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Ethnomycological Study of Macrofungi Utilized by Pamona Community Around Lake Poso, Central Sulawesi Province, Indonesia

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Abstract

This study was conducted around Lake Poso, which is home to several indigenous communities with unique local knowledge about nature. This region encompasses several conservation areas, including Bancea Nature Park, Pamona Nature Reserve, and Wera Nature Park. The community residing in this region include the traditional Pamona community, who are one of the ethnic groups in Central Sulawesi Province, Indonesia. Therefore, this study aimed to determine the ethnomycology and local knowledge of Pamona indigenous people in relation to utilization of wild macrofungi species for food and medicine around Lake Poso, Central Sulawesi Province, Indonesia. The results showed that 21 species of macrofungi were used by the indigenous Pamona community, which served various purposes such as a source of food, medicine, hair growth agent, animal feed mixture, and a lighting tool at night. These species include *Schizophyllum commune, Auricularia auricula-judae, Auricularia nigricans, Volvariella volvaceae, Trichaleurina javanica, Termitomyces* spp, *Tremella* sp, *Physarum polycephalum, Mycena* sp., *Pycnoporus sanguineus, Pleurotus ostreatus, Dictyophora indusiata,* and *Russula* sp. Macrofungi species with the highest Relative Frequency of Citation (RFC) value were *Schizophyllum commune*, *Auricularia auricula-judae* (Bull.) Quel, *Termitomyces eurrhizus* (Berk.) Pegler, and *Trichaleurina javanica,* all of which had a value of 1. Meanwhile, *Tremella sp.* had the lowest RFC with a value of 0.14. The highest Informant Consensus Factor (ICF) value of 0.97 was found in the use of macrofungi as food. These results confirm the wealth of knowledge and practices within the Pamona comunnity, enabling them to effectively utilize macrofungi species for both food and medicine. These practices help to combat malnutrition and prevent and treat certain diseases in Pamona comunnity around Lake Poso, Central Sulawesi, Indonesia.

Keywords: Conservation, Edible Macrofungi, Indigenous Knowledge, Utilization

1. Introduction

There are an estimated 2.2 to 3.8 million species of fungi in the world (Hawksworth & Lűcking, 2017). Among these, more than 14,000 species of fungi have been identified and about 10% of them were macrofungi (El-Ramady et al., 2022). Based on available information, it was estimated that as many as 2189 species of macrofungi are safe for consumption and have been used worldwide (Rai et al., 2005, Li et al., 2021). Additionally, there are about 700 species of edible macrofungi that are beneficial to human health (Li et al., 2021; Lima et al., 2012). Despite the high levels of biodiversity in the tropics, the documentation of macrofungi in this region is still lacking and unclear (Hawksworth, 2001). Gandjar et al. (2006) noted that Indonesia alone may host around 200,000 species of macrofungi, but there is limited data on the number of identified species and their utilization. Generally, information on the use of edible wild macrofungi is sourced from local communities worldwide through ethnomycology. It is important to note that new macrofungi species will continue to be identified in the tropics (Douanla-Meli et al., 2007).

Ethnomycology is a branch of ethnobiology and a relatively new field of study. It is focused on the study of traditional knowledge about the use of macrofungi and the influence of the environment, culture, and its relationship with humans through space and time (Reyes-López et al., 2020). Fungi are integral to ecosystems and have historically as well as globally been recognized for the use of macrofungi in food and medicine (Živković et al., 2021). Wild edible macrofungi are known to have a long-standing and close relationship with humans, providing significant biological, economic, and nutritional contributions. They are also extensively consumed by individuals worldwide (Osarenkhoe et al., 2014; Kim & Song., 2014; Semwal et al., 2014; Alvarez-Farias et al., 2016; Kinge et al., 2011; 2017). However, in the field of

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ethnomycology, this knowledge is still limited when compared to knowledge about animals and plants.

According to Manzi et al. (1999), edible macrofungi have been traditionally used by people in Asia as food and medicine since ancient times, with a growing trend of their increased use in various parts of the world (Lu et al., 2020; Wasser, 2011). Every local community possesses unique wisdom and knowledge regarding the use of these macrofungi, influenced by culture, beliefs, perceptions, environmental conditions, and local habits. Traditional knowledge about the use of macrofungi is passed down orally from generation to generation (Albuquerque, 2006; Garibay-Orije et al., 2007; Molares et al., 2019).

Macrofungi have macroscopically filamentous fruiting bodies that can be seen with the naked eye. All macrofungi are fungi, but not all fungi are macrofungi (Mgbekem et al., 2019), and they hold significant potential as a source of food and medicine. They thrive naturally and abundantly in nature and can easily be cultivated intensively, although this is limited to only a few saprotrophic species. Edible macrofungi, depending on their species, chemical composition, and growth substrate, are considered a healthy and sustainable food source for humans (El-Ramady et al., 2022). The indigenous peoples in Indonesia have valuable local wisdom regarding utilization of macrofungi natural resources as a source of food and medicine. However, there is limited knowledge about the diversity, distribution, utilization, and cultivation techniques of potential food and medicinal macrofungi species in Indonesia. Ethnomycological studies are also still lacking, although some studies have reported the existence of several macrofungi used as food and medicine by the local community around Lore Lindu National Park, Central Sulawesi (Yusran et al., 2021; 2022a.b) and by the Baduy community in Banten, Indonesia (Khastini et al., 2018; 2019; Dewi et al., 2022).

This study aimed to determine the ethnomycology and local knowledge of the indigenous Pamona community in terms of utilization of wild macrofungi species for food and medicine around Lake Poso, Central Sulawesi Province, Indonesia

2. Materials & Methods

2.1. Study Location, Ethnography, and Climate

Ethnomycological studies on the use of wild macrofungi by the indigenous Pamona community were carried out around Lake Poso, encompassing several conservation areas such as Pamona Nature Reserve, Bancea Nature Park, and Wera Saluopa Nature Park, Central Sulawesi, Indonesia. Lake Poso is situated in the central part of Sulawesi Island, precisely in Poso Regency, Central Sulawesi Province, Indonesia (Figure 1). The population in this area was 86,366 individuals, spread across several sub-districts surrounding Lake Poso, namely Pamona Puselemba, North, West, East, Southeast, and South Pamona. The inhabitants of this area were dominated by Pamona ethnic group, who were the natives. The average temperature in this area was 27.25°C, with an average humidity of 84.56% and rainfall of 2807.8 mm/year (Badan Pusat Statistik/Central Bureau of Statistics, Poso Regency, 2020). The study was conducted within an altitude range of 381-572 m above sea level. Interviews were conducted in several villages spread over the six sub-districts, namely Sangira, Sulewana, Saojo, Lena, Panjoka, Wera, Owini, Taipa, Bancea, Panjo, Tampemadoro, Poleganyara, Panjoka and Tindoli. The population in these villages was predominantly Pamona individuals.

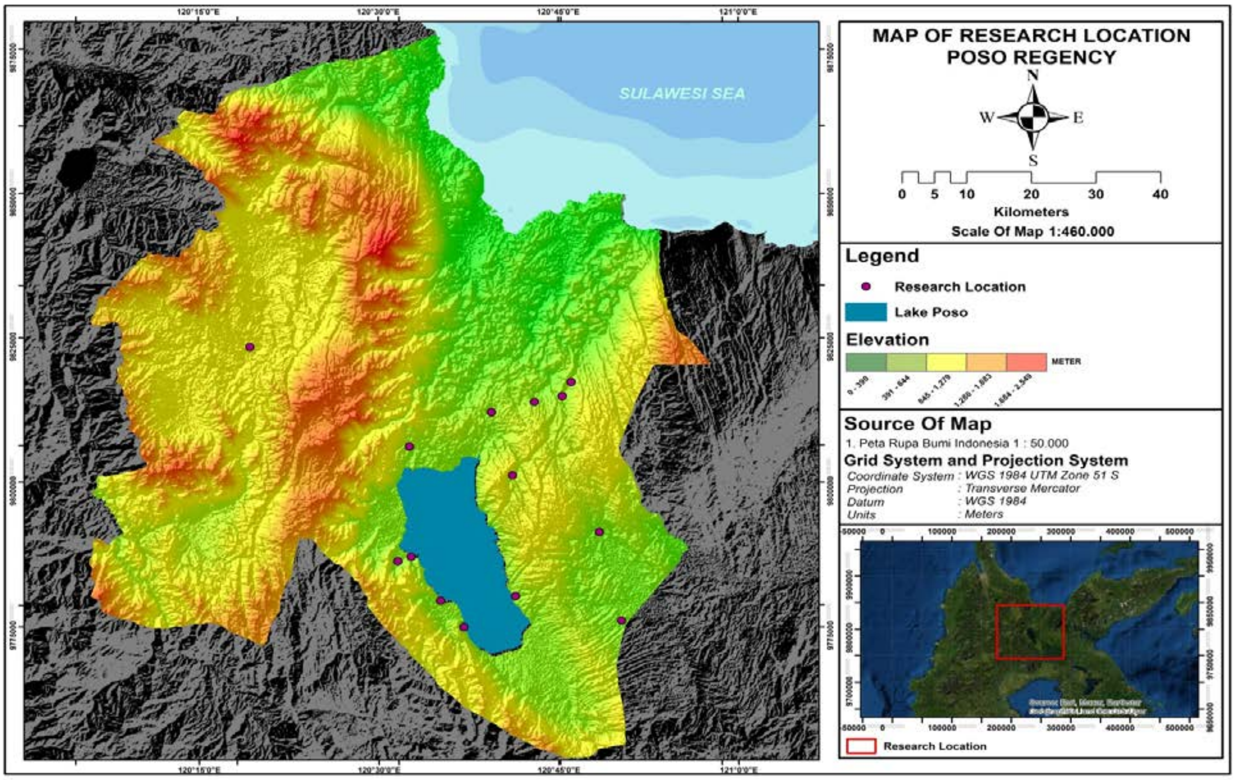

Figure 1. Study sites around Lake Poso, Central Sulawesi, Indonesia

2.2. Sampling Methods and Data Collection

In-depth interviews were conducted with resource people to obtain comprehensive information regarding ethnomycology. Sources were determined using the snowball technique. The selection of resource persons from the community involved two stages: (1) Identifying key resource persons such as traditional leaders, village heads, elders, and macrofungi sellers who were considered relevant and knowledgeable about the study; (2) selecting follow-up sources based on recommendations from previous sources to broaden the range of information and track variations in existing information.

The interviews with the community commenced by meeting with the Village Head as the initial point of contact. The Village Head was asked to provide information about individuals within the community who possessed knowledge and experience in identifying, collecting, and exploiting wild macrofungi. This included village healers, traditional community leaders, and macrofungi sellers in traditional markets who were familiar with food and medicinal macrofungi in several villages surrounding conservation areas. Questionnaires were distributed in each of these villages to selected respondents who were prepared in advance, followed by discussions between the study team and respondents. The total number of respondents in this study was 300. Questions asked included name, age, sex, occupation, education, land ownership, and number of family members. Additionally, respondents were asked about macrofungi, including local name, description, time of appearance, place of growth, method of use, part of fungi used, and the disease treated. During the interviews, photos of food and medicinal macrofungi collected from previous studies were shown to respondents for comparison. In addition to interviews, a Focus Group Discussion (FGD) was conducted to explore the commonly used species of food and medicinal macrofungi within the community and the technology for its use through pictorial percentages. The interviews were conducted in Indonesian and the local language of the local Pamona community, known as Bere'e. The interview took place at each respondent's house and in the field, and questions primarily referred to information about the species of macrofungi and their use by the local community. The collected data were then summarized and transcribed into a quantitative descriptive analysis.

The collection of samples of wild edible macrofungi was carried out over eight months within various ecosystems around the visited villages. These included primary Forest, secondary forest, agroforestry, gardens, monoculture plantations, and yards. Collection of macrofungi fruiting bodies also took place in traditional markets. Each collected fruiting body was placed in paper bags and labeled according to species, and its morphology was recorded using a digital camera. Information regarding their benefits and habitats was also recorded. The collected macrofungi samples were then brought to the laboratory for microscopic examination using a standard microscope (Andrew et al., 2013). Identification of the microfungi was based on references by Hemmes and Desjardin (2002), Desjardin et al. (2000), Desjardin et al. (2004), and online resources such as http://www.indexfungorum.org/, http://mushroomexpert.com/. Collections of dried fruit bodies were also deposited at the Laboratory of Forestry Sciences, Forestry Faculty, Tadulako University, Indonesia.

2.3. Data Analysis

The data was analyzed using qualitative and quantitative methods. Qualitative data obtained from the interviews was presented through descriptive morphological analysis. The analysis of macrofungi species was organized in a table containing information on local names and morphology. Quantitative data was obtained from the utilization value, which was analyzed by calculating the Relative Frequency of Citation (RFC) botanical index. RFC index was obtained by dividing the number of respondents who mentioned certain species of macrofungi (FC) by the number of respondents who participated in the survey (N). The value of RFC index varied from zero to one according to the informant's reference. A value of 0 indicates that no informants mentioned the species as useful macrofungi, while a value of 1 indicates unanimous agreement among all informants regarding the usefulness of the species. RFC index was calculated by using the formula proposed by Qwarse et al. (2021):

$$RFC = \frac{\mathrm{FC}}{\mathrm{N}}$$

where FC=Number of respondents who mentioned a particular species of macrofungi, and N is the total number of respondents interviewed

FL is the ratio of informants who mentioned the use of a particular species in the area surveyed. FL was determined using the formula

$$\mathrm{FL} = \frac{\mathrm{Np}}{\mathrm{N}}$$

where Np is the number of informants who claim to use a particular species for a specific purpose and N is the total number of informants citing the species for any use.

ICF determines the homogeneity of the information provided by the respondents. It was determined by:

$$\mathrm{IFC} = \frac{\mathrm{Nur} - \mathrm{Nt}}{(\mathrm{Nur} - 1)}$$

where Nur is the number of reports on the use of informants for a particular category of macrofungi uses, and Nt represents the number of taxa or species categories of wild macrofungi species.

3. Results

3.1. Important Macrofungi Species in Ethnomycology

The results revealed that the indigenous Pamona community around Lake Poso, Central Sulawesi used 21 species of macrofungi. Macrofungi used were classified into 15 genera and 14 families. The Lyophyllaceae family had the highest number of species (4 species, 19.04%), followed by the Auriculariaceae family (3 species, 14.28%), the Pleurotaceae and Polyporaceae families (2 species, 9.52%), while the remaining 10 families were represented by one species (Table 1). Examples of macrofungi species used by the indigenous Pamona community can be seen in Figure 2.

Table 1. Species of macrofungi used by the indigenous Pamona community around Lake Poso, Central Sulawesi

No.	Vernacular name	Species	Family	Substrate	Utilization and Processing Methods	RFC	FL
1.	Tangkidi/Tangkojo	*Schizophyllum commune* Fr. 1815	Schizophyllaceae	Deadwood	The fruit bodies are used as a vegetable by mixing with coconut milk or sautéing them with other vegetables	1	1
2.	Tanggorugoru	*Auricularia auricula-judae* (Bull.) Quel 1886	Auriculariaceae	Deadwood	Fresh fruit bodies are immediately made into soup, stir-fried with vegetables, or dried, and then stored, which can be processed again at any time	1	1
3.	Tanggorugoru Talinga mbalesu	*Auricularia nigricans* (Sw.) Birkebak, Looney & Sánchez-Garcia	Auriculariaceae	Deadwood	Fresh fruit bodies are immediately made into soup, stir-fried with vegetables, or dried and then stored, which can be processed again at any time	0.56	0.83
4.	Tanggorugoru	*Auricularia* sp.	Auriculariaceae	Deadwood	Fresh fruit bodies are immediately made into soup, stir-fried with vegetables, or dried and then stored, which can be processed again at any time	0.61	0.92
5.	Tambata Mapeni	*Amauroderma* sp	Ganodermataceae	Deadwood	The fruit bodies and stalks are made into souvenirs such as masks and wall paintings by carving and varnishing/painting	0.65	0.69
6.	Tambata Buya/Toyumanu	*Lentinus* sp.	Polyporaceae	Deadwood	The fruit bodies are used like a vegetable by sautéing them with other vegetables	0.88	0.73
7.	Tambata tampopila	*Tremella* sp.	Tremellaceae	Deadwood	The fruit body is used as medicine by grinding it and then applying it directly to the wound	0.14	0.82
8.	Tambata mbega	*Phillipsia* sp.	Sarcoscyphaceae	Deadwood	The fruit body is fried or roasted and then mixed with other drinks like coffee before drinking, causing an intoxicating effect	0.24	0.73
9.	Tanouu ntana 1	*Termitomyces eurrhizus* (Berk.) R. Heim 1942	Lyophyllaceae	Soil	The fruit body is made into soup, mixed with vegetables, sautéed/fried mixed with shallots, chili, and seasonings.	1	1
10.	Tanouu ntana 2	*Termitomyces striatus* (Beeli) R. Heim 1942	Lyophyllaceae	Soil	The fruit body is made into soup, mixed with vegetables, and sautéed/fried with shallots, chili, and seasonings.	0.91	0.92
11.	Tanouu ntana 3	*Termitomyces clypeatus* R. Heim	Lyophyllaceae	Soil	The fruit body is made into soup. mixed with vegetables, and sautéed/fried with shallots, chili, and seasonings.	0.82	0.87
12.	Tanouu ntana 4	*Termitomyces* sp.	Lyophyllaceae	Soil	The fruit body is made into soup, mixed with vegetables, and sautéed/fried with shallots, chili, and seasonings.	0.80	0.82
13.	Tanouu	*Physarum polycephalum* Schwein. 1822	*Physaraceae*	Corncob	The fruit body is made into a soup mixed with other vegetables	0.56	0.81
14.	Toyu ntana	*Trichaleurina javanica* (Rehm) M.Carbone, Agnello & P. Alvarado 2013	Pyronemataceae	Soil	The liquid squeezed out of the fruit body is used as a hair tonic and the dregs of the fruit body are finely chopped and used as a mixture for pig feed.	1	1
15.	Tare'e	*Volvariella volvaceae* (BuLL.) Singer 1822	Pluteaceae	Soil	The fruit body is made into a soup mixed with other vegetables	0.22	0.82
16.	Tambata columbia	*Pycnoporus sanguineus* (L.) Murrill.	Polyporaceae	Deadwood	The fruit bodies are sautéed or boiled	0.34	0.78
17.	Tambata karyada	*Mycena* sp	Mycenaceae	Deadwood	The fruit bodies, which light up at night and are still attached to weathered wood, are used as a light source when walking in the garden/forest	1	1
18.	Tanouu ngkaju/ntua	*Pleurotus* sp.	Pleurotaceae	Deadwood	The fruit bodies are sautéed or dipped and mixed with other spices and vegetables	0.80	0.87
19.	Tamporu	*Russula* sp.	Russulaceae	Soil	The fruit bodies are sautéed or dipped and mixed with other spices and vegetables	0.49	0.63

20.	Keje angga	*Dictyophora indusiata* (Vent.) Desy, 1822	Phallaceae	Soil	The stalk and the cap are used as medicine for goiter and swelling of the body by finely grinding the fruit body and then mixing it with coconut oil, then smeared on the surface of the goiter of the neck or any part of the body that is swollen or has lumps.	0.92	1
21.	Arindi	*Pleurotus ostreatus* (Jacq.) P. Kumm. 1871	Pleurotaceae	Deadwood	The fruit body is made into a soup mixed with other vegetables	0.46	0.83

Note: RFC= Relative Frequency of Citation, FL= ratio of informants.

Table 2. Informant consensus factor (ICF)

User category	**N_{ur}**	**N_t**	**ICF**
Food	655	18	0.97
Medicine	67	7	0.91
Souvenir & Lighting	45	3	0.95
Animal Feed	33	5	0.88

N_{ur} is the number of use reports and **N_t** is the number of taxa

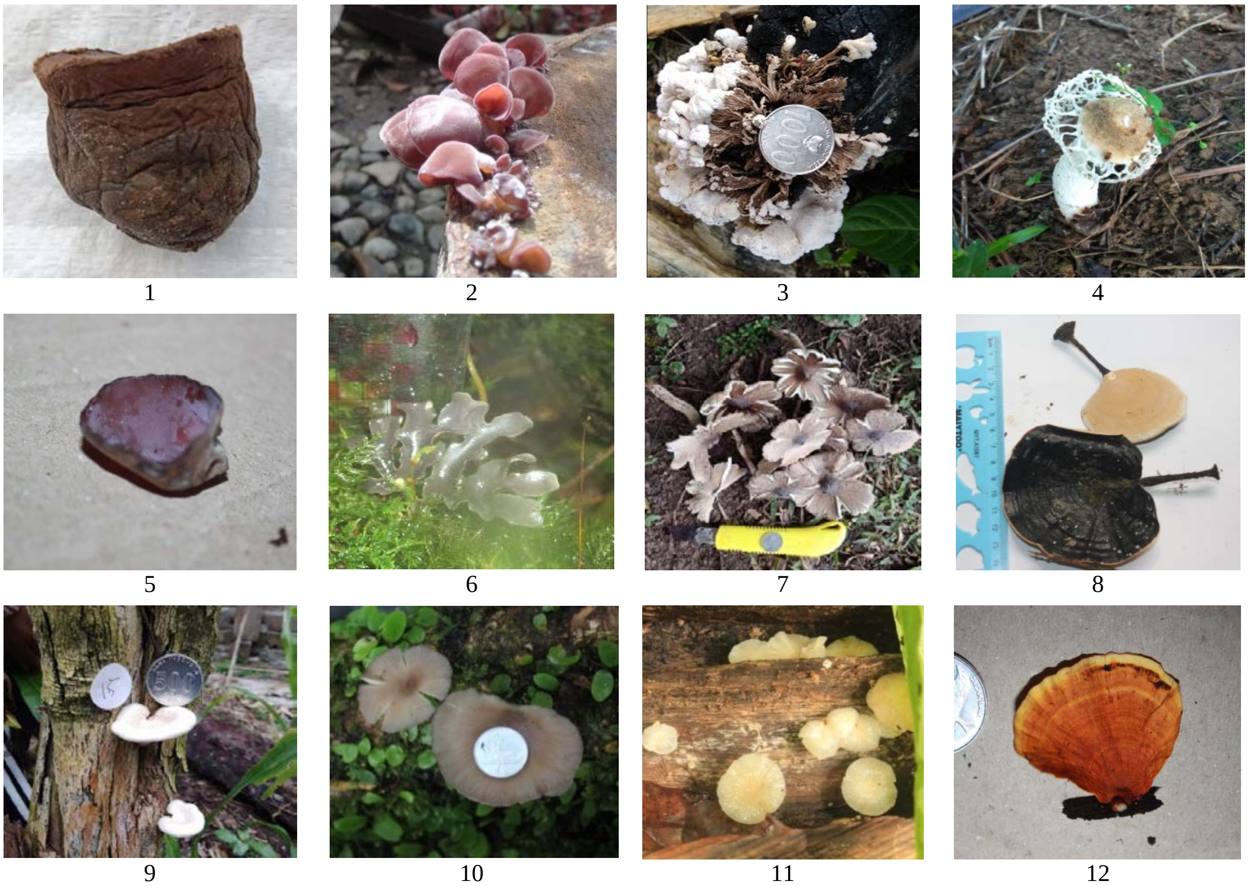

Figure 2. Examples of species of macrofungi used by the indigenous Pamona community: 1) *Trichaleurina javanica*, 2) *Auricularia auricula-judae*, 3) *Schizophyllum commune*, 4) *Dictyophora indusiata*, 5) *Auricularia nigricans*., 6) *Tremella* sp., 7) *Termitomyces eurrhizus*, 8) *Amauroderma* sp., 9) *Lentinus sp*., 10) *Termitomyces sp*., 11) *Mycena sp*., 12) *Pycnoporus sanguineus*

3.2. Preference Rating for Edible Macrofungi

Species of macrofungi with low RFC values have a greater risk of extinction than other species due to their limited recognition and utilization by the public. Increasing the awareness and introduction of these macrofungi to younger generations can help enhance their recognition value.

Table 1 shows that *Schizophyllum commune*, *Auricularia auricular-judae* (Bull.) Quel, *Termitomyces eurrhizus* (Berk.) Pegler and *Trichaleurina javanica* had the highest RFC values of 1, while *Tremella sp* had the lowest RFC value of 0.14. Macrofungi species with low RFC values require domestication to ensure their sustainable use. The highest FL value of 1 was found in *S. commune*, *A. auricula-judae* (Bull.) Quel, *T. eurrhizus* (Berk.) Pegler, *Trichaleurina javanica*, *Mycena sp.*, and *Dictyophora indusiata,* while the other species were below zero. Furthermore, the highest ICF value of 0.97 was found in the use of macrofungi as food.

3.3. Collection, Transfer of Knowledge, Market Opportunities, Utilization, and Phenology of Macrofungi

Knowledge of mycology, including species identification, naming, habitat, phenology, and preparation methods for using macrofungi as food and medicine, has been passed on by word of mouth across generations. There was also no written documentation found regarding these aspects. Furthermore, schools or other formal educational institutions, social and religious institutions, government institutions, and agricultural experts do not play a significant role in the transfer of local knowledge in this study area.

The majority of the local Pamona community trades macrofungi, particularly *Schizophyllum commune* (tanggidi) and *Auricularia auricula-judae* (Tambata talinga valesu). This mainly occurs during the rainy season when these macrofungi grow easily. Due to the abundance of these two macrofungi, they are harvested in large quantities. Some are sun-dried and then stored in jars, and at any time when required, the dried fruit bodies are soaked in water for a few minutes to rehydrate before being cooked.

Table 3. Percentage of macrofungi respondent groups involved in the food macrofungi collection

Parameters	Informant groups	Involvement in macrofungi collection		How often do you collect macrofungi?		
		Yes	No	Never	Sometimes	Always
Sex	Female	104 (34.7%)	13 (4.3%)	13 (4.3%)	17 (5.7%)	87 (29.0%)
	Male	162 (54.0%)	21 (7.0%)	21 (7.0%)	27 (9.0%)	135 (45.0%)
Age	Young (15-30 Years)	76 (25.3%)	7 (2.3%)	7 (2.3%)	27 (9.0%)	49 (16.3%)
	Senior (>30 Years)	202 (67.4%)	15 (5.0%)	15 (5.0%)	8 (2.7%)	194 (64.7%)
Literacy level	Illiterate	50 (16.7%)	6 (2.0%)	6 (2.0%)	17 (5.7%)	33 (11.0%)
	literate	230 (76.7%)	14 (4.6%)	14 (4.6%)	47 (15.7%)	183(61.0 %)
Informant category	Key	117 (39.0%)	17 (5.7%)	17 (5.7%)	32 (10.7%)	85 (28.6%)
	General	137 (45.7%)	29 (9.6%)	29 (9.6%)	51 (17.0%)	86 (51.8%)
Family income	Low (3.000.000 IDR)	218 (72.7%)	5 (1.6%)	5 (1.6%)	19 (6.3%)	199 (66.3%)
	High (>3.000.000 IDR)	68 (22.7%)	9 (3.0)	9 (3.0%)	36 (12.0%)	32 (10.6%)
Distance from forest	<5 km	162 (54.0%)	16 (5.3%)	16 (5.3%)	7 (2.3%)	155 (51.7%)
	>5 km	113 (37.7%)	9 (3.0%)	9 (3.0%)	42 (14.0%)	71 (23.6%)

IDR = Indonesian currency

The group of informants described in Table 3 exhibits differences in their involvement in the collection of macrofungi. Among the 183 male and 117 female informants, 162 men (54.0%) and 104 women (34.7%) were involved, while 21 men (7.0%) and 31 women (4.3%) were not involved in the collection of macrofungi. In terms of age, 76 youths (25.3%) of 15-30 years were involved in the collection of macrofungi, while 7 (2.3%) were not involved. Among the seniors (> 30 years), 202 individuals (67.4%) were involved in the collection of macrofungi, while the remaining 15 individuals (5.0%) were not involved. Based on their level of education, educated informants were more active in collecting macrofungi than the uneducated. Informants from households with low income were more active in collecting macrofungi than those with high income. The distance from the house to the forest where macrofungi are collected also had an effect, with informants residing closer to the forest collecting more macrofungi.

Table 3 also shows the frequency of informants in collecting macrofungi. Pamona community frequently collect macrofungi, as evidenced by percentages above 50% across all parameters except for informant income. Individuals with higher income rarely collect macrofungi, as they have the means to fulfill their family's needs and prefer to purchase them at local traditional markets.

Respondents showed understanding of the seasonal emergence of macrofungi by acknowledging the significant influence of the rainy season on the appearance of fruit bodies (Table 4). Although most species of edible macrofungi appeared during the rainy season, certain species exclusively appeared during the rainy season, such as *Termitomyces* spp. which was associated with rainy weather accompanied by lightning. There were also macrofungi species emerged during the dry season, such as *Amauroderma sp*., *Lentinus sp*., and *Picnoporus sanguineus*. *Trichaleurina javanica* was found in forests, gardens or recently cleared fields due to their preference for fertile soil. These microfungi were particularly abundant in the rainy season during months like September, October, November, and December. However, *S. commune* macrofungi were found and used by the Pamona community all year round due to their widespread growth.

Table 4. Phenology of the species of macrofungi based on the perceptions of the respondents

No.	Species	Months
1.	*Schizophyllum commune* Fr. 1815	January-December
2.	*Auricularia auricular-judae* (Bull.) Quel 1886	April – November
3.	*Auricularia nigricans* (Sw.) Birkebak, Looney & Sánchez-Garcia	January – August
4.	*Auricularia* sp.	July – December
5.	*Amauroderma* sp.	April – July
6.	*Lentinus* sp.	March – June
7.	*Tremella* sp.	January – May
8.	*Phillipsia* sp.	May – November
9.	*Termitomyces eurrhizus* (Berk.) R. Heim 1942	September – October
10.	*Termitomyces striatus* (Beeli) R. Heim 1942	September – October
11.	*Termitomyces clypeatus* R. Heim	August – September
12.	*Termitomyces* sp.	August – October
13.	*Physarum polycephalum* Schwein. 1822	June – September
14.	*Trichaleurina javanica* (Rehm) M.Carbone, Agnello & P. Alvarado 2013	January – December
15.	*Volvariella volvaceae* (BuLL.) Singer 1822	April – June
16.	*Pycnoporus sanguineus* (L.) Murrill.	May – August
17.	*Mycena* sp.	January – December
18.	*Pleurotus* sp.	June – September
19.	*Russula* sp.	September – November
20.	*Dictyophora indusiata* (Vent.) Desy, 1822	September – December
21.	*Pleurotus ostreatus* (Jacq.) P. Kumm. 1871	October – December

4. Discussion

The Pamona community categorizes macrofungi into two major groups based on where they grow. These include "Tambata" for macrofungi that grow on weathered wood or living trees (saprophytes) and "Tanouu" for those that grow on the ground. The name Tambata is also the same as that given by the Kaili community, who live in the valley of Palu and Sigi Regency, Central Sulawesi, Indonesia (Yusran et al., 2021; 2022a).

The ethnomycology study showed that all respondents had extensive knowledge of several macrofungi as being the best quality food for the Pamona community. These microfungi include *Schizophyllum commune*, *Auricularia auricula-judae* (Bull.) Quel, *Auricularia nigricans*, *Auricularia* sp., *Termitomyces eurrhizus* (Berk.) Pegler, *Termitomyces striatus* Var. annulatus R. Helm Pegler, *Termitomyces clypeatus* R. Heim, and *Termitomyces* sp. The identification and folk taxonomy of these macrofungi was easily understood by the public, as they were frequently collected for consumption and sale.

Macrofungi *Trichaleurina javanica* is called "Toyuntana" when it is young and underground and "Tanouu" when it blooms. Among the 21 macrofungi species found, macrofungi *Schizophyllum commune* (Tanggidi) was the most commonly known among the indigenous Pamona community in Poso District, Central Sulawesi. The name "Tanggidi" was also used by the Kaili community in Sigi Regency, Central Sulawesi (Yusran et al., 2022b). This species is commonly consumed due to its excellent taste and easy availability, especially during the rainy season. It is well known with different names across several provinces in Indonesia, such as Kulat Kritip in Central Kalimantan (Nion et al., 2012), Supa in Banten (Khastini et al., 2018), Tirau in Sumatera Island (Kusrinah and Kasiamdari, 2015), and Jaggery in West Papua (Nurlita et al., 2021).

Another species of macrofungi that is believed to cure goiter by the indigenous Pamona community is *Dictyophora indusiata*. The method of using it involved taking the stem (stipe) of macrofungi, growing it until smooth, mixing it with coconut oil, and then applying it to the surface of the goiter lump on the neck. *Tremella sp.* (Tambata Tampopila) is a species that is believed by the Pamona community to heal wounds on the surface of the body. The method of use involved crushing the fruit body until smooth and then sticking it directly on the wound.

According to Panda and Tayung (2015), it is very common for people in newly developing countries to use macrofungi to maintain health and prolong life. Macrofungi have high nutritional value because they are rich in protein, essential amino acids, vitamins, and fiber but low in fat and antioxidants (Rahman et al., 2021; Agrahar-Murugkar and Subbulakshmi, 2005; Balan et al., 2018; Cardwell et al., 2018; Taşkın et al., 2021). Various studies have reported on the medicinal effects of *D. indusiata* fruit bodies, including anti-obesity (Wang et al., 2019), neuroprotective effects for Alzheimer's disease (Talebi et al., 2021), and wound treatment (Nazir et al., 2021). Similarly, the microfungi *Tremella fuciformis* Berk., known for its snow-like appearance, has been used for thousands of years in China due to its traditional therapeutic effects, particularly in skin care, immune repair, and disease prevention (Ma et al., 2021). In this study, it was found that there were 21 macrofungi used by the indigenous Pamona community around Lake Poso. This number is higher compared to a study by Sharma et al. (2022) which identified 14 species of edible macrofungi in the Jammu district, India. However, the results were lower than several previous studies, as reported by Kamalebo et al. (2018), who discovered 68 species of macrofungi used as food and medicine in Thsopo Province, the Democratic Republic of Congo. It was also lower than the 46 species in San Mateo Huexoyucan, Tlaxcala, Mexico (Alonso-Aguilar et al., 2014), 47 species of edible macrofungi by five communities in Ocoyoacac, Mexico (Romero et al., 2015), 25 species in Sabah, Malaysia (Fui et al., 2018), and 91 species of food and medicinal macrofungi found through a market survey in Southwest Yunnan, China (Wang et al., 2022).

The Pamona community primarily obtain macrofungi for household consumption and rarely for sale in the local market, resulting in minimal impact on their income levels. The most commonly found macrofungi was *Termitomyces*, which was consistent with the results of previous studies (Sharma et al., 2022; Teke et al., 2018; Sitotaw et al., 2020; Tibuhwa et al., 2012). Among macrofungi species, *Schizophyllum commune* is the most frequently consumed due to its delicious taste and easy availability. Based on previous reports, it has been used traditionally in Southeast Asian countries and India (Singh, 2017; Waktola and Temesgen, 2018; Valverde et al., 2015; Sánchez, 2017; Sande et al., 2019; Srikram and Supapvanich, 2016).

According to Dapar et al. (2020), a high FL value validates the traditional potential of macrofungi for specific uses, while a low FL value indicates a wide range of uses with disagreement over the specific uses of certain species. An FL value of 1 for a particular macrofungi species suggests that all usage reports mention the same macrofungi for specific uses in the study area (Khastini et al., 2018).

Preferences for macrofungi species vary among communities in different parts of the world. In this study, the most preferred was the *Schizophyllum commune* species, which aligned with the preferences of the local people in Tshopo Province, the Democratic Republic of the Congo (Kamalebo et al., 2018), and the Gaddang community in Nueva Vizcaya, Philippines (Lazo et al., 2015). However, in the Selous-Niassa Corridor in the Ruvuma Region, Tanzania, the most preferred macrofungi species was *Agaricus* (Qwarse et al., 2021). Different countries also have their preferences, such as the genus *Termitomyces* in the Meng district, Asossa Zone, Benshangul Gumuz Region, Ethiopia, (Sitotaw et al., 2020), *Cantharelus* in ethnicities in India, Cameroon, Burundi, and Congo (Kamalebo and Kesel., 2020), and the genus *Lactarius* in India (Kumar et al., 2017). These species are well known and liked by the public because they taste good and have high nutritional content. In addition, *Schizophylllum commune*, *Auricularia* sp., and *Termitomyces* sp. had sufficient nutritional content before and after cooking (Yusran et al., 2022a).

These results are consistent with a previous study conducted by Sharma et al. (2022) in a community in Jammu district, India, where macrofungi were primarily used as food. Similarly, the local community in The Selous-Niassa Corridor, Ruvuma Region, Tanzania, obtained the highest ICF values for macrofungi used as food (Qwarse et al., 2021). According to Uddin and Hassan (2014), ICF value for macrofungi species was used to determine agreement among informants residing around Lake Poso regarding customary knowledge about edible and inedible wild macrofungi or other uses such as medicine. ICF score reflects the homogeneity, reliability, and level of knowledge among informants on the use of macrofungi species for food, medicine, and those considered inedible in the community.

Pamona community collected macrofungi mainly for food and medicine, and this was also practiced by local people in the Selous-Niassa Corridor, Ruvuma Region, Tanzania (Qwarse et al., 2021), and several communities in Tanzania (Haäkönen et al., 2003). It was prepared by boiling, frying/stir-frying, or cooking with coconut milk (curry) mixed with fish or other species of vegetables. The same method was also practiced by the Khasi people in India (De Leon et al., 2012) and the Gaddang people in Nueva Vizcaya, Philippines (Lazo et al., 2015). A similar phenomenon was also observed among the local community in Meng district, Asossa zone, Benshangul Gumuz Region, Ethiopia (Sitotaw et al., 2020) and also a community in Jammu district, J&K (UT), India (Sharma et al. 2022). This differs from local people in the Meng district, Asossa Zone, Benshangul Gumuz Region, Ethiopia (Sitotaw et al. 2020), where family income does not affect the frequency of macrofungi collection.

5. Conclusions

In conclusion, the consumption of macrofungi was based on knowledge of the informants. Pamona community was rich in traditional knowledge and practices in utilizing various macrofungi species for both food and medicine and could distinguish between edible and poisonous macrofungi. Therefore, the results of this study provide valuable information about edible macrofungi, which can improve nutritional status, reduce malnutrition and prevent and treat certain diseases within the Pamona community residing around Lake Poso, Central Sulawesi, Indonesia. The results also showed that a total of 21 macrofungi species were used by Pamona indigenous people as food, medicine, souvenirs, lighting in the dark, hair growth agents, and a mixture for making livestock rations. Among these, *Schizophyllum commune*, *Auricularia auricula-judae* (Bull.) Quel, *Termitomyces eurrhizus* (Berk.) Pegler, and *Trichaleurina javanica* had the highest RFC of 1, while *Tremella sp* had the lowest RFC of 0.14. The highest ICF value of 0.97 was associated with the use of macrofungi as food. It is worth emphasizing that saprotrophic macrofungi species that have low RFC values require domestication to ensure their availability and promote sustainability. These macrofungi have the potential for further development in the domestication stage through cultivation and future analysis of nutrients and bioactive compounds.

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Conflict of interest

All the authors declare that there is no conflict of interest.

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