Article

A walk in the woods: Macrofungal diversity and distribution across vegetation along Mt. Hamiguitan Trail, San Isidro, Davao Oriental, Philippines

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Abstract

Macrofungi are key ecological decomposers and essential indicators of ecosystem health in forests. This group of organisms remains poorly studied in the Philippines, especially in Mount Hamiguitan Range Wildlife Sanctuary. This study recorded the abundance and distribution of macrofungi along the hiking trail in three vegetation types: dipterocarp forest, montane forest, and mossy-pygmy forest. A total of 18 (50-m x 10-m) belt transects were set up along the trail and sampled on two observations in November 2018 and January 2019. A total of 733 macrofungal individuals were reported, representing 46 genera and 22 families. Polyporaceae was the most dominant family in both sampling periods. The montane forest had the greatest macrofungal diversity, with a Shannon diversity index of 2.7 to 2.2. The most abundant species in the first sampling was *Marasmius pellucidus*, and the second sampling was dominated by *Favolus* sp. The most frequent species of both sampling periods was *Microporus xanthopus*. Overall, the findings indicate that macrofungal communities in Mount Hamiguitan exhibit moderate diversity, with a remarkable variation across vegetation types and sampling periods. This paper will give the first comprehensive baseline data on the macrofungal diversity in the sanctuary. Additionally, it highlights the need for further studies to elucidate the species composition and ecological patterns of Philippine tropical forests.

Keywords basidiomycota; elevational gradient; vegetation types; mushrooms; polyporaceae.

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1 Introduction

Mount Hamiguitan Range Wildlife Sanctuary (MHRWS) has the biggest pygmy forest ecosystem in the Philippine archipelago. Owing to its exceptional habitat heterogeneity and the presence of numerous

endangered, endemic, and rare flora and fauna species, the area has been recognized by Conservation International as one of the Philippine biodiversity hotspots (Amoroso & Aspiras, 2011). Because of its outstanding universal significance, MHRWS was inscribed as a UNESCO World Heritage Site in June 2014 and was named the Mindanao Long-Term Ecological Research Site (Amoroso et al., 2016).

Following these recognitions, Mount Hamiguitan has become a subject of scientific research, particularly on the biodiversity, systematics, and ecology of its flora and fauna. There were several studies by Amoroso & Aspiras (2011), Amoroso et al. (2016), Amoroso et al. (2018a, 2018b), and Magapan & Ybañez (2025) that addressed knowledge gaps in the sanctuary's flora and fauna. These reports have significantly enhanced knowledge on the sanctuary's floristic and faunal diversity and have made it more significant for conservation. Despite this accumulated body of work, fungal diversity has received relatively little attention. The UNESCO World Heritage List (2014) reported that the Kingdom Fungi was identified as one of the least studied biological groups in Mount Hamiguitan, particularly macrofungi.

Fungi are heterotrophic organisms that have a thalloid body, vegetative growth through hyphae, and do not develop genuine roots, stems, and leaves (Andrew et al., 2013). The macrofungi (or macromycetes) are those fungi that form conspicuous fruiting bodies visible with the naked eye, and are primarily classified under phyla Basidiomycota and Ascomycota. Ecologically, these species are considered saprotrophs that break down organic matter, although many species form mutualistic relationships with plants, especially mycorrhizal fungi, or act as plant pathogens (Suliaman et al., 2017). These functions play a central role in nutrient cycling and overall ecosystem functioning in forest environments.

Macrofungal community and composition are known to be strongly influenced by forest structure, vegetation type, and other conditions in both temperate and tropical ecosystems (Angelini et al., 2015). Macrofungal distribution in the tropical mountain forests, such as Mount Hamiguitan, is influenced by habitat heterogeneity and elevational gradients (Bustillos et al., 2024). Together with the high floral endemism and complex forest structure of MHRWS (Amoroso & Aspiras, 2011), these conditions might suggest the presence of a diverse macrofungal community. Nevertheless, macrofungi remain among one of the least-studied biological groups in the Philippines (Jacob et al., 2022), and most protected areas, such as Mount Hamiguitan, still lack baseline data (UNESCO-WHC, 2014).

Tadiosa and Lubos (2019) previously reported an initial report of macrofungi in Mount Hamiguitan, but this was a preliminary study with a limited scope. Consequently, there remains a need for a more comprehensive and systematic evaluation that records macrofungal prevalence across various types and quantitatively characterizes the community composition and distribution. Addressing this gap is important for developing a more complete understanding of the biodiversity patterns and ecological processes in the sanctuary.

Therefore, this study documented the macrofungal species occurring along the Mount Hamiguitan hiking trail and determined the species composition, frequency, and diversity across three different vegetation types. The findings provided updated baseline data regarding macrofungal diversity in Mount Hamiguitan and further developed existing knowledge on fungal biodiversity in Philippine protected areas, which can be used in future ecological, taxonomic, and conservation-related studies.

2 Study area and Methodology

2.1 Study site

The study was conducted in Mount Hamiguitan Range Wildlife Sanctuary, which is globally positioned at 6 °40 'N to 6 °47 'N and 126 °09 'E to 126 °13 'E. This mountain range is a protected area located in Davao Oriental Province, Mindanao (Figure 1). It covers 6,834 ha with the highest elevation of 1,637 m above sea

level. It is categorized by a diverse variety of vegetation types, including agro-ecosystem forest, dipterocarp forest, montane forest, typical mossy and mossy-pygmy forest (Amoroso et al., 2016). The uniform distribution of rainfall, temperature, humidity, and air indicates mild weather conditions (Amoroso & Aspiras, 2011).

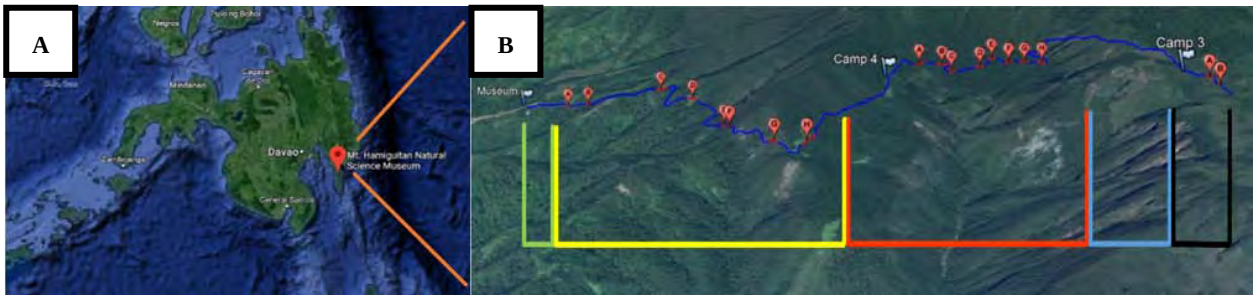

Fig. 1 Geographical satellite view of the study area in Mount Hamiguitan Range Wildlife Sanctuary, Davao Oriental (**A**) study area location and (**B**) five types of vegetation in the site (agro-ecosystem, dipterocarp, montane, typical mossy, mossy-pygmy).

The survey was conducted in November 2018 and January 2019 under a Wildlife Gratuitous Permit issued by the Department of Environment and Natural Resources (DENR- Region XI). A total of eighteen (18) 50 m x 10 m transect belts were established along the San Isidro hiking trail to assess the abundance of macrofungal species. As shown in Fig. 1, transects were marked out across the three vegetation types: eight in the dipterocarp forest, eight in the montane forest, and two in the mossy-pygmy forest.

Mt. Hamiguitan consists of five major vegetation types. Nevertheless, the sampling bias was reduced through a weighted distribution of transects, given differences in the lengths of hiking trails through each vegetation type. The transect number allocated to each vegetation type was calculated by dividing the hiking trail length for that vegetation type by the total trail length, then multiplying the quotient by the total number. However, all fungal species encountered within each transect belt were documented, initially identified, and collected for further identification.

2.2 Sample collection

Macrofungal collection was conducted from 8:00 AM to 4:00 PM, when temperature conditions were favorable, and the fruiting bodies were fully expanded. This sampling schedule followed the method described by Nacua et al. (2018), who reported that the morning hours are optimal for collecting macrofungi. The first sampling was conducted on November 1-4, 2018, under a stable environment with a temperature of 22 °C to 26 ° C and no rain. On the other hand, the second sampling, which was January 2-5, 2019, was marked by precipitation, high winds, and a lower temperature of 21°C - 24°C. No sunrise or any heat was observed due to tropical cyclones and storms.

Both woody and fleshy mushrooms were collected using a machete. Woody mushrooms were wrapped in newspaper with desiccant beads, while fragile fungi were preserved in 70% ethanol (Tadiosa et al., 2011). Additionally, key data were recorded, including vegetation type, collection number, collection date, location, latitude, elevation, substrate, species count, sampling point, fungal type, and picture number.

2.3 Identification and classification of fungi

Specimen identification was based on macroscopic features, including key morphological characteristics such as sporocarp size, color, shape, and texture. These were recorded before the drying to account for any possible color or texture changes. Other characteristics were examined, such as lamellulae color, attachment, spacing,

and texture. Additionally, stalk size and the presence or absence of partial and universal veils were documented (Denchev et al., 2013).

Initial identifications were compared using available taxonomic keys and verified literature descriptions, and further confirmed through consultations with mycologists. Despite the growing use of molecular methods in fungal taxonomy, morphology-based identification remains a widely used method for conducting basic macrofungal surveys, especially in tropical areas where molecular reference data are still scarce. Several studies have employed morphology-based approaches, similar to those used in macrofungal diversity surveys in the Philippines and other tropical forests (Bustillos et al., 2024; Bustillos et al., 2025; Dulay et al., 2025; Jacob et al., 2020; Torres et al., 2020).

2.4 Statistical analysis

Standard ecological procedures were used to establish the distribution and diversity of the macrofungi species. Abundance was the total number of individuals recorded for each species in a given area (Begon et al., 2006) and was used to calculate species counts. Data analysis was performed using R Software (R 4.4.2) and PAST (Paleontological Statistics Software Package for Education and Data Analysis) Software to calculate key diversity indices, including abundance, relative frequency, and Shannon diversity index.

The Shannon diversity index (H') was calculated as follows:

$H' = -\Sigma\ Pi \ln Pi$

where:

- H'= Shannon diversity index
- Pi = proportion of individual species
- ni = number of individual species *i*
- N = total number of individuals across all species

According to Odum & Barrett (2004), the value of the diversity index lower than 1 (H'<1) means the diversity is low, while the value ranges from 1-3 (1< H' ≤ 3) in diversity index is moderate, higher than 3 (H'> 3) means the diversity index is high (Izatti et al., 2020). These values help in understanding the ecological stability of macrofungal communities observed within each vegetation type at the study site. Furthermore, relative frequency was calculated to determine the dispersion patterns across the study plot.

$$\text{Relative Frequency (\%)} = \left(\frac{\textit{Number of transect belts where the species is present}}{\textit{Total number of transect belts}}\right) \text{X } 100$$

3 Results and Discussion

3.1 Morphological characterization of macrofungi

Observed macrofungal specimens were morphologically identified, resulting in a comprehensive taxonomic checklist. A total of 75 macrofungal species were reported, and they are all classified in the class Agaricomycetes. These species were grouped into six orders, including Agaricales, Boletales, Gloeophyllales, Hymenochaetales, Polyporales, and Russulales, with 22 families, 46 genera, and 75 species. However, Figures 2A and 2B provide representative photographs of selected macrofungi found on the hiking trail of Mt. Hamiguitan. These emphasize the morphological diversity of the taxa documented, and the entire list of the families and the respective species is given on the following:

(1) Family Agaricaceae

Agaricus sp.

This mushroom has a rusty brown bump in the center of the cap. The pileus measures 2 to 6 cm, which is cream to grayish-white and has a brittle, smooth surface. Its gills are cinnamon-brown, crowded, and free. The bulbous stipe ranges from 3 to 9 cm long and 0.5 to 1.3 cm wide. It is marginally off-center, hollow, and encircled with minute hairs having white mycelial roots. It has a thick and pendulous annulus.

Calvatia sp.

The flaky brown patches in the center of the fruiting body are finely floccose in the yellowish outer layer. This species circle-shaped and it measures 3 to 10 cm wide. It becomes the edges of the fruiting body, cracking into irregular and flaky patches. The chocolate brown inner layer is thick, smooth, and shiny. An area around the roots is covered with a mycelial mat.

Lepiota sp.

This species has a yellowish-white, scaly cap that measures from 3 to 5 cm, with a flat apex and a splitting margin. It has free, cream-colored gills that are intercalated. The smooth, dry stipe measures from 5 to 8 cm long and 0.5 to 2cm wide. This is cylindrical to bulbous with a centrally attached annulus.

Leucocoprinus birnbaumii (Corda) Singer

This mushroom has a bell-shaped cap that measures 2 to 3 cm wide. It is sulfur-yellow, has delicate, tiny hairs, and is detachable. It has powdery-looking scales. Its pileal margin is striated with radial grooves, and the gills are free from the stipe, with some other short gills that are present. The bulbous stipe measures 2 to 8 cm long and 1 to 3 cm wide. It has a powdery texture and is grouped at the base with pale yellow basal mycelium.

Lycoperdon perlatum Pers.

The body of this fungus is petite and pear-shaped, measuring 2 to 5 cm long and 2 to 3 cm wide, with a netlike surface. It has an outer color of olive-brown, with warts of this tiny type. The inner mass of the spores is soft and powdery, being olive or yellowish-brown. The fruiting body is covered with tiny pyramidal bumps and a rootlike structure, thin and white. It secures the body to the ground and traps soil particles in the process.

(2) Family Amanitaceae

Amanita fulva (Schaeff.) Fr.

The mushroom has a warm, tawny cap that flattens with age, acquiring delicate ridges that may crack. It measures 4 to 9 cm. It is slightly sticky when wet, and its color is greater towards the edges. It has cream-white gills that are packed closely and devoid of the stem. The slender hollow stalk is feeble and lined with fine white hairs. This measures 6 to 15 cm long and 1 to1.5 cm wide. A ring does not bind it, but a large, white, and bag-shaped volva.

Amanita sp.

The cap of this mushroom is smooth, white to beige, measures 3 to 7 cm, flattened in old age, with fine striations along the margins, and has no bump in the center. The white stem of its gills is free. The thin hollow stalk measures 4 to 9 cm long and 0.7 to 2.5 cm wide. This is slightly scaly with a central or off-central position. It has a turnip-shaped white volva at the base with mycelial roots of a thin nature. There is a weak ring that is hanging around the top of the stalk.

(3) Family Boletaceae

Boletellus cf. *emodensis* (Berk.) Singer

This mushroom has a convex to hemispherical pileus that measures 4 to10 cm. The warts of the cap are radially splitting and dull to rose-red tomentose. A yellow poroid hymenophore also shows wherein it radially sinks around the adnate stipe. The cylindrical stipe measures 6 to 8 cm long and 0.8 to 1 cm wide. This is firm, dry, concolorous with the pileus, has a villous base with white mycelium, and lacks an annulus and volva.

Boletus cf. *orientialbus* N.K. Zeng & Zhu L. Yang

The pileus is hemispherical to applanate, measuring 4 to10 cm, and is cream in color. It has verrucose surface around the margin and the olivaceous yellow tubulous hymenophore with angular, adnate pores. The subcylindrical stipe measures 8 to10 cm long and 1.5 to 2.5 cm wide, and is dry. It matches the same color as the cap. It is reticulated, with no annulus, and does not turn color upon being injured.

Boletus sp.

The convex pileus measures 4 to 16 cm and is velvety, becoming cracked towards the surface of a pinkish-red to dark brick red surface with a yellow margin. The reticulated clavated stipe measures 5 to 15cm long and 1.5 to 3 cm width becomes blue when injured. The gills will also become blue when cut.

Heimioporus sp.1

The applanate pileus measures 3 to 9.5 cm, is smooth and dry, and is pinkish-red in color with an incurred margin. The lamellae are strongly decurrent with a yellow color that rigorously releases yellow substances upon squeezing. The centrally attached stipe is attached to whitish mycelial roots. This measures 5 to10 cm long and 0.2 to 1 cm wide.

Heimioporus sp.2

This mushroom has a carmine-red to reddish-pink convex to planate-convex pileus that measures 5 to 8 cm. It has medium-sized patches of bulges, a small umbo, a decurved margin, and a poroid hymenophore, with subadnate tubes. The subclavate, reticulated, slender stipe ranges from 7 to 9 cm long and 0.5 to 2.5 cm wide. This is brownish red to rhubarb red and centrally attached. It has a swollen base, white rhizoid mycelia, and becomes blue when bruised.

Heimioporus sp.3

The hemispherical to applanate pileus measures 3 to 10.5 cm, and is viscid, crimson-carmine, with narrow red hairs, and cracking imperceptibly at the edge. The centrally attached red stipe measures 5 to 20 cm long and 0.7 to 3 cm wide. This is bulbous, with carmine fibrils covered, with reticulations and scales of red color. It has a whitish mycelial base, but the yellow poroid lamellae do not change when bruised.

Leccinum sp.

This mushroom has a 5 to 6 cm convex to applanate cap with a squamulose-like sticky surface, and the white flesh turns reddish-brown when bruised. It has an adnexed and poroid hymenophore with white pores that become dark upon incision. The stipe measures 6 to 10 cm long and 1 to1.5 cm wide. This is covered by brown-black scales with ridges, and is centrally attached to the soil using white basal mycelium.

Strobilomyces sp.

The cap of the mushroom is convex, measuring 3 to 10 cm. It is capitulated, yellowish to olive-brown, with a black apex and remnants of the veil. It is slightly decurrently poroid. The clavate stipe measures from 5 to 10 cm long and 0.5 to 2 cm wide with woolly black scales. It has a grayish tomentose base and is mostly dry and rough.

(4) Family Cortinariaceae

Cortinarius sp.1

This mushroom has a convex, rounded cap that measures 2 to 8 cm. It has tiny radial fibers and a grayish-white center, darker to brownish-violet at the edges. As it matures, the margin smooths out and may split. The rusty brown gills are closely packed and have a slightly tacky cap. The bulbous stalk measures 4 to 10 cm long and 1 to 2 cm wide. This is slightly violet-grey in color, with fine fibers and a swollen base. A rusty Cortina remnant remains at the top. The stalk becomes light lilac when bruised.

Cortinarius sp.2

This mushroom has a black to black-violet cap that measures 2 to 6 cm. It has a slightly raised center and fringed edges. Its blackish-brown gills are attached in slightly notched and arranged in subdistant. The stipe

ranges from 5 to 9 cm with a swollen base of 1 to 2.5 cm wide, enclosed in mycelial roots. It has no annulus and volva and does not change color upon injury.

(5) Family Entolomataceae

Entoloma sp.1

This hollow mushroom has a dark violet to blackish-blue velvety cap that measures 4 to10 cm. It is lined with hair and has a cream-colored interior. Its white gills initially grow closely, but with age, they are widely spaced. The grayish-violet hollow stipe ranges from 4 to 9cm long and 0.5 to 1.7 cm wide. This has a fine-fibered texture. It has no volva, annulus, and basal tomentum and does not change color when bruised.

Entoloma sp.2

This delicate fungus has a small and velvety cap that measures 2 to 6 cm. The cap is fading in color from dark brown in the center to the pale edges, which has a small bump in the center of the form. Its gills are soft pink and freely arranged. The deep brown to violet-brown thin and hollow stalk ranges from 2 to 8 cm long and 0.5 to 1 cm wide. It has a tapered base with fine white hairs. Having neither ring nor volva, this mushroom remains unchanged when injured.

Entoloma sp. 3

Its blackish grey pileus measures 3 to 8 cm, is dry, glabrous, and vertically-fibered. It has a darker umbo and a striated margin. The grayish-white adnate lamellae are moderately dense. It has a hollow, flexible stipe that ranges from 4 to 10 cm long and 0.1 to 0.5 cm wide. The stipe is ventrally attached, slightly pruinose, and fibrillose. It also has fine white rhizomorphs in the lower part. This mushroom has no volva or annulus.

Entoloma sp.4

The convex to broadly bell-shaped tan-light sepia pileus measures 1 to 7 cm and is smooth. This is hygrophanous, and it also has a striated cap margin. The white lamellae are free to emarginate. The clavated stipe measures 3 to 8 cm long and 0.4 to 2 cm wide. It is fibrillose striate, pruinose towards the apex, and enclosed by the white basal mycelium.

Entoloma sp.5

This campanulate mushroom has a dark and scaly cap that measures 1 to 3 cm. It has a central depression and white fibrillose margins. The spacing of its whitish gills is moderate. The slender and dark stipe ranges from 4 to 7 cm long and 0.2 to 0.5 cm wide. It has a pruinose apex and a white and tomentose base. It lacks a volva and annulus.

Entoloma sp.6

The conical to plano-convex blue pileus measures 2 to 5 cm deep, is squamulose, umbonate, velvety, and laterally attached. The white to gray lamellae are subdistant. The hollow squamulose stipe ranges from 2 to 8 cm long and 0.5 to 1 cm wide and has a white basal tomentum.

(6) Family Ganodermataceae

Amauroderma sp.

This macrofungus has a dry and flexible cap that measures 1 to 3 cm wide. It is funnel-shaped, and it curls in on drying. It has a cream hymenial surface with minute pores. It has slightly decurrent lamellae. The brown to black non-lactated stipe ranges from 5 to 15 cm long and 0.3 to 0.8 cm wide. This species is centrally attached to the substrate.

Ganoderma applanatum (Pers.) Pat.

This macrofungus exhibits a bracket-shaped cap that ranges from 10 to 40 cm. It has a thickness of 1.5 to 5 cm and has a zoned surface of shiny reddish-brown to dull orange-brown with an incurved margin. The hard whitish hymenial surface is moderately crowded. This is attached in a sessile manner to dead wood.

Ganoderma lucidum (Curtis) P.Karst.

The semicircular to kidney-shaped cap is 3 to 7 cm long and wide. The fruiting body is dark red or brown, laccate with a non-lactate yellow-white margin. It is thick, wavy, woody, and stipeless. The hymenial surface is dry and smooth. It is covered in cream or milky coffee pores and attaches centrally or laterally to wood.

Ganoderma sp.1

The semicircular with non-laccate pilei measures 6 to 12 cm long and 3 to 6 cm wide. This is sessile, woody, and thick. It is covered with concentric areas of light to dark brown, having a purplish-brown tint and uneven and wavy margins. The purplish-brown hymenial layer has evenly distributed circular minute pores.

Ganoderma sp.2

The basidiome is stipitate, non-laccate, annual, woody, thick, and the bracket pilei measure between 5 and 30 cm wide. It is dark brown to purplish-brown on the upper surface and has concentric areas, tuberculate bumps, radial ridges, and wavy margins. It is a hymenial surface that is pale yellow to greyish-orange, and the minute circular pores have even distribution. Its stipe is erect, eccentrically fixed, non-laccate, and of the same color as the pileus.

Ganoderma sp.3

The suborbicular to flabelliform fruiting body measures 4 to 6 cm long by 3 to 5 cm wide. This is annual, stipitate, laccate, and woody. The pileus is reddish-brown and slightly rugose radially and wavy-margined. The lower surface is whitish-brown with evenly distributed minute circular pores. The short and thick stipe is eccentrically fixed and has the same color as the pileus.

Ganoderma sp.4

The basidiome is corky and annual to perennial, with an applanate pileus diameter of 3 to 5.5 cm and a thickness of more than 1cm. It has a light brown to dark brown, non-laccate pileus with clear zones of concentric sulci on the plain margin. The base is rusty chocolate brown and has small circular pores which are evenly spaced.

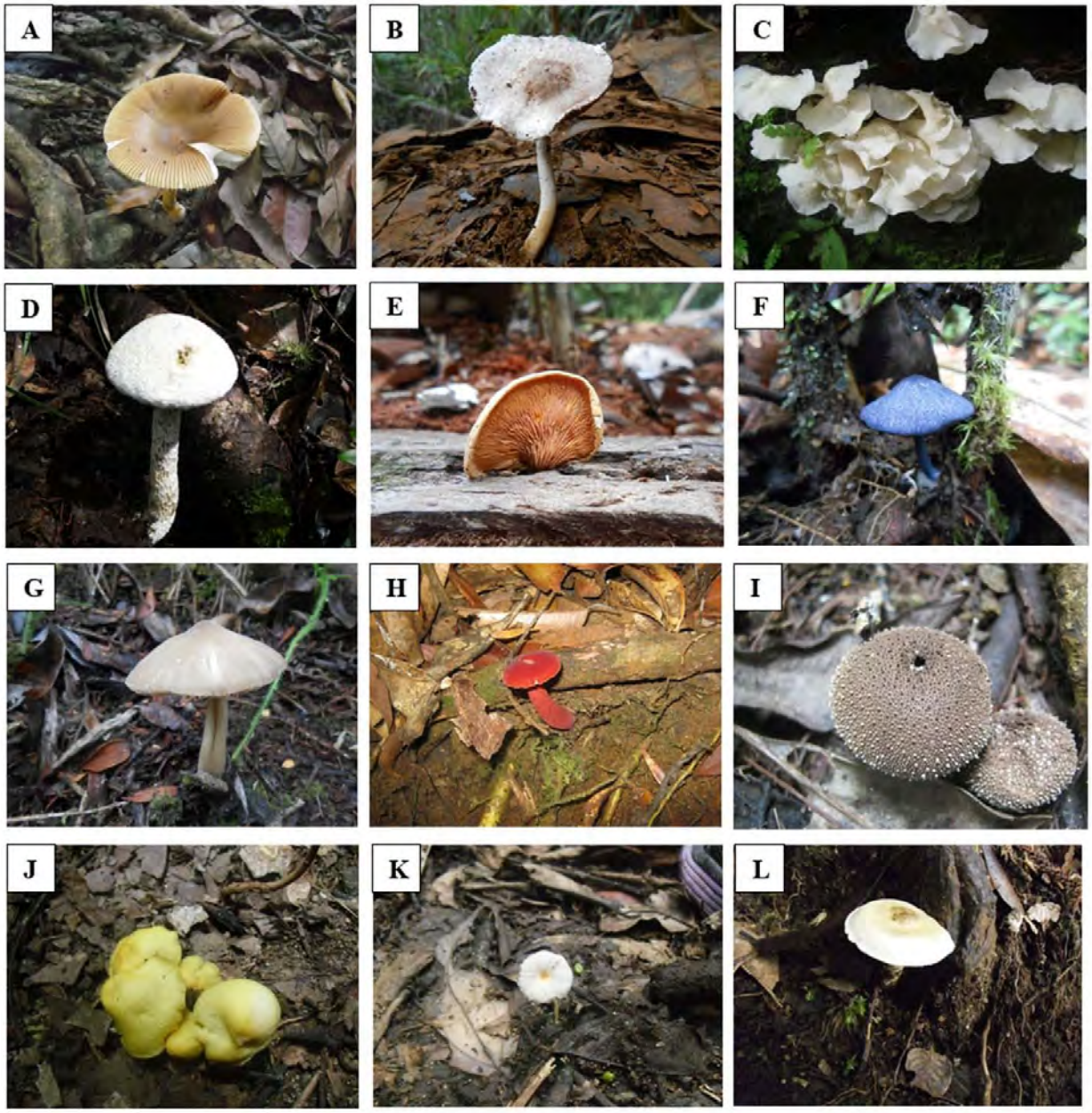

Fig. 2A Some captured macrofungi species in three vegetation types (**A**) *Amanita fulva* (Schaeff.) Fr. (**B**) *Agaricus* sp. (**C**) *Marasmius* cf. *pellucidus* Berk. & Broome, J. Linn (**D**) *Boletus* cf. *orientialbus* N.K. Zeng & Zhu L. Yang (**E**) *Phyllotopis nidulans* (Pers.) P. Kumm. (**F**) *Entoloma* sp. 6 (**G**) *Entoloma* sp.3 (**H**) *Heimioporus* sp.3 (**I**) *Lycoperdon perlatum* Pers. (**J**) *Leucocoprinus birnbaumii* (Corda) Singer (**K**) *Parasola* sp. (**L**) *Clitocybe* sp.

Fig. 2B (continuation) Some captured macrofungi species in three vegetation types (**M**) *Gloeophyllum sepiarium* (Wulfen) P. Karst. (**N**) *Ganoderma tornatum* (Pers.) Bres. (**O**) *Ganoderma* sp.5 (**P**) *Cymatoderma caperatum* (Berk. & Mont.) D.A.Reid (**Q**) *Artolenzites* cf. *acuta* comb. Nov (**R**) *Pycnoporus sanguineus* L. Murrill (**S**) *Favolus* sp. (**T**) *Laetiporus* sp. (**U**) *Trametes* sp. (**V**) *Russula* sp.1 (**W**) *Lactarius* sp.2 (**X**) *Calvatia* sp.

Ganoderma sp.5

The sub-orbicular fruiting body measures 6 to 9 cm long and 3 to 5 cm wide, and is dimidiate and woody. It has concentric sulcate swollen areas of the strongly laccate upper surface, fading to yellow to white irregular margins. Its crust is fibrous and pithy in nature. It also has a central undulated bulge. The hymenophore is creamy white to pale brown, with uniformly distributed, evenly spaced minute pores.

Ganoderma tornatum (Pers.) Bres.

The basidiome has a fan-shaped cap that measures 6 to 13 cm long and 5.5 to 6 cm wide, and is non-laccate and woody. The pileus has a swollen stipe at the center of the pileus, which is loosely pinned to rotting wood. The upper surface is brownish-orange to brown, with concentric sulcate areas of different tones of brown. The hymenial surface is becoming brown. The context is thick and consists of rough and loose fibrils.

(7) Family Gloeophyllaceae

Gloeophyllum sepiarium (Wulfen) P. Karst.

The fan-shaped macrofungus measures 2 to 8 cm long and 1 to 5 cm wide. The orange to rusty brown upper surface is leathery and wrinkled. This is tough, and the brown hymenial surface is angular to radially elongated spores. This is also a sessile basidiome.

(8) Family Hygrophoraceae

Hygrocybe sp.

The fungus has a convex to flattened white cap that measures 1 to 6 cm. It has a slight central umbo, a viscid surface, and yellow colorations. It has decurrent white gills, which are moderately spaced. The clavate, cream-colored stipe ranges from 1 to 6 cm long and 0.3 to 1 cm wide. This has small white squamulose and longitudinal fissures. It is also hollow, fragile, and glutinous.

Hygrophorus sp.

The convex to slightly umbonate pilei have a diameter ranges 4 to 6 cm and are hygrophanous. The reddish-brown pileus has a yellowish-brown knobbed umbo in the center. The surface is glabrous towards the entire margin. The reddish-brown lamellae are attached in free and arranged in subdistant. The slightly bulbous measures 9 to 13 cm long and 0.5 to 1.5 cm wide, and is centrally attached to the cap. The light grayish-yellow green stipe is pruinose, hollow, and slender. The stalk is encased with thick mycelial roots and has thick white pigments near the apex. Volva and annulus are absent.

(9) Family Hymenochaetaceae

Coltricia sp.1

This macrofungus has an infundibuliform reddish-brown cap that measures 3 to 8 cm, with thin radial ridges and a wavy edge. It is slightly decurrent and wrinkled white hymenial tissue that has minute, round pores. The concolored cylindrical stipe ranges from 4 to 7 cm long and 0.5 to 3 cm wide. This is lightly wrinkled with white pigments.

Coltricia sp.2

The reddish-black, shiny, thick cap measures 1 to 2 cm, has concentric circles, and a depression in the center. Their hymenial surface is grayish-black, with an angular pore surface. The woody black stipe measures from 4 to 8 cm long and 0.5 to 2 cm wide, and it has small dots.

Phellinus sp.

The semicircular cap of this fungus measures 5 to 10 cm. The surface has a zonation of pale brown to rusty brown that is thin and corky. It has a smooth yet hard grayish-brown hymenial surface. This was composed of minute, round pores. This species is also a sessile basidiome.

(10) Family Lyophyllaceae

Termitomyces sp.

The mushroom possesses a grayish-white cap that measures 1 to 4 cm. It has got a blackish-gray umbo and squamulose that are scurfy. The cream to white free and crowded gills are dense and smooth. It has a cylindrical stipe that ranges from 4 to 8 cm long and 0.5 to 1.5 cm wide. This is pubescent, tomentose, and linked to termite nests via basal mycelial roots. It lacks an annulus and volva.

(11) Family Marasmiaceae

Marasmius cf. *pellucidus* Berk. & Broome, J. Linn

This macrofungus has a cream-colored cap that measures 1.5 to 5 cm. It has a shallow depression and striated margin. It's white to cream gills are adnate to adnexed. The slender and reddish-brown stipe ranges from 2 to 15 cm long and 0.1 to 0.3 cm wide. It is hollow, fibrillose, and developed out of thick white mycelium.

Marasmius sp.

The fungus has a white to pale gray cap that measures 1.5 to 5 cm that is shallowly depressed with a striate margin. Its adnate gills, white, are widely spaced. The cylindrical stipe measures 2 to 9 cm long and 0.1 to 0.3 cm. This is light to reddish-brown, solid, pubescent, and centrally fixed on the soil. It does not have a volva, annulus, or rhizomorphs.

(12) Family Meruliaceae

Cymatoderma caperatum (Berk. & Mont.) D.A.Reid

The infundibuliform pileus measures from 2 to 12 cm wide. It has tints of vinaceous and radially folds the ridges. It has creamy white on the side, which changes to reddish brown. It loses bunches towards the side and full-grown tomentum at the bottom. The hymenial surface is radiately rugose and dry. This is a centrally attached species but with a highly developed mycelial pad around the brownish basal disc. It has a tough stipe that measures 0.5 to 1 cm long and 0.2 to 0.5 cm wide.

(13) Family Mycenaceae

Mycena sp.

This mushroom has a small pink to brownish cap that measures 0.3 to 2.1 cm. It has a darker center and a moist, slightly viscid surface. It has a decurrent tooth on its pale pinkish gills. The hollow stipe ranges from 2 to 5 cm long and 0.2 to 0.5 cm wide. It changes to a dark brown, to pale pink-brown, with a fibrillose bottom and a dry pruinose surface.

(14) Family Pluteaceae

Pluteus sp.

This has a grayish-white cap that measures 4 to 8 cm with a dark center and striate margin. It's pale pinkish-white to reddish-brown, with free gills that change in color. The white to pale cream stipe measures 3 to 5 cm long and 0.2 to 0.4 cm wide. This is striate, moderately swollen at the base, and has meager basal mycelium.

Volvariella sp.

This mushroom is brownish to gray-capped, measures 3 to 5cm, and has evidence of a veil. It has a free pinkish gill. It also has a glabrous stipe that measures 3 to 8cm long and 0.1 to 0.2 cm wide, which is attached to rotting wood. Though without an annulus, it has a saccate volva. It is also dry and has a matte texture.

(15) Family Polyporaceae

Artolenzites cf. *acuta* comb. nov.

The dimidiate to applanate pilei, either broadly attached or substipitate with few imbricate outgrowths measures 2 to 12 cm long and 2 to 8 cm wide. The glabrous cream-colored pileus is concentrically zonate, radially ridged, and weakly sulcate based. The white hymenophore is decurrent, formed in daedaloid to sinuous lamellae, having forking gills. It is substipitate and almost sessile.

Daedaleopsis confragosa (Bolton) J.Schröt.

The basidiocarp measures between 10 to 16 cm long and 8 to 11 cm wide. This has a concave pileus with yellow, brown, and white pigments in concentric areas. The hymenium surface is pale yellow, brittle, and hard. This is a sessile and institious species that clings to logs directly.

Favolus sp.

The pileus is flabelliform to circular, measuring 2 to 10 cm, stipitate to almost sessile. The white to cream pileus is glabrous having radial striations along the margin. The hymenophore cream is evenly spaced with

circular to angular pores evenly distributed. The stipe is cylindrical to flattened ranges from 0.5 to 4.5 cm long and 0.1 to 1.3 cm wide. This is also concolorous with the pileus. This species is stiff and glabrous.

Laetiporus sp.

The irregular and fan-shaped pilei measure 4 to 20 cm. It is sessile to laterally stipitate and occurs in imbricate clusters. The pale orange or yellowish-orange fruiting body contains diffuse concentric bands or bulges in the direction of the white and wavy margin. The surface is smooth to wrinkled, tuberculated, and firm. The cream-colored hymenophore has evenly distributed and minute circular pores that are not visible to the naked eye.

Lentinus sajor-caju (Fr.) Fr.

This macrofungus has a deeply infundibuliform to cyathiform pilei that measure 5 to 14 cm wide. This is a dry surface. It has radiated striations and a margin that becomes incurved, decurved, crisped, and eroded. The gills are yellowish-white and strongly decurrent. It is arranged in narrowly crowded. The short and solid stipe measures 0.1 to 0.5 cm long and 0.2 to 0.3 cm wide. This is also concolorous to the pileus and squamulose.

Lentinus sp.

The mushroom has a convex cap that measures 2 to 6 cm wide. It has a shallow central umbilicus with an undulating margin all around. Its yellowish-brown surface is finely radially fibrillose-striate at the center. The thin fibrous flesh is supported by cream-colored and decurrent gills. White stipe measures 0.5 to 1 cm long and 0.2 to 0.5 cm wide. It is also smooth and centrally attached to the substrate.

Microporellus obovatus (Jungh.) Ryvarden

Its flabellate to spathulate cap measures 6 cm long and 4 cm broad. It is flexible when it is fresh, but turns corky and rigid on drying. It is characterized by vinaceous to beige and brown concentric areas. It also has a wavy margin and a glabrous surface that is slightly velvety. The hymenial surface is uniformly dotted with white minute pores. The beige to brown stipe is attached laterally to the eccentrically with decurrent to stipitate attachment.

Microporus affinis (Blume & T. Nees) Kuntze

This is a thin, flattened pileate-shaped macrofungus that measures 5 to 8 cm wide. This is glabrous to tomentose cap bearing slightly raised sulcate zonation. It also transitions from light yellowish or reddish-brown to almost black and darker in the center. Its light cream to grayish yellow hymenium surface is covered with minute circular entire spores. The lateral stipe ranges from 2 to 4 cm long and 0.5 cm wide. It is a little flattened and occasionally swelled at the base, and has a finely tomentose texture. It has a blackish-brown crust and a growing circular disc covered in tomentum.

Microporus vernicipes (Berk.) Kuntze

This is a kidney-shaped basidiomata that measures 3 to 5 cm wide, is thin, and flexible. It is a glabrous, smooth pileus with concentric reddish-brown, violet-brown, lemon yellow, or dark red concentric zones. The round stipe ranges from 0.1 to 0.2 cm long and 0.2 to 0.3 cm wide. Its base is bulbous and covered with white pad mycelium. The white hymenial surface is covered with decurrent pores.

Microporus xanthopus (Fr.) Kuntze

This macrofungus has a flat to broadly funnel-shaped pileus that measures 2 to 6 cm. It is centrally or laterally mounted on the substrate with a smooth, shiny, and leathery surface with concentric yellow to brown areas of dark and light colors. Its white poroid lamellae are hard, dry, and too fine to be observed by the naked eye. The pores stick on in a slightly decurrent manner. The cylindrical stipe ranges from 0.1 to 5 cm long and 0.2 to 0.8 cm wide, bearing a low-lying yellowish to light brown cuticle. This secures the substrate through a characteristic yellow disc bearing a tomentose context of white base.

Pycnoporus sanguineus (L.) Murrill

The semicircular to flabelliform pilei measure 2 to 8 cm. It is annual, sessile, leathery, coriaceous, and finely pubescent. The orange ocher or pale orange pileus is smooth or warty and has radial zonation with an irregular margin. The hymenophore is bright orange to reddish-orange, and it is covered with circularly distributed pores that are evenly spread. This species has no stipe, and the basidiocarp is directly attached to the decaying logs.

Trametes sp.1

The dimidiate to flabelliform grayish-white to cinnamon buff pileus is from 10 to 14 cm. It is strigose to hirsute at the wavy yellow fringe, which is zonated and with enduring tomentum. The context is white, tough to fibrous, soft to corky, and thin. The pore surface is white to cinnamon buff in evenly spread angular to rounded pores, occasionally radially elongated or sinuous.

Trametes sp.2

The broadly attached with dimidiate pilei measures 7 to 10 cm wide. The buff-brown to reddish-brown pileus has concentric bands of yellowish-brown. It is hirsute to tomentose in surface, and it has a thick, irregular, or wavy margin. The surface of the pore is reddish-brown with minute, round to angular pores. The context is brown, tough, fibrous, corky, and imbricate.

Trametes versicolor (L.) Lloyd

The semicircular or kidney-shaped pilei measure 2 cm to 10 cm long and 3 cm to 6 cm wide. The fruiting body is exhibited in fine concentric alternating areas of white, brown, and cinnamon. It has a wavy, undulating border, corky, dry, glabrous, and brittle surface. The white lower surface is covered with small circular to angular-sized pores.

(16) Family Psathyrellaceae

Coprinopsis sp.

This mushroom has a blackish-grey cap that measures 1 to 5 cm, and it has a central bump. It has a white gill and is attached in a free and close that has intermediate gills. The cylindrical stipe measures 1 to 8 cm long and 0.2 to 0.6 cm wide, and is centrally attached. This hollow stipe is strongly deliquescent and slight apprised fibrillose. Both volva and ring are absent.

Parasola sp.

The conical to convex pileal diameter measures from 0.4 to 1.3 cm. It is centrally pigmented by a depressed yellowish tint. The dry and pale cream pileus is expanded radially, associated with its vertical grooves. The gills are attached freely and arranged in narrow-lanceolated with some long and short gills. The cylindrical stipe ranges from 3 to 9 cm long and 0.1 to 0.2 cm wide, and is also glabrous. This slender and fragile stipe is translucent and concolorous. It is also very thin and hollow and is centrally attached.

(17) Family Russulaceae

Lactarius sp.1

The convex to funnel-shaped cap measures 3 to 9 cm. It is light yellowish-orange, has zonations, and a small hole in the center. The yellow-orange to orange gills are attached in decurrent and arranged in adnate. This produces milky orange latex when injured. The cream-colored and glutinous stipe ranges from 2 to 5 cm long and 0.5 to 3 cm wide. This is eccentrically fixed and does not have a volva or annulus.

Lactarius sp.2

This mushroom has an applanate to slightly depressed surface that measures 4 to 8 cm. It has a high radial rugosity, fine circular orange spots, and a wavy pileal margin. The orange gills are deeply decurrent and distantly arranged. The slightly tapering downwards stipe measures 2 to 5 cm long and 1 to 3 cm wide. Both cap and stipe exude orange milky latex and concolorous.

Russula delica Fr.

This mushroom has a funnel-shaped cap that measures 5 to 13 cm and has a central depression. It is a dirty white to pale yellowish-brown, dry, and has a matte surface. It has brittle, white or pale cream gills that are attached in decurrent and arranged in narrow, medium-spaced, and occasionally forked. The smooth, thick, and cylindrical stipe ranges from 2 to 12 cm long and 1 to 2 cm wide. This has no annulus and does not change color when damaged.

Russula sp.1

This is another species of *Russula* that has a plano-convex to applanate cap, measuring 2 to 10 cm with a shallow center depression. It is a creamy surface, a yellowish central spot, and a striate to sulcate margin, which may break or fissure. Its adnate to slightly adnexed lamellae are subdistantly arranged. The eccentrically attached stipe ranges from 2 to 6 cm long and 1 to 1.5 cm wide. This is chalky white, glabrous, and longitudinally striate. It has no volva or ring. The fruiting body is firm but non-lactic and does not possess a color change on injury.

Russula sp.2

This species has a hemispherical to applanate cap that measures 3 to 6 cm. It has a light yellow to light brown center, a chalky white, slightly depressed surface, and a sulcate outline near the striate margin. The cap is dry, does not exude milky latex. It has cream-colored, brittle gills. It is attached in an adnate, slightly adnexed, and arranged in closely spaced. The subcylindrical stipe ranges from 3 to 5 cm long and 0.5 to 2 cm wide. It is centrally attached, longitudinally grooved, and encased with whitish mycelial roots at the base. It lacks a volva and ring, and does not change color when injured.

(18) Family Sclerodermataceae

Calostoma insignis (Berk.) Massee

This fungus has a 2 to 5 cm spherical fruiting body with a multi-layered peridium with a gelatinous texture. It has a shiny exoperidium that peels as it matures. It displays a star-shaped spore-release pore and has a smooth membranous endoperidum. This is a stipeless, centrally attached, and has thick and joined hyphae cords.

(19) Family Steccherinaceae

Flabellophora sp.

This macrofungus has a semicircular to reniform pileus that measures 3 to 5 cm long and 2 to 4 cm wide. It is an annual basidiome, stipitate to flabelliform. The whitish-yellow fruiting body is azonated, and around the edges, the colors are slightly fading. The pileal margin is heavily lacerated and wavy. The pale yellow-brown hymenial surface is dry. The stipe is centrally erect and concolor with the basidium. The context is thin and pliable, which is covered with minute angular to circular spores.

(20) Family Stereaceae

Stereum sp.1

This macrofungus has a semicircular to irregular, fan-shaped measures 5 to 7 cm long and 0.1 to 0.2 cm wide. This is a tough, corky, or papery texture. The ochraceous to rusty brown upper surface is zoned with alternating dark and light bands. The whitish grayish-white margin is wavy and outward. The underside is creamy yellowish-gray, smooth to slightly bumpy with radial and concentric ridges.

Stereum sp.2

The semicircular to fan-shaped fungus measures 2 to 5 cm wide and 4 to 10 cm long. It is corky and brittle, with a concentrically ridged. The upper surface is radially pleated and has hairs at the lower toward the tuberculate rusty brown margin. The hymenial surface is yellowish to light brown. It has radial ridges corresponding to the growth axes of the fruiting body.

(21) Family Strophariaceae

Agrocybe sp.1

The broadly convex to almost applanate pileal diameter measures 4 to 10 cm broad. The white or cinnamon buff is smooth and not viscid, and it is cracking towards the center. This has whitish partial veil remnants on the margin. The lamellae are in adnate and arranged closely. The gills are creamy beige at first, then turn into grey-brown to strongly rusty brown. The cylindrical stipe measures 1 to 15 cm long and 0.2 to 2.5 cm. It has no volva and annulus, but the base was encased with fine white rhizomorphs.

Agrocybe sp.2

The mushroom is convex to flat with a wrinkled cap measures 2 to 7 cm. This is darker brown at the center and paler and cracked at the margins. Its cinnamon-brown gills are adnate, cinnamon-brown and slightly emargined. The cylindrical stipe ranges from 2 to 9 cm long and 0.3 to 0.9 cm wide. It is brown, strongly fibrillose, and covered with dark brown granulose-floccose. It is also surrounded by white rhizomorphs.

Hypholoma sp.

The conical or convex then flattened pileus, sizes 2 to 5 cm, has an umbo. The smooth and subviscid pile surface is sulfur yellow in the center and getting lighter or cinnamon buff towards the entire margin. The yellowish-white lamellae are in adnate and closely arranged. The cylindrical stipe is 4 to 8 cm long and 0.1 to 0.5 cm wide. It is centrally attached to the pileus and substrate. The whitish stipe has thick, outlined ridges that make the surface reticulated. The stalk is hollow, and the rhizomorphs are not well-developed.

(22) Family Tricholomataceae

Clitocybe sp.

The convex pileus measures 2 to 5 cm and is centrally attached. The cream buff cap has a very distinct, broad umbo in the center. Its surface is glabrous and smooth towards the entire margin. The white lamellae are deeply decurrent and arranged in fairly crowded. The bulbous stipe measures 3 to 10 cm long and 1.5 to 3 cm wide, which is concolorous to the cap. The whitish-cream stalk surface is fibrous and smooth. The stipe is compact, firm, and hard-fleshed.

Phyllotopsis nidulans (Pers.) P. Kumm.

The fan-shaped or semicircular pilei measure 2 to 7 cm that grows solitary or gregariously, sometimes in overlapping clusters. The bright orange to yellowish orange pileus is slightly tomentose towards the inrolled margin. The orange lamellae are attached in decurrent and arranged in close or nearly crowded. It has no stipe wherein the gills develop substrate below the cap, so that it becomes resupinate.

3.2 Abundance of macrofungal families

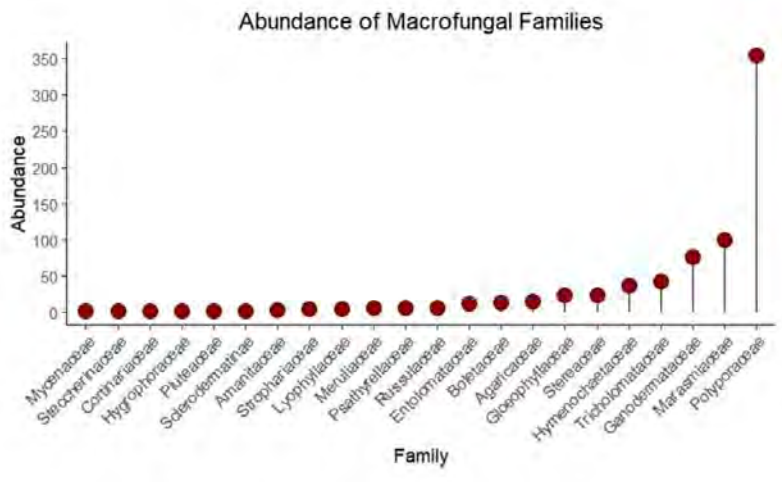

Fig. 3 Species counts of families.

The family Polyporaceae observed the highest abundance (Fig. 3) with 355 individual specimens recorded across two sampling periods. This suggests that Polyporaceae are both highly diverse and extremely common in Mt. Hamiguitan. Moderately abundant families, including Marasmiaceae, Ganodermataceae, Tricholomataceae, Hymenochaeteae, and Stereaceae, are likely still one of the significant contributors to the overall fungal community. In contrast, the vast majority of the families exhibit low abundance (Mycenaceae, Steccherinaceae, Cortinariaceae, Hygrophoraceae, Pluteaceae, Sclerodermatinae, Amanitaceae, Strophariaceae, Lyophyllaceae, Meruliaceae, Psathyrellaceae, Russulaceae, Entolomataceae, Boletaceae, Agaricaceae, and Gloeophyllaceae).

Findings on the dominance of the family Polyporaceae in both sampling periods align with observations from other studies, such as Parlucha et al. (2021), which similarly reported its prevalence in the forest ecosystems. This consistency is further supported by Guerrero et al. (2020), who noted Marasmiaceae as the next most abundant family. Members of the Polyporaceae are known as crucial wood-decaying fungi, encompassing species with diverse decaying capabilities, rot types, and trophic roles (Adarsh et al., 2015). This morphological and functional adaptation allows these lignicolous fungi to grow in a wide range of vegetation habitats. This highlights the importance of the decomposition process and nutrient cycling of forest ecosystems.

3.3 Species abundance by sampling period

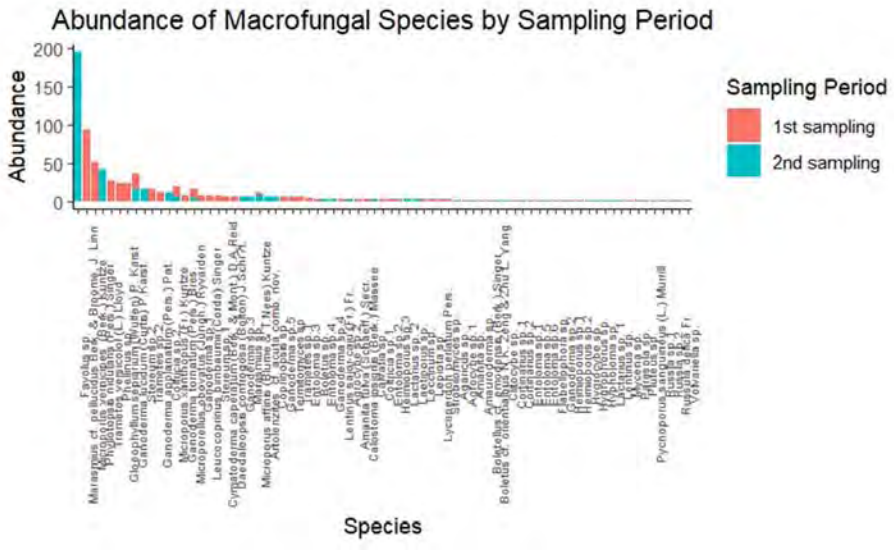

Fig. 4 Abundance of Macrofungal Species.

Marasmius cf. *pellucidus* Berk. & Broome, J. Linn recorded the highest count in the first sampling period with 93 individuals. In contrast, *Favolus* sp. was the most dominant observed in the second sampling, with 195 individuals (Fig. 4). Moreover, the abundance of species reflected by the sampling periods and the vegetation type had vast differences. Dipterocarp forest showed a significant growth in abundance between the periods of 110 and 395 individuals, whereas the montane forest registered a decrease between 157 and 38. Mossy-pygmy has a slight increase from 10 to 23 counts (Fig. 5 and Table 1).

Temporal differences in abundance were observed for many species, particularly for *Marasmius* cf. *pellucidus* Berk. & Broome, J. Linn and *Microporus xanthopus* (Fr.) Kuntze, which showed considerably higher abundance during the first sampling. On the other hand, there are other species were usually less

abundant. It also showed an increase or original occurrence in the second sample that was not present in the first sampling, such as *Pycnoporus sanguineus* (L.) Murrill. These changes emphasize the essential role of various sampling seasons. With this, it signifies that macrofungal communities are very seasonal and responsive to the environmental situation.

3.4 Abundance by vegetation type and sampling round

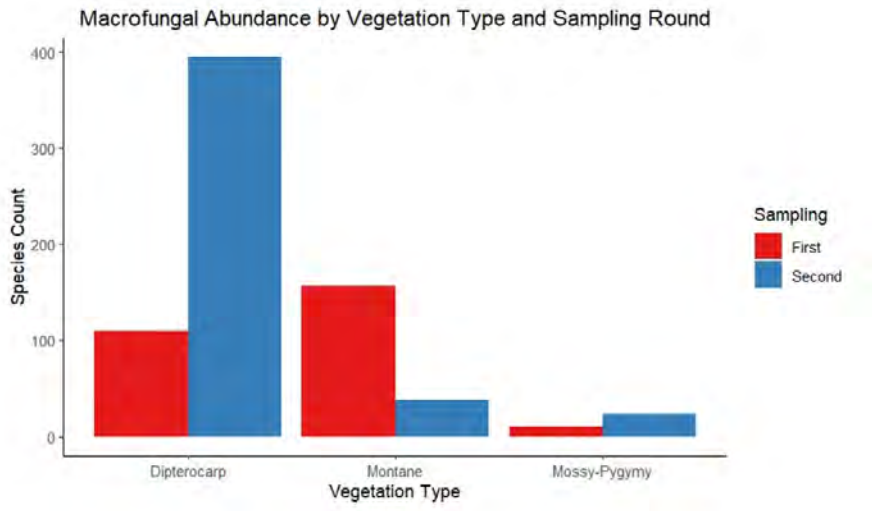

Fig. 5 Macrofungal Abundance Across Different Sampling and Vegetation Types.

Macrofungal community structure varied across vegetation types and between sampling periods (Fig. 5). During the first sampling, montane vegetation recorded the highest species richness and abundance. On the other hand, the second sampling depicted a significant rise in macrofungal abundance in dipterocarp vegetation. For both samplings, mossy-pygmy vegetation was consistently characterized by strong dominance of a few species.

Table 1 Diversity indices across three vegetation types during the first sampling (November 2018) and the second sampling (January 2019) in Mt. Hamiguitan.

	First Sampling			Second Sampling		
	Dipterocarp	Montane	Mossy-Pygmy	Dipterocarp	Montane	Mossy-Pygmy
Richness	16	28	3	16	13	5
N	110	157	10	395	38	23
D	0.23	0.09	0.42	0.3	0.14	0.5
1-D	0.8	0.9	0.6	0.7	0.8	0.5
H'	2	2.7	0.9	1.5	2.2	1

N=abundance, D=Simpson's Dominance, 1-D=Simpson's index of diversity, H'=Shannon-Wiener Diversity index

Montane forests consistently exhibited the highest results in diversity, ranging from H'=2.7 during the first sampling to H'=2.2 during the second (Table 1). However, this result is coupled with the fact that most of the macrofungi were observed only once. This might indicate a fertile but low-density fungal community. This increased diversity is likely to be linked to multiple environmental factors. Moreover, the elevated abundance

in the montane ecosystems during the first sampling and in Dipterocarp in the second can be influenced by unique microclimates or ecological niches within these habitats (Nordin et al., 2024). In addition to that, the discrepancy in the index values between the two periods of sampling might be attributed to seasonal changes or local environmental changes (Obedencio et al., 2024).

The results montane vegetation exhibited favorable conditions for the proliferation and increased productivity of macrofungi. However, the higher abundance observed did not correspond to the highest diversity. Despite having fewer individuals, this vegetation type still recorded the highest diversity. The persistently lower diversity and higher dominance observed in mossy-pygmy vegetation indicate a more uneven community structure. The minor decrease in diversity that was observed in the montane vegetation between sampling periods was probably due to seasonal variations or local environmental changes that have affected the proliferation of macrofungal fruiting dynamics (Boddy et al., 2013).

Montane vegetation in Mt. Hamiguitan boasts the highest floristic diversity among sampled vegetation types (UNESCO-WHC, 2014). With the same vegetation, Polyporaceae were also consistently observed as the most dominant. Although there is no direct evidence linking macrofungal diversity to overall plant diversity, some studies suggest a positive correlation between population increases in certain plant species and macrofungal diversity (Tuo et al., 2022; Rudolf et al., 2013). Therefore, the extensive plant diversity of Mt. Hamiguitan could probably offer a greater variety of potential hosts on living or dead trees, and a broader range of ecological niches for fungal symbionts. Thereby, this could facilitate a higher macrofungal proliferation. This rich floristic diversity and endemicity could be a stronger driver of fungal diversity in this montane environment (Li et al., 2018).

Additionally, other environmental factors common in montane forests, such as lower temperatures, higher humidity, and forest litter, create conditions that favor macrofungal growth (Hu et al., 2022). Fungal abundance, especially lignicolous basidiomycetes of the predominant Polyporaceae family, also has vital roles in food web interactions that help to sustain faunal communities (Bahram & Netherway, 2022). This is an indication that they have an important ecological contribution to the decay of wood and nutrient turnover. This is emphasized by their frequent recording.

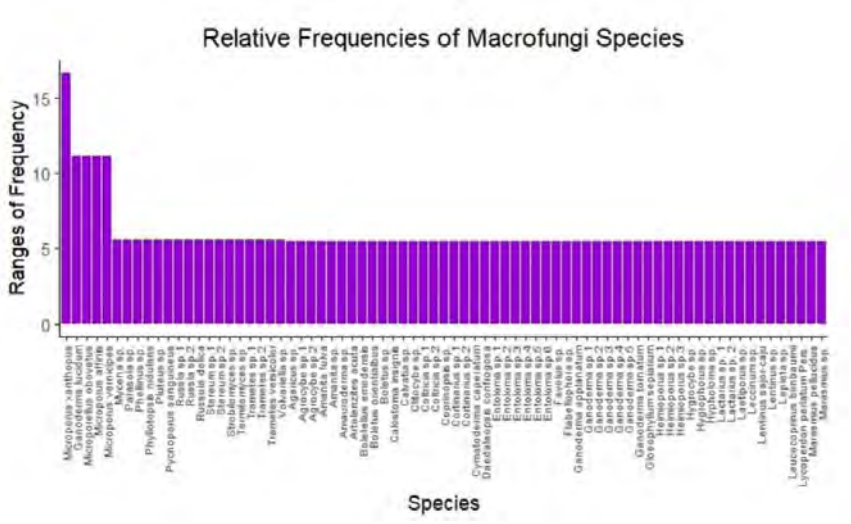

Fig. 6 Macrofungal abundance across different sampling and vegetation types.

Selective logging operations in dipterocarp and montane forests of Mt. Hamiguitan during the 1980s may explain the notable presence of saprophytes along the sampling trails (UNESCO-WHC, 2014). It was observed that there were many remains of logging that included large fallen trees during the two sampling periods. Those trees served as a good source of substrate for the fungi that had to decompose wood. Although the disturbances of forests can noticeably affect the development of the macrofungal community and diversity, basidiocarps are likely to grow in stable conditions with the minimum human disturbance and organic resources (Njuguini et al., 2018). In addition, the high humidity and temperature of the montane habitat are probably the reasons that optimize macrofungal growth despite the historical disruptions (Hu et al., 2022; Bustillos et al., 2024). The higher trail length in the montane region can also play a role in its high levels of diversity by raising the chances of finding different microhabitats and more deadwood. This creates the best environment for the proliferation of wood-rotting fungi. The saprophytic bracket fungi that dominated in this study. These are important in the decomposition and recycling of nutrients through the forest ecosystem (Cababan et al., 2021).

3.5 Relative frequencies of macrofungal species

As depicted in Figure 6, *Microporus xanthopus* (Fr.) Kuntze obtained the highest relative frequency, which resulted for 16.67% of observations. This species was found in the dipterocarp forest during the first sampling and in both dipterocarp and montane forests during the second. This is followed by *Ganoderma lucidum* (Curtis) P.Karst., *Microporellus obovatus* (Jungh.) Ryvarden, *Microporus affinis* (Blume & T. Nees) Kuntze, and *Microporus vernicipes* (Berk.) Kuntze, each of which had a relative frequency of 11.11%, having been recorded in two of the 16 transect belts.

The dominance of lignicolous basidiomycetes with high relative frequencies is consistent with the overall prevalence of the Polyporaceae. The presence of species distributed in isolated areas, potentially off the main trail due to the cliffside location, suggests the influence of dispersal mechanisms. The spores can easily be dispersed at high wind speeds, which is common in this area. This can also possibly colonize new substrates and other host plants farther away due to this (Tadiosa & Lubos, 2019). Additionally, strong winds have been sufficient to break branches of trees, causing them fall, which creates more available surfaces for wood-decaying fungi to grow on (Tadiosa & Briones, 2013).

4 Conclusions

This study revealed that saprophytes were more abundant than symbiotic fungi along the trail of Mt. Hamiguitan. Many of the macrofungal species that were identified were rare, and some had been encountered in one transect belt or had been seen in the same transect on a single sampling day. The types of species documented changed a lot from one sampling period to another, wherein it shows that these species are seasonal or can appear and disappear over time due to various environmental factors. However, few saprophytic species were consistently present in multiple vegetation types and at different sampling seasons.

The results primarily highlight the dominance of wood-decaying fungi. This is a characteristic of their robust morphology. However, the observation of several rare species underscores the need for further, advanced studies, including molecular analyses, to investigate their morphology and DNA more thoroughly. Given that the Mindanao region remains underexplored in terms of macrofungal composition, these studies play a significant role in understanding regional biodiversity. Monitoring of macrofungal occurrence is also strongly suggested to facilitate conservation and biodiversity management, especially in ecologically important regions such as these UNESCO World Heritage sites.

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