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HABITAT CHARACTERISTIC OF SUNDA CLOUDED LEOPARD (Neofelis diardi Cuvier 1823) IN BATUTEGI PROTECTION FOREST LAMPUNG

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ABSTRACT

Sunda clouded leopard (Neofelis diardi Cuvier, 1823) is a predator that threatened by habitat fragmentation due to the conversion of forest into residential and agricultural areas. One of the habitats of sunda clouded leopard in Sumatra is in the Batutegi Protection Forest. This research aimed to identify the habitat functions of sunda clouded leopard and its characteristic. Data were collected by direct observation using vegetation plots, line transect, camera trapping, and indirect observation to determine signs of animal activities. Vegetation and canopy openness analysis was used to describe the habitat characteristic, while data of potential prey were analyzed using species diversity and abundance indices. The results show that hunting area for sunda clouded leopard was an area with dense canopy cover (64,67%). Resting area and cover area for sunda clouded leopard were areas with very dense canopy cover (78,64% and 73,43%). Potential prey diversity and abundance with higher rate found in lowland forest (H'=2,35), while the lower rate found in sub-montane forest (H'=1,81).

Key words: *habitat, prey, sunda clouded leopard*

INTRODUCTION

The Sunda clouded leopard (*Neofelis diardi* Cuvier, 1823) is a predator that only found on the islands of Sumatra and Borneo. The Sunda clouded leopard in Sumatra rarely gets attention because it is covered by the presence of the island's top predator the Sumatran tiger (Maryani et al. 2014). The Sunda clouded leopard is classified as vulnerable according to the International Union for Conservation of Nature (IUCN) Red List and it is protected by the Indonesian government in the Minister of Environment and Forestry Regulation Number P.106 of 2018 concerning protected plant and animal species. the clouded leopard is an elusive and cryptic animal, those traits are some of the reasons why research on the Sunda clouded leopard is still less than other members of Phanterinae (Hearn et al. 2013). The biggest threat currently faced by the Sunda clouded leopard is deforestation and habitat fragmentation due to the conversion of forest functions for human needs, considering that the Sunda clouded leopard is an arboreal animal, its dependence on forest ecosystems is very high.

The Batutegi Protection Forest is one of the protected forests in Indonesia and is managed by the Batutegi KPHL (Protection Forest Management Unit). In the Batutegi Protection Forest, there is still a high diversity of wildlifes (Huda et al., 2018). Due to the status of the Batutegi Protection Forest which is not established for conservation purpose, it will subject to conversion for the sake of human needs. If this occurre, it will be able to disrupt its biodiversity includes Sunda clouded leopard. The Sunda clouded leopard is one of the predators in the Batutegi Protection Forest which is very sensitive to land cover changes. Therefore, research on the habitat of the Sunda clouded leopard is important as an initial effort to preserve ecosystem and its biodiversity. This study aims to identify and analysis the habitat characteristic of the Sunda clouded leopard.

RESEARCH METHOD

This study was carried out in January-March 2022 in Resort Way Sekampung and Resort Batulima in Batutegi Protection Forest (Figure 1). The research instruments were headlamp, GPS, plastic rope, measuring tape, and camera. The data collected were the Sunda clouded leopard potential prey and vegetation (structure, composition, canopy coverage). The Sunda clouded leopard potential prey data was collected by direct observation using line transect to count the number of individuals and species found and indirect observation to determine signs of animal activities. The observation was done in four area in two different habitat types, lowland forest and sub-montane forest.

Vegetation data was collected in the same area as potential prey data by vegetation analysis using vegetation plots (Figure 2) (Soerianegara and Indrawan 1980). The plots used were 3 in each area and selected by the presence of clouded leopard's activities signs (scratchs and scrapes). Measurement at seedling level (the height of sample <1.5 m) use a 2m x 2m plot. Sapling level (the height of sample >1.5 m and stem diameter <10 cm) use 5m x 5m plot. Pole level (plant diameter between 10-20 cm) use 10m x 10m. The tree

level (diameter >20 cm) use 20 m x 20 m. Variables measured were diameter, height, and canopy, name, and number of individuals. The variables were calculated to have Importance Value Index (IVI) representing vegetation analysis.

The analysis of vegetation canopy coverage was done by analyzing vegetation profile with Spatially Explicit Individual-based Forest Simulator (SExI-FS). The analysis of the Sunda clouded leopard potential prey was done by ecological indices analysis those were species diversity index, species richness index, and species evenness index. Species diversity is an expression that connects number of species to the number of individuals, while evenness index is to identify the community evenness.

a. Shannon-Wiener Species Diversity Index (Magguran 2004)

$$H' = -\sum pi \ln pi$$

Where:
H' = species diversity index
pi = abundance value (ni/N)

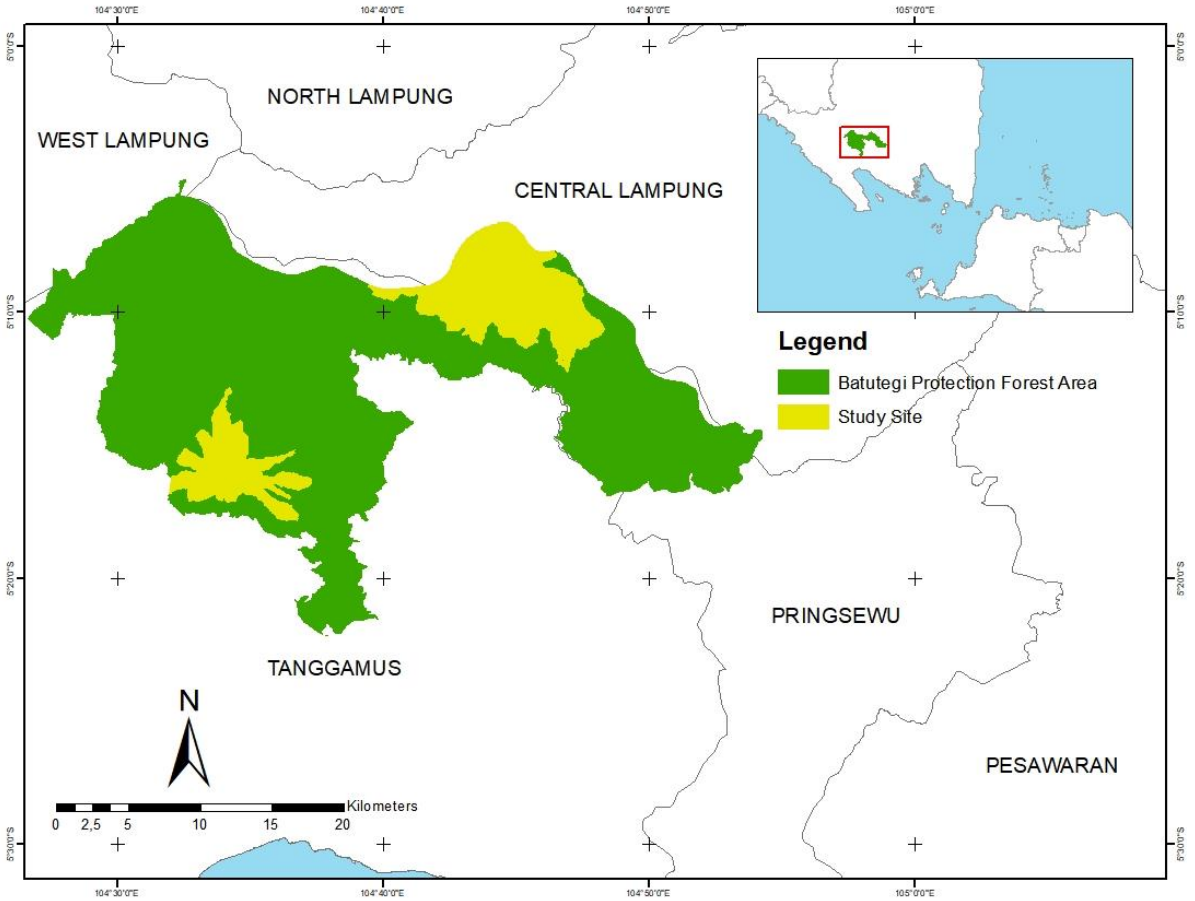

Figure 1 Research site map

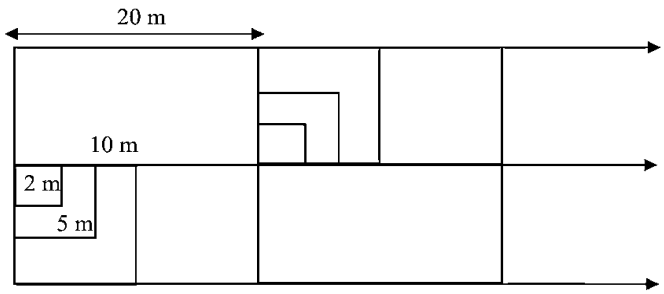

Figure 2 Vegetation analysis plots

b. Species Eveness Index (Magguran 2004)

$$E = \frac{H'}{ln\ S}$$

Where:
E = degree of species eveness
S = number of species found

c. Species Richness Iindex (Magguran 2004)

$$D_{mg} = \frac{S-1}{ln\ N}$$

Where:
Dmg = Margalef species richness index
N = number of individuals found

d. Species abundance (Brower dan Zar 1997)

$$Psi = \frac{ni}{N} \times 100$$

Where:
Psi = Species abundance percentage
ni = number of individuals in species-I

RESULT AND DISCUSSION

1. Resting area characteristic

The sunda clouded leopard resting area was a forest with high density canopy cover and continuous branching among trees. Areas with high density canopy cover are able to withstand sunlight entering the forest floor so that they can be used as resting places. The signs of activity that indicate the presence of the Sunda clouded leopard found in this area are only the scratches on tree trunks. The lack of traces of clouded leopard activity in the bed area is due to little activity of the Sunda clouded leopard in this area other than sleeping and resting.

The scratches found on the Schima wallichii tree have an average diameter (dbh) of 35.7 cm and an average branch-free height of 11.18 m. The Sunda clouded leopard tends to choose a location with vegetation that has a branch-free height between 8-14 m to sleep and rest (Kuncahyo 2015). The vegetation in this area was found at the seedling level as many as 12 species, at the sapling level as many as 9 species, at the pole level as many as 4 species, and at the tree level as many as 7 species. Schima wallichii is the most dominant species in the area used as a resting place by the Sunda clouded leopard (Table 1).

The vegetation canopy coverage analysis showed that the sunda clouded leopard resting area had a canopy cover of ±78.64% (Figure 3). The area with a dense vegetation canopy cover could optimally prevent the entry of sunlight that arboreal animals like the Sunda clouded leopards prefers to rest (Lestari 2006).

Table 1 Highest Vegetation IVI value in the Sunda clouded leopard resting area

Level	No	Name of species	IVI
Seedling	1.	*Macaranga sp.*	46.32
	2.	*Antidesma neurocarpum*	37.23
	3.	*Schima wallichii*	32.47
Sapling	1.	*Schima wallichii*	46.89
	2.	*Lithocarpus bennettii*	46.89
	3.	*Macaranga sp.*	42.12
Pole	1.	*lithocarpus bennettii*	101.05
	2.	*Schima wallichii*	85.38
	3.	*Antidesma neurocarpum*	74.01
Tree	1.	*Schima wallichii*	166.51
	2.	*Lithocarpus bennettii*	38.54
	3.	*Macaranga sp.*	23.78

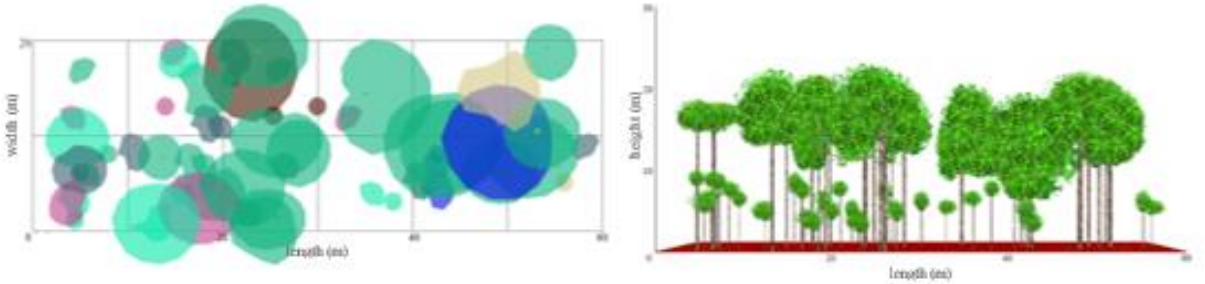

Figure 3 Vegetation profile in the Sunda clouded leopard resting area

2. **Hunting area characteristic**

The Sunda clouded leopard hunting area was a forest that has complete canopy strata with dense canopy cover, it was overgrown with seedlings, saplings, and shrubs, it was also has a high abundance of potential prey animals. The complete canopy strata in the area where the Sunda clouded leopard hunts can provide space for potential prey animals, the presence of food plants for potential prey animals and the flow of water in the area where the Sunda clouded leopard hunts make the area a place for animal concentration. Resting around water sources for predators is one strategy for hunting, where when prey animals approach water sources, predators will wait behind bushes and can immediately ambush the prey (Gunawan and Alikodra 2013). There were signs of Sunda clouded leopard activity in the hunting area those were feces and scrapes.

There were 10 species of vegetation in this area at the seedling level, 12 species at the sapling level, 6 species at the pole level, and 8 species at the tree level. Endospermum malaccense became the most dominating species in the three growth stages (Table 2). This is because Endospermum malaccense is one of the feeding trees for the sunda clouded leopard prey, Macaca fascicularis (Kamilah et al., 2013) and Symphalangus syndactylus (Thiyana 2019). Macaca fascicularis utilizes leaf and Symphalangus syndactylus utilizes the fruit part of the Endospermum spp. as feed Analysis of canopy cover showed that the Sunda clouded leopard hunting area had a canopy cover of ±64.67% (Figure 4).

3. **Cover area characteristic**

The Sunda clouded leopard cover area was a forest with high density canopy cover and it was densely overgrown with understory vegetations. The dense canopy cover and understory vegetation can serve as a place for wild animals to take refuge from disturbances, it can also make animals like the Sunda clouded leopard easier to disguised from the surrounding environment. Clouded leopards are elusive and cryptic animal, so it will avoid open places with little shade (Hearn et al. 2013). There was a record of the Sunda clouded leopard presence in cover area (Figure 5).

There were 12 species of vegetation in this area at the seedling level, 10 species at the sapling level, 5 species at the pole level, and 7 species at the tree level. Hopea odorata became the most dominant species at the tree level in the Sunda clouded leopard cover area (Table 3). Vegetation from the genus Hopea have high density of crown (Maria et al., 2016). The tree with dense canopy can withstand incoming sunlight and is suitable as a shelter for arboreal animals like clouded leopards. The canopy cover analysis showed that the sunda clouded leopard shelter area had a canopy cover of ±73.43% (Figure 6). high density vegetation used by wildlife as a place to hide and avoid disturbance (Lestari 2006).

Table 2 Highest Vegetation IVI value in the Sunda clouded leopard hunting area.

Level	No	Name of species	IVI
Seedling	1.	*Antidesma neurocarpum*	38.89
	2.	*Dipterocarpus sp.*	33.33
	3.	*Endospermum malaccense*	27.78
Sapling	1.	*Endospermum malaccense*	45.96
	2.	*Antidesma neurocarpum*	34.85
	3.	*Macaranga sp.*	34.85
Pole	1.	*Lithocarpus bennettii*	96.26
	2.	*Litsea sp.*	82.10
	3.	*Dipterocarpus sp.*	66.60
Tree	1.	*Shorea multiflora*	75.07
	2.	*Endospermum malaccense*	47.10
	3.	*Lithocarpus bennettii*	42.02

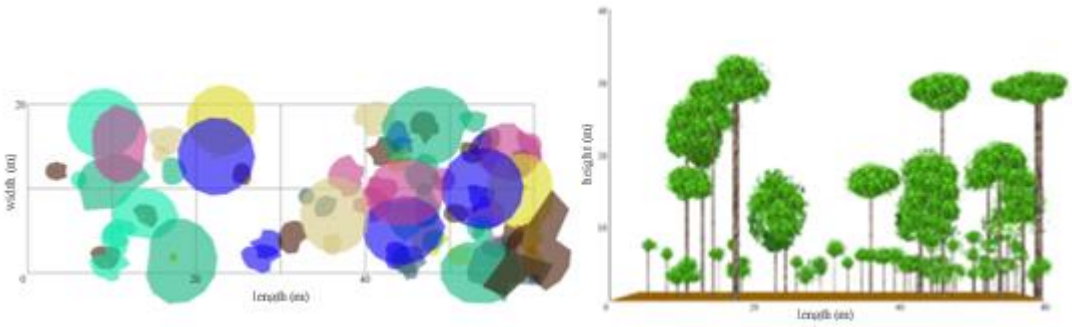

Figure 4 Vegetation profile in the Sunda clouded leopard hunting area

Figure 5 Presence of the Sunda clouded leopard in cover area (copyright IAR Indonesia)

Table 3 Highest Vegetation IVI value in the Sunda clouded leopard cover area (the Sunda clouded leopard presence)

Level	No	Name of species	IVI
Seedling	1.	*Shorea multiflora*	60.00
	2.	*Shorea leprosula*	42.22
	3.	*Lithocarpus bennettii*	31.11
Sapling	1.	*Syzygium lineatum*	53.33
	2.	*Palaquium gutta*	42.22
	3.	*Shorea leprosula*	42.22
Pole	1.	*Palaquium gutta*	73.72
	2.	*Lithocarpus bennettii*	72.26
	3.	*Macaranga sp.*	69.00
Tree	1.	*Hopea odorata*	67.68
	2.	*Palaquium gutta*	52.65
	3.	*Macaranga sp.*	51.17

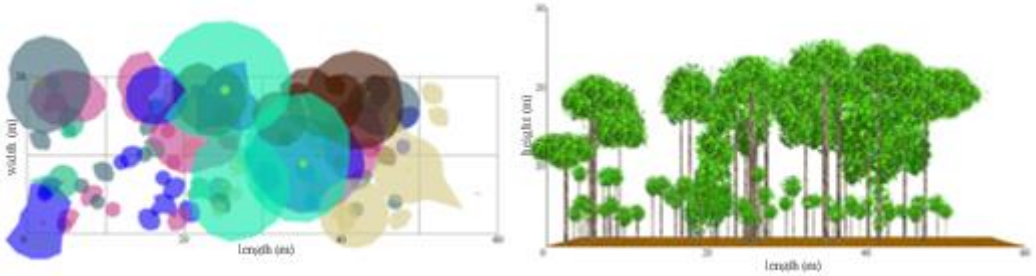

Figure 6 Vegetation profile in the Sunda clouded leopard cover area

4. **Potential prey**

Data of the Sunda clouded leopard prey was taken in areas with the Sunda clouded leopard activities signs then identified as two different habitat types, those were sub-montane forest (Batulima) and lowland forest (Way Sekampung). The diversity of prey species of the Sunda clouded leopard in the lowland forest habitat (Way Sekampung) is higher than the diversity of prey species in the sub-montane forest habitat (Batulima) (Table 4). The Sunda clouded leopard has a variety of prey due to the arboreal nature of the Sunda clouded leopard. Clouded leopards have the ability to hunt in trees as well as the ability to hunt above the ground, so clouded leopards have a variety of prey animals (Grassman et al., 2005). The prey species of the Sunda clouded leopard that have high species abundance in both habitat types are primates, where in the sub-montane forest habitat (Batulima) the highest abundance of prey species is simpai (*Presbytis melalophos*) and in lowland forest habitat (Way Sekampung). The highest abundance of prey species is siamang (*Symphalangus syndactylus*) (Table 5).

The tendency of the Sunda clouded leopard to choose primate prey assumed to avoid competition with other predators. In Kalimantan, the Sunda clouded leopard's predation on the proboscis monkey (*Nasalis larvatus*) occurs when there is no threat of predation from crocodiles (Matsuda et al., 2008). In addition, considering that in the Batutegi Protection Forest there is still a top predator, namely the Sumatran tiger (*Panthera tigris sumatrae*) which has a dominant behavior as a terrestrial animal. Clouded leopards and tigers have similar activity patterns, the daily activities of the two species have a high degree of overlap (Lynam et al., 2013).

Table 4 Species diversity, species richness, and species eveness of the Sunda clouded leopard prey

Location	Type of habitat	Dmg	H'	E
Resort Batulima	Sub-montane forest	2.27	1.81	0.93
Resort Way Sekampung	Lowland forest	2.97	2.35	0.98

Table 5 The Sunda clouded leopard potential prey abundance

No	Name of species	Batulima abundance (%)	Way Sekampung abundance (%)
1	*Argusianus argus*	-	6.90
2	*Nycticebus coucang*	7.14	-
3	*Macaca fascicularis*	14.29	10.34
4	*Macaca nemestrina*	7.14	6.90
5	*Presbytis melalophos*	28.57	6.90
6	*Hylobates agilis*	-	6.90
7	*Symphalangus syndactylus*	-	17.24
8	*Sus scrofa*	14.29	6.90
9	*Tragulus napu*	-	10.34
10	*Muntiacus muntjak*	7.14	6.90
11	*Ratufa bicolor*	-	10.34
12	*Hystrix brachyura*	21.43	10.34

CONCLUSION

The characteristic of Sunda clouded leopard hunting area was a forest with abundance potential prey animals, and a small water stream overgrown with understory vegetation. Meanwhile, for its resting place was dominated by homogenous vegetation with high canopy density. In addition for cover habitat was an area dominated by vegetation that has a very high canopy density. The Sunda clouded leopard potential prey in the lowland forest habitat (Way Sekampung) has higher species diversity and abundance values than the Sunda clouded leopard potential prey in the sub-montane forest habitat (Batulima) which has lower species diversity and abundance values. Primates were the Sunda clouded leopard potential prey that have highest abundance.

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