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The Distribution Pattern of Palm Plants (*Arecaceae*) in Lore Lindu National Park Area, Sedoa Village

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ABSTRACT

Sulawesi Island has a fairly high level of palm endemics (72%), 58% genus and 68% species. Palms that grow in the area are native to this island. Therefore, the distribution pattern of these plants needs to be revealed. The current research aimed to analyze the species composition and distribution pattern of palm trees (*Arecaceae*) in Lore Lindu National Park, Sedoa village. Surveying and plotting methods were employed in a square area of 200 m x 200 (four hectares). 20x20m subplots were dug inside the area and 40 plots were randomly picked as the samples. Nine palm plant species with 397 individuals in total were successfully identified: *Calamus zollingeri* Becc., *Areca vestiaria* Becc., *Calamus koordersianus* Becc., *Caryota Mitis* Lour, *Calamus* sp., *Areca catechu* L., *Daemonorops* sp., *Areca* sp., *Daemonorops robusta* Werb. ex Becc). The highest Morisita Index value (Iδ=5.81818) was observed in *Lauro* or *Rotan* (rattan) *Lentedui* (*Daemonorops sp*) while the lowest Morisita Index (MI) value (Iδ= 1,70582) was reported by *Lauro* or *Rotan* (rattan) *Batang* (*Calamus zollingeri* Becc). The figures (Iδ>1) suggested that palms distributed in the research area were mostly found in groups or clusters.

INTRODUCTION

Indonesia belongs to one of the highest biodiversity centers in the world, particularly of palm diversity. There are more or less two hundred and sixteen genus of palm found on earth. Forty six of them can be found in Indonesia and twenty nine genus are endemic to Sulawesi. This number is possible to increase due to a wide range of areas that are yet to be inventoried (Witono *et al.*, 2000).

Sulawesi has a high level of palm endemics (72%), 68% species and 58% genus. Palms that inhabit this bio-region are native to that island. Some endemic palm species from Sulawesi include *Pigafetta elata* Becc., *Licuala celebica* Miq., and some rattan species such as Taimanu (*Korthalsia celebica*), Tohiti (*Calamus inops* Becc. ex. *Celebicus* Becc.), Batang *(Calamus zollingerii* Becc.), *Calamus minahassae*, *Calamus koordersianus* Becc., *Calamus symphisipus* Mart., and many others (Mogea, 2002).

According to the Decree of the Forestry and Plantation Minister No/464/KPTS-II/1999 dated on 29 January 1999, Lore Lindu has been appointed as a National Park (LLNP). Based on the Forestry Minister regulation No. P.03/Menhut-II/2007, since 1 February 2007, the management of the National Park has been delegated to *Balai Taman Nasional Lore Lindu* (LLNP). Referring to the decree of zone division, this National Park lies on an area of 215.733,70 ha in between Sigi and Poso Regencies, Central Sulawesi. Lore Lindu National Park (LLNP) is unique in terms of the ecosystem, flora, and fauna live within. One of the distinguished characteristics of LLNP is that it provides a habitat for a great diversity of palm species (BTNLL, 2014).

Arecaceae (Palm) family according to Sudarnadi (1996) *in* Siregar (2005) is the oldest family of flowering plants. Research on fossils has suggested that palms have been found since the cretaceous era which existed about 120 millions years ago.

Sedoa village with an area of 51.879 ha can be divided into three parts: 48% (±24.902) of the lands in the west and north are parts of the LLNP conservation area, meanwhile 46% (±23.864 ha) of the east and south areas serve as the protected forest, and the rest or 6% of it will be used for the residential land, agriculture and other social facilities and infrastructure (Huma, 2014).

Human activities are very intense in this area. One of the examples is the conversion of the function of the area, especially for agriculture. This land conversion effort has threatened the sustainability of a large number of flora and fauna living in LLNP, including the endemic palm plants (BTNLL, 2016).

MATERIALS AND METHODS

This research was conducted in LLNP area, Sedoa vilage, North Sulawesi district, Poso regency, Central Sulawesi. It employed a surveying method. The research area resembled a square with an area of 4 hectares (200x200m). Ten observation paths were created on the plot. Each path contained 10 plots with a size of 20x20m. Of 100 plots, 40 observation plots were selected randomly. Every palm plant found on the observation plots was identified on the field. However, if the field identification was not successful, parts of the palm species such as stem, leave, flower, fruit would be labeled, put into a specimen bag, and given alcohol 70%. The bag was sealed and transferred to the Technical Implementation Unit of Biological Resources in Universitas Tadulako for further examination. The observation data was analyzed to investigate the distribution pattern of the palm plants (*Arecaceae*) using MI **(**I*δ*). MI **(**I*δ*) was chosen because of its consistency despite the area of the sampling station and its reliability in comparing the distribution pattern of the plants (Browet *et al*., 1990 *in* Adrianto, 2015). The MI **(**I*δ*) was calculated using the following formula:

$$I\delta = \frac{n \sum Xi\,(Xi-1)}{N\,(N-1)}$$

Iδ = Morisita Index (MI)

N = number of the total individuals

n = number of the total sampling plots

Xi = the amount of per plot

Morisita Index value would be interpreted as follows:

Iδ<1, the distribution of n individuals is likely random,

Iδ=1, the distribution of n individuals is likely even,

Iδ>1, the distribution of n individuals is likely clustered.

I. RESULTS AND DISCUSSION

1. Research Findings

Based on the research findings, there were 9 palm species successfully identified. The composition of the plants was presented in Table 1 below.

Table 1. The Composition of the Palm (*Arecaceae)* Plant Species.

No.	Local Name	Scientific Name	Status	No of plots	No of individuals
1.	Lauro Batang	*Calamus zollingeri* Becc.	E	21	89
2.	Yellow Pinang	*Arecavestiaria* Becc	E	8	24
3.	Lauro Pai	*Calamuskoordersianus* Becc	E	16	64
4.	Lauro D	*Caryotamitis* Lour	Lc	7	10
5.	Lauro Noko	*Calamus* sp	E	16	65
6.	Green Pinang	*Areca catechu* L	Lc	8	25
7.	Lauro Lentedui	*Daemonorops* sp	Lc	6	11
8.	Lauro H	*Areca* sp	E	8	17
9.	Lauro Botol	*Daemonorops robusta* Werb. ex Becc.	E	19	92
		Total		109	397

Source of data: Research Data 2018.

Note: E: Endemic to Sulawesi.

Lc: Least Concern

Table 1 suggested that there were 9 palm plant species found in the research area, consisting of 109 clusters and 397 individuals. Rotan Batang (*Calamus zollingeri* Becc) was the most commonly encountered palm (89 individuals and 21 clusters) on the observation plots and *Caryotamitis* Lour was the least concerned species with 10 individuals and 7 clusters in total found on the observation plots.

The research also successfully identified four palm genus as follows:

1. Genus *Calamus,* which consists of three species, Lauro Batang (*Calamus zollingeri* Becc), Lauro Pai (*Calamuskoordersianus* Becc), and Lauro Noko (*Calamus* sp),

2. Genus *Areca,* which also consists of three species, Yellow Pinang (*Arecavestiaria* Becc), Green Pinang (*Areca catechu* L), and *Areca* sp,

3. Genus *Daemonorops*,which consists of two species, Lauro Lentedui (*Daemonorops* sp), and Lauro Botol (*Daemonorops robusta* Werb. ex Becc), and

4. Genus *Caryota*, which only consists of one species, *Caryotamitis* Lour.

The distribution pattern of the palm (*Arecaceae*) plants in the current research was analyzed using the MI (Iδ) formula. The results were depicted in the following table (Table 2):

Table 2. The Distribution Pattern of Palm Plant Species in LLNP, Sedoa Village

No.	Local Name	Scientific Name	Morisita Index (Iδ)	Distribution pattern
1.	Lauro Batang	*Calamus zollingeri* Becc.	1.7082	Clustering
2.	Yellow Pinang	*Arecavestiaria* Becc	4.49275	Clustering
3.	Lauro Pai	*Calamus koordersianus* Becc	2.22222	Clustering
4.	Lauro D	*Caryotamitis* Lour	3.55556	Clustering
5.	Lauro Noko	*Calamus* sp	2.48077	Clustering
6.	Green Pinang	*Areca catechu* L	4.13333	Clustering
7.	Lauro Lentedui	*Daemonorops* sp	5.81818	Clustering
8.	Lauro H	*Areca* sp	4.70588	Clustering
9.	Lauro Botol	*Daemonorops robusta* Werb. ex Becc.	1.94935	Clustering

Source of data: Research Data, 2018

Table 2 indicated that all *Arecaceae*plantswhich grew on the LLNP were found in clusters. The highest MI value (5.81818) was observed in Lauro Lentedui (*Daemonorops* sp) while the lowest MI value (1,70582) was found in Lauro or Rotan (rattan) Batang (*Calamus zollingeri* Becc). Clustering distribution pattern is a pattern that occurs most frequently in nature. Furthermore, Indriyanto (2008) argues that clustered population is actually a common pattern, both for plants and animals. This statement is in line with the results of the research which showed that the palm plants found in the national park area were distributed in clusters.

The distribution pattern of all palm plant species inhabited the research area was clustering. Arecaceae live in groups because they have thick fruit flesh and rough seeds skin so that animals are reluctant to serve as the dispersion agent. Also, the heavy Aracaceae fruit does not allow the wind to help the plants in distributing the seeds. As a result, there are only two reasons that make the palm plants live in clusters. The first is if the plants breed with seeds or fruits, it makes it possible for the seeds or fruits to fall near the parents. The other reason is associated with the microenvironment. Homogeneous habitats in a macro environment could

consist of some different microsites; therefore, the plants are able to grow in an appropriate environment. Plant species that live in the most convenient microsites will possess a higher population density (Barbour, 1980 *in* Dani, 2016).

According to Bismark and Murniati (2011) *in* Natalia (2014), the evolving theory mentions that the uniform distribution pattern is less likely to appear in nature. Instead, plant species are normally found in clusters. Siti (2012), adds that this phenomenon may result from the tendency of the individuals to gather and look for an environmental condition that can help them to fulfil their life necessities. Clustering occurs due to the advantageous interactions established among the individuals. However, this distribution pattern also has the ability to increase the competition within the same population in terms of the effort to search for nutrients, space, and light.

The clustering distribution pattern can also happen because the plants reproduce with seeds that can fall near the parents or with rhizomes which are able to generate vegetative saplings that are still close to the parents. As is suggested, the clustered species individuals tend to be distributed in groups instead of having regular and random distribution patterns (Djufri, 2002 *in* Sofiah, 2013).

II. CONCLUSION

Based on the research findings, it can be concluded that: :

1. Palm (*Arecaceae*) plants found in the LLNP could be identified in 4 genus and 9 species with the composition: *Calamus zollingeri* Becc, *Areca vestiaria* Becc., *Calamus koordersianus* Becc., *Caryotamitis* Lour, *Calamus* sp., *Areca catechu* L., *Daemonorops* sp., *Areca* sp., *Daemonorops robusta* Werb. ex Becc). The total number of the individuals was 397 trees.

2. Lauro Lentedui (*Daemonorops* sp) reported the highest MI value (*Iδ*=5.81818) while the lowest MI value (*Iδ* = 1.70582) was observed in Lauro or Rotan (rattan) Batang (*Calamus zollingeri* Becc). All the observed plants suggested a Iδ >1 MI value which indicated that the distribution pattern of the palm (*Arecaceae*) plant species found in the research area could be categorized into the clustering pattern.

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