ESTIMATION OF ORANGUTAN POPULATION IN SIBONGKARAS PAKPAK BHARAT VILLAGE FOREST AREA

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Abstract : Orangutan is classified as an endangered species. Forest clearance for a variety of purposes and functions over the region led to the limited habitat for orangutans. Orangutans habitat is fragmented into several regions led to the survival of a population of a species depends on habitat conditions. Performing a nest survey is important to give a deeper understanding of the ecology and help determine the best protective management measures. We provide basic data of orangutan density and orangutan nesting characteristics in protected forest area Sibongkaras village. This study was conducted in April 2019 until June 2019 in protected forest area Sibongkaras village, Pakpak Bharat. Tracking begins with observed the presence of a nest based on a purposive sampling method. And data retrieval was done by line transect method. Data analyzed at Universitas Nahdlatul Ulama Sumatera Utara. Our result showed that the orangutan population density was 0.0072 individuals/km^2 or 0.72 individuals/ha. The dominant position of the nest is in a position which is a position I nest close to the main stem of the tree with the nest number 13 (43.3%). Generally, the nest is found at an altitude of >15 meters with a sum of 27 nests (90%).
Keywords : Orangutan, Nest, Pakpak Bharat, Sibongkaras

Abstrak : Orangutan diklasifikasikan sebagai spesies yang terancam punah. Penebangan hutan untuk berbagai tujuan dan fungsi di kawasan tersebut menyebabkan terbatasnya habitat orangutan. Habitat orangutan yang terfragmentasi menjadi beberapa wilayah menyebabkan kelangsungan hidup suatu populasi suatu spesies tergantung pada kondisi habitat. Melakukan survei sarang penting untuk memberikan pemahaman yang lebih dalam tentang ekologi dan membantu menentukan langkah-langkah manajemen perlindungan terbaik. Kami menyediakan data dasar kepadatan orangutan dan karakteristik sarang orangutan di kawasan hutan lindung Desa Sibongkaras. Penelitian ini dilakukan pada bulan April 2019 hingga Juni 2019 di kawasan hutan lindung Desa Sibongkaras, Pakpak Bharat. Pengamatan dimulai dengan mengamati keberadaan sarang berdasarkan metode purposive sampling. Dan pengambilan data dilakukan dengan metode transek garis. Data yang diperoleh di analisis di Universitas Nahdlatul Ulama Sumatera Utara. Hasil Penelitian kami menunjukkan kepadatan populasi orangutan di 0,0072 individu/km^2 atau 0,72 individu/ha. Posisi sarang yang dominan adalah pada posisi sarang yang berada di posisi paling dekat dengan batang utama, dengan jumlah sarang 13 (43,3%). Umumnya sarang ditemukan di ketinggian > 15 meter dengan jumlah 27 sarang (90%).
Kata kunci : Orangutan, Sarang, Pakpak Bharat, Sibongkaras

Introduction

Geographically, Pakpak Bharat district is located in the north-western part of North Sumatra province. The topographic area is dominated by hilly terrain, with altitudes ranging from 400 to 1800 masl on some peaks. Pakpak Bharat still has pristine forest areas, especially in mountainous areas. Another factor is the hilly landscape which makes it difficult to be explored further by large-scale logging. However, small-scale logging from the community that is currently still running is feared that it will damage the wildlife habitat in the area.Which is thought to be among the wild orangutans.

The existence of orangutans on the island of Sumatra is distributed in the Leuser Ecosystem which consists of two provinces, namely North Sumatra and Aceh. North Sumatra has three districts that are neighbouring the Leuser Ecosystem: Langkat, Dairi and Pakpak Bharat. Ecologically, this area functions as an integral part of the habitat of other animals including orangutans that live in the Leuser Ecosystem (Dasrul, 2015). Many scientific publications related to the existence and population of orangutans in Langkat and Dairi (Rijksen, 1978; 2005 Van Schaik et al., 2005).

Considering the location of the forest areas that are close together, it is suspected that the orangutan is also in the Pakpak Bharat forest area. This is also supported by local community information about the encounter of individual orangutans in the area. Especially in the area of Sibongkaras village forest, both the meeting of individual orangutans directly or the meeting of nests. However, scientific data related to the certainty of the orangutan population in the region is still very minimal.

In this study, the authors use the nest as an object of observation. The nest is an indicator of the existence of orangutans in an area that is their habitat. Therefore, the estimated population of orangutans can be determined by analyzing the number of nests found. The nest is easier to count than the animal itself and can be seen in a long period of time, and less fluctuating in a particular location (Johnson et al., 2004; Prasetyo et al., 2012; 2005 Van Schaik et al., 2005).

Based on the brief description above, this research leads to the analysis of orangutan populations based on the number of nests. In addition, we are identifying the characteristics of trees used by orangutans in nesting.

Research Methods

This research was conducted in the protected forest area of the village of Sibongkaras, Pakpak Bharat. This research was conducted from May to June 2019. The tools used in this study were the Global Positioning System (GPS), cameras, binoculars, measuring tapes, machetes, gloves, 10 kg plastic bags and stationery. The material used in this study was a tally sheet, stationery, map of the study

location, raffia ropes, trees used by orangutans to make orangutan nests and nests
in the observed pathway.

Figure 1. Research transect map

The method used in the collection of orangutan density data is the line
transect method (Van Schaik et al., 1995) based on the presence of nests
(purposive sampling), with a total of 6 (six) transects. This method is very
effective for estimating the population density of orangutans.

The nest is the most easily observed evidence of the existence of
orangutans(Mathewson et al., 2008). The observer walks along the transect line
and records all the nests observed. Nest counts data collection is done by
recording nests that are found along the transect line. Retrieval of these nested
data is done with binocular assistance to find nests that are far from and hidden
(Cayani et al., 2014; Rifai et al., 2012). The search for nests on each transect line
starts at 0 km to the specified transect deadline. Each nest found was then marked
by a tree using a plate / pitapanda and the Global Positioning System (GPS)
(Atmoko and Rifqi, 2012; Sembiring, 2016). Nest data taken include (1) nest
height, (2) nest tree height, (3) nest tree diameter, (4) species of nest tree, (5)
distance between nest position and transect line, (6) nest position, (7) nest class
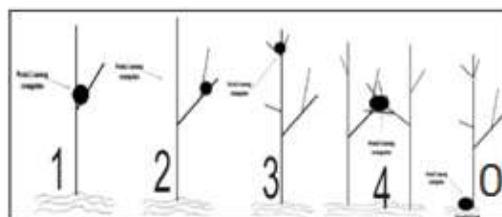(Figure 2).

Figure 2. Orangutan Nesting Sketch Position

Where, Position 1: at the base of the main branch.

Position 2: in the middle or tip of a branch.

Position 3: at the top of the tree.

Position 4: formed from branches of 2 different trees (the number of trees can be
more than 2 different trees)

Position 0: on the ground. (Prasetyo et al, 2009)

The nest tree species were identified directly in the field by using the reference book of Flora Malesiana identification as well as guidance from the local community to identify the local name of the tree that became the research data. Some species of trees that cannot be identified directly in the field are taken specimens to be taken to the plant taxonomy laboratory of the University of North Sumatra (USU) to be identified. The distribution of nest endurance values is based on the categorization used by (Wich and Boyko, 2011) by dividing nests based on 4 classes, namely:

Class A: (new) marked with leaves that make up the nest making it look green.

Class B: (not long ago) all leaves are dry and some leaves are still green on the
bottom but brown on the surface.

Class C: (old) some leaves have disappeared, others are still attached, dark brown,
hollow, but still relatively sturdy and intact.

Class D: (very long time) almost all leaves have decayed, nest buildings tend to
stay skeletons/branches only and the original shape of the nest is not
clearly visible.

Data analysis

After making lane and nest calculation, the next step is to estimate the population density of orangutans in each observation lane using the Van Schaik calculation method. Calculation of population densities based on nests by these methods is as follows:

$$D = \frac{N}{(L \ x \ 2w \ x \ p.r.t)} \ldots\ldots\ldots\ldots(1)$$

Information:

D = Orangutan population density (individual / km²)

L = path length / transect (km)

w = average distance between nests and transects (m)

P = Proportion of nests built in the population

r = rate of nest production

t = Resistance of hives

N = Number of nests recorded / found along the transectline.

The value used in this study is the value set by Van Schaik. However, the values of L, N, and w (*) are adjusted based on conditions and data obtained in the field. The explanation of formula values is:

- Transect length (L) = 1 km *
- Proportion of number of nests built in population (p) = 0.9
- Nest production rate (r) = 1.7
- Nest resistance value (t) = 73 days
- The average distance between nests and transects (w = 9.41 m) *

(Van Schaik et al., 1995)

Characteristics of Nest Trees

Orangutan nest tree characteristics were analyzed descriptively using the Microsoft Excel Professional Plus 2013 program to determine the frequency of each category of nest tree in the form of charts and tables. The distribution and diameter of the nest tree height are divided into four categories following the four diameter and forest layer categories used by Ogawa et al., 1965. The four categories of nest tree diameter are (> 40 cm), (> 30-40 cm), (> 10-30 cm) and (5-10 cm), while for the four categories of nest tree height (> 15m), (> 10-15m), (> 5-10m), and (<5m).

Results and Discussion

Orangutan Population

Analysis of orangutan population estimates based on 30 nests found from all paths obtained an estimated population value of 0.0072 individuals/km^2 or 0.72 individuals/ha. From table 1 it can be seen that the most estimated orangutan population is in transect 1 with a total of 0.0036 individuals/km^2 or 0.36 individuals/ha. The average orangutan population on all transects is 0.001 individuals/km^2 or 0.119 individuals/ha.

Table 1. Estimated value of orangutan population density (ind / km^2 or ind / ha) for each research transect

Transect	Number of Orangutan Nest	Population	
		D (ind/km^2)	D (ind/ha)
I	13	0.0036	0.36
II	1	0.0002	0.02
III	3	0.0005	0.05
IV	9	0.0020	0.20
V	2	0.0005	0.05
VI	2	0.0004	0.04
Total	30	0.0072	0.72
Average	5	0.001	0.119

The number of populations that use nests as a basis for calculation is greatly influenced by the ability of orangutans to build nests. Based on previous research Sumatran orangutans build nests an average of 1.6-1.8 nests per day (Singleton et al., 2017); 1995 Van Schaik et al., 1995). Different decay values or nest endurance at each location also affect the results of population count calculations. Based on orangutan population research conducted at Leuser by Van Schaik (1995) it is known that the nest endurance time is 73 days, whereas based on research by (Rijksen, 1978) and (Buij et al., 2002) conducted in Ketambe, the nest endurance time is between 81-250 days. There are several factors that affect the fast or slow holding time of orangutan nests, including the pH of the soil, temperature, rainfall, canopy conditions (open or closed) and nest position(Prasetyo et al., 2012, 2009).

Number of Orangutan nests

Sibongkaras Village is a remote village surrounded by protected forest. Administratively, Sibongkaras villagers live by farming with a system of moving and partly clearing forest areas. Field clearing and feeding conditions affect orangutan nests throughout the entire transect, and this affects the number of nests found from the six transects, as shown in the following Table 2.

Research transects created based on the purposive sampling method cause the characteristics of each research transect to differ. Table 2 shows that the highest number of nests was found in transect I with a total of 13 nests and in the transect with the least number of nests found in transect II, namely 1 nest. From the conditions in the field, it can be seen the presence of feed is a major factor in the existence of nests. During the study, feed sources (young leaves and fruit) were more commonly found in transects I and IV. The distribution of orangutan nests is very much influenced by the distribution of feed trees and orangutans will definitely choose sufficiently available habitat (Alqaf et al., 2016; Ancrenaz et al., 2004; Prasetyo et al., 2006). Orangutans are also known to choose the areas or trees that have enough feed(Smith et al., 2011; Wich et al., 2011).

The height factor is also one of the determinants of the existence of orangutans. The density of orangutans is influenced by the height of the place above sea level (asl), the type of forest and existing disturbance. The density of orangutans is known to continue to decline with increasing somewhere above sea level (asl). Starting with a density of 5 individuals / km2 in swamp forest (approximately 30 masl), around 2.5 individuals / km2 at an altitude of more than 500 masl, less than 1.8 individuals / km2 at an altitude of 500-1000 masl, until finally rarely or even not got altogether at an altitude of more than 1800 masl. (Buij et al., 2003; Prasetyo et al., 2006; Singleton et al., 2017; 1995 Van Schaik et al., 1995).

Table 2. Number of orangutan nests on each transect

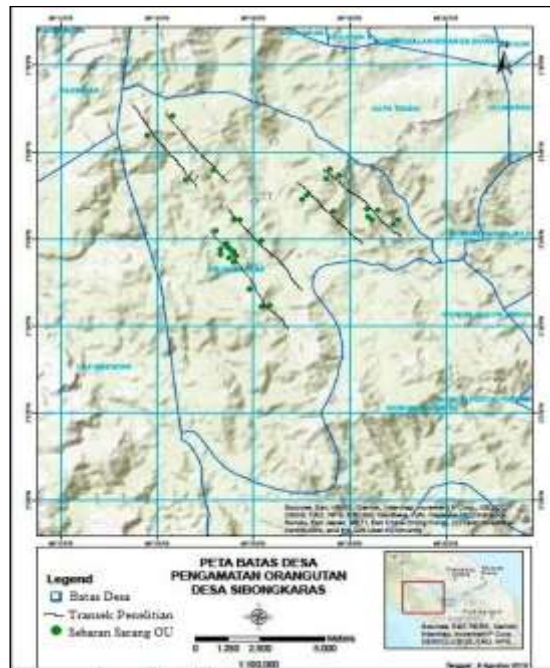| Transect Distance	Transect						Total	Persentase
	I	II	III	IV	V	VI		
0-100	0	0	0	2	0	1	3	10
>100-200	0	0	0	0	1	0	1	3.33
>200-300	0	0	0	0	0	0	0	0.00
>300-400	2	0	0	3	0	0	5	16.67
>400-500	1	0	0	1	0	0	2	6.67
>500-600	0	0	1	0	0	0	1	3.33
>600-700	0	0	0	0	1	0	1	3.33
>700-800	2	0	0	1	0	0	3	10
>800-900	7	0	2	1	0	0	10	33.33
>900-1000	1	1	0	1	0	1	4	13.33
Total	13	1	3	9	2	2	**30**	**100.00**

Figure 3. Map of nest distribution in research transects

Characteristics of Nest Trees

Nest and Tree Nest Height

The diameter distribution reflects the state of the environment and the condition of the forest, while the high distribution represents forest stratification. From Table 3 it can be seen that one hundred percent of orangutans choose to build nests on trees that have a large trunk with a size of more than 40 cm. The height of the tree chosen by the orangutan builds more nests at the height of more than 15 meters.

Table 3. Orangutan nest position

Diameter Category	Transect						Total	(%)
	I	II	III	IV	V	VI		
5-10cm	0	0	0	0	0	0	0	0
10-30cm	0	0	0	0	0	0	0	0
30-40cm	0	0	0	0	0	0	0	0
> 40cm	13	1	3	9	2	2	30	100
Total	13	1	3	9	2	2	30	100

Height Category	Transect						Total	(%)
	I	II	III	IV	V	VI		
5 m	0	0	0	0	0	0	0	0
>5-10 m	0	0	0	0	0	0	0	0
>10-15m	1	0	0	1	1	0	3	10
> 15 m	12	1	3	8	1	2	27	90
Total	13	1	3	9	2	2	30	100

Orangutans will choose to build nests in suitable tree structures related to adult orangutan weights reaching 30-70 kg. Nest structure and construction strongly influence the safety of orangutans while in the nest (Hawari et al., 2014; Prasetyo et al., 2012). Building a nest on a tree that has a small trunk circumference will jeopardize the position of the orangutan in the stand due to the construction that is not strong enough to hold the orangutan's body. An altitude of 10-25 meters above ground level is ideal for orangutans so as to protect orangutans from predators and parasitic animals (Stewart, 2011).

The results of the study, (Ancrenaz et al., 2004) related to the selection of tree heights as nesting sites, where the majority of orangutan nests are found at altitudes between 10 and 30 m in the mid-layer of trees and very few nests are built on tall young trees. Nest height has a significant relationship to tree height (Khoetiem et al., 2014). Similar research results were also shown by (Hawari et al., 2014). According to (Rijksen, 1978) orangutan nest height depends on the structure of the forest at a certain place.

Nest Position

The position of the nest is made to allow the orangutan to get a good and clear direction of view around the forest. The dominant nest position in this study site is position 1 (close to the main stem) with 13 nests (43.3%). Orangutans tend to place nests on strong trunks or main branches that have stable and strong branches (Casteren et al., 2013; Prasetyo et al., 2006).

Table 4. Orangutan nest position

Nest Position	Transect						Jlh	%
	I	II	III	IV	V	VI		
1	6	0	2	3	1	1	13	43.3
2	1	0	0	3	1	0	5	16.7
3	6	1	1	3	0	1	12	40
4	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
Total	13	1	3	9	2	2	30	100

Prasetyo *et al.*, 2009 explained that orangutan nests could be made in different positions in the tree. Four positions commonly used by orangutans are positions 1, 2, 3, and 4 and the unusual position is position 0. Then (Sugardjito, 1983) added that the position of the nest is above the treetop (position 3) and tree branches (position 1 and 2), both on one trunk or on two trunks has the advantage for orangutans that are not obstructed view and reach that can cover most of the forest. In addition, this position also makes it easier for orangutans to move when they leave the nest, in terms of security, this position prevents orangutans from being threatened by predators(Casteren et al., 2013; Stewart, 2011).

Figure 4. Nest on position 1

Based on (Kuswanda & Pudyatmoko, 2012) research, it turns out that the most preferred position by orangutans is position 1 and 2 with index values > 1, while positions 3 and 4 tend to be avoided. Orangutans prefer this part of the tree because it has enough nesting material. Branches and tree branches that cluster vertically and horizontally in this section, making it easier to form a circle of nests, nest bowls and supports that are able to support the bodyweight of orangutans. Prasetyo et al., 2009, states that tree position plays a major role in building nests. The position of the nest is made to allow the orangutan to get a good and clear direction of view around the forest, as in the top of the tree canopy.

Nesting tree

There are 9 family tree nests found in the field with varying amounts. Some of the trees used as nesting sites are also orangutan feed trees. There are two dominant tree families used as orangutan nests, namely from the Dipterocarpaceae family (44%) and Bombacaceae (23%) as shown in Figure 4.
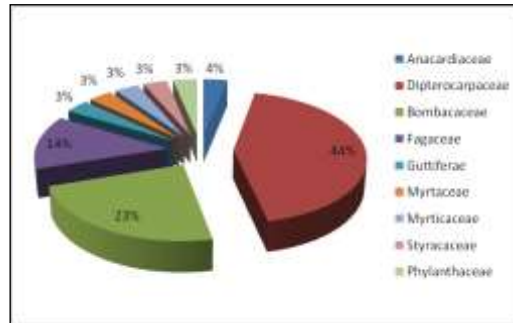

Figure 5. Selection of orangutan nest trees

Orangutans in this region use more trees from the family Dipterocarpaceae for nesting because the trees of the family Dipterocarpaceae generally have stronger trunks, have more branches and lush. Young shoots from the Dipterocarpaceae tree are also used by orangutans as an alternative feed. It was found that several orangutans used alternative food sources such as young leaves, tree bark, and insects to eat (Felton et al., 2003; Marshall et al., 2009). Dipterocarpaceae is also one of the main choices for orangutans in making nests in the Sikundur region of GunungLeuser National Park.

Nest Class

The nested class is crucial in calculating the number of nests in the field. In addition to affecting the nested class, the number of nests in the field can also determine the presence and movement of the orangutan. Nests with class C and D are generally easily seen among the canopy of the tree with green leaves. The results of this study, nest C class is the most commonly found nest class (37%). No nests were found with nest class A, data on nest class distribution can be seen in Table 3:
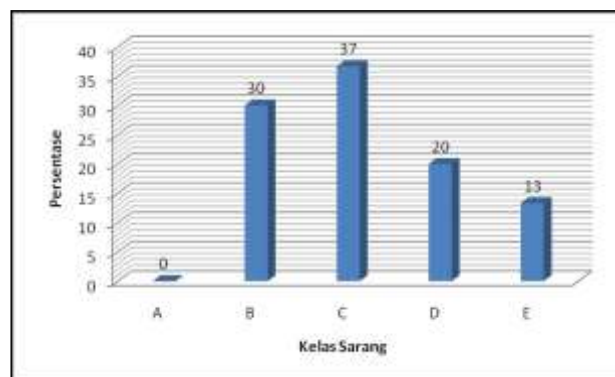
Figure 6. Nest class found

Information :
Class A: A new nest with all the leaves still green
Class B: Nest where the leaves are partially green and some are brownish
Class C: Nest where all the leaves are brown
Class D: Nest where the base is perforated and the shape is less intact
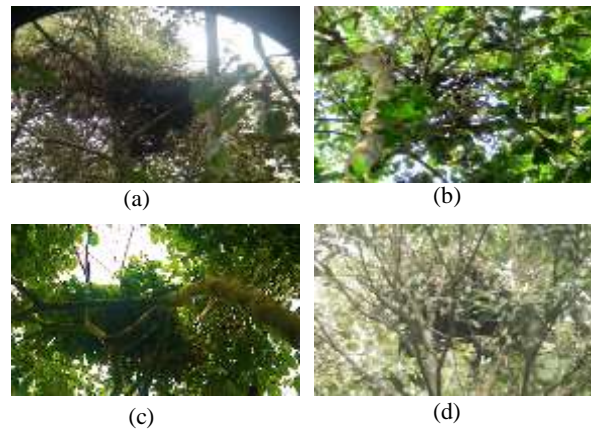Class E: Nestis a skeleton

(a) (b)

(c) (d)

Figure 7. Class of hive. (a) class B, (b) class C, (c) class D, (d) class E

The high-class C nests in this study indicate that orangutans have left the study site for a very long time. The main reason for orangutans to leave the nest is suspected to be the feed factor. Kuswanda, 2013 states that the large number of nest age classes found in the study sites that belong to the C and D class categories shows the low feed plants in these locations so that the possibility of orangutans having a large home range to get quality feed. When compared with the two previous studies, the class D nests in Bulumario and Aek Nabara villages were lower, namely 46.94% and 27.78%, respectively (Hawari et al., 2014).

Conclusions

Analysis of orangutan population estimates based on 30 nests found from all paths obtained an estimated population value of 0, 0072 individuals / km2 or 0.72 individuals/ha. The characteristics of nesting trees which are used as a place for orangutans to make nests include trees that have large stems (having a diameter of more than 40 cm) and a height of more than 15 meters. The tree species of the Dipterocarpaceae family are the tree species that are preferred by orangutans to make nests.

This research provides basic data as a recommendation for the existence of orangutans in the Sibongkaras protected forest area. Further research is needed to be related to phenology in Sibongkaras protected forest to see its effect on the density distribution of orangutan nests in the area. Research on habitat carrying

capacity and rate of decay of nests is also important to do to increase the reference for counting orangutan populations in Sumatra.

Acknowledgements

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