



Vertical Space Use and Vegetation Characteristics of Reintroduced Orangutan Activities in the Jantho Nature Reserve

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ABSTRACT: Orangutans are a wild animal species that is threatened with extinction, so the IUCN has designated its conservation status as Critical Endangered and Appendix I in CITES. The Indonesian government has also designated the Sumatran orangutan as a protected animal. Jantho Nature Reserve (JNR) is one of the conservation areas that is used as a place for orangutan reintroduction. This area is also an important habitat for seven other primate animals. On the other hand, reintroduced orangutans are arboreal animals that have become accustomed to the human environment. They do not know the types of trees that source their food, and the predators that endanger them. This will be a threat to the sustainability of reintroduced orangutans in the area. This research is important to carry out because there is still very little information regarding the use of vertical space in the daily movements of reintroduced orangutans, and there is no information about the daily movements of reintroduced orangutans in the JNR area. This research aims to obtain initial data on the daily movement patterns of reintroduced orangutans in utilizing vertical space to obtain food sources. The transect route is a method used to obtain data on the movement of reintroduced orangutans. A total of 5 line transects were used to collect data by following the reintroduced orangutans and recording each canopy height used by the orangutans for activities. The data obtained was made in tabulated form and analyzed descriptively. The research results showed that reintroduced orangutans used vertical space at a height of 1 – 29 m. This height level was different for the four reintroduced orangutans observed. molikha has higher activity at a height of 1 – 10 m. Poni activity is highest at a height of 10 - 19 m. Cut keke and asokha use higher vertical space at a height of 20 -30 m. A total of 34 trees were used as reintroduced orangutans as activity sites, with tree heights of 1 - 30 m and trunk diameters of 1 - 200 cm. Vegetation connectivity is still connected between vegetation.

KEYWORDS: *Pongo abelii*, vertical space, vegetation connectivity

INTRODUCTION

Orangutans (*Pongo abelii*) are arboreal animals, whose life is very dependent on vegetation, especially at tree level and pole level. In the wild, orangutans are rarely found descending to the forest floor to search for food. They spend time doing activities throughout the day by hanging from one vegetation to another, looking for food or other social activities. They can live in various types of secondary forest and primary forest habitats (1). Swamp forest habitat type (2; 3; 4). The conversion of forests for other purposes has resulted in orangutans losing vegetation where they can do activities and forage, as well as losing food sources. IUCN determines the conservation status of Critically Endangered orangutans, and Appendix I according to CITES. The government has also designated the Sumatran orangutan species as a protected primate animal (5). The Jantho Nature Reserve (CAJ) is one of the conservation areas designated by the government for the conservation of the Acehese strain of pine (*Pinus merkusii*). This area is also an important habitat for a number of terrestrial and arboreal wildlife. Apart from conservation, this area is currently used as a place for orangutan reintroduction. This area was used as a reintroduction habitat because no wild orangutans were found in this area. This means that reintroduced orangutans will not have competition with other species for food sources, but this area is also a habitat for seven other primate species (6). These seven primates need food sources and trees as a place to find food and a place to sleep. In this way, there will be competition between reintroduced orangutans and other primates, in terms of getting food sources and trees for nesting places (6; 7). Orangutan reintroduction is one form of orangutan protection carried out by the government and non-governmental organizations in the form of cooperation in the field of orangutan conservation. Reintroduced orangutans never received teaching from their mothers about food and predators.



Reintroduction of orangutans is carried out after going through a rehabilitation process at a training center, to reintroduce them to natural food and also teach them how or techniques to climb trees. This is important so that in the wild they can recognize and find food sources. The size of the moving buck is very dependent on the food source tree. The denser the trees, the easier it is for reintroduced orangutans to move, but the sparser the trees, the more difficult it is for reintroduced orangutans to move (6). The movement carried out is movement activity carried out every day to obtain food sources, which is known as daily movement. Referring to (8), every wild animal moves every day to get food sources. Likewise, with primates, these animals also move every day to find food sources.

This daily movement can be done vertically or horizontally. Reintroduced orangutans move vertically in vegetation at a certain height for their safety in obtaining food sources and predators. Horizontally, the reintroduced orangutans move following the food source trees, which are hundreds of meters away from their sleeping trees. So far there is very little information about the use of vertical space in orangutans and there is no data on the use of vertical space in reintroduced orangutans at CAJ. This research generally aims to obtain information on the use of vertical space by reintroduced orangutans in CAJ and specifically to determine the height of vegetation used by reintroduced orangutans to find food sources and other activities.

RESEARCH METHOD

Time and Place of Research

The research was conducted at CAJ, starting from August – September 2023. This location is geographically located at 05°13'08 North Latitude. 95°40'54. East longitude. Observation sites are focused on rehabilitation blocks and protection blocks (9). The rehabilitation block is a secondary forest that is overgrown with bushes and the protection block is the primary forest which is overgrown with *Pinus merkusii* and natural forest vegetation. The rehabilitation block is smaller in area than the protection block. The objects of this research were four individuals of reintroduced juvenile Sumatran orangutans and trees that were used as places for activities by reintroduced Sumatran orangutans, and the tools used in collecting data included work maps, binoculars, compasses, distance lasers, GPS, and cameras and writing tools. This research uses the line transect method to obtain data on tree characteristics and vertical space used by reintroduced Sumatran orangutans as a place to find food sources, rest, and make nests. The line transect method, or path method, was placed purposively in an area with lots of food trees for reintroduced Sumatran orangutans.

The researcher walked along the transect line and stopped when an orangutan nest tree was found, to record the tree type, tree height, tree diameter, canopy type, tree canopy area, and nest height from the ground. The observation route used for data collection is an orangutan monitoring route carried out in collaboration with the Aceh KSDA Center and partners Sustainable Ecosystem Foundation (YEL). The observation path is presented in Figure 1. The data collected in this research consists of secondary data and primary data. Secondary data is data obtained from various literature, including books, journals, and reports from agencies related to BKSDA, DLHK, and others. Primary data is data obtained from observation and identification at the research location, including the type of nest tree, total height of the nest tree, free branch height, diameter of the nest tree, and tree canopy type. Data on the characteristics of orangutan nest trees recorded the types of trees found in the observation route. There are 5 observation lines, each line measuring two ha.

Materials and tools

Material

This research material consists of reintroduced orangutans and vegetation as important components of the habitat for moving around and carrying out their daily activities. Observations of reintroduced orangutans focused on groups of juveniles who had just been released into the wild. The tools needed for this research include: 1. Location map, 2. GPS, 3. binoculars, 4. Compass, 5. Camera, 6. Haga meter, and 7. Stationery

Method of collecting data

The data needed in this research consists of secondary data and primary data. Secondary data was obtained from the Aceh BKSDA, the community around CAJ, and other supporting literature. Arranging location entry permits and health checks (free of TB and Hepatitis) research procedures that must be carried out before data collection. Primary data was obtained from the field, but to make data collection easier a preliminary survey was carried out first. This preliminary survey is to make it easier to collect primary data in the field. The activities carried out in the preliminary survey are observations aimed at obtaining initial data (8). This initial



survey activity used the line transect method (10: 11; 12). To obtain this initial data, observations were made by following the orangutan transect monitoring route. Data collected in the preliminary survey includes habitat conditions (vegetation type, food trees, and sleeping trees).

Data Collection Technique

Research location for the reintroduction of orangutans in the Jantho Nature Reserve (JNR) conservation area, Aceh Besar Regency. The data used in determining the research location includes primary data and secondary data. Primary data was obtained through survey activities in the JNR. Two locations will be selected as observation samples for the use of horizontal and vertical space, namely the rehabilitation block and the protection block. The selection of these two blocks was to determine the distance traveled by orangutans' daily movement horizontally and the height of the tree strata used for vertical movement, in each block. In this case, it is likely that the area will be different because the number and type of food trees are different in the two blocks. Likewise with sleeping trees. To obtain daily movement data, observers walked in the direction of movement of the reintroduced orangutans starting from the sleeping tree in the morning (06.00 WIB) when looking for food until returning to the sleeping tree in the afternoon (18.00 WIB). Observations used GPS tools to record the coordinates of all the places the orangutans passed. Location coordinates are taken at a certain distance of 25-50 m depending on the topography of the area. Data recorded included: (a) the coordinates of each food tree used as a place for orangutans to feed, (b) the distance traveled by orangutans from morning to evening. This vertical data collection uses the scan sampling method (13). The data collected includes the height of the tree canopy strata used by orangutans for eating and making day and night nests, using a laser distance aid.

Data analysis

Data analysis for determining horizontal area was determined by plotting each coordinate obtained from each orangutan that was followed from the time they started their activities from the sleeping tree in the morning (06.00 WIB) until they returned to the sleeping tree in the afternoon (18.00 WIB) in one day. The sample groups observed were adult female orangutans, juveniles, and children. The data collected are coordinate points recorded using GPS at the places or trees visited by the orangutans, visualized in map form using Arch GIS 10.1. Each outer coordinate is combined to form one polygon which represents the home range of an orang-utan at a certain time. Determining the horizontal area uses the Maximum Convex Polygon method (14). The interaction and use of food trees and sleeping trees by orangutans and other primates uses the scan sampling method, by observing and recording orangutans at certain time intervals and recording all activities carried out by orangutans in the ethogram that has been prepared. The results are presented in tabulated form and described in the form of habitat vegetation profiles.

RESULTS AND DISCUSSION

1. Frequency of Presence of Reintroduced Orangutans

In order to obtain data on the daily activity of reintroduced orangutans in the Jantho Nature Reserve (JNRJ), it is necessary to follow the movements of reintroduced orangutans from waking up in the morning to going back to sleep in the afternoon. This is to find out their activities in using space vertically and horizontally. Reintroduced orangutans that can be followed are those that are still habituated to society. During data collection only four reintroduced orangutan individuals could be followed. The four individuals are molika, poni, cut keke and asokha. Based on gender groups, they consist of females and males. molikha, poni, and cut keke, are female reintroduced orangutans and asokha is a male reintroduced orangutan. Based on the age group, the four reintroduced orangutans are teenagers. The movements of the four individual orangutans were still close to the research camp. Based on the facts in the field, the reintroduced orangutans that are still relatively easy to follow are the four of them, therefore this research is limited to the daily activities of the reintroduced juvenile otangutans at JNR

2. Types of trees where reintroduced orangutans are active.

Based on research data obtained by reintroduced orangutans at JNR, they carry out their daily activities in various canopy strata. They operate from the lowest strata to the highest strata. The lowest canopy strata used by reintroduced orangutans for activities is a tree height of 0.5 meters from the ground and the highest tree height is 25 meters. Based on the classification, the vegetation consists of shrubs, lianas, and trees. Shrubs are low - level vegetation with a height of 1 – 5 m, and trees with a height of > 5 m (15). They are active from 06 in the morning until dusk (18.45 WIB). They carry out feeding activities, moving from one vegetation to another through tree branches by walking or hanging from one liana to another between the trees they are going to eat. They will



jump when the tree canopy is discontinuous or the canopy is much higher than the canopy under the tree they are visiting. During the research, this jump was only found once. This is because orangutans are a species of primate that walks on two legs (bipedal), not like the colobine group (16). The types of vegetation used as a place for reintroduced orangutans to carry out activities in the Jantho Nature Reserve during the research were found to be 34 types out of 473 individual trees. The types of trees visited by orangutans to search for food at the research locations in both CA and TWA are presented in Table 1.

No	Species Local Name	Scientific name	Family	Amount	Percentage (%)
1	Medan	<i>Phoebe sp.</i>	<i>Lauraceae</i>	3	0.63
2	Forest Mango	<i>Mangifera sp</i>	<i>Anacardiaceae</i>	4	0.84
3	Sugar palm	<i>Arenga pinnata</i>	<i>Arecaceae</i>	3	0.63
4	Fig	<i>Ficus spathulifolia</i>	<i>Moraceae</i>	36	7.61
5	Bayur	<i>Pterospermum javanicum</i>	<i>Sterculiaceae</i>	56	11.83
6	Cermai Forest Rambong Uah-uah	<i>Phyllanthus emblica</i>	<i>Euphorbiaceae</i>	1	0.21
7	(Liana)	<i>Ficus obscura</i>	<i>Moraceae</i>	5	1.05
8	Forest Pandan	<i>Pandanus tictorius sol</i>		7	1.48
9	Rambong Banyan	<i>Ficus Sumatrana</i>	<i>Moraceae</i>	44	9.30
10	Santalun	<i>Terminalia bellirica</i>	<i>Combretaceae</i>	1	0.21
11	Banitan	<i>Mystixia trichotoma</i>	<i>Cornaceae</i>	7	1.48
12	Prone Rumpi	<i>Mallotus sphaerocarpus</i>	<i>Euphorbiaceae</i>	56	11.83
13	The Smell of Heaven	<i>Cyathocalys sumatrana</i>	<i>Annonaceae</i>	10	2.11
14	Reluctant	<i>Tetranelas nudiflora R. BR</i>	<i>Datisceae</i>	6	1.26
15	Tinkeum	<i>Bischoffia javanica</i>	<i>Staphyliaceae</i>	25	5.29
16	Padi Stur	<i>Aglaia korthalsii</i>	<i>Meliaceae</i>	9	1.90
17	Forest betel (Babelo)	<i>Piper macropiper</i>	<i>Piperaceae</i>	10	2.11
18	Laban	<i>Vitex pubescens</i>	<i>Verbenaceae</i>	14	2.96
19	Geulumpang			6	1.26
20	Geseng	<i>Lithocarpus wrayii</i>	<i>Phageaceae</i>	1	0.21
21	Bungur	<i>Teysmanniodendron pteropodum</i>	<i>Verbaceae</i>	2	0.42
22	Mountain Guava	<i>Eugenia grandis</i>	<i>Myrtaceae</i>	12	2.53
23	Tampu	<i>Macaranga tanarius</i>	<i>Euphorbiaceae</i>	1	0.21
24	Red Meranti	<i>Shorea acuminatissima</i>	<i>Dypterocarpaceae</i>	1	0.21
25	Dedap Bitch	<i>Erythrina subumbrans</i>	<i>Leguminoceae</i>	3	0.63
26	Guava Jerik	<i>Eugenia decipiens</i>	<i>Myrtaceae</i>	1	0.21
27	Rambong gala - gala	<i>Ficus variegata</i>	<i>Moraceae</i>	10	2.11
28	cepedak prone	<i>Artocarpus teysmanii</i>	<i>Moraceae</i>	41	8.66
29	Rusip	<i>Baccaurea maingayi</i>	<i>Euphorbiaceae</i>	9	1.90
30	Three Veins	<i>Cinnamomum sp</i>	<i>Lauraceae</i>	5	1.05
31	Rattan	<i>Calamus, sp</i>	<i>Arecaceae</i>	1	0.21
32	Remove the gristle			1	0.21
33	Jemali	<i>Leea indica</i>	<i>Leeaceae</i>	61	12.90
34	Pepoa	<i>Mallotus phillipensis</i>	<i>Euphorbiaceae</i>	21	4.43
				473	100

All types of vegetation are food sources for reintroduced orangutans in the Jantho Nature Reserve and Nature Tourism Park. These types of vegetation are classified into bushes, saplings, poles and trees, as well as lianas. Data from Table 1 shows that *Leea indica* is the type of vegetation that is most frequently visited by reintroduced molikha and poni orangutans, namely 12.90%, followed by



bayur (*Pterospermum javanicum*) and prone grass (*Mallotus sphaerocarpus*) respectively. 11.83%. Cut Keke and Asokha are the two reintroduced orangutans who most often visit Rumpi Prone and Bayur. These two vegetation species were producing a lot of fruit when data collection took place. The high daily activity of molikha and poni in shrub - level vegetation cannot be separated from their adaptability to forest habitats, especially in climbing trees. This can be understood because reintroduced orangutans are orangutans that have received care and attention from humans. To return to nature, these orangutans have been retrained so they can climb trees and become familiar with natural food in the form of fruit and leaves. Cut Keke and Asokha were not found active on jemali (*Leea indica*). When the research was underway, the three types of vegetation had their fruit ripening, and the fruiting period for other types of food had begun to decrease.

Referring to (17) and (16) food trees for orangutans and thomas langur primates in the Jantho Nature Reserve, the fruiting period is influenced by climate. The peak fruiting period is April to September. Apart from that, there are also many lianas attached to the above types of plants whose ripe fruit is still tall. Jemali and grasshoppers are two types of food consumed by reintroduced orangutans in the form of fruit, while the vegetables consumed by reintroduced orangutans are fruit and young leaves. Primate animals from the langur, kedih and long-tailed monkey groups also consume the fruit (18). Ficus sp is a type of food tree that many reintroduced orangutans visit to eat. Ficus sp is a type of vegetation that bears fruit all year round, and is food that is always available for reintroduced orangutans in the Jantho Nature Reserve. This is in accordance with (17) which states that the Moraceae family which consists of the types *Ficus sumatrana* and *Artocarpus teysmani* are food trees that provide food in stable amounts every month. (19) stated that the Moraceae family is the vegetation species most visited by Howler Monkeys (36.1%) to fulfill their nutritional intake. has high nutritional content. The movement activities of reintroduced orangutans follow the source of their food trees.

2. Characteristics of the Vegetation Where Reintroduced Orangutans Are Active.

2.1 The height of trees where reintroduced orangutans are active.

Reintroduced orangutans at CAJ have primary activities, namely waking, eating, resting, walking, and nesting. This activity is carried out at various levels of the tree canopy, starting from the lowest with a height of <1 m to a height of >25 m. refers to (20) tree canopy classification where reintroduced orangutans are active, 1 – 9 m, 10 – 19 m, and 20 – 29 m. Based on research results, the height of the trees most commonly used for activities with a height of 10 – 19 meters is 45.15% for molikha orangutans and poni. 38.81%. Cut Keke and Asokha had more activity at tree heights of 20 – 29 m, 30.40%, and 26.40% respectively. Eating is the dominant activity carried out by molikha, poni, cut keke, and asoka. This activity is the same as (21) in that reintroduced orangutans spend more time eating and less time resting. In contrast to (18) who said that rehabilitated orangutans in the Jantho Nature Reserve, eating activity was lower than resting activity by 37.00%. Based on field observations of four reintroduced orangutans in the Jantho Nature Reserve, no special midday resting activities were found involving building nests during the day. Resting is done by hanging on vines or by sleeping face down on a tree branch. rest is dominant with the highest proportion (47.32%). In contrast to (18), rehabilitation orangutans are more dominant in rest at the Jantho Nature Reserve, research conducted by (22) states that *Pongo pygmaeus wurmbii* at the Panti Branch Research Station, Gunung Palung National Park, Kalimantan Wests will make nests to rest during the day. Reintroduced orangutans in the Jantho Nature Reserve rest activities while standing on lianas or on branches while observing the next food tree they will go to. This feeding activity is carried out at various levels of the tree canopy.

The results showed that the reintroduced orangutans Molikha and Poni had the highest activity in trees with a height of 1-9 m from the ground. Molikha is sometimes found descending to the forest floor to look for food. In Batang Toru, Sumatran orangutans are more likely to be at tree heights of 6 – 10 m when they consume young leaves (23). In contrast to the wild orangutan *Pongo pygmaeus wurmbii* female juveniles studied by (22) at the Panti Branch Research Station of Gunung Palung National Park, West Kalimantan, who stated that female juveniles and juveniles were more active in foraging in vegetation at a height of 31 m. Cut Keke and Asokha are the reintroduced orangutan individuals who are most active at tree heights of 20-29 m, at 30.40% and 26.40% respectively. The calculation of the height of the tree where the daily activities of the reintroduced orangutans in this study follow (24), namely by measuring the total height of the tree, namely the overall height of the tree from the base to the top of the tree. Referring to Indrianto, there are three classes of tree height when observing reintroduced orangutan activity in the Jantho Nature Reserve, namely 1 – 9 m, 10 – 19 m, and 20 – 29 m. This height is generally used by wild orangutans for activities. This is in accordance with research (23) that Sumatran orangutans have higher daily activity at a height of 16 – 25 m.



The difference in the use of canopy height between the four individuals of the reintroduced orangutans is thought to be closely related to their ability to climb trees and the courage to jump from branches that are not connected to other tree branches. This was demonstrated by Molikha when she was on a Sumatran Ficus tree whose tree was more than 25 m high, and the canopy below it was much lower, so there was no gap for Molika to walk down to the canopy under the Ficus. Molika rotates from one branch to another to find a part of the branch that can be flexed to walk to the surrounding trees. However, because there were no tree branches that could be flexed, Molika decided to jump, in order to move from the Sumatrana Ficus tree. to other trees nearby. Jumping is very rare in wild orangutans, because it requires high energy to make the jump (25).

Figure I

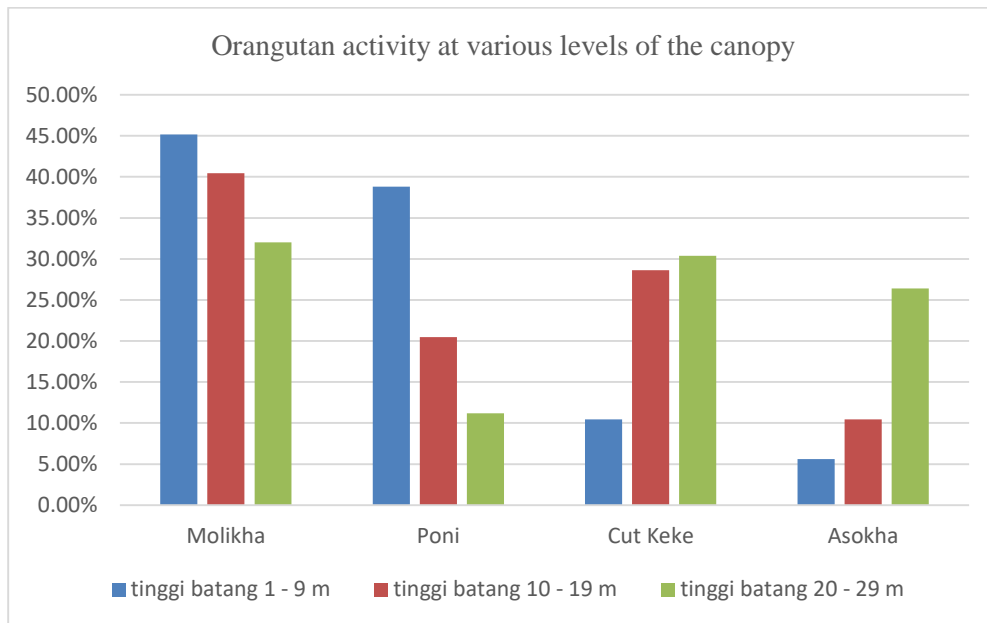


Figure 1. Tauk canopy height, activity of reintroduced juvenile orangutans.

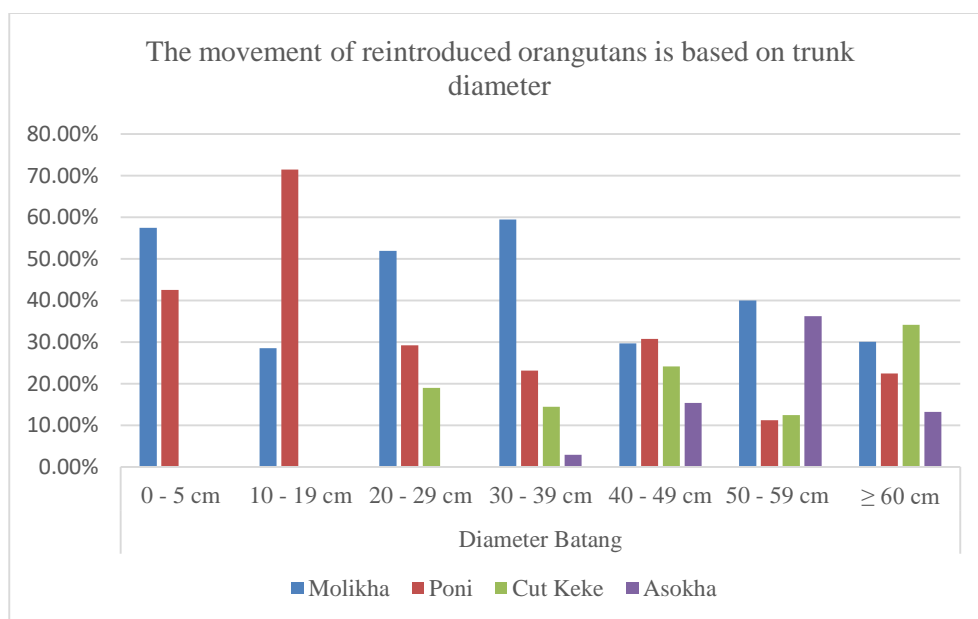


Figure 2. Diameter of the trunk where reintroduced orangutans implanted

2.2 Tree Diameter Daily Activities of Reintroduced Orangutans in the Jantho Nature Reserve

The trees where the orangutans are active have very different trunk diameters, and the four individual orangutans use trees with different diameters. There are seven different tree diameter classes used by reintroduced orangutans to carry out their daily activities, namely 0-9 cm, 10 - 19 cm, 20 - 29 cm, 30 - 39 cm, 40 - 49 cm, 50 - 59 cm and ≥ 60 cm. The movements of reintroduced orangutans based on trunk diameter are presented in Figure 2.

Molikha and poni had the highest activity in the 30-39 cm diameter class, namely 59.42% and 71.43%. while the highest daily activity of cut keke and asokha was carried out in the 50 - 59 cm diameter class at 34.18% and 36.25%. Molika and poni are more active in the smaller tree diameter class, presumably because they are easy to bend when moving. They are also found active on vegetation with a stem diameter of 200 cm, only they use lianas attached to large stems to climb to a certain height. Liana is also used by molikha and poni to rest while standing. The large size diameter class is difficult for their hands to hug the tree. The diameter class of trees in the Jantho Nature Reserve and Nature Tourism Park can reach 200 cm. The use of this diameter class is different from that of wild orangutans in Suaq Balimbing in nest-making activities. In Suaq Balimbing, the highest diameter class is used, 20% in the 40 – 49 cm diameter class (24). At the Soraya Research Station, the highest tree diameter used is in the 20 – 25 cm class for 61.54% orangutan nest making activities (26). In contrast to (27), the highest trunk diameter used by orangutans in the Lamandau Wildlife Reserve, Central Kalimantan, is 0 – 20 cm, which is 45% for nesting activities. Apart from the height of the otangutan tree, the diameter of the tree is also taken into account when carrying out activities. This is in accordance with (22). The tree diameter class describes the current condition of the forest in these two locations. In contrast to (16), the forest conditions in the two locations have striking differences, namely in the Nature Reserve the large tree diameter class and in the TWA the smaller tree diameter class. Current conditions illustrate that the tree diameter class in TWA is able to match the tree diameter class in CA, indicating success in forest restoration is going well in TWA.

Reintroduced Orangutan Habitat Vegetation Provil

Vegetation with various diameter classes and stem height will facilitate the movement of reintroduced orangutans to meet basic needs, such as food and other social activities. The presence of dense vegetation also provides comfort for reintroduced orangutans as a place to hide from predators. Visualization of vegetation structure in several observation plots at CAJ depicts a habitat profile in good condition, namely the canopy is still connected between one vegetation and another. Figure 3 shows that the connectivity of the tree vegetation in CAJ is still very good, making it easier for reintroduced orangutans to move from one canopy to another

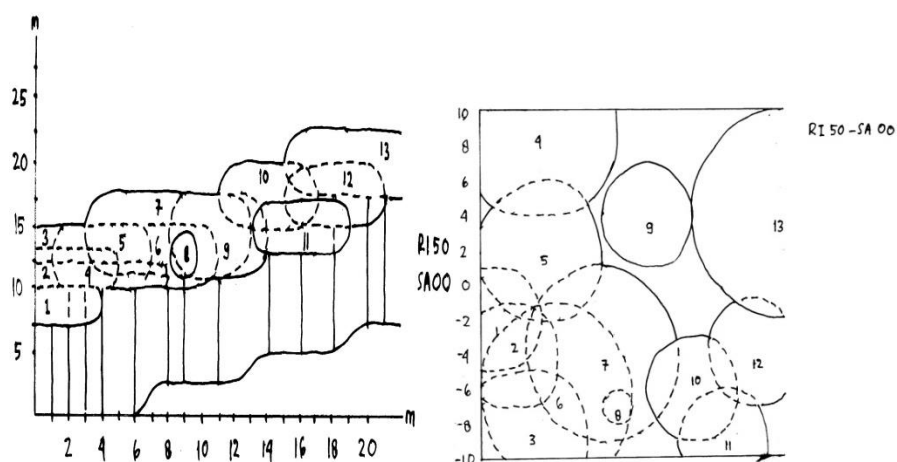


Figure 3. Tree canopy profile in CAJ

Figure 3 provides a visualization of the tree vegetation structure in CAJ which can provide good connectivity for reintroduced orangutans, both reintroduced orangutans in CAJ and TWA. The canopy is still connected from one tree to another, making it easier for orangutans to carry out movement activities, search for food, and other activities. This shows that the habitat conditions of the



reintroduced orangutans in CAJ and TWA are in good condition. Good habitat can provide sufficient food sources. Feed is one of the factors for orangutans to continue at CAJ and TWA. The most common type of food at the research location is *Ficus* sp from the *Euphorbiaceae* family which bears fruit all the time and the *Myrtaceae* family which the reintroduced orangutans eat, both leaves and fruit. The peak fruiting of the forage trees in CAJ is December and April (17; 16). This fruiting peak is the same as (29) findings in Gunung Leuser National Park, although there are differences in characteristics between the two habitat types. The CA habitat is a dry primary forest with the highest rainfall of 1,917 mm/year (28), the Ketambe Research Station is lowland rainforest with rainfall reaching 3,288 mm/year (van Shaik *et al.* 1996), and 4,575 mm/year in the Bahorok area (30). Currently, the number of food trees in CAJ is 34 types. The number of food trees and their distribution can influence the daily movements of reintroduced orangutans. The higher the number of food trees and the more evenly distributed the food trees are, the better the shorter the orangutan's movement will be to explore food sources. Tree distribution frequency feed is almost evenly distributed throughout the location observations from the types of *ficus*, *sp*, *prone grass*, *bayur*, and *rice sturdy*.

Use of Vertical Space

Reintroduced orangutans at CAJ use vertical space to carry out various daily activities ranging from heights < 1m – 30 m. The use of vertical space by reintroduced orangutans in CAJ is presented in Table 1. Table 1 shows the range of canopy strata used by reintroduced orangutans for foraging and other social activities. The canopy strata where reintroduced orangutans have the lowest activity is at a height of < 1 meter and the highest is above 30 meters. Complete data are presented in Table 1 .

NO	Orangutan	Stem Height		
		1 - 9 m	10 - 19 m	20 - 29 m
1	Malika	45.15%	40.45%	32.00%
2	Bangs	38.81%	20.46%	11.20%
3	Cut Keke	10.45%	28.64%	30.40%
4	Asokha	5.59%	10.45%	26.40%

These data explain that the reintroduced orangutans observed generally used all levels of the canopy for activities. This is different from wild orangutans, where they all spend their activity time at a certain height only (lailan *et al.* 2022; (susilowati *et al.* 2020). The use of vertical space as in table data explains that reintroduced orangutans can use all vegetation canopy structures. This does not regardless of the ability of reintroduced orangutans to utilize space. Reintroduced orangutans also need time to slowly lose their habituation level with society to become wild again. The table data also shows that not all of these orangutans use the same canopy strata every day. The frequency of use of vertical space is not the same for all reintroduced orangutan species. Not all day they are in a low position of 1-9 m, sometimes on the same day they are in a fairly high vertical space, namely 20-29 m, sometimes they are found at medium heights, namely 10-19 m This explains that CA and TWA In the 1-9 meter canopy strata only 45.15 and 38.81% more time for molika and Poni are used by orangutans for activities, whereas in the 20 -19 m canopy strata the most activity is found for reintroduced orangutans. cut keke and asokha. They stay at high altitudes all day long and are not found active in lower level vegetation. This explains that cut keke and asokha can adapt well to natural habitats and can survive well in natural habitats. is at a height of 11-20 m, namely 49%, followed by canopy strata above 20 m.

Referring to the structure of the vegetation canopy, orangutans have the highest activity in the canopy structure of section B, with a height of 20 - 30 m, followed by the canopy of section C with a canopy height of more than 10 - 19 m, and the least in the canopy of section D with a canopy height of 1 - 9 m. This canopy structure shows that CA and TWA are two forest habitats that are good enough to support the life of reintroduced orangutans. Based on this data, it is known that a height of 1-9 m is an unsafe height for reintroduced orangutans from predators, especially from the presence of wild animal hunters. The use of vertical space with a complex canopy structure like this is also found in the langur (*T. auratus*) group (Hendrawan *et al.*, 2019). This movement is also one of the orangutan's strategies for survival in the future. Figure 4 also shows that the canopy still has uninterrupted connectivity. This condition is very supportive for the continuation of orangutan reintroduction.



CONCLUSIONS

Based on the results and discussion of this research, it can be concluded that the reintroduced juvenile orangutans in CAJ and TWA can function well in various types of vegetation, with diverse tree characteristics. A total of 34 types of vegetation are used by reintroduced orangutans for activities, with vegetation characteristics varying in height, from the lowest 1m to 29 m, and the height of the trees used for activities ranging from 9 cm - to ≥ 60 cm. Molikha and poni have the highest activity at a tree height of 1-10 meters, cut keke and asokha have the highest activity at a tree height of 20 – 29 m. Molikha and poni had the highest activity in the 30-39 cm diameter class, namely 59.42% and 71.43%. Meanwhile, cut keke and asokha had the highest daily activity in the 50 - 59 cm diameter class at 34.18% and 36.25%. The use of vertical space was not the same for all reintroduced orangutans, but throughout the day they were in the vegetation canopy. The time pattern of molika and poni vertical space use in the afternoon is higher at a tree height of 10 m. cut keke and asokha percentages at a tree height of 20 meters. During the day, these four orangutan species are active in the middle to the top of the canopy.

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