



Analysis of Biodiversity Potency In Gunung Lalang Forest Park, Belitung Regency

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ABSTRACT

Gunung Lalang Forest Park (Tahura) was established based on the Decree of the Minister of Environment and Forestry RI Number: 579/Menlhk/Setjen/PLA.2/7/2016, 27th July 2016. However, until now, Tahura Gunung Lalang does not have data about biodiversity condition. This study aims to determine the diversity of vegetation and animals found in Tahura Gunung Lalang. The results showed that during the data collection period, there were 34 species of tree vegetation and 17 species of lower plants. The dominant lower plants species are Lembang (*Alpinia oxymitra* K. Schum), while for the vegetation of the trees are Seruk (*Schima wallichii* (DC.) Korth. The presence of vegetation in Tahura Gunung Lalang is spread evenly. The vegetation species belong to the IUCN criteria, CITES and PP No. 7 1999 were Belanger, Resak and Ketakong/Kantong Semar. While for animal composition, there were 5 species of mammals, 10 birds and 4 species of Herpetofauna. Animals that have a large and varied number of species are from the bird class. While the types of conservation status belong to the IUCN criteria, CITES and PP No. 7 1999 are Pelile'an, Pelandok, Kera, Lutong and Burung Hantu/Owls.

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1. Introduction

Tahura Gunung Lalang is located at Gunung Lalang Conservation Forest Area, Tanjungpandan District, Belitung Regency with an area of $\pm 2,557.68$ hectares. Tahura Gunung Lalang is based on the Decree of the Minister of Environment and Forestry (LHK) RI Number: 579/Menlhk/Setjen/PLA.2/7/2016, 27th July 2016.

Determination of Conservation Forest of Gunung Lalang as Tahura has not been followed by clear boundary of area and management plan. Whereas based on the Regulation of the Minister of Environment and forestry No. 76 of 2015 on Criteria of National Park Management Zone and Nature Reserve Management Block, Wildlife Reserve, Forest Park and Nature Park, a Forest Park should plan and arrange the area by dividing the area into block management according to the results of the regional potential inventory and consider the priority of management area. Inventory of potential area is done by collecting data related to the condition of vegetation, wildlife, distribution of community activities, the potential of natural attractions, as well as physical condition data. According to Erlich (2001), biodiversity conservation effort will rely heavily on information on species conditions and species status so that the communities can get benefit from the existence of the species.

This research will analyze the potential of vegetation and wildlife in Tahura Gunung Lalang where the data will be a consideration for related stakeholders, in this case Belitung Regency Government, in arranging the Tahura Gunung Lalang management block.

2. Materials and Methods

The Location and Time of Research

The research was conducted at Tahura Gunung Lalang, located in 3 (three) villages: Perawas Village and Buluhtumbang Village as part of Tanjungpandan Subdistrict, and Air Seruk Village which is part of Sijuk Subdistrict, Belitung Regency. This study was conducted from August 2017 to October 2017.

Data Collection

Vegetation

The data collection of vegetation in this study was conducted on tree vegetation from seedlings, sapling, poles, and trees and lower plants. Data collection of tree vegetation using the modified method of quadrat Oosting 1956 (Soerianegara and Indrawan, 1988; Kusmana, 1997) with sample size of 20 mx 20 m for tree level, 10 mx 10 m for pole level, 5 mx 5 m for sapling level, and 2 mx 2 m for seedling level. The vegetation data

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collection lane is located in the area of land cover of Tahura Gunung Lalang which is still forested with a length of 3000 meters and 20 meters wide. While the lower plant data were collected from 2 x 2 m sample plot of 5 plots and placed on the sample plot of 20 m x 20 m tree vegetation data collection.

The data collection of vegetation is also done by using explorative method. The data collected by exploring the Tahura Gunung Lalang area to search for/find the vegetation which belongs to the protected criteria based on PP No. 7 1999 concerning Preservation of Plant and Animal Species.

Animals

The data Collection of animal in this study using two kinds of methods, the method of transect path (strip transect) and Rapid Assessment. The pathway transect method is carried out by means of an observer walking along a predetermined path and then recording all types of animals found. Animal data collection lane is placed on each type of land cover located in Tahura Gunung Lalang that is in secondary forest cover type of land, mining, settlement, open land, plantation, and dryland farming. The total size of the animal data collection path is 2500 m long and 50 m wide. Rapid observation methods are conducted outside the wildlife data collection path and are not limited to a particular location. Observers simply record the types of animals found, for example when conducting site surveys, walking outside observation time, and so forth (Bismark, 2011).

Data Analysis

Analysis of vegetation data consists of:

a. IVI (Important Value Index)

IVI = RD+RF+RD (for tree and pole)

IVI = RD+RF (for seedling, sapling and lower plant)

where;

- Density (D)

$$D = \frac{\text{Number of a species}}{\text{Total area sampled}} \quad (\text{N/Ha})$$

- Relative Density (RD)

$$RD = \frac{\text{Density of a species}}{\text{Total density of all species}} \times 100\% \quad (\%)$$

- Frequency (F)

$$F = \frac{\text{Area of plots in which a species occurs}}{\text{Total area sampled}}$$

- Relative Frequency (RF)

$$RF = \frac{\text{Frequency of a species}}{\text{Total frequency of all species}} \times 100\% \quad (\%)$$

- Dominance (D)

$$D = \frac{\text{Total basal area of a species}}{\text{Total area sampled}} \quad (\text{m}^2/\text{Ha})$$

- Relative Dominance (RD)

$$RD = \frac{\text{Dominance of a species}}{\text{Total dominance of all species}} \times 100\% \quad (\%)$$

b. Index of Dominance (C)

$$C = \sum_{i=1}^n \left(\frac{n_i}{N} \right)^2$$

Where:

C= Index of Dominance

n_i = IVI value of i- species

N= Total IVI

c. Margalef Species Richness Index (Dmg)

$$Dmg = \frac{S - 1}{\ln N}$$

Where :

Dmg= Margalef species richness index

S = The number of species recorded

N = The total number of individuals

d. Diversity Index (H)

Shannon Index of general diversity formula (Ludwig and Reynolds, 1988).

$$H' = - \sum_{i=1}^N \left(\frac{n_i}{N} \ln \frac{n_i}{N} \right)$$

Where:

H' = *Shannon Index of general diversity*

n_i = IVI value of i- species

N = Total IVI

e. Index of Species Evenness (E)

$$E = \left(\frac{H'}{\ln S} \right)$$

Where:

E = Index of Species Evenness

H' = Diversity Index

S = The number of species recorded

While the analysis of animal data consist of:

a. Population Density

$$D = \frac{n}{2LW}$$

Where:

D=Population density (number of individuals/ha)

n= Number of individuals every species

L= Total length of transect

W= Transect width

b. Diversity Index (H)

Shannon Index of general diversity formula (Ludwig and Reynolds, 1988).

$$H' = - \sum_{i=1}^N \left(\frac{n_i}{N} \ln \frac{n_i}{N} \right)$$

Where:

H' = *Shannon Index of general diversity*

n_i = IVI value of i- species

N = Total IVI

3. Results and Discussion

Vegetation

Composition and Species Dominance

Based on the result of vegetation analysis, total number of tree species were 34 species, while for the lower plants were 17 (Table 2 and 3). The dominant species for lower vegetation levels (have

the largest INP) is Leping (*Alpinia oxymitra* K. Schum), while for the type of vegetation at the seedling, sapling, pole and tree level is Seruk (*Schima wallichii* (DC.) Korth. According to Tandju (1988) in Nurdin (2002), the large value of INP explains that the species has a higher level of roles and adaptations to the environment than other types.

Pattern of concentration and Diversity

According to Sutanto (2002), the pattern of concentration and diversity of species can be known by looking at the dominance index (C) and the index value of species diversity (H'). The value of the dominance index (C) illustrates the type of concentration pattern in a stand. The interval of the dominance index is between zero and one. If the value of the dominance index is closer to one, then the stand or vegetation community is dominated by a single plant or concentrated in one species only. While the Value of Type Diversity Index is in the range of 1.0-3.5. If the value of the Diversity Index is close to 3.5, it represents a high level of species diversity (Magurran (1998) in Akhiarni (2008). The values of the Dominance Index and the Diversity Index in Tahura Gunung Lalang are presented in Table 1.

The results of the analysis show that the dominant index value for all growth rates (Table 1) is in the range of 0.1. This means that the vegetation composition found in Tahura Gunung Lalang is not only controlled by one plant species, but there are also other types of vegetation. While the index value of diversity

of species has a level of "medium" because it has a range between 1.0-3.5 (2.2-2.5).

Table 1. Dominance Index (C) and Diversity Index (H) in Tahura Gunung Lalang

No	Level of Growth	Dominance Index (C)	Diversity Index (H')
1.	Lower Plant	0,09	2,53
	Seedling	0,16	2,52
	Sapling	0,15	2,35
	Pole	0,11	2,41
	Tree	0,15	2,21

Margalef Species Richness Index (Dmg) and Index of Species Evenness (E)

Margalef richness Index is an index showing the richness of a community type, where the value of this index is influenced by the number of species and individuals of the vegetation present in the area. Although a community has a large number of species, but if the number of individuals is also large, then the index of species richness remains small when compared with other communities whose numbers are almost the same as the first community but the number of individuals is less. Based on the Magurran criterion (1988) in Akhiarni (2008), species richness in an observation plot is said to be high if the value is above 5.00.

Table 2. Tree Species in Tahura Gunung Lalang

No	Scientific Name	Local Name	Family
1.	<i>Ilex cymosa</i>	Mensira	Aquifoliaceae
2.	<i>Calophyllum lanigerum</i>	Betor	Clusiaceae
3.	<i>Endospermum diadenum</i> (Miq.) Airy Shaw	Libut	Euphorbiaceae
4.	<i>Schima wallichii</i> (DC.) Korth	Seruk	Theaceae
5.	<i>Palaquium rostratum</i>	Nyato	Sapotaceae
6.	<i>Litsea elliptica</i> Blume	Medang Perawas	Lauraceae
7.	<i>Garcinia</i> sp	Kandis	Clusiaceae
8.	<i>Camptosperma auriculata</i> Hook.f.	Terentang	Anacardiaceae
9.	<i>Hevea brasiliensis</i> Muell Arg	Karet	Euphorbiaceae
10.	<i>Syzygium</i> sp.	Mengkelingan	Myrtaceae
11.	<i>Eusideroxylon zwageri</i>	Bulin	Lauraceae
12.	<i>Tristanopsis whiteana</i> Griffith	Pelawan	Myrtaceae
13.	<i>Lithocarpus blumeanus</i> (Korth.) Rehd.	Kabal	Fagaceae
14.	<i>Adinandra domosa</i> Jack	Pelempang	Theaceae
15.	<i>Archidendron pauciflorum</i> (Benth.) I.C.Nielsen	Jering	Fabaceae
16.	<i>Hynocarpus</i> sp.	Pelepak	Flacourtiaceae
17.	<i>Vatica rassak</i>	Resak	Dipterocarpaceae
18.	<i>Engelhardia serrata</i> Blume	Beberi	Juglandaceae
19.	<i>Shorea Belangeran</i> Burck	Belanger	Dipterocarpaceae
20.	<i>Ixonanthes petiolaris</i> Blume	Jurong	Linaceae
21.	<i>Aporosa aurita</i> Baill.	Pelangas	Euphorbiaceae
22.	<i>Guioa pleuropteris</i> Radlk.	Pulas	Sapindaceae
23.	<i>Syzygium lepidocarpa</i> Kurz.	Samak	Myrtaceae
24.	<i>Dillenia suffruticosa</i> Griff. ex Hook	Simpor Bini	Dilleniaceae
25.	<i>Dillenia eximia</i> Miq.	Simpor Laki	Dilleniaceae
26.	<i>Aleurithes moluccana</i>	Kemiri/Kumbek	Euphorbiaceae
27.	<i>Garcinia bancana</i>	Manggis Hutan	Guttiferae
28.	<i>Eurycoma longifolia</i>	Pasak Bumi	Simaroubaceae

29.	<i>Ploiarium alternifolium</i> Melchior	Renggadaian	Theaceae
30.	<i>Alstonia scholaris</i>	Pulai	Apocynaceae
31.	<i>Artocarpus integer</i>	Cempedak	Moraceae
32.	<i>Rhodamnia cinerea</i> Jack, Mal. Misc	Jemang	Myrtaceae
33.	<i>Nephelium rubescens</i> Hiern	KerANJI	Sapindaceae
34.	<i>Durio zibethinus</i> Murr.	Durin	Bombaceae

Table 3. Lower Plant Species in Tahura Gunung Lalang

No	Scientific Name	Local Name	Family
1	<i>Alocasia macrorhiza</i> Schoot.	Keladi	Araceae
2	<i>Axonopus compressus</i> Swartz Beauv.	Rumput Pait /Rumput Karpit	Poaceae
3	<i>Nepenthes ampullaria</i> Jack	Ketakong	Nepenthaceae
4	<i>Alpinia oxymitra</i> K. Schum	Lepang	Zingiberaceae
5	<i>Psychotria viridiflora</i> Reinw. Ex Blume	Tenam	Rubiaceae
6	<i>Dicranopteris linearis</i> (Burm. F.)	Resam/Beruta'	Gleicheniaceae
7	<i>Imperata cylindrica</i> L.	Lalang	Poaceae
8	<i>Ixora coccinea</i> L.	Soka	Rubiaceae
9	<i>Melastoma malabathricum</i> L.	Keleta'an	Melastomataceae
10	<i>Mimosa invisa</i> Mart. Ex Colla	Putri malu	Fabaceae
11	<i>Pandanus</i> sp.	Pandan	Pandanaceae
12	<i>Pennisetum purpureum</i> Schumach.	Rumput Bulu	Poaceae
13	<i>Rhodomyrtus tomentosa</i>	Keremunting	Myrtaceae
14	<i>Uvaria hirsuta</i> Jack	Larak	Annonaceae
15	<i>Ampelocissus thyrsoflora</i> Planch.	Lelambai	Vitaceae
16	<i>Clidemia hirta</i>	Keremunting Laki	Melastomataceae
17	<i>Nephrolepis biserrata</i> (Sw.) Schoot.	Pakis Utan	Davalliaceae

Index of Species Evenness is an index showing the level of evenness of species abundance in an area of observation. The value of the evenness index is directly proportional to the diversity index of species. If the value of the diversity index are big, then the value of species evenness index will be greater. The value of species evenness index range from zero to one. If the value closer to one, then the value of the species evenness will be greater.

Table 4. Margalef Species Richness Index (Dmg) and Index of Species Evenness (E)

No	Level of Growth	Margalef Species Richness Index (Dmg)	Index of Species Evenness (E)
1.	Lower Plant	2,59	0,89
	Seedling	4,43	0,77
	Sapling	3,54	0,78
	Pole	2,72	0,94
	Tree	2,58	0,89

The result of analysis show that Tahura Gunung Lalang has more species at the growth rate of seedlings compared to other growth rates, which is 4.43. From Table 4 it can also be seen that the evenness index in all research sites is above 0.70 (close to 1). This means that the level of evenness of species in the study sites is very high. This also means that the presence of vegetation found in Tahura Gunung Lalang for each growth rate

is evenly distributed.

Vegetation Outside Observation Lane and Conservation Status

The type of vegetation found outside the data collection path is the *Nepenthes ampullaria* Jack, while the species whose conservation status is categorized into IUCN, CITES, and PP No. 7 of 1999 are presented in Table 5 as follows:

Table 5. Conservation Status of Vegetation in Tahura Gunung Lalang

No	Local Name	Scientific Name	Conservation Status		
			IUCN	CITES	PP No 7 1999
1	Belanger	<i>Shorea Belangerian</i> Burck	CR	-	Not Protected
2	Resak	<i>Vatica rassak</i>	CR	-	Not Protected
3	Ketakong	<i>Nepenthes ampullaria</i> Jack	LC	Appendix II	Protected

Animals

Composition of Species

Based on animal inventory conducted on all types of land cover in Tahura Gunung Lalang, found 5 species of animals from Mammal class, 10 species of birds, and 4 species of animals from Herpetofauna (Table 6). Animals from the bird class are the most common animals found in Tahura Gunung Lalang, especially in the type of Secondary Dryland Forest cover. The number of bird

species on secondary forest land cover is due to this area there are many trees standing. According to Rohman (1997) in Alghiffari (2015), trees in the forest area can be used as bird habitat. Meanwhile, based on land cover type, secondary dryland forest is the type of land cover that has the most number of animals compared to other types of land cover.

Table 6. Species of Animals in Tahura Gunung Lalang

No	Scientific Name	Local Name
Mamalia		
1.	<i>Macaca fascicularis</i>	Kera/Monyet Ekor Panjang
2.	<i>Trachypitecus</i> sp.	Lutong
3.	<i>Cephalopachus bancanus saltator</i>	Pelilean
4.	<i>Tupaia gracilis</i>	Tupai
5.	<i>Tragulus</i> spp.	Pelandok
Aves/Burung		
1.	<i>Streptopilia chinensis</i>	Tekukur
2.	<i>Corychus malabaricus</i>	Murai Batu
3.		Limbongan
4.		Berebak
5.	<i>Trochilidae</i> sp.	Pentis
6.		Kerucik
7.	<i>Treron vernans</i>	Punai
8.	<i>Copsychus saularis</i>	Kacer
9.	<i>Ninox scutulata</i>	Burung Hantu
10.	<i>Passer domesticus</i>	Burung Gereja
Herpetofauna		
1.	<i>Eutropis multifasciata</i>	Mengkarong/Kadal Kebun
2.	<i>Caloselasma rhodostoma</i>	Ular Tanah
3.	<i>Gekko gekko</i>	Tokek
4.	<i>Fejervarya limnocharis</i>	Kodok

Population Density (D) and Species Diversity (H)

The Result of Population Density and Species Diversity Analysis (Table 7) shows that the largest animal population density is in the bird class with a value of 0.96 individuals/ hectare, with the index value of species diversity 1.26. This means that the animals of the bird class are the dominant species and have numerous and varied species in Tahura Gunung Lalang.

Table 7. Population Density (D) and Species Diversity (H)

No	Animals Class	Population Density (D) (ind/Ha)	Species Diversity (H)
1.	Mammal	0,53	0,60
2.	Bird	0,96	1,26
3.	Herpetofauna	0,57	0,65

Animals Outside Observation Lane and Conservation Status

The animals found outside the data collection path are Pelandok/Kancil and Pelile'an (*Cephalopachus bancanus saltator*). Whereas the type whose conservation status is categorized into IUCN, CITES, and PP No. 7 of 1999 are presented in table 8 as follows:

Table 8. Conservation Status of Animals in Tahura Gunung Lalang

No	Local Name	Scientific Name	Conservation Status		
			IUCN	CITES	PP No 7 1999
1.	Pelile'an	<i>Cephalopachus bancanus saltator</i>	VU dan EN	Appendix II	Protected
2.	Pelandok	(<i>Tragulus</i> spp).	DD	-	Protected
3.	Kera	<i>Macaca Fascicularis</i>	LC	Appendix II	Non Protected
4.	Lutong	<i>Trachypitecus</i> sp.	VU	Appendix II	Non Protected
5.	Burung Hantu	<i>Ninox scutulata</i>	LC	Appendix II	Non Protected

4. Conclusion

Based on the results of the discussion, it can be concluded that vegetation Composition of Tahura Gunung Lalang consists of 34 species of vegetation trees and 17 species of lower plants. The dominant lower plants species are Leping (*Alpinia oxymitra* K. Schum), while for the vegetation of the trees are Seruk (*Schima wallichii* (DC.) Korth. the presence of vegetation in Tahura Gunung Lalang is spread evenly. The vegetation species belong to the IUCN criteria , CITES and PP No. 7 1999 were Belanger, Resak and Ketakong/Kantong Semar. While for animal composition, there were 5 species of mammals, 10 birds and 4 species of Herpetofauna. Animals that have a large and varied number of species are from the bird class. While the types of conservation status belong to the IUCN criteria, CITES and PP No. 7 1999 are Pelile'an, Pelandok, Kera, Lutong and Burung Hantu/Owls.

In addition to research on biodiversity, in the future there should be further research on the physical condition in Tahura Gunung Lalang such as slopes, rainfall, soil type, topography, Potency of nature and cultural tourism, and distribution of community activities, which are needed as other consideration in preparation of Tahura Gunung Lalang management block.

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REFERENCES

- Akhiarni Y. 2008. Composition and Structure of Forest Vegetation of LOA Former Fire 1997/1998 And Growth of Meranti (*Shorea spp.*) In PMUMHM Area at IUPHHK PT. ITCI Kartika Utama East Kalimantan. Theses. Institut Pertanian Bogor. [Indonesian].
- Alghiffari, A., F. 2015. Environmental Capacity Assessment and Strategy of Natural Tourism Development of Curug Nangka at Utilization Zone of Halimun Salak National Park. Theses. Universitas Padjadjaran. [Indonesian].
- Bismark, M. 2011. Standard Operating Procedure (SOP) for Surveys of Species Diversity in Conservation Areas. Center for Climate Change Research and Development and Bogor Policy. Bogor. [Indonesian].
- Erlich, P.R. and Erlich. A.H., 2002. The Value of Biodiversity. *Ambio* 21. 219-226.
- Kusmana, C. 1997. Method of Vegetation Survey. PT. Publisher Bogor Agricultural University. Bogor. [Indonesian].
- Ludwig and Reynolds. 1988. Statistical Ecology. John Wiley and Sons: New York.
- Ministry of Environment and Forestry RI. 2015. Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number P.76/Menlhk-Secretariat/2015 on Criteria of National Park Management Zone and Nature Reserve Management Block, Forest Park and Nature Park. Jakarta.
- Ministry of Environment and Forestry RI. 2016. Decree of the Minister of Environment and Forestry RI Number SK. 579/Menlhk/Setjen /PLA. 2/7/2016 on Function Determination in Main Function of Nature Reserve Area and Nature Conservation Area as Kawasan Taman Hutan Raya Gunung Lalang in Belitung Regency Province of Bangka Belitung Islands covering an area of $\pm 2,557.68$ Hectares. Jakarta.
- Nurdin JF. 2002. Standing Structure and Plant Type Composition At Montana Zone in Gunung Gede Mountain Forest, West Java. Theses. Institut Pertanian Bogor. [Indonesian].
- Oosting, H.J. 1956. The Study Of Plant Communities. Freeman and Company: London.
- Republic of Indonesia. 1999. Government Regulation No. 7/1999 on the Preservation of Plant and Animal Species. State Gazette of the Republic of Indonesia 1999, Number 14. State Secretariat. Jakarta.
- Sutanto A. 2002. Succession of Vegetation of Tree Types and Lower Plants Post Eruption of Mount Galunggung (Case Study in Tasikmalaya BKHH, KPH Tasikmalaya PT (Persero) Perhutani Unit III West Java Theses. Institut Pertanian Bogor. [Indonesian].
- Soerianegara, I and Indrawan, A. 1988. Indonesian Forest Ecology. Ecology Laboratory Faculty of Forestry Bogor Agricultural University. Bogor. [Indonesia]