ABSTRACT

Paniis village located on the border of the National Park Ujung Kulon Banten. This area has three types of habitat, namely land, swamp and coastal. In general, the land is quite fertile region, composed of primary forests and secondary forests, plantations and a wide expanse of rice fields, which allows the finding of several species of macroscopic fungi. The purpose of this study is to determine the macroscopic fungi species diversity based on different types of habitats, i.e. forests, plantations and coastal areas. Sampling was performed by browsing around and looked for macroscopic fungi paths. Macroscopic fungi samples collected in the study site were observed and recorded by morphologic characters, then grouped based on their benefit or potential usage (food or medicine). The results recorded 70 species, 29 species are in the forest, 20 species in plantations and 21 species on the coast. Diversity indices were moderate, the highest diversity index in the forest with the lowest value of 2.508 and on the coastal with a value of 2.245. Value comparison between the species composition of the highest locations in forests and plantations amounted to be 36.73 % and the lowest among the coastal plantations by 34.15 %. Highest presence frequency was found in the forest, i.e. 51% (Microsporus xanthopus), followed by the coastal location of 43.11% (Shcyzophylum communae) and the lowest was 20.32% in the plantation (Shcyzophylum communae). There are 14 species of macroscopic fungi were potential as food, 32 species potential as medicine, and 6 species potential as food and medicine.

Keywords
Biodiversity, macroscopic fungi, Ujung Kulon.
INTRODUCTION

Tropical forest in Indonesia has a high mushroom diversity due to its environmental factors such as humidity, sufficient water, nutrient resources, pH and temperature that can support fungal growth.

Fungus can be seen and indentify easily especially in the places that are humid, such as litter for examples. In its natural environments, fungus can thrive in places that contain carbohydrates, both already degraded or still in larger molecules like cellulose, lignin, and other materials.

In the forest various types of substrate can be overgrown by certain types of fungi. Fungi can live and occupy various types of substrates ranging from soil, water, woods that already withering, litters, animal wastes and so forth (Noverita dan Setia, 2010). One type of fungi usually had certain requirement towards the substrate for itself to grow, nevertheless environment condition should support the growth of the fungi. The difference of substrate and enviromental condition for example air and land humidity,temperature, acidity (pH) of soil, light intensity will effect on growth of different types of fungi (Ronald, 2000).

Fungal organism in forest had it’s retribution for the substrate (environment) they had grown. In the forest fungi had important tasks as decomposer together with other microorganisms such as bacteria, actinomycetes, termite, and so on to degrade any pile material that already accumulate in the woods. Process of decomposition had become great help to balance the ecosystem where the results of degradation organic material can be used by plants and others soil organism (Ronald, 2000). Meanwhile in human’s life fungi had it’s potential too as food stuffs. Few species of fungi that grows in the forest are edible because it has good nutrients for humans, such as Pleurotussp, Auriculariasp, and Lentinussp.

Paniis is an area that lies on the border area of Ujung Kulon National Park, this area had three ecosystem there is coastal, swamp, and land ecosystem. Judging from the region that are supportive, allowing it to had great probability to find variety of macroscopic fungal.

The purposes of this research is to know diversity of macroscopic fungal based on habitat types including forest, plantation and coastal area in Paniis Village Desa Taman Jaya around Ujung Kulon National Park, Banten.

MATERIALS AND METHODS

This research conducted for five days on 16 – 22 May 2012 at Paniis village Desa Taman Jaya around the area of National Park, Ujung Kulon, Banten.

Tools that is used in this research are tabulation data, stationery, wrote plank, paper, label, sample container, soil pH meter, hygrometer, altimeter, thermometer, plastic bag, bunsen burner, beaker glass, inoculation needle, Petri discs, pincette, counter, plastic rope, and digital camera. Materials that is used in this research are alcohol 70%, formalin 4%, cotton, aquadestillata, Potatos Detrosa Agar Medium.

Sampling locations

Sampling sites were chosen in three places, the forest, plantation, and coastal region of Paniis Village Desa Taman Jaya around area of National Park Ujung Kulon Banten, because it has different types of substrate, humidity, and altitude in each habitat that are considered represent the region.
Sampling method

Sampling was performed using Explorer method to browse and search for mushrooms that is passed around the tracks. Samples mushroom that were found in research sites were observed and recorded few of its morphological characters such as hood’s shape, lamella, and other parts as well and took it’s picture. Species that are unknown were put in plastic bag and samples were preserved in a bottle who already had formalin in it for further identification.

Surroundings Parameter

Surroundings parameter includes temperature using thermometer, acidity (pH) of soil using soil pH meter, and humidity using hygrometer. These parameter were taken from morning daytime until sampling time was over. Parameter was recorded in data tabulation sheet.

Identification of Samples

Samples that are stored were identified at laboratory with the help mushroom identification namely "Simon & Schuster’s Guide To Mushrooms” (Simon and Schusters. 1994). Introductory mycology, 4th eds (Alexopoulus at all. 1996), and "Working with Mycorrhiza in Forestry and Agriculture (Brundrett and Baugher.1997).

Data analysis

The data was acquired with this analysis :
1. Diversity using Shanon-Winner equation (Magurran, 1987)
2. Species composition between habitat types, using Sorensen similarity index equation (Brower and Zar, 1990)
3. Frequency of encounter of each habitat Using frequency equation.

RESULTS

Environmental Factors

Environmental conditions were noted during the study at three observation area, consist of parameters humidity, temperature, and soil acidity (pH), shown in Table 1.

Table 1. Condition of Physical Environment at each Location area sample

<table>
<thead>
<tr>
<th>Location</th>
<th>Soil Acidity</th>
<th>Temperature (°C)</th>
<th>Humidity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest (A)</td>
<td>6.4 - 7.3</td>
<td>31 – 34</td>
<td>53 – 67</td>
</tr>
<tr>
<td>Plantation (B)</td>
<td>6.0 - 7.0</td>
<td>31 – 35</td>
<td>50 – 80</td>
</tr>
<tr>
<td>Coastal (C)</td>
<td>5.7 - 7.2</td>
<td>30 – 34</td>
<td>56 – 74</td>
</tr>
</tbody>
</table>

Diversity of Macroscopic Fungi

Diversity index (H ') at three locations displayed in Fig. 1 below:

Figure 1. Bar Chart Diversity of macroscopic Fungi at Three Location area sample
Composition of macroscopic fungi at Three Locations

1. Number of species

Number of species of macroscopic fungi were found in three locations as many as 70 species, with the number at each location are: 29 types at forests, 20 species at plantations, and 21 species at shore. The data is displayed in the diagram Fig. 2 below.

![Figure 2. Bar Chart Number Of Species Macroscopic Fungi in Three Locations](image)

2. Similarity Index

Indeks Similarity of macroscopic fungi were found in three locations in the data collection at Paniis village of Taman Jaya Paniis around Ujung Kulon National Park shown in Figure 3 below.

![Figure 3. Bar Chart of Similarity Index Between Type Location](image)

Frequency of Attendend

Encounter rates in three locations of macroscopic fungi sampling is calculated based on Frequency of Attendendis the presence of the macroscopic fungi in the three locations. The Frequency of Attendend are presented in Fig. 4 below.

![Figure 4. Bar Chart Frequency presence of Macroscopic Fungi](image)

Potential and Benefits

Potential fungus classified using any literature, local guides and information of local people who using macroscopic fungi in daily life. Species that found in three different location is 14 species Potential as a foodstuff, 32 species as a medicine, and 6 species as a both of them

1. Potential Mushroom as Food

The macroscopic fungi which known have used as a foodstuff that found when taking sample in the location is; Auricularia sp, Coprinus sp, Lentinus sajor-caju, Lentinus tigrinus, Lentinus sp., Pteurotus ostreatus, Schyzophyllum commune, Termitomyces munniformis, Termitomyces, Sarcoscypha speciosa., Tremella sp1., Tremella sp2., Volvariella speciosa and Skleroderma citrinum. The following images is an example of fungi that found potential as food.
2. Potential Mushroom as Medicine

The macroscopic fungi which known have medicinal benefits that found when taking sample in the location is *Amaroderma, Ganoderma, Polyporus, Picnoporus, Rigidoporus, Scleroderma*, and *Trametes*. *Amaroderma parasiticum, Auricularia* sp., *Cookeina* sp., *Daldineaconcentric, Ganoderma lucidum, Ganoderma aplanatum, Lentinus sajor-caju, Lentinus tigrinus, Lentinus squamulosus, Microporus xanthopus, Picnoporus cinnabarinus, Picnoporus sp 2, Picnoporus sp.3, Picnoporus sp.4, Polyporus elegant, Rigidoporus sp.1, Rigidoporus sp2, Rigidoporus sp.3., Rigidoporus sp.4., Stearum sp., Trametes sp.1, Trametes sp.2., Trametes sp 3., Trametes sp.8., Trametes sp.9., Trametes sp.10., Polyporus arcularius*, and *Pleurotus ostreatus*. The following figure shows an example of a fungus found potential as medicine;

![Image](image_url)

**Figure 5.** Some examples of potential macroscopic fungal as a Foodstuff found in Paniis Village Ujung Kulon

3. Potential mushroom as food and medicine

The macroscopic fungi which known have food and medicine benefits that found when taking sample in the location is *Auricularia sp., Lentinus sajor-caju, Lentinus tigrinus, Lentinus squamulosus, Pleurotus ostreatus, Sarcoscypha spesciosa* and *Scleroderma citrinum*.

**DISCUSSION**

Environmental conditions which recorded at the time of the study at each sampling area (Table 1) are generally very supportive for the growth of fungi. According to Chang and Miles
(2004), generally the fungus will grow on range from 4.5 to 8.0 with a pH optimum between 5.5-6.5. Fungal growth temperature ranged between 20-28°C, while humidity for mycelial growth of around 50-75%.

The bar chart above (Fig. 2) shows that the index of diversity (H') that at A location is greater than B and C location, which amounted to 2,508, whereas B and C location respectively amounted to 2,305, and 2,245. Hal This is due to the condition of the habitat on A location has a factor better environment for fungal growth compared with 2 other habitats (Table 1), except that these location crossed the river path that retains moisture and vegetation diversity, so the diversity of fungi are found to be more varied than the location other. Smallest diversity index found at the C location where the condition of this location is adjacent to the beach. salinity influenced to pH, and became one of the environmental factors that inhibit the fungus to grow. At these location also has an open shade, so the presence of the fungus is limited because light penetration is too excessive.

Based on the Shannon-Winner Test, diversity of mushroom on the A, B and C location included in the 2245-2508 categories. This is in accordance with the opinion Maguran (1987) who stated range diversity index value or (H') between 0 to 2.302 is low, (H') between 2.302 to 6.907 were moderate and if the value is high (H') is more than 6,907.

Generally, the amount of macroscopic fungi in each location is determined by habitat conditions and environmental factors. The location itself, when the retrieval data found various fungi growing on various substrates such as soil, litter, dead wood and trees. Number of fungal species that obtained at location A at most as many as 29 species, it was related to habitat conditions that affect the humidity and temperatures that support macroscopic fungigrowth. At B location and C location has found a lower number of fungi in a location that is equal to 20 and 21 species, this is caused by the presence of substrates that are not shaded by tree so that habitat conditions are not in optimal conditions for port macroscopic fungi growth. Besides that location B and C also has a rather dry soil conditions and high temperatures so that the macroscopic fungi is difficult to grow in these conditions.

Similarity index at A location and B location is worth the highest of 36.73% which means only little different macroscopic fungi were found. This is due to the location of habitat adjacent to the factors that affect the growth of fungi is almost the same, so the macroscopic fungi are found mostly the same. For B location and C location have the value of similarity index by 36%. while the similarity index of the lowest types A and C is the location of the forest and the beach. This can occur due to different external factors, especially the substrate, and the shade that causes the differences in each type of habitat.

Percentage Frequency attendance based of the results obtained ranged from 20-51%. According to Michael (1994), categories of frequency attendance at A location that has a percentage of 51% is called a constant. Type of fungus that is found in here is *Microporus xanthopus*, whereas the frequency of attendance at B location  and C has a percentage of 20.32% and 43.11% so that could be called assesori. Types of fungi were found in both locations are *Schizophyllum communae*.

Judging from the potential, pretty much macroscopic fungi found in this study has potential as an ingredient, or as medicine. However, Based on the results in discussions with local guide, there are many people do not know the type of fungus that can be used. Those species are used as food because they
have a thick fruit body, savory taste, soft texture and high nutritional value.

Used as medicine, macrospheric fungi used as ingredient because it contains a potential chemical found on fruit body. one example is *Ganoderma* which can be used as an anti tumor and also can inhibit HIV infection in humans. *Pleurotus chinensis* used as medicine in some countries in Asia and Africa. *Auricularia auricula-judae* used as anti-cholesterol drug (Chang and Miles, 2004).

Some fungi are found with double potential (as foodstuff and medicine) like *Auricularia, Pleurotus,* etc. One example like *Auricularia* can produce mucus when cooked, but it can be used as poison antidote that contained in the cooked ingredients, derived from pesticide residues, detergents, etc. (Suriawiria, 2000).

**CONCLUSION**

1. pH, humidity, and temperature are the environmental factors that influence the growth of fungus
2. Found as many as 70 species of fungi in three different habitats.
3. Highest diversity index at location A with a value 2.508 while the lowest value at location C with a value 2.245.
4. Comparison of the similarity of the highest percentage of 36.73% at locations A and B, while the smallest was 34.15% at site B and C.
5. Percentage frequency of fungus presence with value 51% in location A (forest area), one example is *Mikrosporus xanthopus;* location B and C for the plantations and coastal with value of 20.32% and 43.11%. one example is *Shcyszophylum communae.*
6. There are 14 species of fungi that used as foodstuff, 32 kinds of potential as a medicine, and 6 types of potential as a foodstuff and medicine.

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