

Chapter 2.5

Human Exploitation of Forest Resources in Mandena in 2000

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Abstract

The utilization of forest resources was monitored in three forest fragments of Mandena over a 3 month period in 2000. People from the nearby villages used the forests for construction and fire wood, and charcoal was produced on a commercial basis. The rate of forest exploitation was certainly not sustainable. The transformation of the forests into a protected area still allows for some subsistence harvesting, but many of the forest resources originally extracted from Mandena now have to be found elsewhere.

Résumé

Exploitation des ressources forestières à Mandena en 2000. L'utilisation des ressources forestières a été suivie pendant une période de trois mois dans trois fragments de forêt à Mandena en 2000. Les gens des villages voisins utilisaient la forêt pour rechercher des bois de construction et des bois de chauffe pour leur propre usage. Les producteurs de charbon de bois menaient quant à eux, une activité commerciale. Le niveau de l'exploitation forestière n'était certainement pas pérenne. La transformation de la forêt en une aire protégée permettra toujours une récolte de produits de subsistance mais de nombreuses ressources sylvicoles exploitées à Mandena devront être substituées d'ailleurs.

Introduction

The goal of this study was to quantify the utilization of forest resources by the local human population in the Mandena Forest. The data are intended to provide information on the degree and sustainability of resource exploitation. Specifically, baseline data for long-term monitoring and evaluation of the effectiveness of conservation initiatives.

Methods

Human activities were monitored from April to June 2000 in three forest fragments at Mandena (M3, M15, and M16), located some 9 km northeast of Tolagnaro. At the time of study in 2000, M3 measured 221 ha, M15 95 ha, and M16 53 ha. A more detailed description of the study sites is given in Donati *et al.* (Chapter 4.9).

Each morning, all individuals entering the forest were counted to ensure everyone's eventual exit. Individuals entering fragment M3 were professional charcoal producers from Tolagnaro. They followed a very regular work schedule, and their activities were monitored for seven days. The people using forest resources of M15 and M16 came from neighboring villages. They entered the forest more erratically according to their daily needs, and their activities were monitored for longer periods, i.e. 29 days in May and 11 days in June. Data on the human population were taken from documents provided by the local authorities of Tolagnaro, and by the socio-economic studies carried out by QMM (2001).

Results

At the time of the study, some 6323 people were living in the immediate vicinity of the study sites (Table 1). The average size of the 635 families in Ampasy Nahampoana was 5.4 people, and 5.6 for the 515 families in Mandromondromotra.

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Table 1. Human population in villages neighboring the study sites of Mandena, including ethnic group affiliations. Numbers indicate the total number of individuals per village.

Village	Ethnic composition	Males	Females	Total
Ampasy Nahampoana	Antanosy: 26.8%	1714	1728	3442
	Antesaka: 50.5%			
	Antandroy: 22.6%			
Mandromondromotra	Antanosy: 92.4%	1427	1454	2881
	Antesaka: 6.7%			
	Antandroy: 0.9%			
	Antemoro: 0.1%			
	Vezo: 0.03%			

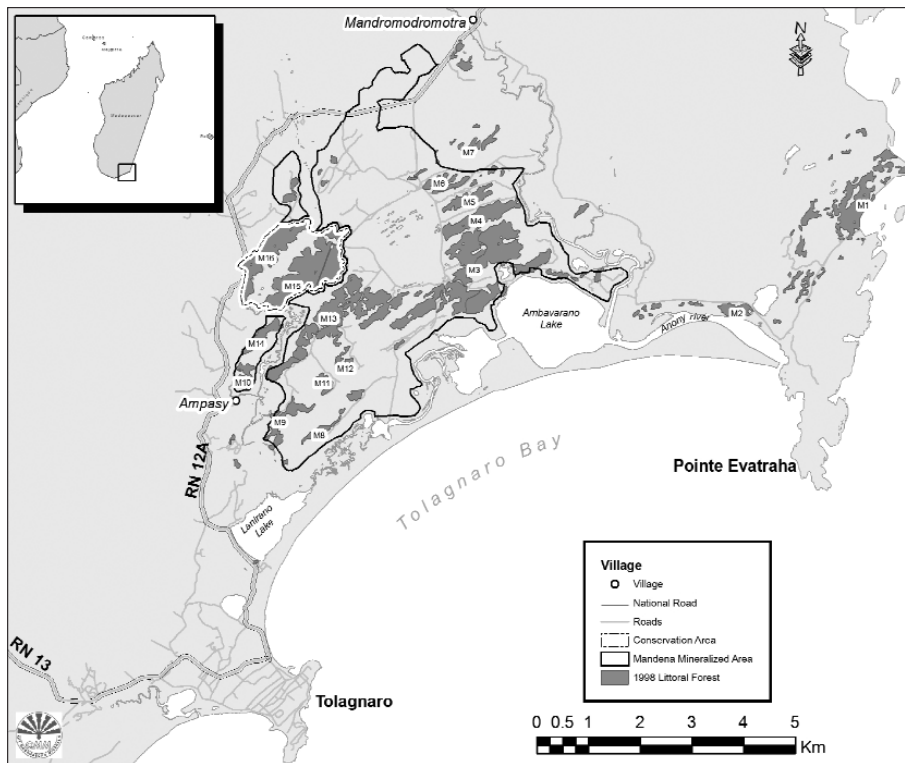


Figure 1. Location of study sites and neighboring villages.

About 75 people entered the M3 forest each day. Fifty of them were professional charcoal makers from Tolagnaro, and all belonged to the Antandroy ethnic group. The other 25 individuals came from other ethnic groups (collectively called “Antanosy” in Table 2) of the neighboring villages to collect fire and construction wood primarily for personal needs (Table 2).

The first individuals entered the forest at 5.50 h and the last left at 17.40 h. In M3, more than 25 people were continually present in this forest fragment between 8.00 and 14.00 h. This represents a density of 11 humans/km². Maximum densities with more than 70 people (corresponding to 32 humans/km²) were reached between 9.30 and 10.00 h (Fig. 2). No evidence of hunting was observed during this study.

Table 2. Number of people entering the M3 forest at Mandena per day. Values are means and standard deviations.

	Charcoal makers				Other resources			
	Ethnical group		Origin		Ethnical group		Origin	
	Antandroy	Antanosy	Tolagnaro	Neighboring villages	Antandroy	Antanosy	Tolagnaro	Neighboring villages
Male	38 ± 6	-	100%	-	-	15 ± 5	20%	80%
Female	12 ± 4	-	100%	-	-	8 ± 4	-	100%
TOTAL	50.6 ± 7.6				23.7 ± 8.9			

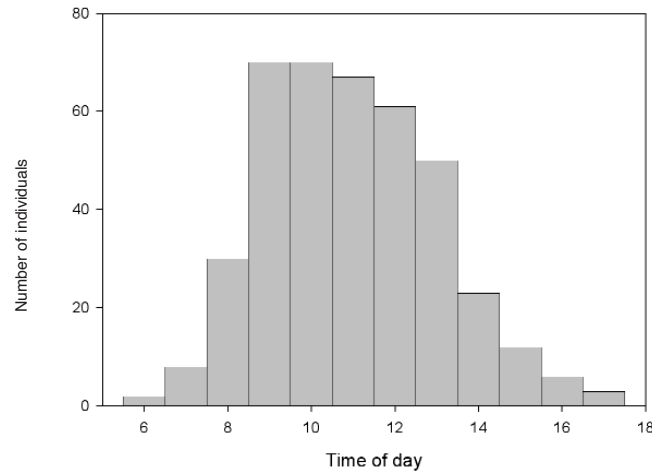


Figure 2. Temporal distribution of humans present in the M3 forest of Mandena.

Charcoal fabrication had ceased in M15/M16 after the installation of the ecological center in M15 in 1997. Therefore, the figures presented here are derived from exploitation in M3. Systematic searches revealed 10.6 active charcoal pits per ha in M3. The average size of the charcoal pit was $5.7 \pm 1.17 \text{ m}^2$ ($n = 53$). The number of trees required to fill one pit ranged from 2 - 16. It takes 1 - 7 people to cut the wood and prepare it (1 - 3 days) and place it in the charcoal pit (0.5 - 2 days; Table 3). One half-day is needed to dig the charcoal pit. Once the pit is filled with the cut wood, it is cov-

ered with green leaves and sand, about a half-day of work. The wood is then set on fire and is allowed to burn for 3 - 7 days. The variation associated with these figures depends not only on the number of people involved, but also on the type of wood. Men are responsible for cutting the wood, digging the pit, and arranging the wood in the pit, while the balance of the tasks is done by women and children. The numbers listed in Table 3 illustrate that during the period of this study, 18 - 25 trees with DBHs ranging from 5 - 35 cm were cut everyday in M3 for the production of charcoal.

Table 3. Some characteristics for charcoal production in the Mandena Forest. Values are means and standard deviations.

Dimensions of a pit [m]		Number of trees cut / pit (DBH [cm])				Number of new pits / day	Number of days needed for preparation	Number of working people per pit
Length	Width	< 10	10 - 15	> 15	Total			
2.9 ± 0.7	2.0 ± 0.5	4.7 ± 2.1	3.2 ± 1.6	0.9 ± 0.9	8.6 ± 3.2	2.1 ± 1.6	4.5 ± 1.2	2.3 ± 1.2

While charcoal making was restricted to people coming from Tolagnaro, people from the villages surrounding the Mandena forest collected a variety of wood resources for their daily needs (Tables 2, 4, 5). These people spent varying amounts of time in the forest. Charcoal producers spent on average 8 h and 25 min per day in the forest. People collecting wood for construction or firewood spent an average of 7 h and 20 min in the forest per day. Collection of forest resources comprises only part of the occupations of the people living in the neighborhood of Mandena. In contrast, charcoal making is a fulltime profession.

Discussion

The intensity of forest resource utilization during the period of study does not represent a sustainable degree of exploitation. Charcoal production was intensified in 2005 and resulted in the destruction of the remaining M3 forest. While fragment M3 had been outside the immediate zone of exploitation of individuals from the local communities and, therefore, had been targeted by immigrant charcoal producers, the forests of M15 and M16 are very close to the neighboring villages and it is in the interest of these communities to maintain resource extraction at

Table 4. Forest products extracted from different forest fragments in Mandena per day. Values are medians and quartiles.

	April (M3)	May (M15/M16)	June (M15/M16)
Number of days of observation	7	29	11
Roughed squared wood beams ($\geq 7 \times 7 \times 400$ cm)	31	41	32
	22—33	35.5—48.5	25—41
Poles (diameter 5 - 10 cm)	18	14	8
	13—49	11—23.5	5—16
Poles (< 5 cm DBH to make fences and walls for houses)	2	4	1
	2—6	2—6.5	0—4
Firewood	8	6	5
Packages of 100 sticks	4—12	2.5—12	2—7
Packages of <i>Pandanus</i> leaves (20 - 30 leaves/package)	3	1	1
	0—4	0—5	0—4

Table 5. Summary of daily resource utilization of the fragments M3, M15, and M16 of Mandena.

Activity	Number of people/day	Origin	Resources	Number of trees cut
Charcoal making	50	Tolagnaro	16 trees/charcoal pit; 2 pits/day	12 - 25 trees in M3
Fire wood and wood for construction	25	Neighboring villages	30 - 40 squared wood beams 8 - 18 poles several bundles of sticks	50 trees in M3, M15, M16
Other	< 5	Neighboring villages	1 - 3 bundles of 20 - 30 <i>Pandanus</i> leaves	Whole plants cut

About one third of the people entering the forest were collecting small sticks, poles (> 5 cm diameter), and roughly squared wood beams of the standard size to be used for construction ($\geq 7 \times 7 \times 400$ cm). The collection of *Pandanus* leaves to be used for weaving and the building of houses has a major impact on the population of these plants because the whole plant is cut in order to collect the leaves. In total, about 60 - 70 *Pandanus* trees were cut every-day in the three forest fragments.

a sustainable level.

In a collaborative approach, a dina was established to prevent further degradation and destruction of M15 and M16 (see Rarivoson Chapter 6.1). This resulted in the creation of the clearly delimited, 230 ha Mandena Conservation Zone in 2002. A team of wardens was established, which included individuals from Eaux et Forêts, the local villages, and QMM. The team not only controls the conservation zone, but also promotes public awareness, education,

and environmental training among the local people. A variety of alternative income activities were also promoted. Six months after these activities commenced the excessive and unsustainable exploitation pressures on this forest block had ceased.

By 2005, significant differences in forest structure associated with habitat regeneration were noted. However, in 2006, people from more distant villages outside the zone of the dina, entered the forest and cut some trees. This illustrates that the conservation issues have to be approached at a regional, as well as at a local level. Furthermore, the forest resources previously extracted from the Mandena Conservation Zone by the neighboring villages clearly had to be substituted. Perhaps wood from the introduced and highly invasive *Melaleuca quinquen-*

ervia and from other exotic tree plantations can replace some of the construction material and firewood previously gathered by these people from the forest. However, these resources are also limited and may not be sufficient to satisfy the need of the growing population. Thus, a regional, or even a national initiative to manage the utilization of natural forest products is required.

References

QIT Madagascar Minerals (QMM). 2001. Ilmenite Project. Social and Environmental Impact Assessment, Vol.1, Chapter 3. Presented by QIT Madagascar Minerals S.A. to the Madagascar National Environment Office, May 2001.

