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The Profile of Dipterocarpaceae In Momiwaren Protected Forest in South Manokwari District West Papua

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Abstract. The family Dipterocarpaceae is one of the families which dominated tropical forest in lowland area, but the existence of this type is very restricted in eastern Indonesia region. Information about Dipterocarpaceae is imperative because there are different types of Dipterocarpaceae which have been listed in the category of endangered status. Therefore, research is required to obtain data about the potency of the family Dipterocarpaceae in West Papua region. The method used for collecting data at tree and stake levels was continuous strip sampling method while at sapling and seedling levels was line plot sampling method with nesting plot. The data were analyzed by mean density value, frequency, and important value index (IVI). The result of this study found three types of Dipterocarpaceae namely Vatica rassak, Anisopthera thurifera and Hopea iriana. Vatica rassak had the highest IVI at tree level as 14.302 and the lowest level was the poles level as 9.90. Meanwhile, species H. iriana had INP of 0.176% at the seedling level and 0.114 at sapling level. Tree and pole levels were not found in this species. Based on stratification type, Vatica rassak had B stratification with the height between 20 and 30 m.

1. Introduction

Tropical rain forest of low-land area is a type of terrestrial vegetation with the most complex and the highest number of species in the world [1][2]. Low-land tropical rainforests are located in wet areas in Indonesia, and is predicted the area of low-land tropical rainforests of Papua is around 176.750 km² or 26.5% of the total low-land tropical forests in Indonesia.

The family Dipterocarpaceae is one of the family who dominated scrublands tropical low-land area, and thus it has very important in ecology aspect. The family has the largest number of species in the world, more than 500 species, where most of the species distribution are found in Indonesia which is as many as 238 species [1]. [3] said that the distribution of Dipterocarpaceae in Indonesia is even throughout the archipelago of Indonesia, where the diversity towards Eastern Indonesia region becomes less. Dipterocarpaceae was mostly found in Borneo (200 species), Sumatra (111 species) and Papua [2]. Dipterocarpaceae has significant role in wood trade due to high commercial values. However, the ecology of the species from the family has several limiting factor(s) to grow and distribute due to climate, soil and altitude factors.

There are 21 type of Vatica spp which is endemic the Indonesian archipelago. The family Dipterocarpaceae their distribution are known in the region of Papua is V. papuana [3]. This type is of allegedly one type of endemic Dipterocarpaceae to the island of Papua. [4] further reported that the family of Dipterocarpaceae was sighted in the region of Ransiki in West Papua. But types of Dipterocarp that have been found as well as the potency were not explained in detail.
Momiwaren Protected Forest was located in Manokwari regency, however the forest had been handed over to Manokwari Selatan regency as part of devolution policy from the federal government in Papua Barat Province. The Dipterocarpaceae population in the area was estimated being degraded not only due to growth limiting factors but also the mismanagement in protected forest as well as the change in political and policy aspects in the opening of forest area and its conversion to other functions. In addition, the surrounding area of the forests, there are people who lived and make use of forest resources in order to fulfill their needs. Considering Dipterocarpaceae is one of the family that have high commodities value even some of which were included in the category of endangered status based on the IUCN criteria, then the information about the potency, type of Dipterocarpaceae are highly required for development and conservation. The purpose of this research was to examine the potency the family Dipterocarpaceae in the lowland forests of Manokwari Selatan, Papua Barat Province.

2. Material and Methods

2.1 Study Area

This study was conducted in preserved forest area of Sub-district Momiwaren, South Manokwari. The type of protected forest Momiwaren is lowland forest of the light slope to steep (Figure 1).

![Figure 1. Location of Momiwaren South Manokwari, 133° 59' 8.1276” BT until 134° 9'19.7712” BT and 1° 32' 34.098'' LS to 1° 49' 21.9792'' LS.](image)

Material and equipment necessary in this research is all kinds of trees included in the family of Dipterocarpaceae identified in research plot, expedition book, label, stationary paperwork, compass, meter (30m), Phi band and GPS.

2.2. Sampling

The observation was located on protected forest in Momiwaren for 50 acre area. With gap between lines 500 meter, with the number of the observation is 10 lines, in which in each line there were 25 principal observation plot so the total observations were 250 plots. A method of the example to tree level and the done with continuous strip sampling method on a level and seedling stake in a line plot sampling method used systematic with nesting plot.

2.3. Material Collection

Plant species of Dipterocarpaceae were taken in plots and every individual was identified according to the scientific name. Species identification was performed by two vegetation identifiers from herbarium technician. Unidentified samples were set as voucher specimens and were sent to
Herbarium of Forest Research Institute Manokwari and Herbarium Manokwariense to be further identified. used systematic with nesting plot.

2.4. Data Analysis
Density. Density was then used to describe number of each species per hectare (ind ha⁻¹). Density was carried out for all plant life-forms. Basal Area (BA). Basal area was only performed for tree. Basal area will be computed by taking into account diameter for tree species. The computation of BA is as, where \( BA_i = \sum D_i^2 \times 0.7854 \), where BA is basal area (m²) of tree species \( i \), \( D_i \) is diameter (m) of tree species \( i \), 0.7854 is \( \pi \) divided by 4. Then, BA per hectare where \( BA_{of} \) tree species is divided by area of plots (m²ha⁻¹) as density. The BA for each species is used to describe how large the tree species dominate in location. Diversity index. Shannon-Weiner diversity index was singled out as parameter and to describe distribution of each species in term of number of individuals by computing evenness (E) [5]; [6]. The diversity index is calculated as \( H' = -\sum p_i \ln (p_i) \), where \( H' \) is Shannon-Weiner diversity index, \( p_i \) is number of sample in which species \( i \) is present. Evennessmeasured using in which \( S \) is numberof species. Frequency. All species of plant life-forms were described using frequency. Furthermore, number of plots where tree species \( i \) is present are divided by total number of sample plots. Hence, the frequency is calculated as where \( F_{ri} \) is frequency of species \( i \), \( n_i \) is number of plots in which species \( i \) is found. N is total number of sample plots. Importance value index (IVI). The important values index was performed only for tree level and was calculated to figure out distribution of each tree species in term of dominance [7]. The index is determined by adding relative frequency, relative density and relative dominance as where \( IV_i \) is important value index of tree species \( i \), \( RF_{ri} \) is Relative Frequency of tree species \( i \), \( RD_{ei} \) is Relative Density of tree species \( i \), \( RD_{oi} \) is Relative Dominance of tree species \( i \).

3. Result And Discussion
3.1 Species Composition
Based on the inventory results in the low-land tropical forests of Momiwaren, the total kinds of woody vegetation found was 296 species. Where to phase seedling found was 223 species, phase sapling was 211 species, phase pole was 24 species, and tree phase was 175 species (Figure 2). Composition of vegetation in lowland forests varied, even some of them are endemic type. According to [1], wet tropical forest is one of terrestrial vegetation with the most complex and the highest number of its kind in the world.

Figure 2 The composition of tree in lowland forests in South Manokwari

Papua has a high diversity flora, but according to [8] the number of family spread relatively little. It is proven where from 250 plot observations on tropical forests lowland Momiwaren, the family Dipterocarpaceae found only three types of the V. rasak, Anisopthera thurifera and H. iriana unlike in the Western Malesia.
Density and the number of trees contained in each plot varied, it is very influenced by a variety of factors. That there are several factors affecting ecosystem instability in Papua including; the damage due to the earthquake and forest physical damage because trees, also phenomenon associated with el nino namely the accident happened at regular intervals every seven years namely the period long dry season with various intensity, which could cause the ecological effects of important for vegetation in Papua. Besides the illegal logging will influence forest ecosystem, where damage caused by logging activities very vary depending on trees volume harvested and its composition.

Density relatively of the family Dipterocarpaceae found in the Momiwaren region exhibiting that kind of *V. rasak* of the relatively high density on all the plant growth (Figure 2). But for this kind of *H. iriana* in phase trees and the not found . [9] said that when phase stake and seedling found in an area has density low, so when a certain kind of this will disappear from trees. And for this kind of *H. iriana* found this, need to get special attention from the silviculturist in maintaining the existence of this type in nature.

**Figure 3** Relative density of Dipterocarpaceae in South Manokwari

Value density kind of vegetation are related to the condition place growing, especially the nutrient element, such a concentration phosphor and magnesium. [10] reported that his wealth kind of Dipterocarpaceae in Berau Regency higher for land have drainage either by slope who being compared to places drainage ugly with slope so steep. According to [2], variety of in the forest torrid wet many caused by the presence of the interaction that complex between factors physical.

### 3.2 Dominance of tree species

Based on the results of the analysis vegetation, hence the value of relative dominance to a kind of *V. rasak* is 4.75 % and *A. thurifera* only 0.16 %, was to that phase of a mast to *V. rasak* 4, 95 % and the type of *A. thurifera* of 0.085 % was for a kind of *H. iriana* not to be found at phase trees and phase the mast. The results is very different model with the result [11] at the forest research Labanan in Berau Regency with broad plot observation three hectares, that the dominant relatively to Vatica sp can reach 42,92 %. [12] said that the majority of primary forest remaining at in Kalimantan, dominated by Dipterocarpaceae. Ecologically the value of vegetation determined by the function of dominant species that is the result of interplay of components that are existing in ecosystem. Dominant species is species of which have the highest score in ecosystem concerned, so that the types of these can affect the stability in ecosystem.
[13],[14] said that the dominant is of the type can use environment inhabited efficiently compared to other kinds in the same place.

3.3. Importance Value Index

Important value indeks is value state the role of a plant in their community. The higher index value a species, so the greater also the role of such in a community where measured. The research result indicates important value indeks V. rasak higher than important value indeks kind of other Dipterocarp. This indicates that V. rasak holding an important role in community the ones on the conservation forest Momiwaren. [14] said that the dominant is of the type can use environment inhabited efficiently compared to other kinds in the same place. [15] said also that a species can be said if INP role to level seedling and stake of over 10%, while was level of pole and tree 15% 

![Figure 4 The Importance Value index of Dipterocarpaceae in South Manokwari](image)

Based on the IUCN data in 2008, a kind of A. thurifera is one type of the family Dipterocarpaceae has been listed in the category of critically endangered status which means the existence of this type is very restricted in nature. A special attention is required in the management and development in the area. This was possible because the wood is good for the interior furniture, a ship planking, vessel, yard and furniture, mobile bodies, furniture making, veneer and plywood, and general construction so the type is of very interested in by many people. In addition, revealed that several species of the family Dipterocarpaceae found in Papua, often were grouped into mixture class because of were less known by the local people, consequently the prices per cubic timbers somewhat is much lower than other wood trade.

4. Conclusion

The family Dipterocarpaceae found in protected forest area in south Manokwariconsist of V. rasak, A. thurifera and H. iriana. The dominance of V. rasak higher than other types of Dipterocarp. A. thurifera is owned to the kind of nearly extinct, but is still found in this location with low dominance. Similarly H. iriana was found only in seedling and poles level.

5. References

[1] Whitmore, T.C. 1984. Tropical Rainforests of the Far East. Oxford Science Publications. Oxford: Clarendon Press.
[2] Siburian R H S, Siregar J, Siregar. 2017. Genetic variation of gyrinops verstegii originated from papua based on RAPD. Asian Journal of Microbiology, Biotechnology and Environmental Sciences Vol 19. No. (3): 2017:1-9
[3] Ashton Peter. 1982. Dipterocarpaceae. Flora Malesiana (9):237-552.
[4] Purwaningsih. 2004. Review: Sebaran Ekologi Jenis-jenis Dipterocarpaceae di Indonesia. Jurnal Biodiversitas Vol. 5 No.2.
[5] Vink, W. 1998. Notes on some lowland rainforests of the Birds Head Peninsula, Irian Jaya. Page 91-109 in Bartstra, G-J (ed) Birds Heads Approachers: Irian Jaya studies. Balkema, Rotterdam/Brookfield
[6] Smith B, Wilson JB. 1996. A consumer’s guide to evenness indices. Oikos 76(1):70–82.
[7] Spellerberg IF, Fedor PJ. 2003. A tribute to Claude-Shannon (1916-2001) and a plea for more rigorous use of species richness, species diversity and the “Shannon-Wiener” Index. Glob Ecol Biogeogr 12(3):177–9.
[8] Cox GW. 1985. Laboratory manual of general ecology. Fifth edition. Dubuque (US): WCM Brown. p. 232-4.
[9] Kartikasari, S.N., A.J. Marshall., dan B.M. Beehler. 2012. Ekologi Pupuk dan Ekosistem Indonesia (Jilid VI). Penerbit Yayasan Pustaka Obor Indonesia. Jakarta.
[10] Whittaker RH. 1975. Communities and ecosystem. Second edition. New York (US): Macmillan Publishing Co.Inc. p. 80-85.
[11] Sist, P dan A. Saridan. 1998. Description of the primary lowland forest of Berau. Agricultural Research in a Lowland Mixed Dipterocarps Forest of East Kalimantan. Cirad Forêt. France
[12] Saridan, A. 2012. Keragaman Jenis Dipterokarpa dan Pohon yang Menghasilkan Minyak Keruing di Hutan Dataran Rendah Kabupaten Berau, Kalimantan Timur. Jurnal Besar Penelitian Dipterokarpa. Balai Besar Penelitian Dipterokarpa. Samarinda. Vol.6, No. 2, Desember 2012.
[13] Purwaningsih. 2004. Review: Sebaran Ekologi Jenis-jenis Dipterocarpaceae di Indonesia. Jurnal Biodiversitas Vol. 5 No.2.
[14] Pratiwi dan R. Garsetiasih. 2007. Sifat Fisik dan Kimia Tanah serta Komposisi Vegetasi Di Taman Wisata Alam Tangkuban Parahu, Kabupaten Bogor, Jawa Barat. Jurnal Penelitian Hutan dan Konservasi Alam, Bogor.
[15] Smith B, Wilson JB. 1996. A consumer’s guide to evenness indices. Oikos 76(1):70–82.
[16] Folega F, Zhang C, Woega Y, Walala, Doumoua M, Batawila K, Akpagana K. 2014. Structure and ecology of forest plant community in Togo. J Trop For Sci 26(2): 225–39.