

Diversity of Mushrooms in Areas Sago, Secondary, and Swamp Forest in Village Khameyaka, Ebungfau District, Jayapura Regency

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ABSTRACT

The research aims to determine the diversity of mushrooms in the sago forest area, secondary forest, and swamp forest of Khameyaka village as well as the types of mushrooms used by local people. Observation of structure, composition, and diversity using transect, documentation, and plot methods. 11 species of mushrooms were recorded in the sago forest, 37 species of mushrooms in the secondary forest, and 5 species of mushrooms in the swamp forest. The index value of mushroom species diversity in sago forest is 2.22 (moderately abundant), secondary forest is 3.31 (highly abundant), and swamp forest is 1.267 (moderately abundant). *Volvariella* sp. is used by local communities to meet food needs, carry out traditional events, and as a source of income

INTRODUCTION

Indonesia is a country with a tropical climate and has the highest biodiversity in the world after Brazil and Zaire. Papua is one of the provinces in Indonesia which is classified as rich in biodiversity. Papua (including West Papua) has many endemic species and diverse ecosystems. This province contributes 30-50% of Indonesia's biological wealth (de Fretes, 1999)

Mushrooms are a very important basic component of soil in forest ecosystems. Fungi can control the nutrient cycle chain which is important for maintaining soil fertility, but it also contributes to building and maintaining soil structure, absorption of toxic materials (remediation), carbon, nitrogen, phosphorus, and sulfur cycles, suppressing soil-borne pathogens, and stimulating growth. root crops and affect vegetation (Garbeva, Van Veen, & Van Elas, 2004; Singh & Singh, 2008).

Fungi can be seen and recognized easily, especially in damp places, for example in litter and plants. Different substrates will usually cause different types of fungi to grow, as well as differences in environmental conditions, such as air humidity, soil moisture, temperature, soil acidity (pH), and light intensity. This is because environmental factors greatly affect the growth of both the mycelium and the mushroom fruiting bodies (Roosheroe, Sjamsuridzal, & Oetari, 2006).

Mushrooms act as one of the decomposers that help the decomposition process of organic matter to accelerate the cycle of matter in forest ecosystems (Suharna, 1993). There are fungi that are saprophytic and parasitic. Saprophytic fungi obtain food by absorbing nutrients from organic matter such as dead plants and animal remains, while parasitic fungi obtain nutrition by absorbing living plants or animals. The main group of fungi that act as lignocellulose degraders come from the *Basidiomycetes* because they are capable of producing lignicellulosic degrading enzymes such as cellulose, ligninase, and hemicellulose Munir (2006) so that the cycle of matter in nature can continue. Fungi have a high level of species diversity. It is estimated that there are about 1.5 million species of fungi worldwide (Campbell, Reece, & Mitchell, 2003).

The importance of this research was conducted to determine the level of diversity of mushrooms found in sago forest areas, secondary forests, and swamps and what mushrooms are consumed by the people of Khameyaka Village, Jayapura Regency.

LITERATURE REVIEW

Research on mushroom diversity in Papua is still very minimal, especially in the outskirts of Lake Sentani, Jayapura district, so researchers conducted studies on mushroom diversity in the sago forest, secondary forest, and swamps in the Khendo forest, Atamali village, Sentani district, Jayapura district. According to research by Suharno, Irawan, Qomariah, & Sufaati (2014), the results were that in the Warmare District, Manokwari Regency, West Papua. There are 62 species of macrofungi from 19 families (29 genera). This study shows that in forest and mountain areas there is a high diversity of fungi and is inseparable from abiotic factors such as air temperature and soil moisture.

According to research by Abbas, Listyorini, & Martanto (2008), observations of endemic sago mushrooms in Papua. During the observation, sago mushrooms were found growing on a stretch of sago dregs in the sago forest in South Yapen District, Warari Village. The shape and morphology of the sago mushrooms found in Warari Village did not vary. Based on the similarity in shape and morphology, it can be informed that there is only one type of sago mushroom in Yapen Regency, which is the genus *Volvariella sp.* The Sago mushroom is an edible mushroom that grows sporadically on decaying sago dregs and sago stems.

Local people like sago mushroom because it tastes good and is nutritious. Mushroom *Volvariella sp.* is generally rich in essential amino acids such as leucine, isoleucine, valine, tryptophan, lysine, threonine, phenylalanine, methionine, and histidine (Jordan, 1993; Widiyastuti, 2005). This research shows that there are several species of mushrooms consumed by the local community.

METHODOLOGY

Study Site

This research was conducted in January 2021. The research location was in the Khendo forest, Khameyaka Village, Ebungfau District, Jayapura Regency.

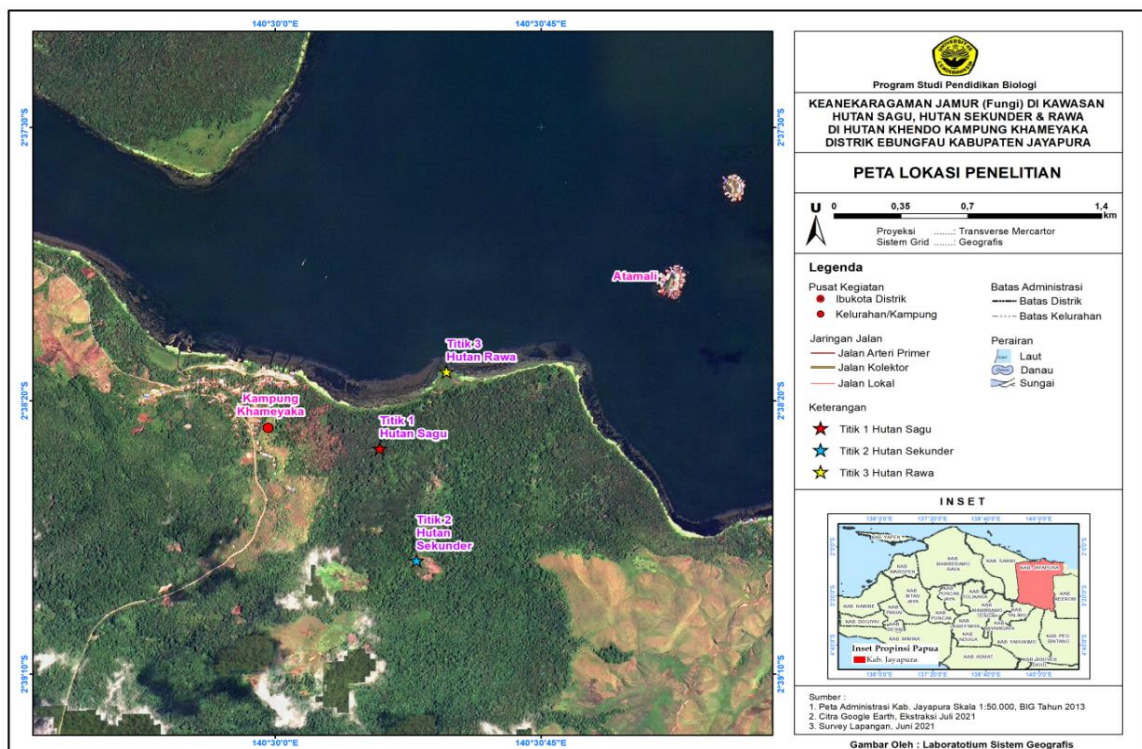


Figure 1. Map of Research Locations in The Khendo Forest of Khameyaka Village, Ebungfau District, Jayapura Regency

Research Design

This research is a type of exploratory descriptive research, namely research that aims to describe or describe existing phenomena, both natural and human engineering. This study used survey methods with exploratory techniques, namely all ways to determine more thoroughly or thoroughly in research and documentation. This type of exploratory descriptive research in this study aims to collect specimens, describe, identify, classify, and inventory the overall diversity of mushroom data obtained.

Tools and Materials

The equipment and materials used in this study included cameras, observation sheets (tally sheets), pencils, 100 m tape measure, raffia rope, picture mushroom applications, identification books, and mushroom specimens.

Population and Research Sample

The population in this study were all types of mushrooms found in the sago forest area, secondary forest, and swamp in the Khendo forest of Khameyaka village, while the samples were the types of mushrooms that were in the transect observation plots in the sago forest area, secondary forest and swamp of Khameyaka village.

Transect Method

Data collection was carried out using the observation plot transect method, namely tracing the areas of the three stations, measuring the height of the mushrooms, and the number of mushrooms found at the three stations. Each station has 3 transects, namely in the sago forest area 2 transects, 2 transects in secondary forest, and 2 transects in swamps. Data collection was carried out using observation sheets/tally sheets. The data collected includes several mushrooms, habitats, scientific names, and families. Then documentation of each mushroom sample obtained in each plot of each transect is used as material for identification using the Putra & Hafazallah identification book (2020) and the picture mushroom application.

Documentation Method

This documentation method is used to take pictures of each mushroom species encountered from each observation plot to facilitate the process of identifying species whose scientific names are unknown and as attachments.

Plot Method

This plot method is used to see the availability and distribution of mushrooms. Data were collected through vegetation analysis using the plot plot method of 30 observation plots. The layout plan of the research plots at the location of Sago Forest, Secondary Forest, and Swamp in Khameyaka Village, Ebngfau District, Jayapura Regency can be seen in Figure 2 (Note: 1 transect=5 plot; 1plot=100m/20mx20m).

Data Analysis

According to Indriyanto (2006), vegetation analysis was carried out to obtain the structure and composition of the vegetation at the study site. The Important Value Index (INP) for pole and tree level vegetation is the sum of the relative density (KR) and relative frequency (FR) values. The diversity of a mushroom species can be determined using the Shannon - Wiener diversity index.

RESEARCH RESULT

The results of research in the Khendo forest area of Khameyaka village showed that in the Sago ecosystem type, 8 families of 11 mushroom species were found, presented in Table 1, in the secondary forest ecosystem type, 18 families were found from 37 mushroom species, presented in table 2, in the type of swamp forest ecosystem, 5 families of 5 species of mushrooms were found which are presented in table 3. The data shows the composition and structure of the mushrooms which have varying values for each species due to the different characteristics of each fungus.

Structure and Composition of Fungi in Sago Forest

Based on the results of the research data in table 1, the number of individuals of the 11 species found was 115, the species with the highest number of individuals was *Parasola plicantillis* with 27 species, *Volvariella* sp. with 25 species, *Parasola auricoma* with 23 species, *Schizophyllum commune* with 11 species, *Pleurotus ostreatus* with 8 species. The growth of this fungus is strongly influenced by several factors, namely: temperature, water demand, oxygen demand and pH, Substrat. In this sago forest area, the humidity level is quite high, and the available substrate is sufficient so that it can become a medium for mushroom growth so that through observation, the number of species found in this sago forest area is higher than in the swamp forest area.

The highest relative density was 23,478% for *Parasola plicantillis*, the second type, *Volvariella* sp, 21,739%, the third type, *Parasola auricoma*, 20,000%, the fourth type, *Schizophyllum commune*, 9,565%, the fifth type, *Pleurotus ostreatus*, 6,956%. Differences in the density values of each species are caused by differences in the ability to reproduce, spread and adapt to the environment. The density value of a species indicates the number of individuals of the species concerned in a certain unit area, so the density value is an illustration of the number of these species in the study area. Density values cannot yet provide an overview of how the distribution and distribution patterns are. An overview of the distribution of individuals in a particular species can be seen from the value of the frequency while the distribution pattern can be determined by comparing the mean value of a particular species with the overall population variation.

The highest frequency value was found in *Pleurotus ostreatus*, *Volvariella* sp. *Parasola plicantillis*, *Parasola auricoma*, *Schizophyllum commune* by 12,500% means that out of a total of 10 plots observed at the study site, around 5 plots of which contained these types. The type of *Parasola plicantillis* is the type with the highest density and frequency values so that it can be considered as a dense species and is widely distributed in almost all research locations. The second, third, fourth and fifth highest frequencies have the same frequency values, namely *Volvariella* sp. *Parasola auricoma*, *Schizophyllum commune*, *Pleurotus ostreatus* species these species also have a high frequency value of 12,500% or are found in 4 of the 10 plots studied. In this study the use of the quadratic method and its placement was carried out using procedures that are easy to do in the field so that the frequency values obtained can describe the conditions at the research sites. The species that have the highest density and frequency values are *Parasola plicantillis* and *Volvariella*

sp. included in the category of species that have good adaptability to environmental conditions.

Table 1. Number, Density, Relative Density, Frequency, Relative Frequency, IVI, H' (Shanon Wiener) Fungal Diversity in Sago Forest.

Family	Species	Fungus						
		Tota I	D	RD (%)	F	RF (%)	IVI (%)	ni/N. Ln ni/N
Agaricaceae	<i>Podaxis pistillaris</i>	1	0.0002 5	0.869	0. 1	6.25	7.120	-0.119
Fomitopsidace ae	<i>Daedalea quercina</i>	1	0.0002 5	0.869	0. 1	6.25	7.120	-0.119
Meruliaceae	<i>Irpex lacteus</i>	5	0.0012 5	4.347	0. 1	6.25	10.598	-0.156
Pleurotaceae	<i>Pleurotus ostreatus</i>	8	0.002	6.956	0. 2	12.5	19.457	-0.227
Pluteaceae	<i>Volvariella</i> sp	25	0.0062 5	21.739	0. 2	12.5	34.239	-0.302
Polyporaceae	<i>Trametes gibbosa</i>	2	0.0005	1.739	0. 1	6.25	7.989	-0.129
	<i>Pycnoporus cinnabarinus</i>	5	0.0012 5	4.347	0. 1	6.25	10.598	-0.156
Psathyrellacea e	<i>Coprinopsis lagopus</i>	7	0.0017 5	6.086	0. 1	6.25	12.337	-0.172
	<i>Parasola plicatillis</i>	27	0.0067 5	23.478	0. 2	12.5	35.978	-0.309
	<i>Parasola auricoma</i>	23	0.0057 5	20.000	0. 2	12.5	32.500	-0.295
Schizophyllace ae	<i>Schizophyllum commune</i>	11	0.0027 5	9.565	0. 2	12.5	22.065	-0.243
Total		115	0.0287 5	100.00	1. 6	100.00 0	200.00 0	-2.225
							H'	2.225

Structure and Composition of Fungi in Secondary Forest

Based on the results of the research data in table 4.2, the number of individuals of the 37 species found was 414, the species with the highest number were *Psathyrella candolleana* with 97 species, *Mycena hameotopus* with 50 species, *Coprinellus disseminatus* with 50 species, *Xylaria longipes* with a total of 50 species, *Ascocoryne sarcoides* with a total of 25 species. The growth of this fungus is strongly influenced by several factors, namely: temperature, water demand, oxygen demand and pH, substrate. Where in this secondary forest area is a suitable area as a mushroom growth medium because there is a suitable substrate as a mushroom growth medium so that in this secondary forest area the number of mushroom species is found to be more than sago and swamp forest.

The highest relative density was 23.373% for *Psathyrella candolleana*, the second, third and fourth species were *Mycena hameotopus*, *Coprinellus disseminatus* and *Xylaria longipes* by 12.048%, the fifth type was *Ascocoryne sarcoides* by 6.024%. Differences in the density values of each species are due to differences in the ability to reproduce, spread and adapt to the environment. The density value of a species indicates the number of individuals of the species concerned in a certain unit area, so the density value is an illustration of the number of these species in the study

area. Density values cannot yet provide an overview of how the distribution and distribution patterns are.

Table 2. Number, Density, Relative Density, Frequency, Relative Frequency, IVI, H' (Shanon Wiener) Fungal Diversity in Secondary Forest.

Family	Species	Fungus						
		Total	D	RD	F	FR (%)	IVI (%)	ni/N. Ln ni/N
Agaricaceae	<i>Clavogaster virescens</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
Auriculariaceae	<i>Auricularia auricularia-judae</i>	7	0.001	1.686	0.30	5.882	7.569	-0.124
			75		0			
	<i>Auricularia delicata</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
	<i>Auricularia americana</i>	5	0.001	1.204	0.10	1.961	3.166	-0.066
			25		0			
	<i>Exidia recisa</i>	10	0.002	2.409	0.10	1.961	4.370	-0.084
			5		0			
Chlorociboriaceae	<i>Chlorociboria aeruginascens</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
Fomitopsidaceae	<i>Laetiporus gilbertsonii</i>	11	0.002	2.650	0.10	1.961	4.611	-0.087
			75		0			
Helotiaceae	<i>Ascocoryne sarcoides</i>	25	0.006	6.024	0.20	3.922	9.946	-0.149
			25		0			
Hericiaceae	<i>Hericium coralloides</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
Hymenochaetae	<i>Pseudoinonotus dryadeus</i>	2	0.000	0.481	0.10	1.961	2.443	-0.054
			5		0			
	<i>Porodaedalea pini</i>	17	0.004	4.096	0.10	1.961	6.057	-0.106
			25		0			
Hypoxylaceae	<i>Daldinia concentrica</i>	7	0.001	1.686	0.20	3.922	5.608	-0.100
			75		0			
	<i>Hypoxylon howeanum</i>	2	0.000	0.481	0.10	1.961	2.443	-0.054
			5		0			
Marasmiaceae	<i>Pleurocybella porrigens</i>	4	0.001	0.963	0.10	1.961	2.925	-0.062
					0			
Marasmiaceae	<i>Marasmius haematocephalus</i>	5	0.001	1.204	0.10	1.961	3.166	-0.066
			25		0			
Meruliaceae	<i>Irpex lacteus</i>	2	0.000	0.481	0.10	1.961	2.443	-0.054
			5		0			
Mycenaceae	<i>Mycena haematopus</i>	50	0.012	12.04	0.10	1.961	14.00	-0.186
			5	8	0		9	
Phallaceae	<i>Pseudocolus fusiformis</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
	<i>Phallus indusiatus</i>	1	0.000	0.240	0.20	3.922	4.163	-0.081
			25		0			
Pleurotaceae	<i>Pleurotus djamor</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
Polyporaceae	<i>Daedaleopsis confragosa</i>	3	0.000	0.722	0.10	1.961	2.684	-0.058
			75		0			
	<i>Amauroderma sp. Murrill</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
	<i>Pycnoporus cinnabarinus</i>	3	0.000	0.722	0.20	3.922	4.644	-0.087
			75		0			
	<i>Hexagonia tenuis</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
	<i>Trametes gibbosa</i>	8	0.002	1.927	0.50	9.804	11.73	-0.166
					0		2	

	<i>Lentinus tigrinus</i>	4	0.001	0.963	0.10	1.961	2.925	-0.062
					0			
	<i>Picipes badius</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
	<i>Lentinus sajor-caju</i>	10	0.002	2.409	0.20	3.922	6.331	-0.109
			5		0			
	<i>Lentinus crinitus</i>	4	0.001	0.963	0.20	3.922	4.885	-0.091
					0			
Psathyrellaceae	<i>Psathyrella candolleana</i>	97	0.024	23.37	0.10	1.961	25.33	-0.262
			25	3	0		4	
	<i>Coprinellus disseminatus</i>	50	0.012	12.04	0.10	1.961	14.00	-0.186
			5	81	0		9	
	<i>Coprinopsis lagopus</i>	16	0.004	3.855	0.10	1.961	5.816	-0.103
					0			
	<i>Coprinellus domesticus</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
Stereaceae	<i>Stereum ostrea</i>	8	0.002	1.927	0.30	5.882	7.810	-0.127
					0			
Strophariaceae	<i>Leratiomyces ceres</i>	1	0.000	0.240	0.10	1.961	2.202	-0.050
			25		0			
Xylariaceae	<i>Xylaria polymorpha</i>	3	0.000	0.722	0.10	1.961	2.684	-0.058
			75		0			
	<i>Xylaria longipes</i>	50	0.012	12.04	0.10	1.961	14.00	-0.186
			5	8	0		9	
Total		415	0.103	100.0	5.10	100.0	200.0	-3.312
			75	0	0	00	00	
							H'	3.312

The highest frequency value was found in the *Trametes gibbosa* species of 9,804%, meaning that out of a total of 10 plots observed at the study site, around 5 plots included these types. The type of *Trametes gibbosa* is the type with the highest density and frequency values so that it can be considered as a dense species and is widely distributed in almost all research locations. The second, third, fourth and fifth highest frequencies had the same frequency values, namely *Coprinellus disseminatus* and *Xylaria longipes*, which had a frequency value of 1.961% or were found in 4 of the 10 plots studied. In this study the use of the quadratic method and its placement was carried out using procedures that are easy to do in the field so that the frequency values obtained can describe the conditions at the research site. The type that has the highest density and frequency values is the type of *Psathyrella candolleana* which belongs to the category of species that have good adaptability to environmental conditions.

Structure and Composition of Fungi in Swamp Forests

Based on the results of the research data in table 4.3, the number of individuals of the 5 species found was 49, the species with the highest number of individuals were *Laccaria laccata* with 31 species, *Psathyrella candolleana* with 10 species, *Volvariella* sp. with the number of species 4, *Daedalea quercina* with the number of species 3, *Trametes versicolor* with the number of species 1. The growth of this fungus is strongly influenced by several factors, namely: temperature, water demand, oxygen demand and pH, substrate. This swamp forest area is an area with a very high humidity level, so only a few species can grow in this swamp forest area, compared to sago forest and secondary forest.

The highest relative density was 62,500% for *Laccaria laccata*, the second *Psathyrella candolleana* was 20,833%, the third was *Volvariella* sp. 8.333%, the fourth

type is *Daedalea quercina* 6.250%, the fifth type is *Trametes versicolor* 2.083%. The difference in the density value of each species is due to differences in the ability to reproduce, spread and adapt to the environment. The density value of a species indicates the number of individuals of the species concerned in a certain unit area, so the density value is an illustration of the number of these species in the study area. Density values cannot yet provide an overview of how the distribution and distribution patterns are.

The highest frequency value was found in the type of *Laccaria laccata* by 50,000% meaning that out of a total of 10 plots observed at the study site, around 5 plots included these types. The type of *Laccaria laccata* is the type with the highest density and frequency values so that it can be considered as a dense species and is widely distributed in almost all research locations. The second highest frequency was *Daedalea quercina* of 20,000%, the third, fourth and fifth species were *Volvariella* sp., *Trametes versicolor*, and *Pastyrella candolleana* have the same frequency value of 10,000%. In this study the use of the quadratic method and its placement was carried out using procedures that are easy to do in the field so that the frequency values obtained can describe the conditions at the research site. The type that has the highest density and frequency values is the type of *Laccaria laccata* which belongs to the category of species that have good adaptability to environmental conditions.

Table 3. Number, Density, Relative Density, Frequency, Relative Frequency, IVI, H' (Shanon Wiener) Fungal Diversity in Swamp Forest.

Fungus								
Family	Species	Total	D	RD(%)	F	FR (%)	INP	ni/N.(ln ni/N)
Pluteaceae	<i>Volvariella</i> sp	4	0.00	8.333	0.10	10.00	18.33	-0.219
			1		0	0	3	
Psathyrellaceae	<i>Psathyrella candolleana</i>	10	0.00	20.83	0.10	10.00	30.83	-0.288
			3	3	0	0	3	
Hydnangiaceae	<i>Laccaria laccata</i>	30	0.00	62.50	0.50	50.00	112.5	-0.324
			8	0	0	0	00	
Fomitopsidaceae	<i>Daedalea quercina</i>	3	0.00	6.250	0.20	20.00	26.25	-0.267
			1		0	0	0	
Polyporaceae	<i>Trametes versicolor</i>	1	0.00	2.083	0.10	10.00	12.08	-0.170
			0		0	0	3	
Total		48	0.01	100.0	1.00	100.0	200.0	-1.267
			2	00	0	00	00	
							H'	1.267

Importance Value Index (IVI)

Highest Important Value Index (IVI) of mushroom diversity in Sago Forest

Based on table data 4.4, the highest Importance Value Index (INP) was found in *Parasola plicantillis* (35.978%), *Volvariella* sp. (34.239%), *Parasola auricomae* (32.500%), *Scizophyllum commune* (22.065) and *Pleurotus ostreatus* (19.457%).

Table 4. Highest Important Value Index (IVI) For Mushroom Diversity in Sago Forest.

Species	IVI
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<i>Parasola plicatillis</i>	35.978
<i>Volvariella</i> sp	34.239
<i>Parasola auricoma</i>	32.500
<i>Schizophyllum commune</i>	22.065
<i>Pleurotus ostreatus</i>	19.457

The magnitude of the important value index indicates the role of the species in the community or at the research location. The types of *Parasola plicatillis* and *Volvariella* sp are the two species that predominate in the sago forest ecosystem type in the Khendo Kampung Atamali forest area because they have the highest important value index values. Each type of fungus has an important role for the sustainability of the ecosystem in the sago forest area. The high IVI in a mushroom community indicates that the fungus has a role or level of importance in the community. This fungus can adapt to the habitat and a wide tolerance to environmental conditions. Species that have a large (dominant) role in the community will have a high IVI. In Table 4.4 the type *Parasola plicatillis* has the highest IVI and role compared to other types.

Highest Important Value Index (IVI) of Fungal Diversity in Secondary Forest

Based on table data 4.5, the highest Importance Value Index (IVI) was found in the type of *Psathyrella candolleana* (25.334%), *Volvariella* sp. (14.009%), *Coprinellus disseminatus* (14.009%), *Xylaria longipes* (14.009%) and *Ascocoryne sarcoides* (11.732%).

Table 5. Highest Important Value Index (IVI) For Mushroom Diversity in Secondary Forest

Species	IVI
<i>Psathyrella candolleana</i>	25.334
<i>Mycena haematopus</i>	14.009
<i>Coprinellus disseminatus</i>	14.009
<i>Xylaria longipes</i>	14.009
<i>Trametes gibbosa</i>	11.732

The magnitude of the important value index indicates the role of the species in the community or at the research location. The types of *Psathyrella candolleana* and *Mycena hameotopus* are the two species that predominate in the secondary forest ecosystem type in the Khendo forest area of Atamali Village because they have the highest important value index values. Each type of fungus has an important role for the sustainability of the ecosystem in the sago forest area. A high IVI in a mushroom community indicates that the fungus has a role or level of importance in the community. This fungus can adapt to its habitat and wide tolerance to environmental conditions. Species that have a large (dominant) role in the community will have a high IVI. In Table 5 the type of *Psathyrella candolleana* has the highest IVI and role compared to other types.

Highest Important Value Index (IVI) for mushroom diversity in swamp forest

Based on table 6, the highest Importance Value Index (IVI) was found in the species *Laccaria laccata* (112,500%), *Psathyrella candolleana* (30,833%), *Volvariella sp.* (26.250%).

Table 6. Highest Important Value Index (IVI) For Mushroom Diversity in Swamp Forest.

Species	IVI
<i>Laccaria laccata</i>	112.500
<i>Psathyrella candolleana</i>	30.833
<i>Volvariella sp</i>	26.250

The magnitude of the important value index indicates the role of the species in the community or at the research location. The species *Laccaria laccata* and *Psathyrella candolleana* are the two species that predominate in the primary or secondary forest ecosystem type in the Khendo Kampung Khameyaka forest area because they have the highest importance value index values. Each type of fungus has an important role for the sustainability of the ecosystem in the sago forest area. A high IVI in a mushroom community indicates that the fungus has a role or level of importance in the community. This fungus can adapt to the habitat and a wide tolerance to environmental conditions. Species that have a large (dominant) role in the community will have a high IVI. In Table 4.6 the type of *Laccaria laccata* has the highest IVI and role compared to other types.

Shanon-Wiener Diversity Index (H')

The Shannon-Wiener species diversity index (H') in sago forest, secondary forest, and swamp ecosystem types with the highest total number of data on 2 transects obtained from each observation plot, the calculation results show that the diversity index for each individual of each type of mushroom in each observation plot belonged to the moderate category. Through the calculation results for the type of sago forest ecosystem for all types shows that the index of diversity of all species in all plots studied is 2,225 (medium), for the type of secondary forest ecosystem for all types shows that the index of diversity of all species in all plots studied is 3,312 (high), for the type of swamp forest ecosystem, all species show that the index of diversity of all species in all the plots studied is 1,267 (medium).

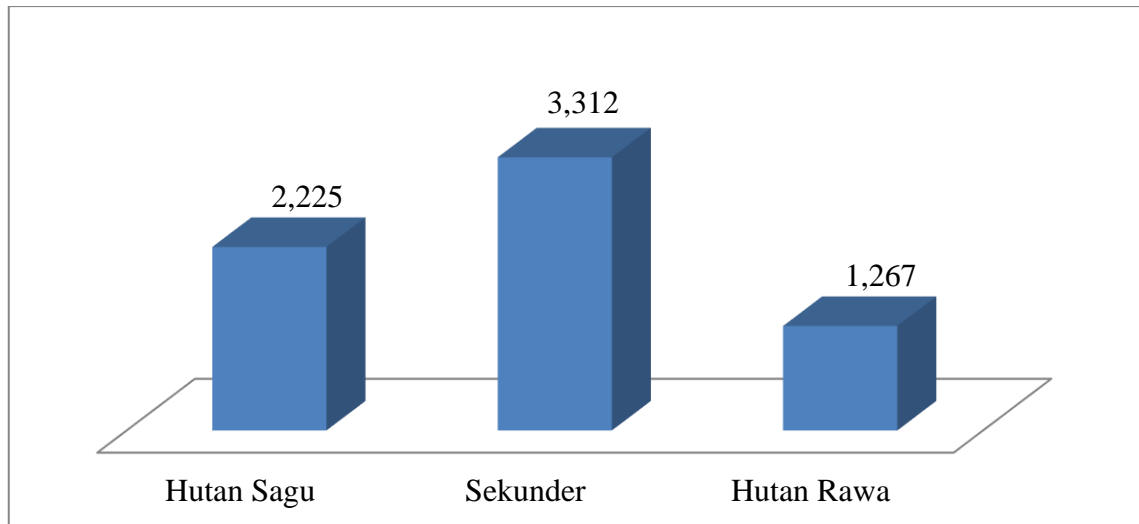


Figure 2. Diversity of Mushroom Species in Sago Forest, Mixed Forest, and Swamp Ecosystem Types

Distributions

The structure caused by the distribution of organisms in nature and these organisms form an interaction with their environment can be called a distribution pattern (Odum, 1994, p. 191).

Table 7. Distribution of mushroom species in Secondary Forest (SF), Sago Forest (SgF), Swamp Forest (SwF) in the Khendo Forest of Khameyaka Village

Species	SF	SgF	SwF
<i>Amauroderma sp. Murrill</i>	V		
<i>Ascocoryne sarcoides</i>	V		
<i>Auricularia americana</i>	V		
<i>Auricularia auricularia-judae</i>	V		
<i>Auricularia delicata</i>	V		
<i>Chlorociboria aeruginascens</i>	V		
<i>Clavogaster virescens</i>	V		
<i>Coprinellus disseminates</i>	V		
<i>Coprinellus domesticus</i>	V		
<i>Coprinopsis lagopus</i>	V		
<i>Coprinopsis lagopus</i>		V	
<i>Daedalea quercina</i>		V	V
<i>Daedaleopsis confragosa</i>	V		
<i>Daldinia concentric</i>	V		
<i>Exidia recisa</i>	V		
<i>Hericium coralloides</i>	V		
<i>Hexagonia tenuis</i>	V		
<i>Hypoxylon howeanum</i>	V		
<i>Irpex lacteus</i>	V		
<i>Irpex lacteus</i>		V	
<i>Laccaria laccata</i>			V
<i>Laetiporus gilbertsonii</i>	V		
<i>Lentinus crinitus</i>	V		

<i>Lentinus sajor-caju</i>	V		
<i>Lentinus tigrinus</i>	V		
<i>Leratiomyces ceres</i>	V		
<i>Marasmius haematocephalus</i>	V		
<i>Mycena haematopus</i>	V		
<i>Parasola auricoma</i>		V	
<i>Parasola plicatillis</i>		V	
<i>Phallus indusiatus</i>	V		
<i>Picipes badius</i>	V		
<i>Pleurocybella porrigens</i>	V		
<i>Pleurotus djamor</i>	V		
<i>Pleurotus ostreatus</i>		V	
<i>Podaxis pistillaris</i>		V	
<i>Porodaedalea pini</i>	V		
<i>Psathyrella</i>			V
<i>Psathyrella candolleana</i>	V		
<i>Pseudocolus fusiformis</i>	V		
<i>Pseudoinonotus dryadeus</i>	V		
<i>Pycnoporus cinnabarinus</i>	V	V	
<i>Schizophyllum commune</i>		V	
<i>Stereum ostrea</i>	V		
<i>Trametes gibbosa</i>	V	V	
<i>Trametes versicolor</i>			V
<i>Volvariella sp</i>		V	V
<i>Xylaria longipes</i>	V		
<i>Xylaria polymorpha</i>	V		
Total	37	11	5

Note: (v=Founded)

The results of the analysis of the distribution of fungal species in three types of ecosystems found 2 species in sago and swamp forests, namely the species *Daedalea quercina* and *Volvarisella sp.* and 1 species is in mixed forest and sago forest, namely the species *Pycnoporus cinnabarinus*. The uneven distribution of the fungus can be caused by differences in habitat types and environmental factors.

DISCUSSION

Based on field observations, there were overall 49 species of fungi from 31 families where in the sago forest ecosystem type found 8 families of 11 mushroom species, in the secondary forest ecosystem type found 18 families of 37 species of mushrooms, in the swamp forest ecosystem type found 5 families of 5 species of mushrooms.

Research by Suharno, Irawan, Qomariah, Putri, & Sufaati (2014), obtained the result that in the Warmare District, Manokwari Regency, West Papua. There are 62 species of macrofungi from 19 families (29 genera). Members of the families with the highest number of species are Poly-yporaceae (14 species), Agaricaceae (11 species), Tricholomataceae (9 species) and Clavariaceae (7 species). Of these, 8 samples of the fungus could not be identified. The results of observations at the study sites show that the average temperature is between 20-290C with humidity

of 83-95%. The area explored is at an altitude between 15–290 m asl. The condition of the level of soil fertility in this area is quite good and suitable for agricultural land and plantations. According to Suharno, Irawan, Qomariah, Putri, & Sufaati (2014) the presence of mycorrhiza is related to the condition of phosphorus (P) available in the plant environment. The number of macrofungi obtained in the Warmare District was quite high. Differences in forest types greatly affect the diversity of macrofungi.

Based on the results of the analysis for the diversity of mushroom species in sago forest, secondary forest, and swamp areas, it can be seen from the Shannon-Wiener diversity index. The Shannon-Wiener diversity index value for mushroom species in sago forest habitat types is (2,225) in the moderately abundant category, in habitat types of secondary forest of (3,312) is in the highly abundant category, in the swamp forest habitat type it is (1,267) belonging to the moderately abundant category. (The value of $H' 1 \leq H' \leq 3$ indicates that species diversity on the transect is currently abundant). The value of $H' > 3$ indicates that there is a high abundance of species diversity on the transect. Species diversity is classified as moderate, meaning that the diversity of mushroom species found in the Khendo forest research area is adequately represented by each family/tribe. Macro mushrooms can grow optimally at a temperature of 20-30% and the ideal humidity needed is between 80-90%. However, in general, the temperature, humidity, and light intensity for the growth of macro fungi varies depending on each species of fungus. In addition, many mushrooms were found that were dry or dead. According to Suriawiria (1986), fungi found in the temperature range of 25-37°C with an optimum temperature of 30°C are classified as mesophilic fungi. Mushroom substrate grows mostly on dead wood (trees), only a few mushrooms grow on trees that are still alive and some grow on the ground.

The Basidiomycetes class mushroom found in the Khendo forest area which is utilized as a food mushroom is the sago mushroom (*Volvariella* sp.). This fungus was found at the study site growing on sago dregs and watery soil contaminated with sago dregs so that this fungus could grow. *Volvariella* sp. is a species found in sago forests and swamp forests. *Volvariella* sp. These are often used by the Sentani people to meet their food needs in their daily lives and in carrying out traditional events in the traditions of the Sentani people, and are also used as a source of their income. *Volvariella* sp. In the local language of the Sentani people it is called Fehlung or generally called the sago mushroom.

According to research by Abbas et al (2009) Observations of Papuan Endemic Sago Mushrooms. When the observation was carried out, it was found that sago mushrooms were growing on a stretch of sago dregs in the sago forest in South Yapen District, Warari Village. The shape and morphology of the sago mushrooms found in Warari Village did not vary. On the basis of similarity in shape and morphology, it can be informed that there is only one type of sago mushroom in Yapen Regency, which is the genus *Volvariella* sp. Sago mushroom (*Volvariella* sp.) is an edible mushroom that grows sporadically on decaying sago dregs and sago stems. Local people like sago mushroom because it tastes good and is nutritious. Mushroom *Volvariella* sp. generally rich in essential amino acids such as leucine, isoleucine, valine, tryptophan, lysine, theonin, phenylalanine, methinin and

histidine (Jordan, 1993; Widiyastuti, 2005). With this research, it shows that there are several species of mushrooms that are consumed by the local community.

Based on the research results of Yigibalom, Sufaati, & Purnamasari (2014), it is known that there are around 19 (nineteen) types of natural mushrooms that can be used as a food source by local people in the Beam Region, namely: obon, punawi, enggambi, nambu, guni, ku -geya, yaliruk, pokea, nage, peraliaga, ligibin, wam anugum, yanggemili, tengkekalok, mbogo-la, wurumbiak, ligilage, talorago, kilumonok. All these types of mushrooms are classified as non-toxic, people can differentiate between poisonous and non-toxic mushrooms based on experience in consuming mushrooms and from information passed down by parents. Usually, people process raw materials for these mushrooms with stir-fried dishes, mixed with other vegetables, roasted, barapen (coals of fire), and some are eaten raw. These types of mushrooms are collected from nature, especially from the forest, and none of these types are cultivated. This amount is said to be quite a lot compared to the types of mushrooms consumed by urban communities such as in Java.

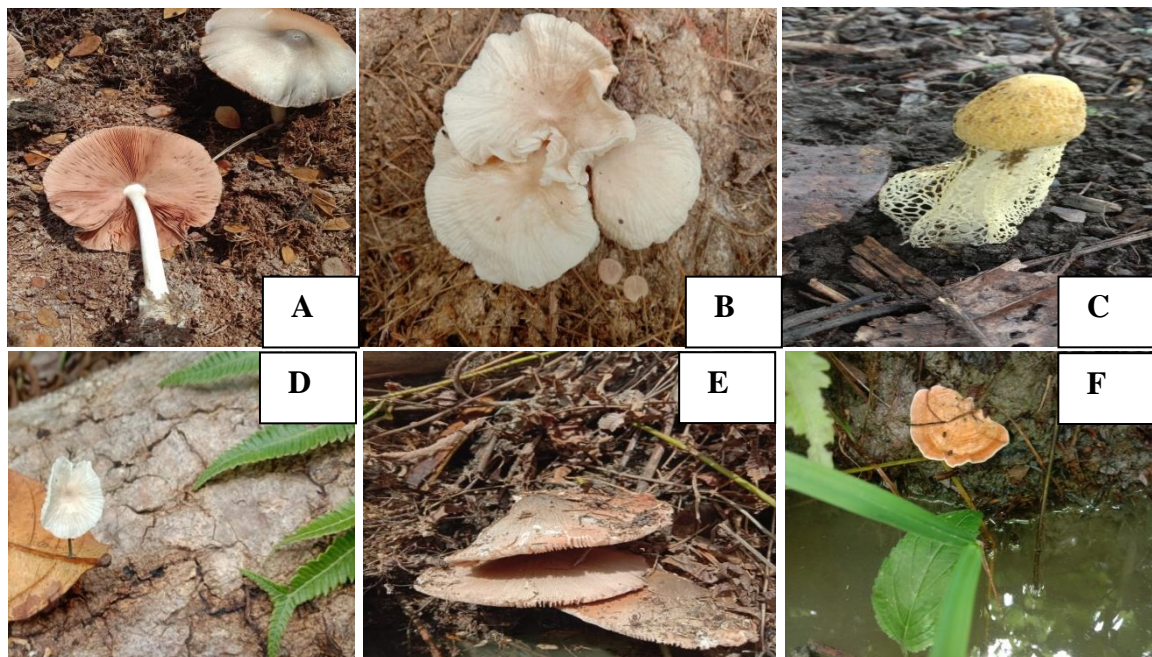


Figure 3. Plant

CONCLUSIONS AND RECOMMENDATIONS

11 species of mushrooms were recorded in the sago forest, 37 species of mushrooms in the secondary forest, and 5 species of mushrooms in the swamp forest. The index value of mushroom species diversity in sago forest is 2.22 (moderately abundant), secondary forest is 3.31 (highly abundant), and swamp forest is 1.267 (moderately abundant). *Volvariella* sp. is used by local communities to meet food needs, carry out traditional events, and as a source of income.

ADVANCED RESEARCH

The continuation of this research is the need to carry out morphological studies related to the types of fungi that have an even distribution in sago, secondary and swamp forests. This study needs to be carried out with the aim of looking at the morphological characteristics of the dominant and distributed species in the three ecosystems.

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