

Daily Activities of Proboscis Monkey *Nasalis larvatus* (Primates: Cercopithecidae) in Bekantan Ecotourism Area, Tapin District, South Kalimantan

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Abstract

The Proboscis Monkeys *Nasalis larvatus* is endemic primate of Borneo Island. Research on the daily activities of Proboscis Monkey using the focal animal sampling method through direct observation of animal behavior by referring to the ethogram that has been carried out in Muning River, Tapin Regency, South Kalimantan Province; which is adjacent to the operational canal owned by PT. Antang Gunung Meratus (AGM). This research was conducted from May to October 2024 with a total of 4,528 minutes observation. The results of the study show the daily behavior of Proboscis Monkeys is highest in resting activities with an average of 61.66%, followed by eating activities with an average of 23.21% which were observed mostly to eat Galam trees *Melaleuca leucadendra*. This caused the existing conditions in Bekantan ecotourism area of PT. AGM are dominated by this species, then followed by moving activities with an average of 8.17%, and the least social activities with an average of 6.96%.

Keywords: Bekantan ecotourism area, daily activity, Kalimantan, *Nasalis larvatus*, Proboscis Monkey.

Introduction

Many species of primates recently considered as Endangered because it is presumed that the population has undergone (Schwitzer *et al.* 2019; Iqbal *et al.* 2023a). The population of primates in Asia and Indonesia are reported in rapid decline due to its high demand in hunting, trading and loss of habitats (Beausejour *et al.* 2021; Setiawan *et al.* 2023, 2024; Iqbal *et al.* 2023b, 2024). The Proboscis Monkey *Nasalis larvatus* is one endangered primate that belongs to the long-tailed monkeys with a characteristic large nose and endemic to Borneo Island (Azizah *et al.* 2023). This primate is a protected animal listed on the Regulation of the Minister of Environment and Forestry of Indonesia no. P.106/MENLHK/SETJEN/KUM.1/12/2018 is a regulation that regulates protected plant and animal species and is also categorized as “Endangered” according to the IUCN Red List and “Appendix I” according to CITES Appendices (Fithria *et al.* 2021).

Damage on Proboscis Monkey's habitat is caused by forest fires, land clearing, and land conversion (Boonratana *et al.* 2009). Habitat destruction is the main factor causing the scarcity of Proboscis Monkeys because it can make the growth and breeding of Proboscis Monkey decline (Yeager 1996). Recently, the decline of Proboscis Monkeys has also been caused by a lack of concern from the general public for the environment, especially wildlife protection. South Kalimantan is one important province in Indonesian Borneo as important habitat for Proboscis Monkey (Soendjoto *et al.* 2001).

Due to the lack information on recent Proboscis Monkeys, here in this paper, we report daily activities of Proboscis Monkeys in Bekantan Ecotourism Area in the Muning River, Tapin Regency, South Kalimantan.

Methods

This research was carried out in May to October 2024. This study uses the focal animal sampling method, which is a direct observation of animal behavior (Yokassye *et al.* 2019). The study site is Muning River, Tapin Regency, South Kalimantan. It is estimated that 192 Proboscis Monkeys were living outside the conservation area in 2014. The PT. Antang Gunung Meratus is one of the coal mines in Tapin District, South Kalimantan where the PT. AGM Operational canals adjacent to the degraded peat swamp ecosystem (Gelam swamp) which also contains Proboscis Monkey habitat.

Development of an ecotourism area by PT. AGM and Tapin Districts government for Proboscis Monkey habitat that adjacent to the operational area, with and has been determined based on the Decree of the Tapin Regent No.188.45/060/KUM/2014 dated April 14, 2014 Regarding the Determination of Important Value Areas for Proboscis Monkey Conservation in Tapin District with the size area 90 ha (Prasetyo *et al.* 2024). Restoration efforts that occurred in 2015 in the PT. AGM Proboscis Monkey ecotourism area have been carried out during the 2016-2023 period, and these efforts were quite successful with several Proboscis Monkeys born naturally in the PT. AGM Proboscis Monkey ecotourism area. The purpose of this study was to examine the daily activity patterns of Proboscis Monkeys outside protected area in Proboscis Monkey ecotourism area of PT. AGM in Tapin District, South Kalimantan.

Proboscis Monkey observations were made by searching the Proboscis Monkeys in the morning (06.00 - 07.00 AM) and afternoon (05.00 - 06.00 PM) with a time interval of 1 minute in data collection. Observation of daily activities using a sample of 1 group of Proboscis Monkeys in the Ecotourism Area consisting of adult males, adult females, and children. Observations of daily activities of Proboscis Monkey behaviour consist of basic activities such as eating, resting, moving, and social. Observations were made by following the Proboscis Monkeys and then records the behaviour of Proboscis Monkeys on the tally sheet by referring to the ethogram that had been made. The position of the Proboscis Monkey will be mapped using GPS which aims to determine the encounter coordinates point of the Proboscis Monkey.

The behavioural observation data collected will then input to tabular form in Microsoft Excel. All collected data are analyzed descriptively, while the mapping of the existence of Proboscis Monkeys will be processed using QGIS 3.40.0 software.

Results and Discussion

Recapitulation of daily behavioural data of Proboscis Monkeys in Bekantan Ecotourism Area of Muning River (Tapin Regency, South Kalimantan) is presented in Table 1 and Figure 1.

Table 1. Recapitulation of daily behavioural data of Proboscis Monkeys in Bekantan Ecotourism Area, PT. AGM.

Focal	Feeding (Minutes)	Resting (Minutes)	Social (Minutes)	Travel (Minutes)	Total Observation Efforts (Minutes)
Adult Female	223	560	90	948	1821
Adult Male	164	460	49	716	1389
Infant	257	292	70	699	1318

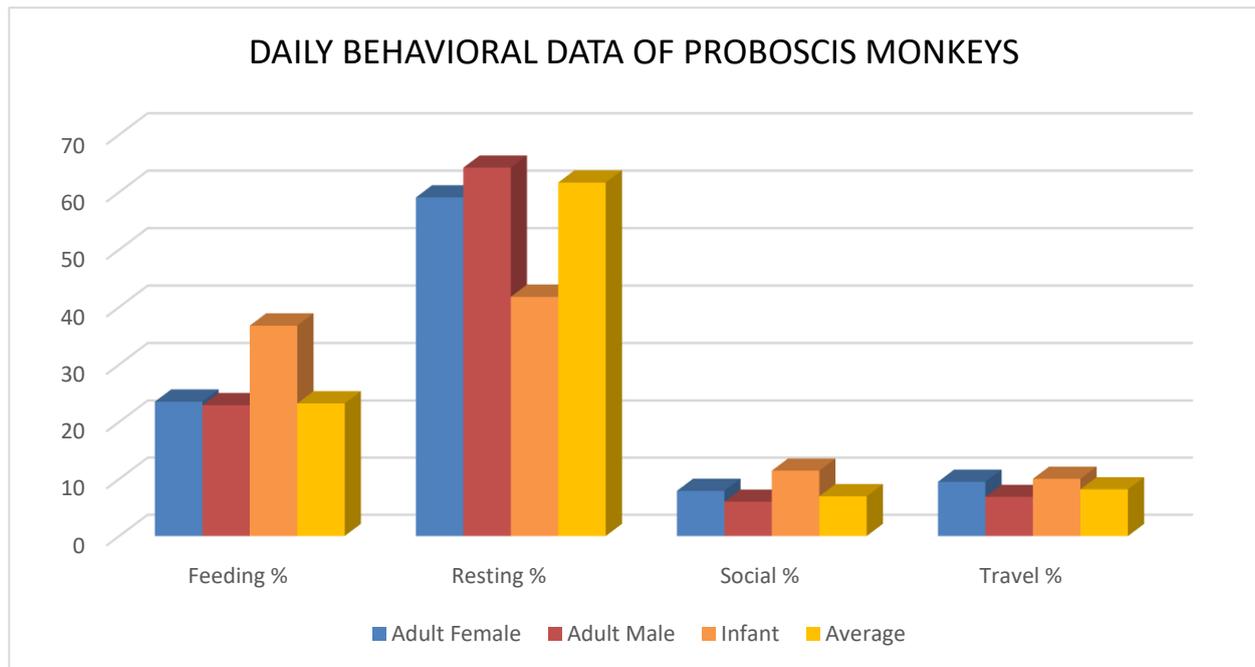


Figure 1. Daily behavioral data of Proboscis Monkeys *Nasalis larvatus*.

Feeding Activity

Eating activity is the most frequent that Proboscis Monkeys done (Fig. 2). Based on observations, Proboscis Monkeys started their daily activities by doing eating activities. From the results of observations in the Bekantan Ecotourism Area of PT. AGM, the eating activities carried out by Proboscis Monkeys averaged 23.21% whereas in this study Infant (36.77%) were more likely to carry out eating activities compared to adult males (22.91%) and adult females (23.52%). The results of previous research in the same place showed the results that Proboscis Monkeys carried out feeding activities ranging from 27.89% to 32.67% starting when leaving the sleeping tree Proboscis Monkeys looking for the nearest food source (Iskandar 2017). Bismark (1986) states that male and female Proboscis Monkeys experience the same pattern with different positions because they are influenced by gender and body size so the fulfilment of the amount of energy needed during activities is also different.

Proboscis Monkeys were observed to do most of feeding activities in the morning when leaving their sleeping tree with the aim of gathering energy through the food consumed as an energy reserve that will be used for activities throughout the day and in the afternoon when heading to sleeping tree because Proboscis Monkeys do a lot of movements when heading to the sleeping tree. So, it requires a lot of energy. Proboscis Monkeys will usually also choose a food tree as well as a sleeping tree. When doing eating activities Proboscis Monkeys more likely to choose the leaves of young shoots to eat. According to Bismark (1986), eating is an activity that Proboscis Monkeys will do in the morning which aims to replenish energy reserves used during rest. The morning time is the peak of Proboscis Monkey's eating time because at this time the Proboscis Monkey collects more energy to process the digestion of the food he consumed earlier and in the afternoon the Proboscis Monkey starts preparing to look for sleeping trees that can also be used as food trees that can meet his needs because before sleeping the Proboscis Monkey will choose to eat before bedtime (Yokassye *et al.* 2019). According to Retanti *et al.* (2021), the active Proboscis Monkeys in the morning and afternoon in carrying out feeding activities depend on the distance of the main food source from the position of the sleeping tree.

When doing eating activities Proboscis Monkeys tend to choose the leaves of the young shoots to eat, although occasionally Proboscis Monkeys are also observed eating flowers because the appearance of flowers on trees also depends on the season. In this study, Proboscis Monkeys were observed to eat Galam trees (*Melaleuca leucadendra*), this caused the existing conditions in Bekantan ecotourism area of PT. AGM are dominated by Galam trees. In addition, the othersource of food for Proboscis Monkeys is also waru (*Hibiscus tiliaceaeus*), Sengon (*Albizzia chinensis*), and fern (*Stenochlaena palustris*). Leaf shoots are the main food for Proboscis Monkeys, other food parts eaten are leaves, flowers, and fruit (Retanti *et al.* 2021). Proboscis Monkeys will choose the part they will eat, Proboscis Monkeys rarely eat all parts of the plant they pick because Proboscis Monkeys only consume young leaves (Yokassye *et al.* 2019).



Figure 2. Feeding activity of Proboscis Monkey *Nasalis larvatus* in study site.

Resting Activity

Resting is a condition where Proboscis Monkeys do not carry out other activities such as eating, social, and movement activities. At rest, Proboscis Monkeys usually sit quietly on tree branches (Fig. 3). At the rest time, Proboscis Monkeys are also often observed while carrying out self-nursing activities, and usually for female Proboscis Monkeys while resting are also sometimes observed while nurturing their children or other fellow Proboscis Monkeys. Iskandar (2017) states that Proboscis Monkeys take a break during the day between eating and movement activities. The resting position is a condition where Proboscis Monkeys sit relaxed after consuming their food or Proboscis Monkeys while enjoying the atmosphere. The sitting position is also the most dominant position when Proboscis Monkeys rest (Basoeki *et al.* 2015).

The study showed that Proboscis Monkeys in this site rested on average 61.66% with the proportion of adult males doing more resting as much as 64.25% followed by adult female Proboscis Monkeys as much as 59.07% and Infant as much as 41.77%. Resting is the most activity carried out by Proboscis Monkeys compared to eating activities (23.21%), social activities (6.96%), and moving/moving activities (8.17%). These results are in-line with previous research in the same place which states that the Proboscis Monkey group has an average proportion of rest time of 52.13%, where the proportion of rest time is the largest compared to the proportion of other activities (Iskandar 2017) and the results of research from Winardi *et al.* (2017) also stated that from the results of observations of the daily behaviour of Proboscis Monkeys in Muara Kaman Sedulang Nature Reserve, East Kalimantan based on sex and age, the results showed that resting activity was the highest percentage compared to other activities and the highest resting activity was adult female Proboscis Monkeys (54.46%), followed by adult male Proboscis Monkeys (53.81%), and juvenile Proboscis Monkeys (47.00%). Similarly, Basoeki *et al.* (2015) state that sleeping and resting activities are the dominant behaviour in daily activities and the most resting time is done by adult Proboscis Monkeys which aims to save excess energy usage.

Proboscis Monkeys usually take a lot of rest after consuming a lot of food or after doing a lot of

movement. After consuming their food, Proboscis Monkeys will rest because Proboscis Monkeys are leaf-eating primates where the leaves have fibres that are difficult to digest, making them have a complex digestive system. Resting is very important for folivore primates such as Proboscis Monkeys to release more energy to facilitate the fermentation process in food digestion (Bismark 1986).

Resting time carried out by Proboscis Monkeys is usually influenced by the weather, from observations made Proboscis Monkeys will rest a lot during hot weather and cold weather or rainy season. In the morning if the weather is cloudy Proboscis Monkeys will prefer to rest in their sleeping trees rather than start their activities. Proboscis Monkeys can relax their muscles by resting (Boonratana 2000). Proboscis Monkeys do not expend energy to move or move excessively and also do not expend energy when facing high temperatures or low humidity (Soendjoto *et al.* 2006).



Figure 3. Resting activity of Proboscis Monkeys *Nasalis larvatus* in study site.

Social Activity

Social activities are activities carried out by Proboscis Monkeys in interacting between one individual and another (Fig. 4). Social activities carried out by Proboscis Monkeys include cursing, playing, mating, and agnostic behaviour. From the results of the research conducted by Proboscis Monkeys in Bekantan Ecotourism, the average social activity is 6.96%, where the most social activities are carried out by infant (11.44%), followed by adult female Proboscis Monkeys (7.91%) and adult male Proboscis Monkeys (6.01%). Of all the daily activities of Proboscis Monkeys, social activity is the least activity carried out by Proboscis Monkeys. This follows the statement from previous research in the same location which states that social activity is the activity with the least proportion of time (Iskandar, 2017), and according to Winardi *et al.* (2017), social activities such as playing, watching, and muttering are observed with a very small percentage.

In this study, the infant did the most social activities, and social activities that are usually carried out by infants are playing with another infant individual. Infants also often interact with mother Proboscis Monkeys in terms of suckling and feeding. Playing activities carried out include chasing each other and going up and down trees while jumping and holding on to each other and grabbing food between individual infants. According to Iskandar (2017), the ones who do a lot of playing activities are juvenile and young Proboscis Monkeys because playing for young individuals means for them to learn (learning behaviour).

Grooming activity is an activity carried out by Proboscis Monkeys to take small parasites on the Proboscis Monkey's body. Grooming activities that are often found during observations are mostly carried out by adult females or mother Proboscis Monkeys. This activity is often carried out by mother Proboscis Monkeys to their children, where the purpose of this grooming activity is to establish a close relationship between mother and child. Sometimes grooming activity is also carried out between individual adult females. Grooming behaviour is carried out spontaneously by Proboscis Monkeys by scratching their body parts and usually juvenile females, infant, and adult females carry out activities in their groups (Kurniawan 2003).



Figure 4. Social activity of Proboscis Monkeys *Nasalis larvatus* in study site.

Vocalizing is also part of the social activities carried out by Proboscis Monkey. In this study, social activity of vocalizing is mostly carried out by adult male Proboscis Monkeys. Adult male Proboscis Monkeys will vocalize because of signs of disturbance, usually this disturbance comes from predators or other animals at the same location. At this research site, there are several other primates such as long-tailed monkeys (*Macaca fascicularis*) and gray langurs (*Trachypithecus cristatus*). Usually, when other primates came up to adult male Proboscis Monkeys, there will be vocalized which aims to provide signals or signs to other Proboscis Monkeys in the group if there are a danger. When the Proboscis Monkey feels threatened, it will make an “onk” sound and direct its body towards the threat while glaring with or without its mouth open (Winardi *et al.* 2017).

Moving Activity

Proboscis Monkeys started movement activities in the morning when Proboscis Monkeys start looking for food sources. This movement activity such as Proboscis Monkeys moving from one tree to another (Fig. 5). The movements carried out by Proboscis Monkeys include jumping, climbing, walking with 4 feet on the ground, and swinging between trees. The results showed that Proboscis Monkeys carried out movement activities on average as much as 8.17% where infants made the most movements as much as 10.01% followed by adult female Proboscis Monkeys as much as 9.49%, and the least movement was adult male Proboscis Monkeys as much as 6.84% (Fig. 6). From this study, it was observed that Proboscis Monkeys usually only make movements when they want to find the source of food or looking for sleeping trees, and also chase or run from other Proboscis Monkeys. Iskandar (2017) stated that basically, the movement carried out by Proboscis Monkeys aims to find the source of food and comfortable resting places. According to Bismark (1986), Proboscis Monkeys will carry out movement patterns that are influenced by the location of beds, food sources, and places to rest.



Figure 5. Moving activity of Proboscis Monkeys *Nasalis larvatus* in study site.

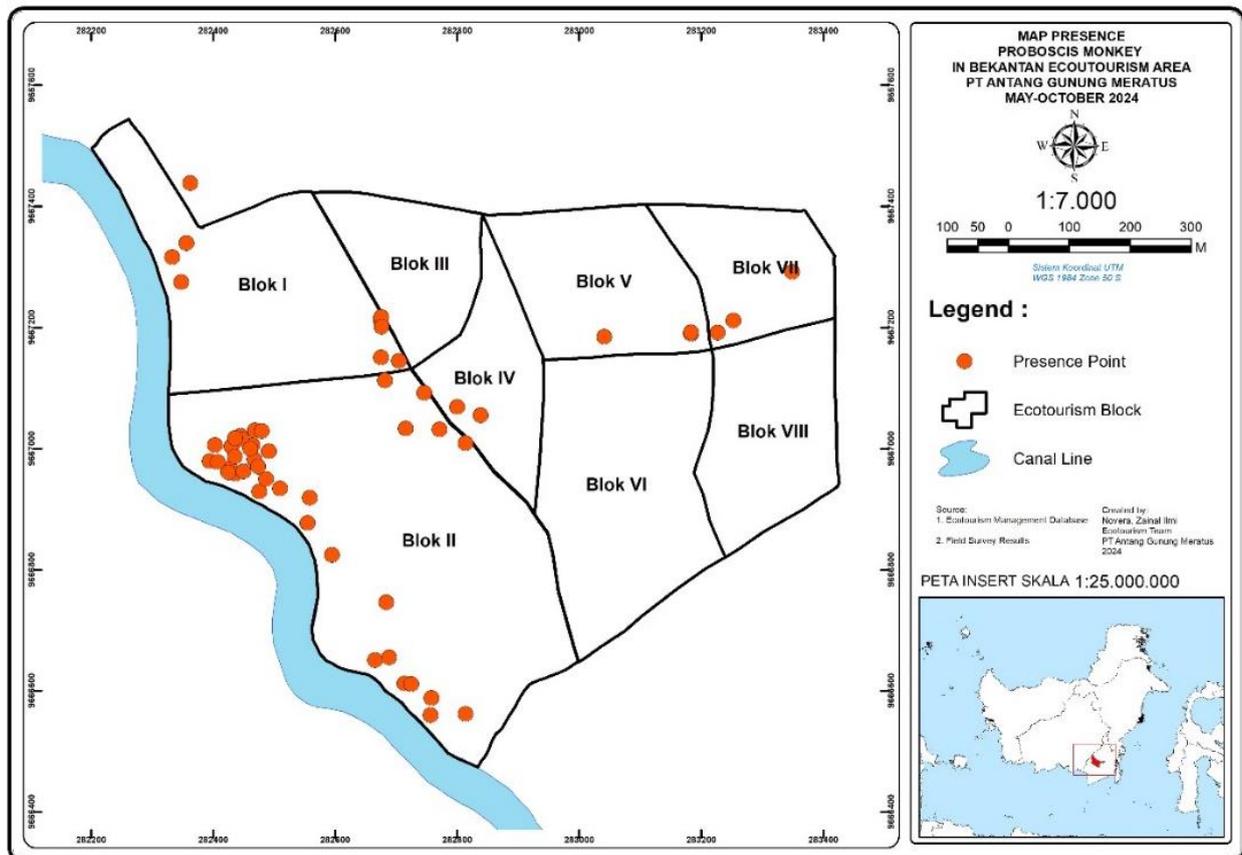


Figure 6. Map of the presence of Proboscis Monkey in Bekantan Ecotourism area from May to October 2024.

Weather factors greatly affected on the Proboscis Monkey movements, same as well as resting activities are also influenced by the weather. Where in hot weather and cold weather condition, Proboscis Monkeys usually prefer to rest without doing much movement or moving from tree to tree. Because this factor, Proboscis Monkeys prefer to choose sleeping trees and at the same time serve as food source trees as well. Proboscis Monkey movement patterns may affect rainfall (Matsuda *et al.* 2009) In this study, the factor of Proboscis Monkey habitat conditions is also an influence of weather on its movement patterns, because the current condition of proboscis ecotourism is that only a few trees have large crowns and because the trees in the research location are much small trees and have less density, so it is difficult for Proboscis Monkeys to take shelter.

Adult males make the least movement activity, in this study adult males were more often observed doing a lot of resting activities, such as sitting quietly in trees to keep watch and be aware of attacks by other Proboscis Monkey groups or predators that exist with the aim of adult male Proboscis Monkeys protecting their groups. Observing activities are recorded when the Proboscis Monkey feels a threat coming closer (Winardi *et al.* 2017).

Conclusions and Recommendations

Proboscis Monkey groups in the Bekantan Ecotourism Area are well adapted to their habitat conditions, this can be seen from the feeding activity of Proboscis Monkeys that use existing trees as a source of feed as part of meeting their energy needs. Rest activities are the most widely carried out by Proboscis Monkey groups because they were more active in the morning and evening. Resting is a way for Proboscis Monkeys to meet their energy recovery needs. The infant does the most social activities, in this case, the most social activities are play and it aims to explore their environment. Moving activities carried out by Proboscis Monkeys usually aim to find food or a place to rest, which is an important part of their daily routine.

The results of the study on Daily Activities of Proboscis Monkeys in Bekantan ecotourism area of PT. AGM is used to provide recommendations in conservation efforts through habitat management and to design better management practices for the sustainability of Proboscis Monkey population in this area.

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