ECOLOGICAL ANALYSIS OF UNDERSTORY VEGETATION AROUND ENDANGERED ORCHID PENCIL (*Vanda hookeriana* Rchb.) FROM LAKE DUSUN BESAR NATURE RESERVE BENGKULU

Efri Roziaty

Pendidikan Biologi FKIP Universitas Muhammadiyah Surakarta, Central Java, Indonesia
Email : eroziaty@yahoo.com ; er375@ums.ac.id

Abstract

The research on Ecological Analysis Of Understory Vegetation Around Endangered Orchid Pencil (*Vanda Hookeriana* Rchb.) From Danau Dusun Besar (DDS) Nature Reserve Bengkulu held on February to December 2013. The research is located around endangered Pencil orchid in DDS Bengkulu Province. Pencil orchid is an endangered orchid in the world. It's an endemic orchid from DDS Bengkulu Province. The research used purposive sampling techniques in site selection and using 2 m x 2 m = 4 m^2 plot for sampling. The highest *Important Value Index* (INP) value is *Imperata* sp. (Graminae) 78.60 %. Some ecological factors which influenced the vegetation such as temperature, humidity, sunlight penetration and the pH of the water. The researcher stated that the assessment needs to be done about the ecological aspects of orchid pencil in their natural habitat.

Key words : Danau Dusun Besar Bengkulu, understory vegetation, endemic orchid.

1. Introductions

In a community of forest ecosystem, plants would normally be found in an habitus between 1-2 m above ground called understory vegetation. Understory vegetation structure is one component in forest ecosystems play an important role as supporting the composition of forest vegetation. Understory vegetation structure can be a shelter for habitat fauna and macrofauna [1].

Orchids are herbaceous plants which are distinguished based on how / where the growth is epiphytic orchids and terrestrial orchids. Orchids are epiphytic orchids that live attached to other plants called the host but does not cause harm to the host organism. Meanwhile, orchids are terrestrial orchids that live in the soil. Pencil orchids belonging to the orchid epiphytic who stays in the host organism [2].

Orchids are included in the small group of family epiphytes that have different characteristics from algae, lichens, fungi, ferns and woody plants. Type of epiphytic plants are around 30,000 species comprising 10% of whom are ethnic Orchidaceae (orchids) [3].

Lake Dusun Besar Nature Reserve region contain endemic flora one of them are orchids species. This pencil orchids are so few that are very difficult to find in endemic areas or the natural habitat. Thus, the conservation status of these orchid categorized almost extinct. Therefore , efforts should be made to the conservation or protection of rare flora in their natural habitat [4].

Lake Dusun Besar Nature Reserve Bengkulu situated in the city, with a height of 0-1 m above sea level (Ludarubma, 2009). Determination of the region as a habitat conservation area because there is a pencil orchid (*Vanda hookeriana* Rchb.). That grow naturally around the Lake Danau Dendam Tak Sudah. Based on 2010 data, forest encroachment and DDB CA area use them in the form of oil palm plantations (52.97 ha/9.18 ha); mixture of agricultural land (12.6 ha/2.18%), rice (200.39 ha/34.73 %); road axis (2.2 ha/0.38 %), and encroachment (200.39 ha/34.73 %). While the nature reserve region area that is still not disturbing for only a 210 ha width /36,4 %. Until now active encroachment still continue occuring [5].

Lake Dusun Besar Nature Reserve region contain endemic flora one of them are orchids species. This pencil orchids are so few that are very difficult to find in endemic areas or the natural habitat. Thus, the conservation status of these orchid categorized almost extinct. Therefore , efforts should be made to the conservation or protection of rare flora in their natural habitat [4] .

2. Material and Method

Implementation research that lasted for ten months in February 2013 to December 2013 held at the Lake Dusun Besar Nature Reserve Bengkulu. The equipment used in this study is a rope, bar

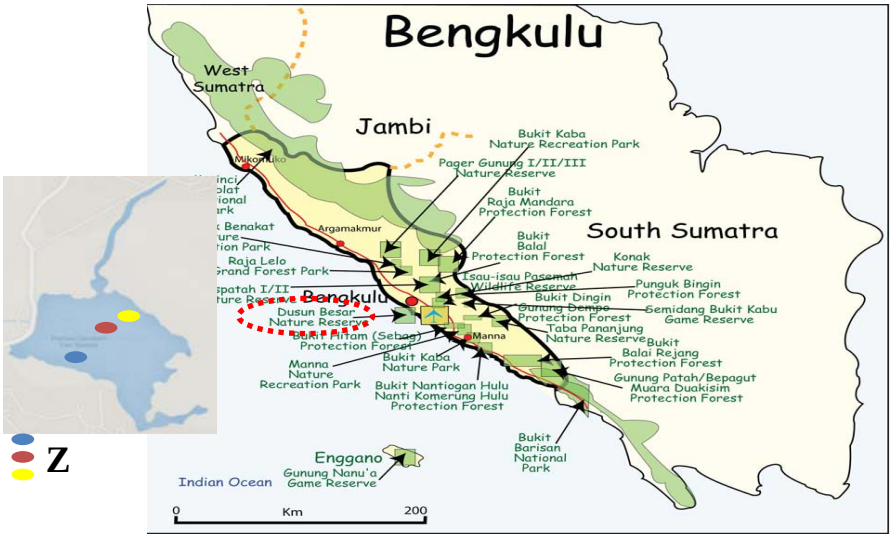

Figure 1. Lakes Dusun Besar Nature Reserve location of sampling sites were divided into two main zones, namely zone 1, zone 2 and zone 3

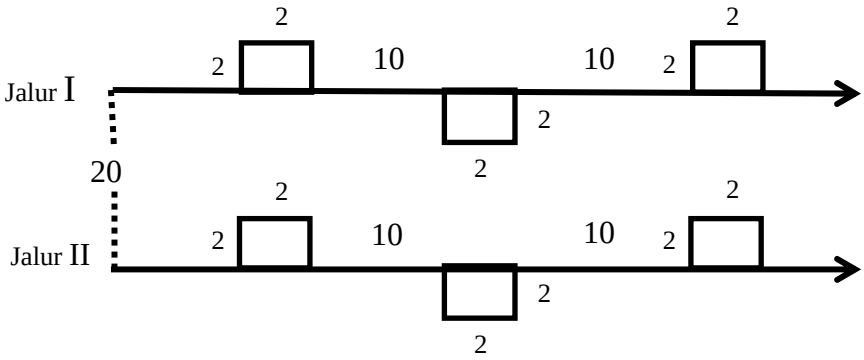

Figure 2. Scheme analysis of vegetation transects

plots, erlenmeyer, hygrometers, diameter tape, plastic rope that had been measured in accordance extensive plot, sacchidisk, compass and camera as well as stationery. Chemicals used consumables is 40 % ethanol and formalin for preservation purposes contained plants in the plot.

Determination of the location of the samples was done by purposive sampling method is based on the existence of orchid plants that are considered representative of the site, while for observation and collection of orchids in the community, using Squares Method. Squares method is the method used in the sampling technique to study the vegetation analysis using sample plot or plots. This method uses a non permanent plots rectangular squares or rectangles with a certain size. Based on the survey location in Lake Dusun Besar Nature Reserve Bengkulu, known as the is divided into three zones: the first zone close to the mainland with the assumption that there are many lilies as the primary host orchid pencil. And zone 2 and zone 3 is in the water bodies . In zone 1 made 1 track with the size of 2 mx 2 m (Figure1) [2].

In zone 1 made by 1 transect made by 2 plots In zone 2 made as much with each transect 3 - 3 pieces each plot. Zone 3 made 4 transects consisted of transects 1 by 1 plot, transect 2 as much as 3 plots, transects 3 by 2 plot and transect 4 consisted of 3 plots. Between zones 1 and 2, 3 separated by a water barrier marsh (Figure 2). Sampling for physical and chemical factors include temperature, humidity, light penetration. While factors include pH measurements of water chemistry. Measurement of each - each abiotic factors will be conducted for each using a particular instrument in accordance with its function in the measurement of factors - such abiotic factors [2].

By analyzing vegetation and it will be known composition or composition of vegetation in the form (structure) of the vegetation communities of plants in this pencil orchid (*Vanda hookeriana* Rchb.). For purposes of analysis of vegetation data required for vegetation types present in the plot, domi-

nance and frequency of vegetation indices to determine the importance of the constituent communities of the forest. With the analysis of vegetation can be obtained quantitative information about the structure and composition of a plant community. From the data obtained will provide information such as the composition of the vegetation in the area, suspect that there is a diversity of flora and perform correlation analysis between vegetation by environmental factors .

Data analysis was performed orchid ecology quantitatively by using the equation the following equation. The data is Important Value Index (INP). The INP contains Density (K); Relative density (KR); Frequency (F); Relative frequency (FR); Important Value Index (INP) = KR + FR [6].

3. Results and Discussion

3.1. Physical and chemical factors

From the measurement results of the factor - physics and chemistry at the hamlet of Lakes Dusun Besar Nature Reserve conducted at three locations (zones) that is close to the zone and the zone of swamp land. The water temperature range is 27 - 28°C. It is possible because when the temperature measurements performed on during the day around 10:00 am. Temperature variation when shooting is not too high /different. Temperature variations and changes that have relatively slow because the water has a large specific heat.

Table 1. Physical conditions factors of waters Lakes Dusun Besar Nature Reserve

No	Physical factors			Chemist factor
	T (^oC)	H(%)	S (m)	pH
1	27 – 27,5	91 - 93	1,5	5,5 - 6
2	28	93,2	1,5	6
Range	**27 – 28**	**91 – 93,2**	**1,5**	**5,5 – 6**

T = water temperature
H = Humidity
S = Sunlight penetration

The temperature fluctuations in the tropical waters generally do not change too high throughout the year so that the water temperature does not fluctuate too much . Temperature is a very important factor in regulating the whole process and the spread of the organism . In addition to the heat of the sun, other factors that affect the flow of surface water temperature is, the state of the cloud, upwelling, divergence and convergence especially around the area waters. The temperature also influenced by rainfall, air temperature, air humidity, and wind speed. The temperature of the water surface also usually follows a seasonal pattern. Changes in temperature can cause the circulation and stratification of water masses and it will affect the organisms present in the water body [7].

Humidity range is around 91-93 %. Air humidity value is usually opposite to the temperature value, if the temperature is high so humidity is low. If the temperature is low, the humidity will be high. According to Michael (1995), the air humidity is an important abiotic factor because it can affect the activity of the organism and may also limit its distribution in an ecosystem. Swamp is generally influenced by the wet tropical climate (Noor , 2007). In the rainy season , marsh experience filling or inundation, otherwise during the dry season water availability will decline sharply. If deterioration occurs unchecked, it will cause water shortages that will result in the survival of flora and fauna in it.

Light penetration is relatively low in the measuring range of 1.5 m, it is assumed to be due at the time of the measurement is carried out during the rainy season. According Sastrawijaya (2000), the ability of sunlight or light penetration in water bodies depends on the content of suspended material (concentrate) in the water. In the rainy season, the suspended material carried away from the bottom waters to the surface and result in lower incoming light penetrates the water .

For the measurement of water chemistry factors, acidity of water (pH) ranged between 5.5 - 6. In marsh areas, areas with fresh water until the water quality was quite good to have a pH of about 5-7. However, because this land is the land of downstream is

Table 2 . Pencil Orchid existence in each zone on the plot example

Zone	Transect	Plot	Orchids existence	Total		Keterangan
1	1	1	No	0	1	No flower
		2	exist	1		
2	1	1	exist	1	8	No flower, the stem is still small and young
		2	exist	1		
	2	1	exist	1		
		2	exist	2		
		3	exist	1		
	3	1	No	0		
		2	exist	1		
		3	exist	1		
3	1	1	exist	2	11	No flower, the stem is still young.
		2	No	0		
	2	1	exist	1		
		2	exist	1		
		3	exist	2		
	3	1	exist	3		
		2	No	0		
	4	1	exist	3		
		2	exist	1		
		3	exist	1		

strongly influenced by the activities of upstream section . Various human activities are located in the upper waters will lead to declining water quality. So it would appear a lot of pollution to the water bodies (Noor, 2007).

3.2. Vegetation Analysis

Based analysis vegetation that has been done in the area of the Lake DDB Nature Reserve in the third study zone is zone 1 , zone 2 and zone 3. In one zone, located at the edge of the lake with a number invidu found only 1 individual in both plots. Total individuals are often found in zone 3 is 11 individuals (Table 2). From total 19 plots made, only 15 plots is

Important Value Index (INP) calculation in habitat *Vanda hookeriana* the highest one is *Imperata* sp. (Graminae) 78.60 % and the lowest one is *Vanda hookeriana* (Orchidaceae) 19.65 % (Table 3). The orchid is one of the endangered species of orchid endemic in Bengkulu province.

INP value indicates the position of the type of *Imperata* sp. (grass tribes) to other species in the swamp community in the Lakes Dusun Besar Nature reserve. These values are derived from the value of the relative density (KR) and relative frequency (FR). The greater the value of INP then we can say the greater the level of mastery of these types in the community [6;8].

3.3. Plants that grow around *Vanda hookeriana*

On this research, observation of plants which grow around the orchids are extremely done. The plants that are always present in all test plots are based on the highest number of *Imperata* sp. (Graminae) is a group of grass categorized weeds. The grass can multiply rapidly even in nutrient-poor habitats, like

Table 3. Understory vegetation which found around Pencil orchid in Danau Dendam Bengkulu

Transect	Total of individual			Family
Zone 1				
	Plot 1	Plot 2	Plot 3	
Transect 1	5	-	-	Polypodiaceae
	52	18	-	Graminae
	15	50	-	Dryopterydaceae
	30	20	-	Cyperaceae
	20	16	-	Liliaceae
	5	3	-	Nympaceae
	22	-	-	Rubiaceae
Zone 2				
Transect 1	20	30		Dryopterydaceae
	3	7	-	Liliaceae
Transect 2	50	20	30	Dryopterydaceae
	20	20	-	Cyperaceae
	-	2	10	Liliaceae
Transect 3	17	22	31	Cyperaceae
	7	5	10	Liliaceae

moist conditions, submerged or shaded.

Genus Nephrolepis is a group of ferns. This group is generally a vegetation or undergrowth that is almost always there in the forest floor area of tropical forest like Indonesia. Ferns growing in a variety of habitats, including terrestrial habitats in the soil and epiphytes, either shaded or open to the light/ sunlight. Epiphytes associated with mossy woods and even sometimes the rocks. These ferns are many in the swamp habitats – wetlands.

Plants are known as the host of *Vanda hookeriana* is *Crinum asiativum* or daffodil. The daffodil is a kind of herbaceous plants , annual , ± 1.3 m high. It has a pseudo stem, ± 10 cm in diameter, erect, soft, greenish white. Single leaf , lanceolate, 32-120 cm lenght, 10 cm width, thick, flat brimmed, pointed tip, base obtuse, green. Compound interest, umbrella shape, flattened stems, thick, 35-120 cm length , the base attaches crown, funnel shape, the flower is white around ± 16 cm long, purple stamens, stalk pollen 5-10 cm long, anthers color is orange, elliptical shaped ovaries ± 1.5 cm length. The fruit is oval contained 1 seed . Hard seeds, kidney shape, length ± 5 cm black. The root is like fibers, cylindrical shape, the colour is white.

4. Conclusions and Recommendations

In the research that has been carried out it was concluded that the INP *Vanda hookeriana* is 19.65 % the lowest one while the highest one is *Imperata* sp. (Graminae) with INP value of 78.60 %. The understory vegetation around Pencil orchid is the family of Graminae.

We need to creat many research of understory vegetation especially in an endemic site in nature reserve in many area in Indonesia. It's very important to support the vegetation in the habitat.

References

Fang ZQ, Bao WK, Yan XL and Liu X. 2014. *Understory Structure and Vascular Plant Diversity in Naturally Regenerated deciduous Forest and Spruce Plantation on Simi-*

lar Clear – Cuts : Implications for Forest Regeneration Strategy Selection. Forests. **2014**, 5, 715 – 743; fulltext : www.mdpi.com/journal/forests.

Roziaty E. *Preservation Of Endangered Orchid Pencil (Vanda Hookeriana Rchb.) From Lake Dusun Besar Nature Reserve Bengkulu.* Prosiding : seminar Nasional Sains and Enterpreneurship 2014. Universitas PGRI Semarang.

Febriliani, Ningsih SM, dan Muslimin. 2013. Warta Rimba Vol. 1 No. 1. Jurusan Kehutanan Fakultas Kehutanan Universitas Tadulako.

Santoso U. 2008. Keanekaragaman Hayati di Propinsi Bengkulu. Full text : http://uripsantoso.wordpress.com. Diakses : 20 Desember 2013. Artikel Kajian Lingkungan Hidup. Universitas Bengkulu.

Susanti D, *et al.* 2011. *Profil Kawasan Cagar Alam Danau Dusun Besar.* BKSDA Bengkulu.

Setiadi D, Muhadiono, Yusron A. 1989. *Penuntun Praktikum Ekologi*. Diktat Perkuliahan. Institut Pertanian Bogor.

Barus T.A. 2004. *Pengantar Limnologi Studi Tentang Ekosistem Air Daratan.* USU Press. Medan.

Soerianegara I, Indrawan A. 2005. Ekologi Hutan Indonesia. Modul Kuliah. Laboratorium Ekologi Hutan Fakultas Kehutanan Institut Pertanian Bogor.