EARTHWATCH INSTITUTE FIELD REPORT

Earthwatch Institute Mission: *Earthwatch engages people worldwide in scientific field research and education to promote the understanding and action necessary for a sustainable environment.*

Earthwatch Institute uses the UNESCO Definition of a Sustainable Environment*:*
A sustainable environment is one in which the natural environment, economic development and social life are seen as mutually dependent - and the interaction between them contributes to the sustainability and enhancement of the quality of people's lives and the natural environment.

SECTION I: UNEP- WCMC WEBLINK INFORMATION

Project Title: The Lemurs and Forests of Madagascar

Principal Investigator (s): Jonah H. Ratsimbazafy (1)

Vololoniaina H. Jeannoda (2) (co-PI)

Position/Affiliations: (1) Scientific Coordinator

Durrell Wildlife Conservation Trust – Madagascar Programme

(2) Professor

Department of Ecology and Vegetal Biology

Research Site(s) (geographic location, include coordinates if known, e.g. Lat/Long):

The Manombo forest is on the southeastern (Indian Ocean) coast of Madagascar, in the province of Fianarantsoa at 23°02'S latitude and 47° 44'E longitude.).

Local Management Status of the Research Site(s) (e.g. National Park, RAMSAR Site, World Heritage Site, IBA etc.):
This forest combines the Manombo Special Reserve (MSR) and the Manombo Classified Forest (MCF). Established in 1962, Manombo Special Reserve is composed of two parcels. Parcel I, west of Route 12, comprises 2,800 ha and Parcel II contains 2,280 ha of remnant coastal forests. The Manombo Classified Forest is 10,650 ha in size, 5,235 ha which are contiguous with Parcel I of the reserve.

Manombo is one of the 5 sites in the south-eastern cluster proposed in 2000 as a World Heritage site.

Scientific names of primary species being studied (if appropriate): *Varecia variegata variegata* (black-and-white ruffed lemurs)

Key Research Objectives
The overall objective of this project is to study the recovery process of the southernmost population of black-and-white ruffed lemurs, *Varecia v. variegata* at Manombo, in order to

maintain the viability of the species after a catastrophic cyclone in 1997. By documenting the movement patterns of the ruffed lemurs and the recovery of the habitat, we were able to improve our understanding of:

- The foraging and feeding behaviour strategies of *Varecia* in response to the changes of its habitat.
- The activity patterns in relation to habitat disturbance.
- The effects of the habitat alteration on the social organization of *Varecia*.

This project reinforced the existing efforts for long-term monitoring of the endangered population of ruffed lemurs at Manombo forest.

Therefore, we discussed foraging and feeding behaviour in relation to food availability used by *Varecia v. variegata* living in an abruptly disturbed habitat (Manombo). In addition to collecting data on different activities such as feeding, foraging, travelling, resting, and others (e.g. social and agonistic), we examined the relative use of different plant species by each individual during different seasons and throughout the study. In this way, we could document not only the proportions of fruits, leaves, nectar and other items in the diet, but also individual preferences for certain plant species and families, and the role of alien plant species in the *Varecia* diet.

Date this report was completed:
February 25, 2005

Data Collection and Results
a) Give a concise account of the data you have collected during the past field season.

During the past field season we have collected data on:

- Behaviour

Data collection procedures involved focal animal sampling (Altmann, 1974). Two *Varecia v. variegata* groups are followed for a full day's activities whenever possible (usually from 7 am to 4 pm). Group I is composed of five individuals and Group II of two individuals. Each day, a different focal animal is chosen in order to obtain a representative sample among individuals and across sexes.

The activity of a focal animal is recorded at five-minute intervals during daylight hours ("instantaneous" samples, Altmann, 1974). Behaviours are described at a general level (forage, feed, travel, rest, other). The percentages of time spent at each activity are then calculated in relation to the total activity records for each five-minute interval.

The habitat type, height in the tree, and distance to the nearest neighbor are also recorded. Height classes are defined as follows: height class 0, 0 m; height class 1, 0-5 m; height class 2, 5-10 m; height class 3, 10-15 m, height class 4, 15-25 m, and height class 5, 25 m or more

Feeding activity is defined as reaching for, picking, placing in the mouth, chewing and swallowing food items, whereas foraging is defined as moving slowly with attention directed toward a food source or manipulating substrates in search of foods. As feeding data are based on scans, they are measures of the frequency (amount), in which focal animal fed on each item every 5-min sample points. The food item and the part eaten are categorized and described as ripe or unripe fruit (only the flesh part and/or the seed or both), young or mature leaves, flowers parts or miscellaneous materials (sap, bark, etc.). Every endeavor is made to identify and record plant species consumed by the animals by local name, genus and species. Whenever possible, voucher specimens are collected for food species that could not be identified in the field, to be identified later at the Parc Zoologique et Botanique de Tsimbazaza, Antananarivo and the Department of Botany of the University of Antananarivo.

In addition, affiliative (mutual grooming, playing, other) or agonistic interactions and other unusual or infrequent behaviors are recorded using "*ad libitum*" sampling (Altmann, 1974). These included fights, scent marking, mating, or assuming the role of travel leader when the group moved from one site to another. Aggression are defined in this study as any threat, displacement or aggressive vocalization at food sources, plus all fights, bites, chases, and lunges. The distance between the focal animal and the closest individual are measured at 5 minute intervals.

Vegetation analysis

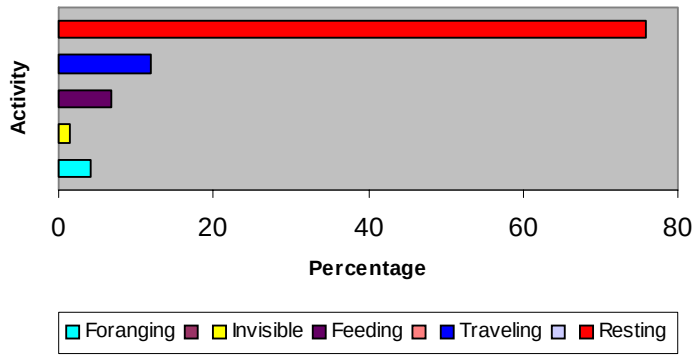
Forest structure and composition

In order to determine the structure and composition of the forest, we set up seven 20 x 50-m plots (0.7 ha) in the study area. Within each of these plots we evaluated the composition of the understory layer. In this way, we counted the total number of non-palm and palm trees equal or smaller than 5 cm dbh, lianas, ferns, and grass. Within each plot, all trees 5 cm diameter at breast height (dbh) and larger were identify and measured for height, dbh, and crown diameter. We considered the average dbh, number of species, stem density of tree (the ratio between the total number of trees of that species in the area of the sample plot), and basal area.

b) What progress have you made towards achieving your original objectives?
Results of this study allow us to better understand:

- the available versus the preferred food that *Varecia v. variegata* consumed at the different seasons or months, because it is important to know these key plants for the management of the population.
- We are able to compare data of the different years, i.e. the changes in diet.
- the microhabitats (habitat types and heights) used by the groups when they feed or rest, etc.
- the movement patterns of the groups and their social organization

c) Please provide a summary of your results (even if they are preliminary).
The analysis of the behavioural data of the study groups indicates that *Varecia v. variegata* spent more time on resting. More than 72% of the time budget is spent resting, whereas only 12% is spent travelling. Likewise, the animals could minimize energy expenditures when food is less abundant. The research months of July and September correspond with the period of food scarcity.
Here is the graph of the different activities of the study groups:



During the two seasons where the volunteers helped us to collect data, we recorded: In July, 17 plant species eaten by *Varecia v. variegata*, in which the “fantsinakoho”, an endemic plant of Manombo constituted the main food of ruffed lemurs. In September, we recorded 16 other plant species consumed by the same groups, in which 30 % was “ramy” and 27% of the total

percentage of their food was “tanatana”, *Cercropia peltata,* an introduced and invasive plant from South America. It is important to note that ruffed lemurs are primarily fruit eaters; more than 80% of the diet consists of fruits. The remaining 20% or so of the diet consists of leaves, nectars, and a small amount of flowers. During the study we recorded less aggression. Solitary foraging was frequent.

We recorded 249 plant species belonging to 96 Families in the seven plots we set. The Families most commonly represented are: RUBIACEAE, EBENACEAE, EUPHORBIACEAE, FABACEAE, LAURACEAE, MELASTOMATACEAE, SALICACEAE, MONIMIACEAE, MORACEAE, MYRTACEAE, OLEACEAE, RUBIACEAE, SAPINDACEAE, SAPOTACEAE.

Significance/Benefits of Research

a) What is/are the significance/benefits of your research at the following levels?

- local (in the area of the research site)

The park managers receive directed benefits from our findings in terms of preserving *Varecia* (the flagship species) at Manombo and its habitats, because we provided them our reports from which they can use our results for the management of the park.

The local field assistants enriched their knowledge from learning and/or exchanging experiences with our neighbour African fellows.

The Manombo Classified forest could be proposed to the authorities as Special Reserve or conservation site, because the study groups we followed were in the Classified Forest.

- National

Because Manombo is one of the few last remaining lowland rainforests, therefore, in order to attract the attention of the decision makers, we need to have strong scientific reasons in order to support the eligibility of Manombo as an important conservation site. Here, I would like to note that during the *International Primatology Society* Congress held in Torino/Italy in August 2004 that I attended, the brown-collared lemur (*Eulemur albocollaris*) is currently among the 25 most endangered non-human primates in the world. Manombo is the only protected area where *E. albocollaris* lives.

- International

It is always important to attract the international attention in saving endangered species. Therefore, the contributions of the other scientists who are interested in the same field are always needed and important. We communicate at the international level by presenting articles in seminars, symposiums, and international conferences, etc.

b) How do your findings contribute to issues of sustainability?

This project involves local people as we believe they are a valuable component and vital for the success of the project. Therefore our findings have been integrated and applied in the formulation of the local laws commonly called “dina”. Such local laws are still very common in many regions in Madagascar. It is an agreement that the villagers in one, two, three or even more villagers establish in order to reinforce local security and punish outlaws.

Dissemination of Results

a) Have you provided details of results from your research to or within:

- Scientific papers (indicate status; e.g., peer reviewed or in progress/press)

  We submitted to *Lemur News* Vol.10 an article entitled: “Etude comportementale et nutritionnelle de *Varecia v. variegata* dans la forêt de Manombo, Madagascar”

co-authored by Bruno Ralainasolo, Jonah Ratsimbazafy, Rockiman Letsara, and Vololoniaina Jeannoda. The article is now in review.

- Management plans and reports (in progress or completed)
  The report of the Manombo project is submitted to the Dept of Water and Forests in Antananarivo and Farafangana, the National Association of the Management of Protected Areas (ANGAP) of Antananarivo, Fianarantsoa and Manombo, the Parlement of Farafangana, the Chef of the region of the South east of Madagascar, the President of the Justice in Farafangana, the Mayor of Anakara, the National Radio in Farafangana, and other partners.
- Presentations (given or planned)
  The Earthwatch Team I was displayed on the National Television in July and Jonah Ratsimbazafy was interviewed as a guest to the National Television in Antananarivo. That program is broadcast to the whole country.
- Popular articles or films (in progress or completed)
  The videofilms of the two teams were displayed quite often on the National Television in Farafangana.
- Books, chapters, illustrations
  In preparation in the book edited by Dr. Lisa Gould and Dr. Michel Sauther.

We would appreciate copies of any relevant materials you can make available to us.