

MA46 Regional biogeography, ecology and behaviour of nocturnal lemurs in the dry deciduous forest of northwestern Madagascar

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Lemurs are 100% endemic to Madagascar and confined to the remaining forest habitats of the island. They are a highly diverse taxonomic group (>100 species) and at the same time the most threatened group of mammals with about 94% of all assessed species being categorized as either vulnerable, endangered, or critically endangered (IUCN workshop Antananarivo/Madagascar, July 2012). Many factors contribute to the prominent conservation crisis on the island. Among the most important ones are the constant loss of forest habitats that coincides with an increasing degree of forest fragmentation and the rather small geographic distributions of many lemur species being often restricted to areas smaller than Cyprus or Jamaica. In addition, remaining forests are often altered by selective logging or wood extraction, and many lemur species are still locally hunted (Mittermeier et al. 2010).

In this situation, it is of utmost importance to understand their local and regional distribution as well as the behavioural constraints, ecological plasticity and ecological requirements of each lemur species in order to determine their vulnerability towards becoming extinct in the near future. Extant Malagasy lemurs have very diverse ecological requirements (microhabitats, sleeping sites etc.), activity patterns (nocturnal, diurnal, cathemeral), feeding habits (folivores, frugivores, omnivores), body sizes (40g - 9.5kg) and social grouping patterns. However, the interactions between these parameters, their local abundance, and the spatial distribution of lemur populations in fragments are still largely underexplored.

A total of nine lemur species have been reported from the Mariarano area, six of which are nocturnal (*Microcebus murinus*, *Microcebus ravelobensis*, *Cheirogaleus medius*, *Phaner pallescens*, *Lepilemur edwardsi*, *Avahi occidentalis*) and three are diurnal or cathemeral species (*Eulemur fulvus*, *Eulemur mongoz*, *Propithecus coquereli*) (Olivieri et al. 2005, Mittermeier et al. 2010). Five of them are categorized as endangered in the most recent IUCN assessment (IUCN 2012). Nocturnal lemurs are generally much less studied than their diurnal cousins but face the same anthropogenic threats. They are therefore chosen as study subjects for this project.

The aim of this study is to study the abundance, spatial distribution, ecology, and behaviour of three different nocturnal lemur genera (*Microcebus* spp., *Lepilemur edwardsi*, *Avahi occidentalis*) in various forest fragments in the Mahamavo region, northwestern Madagascar. Mouse lemurs (*Microcebus* spp.) live in a dispersed neighbourhood system with animals forming sleeping groups during day and foraging solitarily at night (Radespiel 2006). *Lepilemur* and *Avahi* are pair-living cat-sized lemurs, in which pair partners can be either far (*Lepilemur*) or close to each other (*Avahi*) during nighttime (Goodman & Benstead 2006). Dissertation topics may be grouped into two major project areas dealing with (a) population ecology and distribution of lemurs, (b) behavioural ecology of nocturnal lemur (see below).

Methods

Study Site

The project will be conducted in the Mahamavo area in northwestern Madagascar, close to the village of Mariarano. Natural habitats in this area consist of a matrix of wetlands, mangroves, riverine and dry forest. The dry deciduous forest fragments of the area vary in size and surround the camp sites (Figure 1). Various forest trails and a 16 ha grid system (400m x 400m) allow access to the forest and will be used for systematic data collection.

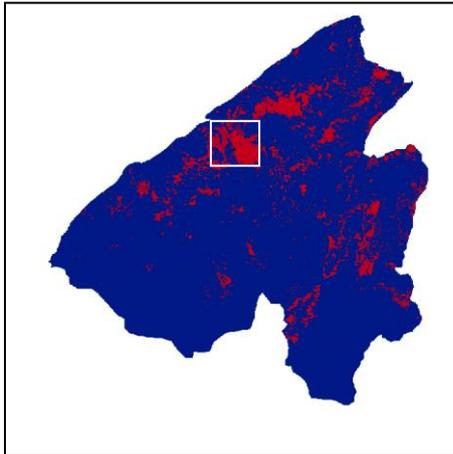


Figure 1: Map of the Mahamavo forest area (in white box) within the region of Mahajanga. In red: forest, in blue: deforested area (map was prepared by Dr, Peter Long from Oxford University).

Data collection methods

Capture-recapture techniques

Mouse lemur capture sessions are typically performed overnight with the help of Sherman Live Traps that are baited with banana in the afternoon and checked in the early morning. The installation of traps in different habitat types and at varying distance from forest edges will allow testing the influence of these parameters on mouse lemur abundance. Captured mouse lemurs will be marked, sexed, and assigned to their respective species. They will also be measured morphometrically in order to obtain physical data on body size, body dimension or body condition that may be relevant for certain questions. All mouse lemurs will be released at their individual capture sites at dusk. Capture data will allow determining species-specific abundance in different fragments or forest parts but also to test for edge responses of both species in a comparable way.

Behavioural observations

Systematic behavioural observations can be conducted during nocturnal survey walks and during the handling or release of mouse lemurs. The aim of direct observations could be to obtain data on inter- and intraspecific differences in personality traits.

Nocturnal surveys

Data on the spatial distribution and habitat use of nocturnal lemurs species are typically collected by means of nocturnal survey walks (Duckworth 1998) which need to be complemented with capture-mark-release sessions in the case of mouse lemurs (*Microcebus* spp.), since grey and golden-brown mouse lemurs cannot be easily distinguished during nocturnal surveys (Rakotondravony & Radespiel 2009). During systematic survey walks, all lemur encounters are documented for each species of

interest together with the perpendicular and animal-observer distance. Complementary data can be simultaneously collected on the used microhabitats (e.g. substrate use, height above ground), group size, and behaviour (e.g. locomotion, feeding, flight response, vocalization) that will allow the test of specific hypotheses. Each survey walk takes between 2-3 hours depending on survey length (1-1.5km).

Depending on the topic that is chosen and developed within this general framework, some of the above mentioned methods can or need to be combined and conducted in parallel. Student projects may focus on different aspects of the distribution and ecology of the three nocturnal lemur genera (see list of topics below).

Possible student topics:

- 1) Habitat plasticity of nocturnal lemurs along a steep ecological gradient from dry forest to mangroves (field methods: CMR-techniques, nocturnal surveys from boat and on land).
- 2) Population ecology and edge dynamics of nocturnal lemurs (field methods: CMR-techniques, nocturnal surveys, microhabitat analyses)
- 3) Species-specific personality in mouse lemurs along the boldness – obstinacy axes (field methods: CMR-techniques, handling, release observation → correlate behaviour during handling and release)

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