

“Effects of Anthropogenic Disturbances on Vegetation Structure and Diversity in the Tropical forest of Ranomafana, Madagascar”

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1. Background and purpose

Deforestation leaves tropical rain forests highly fragmented, which creates isolated areas too small to maintain populations. Madagascar is globally recognized as one of the most important biodiversity hotspot in the world because of the remarkable richness of its fauna and flora, and the high rate of endemism. However, over the past decades, anthropogenic disturbance have been considered as a major factor of forest loss by traditional practice of shifting cultivation, slash and burn agriculture, bushfire, and other detrimental practices. Efforts were put by conservationists to contain growing deforestation by various activities such as the establishment of new protected sites, extension of protected areas, enforcement of conservation policy. Conversely, residential population, who have been depending on forest resources to survive were often overlooked. Thereby, another approach of conservation, which takes into account both indigenous people’s livelihood and forest conservation, is tremendously important. Besides, human disturbance is not necessarily detrimental to forest ecosystem. According to David Wilkinson’s intermediate disturbance hypothesis (IDH), local species diversity is maximized at an intermediate level of disturbance (Grime 1973; Connell 1978; Huston 1979; Wilkinson 1999). In other words, people’s forest resource utilization can influence species diversity.

2. Methodology

One transect line of 500 m in each eleven surveyed site called “Zone” were conducted to assess local vegetation. Each transect is endowed with five (10m x10 m) plots with 100 m distance from each other. Various ecological data such as species name, tree height, diameter at breast height (DBH), GPS data, satellite coverage, basal area, and many other variables were recorded to secure information on local vegetation diversity and structure. Statistical tool such as the software “R” and SPSS were used to analyze the gathered data, and Non-Metric Multidimensional Scaling (NMDS) function, and Jaccard index were applied to highlight dissimilarities between each site. Also, data on the degree of disturbance in different sites of unprotected forest were gathered by direct site observation, semi-structure interview, and by counting of logged tree.

3. Result

161 genera, and 68 families of tree were observed in the entire surveyed sites. Biodiversity indices reveal that unprotected areas are endowed with high rate of biodiversity compared to protected area. Shannon index in unprotected forest called Zone G is highest ($H'=3.69$), followed by Zone E with $H'=3.47$, whereas, protected forest comes only at third position with a Shannon Index $H'= 3.44$. Moreover, Logging data and interview indicate that anthropogenic disturbance in this area is at an average level supporting to some extent David Wilkinson’s hypothesis in the tropical forest of Ranomafana. Hence, it is drastically essential to maintain adequate degree of anthropogenic disturbance. Moreover, forest conservation policy should promote adequate forest utilization, rather than always barricading people’s access to forest. Establishing harmony between local people and forest utilization should be prioritized, as it can constitute a viable solution to mitigate ongoing deforestation.

Table: Summary of Biodiversity index in each surveyed sites.

B.I.	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Zone H	Zone I	Zone J	Zone K
S	47	45	40	34	49	62	65	41	40	41	50
D	0.05	0.06	0.05	0.07	0.05	0.05	0.04	0.06	0.06	0.06	0.08
1-D	0.96	0.94	0.95	0.93	0.96	0.95	0.96	0.94	0.94	0.94	0.92
1/D	22.22	16.67	20	14.29	22.22	18.87	27.03	16.66	25.64	16.13	12.99
H'	3.44	3.19	3.3	3.02	3.47	3.34	3.69	3.16	3.2	3.16	3.19
E	0.89	0.84	0.27	0.86	0.89	0.81	0.88	0.85	0.87	0.85	0.82

(B.I.: Biodiversity Index, S: Species Richness, D: Simpson Index, H': Shannon Index, E: Species Evenness; Protected primary forest: Zone H, I; Protected secondary forest: Zone A, K; Boundary of primary and secondary forest: Zone J, Unprotected forest: Zone B, C, D, E, F, G)