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Macroscopic Fungal Flora of Mts. Palaypalay - Mataas na Gulod Protected Landscape, Southern Luzon, Philippines

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ABSTRACT

Macroscopic fungal species collection and documentation at Mts. Palaypalay - Mataas na Gulod Protected Landscape (MPMGPL) were done to determine the existing macrofungi for conservation. The MPMGPL situated in the municipalities of Ternate and Maragondon in Cavite and Nasugbu in Batangas, is composed of Mt. Palaypalay with an elevation of 595 meters above sea level (masl), Mt. Mataas na Gulod with 622 masl and its highest peak, Mt. Pico de Loro at 648 masl. This protected landscape was categorized by NIPAS through Proclamation No. 1315 as one of the priority areas for biodiversity conservation in the Philippines. Macroscopic fungi sampling was completed using Transect Line (TL) with a combination of quadrat and opportunistic sampling methods from April 2013 to June 2014. Five transect lines, one kilometer each was laid from baseline of 200 masl up to 600 masl. Ten quadrats of 20m x 30m with an interval of 250m were designated for each TL. All macroscopic fungal flora inside and outside the quadrats were classified and documented. A total of 95 species which were collected and identified belonged to Class Ascomycetes and Class Basidiomycetes. Documentation revealed a high number of macroscopic fungal species in MPMGPL as compared to other protected areas in Cavite, Laguna, Batangas, Rizal, and Quezon (CALABARZON) Region.

Keywords: macroscopic fungal species, biodiversity, Mts. Palaypalay- Mataas na Gulod Protected Landscape, Basidiomycetes, Ascomycetes

INTRODUCTION

Fungi are classified by mycologist as large groups of eukaryotic organisms either microscopic or macroscopic. They are known to have a significant role in the nutrient cycling of the forest ecosystem (Klemm 2005; Cooke and Rayner 1984). In the Philippines, 3,956 species representing 818 genera of fungi had been identified (Tadiosa 2012). Macroscopic fungi that includes bracket fungi, puffballs, birds' nests, stinkhorns, umbrella-and fan-like fleshy mushrooms have distinctive fruiting bodies which can be seen by the naked eye, spore-bearers and grow above or below the ground (Chang and Buswell 1996). Their estimated number ranges from 53,000 to 110,000 species and mostly belongs to Basidiomycetes and others to Ascomycetes (Mueller et al. 2007). These eukaryotes commonly appeared with stalks and some have rings. Morphological character differentiation, which may vary depending on the genus and or species, includes: size, texture, shape and color of the fruiting bodies and color of the spore print. These organisms cannot produce their own food (heterotrophic); thus, they obtain nourishment from dead organic matter via production of extracellular enzymes. Typically, they grow on decaying plants or animals, soil, leaf litter, rotting logs or compost heaps or manure (Reyes et al. 2009). Some specifically grows on dipterocarp forest while others on open fields, meadows and lawns (Tadiosa and Militante 2006; Tadiosa et al. 2012).

Mts. Palaypalay–Mataas na Gulod Protected Landscape (MPMGPL) is the last remaining lowland evergreen rainforest in the province of Cavite (Plate 1). It is sitting on a 3,973.13 hectare area and situated $14^0$16'58.432^{0}N latitude and $120^0$51'49.227^{0}E longitude. To date, MPMGPL is recognized as one of the most diverse forest ecosystems in the Philippines; thus, there is a need for conservation and protection. It consists of three mountains namely Mt. Palaypalay, Mt. Mataas na Gulod and Mt. Pico de Loro, with the highest elevation of 648m above the sea level. About 538 hectares of MPMGPL are filled with matured trees while others are brushland, grassland, and cultivated land. Moreover, 697 hectares of which are disturbed and currently under National Greening Program (NGP) of the Philippine Government through the Department of Environment and Natural Resources (DENR- Region IV-A 2014). Several studies on MPMGPL showed a high flora and fauna diversity (Alejandro and Madulid, 1999; Salibay and Luyon 2008; CALABARZON Physical Framework Plan 2008; Lagat 2009 and Arriola and Alejandro 2013). This protected landscape was formerly named as Mts. Palaypalay – Mataas na Gulod National Park. The park is a favorite destination of local hikers and campers and was categorized by NIPAS as Protected Landscape under Presidential Decree, Proclamation No.1315 on June 27, 2007 in order to protect and preserve its biodiversity.

In Region IV-A, macroscopic fungal assessment was previously conducted which accounted for 75 species in Taal Volcano Protected Landscape – Talisay (Tadiosa and Briones 2013), 27 species in Mt. Makiling (Tadiosa et al. 2012) and 100 species in Mt. Maculot (Tadiosa et al. 2007). Since few taxonomic studies were performed on macroscopic fungi in this region, evidently in the Philippines as whole, efforts to identify the macroscopic fungi in MPMGPL is deemed imperative in order to create baseline information. Nevertheless, morphological and anatomical distinctive characteristics of each macroscopic fungus were examined to differentiate and distinguish each species. The data gathered for this research provided awareness on the presence of the organisms' ecological importance (Klemm 2005).

Plate 1. Photo shows the portions of forested areas in Mts. Palaypalay - Mataas na Gulod Protected Landscape

OBJECTIVES OF THE STUDY

This research work was done to document the existing macroscopic fungal species in MPMGPL. Specifically this study aimed to: (1) identify macroscopic fungi based on morphological and anatomical attributes, (2) provide taxonomic listing of macroscopic fungi in MPMGPL, and (3) determine the relationship between the presence of macroscopic fungi and climatic factors such as altitude, humidity, amount of rainfall and temperature.

MATERIALS AND METHODS

Study Area

Sampling and recording of macroscopic fungal species were conducted in MPMGPL. It is geographically positioned in the municipalities of Ternate and Maragondon, Cavite and Nasugbu, Batangas. It is bounded by Puerto Azul and the Calumpang Point Philippine Naval Reservation on the North; by Timberland on the South; by Alienable and Disposable lands on the East; and on the West by West Philippine Sea (Figure 1).

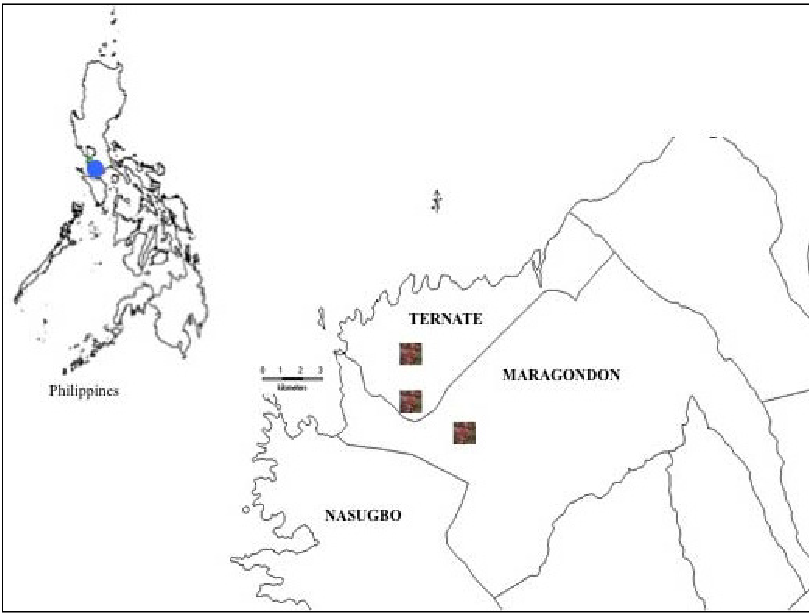

Fig. 1. Map of Mts. Palaypalay - Mataas na Gulod Protected Landscape in the province of Cavite, showing its three peaks: Mt. Palaypalay and Mt. Pico De Loro in Ternate and Mt. Mataas na Gulod in Maragondon

Gratuitous Permit and Entry Protocol at Protected Area

Prior to collecting and photo-documenting of macroscopic fungi at MPMGPL, Mr. Tadiosa and his collaborators were able to coordinate to the MPMGPL Protected Area Superintendent, OIC PENRO Rolinio P. Pozas and his assistant, For. Reynaldo Belen. This coordination was in line to the provision of Article V Section 17 Paragraph 1 of R.A 10066, otherwise known as "The National Heritage Act of 2009." It states that the National Museum (NM) shall have the authority to collect, maintain and develop the national reference collections of Philippine flora and fauna through research and field collection of specimens. It further states that NM shall inform the DENR of such collection. All type of specimens collected in Philippine territory shall be deposited in the National Museum.

Field Sampling of Macroscopic Fungal Species

Field sampling was completed using five transect lines (TL) with 10 quadrats, 20m x 30m with an interval of 250m on each quadrat. Transect line was laid starting at 200m above sea level upward to the peak of 600masl. A total of 50 quadrats were laid out in the study areas. Combination of quadrat method and opportunistic and or purposive sampling methods were employed in the study areas. All macroscopic fungi found inside and outside the quadrat was photographed in their natural habitat, collected, identified and classified (Plate 2). The sampling site was visited five times from April 2013 to June 2014 and collection was done quarterly.

Fungal host, color, shape, size of the fruiting bodies, prevailing temperature and humidity in the area at the time of collection and Global Positioning System (GPS) coordinates were recorded during the time of collection and documentation. Macroscopic fungi inhabiting the soil and ground litter were dug using trowel, and, for those attached to tree branches or barks, were gathered using bolo and knife.

Identification of Macroscopic Fungi

The macroscopic fungal specimens collected were pre-identified in the field and handled properly prior to storage for herbarium purposes. They were brought to the laboratory for thorough analysis of macro- and microscopic attributes of the fruiting bodies. Confirmations of their identity were compared by the researchers to the specimens deposited at the Philippine National Museum Herbarium. Identification of the collected specimens were based from the taxonomic works of Reinking (1921), Quimio (2001), Hemmes and Desjardin (2002), Reyes et al. (2003),Lodge (2004), Ostry et al. (2010), Kuo (2011), Tadiosa et al. (2011) and De leon et al. (2013).

RESULTS AND DISCUSSION

Taxonomy of macro fungi in Mts. Palaypalay – Mataas na Gulod Protected Landscape

The five quarters collection of macroscopic fungi at MPMGPL has led to the identification of 38 families, 69 genera and 95 species (Table 1). Data gathered showed, that six species belong to four families and five genera of Ascomycetes while 89 species in 34 families and 64 genera of Basidiomycetes were collected and identified.

As shown in figure 2, macroscopic fungi belonging to Ascomycetes are poorly represented having only one each for two families (i.e. Pezizaceae and Pyronemataceae) and two each for Sarcoscyphaceae and Xylariaceae. On the other hand, macroscopic fungi under Basidiomycetes were highly represented; family Polyporaceae has the highest number of species, with 17 representatives; followed by Tricholomataceae and Coriolaceae with seven representatives; Ganodermataceae, Stereaceae, and Strophariaceae have five; Auriculariaceae has four; Corticiaceae has three and the rest of the families with one or two representatives. Macroscopic fungi were found growing mostly on rotten trunks or branches of dead trees while others on soil and forest leaf litters (Table 2).

The recommended best time, to collect macroscopic fungi, is in the morning, when temperature is favorable (Halling and Mueller 2005). It is also during this time when the fruiting bodies of the macroscopic fungi are expanded, and the spores remain intact on the pores, tooth or gills.

The climate of Philippine archipelago is described by climatologists as having moderately elevated temperature and humidity with widespread rainfall. Temperature deviates as altitude changes, hence as the elevation increases the temperature decreases. Lowest temperature during the collection period was at 19.8^{0}C on January 2014, and this record is comparable to the annual average temperature of the Philippines at 26.6^{0}C. Humidity, which is defined by the climatologist, as the moisture content in the atmosphere, is correlated to the warm temperature from March to May in the Philippines. Precipitation or rainfall distribution in the Philippines is the most noteworthy climatic factor in the country. The difference on the monthly amount of rainfall is due to the wind direction and presence of mountain in an area. Since rainfall provides low temperature and also resulted in low humidity, thus precipitation permits the growth of macroscopic fungi in a given area.

Another prominent evidence of a macroscopic fungal occurrence in the forest is the typhoon, which it critically affects the prevailing climatic condition in the area that resulted in the emergence or lost of organisms such as macroscopic fungi. For instance, wind direction is altered by the strong winds during a typhoon and tall trees fall on the ground. As these fallen logs of trees decayed, some macroscopic fungi grow on it and aid in the decomposition which resulted in the nutrient cycling of the soil. Other macroscopic fungi cause decay on living trees and prevailing timbers, giving loss to the forest.

Table 1. Taxonomic positions of the different macroscopic fungi collected in Mts. Palaypalay – Mataas na Gulod Protected Landscape

Class	Family	Genus	Species
Ascomycetes	Pezizaceae	*Peziza*	*Peziza repanda* Pers.
	Pyronemataceae	*Octospora*	*Octospora humosa* (Fr.) Dennis
	Sarcoscyphaceae	*Cookeina*	*Cookeina sulcipes* (Berk.) Kuntze
			Cookeina tricholoma (Mont.) Kuntze
	Xylariaceae	*Daldinia*	*Daldinia concentrica* (Fr.) Ces. & de Not.
		Xylaria	*Xylaria polymorpha* (Pers.) Grev.
Basidiomycetes	Agaricaceae	*Agaricus*	*Agaricus campestris* Linn.
		Lepiota	*Lepiota cristata* (Bolt.) Kumm.
	Auriculariaceae	*Auricularia*	*Auricularia auricula-judae* (Mont.) Sacc.
			Auricularia delicata (Fr.) Henn.
			Auricularia mesenterica (Dicks) Pers.
			Auricularia polytricha (Mont.) Sacc.
	Bolbitiaceae	*Agrocybe*	*Agrocybe* sp.
		Panaeolus	*Panaeolus semi-ovatus* (Sowerby) Fr.
	Boletaceae	*Boletus*	*Boletus* sp.
	Cantharellaceae	*Cantharellus*	*Cantharellus infundibuliformis* (Scop.) Fr.
	Coniophoraceae	*Coniophora*	*Coniophora puteana* (Schum.) Karst.
	Coprinaceae	*Coprinus*	*Coprinus disseminatus* (Pers.) Gray
	Coriolaceae	*Coriolus*	*Coriolus* sp.
		Hexagonia	*Hexagonia apiaria* (Pers.) Fr.
			Hexagonia tenuis (Hook.) Fr.
		Lenzites	*Lenzites repanda* (Pers.) Fr.
		Trametes	*Trametes aspera* Jungh.
			Trametes corrugata (Pers.) Bres.
			Trametes versicolor (Linn.) Lloyd.
	Corticiaceae	*Corticium*	*Corticium salmonicolor* Berk. & Br.
			Corticium sp.
		Pulcherricium	*Pulcherricium caeruleum* (Lam.) Parm.
		Cortinarius	*Cortinarius callisteus* (Fr.) Fr.

Basidiomycetes	Crepidotaceae	*Crepidotus*	*Crepidotus mollis* (Schaeff.) Quel.
	Dacrymycetaceae	*Dacryopinax*	*Dacryopinax spathularia* (Schwein.) Mart.
	Entelomataceae	*Enteloma*	*Enteloma lividum* Quel.
	Ganodermataceae	*Ganoderma*	*Ganoderma applanatum* (Pers.) Pat.
			Ganoderma lucidum (Leys.) Karst.
		Ganoderma	*Ganoderma tsugae* Murrill
			Ganoderma sp.
		Amauroderma	*Amauroderma rugosum* (Bl. & Nees.) Bres.
	Geastraceae	*Geastrum*	*Geastrum saccatum* Fr.
	Hydnaceae	*Hydnum*	*Hydnum sp.*
	Hygrophoraceae	*Hygrocybe*	*Hygrocybe* sp.
		Hygrophorus	*Hygrophorus pratensis* Fr.
		Hygrophoropsis	*Hygrophoropsis aurantiaca* (Fr.) Maire
	Hymenochaetaceae	*Hymenochaete*	*Hymenochaete rubiginosa* (Dicks.) Lev.
		Phellinus	*Phellinus* sp.
	Marasmiaceae	*Marasmius*	*Marasmius rotula* (Scop.) Fr.
	Meruliaceae	*Merulius*	*Merulius incarnatus* Schw.
	Mycenaceae	*Mycena*	*Mycena acicula* (Schaeff.) Fr.
			Mycena galopus (Pers. ex Fr.) Kummer
	Nidulariaceae	*Cyathus*	*Cyathus striatus* Willd.
	Physalacriaceae	*Oudemansiella*	*Oudemansiella* sp.
		Armillaria	*Armillaria* sp.
	Pleurotaceae	*Pleurotus*	*Pleurotus ostreatus* Fr.
			Pleurotus porrigens (Pers.) P. Kumm.
	Pluteaceae	*Pluteus*	*Pluteus* sp.
		Volvariella	*Volvariella volvacea* (Bull.) Sing.
	Polyporaceae	*Daedalea*	*Daedalea amanitoides* Beauv.
			Daedalea ambigua Berk.
			Daedalea flavida Lev.
			Daedalea sp.
		Daedaleopsis	*Daedaleopsis confragosa* (Bolt.) J. Schrot.
		Favolus	*Favolus reniformis* (Murr.) Sacc. & Trotter

Basidiomycetes	Polyporaceae	*Fomes*	*Fomes caryophylli* (Rac.) Bres.
			Fomes gilvus (Schwein.) Lloyd.
		Microporus	*Microporus affinis* (Blume & T.Nees.) Kuntze
			Microporus xanthopus (Fr.) Kuntze
		Polyporus	*Polyporus durus* Jungh.
			Polyporus gilvus (Schw.) Fr.
		Polyporus	*Polyporus hirsutus* (Wulf.)Fr.
			Polyporus roseus (Alb & Schwein.)Fr.
			Polyporus sp.
		Poria	*Poria sp.*
		Trichaptum	*Trichaptum abietinum* (Dicks.) Ryvarden
	Psathyrellaceae	*Psathyrella*	*Psathyrella* sp.
	Russulaceae	*Lactarius*	*Lactarius piperatus* (Scop.) Fr.
		Russula	*Russula* sp.
	Schizophyllaceae	*Schizophyllum*	*Schizophyllum commune* Fr.
	Stereaceae	*Stereum*	*Stereum complicatum* (Fr.) Fr.
			Stereum ostrea (Bl.& Nees.) Fr.
			Stereum rugosum (Pers.) Fr.
			Stereum sanguinolentum Fr.
			Stereum sp.
	Strophariaceae	*Hebeloma*	*Hebeloma* sp.
		Hypholoma	*Hypholoma fasciculare* (Huds.) Kummer
		Pholiota	*Pholiota* sp.
		Psilocybe	*Psilocybe* sp.
		Stropharia	*Stropharia rugoso-annulata* (Farlow) Murr.
	Thelephoraceae	*Thelephora*	*Thelephora terrestris* (Ehrenb.) Fr.
	Tremellaceae	*Tremella*	*Tremella fuciformis* Berk.
	Tricholomataceae	*Clitocybe*	*Clitocybe* sp.
		Collybia	*Collybia maculata* (Alb.& Schw.) Kummer
		Lentinus	*Lentinus strigosus* (Schwein.) Fr.
		Panus	*Panus rudis* Fr.
		Termitomyces	*Termitomyces striatus* (Beeli) R. Heim.
			Termitomyces sp.
		Tricholoma	T*richoloma* sp.

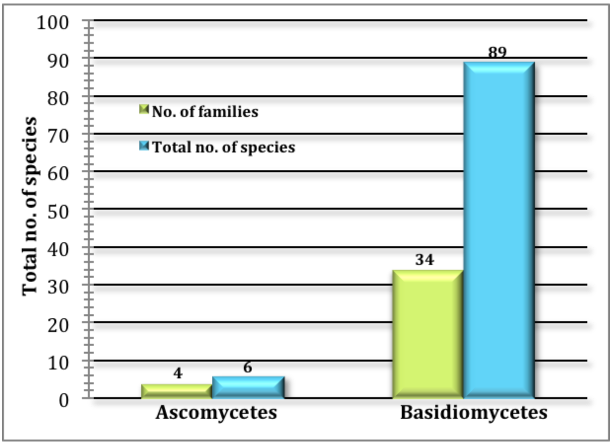

Fig. 2. Summary of the distribution of species in the different families of macroscopic fungi under Class Ascomycetes and Basidiomycetes collected in Mts. Palaypalay – Mataas na Gulod Protected Landscape

Table 2. Different species of macroscopic fungi collected in the study site with their substrates, elevation and habitat

No.	Taxa	Elev. (m)	Substrate	Habitat
1	*Peziza repanda* Pers.	302	on rotten branch of lanite (Wrightia pubescens)	forested area
2	*Octospora humosa* (Fr.) Dennis	284	on rotten root of tibig (Ficus nota)	grassland
3	*Cookeina sulcipes* (Berk.) Kuntze	314	on rotten branch of unknown tree	forested areas
4	*Cookeina tricholoma* (Mont.)Kuntze	320	on rotten branch of banaba (Lagerstroemia speciosa)	plantation forest
5	*Daldinia concentrica* (Fr.) Ces. & de Not.	364	on rotten trunk of bignay (Antidesma bunius)	forested area
6	*Xylaria polymorpha* (Pers.) Grev.	235	on stump of unknown tree	denuded area
7	*Agaricus campestris* Linn.	254	on soil	forested area
8	*Lepiota cristata* (Bolt.) Kumm.	302	on soil	grassland
9	*Auricularia auricula-judae* (Mont.) Sacc.	423	on rotten branch of malaruhat (Syzygium subcaudatum)	forested area
10	*Auricularia delicata* (Fr.) Henn.	378	on rotten root of narra (Pterocarpus indicus)	forested area
11	*Auricularia mesenterica* (Dicks.) Pers.	264	on rotten trunk of molave (Vitex parviflora)	forested area

12	*Auricularia polytricha* (Mont.) Sacc.	330	on rotten trunk of alibangbang (Bauhinia purpurea)	forested area
13	*Agrocybe sp.*	312	on soil	grassland
14	*Panaeolus semi-ovatus* (Sowerby) Fr.	345	on soil	grassland
15	*Boletus sp.*	234	on soil	grassland
16	*Cantharellus infundibuliformis* (Scopr.)Fr.	312	on rotten stump of yemane (Gmelina arborea)	denuded area
17	*Coniophora puteana* (Schum.) Karst.	324	on soil	grassland
18	*Coprinus disseminatus* (Pers.) Gray	346	on rotten ipil-ipil (Leucaena Leucocephala)	grassland
19	*Coriolus sp.*	435	on soil	forested area
20	*Hexagonia apiaria* (Pers.) Fr.	398	on rotten trunk of banaba (Lagerstroemia speciosa)	forested area
21	*Hexagonia tenuis* (Hook.) Fr.	336	on rotten branch of tara-tara (Caesalpinia spinosa)	forested area
22	*Lenzites repanda* (Pers.) Fr.	347	on rotten branch of guava (Psidium guajava)	forested area
23	*Trametes aspera Jungh.*	435	on rotten stump of mahogany (Swietenia macrophylla)	plantation forest
24	*Trametes corrugata* (Pers.) Bres.	314	on rotten trunk of alibangbang (Bauhinia purpurea)	forested area
25	*Trametes versicolor* (Linn.) Lloyd.	324	on rotten stump of akleng-parang (Albizia procera)	denuded area
26	*Corticium salmonicolor* Berk. & Br.	345	on rotten branch of guava (Psidium guajava)	forested area
27	*Corticium sp.*	385	on rotten root of lisihan (Aglaia sp.)	forested area
28	*Pulcherricium caeruleum* (Lam.) Parm.	412	on rotten branch of guava (Psidium guajava)	forested area
29	*Cortinarius callisteus* (Fr.) Fr.	357	on rotten trunk of lamio (Dracontomelon edule)	grassland
30	*Crepidotus mollis* (Schaeff.) Quel.	342	on rotten root of tibig (Ficus nota)	forested area
31	*Dacryopinax spathularia* (Schwein.) Mart.	235	on rotten trunk of guijo (Shorea guiso)	plantation forest
32	*Enteloma lividum* Quel.	278	on soil	grassland
33	*Ganoderma applanatum* (Pers.) Pat.	334	on rotten trunk of akleng - parang (Albizzia procera)	forested area
34	*Ganoderma lucidum* (Leys.) Karst.	394	on rotten roots of lisihan (Aglaia sp.)	forested area
35	*Ganoderma tsugae* Murrill	367	on rotten stump of katmon (Dillenia philippinensis)	forested area
36	*Ganoderma sp.*	333	on rotten trunk of Japanese acacia (Acacia auriculiformes)	forested area
37	*Amauroderma rugosum* (Bl. & Nees.) Bres.	413	on rotten roots of guijo (Shorea guiso)	forested area
38	*Geastrum saccatum* Fr.	345	on rotten trunk of takip-asin (Macaranga grandifolia)	forested area
39	*Hydnum sp.*	333	on rotten trunk of hampas-tikbalang (Myristica sp.)	forested area

40	*Hygrocybe sp.*	346	on soil	forested area
41	*Hygrophorus pratensis* Fr.	367	on soil	forested area
42	*Hygrophoropsis aurantiaca* (Fr.) Maire	378	on soil	forested area
43	*Hymenochaete rubiginosa* (Dicks.) Lev.	237	on rotten trunk of bolong-eta (Diospyros pilosanthera)	forested area
44	*Phellinus sp.*	316	on rotten trunk of galo (Anacolosa luzoniensis)	forested area
45	*Marasmius rotula* (Scop.) Fr.	389	on soil	plantation forest
46	*Merulius incarnatus* Schw.	402	on rotten root of takip - asin (Macaranga grandifolia)	grassland
47	*Mycena acicula* (Schaeff.) Fr.	398	on soil	denuded area
48	*Mycena galopus* (Pers. ex Fr.) Kummer	367	on soil	forested area
49	*Cyathus striatus* Willd.	289	on rotten root of akleng- parang (Albizzia procera)	denuded area
50	*Oudemansiella sp.*	325	on soil	grassland
51	*Armillaria sp.*	347	on rotten stump of lamio (Dracontomelon edule)	forested area
52	*Pleurotus ostreatus* Fr.	387	on rotten roots of malapapaya (Polyscias nodosa)	forested area
53	*Pleurotus porrigens* (Pers.) P. Kumm.	468	on rotten roots of takip - asin (Macaranga grandifolia)	plantation forest
54	*Pluteus sp.*	489	on soil	forested area
55	*Volvariella volvacea* (Bull.) Sing.	346	on rotten leaves of banana (Musa balbisiana)	denuded area
56	*Daedalea amanitoides* Beauv.	348	on rotten trunk of dao (Dracontomelon dao)	forested area
57	*Daedalea ambigua* Berk.	375	on rotten roots of lisihan (Aglaia sp.)	forested area
58	*Daedalea flavida* Lev.	389	on rotten stump of unknown tree	denuded area
59	*Daedalea sp.*	367	on rotten trunk of mahogany (Swietenia macrophylla)	forested area
60	*Daedaleopsis confragosa* (Bolt.) J. Schrot.	501	on rotten branch of anabiong (Trema orientalis)	forested area
61	*Favolus reniformis* (Murr.) Sacc. & Trotter	467	on rotten branch of tibig (Ficus nota)	plantation forest
62	*Fomes caryophylli* (Rac.) Bres.	468	on rotten stump of unknown tree	forested area
63	*Fomes gilvus* (Schwein.) Lloyd.	389	on rotten branch of molave (Vitex parviflora)	forested area
64	*Microporus affinis* (Blume & T.Nees.) Kuntze	378	on rotten branch of guijo (Shorea guiso)	forested area
65	*Microporus xanthopus* (Fr.) Kuntze	327	on rotten branches of mala - mangga (Mangifera sp.)	forested area
66	*Polyporus durus* Jungh.	378	on rotten branch of narra (Pterocarpus indicus)	plantation forest
67	*Polyporus gilvus* (Schw.) Fr.	436	on rotten branch of katmon (Dillenia philippinensis)	denuded area
68	*Polyporus hirsutus* (Wulf.) Fr.	343	on rotten brach of tara - tara (Caesalpinia spinosa)	forested area

69	*Polyporus roseus* (Alb.& Schwein.) Fr.	378	on rotten branch of narra (*Pterocarpus indicus*)	forested area
70	*Polyporus sp.*	366	on rotten trunk of kamagong (*Dyospyros philippinensis*)	forested area
71	*Poria sp.*	402	on rotten branch of mahogany (*Swietenia macrophylla*)	denuded area
72	*Trichaptum abietinum* (Dicks.) Ryvarden	389	on rotten branch of alibangbang (*Bauhinia purpurea*)	grassland
73	*Psathyrella sp.*	380	on soil	grassland
74	*Lactarius piperatus* (Scop.) Fr.	367	on soil	denuded area
75	*Russula sp.*	379	on soil	forested area
76	*Schizophyllum commune* Fr.	404	on rotten branch of golden shower (*Cassia fistula*)	forested area
77	*Stereum complicatum* (Fr.) Fr.	367	on rotten branch of guijo (*Shorea guiso*)	plantation forest
78	*Stereum ostrea* (Bl.& Nees.) Fr.	389	on rotten branch of pagsahingin (*Canarium asperum*)	plantation forest
79	*Stereum rugosum* (Pers.) Fr.	267	on rotten stump of alibangbang (*Bauhinia purpurea*)	forested area
80	*Stereum sanguinolentum* Fr.	289	on rotten stump of unknown tree	forested area
81	*Stereum sp.*	384	on rotten trunk of anonang (*Cordia dichotoma*)	forested area
82	*Hebeloma sp.*	278	on rotten roots of anabiong (*Trema orientalis*)	grassland
83	*Hypholoma fasciculare* (Huds.) Kummer	368	on soil	grassland
84	*Pholiota sp.*	465	on soil	grassland
85	*Psilocybe sp.*	478	on soil	plantation forest
86	*Stropharia rugoso-annulata* (Farlow) Murr.	356	on rotten root of yemane (*Gmelina arborea*)	grassland
87	*Thelephora terrestris* (Ehrenb.) Fr.	278	on rotten root of bignay (*Antidesma bunius*)	forested area
88	*Tremella fuciformis* Berk.	367	on rotten trunk of batino (*Alstonia scholaris*)	forested area
89	*Clitocybe sp.*	367	on soil	grassland
90	*Collybia maculata* (Alb.& Schw.) Kummer	465	on soil	grassland
91	*Lentinus strigosus* (Schwein.) Fr.	389	on rotten root of malapapaya (*Polyscias nodosa*)	forested area
92	*Panus rudis* Fr.	452	on rotten root of takip - asin (*Macaranga grandifolia*)	denuded area
93	*Termitomyces striatus* (Beeli) R. Heim.	278	on soil	grassland
94	*Termitomyces sp.*	267	on soil	grassland
95	*Tricholoma sp.*	289	on soil	grassland

Table 3. Meteorological data within the vicinity of the study sites at the time of collection

	2013									2014					
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Monthly Highest Temperature ^{0}C	37.4	38.8	37.0	35.2	33.8	34.4	33.0	33.5	33.8	31.8	33.5	35.3	37.2	37.2	37
Monthly Lowest Temperature ^{0}C	26.5	26.8	24.5	23.5	23.5	23.5	24	24.8	21.8	19.8	22.4	23.4	24.6	26	25
Monthly Total Rainfall (mm)	1.4	47.4	291	533	1339.5	977.2	246.3	130.2	28.8	0.4	0.0	7.2	1.2	81.5	321
Monthly Mean Humidity (1%)	70	75	79	81	85	87	81	80	79	73	73	73	72	72	80
Number of Rainy Days	2	0	0	21	21	28	13	15	10	1	3	4	2	7	18

Microporus xanthopus **(Fr.) Kuntze**

Ganoderma applanatum **(Pers.) Pat.**

Hexagonia tenuis (**Hook.) Fr.**

Hexagonia apiaria **(Pers.) Bres.**

Trametes corrugata **(Pers.) Bres.**

Auricularia polytricha **(Mont.) Sacc.**

Schizophyllum commune **Fr.**

Daedalea ambigua **Berk.**

Plate 3. Some of the macrofungal species collected from Mts. Palaypalay – Mataas na Gulod Protected Landscape. Photos taken by M. C. Arenas

Factors affecting the growth of macroscopic fungi

One of the important factors that contribute in the occurrence and abundance of macroscopic fungal species is tree species richness (Schmit et al 2005). This relationship explained the significant function of trees in the fungal existence ,as shown in Table 2, most of macroscopic fungal species recorded in MPMGPL are saprophytes inhabiting on rotten trees, trunks and branches. The prevailing meteorological parameters also contribute in the distribution of macroscopic fungi. The MPMGPL exhibits type I climate which is characterized to have two marked distinct season - dry which is from November to April and wet, from May to October. Rainy period is excessive from June to September, accompanying the prolific collection of macroscopic fungi at the time of field sampling.

The growth of fungi is greatly affected by climatic condition patterns, wherein decomposition of fungal species is higher in warm climates (Osono 2011). Therefore, rainy season specified cooler climate and is responsible for the ample growth of fungi as observed during the study period. It is also confirmed by the climatic data taken from record of Philippines Atmospheric Geophysical Services Administration (PAGASA), Sangley Point Cavite Satellite Station (Table 3). Climatic data used in the course of this study consisted of rainfall, temperature and relative humidity which verified the relationship of macroscopic fungal growth to these climatic factors.

The highest temperature during the collection period was in May 2013 with 38.8 ^{0}C and lowest in January 2014 at 19.8 ^{0}C. On the other hand, total monthly rainfall was highest August 2013 (1339.5 mm) and no rainfall in the month of February. Due to climate change, rainfall is not anticipated; this was proven in the variation of number of rainy days within a month. Highest monthly mean relative humidity was observed in September 2013 with 87% and lowest on April 2013 having 70%. Based on the shown climatic data, high rainfall was directly proportional to relative humidity and inversely proportional to temperature. Therefore, if the rainfall was high, the relative humidity was also high and supplemented by low temperature; this climatic condition allows the abundant growth of macroscopic fungal species.

CONCLUSIONS

A total of 95 species of macroscopic fungi identified at MPMGPL represented by Ascomycetes with four families, five genera and six species and Basidiomycetes has 34 families, 64 genera and 89 species. The study sites provide a wide range of habitat for macroscopic fungal species. These are composed of rotten fallen tree trunks and branches, living trees, timber, trails, grasslands, pasture land, fence posts, wood chips, stumps and leaf litters.

The bountiful number of collected and classified macroscopic fungi truly established the relationship of climatic factors specifically temperature, humidity and rainfall in the existence or lost of ecologically functional important organisms. Climatic factors were undeniably playing a crucial role in macroscopic fungal life cycle. Consequently, other factors like flora and fauna in the study sites with biophysical factors like nitrogen, oxygen and carbon dioxide might also affect the growth of macroscopic fungal species. The authors recommend further research in the existence and growth of macroscopic fungi in the Philippines to enhance knowledge in the status of this eukaryotes distribution in the country.

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