Species listing and diversity of myxomycetes from Mt. Makulot and Napayong Island in Taal Lake, Batangas, Philippines

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Abstract
The rich vegetation of volcanic forest offers a unique habitat to explore myxomycetes (slime molds). In this study, the occurrence and diversity of myxomycetes in forest areas of Taal Volcano Crater Rim (Mt. Makulot) and Napayong Island in Taal Lake are reported. Decayed aerial and ground leaf litter, twigs, and woody vines collected from the study areas were used to prepare 1,110 moist-chamber cultures. A total of 35 species belonging to 14 genera were collected. These slime molds were identified as species of *Arcyria, Ceratiomyxa, Clastoderma, Collaria, Comatricha, Cribraria, Diachea, Diderma, Didymium, Hemitrichia, Lamproderma, Perichaena, Physarum* and *Stemonitis*. Five species were unique to Mt. Makulot while seven species were exclusively recorded in Napayong Island. Napayong Island also had a higher species diversity as compared to Mt. Makulot. In terms of substrate types, highest species diversity was recorded in ground litter collected in Napayong Island. This study is the first listing of species of myxomycetes in Napayong Island, a small island within a lake within an island.

Keywords: annotated list, island biodiversity, plasmodial slime molds, species occurrence, taxonomy

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Introduction
Myxomycetes, commonly known as plasmodial slime molds, are a group of morphologically diverse but predominantly terrestrial, fungus-like protists. These organisms are known to occur in forest ecosystems with rich vegetation where they feed on algae, yeasts, and bacteria. Myxomycetes inhabit varied microhabitats including decaying woods (Taylor et al. 2015), aerial and ground leaf litter (Redeña-Santos et al. 2017), woody vines (Coelho and Stephenson 2012), grass litter (Carascal et al. 2017), and sometimes even on living leaves (Stephenson et al. 2011). Their occurrence can be influenced by the type of substrata they inhabit, and by the different intrinsic and extrinsic factors present in their environment (Everhart and Keller 2008).

Myxomycetes are also widely distributed in tropical ecosystems. In tropical Southeast Asia, several studies in the last decade centered on documenting the species of myxomycetes in the region. For example, Rosing et al. (2011) surveyed 12 sites in Singapore and processed previously collected plant litter. That study reported 76 species of myxomycetes from 26 genera, with 36 species as new records for Singapore. Interestingly, many of the new records in the study of Rosing et al. were derived from moist chamber cultures of bark and litter. Ko Ko et al. (2013) reported the first study of myxomycetes in Laos and reported 44 species belonging to 17 genera, with many species recorded as rare, that is, represented only by one or two collections. Ko Ko et al. (2015) also reported the first records of myxomycetes in Cambodia. Their study documented 30 species in 16 genera, mainly from moist chamber cultures. In both studies, not all microhabitats were investigated, and that the collection of substrata and/or field specimens was limited only to few days. This highlighted the need to further study the region as more intensive sampling efforts could yield possibly more new records or even new species of tropical myxomycetes.

Studies on myxomycetes in the Philippines have gained momentum in the last decade. Recent studies have updated the list of species recorded in the country from 107 to 150 (Dagamac and dela Cruz 2015) and recently to 159 (Dagamac and dela Cruz 2019). These new records were identified from studies conducted in Luzon Island (Corpuz et al. 2012, Dagamac et al. 2010, 2012, 2015a, Kuhn et al. 2013a, 2013b, dela Cruz et al. 2014, Rea-Maminta et al. 2015, Bernardo et al. 2018), in the Bicol Region (Dagamac et al. 2017) and in the islands of Bohol (Macabago et al. 2017), Mindoro (Macabago et al. 2012, Dagamac et al. 2015b), Negros Occidental (Alfaro et al. 2015), Palawan (Pecundo et al. 2017) and Polillo (Viray et al. 2014). Studies also shifted from mere taxonomic listing, e.g. dela Cruz et al. (2010, 2011), Dagamac et al. (2011), Atayde et al. (2012), to ecological studies, i.e. Macabago et al. (2010, 2012), Dagamac et al. (2014), dela Cruz et al. (2014) including studies on enzyme production by Macabago and dela Cruz (2014). Myxomycetes have also been the subject of studies for their use in teaching as described in dela Cruz et al. (2012) and Macabago and dela Cruz (2012).

Myxomycetes are also known to thrive in volcanic areas. Rojas et al. (2010) initially reported myxomycetes from the forest and non-forested areas of La Malinche Volcano and Cofre de Perote Volcano in Mexico with a total of 32 recorded species. Albeit low in species number, a total of 21 myxomycetes were also reported along the northern slope of Mt. Makulot, part of the Taal Volcano crater area (Cheng et al. 2013). In the present study, we listed species of myxomycetes obtained from Mt. Makulot along the inner crater rim of Taal Volcano and from Napayong Island within the Taal crater lake. We also evaluated their species diversity. Both study sites were partly disturbed due to the presence of residential houses and eco-tourism activities and therefore, would be ideal sites to study any impact of human disturbance to microbial diversity. However, before such impact assessment can be conducted, it is important to conduct initial taxonomical or biodiversity studies that will serve as baseline data.

Materials and methods

Study sites

Mt. Makulot (N13°55’13’’, E121°2’33’’, 947 meters above sea level), located in the municipality of Cuenca in the province of Batangas is part of the volcanic crater rim wall of Taal Volcano. In this study, the forested area along the inner crater rim of Mt. Makulot served as one of the study sites and represented the sampling locality at the periphery of Taal Lake (Fig. 1). This collection site was also on the other side (back slope) of the study area previously surveyed by Cheng et al. (2013). In addition, this study also surveyed Napayong Island (N14°02'10.1'', E121°02'44.5'', 75 masl) which is part of the Volcano Island within Taal Lake. The island represented a geographically isolated sampling locality at the center of Taal Lake and would therefore be ideal for a comparative study. Generally, the study sites are characterized by Type 1 climate with two pronounced seasons: dry season from November to April and wet during the rest of the year. The average temperature in the area was reported to be 25.7 °C where the month of May has the highest average temperature of 28.8 °C. Highest precipitation is usually experienced in the month of July with an average of 320 mm (https://en.climate-data.org).

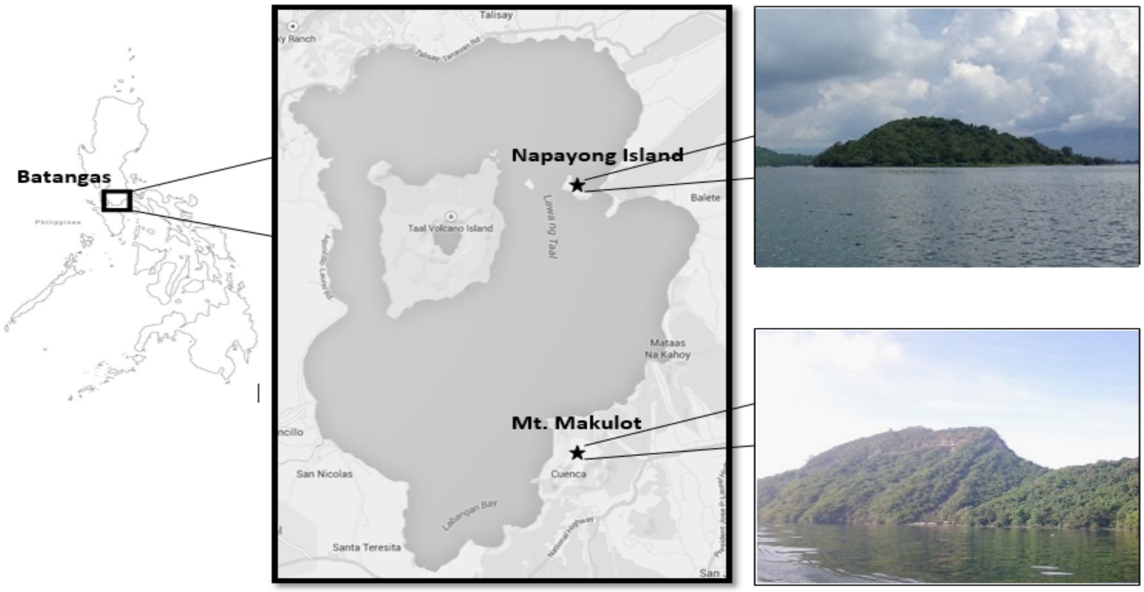

Figure 1: Map of study sites: Napayong Island within Taal Lake under the municipality of Tanauan, Batangas and the inner crater rim of Mt. Makulot under the municipality of Cuenca, Batangas. (Photos by AJL Lapira)

Substrate collection and preparation of moist chambers

Collection of substrata was conducted in May 2014. Twenty samples each of aerial leaf litter (AL), ground leaf litter (GL), and twigs (TW) were randomly collected from three sampling points within the forested areas along the crater rim of Mt. Makulot, while thirty samples of each similar substrata were collected from two sampling points within the forested areas in Napayong Island. Ten samples of woody vines (VN) were collected only from a sampling point in Mt. Makulot. Each of the collected substratum was separately placed inside dry, brown paper bags, labeled accordingly, transported to the laboratory, and air-dried for at least one week prior to preparation of moist chambers (MC). Following the protocol of Stephenson and Stempen (1994), the collected substrata were cut into small pieces and placed inside the moist chambers, i.e. one sample in triplicate MC plates. Moist chamber includes disposable petri plates lined with filter paper. After soaking overnight, the pH of the substrata was determined with a portable pH meter and the excess water was poured out from the dish. All moist chambers were incubated under diffused light at room temperature for eight weeks. The presence of either plasmodia or fruiting bodies in the MC was checked at least once a week. Distilled water was added to keep the chamber moist within the duration of incubation. After eight weeks, moist chambers were allowed to dry, and then moistened with distilled water and incubated for another four weeks. The number of moist chambers positive for myxomycetes was recorded. Furthermore, the collected fruiting bodies were used to prepare voucher specimens for long-term storage. This was prepared by fixing a portion of the substrate together with the fruiting bodies on herbarium boxes. Voucher specimens were assigned with the UST Myxomycete Collection (USTMC) accession numbers and deposited at the Mycology Laboratory, Research Center for the Natural and Applied Sciences, University of Santo Tomas in Manila, Philippines.

Characterization and identification of myxomycetes

All identifiable myxomycetes collected from the moist chambers were observed under a stereomicroscope (Olympus SZ2-ILST) to observe for the type, shape, size, and color of the fruiting bodies. Other identifying characteristics like the presence of capillitium and lime were also noted. Spores were also mounted on a glass slide with lactophenol as mounting medium and were observed under the light compound microscope (Olympus CX31-12C04). The color, size, and shape were noted and recorded. The fruiting body and spore descriptions were compared with published literature (Stephenson and Stempen 1994, Keller and Braun 1999), online database (http://slimemold.uark.edu), and web-based identification key (SYNKey, Mitchell 2008). An online nomenclatural information system was also used to verify the valid names of each identified species (http://nomen.eumycetozoa.com/). A species list was generated for this study.

Data analysis

Initially, the productivity of the moist chambers was assessed as described by Dagamac et al. (2012). The presence of either fruiting body or a plasmodium/ sclerotium on a single moist chamber was noted as a positive collection. The percent yield (PY) was then calculated by dividing the number of MC with plasmodia/ fruiting bodies by the total number of MC prepared. The relative abundance (RA) was also determined for each of species of myxomycetes recorded from the MC as described in Dagamac et al. (2012). The relative abundance for each species was then presented as Abundance Index (Stephenson et al. 1993) wherein the species were categorized as (A) Abundant if RA $\geq$3% of the total collections, (C) Common if RA $\geq$ 1.5% but less than 3% of the total collections, (O) Occasionally Occurring if RA $\geq$ 0.5% but less than 1.5% of the total collections, and (R) Rare if RA< 0.5% of the total collections.

Taxonomic diversity index (TDI), also known as the S/G ratio, was computed as the ratio of the species to the genera. This was calculated by dividing the number of species present by the number of genera present in each substrate. Since the value of the S/G ratio (TDI) is inversely proportional to the taxonomic diversity, the lower the value of the calculated S/G ratio, the higher the taxonomic diversity. Taxonomic diversity was computed to have an overview of the diversity in an area or a substrate. This is supported by Stephenson et al. (1993) which stated that species distributed among a larger number of genera would be more diverse as opposed to a variety of species found in a single genus. In addition, species diversity was also determined using the following diversity indices as described by Magurran (2004): (1) Gleason Index of Species Richness (HG) which measures the species richness or the number of species per sample, (2) the Pielou's Index of Species Evenness (E) which measures the similarity in species relative abundance, and (3) the Shannon Index of Diversity (HS) which measures diversity by taking into account both species richness and evenness. We used the software PAST (Hammer et al. 2001;

http://folk.uio.no/ohammer/past) to compute the Diversity t test for the determination of significant difference between the study sites.

Results

Moist chamber productivity

Of the 1,110 moist chambers prepared in this study, 1,014 MCs equivalent to 91 % yielded myxomycetes either as plasmodium/ sclerotium or fruiting body. Looking at the different substrata, the MC yield was recorded highest for aerial and ground leaf litter (Fig. 2). Interestingly, although very few samples of woody vines (VN) were collected, it still recorded a very high moist chamber productivity.

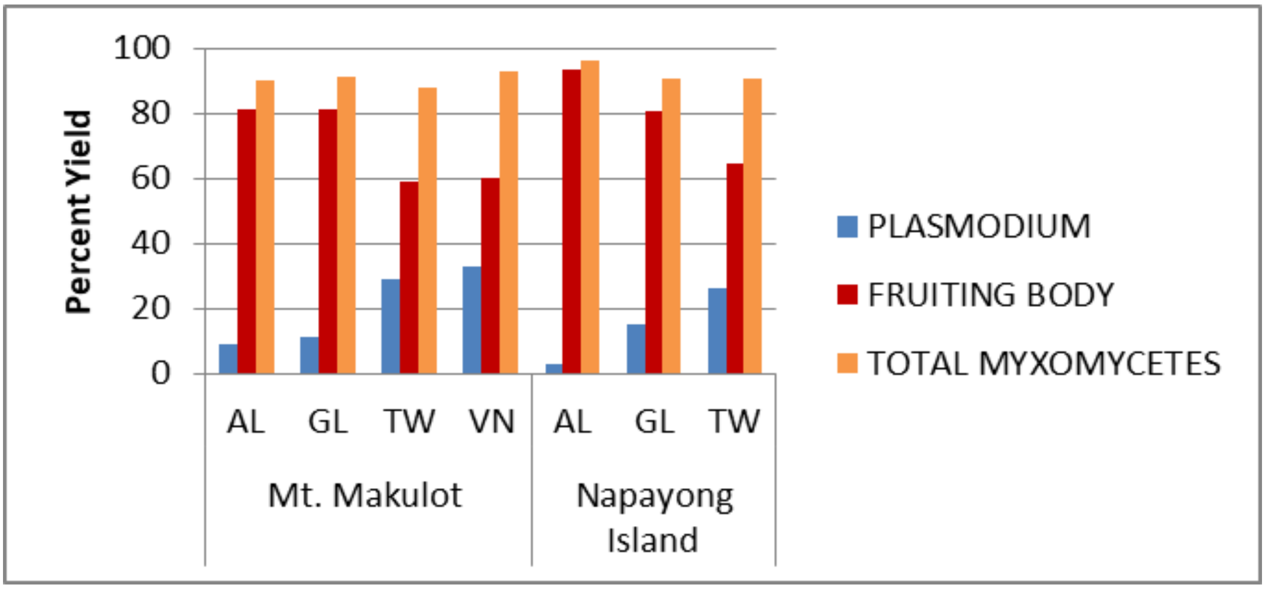

Figure 2: Productivity of moist chambers from substrates collected in Mt. Makulot and Napayong Island, Taal Lake.

Species listing

Twenty-eight species were recorded in Mt. Makulot from 850 collections, while 30 species were recorded in Napayong Island from 1,058 collections. Collectively, a total of 35 species belonging to 14 genera and distributed as — *Arcyria* (5), *Ceratiomyxa* (1), *Clastoderma* (1), *Collaria* (1), *Comatricha* (2), *Cribraria* (1), *Diachea* (1), *Diderma* (2), *Didymium* (4), *Hemitrichia* (1), *Lamproderma* (1), *Perichaena* (5), *Physarum* (8) and *Stemonitis* (2) — were observed in this study. Myxomycetes collected from the two sites are listed below (see Fig. 3 for representative specimens). The list is alphabetically arranged by species, genus and taxonomic order following Leontyev et al. (2019). The species were listed along with the study sites [Mt. Makulot (MK) and Napayong Island (NP)] and the number of collections per site. The substrates [aerial litter (AL), ground litter (GL), twigs (TW) and vines (VN)] where the species were obtained were also indicated. A total of 159 representative herbarium specimens were prepared from these collections and assigned with the accession numbers USTMC 2297 to USTMC 2455 for long-term storage.

CERATIOMYXALES
Ceratiomyxa fruticulosa O.F. Müll. T. Macbr., [4 (MK), 1 (NP); TW]

CLASTODERMATALES
Clastoderma debaryanum A. Blytt, [1 (MK); TW]

CRIBRARIALES
Cribraria violacea Rex, [15 (MK); GL, TW, VN]

PHYSARALES
Diderma effusum Schwein. Morgan, [42 (MK), 7 (NP); AL, GL, TW, VN]
D. hemisphaericum Bull. Hornem., [148 (MK), 103 (NP); AL, GL, TW]
Didymium clavus Alb. & Schwein. Rabenh., [1 (NP); GL]
D. iridis Ditmar Fr., [1 (NP); GL]
D. nigripes Link Fr., [2 (MK), 5 (NP); AL, GL, TW]
D. squamulosum Alb. & Schwein. Fr., [17 (MK), 46 (NP); AL, GL, TW]
Physarum album Bull. Chevall., [2 (MK), 2 (NP); AL GL]
P. bivalve Pers., [97 (MK), 56 (NP); AL, GL, TW]
P. cinereum Batsch Pers., [50 (MK), 43 (NP); AL, GL, TW]
P. compressum Alb. & Schwein., [24 (MK), 31 (NP); AL, GL, TW]
P. decipiens M.A. Curtis, [19 (MK), 21 (NP); AL, GL, TW, VN]
P. melleum Berk. & Broome Massee, [4 (MK), 12 (NP); AL, GL, TW]
P. superbum Hagelst., [1 (NP); GL]
P. viride Bull. Pers., [1 (MK); TW]

STEMONITIDALES
Collaria arcyrionema Rostaf. Nann.-Bremek. ex Lado, [10 (MK), 21 (NP); AL, GL, TW]
Comatricha nigra Pers. J. Schröt., [8 (MK), 42 (NP); AL, GL, TW, VN]
C. pulchella C. Bab. Rostaf., [9 (MK), 23 (NP); AL, GL, TW, VN]
Diachea leucopodia Bull. Rostaf., [50 (MK), 27 (NP); AL, GL, TW]
Lamproderma scintillans Berk. & Broome Morgan, [15 (MK), 7 (NP); AL, GL, TW, VN]
Stemonitis herbatica Peck, [1 (NP); TW]
S. fusca Roth, [12 (MK), 8 (NP); AL, GL, TW]

ORDER TRICHIALES
Arcyria afroalpina Rammeloo, [53 (MK), 139 (NP); AL, GL, TW, VN]
A. cinerea Bull. Pers., [190 (MK), 192 (NP); AL, GL, TW, VN]
A. denudata L. Wettst., [1 (MK); AL]
A. globosa Schwein., [1 (MK), 6 (NP); AL, TW]
A. pomiformis Leers Rostaf., [10 (MK), 1 (NP); AL, TW, VN]
Hemitrichia serpula Scop. Rostaf., [1 (MK); GL]
Perichaena chrysosperma Curr. Lister, [50 (MK), 144 (NP); AL, GL, TW]
P. depressa Lib., [14 (MK), 78 (NP); AL, GL, TW]
P. dictyonema Rammeloo, [30 (NP); AL, GL, TW]
P. minor G. Lister, [1 (NP); GL]
P. pedata (Lister et G. Lister) Lister ex E. Jahn, [8 (NP); AL, G]

Abundance and diversity. Of the 28 species recorded in Mt. Makulot, eight species were abundant, six species were common, five species were occasionally occurring, and nine species were considered rare (Table 1). In Napayong Island, nine species were abundant, six species were common, six species were occasionally occurring, and nine species were rare. Between the two study areas, *Arcyria afroalpina, A. cinerea, P. chrysosperma, D. hemisphericum, Physarum bivalve*, and *P. cinereum* were observed to be abundantly thriving, with *A. cinerea* being the most abundant species of all. A great number of abundant species recorded from both sites belonged to the order *Physarales*. In terms of substrates collected in Mt. Makulot, *A. cinerea* was the most abundant species on aerial litter, twigs, and vines while *D. hemisphaericum* was the most abundant species on ground litter (Table 1). In Napayong Island, *A. cinerea* was the most abundant on aerial litter, *P. chrysosperma* on twigs, and *D. hemisphaericum* on ground litter.

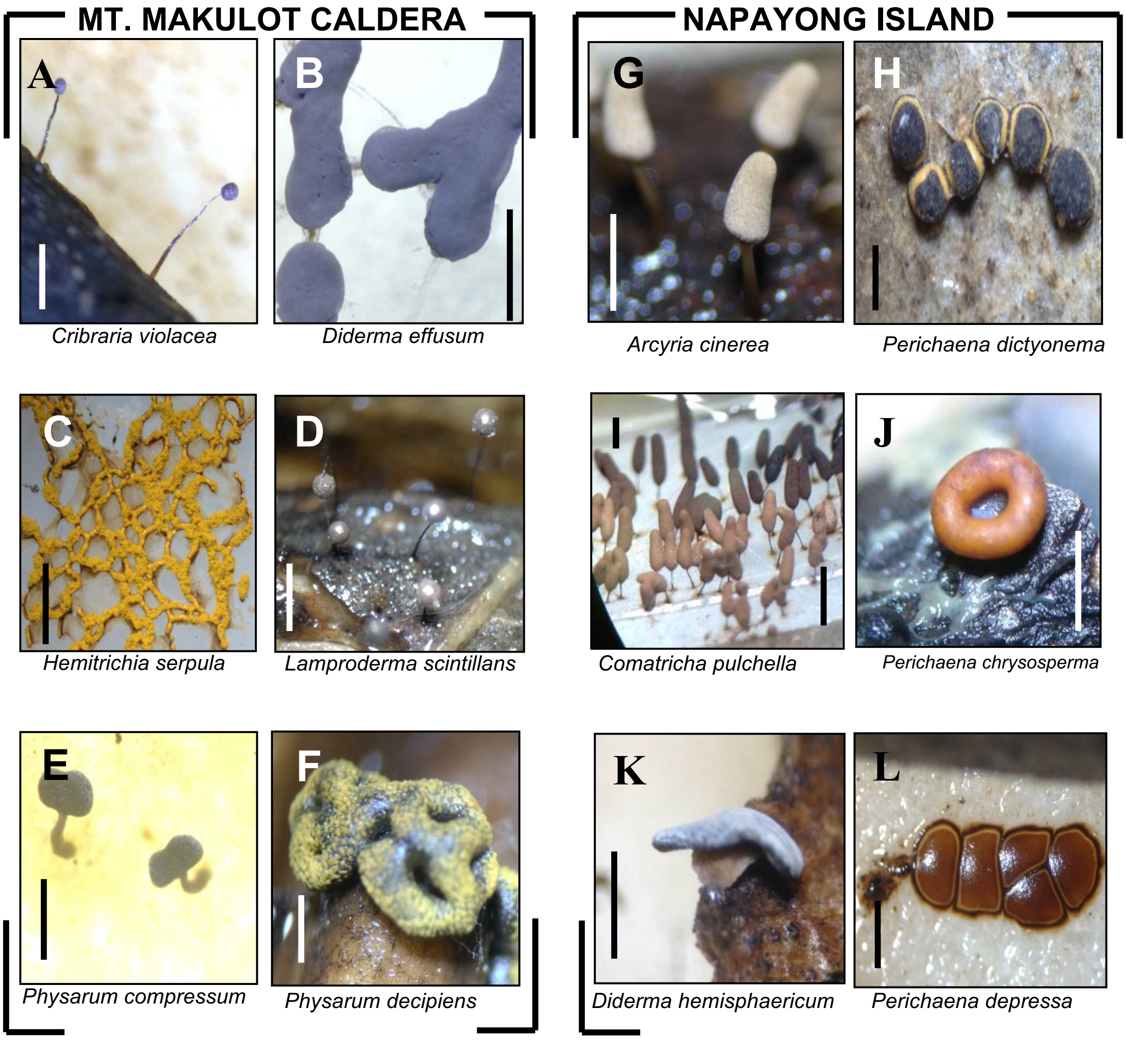

Figure 3: Representative species of myxomycetes recovered from Mt. Makulot Inner Crater Rim (A-F) and Napayong Island (G-L) in Taal Lake. Scale bar in A, C, H, I was 0.5 mm while scale bars in other specimens were 1 mm.

Despite having almost similar number of reported species, Mt. Makulot (TDI = 2.07) had a higher taxonomic diversity as compared to Napayong Island (TDI = 2.73) (Table 2). In terms of substrates, ground leaf litter was most taxonomically diverse in Mt. Makulot, while twigs were recorded as the most taxonomically diverse in Napayong Island. In the present study, higher species diversity was recorded in Napayong Island than Mt. Makulot while both sites presented almost equal evenness (Table 2). Statistical analysis with the diversity t test showed significant differences between the diversity values of Mt. Makulot and Napayong Island (p = 0.0312, alpha = 0.05). Comparing the assemblages of myxomycetes in the two study areas, *A. afroalpina, A. cinerea, A. globosa, A. pomiformis, Collaria arcyrionema, Ceratiomyxa fruticulosa, Comatricha nigra, C. pulchella, D. effusum, D. hemisphaericum, Diachea leucopodia, Didymium nigripes, D. squamulosum, Lamproderma scintillans, Perichaena depressa, Physarum album, P. bivalve, P. cinereum, P. compressum, P. decipiens, P. melleum, P. chrysosperma,* and *Stemonitis fusca* were common to both study sites. In Mt. Makulot and Napayong Island, the following species (with no. of collections) have been found to be unique on a single substrate: *C. fruticulosa* (4), *C. debaryanum* (1), *P. viride* (1), and *S. herbatica* (1) were found only on twigs, *A. denudata* (1) was found on aerial leaf litter only, while *H. serpula* (1), *P. minor* (1), *P. superbum* (1), *D. clavus* (1) and *D. iridis* (1) were found on ground leaf litter only.

Discussion

Forests in volcanic areas provide a unique habitat even for myxomycetes. For example, Rojas et al. (2010) reported the occurrence myxomycetes in the forested and non-forested areas of La Malinche Volcano and Cofre de Perote Volcano in Mexico which suggested the potential of volcanic areas to support the growth of myxomycetes. In that study, a total of 32 species of myxomycetes were reported in contrast to the 35 species recorded herewith. Nevertheless, *Comatricha, Diachea, Didymium, Lamproderma, Perichaena, Physarum* and *Stemonitis* were the genera common to both studies. This is not surprising since it was previously suggested that volcanic areas can provide favorable conditions to which myxomycetes may thrive. This is supported by the study of Dossa et al. (2013) which stated that the surrounding areas post-volcanic eruptions will eventually become suitable for various flora and fauna to inhabit.

The MC productivity reported in the present study is relatively high as compared to other studies of myxomycetes in the Philippines. Considering the productivity for each of the substrates, the highest record was reported in aerial and ground leaf litter (Fig. 2). In the tropics, several studies had also reported a high percent yield for leaf litter (Macabago et al. 2010, Cheng et al. 2013, dela Cruz et al. 2014). It was stated that the rough surface characteristic of leaf litter favored the trapping of spores dispersed through wind (Stephenson 1989) and thus, making it more suitable for myxomycetes (Rojas and Stephenson 2008). Collection of substrata at the onset of the rainy season (May 2014) could have also contributed to the high productivity of the moist chambers. However, further studies are still needed to determine the best time to collect substrata and/or field specimens of myxomycetes in the Philippines.

In the previous study of Cheng et al. (2013), three species were recorded as abundant, two of which, *A. cinerea* and *A. afroalpina* were also found to be abundant in the present study. *A. cinerea* as abundant species is also not surprising due to its cosmopolitan distribution as observed in other studies conducted in the Philippines by Kuhn et al. (2013a, 2013b) and Dagamac et al. (2012). The cosmopolitan distribution of *A. cinerea* could be a result of its better spore dispersal and adaptation to growth in both tropical and temperate ecoregions. One taxon, *Physarum melleum,* was recorded as rare species in this study and that of Cheng et al. (2013). Interestingly, three rare species of myxomycetes, *i.e. Diachea bulbilosa*, *Stemonitis herbatica*, and *Lycogala* sp., were found exclusively along the northern slope (Cheng et al. 2013), while seven rare species were recorded to be present only within the inner crater rim area. *Physarum superbum, Stemonitis herbatica, Perichaena minor* and *P. pedata* were recorded as rare in Napayong Island, that is, with very few collections.

Table 1: Relative abundance of myxomycetes recorded in this study.

Taxa	NP[a]	Napayong Island			MK	Mt. Makulot Caldera			
		GL	AL	TW		GL	AL	TW	VN
Arcyria afroalpina	A	A	A	C	A	O	A	A	A
A. cinerea	A	A	A	A	A	A	A	A	A
A. denudata	-	-	-	-	R	-	R	-	-
A. globosa	O	-	O	-	R	-	-	O	-
A. pomiformis	R	-	R	-	O	-	C	C	A
Ceratiomyxa fruticulosa	R	-	-	R	R	-	-	O	-
Clastoderma debaryanum	-	-	-	-	R	-	-	O	-
Collaria arcyrionema	C	C	C	C	O	O	O	C	-
Comatricha pulchella	C	-	O	A	O	R	O	C	A
C. nigra	A	A	C	C	O	-	O	C	A
Cribraria violacea	-	-	-	-	C	R	-	A	A
Diachea leucopodia	C	C	C	C	A	A	A	C	-
Diderma effusum	O	O	O	-	A	A	A	O	A
D. hemisphaericum	A	A	A	C	A	A	A	A	-
Didymium clavus	R	R	-	-	-	-	-	-	-
D. iridis	R	R	-	-	-	-	-	-	-
D. nigripes	R	O	R	-	R	-	R	-	A
D. squamulosum	A	A	C	C	C	O	C	O	-
Hematricha serpula	-	-	-	-	R	R	-	-	-
Lamproderma scintillans	O	O	O	R	C	R	R	A	A
Perichaena chrysosperma	A	A	A	A	A	C	A	A	-
P. depressa	A	A	A	A	C	O	C	O	-
P. dictyonema	C	O	A	O	-	-	-	-	-
P. minor	R	R	-	-	-	-	-	-	-
P. pedata	O	O	O	-	-	-	-	-	-
Physarum album	R	O	-	-	R	-	O	-	-
P. bivalve	A	A	A	A	A	A	A	A	-
P. cinereum	A	C	A	A	A	A	A	-	-
P. comressum	C	C	C	A	C	R	A	C	A
P. decipiens	C	C	C	C	C	C	-	-	-
P. melleum	O	C	R	O	R	-	-	C	-
P. superbum	R	R	-	-	-	-	-	-	-
P. viride	-	-	-	-	R	-	-	O	-
Stemonitis fusca	O	-	-	A	O	O	O	A	-
S. herbatica	R	-	-	R	-	-	-	-	-

[a] Abundance indices per site (Mt. Makulot, MK; Napayong Island, NP) and substrates (AL, GL, TW, VN): (A) Abundant, RA ≥3%, (C) Common, RA ≥ 1.5 to <3%, (O) Occasional, RA ≥ 0.5 to <1.5%, (R) Rare, RA< 0.5%

Table 2: Taxonomic and species diversity of myxomycetes from forest areas in Mt. Makulot Inner Crater Rim and Napayong Island within Taal Lake.

	No. of Species	No. of Genera	TDI (S/G ratio)	Hs[a]	Hg	E
Mt. Makulot Inner Crater Rim						
AL	20	10	2.00	1.03	3.22	0.40
GL	18	10	1.50	0.91	3.03	0.37
TW	24	14	1.71	1.11	4.39	0.49
VN	11	7	1.57	0.88	2.97	0.60
Pooled	29	14	2.07	2.56	4.15	0.46
Napayong Island						
AL	22	9	2.44	1.06	3.35	0.39
GL	24	9	2.67	1.14	3.99	0.45
TW	20	11	1.82	1.12	3.55	0.48
Pooled	30	11	2.73	2.66	4.16	0.47

[a] Diversity t test showed significant differences between the study areas (p = 0.0312, alpha = 0.05).

Comparing the two sites in this study, Mt. Makulot inner crater rim area had a higher taxonomic diversity as compared to Napayong Island (Table 2), albeit the species diversity indices between the two collecting sites showed significant difference with Napayong Island exhibiting a higher species diversity. Note though that the taxonomic diversity gives only a general overview of the species richness in the area, while the three species diversity indices used in this study consider the species richness and/or species abundance. Despite the high productivity yield in this study, species diversity was relatively comparable to the studies of Cheng et al. (2013).

Research on myxomycetes in the last decade in the Philippines has so far documented at least 50 new records for the Philippines since its last annotation in 1981 (Dagamac and dela Cruz 2019). One species new to science, *Craterium retisporum*, was discovered from a field collection in Anda Island, an inhabited island in the province of Pangasinan (Moreno et al. 2009). Napayong Island, a small island frequently visited by tourists, could potentially be home to yet undescribed species of myxomycetes. This can also be said for many island ecosystems in the country, particularly in the Visayas and Mindanao. Future research is therefore suggested, particularly to document myxomycetes that are associated with other less studied substrata, e.g. barks of living trees, aerial inflorescences, decaying logs, grass litter, animal dung, and even decaying fruits, and in many underexplored and unique habitats in the country and in the Southeast Asian region.

In conclusion, a total of 35 species belonging to 14 genera of myxomycetes were recorded along the inner crater rim area of Mt. Makulot and in the volcanic Napayong Island within Taal Lake in Luzon Island, Philippines. Taal volcano including Napayong Island is often described as “an island within a lake, within an island in a lake within an island”. Hence, the presence of myxomycetes in this unique island habitat offers exciting insights to the local distribution of slime molds in the Philippines. Our research also supported previous observations that volcanic areas offer favorable environment that allows abundant growth of myxomycetes. This research study is the first listing of species of myxomycetes in Napayong Island, a small island within Taal Lake in Luzon Island within the Philippine archipelago.

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Statement on conflict of interest
The authors declare no conflict of interest.

Authors contribution
MDEI, MKCC, YAD, AJLL and TEEDC designed the research study, conducted the field collection, analyze the data, and wrote the manuscript. MHP and TEEDC confirmed the identities of the myxomycetes and revised the final manuscript. The authors contributed equally to this work.

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