POPULATION DENSITIES
FROM 2008 TO 2017
AT AMBATOVY-ANALAMAY FOREST IN MADAGASCAR

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INTRODUCTION

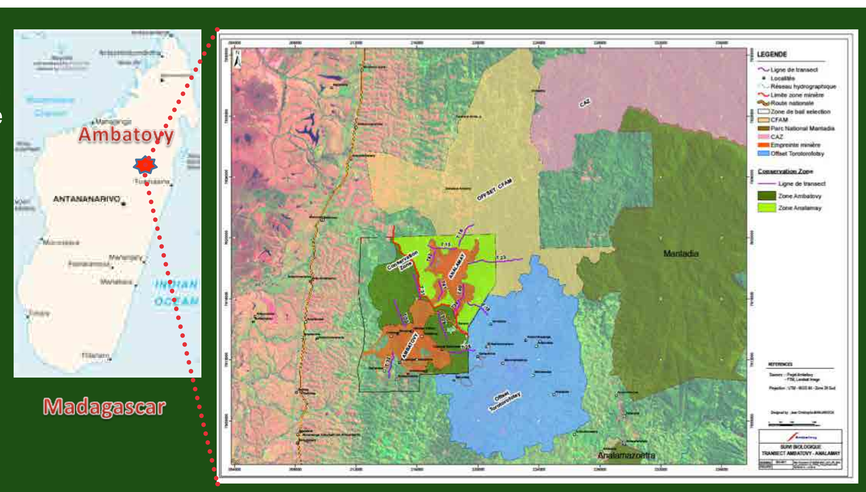
The Ambatovy mining company operates in an open-pit located at the southern edge of the eastern rainforest of Madagascar. The mine footprint is surrounded by a conservation zone called Ambatovy-Analamay forest (5510 ha). The Ambatovy-Analamay forest bloc is connected with the Analamay-Mantadia forest corridor where 14 species lemurs occur. The Ambatovy-Analamay conservation zone itself harbors 11 species of lemurs: six species nocturnal, two species cathemeral and three species diurnal.

Objective:
The study aims (i) to monitor the lemur population in the surrounding areas of the Mine site, (ii) to assess the change of the lemur population over years in the aim to improve habitat management and conservation measures.

METHODOLOGY

Seasonal monitoring of the lemur population density and distribution has been conducted since 2008, within height permanent transects (2km each) located throughout the Conservation zones around the mine footprint. Distance sampling method was implemented, with a total of 28,800 hours of observations between 2008 and 2017. Observations were conducted in the morning, afternoon and night time. The data analysis was conducted using the formula: D = Nt/ (2× ESW × Lt)

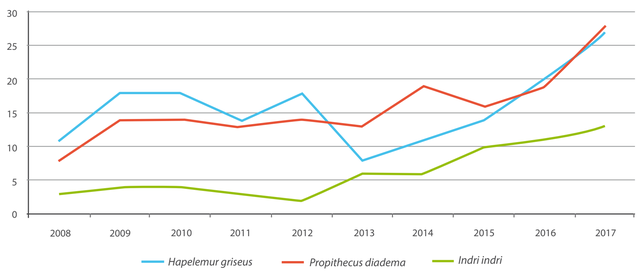
D: species density (individual/Km^2); Nt: total number of the species observed
ESW: perpendicular distance between the observed animals and the transect line
Lt: total length of the transect
(Schmid, 2000; Norscia et al., 2006; Banks et al., 2007; Gardner et al., 2009)



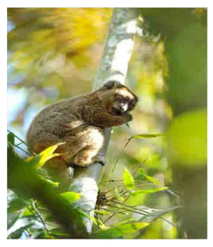
Map of conservation zone and protected area around Ambatovy with the permanent transect

LEMURS DENSITY IN AMBATOVY BETWEEN 2008 TO 2017

Diurnal species



Propithecus diadem

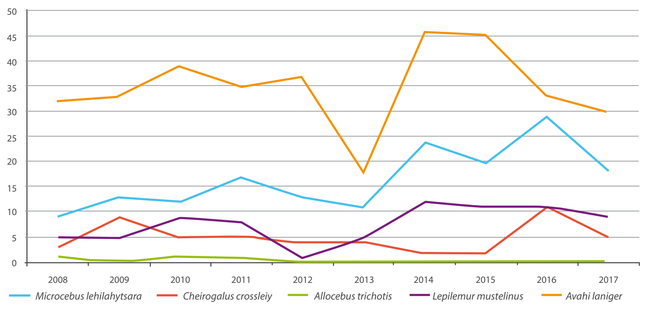


Promelur simus

Hapalemur griseus

Indri indri

~~Noctural~~ species



Microcebus lehilahytsara.

Daubentonia madagascariensis

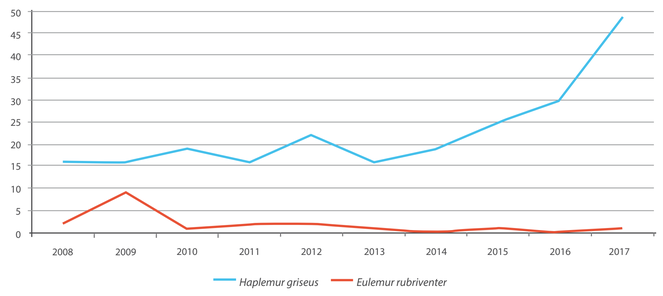
Allocebus trichotis

Lepilemur mustelinus

Avahi laniger

Cheirogaleus crossleyi

Cathemeral species



Eulemur rubriventer

Eulemur fulvus

RESULT OF CONCEPT BETWEEN 2008-2017

Three patterns have been observed:
(i) An increase of the density of *Microcebus lehilahytsara, Lepilemur mustelinus, Hapalemur griseus, Eulemur fulvus, Propithecus diadema* and *Indri indri* has been recorded between 2008 and 2017. Three species are frequently observed and abundant: *Avahi laniger, Propithecus diadema* and *Microcebus lehilahytsara*

(ii) a decrease of the density two lemurs species: *Allocebus trichotis* and *Eulemur rubriventer* have become more difficult to find in the area since 2012. Only, seven individuals of *Daubentonia madagascariensis* were observed during these nine years, and the density cannot evaluate.

(iii) the diurnal lemur species as well as large-sized nocturnal species such as *Avahi laniger* remain stable in terms of abundance and distribution in the area.

Observations:
A general decrease of the lemur population was observed in 2013, except for *Indri indri*, representing high resilience to weather change. This might be due to the passage of Giovanna cyclone (in February 2012). It has affected the birth rate and the habitat quality. The lemur population has recovered quickly from the impact of the cyclone. *Allocebus trichotis* and *Eulemur rubriventer* become rare in the forests, thus, difficult to observe.

DISCUSSION

The increase of the lemur population could be explained by an increase of birth rate as well as the arrival of new groups from the Mine footprint. The paced and directional tree clearing implemented as part of the mitigation approach allows the groups of lemurs to move freely from the clearing zones to the conservation zones. The decrease of the density and encounter rate for some of the lemur species such as *Allocebus trichotis* and *Eulemur rubriventer* would possibly reflect the impact of the mining activity to their habitats. According to their behavior, these two species are sensitive to habitat change and disturbance.

The differences in densities show the responses of each species to the possible disturbances from the mining activities, or climate followed by the destruction of the habitats.

The tolerance of the edge effects could be attributed to the successful recruitment of some of the species, particularly the nocturnal species, such as *Avahi laniger* and *Lepilemur mustelinus*. However, a negative trend of the nocturnal species population has been observed during the last couple of years. More in-depth studies are ongoing to assess the possible cause of this decrease.

CONCLUSION

This monitoring of the lemur population at Ambatovy-Analamay Conservation zone demonstrates the variation of the population growth and their distribution across years. The data show the different responses of each species to habitat disturbances from the mining activities and their recruitment.
These results will inform the management of the lemur population and the conservation zone itself and in the surrounding area.

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