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To cite this article: A Nurliani *et al* 2022 *IOP Conf. Ser.: Earth Environ. Sci.* **976** 012013

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Daily behavioral activities of the proboscis monkey (*Nasalis larvatus* Wurmb) in the Bekantan Rescue Center, Sahabat Bekantan Indonesia foundation

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Abstract. The proboscis monkey or long-nosed monkey is diurnal and arboreal. This species is endemic to Borneo Island inhabit mangrove forest and swampland. Daily behavioral activities of the proboscis monkey kept in the Bekantan Rescue Center, Sahabat Bekantan Indonesia Foundation was interesting to be observed. A couple of adult proboscis monkey, which was approximately 10 years old for each individu, was utilized in the current study. Observation on daily behavioral activities included locomotion, eating, antagonistic, playing, grooming, and rest-activity. Proboscis monkey spent their daily time for resting, locomotion, grooming, eating, antagonistic, and playing with each percentage were 42.50%; 26.04%; 17.15%; 9.29%; 0.86%; and 0.13%, consecutively. Locomotion activities consisted of walk, jump, moving seat, swing, and cage-shaking. Grooming by removing pieces of dirt, dried skin, and insects from the hair were done individually and more frequently in female than male. Eating activities were 3 times a day, morning, noon, and afternoon with the duration of 5-15 minutes. An antagonistic expression such as opening wide-mouth, vocalization, and cage-shaking was frequently observed in the male shown when the unknown person was present. Playing activity was the lowest percentage activity observed. This activity is less frequently observed in the adult period. Rest activity consisted of night sleep and day sleep. Night sleep was observed from 09.00 P.M to 6.00 A.M, and day sleep was observed after eating time in the morning and noon. Daily behavioral activities of the proboscis monkey in the Bekantan Rescue Center tend to be done routinely and regularly.

Keywords: Behaviour, daily, proboscis monkey, Bekantan rescue center.

1. Introduction

Proboscis monkey or Bekantan is a long-nosed monkey that is endemic to the island of Borneo. This species is a protected species based on Indonesian government regulations, Number 7 of 1990, which was later renewed in 2018 [1]. Internationally, this species was also categorized as an endangered species by the International Union for Conservation of Nature and Nature Resources (IUCN) in 2000 [2]. Proboscis monkey has also been designated as the fauna mascot for the province of South Kalimantan [3].



Proboscis monkey is a diurnal and arboreal animal that inhabits mangrove forests and swamps. Currently, the proboscis monkey population is decreasing due to reducing their natural habitat due to land conversion [4]. The main threat of decreasing the proboscis monkey's natural habitat includes land conversion for mining, aquaculture, agriculture, settlements, and oil palm land. In addition, forest fires and the illegal trade in proboscis monkeys as pets have also exacerbated the condition of population decline [5].

The reduced habitat of proboscis monkeys and the pressure of the reduced carrying capacity of feed encourage proboscis monkeys to enter urban areas in search of food. Proboscis monkeys are frequently found hit by cars, electrocuted, and involved in conflicts with residents. The residents then reported this to the Sahabat Bekantan Indonesia Foundation to be evacuated and rehabilitated at the Bekantan Rescue Center. Proboscis monkeys are rehabilitated, cared for, and restored to their condition at The Bekantan Rescue Center before being released back into their natural habitat. The daily behavior of proboscis monkeys is usually in groups, jumping into trees to find food, and relaxing on tree branches. Proboscis monkey's daily activities include eating, sleeping, resting, playing, and socializing. Forms of social interaction include agonistic activity, inquiry, predatory behavior, and sexual behavior [6]. Behavior is the decisive action of an organism to adapt to the conditions of its environment [7].

The process of adaptation related to the daily behavioral activities of the proboscis monkey at the Bekantan Rescue Center is interesting to be observed. In this current study, the observation of the daily behavioral activities of the proboscis monkey was conducted to provide the scientific record that can be used as a guideline for a rehabilitation program, breeding program, and other such kinds of the program to support the conservation effort for this species.

2. Materials and Methods

This research was conducted at the Bekantan Rescue Center, Sahabat Bekantan Indonesia Foundation (SBI) Banjarmasin, South Kalimantan, from June to August 2021. A couple of adult proboscis monkey was approximately 10 years old each individual were utilized in this study. Before main observation, it was needed to do habituation, the process of familiarizing animals with the presence of researchers, so that proboscis monkeys do not feel disturbed when researchers are around them. Habituation was carried out for 10 days by feeding and cleaning the cage.

The method used for data collection is Ad libitum sampling [8]. Ad libitum sampling includes observing and recording all behavior to obtain the frequency of daily behavioral activities. The observed behaviors include locomotion, eating, antagonistic, playing, grooming, and resting activity. Data collection in this study focused on male and female adults with 5-minute intervals. Observations of the daily behavioral activities of proboscis monkeys at the Bekantan Rescue Center were made directly and assisted by CCTV for 50 days. Observation was carried out in front of the cage of a couple of adult proboscis monkeys.

The data were analyzed descriptively to explain the description of daily behavioral activities. Data of daily behavioral activities concerning the frequency and percentages are entered into Microsoft Excel and then tabulated so that the data is displayed in tables.

3. Results and Discussion

Observation of daily behavioral activities of proboscis monkey was summarized in Table 1.

3.1 Resting behavior

The most daily activity of the proboscis monkey at Bekantan Rescue Center was resting activity with a percentage of 42.50%. The finding in this study was similar to the previous report. In the previous study on wild proboscis monkeys, the resting activity had a greater percentage than other activities in the range of 42.3% [9]. It was also similar to the other observation from previous study summarizing that the resting activity is what adult proboscis monkeys mostly do [10]. This current study showed that rest-activity consisted of sitting and relaxing, day sleep, and night sleep. Day sleep was observed after eating time in the morning after 10.00 A.M and afternoon after 2.00 P.M. The duration of rest or day sleep is

about 20 – 45 minutes to \pm 2 hours depending on the conditions around the cage, which are quiet and windy.

Table 1. Daily behavioral activities of proboscis monkey at Bekantan Rescue Center, Sahabat Bekantan Indonesia.

Activities	Frequency	Percentage (%)
Resting	3766	42.50
Locomotion	2308	26.04
Grooming	1520	17.15
Eating	823	9.29
Antagonistic	76	0.86
Playing	12	0.13
And others	357	4.03
Total	8862	100

Previous research stated that the resting position of proboscis monkeys in the Nature Reserve includes lying face down on a tree branch and sitting on a tree without leaning on another [11]. Rest is the condition of proboscis monkeys by sitting quietly after eating and enjoying the atmosphere, often closing their eyes in an awake position [12].

The resting position when sitting and day sleep of the proboscis monkey varied, including sitting with wide open legs, sitting face down with both legs attached to the bars, sitting with one leg straightened, and lying down on the wood or under the cage (Figure 1). Night sleep was observed from 09.00 P.M to 6.00 A.M. The position of the proboscis monkey when night sleep also varied, including sitting with his feet together against the bars and sitting with his head slightly lowered with both legs bent on the wood (Figure 2). When night sleep, proboscis monkeys did not always sleep for a long time until morning. However, in their night sleep, they were often awake by changing positions or moving. Observation on PT Indocement Tarjun, proboscis monkeys began to night sleep around 7.00 P.M and started their activities between 05.00 - 06.00 A.M in the morning [12].



Figure 1. Resting behavior of the proboscis monkey. The male sitting with one leg straightened and the female sitting face down on the wood.



Figure 2. Proboscis monkeys sleep at night by sitting with their faces down.

3.2 Locomotion behavior

The percentage of locomotion behavior in proboscis monkey at Bekantan Rescue Center was 26.04%. Proboscis monkeys in the Muara Kaman Nature Reserve have a locomotion behavior percentage of 15.57% [11]. The movement is done to find food. The movement of proboscis monkeys at PT Indocement Tarjun included jumping, walking upright on two legs, climbing by holding on to a wire net, and swinging [10]. The proboscis monkey at Bekantan Rescue Center moved from place to place using 4 legs and walks on 2 legs with hands holding iron bars. Movement by jumping was also often shown by the proboscis monkey at Bekantan Rescue Center when climbing to a wooden. The conditions of cage also affect the adaptation of proboscis monkeys to move [12]. The size of the cage also influences the movement of proboscis monkeys in the cage. The locomotion in the male was also often done by swing the body with the right hand holding the bars and both legs standing as bowing (Figure 3).



Figure 3. The locomotion behavior of proboscis monkeys. The male swang his body with his right hand holding the iron bars (a) and the female moved the sitting place by sitting among the bars (b).

3.3 Grooming behavior

Observation showed that adult female proboscis monkey at Bekantan Rescue Center was more frequently to do grooming than male. It was similar to the previous report mentioning that grooming is often carried out by adult females rather than males [13].

Grooming can be divided into 2 types, namely, individual grooming (auto-grooming) and grooming involving other individuals (allo-grooming) [10]. Proboscis monkey at Bekantan Rescue Center is often individually grooming and do not involve other individuals (Figure 4). It may caused the proboscis monkeys at the Bekantan Rescue Center was placed in the different cage with the connecting door which was sometimes opened by keeper. It may be caused the proboscis monkeys at the Bekantan Rescue Center to be placed in the different cages with the connecting door, which the keeper sometimes opened. While in proboscis monkeys at Taman Safari Indonesia (TSI), allo-grooming activity occurred because females were in the same cage [10]. Important benefits of grooming are cleaning hair from dirt, strengthening between individuals, and reducing anxiety and stress after a fight between individuals [14].

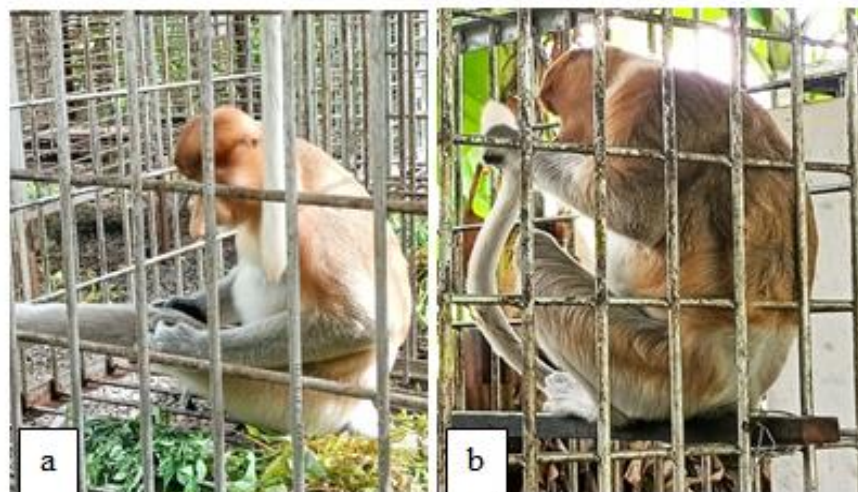


Figure 4. Grooming behavior of the proboscis monkeys. Grooming on the upper leg by male (a), grooming on the tip of the tail by female (b).

3.4 Eating behavior

The percentage of eating behavior in proboscis monkey at Bekantan Rescue Center was 9.29%. It is very different from the previous research showing that the eating behavior of proboscis monkeys in the Nature Reserve has a percentage of 32.98% [11]. It means that proboscis monkeys that live in nature tend to be more active to eat by taking leaves from trees at any time. The proboscis monkeys at the Bekantan Rescue Center are fed 3 times a day, in the morning, afternoon, and evening. When the stock of food in the cage began to decrease, they took a rest.

Eating behavior is the activity of proboscis monkeys entering food into the mouth until it is swallowed. Based on observation, proboscis monkeys at Bekantan Rescue Center chewed the food 13-15 times and then regurgitated it into the mouth to be chewed again. It is related to the fermentation process in their polygastric system. Proboscis monkeys at Bekantan Rescue Center have eating activities with the duration of 5-15 minutes. They take food by grabbing and picking the leaves. They eat the shoots or young leaves first. It is similar to the previous study which mentioned that proboscis monkeys first eat the shoots or young leaves [12]. The male eats a bunch of sage leaves, which are directly devoured on the top of the leaf, then leaves half of the stem to be discarded. While the female eat it by sorting leaf shoots or picking leaves then put into the mouth and the stems are removed. Proboscis monkey at PT Indocement Tarjun used the left hand to put food into the mouth [12]. Proboscis monkeys at Bekantan Rescue Center also used their left hand to put food into their mouth. Food for proboscis

monkey at the Bekantan Rescue Center includes cassava leaves, water spinach, climbing swamp fern, cassava, and bananas (Figure 5). When proboscis monkeys do not eat too much, they are given fruits such as bananas, papayas and guava leaves which is planted around cage.



Figure 5. Eating behavior of the proboscis monkey. Male was eating cassava (a), and female was eating kale leaves (b).

3.5 Antagonistic behavior

Antagonistic is the action of proboscis monkeys when they feel threatened around their area. This behavior was shown by a male proboscis monkey at Bekantan Rescue Center when unknown humans or other animals are around the cage. When felt threatened, the male would open his mouth, slightly move his face forward, wide open his eyes, the back of the body was sticking up, his feet were stomping in the front cage and shaking the cage (Figure 6). The antagonistic expressions of proboscis monkeys at Bekantan Rescue Center were also shown by making a shrill and loud sound when other animals passed them.



Figure 6. The male opened his mouth, slightly moved his face forward, wide opened his eyes, the back of the body was sticking up, and his feet were stomping in the front cage to show the antagonistic expression.

Antagonistic behavior can be characterized by facial expressions (threat), opening the mouth by showing fangs, and a body posture ready to attack [15]. The proboscis monkeys under stress can be characterized by males starting with making a sound when the proboscis monkey feels threatened by other people or creatures [12]. When one member of the proboscis monkey group makes a sound, the other proboscis monkeys also make a sound that indicates a threat or predator in the vicinity. In females, antagonistic behavior is infrequent. Antagonistic behavior is more common in males than females [16]. It is related to the role of males to protect their groups from any threat.

3.6 Playing behavior

Proboscis monkeys at Bekantan Rescue Center were very rarely seen playing behavior. When there was an object attracting proboscis monkeys, they tried to take one not far from the cage. Objects were played by biting, pulling, and stomping. Objects played included iron rods, neat ropes, bowls used to eat, and whiteboards such as a piece of board (Figure 7). Play behavior generally often occurs in children and juveniles [17]. Proboscis monkeys at Taman Safari Indonesia, in one cage, there were proboscis monkeys in the juveniles period, so the adult female as a mother or other proboscis monkeys came into play [10]. In proboscis monkeys at Bekantan Rescue Center, there were only one adult male and one adult female in the cage, so the playing behavior almost was rarely found.



Figure 7. Male proboscis monkey was playing a rope.

3.7 Other activities

The other activities recorded during observation were activities related to sexual activities, such as courtship, mounting, copulation, masturbation, and sexual rejection. These activities were not shown daily. Sexual activities from courtship until copulation were observed frequently in the sexual period following the estrus period of the female. Masturbation was observed repeatedly in the male. Rejection to sexual activity was observed in the female when the female was in the non-estrus period.

4. Conclusion

The highest percentage of daily activity in the proboscis monkey at Bekantan Rescue Center was resting (42.50 %), the second was locomotion (26.04 %), the third was grooming (17.15 %), the fourth was eating (9.29%), the fifth was antagonistic (0.86%) and playing (0.13%). The proboscis monkeys in the Bekantan Rescue Center have adapted well and tend to show daily behavioral activities routinely and regularly.

Acknowledgements

This study was financially supported by Grant from Lambung Mangkurat University, namely Program Dosen Wajib Meneliti (PDWM) 2021 No. 010.23/UN8.2/PL/2021.

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