. These data will be used to calculate diet variability, dietary diversity indices (Chapman, 1987), and dietary overlap (Holmes and Pitelka, 1968) that will be tested within and between social groups. Measures of food abundance will be taken from the botanical plots and measures of food availability will be taken from the phenological monitoring data. Food availability scores will be calculated following Overdorff (1993), and diet selectivity values (percent feeding time/relative density; Hemingway, 1995) will be used to test for correlations between food choice and availability.

Aging Data

For diurnal lemurs such as sifaka and red-bellied lemurs, data are collected as described above with all-day follows conducted on individuals from three age classes (young, prime age, elder). Focal animal follows will be used, as described above, to document diet, activity and height of individuals. For nocturnal species, such as mouse lemurs, radio-collared animals will be followed from 6:00-10:00 pm to determine diet, range and activity. Mouse lemurs will be periodically trapped in Sherman live traps to be collared, weighed and measured. Their teeth will be examined to determine age, and microchips for positive identification will be applied. Then the animals will be released for further study.

Botanical Data

Phenological Monitoring: Food availability will be determined through the phenological monitoring of five mature individuals of each of the 25 most common *Propithecus* food trees, two times each month. Each time, every tree will be visited and the abundance of flower buds, flowers, unripe fruits, ripe fruits, leaf buds, new leaves, and mature leaves will be recorded in two ways. First, to evaluate the proportion of the tree crown containing each phenophase, trees will be ranked from 0 (none) to 4 (full) for each of the above plant parts. Second, to estimate plant part numbers more quantitatively, each tree will be scored from 0-4, based on the log₁₀ of the estimated number of each plant part on each tree, following Janson and Chapman (1999). Food availability scores will be calculated following Overdorff (1993) and these data will be compared to the feeding data collected through behavioral sampling to determine whether or not foods are eaten in relation to what is available within the forest.

Chemical Analyses: To investigate diet quality (nutrient availability and toxin levels), chemical analyses will be performed on samples of the top five foods (species and part) consumed by study animals, each week. Samples will be collected and dried at Ranomafana and then exported to Germany, where they will be analyzed for the following characteristics: alkaloids, condensed tannins and polyphenolic compounds, extractable proteins, soluble sugars, fiber, fat (for fruits), and water content by Dr. Jörg Ganzhorn at the Institute for Zoology, University of Hamburg.

17. RESULTS AND OPPORTUNITIES

Primatologists, behavioral ecologists, conservationists, and natural resource managers benefit from the results of this study. This research will help scientists better understand the evolution of female dominance, the life history of rainforest lemurs, and the relationship between lemur behavior and ecology. The project is also gaining a perspective on how primates age in the wild. Data collected from this study have contributed to the national database coordinated by Madagascar's National Association for the Management of Protected Areas (ANGAP). This project continues to have a strong relationship with ANGAP, both on the local and national levels, and project staff will continue this information sharing process for as long as the research continues. The RNP Management Plan is based in part upon information on *Propithecus edwardsi* population density, territory size, and habitat requirements – data that Earthwatch volunteers have helped collect over the past eight years. These data help estimate how many sifaka exist in the eastern rainforest of Madagascar, and help conservationists estimate needs for a viable population. Earthwatch teams have played a major role in understanding this sifaka population. For example, it was an Earthwatch team that habituated “Group IV” (the fourth study group at the site), which has allowed better understanding of the whole sifaka community and the dynamics that exist within and between groups. With the help of Earthwatch volunteers, this project has been able to document how new sifaka groups are formed, and determine that female-female aggression can lead to formation of new social groups. Through the work of volunteers, the project staff better understands infant development, and have documented when juveniles emigrate out of their natal groups to establish themselves in neighboring groups.

As this project also maintains an active relationship with the Universities of Antananarivo and Fianarantsoa, project staff have been able to host visiting professors at the field station and maintain an active student exchange, where foreign graduate students are paired with Malagasy graduate students to create research teams. The dissemination of project results has been accomplished through oral presentations, journal articles, and several video works. Forums have included meetings of the American Association of Physical Anthropologists, the International Primatological Society, and the Societies of Tropical Biology and Conservation Biology.

Manuscripts have been published in the *International Journal of Primatology*, *Natural History*, *Ranger Rick*, *American Journal of Physical Anthropology*, *American Journal of Primatology*, *Evolutionary Ecology Research*, *Behavioral Ecology and Socioecology*, and *Folia Primatologica*.

Within the past four years, the following articles have been published in international research journals and in scientific volumes:

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- Baden, A.L., Arrigo-Nelson, S.J., and Wright, P.C. (2005) "Mmmm...dirt: Implications for geophagy by the Milne-Edward's sifaka (*Propithecus edwardsi*) at Ranomafana National Park, Madagascar." *American Journal of Physical Anthropology* 126 (S40): 68.
- Dunham, A.E., Wright, P.C., Overdorff, D.J., Pochron, S.T., Arrigo-Nelson, S.J., Morelli, T-L., Ratelolahy, F., and Ratsimbazafy, R. (2005) "Population viability of the endangered Milne-Edwards' sifaka (*Propithecus edwardsi*)." *American Journal of Physical Anthropology* 126 (S40): 97.
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