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SLEEPING TREE PREFERENCE OF SIAMANG IN THE BUFFER ZONE OF DOLOK SIBUAL-BUALI NATURE RESERVE

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ABSTRACT

Sleeping trees are one of the important components in the siamang habitat as an arboreal primate. The purpose of this study was to analyze the characteristics and preferences of the siamang sleeping tree and the parameters that influence it. This research was conducted in the buffer zone of the Dolok Sibual-buali Nature Reserve, North Sumatra from April to May 2022. Data collection was carried out by direct observation, recording, and measurement. The characteristics of the siamang sleeping tree generally include three parameters, namely biotic, physical, and anthropogenic activity factors. There are 12 species of trees identified as siamang sleeping trees. Based on the results of PCA, obtained 6 parameters that have the most influence on the selection of siamang sleeping trees, namely activity from cultivated land, the canopy vertical length, NDVI, distance from feeding plants, distance from settlements, and slope direction. Siamang in habitats that intersect with anthropogenic activity based on the Neu index tends to prefer the location of sleeping trees with a distance of 222,9 – 268,71 m from cultivated land and 1573,5 – 1904,29 m from settlements.

Key words: *Characteristics, preference, sleeping tree, siamang*

INTRODUCTION

Dolok Sibual-buali Nature Reserve as part of the Batang Toru Landscape, North Sumatra Province is home to various species of wildlife that are protected by the Indonesian Government based on the Minister of Environment and Forestry Regulation No. P.106 of 2018 concerning Protected Species of Plants and Wildlife, one of which is the siamang. Siamang or *Symphalangus syndactylus* (Raffles 1821) is a member of the Hylobatidae that is categorized as Endangered based on the IUCN Red List (Nijman *et al*. 2020). According to CITES (2021), all members of the Hylobatidae including siamang are included in Appendices 1, which means that they are prohibited from being traded internationally.

Various studies related to siamang have been carried out in this location. Siamang in this landscape are scattered both inside and outside the conservation area, so there are differences in terms of quality and the risk of disturbance to their habitat. Kuswanda and Garsetiasih (2016) investigated the carrying capacity of the siamang habitat in the Dolok Sipirok Nature Reserve. Kwatrina *et al.* (2013), reported the estimated population density of siamang in the Dolok Sipirok Nature Reserve and its surroundings, which is 9,91 ± 3,4 individuals/km2 (Kwatrina *et al.* 2013). Meanwhile, based on the research of Meylia and Mustari (2022), the siamang population outside the Dolok Sibual-buali Nature Reserve has a lower density, which is 2,88 individuals/km2, and its habitat outside the conservation area is filled with human activities.

Sleeping trees are an essential part of siamang habitat as an arboreal primate. The suitability and use of sleeping trees are closely related to reproductive success and survival (Cheyne *et al.* 2012; Lutermann *et al.* 2010; Phoonjampa *et al.* 2010). In addition, preference for the location of sleeping trees is also carried out as a strategy to avoid predators, and parasites, and to fulfill food needs (Markham *et al*. 2016). Many primates use emergent trees with large holes and branches for sleeping such as pileatus gibbons (*Hylobates pileatus*), francois langurs (*Trachypitecus francoisi*), and gray mouse lemurs (*Microcebus murinus*) (Phoonjampa *et al.* 2010; Qihai *et al*. 2009; Schmid 1998). Anderson (2000) revealed that primates spend 50% of their time in their sleeping trees. Research related to sleeping trees and siamang sleep behavior has been carried out by Harrison *et al*. (2021) in lowland tropical forest (30 – 100 m asl) in Gunung Leuser National Park.

Based on this description, it is strongly suspected that siamang tends to choose trees and environments with certain characteristics to be their sleeping sites. This means that siamang can have certain preferences in choosing sleeping trees as part of an ecological strategy to avoid the threat of environmental disturbances and as an antipredator strategy (Harrison *et al*. 2021), for example threats from felids, snakes, or even human (Fei *et al.* 2012; Phoonjampa *et al.* 2010). Data and information on the preferences of siamang sleeping trees in the buffer zone of Dolok Sibual-buali Nature Reserve as an integral part of the Batang Toru Landscape are still not sufficiently available both from the biotic, physical, and anthropogenic aspects. Therefore, this research is important to conduct. Bulu Mario Village as one of the buffer zones of Dolok Sibual-buali Nature Reserve is a suitable location to study the parameters that determine the preference of siamang sleeping trees based on these aspects. The reason for this statement is Bulu Mario Village is surrounded by forest patches that become wildlife habitats and are integrated with anthropogenic activities such as plantations, settlements, and road developments. Therefore, this study can be conducted by involving all factors. This study aims to analyze the characteristics (biotic, physical, and anthropogenic factors) of the siamang sleeping tree and to analyze the parameters that determine the preference of the siamang sleeping tree in the buffer zone of the Dolok Sibual-buali Nature Reserve.

RESEARCH METHOD

This research was conducted from April to May 2022 in one of the buffer zones of the Dolok Sibual-buali Nature Reserve, namely Bulumario Village, Sipirok District, South Tapanuli Regency, North Sumatra Province. The time allocated for this research is April – May 2022 which includes data collection to report preparation. There are 15 distribution points of the siamang group which is the result of the research of Meylia and Mustari (2022) which will be used as a reference. Figure 1 is a map of the research location.

The data collection method used in this reasearch was direct encounter starting at 08.00 – 18.00 to find the siamang group. Observers detect the presence of siamang visually and audio with the sound emitted by siamang during long calls. Siamang as diurnal anthropoids only use 6,5% of their active time to rest during the day (Anderson 2000, Kartono *et al.* 2002), so this study only justifies their sleeping time starting from sunset until sunrise. Therefore, in this study observers followed the siamang until the afternoon when they entered their sleeping tree. Data collection methods are carried out either directly by recording according to conditions in the field, or with the help of a Geographic Information System (GIS). Data or parameters recorded directly include coordinates of sleeping trees from GPS, land cover, species of sleeping trees, diameter (dbh) of sleeping trees, total height, branch-free height, the vertical length of the canopy, air temperature, humidity, light intensity, distance from the nearest feeding tree, and the number of individual siamangs in each group. The data obtained through GIS include slope, location elevation, distance from cultivated land, distance from roads, distance from rivers, distance from settlements, slope direction, and Normalize Difference Vegetation Index (NDVI). Data collection from GIS is following the coordinates of each sleeping tree obtained at the research location.

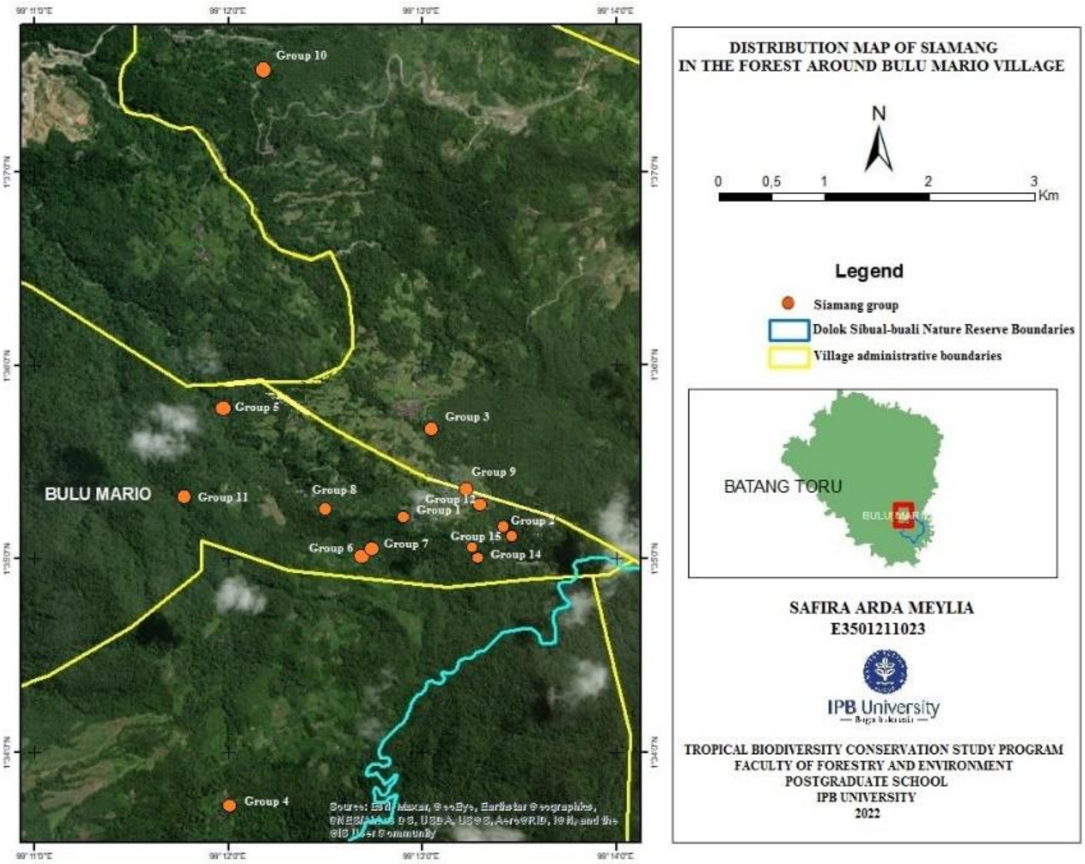

Figure 1. Research site map

The data analysis method used in three steps, there are parameter reduction using the PCA, determination of class and intervals using Sturges Rule, and sleeping tree preference analysis using Neu Index (Neu *et al*. 1974). This index also used in the previous research by Kusumanegara *et al.* (2017) about the habitat preference of surili (*Presbytis commata*) and Maulana *et al*. (2022) about the habitat preference of cuscus. Parameter reduction is carried out to determine the parameters that will be further processed in the sleep tree preference analysis. The method used in this stage is multivariate analysis (Rahman 2021). The goal is to summarize a large number of parameters or variables into several variables that are considered important. Multivariate analysis method can be done in several ways, one of which is Principle Component Analysis (PCA). PCA allows the simplification of multivariate data into a representative main feature with an independent two-dimensional (two-axis) presentation. Although the number of dimensions (complexity) decreases, it retains most of the original relationships between variables (Janžekovič and Novak 2012). The basic equation of PCA can be seen below.

$$Y_1 = a_{11}X_1 + a_{12}X_2 + \cdots + a_{p1}X_p$$

$$Y_2 = a_{21}X_1 + a_{22}X_2 + \cdots + a_{p2}X_p$$

…

$$Y_k = a_{1k}X_1 + a_{2k}X_2 + \cdots + a_{pk}X_p$$

Y = The Principle Componen (PC)
X = The parameters or variable used in this reearch
a = The value of each variable

In this research PCA was performed with PAST 4.06 software. Parameters that will be processed by PCA are numerical parameters. PC selection can be done by selecting a PC with an eigenvalue (≥1) (Kaiser 1960).

Before the calculation of preference index, Chi-square performed to find out wheter there is a selection (relationship) of sleeping trees parameters by siamang.The equation of Chi-square test is listed below (Johnson dan Bhattacharyya 1992).

$$X^2_{\text{calculated value}} = \sum \frac{(Observed - Expected)^2}{Expected}$$

The null hypothesis (H0) that used in this research is that there is no relation between the sleeping trees preference of siamang and the parameters that has been selected before. The null hypothesis rejected when Chi-square calculated value ≥ Chi-square tabular value.

Parameters that are taken into account in the preference analysis are those that are considered to have a correlation with the preference of the siamang sleeping tree based on the PCA results. Each parameter is made into classes by the Sturges Rule method with the following formula.

The number of class (C) = 1 + 3,32 log(N)
N = The number of sleeping trees
Range (R) = xmax - xmin
Interval of class (I) = R/C

The selected parameter were processed to produce a Neu Index to determine the preference. Calculation of the Neu Index is one of the methods commonly used to determine habitat preferences (Neu *et al.* 1974; Bibbly *et al*. 2000). Parameters that are taken into account in the Neu Index are parameters that have been determined by class and intervals. Sleep tree preference index will be analyzed with the equation w = u/p. W is the value of the Neu index, u is the proportion of the number of individual siamang, p is the proportion of the area or the proportion of the number of resources used. If the value (w>1), then the characteristic is preferred. If the value (w < 1), then the characteristic is not preferred (Rahmat *et al.* 2008).

RESULT AND DISCUSSION

1. ***Finding of siamang sleeping tree***

Based on observations, obtained 14 sleeping trees used by 6 groups of siamang. The distribution of the location of the siamang sleeping tree can be seen in Figure 2.

The most common sleeping trees found were sleeping trees in group A with 4 sleeping trees, followed by group C with 3 sleeping trees, groups D, J, and K with 2 sleeping trees each, and group B with 1 sleeping tree. Based on the observation, there is no sleep tree that some groups use. Each group used to sleep in different trees.

2. ***Biotic characteristics***

The siamang sleeping trees found at the study site had a total height of 12,00 – 24,5 m (x̄ = 17,12 m), a bole height of 1,60 – 12,50 m (x̄ = 8,12 m), a canopy vertical length of 4,00 – 15,40 m (x̄ = 9 m), and a diameter at breast height of 38,22 – 170,00 cm (x̄ = 70,76 m). Siamang sleeping trees can also reach a height of more than 30 m with a tree crown that is relatively isolated from the surrounding tree canopy according to research by Marsh (2019). Siamang with family groups (FG) usually sleeps on trees that are bigger and taller (total height can reach 49 m and branch-free height can reach 36,95 m) and thickness (vertical length) of the canopy is greater that can reach a size of 26,1 m (Harrison et al. 2021). The siamang sleeping tree is not always a tree with a thick, dense, and wide canopy. Several groups of siamang at the study site were also observed using sleeping trees with relatively open crowns so that siamang could be seen clearly from outside the canopy.

Most of the sleeping trees found were trees free of lianas or strangler plants. This is thought to be one of the siamang strategies to avoid predators, such as snakes and the Felidae family. Trees overgrown with lianas and vines can increase the risk of predation and other disturbances for siamang because cats and humans can use them toclimb into the canopy and provide hiding places for snakes (Fei et al. 2012; Phoonjampa et al. 2010).

There are 11 species of trees from 8 families found as siamang sleeping trees. Most of the siamang sleeping tree families are Malvaceae and Moraceae. Sleeping trees in this study was found to be 0 - 10 m away from the food plants. Based on the Tabel 1, 8 of the 14 siamang sleeping trees have a distance of 0 m from their feedi source. That means, these trees species are also feeding source for siamang. The feed trees in this research were indicated by the direct foraging activity of siamang on those tree species. The list of species of siamang sleeping tree found in the study can be seen in Table 1.

Several tree species that were recorded to be used more often by siamang to sleep in the lowland tropical forest of Gunung Leuser National Park include those from the genera Intsia, Shorea, Endospermum, and Syzygium (Harrison *et al.* 2021). Siamangs tend to eat more fruit (frugivorous) (Palombit 1997; Meylia and Mustari 2022), but they can also eat vegetative parts of trees, such as leaves when it is not a fruiting season. Elder (2013) stated that siamang are more leaf-eating (folivorous) compared to other Hylobatidae species so their adaptability is higher.

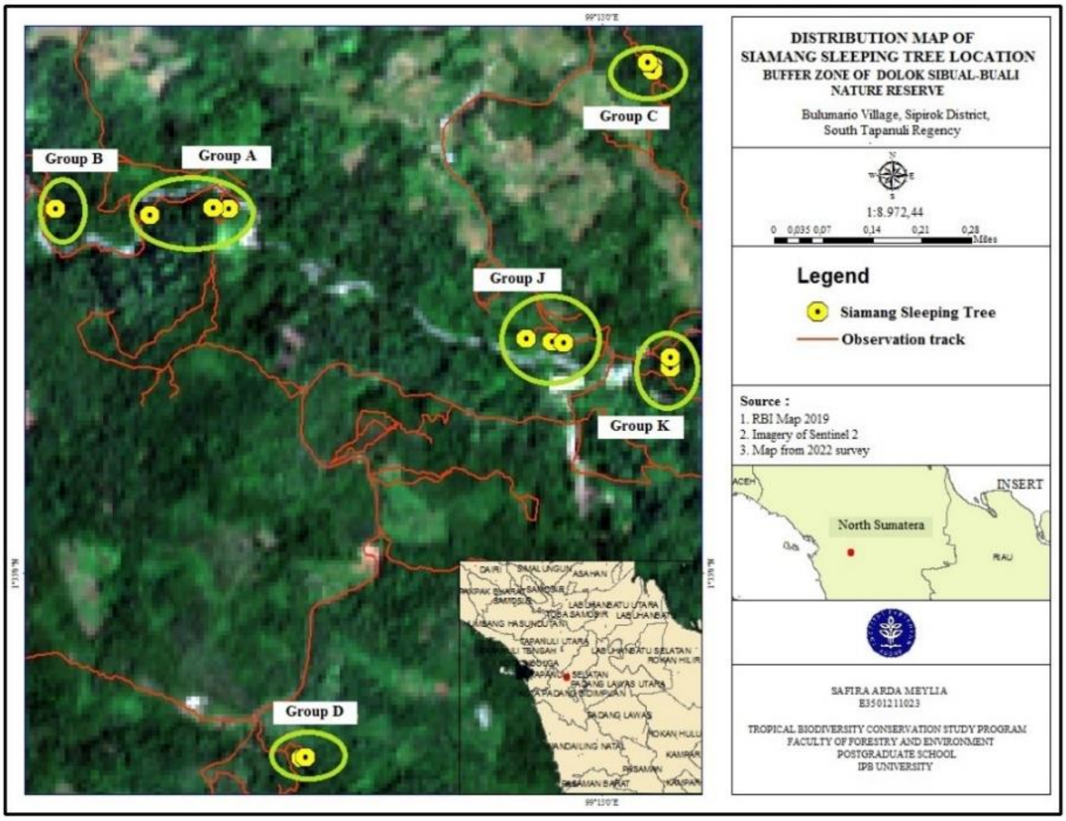

Figure 2. Siamang sleeping trees distribution map

Table 1 Siamang sleeping trees species found in research location.

No.	Tree species	Family	Group	Feed distance (m)
1	*Ficus elastica*	Moraceae	A	0
2	*Sterculia macrophylla*	Malvaceae	C	9
3	*Octomeles sumatrana*	Moraceae	C	10
4	*Artocarpus elasticus*	Tetramelaceae	C	0
5	*Sterculia oblongata*	Malvaceae	A	0
6	*Pterospermum javanicum*	Malvaceae	A	7
7	*Schima walichii*	Theaceae	D	0
8	*Shorea* sp.*	Dipterocarpaceae	D	8
9	*Artocarpus elasticus*	Moraceae	A	0
10	*Ficus microcarpa*	Moraceae	B	0
11	*Sterculia macrophylla*	Malvaceae	K	0
12	*Pterospermum javanicum*	Malvaceae	K	4
13	*Dillenia sumatrana*	Dilleniaceae	J	0
14	*Litsea* sp.*	Lauraceae	J	4,5

3. ***Physical characteristics***

All siamang sleeping trees were found in steep areas with very close proximity to rivers (0 – 80 m) or watercourses. The sleeping tree which is 80 m from the river is very close to the irrigation canal, which is about 5 m away. Based on the geographical aspect, the siamang sleeping tree is found at an elevation of 771,63 – 1035,49 m asl with slopes ranging from 16,57° - 46,80°. The recorded slope direction is 12,18° – 355,73°.

Kwatrina et al. (2013) report that siamang in the Dolok Sipirok Nature Reserve and surrounding areas are commonly found in riverside areas. This is presumably due to the availability of sufficient feed sources in the area. The recorded air temperature in the area around the sleeping trees is 22,10 – 26,4°C with humidity of 85,4 – 96,6% in sunny weather during the day. The temperature is expected to drop at night until the morning before sunrise. The siamang has a larger body size compared to its sympatric species in this region (Hylobates lar and Hylobates agilis). Body weight can reach twice that of these species (Smith and Jungers 1997) with larger group sizes (O'Brien et al. 2003). The larger body size of the gibbon compared to its sympatric species is thought to be the reason for the better adaptability of the gibbon to cold air in mountain forests (Marsh 2019). The relative lack of body surface area to body mass ratio of siamang makes them lose less body heat energy in cold environments compared to their sympatric species (Reichard and Preuschoft 2016). Primates, including siamang, have a tolerance limit to the temperature of their environment. Temperatures above 36°C can cause thermal distress and hyperthermia in primates (Stitt and Hardy 1971).

Based on direct measurements under the canopy, the location of the sleeping tree has an average light intensity value ranging from 110 – 2795.5 lux. NDVI is related to the density of canopy cover in a location where sleeping trees are present. NDVI has a value range of -1 to 1. The NDVI value obtained from GIS at sleeping tree locations ranges from 0,799 – 0,872. This indicates that all sleeping trees were found in locations with canopy cover which can be classified as secondary dryland forest. This classification has also been confirmed by direct observation at the research site. Siamang sleeping trees and habitat in the study area are also in contact with anthropogenic factors because they are located outside the conservation area. Siamang habitat in this location is fragmented by the road network, residential areas, and cultivated activities.

4. **Anthropogenic Factors**

Siamang's habitat in this research location mostly have been interacted with anthropogenic activity factors such as road and infrastructure development, settlements, and cultivated land change land cover from forest to non-forest. Siamang sleeping trees were found 28,28 – 515,46 m from the road, 250 – 1843,58 m from settlements, and 35 – 306,10 m from cultivated land. Those activitycan lead to habitat fragmentation which results in a decrease in the availability of tree crowns needed by siamang to move, meet food needs, and shelter. In addition, changes in land cover will also have an impact on microclimate conditions that are suitable for the habitat and sleeping trees of the siamang. Changes in the microclimate in the form of increasing temperatures at a certain level due to disturbances in habitat and global warming can push the siamang further into a corner of its tolerance limit (Marsh 2019).

5. ***Sleeping tree preference***

A total of 13 parameters were collected for the analysis of the preference of the siamang sleeping tree. Based on the eigenvalue (≥1) on PCA, it was found that 6 PCs had the greatest influence on the selection of siamang sleeping trees that explained 89,06% of the variation. The eigenvalue and variance of each PCs can be seen in Table 2. The parameters of those six PCs was determine with the correlation value in Table 3.

Table 2 Eigenvalue and variance of each PCs.

PC	Eigenvalue	% variance	% cumulative
1	4,96	30,98	30,98
2	3,32	20,75	51,73
3	1,98	12,40	64,13
4	1,55	9,69	73,82
5	1,29	8,07	81,89
6	1,15	7,18	89,06
7	0,76	4,72	93,79
8	0,39	2,43	96,22
9	0,28	1,73	97,95
10	0,19	1,18	99,13
11	0,08	0,49	99,62
12	0,05	0,33	99,95
13	0,01	0,05	100,00

Based on the Table 3, the first principle component explained 30,98% of the data variation that weighted on the distance from cultivated lan (correlation value = -0,39); the second principle component explained 20,75% of the data variation that weighted on the vertical canopy length (correlation value = 0,48); the third principle component explained 12,40% of the data variation that weighted on NDVI (correlation value = 0,56); the fourth principle component explained 9,69% of the data variation that weighted on distance from feeding plants (correlation value = -0,48); the fifth principle component explained 8,07% of the data variation that weighted on distance from settlements (correlation value = -0,63); and the sixth principle component explained 7,18% of the data variation that weighted on slope direction (correlation value = 0,75). These six parameters were tested with Chi-square test. The result can be seen in Table 4.

Based on the Chi-square test result, Chi-square calculated value ≥ Chi-square tabular value in the parameter distance from cultivated land and distance from feeding plants, so the null hypothesis is rejected (H0 : there is no relation between the sleeping trees preference of siamang and the parameters that has been selected before). This result indicate that there is a relation between the sleeping tree preference of siamang and those two parameters. These two parameters are the parameters that are processed in determining the preference of the siamang sleeping tree with the Neu Index. The value of the Neu index for each parameter can be seen in Table 5.

Table 3 Correlation value of PC 1 – PC 6

Parameters	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6
Diamater (*dbh*)	0,15	0,36	-0,09	0,33	0,41	0,13
Tree height	0,28	0,25	0,12	0,29	0,23	-0,20
Bole height	0,26	-0,28	-0,04	0,44	-0,08	-0,15
Vertical canopy lenght	0,05	0,48	0,16	-0,10	0,29	-0,06
Temperature	-0,33	-0,18	-0,25	0,08	0,11	0,03
Light intensity	0,28	0,04	-0,32	-0,27	0,18	-0,04
Relative humidity	0,32	-0,03	0,22	-0,13	-0,20	-0,44
Distance from feeding plants	0,15	-0,15	0,20	-0,48	0,17	-0,18
NDVI	-0,03	0,05	0,56	0,38	-0,17	0,21
Distance from road	-0,22	0,03	0,55	-0,21	0,07	-0,08
Distance from river	0,02	-0,46	0,07	0,10	0,35	0,15
Elevation	0,37	-0,26	0,01	0,06	-0,07	0,07
Slope	-0,38	-0,13	0,12	0,07	0,05	-0,05
Distance from settlements	0,05	0,31	-0,13	-0,03	-0,63	0,15
Slope direction	0,19	0,02	0,11	-0,25	0,07	0,75
Distance from cultivated land	-0,39	0,21	-0,15	0,02	0,08	-0,15

Table 4 The result of Chi-square test for the six parameters (df = 4; α = 5%).

Parameter	Chi-square calculated value	Chi-square tabular value
Distance from cultivated land	12,594	9,448
Canopy vertical length	2,717	9,448
NDVI	8,705	9,448
Distance from feeding plants	29,883	9,448
Slope direction	9,317	9,448
Distance from settlements	6,296	9,448

Table 5 Neu index for selected parameters

Parameter class	*Ai*	*Pi*	*ni*	*Ui*	*Wi*	*Bi*
Distance from cultivated land						
85,44 – 131,25	153,64	0,217	9	0,346	1,598	0,322
131,26 – 177,07	135,89	0,192	1	0,038	0,201	0,041
177,08 – 222,89	138,98	0,196	0	0,000	0,000	0,000
222,9 – 268,71	135,16	0,191	11	0,423	2,220	0,448
268,72 – 314,53	145,61	0,205	5	0,192	0,937	0,189
Total	709,28	1	26	1	4,956	1
Distance from feeding plants						
0 – 2,08	8	0,571	17	0,654	1,144	0,246
2,09 – 4,17	1	0,071	3	0,115	1,615	0,348

Parameter class	*Ai*	*Pi*	*ni*	*Ui*	*Wi*	*Bi*
4,18 – 6,26	1	0,071	1	0,038	0,538	0,116
6,27 – 8,35	2	0,143	3	0,115	0,808	0,174
8,36 – 10,44	2	0,143	2	0,077	0,538	0,116
Total	14	1	26	1	4,644	1

Description : *Ai* (observed area (in ha) or number of individual dormant trees observed), *Pi*(the proportion of the observed area or the proportion of the number of individual sleeping trees observed), *ni*(the number of siamang individuals observed), *Ui*(proportion of the number of siamang observed (*ni / Σ ni*)), *Wi*(preference index of each parameter of sleep tree(*ui/pi*)), *Bi*(Standardized preference index (*wi / Σ wi*))

Preference based on the distance from cultivated land

Based on the value of the Neu index, siamang tend to choose sleeping trees that are in two classes of distance from cultivated land, namely in class 85,44 – 131,25 m (wi = 1,598) and class 222,9 – 268,71 m (*wi* = 2,220) . The index shows that siamang choose the location of sleeping trees at a distance that is close enough or far enough from cultivated land with certain limitations. The highest Neu index value for choosing the location of the sleeping siamang tree is at a considerable distance from cultivated land, namely at a distance class of 222,9 – 268,71 m. This is thought to be related to the siamang strategy to avoid human disturbance to its territory. Alikodra (2002) states that the Hylobatidae group uses various ways to protect its territory. Some gsiamang groups are quite sensitive and intolerant of human presence. The groups of siamang immediately fled from the location of the observer's presence even though the observer had tried to be as calm as possible.

All siamang sleeping trees were found in the riverside area. Some of plantation area or rice fields are not far from the river so that it is easier to get water sources for irrigation. The foraging activity of siamang in the afternoon was found several times in the border area between forest and plantation area or rice fields. Examples of types of feed that are quite often found in the area include sugar palm (*Arenga pinnata*), sihim (*Calamus* sp.), and durian (*Durio zibethinus*). The canopy condition in the border area is also classified as continuous so that it can support siamang movement. These factors are thought to be the reason for siamang choosing the location of the sleeping tree at a distance class of 85,44 – 131,25 m from cultivated land. Another reason for this choice is the ability of siamang to adapt and tolerate habitat destruction and human presence within certain limits (Bismark *et al.* 2019).

Preference based on the distance from feeding plants

Based on the value of the Neu index, siamang tend to prefer sleeping trees with distances ranging from 0 – 2,08 m (wi = 1,144) and 2,09 – 4,17 m (*wi* = 1,615). This finding is also in accordance with the results of Harrison *et al*. (2021) who stated that siamang choose sleeping trees that are as close as possible to their feed trees. The average length of the siamang foraging trajectory in the afternoon is 8% of the total daily roaming path length (1,57 km ± 0,3 km), while in the morning it can reach 20% (Harrison et al. 2021).

The existence of forage trees is one of the crucial things in meeting the needs of the siamang life. In accordance with Alikodra (2010), feed is a major factor in the wildlife movement and its availability must be maintained to avoid competition. The quality and selection of feed will affect the development and growth of animals (Vahlevi 2020). Feed quality is related to the nutritional content of each type of feed. Animal feed plants contain nutrients needed for body maintenance, such as carbohydrates, protein, energy, fat, vitamins, and minerals (Tillman *et al*. 1983). Based on these things, it can be assumed that the selection of sleeping trees close to feed trees is one of the siamang strategies in meeting energy needs efficiently for activities the next day.

CONCLUSION

The characteristics of the siamang sleeping tree can be viewed from three aspects, namely biotic aspects, physical aspects, and anthropogenic factors. There are 11 species of siamang sleeping trees which are dominated by the families Moraceae and Malvaceae. All sleeping trees were found in the riverside area (0 – 80 m) with a steep slope (16,57° – 46,80°). Siamang sleeping trees are usually also become their feeding source or close to their feeding source.

The preference of the siamang sleeping tree is related to its function in supporting antipredator strategies, comfort, and energy efficiency. There are two parameters that determine the preference of siamang sleeping trees, namely distance from cultivated land and distance from feeding plants. Siamang in habitats that intersect with anthropogenic activities tend to prefer the location of sleeping trees with the long distance from the cultivated land (222,9 – 268,71 m ; *wi* = 2,220) and the close distance from the feeding plants (2,09 – 4,17 m; *wi* = 1,615)

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