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Species and Morphological Identification of Wild Macrofungi in Nueva Ecija, Philippines

**Reynante G. Bustillos[1*], Kyla Marie D. De Guzman[1], Sofronio P. Kalaw[2]
Rich Milton R. Dulay[2]**

[1]Nueva Ecija University of Science and Technology, San Isidro Campus, San Isidro, Nueva Ecija 3106, Philippines
[2]Center for Tropical Mushroom Research and Development, College of Science, Central Luzon State University, Science City of Muñoz, Nueva Ecija 3120, Philippines

*Corresponding Author: bustillos_reynante@neust.edu.ph

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Abstract. This study was conducted to list the different species of naturally occurring macrofungi in selected municipalities in Nueva Ecija, Philippines. The collected species were morphologically identified and recorded in terms of physical distribution, collection site, collection month, and climatic conditions. Opportunistic sampling was used to collect the wild mushrooms from May to July 2023 in four collection sites (San Isidro, Jaen, San Antonio, and San Leonardo). There are 53 collected fruiting bodies belonging to 2 phyla, 4 classes, 5 orders, 14 families, 21 genera, and 35 species taxa. Out of 35 species, 25 wild mushrooms were identified at their species level while 10 were identified at their genus level only. Two collected mushrooms belong to Pezizomycetes (5.71%) while the rest belong to Agaricomycetes (94.29%). The collected wild macrofungi grew solitary or gregarious in different substrates such as soil, trees, decaying logs or trunks of trees, and animal dung. Twenty-three (23) of the collected mushrooms were found to be edible, while 12 were poisonous. Site A (San Isidro) was recorded to have the highest percentage composition of macrofungi. The distribution of the macrofungi in the collection sites was found to be affected mainly by physical factors.

Keywords: collection; mushroom; Nueva Ecija

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INTRODUCTION

Mushrooms, the macrofungi belonging to the group Basidiomycota and Ascomycota, are fruiting bodies that are large enough to be seen by the naked eye. These fruiting bodies that are considered decomposers can be found in different substrates like soil, dead-decaying woods or twigs, trees, leaf litters, rotten stumps, bamboo, grasslands, and even in animal dung (Bustillos *et al.*, 2024; Tonjock *et al.*, 2017). Most of these can be poisonous, while others are edible as they have an umami flavor and pleasant aroma (Bustillos *et al*., 2014a). They were considered one of the most important functional foods due to the fact that they contain many nutritional compounds and mycochemical values. Considering the other food sources such as vegetables and meat, these edible decomposers are far more superior because they carry a low amount of fat while having many vitamins, minerals, proteins, and trace elements including riboflavin, niacin, and folates (Bustillos et al., 2014b; Rathore *et al*., 2017; Kumar *et al*. 2021, Krivošija *et al*. 2025). Moreover, they have secondary metabolites of the bioactive compounds found in mushrooms including acids, terpenoids, polyphenols, sesquiterpenes, alkaloids, lactones, sterols, and vitamins which are responsible for many biological processes including antimicrobial, antioxidant, anti-inflammation, cardiovascular and anticancer (Dulay *et al*. 2015a; Dulay *et al.*, 2015b; Eguchi *et al.* 2015; Reyes 2016; Dulay 2020). Considering the benefits that mushrooms have given to humankind, they became prized and admired making people cultivate them more and conduct research about them.

The Philippines holds two-thirds of the biodiversity on Earth making it one of the most biodiverse nations in the world (Dulay *et al.*, 2022). Due to this, the mycological resources found in different parts of the archipelago are so abundant that much mycological research regarding its cultivation, pharmacological, medicinal, and nutraceutical properties was conducted. Aside from that, there are even numerous studies regarding their collection, identification, species and taxonomic listing, and physical distribution.

Nueva Ecija, the largest province and the biggest rice producer of Central Luzon, covers a total area of 5,751.3 sq km. and has an average elevation of 272 m. The province consists of mountains, rivers, large rice fields, waterfalls, and narrow valleys. With its diverse topography, it became one of the notable habitats for wild species including the mushrooms. With this, several mycological researches in different areas in the province were conducted including the Kalanguya communities in Carranglan, Mt. Bangcay in Cuyapo, Central Luzon State University in Munoz, and Mt. Mingan in Gabaldon (Culala & Dulay, 2018; De Leon *et al*., 2016; Dulay & Maglasang, 2017; Guzman et *al*., 2018). However, there are still municipalities in the province that are understudied.

Thus, to further expand mycological research in Nueva Ecija, this study was conducted to collect and identify naturally occurring wild macrofungal species in selected municipalities of the southern portion of the province. Furthermore, the physical distribution of collected macrofungi in four collection sites, in three consecutive months was recorded as well as their natural habitat, (humidity, precipitation, substrate). This research aims to contribute to future efforts to catalog and conserve mushroom species in the province. Through the collection of specimens in several areas, it was found that there are macrofungal species that grow and live depending on their natural habitat, climate, and other factors.

METHODS

Collection Site

The species of wild macrofungi were collected from different areas around the province of Nueva Ecija, Philippines, specifically in San Isidro, San Leonardo, Jaen, and San Antonio (Fig 1). The researchers considered the accessibility, vegetation, temperature, and humidity of the area when choosing the collection sites.

Sample and Sampling Technique

Opportunistic random sampling was used in the collection of mushroom species which was conducted from May to July 2023. Photographs of mushrooms were captured in their natural habitat and respective substrates before they were collected. During the collection, the collected specimens, together with their respective substrate, were put in a container, labeled with the date, and size of the sample, and their necessary information was also recorded. The collected samples were subjected to morphological identification based on their physical characteristics and their mycelia were rescued in a potato dextrose agar.

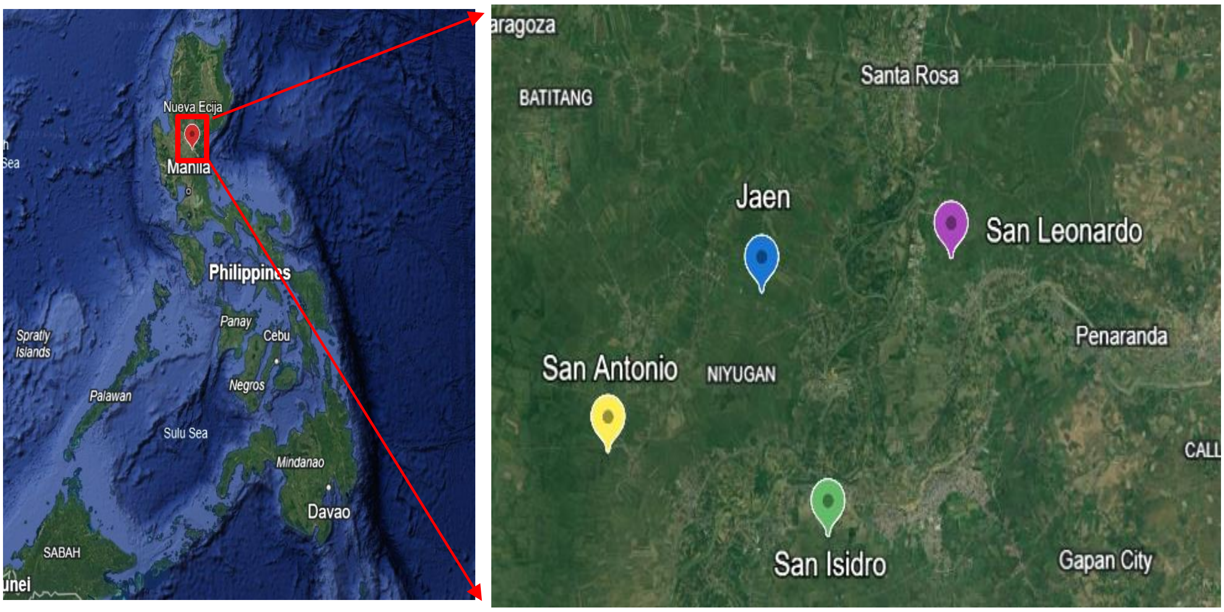

Fig. 1- Google map of Nueva Ecija showing the four collection sites (Jaen, San Antonio, San Leonardo, and San Isidro).

Morphological Identification and Characterization

While the size, and color were observed, morphometric information including the shape of the fruiting body and cap, the gills in section, textures, and colors, as well as measurements of the cap's diameter, stalk or stipe's height, that were acquired and recorded were identified by comparing the morphological features in several published works of Quimio (2001), Tadiosa *et al.* (2011), and Torres *et al.* (2020). A taxonomic checklist of the mushrooms collected in the collection sites was also created using the study of Wijayawardene *et. al* (2022) to record and easily determine the distribution of the collected macrofungi.

RESULTS AND DISCUSSION

Taxonomic Listing and Morphological Identification of Macrofungi

The Philippines, specifically Nueva Ecija is rich in macrofungal species due to its diverse geography, yet many regions remain unexplored and understudied. Thus, further taxonomic studies must be done, and this study was conducted to contribute to the preliminary baseline information or database of macrofungal diversity within the province and even throughout the country. This study explored the municipalities in the province that have little-to-none records in terms of macrofungal species. Using the opportunistic sampling method, 53 macrofungi were collected in selected municipalities in San Isidro, Nueva Ecija, and each of these was brought to the Center for Tropical Mushroom and Development Laboratory in Central Luzon State University for labeling and identification. These species were identified by one of the resident mycologists of the said university as well as the works of Quimio (2001), Tadiosa *et al.* (2011), and Torres *et al.* (2020). To validate this, the taxonomic list of the collected macrofungi was alphabetically arranged starting from the class down to the species taxa using a study of Wijayawardene *et. al* (2022). Their description, substrate, growth habit, and edibility were also recorded.

In the collected fruiting bodies, 25 were identified at their species level while 10 were identified on their genus level only, whereas they belong to 2 phyla, 4 classes, 5 orders, 14 families, 21 genera, and 35 species taxa. Most of them belong to the class Agaricomycetes under the phylum Basidiomycota (94.29%) and only two collected mushrooms belonged to the class Pezizomycetes (5.71%) which is under the phylum Ascomycota. The richness of this phylum in the collected species is similar to the studies conducted in Bicol University Kalikasan Forest (Guerrero et. al., 2020), Mt. Arayat Protected Landscape (Bustillos *et. al.*, 2024), and Mt. Isarog National Park (Paguirigan *et. al.,* 2020).

Table 1. Morphometric Description, Habitat, and Edibility of Collected Macrofungi

Phylum Ascomycota, Class Pezizomycetes, Order Pezizales

No	Family	Species	Description	Figure
1	Sarcosophaceae	*Cookeina* sp.1	A disk-shaped white macrofungi with a zonate appearance; has a wavy margin and no stipeSubstrate: fallen log of guava treeGrowth Habit- gregarious Edibility- edible Height: 4.1 cm Cap: 3 cm x 4 cm	
2		*Cookeina* sp.2	A small, funnel-shaped, yellowish-brown fruiting body that has a hairy texture and thin hollow stipe attached to the pileus Substrate- rotten wood Growth Habit- gregarious Edibility- edible Height: 3.5 cm Cap: 5.6 cm x 5.2 cm	

Phylum Basidiomycota, Class Agaricomycetes

Order Agaricales

No	Family	Species	Description	Figure
1	Agaricaceae	*Agaricus bisporus*	A pulvinate, white, scaly fruiting body that has a smooth margin, crowded gill, and solid stipe attached to the center. Substrate- soil Growth. Habit- solitary. Edibility- edible. Height: 9 cm, Cap: 7.5 cm x 7.5 cm	
2		*Agaricus comtulus*	A convex-shaped and brownish fruiting body that has crowded gill and a central solid stipe. Growth Habit- solitary. Edibility- edible. Substrate- soil. Height – 4.8 cm. Cap – 5 cm x 4.2 cm	
3		*Agaricus trisulphuratus*	A small, convex, orange macrofungi with squarrose texture and scabrous solid stipe attached to the center. Substrate- soil (ant heap). Growth Habit-gregarious. Edibility- not edible. Cap: 1.5 cm. Height: 2.2 cm	
4		*Agaricus* sp. 1	Pileus is depressed, has a brown, smooth and wavy margin; gills are forking and subdistant; with hollow stipe. Substrate- decaying log of acacia tree. Growth Habit- gregarious. Edibility: not edible. Height: 3.5 cm. Cap: 2.3 cm x 3.5 cm	
5		*Agaricus* sp. 2	A small, convex-shaped brown macrofungi with a crenated margin; has hollow stipe. Substrate- the dead trunk of a coconut tree. Growth Habit- gregarious. Edibility- not edible. Height: 11 cm. Cap: 4.5 cm x 4 cm	

6	*Agaricus* sp. 3	The pileus is gray and conic-shaped with a smooth texture; has a smooth margin; the stipe is solid. Substrate: bamboo leaf litter. Growth Habit- solitary. Edibility- edible. Cap- 9.8 cm x 9.6 cm. Height- 20cm.	
7	*Coprinus comatus*	A cylindric-shaped young white macrofungi with a scaly texture and solid stipe. Substrate- decaying log of a malunggay tree. Growth Habit- gregarious . Edibility- edible at young. Height: 1.3 cm. Cap: 2 cm	
8	*Chloropyllum demangei*	A macrofungi with parabolic shaped, white, scaly pileus and crenated margin; has crowded gills; the stipe is attached to the center and has a sheathing ring. Substrate- soil. Growth Habit- gregarious. Edibility- edible. Height: 12 cm. Cap: 10 cm x 9 cm	
9	*Chlorophyllum hortense*	The pileus is brown and spherical with a scaly texture; it has a solid stipe attached to the center of the pileus. Substrate- soil. Growth Habit- gregarious. Edibility- not edible. Height: 7 cm. Cap: 2.5 cm x 2 cm.	
10	*Chlorophyllum molybdites*	Has a flat and white pileus with a scaly texture; has a striate margin and solid stipe. Substrate- soil. Growth Habit- gregarious. Edibility- not edible. Cap: 10.8 × 10.2 cm. Height: 9.2 cm	

11		*Leucoagaricus americanus*	The pileus is depressed and brownish with a crenated margin; it has a small solid stipe. Substrate- the dead trunk of the coconut tree. Growth Habit- solitary. Edibility- edible. Stipe- 5.4cm x 4.8cm. Cap- 3.5cm	
12		*Leucoagaricus maleagris*	Has a depressed, white pileus with a cracked margin and distant gills; has a solid stipe with a sheathing ring. Substrate- Ipil-ipil tree. Growth Habit- solitary. Edibility- edible. Height: 7 cm. Cap: 7 cm x 6.5 cm	
13		*Leucoagaricus* sp. 1	Pileus is cone-shaped and white with a smooth margin; has soft distant gills and hollow stipe. Substrate-soil. Growth Habit- solitary. Edibility- edible. Cap- 1cm x 1cm. Stipe- 2cm.	
14		*Leucocoprinus* sp.	The pileus is flat and white with a striated margin and crowded gills; it has a solid stipe. Substrate- the dead trunk of the coconut tree. Growth Habit- solitary. Edibility- edible. Height: 9 cm. Cap: 4.3 cm x 3.8 cm.	
15	Lycoperdaceae	*Lycoperdon sp.*	A smooth, pear-shaped, white puffball that has a small solid stipe. Substrate- soil. Growth Habit- gregarious. Edibility- not edible. Height: 1 cm. Cap: 1.5 cm x 1.5 cm.	

16	Hymenogastraceae	*Gymnopilus purpureosquamulous*	Has a small, flat, yellow pileus with striate margin and distant gills; has solid stipe attached to the center of the pileus, Substrate- dead trunk of coconut tree. Growth Habit- gregarious. Edibility- not edible. Height: 1 cm. Cap: 2.5 cm x 2.5 cm	
17	Marasmiaceae	*Marasmius* sp.	Has a globose, brown pileus with streaked texture and smooth margin; has distant gills and thin hollow stipe. Substrate- rotten banana plant.Growth Habit- gregarious. Edibility- not edible. Height: 2 cm. Cap: 0.5 cm x 0.5 cm.	
18	Omphalotaceae	*Marasmiellus palmivorus*	Has a amall, depressed, yellow pileus with a cracked margin and distant gills; has a hollow thin stipe. Substrate- the dead trunk of the coconut tree. Growth Habit- gregarious. Edibility- edible. Height: 4 cm.Cap: 1.7 cm x 2.5 cm	
19	Physalacriaceae	*Oudemansiella canarii*	Has an umbonate-shaped white pileus with a smooth uplifted margin and crowded gills; has a thick and solid stipe attached at the center of the pileus. Substrate: Branch of Mango tree. Growth habit: Gregarious. Edibility- edible. Height: 1 cm.Cap: 5.2 cm x 4 cm	

20	Pluteaceae	*Volvariella volvacea*	Has a conical-shaped, grayish-white pileus with rugulose texture; has a closed gill, a striate margin, and a solid stipe attached to the center of the pileus. Substrate- banana plant. Growth Habit- solitary, Edibility- edible. Height: 4 cm. Cap: 9 cm	
21	Psathyrellaceae	*Psathyrella cacao*	Umbonate-shaped, whitish brown pileus with striate margin and closed gills; has a long solid stiped with sheathing ring. Substrate- acacia tree. Growth Habit- gregarious. Edibility- edible. Height: 7 cm. Cap: 7 cm x 6.5 cm	
22	Schizophyllaceae	*Schizophyllum commune*	A conchate-shaped white fruiting body that has a fibrous texture and wavy margins; has distant gills and eccentric stipe. Substrate- decaying twig of acacia tree. Growth Habit- gregarious. Edibility- edible. Height: 2 cm. Cap: 3 cm x 2 cm.	
23	*Incertae sedis*	*Collybia reineckeana*	Pileus is convex and brown with smooth texture and margin; has distant gills and solid longitudinal striate stipe. Substrate- soil. Growth Habit- gregarious. Edibility- edible. Cap: 12 × 10.7 cm. Height: 19.5 cm.	
24		*Panaeolus antillarum*	Pileus is convex shaped and yellowish-white; has smooth margin and crowded gills, has solid stipe. Substrate- cow dung. Growth Habit- solitary. Edibility- not edible. Height: 10.8 cm. Cap: 2cm	

Order Auriculariales				
25	Auriculariaceae	*Auricularia polytricha*	Gelatinous ear-shaped pink macrofungi that have no stipe. Substrate- decaying log of guava tree. Growth Habit- resupinate Edibility- Edible. Height: 1.2 cm. Cap: 0.6 cm x 0.6 cm	
Order Boletales				
26	Boletaceae	*Pycnoporus sanguineus*	A thin, flat, and fan-shaped orange fruiting body that has a wavy margin; has no stipe. Substrate- decaying log of mahogany tree. Growth Habit- resupinate. Edibility- not edible. Height: 0.5 cm. Cap: 1 cm x 2 cm.	
Order Polyporales				
27	Ganodermataceae	Ganoderma lucidum	A large, depressed, red pileus with a cracked margin; has no gills and has a solid reddish-brown stipe attached to the center of the pileus. Substrate- acacia tree. Growth Habit- gregarious. Edibility- edible but not palatable. Cap: 16 cm x 17 cm.	
28	Polyporaceae	*Lentinus sajor-caju*	Depressed white macrofungi with uplifted wavy margins; have distant gills and solid club-shaped stipe attached to the center of the pileus. Substrate- rotten wood. Growth Habit- gregarious. Edibility- edible. Height: 5 cm. Cap: 4.2 cm x 4.5 cm.	

29	*Lentinus squarrosulus*	A fruiting body that has a brown and depressed pileus; has a wavy arched margin and a thick solid stipe. Substrate- decaying log of malunggay tree. Growth Habit- gregarious. Edibility- edible. Height: 4 cm. Cap: 3cm x 4 cm	
30	*Lentinus swartzii*	A scaly flat brown pileus with smooth incurved margin and crowded gills; has a solid stipe attached to the center. Substrate- decaying log of malunggay tree. Growth Habit- gregarious. Edibility- edible. Height: 10.8 cm. Cap: 2cm	
31	*Lentinus tigrinus*	A fruiting body that has a funnel-shaped and yellowish-brown pileus with striate margin and distant gills; has a solid and longitudinal striate stipe. Substrate- decaying log of a malunggay tree. Growth Habit- gregarious. Edibility- edible. Height: 9 cm. Cap: 7 x 6 cm.	
32	*Trametes ellipsospora*	Small, thin, flat, and kidney-shaped white macrofungi that have a smooth margin and no stipe. Substrate- rotten twig of acacia tree. Growth Habit- resupinate. Edibility- not edible. Height: N/A. Cap: 5.5x6 cm	
33	*Trametes sp. 1*	A multi-colored thin and flat fruiting body that has a smooth and white margin; has no stipe, Substrate- decaying log of paper tree. Growth Habit- resupinate. Edibility- not edible. Height: 0.3 cm. Cap: 4 cm x 2.5 cm.	

Globally, there is a current estimation of 53,000 to 110,000 recorded macrofungal species belonging to both Basidiomycota and Ascomycota (Sridhar & Deshmukh 2019). These are known to be symbionts, including mycorrhizal, parasitic, detrimental to their hosts, and saprophytic or decomposers of dead decaying organic matter. This is why these phyla are found in different substrates like woods, trunks, decaying logs or twigs, branches, soil, and even in animal dung (Bustillos *et al.* 2024; Zabel & Morell, 2020). Of the collected species, 25 of them were found on living and decaying trees, twigs, branches, or trunks (71.4%), 9 were only seen on soil (25.71%), and only 1 macrofungus was found on animal dung (2.89%). The composition of macrofungal species in different habitats reflects their role in ecology. Those found in decaying wood like *Schizophyllum commune* show how they act as decomposers in the ecosystem (Matsumae *et al.* 2025). Those found in soil like *Agaricus* species and *Chlorophyllum* species play a huge role in soil ecology contributing to nutrient cycling and soil structure. On the other hand, the macrofungus found in animal dung like *Panaeolus antillarum* contributes to the decomposing process of animal wastes (Bustillos *et al.* 2024).

Aside from their role as decomposers in ecology, they are also now used for human consumption and medicine due to their nutraceutical properties (Hemmes & Wang, 2015; Dulay *et. al.*, 2020; Wu *et al*., 2019). Of the collected fruiting bodies, 23 of them were found to be edible (*A. bisporus, A. comtulus, Agaricus* sp. *3, C. comatus, L. americanus, Leucoagaricus maleagris, Leucoagaricus* sp. *1 Lecocoprinus* sp.*, O. canarii, V. volvacea, P. cacao, S. commune, A. polytricha, G. lucidum, L. sajor caju, L. squarrosulus, L. swartzii, L. tigrinus, Cookeina* sp.*1*, and *Cookeina* sp. *2, C. reinakeana, A. polytricha),* while 12 of them were not edible, as they were not delicious and they were either poisonous or hallucinogens (*A. trisulphuratus, C. demangei, C. hortense, C. molybdites, Lycoperdon sp, P. antillarium, G. purpureosquamulous, Marasmis sp., M. palmivorous, T. ellipsospora, Trametes sp, and P. sanguineus)*. Some of them are also used in medicine like *A. polytricha, S. commune, and O. canarii* (Lazo *et al*., 2015; De Leon *et al.*, 2018; Tantengco & Ragrario, 2018). For instance, *Ganoderma lucidum* was used as coffee in some Ayta communities in Batangas by drying and pounding it. Moreover, they also consume *Volvariella volvacea* by boiling or sautéing it with garlic and onion and eating it with rice (Tantengco & Ragragio 2018). Moreover, mushrooms are considered a healthy functional food as they also contain essential amino acids including alkaloids, carotenoids, enzymes, flavonoids, folates, glycosides, minerals, oils, organic acids, phenolics, terpenoids, tocopherols (Ma *et al.*, 2018, Sevindik, 2018, Mushtaq, 2020, Valverde, 2015).

Today, viruses are common and diseases spread quickly which is why people spend time searching for healthy and nutritious foods. The fact that mushrooms contain vitamins and minerals makes them one of the foods needed to survive. Because of this, the popularity of mushrooms has increased as people seek to increase the nutrients they provide while having less sodium, fat, sugar, and calories. Additionally, mushrooms are used as immune system boosters and antibacterial agents since they exhibit strong action against common bacterial strains and contain chemicals that have immune-boosting properties (Rathore et. al, 2017).

Natural Habitat and Physical Distribution of Collected Macrofungi

The Philippines' "rice granary", Nueva Ecija, is a landlocked province with low-lying alluvial plains and rolling hillsides. Its entire land area is 550,718 hectares, where 63% (330,726 hectares) of it is alienable and disposable land while the remaining 37% of it (97,448 hectares) are forestlands. Due to the geographic limitations where researchers can only collect at nearby places, the fruiting bodies were only collected in the available and accessible collection sites in selected municipalities in Nueva Ecija specifically in San Isidro (Site A), San Leonardo (Site B), Jaen (Site C), and San Antonio (Site D) from May to July 2023.

Site A has an average elevation of 144 m and consists of the large urban area, vegetation and agricultural or farmlands, and agroforest. Site B has an average elevation of 28 m and is situated along an agroforest passing through an agricultural land along with a river. On the other hand, Site C has an average elevation of 20 m and mostly consists of urban areas and agricultural land, while Site D has an average elevation of 15 m and comprises of large urban area with small farmland. Located at an elevation of 66.65 m (218.67 ft) above sea level, Nueva Ecija has a tropical rainforest climate (Type II) with distinct dry and rainy seasons.

Rainfall peaks in July and August and lasts from early May to late December. During May, the average temperature is 30.3°C, with precipitation of 2% and humidity of 69%. On the other hand, June has an average temperature of 29 °C with 8% precipitation and 78% humidity, while July has an average temperature of 28.8°C, 29% precipitation and 82% humidity.

Fig. 2- Google map showing the distribution of 53 collected macrofungi in four collection sites (A, B, C, D) during the months of May (M), June (J), and July (L).

Table 2. Taxonomic positions of macrofungi collected in selected municipalities in Nueva Ecija, Philippines.

Phylum	Class	Order	Family	Genus	Species
Ascomycota	Pezizomycetes	Pezizales	Sarcosophaceae	*Cookeina*	*Cookeina* sp. 1
					Cookeina sp. 2
Basidiomycota	Agaricomycetes	Agaricales	Agaricaceae	*Agaricus*	*A. bisporus*
					A. comtulus
					A. trisulphuratus
					Agaricus sp.1
					Agaricus sp. 2
					Agaricus sp. 3
				Coprinus	*C. comatus*
				Chlorophyllum	*C. demangei*
					C. hortense
					C. molybdites
				Leucoagaricus	*L. amaricanus*
					L. maleagris
					Leucoagaricus sp 1
				Leucocoprinus	*Leucocoprinus* sp.
			Lycoperdaceae	*Lycoperdon*	*Lycoperdon* sp.
			Hymenogastraceae	*Gymnopilus*	*G. purpureosquamulous*
			Marasmiaceae	*Marasmius*	*Marasmius* sp.
			Omphalotaceae	*Marasmiellus*	*M. palmivorus*
			Physalacriaceae	*Oudemansiella*	*O. canarii*
			Pluteaceae	*Volvariella*	*V. volvacea*
			Psathyrellaceae	*Psathyrella*	*Psathyrella cacao*
			Schizophyllaceae	*Schizophyllum*	*S. commune*
			Incertae sedis	*Collybia*	*C. reinakeana*
				Panaeolus	*P. antillarum*
		Auriculariales	Auriculariaceae	*Auricularia*	*A. polytricha*
		Boletales	Boletaceae	*Pycnoporus*	*P. sanguineus*
		Polyporales	Ganodermataceae	*Ganoderma*	*G. lucidum*
			Polyporaceae	*Lentinus*	*L. sajor-caju*
					L. squarrosulus
					L. swartzii
					L. tigrinus
				Trametes	*T. ellipsospora*
					Trametes sp. 1

From the collection sites, Site A (San Isidro) recorded the highest percentage composition of macrofungi, followed by Site C (Jaen). On the other hand, Site B (San Leonardo) has a lower macrofungal composition percentage than Site C (Jaen), and the lowest one is Site D (San Antonio).

In the Philippines, saprophytic basidio mycetes are the most prevalent macrofungi with Polyporaceae dominating the family taxa on woody forest substrates (Arenas et al. 2015; Parlucha et al. 2021). However, the richness of the Agaricales order in the collected species of this study is very much evident by having the highest number of collected species with 10 families and 15 genera. It is very much expected since this order is dominant in the phylum Basidiomycota because it consists of one-fifth of all identified macrofungi in the group (Paquit & Pampolina, 2017). The Agaricaceae family belonging to the Agaricales order has the highest number of species collected (42.86%), followed by the Polyporaceae family (20%) which belongs to the Polypolares order. This is because the physical distribution of the collected macrofungi is always affected by the availability of the substrates and man-made disturbances (Dulay *et al.*, 2020).

Table 3. Distribution of the 53 collected macrofungi in the four collection sites and three collection months.

	Collection Sites				**Collection Month**		
	Site A	**Site B**	**Site C**	**Site D**	**May**	**June**	**July**
Agaricus bisporus	-	-	-	+	-	-	•
Agaricus comtulus	-	-	-	-	-	-	•
A. trisulphuratus	-	+	-	-	-	•	-
Agaricus sp.1	+	-	-	-	-	•	-
Agaricus sp. 2	-	-	-	+	-	•	-
Agaricus sp. 3	+	-	-	-	-	-	•
Auricularia polyticha	-	-	+	-	-	-	•
Chlorophyllum. Demangei	+	-	+	+	-	-	•
C. Hortense	-	-	+	+	-	•	•
C. molybdites	-	+	+	-	-	•	•
Collybia reinakeana	-	-	+	-	-	•	-
Cookeina sp. 1	-	-	+	-	-	-	•
Cookeina sp. 2	-	+	-	-	-	-	•
Coprinus comatus	-	+	-	-	•	-	-
Ganoderma. lucidum [a]	+	+	-	-	•	•	•
Gymnopilus purpureosquamulous	+	-	-	-	-	-	•
Lentinus sajor-caju	-	+	-	-	-	-	•
L. squarrosulus [a]	-	+	-	-	•	•	•
L. swartzii	+	-	+	-	•	-	-
L. tigrinus	+	-	-	-	•	-	•
Leucoagaricus amaricanus	+	-	+	-	-	•	•
L. maleagris	+	-	-	-	-	•	-
Leucoagaricus sp 1	+	-	-	-	-	-	•
Leucocoprinus sp.	+	-	-	-	-	•	-
Lycoperdon sp.	-	+	-	-	-	-	•
Marasmiuellus palmivorus	+	-	-	-	-	-	•
Marasmiellus sp. 1	-	-	+	-	-	-	•
Oudemansiella canarii	+	-	-	-	-	•	•
Paneolus antilarrium	-	-	+	-	•	•	-
Psathyrella sp.	+	-	-	-	-	-	•
Pycnoporus sanguineus	-	-	-	+	-	-	-
Schyzophyllum commune	-	-	+	-	-	-	•
T. ellipsospora	-	-	-	+	-	-	•
Trametes sp. 1	-	-	+	-	-	•	-
V. volvacea	-	+	-	+	•	•	-
Total	14	9	12	7	7	15	23
Composition (%)	40.00	27.14	34.29	20.00	20.00	42.86	65.71

Composition (%) = (total number of macrofungi occurred/total of macrofungal taxa) x 100
(+ •) present; (-) absent
[a] Species occurred in three collection months

More species of macrofungi are seen in grassland areas which is supported in a study in Mt. Maculot, Philippines where the dominance of mushrooms depends on the presence of trees and grassland ecosystems (Arenas *et al*., 2015). That is why Sites A and C have a high number of collected species because it has vast rice fields, grasslands, and trees, including its litter as it is a rural area. Sites C and D, on the other hand, a semi-urban areas where man-made disturbances such as industrial works caused the poor percentage composition of collected species. This shows how macrofungal species depend on the availability of habitat or substrates as they tend to grow more in grassy type areas than in the forested and urbanized type of habitats (Bustillos *et. al.,* 2024). The collection months also affect the existence of mushrooms because of the climatic conditions including temperature, humidity, and amount of rainfall during the collection period (Arenas *et al.*, 2015). Nueva Ecija has a tropical rainforest climate. Its warmest month is in May which has a daily mean temperature of 29.74˚C, average relative humidity of 74.97%, and average rainfall of 156.93 mm. That is why it has the least collected mushroom among the collection months with only 7 collected species, unlike July where it has only a daily mean temperature of 27.22 ˚C, an average relative humidity of 83.79%, and an average rainfall of 248.04 mm making it have the highest number of collected macrofungi with 24 species. These show how the geographical composition of the collection site and climatic conditions during the collection months affect the composition of the macrofungal species.

Undeniably, mushrooms' role in ecology, medicine, and human consumption brought invaluable contributions to the environment, society, and lifestyle of most individuals. Since edible mushrooms are very easy to grow using affordable substrates, they can be cultivated for income generation and sustainable livelihood. Specifically, this can help contribute to the success of achieving the United Nations Sustainable Development Goals (SDGs) including such as SDG 1 No Poverty), SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-Being), SDG 8 (Decent Work and Economic Growth), SDG 11 (Sustainable Cities and Communities), and SDG 12 (Responsible Consumption and Production).

CONCLUSION

Collectively, the four collection sites of the province of Nueva Ecija are natural habitats for several macrofungi belonging to 2 phyla, 4 classes, 5 orders, 14 families, 21 genera, and 35 species taxa. The distribution of these macrofungi is substantially affected by the collection site, collection month, and existing climatic conditions. Since some municipalities in Nueva Ecija are still understudied, this result can contribute to the information and record of mycological resources of Nueva Ecija and the Philippines at large. Further investigation on soil types affecting the growth and distribution of mushrooms as well as the incorporation of spore printing are encouraged. Molecular identification is suggested to verify the accurate identitiy and the taxonomical positions of mushrooms for future pharmacological studies.

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