# Sentarum langurs (*Presbytis chrysomelas*) demographic parameters in Sepandan Resort Area of Sentarum Lake National Park

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*Abstract. Lutung Sentarum (*Presbytis chrysomelas *spp.* cruciger*) is a member of the Presbyis Tribe. Langur Sentarum (*Presbytis chrysomelas cruciger*) is one of the endemic animals in West Kalimantan with unprotected status but is vulnerable to extinction. The study was conducted to obtain data on the demographic parameters of animal populations and their management in the Sepandan Resort area. The research was conducted through field observations to obtain data on demographic parameters with the concentration count method based on consideration of the characteristics of species distribution and field conditions in the research area. Observations or population size calculations at one point were carried out three times, namely in the morning (06.00–08.00), afternoon (12.00–14.00), and afternoon (16.00–18.00), and three replicates were carried out. The results of data from Lutung sentarum at the Sepandan resort found 8 groups from 2 areas, namely in Pelaik Hamlet 2 groups and in Kedungkang Hamlet 6 groups. Each group relatively had 1 adult male. Total individuals found were 58 individuals consisting of; 8 adult males, 25 adult females, 5 juvenile males, 18 juvenile females and 2 chicks. The total number of adult males and juveniles is 13 individuals and the total number of females is 43 individuals. The results in the sex ratio calculation of the encounter of 8 groups consisting of 13 males and 43 females were composed of sex ratio values of 1:3. Total natality value of 8 groups of langur sentarum is 0.08.*

## INTRODUCTION

Sentarum langurs (*Presbytis chrysomelas* ssp. *cruciger*) was the first time known as the sub-species *simpai* or Sumatran langur (*P. melalophos*) until at the time was classified as *P. chrysomelas* because of morphology difference (Groves 2001). Based on morphology and genetics, *P. chrysomelas* ssp. *cruciger* is divided into two sub-species, *Presbytis chrysomelas cruciger* (Vun et al. 2011). Sentarum langurs (*Presbytis chrysomelas* spp. *cruciger*) is a member of the Presbyis. The name 'Cruciger' refers to the morphology of the hair color on the dominant body part, which consists of three colors, namely yellow, black, and white. So far, the spread of *Presbytis chrysomelas* has only been known in the Sarawak region of Malaysia. Still, in 2018 the Betung Kerihun National Park and Danau Sentarum West Kalimantan found the same species in the Sentarum Lake National Park (SLNP). Data and information about the existence of *Presbytis chrysomelas* in the SLNP

area, both the number and population structure as well as its distribution, are still limited, making it difficult for the SLNP management to determine conservation actions and efforts.

Danau Sentarum National Park (SLNP) is a wetland with an ecosystem consisting of swamp forest, lowland forest, and heath forest, a protected fauna habitat. The SLNP area has a wet and humid climate (ever-wet climate), there are 32 flora families found in the lowland forests of the SLNP, which are dominated by the Dipterocapaceae family (Kusmana et al. 2009), and there are 143 species of mammals in the SLNP primates (Giesen and Aglionby 2000). Information about the demographic parameters of the Sentarum langurs is very important to study because it is one aspect considered in improving the quality of conservation management of the Sentarum langurs in the SLNP. Based on this, this study aims to analyze the demographic parameters of the Sentarum langurs.

## METHOD

### Research Location and Time

The research will be carried out in August–October 2021. The research location is in Danau Sentarum National Park, West Kalimantan, to be precise, in the Sepandan Resort Area (Figure 1).
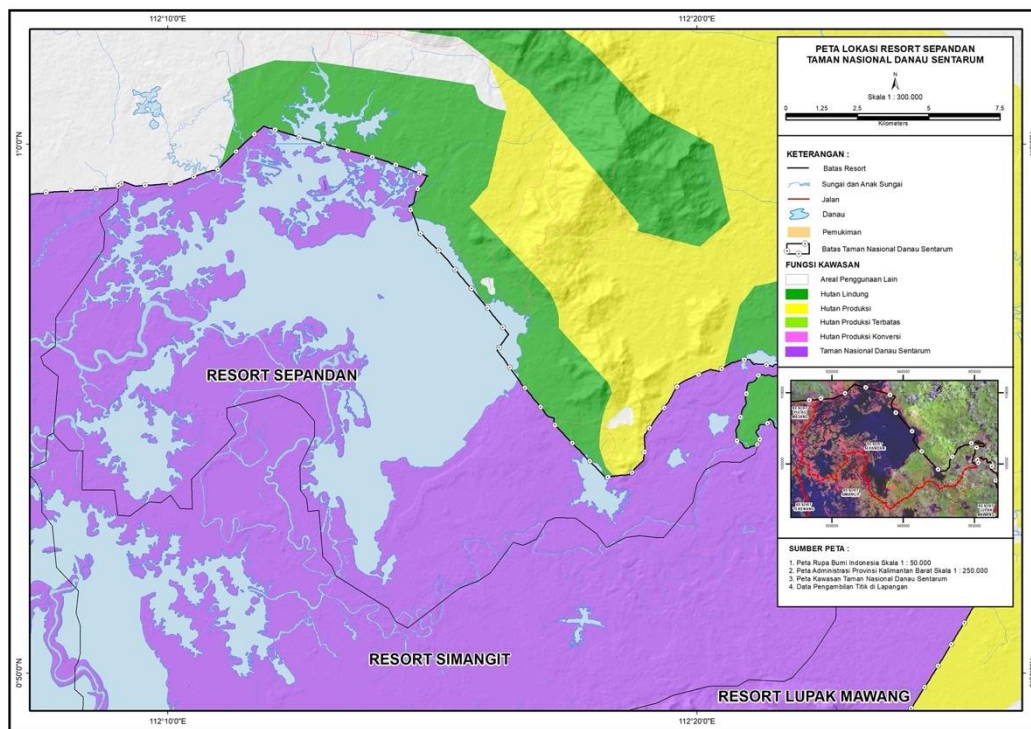


Figure 1 Research site

### Data Collection Methods

Data collection on the population of the Sentarum langurs Past the concentrated count method. An in-depth preliminary study was carried out before carrying out an inventory using the concentrated method (Kusmana 1997). To determine the points where the Sentarum langurs are gathered. This method is based on consideration of the characteristics and distribution of the Sentarum langurs species and the field conditions of the research area. Regarding the characteristics of the Sentarum langurs, according to Kool (1992), it is stated that the langur is a timid and sensitive species, so it will quickly avoid humans, so it is necessary to observe population size and other demographic parameters of the Sentarum langurs (sex ratio, natality, mortality, age composition). Observation techniques were used with the silent observer technique, one of which was the concentration count more precisely related to the distribution of the Sentarum langurs.

Population size data were collected at 15 observation points, spread across all types of habitats that constitute the research study area. It is a form of adaptation made by the Sentarum langurs with the domination of flat to undulating topography in Danau Sentarum National Park. Observations or population size calculations at one point were carried out three times, namely in the morning (06.00–08.00), afternoon (12.00–14.00), and afternoon (16.00–18.00), and carried out three replications.

### Natality

The natality value measured in the field is the crude natality value, carried out by observing the number of babies found at the observation point. Natality data collection simultaneously with population size data collection. If field data are not obtained, the natality rate will be approached by using a literature study on other types of langurs.

### Mortality

Mortality is expressed in terms of the crude death rate, which is the ratio between the number of deaths and the total population  (Napier and Napier 1967; Lekagul and McNeely 1977; MacDonald 1984). If no field data is obtained, the mortality rate will be approached using a literature study of other types of langurs.

### Age Structure

Differences in age structure between children, adolescents, and adults were used in field identification based on Napier and Napier (1967), Lekagul and McNeely (1977), MacDonald (1984). 0-4 years old, small body size, still cared for by their parents until they reach sexual maturity and are very dependent on their parents. 4-8 years old, medium body size, has reached sexual maturity until it reaches optimum reproductive age. For males, the scrotum begins to appear and is often found in groups and for females, the mammary glands are still small, often in groups. 8-20 years old, large body size, optimum reproductive age until the oldest age. For males, the body size is larger than females, while females are often close to individual children (active in raising children). The calculation of the sex ratio is only done in the adult age class, because it is difficult to do it for young people and children.

### Sex Ratio

The sex ratio is an index that is usually defined as the ratio of males to females in a population, and the sex ratio was obtained by field observations, namely by observing the number of males and females. Observation of the sex ratio is only done in young and adult classes because it is difficult for children to do. Sex ratio data retrieval simultaneously with population size data collection (Napier and Napier 1967; Lekagul and McNeely 1977; MacDonald 1984).

## Data Analysis

### Demographic Parameters

Population density estimates are calculated and analyzed for the following information (Santosa and Sitorus 2008).

$$N = \sum Xi$$

$$X = \sum Xi/n$$

$$S^2 = \frac{\sum Xi^2 - (\sum Xi)^2)/n}{n-1}$$

$$\text{Estimation of group size range} = X \pm t^{\propto/2}; n-1 \sqrt{s^2/n}$$

Information:
N  : Total number of individuals
X  : Estimation of mean group size
$X$  : average size of the langur group for each observation location (individual)
Xi : number of langurs in group i (individuals)
n  : number of groups
$S^2$ : variation in the number of individuals at the observation site (individuals)

### *Natality*

Natality will be calculated using the equation (Santosa and Sitorus 2008).

$$b = \frac{B}{N}$$

Information:
b  : Crude birth rate
B  : Number in infant
N  : Number of productive female individuals

### *Mortality*

The mortality value is obtained by using the chance of life approach. The equation used to determine the value of the chance of life and mortality are as follows (Santosa and Sitorus 2008).

$$(a_X) = \frac{N\,(x+1,\ t+1)}{N\,(x,t)}$$

Information:
$a_X$  : Opportunity of life for every age class
$N_{(x,t)}$ : Total population of age class x at time t. Mortality of each age class ($M_i$)
$M_i$  : 1 - $a_X$

### *Age Structure*

The age structure is the ratio of the number of individuals in each age class of a population. The age structure is obtained by counting and grouping the number of adult males, adult females, young males, young females, children, and infants (Santosa and Sitorus 2008). Field identification based on Napier and Napier (1967), Lekagul dan McNeely (1977), MacDonald (1984) referred to in Dewi (2005).

### *Sex Ratio*

Sex ratio is calculated by the equation (Santosa and Sitorus 2008).

$$S = \frac{J}{B}$$

Information:
S  : Sex Ratio
J  : Number of Males
B  : Number of females

### *Analysis of Space Use Patterns for Behavioral/Activity Analysis*

Data and information on Sentarum langurs activity were analyzed in two ways, namely descriptively to describe all types of Sentarum langurs activity found according to the type of habitat used, while quantitatively to explain the relationship between intensity or duration of activity of Sentarum langurs found according to the type of habitat used. These relationships include proportion of activity type with proportion of position in space

(height of trees/vegetation), proportion of activity time with proportion of position in space (height of trees/vegetation).

**RESULT AND DISCUSSION**

The results of the Sentarum langurs study found eight groups in two observation locations, namely 6 groups in Pelaik hamlet and 2 groups in Kedungkang hamlet. The total individuals found were 58 individuals, consisting of 8 adult males, 25 adult females, 5 juvenile males, 18 female juveniles, and 2 pups. The size of the Sentarum langurs population is presented in Table 1.

Table 1 Composition of Sentarum langurs Group

| No | Place name | Adult | | Young | | Baby | Total (Individu) |
|----|------------|-------|--------|-------|--------|------|------------------|
|    |            | Male  | Female | Male  | Female |      |                  |
| 1  | Temukup River | 1 | 2 | 1 | 1 | 0 | 5 |
| 2  | Baung River | 1 | 3 | 0 | 3 | 0 | 7 |
| 3  | Baung River | 1 | 3 | 4 | 4 | 2 | 14 |
| 4  | Tembawang River | 1 | 2 | 0 | 2 | 0 | 5 |
| 5  | Pitung River | 1 | 2 | 0 | 2 | 0 | 5 |
| 6  | Teluk Klansau River | 1 | 4 | 0 | 0 | 0 | 5 |
| 7  | Track 1 (Long Bridge) | 1 | 6 | 0 | 3 | 0 | 10 |
| 8  | Track 2 (Behind the Betang House) | 1 | 3 | 0 | 3 | 0 | 7 |
|    |            | **8** | **25** | **5** | **18** | **2** | |
|    |            | **33** | | **23** | | **2** | |
|    |            | **58** | | | | | |

Based on the results of research that has been done, it is known that the habitat of the Sentarum langurs at the same location can be said to be suitable, especially in the context of environmental temperature that supports the survival of the Sentarum langurs. According to Shofa (2014), environmental temperature conditions in the Presbytis natural habitat are between 20–30 ºC and 80% humidity. According to Ikbal (2001), the high feeding frequency in adult males is due to their relatively large body size and to balance the energy expended to lead group movements. This is consistent with findings in the field that a mature male population indicates large amounts of potential forage trees. The composition of the foraging tree stands indirectly produces new shoots of plants that are food for the Sentarum langurs. It is consentaneous with Sugiharto statement (1992) that primates do a lot of feeding activities at the ends of branches.

**Sex Ratio**

The results in the sex ratio calculation of the encounter of 8 groups consisting of 13 males and 43 females were composed of sex ratio values of 1:3. Calculation of dominant female population size is found so that the calculation in the sex ratio sex has a large amount while for male classified as moderate. It is undeniable that every adult male has a pair of 3–5 females for each group. Pusparini (2012) states that if the number of females is more than males, then the langur can be said to be productive, so it can be concluded the langur in the Sepandan Resort area has the opportunity to have a productive development. Supriatna and Wahyono (2000) stated that a langur is a primate group with only one male as the group leader and several females.

**Age Structurer**

The results on the age structure can be seen in Figure 2 where the dominant age class is the adult age class, while the lowest is in the age of young class. This can be due to a large number of adult age classes found so that the adult age class is relatively high because, at the time of observation, the birth season had not yet occurred, so the adult age structure was dominant. The adolescent age class is classified as moderate

because when in the field, the adolescent population is compared to the child age class. This is because the female is not yet in the production/mating period. So that there are not too many tillers found in the observation area. This will guarantee population sustainability because more individuals in adolescents and children will guarantee population productivity or the natality rate will remain high (Hidayat 2012).
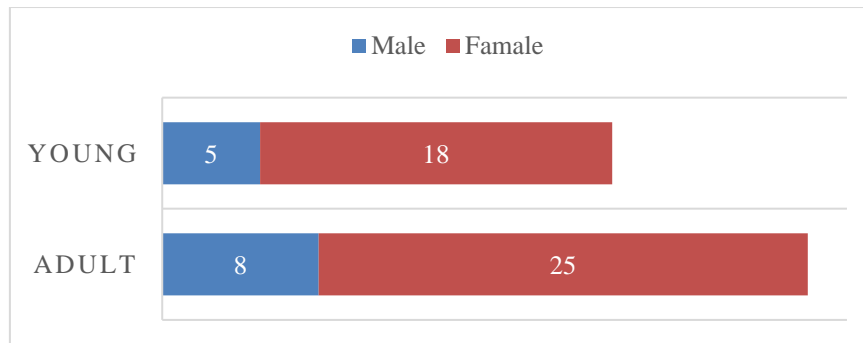


Figure 2 Age structure

## Natality

The calculated birth value in this study was the crude birth rate. The specific birth rate cannot be calculated because the age class of individual Sentarum langurs in the wild cannot be known with certainty, so each individual's grouping is based on qualitative magnitude. In addition, the time interval between age classes is not the same. Natality value is obtained by looking at the number of puppies aged approximately 1 year and compared with the number of productive females.

Based on data processing results, the natality value in the Sentarum langurs group was 0.66. This value is different from the estimated value of Natality *Presbytis aygula* put forward by (Siahaan 2002) where the estimated value of *Presbytis aygula* in the Gunung Salak area is 1.23. The birth rate is the ratio between the number of individual babies born and the total number of reproductive females (Priyono 1998). This is the same as sex ratio and age structure, where there is little research related to demographic parameters, so the comparative data is very limited.

The data processing results showed a moderate birth rate at the Sepandan Resort. Only a few were found in puppies at the time of the study, so it was not comparable to the finding of productive females. In addition, it is suspected that the optimal environmental temperature factor at the Sepandan resort causes the development and metabolism of the baby to go well so that the mortality rate in the baby's age class can be minimized. This value differs from the estimated value of Hidayat (2012), who found that the presumptive value of *Presbyitis comata* was 0.12. It is also different from the value suspected of *Presbyitis thomasi* by Wich et al. (2007) which obtained a birth rate value of 0.48. According to Fitri et al. (2013) the value of natality in the *Presbytis melalophos* study in the Guguk Jambi customary forest was 0.44. This research on the birth rate is based on the observations of each group. The Natality value in Fauzi et al. (2017) study of *presbytis rubicunda* at Nyaru Menteng Arboretum was 0.23. There is little research on Sentarum langurs, especially on demographic parameters, so comparing them is difficult.

## Mortality

Death is a natural occurrence in a population. When in the field, it was difficult to obtain data on the mortality of Sentarum langurs in a short period, especially because of the time limit for this study, which was less than one year. So to obtain the mortality value is calculated by the approach of 1 chance of survival in each age class. The assumption used is that the condition of the population each year is identical to the condition of the population in the previous year. The mortality rate is obtained through assumptions due to the

limited time of this study which is less than one year. The assumption used is that the condition of the population this year is identical to the condition of the population in the previous year.

The mortality rate for the age group of children and adolescents is 0.25, with a chance of survival of 0.75, while the result for the death rate for adolescents and adults is 0.5, with a chance of survival of 0.5. The higher the chance of survival, the higher the success of individuals entering the next age class. According to Hidayat (2012), *Presbyitis comata* deaths that occur in the young-adult class are more influenced by fights with members of the same sex to gain natural resources and power. According to Wich et al. (2007), the death rate for *Presbytis thomas* every year.

Male annual mortality increases again until adulthood, while for females, it continues to decrease until adulthood. In addition, it is also suspected that young or adult males are expelled from the group to fight over young female individuals as partners. According to Fitri et al. (2013), the mortality rate in the *Presbytis melalophos* study in the Guguk Jambi customary forest was 0.65. The mortality value in Fauzi et al. (2017) study of *presbytis rubicunda* at Nyaru Menteng Arboretum was 0.73. Based on the study's results, data were obtained that at certain age classes, some individuals lost in the competition to survive in the wild. According to Yusrizal (1999), deaths in the younger class are more caused by competition in fighting for social status within the group, competition for food, water, and space. Therefore, population management is very important to obtain information about the existence of Sentarum langurs so that they can still exist and be managed properly and prevent extinction. According to Puji (2014), competition between individuals will be low if a forest area has sufficient diversity of feed, water, and space.

## CONCLUSION

The demographic parameters observed in the Sepandan Resort area and its surroundings are 8 groups. The total individuals found were 58 individuals, 8 adult males, 25 adult females, 5 juvenile males, 18 juvenile females, and 2 babies. The total number of adult males and juveniles was 13, and the total number of females was 43. The population size obtained from the study area was 0.96, the highest at the adult and juvenile levels, and the sex ratio of the Sentarum langurs was 1:3. The age structure of the Sentarum langurs consisted of 0 children 0.3, youth 0.39, adults 0.57. Sentarum langurs natality 0.66, and mortality value 0.25. The threats to Sentarum langurs are land conversion, competition for feed, and poaching.

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