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Daily behaviour and home range of adult rehabilitant Javan slow loris (*Nycticebus javanicus* É. Geoffroy, 1812) in Gunung Sawal Nature Reserve, Ciamis, West Java

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ABSTRACT

This study aims to determine the differences in daily behaviour and home range of male and female rehabilitated Javan slow loris (*Nycticebus javanicus*) in Gunung Sawal Nature Reserve, Ciamis, West Java, Indonesia. The study was conducted on four individuals of Javan slow loris rehabilitates (two adult males and two adult females) during their post-released monitoring period. Those animals were fitted with a radio transmitter and were monitored for their daily behaviour and home range for six months (May - October 2018). The focal animal sampling method was employed for daily behaviour observation. The home range of each individual was estimated by Minimum Convex Polygon (MCP) and Kernel Density Estimation (KDE) methods. Data analysis was descriptively displayed in maps, tables, and figures. According to the statistical analyses of the Mann Whitney U test, there are no significant differences (μ = 1,074,554.5 [$p < 0.01$]; P-Value 0.238 > 0.01) in the daily behaviour of male and female Javan slow loris rehabilitate. In contrast, the home range (vertically and horizontally) of female and male Javan slow loris rehabilitate are significantly different (μ = 816,286.0 [$p < 0.01$]; P-Value 0.000 < 0.01).

ABSTRAK

Penelitian ini bertujuan untuk mengetahui perbedaan perilaku harian dan wilayah jelajah kukang jawa (*Nycticebus javanicus*) jantan dan betina hasil rehabilitasi di Suaka Margasatwa Gunung Sawal, Ciamis, Jawa Barat, Indonesia. Penelitian dilakukan pada empat individu kukang jawa rehabilitan (dua jantan dewasa dan dua betina dewasa) selama masa pemantauan pasca pelepasliaran. Satwa-satwa tersebut dipasangi pemancar radio serta dipantau perilaku harian dan wilayah jelajahnya selama enam bulan (Mei - Oktober 2018). Metode pengambilan sampel "Focal Animal" digunakan untuk pengamatan perilaku harian. Daerah jelajah masing-masing individu diperkirakan dengan metode Minimum Convex Polygon (MCP) dan Kernel Density Estimation (KDE). Analisis data secara deskriptif ditampilkan dalam bentuk peta, tabel, dan gambar. Berdasarkan analisis statistik uji U-Mann Whitney, tidak terdapat perbedaan yang bermakna (μ = 1.074.554,5 [$p < 0,01$]; P-Value 0,238 > 0,01) pada perilaku harian kukang jawa jantan dan betina yang direhabilitasi. Sebaliknya, wilayah jelajah (vertikal dan horizontal) kukang jawa betina dan jantan yang direhabilitasi berbeda nyata (μ = 816.286,0 [$p < 0,01$]; P-Value 0,000 < 0,01).

Keywords: *daily behaviour, home range, Javan slow loris, rehabilitant, Gunung Sawal Nature Reserve*

INTRODUCTION

Indonesia boasts a remarkable diversity of primate species, with 60 out of approximately 250 known species worldwide. For this reason, Indonesia places globally among the countries with the highest primate species richness (Supriatna & Ramadhan, 2016; Supriatna, 2019). Notably, at least 36 of these primate species, comprising 60% of the total, are endemic to Indonesia (Supriatna & Ramadhan, 2016). Indonesia possesses a primate species known as the Javan slow loris (*Nycticebus javanicus* É. Geoffroy, 1812), which is exclusive to Java

Island (Groves, 2001; Nekaris & Jaffe, 2007; Maryanto et al., 2008; Supriatna, 2019).

According to Lehtinen (2013), slow lorises are exclusively distributed in South and Southeast Asia. Presently, there are eight recognized species of slow lorises, namely the Bengal slow loris (*Nycticebus bengalensis*), Dwarf slow loris (*N. pygmaeus*), Sunda slow loris (*N. coucang*) also occurs in Baturegi Protected Forest in Lampung (Huda et al, 2020), Philippine slow loris (*N. menagensis*), Javan slow loris (*N. javanicus*), Sodhi slow loris (*N. bancanus*), Bornean slow loris (*N. borneanus*), and Kayan slow loris (*N. kayan*). Slow lorises are distributed across the Indonesian islands of Sumatra, Kalimantan, and Java. The slow lorises inhabit the islands' tropical forests and prefer primary forests, secondary forests, shrubs, and bamboo groves. According to Nekaris and Starr (2015), slow lorises play a significant ecological role in tropical forests as one of the arboreal fauna.

According to the IUCN Red List, the Javan slow loris was classified as endangered (EN) in 2010 and reclassified as critical (CR) in 2013. In Indonesia, the Javan slow loris is a protected wild animal under Law No. 5 of 1990 and Government Regulation No. 7 of 1999 (Supriatna & Wahyono, 2000). The decline in slow loris populations in their natural habitat is attributed to the loss of their habitat and the illicit trade of these animals, as the IAR Indonesia Foundation reported in 2011. Illegal wildlife trade now can be found either through offline or online transactions (Priatna & Monk, 2022).

According to Sjahfirdi et al. (2009), daily behaviour is a purposeful action influenced by an individual's surroundings and available resources. Tanudimadja (1978) defines wild animal behaviour as the manifestation of animal expression influenced by environmental factors, including the availability of food and water sources, the presence of predators, the necessity to reproduce, and human interference. The primary purpose of behavioural adaptation is to adjust to various environmental alterations from internal and external sources.

Slow lorises are solitary primates (Wiens, 2002; Wiens & Zitzmann, 2003; Napier & Napier, 1985; Rowe, 1996). Solitary behaviour in slow lorises is generally accepted; there is no significant difference between sexes or age classes between adults or immature individuals (Wiens, 2002).

Santosa (1990) states that the parameters of spatial use patterns most studied are home ranges and movements. The use of space in habitat is crucial to comprehending the use of forest strata and various types of substrates by animals in carrying out their activities. (Hasan et al., 2007). In searching for food sources, primates use space based on height (vertical stratum) and substrate (horizontal stratum) (Hassan & Kitegile, 2022).

Information obtained from the daily behaviour and movement of animals will provide an overview of the ecology of the species. Information on spatial use patterns is also important concerning how a wildlife species interacts with its environment. This research on the daily behaviour and range of the rehabilitated Javan slow loris in the Gunung Sawal Nature Reserve area is to answer the questions: (1) Are there differences in the daily behaviour of adult male Javan slow loris and rehabilitated adult females in nature? Moreover, (2) Are there differences in the ranges of male Javan slow lorises and rehabilitated females in nature? The information generated from this research can be used to develop and improve future Javan slow loris conservation efforts.

RESEARCH METHODOLOGY

Location and Time

This research was conducted in the Awilega Block, Gunung Sawal Nature Reserve, administratively located in Tanjungsari Village, Sadananya District, Ciamis Regency, West Java. (Figure 1). Field data was collected for six months, from May to October 2018.

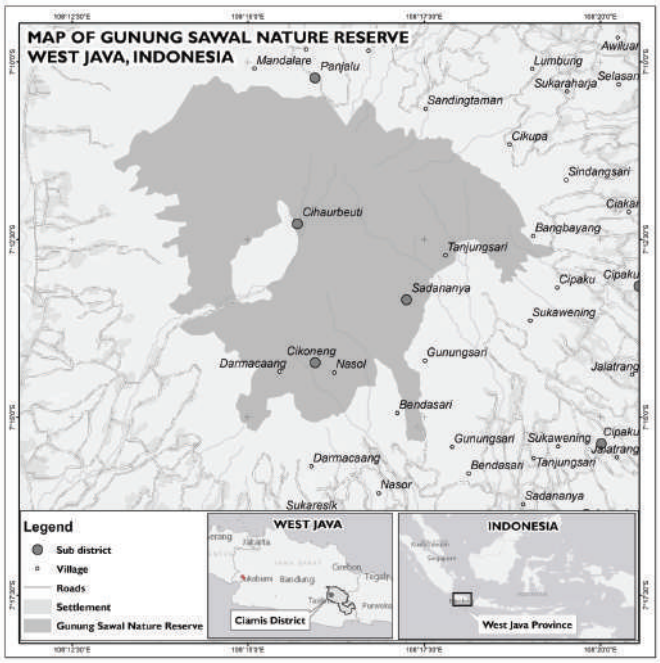

Figure 1. Map of research site in Gunung Sawal Nature Reserve, Ciamis Regency, West Java, Indonesia.

Research Object

Four Javan slow loris, comprising two adult males and two adult females, served as the research subjects. The four animals were either confiscated slow lorises or had been kept as pets by the community, and they had undergone rehabilitation at the Slow Loris Rehabilitation Center of the IAR Indonesia Foundation. The four rehabilitated animals were returned to Gunung Sawal Wildlife Nature Reserve by the Natural Resources Conservation Agency of West Java in mid-2017 (about one year before this research was conducted).

Research Equipment

The study used Biotrack radio transmitters affixed to the four rehabilitated slow lorises as a means of monitoring. In addition, a CSI receiver and a Biotract yagi antenna are used to aid in locating the position of the slow loris, which has been fitted with a radio transmitter. Additional supporting tools used in this study include GPS map 67 CSX brand Garmin, digital cameras, flashlights, and stationery. Meanwhile, computer equipment and ArcGIS 10.1 software are used to process monitoring data.

How Radio Telemetry Works

Data collection on daily activities began with exploring the forest, where the four individuals were released to the wild with a radio transmitter attached to them. A receiver connected to the Yagi antenna is used to find the position of the slow loris. The radio transmitter attached to the slow loris will send a signal that the receiver can receive. When the yagi antenna is directed at one place and gives the strongest signal, that direction indicates the location of the slow loris (Andrusiak et al., 1998). This technique is commonly used in assisting research on the behaviour of prosimian primates active at night (nocturnal), such as Tarsier and Galago.

Work Procedures

Recording of daily behaviour

The daily behaviour of slow lorises was collected using the focal time sampling method (Martin & Bateson, 1993), which involved tracking the rehabilitated slow lorises from 6 p.m (Western Indonesian Time) to 06.00 a.m (Western Indonesian Time) the next day (about 12 hours). Slow lorises' daily nocturnal behaviour is divided into five categories: inactivity (resting/sleeping), travel, foraging, feeding, and hygiene (Nekaris, 2001). The data is recorded at five-minute intervals. Daily behaviour data were then arranged in a modified Fitch-Snyder & Schulze ethogram (Bottcher-Law et al., 2001) and (Glassman & Wells, 1984).

Animal roaming data collection techniques

Data for slow lorises were collected from 18:00 Indonesian Western Time to 06:00 Indonesian Western Time of the following day. Retrieval of location coordinate points begins when the slow loris becomes accustomed to the observer's presence, typically occurring approximately 5-10 minutes after the slow loris was spotted (Pambudi, 2008). The coordinates of the slow loris location are recorded every 15 minutes using GPS.

Data analysis

Daily behaviour data of four individuals of slow lorises were taken qualitatively and subsequently presented in various visual formats, including maps, tables, and pictures or graphs.

The division of vertical space use or forest tree canopy strata refers to the strata used in Pambudi's research (2008), namely forest floor strata (0-5 meters high), lower canopy strata (>5-10 meters high), middle canopy strata (height >10-15 meters), and upper canopy strata (height >15 meters), as measured from the forest floor.

The Javan slow loris home range is determined based on location coordinate point data collected in the field facilitated by the use of GPS technology. These data points are subsequently plotted onto a digital map for analysis and interpretation. The assessment of home range measurement and the evaluation of Javan slow loris habitat types were conducted using ArcGIS 10.1 software. The home range area is calculated using the Minimum Convex Polygon (MCP) and Kernel Density Estimation (KDE) methods.

Statistical test

Mann Whitney U Test was conducted to determine whether there are differences in daily behaviour and the home range size between adult male Javan slow lorises and rehabilitated females in the wild.

RESULTS AND DISCUSSION

Daily Behaviour

Daily activity

Over approximately six months, data were collected on the behaviour of four Javan slow lorises, consisting of two adult males and two adult females. A total of 3,075 male slow loris behaviour were recorded, with an average of 1,537.5 observations per individual. Similarly, 2,871 female slow loris behaviour was documented, with an average of 1,436.5 observations per individual. The results showed that adult male Javan slow lorises allocate a majority of their time (92.4%) to engaging in various activities and only use 7.6% of their time to rest/sleep. The largest proportion of active time is used for traveling (29.6%), feeding (25%), foraging (24.5%), and grooming (13.3%). In the case of adult female Javanese slow lorises, 12.1% of their time is allocated for resting/sleeping, while the remaining 87.9% is for various activities. The highest proportion of active time in female Javan slow lorises is spent traveling (26.9%), foraging (23%), feeding (19.6%), and grooming (18.4%) (Figure 2).

Daily activities based on time distribution

Observations indicate that rehabilitated Javan slow lorises (adult males and adult females) in the Gunung

Sawal Nature Reserve commence daily activity between 18:00 and 19:00 WIB. Most daily activity is allocated to travel, grazing, and foraging, with the most active period occurring between 20:00 and 24:00 Indonesian Western Time. Subsequently, the activity level of these slow lorises tends to decrease between 00:00 WIB and 03:00. Further, there was a subsequent increase in the level of activity exhibited by the slow lorises during 03.00-05.00.

The rehabilitant male Javan slow loris in the study area of Gunung Sawal typically initiates its activities at 18:00, with the peak of its activity observed between 21:00 and 24:00, accounting for 64.2% of its overall activity. In contrast, female rehabilitant slow lorises typically commence their daily routines between 18:00 to 21:00. The initial behaviour observed during this period is waking up and engaging in grooming activities. Adult female slow lorises are most active from 21:00 to 24:00, accounting for 61.1% of their total activity. Subsequently, their activity diminishes during the 00.00-03.00 WIB time frame, constituting only 6.8% of their overall activity. Nevertheless, their activity increased again from 3:00 to 6:00 WIB, up to 15.5% of their total activity, as presented in Figure 3.

The results showed that rehabilitant male slow lorises were more active than adult females by 92.4% versus 87.9%. Rode-Margono et al. (2014) report that female Javan slow lorises spend more time foraging, whereas males spend more time traveling. Meanwhile, Nekaris et al. (2017) contend that adult males spend more time traveling than adult females. The high time spent traveling in males is closely related to the behaviour of marking their territory using urine, as well as the distance between sleeping trees and foraging locations. This is congruent with the results shown by male and female rehabilitatant lorises observed, where the percentage of time adult males spend traveling was 29.6%, higher than that of adult females for traveling, only 26.9%. The high proportion of time spent traveling, feeding, and foraging by rehabilitant slow lorises (adult males and adult females) is because rehabilitant slow lorises generally take a long time to recognize their new habitat by exploring and simultaneously looking for suitable habitat to meet their food needs (foraging) to survive in the wild (IAR Indonesia Foundation, 2011).

Pambudi (2008) asserts that the Javan slow loris in the Bodogol, Gunung Gede Pangrango National Park forest area spends 65% of its time engaging in activities (14% traveling, 28% foraging, 13% feeding, and 10% grooming) and 35% resting/sleeping (inactive). Angeliza (2014), who studied two individuals of Javan slow loris on Gunung Halimun Salak National Park, discovered that individual A exhibited three prevalent loris behaviours: traveling (41.6% of the time), foraging (14.3% of the time) and feeding (14.1% of the time). Individual B, meanwhile, engaged in travel (34,1%), grazing (29,5%), and foraging (14,6%). This result is consistent with what

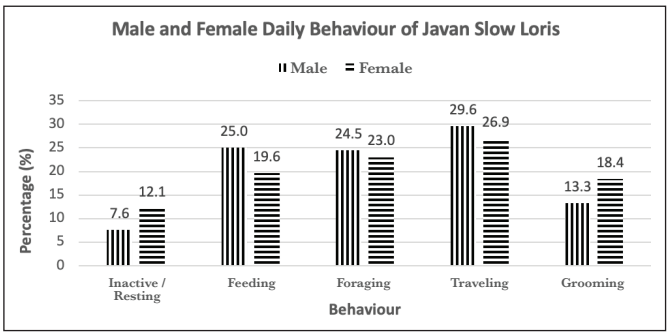

Figure 2. Percentage of the daily behaviour of male and female rehabilitant Javan slow lorises.

was observed by rehabilitant slow lorises in Gunung Sawal Nature Reserve, where traveling, grazing, and foraging are the primary daily activities.

Observation of the daily activities of the rehabilitant Javanese slow loris commences at 18:00 WIB and concludes at 06:00 the following day. The first behaviour observed between 18.00 and 19.00 is resting when the slow loris has just awoken and sits quietly observing its surroundings and grooming. According to (Nekaris, 2001), the slender loris begins its activities between 18.00 and 19.00 and concludes them between 05.00 and 06.00. Male slow lorises exhibit the greatest daily activity between 20:00 and 24:00. Activity tends to diminish and stabilize at 00.00 WIB until 06.00. In females' slow lorises, the highest daily activity occurs at 21.00-24.00. Activity decreases at 00.00-03.00 and will increase again at 03.00-06.00. Male and female slow lorises exhibit the same behaviour during their highest (dominant) daily activities, namely traveling, grazing, and foraging.

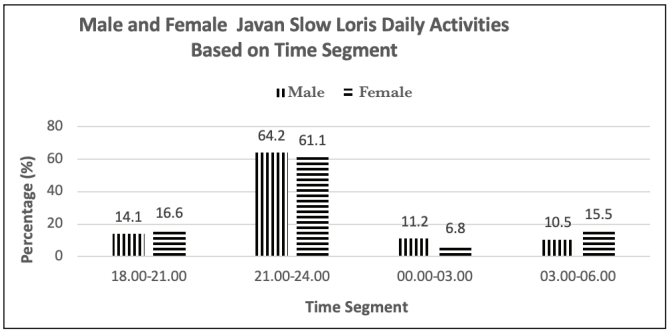

Figure 3. Daily activities based on time segment of male and female rehabilitant Javan slow lorises.

Slow lorises are nocturnal primates that are active after sunset. Slow lorises are very active, from 21.00 WIB to 00.00 WIB in nature. As the sun begins to rise, there will be a significant decrease in activity. The peak feeding activity of Java slow lorises occurs at 20:00 - 21:00 and 01:00 - 02:00 (Nekaris, 2001), while Pambudi (2008) stated that slow loris activity would begin to increase immediately after waking up and then decreases towards midnight and will increase again in the early morning to look for sleeping trees to rest.

Each slow loris' behaviour is substantially influenced by habitat conditions, individual animals, and the presence of predators and competing species.

Roaming

Primates utilize their habitat vertically as well as horizontally (Jolly, 1985). Habitat utilization horizontally and vertically can be investigated by mapping the home range to determine how much forest is utilized and which part of the forest is most often used by primates (Chalmers, 1980).

Vertical roaming

The pattern of vertical space utilization by slow lorises is influenced by the vegetation type and their foraging activity patterns. Foraging activities that impact strata use consist of searching for insects in tree trunks and searching for sap.

Based on our observational data (n = 3,075), male Javan slow lorises utilized vertical space most frequently at heights of 0-5 meters (58%), followed by heights of >5-10 meters (33.8%), >10-15 meters (7.2%), and only one percent (1%) above a height of >15 meters above the ground or forest floor. Meanwhile for female Javan slow lorises (n = 2,871 behaviours) used vertical space most frequently at heights > 5-10 meters (48.2%), > 5-10 meters (34.1%), > 10-15 meters (15.4%), and >15 meters above ground level or forest floor (2.3%). (See Figure 4).

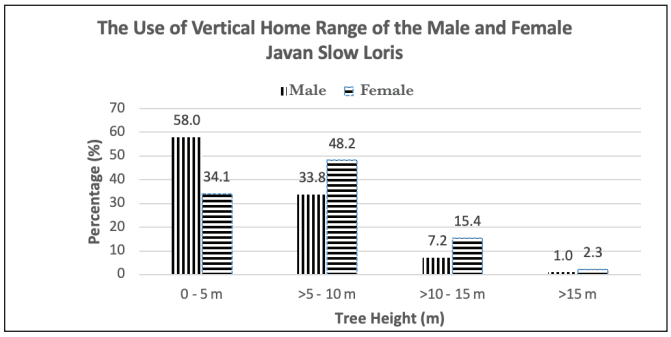

Figure 4. Percentage of use of vertical home range of male and female Javan slow lorises.

Horizontal roaming

The home range of the Javan slow loris was estimated using the Minimum Convex Polygon (MCP) and Kernel Density Estimation (KDE) methods. The KDE approach is used to display and estimate the core area (core range) and total area (fixed home range) used by slow lorises during observations.

During the observation of four Javan slow lorises, a total of 2,398 coordinate points were obtained for the tracking movement location (1,058 male coordinates and 1,340 female coordinates). Using the MCP (Minimum Convex Polygon) method, it is known that the male Javan slow loris has a home range of 46.9 ha, while the female has a home range of 42.7 ha (Figure 5). Meanwhile, using the KDE method, it was discovered that the male slow loris had a fixed home range of 25.4 hectares and a core range of 4.9 hectares, while the female slow loris had a fixed home range of 20.4 hectares and a core range of 4.4 hectares (Figure 6).

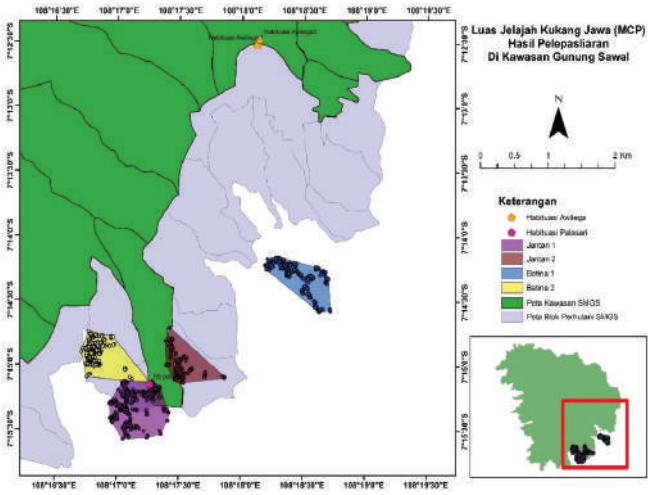

Figure 5. Home range of rehabilitant Javan slow lorises in the Gunung Sawal Nature Reserve area using the MCP (Minimum Convex Polygon) approach.

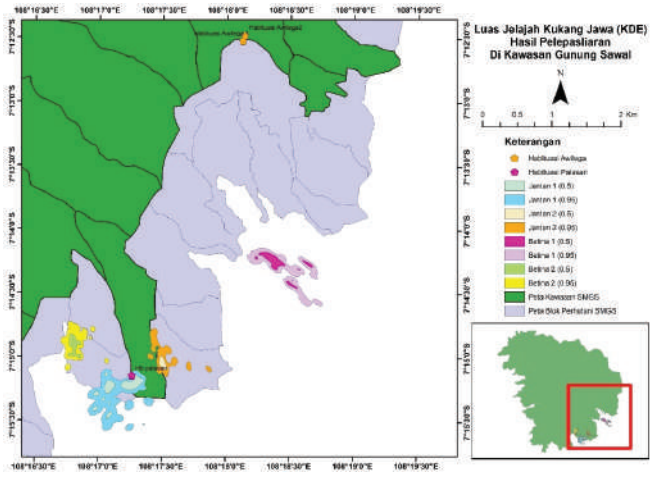

Figure 6. Home range of rehabilitant Javan slow lorises in the Gunung Sawal Nature Reserve area using the KDE (Kernel Density Estimation) approach.

habitat preference

Rehabilitant slow lorises released to the wild were observed using areas belonging to three status areas: the Gunung Sawal Nature Reserve area, the Perhutani area, and community-owned plantations.

Based on field monitoring which was then processed using a GIS (Geographical Information System), of 2,398 coordinated position points for four observed Javan slow lorises, the majority of slow lorises utilized secondary forest habitat and talun forest (forest managed by indigenous peoples in West Java). The analysis revealed that slow lorises spend 47.3% of their time in

the Perhutani area, 45.1% in community-owned plantations, and just 7.6% in the Gunung Sawal Nature Reserve area (Figure 7). Priatna et al. (2012a) suggested that the existence of natural forests within the landscape as habitat or cover remains important for the survival of wildlife, particularly terrestrial mammals.

Moreover, observations result indicate that the rehabilitant Javan slow loris range is 500 to 800 meters above sea level. Most activities occur between 600 and

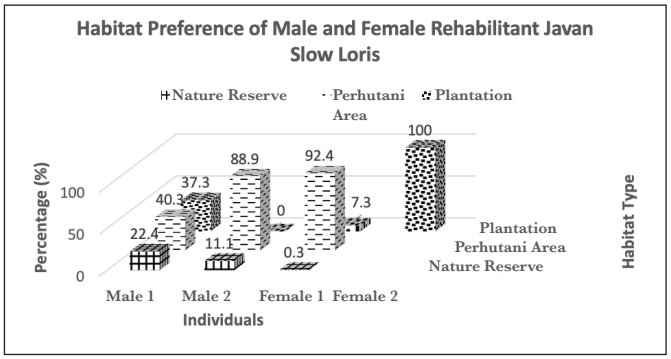

Figure 7. Habitat preferences of the relabilitant Javan slow loris in the Gunung Sawal Nature Reserve area.

800 meters above sea level, predominantly in Perhutani areas and plantations owned by the community.

Slow lorises are slow-moving animals that ascend using all four legs (quadrupedal). Slow lorises are capable of bridging (forming like a bridge) between tree branches at various angles, as they cannot jump (Wiens & Zitzmann, 2003).

Based on empirical evidence, male Javan slow lorises predominantly engage in vertical cruising within a range of 0-5 meters above ground level, accounting for approximately 58% of their activity. Subsequently, vertical cruising occurs at higher heights, with 33.8% occurring at a height of > 5-10 meters, 7.2% at > 10-15 meters, and a mere 1% occurring at a height > 15 meters above ground level. In the case of female slow lorises, vertical cruising predominantly occurred at a height of > 5-10 meters from the ground, accounting for 48.2% of observations. Subsequently, cruising was observed at > 5-10 meters (34.1%), >10-15 meters (15.4%), and a mere 2.3% of instances involved cruising at> 15 meters above the ground. A notable disparity exists in the vertical utilization patterns of male and female slow lorises, particularly concerning the predominant height ranges employed for various activities. Specifically, male slow lorises are more inclined to utilize heights within the 0-5 meter range, accounting for 58% of their overall activity. Conversely, female slow lorises demonstrate a higher level of engagement at heights> 5-10 meters, constituting 48.2% of their total activity.

The data collected from observations indicated that a significant majority, exceeding 70%, of both male and female slow lorises engaged in activities primarily within the arboreal habitat. These activities were predominantly observed at two specific height ranges, 0-5 meters and > 5-10 meters above ground level. Generally, male and female slow lorises typically utilize vertical spatial areas within the lower to medium height range, specifically between 0 and 10 meters above ground level. The statement exhibits a strong correlation between This is closely related to the condition of the vegetation in the slow loris' home range. According to Arismayanti's (2014) findings, the Javan slow loris inhabiting Gunung Halimun Salak National Park engages in foraging activities within a lower canopy at a height ranging from 2 to 8 meters above ground level. The Javan slow loris in Bodogol Gunung Gede Pangrango National Park and the Tasikmalaya and Ciamis taluns (Pambudi, 2008; Winarti, 2011) exhibits similar behaviour by utilizing a height range of 3-12 meters above the ground for feeding and foraging (Putri, 2014; Winarti, 2011). In the context of the observed rehabilitant of slow lorises, the daily behaviours exhibited by the subjects included periods of inactivity (resting/sleeping), feeding, foraging, moving, and grooming. These activities were predominantly conducted within a height range of 0-10 meters from the ground, accounting for over 70% of the observed behaviours. The utilization of these strata is intricately linked to the specific vegetation type and foraging behaviour of slow lorises. Foraging behaviours that impact the utilization of different strata encompass activities such as searching for insects within tree trunks or seeking sap.

The data obtained from the study of the Javan slow loris includes 2,398 coordinate points representing their movement patterns. This dataset comprises 1,058 coordinates for males and 1,340 coordinates for females. According to the Minimum Convex Polygon (MCP) method, the male Javan slow loris exhibits a home range stretching 46.9 hectares. In comparison, the female Javan slow loris demonstrates a home range encompassing 42.7 hectares. The findings derived from applying the Kernel Density Estimation (KDE) method indicates that male slow lorises exhibit a consistent home-range size of 25.4 hectares, while female slow lorises possess a home-range size of 20.4 hectares. In the study by Moore et al. (2014), the rehabilitant slow loris by the International Animal Rescue Indonesia Foundation (YIARI) exhibited a home range spanning 29.21 hectares. The Javan slow loris, following its rehabilitation and subsequent reintroduction into its native environment, engages in exploratory behaviour to identify and establish its territory within regions other loris individuals have not occupied. The slender loris, belonging to the genus Loris, is the research subject in Sri Lanka and India. It is a small primate weighing between 0.1-2.5 kg. Studies have indicated that the loris has a home range extending up to 35 hectares (Nekaris & Bearder, 2011; Wiens &

Zitzmann, 2003; Wiens et al., 2006). The home range refers to the spatial extent within which an animal resides and actively defends against intrusions by conspecifics. According to Alikodra (2002), when a particular species starts to protect its area of residence from intruders of the same species, it establishes a territory.

Based on the results of calculating the home range using the KDE method, the home range area for the rehabilitant slow loris studied demonstrates a narrower home range (Moore et al., 2014; Nekaris & Bearder, 2011; Wiens & Zitzmann, 2003; Wiens et al., 2006). The shrinkage range is because the data for the range points are collected three months after the slow lorises have reached a stable adaptation period.

Using the Kernel Density Estimation (KDE) method, the male slow loris' core–range area is 4,9 ha, while the female's is 4,4 ha. After a sustained adaptation period, the four released individuals, consisting of two males and two females, established a core and home range similar to the wild Javan slow loris. The core-range area is considered territorial significance for each individual, ensuring their protection against predators, competitors, and human interference. According to Wiens (2002), the home range of slow lorises varies depending on their habitat type. In primary forest, the home range of slow lorises is between 0.4 and 3.8 hectares; in forests affected by logging disturbances, it expands to 2.8-8.9 hectares; and in grasslands savanna, it is between 10.4 and 25 hectares. According to Arismayanti (2014), the home ranges of two Javan slow loris individuals on Gunung Halimun Salak National Park are 5.44 ha and 5.50 ha, respectively. According to the data presented, there is no significant difference between the home ranges of rehabilitant and wild Javan slow lorises. According to Priatna et al. (2012b) the home range and movement of animals are affected by their surroundings and the distribution of the resources they need to grow, reproduce and survive.

The rehabilitan Javan slow loris typically inhabits elevations ranging from 500 to 800 meters above sea level (asl). Notably, these slow lorises exhibit their highest frequency of activity within the altitude range of 600 to 800 meters asl. Based on field monitoring and GIS (geographic information system) analysis, most slow lorises inhabit secondary forest and talun garden habitats. Based on field observations, the majority of these areas are in the Perhutani area and plantations belonging to the community, which contain forage plants utilized by the Javan slow loris for rehabilitation in the Gunung Sawal Nature Reserve area, such as Kaliandra, Mahogany, Sengon, Aren, and Bamboo. In addition, there exist various species of indigenous forest flora, including Puspa, Tepus, Bungbuay, and Bingbin. Food sources for the rehabilitated Javan slow loris in the Gunung Sawal Nature Reserve consist primarily of nectar from flowering plant species, sap from stems, and branches of wood that the slow lorises peel off. In addition, slow lorises consume numerous species of insects and reptiles. The Javan slow loris has been observed consuming the sap extracted from palm trees that palm sugar farmers are tapping. From the perspective of indigenous knowledge, the local community implies that the palm flower clusters visited by the Javan slow loris tend to release high-quality water. Furthermore, in its natural habitat, the Javan slow loris commonly relies on palm sap, locally referred to as bubudur, as a natural food resource.

Based on the statistical analysis of the Mann Whitney U test, there was no significant difference (μ = 1,074,554.5 [$p < 0.01$]; P-Value 0.238 > 0.01) between the daily behaviour of male and female Javan slow lorises that were rehabilitated and released in the Gunung Sawal Nature Reserve Area. Meanwhile, the home ranges (vertical and horizontal) of female and male Javan slow lorises rehabilitated and released in Gunung Sawal Nature Reserve were significantly different (μ = 816,286.0 [$p < 0.01$]; P-Value 0.000 < 0.01).

CONCLUSION

There was no statistically significant difference in daily behaviour between male and female Javan slow lorises undergoing rehabilitation in the Gunung Sawal region, as determined by the Mann-Whitney U Test. Theoretically, there should be differences in their daily behaviours. It is conceivable that there are no differences in daily behaviour because the research samples are small, and the field data collection period is brief.

Based on statistical tests using the Mann-Whitney U Test, there were differences in vertical and horizontal ranges between male and female rehabilitant Javan slow lorises in the Gunung Sawal area. Male Javan slow lorises traversed mostly at canopy height/strata of 0-5 meters (58%), and female Javan slow lorises mainly were at altitudes >5-10 meters (48.2%). The horizontal range on the male Javan slow loris was 46.9 ha, and the female Javan slow loris was 42.7 ha using the Minimum Convex Polygon (MCP) approach. In contrast, using the Kernel Density Estimation (KDE) method, the male Javan slow loris was 25.4 ha, and the female Java slow loris was 20 .4 ha for fixed home range and 4.9 ha male Javan slow loris and 4.4 ha female Javan slow loris for core-range.

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