

Impacts of edge effects on lemur communities in Madagascar's eastern rainforests

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Edge effects are dynamic zones characterized by the penetration of conditions from the surrounding environment (matrix) into the forest interior, the result of interactions between two adjacent ecosystems when the two are separated by transition (Murcia, 1995; Lehmann et al., 2006). The contact between the matrix and the forest is the primary cause of edge effects (Murcia, 1995). Research investigating the response of lemurs to edge effects is relevant in Madagascar because the remaining forests of Madagascar are highly fragmented. Currently, Madagascar has huge issues regarding edge effects because up to 80% of the original forest area has been lost (Irwin et al., 2010). Species' responses to edge effects are often site-specific, and the results cannot be generalized to produce a general theory of edges (Murcia, 1995). Little is known about how lemurs respond to edge effects. My study aimed to investigate how edge effects influence lemur distribution and forest structure and composition in eastern Madagascar, specifically in Iofa. My specific objectives were: (i) record which lemur species were present in the forest, (ii) determine whether lemur distribution varies along the edge-interior gradient, (iii) determine how vegetation structure and composition change along the edge and into the forest patch (edge-interior forest) gradient. A total of five transects of 3,000 m were set up for lemur distribution surveys. Each of the five transects ran perpendicular from the edge to the interior of forest and each transect was at least 1 km distant from any other transect. These transect lines were sampled day (between 06:30–12:00) and night (between 18:30–02:00) from February to May 2017 in order to assess distribution and density of the lemur species present. Fifteen botanical plots were set up to characterize the forest structure and composition across the transect gradient. Vegetation structure and composition was evaluated through three botanical plots (40 m x 40 m) along each transect. Six nocturnal species (*Avahi laniger*, *Cheigoleus major*, *Lepilemur microdon*, *Lepilemur mustelinus*, *Microcebus lehilahytsara* and *Microcebus. rufus*) and six diurnal taxa (*Eulemur fulvus rufus*, *Eulemur rubriventer*, *Hapalemur griseus griseus*, *Indri indri*, *Propithecus diadema diadema* and *Varecia variegata variegata*) were sighted during surveys. We also found bite marks on trees which indicate the presence of *Daubentonia madagascariensis*, however no individuals were seen during the surveys. No significant difference was found between the average distance of the distribution of each lemur species and the expected mean of 1500 m. However, two lemur species showed a pattern which indicated a preference for edge or interior forest. *E. f. fulvus* showed a tendency towards a preference to the edge, whereas *P. d. diadema* showed a tendency towards a

preference to the interior of the forest. In addition, we found the interior forest had higher rates of plant species richness and abundance compared with the middle and forest edges. Moreover, at the forest edge, we found that trees (for those >10 cm in diameter at breast height) were smaller in size and shorter compared to the trees in the forest interior.

This study highlighted the importance of the fragmented forest in Madagascar for lemur conservation. Fragmented forests are often undervalued for conservation purposes. We have updated the species list of lemurs in Iofa in 2017. The last survey found eight species (Schmid et al., 1999). These results are crucial for lemur conservation in Madagascar because they show that Iofa has the potential to be considered important for lemur conservation in terms of species richness, despite the fact that this site is not presently listed as a protected area. Further to this, understanding how lemur species respond to the edges constitutes an important parameter for the viability of these taxa. Moreover, this study also allows us to understand more about the ecology of the habitat of each lemur species detected. Understanding the ecology of the habitat ecology of these lemur species will enable us to elaborate or to reinforce conservation policy in near future.



Iofa team (guides, students, cook and principal investigator)