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Vegetation characteristics of the Javan slow loris habitat in Mount Masigit Kareumbi Protected Area, West Java, Indonesia

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Abstract. *Allasselcida A, Sumarga E, Sofiatin. 2024. Vegetation characteristics of the Javan slow loris habitat in Mount Masigit Kareumbi Protected Area, West Java, Indonesia. Biodiversitas 25: 2512-2520.* Habitat loss and degradation are major threats to the conservation of endemic wildlife in Indonesia, owing to the high rates of deforestation over the past decades. Most of these endemic animals are now at risk of extinction. Javan slow loris (*Nycticebus javanicus*) is a primate endemic to Java Island and is currently classified as critically endangered by the IUCN. This study analyzes four key aspects of the loris' habitat in Mount Masigit Kareumbi Protected Area (MMKPA), West Java: plant diversity, vegetation community structure and composition, plant species as food sources, and canopy density. A vegetation survey was conducted in three research sites using 41 nested plots measuring 20x20 m for trees, 10x10 m for poles and shrubs, 5x5 m for saplings, and 2x2 m for herbaceous plants. Data on plant species, diameter at breast height (DBH), and abundance (number of individuals) were collected within each plot. Forest Canopy Density (FCD) was mapped using Landsat 8 RAW Imagery and Landsat 8 TOA Reflectance Imagery, involving calculating several indices: Advanced Vegetation Index (AVI), Bare Soil Index (BI), Shadow Index (SI), and Thermal Index (TI). This study identified 104 plant species from 40 families across the three studied sites with dominant tree species were *Pinus merkusii*, *Schima wallichii*, *Actinodaphne procera*, *Pinanga coronata*, *Miconia crenata*, and various Setaria species. The diversity index at the three locations ranged from 3.02 to 3.41. This study found 35 species, including the dominant tree species, which served as food sources for slow lorises. The primary food sources available to slow lorises are sap (92.4%), followed by fruit (3.9%) and flowers/nectar (3.7%). The results of FCD analysis indicated that 83% of MMKPA has a "high" category, suggesting the presence of a continuous branch network that facilitates the easy movement of Javan slow loris. This information can be used to develop strategies for improve habitat management in the area, such as enriching fruit-bearing crops to increase food diversity.

Keywords: Conservation of endemic species, forest canopy density, habitat, *Nycticebus javanicus*, vegetation analysis

INTRODUCTION

The conservation of endemic wild animals in Indonesia faces many challenges, reflecting the complex interactions between environmental, socio-economic, and political factors. Some of the key challenges include habitat loss and degradation (Widyastuti et al. 2023), illegal wildlife trading (Nijman et al. 2019), human-wildlife conflict (Patana et al. 2023), and weak law enforcement (Purwanto and Susanto 2022). The combination of these challenges and the natural characteristics of endemic species, which have limited geographical ranges or special habitat requirements, implies that some of Indonesian endemic wildlife face a high risk of extinction.

One of the endemic wild animals currently threatened with extinction is Javan slow loris (*Nycticebus javanicus*) or locally known as Kukang Jawa. Javan slow loris is a primate endemic to Java Island and belongs to Lorisidae family. This primate is primarily characterized by its small body size with whitish gray hair, and on its back, there is a transverse brown stripe from the back of the body to the forehead (Nekaris 2014). Currently, Javan slow loris is listed as Critically Endangered (CR) under the International Union for Conservation of Nature (IUCN) (Rode-Margono et al. 2014), meaning that it faces the threat of extinction shortly. Imminent threats to this species include illegal animal trade, habitat loss and disturbances from human activities and roads, as well as intrinsic factors such as a long reproductive period with only one infant at a time (Sodik et al. 2020). Additionally, CITES 2007 changed the status of Javan slow loris from Appendix II to Appendix I.

The loss and degradation of the natural habitat of Javan slow loris is highly related to the history of deforestation in Java Island in the past (Karimloo et al. 2023), which is among the most densely populated islands in the world. The remaining natural forests on the island which serve as the primary habitat of many endemic wild animals are highly fragmented and mostly distributed in mountainous areas (Higginbottom et al. 2019). Currently, most of the remaining natural habitats in Java Island have been designated as conservation areas to preserve the biological diversity in the areas. This designation highlights the crucial role of conservation areas in protecting endemic wild animals and their natural habitat. Accordingly, effective habitat management of Javan slow loris is imperative to support the conservation of this primate in conservation areas.

Effective habitat management requires a combination of two key components, namely habitat protection from degradation and fragmentation, and habitat assessment and monitoring. Assessing the habitat of Javan slow loris will help understand its ecological characteristics, which are crucial to guide adaptive habitat management.

Javan slow loris is an arboreal and omnivore species. Hence, vegetation resources play crucial roles in supporting the survival of this primate. The diversity and structure of vegetation, particularly those that serve as food sources, are key indicators of habitat quality for Javan slow loris. This primate mostly consumes exudates, fruits, and nectar (Rode-Margono et al. 2014), implying that the information on food-producing plant species is necessary to evaluate the current availability of food resources and to guide habitat improvement strategy. The physical structure of vegetation, particularly canopy cover, is also a crucial component of Javan slow loris habitat. As an arboreal species, this primate requires continuous canopy cover to support its daily activities (Sodik et al. 2019).

Mount Masigit Kareumbi Protected Area (MMKPA), West Java, Indonesia is one of the conservation areas that serves as the natural habitat of Javan slow loris. This protected area is a habitat for native and introduced Javan slow loris. The reintroduction was carried out in Cimulu Hamlet (Pangeureunan Village) as part of the endangered animal conservation program to restore the Javan slow loris population and support this endemic species' long-term survival. On the other hand, the MMKPA is currently facing the risk of habitat degradation due to anthropogenic disturbances. A previous study by Sumarga et al. (2021) reported forest fires and encroachment inside the MMKPA that potentially disturb the habitat of Javan slow loris. Habitat assessment will provide information on the current condition of the Javan slow loris habitat and evaluate the effectiveness of habitat management strategies, including on how dealing with potential threats from anthropogenic disturbances.

Therefore, this research aimed to analyze the vegetation characteristics as the main component of the Javan slow loris habitat in MMKPA. Four characteristics of vegetation representing the Javan slow loris habitat were investigated, including vegetation species diversity, vegetation structure, food abundance, and forest canopy density. The information on forest canopy density is theoretical and can be practically applied to analyze habitat connectivity and detect the degree of habitat fragmentation. This study, with its comprehensive data on the diversity and structure of vegetation types, provides practical insights into the Javan slow loris' habitat quality and food resource availability. The implications of this primate conservation strategy are further discussed to inform conservationists with applicable strategies.

MATERIALS AND METHOD

Research location

This research was conducted in the Mount Masigit Kareumbi Protected Area (MMKPA) in West Java, Indonesia, which is designated as a conservation area in the form of a hunting reserve. This area spans the Bandung, Sumedang, and Garut Districts and is geographically located between 6°52’58.6”-7°0’12.80” SL and 107°50’58.6”-108°1’39” EL. With a total area of 12,420.70 hectares, the West Java Natural Resources Conservation Center (BBKSDA Jawa Barat) manages this area. Figure 1 presents the geographic and land cover information of MMKPA, which is dominated by secondary and plantation forests. This protected area features a hilly and mountainous landscape, with Mount Karenceng reaching the highest elevation at 1,736 meters above sea level (masl) and the slopes typically ranging from 20 to 30 degrees. It has type C the Schmidt Ferguson climate classification, with an average annual rainfall of 1,900 mm, air humidity fluctuating between 60 and 90%, and an average temperature of 23°C.

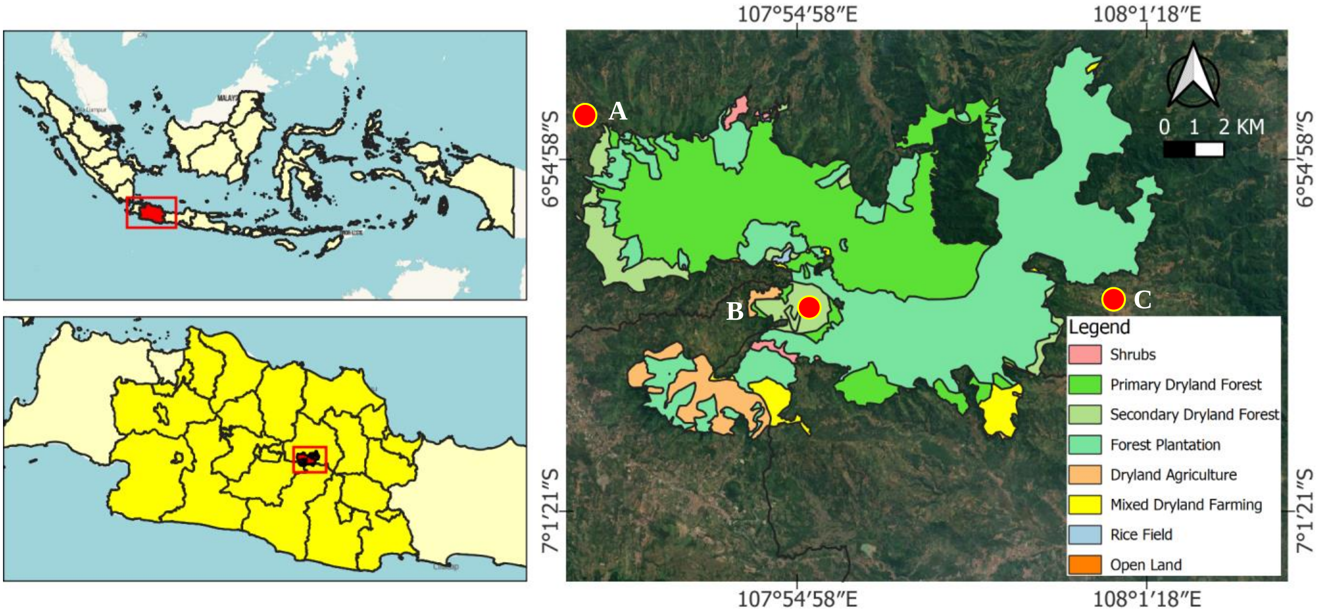

Figure 1. Map of study area and land cover of Mount Masigit Kareumbi Protected Area, West Java, Indonesia, i.e., A. Cigendel Village, B. Cimulu Hamlet (Pangeureunan Village), C. Cibugel Village

Plantation forests and primary dry land forests dominate land cover in the protected area. The area borders directly with villages or community-owned land. Two enclaves exist within MMKPA-settlements known as Cimulu Hamlet (Pangeureunan Village) and Cigumentong Hamlet (Sindulang Village). The residents of these hamlets have a close relationship with the protected area. Some residents farm within the enclave, while others tap pine sap in designated utilization blocks. A special access route is created to facilitate these villagers' livelihoods, which stretches approximately 2.5 km and width varying up to 8 m in certain sections. It connects the enclaves to some villages outside the protected area.

Data collection

Field data was collected from December 2023 to January 2024 at three primary locations: Cigendel Village (Sumedang District) and Cimulu Hamlet (Pangeureunan Village, Garut District) within the West Kareumbi Resort, and Cibugel Village (Sumedang District) within the East Kareumbi Resort. The selection of the three locations was based on the information from protected area managers and local communities regarding the presence of slow lorises in those locations. Habitat vegetation data was collected using a quadratic plot method. Plots were established around Javan slow loris encounter sites and in representative ecosystems in the MMKPA area. Plot sizes varied depending on the vegetation habitus and tree growth stages: 20x20 m for trees, 10x10 m for poles and shrubs, 5x5 m for saplings, and 2x2 m for herbaceous plants. Tree growth stages were categorized as trees for those with diameter at breast height (DBH) greater than 20 cm, poles (DBH between 10 and 20 cm), and saplings (DBH less than 10 cm and height greater than 1.5 m). Data on plant species, diameter at breast height (DBH), and abundance (number of individuals) were recorded for each plot. In total, there were 41 vegetation plots established where 10 vegetation plots in Cigendel Village, 16 in Cimulu Hamlet (Pangeureunan Village), and 15 in Cibugel Village, with a minimum distance of 100 m between plots. Forest Canopy Density (FCD) was mapped using Landsat 8 RAW Imagery and 8 TOA Reflectance Imagery from Google Earth Engine image collection, with a 30x30 m spatial resolution, collected in December 2023 and Januari 2024.

Data analysis

Vegetation data collected in the field was analyzed to calculate two key metrics: the Important Value Index (IVI) to represent species composition and the Diversity Index (H'). These indices describe the vegetation characteristics of the Javan slow loris habitat. Tilman et al. (2001) classified the Shannon-Wiener diversity index into three categories: H'>3, high species diversity; 1≤H'≤3, medium species diversity; and H'<1, low species diversity. The IVI and H'' were calculated using the following formulas:

Species density

$$Total\ Density = \frac{number\ of\ individuals\ of\ each\ species\ in\ all\ plots}{plot\ area\ x\ number\ of\ plots}$$

$$Relative\ Density = \frac{total\ density\ of\ each\ species}{total\ density\ all\ species}\ x\ 100\%$$

Species frequency

$$Total\ Frequency = \frac{number\ of\ number\ of\ species\ encounter\ plots}{total\ plots}$$

$$Relative\ Frequency = \frac{total\ frequency\ of\ each\ species}{total\ frequency\ all\ species}\ x\ 100\%$$

Species dominance

$$Tree\ basal\ area\ (LAB) = \frac{1}{4}\ x\ \pi\ x\ DBH^2$$

$$Total\ Dominance = \sum LAB\ of\ each\ species\ in\ all\ plots$$

$$Relative\ Dominance = \frac{total\ dominance\ of\ each\ species}{total\ dominance\ all\ species}\ x\ 100\%$$

Important value index (IVI)

$$IVI\ (\%) = Relative\ density + Relative\ frequency + Relative\ dominance$$

Diversity index ('H)

$$H' = \sum_{i=1}^{S} p_i\ x\ \ln\ (p_i)$$

$$p_i = \frac{n_i}{N} = \frac{n_i}{\sum_{i=1}^{S} n_i}$$

N is the total number of individuals of all types found, *ni* is the number of individuals of species *i* and *S* means the total number of species found.

Plant species used as food sources of Javan slow lorises were identified based on the combination of two literature sources: the Indonesian Rehabilitation Natural Initiation Foundation (YIARI) list of Javan slow loris foods and research conducted by Ikhlas (2023). The parts they eat were also identified. Food abundance was determined by counting the number of individuals of these identified food plant species per hectare.

Forest Canopy Density (FCD) is a useful index for estimating stand density by analyzing several parameters. These parameters include the Advanced Vegetation Index (AVI), Bare Soil Index (BI), Shadow Index (SI), and Thermal Index (TI). A Principal Component Analysis (PCA) was performed on AVI and BI to calculate FCD. This analysis combined them into a single metric called Vegetation Density (VD). Similarly, TI and SI were combined using PCA to create a Scaled Shadow Index (SSI). These analyses were applied across the entire MMKPA using Google Earth Engine software using the following formula (Rikimaru and Miyatake 2009):

$$AVI = \left((NIR + 1)x(1 - Red)x(NIR - Red)\right)^{\frac{1}{3}}$$

NIR is the near-infrared band reflectance value and *Red* is the red band reflectance value.

$$BI = \left(\frac{(SWIR1+Red)-(NIR+Blue)}{(SWIR1+Red)+(SWIR1+Blue)} x100\right) + 100$$

*SWIR*1 is the reflectance value of the shortwave-infrared band 1 and *Blue* is the reflectance value of the blue band, while *NIR* and *Red* have the same meaning as in the AVI formula. Before calculating the thermal index, radiometric calibration was performed to detect ground surface temperature values by converting pixel values into spectral radians ($L\lambda$).

$$L\lambda = M_L \, x \, Qcal + A_L$$

$$TI = \left(\frac{K2}{ln\left(\frac{K1}{CV_R}+1\right)}\right) - 272{,}15$$

M_L in equation 13 means scale factor, *Qcal* is the digital number, and A_L is the increase factor. TI was calculated using the thermal band constants (*K1* and *K2*) and the radian value in the thermal band (CV_R). In addition to the *Red* band reflectance value and *Blue* band reflectance value, which has been used previously, SI calculations require the *Green* band reflectance value as in the following equation.

$$SI = ((1 - Blue)x(1 - Green)x(1 - Red))^{\frac{1}{3}}$$

PCA was carried out to obtain VD and SSI, which were then used in the following formula to calculate FCD.

$$FCD = \sqrt{VDxSSI + 1} - 1$$

RESULTS AND DISCUSSION

Vegetation dominance and diversity

Across the three data collection sites within the MMKPA, 104 plant species belonging to 40 families were identified. These species contribute to the forest's overall vegetation composition. The dominant species of tree vegetation at all life stages (tree, pole, and sapling) were pine (*Pinus merkusii*) and puspa (*Schima wallichii*) (Figure 2). The dominance of both species can be attributed to large-scale reforestation efforts undertaken by the West Java Provincial Forestry Service between 1953 and 1976. Based on the MMKPA Long Term Management Plan, these initiatives involved planting *Pinus merkusii, Schima wallichii*, and *Liquidambar excelsa* across 4,809.98 hectares (West Java Natural Resources Conservation Centre 2017). The impact of this reforestation on current land cover is evident which is indicated with the domination of plantation forests, particularly pine, which continues to be a valuable resource for the local community.

The shrub habitus exhibited variation across the three locations. Two sites were dominated by bingbin (*Pinanga coronata*), a palm species known for its year-round flowering and fruiting. This characteristic, coupled with its ability to regenerate readily through shoots, results in clumps containing 5-10 individuals (Zulkarnaen et al. 2022). The third location was dominated by harendong (*Miconia crenata*), a shrub with white flowers and bluish-black fruit. This shade-tolerant species can become invasive in open areas, densely growing and hindering the establishment of other plants. An example of this invasiveness can be found in Endau Rompin National Park, Malaysia (Le et al. 2018). On the other hand, the herbaceous layer was dominated by *Setaria* sp., a type of grass known as a food source for Timor Deer (Soenarno 2022).

The diversity index for each vegetation habitus and tree growth stage within the MMKPA forest ranges from 1.61 to 3.69, falling within the medium to high category. Figure 3 presents the overall vegetation diversity index at the three research sites, which ranged from 3.02 to 3.41. This indicates good species diversity, crucial for maintaining ecosystem balance and promoting healthy productivity. Interestingly, the saplings exhibits the highest diversity, likely due to their young life stage. This trend of higher diversity in younger stages is often observed in nature (Andesmora et al. 2021); sustainable natural regeneration in trees relies on a suitable ecosystem environment (Suganda 2016). The high regeneration potential observed in the MMKPA's tree life stage suggests a favorable environment for future diversity increase.

The proportion of the available plant food sources for Javan slow loris across the 3 research sites, which were calculated from the relative density of the food plant species, is presented in Figure 4. Research by Wiens (2002) and Streicher et al. (2012) confirms that fruits are the most crucial part of their diet. Unfortunately, all three locations have a low proportion of fruit availability, ranging from just 2.5 to 5.8%. Interestingly, recent studies (Dewi et al. 2022) show a shift in the lorises' dietary preferences. They are increasingly consuming sap with high polysaccharides and low flavonoids. This change is likely driven by a principle called competitive exclusion (Raerinne and Baedke 2015). This principle suggests that when two or more species compete for the same resources in the same environment, one species will eventually be outcompeted. Therefore, the species adapted by switching to more easily available food sources to avoid this.

Availability of Javan slow loris food vegetation

Sufficient food sources are crucial for Javan slow loris's survival in the MMKPA. In total, there were 35 of the 104 plant species in the area which serve as food sources for Javan slow lorises. As shown in Table 1, the slow lorises consume various plant parts, including flowers/nectar, fruits, and sap.

Javan slow loris is an omnivorous primate that consumes various food, including fruit and plant fluids such as sap, nectar, and palm sap, as well as small animals such as lizards, insects, and baby birds. Research shows some variation in their diet. Wiens (2002) found their typical food might be 50% fruit, 40% animal prey, and 10% plant fluids. Streicher et al. (2012) observed a different breakdown: 34% fruits, 32% plant fluids, and 23% arthropods. Javan slow loris consumes nectar to meet its sugar needs and obtain calcium from sap and other tree exudates (Cabana et al. 2017).

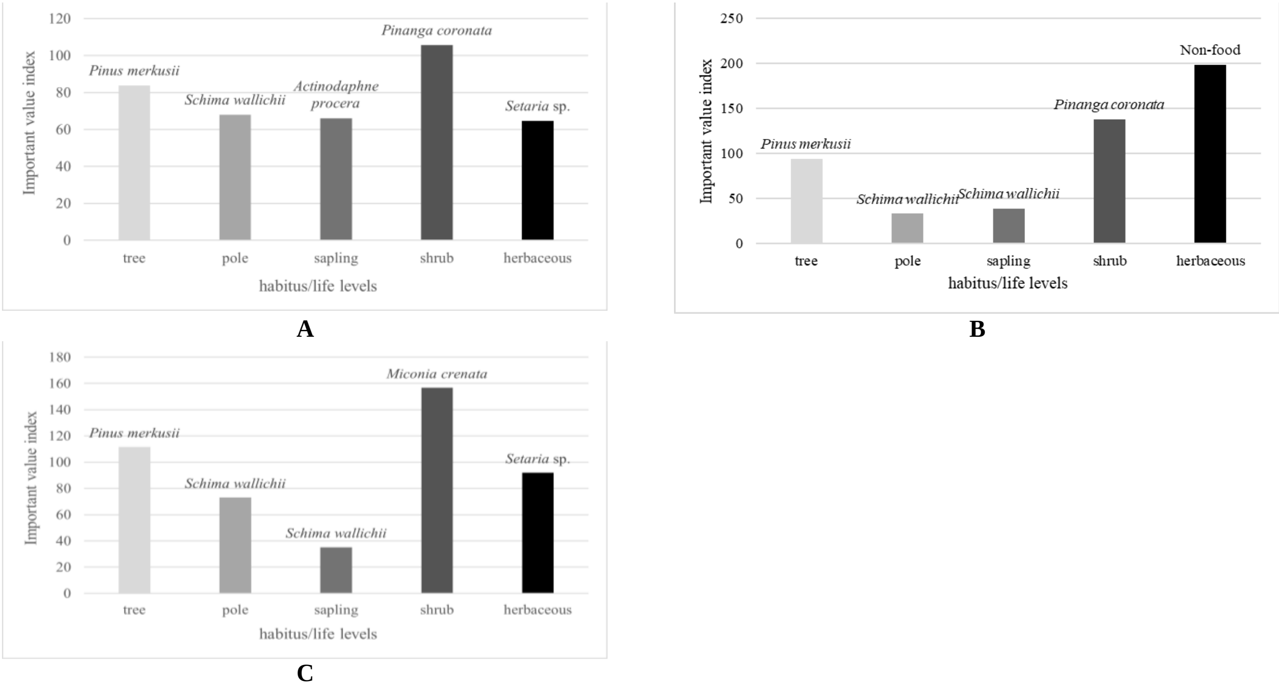

Figure 2. Plant species with the highest importance value index in Mount Masigit Kareumbi Protected Area, West Java, Indonesia, i.e., A. Cigendel Village, B. Cimulu Hamlet (Pangeureunan Village), C. Cibugel Village

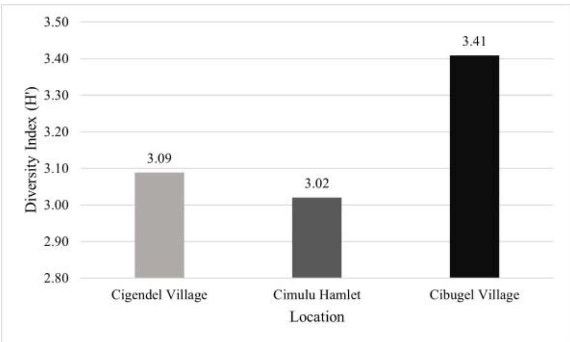

Figure 3. Vegetation species diversity indices at each observation location in Mount Masigit Kareumbi Protected Area, West Java, Indonesia

Cibugel Village stands out as the area with the highest percentage of fruit-bearing plant specieswith 5.8% of the available food sources. During field observation, 14 Javan slow lorises were encountered on this site. In contrast, we found no slow lorises in Cigendel Village, which had the lowest proportion of fruit-producing plants. This suggests a relationship between Javan slow loris populations and fruit availability. This finding can be valuable for conservation managers. Enriching habitats with more fruit-bearing plants can create more hospitable environments for these slow lorises.

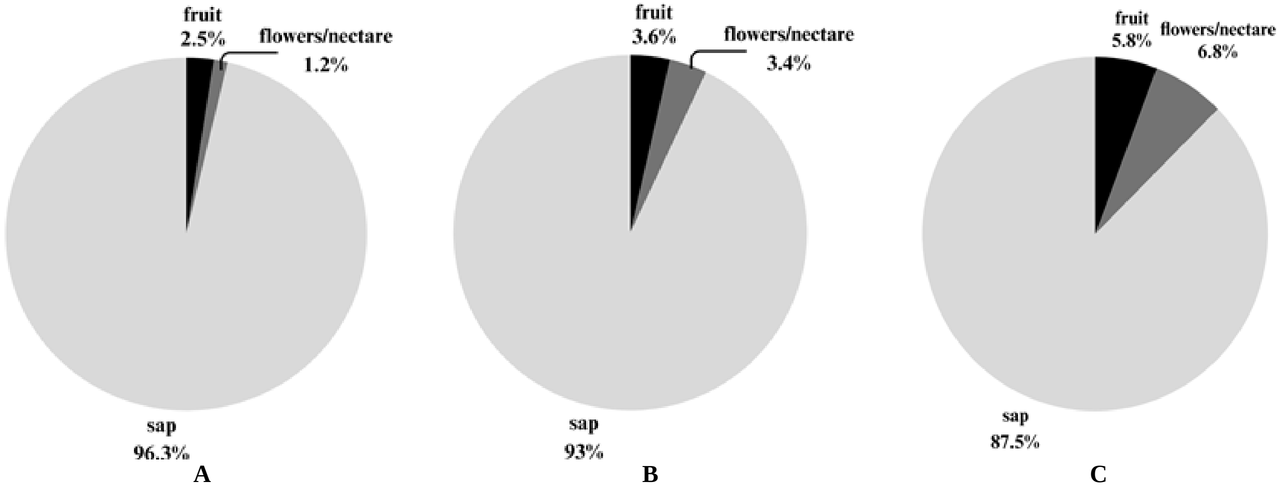

Figure 4. Proportion of Javan slow loris food availability at each observation location in Mount Masigit Kareumbi Protected Area, West Java, Indonesia, i.e., A. Cigendel Village, B. Cimulu Hamlet (Pangeureunan Village), C. Cibugel Village

Table 1. List of plant species used as food sources of Javan slow loris in Mount Masigit Kareumbi Protected Area, West Java, Indonesia

Species	Local name	Family	Edible part
Actinodaphne procera	Huru	Lauraceae	Sap
Albizia sp.	Alba	Fabaceae	Flowers/nectar and sap
Archidendron pauciflorum	Jengkol	Fabaceae	Flowers/nectar and sap
Arenga pinnata	Aren	Arecaceae	Sap
Artocarpus heterophyllus	Nangka	Moraceae	Fruit
Calliandra calothyrsus	Kaliandra merah	Fabaceae	Flowers/nectar
Caryota mitis	Saray	Arecaceae	Sap
Casearia flavovirens	Huru minyak	Salicaceae	Sap
Cinnamomum iners	Kayu manis	Lauraceae	Fruit and sap
Coffea robusta	Kopi	Rubiaceae	Fruit
Dendrocnide sinuata	Pulus	Urticaceae	Flowers/nectar and fruit
Etlingera coccinea	Tepus	Zingiberaceae	Sap
Ficus annulata	Kiara	Moraceae	Fruit
Ficus fistulosa	-	Moraceae	Fruit and sap
Ficus sp.	-	Moraceae	Fruit
Hibiscus macrophyllus	Tisuk	Malvaceae	Flowers/nectar and sap
Homalanthus populneus	Kareumbi	Euphorbiaceae	Fruit
Lithocarpus daphnoides	-	Fagaceae	Fruit and sap
Lithocarpus sp.	Pasang	Fagaceae	Fruit and sap
Macaranga tanarius	Mara	Euphorbiaceae	Fruit and sap
Maesopsis eminii	Kayu Afrika	Rhamnaceae	Fruit and sap
Melicope latifolia	Sampang	Rutaceae	Sap
Miconia crenata	Harendong bulu	Melastomataceae	Flowers/nectar and fruit
Parkia speciosa	Petai	Fabaceae	Flowers/nectar and sap
Pinanga coronata	Bingbin	Arecaceae	Sap
Pinus merkusii	Pinus	Pinaceae	Fruit
Piper sp.	Sirih hutan	Piperaceae	Flowers/nectar and fruit
Plerandra grandiflora	Ki Pangang	Araliaceae	Flowers/nectar
Saurauia cauliflora	Ki Leho	Actinidiaceae	Fruit
Schima wallichii	Puspa	Theaceae	Flowers/nectar
Swietenia macrophylla	-	Meliaceae	Sap
Swietenia mahagoni	Mahoni	Meliaceae	Sap
Syzygium polyanthum	Salam	Myrtaceae	Flowers/nectar
Toona sinensis	Surian	Meliaceae	Fruit and sap
Toona sureni	Suren	Meliaceae	Fruit and sap

Forest canopy density

Javan slow loris is an arboreal animal that spends most of its life in trees or shrubs; hence, tree connectivity is vital for survival. Figure 5 shows maps of key indicators used to assess Forest Canopy Density (FCD). Advanced Vegetation Index (AVI) uses satellite imagery to analyze plant health and canopy height. It is considered to have more sensitive response than the standard NDVI (Normalized Difference Vegetation Index) and can pick up on subtle variations in tree cover (Bera et al. 2020). The map's central area appears blue, indicating a higher AVI value and a denser canopy. The Bare Soil Index (BI) reveals information about soil conditions. Green areas on the map signify low BI values, suggesting the central area had more vegetation cover and less exposed soil compared to the edges; this points towards a denser forest in the center. Shadow Index (SI) reflects forest maturity. Denser, more mature forests cast deeper shadows, resulting in higher SI values (Nugraha and Citra 2021). The map shows higher SI values at the center of the MMKPA area, suggesting a more mature forest there. Thermal Index (TI) represents surface temperature in degrees Celsius. The map reveals higher temperatures at the edges compared to the center. Forest canopies act like giant umbrellas, absorbing and retaining solar energy and keeping the ground cooler (Jamalabad and Abkar 2020). Additionally, leaf surface evaporation contributes to this cooling effect. The Vegetation Density (VD) combining AVI and BI, provides a more comprehensive picture because it considers vegetation conditions and soil openness. As shown in Figure 5, the central area tends to have higher VD values, suggesting denser vegetation. The Scaled Shadow Index (SSI), which combines information from SI and TI, reflects both the shade created by the canopy and the surface temperature. The map shows that the edge areas have higher SSI values, indicating a combination of lower shade and potentially warmer temperatures.

As shown in Figure 6, FCD mapping categorizes the MMKPA area into five classes based on canopy density. Around 83% of the MMKPA area falls under the "high" category. This translates to a well-connected forest canopy with minimal gaps, perfect for the Javan slow lorises. As slow lorises are animals with low jumping ability, they require a high level of tree connectivity to cross from one tree to another (Shuhada 2023). Coupled with its strong ability to hold branches, the presence of vegetation with high connectivity is a useful habitat for facilitating loris movement. Javan slow loris prefers vegetation with moderate to high canopy cover (Sodik et al. 2019).

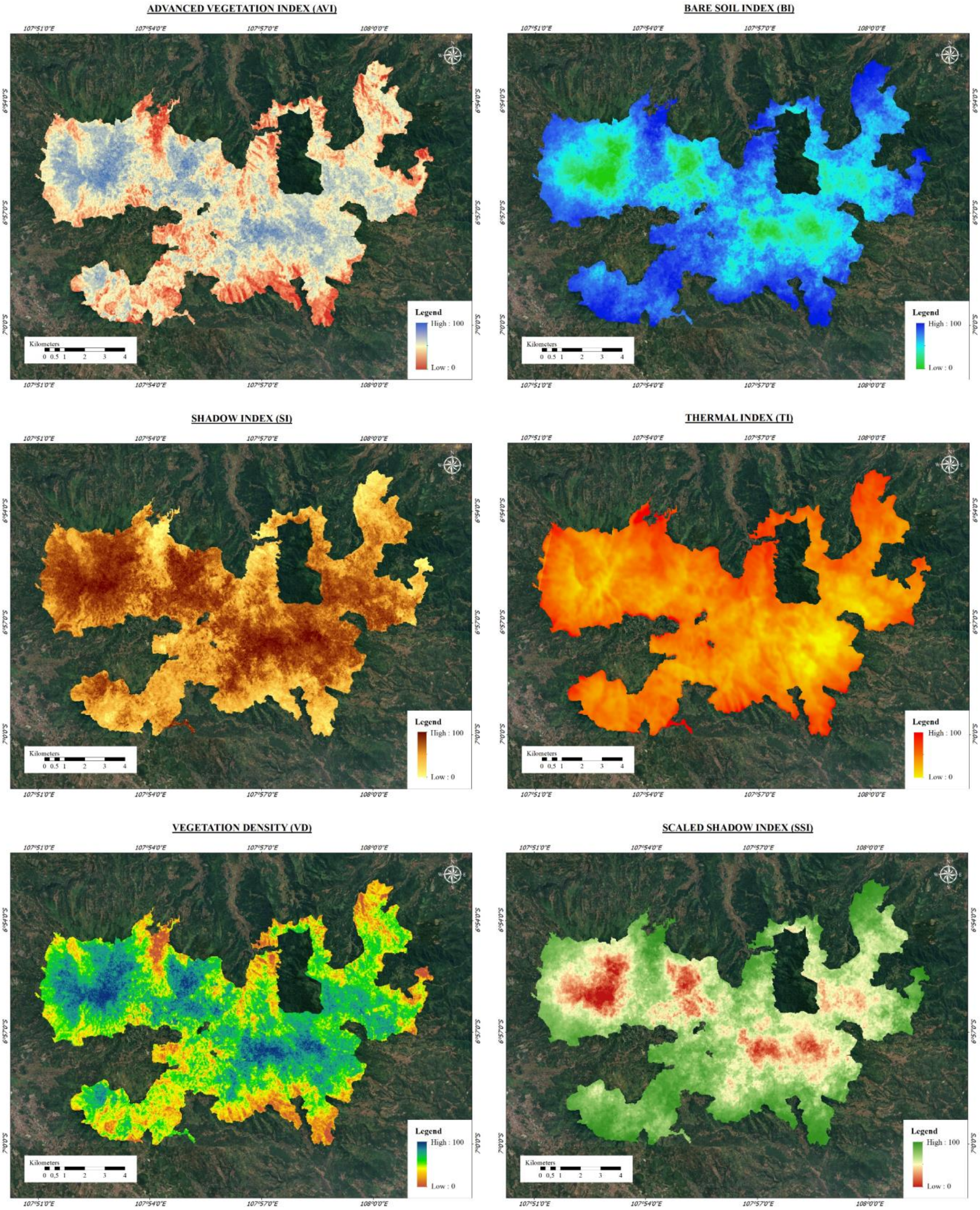

Figure 5. Results of mapping the parameters that determined forest canopy density in Mount Masigit Kareumbi Protected Area, West Java, Indonesia

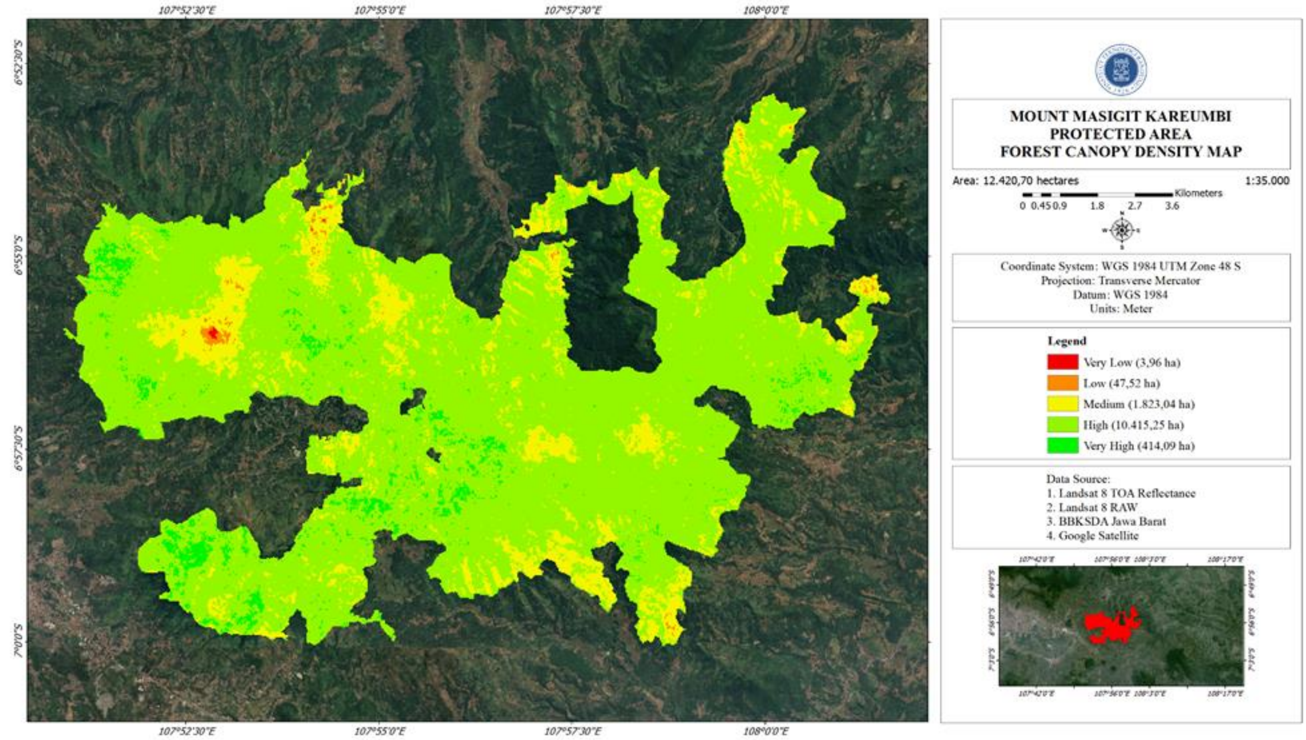

Figure 6. Forest canopy density map in Mount Masigit Kareumbi Protected Area, West Java, Indonesia

Easy movement through the forest canopy is critical for Javan's slow lorises' survival. These solitary animals raise their young for about three years (Barrett et al. 2021). Once mature and independent, young lorises disperse, leaving their birthplace to find new territories for breeding or establishing new populations (Poindexter et al. 2023). This movement, called dispersal, ensures access to resources for all individuals and helps prevent inbreeding.

In conclusion, this study analyzed the characteristics of vegetation as the main component of the habitat of Javan slow loris in Mount Masigit Kareumbi Protected Area (MMKPA), West Java, Indonesia, with a focus on four key aspects: the variety of plant species, the structure of the vegetation, the abundance of food sources, and the dense the forest canopy density. This study found that over a third (35 out of 104) of the plant species in three research sites provided food for the lorises, including fruits, sap, and flowers/nectar. Food-producing plant species dominate the vegetation community for trees (at various stages of growth) and shrub habitus. Tree exudates were the most crucial part of Javan slow loris' diet in three research sites. The forest canopy is dense in over 80% of the area, creating a continuous network of branches that allows the lorises to move easily. This research provides valuable insights into managing the Javan slow loris habitat within MMKPA. One recommendation is to enrich the forest with more fruit-bearing plants to increase food availability. However, the management plan must also consider the social and cultural aspects of the surrounding community, striking a balance between conservation and community needs. Raising public awareness regarding Javan slow loris conservation is becoming increasingly important as these protected areas border private land and even include villages within their boundaries.

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