

# POPULATION DENSITY OF LEAF-EATING MONKEYS AND DOMINANT VEGETATION AT THE IPUKAN, GUNUNG CIREMAI NATIONAL PARK, INDONESIA

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## ABSTRACT

The purpose of this study was to analyze the population density of leaf-eating monkeys (javan langur and grizzled leaf monkey) and vegetation dominating their habitat. The research has been done in the Ipuhan of Gunung Ciremai National Park and used line transect method for population data collection and sample plot for data collection of vegetation. The results showed that the population density was 0.49 animals/ha for javan langur and 0.24 animals/ha for grizzled leaf monkey and the mean of group size were 7.42 and 8 animals, respectively. Vegetation was dominated by *Pinus merkusii*, followed by *Ficus fistulosa*, *Macaranga rhicinoides*, and *Ficus ribes* indicating that monkey habitat was a modified ecosystem and secondary forest.

**Keywords:** conservation, grizzled leaf monkey, javan langur, *Presbytis comata*, *Trachypithecus auratus*.

## 1. Introduction

Conservation areas are widely distributed in Indonesia and play an important role in the conservation of biodiversity, both endemic and non-endemic species. One of the conservation areas in Indonesia is Gunung Ciremai National Park (TNGC). Gunung Ciremai became a national park since 2004 through Decree of Minister of Forestry Number 42/Menhut-II/2004. Prior to 2004, Gunung Ciremai was a production forest for both lowland and sub-mountain forest and protected forests for mountain ecosystems. Gunung Ciremai still contains many floras and faunas, including primates species.

Primates occupying the TNGC area include leaf-eating monkeys, namely *Trachypithecus auratus* and *Presbytis comata* (Hidayat 2013; Supartono 2010; Wakidi 2013). Both species are protected species, even including endangered species for grizzled leaf monkey. The primates are scattered in several forest blocks of TNGC, including in Ipuhan. As a protected and endangered species, the existence of both primates needs to be maintained. However, the efforts of population preservation must be supported by sufficient information.

One of the most important information about the preservation of leaf-eating monkey populations is population density. However, the density of the two monkey species at these sites is not known. Therefore, there is an effort to estimate the population of leaf-eating monkeys in the Ipuhan forest block, Gunung Ciremai National Park. To address the information gap, this article presents the density conditions of the langurs and the grizzled and vegetation that dominate it.

## 2. Methods

### 2.1. Time and Study Sites

The study was conducted for 2 months, starting from September to October 2016. The location is Ipuhan Block, Cigugur Resort of Gunung Ciremai National Park. The areas are about 96 ha with diverse land cover. The land cover consists of secondary natural forest and pine forest mixed with natural vegetation. Pine forests are generally located on the edge of the forest or the adjacent portion and the private land. Meanwhile,

the secondary natural forest is on the inside, ie after pine forest. The sites also generally have steep and very steep topography.

### 2.2. Data Collected

The data collected includes population and vegetation data. Population data consists of primate species and number of group members. The vegetation data consists of tree species and diameter. Trees recorded are trees that have a diameter of  $\geq 10$  cm.

### 2.3. Population Data Collection

Population data were collected by using line transect method (Greenwood & Robinson 2006; Martin 2005). The method is the best method for low population density estimation (Caughley 1977). When using the method, the observations traces along a predetermined observation path at a fixed rate. The transect was paths and lanes made directly when observing. Data recorded when encountering primate groups are primate species, number of group members, observer distance to primate individuals first seen ( $r$ ), and angles formed into primate position ( $\theta$ ), observer position and observation path direction. The observation line is 5 lanes and the length of each lane is 1 km. The number of replication on each line is 3 times.

### 2.4. Vegetation Data Collection

Collection of vegetation data used Gentry method (1982) with sample size of 2m x 50m. The vegetation groups recorded in the sample plots include growth rates of pole and tree. The recorded data includes tree species and diameter. The sample plot is placed along the population observation track. The number of sample plots of each path was 20 plots.

### 2.5. Data Analysis

The data analysis for the population is the estimation of individual density of each primate species. The first step is to calculate the perpendicular distance ( $y$ ) of each primate position to the observation path: the observer's distance from the animal ( $r$ ) multiplied by the angular sinus ( $\theta$ ). The perpendicular distance is used to estimate the width of the observation path.

In this study, the perpendicular distance used is the widest distance after eliminating the outlier data. Thus, the population density is calculated using the formula: (total primate encountered) / (total line length x 2 line width).

In vegetation, data analysis is the estimation of individual density of each species, frequency of presence in each plot, and basal area. The analyzes was performed to obtain an important value index of each tree species (Soerianegara and Indrawan 2005).

### 3. Results and Discussion

#### 3.1. Group Size

The study has been conducted on five lines with three replications. Of all the lines and replications, the study has recorded 89 animals of 12 groups or 29.67 animals/replicates for javan langur and 40 animals of 5 groups or 13.33 animals/replicates for grizzled leaf monkey. Group size ranged from 5 to 11 animals (mean 7.42 animals) for langur and 4-14 animals (mean 8 animals) for grizzled. The size and range of langur groups obtained from this study were smaller than those of groups obtained from Wakidi (2013) study in several locations in the TNGC region, ranging from 4-17 animals with an average of 10.5 animals. When compared to the range and size of the group outside TNGC, this result was also smaller than that of the Murthafiah (2015) at Dungus Iwul Nature Reserve, Bogor and Rahmawati & Hidayat (2017) at Ulolanang Nature Reserve, Batang. The group size of the study of Murthafiah (2014) was ranged from 2 to 24 animals, whereas in the study of Rahmawati (2017) was ranged from 14 to 15 animals. The lower group size of this result compared to that of other studies was thought to be due to several factors, such as patterns of feed distribution, habitat quality, and level of disturbance.

For the group size of the grizzled, the result is not much different from the result of Supartono (2010) in the same area with a wider research area: around 2-15 animals with an average of 7.15 animals. In the study of Supartono et al. (2016) outside the conservation area, the group size interval is wider than that of this study, ie 2-22 animals, but the average is not much different, about 8.52 animals. The shorter group size interval of this study compared to other studies showed that the environmental conditions at this study site were more uniform than those in other locations, but the pressure was higher.

#### 3.2. Population Density

This study has resulted in a population density of 0.49 animals/ha for langur and 0.24 animals/ha for grizzled. For density of langur population, this result is lower than that of Leksono (2014) in Pananjung Nature Reserve: 2-8 animals/ha and close to that of Rahmawati & Hidayat (2017) in Ulolanang Nature Reserve: 0.62 animals/ha. The differences are suspected because of differences in habitat characteristics from these sites. For population density of grizzled, this result is lower than that of Supartono et al. (2016) in secondary natural forests outside conservation areas: 0.60 animals/ha. As with the density of langur, this difference is thought to be due to differences in quality and habitat characteristics. The quality of habitat at the study sites was lower than that in other locations.

The study that found higher density of langur compared with that of grizzled indicates that Ipukan area is more feasible for langur populations than grizzled and also shows that adaptability of langur is higher than that of grizzled. This is because the Ipukan currently has a high level of human activity. The site has been used as a campground and ecotourism area.

#### 3.3. Dominant Vegetation

The study has recorded as many as 68 tree species in the location that became the habitat of leaf-eating monkeys. The tree species that dominate the habitat are *Pinus merkusii*, followed by *Ficus fistulosa*, *Macaranga rhicinoides*, and *Ficus ribes* (Table 1). The last three species are pioneer types and are common to secondary forests. Habitat for langur dominated pine is rarely reported by previous researchers. In Hendratmoko (2009), the habitat in Pangandaran Nature Reserve was dominated by laban (*Vitex pubescens*), marong (*Cratogeomys formosum*), and kiandong (*Rhodamnia cinerea*). In Utami (2010) research in several locations of Bromo Tengger National Park, tree-level vegetations dominating the langur habitat were jarakan (*Castanopsis javanicus*), sapen (*Engelhardia spicata*), nyampo (*Litsea cubeba*), tunjung (*Homalanthus populneus*), genitri (*Elaeocarpus sphaericus*), jambean (*Ficus* sp.), kisomang (*Sloanea sigun*), lembayung (*Turpinia shaerocarpa*), katesan (*Macropanax dispernum*), and pasang (*Quercus sondaicus*).

As in habitat of langur, habitat of grizzled dominated pine was rarely reported by previous researchers, except by Suryana (2010) in Pekalongan and Supartono (2016) outside conservation areas in Kuningan District. Based on the results of previous studies in several places, trees dominating the grizzled habitat were *Actinodaphne* sp., *Quercus* sp., *Schima walichii* (Siahaan 2002), kihaji, *Maesopsis eminii*, and *Pterospermum javanicum* (Wahyono 2012).

The pine-dominated site indicated that the habitat of the langur and grizzled has changed and both species have adapted to modified habitats. The results of this study also indicated that the habitat of langur and grizzled consists of plantations of exotic species and secondary forest. The existence of modification of some habitats was thought to be one of the reasons why the density of both species populations of the study sites tends to be lower than that of the leaf-eating monkeys in other locations outside the Gunung Ciremai National Park areas.

#### 4. Conclusion

The population density of leaf-eating monkeys was 0.49 animals/ha for langur and 0.24 animals/ha for grizzled and indicated that the langur were more adaptable than grizzled. Leaf-eating monkey habitat was dominated by commercial and exotic species: *Pinus merkusii*, followed by local species: *Ficus fistulosa*, *Macaranga rhicinoides*, and *Ficus ribes* indicating that the habitat was secondary forest and has been modified.

**Table 1.** Vegetation dominating leaf-eating monkey habitat

No	Local Name	Scientific Name	F	K (ind/ha)	D (m <sup>2</sup> /ha)	INP (%)
1	Pinus	<i>Pinus merkusii</i>	0,43	196	15,63	61,95
2	Kondang	<i>Ficus fistulosa</i>	0,33	50	3,55	18,73
3	Mara	<i>Macaranga rhicinoides</i>	0,35	46	2,48	16,42
4	Walen	<i>Ficus ribes</i>	0,36	54	1,63	15,77
5	Kipare	<i>Glochidion macrocarpus</i>	0,25	30	1,98	11,83
6	Kihiur	<i>Castanopsis javanica</i>	0,20	31	1,29	9,67
7	Pasang	<i>Lithocarpus indutus</i>	0,19	24	1,60	9,33
8	Kaliandra	<i>Calliandra calothyrsus</i>	0,17	35	1,09	9,19
9	Beunying	<i>Ficus fistulosa</i>	0,23	23	0,78	8,23
10	Huru	<i>Actinodaphne procera</i>	0,22	22	0,85	8,08

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