The role of male Sumatran slow loris *Nycticebus coucang (Boddaert, 1785)* in family at Yayasan Inisiasi Alam Rehabilitasi Indonesia (YIARI), Bogor, West Java

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**Abstract.** Research has been conducted to identify the role of captive male sumatran slow loris *Nycticebus coucang (Boddaert 1785)* in family at Yayasan Inisiasi Alam Rehabilitasi Indonesia (YIARI) Rehabilitation Center, Bogor, West Java. The subjects were two male sumatran slow lorises living in shared cages with females and their infant. Focal animal sampling and ad libitum methods were used to observe interactions between male and female and their infant. The study took approximately 6 hours per day with 15 minutes non-stop interval in 24 days during October-November 2019. The total duration of the observation was equal to 8,628 minutes. Subjects spent 26.21 % of their time involved in social interactions with female and their infant. Interactions performed between subjects and female *N. coucang* occurred as much as 13.18 % with the most performed interactions being proximity, social grooming, and approach respectively. Interactions between subjects and their infant occurred as much as 13.03 % of total duration with the most performed interactions included social grooming, proximity, and social playing respectively. Social interactions performed by subjects were higher compared to their counterparts in the wild. Captive male *N. coucang* in YIARI played role as female’s social and sexual partner and in social development of their infant.

**Keywords:** Male *N. coucang*, role, social interaction, rehabilitation

1. Introduction

*Nycticebus coucang* or known as Sumatran slow loris is one of the primates whose population tends to decline in nature because it is widely traded as pets. One form of slow loris conservation is carried out through Ex-situ conservation by Yayasan Inisiasi Alam Rehabilitasi Indonesia (YIARI). The slow loris conservation program run by YIARI consisted of rescue, rehabilitation, and reintroduction activities [1]. Slow lorises in nature tend to be solitary. Their social interactions only occurred in their spatial groups [2]. Most slow lorises at YIARI are housed together as groups or families consisting of male, female, and infant which allows more social interaction between their family members. Social interactions that might occur in captivity are including associative and agonistic interactions [3].

Female slow lorises are known for having a big role in the family both in the wild and in captivity through parental care towards their infant. Meanwhile, males in the wild are not widely reported to have...
an obvious role in their families or their spatial groups. Accordingly, this study was conducted to identify the presence of male-female and male-infant interactions of Sumatran Slow lorises in the rehabilitation cages at YIARI, Bogor. Through this research, it is expected that a description of the role of males in the Sumatran slow loris family at the YIARI rehabilitation center can be obtained.

2. Materials and method

2.1. Study sites
Yayasan Inisiasi Alam Rehabilitasi Indonesia (YIARI) is one of the conservation foundations that was established in February 2008. YIARI runs two rehabilitation centers located in Ciapus, Bogor, West Java and Ketapang, West Kalimantan. The study was carried out in YIARI’s slow loris rehabilitation center located in Bogor, West Java (figure 1). The study was implemented in two rehabilitation cages labelled by K1 and K2 in figure 2.

![Figure 1. YIARI location in Bogor, West Java](image1)

![Figure 2. Rehabilitation area in YIARI](image2)
2.2. Instrumentation
The instruments used in the study included stationery, observation sheets, headlamp (Energizer), masks, field cloths, boots, watch (Xiaomi Redmi 5), stopwatch (Xiaomi Redmi 5), room thermometer and camera (Xiaomi Redmi 5).

2.3. Studied subjects
The subjects used in this study were two adult male Sumatran slow lorises, Milis (K1) and Boas (K2) which are categorized as adults. Each subject was caged with one female and their infant. The infant in each group were 9 and 8 months old.

2.4. Procedure
The observation was implemented by recording the presence of social interactions between subjects (K1 and K2) (figure 3) and female and subjects with their infant. The distance between observer and subjects during observations are approximately 3 m. The study was held in October–November 2019 which was divided into two sessions namely 18.00–24.00 PM and 00.00–06.00 AM according to YIARI’s policy with 15 minutes non-stop interval.

2.5. Data analysis
The data obtained from the observation were nocturnal activity of the subjects and social interactions between subjects and females and their infant. Data was collected, tabulated, and the percentage was calculated and displayed as diagrams or graphs. The data was analyzed descriptively to be able to explain the role of males in the slow loris family in captivity. Percentage of observed behaviors or interactions are obtained using this following formula:

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\% \text{ Behaviour} = \frac{\text{Duration of targeted behaviour}}{\text{Total observation time}} \times 100 \%
\]

3. Results and discussion

3.1. Daily activity of male sumatran slow loris in cage
The activities performed by K1 and K2 during the observation included 49.00 % exploration, 26.21 % social behaviour, 10.20 % resting, 6.80 % observation, 4.65 % feeding and 3.14 % autogroom (table 1 and figure 4).
Subjects spent 89.80% of their time being active and another 10.20% for resting. This shows that male Sumatran slow lorises in YIARI rehabilitation cage, Bogor, West Java are not more active than their counterparts in the wild. According to Wiens [4], Sumatran slow loris in the wild spends 93.3 ± 5.4% of their time doing activities including exploration, observation, eating, and foraging and only spends 5.4 ± 1.6% of their time for resting.

Some factors influencing primate activity were the type and the availability of food. Slow lorises are insectivorous, exudativorous, and frugivorous where the abundance of food is relatively low in nature which make them require a lot of time to obtain enough food [5]. Slow lorises in captivity show a lower percentage of activity time because they were provided with well-maintained food. As a result, captive slow lorises are less actively foraging compared to the wild.

Both subjects spent 26.21% of their time doing social interactions. Observations show that male Sumatran slow loris which placed together with other individual carry out more social interactions compared to their species in the wild. Based on the data published by Wiens et al. [6], wild Sumatran slow lorises only spend about 3% of their nocturnal activity interacting with members of their spatial groups. Some influencing factors in this difference are the food availability and the size of the cage.

Slow lorises in cages are fed regularly, so they do not spend as much time foraging as wild slow loris do. Therefore, slow lorises in their cages allocate more time to interact with group members or families in the same cage [7]. Kitchen et al. [8] suggested that there was a significant decrease in the duration of animals involved in contact with other individuals in the cage along with an increase of the cage size. The larger size of the cage tends to cause the animal to have less contact with individuals compared to the smaller cage size.

| Behavior     | Duration (Minutes) | Percentage (%) |
|--------------|--------------------|----------------|
| Exploration  | 4,228              | 49.00          |
| Observation  | 587                | 6.80           |
| Feeding      | 401                | 4.65           |
| Autogrooming | 271                | 3.14           |
| Resting      | 880                | 10.20          |
| Abnormal     | 0                  | 0              |
| Social       | 2,261              | 26.21          |
| Active       | 7,748              | 89.80          |
| Resting      | 880                | 10.20          |
| Total        | 8,628              | 100            |

**Figure 4.** Daily activities of male Sumatran slow lorises in YIARI.
3.2. The role of male slow lorises to females
The total time spent by K1 and K2 to interact with females was 1,137 minutes. The interaction between K1 and K2 and females that was observed has a proportion of 13.18% of their total activity time. The interactions performed included associative interactions, spatial interactions and sexual interactions. Associative interactions displayed by both subjects to females including proximity with a total duration 335 minutes, passive contact 80 minutes, following 123 minutes, social exploration 58 minutes, social grooming 212 minutes, and social playing 54 minutes. Spatial interactions that occurred between included proximity with total duration 209 minutes and departure which takes a total time 61 minutes. The only sexual interactions observed during the observation was licking in a total of 5 minutes (table 2 and figure 5).

The results showed that subjects approached females more than moving away. According to Ehrlich et al. [3], when *N. coucang* had been familiar reciprocally, they tend to approach other and engage in passive interactions such as proximity or active interactions such as social grooming or social playing rather than trying to avoid the other.

The observations showed that from four sexual interactions that might occur between males and females, only one interaction was observed during the observation, namely licking behaviour. Licking behaviour is an activity performed by animals (mostly male) to inspect their partner's reproductive condition by licking other’s genital area [9]. Both males have been vasectomized. Vasectomy is the process or treatment in removing some parts or all the vas deferens duct in males [10]. This treatment does not interfere with the male’s hormone secretion because the testes are retained, so the process of spermatogenesis will still occur, and spermatozoa will still be produced [11]. Therefore, vasectomy does not affect the appearance of sexual behaviour in males, and sexual behaviour such as licking can still occur as a consequence.

The male *N. coucang* which caged together with the female in YIARI rehabilitation cage acts as the social and sexual partner of the female. The absence of agonistic behaviour indicates that the two subjects are in good social and housing conditions because agonistic behaviour is a negative social behaviour that indicates a mismatch with the members of the social group or the conditions of their housing [12].

3.3. The role of male slow lorises to their infant
The total time spent by subjects to interact with their infant were 1,124 minutes or 13.03% of the total observation time. The interactions observed were physical contact, associative interactions, spatial interactions, and social-active interactions. Physical contact observed included clasping with a total time of 6 minutes and passive contact for 47 minutes. Associative interactions observed in observation were proximity with a total duration of 243 minutes and following with a total time of 113 minutes. Observed spatial interaction included approaching with a total time of 118 minutes and departure with a total time of 89 minutes. Social-active behaviour that occurred consists of social grooming which observed for a total time of 291 minutes, and social playing for a total of 217 minutes (table 3 and figure 5).

The most frequent interactions displayed by subjects with their infant were social grooming, proximity, and social playing respectively. All behaviours observed between subjects and their infant were categorized as affiliative interactions. The results of research conducted by Wiens [4] show that interactions between wild male slow lorises and their offspring occur in a very low frequency. The interaction is in the form of sleep contact and infant carrying.

Social-active behaviour such as social grooming and social play between males and infant are rarely found in wild Sumatran slow lorises (figure 6). Social-active behaviour in male *N. coucang* with infant is more common in captivity. Male slow loris in cage has a role in carrying out active social interaction with their infant through social grooming and social play activities, in contrast to wild slow lorises who more often use their active time to do their own activities [3].

Subjects showed a higher level of proximity to infant compared to their counterpart in the wild because they do not experience the threat of predation, which means the proximity will not affect the survivability of infant. The higher occurrence of social interaction the absence of agonistic interactions
and the overall affiliative behaviour displayed shows that the subjects could accept the existence of infant as a member of their social group alongside with the female [13]. Captive male slow loris has a role in the social development of infant through social grooming, social playing and proximity. The infant will learn various social interactions they need to form their own social group through the behaviour displayed by the parents, both male and female [14].

Table 2. Social interactions between male and female Sumatran slow lorises in YIARI.

| No. | Interactions                  | Duration (Minutes) | Percentage (%) | Mean   |
|-----|-------------------------------|--------------------|----------------|--------|
| 1.  | Agonistic                     |                    |                |        |
|     | Attack                        | 0                  | 0              | 0      |
|     | Pursuit                       | 0                  | 0              | 0      |
|     | Threat                        | 0                  | 0              | 0      |
|     | Fight                         | 0                  | 0              | 0      |
|     | Assertive                     | 0                  | 0              | 0      |
| 2.  | Associative                   |                    |                |        |
|     | Proximity                     | 335                | 3.88           | 13.95 ± 3.88 |
|     | Contact                       | 80                 | 0.93           | 3.33 ± 0.92  |
|     | Following                     | 123                | 1.43           | 5.13 ± 4.74  |
|     | Social Exploration            | 58                 | 0.67           | 2.42 ± 8.86  |
|     | Social grooming               | 212                | 2.46           | 8.33 ± 9.82  |
|     | Social playing                | 54                 | 0.63           | 2.25 ± 4.68  |
| 3.  | Spatial                       |                    |                |        |
|     | Approach                      | 209                | 2.42           | 8.71 ± 8.76  |
|     | Departure                     | 61                 | 0.71           | 2.54 ± 2.25  |
| 4.  | Sexual                        |                    |                |        |
|     | Inverted Embrace              | 0                  | 0              | 0      |
|     | Sniffing                      | 0                  | 0              | 0      |
|     | Licking                       | 5                  | 0.06           | 0.21 ± 0.51  |
|     | Mount Attempt                 | 0                  | 0              | 0      |
|     | Copulation                    | 0                  | 0              | 0      |
|     | Total                         | 1.137              | 13.18          | -      |

Figure 5. Social interactions between both male and female.
### Table 3. Social interactions between male and infant.

| No. | Behavior/interactions       | Duration (Minutes) | Percentage (%) | Mean (Minutes) |
|-----|-----------------------------|--------------------|----------------|----------------|
| 1.  | Physical contact            |                    |                |                |
|     | Ventral contact             | 0                  | 0              | 0              |
|     | Dorsal contact              | 0                  | 0              | 0              |
|     | Clasping                    | 6                  | 0.07           | 0.25 ± 0.85    |
|     | Carrying                    | 0                  | 0              | 0              |
|     | Passive contact             | 47                 | 0.54           | 1.96 ± 1.97    |
| 2.  | Associative Proximity       | 243                | 2.82           | 10.12 ± 5.35   |
|     | Following                   | 113                | 1.31           | 4.71 ± 4.24    |
| 3.  | Spatial Approach            | 118                | 1.37           | 4.92 ± 2.84    |
|     | Departure                   | 89                 | 1.03           | 3.71 ± 3.29    |
| 4.  | Social-Active               |                    |                |                |
|     | Social grooming             | 291                | 3.37           | 12.13 ± 11.82  |
|     | Social playing              | 217                | 2.52           | 9.04 ± 11.64   |
|     | Attack                      | 0                  | 0              | 0              |
|     | Threat                      | 0                  | 0              | 0              |
|     | Fight                       | 0                  | 0              | 0              |
|     | Pursuit                     | 0                  | 0              | 0              |
|     | Subordinance                | 0                  | 0              | 0              |
| 5.  | Protective                  |                    |                |                |
|     | Departure restraint         | 0                  | 0              | 0              |
|     | Retrieve                    | 0                  | 0              | 0              |
|     | Total                       | 1,124              | 13.03          | -              |

*Figure 6. Social interactions between both male and infant Sumatran slow lorises in YIARI.*
4. Conclusion
Interactions that appear between males and females *N. coucang* in rehabilitation cages include proximity, social grooming, approach, following, passive contact, departure, social exploration, and social playing and sexual interactions in the form of licking, whereas interactions that occur between *N. coucang* males and infant include social grooming, social playing, proximity, approach, following, departure, passive contact and clasping. Sumatran slow lorises (*N. coucang*) males in YIARI rehabilitation cages have a role as a female social and sexual partner. Male *N. coucang* also plays a role in the social development of their infant through social grooming, social playing and proximity interactions.

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References
[1] International Animal Rescue (IAR) 2010 *Indonesia Volunteer Guide* available at http://www.internationalanimalrescue.org
[2] Gron K J 2009 *Primate Factsheets: Slow loris (Nycticebus) Behavior* available at http://pin.primate.wisc.edu/factsheets/entry/slow_loris/behav
[3] Ehrlich A and Musicant A 1977 *Behaviour* 60 195-220
[4] Wiens F 2002 *Behaviour and Ecology of Wild Slow Lorises (Nycticebus coucang): Social Organization, Infant Care System, and Diet* PhD Thesis (Bayreuth: Faculty of Biology, Chemistry and Geosciences, Bayreuth University)
[5] Strier K B 2017 *Primate Behavioral Ecology* (New York: Routledge Publisher)
[6] Wiens F and Zitzmann A 2003 *J. Zool.* 261 35-46
[7] Pasquaretta P et al. 2014 *Scientific Reports* 4 1-8
[8] Kitchen A M and Martin A A 1996 *Laboratory Animals* 30 317-26
[9] Bottcher-Law L, Fitch-Snyder H and Hawes J 2001 *Management of Lorises in Captivity: A Husbandary Manual for Asian Lorises (Nycticebus & Loris ssp.)* available at http://www.loris-conservation.org/database/captive_care/manual/
[10] Wandia I N, Soma I G, Suatha I K, Putra I G A A, Widyastriti S K and Rompis A L 2012 *Udayana Mengabdi* 11 59-61
[11] Peng B, Zhang R D, Dai X S, Deng X Z, Wan Y and Yang Z M 2002 *Reproduction* 124 847-56
[12] Neveu H and Deputte B L 1996 *Am. J. Primatol.* 38 175-85
[13] Ehrlich A and Macbride L 1989 *Am. J. Primatol.* 19 217-28
[14] Rilling J K and Young L J 2014 *Science* 345 771-6