The University of Edinburgh

Lemur Search Zahamena 1999

PRELIMINARY REPORT

CONSERVATION INTERNATIONAL

THE UNIVERSITY OF EDINBURGH

CONTENTS

List of Figures & Tables

INTRODUCTION

After in depth consultation with Conservation International operatives in Madagascar the decision was made to modify the structure of the field study. It was decided that rather than comparing biota between two regions, exposed to human activity in the past and at present, an investigation into a little studied but strategic area would prove more rewarding. However, the project remained true to it's original aim, to determine the human impact on lemur populations and to assess the threat posed by a village in close proximity to a protected area.

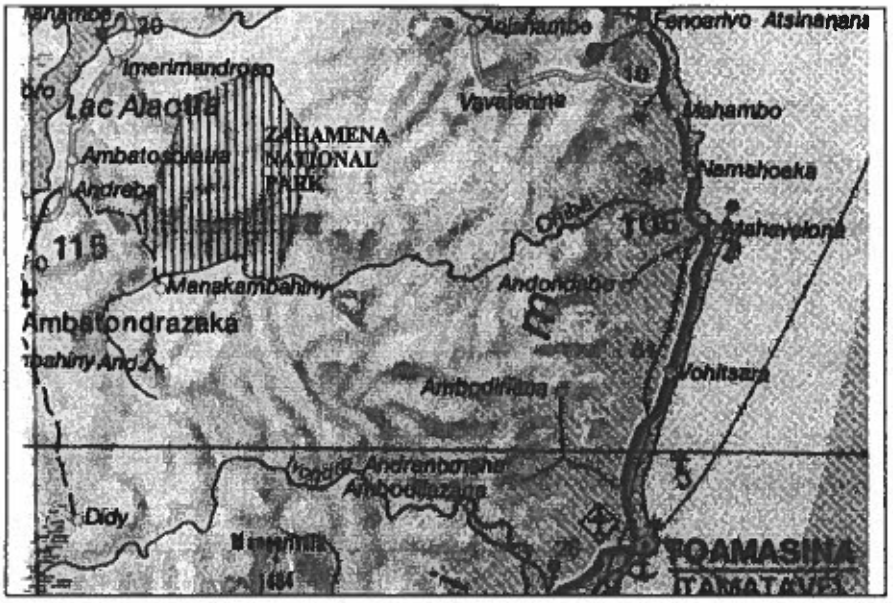


Fig 1. Map depicting a section of Eastern Madagascar with; Toamasina (Madagascar's largest port), Ambatondrazaka (Madagascar's prime rice growing region) and Fenoarivo (or Fenerive, home to CI's Zahamena Project HQ). The Zahamena National Park is shown, the research area was on the Southern border of the Park, near to the Onibe river.

The area chosen for the study lay at the southern tip of the Zahamena National Park (see figs 1 & 2). Two distinct sites were studied, the first inside the confines of the park and the second in a tract of unprotected forest about 8-10 kms to the south west of the comparatively large village of Mitanonoka (over 100 people). The area is of key conservation importance because it is here that the forests of the Zahamena National Park almost touch with the Mantadia forest corridor. The corridor is a large tract of jungle that stretches over 120 kilometers to the south as far as the town of Moromanga. If animal species are at all capable of crossing from the reserve into the forests to the south of the Onibe river it will most likely happen in the region to the west of Mitanonoka, where our study was conducted. Conservation International have, up until now, not obtained comprehensive data on the range of issues that our project aimed to address and thus the opportunity to go on fact finding mission was firmly grasped. Conservation International are now returning to the area and the preliminary data which we collected will be of significant benefit to their work.

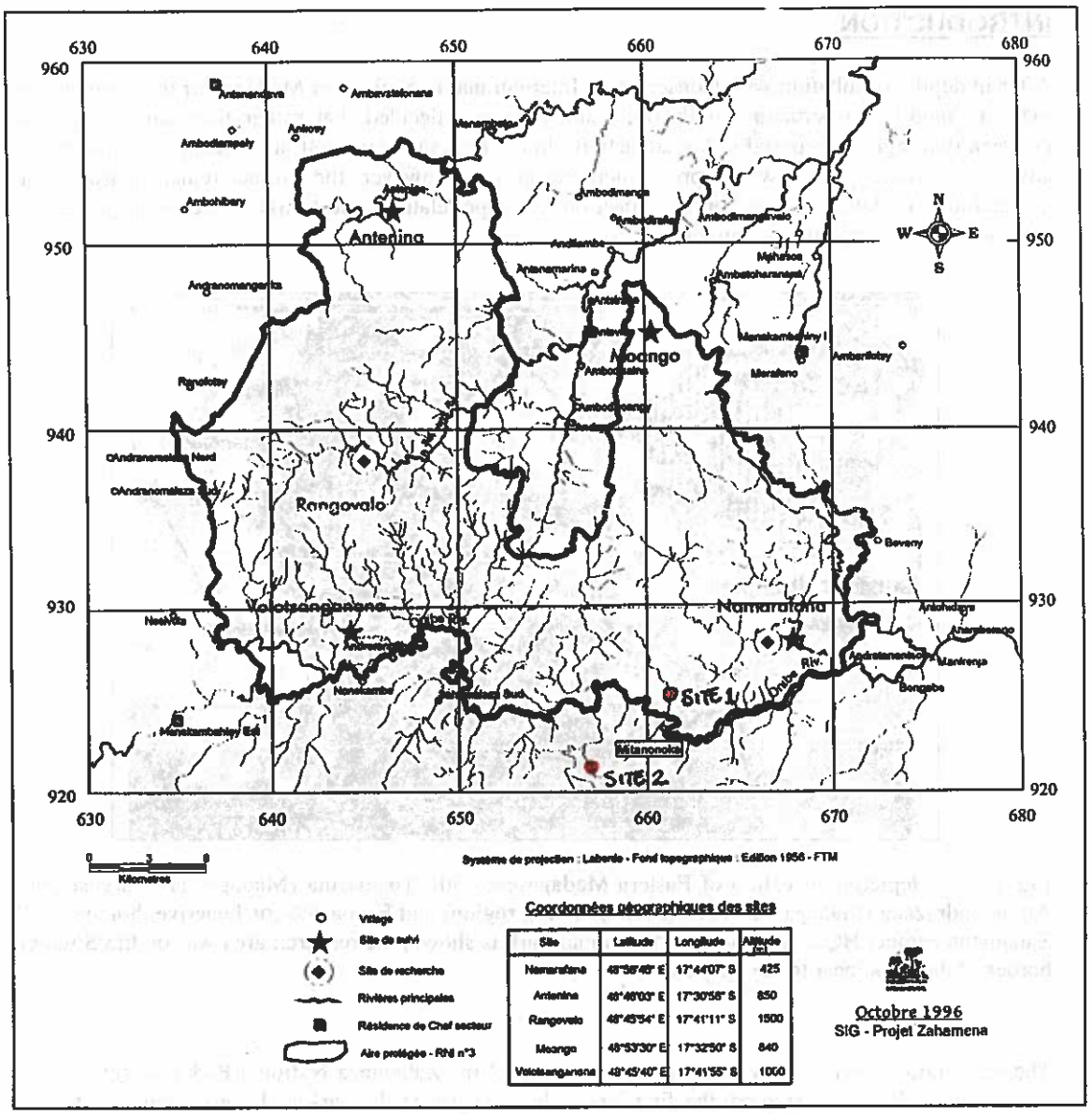


Fig 2. Detailed map of the Zahamena National Park, approximate positions are given for site1 &2 and the community study village, Mitanonoka.

At both study sites three transects were developed, not in the fashion which had been originally intended (4km straight-line trails), which would have proved too impractical but in a clover leaf formation. The study method enabled the region to be thoroughly surveyed although the area covered was smaller than originally intended and possibly covered a reduced range of habitat types.

DIARY OF EVENTS

Below is a list of dates that give a clear chronology of the project work carried out in Madagascar.

28th Jun Team arrives in Antananarivo (Tana)

30th - 4th Jul Meetings with conservation organisations in Tana, liaison with Conservation International contacts, information gathering on Zahamena National Park.

5th Jul Caroline Onie and Claire leave for Fenerive to meet with CI field biologists and officials. Gavin and Andy (ill with cholera) remain in Antananarivo to arrange supplies and equipment.

10th Jul Gavin and Andy leave for Fenerive, equipment and supplies sent on the previous day in a CI vehicle.

11th – 13th Jul Final meetings with the directors and field agents at the "Zahamena Project" CI's Zahamena Programme headquarters in Fenerive. Lucien Randrianjanaka, a Malagasay field biologist employed by CI, joins the team.

14th Jul Team departs for Vavatene by 4wd vehicle. 22 Porters are hired in Vavatene to help ferry equipment and supplies to Mitanonoka. After five hours walk the first night stop over, Mianarive is reached.

15th Jul 2nd night stop over in the village of a CI field agent, Rosalet, who joins the team

17th Jul Arrival in Mitanonoka after 3½ days of arduous trekking. Village headmen are approached, our research is explained and negotiations settled to arrange for guides to assist in the field. A delay is incurred whilst two bamboo rafts are constructed, to ferry people and supplies across the Onibe River (approx. 100m wide) into the Park.

19th Jul Initial reconnaissance undertaken inside the Zahamena National Park, potential study areas are identified and a suitable site for the first site encampment located.

20th Jul Camp prepared and transect trail development started. Gilbert, Mitanonoka's vice President joins the team, he has a great knowledge of the area and is skilled in finding trails through the forest.

21st Jul Transect development completed (3 days taken in total)

22nd Jul Vegetation study begins

24th Jul Transect walks (for lemur census) begin, Gilbert returns to Mitanonoka and is replaced by another villager, Rakootson.

26th Jul Lucien and Rosalet depart. Fieldwork follows a daily pattern.

6th Aug Lucien rejoins the team

9th Aug Andy, Onie Claire and Gilbert remain at 1st site, in Zahamena. Gav, Caroline, Lucien, and Rakootson head for a region of forest approx. 10 kilometres due West-South-West of Mitanonoka, to set up the second study area and encampment.

10th Aug Caroline, Gav etc. reach site 2. Transects are developed by 13th August.

11th Aug Last lemur transect walked at the site 1, in Zahamena. Transect walks for the lemur census at site 2, Befossa, begin on the 12th August.

13th Aug Claire, Andy and Onie arrive at second site

17th -19th Aug Vegetation study begins at site 2.

26th Aug Gav, Caroline & Lucien leave for Mitanonoka to carry out community study

28th Aug Last lemur transect walked

30th Aug Claire, Andy & Onie arrive in Mitanonoka. Community study completed

31st Aug Team depart from Mitanonoka to reach a pick-up point at Vavatene

3rd Sep Team arrive in Fenerive

4th – 7th Sep Debrief with CI personnel, presentations of results given in french.

8th-21st Sep Time off to visit Isalo and Ranomafana National Parks (run by ANGAP)

22nd-25th Sep Return of equipment borrowed from MBG & Kew, final preparations, interview with personnel in Moromanga and return to U.K.

LEMUR CENSUS

At each of the two study sites lemur numbers were estimated through transect walks. All team Transects trails were developed so that they began approximately 200m away from the encampment and members were involved in walking transects which were conducted in the morning and the afternoon.. then described a loop through an area of forest terminating at a point approximately 200m from camp. Transects were walked by all team members in rotating combinations, they were walked in both forward and reverse directions and in all weather conditions. Below is a basic summary of lemur sightings. All vocalisations that were heard were recorded along with estimated positions of source group, data on this section of the lemur study will follow in due course.

Work undertaken at Site 1. Transects walked for 21 days (between 22/07/99 and 11/08/99)

Work undertaken at Site 2. Transects walked for 16 days (between 13/08/99 and 28/08/99)

Table 1. Summary data, of gross number of Lemur sightings on each transect for both study areas.

Transect	Distance (M)	*P. diadema*	*I. indri*	*E. fulvus*	*V. variegata variegata*	*H. griseus griseus*	*A. laniger*	TOTAL
A (site 1)	2600	1	3	5	3	1	0	13
B (site 1)	1400	2	2	0	1	1	0	6
C (site 1)	1650	1	4	3	5	1	0	14
Total	**5650**	**4**	**9**	**8**	**9**	**3**		**33**
D (site 2)	1450	2	2	3	11	3	0	21
E (site 2)	2100	4	2	2	4	3	1	16
F (site 2)	1800	1	4	0	4	4	0	13
Total	**5350**	**7**	**8**	**5**	**19**	**10**	**1**	**50**

Signs of human disturbance, were noted in many sections of the transect trails, at both sites, details of which follow in the final report. At first glance it seems that lemur groups and individuals were seen at a higher frequency in the unprotected forest to the south of the Zahamena National Park. The higher incidence of traps and predominance of secondary forest in the southern region of the park would support such a result. It was also apparent that lemurs were more wary of our presence at the first site, inside the park. The relative remoteness and inaccessibility of site 2 from human habitations of any size may equate to lower hunting pressure and thus lemurs may be less likely to take flight on seeing a human.

Table 2. Frequency of lemur sightings, expressed as groups/individuals seen per 1000m of transect surveyed.

Transect	Repeats	Dist. (m)	*P. diadema*	Sight. Freq.	*I. indri*	Sight. Freq.	*E. fulvus*	Sight. Freq.
A (site 1)	21	2600	1	0.018	3	0.055	5	0.046
B (site 1)	20	1400	2	0.071	2	0.071	0	0.000
C (site 1)	22	1650	1	0.028	4	0.110	3	0.041
Site1	63	5650	4	0.034	9	0.076	8	0.034
D (site 2)	21	1450	2	0.066	2	0.066	3	0.049
E (site 2)	20	2100	4	0.095	2	0.048	2	0.024
F (site 2)	20	1800	1	0.028	4	0.111	0	0.000
Site2	61	5350	7	0.065	8	0.074	5	0.023

Density estimates of lemur species will be calculated for the final repor and statistical analysis will be carried out to determine whether vegetation and elements of human d sturbance can account for any differences in these densities.

Table 3. Frequency of lemur sightings contd.

Transect	Repeats	Dist. (m)	*V. variegata*	Sight. Freq	*H. griseus*	Sight. Freq	*A. laniger*	Sight. Freq
A (site 1)	21	2600	3	0.055	1	0.018	0	0
B (site 1)	20	1400	1	0.036	1	0.036	0	0
C (site 1)	22	1650	5	0.138	1	0.028	0	0
Site1	63	5650	9	0.076	3	0.025	0	0
D (site 2)	21	1450	11	0.361	3	0.099	0	0
E (site 2)	20	2100	4	0.095	3	0.071	1	0.024
F (site 2)	20	1800	4	0.111	4	0.111	0	0
Site2	61	5350	19	0.175	10	0.092	1	0.009

Table 4. Frequency of total lemur sightings for each transect and each site.

Transect	Repeats	Dist. (m)	All lemurs	Sight. Freq
A (site 1)	21	2600	13	0.238
B (site 1)	20	1400	6	0.214
C (site 1)	22	1650	14	0.386
Site1	63	5650	33	0.278
D (site 2)	21	1450	21	0.690
E (site 2)	20	2100	16	0.381
F (site 2)	20	1800	13	0.361
Site2	61	5350	50	0.461

VEGETATION SURVEY

RAPID ASSESSMENT PROGRAM

Introduction

The Rapid Assessment Programme (RAP) is a technique that was pioneered by Conservation International and is now widely used to gain an understanding of the tree flora in an area over a brief period of time. The RAP was carried out at each of the two study sites. Three habitat areas were examined at each site: valley, mid-point and summit, in order to get a picture of the overall habitat.

Methods

Three categories of vegetation were surveyed, based on the commonly used diameter at breast height (dbh) measurement. Based on the vegetation at site 1, the following categories were chosen;

- 0-5cm
- 5-15cm
- 15cm+

For each of the three categories ten individual plants were sampled from a chosen starting point (five individuals from either side of an arbitrary (centre) line). For each category the sampled plants fell within a certain, pre-specified distance from the centre line.

The specified distances are as follows: For the 0-5cm category; 2m either side of the centre line, for the 5-15cm category; 4m either side and for the 15cm+ category; 10m either side of the line. The distance covered after ten individuals had been sampled (juvenile stages of canopy trees included) was noted for each dbh category. The starting point for the next 10-plant survey was taken as the furthest point reached, by any of the dbh classes, from the original starting point for the previous survey (see fig1.). The procedure was repeated until 300 plants had been sampled in total (100 individuals for each category of dbh). Thus, at each site which in turn is made up of three sampling regions, a total of 300 plants were surveyed for each of the 3 dbh categories.

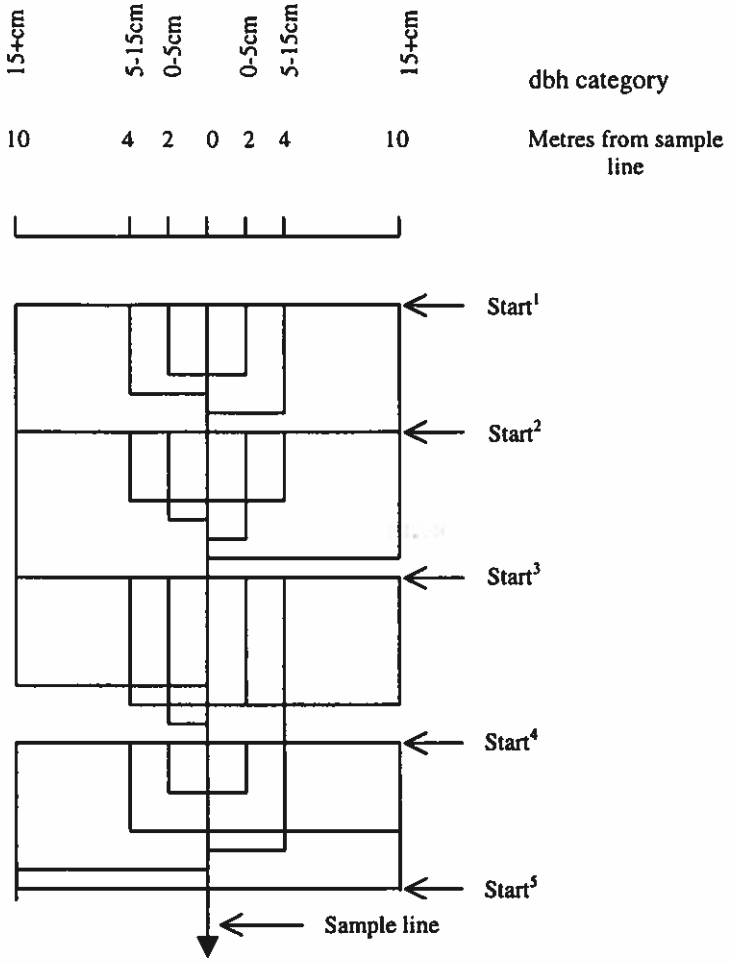


Fig. 3. Example of RAP technique showing five starting points. Actual RAP's consisting of ten starting points.

For the plants sampled the local, vernacular names, and height of each specimen was recorded. Local guides and Lucien (a CI field operative) provided vernacular names. Throughout the survey all the tree heights were estimated by the same person in order to maintain consistency. Lucien is currently completing a list of scientific names corresponding to the list of vernacular names compiled in the field.

Results and Conclusions

We are at present waiting the list of plant names to be sent from Madagasacr. After detailed analysis and comparison of the results between the two sites it will be possible to determine:

- Density estimates of individual species
- Overall forest density and canopy height variation
- Predominant species in each site/habitat
- Presence/absence indicator species which may provide a further measure of anthropogenic disturbance

At this stage it is possible to mention that the second site, Befossa, was on the whole a much older, more established primary forest in comparison to the disturbed secondary forest at Zahamena. There were many larger trees (a greater percentage of trees 30m+ in height and trees with 30cm+ dbh), a far

greater prevalence of buttress rooted trees and a greater number of strangling figs at Befossa. There is some evidence that there was a predominance of *Uapaka* (Voapaka) at Zahamena and *Eugenia* (Rotra) at Befossa, perhaps indicative of the different altitudes at each site.

PART 2 THE HABITAT ASSESSMENT

Introduction

The second part of the plant survey followed the transect routes developed for the lemur census. The habitat assessment served to give fairly detailed descriptions of the vegetation structure along the six transects, A-F, which will be correlated with the lemur sightings.

Methods

The 5 most predominant species within each 50m stretch of each transect for each dbh category were estimated. At site 2 we had to drop the 15cm+ dbh category, creating a 15-30cm category instead. Due to the prevalence of larger trees at site two compared with site 1, a further category, at 30cm+ was added.

- The percentage cover of each dbh category was estimated every 50m (at the point marker) along with a measure for bamboo and bush cover.
- Positions of obvious features such as tree falls, lemur traps, rivers, clearings and hunting lodges were recorded for each transect.
- The lateral visibility along each transect was determined by estimating the average visibility distance at different angles from the path (see fig. 2).

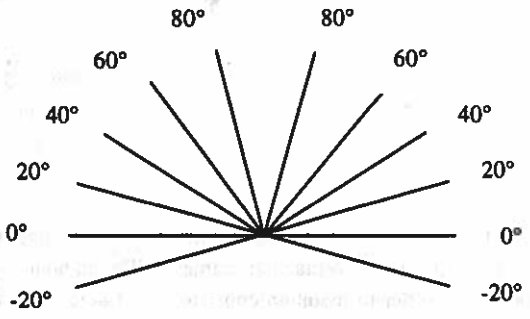


Fig. 4. The array of angles at which visibility estimates were made.

Measurements were made by the same person throughout the study to minimise repetition errors and character bias. Before the lateral visibility component of the survey was conducted the technique was practised in order to develop a consistent accuracy in estimating distances and percentage cover.

Results and Conclusions

The data from the habitat assessment was compiled in order to give an idea of the general makeup of the forest. Once analysed the visibility data will be compared with data from the lemur survey in the same area. The data will be checked for correlation, to detect whether it was likely that visibility affected the number of lemur sightings. The assessment will be useful in determining whether lemurs

displayed specific habitat preferences. *Hapalemur griseus griseus* (the grey bamboo lemur) for instance, is often found in or near stands of bamboo on which it depends upon as a source of food. The habitat survey will also be used to test whether the presence of lemur traps and other anthropogenic factors such as felled areas have an affect on lemur prescence.

COMMUNITY BASED STUDY

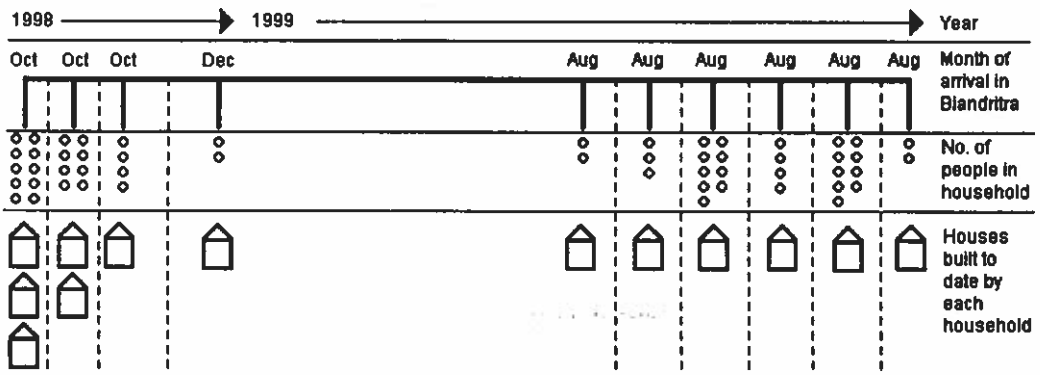
Below are detailed summaries of all the discussions conducted for the community survey; what the subjects of each session imparted to us and representations of diagrams and tables constructed by the villagers using PA techniques.

Discussion / PA group 1 - Beandraitra (27/08)

Informal gathering in the house of a villager.
Mixed sex group, up to 8 individuals participating, others present (approx. ages - 20 to 60 yrs).
Subjects: 1) Establishment of village and demographics of its population (using discussion & PA).
2) Use of forest and relative frequency of uses (using discussion & PA).

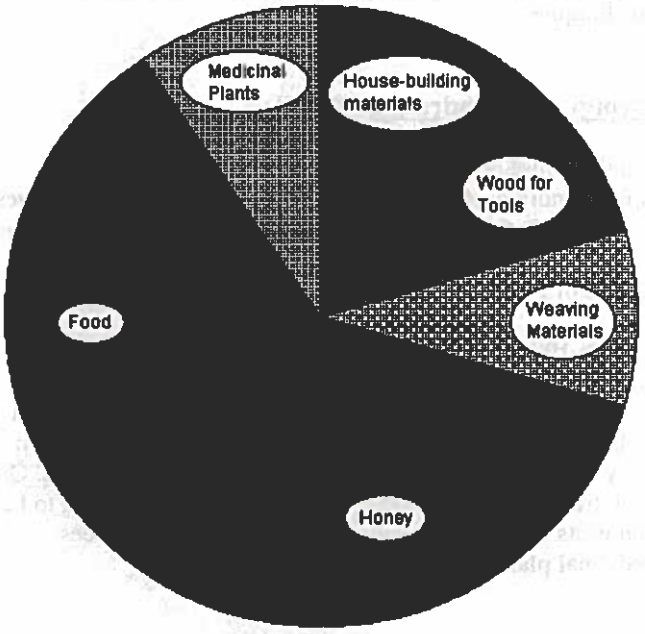
- Village established in 1998.
- Each house is typically home to a mother, father and their children.
- There are 50 people in the village now, but it is already becoming difficult for them to find honey, other foodstuffs and land suitable for cultivation, they will have to move on in a few years to
- In collecting honey the villagers didn't want to admit that they cut trees. On further questioning they said they only cut trees when the bees' nest in question was too high to be reached by climbing.
- Villagers seek out nests individually and use smoke to sedate the bees.
- Villagers use medicinal plants but don't sell them.

Fig. 5. A representation of a diagram constructed by the discussion group, using locally available materials. The diagram depicts all the people that have migrated to Beandraitra, from Mitanonoka. Movements of people occurred in individual groups/households that are bounded by the dashed lines. All the people who have moved to date are part of an extended family.



■ On the subject of the future arrival of people in the village it was expected that about 20 more villagers would arrive to set up cultivation in the region next year. No estimates could be given whatsoever as to the longer-term movement of people.

Fig. 6. A proportional estimate of the frequency with which purposeful trips are made into the forest by villagers from Beandraitra (i.e. "Food" means trips made to collect forest produce for eating etc.). The original diagram was constructed using locally available materials. (N.B The pie-chart concept was not fully understood by all participants).



Discussion / PA group 2 - Mitanonoka (28/08)

Arranged gathering in the house of the village president.
President, Tangalamen (ancestral family headman), Pastor also present (approx. ages 45, 70 & 35yrs respectively). Tangalamen spoke most, other men are forced to defer to him if he wants to speak, Pastor spoke very little.
Subjects: 1) Establishment of village, its history and demographics.
2) Process of establishment of hamlets, villages that split off from Mitanonoka.
3) Deforestation process.

■ The Tangalamen's grandfather set up the village, perhaps about 120 yrs ago, the grandfather migrated to the area to harvest Catchouc (latex from vines) to be used for making rubber. The latex fetched a good price.
■ When the grandfather arrived he cleared an area of forest and set up a settlement.
■ As more money was earned other members of the grandfather's family moved in.
■ The settlers married people from other regions, most stayed in Mitanonoka although some left.
■ They cultivated rice in the traditional way, once the market for Catchouc was exhausted the traditional rice cultivation/subsistence lifestyle was reinstated.
■ The grandfather and his 10 sons stayed in Mitanonoka, 1 of these sons had 10 sons of his own, one of which is the Tangalamen, the others are dead. The Tangalamen had 9 sons, one of which is the current president.
■ The people of Mitanonoka set up other villages/hamlets in the same region but have never emigrated to towns such as Vavatene.
■ A new village always has a chief.
■ A family wanting to move into a new area first of all decides where to go. The Tangalamen and the President of their village are approached for permission to undertake the move, the headmen, in turn,

consult the rest of the village, if the village people accept and the Tangalamen and president accept, the president then informs the authorities of the sub-prefecture.

- Further people may move to the new village by seeking permission form the Tangalamen, the man who set up the new village does not have the power to veto requests. New villages are merely extensions of the ancestral village and are therefore directly subject to such authority and do not enjoy autonomy.
- The Tangalamen says that no limitations exist at present on the destruction of forest, the forestry Agents have allegedly given Mitanonoka deforestation rights over all the forest outside the Zahamena National Park..
- Every five years a committee is supposed to come to review the land clearance in the area. If they find that forest is being cut back too rapidly limitations are imposed.
- No limitations have yet been laid down but the Tangalamen says he is thinking of applying restrictions in the year 2000, to prepare for the future of the people of Mitanonoka. (Lucien believes that Agents from the Direction des Eaux et Forêts may not have been in the area for at least 10 yrs.
- Once an area has been deforested and cultivated it is left for a few years and may be used for grazing Zebu.
- Every year farmers/peasants are supposed to lodge a demand for the amount of forest they intend to cut the following year.
- We saw evidence of deforestation about 30-minute's walk away from our second study site (approx 2hrs walk from Beandritra). A patch of forest (80m by 50m) had been cleared and apparently abandoned without being cultivated. For some reason a decision had been made to pull out of the area. It is not known whether this deforestation took place before consultation with the village heads, who on discovering that deforestation had taken place took action which led to a retreat from the area. Perhaps the area was abandoned in favour of another, preferable spot. This and other patches of deforestation we came across probably demonstrate that deforestation takes place in advance of consultation with the village authority and without careful consideration and decision making.
- A man who clears an area of forest gains the right to cultivate on it, after one year, once he has harvested his crop, he must return ownership to the state.
- Land can only be re-cultivated after 5 years, to allow nutrients to build up again (in the meantime the farmer will have deforested 5 further plots).
- President said that 5-year limitations on deforestation are implemented and further forest is only cut down when necessity dictates.
- After the 5 year period has past, a farmer can return to his original plot but normally he will choose to clear further forest because it is easier to cut down trees than to clear the secondary growth of weeds etc.

It is worth noting that they were very curious about our reason for being in the region – were we actually going to help them in the future and give them what they needed or were we simply there to understand their lifestyle? Were we going to come back? Did we like Madagascar and how did we find the people?

Prior to our discussion the president had approached Lucien in order to get understand the reasons behind our undertaking research in the area. He was particularly intent on finding out about what sort of conservation minded practices he should be carrying out and where his limits lay. Perhaps he saw Lucien as someone he could learn a lot from, not usually getting to he opportunity to talk to someone of his biological understand although, on the other hand he may have been testing the water in order to avoid saying anything to us which he might regret.

Discussion / PA group 3 - Mitanonoka (29/08)

Meeting arranged in one of the village huts used by us as a kitchen.
5 Women from the village (approx. ages - 25, 30, 35, 40 & 45yrs).
Subjects: 1) Issues related to children.
2) Children's education.
3) Diet.

- The main problems facing children in the village are 1) Health (illnesses include cholera, malaria, fever/flu and rashes), there is a difficulty in obtaining medication/treatment. 2) Education, or lack of it due to very limited funds. 3) Lack of quality food.

- Of the five women talked to number of children was as follows: 1) 4 alive, 12 dead. 2) 5 alive. 3) 1 alive, 4 dead. 4) No children, 5) Not known. Many of the children who died were not that young, i.e. between the ages of 7-10 yrs.
- The women started their families at various ages: 15, 16, 19 and 20.
- The women believed that large family sizes are important in order to have people to help you in your old age and also to keep your lineage going. On the downside large families are more expensive to raise.
- Big families are a status symbol, they are desirable because they demonstrate wealth. Boys are more sought after than girls.
- The women educate their children in the methods they use to cultivate the land and the daily chores etc.
- The women are too busy to spend time helping their children with school studies, maybe getting a chance to help them once a month.
- In 1985 the village school was destroyed by a cyclone and has not been re-built, instead school is held in one of the two village churches.
- Children learn to read, write and count (with some very limited French – the teacher has only a very basic grasp of French). Children are only able to go to school for a total of three years. The oldest a child is permitted to start school is at 13 years old.
- All the women wanted was for their children to be educated and find work in more developed areas (towns), if their children were unable to find work they should come back and educate their parents. To date however, no children have ever been educated outside Mitanonoka and no one from Mitanonoka has ever found work in Mianarive, Vavatene or other villages/towns with greater commercial opportunities. The women hoped that their children could go elsewhere because they felt that there is not enough land to cultivate around Mitanonoka. In addition the women considered that town life offers people more if work can be found, they would be proud if a child of theirs could settle in a town.
- Children cannot be sent elsewhere to receive better schooling because they do not have the money to pay.
- Children encounter problems even whilst they are enrolled at school; Because their parents require them to help in the annual rice cultivation they will sometimes be too remote to get back to school each day. They may actually be physically unable to cross rivers to get back to school during the period after the rains when the rivers are too strong (especially the younger children).
- The women talked to complained that their food was not of good enough quality.

Table 5. Table showing the foodstuffs eaten in the villagers women in the village consider

		FOOD-STUFF										
		Honey /sugar	Green veg.	Zebu	Chicken/ Duck	Beans	Banana	Rice	Eggs	Fish	Root Veg.	Wild Pig
ASSESS-MENT TYPE	Freq. / day	XX	XXX					XX X			XX	
	Freq./wk					XX	XX					
	Freq./mth			X	X					X		
	Eaten every 6 mths								X			X
	Preference *	4	W	4,4	2,3,3,4	2,3		1,1,1 ,1,1	3	2,3,4 ,W, W		2,2,W, W

*Preferences were ascertained by ranking 1st (1), 2nd (2), 3rd (3), 4th (4), and least (W) preferred foodstuff.
X indicates the number of servings eaten over a given period (daily, weekly, monthly). For the 6 monthly category X simply indicates that the foodstuff is eaten over that period but the frequency with which it is eaten is not known.

Whilst in Mitanonka it was clear that there are other highly nutritious foods available which could help prevent the malnutrition that was apparent in some individuals, i.e. grapefruit and breadfruit. It is clear that there is very little understanding of what constitutes a healthy diet and that other factors such as tradition are the determinants of food preference. Although green vegetables (watercress type plant) are eaten daily, they are taken in very small portions.

- If the villagers require money they would do best to go to Mianarive to sell their rice, where they can fetch a higher price than in Mitanonoka.
- The women feel that religion is important to having a good spirit and they enjoy singing as a recreation that helps them to forget their problems.

Some further PA exercises were attempted using concepts of relative proportion i.e. their days work divided into portions of time spent on specific activities. After trying in vain to go through the proceedure step by step it was decided to call a halt to the activity.

Discussion / PA group 4 (30/08)

Meeting arranged in one of the village huts used by us as a kitchen.
Same five women as in previous discussion took part.
Subjects: 1) Carried out discussion to ascertain key issues of importance in the lives of the women.
2) Determined relative importance of the issues raised (PA exercise).

The choices and priorities of the women were first discussed

Table 6. Pairwise ranking of the relative importance* of what are perceived to be the key issues in the lives of the women of Mitanonoka.

	Clothes	Education
Food	- - - - -	+ - + + +
Money	- - + - +	- - + + +
Route to Market	+ + + - -	+ + - + -
Education	+ - - - -	N\A
Medicine & Health Care	- - + - -	- - - + +

*The five issues in the right hand column are considered one by one against the two issues in the top row. Five women took part and for each paired comparison i.e. food vs. clothing they were asked to determine what they considered to be the most important of the two. A + indicates that the factor in the left-hand column was more important than the factor against which it was being compared and vice versa. From the above table it can be seen that all the women considered food to be of less importance than clothes. N.B it took some time for the women to understand the concept and they found it very difficult to make up their mind over each comparison. As a crosscheck a further meeting was arranged and a similar exercise was carried out but presenting the problem in a slightly different way.

Table 7. Pairwise ranking 2nd stage.

	Food	Money	Route to market	Education	Medicine & Health care
Clothes	+ + + + +	+ + - - -	+ + - - -	+ + + + -	+ + + + -
Education	+ - - - -	+ + - - -	+ + + - -	N\A	+ + + - -

+ & - should be read in the same way as explained above. - indicates that the factor in left hand column is of less importance than the factor in the top row.

- If better education was available they would find it easier to earn money, however education was eventually considered of least importance, the women explaining that they could still live without it but the other factors were more essential to survival.
- If they wanted to boost any of the five factors the only means of doing so would be to further exploit

the forest, if all the five needs of the women were provided for then they could leave the forest alone. Money must be provided for first, as the other four factors can be made up for if money is available.
- The women believed that there was no way for them to make a living and obtain money without

destroying the forest. Even if tourism brought alternative income to the village the women believe that they would still exploit the forest in order to have products/souvenirs to sell.

- The women say that they live near to the forest by necessity, they could not lead an alternative life remote from the forest. They would be prepared to live somewhere else if they could find employment they do not consider their traditional way of life as sacrosanct and immutable.
- At present the women believe that their families cannot live without the forest, however they believe

that they need help to improve their situation and asked us if we would be able to give them the advice and support to enable development.

- Other matters of importance were addressed after the exercise, women wanted ; 1) A school with education for all and external teachers. 2) Health provision from trained individuals and medicine. 3) A general information centre, to promote development.

There were many complications with the methods we used to obtain PA results in this session. However the exercise was judged to have been more successful in the respect that a great deal of thought and serious discussion was generated amongst the women, which carried on even after the session had been terminated. If our intention had been to get people to think clearly about their plight and priorities then our objective would certainly have been achieved.

Discussion / PA group 5 (30/08)

Meeting arranged in one of the village huts, which was used by us as a kitchen.
With the former president form 2 years ago (approx. age - 60yrs).
Subjects:
1) The importance of the forest.
2) Controls on deforestation.
3) Medicinal plants.
4) Comparing the standard of living now and in the past.
5) Mapping the region around Mitanonoka and charting the establishment of hamlets.

- He regards forest as important to the well being of the people in Madagascar, citing that deforestation in the Ambatondrazaka region has caused poor rains which in turn has adversely affected rice yields. He goes on to say that in his region there is still plenty rain because the forest still exists.
- He believes that collection of honey is the most common utilisation of forest / most significant reason for villagers to make excursions into the forest.
- Individuals collect honey, although there is not much left. A greater amount of money can be made if you collect honey on your own.
- Honey production lasts between November and February
- He says that there have been no forest gendarmes (from the Direction des Eaux et Forêts) in the area for the last 10-20 years. Although limitations may exist they are not implemented
- He believes that "DEEF" have already designated certain tracts of forest for cultivation by the villagers.
- 20 years ago there were agents that came to assess forest clearance.
- He knows of many forest plants, which have medicinal properties, but only knows the method of use for a fraction of them. Younger generations are less interested in learning traditional medicine, despite their crippling lack of money they have put more faith in modern medicine to solve their ills. (We were consistently asked to provide medical help to children and adults in the village for a range of ailments).
- There used to be traditional doctors who practised medicine using all the medicinal plants of the forest but they have since disappeared along with much of their knowledge. He thinks that there are still some traditional practitioners around today. (There is usually someone in each village who calls themselves a doctor, however Lucien believes that these people are not particularly knowledgeable and use false practices to make money).
- He used to venture into the forest to play as a child but these days children have less contact with the forest because it is far away.
- Life is now easier for villagers than it was when he was young, there are many more things available to us (if they have the money to buy them).
- He feels people prefer to live in Mitanonoka and its' surrounding hamlets rather then towns, no one has left yet.

A map w .s drawn up with the help of the ex-president, the aim of which was to plot the positions of villages t ıat have budded off from Mitanonoka. I cannot include them map at present but here is a list of the vi'lages and the approximate dates at which they were officially considered to have been established.

Salampona (1960)
Marovato (1988)
Sahavolo (1990)
Andratanhomby (1992)
Beandraitra (1998)

In all cases people may have started cultivation in the respective areas prior to their settlement being considered a village in its own right.

Discussion / PA group 6 (02/09)

On the porch of school building in Mianarive
5 farmers from Mitanonka who were employed as porters (approx. ages - 16, 25, 22, 38 & 42yrs).
Subjects:
1) Views of villagers to our presence and research in and around Mitanonoka.
2) Preferred lifestyle, in rural villages or in market towns.
3) General issues concerning deforestation and cultivation.
4) Views on improving communications/routes with markets.
5) Development.

- They are fearful that the presence of a research team like us will lead to stricter or wider limitations being placed on their use of the forest. They believe that areas of forest around Mitanonoka are already destined for their use to cultivate rice and that we might put that in jeopardy.
- They are positive about our presence because we provide them with work, money and education of sorts. "You give us the same in one day as we could find in a month."
- They perceive that life in a town would be better if work could be found but they are always forced to return to the forest in order to produce something that can be sold. Agriculture is their only choice.
- They must live far from the towns because land nearer to towns is already owned and hired out to towns-people for their own cultivate, peasants are forced to move further afield.
- People around towns who own large farms only cultivate small plots of land because they cannot afford to pay the wages for the additional workers that would be required during the period of cultivation. Instead they hire out land to other towns-people.
- Lots of land is left uncultivated along the routes away from towns, in order that it can be passed on to the descendants of those who first cleared it. (The forest is not always cut out of necessity but rather as preparation for the future).
- The men desire an easier way of reaching markets in order to sell their rice/produce at more favourable prices than they can achieve in their locality.
- There is no village committee for discussing means by which they can improve their way of life/increase efficiency etc. they do discuss things but there is no one to help them realise their ideas.
- They ask that we help them to develop better ways of earning money and obtaining education.
- The forest could be protected if the proportion of rice cultivation lost by reducing the cultivated area is made up in some other way.
- At present about ¾ of what they grow is sold and ¼ remains to feed their families, however, that is not sufficient to match their needs. They sell rice to have disposable income when they need to buy essentials (oil, salt, clothes, candles etc) but they are also forced to buy back rice when their stores are depleted.
- Apparently it is a fady to navigate the Onibe by boat, however fady's are disappearing with the passing of generations, development is the priority and if it was possible to ferry produce more easily along sections of the Onibe then they would do so. It would also enable the sick to reach help more quickly. (Lucien believes that the men are still afraid of the elders when it comes to issues of fady).
- The men want to be educated to understand the value of the forest so they can decide whether it is worth saving.

Discussion / PA group 7 (03/09)

Deputy for the Vavatene area (Emile Ralefy)
At his house
Subjects: 1) The extent of his responsibilities.
2) Trends in forest clearance in his area
3) Process of decision making in which he is involved
4) Problems he faces in all areas of his job

- Deputies represent the population in issues concerning state intervention, i.e. forest clearance there is corruption in the authority which allocates lands for deforestation. People from towns tend to clear more forest than more rural villagers.
- Democracy exists in the decision making process but with many levels between himself and the population, the truth gets lost and he real needs of the people are diluted
- State decisions are now becoming more decentralised, with greater involvement for the people.
- The Deputy complains about communication with the population, he addresses problems of the people but has no idea whether they are alleviated because there is no feedback.
- Around Vavatene many valleys no longer support cultivation and people must go further to find themselves land.
- Corruption exists he says, because although little punishment is implemented the people are scared of what might happen if they deforested lands without the says so of the department des eaux et forets. Thus money is paid to "legitimise" their deforestation.
- Problems relating to education: There aren't enough teachers, teachers are not always replaced when they leave or die. School buildings are not of a high standard, many need repairing. Class sizes are too large.
- Problems relating to health: It is difficult for ill people to get to hospitals because they are far from most villages. People do not have much money to pay for treatments and they must always pay in advance.
- Problems relating to roads: There are only very few good roads.

THE FINAL REPORT/CONTACT DETAILS

Further results, detailed analysis and discussion will follow in the final report, along with photographs and acknowledgements of all contributors to the project. In the meantime if you have any queries or request further information before the scheduled final report despatch date (approx. Feb.Mar 2000) please contact;

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