

Lichens and Bryophytes in the University of Mindanao Matina Campus, Davao City, Philippines

Milton Norman D. Medina* and Hazel G. Carreon

¹Research and Publication Center, University of Mindanao, Davao City Philippines

Email: mnd_medina@umindanao.edu.ph

Date received: October 2, 2018

Date accepted: December 17, 2018

Date published: December 20, 2018

ABSTRACT

The present paper presents the baseline data of lichens and bryophytes within UM Matina campus or even in Davao City Philippines. Opportunistic sampling using standard collection protocol was employed between the months of September 2016 and June 2017 documenting 5 families under 7 genera with 30 species of lichens including a Philippine endemic species *Graphis mindanaoensis* and bryophytes represented by 2 families, 4 genera and 5 species. The mini forest hosts the most number of species. It is recommended to make conservation efforts within the mini forest especially to the area where the endemic species is located.

Keywords: *Biodiversity, Baseline, Non-Vascular Plants, Davao, Philippines.*

INTRODUCTION

University of Mindanao (UM) is one of the largest universities in Region XI in terms of land area covering approximately 50 hectare located within the downtown area of Davao City and student population with roughly 24,000 students. As a leading academic institution in the Philippines it aims to promote research on sustainable development particularly in our ecosystem. As part of the sustainable research agenda of the University, a group of science teachers from the Math and Science Department were commissioned to do the inventory of lichens and bryophytes species within UM Matina Campus.

Lichens are composite organisms arises from algae and/or cyanobacteria living among filaments of a fungus in a symbiotic relationship while bryophytes is the general term for non-vascular plants consisting of mosses, hornworts, and liverworts. Bryophytes are locally known as "*Lumot*" in the Philippines while lichens as "*Ap-ap sa lasang*" are not well-studied particularly in the urban areas. Both taxa are excellent indicators of air quality (Conrad, 2010) and environmental disturbance (Carreon et al. 2015; Shevock et al. 2014; Domingo et al. 2015). Hence, these taxa could serve as indicator species on the state of air quality and the extent of environmental disturbance within UM Matina campus.

Furthermore, this was conducted in support to the Sustainable Development Agenda of the Research and Publication Center of the University of Mindanao especially contributing to the Sustainable Environment. Not only documenting species composition of bryophytes and other taxon within the campus but also this endeavour served as training and capacity building for BS Biology Teachers in conducting biodiversity research which is the main agenda of the program. Furthermore, results of this study could be used for creating conservation plan for lichens and bryophytes within UM Matina campus.

MATERIALS AND METHODS

Place and duration

This study was conducted within the UM Matina Campus (Fig. 1) between September 2016 – June 2017. Since UM Matina campus is expected to host a random distribution of lichens and bryophyte species, opportunistic sampling was conducted to all substrates and host plants (Bartram, 1939; Medina, 2013; Domingo, et al. 2015) from the two sampling sites, namely: along the college and administration buildings and the university mini forest. This method is appropriate since the purpose of this study is to provide the list, determine the conservation status, and geographic distribution of identified lichens and bryophyte species. Species diversity and abundance was not included.

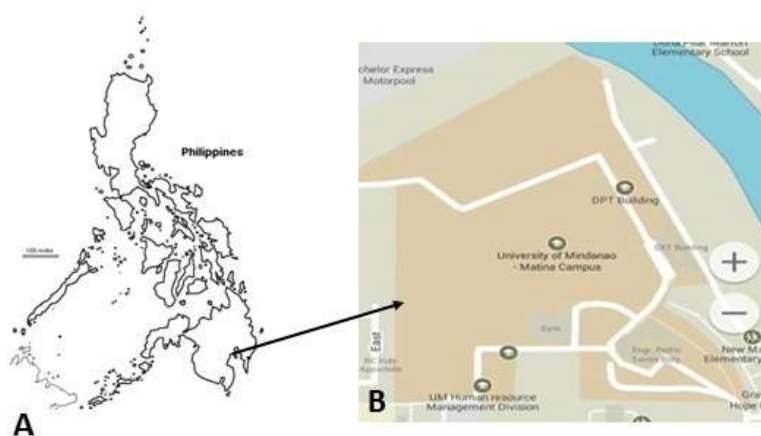


Fig. 1 A. Map of the Philippines; B. Aerial view of the University of Mindanao Matina Campus.

Collection and identification

Standard collection protocol for bryophyte species was conducted (Medina, 2013; Shevock, et al. 2014) and all specimens were properly cleaned, air dried, and labeled. Preliminary identification of specimens was done by the authors through comparing type materials available at Central Mindanao University Museum previously identified by Dr. Jim Shevock and the late Dr. Benito Tan of California Academy of Sciences. Validation of species identification was conducted by Dr. Andrea Azuelo, bryologist from Central Mindanao University. Geographic distribution of each species was determined using the Global Biodiversity Information Facility (GBIF) and the International Union for Conservation of Nature.

RESULTS AND DISCUSSION

Results revealed that the University of Mindanao Matina Campus has 30 species of lichens, representing 5 families and 7 genera. The bryophytes are represented by 2 families, 4 genera, and 5 species. This represents the baseline data of lichens and bryophytes in UM Matina campus.

Lichens

The Philippines have at least 789 species of Lichens (Shevock et al. 2014) with majority has not been assessed on their conservation status and geographic distribution (Fernando et al. 2008). In UM, Majority of the lichen species were widely distributed in the Mini Forest (MF) as expected for having a relatively not polluted habitat with more favourable microclimate (Palijon, 2012) compared to the infrastructures such as administration and college buildings (CB). Since lichens are association of algae and fungi (Domingo et al.2015), their survival depends of suitable environmental conditions like enough moisture, shade, and nutrients (Fajardo et al.2015). Thus, it is evident during the field survey that most lichens are found within the mini-forest and very minimal in the administration and college buildings. Surprisingly, there is one Philippine endemic species discovered *G. mindanaoensis* Vain. in the mini forest. Since most of the lichens and bryophytes species are still not thoroughly assessed by IUCN their conservation status is not provided in this paper.

Table 1. Lichens of the University of Mindanao, Matina Campus

Family	Genera	Scientific name	CB	MF	GD
Graphidaceae	<i>Graphis</i>	<i>Graphis leptocorisa</i> Vain.		√	WD
		<i>Graphis mindanaoensis</i> Vain.		√	PE
		<i>Graphis streblocarpa</i> (Bél.) Nyl.		√	WD
Lecanoraceae	<i>Lecanora</i>	<i>Lecanora chlaroteraa</i> Nyl.	√	√	WD
		<i>Lecanora helva</i> Stizenb.		√	WD
		<i>Lecanora legalloana</i> Elix & Øvstedal		√	WD
		<i>Lecanora leprosa</i> Fée	√	√	WD
		<i>Lecanora sambuci</i> (Pers.) Nyl.	√	√	
		<i>Lecanora tropica</i> Zahlbr.		√	WD
Pertusariaceae	<i>Pertusaria</i>	<i>Pertusaria excludens</i> Nyl.	√	√	WD
		<i>Pertusaria huangshanensis</i> Sen H. Yu & J.N. Wu ex Q. Ren		√	WD
		<i>Pertusaria striolata</i> Räsänen	√	√	WD
		<i>Pertusaria texana</i> Müll. Arg.		√	WD
		<i>Pertusaria xanthodes</i> var.	√		WD
		<i>Porina</i> sp.	√		WD
Physciaceae	<i>Physcia</i>	<i>Physcia aipolia</i> (Ehrh. ex Humb.) Fürnr.		√	WD
		<i>Physcia americana</i>		√	WD

		<i>Physcia atrostriata</i> Moberg	√	WD	
		<i>Physcia caesia</i> (Hoffm.) Hampe ex Fürnr.	√	WD	
		<i>Physcia dubia</i> (Hoffm.) Lettau	√	WD	
		<i>Physcia millegrana</i> Degel.	√	WD	
		<i>Physcia subtilis</i> Degel.	√	WD	
		<i>Physcia tenuis</i> Moberg	√	WD	
	<i>Pyxine</i>	<i>Pyxine berteriana</i> (Fée) Imshaug	√	WD	
		<i>Pyxine Consocians</i> Vain.	√	WD	
		<i>Pyxine coralligera</i> Malme	√	WD	
		<i>Pyxine hemalayensis</i> D.D. Awasthi	√	WD	
		<i>Pyxine sorediata</i>	√	WD	
Pyrenulaceae	<i>Pyrenula</i>	<i>Pyrenula leucostoma</i> Rchb.	√	WD	
		<i>Pyrenula balia</i> (Kremp.) R.C. Harris	√	√	WD

Legend: CB - College Buildings; MF - University Mini forest; GD – Geographic Distribution; WD – Widely Distributed; PE – Philippine endemic.

Survey revealed that the family Physciaceae has 13 species, the highest number among of the families followed by Lecanoraceae and Pertusariaceae both with 6 species, Graphidaceae with 3 species including the endemic species *G.mindanaoensis*, and Pyrenulaceae with 2 species. Several species are also documented from both areas especially from the genera *Pertusaria* and *Lecanora*. There are also species strictly confined to the buildings like *Porina* sp.

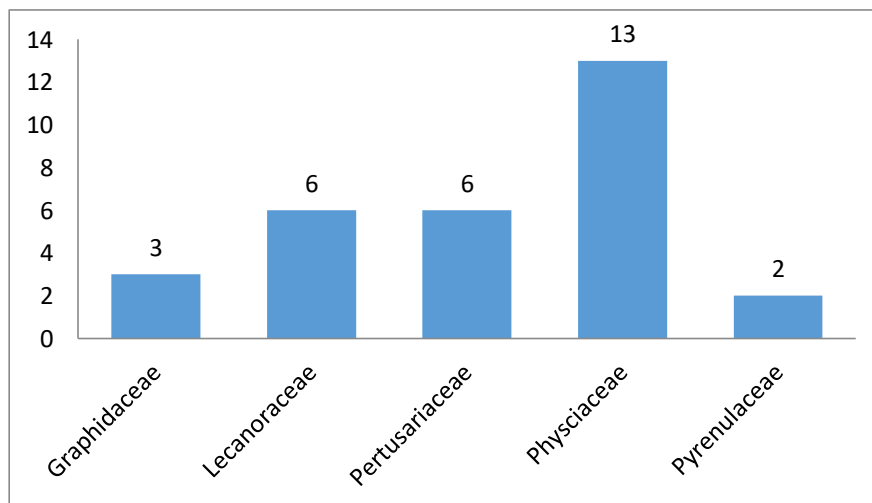


Fig. 2 Number of lichens per family documented within UM Matina campus.

The family Physciaceae is fairly distributed throughout Southeast Asia specifically in Thailand (Mongkulsok et al. 2012) and Philippines (Gruezo, 1977, 1979). Moreover, members of this family particularly genus *Physcia* have been studied on their chemical constituents since 1969 (Sevilla-Santos & Josen, 1969). In fact, lichens have been used as traditional medicines in many different cultures in Africa, Europe, Asia, Australia, North America, and South America (Smith, 1921). Hence this group has been studied by various local researchers from Thin-Layer

Chromatography (Sevilla-Santos & Mondragon, 1969) and the recent molecular studies in understanding chemotherapeutic properties.

Members of the group Lecanoraceae and Pertusariaceae are widely studied on their potential as source of dye and litmus (Saxena & Raja, 2014). This data may also provide the biology program of UM to conceptualise future projects and studies in this group. Graphidaceae and Pyrenulaceae are among the least represented group with 3 and 2 species respectively. It is also worth noting that Philippine endemic lichen, *G.mindanaoensis* is found inside UM mini forest. At present, there is not much available data as to the biology of this species, but this species is also found in various mountain areas in Mindanao (Azuelo et al. 2010; Lubos, 2009).

Bryophytes

There are at least 1,271 species of Bryophytes in the Philippines with approximately 195 are endemic or 15% endemism (www.bmb.gov.ph). Inside UM Matina campus, species documented are representatives from Marchantiophyta (liverworts) under family Lejeuneaceae with three species *L. catanduana* (Steph.) H.H. Mill, *L. bornensis*, and *L. elliptica* (Lehm. & Lindenb.) Schiffn. and Bryophyta (mosses) under family Bryaceae consisting represented by 1 genus *Bryum* with 2 species namely *B. apiculatum* Schwägr. and another species needing further analysis of its identification. In 2009, Lubos mentioned that *B.apiculatum* is a new record in Mt. Kalatungan in terms of locality (Lubos, 2009). Hence, this paper also presents the first record of *B.apiculatum* within UM Matina campus or even Davao City.

It is also important to note that the University Of Mindanao is an urban area thus vulnerable to any forms of environmental disturbances. Hence it is expected that the list is low compared to surveys conducted in high altitude, moist areas in Mindanao like Mt.Kitanglad and Mt.Kalatungan (Lubos, 2009). Bryophytes have biological properties that made them more vulnerable to environmental changes than many other plant groups (Azuelo et al. 2010, 2011; Gignac, 2001), thus explains the dwindling number of bryophytes species in both areas. Moreover, several studies confirmed some medical importance of Bryophytes (Azuelo et al. 2011) particularly to ethnic groups. Considering that they are non-vascular plants, they largely depend entirely in the environment for food, water, and reproductive requirements.

CONCLUSION AND RECOMMENDATION

Considering the very minimal number of species documented inside UM Matina campus wherein majority is widely distributed species, it is considered that the existing environment is no longer suitable for endemic species. Moreover, the mini forest host the most number of lichens and bryophytes species including an endemic species *G.mindanaoensis*. It is recommended to make conservation efforts within the mini forest especially to the area where the endemic species is located.

REFERENCES

- Azuelo, A. G., Sariana, L. G., & Pabualan, M. P. (2010). Diversity and ecological status of bryophytes in Mt. Kitanglad, Bukidnon. *Asian Journal of Biodiversity*, 1(1), 49-71.
- Azuelo, A.G.; Sariana, L.G., Pabualan, M. P. 2011. Some Medicinal Bryophytes: their Ethnobotanical Uses and Morphology. CHED Accredited Research Journal, Category A. Article no. 92 pp. 49-80.
- Bartram, E.B. (1939). Mosses of the Philippines. *Philippine Journal of Science* 68: 1–423.
- Carreon, H., Morales, N., Cabras, A., & Medina, M.N. (2015). Preliminary list of bryophytes in Tagbaobo, Kaputian, Island Garden City of Samal, Philippines. *University of Mindanao International Multidisciplinary Research Journal*, 1(1), 152-157.
- Conrad, J., (2009). Mosses. Backyard Nature. Retrieved 10 October 2016, from <http://www.backyardnature.net/mosses.html>
- Domingo, W.J., Medina, M.N.D., Leaño, E.P. (2015). Annotated list of bryophytes and lichens from Mainit Hot Spring Protected Landscape, Nabunturan, Compostela Valley, Mindanao, Philippines. *International Journal of Current Research in Bioscience and Plant Biology*, 2(10), 110-119.
- Fajardo, W.T., Doria, C.S., Cruz, R.R. (2015). Personal and Tacit Knowledge: Its Concept and Implication to the Study Biodiversity and Adaptive Features of Corticolous Lichens of Hundred Islands National Park, Northern Philippines. *Asia Pacific Journal of Multidisciplinary Research*, 3(5), 80-90.
- Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruezo, J.F. Barcelona, D.A. Madulid, A. Baja-Lapis, G.I. Texon, A.C. Manila & P.M. Zamora (2008). Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences, Supplement 3*, 1–52.
- Fernando, E. S. (2011) Philippine Biodiversity: Ecological Roles, Uses, and Conservation Status. Philippine Flowering Plants. Slideshare no.10. Retrieved January 12, 2017. Available at <https://www.slideshare.net/mobile/philippines>
- [Gignac, L.D. \(2001\) New Frontiers in bryology and lichenology. Bryophytes as indicators of climate change. *The Bryologist*, 104, 410-420.](#)
- Gruezo, W. S. (1977). Contributions to the lichen flora of the Philippines. I. New and additional records. *Philippine Journal of Biology*, 6, 135 - 142.
- Gruezo, W. S. (1979). Compendium of Philippine lichens. *Philippine Journal of Biology*, 8, 267 - 300.
- Lubos, L.C. (2009). Species Richness, Distribution, and Status of Mosses in Selected Mountains in Mindanao, Philippines. Retrieved January 13, 2017. Available at www.eisrjc.com/documents/Species

- Medina, M.N.D. (2013). Basic biodiversity research protocols for local communities. UNIID-SEA. Available at <http://uniid-sea.net/tag/innovation-for-inclusive-development>
- Mongkolsuk, P., Meesim, S., Poengsungnoen, V. and Kalb, K. (2012). The lichen family Physciaceae in Thailand—I. The genus *Pyxine*. *Phytotaxa*, 59,
- Palijon, A.M. (2012). Organism associated with trees in urban greenspaces and their impacts on management. University of the Philippines –Los Banos. Institute of Renewable Natural Resources.
- Shevock, J., J.D. Yang, and B. Tan. (2014). New moss records for Taiwan. *Journal of Plant Systematics*, 17: 223-228.
- Sevilla-Santos, P. & Joson, M. (1969). Studies on Philippine lichens, I. Chemical constituents of *Physcia albicans* and *Physcia picta*. *Philippine Journal of Science*, 98, 1 - 9.
- Sevilla-Santos, P. and Mondragon, A.M. (1969). Studies on Philippine lichens, II. Thin-layer chromatographic study of the constituents of some lichen species. *Philippine Journal of Science*, 98, 297-302.
- Sujata Saxena and A. S. M. Raja. (2014). Natural Dyes: Sources, Chemistry, Application and Sustainability Issues. In S. S. Muthu (eds.), *Roadmap to Sustainable Textiles and Clothing*. Singapore: Springer.
- Tan, B.C. (1994). The bryophytes of Sabah (North Borneo) with special reference to the BRYOTROP Transect of Mount Kinabalu. XIX. The genus *Acroporium* (Sematophyllaceae, Musci) in Borneo with notes on species of Java and the Philippines. *Willdenowia* 24: 255–294.