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SHORT COMMUNICATION

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Analysis of Daily and Social Behavior of Slow Loris (*Nycticebus Coucang*) at the Primate Research Center IPB University

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Abstract
Indonesia has three types of slow lorises, namely *Nycticebus coucang* which is spread in Sumatra and the Riau Islands, *Nycticebus* crysis which is spread in Kalimantan, Bangka Belitung, and *Nycticebus javanicus* (Javanese slow loris) which is only spread on the islands of Java and Panaitan. Slow lorises are also known as solitary animals in their natural habitat. Social behavior is very rarely found in slow loris observations in their natural habitat. The status of the existence of the slow loris is now a protected animal due to the large number of poaching. In order to increase the population of slow lorises, many conservation efforts have been made to preserve slow lorises. One of the determining
factors for the success of an ex-situ conservation is the state of the animal enclosures which are artificial habitats that represent their natural habitats in nature. In the management of the cage, it is necessary to enrich the cage as a method that represents its natural habitat in nature. Social behavior observation activities also need to be observed in order to estimate the success of mating activities and increase the population. This study proofs that social behavior in soliter animal such as *Nycticebus coucang* increased in the Primate research center (PRC) IPB University.

Keywords: Coucang, Social Behaviour, Conservation, Observation

1. Introduction

The global primate population tends to decline drastically (Mittermeier and Cheney 1984). The primary cause of this significant decline is the accelerating rate of habitat destruction and loss (Mittermeier and Cheney 1984; Mittermeier *et al*. 1999; Cowlishaw and Dunbar 2000; Jurmain *et al*. 2003). The reduction, degradation, and changes in the structure and composition of forests result in fewer food sources and living space for primates, increasing pressure on their populations and causing further declines. In addition to habitat loss, high levels of hunting and wildlife trade contribute to the drastic decline in primate populations (Mittermeier and Cheney, 1984; Cowlishaw and Dunbar, 2000).

Indonesia is one of the countries with the highest primate diversity in the world (MacKinnon 1987; Supriatna and Wahyono 2000). Approximately 40 primate species are found in Indonesia›s tropical rainforests, of which 24 are endemic (Supriatna and Wahyono 2000). However, Indonesia is also among the countries with the highest risk of primate extinction worldwide (MacKinnon 1987). Efforts to address threats to biodiversity in Indonesia have included practical measures to promote ecological succession, thereby creating a heterogeneous environment that allows all species to develop naturally.

The slow loris (*Nycticebus sp*.; *Lorisidae*) is a primitive primate (prosimian), similar to lemurs and tarsiers (Napier and Napier 1985; Bearder 1999). In Indonesia, the slow loris is commonly known as malu-malu and has a wide distribution across South Asia and Southeast Asia (Supriatna and Wahyono 2000). Indonesia is home to three species of slow loris: *Nycticebus coucang*, which is found in Sumatra and the Riau Islands; N. menagensis, which is distributed in Kalimantan, Bangka Belitung; and *N. javanicus*, which is found only on the islands of Java and Panaitan (Groves and Maryanto 2008; Nekaris and Munds 2010). The species is a charismatic primate with unique and uncommon characteristics. It is the only venomous primate and possesses a specialized grooming tongue with two comb-like structures formed by its lower incisors.

Recent research indicates that the *N. javanicus* (Javan slow loris) plays a crucial role in pollinating flowering plants. The decline in *N. coucang* (Sumatran slow loris) populations is primarily attributable to habitat destruction resulting from human activities, including deforestation and land clearing for agriculture and infrastructure development. Additionally, uncontrolled hunting, conducted without regard to age or sex, has further exacerbated the problem (Wirdateti *et al*. 2001). This is reflected in the classification of the Sumatran slow loris as Endangered on the International Union for Conservation of Nature (IUCN) Red List (IUCN 2020) and its inclusion in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The rarity of slow lorises has led to an increased demand for them as pets. As market demand rises, hunting pressure intensifies,

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which threatens their population and conservation. If this continues unchecked, it could significantly affect the species› survival. Both ex situ and in situ conservation efforts, such as captive breeding and habitat protection, are essential strategies for preserving the endangered *N. coucang* population (Kusumorini *et al*. 2014).

As noted by Starr *et al*. (2012), nighttime forest conditions significantly influence the behavior and physiology of nocturnal mammals. Due to low light intensity, the activity patterns of nocturnal mammals are affected by the level of nighttime illumination. Dependence on moonlight can lead to a reduction in activity (lunar phobia), an increase in activity (lunar philic), or no change at all (lunar neutrality) (Gannon and Willig 1997; Gursky 2003; Nash 2007; Starr *et al*. 2012). Activity patterns also vary seasonally or over time. For example, animals may become less active during certain phases of their reproductive cycle or during seasonal changes that induce hibernation (Eads *et al*. 2013).

One of the key factors in the success of ex situ conservation is the condition of enclosures, which serve as artificial habitats that replicate the species› natural environment (Frankham *et al*. 1986). In enclosure management, enrichment is necessary to simulate the species› natural habitat (Masy'ud 2002). The suitability of an enclosure relative to its natural habitat strongly influences animal behavior and space utilization within the enclosure, both of which are important indicators of animal welfare in an ex situ conservation institution (Ditjen PHKA 2011). Enclosures should accurately reflect the ecological aspects of the species› natural habitat (Sinaga and Masy'ud 2017). Another goal of ex situ conservation is to facilitate breeding, followed by restocking into the wild to ensure the species› population remains stable and sustainable. This background motivated the author to study the social behavior of the *N. coucang* at the Primate Research Center (PRC) IPB University.

2. Materials and Methods

2.1 Time and Location

The observational study was conducted at PRC-IPB at the *N. coucang* enclosure. The study lasted from September 2021 to October 2021.

2.2 Tools and Materials

The research collected two types of data, primary and secondary. The type of data collected can be seen in Table 1.

2.3 Research Design

This study involved observing a pair of Sumatran slow lorises, one male and one female. Observations were conducted over one month, with continuous 24-hour recording of the lorises's behavior using a CCTV camera.

Primary data collected during the study included information on enclosure conditions, enrichment within the enclosure, slow loris activities, and space utilization. The methods for collecting primary data involved direct observation, measurements (including calculations), and informal interviews with caretakers. Secondary data, which supported the validity of primary data and research findings, were obtained through a literature review.

2.4 Primate Behavior Observation Methods

2.4.1 Scan Sampling

The scan sampling method is used to observe activity patterns by estimating the percentage of time spent on each activity. Behavior recording is conducted at predetermined time intervals, such as every one minute.

2.4.2 Instantaneous Sampling

The instantaneous sampling method is used to observe and record activities occurring at specific sampling points. This method helps determine time comparisons and estimate the duration of particular activities.

2.4.3 One-Zero Time Sampling

In the one-zero-time sampling method, the observer assigns a value of 1 if an activity occurs during the observation period and 0 if none occurs. The limitation of this method is that it tends to overestimate activity duration while underestimating its frequency.

2.4.4 Ethogram

An ethogram is a diagram created to simplify ongoing observations. The ethogram used in this study follows that of the Little Fireface Project, adapted from the research by Rode-Margono et al. (2014). Additionally, the ethogram for social behavior is adapted from the research by Fitch-Snyder and Ehrlich (2003).

2.5 Research Procedures and Preparation

2.5.1 Enclosure Preparation

N. coucang were housed in enclosures equipped with environmental enrichment to simulate natural conditions, facilitating adaptation and maintaining their natural behaviors. The environmental enrichment in each enclosure included tree branches with leaves extending along the sides, bamboo tubes, artificial nests made of wooden boxes, PVC pipes, and plastic containers for placing food, such as fruits and insects.

The enclosures for the Sumatran slow lorises were divided into three types: quarantine enclosures (2x2x2 m), breeding enclosures (2x2x2 m), and individual enclosures (2x2x2 m). The transition of wild-caught slow lorises from the clinic enclosure to the rehabilitation enclosure was carried out in two stages.

In the first stage, the slow lorises were placed in quarantine enclosures for six weeks to acclimate to their new environment. In the second stage, they were transferred from the quarantine enclosure to the

rehabilitation enclosure, which consisted of breeding and individual enclosures. Healthy slow lorises that exhibited behaviors similar to those observed in the wild were placed in the breeding enclosure, which was larger than the other enclosures.

2.5.2 Identification of Daily Behavior and Social Behavior of the Sumatran Slow Loris.

Data in the form of videos recorded by the recorder were downloaded and either transferred to a hard drive or labeled with the observed slow loris's identity. The observation period began at 17:30h (Western Indonesia Time; WIB). Observations were conducted according to the ethogram of daily and social behaviors using the instantaneous sampling method. The videos were analyzed on a laptop using the MPC-HC x64 application, and the audio was recorded in Microsoft Excel 2013 using the one-zero sampling method.

2.5.2 Data Analysis

The analysis was conducted descriptively, based on behavioral recordings of slow lorises over 1 month and on CCTV footage from the enclosure, particularly during the breeding season. The descriptive analysis was then conducted by interpreting the observational data in the form of diagrams to provide an overview of the social behavior patterns of slow lorises at PRC-IPB.

Table 1. Ethogram of the Daily Behavior of *Nycticebus coucang*

No	Behavior	Code	Description
1	Resting	SL	The slow loris remains still, curing its body with eyes closed.
2	Staring	FR	The slow loris appears immobilized, standing or sitting in a stiff posture for at least three seconds, sometimes exhibiting very slow movements.
3	Grooming	GR	The slow loris cleans itself by licking parts of its body or using its toothcomb.
4	Scanning	SC	The slow loris observes its environment with its eyes open, moving its head left, right, up, and down.
5	Moving	LO	Directed movement from one location to another.
6	Exploring	EX	Movement related to searching for food (often followed by looking around or sniffing) or exploring the habitat.
7	Eating	FE	The activity of consuming food or drinking water.
8	Elimination	EI	Activity involving excretion, including urination and defecation.

Table 2. Ethogram of the social behavior of *Nycticebus coucang*

No	Behavior	Code	Description
1	Sleeping Together	ST	The observed slow loris is resting or sleeping, huddled with another individual.
2	Approaching	AP	The slow loris is seen moving toward another individual.
3	Following	FO	The observed slow loris is following another individual.
4	Grooming Each Other	AG	The slow loris cleans another individual by licking or using its toothcomb.
5	Playing	PL	The observed individual is engaged in play (e.g., biting, small grips, hugging without making noise or aggressive behavior).
6	Copulation	CO	The activity performed by slow lorises for reproduction.
7	Sharing food	AS	The slow loris shares food with another individual.
8	Vocalization	VO	The slow loris produces non-aggressive vocalizations (e.g., calls).

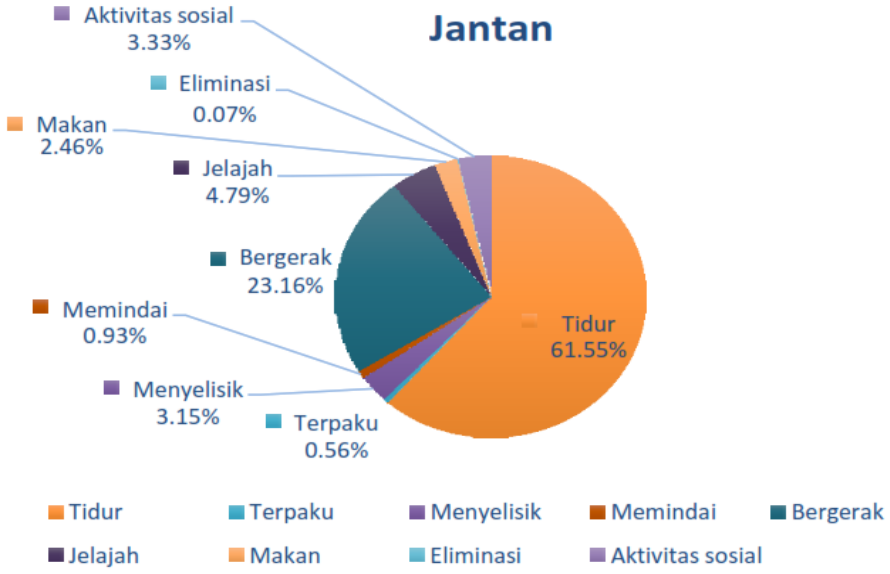
3. Results

The daily behavioral activity of the slow lorises at PRC-IPB was dominated by sleeping together during the day, accounting for 61.55% and 63.40%. During the night, activities included grooming (3.15% and 4.33%), moving (23.16% and 5.71%), exploring (4.79% and 16.62%), social activities (3.33% and 4.56%), eating (2.46% and 3.64%), scanning (1.16% and 0.93%), staring (0.29% and 0.56%), and elimination (0.07% and 0.29%). The social behaviors observed in both slow lorises included sleeping together, grooming each other, approaching, following, and sharing food. The frequency of social Behaviors increased at night and decreased during the day.

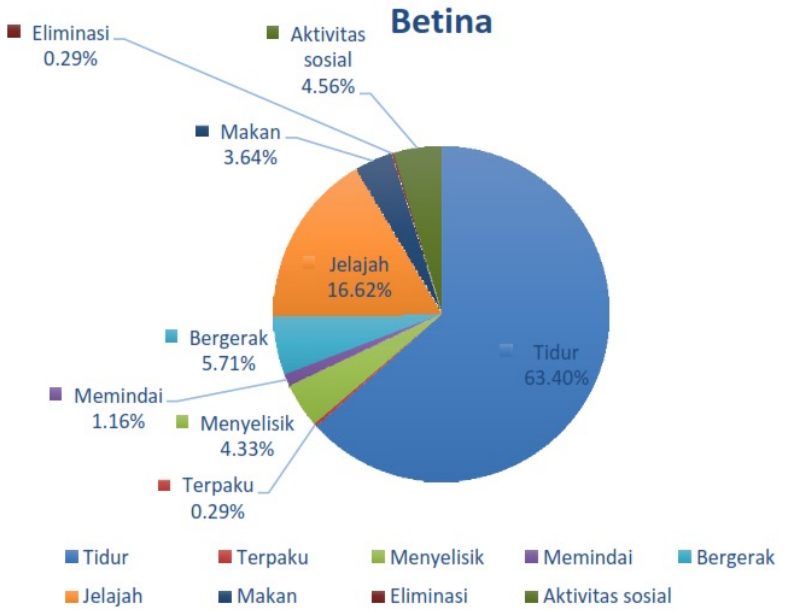
4. Discussion

The percentage of social activity in slow lorises over one month was 3.33% for males and 4.51% for females. According to Fitch-Snyder and Schulze (2001), Javan slow lorises are difficult to observe in social contexts, wich as led to their classification as solitary animals. Similarly, Wiens (2002) stated that information on the social life of slow lorises remains limited. It is known that slow lorises live solitarily; however, occasional interactions do occur, though

Graph 1. Pie chart of individual activities of male slow lorises for 1 month.



Graph 2. Pie chart of individual activities of female slow lorises for one month



however, occasional interactions do occur, though primarily during reproductive phases.

This indicates that in the PRC-IPB captivity environment, some social behaviors are observed, including sleeping together, approaching, following, investigating, playing, and food sharing, which occur between both males and females. Slow lorises employ various communication systems, such as urine marking to mark territory, vocalizations to attract mates, and tactile communication, including mutual investigation and food sharing.

Activities categorized as social behaviors include sleeping, which had the highest percentage at 62.68%. Slow lorises are nocturnal animals that spend most of the day resting. The behavioral pattern of both male and female slow lorises is generally active between 17:30 and 19:30h, characterized by waking, observing their surroundings, and initiating active movement. This aligns with research by Sinaga and Masyud (2017), which states that male and female slow lorises begin their active behavior between 18:00 and19:00h.

According to Lekagul and McNeely (1977), slow lorises are highly sensitive to bright light. They usually leave their sleeping nests at dusk and return before dawn, depending on the level of light. Their activity decreases drastically at sunrise. The highest feeding activity of Javan slow lorises occurs between 20:00–21:00h and 01:00–02:00h.

Grooming is defined as the behavior of cleaning oneself or another individual by licking, using the hands or feet, a toothcomb, or a toilet claw (Fitch-Snyder and Schulze 2001). Grooming is among the most frequently observed behaviors in both male and female slow lorises. There are two types of grooming behavior: autogrooming (self-grooming) and allogrooming (grooming another individual).

Figure 3. Slow lorises sleeping together.

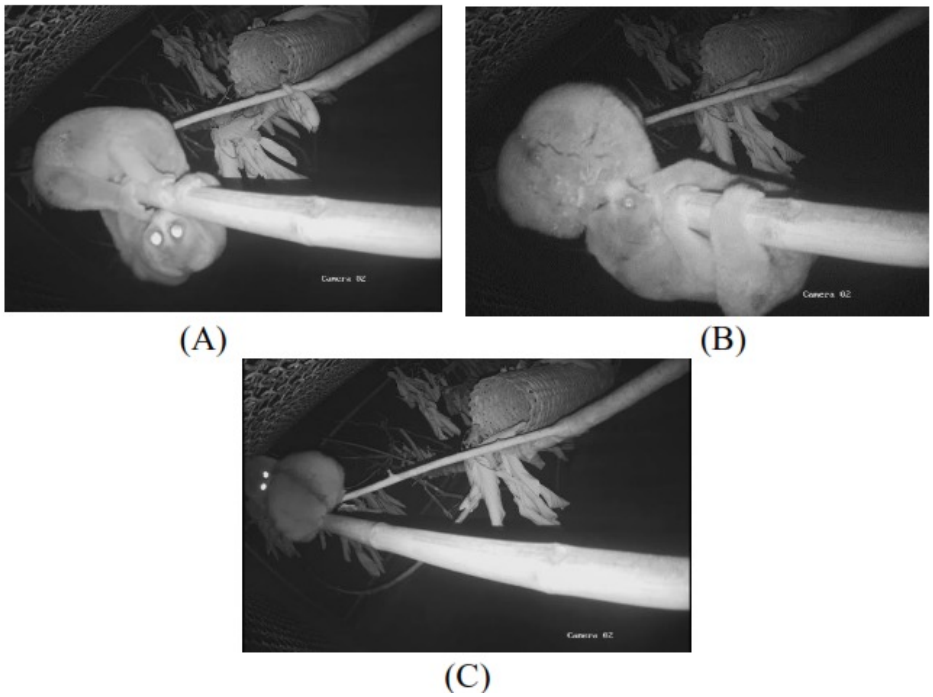


Figure 2. Snooping behavior in slow lorises. (A) Female slow loris snooping male slow loris, (B) Male slow loris snooping female slow loris, (C) Both slow lorises snooping each other.

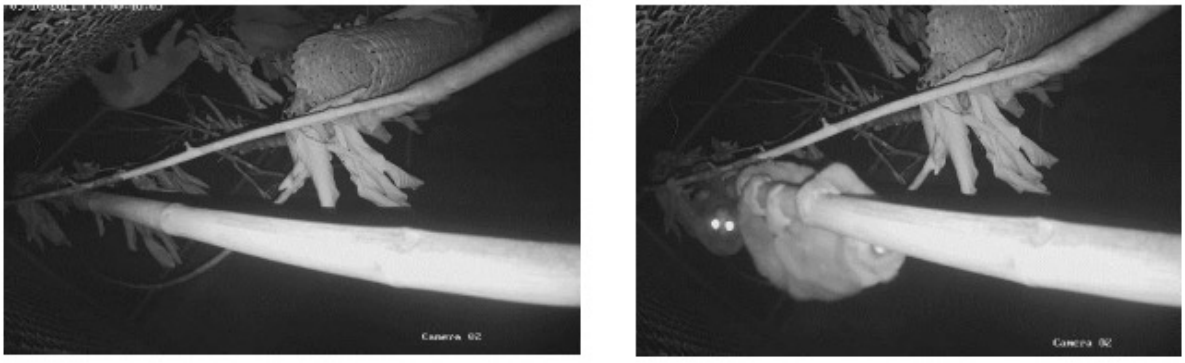


Figure 3. Behavior of approaching other individuals.

Allogrooming is considered a social behavior in slow lorises (Wiens 2002). Javan slow lorises spend 10% of their daily activities on grooming (Arisona 2008). Other behaviors observed in slow lorises include exploration, observation, vocalization, scent marking, and social interaction. Exploring is defined as the movement while observing an object. Observing refers to watching an object while remaining still (Nekaris 2001). Slow lorises exhibit various body positions and movement patterns, classified into 11 categories (Nekaris 2010): quadrupedal stand – standing on all four limbs, bipedal stand – standing on two legs, triplet – standing using three limbs, sitting – resting in a seated position, sleeping ball – curled-up sleeping posture, crouching – bending the body low, clinging – gripping onto a surface, quadrupedal walk – walking on all fours, suspension – hanging from a structure, climbing up – moving upwards, climbing down – moving downwards, and postural transition (bridge) – shifting or crossing between positions.

According to Lekagul and McNeely (1977), slow lorises are highly sensitive to bright light. They usually leave their sleeping nests at dusk and return before dawn, depending on the level of light. Their activity decreases drastically at sunrise. The highest feeding activity of Javan slow lorises occurs between 20:00–21:00h and 01:00–02:00h.

Copulation behavior was not observed during this study. According to Izard *et al*. (1988), the reproductive organs of male slow lorises mature at 17 months, while female slow lorises reach maturity at 18–24 months, with an estrous cycle of 29–45 days. This may explain the absence of copulation behavior during this period, as the study lasted 30 days and may not have coincided with the slow lorises' estrous cycle. However, 1.80–1.56% of approaching behavior between pairs was observed at certain moments. Approaching behavior is closely related to copulation behavior, as shown in Graph 1, where male slow lorises were observed following females more frequently. However, there were also instances in which females followed males, with a 0.87% difference.

Food sharing was observed between the two slow lorises in the PSSP enclosure, but it was infrequent. This is likely due to the placement of food in various locations within the enclosure and the natural solitary behavior of slow lorises in the wild. Playing behavior was also minimal, accounting for only 0.18–0.19% of the total activities observed over one month. This contrasts with *Macaca fascicularis*, which lives in groups and tends to hoard as much food as possible, even if it cannot consume it all. Food accumulation is often associated with a desire to display dominance over others, which frequently leads to conflicts and fights.

The study concludes that the daily behavioral activities of slow lorises at PRC-IPB were dominated by sleeping together during the day, accounting for 61.55% and 63.40%, respectively. Meanwhile, at night, their activities included investigating (3.15% and 4.33%), moving (23.16% and 5.71%), exploring (4.79% and 16.62%), social activities (3.33% and 4.56%), eating (2.46% and 3.64%), scanning (1.16% and 0.93%), freezing (0.29% and 0.56%), and elimination (0.07% and 0.29%). The observed social behaviors of the two slow lorises included sleeping together, mutual investigation, approaching, following, and food sharing. The frequency of social behaviors increased at night while overall activity and movement decreased during the daytime.

Overall, slow lorises are known as solitary animals that rarely engage in social interactions or group activities in their natural habitat. However, in the PRC-IPB enclosure, their social interactions increased. This suggests that ex situ conservation facilities, such as PRC-IPB, can support breeding activities, thereby helping to preserve endangered species such as the slow loris. For future studies, it is necessary to conduct behavioral observation research using devices that can monitor slow loris behavior, both audio and visually, to interpret the data more accurately.

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