

Using Camera Trap Database to Assess Altitudinal Range of *M. fascicularis* and *M. nemestrina* in West Sumatra, Indonesia

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Abstract – The co-existence of *Macaca fascicularis* and *Macaca nemestrina* has been known for a long time. However, species that are living sympatrically use a niche differentiation strategy to avoid competition. We investigate whether altitude range affects the presence and absence of *M. fascicularis* (long-tailed macaque) and *M. nemestrina* (pig-tailed macaque) at several types of elevations in the forest area of West Sumatra. The presence and absence of data were recorded using camera traps. This study indicates that the altitude of the location is one of the factors affecting the presence of *M. fascicularis* and *M. nemestrina*. *M. fascicularis* prefers a location in the lowlands or an altitude of less than 900 masl, while *M. nemestrina* can be found in almost all types of altitude up to the sub mountains forest area up to a location of more than 900 masl.

Keywords – *Macaca Fascicularis*, *Macaca Nemestrina*, Altitude Levels.

I. INTRODUCTION

Primates can co-exist in the same habitat and for long periods. However, [1] explained that each species must have a separate ecological niche, or matters relating to resources for growth and reproduction must be different from other species. Indonesia provides a suitable habitat for two Macaques species to co-exist, e.g., *Macaca fascicularis* (long-tailed macaque) and *Macaca nemestrina* (pig-tailed macaque). They have shown the similarity of food preferences that could lead to competition over similar resources, particularly for populations with the same food source and have a similar adaptive pattern ([2]).

Research on ecological niche separation in *M. fascicularis* and *M. nemestrina* has been conducted by [2] in Sumatra using census or direct survey methods. That study observed that these two monkey species showed niche separation based on relative density in various habitat types. *M. fascicularis* found mostly in riverbank habitats, forest edges, and

secondary forest habitats in the lowlands, whereas *M. nemestrina* usually found in primary forests, especially mountains.

Camera traps can monitor the animal presence and absence data for a long period without direct contact between researcher and animal subject. Most of camera trap-based studies have proven the effectiveness of using camera traps in monitoring the presence of wild animals that normally avoid contact with human presence ([3], [4], [5], [6]).

This study aims to determine the ecological distribution of *M. fascicularis* (long-tailed macaque) and *M. nemestrina* (pig-tailed macaque) at different elevations in the forest area of West Sumatra. We expected the result would be useful as a basis for species conservation and habitat management of *M. fascicularis* and *M. nemestrina*.

II. MATERIAL AND METHODS

2.1 Study Area

We placed camera traps for one year-round in the conservation forest area of TKA (Tidar Kerinci Agung) in

Solok Selatan, West Sumatra. We included additional supported data from a previous study in different elevations (Figure 1) and (Table 1).

Table 1. Location, data owner, number of camera location, and total trap night

No.	Location	Data owner and year	Number of camera locations	Total trap night
1	HPPB	Junaidi (2012) dan Wido (2013)	8	856
2	Anai	Alan (2013) dan Fika (2017)	13	672
3	Mahat	Shobri (2015)	5	342
4	KSI	Inda (2015)	8	966
5	Nyarai	Dwiyanto (2015)	6	472
6	Rimbo Panti	Tomi (2016)	11	449
7	Supayang	Bunga (2014) dan Erik(1016)	12	2592
8	Malampah	Nindy (2015)	10	303
9	TKA	Inda (2015) dan Monitoring PT TKA (2016-2017)	37	5872

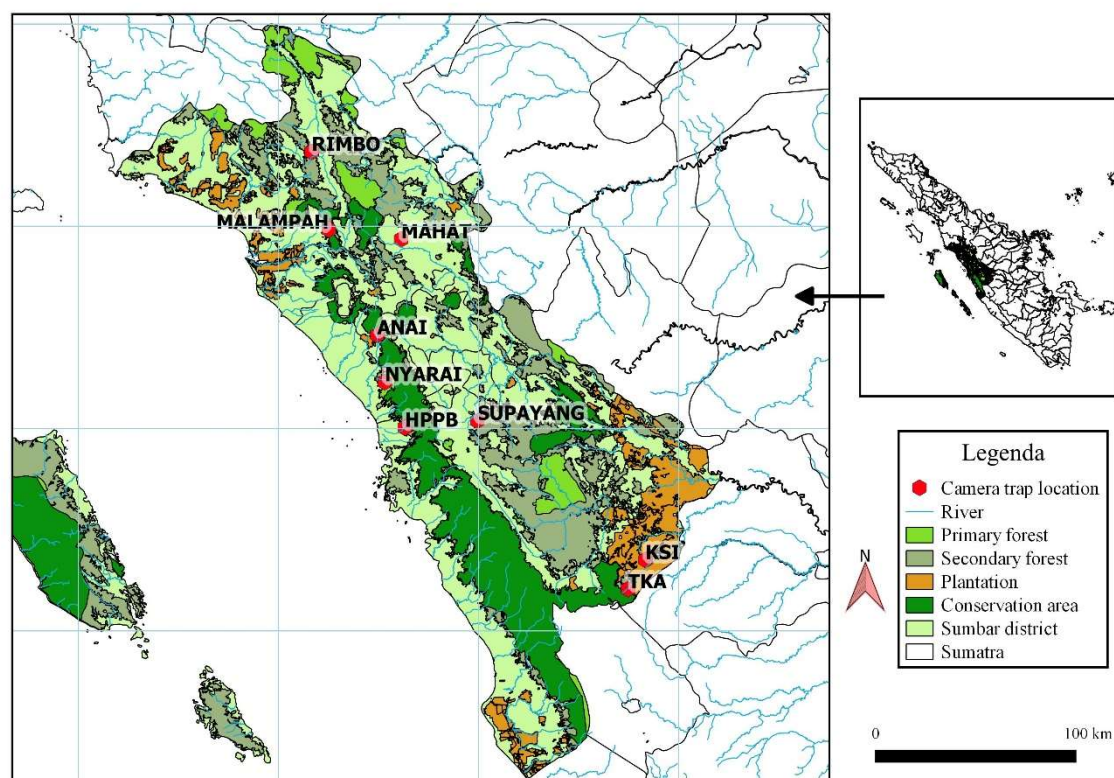


Figure 1. Map of location for camera traps in various forest types

Information :

HPPB	HPPB (Hutan Pendidikan dan Penelitian Biologi, Universitas Andalas)
Anai	Cagar Alam Lembah Anai
Mahat	Nagari Mahat Kabupaten 50 Kota
KSI	PT Kencana Sawit Indonesia Solok Selatan
Nyarai	Kawasan Objek Wisata Alam Nyarai Kecamatan Lubuk Alung
Rimbo Panti	Cagar Alam Rimbo Panti Kabupaten Pasaman
Supayang	Hutan Kalaweit Supayang Kabupaten Solok
Malampah	Suaka Alam Malampah Kabupaten Pasaman
TKA	PT Tidar Kerinci Agung Solok Selatan

2.2 Camera trapping

Camera traps were placed in several locations that might be animal trails [7]. Data management and preliminary analysis were assisted with software developed by Sanderson and Harris [8]. The software generates a table of species location based on the GPS coordinates and the altitude. We categorized the distribution of *M. fascicularis* and *M. nemestrina* based on their habitat from lowland forest: <450 masl, hill forest: 450 - 900 masl, and sub-mountainous forest: 900 - 1,400 masl ([9]). For each altitude, we deployed xxxx camera traps for xxxx(time) months. We use a Generalized

Linear Model (GLM) with a stepwise-backward function in R to assess the relationship between presence and species and altitude we used [7].

III. RESULTS AND DISCUSSION

A total of 13 camera trap data were used in this study, placed into nine locations in West Sumatra with a 110 total camera location at various altitude. The results of installing the camera for 12,524 trap nights (active camera days) obtained 191 photos of *M. fascicularis* and 2,451 photos of *M. nemestrina*.

Table 2. presense of *M. fascicularis* and *M. nemestrina* at various altitude types

No.	Lokasi	Lowland forest		Hills forest		Sub mountains forest		altitude (masl)
		<i>M. f.</i>	<i>M. n.</i>	<i>M. f.</i>	<i>M. n.</i>	<i>M. f.</i>	<i>M. n.</i>	
1	HPPB	1	1	0	0	0	0	253-419
2	Anai	0	1	1	1	0	0	448-742
3	Mahat	0	0	0	0	0	1	938-1297
4	KSI	1	1	0	0	0	0	272-396
5	Nyarai	0	1	0	1	0	0	311-605
6	Rimbo Panti	1	1	0	1	0	0	216-871
7	Supayang	0	0	0	1	0	1	815-1017
8	Malampah	0	0	0	1	0	1	650-1113
9	TKA	1	1	1	1	0	1	432-1041

The presences of *M. fascicularis* does not record in the sub-mountain forest from all camera trap locations in our study. *M. fascicularis* tends to be found only in lowland forests and hills forests, namely at the locations of HPPB, KSI, Rimbo Panti, TKA, Nyarai, Anai, Malampah, and Supayang, with an altitude range from 216 to 871 masl. *M. fascicularis* is more likely to be found at low altitude and flat terrain. *M. fascicularis* commonly found in mangrove forests, followed by mixed mangrove forests and river sections in lowland forests [2].

M. nemestrina can be found in almost all types of altitude up to the sub mountains forest area. Our result aligned with [9] where *M. fascicularis* and *M. nemestrina* occupy different types of forest habitat, *M. fascicularis* can be found in lowland forest habitat types (<450 masl) and in hilly forests (450-900 masl), while *M. nemestrina* can be found from lowland forests to mountainous forests that reach an altitude of 1400-2400 masl.

Animals tend to select habitat that provides favorable conditions for their survival [10] for instance food

availability, the presence/absence of competitors and predators, mate choice, and shelter ([11, 12]. The following

GLM test results in analyzing the relationship between presence and each species and height:

Table 3. Results of the evaluating GLM, the relationship between presence and species and altitude

	Z value	
(Intercept)	-0.290	
Species <i>M. nemestrina</i>	7.357	***
Hills	-0.929	
Sub montains	-2.192	*
AIC : 198.987		
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1		

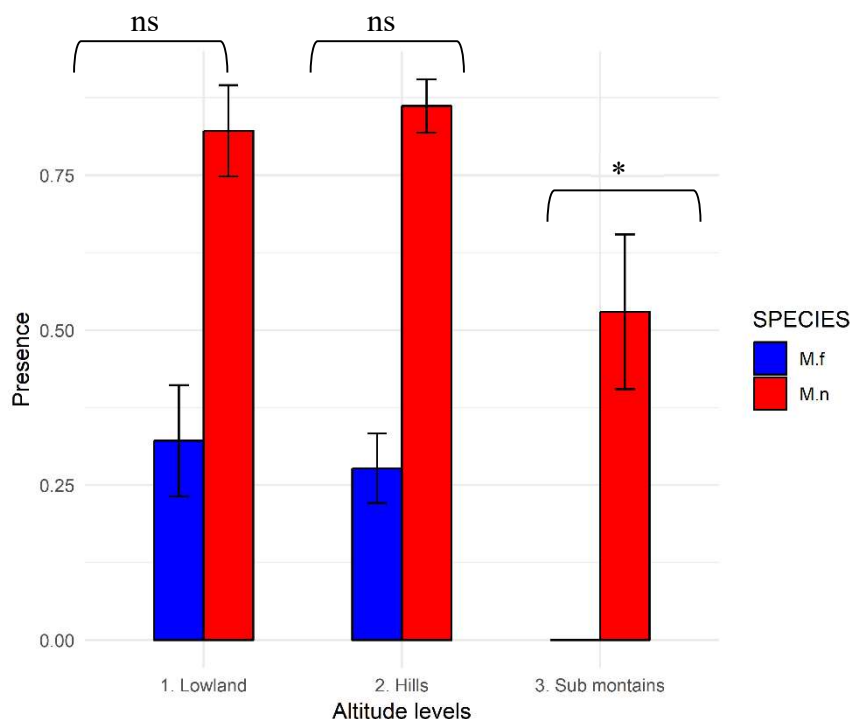


Figure 2. Presence of *M. fascicularis* and *M. nemestrina* based on altitude (* 'P = 0.05'; ns 'not significant'). Specification: lowland <450 masl, hills 450-900 masl, sub montains 900-1,400 masl

The GLM analysis results indicate that altitude is a significant factor affecting the presence of these two monkey species (Table 3). Figure 2 showed *M. fascicularis* absences in sub-mountain. The presence of both species is lower in sub-mountains compared to the other two altitude range. The higher the location, the more difficult it is to find *M. fascicularis*, while *M. nemestrina* is present in all altitude classes but the highest presence is in hilly areas or at an altitude ranging from 450 to 900 masl.

The result is confirmed with [9] in KSNP, that only *M. nemestrina* was found in mountain forests with an average height of 477 masl, few records of *M. fascicularis* in mountain forests and at elevations over 800 masl. *M. fascicularis* only recorded in the lowlands and Dipterocarpaceae's forest with a maximum height of 700 masl.

IV. CONCLUSIONS

The presence of *M. fascicularis* and *M. nemestrina* is significantly affected by the altitude. In our study, *M. fascicularis* only recorded in a location in the lowlands or an altitude of less than 900 masl. In comparison, *M. nemestrina* occupied in all range of altitude. We assumed that altitude is one of factor delimit the distribution of *M. fascicularis* and *M. nemestrina* in West Sumatra.

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