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Characteristics of Nests and Nest Trees of the Bornean Orangutan Subspecies (*Pongo pygmaeus wurmbii*, TIEDEMAN 1808) in the Protected Area of Rungau River Riparian Zone, Central Kalimantan Province

Firmansyah[1], Achmad Yanuar[1,2], Tatang Mitra Setia[1,2]

[1]*Department of Biology, Graduate Program, Universitas Nasional, Jakarta 12520, Indonesia*
[2]*Faculty of Biology and Agriculture, Universitas Nasional, Jakarta 12520, Indonesia*
email: firmanrg@gmail.com

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Abstract

Orangutan conservation efforts can be carried out through habitat management both within and outside of conservation areas. The protected areas along the Rungau River have indications of an orangutan population. So, it is necessary to study the characteristics of nests and nest trees. The research method uses transect lines to record the characteristics of the nets and the characteristics of the nest tree. Based on research on the characteristics of the nest, it is known that the height of the nest ranges from 5 to 32 m from the ground. Class B is the dominant nest class. Dominant nest diameter of more than 1 m. Then the characteristics of the nest tree are known and the height of the nest tree ranges from 10 to 37 m. In adults, tree nests have a diameter at breast height in the range of 5 to 96 cm. The dominant types of nest tree species are guava and meranti.

Keywords: *Orangutans, nest trees, Rungau River riparian zone*

INTRODUCTION

Orangutans spend most of their time in trees (arboreal) by building nests from leaves and branches (van Schaik et al., 1995). According to van Schaik and Idrusman (1996), in a tree there are several nest positions commonly used by orangutans, namely the nest position that is located near the main trunk, the nest position that is located in the middle or on the edge of the main branch, and the nest position that is located at the top (above the crowns of the tree). Nests are built for survival and are used for breeding, resting sleeping and playing.

According to van Schaik et al (1995), orangutans build 1 to 3 nests per day with an average daily reach of more than 0.1 km^2. Nest building activities will help open up the canopy so sunlight can penetrate the forest floor. Regeneration of tree saplings, especially intolerant tree species that previously existed in the forest ecosystems, can also grow well in the presence of orangutans in a habitat. Referring to their role in the ecosystem, orangutans are referred to as an umbrella species, namely species whose sustainability affects the sustainability of the ecosystem in which they are found (Branton & Richardson 2010).

Nesting involves breaking and bending branches and/or twigs to create a nest for sleeping, resting, and playing, as well as constructing a circular or bowl-like base structure for feeding or supporting the body and an upper part for protecting the head from rainwater (Galdikas, 1978). The ability to build nests is an important factor for orangutans. According to Mackinnon (1974), nest

building time can be influenced by weather factors, the distance of the nest from the tree, and the fulfillment of orangutan hunger.

Based on Prasetyo's research (2006), several reasons why orangutans choose nest positions are related to the strength of nest construction to hold body weight and protect against predators. According to Yakin (2013), a nest located in the middle or at the end of a fork, which is categorized as nest position 2, is strong enough to hold the weight of two individual orangutans (mother and baby). Apart from that, orangutans are also free to monitor conditions under the nest so that if there is a disturbance, they can easily move to another area, or another tree. Van Schaik (2006) states that orangutans will choose trees that are strong and comfortable to make nests. The reason why orangutans prefer nest trees from the *Dipterocarpaceae* family is because these trees are relatively strong, so the nest built will be able to withstand the weight of the orangutan's body.

In general, wild animals, including orangutans, need forests as a place to live and breed. The reduction in forest area greatly affects the existence and distribution of these large Asian primates. The main threats to orangutan survival are forest destruction, poaching and illegal trade (Rijksen & Meijaard, 1999). The Rungau River is included in the Seruyan watershed, the Rungau sub-watershed. Administratively, this area is included in Seruyan Regency, Central Kalimantan Province. Referring to KEPPRES regulation No. 32 of 1990 concerning the Management of Protected Areas, the right and left boundaries of the river are local protection areas. So that along the Rungau River riparian it is categorized as a protected area.

Research objectives:

1. To determine the characteristics of live trees selected by orangutans to build nests in the protected area along the Rungau River.
2. To determine the characteristics of nests used by orangutans in the Rungau River riparian protected area.

METHOD

Sampling location

The research was conducted in the protected area of the Rungau River riparian, Seruyan Regency, Central Kalimantan. Data were collected at 15 research transects. Data collection was carried out in the period July to September 2016 and 2019.

Research Materials

Materials used in this study include: area maps and tally sheets. Data sheet for nest characteristics and data sheet for nest tree characteristics.

Research Equipment

Equipment used in this study includes: binoculars, Geographical Position System (GPS) Garmin Montana, digital camera, tagging tape, compass, roll meter, stationery, dBH meter.

Data Collection Method

In the research, data collection was carried out through the discovery and observation of orangutan nests and nesting trees. Data collection was carried out by directly observing the characteristics of nests and the characteristics of orangutan nesting trees. The search for nests and signs of orangutan presence was carried out purposefully, namely looking for areas suspected of having orangutan nests. Then at the location, a line transect (LT) was made to observe orangutan nests. For each nest, characteristic data were recorded, including nest class, nest size, nest position,

and nest height. Then the characteristics of orangutan nesting trees were recorded, including tree type, tree height, and tree diameter.

The data obtained were then tabulated based on groups of nest and tree characteristics where orangutans' nests were located. The data were entered into a tally sheet and analysed descriptively. Nest data were analysed with the distance software program version 7.3, which aims to obtain the effective distance of nests from transects (estimated wide strip - ESW) due to differences in the distance of nests to transect lines found and recorded in each transect.

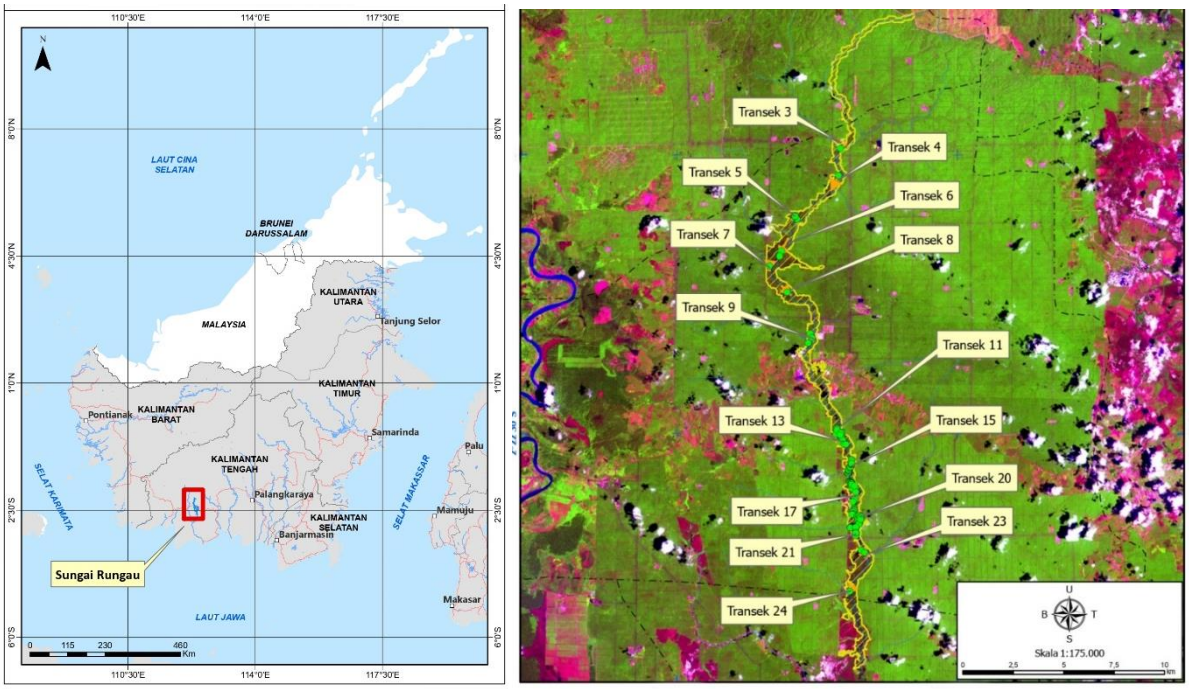

Figure 1: Location of Data Collection Transect

Nest Positioning

Data collection was carried out by tracing the transect lines (TLs) that had been drawn in the initial survey and recording several data criteria to determine the density of the orangutan population. These criteria include the distance from the nest perpendicular to the observation path (LTs) also called perpendicular (ppd), nest position, nest class and others. Nest position can be divided into 5, namely position 1, position 2, position 3, position 4 and position 0 (Prasetyo, et al, 2009). The explanation for each position is:

- Position 1, the nest is located at the base of the main branch of the tree.
- Position 2, the nest is located in the middle of the branch or at the end of the branching.
- Position 3, the nest is located at the top of the tree.
- Position 4, the nest is located between two branches of two or more different individuals.
- Position 0, the nest is parallel to the ground.

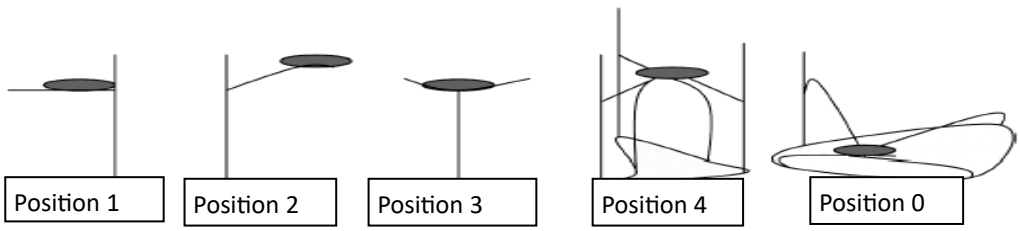

Figure 2. Orangutan Nest Position (Prasetyo, et al., 2009)

Determination of Nest Class

Orangutan nest classes were divided into 4 classes with criteria according to Johnson et al. (2005), namely:

- Class A nests are new nests and are characterized by green leaves.
- Class B nests or relatively new nests are characterized by a mixture of green leaves with leaves that are starting to dry and the presence of leaves that have begun to wither with a yellowing color.
- Class C nests are old nests characterized by dry and brown leaves but the nest is still sturdy and solid.
- Class D nests are very old nests, which are characterized by holes in the nest.

Statistical Analysis

We utilized IBM SPSS Statistics 20, using alpha level at $\rho = 0.05$ (IBM Crop Released, 2011) , to analyze data used in data processing by using the Mann-Whitney (U) analysis to determine differences in 2016 and 2019 in nest characteristics, namely nest height, nest class, nest position, nest diameter. The Mann-Whitney (U) test was also used to determine differences in 2016 and 2019 in nest tree characteristics including nest tree height, nest tree dBH, tree species.

RESULT

Nest Height

Based on observations in 2016, nests were found at heights ranging from 5 to 28 meters. Then from the results of observations in 2019, we identified nest heights ranging from 7 to 32 meters (Figure 3). Nest height data were grouped into heights of 9 meters or more, for 2016 there were 5 nests and in 2019 there were 3 nests. For nest heights between 10 and 19 meters in 2016 there were 29 nests and in 2019 there were 46 nests. Then the height of the nest was between 20 and 29 meters in 2016 there were 16 nests and in 2019 there were 15 nests. And nests 30 - 39 meters high were not found in 2016 while in 2019 there were 3 nests. Data on orangutan nest height based on statistical analysis using Mann-Whitney ($U = 1.572$; $\rho = 0{,}569$) showed that there was no significant difference in the determination of nest height when orangutans made nests in 2016 and 2019.

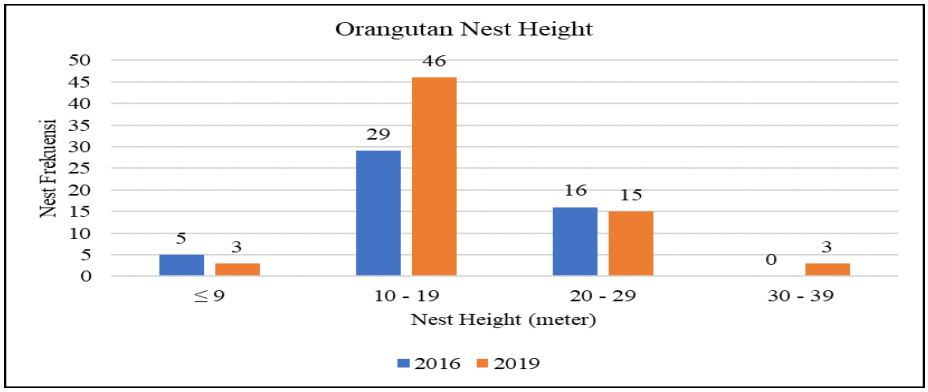

Figure 3: Chart of Orangutan Nest Height

Orangutan Nest Classes

The nests found were grouped into four classes (Figure 4) based on the level of nest destruction and leaf color. In 2016 for new nests whose leaves were still green or class A nests were 3 nests, and class B nests which included new nests whose leaves had begun to wither there were 18 nests. For class C nests whose leaves have dried there are 17 nests, and for old nests that have started to have holes, or class D, there are 12 nests. In 2019, 7 new class A nests were identified, 24 class B nests, 20 old class C nests and 16 old class D nests with holes. Based on statistical analysis of orangutan nest class data using Mann-Whitney (U = 1.592,5; ρ = 0,569), it is known that there is no significant difference in the class of nests found in 2016 and 2019. Nests found in 2016 and 2019 had the same nest class diversity, namely nests found in classes A, B, C and D.

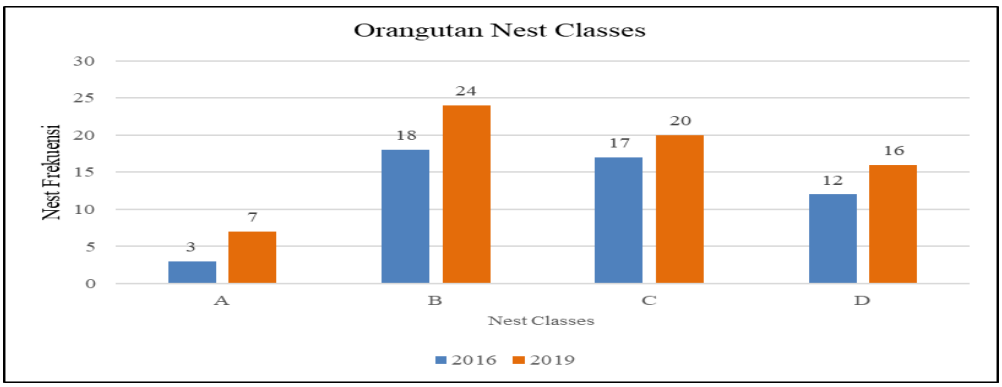

Figure 4. Graph of Orangutan Nest Class

Orangutan Nest Diameter

In 2016 there were 11 nests with a diameter size of less than 1 m, and then there were 39 nests with a size of more than 1 m. According to the results of observations in 2019 there were 40 nests with a diameter size of less than 1 m, then there were 25 nests of more than 1 m in size and there were 2 nests of more than 2 m in diameter. Based on statistical analysis for nest diameter using Mann-Whitney (U = 1.082,5; ρ = 0,00), it is known that there are significant differences in the size of the nest diameter. The results of observations in the 2016 period show that the nests found were dominantly more than 1 m in diameter at 78%, then 22% were less than1 m in size. Whereas in 2019 observations recorded dominant nest findings with a diameter of less than1 m in the amount of 60%, then the findings of more than 1 m diameter nests in the amount of 37% and more than 2 m diameter nests in the amount of 2%.

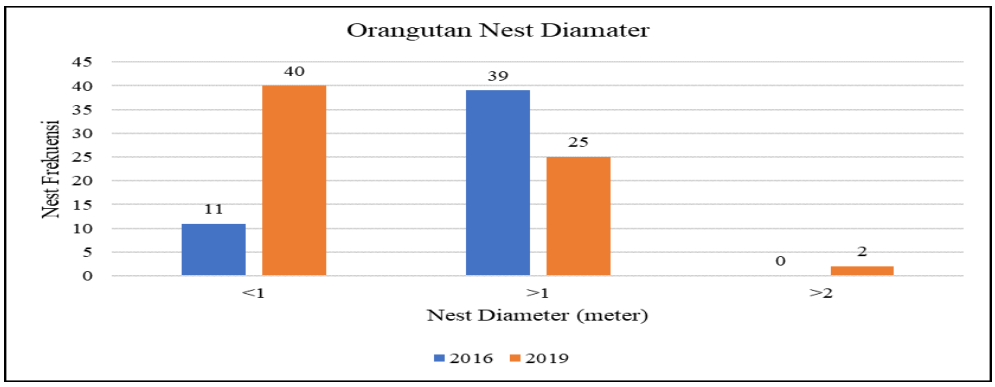

Figure 5. Graph of Orangutan Nest Diameter

Orangutan Nest Position

Based on the results of research in 2016, for position 1, there were 6 nests; for nest position 2, there were 19 nests; for nest position 3, there were 19 nests; and for nest position 4, there were 6 nests. Then observations in 2019, for nest position 1, there were 23 nests, while for nest position 2, there were 33 nests, for nest position 3, there were 8 nests, and for position 4, there were 3 nests. If you pay attention, in 2016, the findings of nests tend to be in positions 2 and 3, while in 2019, the nests found tend to be in position 2 and position 1. Calculation of statistical analysis for nest position using Mann-Whitney (U = 997,5; ρ = 0,00) found that there were differences in nest position, namely that in 2016, orangutans tended to nest in positions 2 and 3, and in 2019 orangutan nests tended to be in positions 1 and 2.

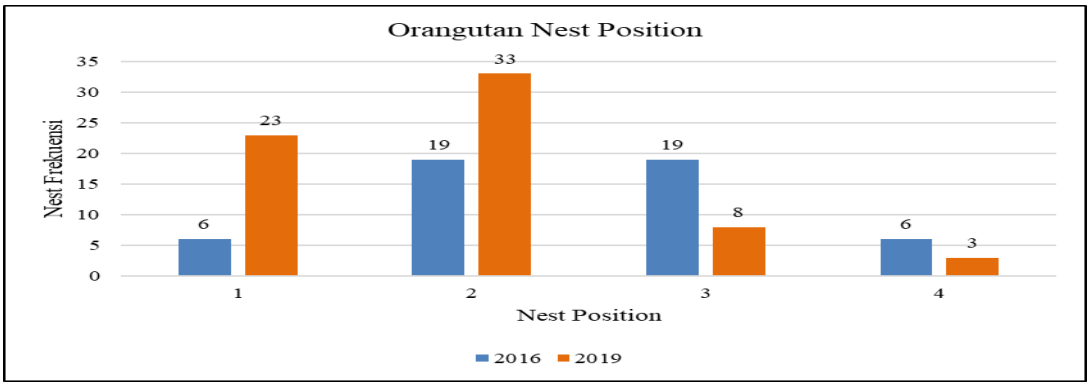

Figure 6. Graph of Orangutan Nest Position

Tree Diameter.

The diameter of breast high (dBH) of trees in 2016 was found to be between 8 and 96 cm. Then, in 2019, the tree diameter was found to be between 5 and 64 cm. Based on the 2016 observation, the diameter of nest trees with a size of 9 cm or more was 2 trees. There were 16 trees with a diameter of 10 - 19 cm. Then, nest trees measuring 20 - 29 cm were identified as 12 trees. Tree diameter is 30 - 39 cm, there are 10 trees. In the diameter of 40 - 49 cm, 7 nest trees were found. And nest trees of 60 cm or more in diameter in 2016 found 3 trees. Based on the results of observations in 2019, 13 nest trees measuring 9 cm or more were found. There are 28 nest trees with a diameter of 10 - 19 cm. Nest trees with diameters between 20 and 29 cm were identified as 10 trees. Then, the diameter of the tree is between 30 and 39 cm, there are 2 trees. Nest trees with a diameter of 40 - 49 cm were found in nine trees. There is one tree with a diameter between 50 and 59 cm. And in 2019, there were 4 nest trees with a diameter of 60 cm or more.

Based on statistical analysis using Mann-Whitney (U = 1.163,5; ρ = 0,005), it is known that there is a difference between the diameter of nest trees in 2016 and 2019. In 2016, orangutans tended to use nest trees with diameters measuring 0 - 9 cm and 10 - 19 cm. Whereas in 2019 orangutans tended to choose trees with diameters of 10 - 19 cm and 20 - 29 cm. In addition, in 2016, there were no nest trees with a diameter of 50 - 59 cm.

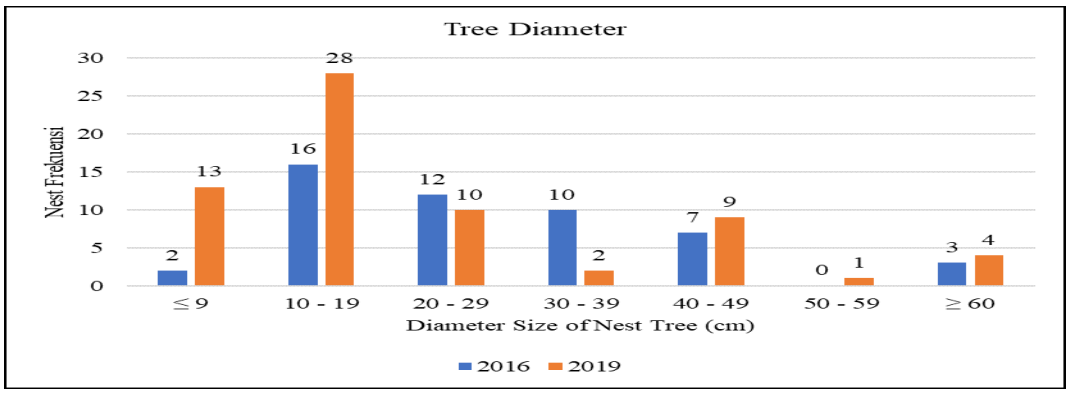

Figure 7: Graph of Diameter Orangutan Nest Trees

Height of Nest Trees

In 2016, the height of nest trees was between 11 and 34 m, while in 2019, the height of trees was between 10 and 37 m. Nest tree heights of 9 m or more in 2016 and 2019 were not found at the study site. The height of nest trees 10 - 19 m in 2016, when there were 15 trees and in 2019, there were 20 trees. Nest tree height is 20 - 29 m. In 2016, there were 29 trees and in 2019 there were 31 trees. In 2016, 6 trees with a height of 30 - 39 m were identified, while in 2019, there were 16 trees. Based on statistical analysis using Mann-Whitney (U = 1.454,5; ρ = 0,224), it was found that there was no difference in the selection of nest tree height by orangutans. In 2016 and 2019 orangutans predominantly selected nest trees with a height of 20 - 29 m, then at a height of 10 - 19 m. In addition, there were no nest trees with a height of less than 9 m in 2016 and 2019. In addition, there were no nest trees with a height of less than 9 m in 2016 and 2019.

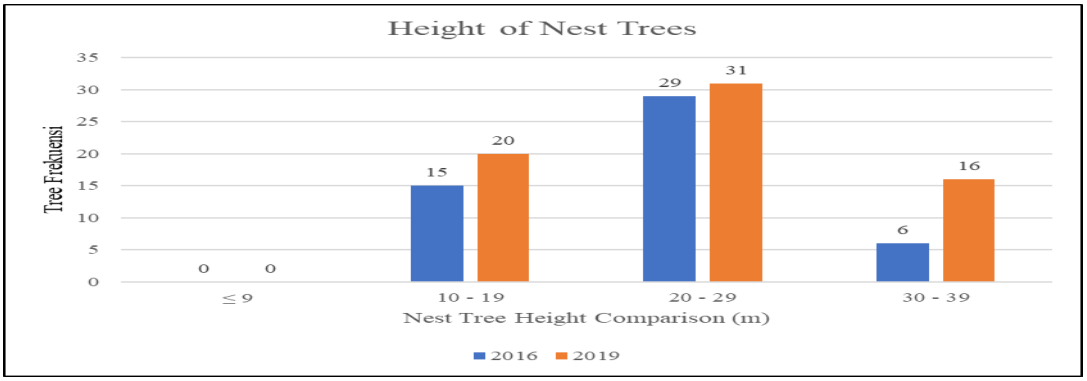

Figure 8: Graph of Nest Tree Height

Nest Tree Species

Based on the results of observations in 2016 and 2019, a total of 19 nest tree species were identified. In 2016 alone, a total of 12 nest tree species were identified, and in 2019 a total of 14 nest tree species were identified. In 2016, the dominant tree species used to make orangutan nests were resin and forest rambutan. In addition, the types of trees used as nests were also identified, namely coffee, meranti, ubar, guava, laban, rengas, keruing, geronggang, ketiau and bengaris. Then in 2019, it was identified that the dominant species used to build nests were guava and meranti. Other tree

species identified as nest trees in 2019 were geronggang, ubar, banyan, benuas, hibiscus, resak, sungkai, pasulan, bangaris, bangkirai, coffees and resin.

Based on statistical analysis using Mann-Whitney (U = 1.502; ρ = 0,336), it is known that there is no change in the selection of nest trees used by orangutans in 2016 and 2019, which on average have the same tree types and characteristics, namely strong wood trees and food trees.

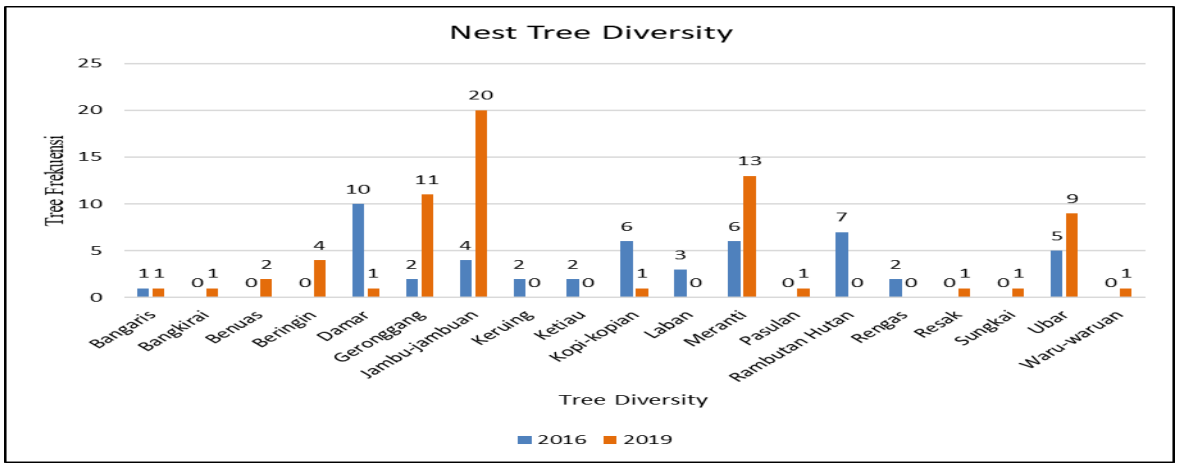

Figure 9: Graph of Nest Tree Species

DISCUSSION

Nest heights of 10 - 19 m are heights that have a lot of tree branches, making it easier for orangutans to get nest building materials. Conditions with lots of branching will also make it easier for orangutans to move between trees. According to Sosilawaty research (2020) in the Lamandau Wildlife Sanctuary, the most preferred orangutan nest height is 11 to 15 m. Based on Muin research (2007) in the Tanjung Puting research location, it is known that orangutan nests are found at heights ranging from 4 to 27 m. Nest height is also influenced by orangutans' sense of security against possible predators.

In the research transect, class A nests were still found, indicating the presence of orangutans not far from the time of the research team's presence at the transect location. Usually, orangutans are still around the location of new nests, but during data collection there were no direct encounters with orangutans. Due to the sensitivity of orangutans to human presence, orangutans tend to avoid direct encounters with humans. Class B nests were relatively common in both 2016 and 2019, indicating that there are still many orangutans using the transect area for their daily activities, both for eating, resting during the day and resting at night. Class C and D nests were also found, indicating that orangutans have been using the transect location for a long time for their daily activities and nest building.

Nests in 2016 predominantly had a diameter of > 1 m. Whereas in the 2019 study, orangutans predominantly made nests with a diameter of < 1 m. Based on statistical analysis using Mann-Whitney, it is also known that there is a significant difference in the size of the nest diameter in 2016 and 2019. Nest diameter is influenced by the needs and body weight of the orangutan, the larger and heavier the body weight, the orangutan will need a larger nest. Large nest diameters of > 1 m are usually used by orangutan mothers carrying their young. Due to the presence of 2 orangutans, a relatively large nest is required. Nests < 1 m in diameter are usually made by juvenile orangutans and are also used as resting nests.

Nest positions found in 2016 and 2019 were predominantly found in position 2. Position 2 nests are located in the middle of tree branches, making it easier to obtain nest-making materials. In nest position 2, orangutans can also freely observe the conditions around the nest, so if there is a

disturbance orangutans can easily move to another tree. Position 2 has a canopy shade so that it can protect orangutans from sun exposure, rainwater and wind gusts. According to Prasetyo (2006), some of the reasons for choosing a nest position relate to the strength of the nest construction to withstand the orangutan's body weight and protection against predators.

The diameter of the tree selected to make the nest was found to be the smallest at 5 cm for the type of guava tree, which is also an orangutan food tree. The diameter of the largest nest tree was 96 cm with rambutan, which is also an orangutan food tree. In general, the diameter of nest trees found was dominantly 10 - 19 cm in 2016 and 2019. Based on research by Sosilawaty (2020) in Lamandau Wildlife Sanctuary, the most preferred tree diameter for orangutans to make nests is 0 - 20 cm. The Sungai Rungau protected area is a secondary forest where there are not many trees with large diameters. Based on statistical analysis using Mann-Whitney (U), it is also known that there is a difference in the diameter of trees used as nest trees in 2016 and 2019. This difference is influenced by the availability of trees to build nests. In 2016, the dominant tree diameter was 20 - 29 cm while in 2019 the dominant tree diameter was 10 - 19 cm.

Orangutans tend to choose tall trees to build their nests so that they can monitor their surroundings. Nest tree height has connectivity with nest height. This can be seen from the observation that the higher the nest tree, the higher the nest. In 2016, the height of the nest tree ranged from 11 to 37 m while the height of the nest ranged from 5 to 28 m. Then the height of the nest trees in 2019 ranged from 10 to 37 m with the nest height ranging from 7 to 32 m. The connectivity between nest trees and nest height is related to the availability of tree branching to make strong nests and protection from predators and weather conditions.

Trees used as nest trees in 2016 were dominated by resin (*Agathis* sp.) at 20% and forest rambutan (*Nephelium* sp.) at 14%. While in 2019 the dominant nests were found in guava trees (*Syzgium* sp.) at 30% and meranti (*Shorea* sp.) at 19%. The identified nest tree species are hardwood species with flexible branches and are also included in the orangutan food tree species. Dammar trees belonging to the Dipterocarpaceae family are widely used for nest trees because they are strong woods that can support the body weight of orangutans, which are morphologically large primates. Meranti trees are also widely used as nest trees because they are strong woody species and also have relatively dense branching with hairless leaves whose leaves are scattered throughout the branches of the tree. Van Schaik (2006) states that orangutans will choose strong trees that have a lot of branching and leaves that are not too large and soft to be used as nest trees. Guava and rambutan are fruit trees that are often used as food trees. Orangutans tend to maximize food trees as well as nest trees to ensure food availability for the next day. This is stated by Prasetyo (2006), for efficiency in obtaining food orangutans will maintain the food tree by making nests in it.

CONCLUSION

Based on the results of the research that has been carried out, it can be concluded as follows:

1. Nest height in 2016 ranged from 5 to 28 m, dominant at a height of 10 to 19 m. Nest height in 2019 ranged from 7 to 32 m which was dominant at a nest height of 10 to 19 m. The dominant nest class found in 2016 and 2019 was class B. The diameter of nests in 2016 was dominantly more than 1 m while in 2019 the dominant size was less than 1 m. In 2016 the dominant nest position was 2 and 3 while in 2019 the dominant position was 2 and 1.
2. The diameter of nest trees in 2016 ranged from 8 to 96 cm while in 2019 it ranged from 5 to 64 cm. The dominant diameter of nest trees in 2016 and 2019 was between 10 and 19 cm. Nest tree height in 2016 ranged from 11 to 34 m, while in 2019, it ranged from 10 to 37 m. The type of vegetation used by orangutans to build nests in total identified 19 tree species, specifically, in 2016, identified 12 tree species and in 2019, a total of 14 tree species. In 2016, the dominant

tree species were resin (*Agathis* sp.) and rambutan (*Nephelium* sp.), while in 2019, the dominant tree species were guava (*Syzgium* sp.) and meranti (*Shorea* sp.).

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