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Vegetation Physiognomy, Diversity, Evenness and Abundance of Trees in the Protected Sirimau Forest Soya Village, Ambon City

Pamella Mercy Papilaya
Program Studi Pendidikan Biologi FKIP Unpatti

Abstract
Sirimau protected forest is one forest area that still has the characteristics of the forest consists of primary forest and old secondary forest. Particularly for the purpose of education and research, Sirimau Protected Forest Area has a diversity of flora and fauna as well as the high potential tourist attraction. This study aims to determine the condition of the vegetation Physiognomy, evenness, the abundance and diversity of tree species in the Forest Preserve Sirimau Ambon City. In general, Ambon city Sirimau Protected forests consist of protected forest vegetation characteristic of the region indicate that the tropical rainforest is typically display the five strata or layers of the tree. The number of species found in protected forests Sirimau Ambon city a total of 93 species. *Gandaria (Bouea macrophylla*) has the highest frequency of protected forest in Sirimau, followed by *Durio zibethinus* and *Lansium domesticum*. The results of the analysis of diversity, evenness and abundance on all observation stations index values obtained are relatively the same. Measurement of Importance Value Index (IVI) do indicate a shift in the dominance of plant species and the difference between the research stations throughout the observation station.
Keywords: physiognomy, diversity, evenness, Sirimau protected forest, the village of Soya, Ambon city

1. Introduction

Sirimau protected forest is one forest area that still has the characteristics of the forest consists of primary forest and old secondary forest. Particularly for the purpose of education and research, Sirimau protected forest area has a diversity of flora and fauna as well as the high potential tourist attraction. Sirimau protected forest provides many economic and ecological benefits for the surrounding areas, is a functioning forest ecosystems sustain life, which is to regulate the water system, prevent flooding and erosion, as well as maintaining the durability and soil fertility. Aside from being system life support, protected forests Sirimau a water catchment area for the city of Ambon. Sirimau protected forest is located in the village of Soya rich with fruit trees and has become a trade mark, for the fruit in the city of Ambon as a delicacy and always fresh. A number of other forest products that are considered quite productive for the economic development of the people. Thus Soya village where there is a protected forest area in fact became one of the hinder land for supplying the city of Ambon in the wheels of the market economy (Souissa, 2012).

According to Monks (2000), there are two practical usefulness of the study of local species that have unique properties, namely (1) for the protection and use of biodiversity, and (2) assess the impacts that may arise due to changes in the environment. Thus, a specific part of the study of biodiversity and the environmental impact is the identification of indicators in the ecological system. This interest is useful in monitoring the population of a species mainly to determine the type of function in the community. According Samways et al (in Monk, 2000) that some components were carried out to determine a species as indicators are (1) the diversity of taxonomy, (2) the abundance, (3) distribution, (4) the role of these types, and (5) the extent which types are easily recognizable. Each species requires appropriate environmental conditions for life, so live each species requirements vary, where they only occupy a suitable environment for life. Every plant is the result of conditions in which the plant is alive, so the plants can be used as a dominant set environmental indicators (Barbour et al., 1987). Understanding diversity, evenness and abundance of plant species are important in the ecology of a species. In addition, information about the diversity of plants in an ecosystem is indispensable as the first step in studying the stability of the ecosystem.

In a community, there are a number of biotic and abiotic factors that affect wealth, abundance and diversity of plant species. Living creatures of various species that live naturally in a place to build another set in which each individual find an environment that can meet their needs. Groups living together has adjusted and inhabit a natural spot called community. Characteristics of the community in an environment is diversity. The more diverse biotic component, the higher the diversity. Conversely, the less diversity and then said diversity is low (Prasad, 2007).

Diversity of plant species in an area depends on several environmental factors, such as moisture, nutrients and minerals, sunlight, topography, parent rock, soil characteristics, canopy structure and land use history. The composition of a plant community is determined by the selection process at the climax phase capable of living in these places. Community activities dependent on each individual's ability to adapt to both the abiotic and biotic factors of the place. Plant community, the controlling presence of the species can be either one or a few particular species or from the physical properties of the habitat. But there is no limit both can operate

together, or the interplay (Barbour et al, 1987).

Until today the availability of data and information, especially about equity, the abundance and diversity of tree species in the region Sirimau Protected Forest is still very poor. It can be seen among others from the least amount of collection of herbarium specimens stored in Bogoriense Herbarium, and the limited data / information from the literature pertaining to wealth, abundance and diversity of flora in the region's potential. Protected Forest Sirimau has a unique natural potential where the diversity of flora and fauna and culture. The potential for natural resources Protected Forest Areas Sirimau not been optimally utilized in the management of the tourist area. Related to the above, according to Souisa, (2012) the problems that exist in the area of Protected Forest Sirimau among others: (a) The absence of efforts to inventory the potential of tourism development based on environment and community (ecotourism): (b) how the strategy of ecotourism management at Protected Forest areas Sirimau; (C) What are the priority strategies in the management of Protected Forest Sirimau. Related to solving the issue with the necessary support of data related to the potential evenness, the abundance and diversity of flora in the region's potential.

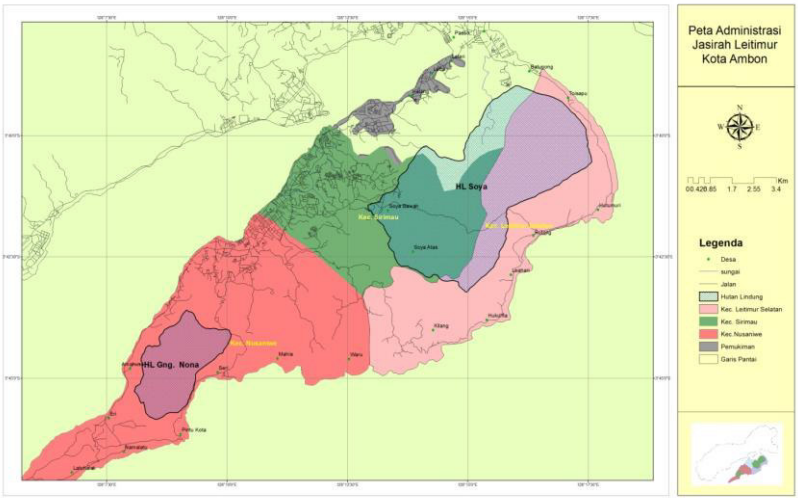
Ambon is part of Maluku province is one of the small islands in Maluku that according to the results of research conducted by several researchers show that the damage to the forest ecosystem in the small island is due to three main issues: (a). Shifting cultivation activities by the public, (b). Tree felling activities legally and illegally for various energy needs such as firewood, building construction, furniture and others, (c). Activities expansion of land use by the public and the government for various purposes such as residential communities, office buildings, roads, monoculture and the others (the Forest Service Ambon City in 2009; Matinahoru and Hitipeuw, 2005; Van Ersnt 2007; Paliama, 2012). Forest Preserve layout Sirimau administratively in accordance with Rule city of Ambon Number 2, 2006. Now it begins to break down due to act of a group of irresponsible people who do illegal logging. Mayor of Ambon admit, the water catchment area in Ambon is getting narrower due over the function. The condition is very difficult to prevent because the housing needs of post-conflict social community must be met. On the other hand, the flat land available in the city of Ambon is very limited. (Kompas 29/12/2006)

Given the complexity of the problems in the protected areas Sirimau we need a study to determine the potentials and prospects of its development, so that it can formulate strategies ecotourism development in the region. Thus, the development of ecotourism in Protected Forests Sirimau expected not contrary to its primary function as a protected forest (Souissa, 2012). This study aims to determine the condition of the vegetation physiognomy, evenness, the abundance and diversity of tree species in the Forest Preserve Sirimau Ambon

2. Research Methods

2.1. Data collection technique

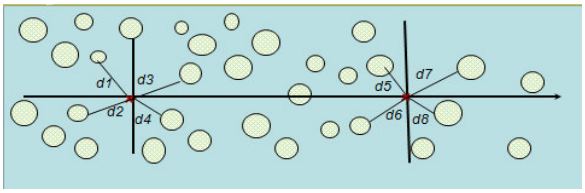
Preceding this research, data collection in advance in the form of literature. Then do the exploration / survey to determine the general description and specify a location to be observed. This study does not cover the whole area of Protected Forest Sirimau Ambon, but selected locations that are considered representative of the entire region to study the diversity of tree species. Implementing this study using two approaches: 1). Analysis of Vegetation which aims to study physiognomy forest vegetation, and 2). Floristic study aimed to collect data evenness, the abundance and diversity of tree species in the Forest Preserve Sirimau Ambon.



a). analysis of Vegetation

The location was chosen as the study area location is considered to represent the protected forest area Sirrimau,

which is three (3) Region (station) that Station 1 is located in the District Sirimau (Petuanan village of Soya and STAIN-Air Large Batumerah), Station 2 in Teluk Ambon Baguala (Petuanan villages of Passo and Halong), and station 3 in the District of South Leitimur (Petuanan Village Hutumuri, Rutong village, village and village Lehari Hukurila). This research was conducted using the method without a plot that is using Method Squares Central Point (Point Center Quarter Method). Distance titi central one to the other as long as 50 meters. At each station placed 30 points.



Picture 1. *Point Center Quarter Methode*

Tree species identification is done directly in the field using local names and who can be identified using scientific names, while for unknown individuals are directly performed herbarium sample collection. Identification of the type specified to the species level and distinguished by morphologic appearance (morph species).

Morphological observations done in the field, and to specimens of unknown species were collected and arranged on old newspapers and put in a plastic bag. Furthermore, the specimen was given a 70% alcohol to wet enough so it does not rot and then dried in Unpatti Biology Laboratory Herbarium. The process of making herbarium using the "Schweinfurt Method" (Bridson and Forman, 1989) international standard and will save using Brahms ("Biodiversity Research and Herbarium Management System"). Identification is done also by using Roster Trees of North Maluku and Maluku Selatan, (1975) and The Concise Flora of Singapore. Gymnosperm and cotyledons. Atlas of seed plants, Backer.

Diversity type

To determine the level of diversity of plant species can be analyzed using
Shannon-Wienner index (Krebs, 1978; Barbour et al., 1987; Ludwig and Reynolds, 1988):

$$H = - \Sigma \{(ni / n) \ln (ni / n)\}$$

Where:
H '= shannon Wiener diversity index

$$pi = \frac{ni}{N} \quad \text{.....(1)}$$

Ni = Number of the importance of a kind
N = Number of the importance of all types
ln = natural logarithm (natural number)

Table 1. Values Diversity Benchmarking Index

Benchmark Value	explanation
H' < 1,0	Biodiversity is low, poor, very low productivity as an indication of severe pressure and unstable ecosystems
1,0 < H' < 3,322	Diversity being, productivity enough, the condition is fairly balanced ecosystem, ecological pressures moderate
H' > 3,322	High biodiversity, ecosystem stability steady, high productivity, resistant to ecological pressures

Source: Fitriana 2006

2. Abundance of can be calculated by
Using the following formula:

$$N = eH \quad \text{..... (2)}$$

Where:
N = Abundance of
e = Numbers natural
H = diversity index

3. Evenness index (e) is determined by the following formula (Barbour et al., 1987)

$$e = H/\log(S\,H) \quad \text{..... (3)}$$

H = index of species diversity
S = Number of species

4. The importance Value

To determine the type of plants that dominate in a research plot analysis with calculate the significance of each

study plot.

$$NP = KR + FR + DR \quad \text{.....(4)}$$

NP = Importance;
KR = Relative Density;
FR = Relative Frequency and
DR = Dominance Relative

3. Results and Discussion

3.1.General Conditions Protected Forest Sirimau

Location of Protected Forest Sirimau administratively in accordance with Rule city of Ambon Number 2 of 2006 stood at 3 (three) Regional District of the District Sirimau (Petuanan village of Soya and STAIN-Air Large Batumerah), Teluk Ambon Baguala (Petuanan villages of Passo and Halong), and the District of South Leitimur (Petuanan Village Hutumuri, Rutong village, village and village Lehari Hukurila).

State Soya is an Indigenous Affairs, located on the edge of the city of Ambon, at the peak of his Sirimau as Icon. This country is located at an altitude of 566m above sea level, with the limits of the territory as follows:

North : Sea in the Bay of Ambon
West : Hatalai adjacent to the village, the village Naku, Kilang village, and the village Ema
East : adjacent to the village and the village Hutumuri Leahary
South : bordering villages Refinery

Based on the Slopes of Ambon City Map 1: 100,000 scale topographic 2008 state Forest Preserve Sirimau are grouped in the five classes: flat (0-3 percent), ramps (3-8 percent), corrugated (8-15 percent), rather steep (15-30 per cent) and steep (30-40 per cent). Altitude based on the results of GPS measurements at the study site ranged between 50-525 m above sea level (asl).

Sirimau protected forests have the potential of natural resources and high culture to the development of ecotourism. Potential deals Sirimau protected forest ecotourism is tourism that has an appeal and uniqueness, such as the potential biophysical and cultural potential. Natural scenic beauty, flora, fauna is diverse and challenging terrain that often even become the main attraction, also the cultural diversity of the community is a potential asset for Sirimau Protected Forest areas for the development of ecotourism. Special eco-tourism is a form of ecology and natural aesthetics with various forms of ecosystem that is owned by an area. This potential is a tourist attraction that are offered to the general public (Tropenbos International Indonesia 2006).

The types of flora found in protected forest areas Sirimau are: wood types *lenggua* (*Peterocarpus indicus*), walnuts (*Canarium commune*), *damar (Agathis alba*), *matoa (Pometia pinata*) and *syzygium (Eugenia sp*.) As for the fauna contained in the region include: *King parrot* (*Alisterus amboinensis*), *Perkicit* (*Triholousus spp*), wild boar (*Sus Crova*) and others. In some places within the protected area Sirimau are clearing forests for plantations clove (*Eugenia aromaticum*) even hamlets clove (*Eugenia aromaticum*) had reached the upper river (water) so that the dry season is very affect the river flow.

3.2. Protected Forest Vegetation physiognomy Sirimau

In general, Ambon city Sirimau Protected forests consist of protected forest vegetation that region showed the characteristics of tropical rain forest. These characteristics are shown by the coating. Characteristics of tropical rain forest in question by Richard (1964) is a forest that typically displays five strata or layers of the tree. Characteristics of the tree layer will be explained as follows.

1. Stratum A

Stratum A is composed of layers of trees with a height of over 30 meters (layer A). These trees form a canopy layer that pops out, sticking out high above the corner of the forest, titled width and generally spread out so as not to touch each other form a continuous layer. The typical shape of the canopy are often used to identify the species in a region. The trees are sticking it often rather shallow rooted and buttresses. The trees generally have three or four layers of canopy, trunk grows straight, tall, and branch-free trunk is quite high. Some types of trees that grow in this area, known as the area include wood *nani (Eusideroxylon swageri*), tree *cassowaries (Casuarina sumatrana), pule (Alstonia scholaris), Gayang (Inocarpus vagiferus), eucalyptus (Melaleuca lecadendron), lenggua (Pterocarpus indicus), salawaku (Albizzia falcata), redwood (Eugenia sp)* and wood *Samama (Anthocephalus macrophylus)* and one of the largest fruit, ie durian (*Durio zibethinus*).

A forest stratum often found liana-liana trunked thick, woody, herbaceous and epiphytic nature. Liana is an important component of tropical forests and have an influence on the diversity, structure, and dynamics of tropical forests, by inhibiting the growth of trees. Ecologically some liana role as the host of several parasites of plants. Liana also has a role to prevent trees due to high winds, inhibits the growth of trees, and reduced fertility, pressing phase of regeneration and improve the relationship between canopies (Asrianny et al, 2008). Some types are found among other types of rattan and some *Cucurbitaceae* (pumpkin rate). Liana is a creeper or

cannot grow upright supports of the canopy. To support its growth, this plant group generally utilize different types of trees to propagate. By leveraging its host tree, some liana species can reach a layer canopy and canopy cover its host.

2. Stratum B

Stratum B consists of a layer of the tree with a height of about 15-27 meters, the second tree layer (layer B) below the layer A. These trees grow closer together and tend to form continuous angle. Heading often rounded or elongated and not as wide as the tree sticking out. Some types of trees that grow in this layer include *Hanua (Ficus melinocarpa)* and *Haleki (Gironniera sp*). Additionally covered also by the vegetation of trees and crops producing fruits like durian (Durio zibethinus), (*Salacca edulis), campada (Artocarpus campaden), Gandaria (Bouea macrophylla), coconut (Cocos nucifera), kucapi (Sandoricum kutjape), manggustan (Garcinia mangostana), mango (Mangifera indica), tan (Langsium domesticum), guava bol (Eugenia jambola), kukusang (Lansium domesticum), soursop (Anona muricata), tomi-tomi (Flacourtia euphalobia), potion-potion (Cyroptera cauliflora) and rambutan (Nephelium lappesium)*. Some industrial plants such as clove (*Eugenia aromatica), nutmeg (Myristica fragans), cinnamon (Cinnarmomun zeylaricum)* and sago *(sago Metroxylon*). The trunk is usually branched and free trunk branches that are not so high. This stratum of tree species in less need for light or shade tolerance (tolerant). Basna et al (2012) mentioned that tree species that exist in stratum B are the kinds that can provide multiple benefits to society and the environment can be an optimal control.

3. Stratum C

Stratum C is composed of a layer of small trees with a height of about 8-14 meters. A third layer (layer C), is said to also lower levels, consisting of trees that grow often have a rather diverse forms but tend to form a layer of dense, especially in places that both layers are not. In stratum C, the trees are associated with different populations were found among other *efipit Medinilla alternifolia*, climbing plants and parasites. The types of rattan, ground orchid (Dendrobium), a type of fern *Asplenium antiqum* nails, as well as some of the *Cucurbitaceae* (gourd rate). Liana is usually not a parasite, but it may weaken another plant that became the cradle and compete against the light.

4. Stratum D

Stratum D is composed of layers of shrubs and bushes that have a height 1-4 meters. Included is young trees, palm-small palms, herbs and ferns great big, which is a group of pioneer vegetation of lowland forest in the process towards a climax, among others, wire nails (Equisetum *debill*), *Kusu-Kusu (Imperata cylindrica*), tuberose *Myrmecodia Drymoglossum piloselloides* kinds of nails fern *Asplenium nidus, Adiantum cuneatum* and liana species Derris *elliptica*. This includes young trees, palm-small palms, herbs and ferns big big. Basna et al, (2012) mentions stratum D can strengthen soil and resist erosion were great. A good ground cover vegetation, such as grasses are thick or dense jungle will eliminate the influence of rainfall, topography against erosion and reduce water surface. Based on this, the public is directed in an attempt to lower plantings that can provide real economic benefits and is able to play an important role in the prevention of erosion, reduce water surface, and increase water infiltration in the soil for the benefit of the utilization groundwater.

5. Stratum E

Stratum E is composed of layers of vegetation or ground cover layer having a high pitch of 0-1 meters. Life forms of life or form or forms of plants which are the individuals making up the plant community consists of species of trees, herbaceous and deciduous. Vegetation encountered in the vegetative body of the plant, so that the shape of the body vegetative plants were found to have the same morphological sign form at any height, so it can be said to have the same form Life.

Their morphological traits in plants found in the forest at any height in protected forests Sirimau Ambon city is due to the long process such as evolution and adaptation to the environment protected forest floor geomorphology Sirimau Ambon city in order to survive. Morphology which looks like a forest dominated by tall trees, broad-leaved (Broadleaf evergreen), rich in epiphytes and evergreen. The types of epiphytes are found inter alia: Hoya

Sp, Bauhinia dipteral, Piper *sp, Pycnarrhena tumefacta, Aristolochia sp*. *Schindapsus sp, and Gmelina sp.* Protected forest Sirimau Ambon city is old secondary forest which has a height of forest area varies fluctuations caused perbadaan-phygsionomi difference in diameter of the tree and plant species forest or tree, as well as the growth and increment of trees.

3.3. Variety type Sirimau Trees Forest Preserve in Ambon

The observation of an inventory of trees in protected forests Sirimau city of Ambon on each station, are shown in Table 2. Breakdown of species and the number of species found in protected forests Sirimau Ambon city a total of 93 species, the various research stations can be explained as follows.

- At the first station, the type of trees found consist of 23 orders, 39 families, 84 genera and 72 species.
- At the second station, the type of trees found comprised 23 orders, 25 families, 37 genera and 49 species.
- At the third station, the type of trees found consist of 23 orders, 35 families, 77 genera and 57 species.

Family showing most types of protected forests Sirimau in Ambon city was *Moraceae* and *Myrtaceae*. *Moraceae* family consists of 13 types 4 types among which *Artocarpus compaden, Artocarpus communis, Artocarpus Artocarpus* integer incisus and the kinds of trees producing food ingredients and fruits planted by the community. Besides, there are 2 types of *Ficus variegata* and *Morinda cytrofolia* is a medicinal plant that grows naturally, so there is a tendency that these types of protected forests dominate more Sirimau Ambon city. The growth of these species naturally according to Edwards et al (in Monk, 2000), is a hallmark of the tropical forests of the mountains that is the root buttresses are large, straight-trunked, and have shapes *kauliflori* (fruit growing on the stem), *ramiflori* (fruit growing on the branches of trees). He also explained that these species are those species MEGATHERM, and are limited in the tropics and only exist in Maluku and Nusa Tenggara. In addition, this region is an area of protected forest, protected forest Sirimau also serve as regional reforestation and nature conservation areas Maluku planted with various types of fruit trees longevity to increase the income of forest communities, and also can restore the health of water resources in some neighborhood in the city of Ambon.

Family *Myrtaceae* consists of 10 species, three of which are fruit-bearing trees and drugs, Eugenia aquea, Eugenia *aromatica*, *Eugenia malaccensis*, and *Psidium guajava*. These species are typical tree species besides the Moluccas planted by the community, also grows wild and reproduces very quickly is by seed, so the presence of high frequency. 3 other types are forest trees grow wild among others *Euqualiptus deglupta, Metrosideros nigroviridea,* and M. *vera.* According Heyne, (1987), these species are often discovered by the expedition *Rumphius* grown in sandy soil that is moist soils and mud, the water source areas or watersheds. He also explained that the spread can reach a height 400-800meter above sea level. Thus protected forest Sirimau Ambon city is a suitable habitat for these species.

Botanical Gardens Conservation International (in Jackson, 1993) mentions that a particular plant species that are endangered and who need to be protected in Maluku. Some species of which are grown in the forest among others *Alangium* Protected Sirimau *villosum, Alstonia spectabilis, Metroxylon sago, Comersonia bartrania, Aleurites moluccana, Arenga piñata, lolin Diospyros, Durio zibethinus,* and *Instia palembanica*. These types according Jakson (1993), needs to be protected ex situ. Therefore, it needs to be emphasized here that the utilization of the production function of natural ecosystems need to be taken into account, especially external influence in this case the local community needs to be limited to the level of sustainable use in order to maintain continuity as protected forest and scientific information.

Of the 93 species of trees are found in protected forests Sirimau Ambon, has largely become a buffer for the life of the local community. Among other benefits as food, producing fruits, and medicines. There was also a significant value, are endemic to the Moluccas and possess good soil conservation on water catchment zone. Types include *Aleurites moluccana, Arenga piñata, Anacardium occidentale, Artocarpus integer, Eucalyptus deglupta, Bambusa sp, Durio zibethinus, Gosampinus malabarica, Gnetum gnemon, Pterocarpus indicus* (Fiqa et al., 2005).

Order group showing the highest number is the order *malvales* family consisting of 4 families, followed by the order *Myrtales, Ranales* and order Rosales each consisting of three families. Group orders of the least among other orders *Apocynales, Araucariales, arecales, Casuarinales, celastrales, geraniales, Gnetales, Guttiferales, Poales, pandanales* and *Rubiales*, each have one family. Group orders *geraniales, Gnetales, Poales, Casuarinales* and *Rurticales* each consisting of one family.

The trees belonging to the order *malvales* generally dominate the forest areas Protected Forest Sirimau Ambon. These trees have the feature broadleaf form two formations. Formation climax *edafik* ie, formation that was formed under the influence of the state of the site, such as forests formed due to water or swamps and formation climactic climate which is the formation that was formed under the influence of climate and rainfall is quite high, for example in the nation *malvales* (Subuea, 2011) ,

Family showing most types in protected forests Sirimau Ambon is *Moraceae* and *Myrtaceae*. Moraceae family consists of 13 types 4 types among which *Artocarpus compaden, Artocarpus communis, Artocarpus Artocarpus* integer incises and the kinds of trees producing food ingredients and fruits planted by the community. Besides, there are 2 types of *Ficus variegata* and *Morinda cytrofolia* is a medicinal plant that grows naturally, so there is a tendency that these types more dominate the forests on the island of Ambon. The growth of these species naturally according to Edwards et al (in Monk, 2000), is a hallmark of the tropical forests of the mountains that is the root buttresses are large, straight-trunked, and have shapes *kauliflori* (fruit growing on the stem), *ramiflori* (fruit growing on the branches of trees). He also explained that these species are those species that MEGATHERM, and are limited in the tropics and only exist in Maluku and Nusa Tenggara. Moreover, because the forests in the protected Sirimau generally a protected forest area, then this area is also used as an area of greenery and nature conservation areas Maluku planted with various types of fruit trees longevity to increase the income of forest communities, and also can restore health water resources in some areas in the city of Ambon.

Some other types are still relatively more family *Moraceae* are forest trees that grow wild among others *Ficus abrasives, septica Ficus, Ficus benjamina, Ficus erioclona, melinocarpa Ficus, Ficus septica, Ficus*

variegta and *Morinda citrofolia*. These types according to the observations found in the study site, grows on soil habitat consists of rocky sand, or at the tops of rocks. Whitmore (in Monk, 2000) states that this condition describe a rocky mountain forest structures which have low or moderate canopy that is 10-30 meters in a uniform arrangement, as well as having the trunks of small *seromorfik*. Therefore the tree species have small leaves or *mikrofil* and not leaf mesophyll and are *sclerofilus* (thick and coarse), which is useful as an evaporation protection and ultraviolet radiation.

Family *Myrtaceae* consists of 10 species, four of which are fruit-bearing trees and drugs, *Eugenia aquea, Eugenia aromatica, Eugenia malaccensis, Exipatori odorata,* and *Psidium guajava*. These species are typical tree species besides the Moluccas planted by the community, also grows wild and reproduces very quickly is by seed, so the presence of high frequency. 3 other types are forest trees grow wild among others *Euqualiptus deglupta, Metrosideros nigroviridea,* and *M. vera.* According Heyne, (1987), these species are often discovered by the expedition Rumpus grown in sandy soil that is moist soils and mud, the water source areas or watersheds. He also explained that the spread can reach a height 400-800meter above sea level. Thus protected forest Sirimau Ambon city is a suitable habitat for these species.

In addition, the types that have the largest populations that grow in protected forests Sirimau Ambon city is *Durio zibethinus* A stratum occupy the highest layer that can reach 30 meters. Then *Bouea macrophylla, Lansium domesticum* (consisting of olive, duku and steamer), *Garcinia mangostana*, *Arthocarpus campaden, Arthocarpus integer,* and *Gnetum gnemon*. These are the types of trees that physiognomy of vegetation occupying co-dominant stratum. In this stratum encountered thick trunked liana-liana, woody, herbaceous and epiphytic nature. The trunk is usually branched and free trunk branches that are not so high. The types of these trees requires less light or shade (Hutchincson, 1999, in Kurniawan, 2008). These species have significance consumptive ie as producer of fruit trees that can improve the economics of the family. *Gandaria* as one of the types of these ecologically, has a particularly important role in the recovery of soil and water resources.

Some families whose presence consists of one species are found there amounted to 9 families. Some species of which are those species that are important, especially in the catchment area. The families, among others *casuarinaceae* namely *Casuarina rumphiana, families Pandanaceae* namely *Pandanus tectorius*, Family *Lecythidaceae* namely *Terminalia catapa*, families *Araliceae* namely *Polycias nodosa*, families *Morasaceae* namely *Artocarpus campaden*, family *Rosaceae* which *Parinari corymbosa, Gnetaceae* family is *Gnetum gnemon,* family *Alangiaceae* ie *Alangium villosum*, and family *Morasaceae* is *Artocarpus campaden*.

Of the 93 species of trees are found in protected forests Sirimau Ambon city, has largely become a buffer for the life of the local community. Among other benefits as food, producing fruits, and medicines. There was also a significant value, is the type that has excellent properties of soil conservation on water catchment zone. Types include *Aleurites moluccana*, *Arenga piñata, Anacardium occidentale, Artocarpus integer, Eucalyptus deglupta, Bambusa sp, Durio zibethinus, Gosampinus malabarica, Gnetum gnemon, Pterocarpus indicus Hulster* (in Purwanto, 2007: Basna et al, 2012).

Gandaria (Bouea macrophylla) is a tree or a type that has the highest frequency and dominating presence and importance of the highest in the protected areas Sirimau. Ecologically plants *Gandaria* lead to the properties of soil fertility and potential when viewed from several aspects including: (1) leaves *Gandaria* who fell down and buried in the ground would contribute both to the fertility of the soil by adding litter into the soil, (2) canopy plants shaped shield as well as of a large tree can be used as a shade, so the plants *Gandaria* often used as shade plants for plants growing underneath, and (3) *Gandaria* root system that can protect the soil from erosion, leaching and soil erosion. This will greatly help the existence of the availability of nutrients around the roots *Gandaria*. This situation according to Santoso (2000) that the presence of plants, especially the availability of litter, and the crown form a good root system, in general it will affect the content of organic matter, *humification* and the nutrient content in general.

In addition there are several types *Gandaria* utilized by the local community in a high enough frequency so that the size of the population to be reduced and some species could become extinct, such as some types of bamboo are often used by people in Ambon, especially in mountainous areas. In addition, some types of durian also often cut down for wood materials used. These species must be constantly monitored and there should be a good business management in order to conserve and as an indicator of diversity. Brooks (2001) in Indrawan, et al. (2007) says that if the detailed data required to draw a community is not available then a particular species can be used as indicators of biodiversity.

In relation to the nature of good water conservation, also found that the types of trees pioneer. Trees pioneer in question is a tree with characteristics of rapid growth, branching slightly, most of the leaves are large (typically rough hairy), has the wood is soft even when adulthood many of them are missing, fast flowering and fruiting, fruit size is relatively small, can be grown in the open and had dormancy quite long and having a relatively short lifespan of about 8-25th (Yassir and Omon, 2009: Muads, 2013),

These trees are indispensable to ecological preconditions for the growth of trees core that has the properties of soil and water conservation is good. These trees also have multiple uses ecologically also have

economic value to society. Tree species according Hulster (in Purwanto, 2007: Basna et al, 2012), among others *Leucaena glauca*, the types of Hibiscus, the types *Albizzia, Tectonia grandis, Acacia sp, Melaleuca leucadendron, Aleurites moluccana, Arenga piñata, Anacardium occidentale , Parkia speciosa, Bambusa sp, Gnetum gnemon, Artocarpus integer, Gosampinus malabarica, Durio zibethinus*, and *Eucalyptus deglupta*. These species exist that have significant value is low. Therefore, in an effort to rehabilitate critical land in the zone of water infiltration caused by practices of shifting cultivation or illegal logging, it is necessary to plant tree species capable of restoring land conditions such as the types that have been disclosed.

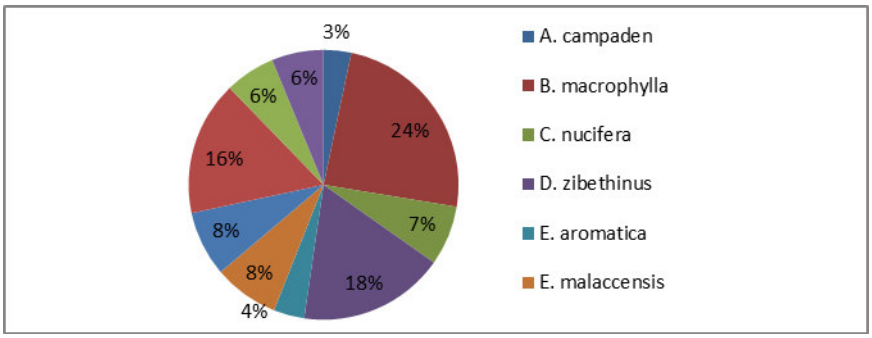


Figure 2. Graph Frequency Highest Attendance Types of Trees in the Forest Preserve Sirimau Ambon City on various observation stations.

Gandaria (Bouea macrophylla) are endemic to the Moluccas, growing abundantly on the island of Ambon, keberadaannnya largely determined by the local environment in terms of natural and human condition as one of the factors determining the sustainability. Indrawan et al, (2007) mentions plant species regarded as endemic species has characteristics such as having a narrow geographical distribution, the type that consists of only one population, have certain niches, and has the ability to spread high in its native habitat.

Plant *Gandaria (Bouea macrophylla Griff)* is one of the typical annual fruit plants need to be cultivated in Maluku as beneficial both economically and ecologically. *Gandaria* is a tropical fruit crop Maluku very spesiik and known as exotic fruit (Rehatta, 2005). *Gandaria* young fruit is green and consumed as a mixture of chili, salad and salad (Sinay, 2011). Can be used as a substitute for lime, and sour pickles. The ripe fruit is yellow and has a sweet sour taste can be consumed directly as table fruit. As fruit juice (iced fruit) or in processed form, such as syrups, preserves and jams. The young leaves can be eaten as fresh vegetables. The wood can be used as a board and handle machetes because it is not easily broken when dried (and Bayu Kurniawan, 2010). In addition, Gandaria plants can be used as plant conservation for a lush canopy shape and compact and well-developed root system and strong to prevent erosion (Tangkuman, 2006). Fig Tree *Gandaria (Bouea macrophylla)* is shown in Figure 3.

In addition there are several types *Gandaria* utilized by the local community in a high enough frequency so that the size of the population to be reduced and some species could become extinct, such as some types of bamboo are often used by people in Ambon, especially in mountainous areas. In addition, some types of durian also often cut down for wood materials used. These species must be constantly monitored and there should be a good business management in order to conserve and as an indicator of diversity liver. Brooks (2001) in Indrawan, et al. (2007) says that if the detailed data required to draw a community is not available then a particular species can be used as indicators of biodiversity.

Gambar 3. Tumbuhan Gandaria (*Bouea macrophylla*)
a. Gandariatree (*Bouea macrophylla)*
b. Gandaria Flowers and leaves (*Bouea macrophylla*)
c. Gandaria fruits (*Bouea macrophylla*)

Diversity, Evenness, Abundance Tree In Forest Preserve Sirimau Ambon Results analysis diversity, evenness and abundance in Chart 2. The very relevant with the opinion of Barbour et al., (1987) for the entire

observation station index values obtained are relatively the same. This suggests that the habitat conditions throughout the observation station is relatively homogeneous, when viewed from the aspect of disruption to the ecosystem, because in all places at station 2, *Teluk* Ambon *Baguala Petuanan* the villages of Passo and Halong, destruction does not occur on a periodic basis. This is understandable because the area is the area has been used for post-conflict settlement area of Ambon. Species evenness index calculation results indicate that the value is relatively homogeneous, ranging from 1.9 - 2.7. The difference at any observation station is very small, thus the tree species that live in the entire height of relatively equal in terms of aspects number of species. This gives a sense that these trees are everywhere growing spread throughout the region protected Sirimau forest.

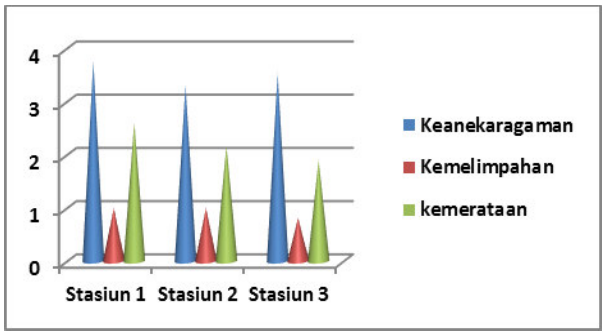


Figure 2. Graph Diversity, Evenness, and Abundance Tree in Forest Preserve Sirimau Ambon

Diversity index and evenness index are two different things. According to Barbour et al., (1987) sometimes positively correlated with species richness of diversity of species, but environmental conditions throughout the study area is heterogeneous, so the decline in species richness may be accompanied by an increase in diversity. This is possible because the number of individuals at any observation station in the protected areas Sirimau vary greatly. Equity will be maximum and homogeneous if all species have the same number of individuals at each observation location.

This phenomenon is very rare in nature, since each species has the ability to adapt and tolerance, as well as historical patterns (life history pattern) different. In addition, the environmental conditions in nature are complex and varied. At the micro level (*mikrositus*) may be homogeneous environment, but on a macro level (*makrositus*) consists of *mikrositus-mikrositus* heterogeneous. *Mikrositus* relatively the same will be adapted by the same individual. This phenomenon will be known by detecting the distribution patterns and associations of species in a community that usually results in most species with a clumped distribution patterns and associations tend to be positive (Barbour et al., 1987; Chapman and Moore, 1986).

Important Value Type Trees in the Forest Protected Areas Sirimau Ambon

Measurement of Importance Value Index (IVI) is performed to determine the species dominance at every level of growth in a community. IVI which may indicate a possession or domination is also high (Saharjo and Gago, 2011). Results analysis The importance of trees in protected forest areas Sirimau indicate that there has been a shift in the dominance of plant species and the differences between the research stations throughout the observation station.

Table 2. Importance Value Index (IVI) For each species Dominant In Every station on Forest Protected Areas Sirimau Ambon

Location	number of types	presentation	Dominant type	Urgent Value (NP)
Stasiun 1	72	77.42	*Bouea macrophyla*	68.14
			Garcinia mangostana	25.26
			Lansium domesticum	58.64
			Durio zibethinus	25.99
			Arthocarpus campaden	12.98
Stasiun 2	49	52. 69	*Bouea macrophyla*	55.45
			Durio zibethinus	21.78
			Eugenia aromatic	30.24
			Nephelium lappesium	16.31
Stasiun 3	57	61.29	*Bouea macrophylla*	48.81
			Eugenia malaccensis	20.22
			Myristica fragans	33.00
			Cocos nicifera	28.31

The result of the calculation of important value to the dominant tree species are presented in Table 2, while an important value for all species are presented in Table 3. Based on the data in Table 1 it is known that

each different place dominated by different species, hence the ability of species to live on somewhere very dependent ability to adapt to environmental conditions at the venue. Therefore, the environment was instrumental in selecting the species to survive in a habitat. Ecologically it can be argued that the importance (NP) exhibited by each species is an indication that the species in question as dominant at the venue, which has a value of frequency, density and dominance was higher than other species. Referring to Table 1 *Bouea macrophylla*. is a species with the highest importance, namely in all three observation stations (station I 68.14; Station II. 55, 45, and station III, the other 48.81). Important values shown in Table 3 ecologically dominant species dominate the habitat and can be used as indicators of habitat in each of the different stations in the protected forest Sirimau.

Table 3. Type Trees Forest Preserve in Mount Sirimau Ambon

No	Ordos	Familyes	Types	The importance Value of the observation station Type		
				1	2	3
1	Apocynales	1. Apocynaceae	*1. Alstonia scholaris*	0.82	3.8	-
			2. Alstonia spectabilis	0.85	-	1.65
2	Araucariales	1. Pinaceae	*1. Agathis alba*	-	5.05	-
3	Arecales	1. Arecaceae	*1. Arenga pinñata*	0.81	-	1.61
			2. Cocos nucifera	1.89	9.78	28.31
			3. Crystostachys renda	-	-	11.27
			4. Metroxylon sagu	5.71	8.22	13.1
4	Casuarinales	1. Casuaninaceae	*1. Casuarina rumphiana*	3.29	-	6.66
5	Celastrales	1. Celastraceae	*1. Eounymus javanicus*	0.82	4.97	-
6	Ebenales	1. Ebenaceae	*1. Diospyros lolin*	0.81	-	5.61
			2. Diospyros maritime	2.82	3.2	6.51
		2. Sapotaceae	*1. Laplacea amboinencis*	1.93	-	4.09
7	Eoporbiales	1. Aralisceae	*1. Polycias nodosa*	1.54	-	1.62
		2. Euporbiaceae	*1. Aleurites moluccana*	0.84	8.02	-
			2. Antidesma bunius	-	3.38	3.62
			3. Macaranga mappa	-	-	2.73
			4. Pimeleodendron amboinicum	1.52	-	2.34
8	Geraniales	1. Oxalidaceae	*1. Averhoa bilimbi*	0.87	3.9	-
9	Gnetales	1. Gnetaceae	*1. Gnetum gnemon*	5.15	-	7
10	Guttiferales	1 Clusiaceae	*1. Garcinia insipida*	-	4.72	-
			2. Garcinia mangostana	26.26	-	6.51
11	Malvales	1.Bombacaceae	*1. Durio zibethinus*	25.99	21.78	-
			2. Gosampinus malabarica	-	-	1.64
		2. Elaecarpaceae	*1. Eleacarpus sphaericus*	-	4.34	
		3. Malvaceae	*1. Hibiscus aruensis*	0.91	3.3	1.61
			2. Hibiscus macrophyllus		4.9	
			3. Hibiscus teleaseus	0.83	-	1.7
		4. Sterculiaceae	*1. Commersonia bartrania*	0.81	5.1	-
			2. Sterculia foetida	-	-	1.64
			3. Teobroma cacao	0.9	2.08	-

12	Myrtales	1. Alangiaceae	*1. Alangium vilosum*	0.89	-	1.63
		2. Lecythidaeceae	*1. Terminalia catappa*	0.84		1.61
			2. Letchi sinencis	-	3.67	-
		3. Myrtaceae	*1. Eucalyptus deglupta*	-	3.1	1.7
			2. Eugenia Aquea	0.9	-	1.69
			3. Eugenia aromatica	4.19	30.24	-
			5. Eugenia malaccensis	1.71		20.22
			6. Metrosideros nogroviridea			1.8
			7. Metrosideros petiolata	0.82	3.13	
			8. Metrosideros vera	-	-	4.65
			9. Psidium guajava	0.82	3.76	-
			10. *Exipatori odorata*			1.66
14	Pariatales	1. Cornaceae	*1. Pangeum edule*	2.7	4	1.63
		2. Flacourtiaceae	*1. Flacourtia euphelobia*	0.85	-	7.62
15	Poales	1. Poaceae	1. *Bambusa sp*	2.69	5.56	-
16	Ranales	1. Anonaceae	*1. Annona muricata*	-	3.08	-
			2. Cananga odorata	0.87	-	2.61
			2.Saccopetalun horsfieldii	1.17	3.1	-
		2. Lauraceae	*1. Litcea firma*	0.82		3.49
			2. Persea Americana	1.69	2.51	
		3. Myristicaceae	*1. Myristica fragans*	2.01	4.12	33
			2 . Myristica insipida			1.44
17	Rosales	1. Caesalpinaceae	*1. Maniltoa gemmipara*	0,84	3.4	-
			2. Tamarindus indica	1.86	-	-
		2. Mimosaceae	*1. Acasia sp*	0.83		
			2. Albizzia falcate		4.17-	1.63
			3. Leucaena glauca	0.87	-	1.61
		3. Papilionaceae	*1. Inocarpus vagiferus*	0.81		
			2. Pterocarpus indicus	0.82	3.91	1.7
19	Rubiales	1. Rubiaceae	*1. Timonius timmon*	2.00		1.69
20	Rutales	1. Burseraceae	*1. Canarium vulgare*	1.21	3.22	-
			2. Canarium sylvestris	1.08	-	2.86
		2. Meliaceae	*1. Lansium domesticum*	58.64	-	3
			2. Sandoricum koetjapea	1.78	3.38	-
		3 Rutaceae	*1. Citrus latifolia*	0.84		2.65
			2. Citrus maxima	2.75		1.61
			3. Citrus nobilis	0.87	5.1	
21	Sapindales	1. Anacardiaceae	*1. Anacardium oxydentale*	1.31	-	1.68
			2 Bouea macrophylla	68.14	55.45	48.81
			3. Mangifera indica	5.89	8.36	1.65
			4. Spondias chytherea	3.78	5.14	2.99
		2. Sapindales	*1. Nephelium lappesium*	2.89	16.31	1.82

22	Solanales	1. Verbenaceae	*1. Gmelina moluccana*	-	2.59	-
			2. Tectonia grandis	0.92		
			3. Vitex covasus	2.32	-	5.25
			4. Vitex eroclona	1.7	4.3	-
			5. Vitex eroclona	1.88	-	-
23	Urticales	1. Moraceae	*1. Arthocarpus campaden*	12.98	5.94	3.69
			2. Arthocarpus communis	0.87	-	6.69
			3. Arthocarpus elastica	-	-	1.72
			4. Arthocarpus incisus	2.06	-	3.12
			5. Arthocarpus interger	2.2	7.28	-
			6. Ficus erecta	0.8	-	2.68
			7. Ficus ampelas	1.85	-	-
			8. Ficus benjamina	0.81	-	-
			9. Ficus erioclona	-	-	1.68
			10. Ficus melinocarpa	0.88	2.56	-
			11. Ficus septica	1.2	-	2.62
			12. Ficus variegate	0.82	4.73	
			13. Morinda cytrofolia	2.09	-	1.82
		2. Ulmaceae	*1. Gironniera canaroides*	1.02		1.65
			2. Gironniera subaequales	0.85	5.31	

Information:
Station 1: located in the district Sirimau (petuanan village of Soya, STAIN, Air Besar, Batumerah)
Station 2: located in the district of Teluk Ambon Baguala (Petuanan villages of Passo and Halong)
Station 3: located in the district of South Leitimur (Petuanan Village, Hutumuri village, Rutong village, and Lehari Hukurila village).

One thing that is interesting from the calculation of significant value that most species have a relatively low importance. Such symptoms are common on the type of vegetation that leads to the climactic conditions and stable. According to Mueller and Ellenberg (1974) of natural forest vegetation composition that has formed in the long term will show physiognomy, phenology, and regeneration is slow and tends to steady, so the dynamics of the floristic community forests are not too obvious and blatant. Substitution generation or regeneration of the species as if it does not, as a result of certain rare species are dominant, because all species have adapted in the long term. Based on the adaptability of the species of tree in the three research stations, there are 10 known species are able to grow at three stations as described in Table 2.

Ecologically these species have adaptability and tolerance are relatively better than other species, especially the factor of altitude, whereas other species tend to be able to live in a certain height in three research stations. Furthermore, in addition to 10 types in all three stations are found in the study, not all types are able to live at all heights at each observation station. The composition of families in the study area Number of tree species that are present in all observation stations as many as 92 species, classified into 21 orders and 35 families. Based on the data in Table 3 is known that most families only represented 1-4 species. Families that have a relatively large number of species, 5-10 species, are *Moraceae, Myrtaceae* and *Verbenaceae* so based on their dominance relatives, then Sirimau protected forests dominated by the two families. Ecologically course, members of this family have the capability of adaptation and tolerance is relatively better than other families. *Moraceae family consists of a kind Arthocarpus campaden, Arthocarpus campaden, Arthocarpus comunis, Elastica Arthocarpus, Arthocarpus incises, Arthocarpus interger, Ficus erecta, emery Ficus, Ficus benjamina, Ficus erioclona, melinocarpa Ficus, Ficus melinocarpa, variegate Ficus* and *Ficus variegate*. Family *Myrtaceae Eucalyptus deglupta consists of types, Aquea Eugenia, Eugenia aromatic, Eugenia malaccensis, Metrosideros nogroviridea, Metrosideros petiolata, Metrosideros petiolata, Psidium guajava,* and *Exipatori odorata.* Family *Verbenaceae* composed of a type of *Gmelina moluccana, Tectonia grandis, cofassus Vitex, Vitex erioclona*, and *Vitex quinata*.

4. Conclusion

From the analysis of vegetation can be concluded that: (i) Protection forest Generally Sirimau Ambon city consists of protected forest vegetation characteristic of the region indicate that the tropical rainforest is typically display the five strata or layers of trees; (ii). tree species are found in protected forests Sirimau Ambon city a total of 93 species, comprising the station I, types of trees found consist of 23 orders, 39 families, 84 genera and 72 species, station II, trees were found to comprise 23 orders, 25 families, 37 genera and 49 species, and station

III, types of trees found consist of 23 orders, 35 families, 77 genera and 57 species; (iii) *Bouea macrophylla*. is a species with the highest importance, namely in all three observation stations (station I 68.14; Station II. 55, 45, and station III. other 48.81); (iv). Results analiais diversity, evenness and abundance on all observation stations index values obtained are relatively similar; (v). Measurement of Importance Value Index (IVI) shows that there is a shift and the dominance of plant species differences between the research stations throughout the observation station

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