

Identification Of Biodiversity In Siosar Pineforest Karo District, North Sumatra

Andini Saputri

Department of Biology, Faculty of Engineering,
Samudra University, Langsa, Aceh, Indonesia
e-mail: puputandini87@gmail.com

Kartika Aprilia Putri

Department of Biology, Faculty of Engineering,
Samudra University, Langsa, Aceh, Indonesia
e-mail: kartikaputri48@gmail.com

Zidni Ilman Navia

Department of Biology, Faculty of Engineering,
Samudra University, Langsa, Aceh, Indonesia
e-mail: navia1529@gmail.com

Beni Alfajar

Department of Biology, Faculty of Engineering,
Samudra University, Langsa, Aceh, Indonesia
e-mail: benialfajar@yahoo.com

Abstract- This study aims to identify biodiversity in *Pinnus mercusii* forest in Karo District. Observations on plants using the quadratic method by making 10 plots, 2 x 2 m, recording seedling plants that exist in each plot. In addition, carbon sequestration was performed on *Pinnus mercusii* plants by using allometric equations to extrapolate biomass. Carbon calculations are performed using the quadratic method. Aves observation is done by point count or indices *Ponctuele d'abundance* method. Using 5 observation stations by walking, stopping and silent at certain observation posts. Observation of mammals using survey methods and point determination. Drawn 200 m at point 1, 2 and 3, observed the type and number of mammals. Herpetofauna cluster using visual encounter survey method (VES). The results show that there are 14 species of seedling, 15 species of aves, 2 species of mammals, 2 species of reptiles and 6 species of amphibians. The result of carbon calculation on *Pinnus mercusii* plants is 6,365,063 ton /ha.

Keywords: Diversity, Pine Forest, Siosar, Karo District, Biodiversity.

I. Introduction

Construction of residential relocation area is a planned effort to transform an area that is occupied by a community with a variety of ecological, social, economic and physical limitations to become a region forward with the community quality of life equal or not far behind compared to other Indonesian society. Based on the ecology and topography, Siosar was being overgrown village collection of pine trees (*Pinus merkusii* Jungh. Et de Vriese) with relatively hilly soil conditions in the highlands with humidity and relatively high rainfall. Pine Forest at Siosar Village is a highland area that allows the landslide. Daniel et al., (1995) and Magurran (1988) said genetically pine has the potential to be developed as avalanche control plants because it has several advantages such deep roots, interception and evapotranspiration is high, the tree is not too heavy or light, and the major product is not a timber.

In the construction of the relocation area, the logging is done in the area of pine forest into something that is not inevitable. This leads to the occurrence of landslides if not controlled, so that the necessary effort to keep the preservation of pine forests in addition there are many important fauna endangered birds such as hornbills and large mammals. Pine forest conservation rescue efforts not only to prevent the occurrence of landslides, global

warming or changes in land use, but also as an effort to protect Germ Plasma of extinction, especially species that are threatened with extinction. Based on this background, the purpose of this research is to identification the biodiversity of seedling, mammal and herpetofauna in siosar pine forest of Karo District, North Sumatera, So it is hoped that people will realize the importance of conservation as part of pine forest rescue efforts and disaster risk reduction in their region.

II. Materials and Methods

a) Inventory of Plants

Field sampling using exploratory methods (Rugayah et al., 2004) by exploring each section of the study site. Each individual plant collected parts of twigs, leaves, flowers, fruit and seeds. The sample material collected from the field made two herbarium specimens of duplicate for each individual in the population by following the collection and preservation methods by Steenis (1950) and Kartawinata (1977).

b) Inventory of Aves

The tools used is namely binoculars, digital cameras, board work, and stationery and bird identification books (MacKinnon et al., 2000; Coates & Bishop, 1997), as well as the materials used, namely tally sheet. Data on the diversity of bird species can be obtained by using the point count method (Point Count) or IPA (*Indices Ponctuele d'Abundance-Indeks -Abundance Index on Point*). Observations can made by walking slowly, stop and rest at some point later noted of found birds. The parameters measured are the type and number of birds. In observation using a five-point arithmetic (point count)/ observations station, observations were made during the time span of ± 15 -20 minutes for each observation point and ± 10 minutes is the time to walk to the next observation point. Each bird species found were identified using identification book. Observations were made in the morning at 6:30 to 10:00 am and in the afternoon at 15:00 to 18:00 pm. The data obtained were grouped according to the species taxa.

c) Inventory of Mammals

The tools used, namely binoculars, digital cameras, board work, and stationery and books of mammal identification (Payne et al., 2000), as well as the materials used, namely tally sheet. Data collecting the diversities of

mammals at the location are using a combination of survey methods and methods of determining the point. Implementation of the observations was made by drawing a line as far as 200 meters to determine the point 1, point 2 and point 3 with each point of observation taking 20-30 minutes. Then note the found mammal. The parameters measured are the type and number of mammal. Time observations were made in the morning until late afternoon. The data obtained were grouped according to the species taxa.

d) Herpetofauna (Study of Amphibians and Reptiles)

The used tools, namely headlamp, flashlight, plastic, digital cameras, tally sheet and identification book (Mistar, 2003). Data collecting diversity of herpetofauna (Amphibian and Reptile) on location is using Visual Encounter Survey (VES). Animal observations made in the areas of water, such as rivers, puddles and ponds. Then record the species found. The parameters determined that the species and number. Time observations were made at night, which is 18:00 pm-22.00 pm.

e) Potential Carbon

The used tools in this study are, meter cloth, GPS (Global Positioning System). To determine the potential of existing plants in the pine forest can was done by using the method of Squares. Squared sampling technique is a technique that is frequently used vegetation surveys in all types of plant families. Sample plots were made in this sampling technique can be either single or multiple plots. Single plot will probably give good information when vegetation families under study are homogeneous. The multiple plots can be placed at random way or irregular one, multiplied by the weight density of trees.

III. Results and Discussions

a) Plant Diversity

Based on the research that has been conducted in four different locations in the Siosar Forest Zone of Karo

According to Krebs (1994), the success of each plant species to occupy an area affected by the plant's ability itself to adapt optimally to all physical environmental factors (temperature, light, soil structure, and humidity), biotic factors (interactions between species, competition, and parasitism) and chemical factors include the availability of water, oxygen, pH, and nutrients in the soil interact.

b) Volume of Tree

Measurement of the volume of trees in the field is done by measuring the circumference of the tree (cm) which is then converted to obtain a measure tree diameter and height of the tree. From the table above it can be seen that the average total volume of pine trees and the average volume of 10 plots of pine trees is 38.417 m³ and 3.8417 m³. So that, the total volume of pine trees with a spacing of 3x3 m in 1 hectare is 4268.555 m³ ha⁻¹. According Soerianegara and Indrawan (1988), pine is a big tree, straight trunk, cylindrical. Normal pine stands can reach a height of 30 m,

was found one class tree species namely *Pinus merkusii* and some seedling (Table 1). In addition, *Pinus merkusii* density is 93 trees/ha (Relative Density = 100%) The high density of *Pinus merkusii* as dense spacing of which is 3 x 3 meters, which were planted about 30 years ago. State land and suitable climate make *Pinus merkusii* can grow well so rarely was found dead, besides *Pinus merkusii* contains *alelopat* in surface of leaves so little competition against other plants, because only certain plants that can survive in the alelopat substance. In accordance with Pramono (1992), the growths of plants in addition influenced by genetic factors are also influenced by the interaction of these plants on the environment. Environment influenced consists of the soil, climate, microorganisms, as well as competition with other organisms.

Based on Table 1. some seedling are found namely; *Ageratum conyzoides* and *Eupatorium odoratum* (Asteraceae), *Cyathea contaminans* (Pteridophyta), *Gleichenia* sp. (Gleicheniaceae), *Cinnamomum zeylanicum* (Lauraceae), *Melastoma malabatricum* and *Clidemia hirta* (Melastomataceae), *Bulbophyllum* sp. (Orchidaceae), *Passiflora* sp. (Passifloraceae), *Saccharum spontaneum* (Poaceae), *Moluccanus rubus* (Rosaceae), (*Rubiaceae*), *Eurya* sp. (Theaceae), and *Centella asiatica* (Umbelliferaceae).

Table 1. Seedling Diversity (Undergrowth)

No.	Family	Species
1.	Asteraceae	<i>Ageratum conyzoides</i>
2.	Asteraceae	<i>Eupatorium odoratum</i>
3.	Cyatheaceae	<i>Cyathea contaminans</i>
4.	Gleicheniaceae	<i>Gleichenia</i> sp.
5.	Lauraceae	<i>Cinnamomum zeylanicum</i>
6.	Melastomataceae	<i>Melastoma malabatricum</i>
7.	Melastomataceae	<i>Clidemia hirta</i>
8.	Orchidaceae	<i>Bulbophyllum</i> sp.
9.	Passifloraceae	<i>Passiflora</i> sp.
10.	Poaceae	<i>Saccharum spontaneum</i>
11.	Rosaceae	<i>Rubus moluccanus</i>
12.	Theaceae	<i>Eurya</i> sp.
13.	Umbelliferaceae	<i>Centella asiatica</i>

a diameter of 60-80 cm. Old pine stands can reach a height of 45 m, a diameter of 140 cm.

Table 2. Volume of Tree

Plot	Species	Volume of Tree (m ³)	Plot	Species	Volume of Tree (m ³)
1	<i>Pinus merkusii</i>	2,963	6	<i>Pinus merkusii</i>	3,980
2	<i>Pinus merkusii</i>	2,605	7	<i>Pinus merkusii</i>	4,553
3	<i>Pinus merkusii</i>	2,744	8	<i>Pinus merkusii</i>	4,885
4	<i>Pinus merkusii</i>	3,247	9	<i>Pinus merkusii</i>	4,907
5	<i>Pinus merkusii</i>	3,704	10	<i>Pinus merkusii</i>	4,829
Total			38,417		
The average volume of			3,8417		

Trees	
Volume of Tree per hectare	4.268,555

c) Potential Carbon

The issue of global warming is a phenomenon that will be faced in the future. One of the biggest factors that affect global warming is deforestation and forest degradation resulting in increased emissions of carbon dioxide (CO₂). Forests play a role in neutralizing carbon dioxide (CO₂ sequestration) with the help of sunlight and water from the soil, vegetation chlorophyll is able to absorb CO₂ from the atmosphere through photosynthesis.

Based on the results of research in Siosar pine forest, tree density is 93 trees per hectare, with an average diameter of 51.33 cm. Pine planting distance is 3 x 3 meters with about 30 years old. The results of the analysis of the biomass, carbon stored and the value of Siosar pine forest carbon is 180,11 tons ha⁻¹ (equivalent to CO₂ sequestration by 661,01 tons ha⁻¹) and the value of the carbon uptake services of US \$ 3.020,84 ha⁻¹.

The high uptake of pine carbon produced because of vegetation possess a canopy or large canopy cover so that the number of leaves that can absorb a lot of carbon. Pines are also uptaking the highest rate of carbon followed by litter, dead trees and landed plants. Carbon stock is stored either the carbon content in the surface soil as plant biomass, crop residues dead (*nekromasa*), and in

the soil as organic matter. The altering of carbon form is then the basis for calculating emissions, where most of the carbon elements (C) which decomposes into the air are usually bound with O₂ (oxygen) and to CO₂ (carbon dioxide). When one hectare of forest disappears (dead trees), the biomass of the trees sooner or later will decompose and the carbon element is bound to become air emissions.

Forests as a provider of environmental services are sometimes forgotten by the more valuable management of economic objectives. But recently, the value of forest environmental services can already be assessed price, one of which is carbondioxide uptake value services. Based on market updates BII (2015), the exchange rate against the dollar is Rp. 12,980 per dollar. If the value is converted into rupiahs, then the absorption of carbon dioxide environmental services of pine forests of Siosar is around Rp. 39,210,503.2 ha⁻¹.

d) Aves Diversity

Table 3 shows the diversity of Aves (birds) in a pine forest Siosar which consists of six ordos, twelve families, fourteen genus and fifteen species. The high diversity of Aves in the Siosar forest due to *Pinus mercurii* of Siosar forest is being directly adjacent to the protected forest.

Table 3. Data of Aves Diversity in Siosar Pine Forest

Ordo	Famili	Spesies	Vernacular Name
Accipitriformes	Accipitridae	<i>Haliastur indus</i>	Elang
Columbiformes	Columbidae	<i>Geopelia striata</i>	Perkutut Jawa
Coraciiformes	Bucerotidae	<i>Buceros rhinoceros</i>	Rangkong Badak
Passeriformes	Dicruridae	<i>Dicucrus</i> sp.	Sri Gunting
	Dicaidae	<i>Dicaeum</i> sp.	Cabai
	Muscicapidae	<i>Culicicapa ceylonensis</i>	Sikatan Kepala Abu-Abu
	Oriolidae	<i>Oriolus</i> sp.	Kepudang
		<i>Prionochilus percussus</i>	Pentis Pelangi
	Silviidae	<i>Orthotomus</i> sp.	Cinenen
	Pycnonotidae	<i>Pycnonotus aurigaster</i>	Cucak Kutilang
		<i>Pycnonotus atriceps</i>	Cucak Kurincing
	Muscicapidae	<i>Sturnus</i> sp.	Jalak
Piciformes	Picidae	<i>Megalaima</i> sp	Takur
		<i>Reinwardtipicus validus</i>	Pelatuk Kundung
Trogoniformes	Trogonidae	<i>Harpactes oreskios</i>	Luntur harimau

e) Reptile Diversity

The observation of reptile diversity in pine forests of Siosar is only found two types of reptiles, namely *Calotes* sp., And *Cyrcodactylus* sp., included in the subordo of *Lacertilia* (lizards group), family of Agamidae and

Gekkonidae, *Calotes* and *Cyrcodactylus* genus (Table 4). *Cyrtodactylus* was found mostly in pine trees. This is because of the pine forest directly adjacent to protected areas that have high fauna diversity. *Cyrtodactylus* characterized by strong fingers and claws for gripping and climbing or rounded shape and curved sturdy body shape.

Table 4. Reptile Diversity

Ordo	Sub Ordo	Famili	Spesies	Name of regency
Squamata	Lacertilia	Agamidae	<i>Calotes</i> sp.	Bunglon coklat
		Gekkonidae	<i>Cyrcodactylus</i> sp.	Tokek Hutan

f) Amphibious Diversity

In Table 5 indicated that Amphibious was found in the region namely 1 ordo (Anura), 3 families (Rhacoporidae, Bufonidae, Ranidae), 6 genus (*Rhacoporus*, *Polypedates*, *Duttaphrynus*, *Phryonidis*, *Odorrana*, *Hylarana*) and 6 species (*Rhacoporus dullitensis*, *Polypedates leucomystax*, *Duttaphrynus melanostictus*, *Phryonidis aspera*, *Odorrana hosii*, *Hylarana chalconota*). The number of species was found in the observations at Siosar District, Karo because these locations are in the forest that still has sustainable environmental physical factors and plant communities are still good. According Ruler (2003), the most preferred habitats by amphibians is a wooded area because it requires a stable humidity, and some are never left at all. Besides, the location was also located in the forest where vegetation is still good and still awake.

Table 5. Diversity of Amphibious Type in The Siosar Pine Forest

Ordo	Famili	Spesies
Anura	Rhacoporidae	<i>Rhacoporus dulitensis</i>
		<i>Polypedates leucomystax</i>
		<i>Duttaphrynus melanostictus</i>
	Bufonidae	<i>Phryonidis aspera</i>
		<i>Odorrana hosii</i>
	Ranidae	<i>Hylarana chalconota</i>

Rana (Hylarana) chalconota is a species that is often encountered at various habitat types. Siregar (2010) stated that due to the high of *Rana chalconota* this species found in different types of habitats such as ponds, in the grass, herbs in the forest and in the puddles flow slow. States that this species live in the primary forest to the secondary forest and are often found around settlements and usually voiced in shrubs or small trees, and often found in ponds or puddles riverbank.

g) Mammals Diversity

From Table 5 it can be seen diversity of mammals in the Pine mercusii of Siosar Forest is 1 ordo (*Artiodactyla*), 2 families (*Cervidae*, *Suidae*), 2 genus (*Muntiacus*, *Sus*) and 2 types (*Indian muntjac deer* and *Wild Boar Sus scrofa*).

Table 5. Mammals data in the Siosar pine forest

Ordo	Family	Species
Artiodactyla	Cervidae	<i>Muntiacus muntjak</i>
	Suidae	<i>Sus scrofa</i>

During field observations, it was found some footprints of wild boar (*Sus scrofa*) in the first observation locations (coordinates), as well as wild boar, although not found immediately, but the observation is based on a trail, it is known that there are deer around the research station. Traces of antelope found mixed with traces of wild boar. Chances are carried out by both of these animals is looking for sources of water and streams that are close to the research station (Yasuma, 1994).

IV. Conclusions

- The biodiversity of flora and fauna in the pine forest of Siosar is low. It is easy to be accepted in view of this region is the result of reforestation plantations (HTHR) planted with pine plant communities. Under plants only found 13 species. The most common types of fauna is aves group.
- The value of the carbon stored in pine stands amounted to 180.11 tonnes ha⁻¹ (equivalent to CO₂ sequestration by 661,01 tons ha⁻¹) and the value of the carbon uptake services of US \$ 3.020,84 ha⁻¹

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