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# Macrofungal Diversity in Wetlands in the Aik Nyet Hamlet Area, Sesaot Village, Narmada District, West Lombok Regency, Indonesia

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**Abstract.** Indonesia's tropical forests are among the most biodiverse ecosystems globally, harboring diverse macrofungal communities essential for nutrient cycling and ecosystem stability. This study aimed to identify and analyze the macrofungal diversity in the Aik Nyet Sesaot Forest, West Lombok Regency. Field surveys were conducted in April 2025, collecting and identifying macrofungal specimens based on morphological characteristics. Ecological indices including species density, frequency, Importance Value Index (IVI), Shannon-Wiener Diversity Index (H'), Evenness Index, Simpson Dominance Index, and Margalef Richness Index were calculated to evaluate community structure and diversity. The results showed that the Agaricales order dominated with six species, while Pluteus salicinus showed the highest Importance Value Index (IVI) of 50.8%, supported by a relative density of 28.6% and a relative frequency of 22.2%. Other important species included Tremella fuciformis (IVI 32.5%) and Coprinopsis atramentaria (IVI 25.4%). The Shannon-Wiener Diversity Index (H') was calculated at 2.2, indicating a moderate level of diversity in the fungal community, with species evenness (E) measured at 1.1. The Simpson Dominance Index (C) was 0.8, reflecting moderate species dominance, while the Margalef Richness Index (Dmg) was 7.6, indicating high species richness relative to total individuals. Deadwood substrates were the primary habitat for most species, emphasizing the ecological role of macrofungi in lignocellulose decomposition. These quantitative results highlight a stable yet quite diverse macrofungal community structure, with certain species being ecologically dominant, likely due to adaptation to microclimatic conditions. Although the sample size was limited to 14 individuals, this study provides important baseline data for understanding macrofungal diversity and ecosystem function in tropical forests.

**Keywords:** Diversity, identification, macrofungi

## INTRODUCTION

Indonesia's biodiversity is very diverse compared to other regions in the world, especially because its tropical climate offers suitable habitats for various species, both plants and animals. Indonesia's forests are among the most biodiverse ecosystems in the world. Intact forests have many diverse ecosystem components. Ecosystems consist of two types of components: (1) abiotic components, namely; soil, light, temperature, water, and (2) biotic components, namely; producers, consumers, and decomposers. Decomposers, such as fungi, play an important role in forests that are not fully utilized (Nur et al., 2021).

Fungi, especially the macrofungi group, are part of the main group of lignocellulose decomposing organisms because they have the ability to produce lignocellulose decomposing enzymes such as ligninase, cellulase, and hemicellulase, thus ensuring the continuity of the material cycle in nature. The diversity of macrofungi is related to the type of habitat, many macrofungi species only thrive in certain or specific habitats. In addition, various elements that affect the growth of macrofungi such as air and soil humidity, soil pH, temperature, and light intensity have a significant impact on the development of mycelium and fruiting bodies of macrofungi. Macrofungi also affect the food web in the forest, the survival or germination of young seedlings, and the overall health of the forest.

The high diversity of fungi in Indonesia is driven by its geographical and climatic conditions, which have various ecosystems, ranging from tropical rainforests to wetlands, which are habitats for fungi (Afifah et al., 2024). Fungi are heterotrophic organisms (unable to produce their own

food) that consume organic matter produced by other organisms (Mahardhika et al., 2021). In general, fungi can grow in various environments, but most of them will thrive in cool and humid conditions (Coleine et al., 2022; Cordero et al., 2023).

Macroscopic fungi are eukaryotic organisms whose identification is facilitated by the presence of their generally large fruiting bodies (Liu, 2024; Naranjo-Ortiz & Gabaldón, 2020). One of the important roles of these organisms is to be a significant component of the ecosystem, capable of decomposing organic matter into accessible nutrients. In addition, macroscopic functions can be applied in various fields of life, such as agriculture, nutrition, and health (Putri et al., 2023).

The main role of fungi in the ecosystem lies in their ability as decomposers of organic matter, helping to break down organic matter into simpler compounds that can be reabsorbed by plants and other organisms. Fungi are also often found around tree roots or in soils rich in organic matter, where they act as decomposers of organic matter to obtain nutrients. (Mohammad et al., 2024)

This study aims to determine the types of mushrooms found in the Aik Nyet Sesaot forest area. The research is expected to provide knowledge to the community about mushrooms that can not only be consumed, but can also be cultivated and become an income for the community in the sub-district.

## RESEARCH METHODS

This research was conducted in the Aik Nyet Sesaot Forest area, Narmada District, West Lombok Regency on April 19, 2025. The tools used were rulers, stationery, and cameras. The materials used in this study were all macrofungal samples in the Aik Nyet Sesaot Forest area. The method used in this study was a direct survey in the field by exploring the secondary forest area. Data collection was carried out by making a brief description of the species and habitat found. The species found were photographed to facilitate the identification process (Firdaushi & Muchlas Basah, 2018).

Data analysis was conducted to assess the community structure and diversity levels of macrofungal species using several ecological indices. Species density and frequency were calculated to determine the distribution of individuals per unit area and the distribution of species in the field. Relative density and frequency were then used as the basis for calculating the Importance Value Index (IVI). Species abundance (Di) was calculated as the number of individuals per unit area, while the Shannon-Wiener Diversity Index (H') was used to assess the level of diversity by considering the proportion of each species to the total number of individuals, which were categorized as low, medium, or high. The Evenness Index (E) measured the even distribution between species, the Simpson Dominance Index (C) assessed the dominance of a particular species in the community, and the Margalef Richness Index (Dmg) was used to assess the number of species relative to the total number of individuals. The combination of these calculations provided a complete picture of the diversity, dominance, and structure of the macrofungal community at the study site.

## RESULTS AND DISCUSSION

Indonesia is one of the countries with 64 percent or 120.5 million hectares of its land area as Forest Areas with very diverse natural plant resources. Forests are widely recognized as a very unique resource that is a habitat for plants that directly or indirectly provide various benefits for places of life, including macroscopic fungi (Azmi et al., 2023). Macrofungi play an important role in all conditions of the forest ecosystem. Macrofungi are a group of fungi that are able to form fruiting bodies in suitable conditions so that they can be easily observed directly. The role of fungi is not only as a mediator of nutrients and water absorption by host plants, but

also facilitates nutrients on the surface and in the soil to be utilized by plants (Suharno et al., 2018). In addition, symbiotic fungi found in nature can be beneficial or detrimental to plants by acting as parasites (Prasetyaningsih & Rahardjo, 2015).

Fungi are one of the organisms that play an important role in the life cycle. One of the important roles of fungi is as a decomposer of complex organic materials found in nature into simpler elements, so that they will be more easily absorbed and utilized by other organisms. (Naufal et al., 2021). Fungi are organisms that are decomposers, parasites, and mutualistic (. Lestari & Fauziah, 2022). In the ecosystem, fungi are actively involved in the process of soil formation and fertility by decomposing dead plants and animals and also play a role in the nutrient cycle. An interesting group of fungi to see the diversity and potential of is macrofungi. In the identification process, these macroscopic fungi are identified by observing the main morphology. Macrofungi usually grow on rotting tree trunks, soil surfaces or litter. The parameters used as a reference for observing fungi include macroscopic characteristics (shape, color and texture of the fruit body) (Lestari et al., 2023).

Each type of fungus that has been successfully identified has distinctive morphological characteristics, such as cap color, stem shape, and spore shape. (Rhahillia et al., 2025). These characteristics form the basis of the taxonomic identification process. For example, mushrooms with dark brown caps and smooth surfaces tend to belong to the genus Coprinus, while mushrooms with brightly colored caps and hairy surfaces can be attributed to the genera Mycena or Marasmius. This identification is also aided by the use of determination keys and references to mycological literature.

**Table 1.** Results of Identification of Macroscopic Fungal Research in the Aik Nyet Sesaot Forest Area

| No. | Ordo | Famili | Genus | Species |
|---|---|---|---|---|
| 1. | *Agaricales* | *Psathyrellaceae* | *Psathyrella* | *Psathyrella candolleana* |
| | | *Pluteaceae* | *Pluteus* | *Pluteus salicinus* |
| | | *Mycenaceae* | *Mycena* | *Mycena adscendens* |
| | | *Pleurocybellaceae* | *Pleurocybella* | *Pleurocybella porrigens* |
| | | *Pleurotaceae* | *Pleurotus* | *Pleurotus ostreatus* |
| | | *Psathyrellaceae* | *Coprinopsis* | *Coprinopsis atramentaria* |
| 2. | *Cantharellales* | *Cantharellaceae* | *Cantharellus* | *Cantharellus lateritius* |
| 3. | *Tremellales* | *Tremellaceae* | *Tremella* | *Tremella fuciformis* |

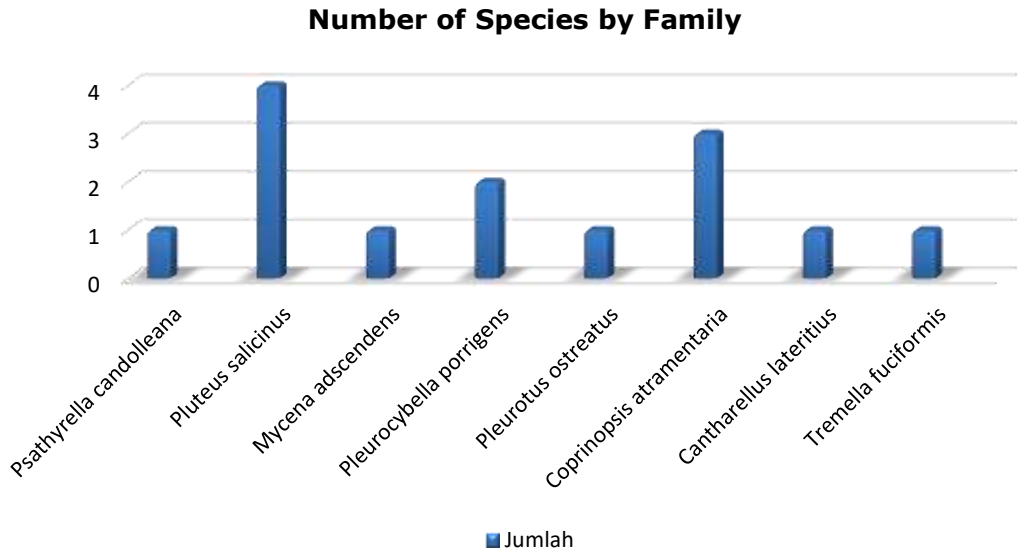


**Figure 1.** Species Diagram Based on Families Found in the Aik Nyet Sesaot Forest Area

Based on the identification results in Table 1, macrofungi in the Aik Nyet Forest Area can be classified into 3 main orders. The Agaricales order dominates with 6 species that show typical

morphological characteristics of members of this group, namely having an umbrella-shaped fruit body (pileate-stipitate) with lamellae as a spore-producing structure. *Psathyrella candolleana* (Family Psathyrellaceae) shows typical characteristics in the form of a campanulate to convex pileus with a hygrophanous surface, while Coprinopsis atramentaria from the same family has a bell-shaped cap with edges that undergo autodigestion (deliquescent) when ripe. Based on the results of observations carried out in the Aik Nyet Sesaot Forest Area, 14 types of macrofungi were found (Figure 3).

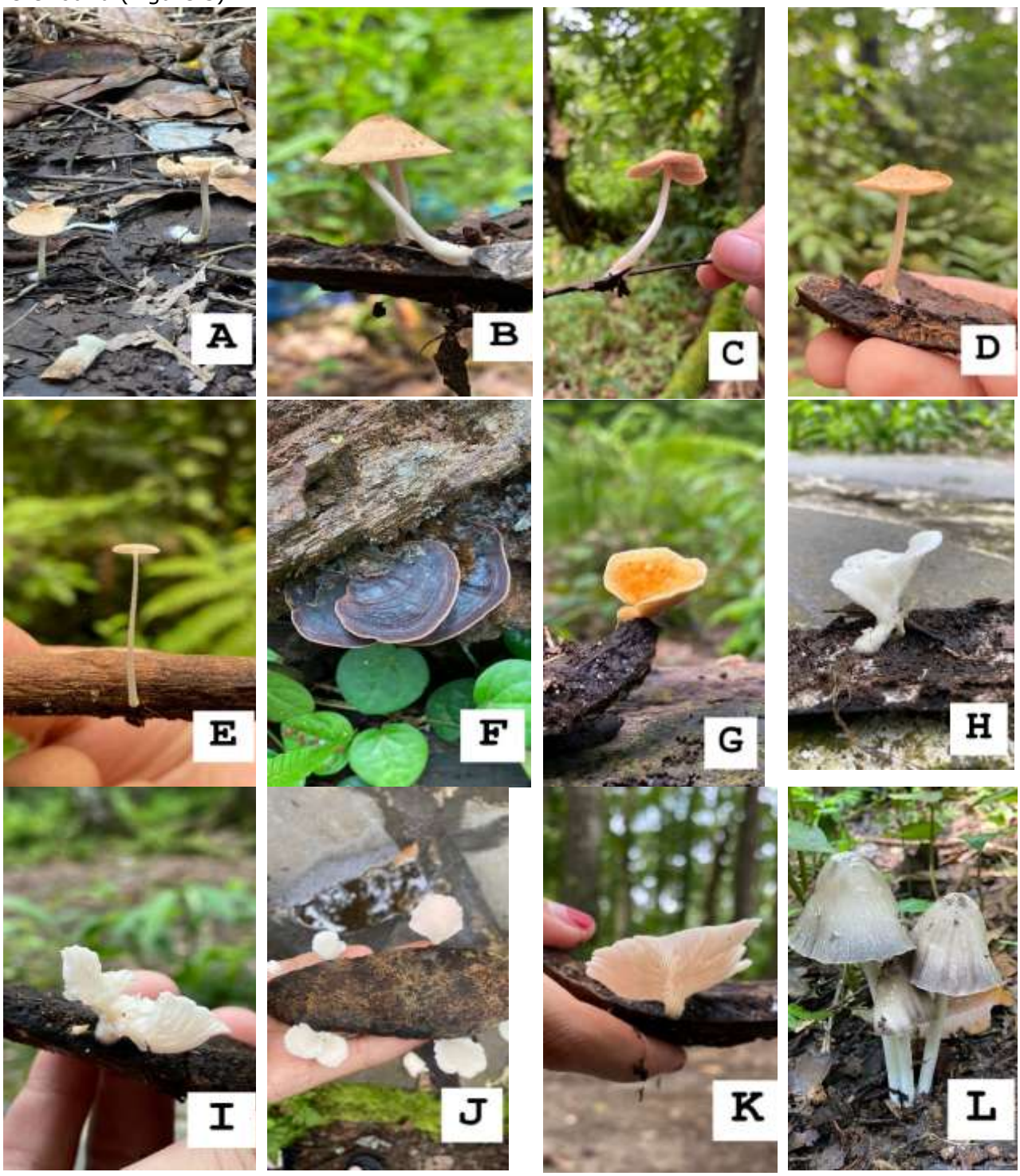


**Figure 3.** *Macrofungi found at the location:* (A) *Pluteus salicinus,* (B) *Psathyrella candolleana,* (C) *Pluteus salicinus,* (D) *Pluteus salicinus,* (E) *Mycena adscendens,* (F) *Lingzhi,* (G) *Cantharellus lateritius,* (H) *Pleurocybella porrigens,* (I) *Tremella fuciformis,* (J) *Toothed jelly fungus,* (K) *Pleurotus ostreatus,* and (L) *Coprinopsis atramentaria.*

Members of the families Pleurotaceae (*Pleurotus ostreatus*) and Pleurocybellaceae (*Pleurocybella porrigens*) show interesting morphological adaptations. P. ostreatus has an oyster shell-shaped (pleurotoid) cap with an eccentric stipe, while P. porrigens develops a spatulate or fan-shaped cap without a distinct stipe. *Pluteus salicinus* (Family Pluteaceae) and *Mycena adscendens* (Family Mycenaceae) represent a group of small fungi with a thin pileus and slender stipe, morphological adaptations to the decomposition of small woody plant material. (Hanifa et al., 2022).

The Cantharellales order is represented by Cantharellus lateritius which exhibits unique morphological characteristics in the form of a funnel-shaped fruit body with a folded hymenal surface (not true lamellae), increasing the surface area for spore production. *Tremella fuciformis* (Order Tremellales) exhibits a distinctive jelly-like morphology with a grooved surface and gelatinous texture, an adaptation to humid environments.

**Table 2.** Macroscopic Fungi Found in the Aik Nyet Sesaot Forest Area

| No. | Family | Genus | Species | Habitat |
|---|---|---|---|---|
| 1. | *Psathyrellaceae* | *Psathyrella* | *Psathyrella candolleana* | Kayu mati |
| 2. | *Pluteaceae* | *Pluteus* | *Pluteus salicinus* | Ranting |
| 3. | *Mycenaceae* | *Mycena* | *Mycena adscendens* | Ranting |
| 4. | *Pleurocybellaceae* | *Pleurocybella* | *Pleurocybella porrigens* | Kayu mati |
| 5. | *Pleurotaceae* | *Pleurotus* | *Pleurotus ostreatus* | Kayu mati |
| 6. | *Psathyrellaceae* | *Coprinopsis* | *Coprinopsis atramentaria* | Tanah |
| 7. | *Cantharellaceae* | *Cantharellus* | *Cantharellus lateritius* | Kayu mati |
| 8. | *Tremellaceae* | *Tremella* | *Tremella fuciformis* | Kayu mati |

Based on the data in Table 2, eight species of macrofungi belonging to six different families were identified in the Aik Nyet Forest Area, Sesaot. Habitat analysis showed that dead wood is the dominant substrate compared to twigs and soil, dead wood provides an optimal substrate for the growth of various types of macrofungi in the Indonesian tropical forest ecosystem due to its high lignin and cellulose content.

The Psathyrellaceae family shows interesting intrafamilial diversity, with *Psathyrella candolleana* being lignicol (growing on dead wood) and Coprinopsis atramentaria being tericol (growing on soil), enzymatic adaptation in the Psathyrellaceae family allows colonization of various types of organic substrates. This adaptive mechanism involves the expression of lignin peroxidase (LiP) and manganese peroxidase (MnP) enzymes that vary between species.

The presence of *Pleurotus ostreatus* (Family Pleurotaceae) and *Mycena adscendens* (Family Mycenaceae) on the decaying wood substrate indicates the high availability of decomposed organic matter in this area, forests with dense canopy cover tend to have high litter accumulation as an ideal substrate for the growth of various types of macrofungi. The species Pluteus salicinus which belongs to the Family Pluteaceae was also found, indicating an interaction between fungi and woody vegetation in the area.

The presence of *Cantharellus lateritius* (Order Cantharellales) and *Tremella fuciformis* (Order Tremellales) provides important information about the ecological conditions of the area. Cantharellus lateritius which is mycorrhizal indicates a symbiotic relationship between fungi and host plants in the forest, as stated in the study added references. Meanwhile, Tremella fuciformis which is a jelly fungus shows the characteristics of a humid environment with high air humidity throughout the year.

The discovery of *Pleurocybella porrigens* which belongs to the Family Pleurocybellaceae adds to the list of macrofungal diversity in this area. This species is known as a wood fungus that plays a role in the decomposition of cellulose material, showing an important ecological role in the nutrient cycle in the forest ecosystem. Overall, the results of this identification indicate that the Aik Nyet Forest Area has significant macrofungal diversity with various ecological roles, both as decomposers, mycorrhizae, and in other forms of ecological interactions.

The Importance Value Index (IVI) analysis in table 3 shows a typical macrofungal community structure in the Aik Nyet Forest Area, with Pluteus salicinus occupying a dominant position (IVI 50.8). This value is supported by significant ecological parameters, namely Relative Density (KR) of 28.6 and Relative Frequency (FR) of 22.2, indicating the presence and wide distribution of the species in the study area. This ecological dominance can be explained through the optimal physiological adaptation of the Pluteaceae family to local microclimate conditions. The study revealed that Pluteus salicinus has a high tolerance to environments with relative humidity of 80-90% and limited light intensity (only 15-30% light penetration through the forest canopy), conditions that are typical of tropical rainforest ecosystems such as the Aik Nyet Forest. This adaptation allows the species to utilize resources more efficiently than other species in the community. The species group with medium INP 25.4-32.5 consists of *Coprinopsis atramentaria* INP=25.4 and Tremella *fuciformis* INP=32.5. This distribution indicates the specific ecological roles of both species in the macrofungal community. Coprinopsis atramentaria, with a habitat preference on organic soil, acts as a secondary decomposer that decomposes complex organic material, while Tremella fuciformis shows a special adaptation as a jelly fungus that grows optimally on dead wood in high and stable humidity conditions.

**Table 3.** Importance Value Index of macroscopic fungal species found in the Aik Nyet Sesaot Forest Area

| No. | Species | Totals | KJ | KR (%) | FJ | FR (%) | INP (%) |
|---|---|---|---|---|---|---|---|
| 1. | *Psathyrella candolleana* | 1 | 0.04 | 7.1 | 0.3 | 11.1 | 18.3 |
| 2. | *Pluteus salicinus* | 4 | 0.16 | 28.6 | 0.7 | 22.2 | 50.8 |
| 3. | *Mycena adscendens* | 1 | 0.04 | 7.1 | 0.3 | 11.1 | 18.3 |
| 4. | *Pleurocybella porrigens* | 1 | 0.04 | 7.1 | 0.3 | 11.1 | 18.3 |
| 5. | *Pleurotus ostreatus* | 1 | 0.04 | 7.1 | 0.3 | 11.1 | 18.3 |
| 6. | *Coprinopsis atramentaria* | 2 | 0.08 | 14.3 | 0.3 | 11.1 | 25.4 |
| 7. | *Cantharellus lateritius* | 1 | 0.04 | 7.1 | 0.3 | 11.1 | 18.3 |
| 8. | *Tremella fuciformis* | 3 | 0.12 | 21.4 | 0.3 | 11.1 | 32.5 |
| | **Totals** | **14** | **0.56** | **100** | **3** | **100** | **200** |

**Table 4.** Shannon Wiener Diversity Index of Macroscopic Fungal Species Found in the Aik Nyet Sesaot Forest Area

| No. | Species | Totals | 'H' |
|---|---|---|---|
| 1. | *Psathyrella candolleana* | 1 | 2.6 |
| 2. | *Pluteus salicinus* | 4 | 1.3 |
| 3. | *Mycena adscendens* | 1 | 2.6 |
| 4. | *Pleurocybella porrigens* | 1 | 2.6 |
| 5. | *Pleurotus ostreatus* | 1 | 2.6 |
| 6. | *Coprinopsis atramentaria* | 2 | 1.9 |
| 7. | *Cantharellus lateritius* | 1 | 2.6 |
| 8. | *Tremella fuciformis* | 3 | 1.5 |
| | **Totals** | **14** | **2.2** |

Meanwhile, the other five species *Psathyrella candolleana*, *Mycena adscendens*, *Pleurocybella porrigens*, *Pleurotus ostreatus*, and *Cantharellus lateritius* have a uniform Importance Value Index (IVI) of 18.3. This uniformity is supported by the Relative Density (KR) value of 7.1 and the Relative Frequency (FR) of 11.1 which are the same for each species. This stable distribution pattern indicates a balanced ecological niche division among the five species in the macrofungal community of Aik Nyet Forest. Each species appears to have developed a unique ecological strategy to utilize available resources, both in terms of substrate, microclimate, and biological interactions, thus enabling stable coexistence in the community. The uniformity of IVI values also reflects a comparable level of adaptation among the five species to local environmental conditions. Analysis of macrofungal communities in the Aik Nyet Forest Area shows a total Importance Value Index (IVI) of 200 with a Species Density Index (KJ) of 0.56, indicating a stable community structure but with a specific dominance pattern. This high total

IVI value reflects the ecological balance maintained among the species that make up the community.

Based on table 4. above, it can be seen that the number of individual macroscopic fungal species found in the Aik Nyet Sesaot Forest area was 14 individuals consisting of 8 types of macroscopic fungal species. After analyzing the data using the Shannon-Wiener diversity index formula, a total value of H'=2.2 was obtained, which means that this value is in the range of 1.0 <H' <2.2. This value indicates that the level of macroscopic fungal diversity is at a moderate level. This is in accordance with the criteria (Afrita et al., 2021) which states that if the H' value is in the range of 1.0 < H' < 2.2, it indicates that the species diversity is at a moderate level, meaning that the distribution of individuals between species is quite even and the macroscopic fungal community at the research location is quite complex.

This diversity index value is lower than the findings Situmorang & Jayanthi, (2019) in the study of Macroscopic Fungal Diversity in Bukit Barisan Forest Park, Dolat Rakyat District, Karo Regency, which shows the value of the macroscopic fungal diversity index is included in the high category, namely H'=3.125. This is in accordance with the criteria of Fachrul (2017) which states that if the value of H'> 3 indicates that the diversity of species is high, but this result is in line with the results of the study (Wati et al., 2019) which shows the result H'=2.154. This difference can be explained by several ecological factors, including: (1) more limited substrate availability, (2) level of anthropogenic disturbance, and (3) variation in microclimate conditions.

**Table 5.** Margalef species richness index of Macroscopic Fungal Species found in the Aik Nyet Sesaot Forest Area

| No. | Species | Totals | Pi | H’ | E | C | D |
|---|---|---|---|---|---|---|---|
| 1. | *Psathyrella candolleana* | 1 | 2.6 | 2.6 | 1.3 | 1.0 | 7.6 |
| 2. | *Pluteus salicinus* | 4 | 1.3 | 1.3 | 0.6 | 0.3 | |
| 3. | *Mycena adscendens* | 1 | 2.6 | 2.6 | 1.3 | 1.0 | |
| 4. | *Pleurocybella porrigens* | 1 | 2.6 | 2.6 | 1.3 | 1.0 | |
| 5. | *Pleurotus ostreatus* | 1 | 2.6 | 2.6 | 1.3 | 1.0 | |
| 6. | *Coprinopsis atramentaria* | 2 | 1.9 | 1.9 | 0.9 | 0.8 | |
| 7. | *Cantharellus lateritius* | 1 | 2.6 | 2.6 | 1.3 | 1.0 | |
| 8. | *Tremella fuciformis* | 3 | 1.5 | 1.5 | 0.7 | 0.6 | |
| | **Totals** | **14** | **1** | **2.2** | **1.1** | **0.8** | **7.6** |

This value reflects the composition of the community consisting of several species with a relatively balanced distribution, although there are variations in the contribution of each species. An interesting phenomenon is seen in Pluteus salicinus which, despite having the largest number of individuals (4 individuals), actually contributes the lowest diversity index H'=1.3. This pattern, as explained, is a typical characteristic of dominant species in an ecological community, where high abundance tends to be inversely proportional to the value of diversity contribution. This ecological mechanism can be explained through the concept of competitive dominance, where certain species are able to control resources disproportionately, thereby reducing equality (evenness) in the community. On the other hand, five species, namely Psathyrella candolleana, Mycena adscendens, Pleurocybella porrigens, Pleurotus ostreatus, and Cantharellus lateritius showed the highest diversity index value with a value of H'=2.6, although each was only found in 1 individual, species with limited distribution often contribute significantly to the overall diversity value. Coprinopsis atramentaria (2 individuals) and Tremella fuciformis (3 individuals) occupy the middle position with index values of H’=1.9 and H’=1.5 respectively.

## CONCLUSION

Macroscopic fungi are eukaryotic organisms that have large fruiting bodies that make it easy to identify. One of the important roles of these organisms is to be a significant component of the ecosystem, capable of decomposing organic matter into accessible nutrients. Macrofungi have an important role in all conditions of the forest ecosystem. Macrofungi are a group of fungi

that are able to form fruiting bodies in suitable conditions so that they can be easily observed directly. The role of fungi is not only as a mediator of nutrients and water absorption by host plants, but also facilitates nutrients on the surface and in the soil to be utilized by plants.

Fungi have various specialties that enrich the diversity of living things. Fungi are organisms that are morphologically similar to plants, but are clearly different from various types of plants. Unlike plants that produce their own food through photosynthesis, fungi depend on other living things to get food. Another major difference is that fungi have chitin (a material used by insects and crustaceans to form their exoskeletons) in their cell walls, while in plants, the cell walls are composed of cellulose.

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## REFERENCES

Afrita, E., Jayati, R. D., & Riastuti, R. D. (2021). Keanekaragaman Jamur Makroskopis Di Kawasan Air Terjun Curug Embun Kota Lubuklinggau. *Jurnal Biosilampari : Jurnal Biologi*, *4*(1), 26–32. https://doi.org/10.31540/biosilampari.v4i1.1459

Azmi, Bq. S. M., Pratama, O., Islamiah, S., Meilani, U., Purwati, N., & Jayanti, E. T. (2023). Jenis-Jenis Tumbuhan Paku Dikawasan Hutan Lindung Aik Nyet Sesaot, Narmada, Kabupaten Lombok Barat. *Quagga: Jurnal Pendidikan dan Biologi*, *15*(1), 65–70. https://doi.org/10.25134/quagga.v15i1.5222

Coleine, C., Stajich, J. E., & Selbmann, L. (2022). Fungi are key players in extreme ecosystems. *Trends in Ecology & Evolution*, *37*(6), 517–528.

Cordero, R. J., Mattoon, E. R., Ramos, Z., & Casadevall, A. (2023). The hypothermic nature of fungi. *Proceedings of the National Academy of Sciences*, *120*(19), e2221996120.

Firdaushi, N. F., & Muchlas Basah, A. W. (2018). Inventarisasi Jamur Makroskopis Di Kawasan Hutan Mbeji Lereng Gunung Anjasmoro. *Biosel: Biology Science and Education*, *7*(2), 142. https://doi.org/10.33477/bs.v7i2.651

Hanifa, S. M., Afdhala, R. R., & Sari, S. (2022). Keanekaragaman Jamur Mikroskopis Di Kawasan Ekowisata Sarah Kabupaten Aceh Besar. *Prosiding Seminar Nasional Biotik*, *10*(2), 152–175.

Lestari, I. D., & Fauziah, U. T. (2022). Identifikasi Keanekaragaman Jenis Fungi Makroskopis Di Kawasan Hutan Liang Bukal, Moyo Hulu. Sumbawa. *Jurnal Kependidikan*, *7*(2), 8–18.

Lestari, P. U., Hasyimuddin, H., & Nurindah, N. (2023). Ragam jenis jamur makroskopis di Kawasan Hutan Topidi dan Hutan Garassi Malino. *Filogeni: Jurnal Mahasiswa Biologi*, *3*(1), 27–32. https://doi.org/10.24252/filogeni.v3i1.30257

Liu, D. (2024). Classification of medically important fungi. In *Molecular Medical Microbiology* (pp. 2763–2777). Elsevier.

Mohammad, T., Maharani, S., Arroyan, N. F., Putri, A. O., & Muliyah, E. (2024). Eksplorasi Keanekaragaman Jamur Makroskopis Di Kawasan Evergreen Taman Nasional Baluran Situbondo Jawa Timur. *BIO-SAINS : Jurnal Ilmiah Biologi*, *4*(1), 38–54. https://doi.org/10.34005/bio-sains.v4i1.4171

Naranjo-Ortiz, M. A., & Gabaldón, T. (2020). Fungal evolution: Cellular, genomic and metabolic complexity. *Biological Reviews*, *95*(5), 1198–1232.

Naufal, M. A., Cici, A., Kusumawardhani, A. S., Sugiarto, A. Z., Fadila, D. S. R., Indraswati, F., Shalsabilla, S. E., & Fifendy, M. (2021). *Identifikasi Makrofungi di Komplek Tumbuhan Suku Rubiaceae, Myrtaceae, dan Anacardiaceae Kebun Raya Bogor*.

Nur, I. F., Sihombing, A. D., Fazriati, N., Az-Zahra, R., Utami, A. W. A., & Ristanto, R. H. (2021). Keanekaragaman makrofungi di hutan kota Srengseng dan Pesanggrahan Sangga Buana Jakarta. *Proceeding of Biology Education*, *4*(1), 89–108. https://doi.org/10.21009/pbe.4-1.9

Prasetyaningsih, A., & Rahardjo, D. (2015). *Keanekaragaman Dan Potensi Makrofungi Taman Nasional Gunung Merapi*.

Putri, A., Inayah, N. A., & Fitri, R. (2023). *Identifikasi Keanekaragaman Jamur Basidiomycota Makroskopis di Kawasan Tunggul Hitam, Kota Padang*.

Rhahillia, L., Purwasi, R., Nurhafifah, I., Oktaviani, H. D., Adnin, F., Khotimah, A., & Khastini, R. O. (2025). Identifikasi Jenis Makrofungi di Kawasan Curug Cikotak. *Jurnal Sains dan Edukasi Sains*, *8*(1), 63–70. https://doi.org/10.24246/juses.v8i1p63-70

Situmorang, E., & Jayanthi, S. (2019). Keanekaragaman Jamur Makroskopis Di Taman Hutan Raya Bukit Barisan Kecamatan Dolat Rakyat Kabupaten Karo. *Jurnal Jeumpa*, *6*(2).

Suharno, S., Irawan, C., Qomariah, E. N., Putri, I. A., & Sufaati, S. (2018). Keragaman Makrofungi di Distrik Warmare Kabupaten Manokwari, Papua Barat. *JURNAL BIOLOGI PAPUA*, *6*(1), 38–46. https://doi.org/10.31957/jbp.451

Wati, R., Noverita, N., & Setia, T. M. (2019). Keanekaragaman Jamur Makroskopis Di Beberapa Habitat Kawasan Taman Nasional Baluran. *Al-Kauniyah: Jurnal Biologi*, *12*(2), 171–180. https://doi.org/10.15408/kauniyah.v12i2.10363