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Potential feeding plants of Javan Langur (*Trachypitecus auratus*) in the eastern slope of Biru Mountain, Batu City, East Java, Indonesia

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Keywords: Distribution, forage, release, wandering, wildlife

INTRODUCTION

Ebony leaf monkey is one of the endemic primates in Indonesia and a species protected by Minister of Environment and Forestry of the Republic of Indonesia No. P.20/MEN/LK/SETJEN/KUM.1/6/2018. According to CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) it is included in the Appendix II category, wild animals that should not be traded because of their endangered status. Vulnerable status by the International Union for Conservation of Nature and Natural Resources (IUCN) red list due to high human activities, namely burning, as well as the conversion of forest areas into agricultural land and settlements (Lecu et al. 2013; Nijman 2021). The reduction in the presence of tree stands in non-forest areas can impact large mammal species that depend on specific and expansive habitats for locomotion. Javan langurs can still be found in several pockets of habitat in the eastern part of Java Island (Nijman 2013). Primate species are essential components of tropical biodiversity by contributing to forest regeneration and ecosystem health (Estrada et al. 2017). Large mammals are effective seed dispersal agents because they move farther. As an effort to combat the decline in the population of Javan langurs due to human activities to protect them from illegal trade, confiscations or voluntary handovers are carried out from the community. The animal was then

rehabilitated by the ex-situ Javan Langur Center (JLC), part of the Aspinall Foundation Indonesia located in Coban Talun Batu, East Java, before being released into its natural habitat. Before release, it is necessary to find a location based on observations, finding suitable habitat before releasing wild animals is significant because it supports the released animals in the long term. In addition, Lutung is a primate species in groups (Leou et al. 2013; Nijman 2013), so this species needs an area that can cover to find food supplies to meet all its members (Chapman and Teichroeb 2012).

Trachypitecus species show a diet dominated by leaves followed by fruits/seeds, flowers and other types of food (Tuan et al. 2019). Javan langur is a species that mostly eats plant parts, namely young leaves, the rest are old leaves, petioles and leaf shoots (Tuzji et al. 2019), but has also been recorded to eat fruit (Aryanti and Asturah 2019; Aryanti et al. 2021). The arboreal lifestyle of langurs has an impact on obtaining food sources, and more species of tree-level plants are found (Fabri and Rintawan 2018). The presence of trees and dense canopy serves to support daily activities of eating, resting, socializing and moving (Aryanti et al. 2019; Aquanti and Asturah 2019; Sari et al. 2020). The dense and interconnected canopy allows the langurs to move (Sugartono et al. 2016). Therefore, the need for the availability of vegetation is very important for the langurs. Currently, the Javan langur release area around

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INTRODUCTION

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As an effort to combat the decline in the population of Javan langurs due to human activities to protect them from illegal trade, confiscations or voluntary handovers are carried out from the community. The animal was then

rehabilitated by the ex-situ Javan Langur Center (JLC), part of the Aspinnall Foundation Indonesia located in Coban Talun Batu, East Java, before being released into its natural habitat. Before release, it is necessary to find a location based on observations, finding suitable habitat before releasing wild animals is significant because it supports the released animals in the long term. In addition, Lutung is a primate species in groups (Leca et al. 2013; Nijman 2013), so this species needs an area that can cover to find food supplies to meet all its members (Chapman and Teichroeb 2012).

Trachypithecus species show a diet dominated by leaves followed by fruit/seeds, flowers and other types of food (Tran et al. 2019). Javan langur is a species that mostly eats plant parts, namely young leaves, the rest are old leaves, petioles and leaf shoots (Tsuji et al. 2019), but has also been recorded to eat fruit (Aryanti and Azizah 2019; Aryanti et al. 2021). The arboreal lifestyle of langurs has an impact on obtaining food sources, and more species of tree-level plants are found (Fahmi and Bintarawati 2018). The presence of trees and dense canopy serves to support daily activities of eating, resting, socializing and moving (Ayunin et al. 2014; Aryanti and Azizah 2019; Sari et al. 2020). The dense and interconnected canopy allows the langurs to move (Supartono et al. 2016). Therefore, the need for the availability of vegetation is very important for the langurs. Currently, the Javan langur release area around

the JLC location has reached its limit, thus requiring a new place. The JLC plans to release the Javan langur in a natural forest area that is included in the mountainous Tahura R. Soerjo area, namely Mount Biru in the eastern part, which is administratively included in Batu City, East Java. Eating is one of the limiting factors that are very important for the life of the langur (Akbar et al. 2019), the available feed is very sufficient and of good quality, which will be able to support the life and process of growth and reproduction of the langur properly (Zakki et al. 2017). The quality and quantity of wild animal feed sources can affect the presence of wild animals (Arief 2012). However, there is no information regarding the potential availability of natural food plants in that location, feed is one of the essential aspects of improving wildlife viability which is also a limiting factor for animal life (Musyaffa and Santoso 2020). Therefore, information on the potential of forage plants is needed to understand the current conditions of the area that will be used as a rehabilitation area for Javan langurs released from the JLC. It is the basis for an appropriate and effective area management plan to ensure species diversity, especially the conservation of Javan langurs in East Java, Indonesia.

MATERIALS AND METHODS

Study area

This research activity was carried out in December 2020 - January 2021, in the Grand Forest Park (Tahura) R. Soerjo area, especially in the protected forest area on the eastern slopes of Gunung Biru, Batu City, East Java, Indonesia. Under Government Regulation of the Republic

of Indonesia No. 28 of 2011, the function of Tahura for collect natural or non-natural plants and/or animal species that are not invasive and utilized for research, science, education, cultivation, culture, tourism and recreation. The location and path of observation can be seen in Figure 1.

Procedures

Collecting data

Collecting data in the field using the method of analysis of vegetation without plots, used to wandering quarter method. Using the wandering quarter method, the vegetation structure is analyzed only at the tree and pole level. This selection is based on the Javan langur in carrying out their daily activities, most of which are carried out on the tree and pole strata. Wandering quarter method can increase the accuracy or precision of density and be able to study the distribution pattern of vegetation (Zhu et al. 2014).

Based on the visual survey (accessibility and topography) used to determine the location of the transect by purposive sampling. However, based on the visual survey did not have enough to determine the release area. But it was necessary to know the potential of forage plants through vegetation analysis. The number of transects made the protected forest area on the eastern slope of Gunung Biru was 3 lines. Each transect has a length of 1000 meters for the vegetation analysis. On each transect, there is a distance between observation points of 25 meters so that there are 40 observation points. The starting point of each transect was 50 meters, perpendicular to and away from the border of the community's plantation area.

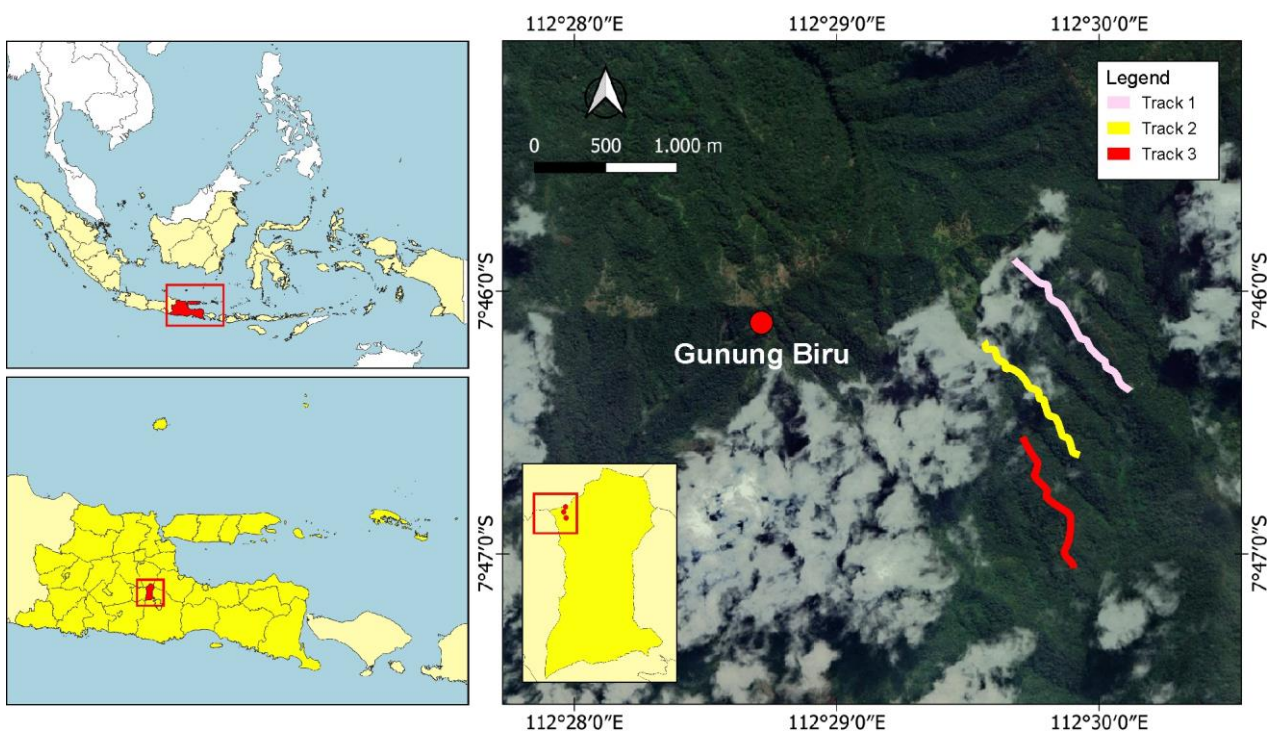


Figure 1. Location of Gunung Biru, Batu City, East Java, Indonesia and the sampling sites of *Trachypithecus auratus*

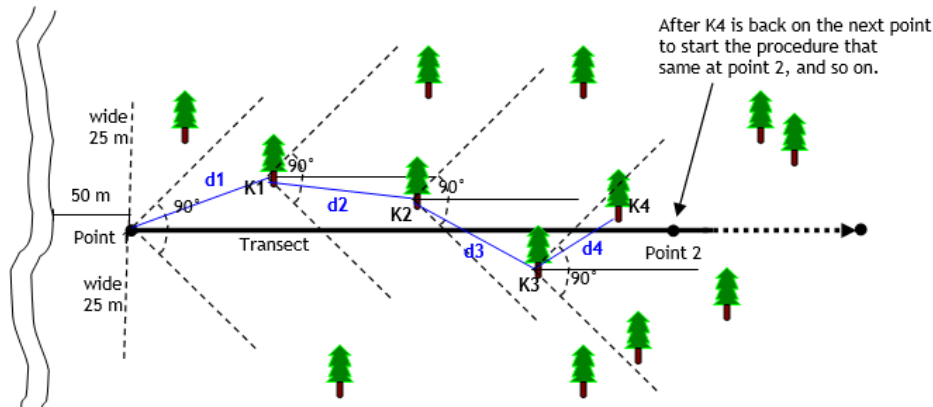


Figure 2. Design transect of wandering quarter method on Gunung Biru, Batu City, East Java, Indonesia

The wandering quarter method begins by making a transect line and establishing a starting point for the measurement, then identification along the transect with the right and left boundaries of the transect, each 25 meters wide. Then by using a compass, the first point as the first quadrant with made an angle of 90° perpendicular to the transect as a starting point. In the angle, 90° looked for the nearest tree and pole within and a distance didn't more than 25 meters from the transect, then recorded the species and measured diameter, height and distance pole to previous pole or tree to the previous tree. The measured tree is then considered as a next quadrant (2nd quadrant) with made an angle of 90° perpendicular parallel to transect, looked for tree or pole closest to the center point of 2nd quadrant and did it procedure until the end of the transect (Kurniawan et al. 2019). Simply put, the wandering quarter method can be described on Figure 2, where K1-K4 is quadrant, d1-d4 is the distance between trees. The criteria for trees and poles used are as follows (Kurniawan et al. 2019), with tree category: >35 cm and pole category: >10-35 cm. The way to identify the type of vegetation was founded by asking local names to the field guide and using a study of journal literature vegetation analysis that has been carried out in the Tahura R. Soerjo area. To find out which species are consumed and what part is consumed by the Javan lutung, using a study of journal literature that asked JLC captive managers.

Data analysis

Plant composition

Vegetation analysis using the wandering quarter method to determine the Important Value Index (IVI) with the equation:

$$\text{Average tree distance (m)} = \frac{\text{Total distance}}{\Sigma \text{ whole individual}}$$

$$\text{Density of all species per Ha (KH)} = \frac{10000}{(\text{Average tree distance})^2}$$

$$\text{Quantity in quadrant} = \frac{\Sigma \text{ all individuals of a species at all points}}{\Sigma \text{ total quadrant at all points}}$$

$$\text{Quantity of trees per Ha (Density)} = \text{quantity in the quadrant of a type} \times \text{KH}$$

$$\text{Average basal area} = \frac{\Sigma \text{ basal area of a species}}{\Sigma \text{ all individuals of a species at all points}}$$

$$\text{Dominance of a species} = \Sigma \text{ basal area} \times \text{number of trees per Ha of a species}$$

$$\text{Relative dominance (\%)} = \frac{\text{dominance of a species}}{\Sigma \text{ domination of all species}} \times 100\%$$

$$\text{Frequency of a type} = \frac{\text{number of points found of a species}}{\text{Total point}}$$

$$\text{Relative frequency (\%)} = \frac{\text{Frequency of a species}}{\Sigma \text{ frequency of all species}} \times 100\%$$

$$\text{Relative density (\%)} = \frac{\text{Density of a species}}{\Sigma \text{ Density of all species}} \times 100\%$$

$$\text{Important value index (IVI)} = \text{Relative frequency} + \text{Relative dominance} + \text{Relative density}$$

Plant distribution index

The spatial distribution pattern of forage plants was analyzed using the Morisita distribution index (Hidayat 2014), with the equation:

$$I_d = n \times \frac{(\Sigma x^2 - \Sigma x)}{(\Sigma x)^2 - \Sigma x}$$

Where, I_d : dispersia Morisita index; n: number of sampling plots; Σx : total number of individuals of a species in a community; Σx^2 : sum of squares of the total individuals of a species in a community.

If the value of $I_d = 0$ then the similarity of the community is low, while $I_d = 1$ then the similarity of the community is high / equal. While the distribution patterns is shown by uniform index (Mu) and clumped index (Mc) calculations, including:

$$Mu = \frac{\chi^2 0.975 - n + \Sigma x}{(\Sigma x) - 1}$$

$$Mc = \frac{\chi^2 0.025 - n + \Sigma x}{(\Sigma x) - 1}$$

Where, Mu: Morisita Index for uniform patterns; $\chi^2 0.975$: Chi-square table value with n-1 free degree and 97.5% confidence interval; Mc: Morisita index for clustering patterns; $\chi^2 0.025$: Chi-square table value with n - 1 free degree and 2.5% confidence interval.

Morisita degree standards are calculated by the formula:

$$I_p = 0.5 + 0.5 \left(\frac{I_d - M_c}{n - M_c} \right); \text{ if } I_d \geq M_c > 1.0$$

$$I_p = 0.5 \left(\frac{I_d - 1}{M_c - 1} \right); \text{ if } M_c > I_d \geq 1.0$$

$$I_p = -0.5 \left(\frac{I_d - 1}{M_c - 1} \right); \text{ if } 1 \geq I_d > M_u$$

$$I_p = -0.5 + 0.5 \left(\frac{I_d - M_u}{M_u} \right); \text{ if } 1 > M_u > I_d$$

Based on the I_p value, it can be concluded that the distribution pattern is uniform distribution if $I_p < 0$, random distribution, if $I_p = 0$, and clump distribution if $I_p > 0$.

Species diversity index

The diversity of species contained in an ecological unit can be known from the Shannon-Wiener index (Ismaini et al. 2015), with the following formula :

$$H' = - \sum (n_i/N) \ln (n_i/N)$$

Where, H' is the diversity in a circle of a species, n_i is the number of individuals of the i th species, N is the total number of individuals of all the species, and \ln is the natural logarithm. With criteria if $H' \leq 1$ = low diversity, if $1 < H' < 3$ = medium diversity, if $H' \geq 3$ = high diversity.

Species richness index

Species richness in an ecosystem uses the Margalef Index (Ismaini et al. 2015), with the equation:

$$D_{mg} = \frac{S-1}{\ln N}$$

Where, D_{mg} is margalef index, S is the number of species observed, N is the total number of individuals observed, and \ln is natural logarithm. With criteria if $D_{mg} < 2.5$ = low level of richness, $2.5 > D_{mg} > 4$ = medium level of richness, $D_{mg} > 4$ = high level of richness.

Species evenness index

To find out the evenness of species in an area, the evenness value can be measured (Ismaini et al. 2015), with the formula:

$$E = \frac{H'}{\ln S}$$

Where, E is evenness index, H' is diversity index, S is the number of species observed, and \ln is natural logarithm. With criteria $E \leq 0.4$ = low evenness, $0.4 < E < 0.6$ = medium evenness, $E \geq 0.6$ = high evenness.

Similarity index

To see the similarity of the communities compared in each observation path with Sorensen Similarity Index (Abdullah et al. 2015) uses the following formula:

$$IS = \frac{2C}{A+B} \times 100\%$$

Where, IS is Sorensen index, A is number of vegetation types in transect 1, B is number of vegetation types in transect 2 and C is the same number of vegetation types is in transect 1 and 2. With criteria if $IS < 50\%$ = low similarity index, if $IS > 50\%$ = high similarity index.

RESULTS AND DISCUSSION

Vegetation composition of Javan langur habitat in Blue Mountain

On Gunung Biru found 45 plant species, including 45 types of pole-level vegetation and 26 types of tree-level vegetation, all of the plant species obtained were included in the category of forage sources for Javan langurs. The diversity of vegetation both at the pole and tree levels is quite varied, high for diversity of pole (H' 3.27) and moderate for diversity of tree (H' 2.54). Based on calculation of Index Value Importance (IVI) tree was *Quercus sondaicus* (42.33%), *Homalanthus giganteus* (101.62%) and *Engelhardia spicata* (83.62%). IVI for pool was *Q. sondaicus* (38.17%), *Acmena acuminatissima* (22.01%) and *H. giganteus* (28.96%). That species of vegetation is Javan langur's species of feed.

Distribution, richness and evenness of vegetation

The distribution of plants is divided into three primary patterns: random, uniform or clumped. The distribution pattern of the Javan langur food plant species in the Gunung Biru forest was classified as clustered at pole and tree vegetation, indicating the close distance between the stands. The species richness of both poles and trees is high, with 47 species of plants found in Blue Mountain. The value of species richness depends on the number of plants found in the plot (Nahlunnisa et al. 2016). The placement of a suitable measuring plot can describe the forest area still intact in Gunung Biru. The wider the sample plot or plot can be maximized with the number of observation points, the more information about the value of species richness (Hoffmann et al. 2019). The evenness of trees and poles in the Gunung Biru forest shows a high value. The number of different individuals in each species encountered causes the community to have a maximum evenness value (Ismaini et al. 2015).

Similarity

The similarity and dissimilarity of vegetation community types in each lane in the protected forest on the Gunung Biru. A comparison was made between the three observation lines at the pole and tree level. Based on the analysis, the dissimilarity value between paths is above 70% and similarity is less than 50% which shows that the levels of poles and tree species found are different.

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Table 1. Part of the potential of plants consumed by the Javan Lutung in Gunung Biru forest, Batu City, East Java, Indonesia

Species	Growth from		Part of plant			Note
	Pool	Tree	Leaf	Flower	Fruit	
<i>Acer laurinum</i>	✓	✓	✓			Staf JLC
<i>Acidendron</i> sp.	✓		✓			Kurniawan et al. 2019
<i>Acmena acuminatissima</i>	✓	✓	✓	✓		Staf JLC
<i>Acrornicia trifoliata</i>	✓		✓			Staf JLC
<i>Ardisia javanica</i>	✓		✓			Staf JLC
<i>Articia homilis</i>	✓		✓			Mustari and Pasaribu 2019
<i>Bischofia javanica</i>	✓		✓			Zakki et al. 2017
<i>Casuarina junghuniana</i>	✓	✓	✓			Staf JLC
<i>Cordia</i> sp.	✓	✓	✓			Staf JLC
<i>Croton hirtus</i>	✓	✓	✓			Kurniawan et al. 2019
<i>Elaeocarpus glaber</i>	✓	✓	✓	✓		Nurul 2015
<i>Elicia srata</i>	✓		✓			Staf JLC
<i>Emaneli</i> sp.	✓		✓			Staf JLC
<i>Engelhardia spicata</i>	✓	✓	✓	✓		Wedana et al. 2013
<i>Ficus</i> sp.	✓		✓	✓		Wedana et al. 2013
<i>Ficus lepicarpa</i>	✓		✓	✓	✓	Staf JLC
<i>Ficus padana</i>	✓	✓	✓	✓	✓	Mahbuby 2017
<i>Fitus foruntobira</i>	✓	✓	✓			Staf JLC
<i>Garuga floribunda</i>	✓	✓	✓		✓	Kurniawan et al. 2019
<i>Glochidion rubrum</i>		✓	✓			Ayunin 2014
<i>Hellicia crata</i>	✓		✓			Staf JLC
<i>Homalanthus giganteus</i>	✓	✓	✓			Wedana et al. 2013
<i>Saurauia cauliflora</i>	✓		✓			Wedana et al. 2013
<i>Laportea stimulans</i>	✓		✓	✓		Zakki et al. 2017
<i>Macropanax dispermus</i>	✓	✓	✓			Wedana et al. 2013
<i>Mallotus</i> sp.	✓	✓	✓			Staf JLC
<i>Manglietia glauca</i>	✓		✓		✓	Staf JLC
<i>Melastoma</i> sp.	✓		✓			Staf JLC
<i>Melastoma malabathricum</i>	✓	✓	✓			Staf JLC
<i>Miren</i> sp.	✓		✓			Staf JLC
<i>Ardisia elliptica</i>	✓		✓			Staf JLC
<i>Cinchona succirubra</i>	✓	✓	✓			Staf JLC, Nurul 2015
<i>Podocarpus imbricatus</i>	✓		✓			Staf JLC
<i>Podocarpus neriifolius</i>	✓		✓			Staf JLC
<i>Prunus</i> sp.	✓	✓	✓			Nurul 2015
<i>Quercus sondaicus</i>	✓	✓	✓		✓	Zakki et al. 2017
<i>Quercus teysmannii</i>	✓	✓	✓			Zakki et al. 2017
<i>Saurauia bracteosa</i>	✓		✓	✓	✓	Mahbuby 2017
<i>Schima wallichii</i>	✓	✓	✓			Mahbuby 2017
<i>Slonia sigun</i>		✓	✓			Wedana et al. 2013
<i>Syzygium cumini</i>	✓		✓			Staf JLC
<i>Syzygium</i> sp.	✓	✓	✓			Wedana et al, 2013
<i>Trema orientalis</i>	✓	✓	✓			Mahbuby 2017
<i>Turpinia sphaerocarpa</i>	✓	✓	✓			Zakki et al. 2017
<i>Vernonia arborescens</i>	✓	✓	✓			Wedana et al. 2013

Table 2. Distribution, richness and evenness of potential vegetation plant of Javan Langur in Gunung Biru, Batu City, East Java, Indonesia

Vegetation level	I _d	Mu	Mc	I _p	D _{mg}	E
Pole	0.987	0.971	1.079	0,081 ^a	6.916*	0.874*
Tree	0.968	0.946	1.149	0.106 ^a	4.461*	0.789*

Note: ^a Distribution pattern I_p > 0 is clustered/clumped; * high criteria is E ≥ 0,6 and D_{mg} > 4

Table 3. Similarity and dissimilarity index values pole each transects

IS (%) ID (%)	1	2	3
1	-	28.30	23.10
2	71.70	-	22.67
3	76.90	77.33	-

Table 4. Similarity and dissimilarity index values tree each transects

IS (%) ID (%)	1	2	3
1	-	12.09	15.73
2	87.91	-	15.55
3	84.27	84.45	-

Discussion

The types of plants found in the study include those used as food for Javan Langurs, which is a sign if the forest in Gunung Biru can be a habitat for animals to be released into the wild. This is also supported by the types of plants that are classified as diverse, so that are classified as diverse so that the availability of types of feed is met. These types of forage plants are mostly consumed on the leaves, which contain high protein to meet the needs of life (Li et al. 2020). Potential of several types of food plants in Gunung Biru was a high importance value index (IVI). Including the highest scores, such as *Q. sondaicus* and *H. giganteus*. Both at the tree and pole levels, so a high IVI value can guarantee regeneration for this species (Ismail et al. 2017) to become food plants for the Javan Langur in Gunung Biru. Potential plants with high density can be ideal conditions for Javan langurs because tree crowns can overlap, which is helpful for moving from one tree to another (Sari et al. 2020). Forest communities with vegetation structures such as natural forests can be a habitat for Javan langurs trees to provide protection, food, shelter and breeding (Diniyati 2015; Tolangara et al. 2019).

The composition of the vegetation in Gunung Biru forest is a pattern of distribution of both trees and high pools. It benefits for Javan langur because it has no difficulty finding food. The high evenness also makes it easier for animals to move around looking for food, animals looking for food to maximize fitness. Feeding by animals to get nutrients and calories again after losing most of the energy for foraging, looking for places to eat and choosing food (Clark and Begley 2015). It is very complex and has many factors, namely the amount of energy needed in moving mode (walking, running, jumping, flying), environmental conditions, seasons, distribution of food sources, presence of predators and competitiveness (Clark and Begley 2015; Dutta 2019).

The potential for highly diverse plant species indicates that the Gunung Biru forest is still intact and the impact of natural biodiversity is more significant than in artificial ecosystems such as production forests (Flombaum and Sala 2008). That shows the condition of the forest stands in Gunung Biru is still maintained. Undamaged forest ecosystems provide a source of food and habitat, thereby increasing biodiversity (Mahajan and Patil 2014). Species diversity in an area depends on the number of species observed and the total number of individuals (Brenda et al. 2018). High species diversity is positively correlated with increased stability in an ecosystem (Loreau and Claire 2013; Lucini et al. 2020). It showed the forest on Gunung Biru in good condition, with low human activities entering the forest that can threaten the habitat and wildlife species. The similarity of vegetation on each transect was found to be low, confirming that the forest in Gunung Biru has high species richness and potential for diverse food trees for Javan langurs that will be released into the wild by the JLC. The potential sources of forage plants in Gunung Biru are not yet known to be able to support the number of Javan langur populations. This is to prevent competition between individuals and groups.

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REFERENCES

- Abdullah, Martolis J. 2015. Tingkat kesamaan jenis pakan Gajah Sumatera (*Elephas maximus* Sumatranus) pada habitat berbeda di Conservation Response Unit (CRU) Mane Pidie. Prosiding Seminar Nasional Biotik. Banda Aceh, 30 April 2015. [Indonesian]
- Akbar MA, Rizaldi, Novarino W, Perwitasari-Farajallah D, Tsuji Y. 2019. Short communication: Activity budget and diet in silvery lutung *Trachypithecus cristatus* at Gunung Padang, West Sumatra, Indonesia. *Biodiversitas* 20 (3): 719-724. DOI: 10.13057/biodiv/d200315.
- Arief H. 2012. Keanekaragaman jenis satwaliar di kawasan perkebunan kelapa sawit dan status perlindungannya: Studi kasus di kawasan unit pengelolaan PT. Tandan Sawita Papua, Kabupaten Keerom. *Media Konservasi* 17 (2): 65-70. DOI: 10.29244/medkon.17.2.%25p. [Indonesian]
- Aryanti N, Azizah L. 2019. Karakteristik habitat lutung jawa (*Trachypithecus auratus*) di Kawasan Hutan Lindung RPH Sumbermanjing KPH Malang. *Indones J Primatol* 16 (1): 24-30. [Indonesian]
- Aryanti NA, Jaki DF, Pribadi T, Kurniawan I. 2021. Mammal distribution and diversity in the protected forest of RPH Sumbermanjing Kulon KPH Malang. *Jurnal Penelitian Hutan Konservasi Alam* 18: 97-110. DOI: 10.20886/jphka.2021.18.2.97-110. [Indonesian]
- Ayunin Q, Pudyatmoko S, Imron MA. 2014. Seleksi habitat lutung jawa (*Trachypithecus auratus* E. Geoffroy SaintHilaire, 1812) di Taman Nasional Gunung Merapi. *Jurnal Penelitian Hutan Konservasi Alam*. 11 (3): 261-279. DOI: 10.20886/jphka.2014.11.3.261-279. [Indonesian]
- Brenda M, Rick S, Virginia B. 2018. General issues in statistical analysis of RAMs. In: Dorney J, Savage R, Tiner RW, Adamus P (eds). *Wetland and Stream Rapid Assessments*. Academic Press, United Kingdom.
- Chapman CA, Teichroeb JA. 2012. What influences the size of groups in which primates choose to live?. *Nat Educ Knowl* 3 (10): 9.
- Clark JM, Begley MT. 2015. Fight for life: A classroom game of foraging, patch selection and risk. *Am Biol Teach* 77 (9): 693-698. DOI: 10.1525/abt.2015.77.9.8.
- Diniyati D. 2015. Satwa yang sering ditemukan pada hutan rakyat agroforestri di Kabupaten Ciamis dan Tasikmalaya, Jawa Barat. Prosiding Seminar Nasional Masyarakat Biodiversitas Indonesia. Sebelas Maret University, Surakarta, 12 September 2015. [Indonesia]
- Dutta K. 2019. Superdiffusive searching skill in animal foraging. *Discontin Nonlinearity Complex* 8 (1): 49-55. DOI: 10.5890/DNC.2019.03.005.
- Estrada A, Garber PA, Rylands AB, Roos C, Fernandez-duque E, Di Fiore A, Nekaris KA, Nijman V, Heymann EW, Lambert JE, Rovero F, Barelli C, Setchell JM, Gillespie TR, Mittermeier RS, Arregoitia LV, de Guinea M, Gouveia S, Dobrovolski R, Shenee S, Shanee N, Boyle SA, Fuentes A, MacKinnon KC, Amato KR, Meyer ALS, Wich S, Sussman RW, Pan R, Kone I, Li B. 2017. Impending extinction crisis of the world's primates: Why primates matter. *Sci Adv* 3 (1): e1600946. DOI: 10.1126/sciadv.1600946.
- Fahmi R, Bintarawati VS. 2018. Inventarisasi jenis pakan lutung jawa (*Trachypithecus auratus*) pada Blok Cilame dan Blok Cimeudeum Taman Wisata Alam Gunung Tampomas Kabupaten Sumedang. *Wanamukti* 21 (1): 17-29. DOI: 10.35138/wanamukti.v21i1.152. [Indonesian]
- Flombaum P, Sala OE. 2008. Higher effect of plant species diversity on productivity in natural than artificial ecosystems. *PNAS* 105 (16): 6087-6090. DOI: 10.1073/pnas.070480110.
- Hidayat O. 2014. Komposisi, preferensi dan sebaran jenis tumbuhan pakan Kakatua Sumba (*Cacatua sulphurea citrinocristata*) di Taman Nasional Laiwangi Wanggameti. *Jurnal Penelitian Kehutanan*

- Wallace 3 (1): 25-36. DOI: 10.18330/jwallacea.2014.vol3iss1pp25-36. [Indonesian]
- Hoffmann S, Steiner L, Schweiger AH, Chiarucci A, Beierkuhnlein C. 2019. Optimizing sampling effort and information content of biodiversity surveys: A case study of alpine grassland. *Ecol Inform* 51: 112-120. DOI: 10.1016/j.ecoinf.2019.03.003. [Indonesian]
- Ismaini L, Lailati M, Rustandi, Sunandar D. 2015. Analisis komposisi dan keanekaragaman tumbuhan di Gunung Dempo, Sumatera Selatan. *Prosiding Seminar Nasional Masyarakat Biodiversitas Indonesia*. Sebelas Maret University, Surakarta, 13 Juni 2015. [Indonesian]
- Ismail MH, Fuad MFA, Zaki PH, Jemali NJN. 2017. Analysis of importance value index of unlogged and logged peat swamp forest in Nenasi Forest Reserve, Peninsular Malaysia. *Bonorowo Wetl* 7 (2): 74-78. DOI: 10.13057/bonorowo/w070203.
- Kurniawan A, Baskoro K, Jumari J. 2019. Komposisi vegetasi habitat lutung jawa (*Trachypitecus auratus*) di Kawasan Wana Wisata Kalipaingan Kabupaten Pekalongan. *Bioma* 21 (2): 132-138. [Indonesian]
- Leca JB, Gunst N, Rompis A, Soma G, Putra IGAA, Wandia IN. 2013. Population density and abundance of ebony leaf monkeys (*Trachypitecus auratus*) in West Bali National Park, Indonesia. *Primate Conserv* 26 (1): 133-144. DOI: 10.1896/052.026.0106.
- Li Y, Ma G, Zhou Q, Li Y, Huang Z. 2020. Nutrient contents predict the bamboo-leaf-based diet of Assamese macaques living in limestone forests of southwest Guangxi, China. *Ecol Evol* 10 (12): 5570-5581. DOI: 10.1002/ece3.6297.
- Loreau M, de Mazancourt C. 2013. Biodiversity and ecosystem stability: A synthesis of underlying mechanisms. *Ecol Lett* 16 (1): 106-115. DOI: 10.1111/ele.12073.
- Lucini FA, Morone F, Tomassone MS, Makse HA. 2020. Diversity increases the stability of ecosystems. *Plos One* 15 (4): e0228692. DOI: 10.1371/journal.pone.0228692.
- Nahlunnisa H, Zuhud EAM, Santosa DY. 2016. Keanekaragaman spesies tumbuhan di Areal Nilai Konservasi Tinggi (NKT) Perkebunan kelapa sawit Provinsi Riau. *Media Konservasi* 21 (1): 91-98. DOI: 10.29244/medkon.21.1.91-98.
- Nijman V. 2013. Distribution and ecology of the most tropical of the high-elevation montane colobines: The ebony langur on Java. In: Grow N, Gursky-Doyen S, Krzton A (eds). *High Altitude Primates. Developments in Primatology: Progress and Prospects*. Springer, New York.
- Nijman V. 2021. *Trachypitecus auratus*. The IUCN Red List of Threatened Species 2021: e.T39848A17988500. DOI: 10.2305/IUCN.UK.2021-1.RLTS.T39848A17988500.en.
- Mahajan DM, Patil RD. 2014. Plant and insect species diversity: A case study of Western Satpuda (Maharashtra). *Indian For* 140 (3): 312-316.
- Mahbuby MI. 2017. Komposisi Jenis Tumbuhan Pakan Lutung Jawa (*Trachypitecus auratus*) di Tempat Pelepasan Liar Hutan Cibuni Kabupaten Bandung Jawa Barat. [Thesis]. UIN Sunan Gunung Djati, Bandung. [Indonesian]
- Mustari AH, Pasaribu AF. 2019. Habitat characteristics and population of javan langur (*Trachypitecus Auratus* E. Geoffroy Saint-Hilaire, 1812) in Leuweung Sancang Nature Reserve, Garut, West Java. *Jurnal Wasian* 6 (2): 77-88. DOI: 10.20886/jwas.v6i2.4816.
- Musyaffa MEF, Santoso N. 2020. Karakteristik habitat dan pola aktivitas langur borneo (*Presbytis chrysomelas cruciger*) di Taman Nasional Danau Sentarum. *Jurnal Penelitian Hutan dan Konservasi Alam*. 17 (2): 155-172. DOI: 10.20886/jphka.2020.17.2.155-172.
- Sari I, Baskoro K, Hadi M. 2020. Estimasi populasi dan vegetasi habitat lutung jawa di Gunung Ungaran, Jawa Tengah. *Jurnal Habitat Tropika* 3 (2): 47-56. DOI: 10.14710/jbt.3.2.47-56. [Indonesian]
- Supartono T, Budi L, Hikmat A, Priyono A. 2016. Spatial distribution and habitat use of Javan Langur (*Presbytis comata*): Case study in District of Kuningan. *Proc Environ Sci* 33: 340-353. DOI: 10.1016/j.proenv.2016.03.085.
- Tolangara A, Ahmad H, Liline S. 2019. The composition and important value index of trees for wildlife feed in Bacan Island, South Halmahera. *IOP Conf Ser Earth Environ Sci* 276 (1): 012037. DOI: 10.1088/1755-1315/276/1/012037.
- Tran VB, Hoang MD, Luu HT, Workman C, Covert H. 2019. Diet of the Annamese langur (*Trachypitecus margarita*) (Elliot, 1909) at Takou Nature Reserve, Binh Thuan Province, Vietnam. *Raffles Bull Zool* 67: 352-362. DOI: 10.26107/RBZ-2019-0026.
- Tsuji Y, Mitani M, Widayati KA, Suryobroto B, Watanabe K. 2019. Dietary habits of wild Javan lutungs (*Trachypitecus auratus*) in a secondary-plantation mixed forest: Effects of vegetation composition and phenology. *Mamm Biol* 98: 80-90. DOI: 10.1016/j.mambio.2019.08.001.
- Wedana M, Kurniawan I, Arsan Z, Wawandono NB, Courage A, King T. 2013. Reinforcing the isolated Javan langur population in the Coban Talun Protected Forest, East Java, Indonesia. *Wild Conserv* 1: 31-39.
- Zakki A, Sukarno A, Farida S. 2017. Preferensi jenis-jenis pakan lutung jawa (*Trachypitecus auratus* É. Geoffroy Saint-Hilaire, 1812) di Hutan Lindung Coban Talun. *Konservasi Sumberdaya Hutan Jurnal Ilmu-Ilmu Kehutanan* 1 (4): 86-91. [Indonesian]
- Zhu XZ, Gao T, Zhang JT. 2014. Point-Centred Quadrangle Method: A Novel Distance Method for Density Estimation. *Trans Tech Publications, Ltd., Switzerland*.