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TAXONOMIC INVENTORY BASED ON PHYSICAL DISTRIBUTION OF MACROFUNGI IN MT. MACULOT, CUENCA, BATANGAS, PHILIPPINES

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ABSTRACT

This research was conducted to assess the macrofungi and their physical distribution in terms of habitat, collection time, and elevation at Mt. Maculot, Cuenca, Batangas, Philippines. Field sampling was done using five transect lines each with 1,000 meters long in five different habitats. Opportunistic sampling was made from a baseline of 200 masl (meter above sea level) to 950 masl high. The collection sites were surveyed in different months of 2017, i.e. February, June, September and December. Collected macrofungal samples were categorized based on macro-anatomical characteristics. The documentation resulted in the identification of 92 species under 5 classes, 33 families, and 57 genera. Out of 92 collected taxa, 89% of collection were found inhabiting the forested area; 26% in grassland; 24% in shrub land / agricultural / denuded; 9% in rocky areas; and 11% in cliff. As regards to the collection time, 59% of 92 taxa were documented in February, 58% in June, 54% in September and 63% in December. Moreover, in accordance with elevation, 29% out of 92 taxa were observed between 348 - 405(masl), 8% of taxa in 406 – 463masl, 0 collection between 464 – 579 masl, 2% of taxa at 580 – 695masl, 36% of taxa in 696-753masl, 47% taxa in 754 - 811masl, 21%

taxa in 812-869masl and 22% taxa in 870-927 masl. The results suggest that the presence of macrofungal species is greatly affected by physical distribution.

Keywords: habitat, macrofungi, transect, physical distribution, Mt. Maculot

INTRODUCTION

Macrofungi are categorized as having spore-bearing fruiting bodies visible to the naked eye, which can be in the form of mushrooms, brackets, puffballs, false-truffles, cup fungi, etc. [1, 2]. They are the noteworthy component of the terrestrial ecosystem, which play crucial role in nutrient cycling [3]. Also have economical and medicinal importance, for they are good sources of food and nutraceutical products. These eukaryotic organisms are incapable of producing their own food, thus, they depend on the substrate for survival [4].

Globally there have been few studies on macrofungi, such as cited by Mueller [1] estimated 53,000 to 110,000 species. Hence, taxonomic studies of these organisms in the Philippines gains minimal attention, since there limited numbers of studies done in this field. Some of the areas surveyed are in Cavite [5], Aurora [6], and Batangas [7]. More studies are needed and should be made to account for the continuing survey of macrofungi in the Philippines.

Mt. Maculot is in the municipality of Cuenca in the province of Batangas, located in the Southern part of Luzon. It is between 13°55.241'N latitude and 121°02.513'E longitude and has an altitude of 200 to 963 masl [8, 9]. The mountain is considered as one of the popular mountain ecotourism site in the Philippines. Around three hours drive from Manila with it's rocky and cliff areas make it interesting weekend tourist spot for climbers and Catholic devotees on a Holy week for its famous Grotto [9].

Based on the case study done in ecotourism, the average monthly visitors in Mt. Maculot are around 3,000 persons [10]. With this notable disturbance of tourist visiting the mountain, which is evidently crossing the different habitat in the area and a common knowledge that species distribution is greatly affected by forest fragmentation [11], and the idea that the vegetation in the mountain influence the abundance of macrofungal species in the place [12]. Therefore, the researchers decided to conduct a study on how the trampled different habitat such as forested, grassland, shrub, agricultural, denuded, rocky and cliff account for the presence of macrofungi in Mt. Maculot. Moreover, evaluations of macrofungal species presence and absence in four times collection and in different altitude were also noted and measured.

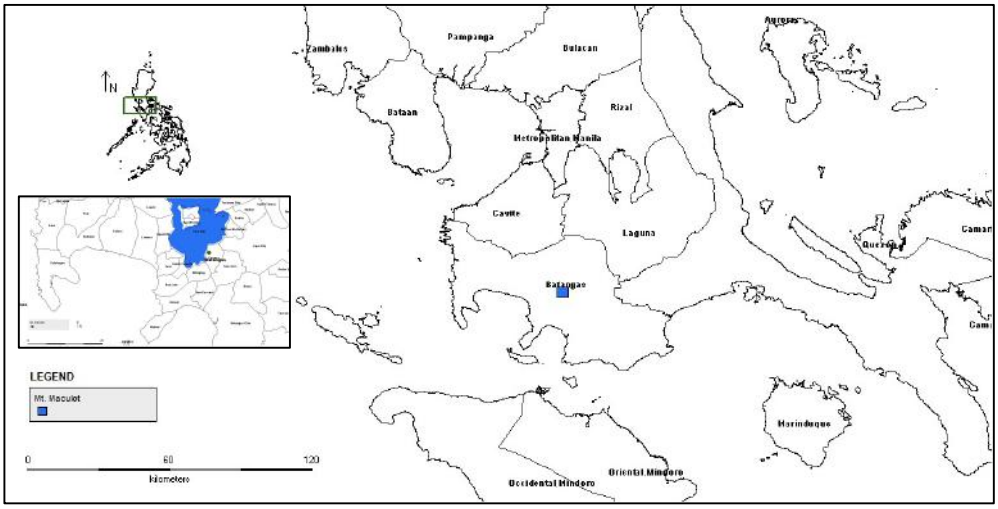

Fig.1 Map showing location of Mt. Maculot in the province of Batangas

MATERIALS AND METHODS

Field sampling of macrofungal species

Field sampling was accomplished using opportunistic sampling in different habitats such as forested area, grassland, shrub land / agricultural / denuded, rocky areas, and cliff. Collection and documentation were done in five transect lines each with 1000 meters long and started from a baseline of 200 masl up to 900 masl. The samplings were made in the months of February, June, September, and December. Substrates and growth habit of macrofungi, altitude of the site were recorded at the time of collection. Macrofungi that grow in soil were taken by trowel and those inhabiting the rotten tree logs were collected using a bolo.

Identification of macrofungi

The preliminary identification of collected samples was carried out using the taxonomic listing of Arenas [2], Lodge [12], Kuo [13], Ostry [14], Reyes [15], and Tadiosa [16]. The final identification of collected samples was done at Philippine National Herbarium.

Data Analysis

In order to determine the distribution of macrofungi, percent composition was determined to compare the number of taxa existing in the different habitat, collection period and altitude.

RESULTS

Taxonomic listing

During the four months of sampling of macrofungi at Mt. Maculot, a total of 92 species under 5 classes, 33 families, and 57 genera, as presented in Figure 2 and Table 1 were recorded. The data gathered revealed that macrofungi belonging to Class Agaricomycetes are the most dominant in Mt. Maculot. Most of the collected specimens were classified under Family Polyporaceae (Figure 3). The macrofungi that were observed in rotten twigs, logs, and branches were mostly solitary to gregarious and few are resupinate (Table 2).

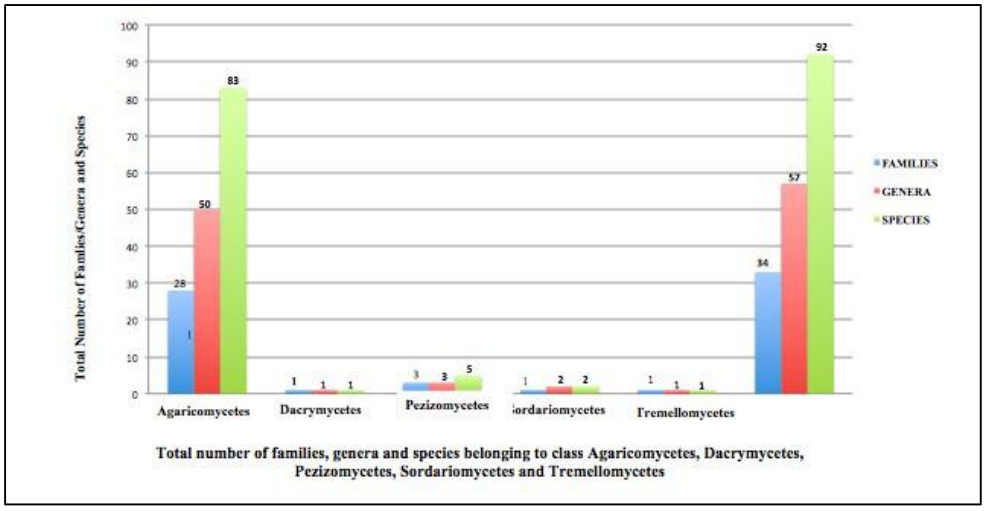

Figure 2: Classes of macrofungi collected in Mt. Maculot

Table 1: Taxonomic positions of the different macrofungi collected in Mt. Maculot

Agaricomycetes	COPRINACEAE	*Coprinus*	*Coprinus atramentarius* (Bull.) Fr.
			Coprinus comatus (O.F. Mull) Pers.
			Coprinus sp.
	CORIOLACEAE	*Lenzites*	*Lenzites sp.*
			Lenzites striata (Swartz.) Fr.
		Trametes	*Trametes corrugata* (Pers.) Bres.
			Trametes versicolor (L.) Lloyd.
	CORTICIACEAE	*Corticium*	*Corticium confluens* (Fr.) Fr.
			Corticium salmonicolor B.& Br.
			Corticium sp.
	CORTINARIACEAE	*Cortinarius*	*Cortinarius callisteus* (Fr.) Fr.
			Cortinarius sp.
	CREPIDOTACEAE	*Crepidotus*	*Crepidotus herbarum* (Peck) Sacc.
	ENTOLOMATACEAE	*Entoloma*	*Entoloma lividum* (Bull.) Quelet.
			Entoloma sp.
	GANODERMATACEAE	*Ganoderma*	*Ganoderma applanatum* (Pers.) Pat.
			Ganoderma lucidum (Leys.) Karst.
	GEASTRACEAE	*Geastrum*	*Geastrum triplex* Jungh.
	HYDNANGIACEAE	*Laccaria*	*Laccaria sp.*
	HYGROPHORACEAE	*Hygrocybe*	*Hygrocybe miniata* (Fr.) Kumm.
			Hygrocybe sp.
		Hygrophorus	*Hygrophorus pratensis* Fr.
			Hygrophorus sp.
	HYMENOCHAETACEAE	*Hymenochaete*	*Hymenochaete rubiginosa* (Dick.) Lev.
			Hymenochaete sp.
		Phellinus	*Phellinus* sp.
	MARASMIACEAE	*Marasmius*	*Marasmius ramealis* (Bull.) Fr.
			Marasmius rotula (Scop.) Fr.
			Marasmius sp.
		Omphalotus	*Omphalotus* sp.
	MERULIACEAE	*Cymatoderma*	*Cymatoderma elegans* Jungh.
	NIDULARIACEAE	*Cyathus*	*Cyathus striatus* Willd.
	PHALLACEAE	*Dictyophora*	*Dictyophora duplicata* (Bosc.) E. Fisch.
	PLUTEACEAE	*Pluteus*	*Pluteus* sp.
	POLYPORACEAE	*Coriolus*	*Coriolus versicolor*
		Daedalea	*Daedalea ambigua*
			Daedalea sp.
		Fomes	*Fomes caryophylli* (Rac.) Bres.
			Fomes gilvus (Shwein.) Lloyd.
			Fomes senex (Nees. & Mont.) Cooke
		Microporus	*Microporus xanthopus* (Fr.) Kuntze
		Panus	*Panus rudis* Fr.

Agaricomycetes	POLYPORACEAE	*Coriolus*	*Coriolus versicolor* (L.) Lloyd.
		Daedalea	*Daedalea ambigua* Berk.
			Daedalea sp.
		Fomes	*Fomes caryophylli* (Rac.) Bres.
			Fomes gilvus (Shwein.) Lloyd.
			Fomes senex (Nees. & Mont.) Cooke
		Microporus	*Microporus xanthopus* (Fr.) Kuntze
		Panus	*Panus rudis* Fr.
		Polyporus	*Polyporus grammocephalus* Berk.
			Polyporus hirsutus (Wulf.) Fr.
			Polyporus picipes Fr.
			Polyporus pinsitus Fr.
			Polyporus sp.
		Poria	*Poria* sp.
		Pycnoporus	*Pycnoporus sanguineus* Fr.
	RUSSULACEAE	*Lactarius*	*Lactarius piperatus* (Scop.) Fr.
			Lactarius sp.
		Russula	*Russula emetica* Fr.
			Russula sp.
	SCHIZOPHYLLACEAE	*Schizophyllum*	*Schizophyllum commune* Fr.
	STEREACEAE	*Stereum*	*Stereum ostrea* (Bl.& Nees.) Fr.
			Stereum sp.
	STROPHARACEAE	*Stropharia*	*Stropharia rugosoannulata* (Farlow) Murril
		Agrocybe	*Agrocybe* sp.
		Conocybe	*Conocybe* sp.
			Conocybe tenera (Schaeff.) Fayod
		Psilocybe	*Psilocybe sp.*
	TRICHOLOMATACEAE	*Clitocybe*	*Clitocybe* sp.
		Mycena	*Mycena* sp.
		Pleurotus	*Pleurotus ostreatus* (Jacq. ex Fr.) Kummer
			Pleurotus sp.
		Termitomyces	*Termitomyces albuminosa* (Berk.) Heim
			Termitomyces clypeatus R. Heim.
			Termitomyces eurhizus (Berk.) R.Heim.
		Tricholoma	*Tricholoma saponaceum* (Fr.) P.Kumm.
			Tricholoma sp.
	CANTHARELLACEAE	*Cantharellus*	*Cantharellus cibarius* Fr.
			Cantharellus infundibuliformis (Scop.) Fr.
			Cantharellus sp.
	CORIOLACEAE	*Hexagonia*	*Hexagonia apiaria* (Pers.) Fr.
			Hexagonia tenuis (Hook.) Fr.
	HYDNACEAE	*Hydnum*	*Hydnum* sp.
Dacrymycetes	DACRYOMYCETACEAE	*Dacryopinax*	*Dacryopinax spathularia* (Schwein.) Martin
Pezizomycetes	SARCOSOMATACEAE	*Galliela*	*Galiella rufa* (Shwein.) Nannf.& Korf.
		Cookeina	*Cookeina tricholoma* (Mont.) Kuntze
	PEZIZACEAE	*Peziza*	*Peziza repanda* Pers.
	PYRONEMATACEAE	*Octospora*	*Octospora sp.1*
			Octospora sp.2
Sordariomycetes	XYLARIACEAE	*Daldinia*	*Daldinia concentrica* (Bolt.) Ces.& de Not.
		Xylaria	*Xylaria polymorpha* (Pers.) Grev.
Tremellomycetes	TREMELLACEAE	*Tremella*	*Tremella fuciformis* Berk.

Table 2: Growth habits and substrates of collected macrofungi at Mt. Maculot

No.	Species	Growth Habit	Substrate
1	*Agaricus augustus* Fr.	gregarious	soil
2	*Agaricus campestris* Linn.	solitary	soil, along the trail
3	*Agrocybe* sp.	solitary	soil
4	*Auricularia auricula* (Hook.) Underw.	solitary to gregarious (2 -4 in a group)	rotten branch of *Clausena* , rotten twig of kakawate
5	*Auricularia mesenterica* (Dicks.) Pers.	gregarious	rotten branch of mango tree, unknown trunk
6	*Cantharellus cibarius* Fr.	gregarious	rotten twig of unknown tree
7	*Cantharellus infundibuliformis* (Scop.) Fr.	solitary to gregarious (2 -4 in a group)	rotten twig of *Murraya* , rotten branch of *Clausena*
8	*Cantharellus sp.*	gregarious	soil, near the creek
9	*Chlorophyllum sp.*	solitary	soil
10	*Clitocybe* sp.	solitary to gregarious (3-5 in a group)	soil
11	*Conocybe* sp.	gregarious	soil
12	*Conocybe tenera* (Schaeff.) Fayod	solitary	soil
13	*Cookeina tricholoma* (Mont.) Kuntze	solitary to gregarious (3-4 in a group)	rotten twig of *Murraya*
14	*Coprinus atramentarius* (Bull.) Fr.	gregarious	soil, near the creek
15	*Coprinus comatus* (O.F. Mull.) Gray	solitary to gregarious (3-5 in a group)	soil
16	*Coprinus* sp.	solitary	soil, along the trail
17	*Coriolus versicolor Linn.*	resupinate	rotten trunk of *Ficus*
18	*Corticium confluens Fr.*	resupinate	rotten stump of kakawate
19	*Corticium salmanicolor* Berk & Broome	resupinate	rotten twig of unknown tree
20	*Corticium sp.*	resupinate	unknown trunk
21	*Cortinarius callisteus* (Fr.) Fr.	gregarious	rotten trunk of *Harpulia*
22	*Cortinarius* sp.	solitary to gregarious (2 -4 in a group)	soil
23	*Crepidotus herbarum* (Peck) Sacc.	solitary to gregarious (3-4 in a group)	rotten trunk *Antidesma* , rotten branch of unknown tree, rotten twig of lianas
24	*Cyathus striatus* Willd.	gregarious	rotten roots of tuai, rotten bamboo culm, rotten roots of tuai
25	*Cymatoderma elegans* Jungh.	solitary	rotten roots of *Canthium*
26	*Dacryopinax spathularia* (Schwein.) Martin	soitary to gregarious (2 -3 in a group)	rotten stump of *Wrightia* , *Syzygium,* rotten trunk of *Harpulia*
27	*Daedalea ambigua* Berk.	solitary to gregarious (2 -4 in a group)	rottem stump of *Pterospermum*
28	*Daedalea sp.*	solitary to gregarious (3-5 in a group)	rotten stump of ipil - ipil, unknown roots
29	*Daldinia concentrica* (Bolt.) Ces.& de Not.	solitary to gregarious (3-4 in a group)	rotten trunk of *Palaquium* , *Macaranga, Antidesma*
30	*Dictyophora duplicata* (Bosc.) E. Fisch.	solitary	soil
31	*Entoloma lividum*	gregarious	soil
32	*Entoloma* sp.	solitary	soil
33	*Fomes caryophylli* (Rac.) Bres.	solitary (2-3 in a group)	rotten stump of *Wrightia*
34	*Fomes gilvus* (Shwein.) Lloyd.	solitary	rotten stump of katmon
35	*Fomes senex (Nees. & Mont.) Cooke*	solitary to gregarious (4-6 in a group)	rotten branch of jackfruit
36	*Galliela rufa* (Shwein.) Nannf.& Korf.	gregarious	rotten roots of *Canthium, Antidesma*
37	*Ganoderma applanatum* (Pers.) Pat.	solitry to gragarious (3-4)	rotten roots of *Canthium* , rotten stump of balobo, rotten stump of *Pterospermum*
38	*Ganoderma lucidum* (Leys.) Karst.	solitary to gregarious (3-5 in a group)	rotten stump of *Canarium*
39	*Geastrum triplex* Jungh.	solitary to gregarious (3-4 in a group)	rotten roots of *Pterospermum* , bamboo culms, unknown roots, soil along the trail
40	*Hexagonia apiaria* (Pers.) Fr.	solitary to gregarious (3-4 in a group)	rotten branch of *Macaranga*
41	*Hexagonia tenuis* (Hook.) Fr.	solitary to gregarious (3-4 in a group)	rotten branch of *Harpulia,*
42	*Hydnum* sp.	resupinate	rotten trunk of jackfruit
43	*Hygrocybe miniata* (Fr.) Kumm.	solitary	soil
44	*Hygrocybe sp.*	gregarious	soil
45	*Hygrophorus pratensis* Fr.	gragarious	soil, along the trail
46	*Hygrophorus* sp.	solitary	soil
47	*Hymenochaete rubiginosa* (Dick.) Lev.	soitary to gregarious (2 -3 in a group)	unknown trunk
48	*Hymenochaete* sp.	solitary to gregarious (3-4 in a group)	rotten branch of *Macaranga*
49	*Laccaria sp.*	resupinate	soil
50	*Lactarius piperatus* (Scop.) Fr.	solitary	soil
51	*Lactarius* sp.	solitary	soil
52	*Lenzites striata* (Swartz.) Fr.	solitary to gregarious (4-6 in a group)	rotten branch of jackfruit
53	*Lenzites sp.*	gregarious	rotten bamboo culm
54	*Lepiota cristata* (Bolt.) Kumm.	gregarious	rotten twig of *Murraya*
55	*Macrolepiota procera* (Scop.) Gray	gregarious	soil, along the trail
56	*Marasmius ramealis* (Bull.) Fr.	solitary to gregarious (3-5 in a group)	unknown roots, rotten branch of lianas
57	*Marasmius rotula* (Scop.) Fr.	gregarious	unkown roots, soil
58	*Marasmius sp.*	gregarious	soil

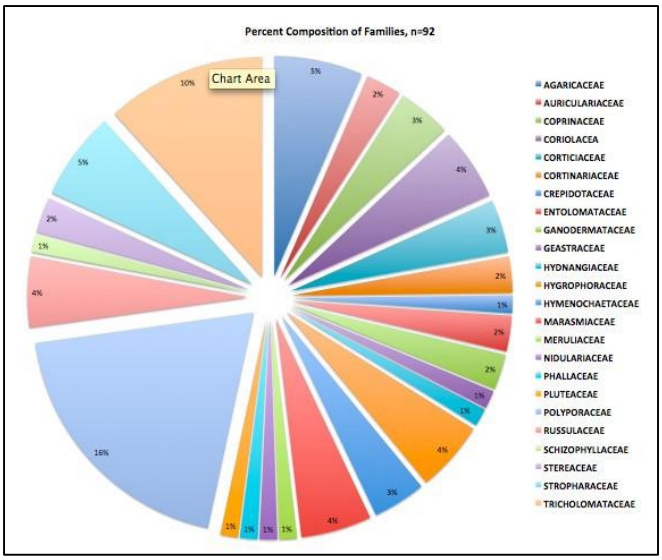

Figure 3: Percent composition of macrofungal families in Mt. Maculot

Physical Distribution of Macrofungi in Mt. Maculot

The climatic data at the time of collection are reflected in Table 3 wherein the highest temperature is 36.2^{0}C in June and the lowest temperature is 17^{0}C in February. On the other hand, relative humidity is highest in September and lowest in February. Moreover, amount of rainfall is highest (326.8 mm) in December, which corresponds to the number total of rainy days.

The macrofungal habitat distribution showed that among 92 taxa collected in Mt. Maculot, 82 (89%) taxa were documented in forested area, 24 (26%) taxa in grassland, 13 (14%) taxa in shrub/agricultural/kaingin, 8 (9%) taxa in rocky and 10 (11%) taxa in cliff as reflected in Table 4. In Table 5, the four months collection with 92 taxa 54 (59%) found in the month of February, 53 (58%) in June, 50 (54%) in September and 58 (63%) in December. Also, in Table 6 distribution of species in distinctive elevations are shown, 27 (29%) of taxa were documented at 348 – 405masl, 9 (10%) at 406 – 463masl, without collection at 464 – 579masl, 2 (2%) of taxa at 580 – 695masl, 33 (36%) of taxa at 696-753masl, 43 (47%) of taxa at 754 – 811masl, 19 (21%) of taxa at 812 – 869masl, and 20 (22%) of taxa at 870 – 927masl. The result showed that no common species were observed in all altitudes.

Table 3: Prevailing climatic conditions during collection

	Ambulong Synaptic Station Data			
	February	June	September	December
Highest Temperature ^{0}C	33.7	36.2	34.4	32.3
Lowest Temperature ^{0}C	17.6	23.5	21.2	21.1
Monthly Mean Relative Humidity	76	83	85	80
Monthly Rainfall (mm)	0	78.9	321.15	326.8
Number of Rainy Days	1	14	19	22

Table 4: Distribution of macrofungi in different habitat at Mt. Maculot

No.	Species	Forested	Grassland	Shrub/Agricultural / Kaingin	Rocky	Cliff
1	*Agaricus augustus* Fr.	+	-	-	-	-
2	*Agaricus campestris* Linn.	-	+	-	-	-
3	*Agrocybe* sp.	+	+			
4	*Auricularia auricula* (Hook.) Underw.	+	-	+	+	-
5	*Auricularia mesenterica* (Dicks.) Pers.	+	+		-	-
6	*Cantharellus cibarius* Fr.	+	-	+	-	-
7	*Cantharellus infundibuliformis* (Scop.) Fr.	+	-	-	-	-
8	*Cantharellus sp.*	+	-	-	-	-
9	*Chlorophyllum sp.*	+	-	-	-	-
10	*Clitocybe* sp.	+	+	-	-	-
11	*Conocybe* sp.	+	+	-	-	-
12	*Conocybe tenera* (Schaeff.) Fayod	+	+	-	-	-
13	*Cookeina tricholoma* (Mont.) Kuntze	+	-	-	-	-
14	*Coprinus atramentarius* (Bull.) Fr.	+	-	-	-	-
15	*Coprinus comatus* (O.F. Mull.) Gray	+	-	-	-	-
16	*Coprinus* sp.	+	-	-	-	-
17	*Coriolus versicolor Linn.*	+	-	+	-	-
18	*Corticium confluens Fr.*	+	-	-	-	-
19	*Corticium salmanicolor* Berk & Broome	+	-	-	-	-
20	*Corticium sp.*	+	-	-	-	-
21	*Cortinarius callisteus* (Fr.) Fr.	+	+	-	-	-
22	*Cortinarius* sp.	+	-	-	-	-
23	*Crepidotus herbarum* (Peck) Sacc.	+	-	-	-	+
24	*Cyathus striatus* Willd.	+	-	+	-	-
25	*Cymatoderma elegans* Jungh.	+	-	-	-	-
26	*Dacryopinax spathularia* (Schwein.) Martin	+	-	+	-	-
27	*Daedalea ambigua* Berk.	+	-	-	-	-
28	*Daedalea sp.*	-	-	-	-	+
29	*Daldinia concentrica* (Bolt.) Ces.& de Not.	+	-	+	+	+
30	*Dictyophora duplicata* (Bosc.) E. Fisch.	+	+	-	-	-
31	*Entoloma lividum*	+	-	-	-	-
32	*Entoloma* sp.	+	+	-	-	-
33	*Fomes caryophylli* (Rac.) Bres.	+	-	-	-	-
34	*Fomes gilvus* (Shwein.) Lloyd.	+	-	-	-	-
35	*Fomes senex (Nees. & Mont.) Cooke*	+	-	-	-	-
36	*Galliela rufa* (Shwein.) Nannf.& Korf.	+	-	+	-	-
37	*Ganoderma applanatum* (Pers.) Pat.	+	-	+	-	-
38	*Ganoderma lucidum* (Leys.) Karst.	+	-	-	-	-
39	*Geastrum triplex* Jungh.	+	-	+	-	-
40	*Hexagonia apiaria* (Pers.) Fr.	+	-	-	-	-
41	*Hexagonia tenuis* (Hook.) Fr.	+	-	-	+	+
42	*Hydnum* sp.	+	-	-	-	+
43	*Hygrocybe miniata* (Fr.) Kumm.	-	+	-	-	-
44	*Hygrocybe sp.*	+	+	-	-	-
45	*Hygrophorus pratensis* Fr.	-	+	-	-	-
46	*Hygrophorus* sp.	-	+	-	-	-
47	*Hymenochaete rubiginosa* (Dick.) Lev.	+	-	-	-	-
48	*Hymenochaete* sp.	+	-	-	-	-
49	*Laccaria sp.*	+	-	-	-	-
50	*Lactarius piperatus* (Scop.) Fr.	+	+	-	-	-
51	*Lactarius* sp.	+	-	-	-	-
52	*Lenzites striata* (Swartz.) Fr.	+	-	-	-	-
53	*Lenzites sp.*	+	-	-	-	+
54	*Lepiota cristata* (Bolt.) Kumm.	-	+	-	-	-
55	*Macrolepiota procera* (Scop.) Gray	-	+	-	-	-
56	*Marasmius ramealis* (Bull.) Fr.	+	+	-	-	-
57	*Marasmius rotula* (Scop.) Fr.	+	+	-	-	-
58	*Marasmius sp.*	+	-	-	-	-
59	*Microporus xanthopus* (Fr.) Kuntze	+	-	-	+	+
60	*Mycena* sp.	+	+	+	-	-
61	*Octospora sp.1*	+	-	-	-	-
62	*Octospora* sp.2	+	+	-	-	-
63	*Omphalotus* sp.	+	-	-	-	-
64	*Panus rudis* Fr.	+	-	-	-	-
65	*Peziza repanda* Pers.	+	-	-	-	-
66	*Phellinus* sp.	+	-	-	-	-
67	*Pleurotus ostreatus* (Jacq. ex Fr.) Kummer	+	-	+	-	-
68	*Pleurotus sp.*	+	-	-	-	-
69	*Pluteus* sp.	+	-	-	-	-
70	*Polyporus grammocephalus* Berk.	+	-	-	-	-
71	*Polyporus hirsutus* (Wulf.) Fr.	+	-	-	-	-
72	*Polyporus picipes Fr.*	+	-	-	+	-
73	*Polyporus pinsitus* Fr.	+	-	-	-	-
74	*Polyporus sp.*	+	-	-	-	-
75	*Poria* sp.	+	-	-	-	-
76	*Psilocybe sp.*	+	-	-	-	-
77	*Pycnoporus sanguineus* Fr.	+	-	-	+	-
78	*Russula emetica* Fr.	+	+	-	-	-
79	*Russula sp.*	+	-	-	-	-
80	*Schizophyllum commune* Fr.	+	-	+	+	+
81	*Stereum ostrea* (Bl.& Nees.) Fr.	+	-	-	-	-
82	*Stereum sp.*	+	-	-	-	-
83	*Stropharia rugosoannulata* (Farlow) Murril	-	+	-	-	-
84	*Termitomyces albuminosa* (Berk.) Heim	+	-	+	-	-
85	*Termitomyces clypeatus* R. Heim.	+	+	-	-	-
86	*Termitomyces eurhizus* (Berk.) R.Heim.	-	+	-	-	-
87	*Trametes corrugata* (Pers.) Bres.	-	-	-	+	+
88	*Trametes versicolor (L.) Lloyd.*	+	-	-	-	-
89	*Tremella fuciformis* Berk.	+	-	-	-	-
90	*Tricholoma saponaceum* (Fr.) P.Kumm.	+	-	-	-	-
91	*Tricholoma* sp.	+	-	-	-	-
92	*Xylaria polymorpha* (Pers.) Grev.	+	-	-	-	+
	Total number of taxa collected	**82**	**24**	**13**	**8**	**10**

Table 5: Distribution of macrofungi in different time of collection at Mt. Maculot

No.	Species	February	June	September	December
1	*Agaricus augustus* Fr.	-	-	+	-
2	*Agaricus campestris* Linn.	-	+	+	-
3	*Agrocybe* sp.	+	-	+	-
4	*Auricularia auricula* (Hook.) Underw.	+	+	+	-
5	*Auricularia mesenterica* (Dicks.) Pers.	-	+	-	-
6	*Cantharellus cibarius* Fr.	-	-	-	+
7	*Cantharellus infundibuliformis* (Scop.) Fr.	+	+	+	+
8	*Cantharellus sp.*	-	-	+	-
9	*Chlorophyllum sp.*	-	-	+	-
10	*Clitocybe* sp.	+	-	+	+
11	*Conocybe* sp.	-	-	-	+
12	*Conocybe tenera* (Schaeff.) Fayod	+	-	-	+
13	*Cookeina tricholoma* (Mont.) Kuntze	-	+	+	+
14	*Coprinus atramentarius* (Bull.) Fr.	-	+	-	+
15	*Coprinus comatus* (O.F. Mull.) Gray	-	-	+	-
16	*Coprinus* sp.	+	-	-	-
17	*Coriolus versicolor Linn.*	-	-	-	+
18	*Corticium confluens Fr.*	-	-	-	+
19	*Corticium salmanicolor* Berk & Broome	+	-	-	-
20	*Corticium sp.*	-	+	-	-
21	*Cortinarius callisteus* (Fr.) Fr.	+	+	+	+
22	*Cortinarius* sp.	+	-	-	-
23	*Crepidotus herbarum* (Peck) Sacc.	+	+	+	+
24	*Cyathus striatus* Willd.	+	+	+	+
25	*Cymatoderma elegans* Jungh.	-	+	-	+
26	*Dacryopinax spathularia* (Schwein.) Martin	+	+	+	+
27	*Daedalea ambigua* Berk.	+	+	-	+
28	*Daedalea sp.*	-	-	+	
29	*Daldinia concentrica* (Bolt.) Ces.& de Not.	+	+	+	+
30	*Dictyophora duplicata* (Bosc.) E. Fisch.	+	+	+	+
31	*Entoloma lividum*	-	+	-	
32	*Entoloma* sp.	-	+	-	+
33	*Fomes caryophylli* (Rac.) Bres.	-	-	-	+
34	*Fomes gilvus* (Shwein.) Lloyd.	+	+	-	+
35	*Fomes senex (Nees. & Mont.) Cooke*	-	-	+	-
36	*Galliela rufa* (Shwein.) Nannf.& Korf.	-	+	+	+
37	*Ganoderma applanatum* (Pers.) Pat.	+	+	+	+
38	*Ganoderma lucidum* (Leys.) Karst.		+	-	+
39	*Geastrum triplex* Jungh.	+	+	+	+
40	*Hexagonia apiaria* (Pers.) Fr.	-	+		+
41	*Hexagonia tenuis* (Hook.) Fr.	+	+	+	+
42	*Hydnum* sp.	+	+	+	+
43	*Hygrocybe miniata* (Fr.) Kumm.	-	+	-	+
44	*Hygrocybe sp.*	+	-	+	-
45	*Hygrophorus pratensis* Fr.	+	-	-	-
46	*Hygrophorus* sp.	-	-	+	+
47	*Hymenochaete rubiginosa* (Dick.) Lev.	-	-	+	+
48	*Hymenochaete* sp.	+	-	+	-
49	*Laccaria sp.*	-	-	+	-
50	*Lactarius piperatus* (Scop.) Fr.	+		+	-
51	*Lactarius* sp.	+	-	-	+
52	*Lenzites striata* (Swartz.) Fr.	+	+	-	+
53	*Lenzites sp.*	+	-	+	
54	*Lepiota cristata* (Bolt.) Kumm.	+	+	-	+
55	*Macrolepiota procera* (Scop.) Gray	+	+	-	+
56	*Marasmius ramealis* (Bull.) Fr.	+	+	+	+
57	*Marasmius rotula* (Scop.) Fr.	+	+	+	+
58	*Marasmius sp.*	+	+	-	-
59	*Microporus xanthopus* (Fr.) Kuntze	+	+	+	+
60	*Mycena* sp.	+	-	+	+
61	*Octospora sp.1*	+	-	+	+
62	*Octospora* sp.2	+	-	+	+
63	*Omphalotus* sp.	+	+	+	+
64	*Panus rudis* Fr.	-	+	-	+
65	*Peziza repanda* Pers.	-	+	+	+
66	*Phellinus* sp.	+	+	-	+
67	*Pleurotus ostreatus* (Jacq. ex Fr.) Kummer	-	+	-	+
68	*Pleurotus sp.*	+	-	+	-
69	*Pluteus* sp.	-	+	-	+
70	*Polyporus grammocephalus* Berk.	-	-	-	+
71	*Polyporus hirsutus* (Wulf.) Fr.	-	+	-	+
72	*Polyporus picipes Fr.*	+	+	+	+
73	*Polyporus pinsitus* Fr.	-	+	-	+
74	*Polyporus sp.*	+		-	
75	*Poria* sp.	+	+	+	+
76	*Psilocybe sp.*	+	-	+	-
77	*Pycnoporus sanguineus* Fr.	-	+	-	-
78	*Russula emetica* Fr.	+	+	+	+
79	*Russula sp.*	+	-	-	-
80	*Schizophyllum commune* Fr.	+	+	+	+
81	*Stereum ostrea* (Bl.& Nees.) Fr.		+	+	+
82	*Stereum sp.*	+	-	-	-
83	*Stropharia rugosoannulata* (Farlow) Murril	+	-	+	+
84	*Termitomyces albuminosa* (Berk.) Heim	-	+	-	-
85	*Termitomyces clypeatus* R. Heim.	+	-	+	+
86	*Termitomyces eurhizus* (Berk.) R.Heim.	-	+	+	
87	*Trametes corrugata* (Pers.) Bres.	+	-	+	+
88	*Trametes versicolor (L.) Lloyd.*	+	-	-	-
89	*Tremella fuciformis* Berk.	+	+	-	-
90	*Tricholoma saponaceum* (Fr.) P.Kumm.	+	+	+	-
91	*Tricholoma* sp.	-	+	-	-
92	*Xylaria polymorpha* (Pers.) Grev.	+	+	-	+
	Total number of taxa documented	**54**	**53**	**50**	**58**

Table 6: Distribution of macrofungi in different elevations

No.	Species	348-405	406-463	464-521	522-579	580-695	696-753	754-811	812-869	870-927
1	*Agaricus augustus* Fr.	-	-	-	-	-	+	-	-	-
2	*Agaricus campestris* Linn.	+	-	-	-	-	-	-	-	-
3	*Agrocybe* sp.	+	-	-	-	-	+	-	-	-
4	*Auricularia auricula* (Hook.) Underw.	+	-	-	-	+	+	-	-	-
5	*Auricularia mesenterica* (Dicks.) Pers.	+	-	-	-	-	+	-	-	-
6	*Cantharellus cibarius* Fr.	-	-	-	-	-	-	-	+	-
7	*Cantharellus infundibuliformis* (Scop.) Fr.	+	+	-	-	-	+	-	-	-
8	*Cantharellus sp.*	-	-	-	-	-	-	+	-	-
9	*Chlorophyllum sp.*	-	-	-	-	-	-	+	-	-
10	*Clitocybe* sp.	-	+	-	-	-	-	-	-	-
11	*Conocybe* sp.	-	-	-	-	-	+	-	-	-
12	*Conocybe tenera* (Schaeff.) Fayod	-	+	-	-	-	-	-	-	-
13	*Cookeina tricholoma* (Mont.) Kuntze	-	-	-	-	-	+	+	-	-
14	*Coprinus atramentarius* (Bull.) Fr.	-	-	-	-	-	-	+	-	-
15	*Coprinus comatus* (O.F. Mull.) Gray	-	-	-	-	-	-	+	-	-
16	*Coprinus* sp.	-	-	-	-	-	-	+	-	-
17	*Coriolus versicolor Linn.*	+	-	-	-	-	-	-	-	-
18	*Corticium confluens Fr.*	-	-	-	-	-	-	+	-	-
19	*Corticium salmanicolor* Berk & Broome	-	-	-	-	-	-	+	+	-
20	*Corticium sp.*	-	-	-	-	-	-	+	+	-
21	*Cortinarius callisteus* (Fr.) Fr.	+	-	-	-	-	-	-	-	-
22	*Cortinarius* sp.	-	-	-	-	-	+	-	-	-
23	*Crepidotus herbarum* (Peck) Sacc.	-	-	-	-	-	+	-	+	-
24	*Cyathus striatus* Willd.	+	-	-	-	-	+	+	-	-
25	*Cymatoderma elegans* Jungh.	-	-	-	-	-	-	-	+	-
26	*Dacryopinax spathularia* (Schwein.) Martin	-	-	-	-	-	-	-	+	-
27	*Daedalea ambigua* Berk.	-	-	-	-	-	-	+	+	-
28	*Daedalea sp.*	-	-	-	-	-	+	+	-	-
29	*Daldinia concentrica* (Bolt.) Ces.& de Not.	-	+	-	-	+	+	-	+	-
30	*Dictyophora duplicata* (Bosc.) E. Fisch.	+	-	-	-	-	+	-	-	-
31	*Entoloma lividum*	+	-	-	-	-	-	-	-	-
32	*Entoloma* sp.	+	-	-	-	-	-	+	+	-
33	*Fomes caryophylli* (Rac.) Bres.	-	-	-	-	-	-	-	+	-
34	*Fomes gilvus* (Shwein.) Lloyd.	-	-	-	-	-	-	+	+	-
35	*Fomes senex (Nees. & Mont.) Cooke*	-	-	-	-	-	-	-	+	-
36	*Galliela rufa* (Shwein.) Nannf.& Korf.	+	-	-	-	-	-	-	-	+
37	*Ganoderma applanatum* (Pers.) Pat.	+	-	-	-	-	-	+	-	+
38	*Ganoderma lucidum* (Leys.) Karst.	-	-	-	-	-	-	-	-	+
39	*Geastrum triplex* Jungh.	+	-	-	-	-	-	-	-	+
40	*Hexagonia apiaria* (Pers.) Fr.	-	-	-	-	-	-	-	-	+
41	*Hexagonia tenuis* (Hook.) Fr.	-	-	-	-	-	+	+	-	+
42	*Hydnum* sp.	-	-	-	-	-	-	+	-	+
43	*Hygrocybe miniata* (Fr.) Kumm.	+	-	-	-	-	-	-	-	-
44	*Hygrocybe sp.*	+	-	-	-	-	-	-	-	+
45	*Hygrophorus pratensis* Fr.	-	+	-	-	-	-	-	-	-
46	*Hygrophorus* sp.	+	-	-	-	-	-	-	-	-
47	*Hymenochaete rubiginosa* (Dick.) Lev.	-	-	-	-	-	-	-	+	-
48	*Hymenochaete* sp.	-	-	-	-	-	-	-	+	+
49	*Laccaria sp.*	-	-	-	-	-	-	+	-	-
50	*Lactarius piperatus* (Scop.) Fr.	+	-	-	-	-	+	-	-	-
51	*Lactarius* sp.	-	-	-	-	-	-	-	+	-
52	*Lenzites striata* (Swartz.) Fr.	-	-	-	-	-	+	-	+	-
53	*Lenzites sp.*	-	-	-	-	-	+	-	-	-
54	*Lepiota cristata* (Bolt.) Kumm.	-	+	-	-	-	-	-	+	-
55	*Macrolepiota procera* (Scop.) Gray	+	-	-	-	-	-	-	-	-
56	*Marasmius ramealis* (Bull.) Fr.	+	-	-	-	-	-	+	+	-
57	*Marasmius rotula* (Scop.) Fr.	+	-	-	-	-	-	+	+	-
58	*Marasmius sp.*	-	-	-	-	-	-	+	-	-
59	*Microporus xanthopus* (Fr.) Kuntze	-	-	-	-	-	+	-	-	+
60	*Mycena* sp.	+	-	-	-	-	+	+	-	+
61	*Octospora sp.1*	-	-	-	-	-	+	-	-	+
62	*Octospora* sp.2	-	-	-	-	-	-	+	-	-
63	*Omphalotus* sp.	+	-	-	-	-	-	+	-	+
64	*Panus rudis* Fr.	-	-	-	-	-	+	-	-	-
65	*Peziza repanda* Pers.	-	-	-	-	-	+	+	-	+
66	*Phellinus* sp.	-	-	-	-	-	-	+	-	-
67	*Pleurotus ostreatus* (Jacq. ex Fr.) Kummer	-	-	-	-	-	-	+	-	+
68	*Pleurotus sp.*	-	-	-	-	-	-	+	-	+
69	*Pluteus* sp.	-	-	-	-	-	-	+	-	-
70	*Polyporus grammocephalus* Berk.	-	-	-	-	-	-	+	-	-
71	*Polyporus hirsutus* (Wulf.) Fr.	-	-	-	-	-	-	+	-	-
72	*Polyporus picipes Fr.*	-	-	-	-	-	-	+	-	+
73	*Polyporus pinsitus* Fr.	-	-	-	-	-	+	-	-	-
74	*Polyporus sp.*	-	-	-	-	-	-	-	-	+
75	*Poria* sp.	-	-	-	-	-	+	+	-	+
76	*Psilocybe sp.*	-	-	-	-	-	+	+	-	-
77	*Pycnoporus sanguineus* Fr.	-	-	-	-	-	-	+	-	-
78	*Russula emetica* Fr.	-	+	-	-	-	-	-	-	-
79	*Russula sp.*	-	-	-	-	-	+	-	+	-
80	*Schizophyllum commune* Fr.	+	-	-	-	-	+	+	-	-
81	*Stereum ostrea* (Bl.& Nees.) Fr.	-	-	-	-	-	-	+	-	-
82	*Stereum sp.*	-	-	-	-	-	+	-	-	-
83	*Stropharia rugosoannulata* (Farlow) Murril	-	+	-	-	-	-	-	-	-
84	*Termitomyces albuminosa* (Berk.) Heim	+	-	-	-	-	-	-	-	-
85	*Termitomyces clypeatus* R. Heim.	+	-	-	-	-	-	-	-	-
86	*Termitomyces eurhizus* (Berk.) R.Heim.	+	-	-	-	-	-	+	-	-
87	*Trametes corrugata* (Pers.) Bres.	-	-	-	-	-	+	+	-	-
88	*Trametes versicolor (L.) Lloyd.*	-	-	-	-	-	+	+	-	-
89	*Tremella fuciformis* Berk.	-	-	-	-	-	+	+	-	-
90	*Tricholoma saponaceum* (Fr.) P.Kumm.	-	-	-	-	-	+	+	-	-
91	*Tricholoma* sp.	-	-	-	-	-	+	-	-	-
92	*Xylaria polymorpha* (Pers.) Grev.	-	-	-	-	-	+	+	-	+
	Total number of taxa documented	**27**	**9**	**0**	**0**	**2**	**33**	**43**	**19**	**20**

DISCUSSION

Members of the Order Agaricales are the most abundant among the macrofungi under Phylum Basidiomycota, in fact, one-fifth of all the described fungi is contained in this group [17] and they propagate in a various habitat [18], hence their existence can be a symbiont, saprophytes and parasitic [4]. Thus, the richness of class Agaricomycetes in Mt. Maculot is due to the availability of numerous substrates in the area, making macrofungal species survived although it is one of the most visited mountains in the region[19].

The dominance of family Polyporaceae at Mt. Maculot is viable because the tree species in the mountain is diverse and 22.9% of them are even endemic [8], so more wood-rotting macrofungi can be seen in the forested area compared to other habitats. A study in the tree and macrofungal species revealed that the presence of tree, is positively correlated with fungal diversity [12]. In fact, in the study of Marzuki [20] 19 species of macrofungi were documented in a wood substrate which is distributed in the different designated stations. Therefore, forested area has more number of macrofungal species since it is undisturbed [25], which corresponds to the high occurrence of 82 taxa out of 92 taxa documented in the forested area at Mt. Maculot. Additionally, plant host specificity of wood rotting fungi has great effect on the distribution of macrofungal species in the forest [11].The host specificity is also evident in the result of the study of Pradhan [26] showing macrofungal specificity in terms of habitat such as natural forest, plantation forest, and villages.

Understanding the distribution of species in the habitat is important in the assessment of species in a particular place and time [4]. This is supported by the data collated in this study that shows a distinct number of macrofungal taxa wherein 82 out of 92 documented taxa. The other habitat which is basically grassland yielded poor number of documented taxa due to limited availability of substrates for macrofungi to grow. On the other hand, agricultural area is disturbed by residents due to intensive farming activities.

The Philippines has four types of climate being specific to each region. Mt. Maculot is in the eastern part of Batangas which falls under Type III climatic type, wherein there is no distinct maximum rain and has a short dry season i.e. from December to February or March to May [19]. Rainfall is one of the important factors to consider in macrofungal growth, in fact, many species emerged after rainfall within 10, 15, or 30 days [29] and the amount of

rainfall which yielded abundant growth of macrofungi is 200mm. Another factor is the effect of the temperature on nutrition of fungi [13], a high occurrence is in the average of 23~24.9^{o}C, maximum of 28~31.9^{o}C, and minimum temperatures of 22~23.9^{o}C. The relative humidity is an additional factor for ample growth of fungi and the ideal is > 82% [14].

In another study in the course of temperature and relative humidity in mushroom cultivation, productive growth is in the range of 18/25ºC – 27/29ºC and 55-85/78-93% relative humidity [18]. Nowadays, fungal growth and distribution are affected by the concurrent climate change which is an inevitable fact that resulted in the disturbance of seasonal occurrence of fungal species [5],[24],[26]. The climatic data during the collection is within the range that stimulated the emergence of various macrofungal species. Moreover, the capacity of spores to store water and survived until enough moisture is absorbed in the environment, facilitated hyphal growth and eventually towards the development of fruiting bodies [15]. Thus, moisture and temperature have great influence on fungal growth in a favorable climatic condition [33].

The elevation or altitude is expressed as meters above sea level (masl), likewise a contributing factor in the distribution of macrofungi in the study site [16]. In this study, most macrofungi were documented at 696 -753masl and in 754 – 811masl than in lower elevation. This is due to the availability of tree species as substrates in the forested area in high elevation [3]. And the number decreases at 812 -927masl, this fact is conceivable because the Mt. Maculot Rockies is overseeing the Taal Lake and Taal Volcano, due to its well-known trail with well developed camp site for tourists, thus, many hikers often visit the mountain which causes stress to the vegetation and other inhabitants including macrofungi. In addition, sightseers may not be concerned in the conservation of Mt. Maculot to provide sustainability [7].

CONCLUSION

The collection yielded a total of 92 species which were grouped under five classes, the Agaricomycetes with 28 families, 50 genera, and 83 species; Dacryomycetes with one family, one genus and one species; Pezizomycetes with three families, three genera and five species; Sordariomycetes with one family, two genera and two species; and Tremellomycetes with one family, one genus and one species. The distribution of macrofungal species in the different habitat of Mt. Maculot implied that the forested areas with diverse tree species and is rarely visited by hikers contained the largest number of collected taxa compared with the cliff and rocky sites that have the least

number of documented taxa. In the lowest elevation at 348masl – 405masl, the documented taxa are mostly gilled mushrooms that grow on leaf litter and in the soil. On the other hand, most macrofungal species in Mt. Maculot are confined in higher elevation various tree species. Despite being visited by hikers, Mt. Maculot still harbors different macrofungal species due to the availability of substrates such as rotting trees and leaf litters. However, there is still a need of continuously monitoring the macrofungal and other species for sustainability and conservation of Mt. Maculot.

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