The Daily Activity of Long Tailed Macaques (*Macaca fascicularis* Raffles) in Cikakak Tourist Resort Wangon Banyumas (a Conservation Effort)

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Abstract. This research aimed to record the daily activity of long-tailed macaques (*Macaca fascicularis* Raffles) in Cikakak Tourist Resort Wangon. The daily activity of monkey was taken by the Scan Sampling method, and their moving behavior was observed with the Chivers method by following them from the time they began to wake up to they started to sleep. The Path method was applied to observe plant varieties they ate. Based on the observation, it was found that the long-tailed macaques have consumed 64 plant types (35 families) consisting of 21 trees, 33 shoots, and 24 buds. *Syzygium polyanthum* and *Ficus* sp were the dominant plants in the area. The macaque activities mostly performed in the morning, while in the evening, they seemed to take a rest.

1. Introduction

Java is one of the fifth big islands in Indonesia. It is home to various kinds of plants and wild animals that distribute in its diverse habitats. They, ecologically, socially, and culturally, are valuable natural resources that benefit human beings. Thus, it is not surprising that Indonesia is the place for primates, both endemic and cosmopolitan. Long-tailed macaques (*Macaca fascicularis* Raffles) is one of the thousands of primate that lives in the country.

The macaques have been used for medical interest, such as experiments to cure some diseases. The most acceptable reason why primate is chosen for medical research is that their anatomy, physiology, and morphology are the closest to humans [1]. The experiments of long-tailed macaques in medical issues must be stopped and be replaced by non-animals alternatives. The experiments in animals for any particular purpose has been a big issue and has no longer used in modern country [2].

It has been reported that the population size of *M. fascicularis* has been decreased by approximately 50% in three years [3]. The long-tailed macaques are in a lower Risk Treatment or Endangered Species in red note [4].

Cikakak Reservation Resort is a protected forest because it is a conservation area that has potential resources in its beauty and natural resources such as flora, fauna, and sacred places. This resort lies in the west of Banyumasan Regency that is dominated by pines and some rare species of trees.

The changes in the area into a resort will affect its flora and fauna. Increase of visitors to the resort is alarming as it potentially disturbs the macaque habitat and esthetical value of the area. It is believed that visitors will influence the life of the long-tailed macaques.

The attempt to protect the habitat is necessary to prevent habitat destruction and species extinction. Conservation effort succeeds when knowledge, especially about long-tailed macaques habitat, life, and ecosystem, is sufficient. The macaque habitat should be supported by the ecosystem rich with trees as
its food resource, resting place, and shelter. Therefore, it is necessary to observe the trees needed by long-tailed macaques that are essential for their life, and the roles of society for the existence of long-tailed macaques in Cikakak Resort.

The purposes of this research were to find out the macaque daily activities, to identify the potential trees and plants for food resource, resting place, and shelter in Cikakak Resort.

The results are expected to provide valuable information for KPH of West Banyumas Regency and Banyumas Government related to the conservation effort of long-tailed macaque habitat, and technology for habitat maintenance in Cikakak Resort Wangon.

2. Methods

The research subjects were long-tailed macaques, tree or plant types (food resource), resting place, and shelter. The macaques were classified according to their age and gender, AM = Adult Male, AF = Adult Female, SM = Sub Adult Male, SF = Sub Adult Female Juvenile Male, JF = Juvenile Female, and I = Infant.

The study applied a survey method to observe the macaque daily activities. Selected trees or plants by the macaque were recorded according to path method by following the macaque route. Trees to where the macaques jump to and use them for food resource, resting place, and shelter were listed [5].

The data consisted of collection and identification of the macaque food resources, including leaves, seedling, stems, tree branch, fruit type, flowers, seeds, and the feed remnants on the ground. Also, the fecal analysis to figure out food that had been consumed (seed, leaves, or fruits). Members of the population were enumerated by census, which was done from morning to evening three times during three weeks.

Their daily activities were based on the Scan Sample Method [6] by following their journeys from wake up to sleeping time in 10 minutes intervals. Activities to observe were walking, foraging, eating, playing, agonistic behaving, grooming, copulating, interacting with other animals, based on [7]. Other recorded data included their daily range, a maximum range of exploration from the shelter trees, and sleep position from one shelter to the next night shelter.

The macaque daily activities were analyzed descriptively. The questionnaire data of the respondents were presented in percentages. The research took five months to finish, and daily activities observation was started from August up to October 2015 in Cikakak Resort Wangon.

3. Results

3.1 The Population of Long-tailed Macaques in Cikakak Resort

The long-tailed macaque population was divided into three social groups. The member of each social group ranges from 25 to 56 individuals (Table 1). The table shows that during the observation, five births in groups 1 and 2, and four births in groups 3 and 4 occurred. The macaques had made lots of characteristic displacements.

| Group of Macaque | Observation | AM | AF | SM | SF | JM | JF | I | Number |
|------------------|-------------|----|----|----|----|----|----|----|--------|
| 1                | 1           | 4  | 15 | 7  | 7  | 11 | 4  | 3  | 51     |
|                  | 2           | 4  | 14 | 11 | 5  | 12 | 5  | 2  | 53     |
|                  | 3           | 7  | 16 | 13 | 3  | 10 | 4  | 3  | 56     |
| 2                | 1           | 2  | 6  | 6  | 5  | 5  | 2  | 2  | 28     |
|                  | 2           | 2  | 8  | 8  | 2  | 6  | 3  | 1  | 30     |
|                  | 3           | 4  | 9  | 10 | 2  | 5  | 3  | 0  | 33     |

Table 1. The population of long-tailed macaques in Cikakak resort
3.2 Tree and Plant Types
During the survey, there were 64 plant types consisted of 34 tree species and divided into 21 trees, 33 shoots, and 24 grass utilized by the macaques. The dominant trees in Cikakak Resort were *Syzygium polyanthum* and *Ficus benjamina*.

3.3 Daily Activity of Long-tailed Macaques
The observation of daily activity was started at 6 am. Most macaques had already on the ground to find some food at 7 am, whereas the juveniles were stayed up above the trees. Next, some of them were walking to find something to eat from the grasses. The peak activity took place between 10.00 am and 12.00 pm, rested then on the move again at 02.00 pm. Their activity was little after 05.00 pm, which mostly started to find shelter to sleep. The daily activity percentage of the macaques is summarized in Table 2.

| No | Activities        | AM  | AF  | SM  | SF  | JM  | JF  | I   |
|----|-------------------|-----|-----|-----|-----|-----|-----|-----|
| 1  | Eating            | 10.24 | 15.36 | 18.54 | 25.23 | 22.22 | 18.75 | 25.39 |
| 2  | Walking           | 21.28 | 24.32 | 23.61 | 19.44 | 22.92 | 20.14 | 16.97 |
| 3  | Searching for Food| 0   | 3.18 | 4.86 | 9.71 | 2.33 | 6.94 | 11.8 |
| 4  | Taking a rest     | 47.28 | 41.57 | 27.69 | 14.58 | 17.45 | 12.5 | 10.42 |
| 5  | Social            |      |      |      |      |      |      |      |
|    | a. Grooming       | 7.84 | 6.74 | 3.18 | 3.18 | 12.33 | 9.03 | 10.19 |
|    | b. Playing        | 3.18 | 4.56 | 17.45 | 25.08 | 18.08 | 26.17 | 25.23 |
|    | c. Copulation     | 6.46 | 1.49 | 3.18 | 2.78 | 3.18 | 3.47 | 0  |
|    | d. Agonistic      | 3.18 | 2.78 | 1.49 | 0   | 1.49 | 0   | 0  |

Day range (DR) in seven days approximately was 289.7 m with the maximum radius (MR) reached 158.8 m and movement place of sleep (NPS) 40.8 m (Table 3)

| Observation Days | Day Range | Maximum Radius | Movement Place of Sleep |
|------------------|-----------|----------------|-------------------------|
| 1                | 310       | 165            | 0                       |
| 2                | 299       | 160            | 52                      |
| 3                | 295       | 154            | 43                      |
| 4                | 283       | 167            | 55                      |
| 5                | 306       | 163            | 37                      |
| 6                | 297       | 147            | 39                      |
| 7                | 301       | 156            | 60                      |
| Sum              | 2091      | 1112           | 286                     |
| Average          | 298,7     | 158,8          | 40,8                    |

There were some plant parts consumed by the macaques such as leaves, flowers, and fruits. They mostly ate young leaves and blossom flowers (Table 4). Sometimes, they ate some branches, bark, and stalk.
Table 4. The feed composition of Long-tailed Macaques in Cikakak Resort

| Food Resource          | Group of Age | Average |
|------------------------|--------------|---------|
|                        | AM          | AF      | SM      | SF      | I        |
| Fruits                 | 22.6        | 22.5    | 23.5    | 26.5    | 33.4     | 25.7     |
| Leaves, Flowers, Shoots| 48.2        | 29.8    | 31.6    | 30.3    | 29.1     | 33.8     |
| Grass                  | 8.3         | 9.2     | 13.5    | 10.9    | 4.1      | 9.2      |
| Insects                | 10.6        | 19.2    | 12.6    | 18.5    | 12.6     | 14.7     |
| from Visitors          | 14.3        | 19.3    | 18.8    | 13.7    | 20.8     | 17.38    |

The data indicate the macaque mostly eats leaves, flowers, and shoots (33.8%), fruits (25.7%), food from visitors (17.38%), insects (14.7%), and grass (9.2%) (Table 4).

The following are the environmental factors of the habitat. The temperature was 22o – 28,5oC, humidity 70 – 92%, light density 478 – 875 lux. Environmental factor in the resort was highly suitable for the living of Long-tailed macaques. Some springs and streams are surrounding to provide water during the dry season.

4. Discussion

Macaques birth took place almost every month. Thus, there was an inclination but no particular breeding season, possibly due to supporting climate all the year. It is supported by a published report claiming that there is no certainty for the breeding season in macaques [8]. In 2001, there are two groups of macaques in Cikakak resort [9], but found one social group of Long-tailed macaques in the resort in 2004 [10]. The more social group that was found during this study indicated that macaques conservation in Cikakak was successful.

*Ficus* sp was the plant that mostly consumed by macaques and a place to play as well as shelter [11]. Long-tailed macaques prefer to stay on big and tall trees with the horizontal branch, ample space, and shady. The tree characteristics can be found in *Ficus benjamina, Syzygium polyanthum, Barringtonia spicata,* and *Scima wallichii.*

Table 2 shows that subadult and adult individuals had higher daily activities than others. The movement of those macaques is so high that they need to consume more food to fulfill their energy. Eating duration in the female adult is higher than the male adult does. It is because female adults have more time to eat some food.

Lack of exploration is due to the inclination of desire to have something to eat in their life. When they found a place with abundant food, they will no go to farther places to explore. The feeding activities by visitors made the macaques have a shorter range of exploration [9].

Fecal observation contained some fibrous parts of fruits, trees, and seeds. These kinds of elements are hardly digested, but they are very needed in the digesting process.

5. Conclusion

The macaques mostly ate in the morning and evening, while at noon, they mostly rested. There are 64 tree types consumed by the macaques, including barks, shoots, and grass. The macaques preferred *Syzygium polyanthum* and *Ficus* sp for resting and sheltering, playing, and retreating.

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