

Short Communication

A Checklist of Fern Species in Disturbed Areas of Mount Makiling, Philippines

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ABSTRACT: Mount Makiling Forest Reserve rises to 1,100 masl. It is a well-known tropical forest recorded to have diverse ecosystems and home to many species of life. Pteridophyte species are among the floral groups found thriving in the said mountain. This study aimed to create a checklist of fern species found in disturbed areas of Mt. Makiling. The species listed were surveyed from a fern study along specific altitudinal areas from 150 masl to 1100 masl. Ferns surveyed were found along the trail going up to the peak of the mountain. A total of 48 species belonging to 30 genera and 18 families. The families with the greatest numbers of species were Dryopteridaceae (6 spp.), Selaginellaceae (5 spp.), Tectariaceae (5 spp.), Thelypteridaceae (5 spp.), and Pteridaceae (4 spp.). Threatened fern species were found on the mountain among which included *Angiopteris evecta* (G. Forst.) Hoffm. and *Phymatosorus membranifolius* (R. Br.) Ching.

INTRODUCTION

Mount Makiling Forest Reserve (MFR) is a tropical rainforest known for its floral and faunal biodiversity. There are four types of vegetation recognized on the mountain based on altitude: upper montane rain forest (>1000 masl), lower montane forest (>750 masl), lowland evergreen forest (100–500 masl), and parang vegetation (< 100 masl) (Fernando *et al.*, 2004).

Pteridophytes are one of the many plant groups in Mt. Makiling Forest Reserve (MFR). Fern species are food plants, medicinals, and ornamentals (Amoroso, 1987, 1990, 1993, 1997, 1995; Barcelona, 2002, 1986). They are also excellent biological tools in recognizing

differences in climatic factors such as temperature, humidity, and elevation (delos Angeles and Buot, 2012, Banaticla and Buot, 2004, 2005). An early comprehensive attempt in studying the pteridophytes present on Mt. Makiling was that of Salvoza (1939). Salvoza reported 12 families, 70 genera, 227 native species, and seven introduced species of pteridophytes. Price (1975) accounted 28 families, 97 genera, 291 species, four varieties and three hybrids of pteridophytes from Mt. Makiling. On the same mountain, delos Angeles and Buot (2015) reported 27 species belonging to 18 genera and 14 families collected on the Northeastern slope of the mountain during the dry season.

Disturbances such as anthropogenic activities

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are important in land use change processes. In 2019, Alcalá et al. identified six land use types in the said mountain and were identified to be: i) Mahogany, ii) Agriculture, iii) Buffer zone, iv) Agroforest, v) Roadside and vi) Forest. The study accounted a total of 28 fern species found across the different land use types. The documentation of ferns in disturbed areas is crucial in reinforcing the roles of ferns as bioindicators. Currently, there is no published list of fern species that can be found in disturbed areas of Mt. Makiling. The main goal of the study was to produce a checklist

of ferns recorded in disturbed areas along the altitudinal gradient of Mt. Makiling.

MATERIALS AND METHODS

According to Lenson (2004), Mt. Makiling rises at 1,110 meters above sea level (Fig. 1). The fern species were recorded from fern diversity studies conducted by delos Angeles and Buot (2015) during the wet and the dry season between the months of June 2010 until February 2011 along the slopes of Mt. Makiling from an elevation of 150 to 1050

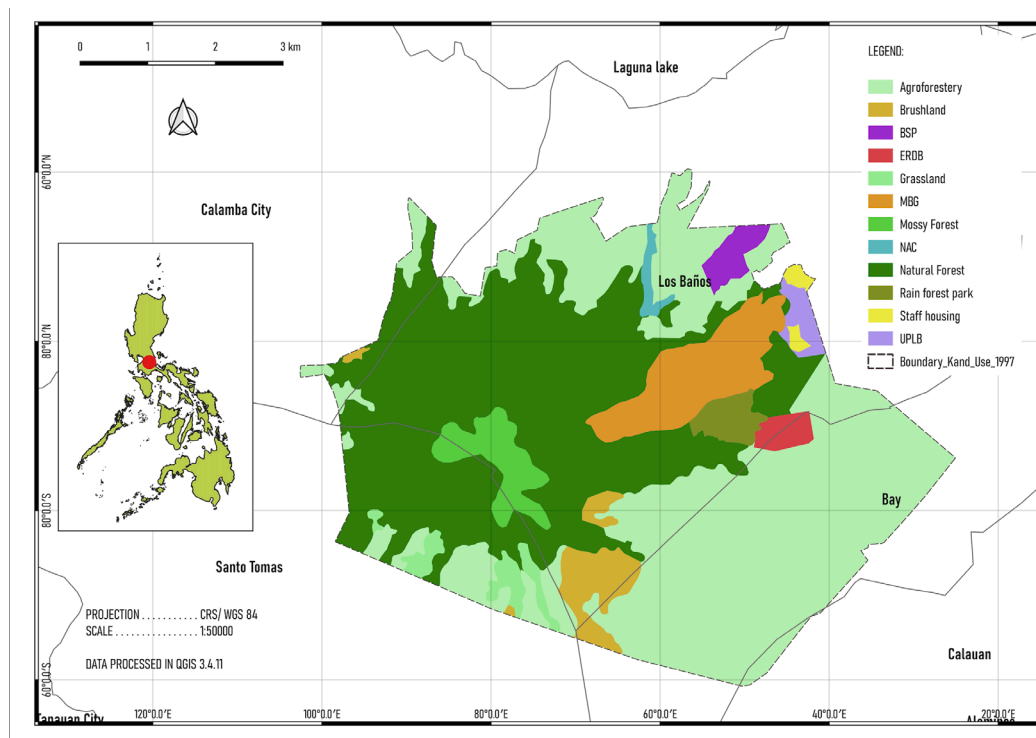


Figure 1. Map of the Philippines and the inset showing the location of Mt. Makiling.

Table 1. Coordinates and landmarks of the 10 sampling sites for every 100 masl interval along the northeastern slope of Mt. Makiling.

Altitude (masl)	Coordinates	Landmarks
150	14°08.605'N; 121°14.001'E	Above a body of water locally called "Flatrocks"
250	14°08.639'N; 121°13.911'E	rocky substrate; many mahogany trees
350	14°08.234'N; 121°13.827'E	rocky substrate; under thick canopy

Table 1. (Continued).

Altitude (masl)	Coordinates	Landmarks
450	14°08.220'N; 121°13.200'E	many trees; thick canopy
550	14°08.220'N; 121°12.031'E	presence of a stream; ravine
650	14°08.227'N; 121°12.354'E	rocky with a presence of a stream; ravine
750	14°08.337'N; 121°12.009'E	beside the trail
850	14°08.336'N; 121°12.009'E	beside the trail
950	14°08.247'N; 121°11.864'E	beside the trail
1100	14°08.142'N; 121°11.623'E	Peak 2

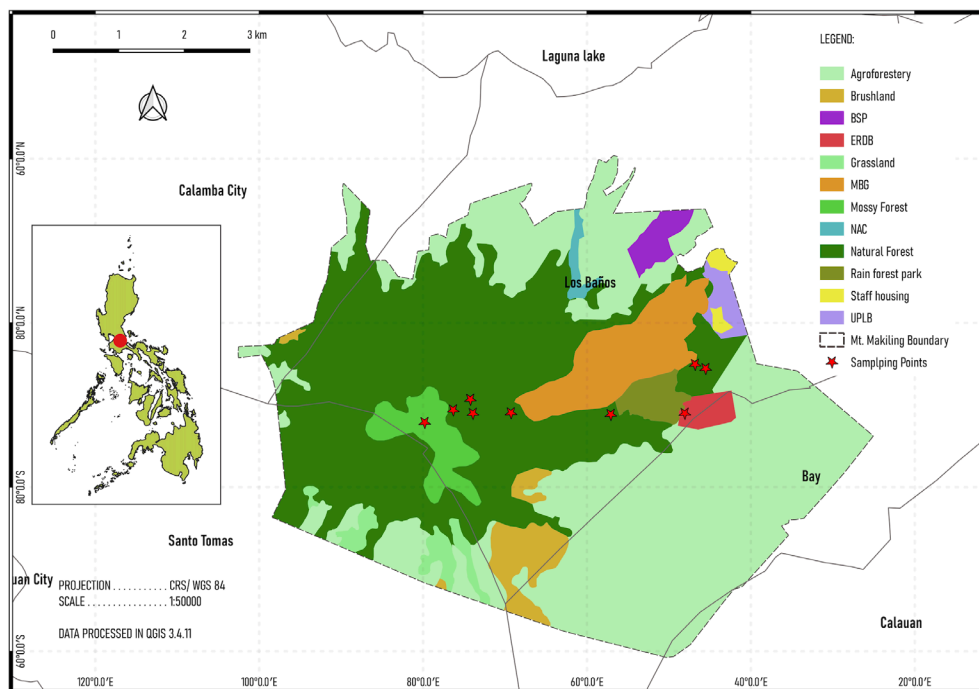


Figure 2. Detailed map showing the 10 sampling sites where the fern surveys were conducted along the altitudinal gradient of the mountain.

masl. Fern species were surveyed altitudinally with 100-meter intervals along the disturbed areas of the mountain (Table 1 and Fig. 2). Published materials were also consulted with regard to the occurrences of ferns in Mt. Makiling. The survey was done 20–50 meters away from the trail. Voucher specimens of the fern species are deposited in the Plant Biology Division Herbarium (PBDH), Systematics Laboratory, Institute of Biological Sciences,

College of Arts and Sciences, University of the Philippines Los Baños.

The checklist classified the genera by the order of families followed by a list of species and the elevation where the fern species could be located. The classification system used was based on the Pteridophyte Phylogeny Group (2016). Current accepted species name of the ferns were confirmed by consulting the

International Plant Name Index (IPNI).

RESULTS AND DISCUSSION

The list of ferns found along Mt. Makiling included a total of 48 species belonging to 30

genera and 18 families. The families with the greatest numbers of species were Dryopteridaceae (6 spp.), Selaginellaceae (5 spp.), Tectariaceae (5 spp.), Thelypteridaceae (5 spp.), and Pteridaceae (4 spp.). Among the fern species, 47 fern of species could be

Table 2. List of fern species on Mt. Makiling during the wet and dry season found along the altitudinal gradient. Nomenclature based on the Pteridophyte Phylogeny Group (2016).

Class	Order	Family	Scientific name	Altitudinal Distribution Range	Dry/Wet Season	Exsicatta	
Lycopodiopsida	Lycopodiales	Selaginellaceae	<i>Selaginella cupressina</i> (Willd.) Spring	650-850	dry/wet	delos Angeles 6163 (PBDH)	
			<i>Selaginella involvens</i> (Sw.) Spring	650-850	dry/wet	delos Angeles 6167 (PBDH)	
			<i>Selaginella nummularia</i>	550	wet	delos Angeles 6168 (PBDH)	
			<i>Selaginella</i> sp. 2	850-950	dry/wet	-	
			<i>Selaginella</i> sp. 3	650	dry/wet	-	
Polypodiopsida	Marattiidales	Marattiaceae	<i>Marattia</i> sp.	850	wet	delos Angeles 6194 (PBDH)	
			<i>Ptisana sylvatica</i> (Blume) Murdock	450-750	dry/wet	delos Angeles 6197 (PBDH)	
			<i>Angiopteris evecta</i> G. (Forst.) Hoffm.	300-500	dry/wet	delos Angeles 6897 (PBDH)	
			Dipteridaceae	<i>Dipteris conjugata</i> Reinw.	700	wet	-
			Gleicheniaceae	<i>Dicranopteris linearis</i> (Burm.f.) Underw.	700	wet	-
		Lygodiaceae	<i>Lygodium circinatum</i> (Burm.f.) Sw.	350-850	dry/wet	delos Angeles 6898-6900 (PBDH)	

Table 2. (Continued).

Class	Order	Family	Scientific name	Altitudinal Distribution Range	Dry/Wet Season	Exsicatta
		Cyatheaceae	<i>Cyathea</i> sp. 1	950	dry/wet	-
			<i>Cyathea</i> sp. 2	650	dry/wet	delos Angeles 6190 (PBDH)
		Lindsaeaceae	<i>Lindsaea obtusa</i> J Sm. Ex Hook	650	dry/wet	delos Angeles 6182 (PBDH)
			<i>Lindsaea</i> sp.	150	wet	delos Angeles 6188 (PBDH)
	Pteridinae	Pteridaceae	<i>Adiantum</i> sp.	550	wet	delos Angeles 6186 (PBDH)
			<i>Adiantum diaphanum</i> Blume	350-400	wet	delos Angeles 6902-6904 (PBDH)
			<i>Pteris blumeana</i> Agardh	350-450	dry/wet	delos Angeles 6185 (PBDH)
			<i>Pteris pellucens</i> J Agardh	600	wet	-
	Dennstaediinae	Dennstaedtiaceae	<i>Dennstaedtia philippinensis</i> Copel.	950	wet	-
			<i>Microlepia</i> sp.			delos Angeles 6910 (PBDH)
			<i>Histiopteris incisa</i> (Thunb.) J Smith	1000	dry/wet	-
	Aspleniinae (Eupolypods II)	Aspleniaceae	<i>Asplenium affine</i> Sw.	850-950	wet	delos Angeles 6173 (PBDH)
			<i>Asplenium tenerum</i> G Forst.	750-850	dry/wet	-
		Blechnaceae	<i>Blechnum egregium</i> Copel. In Perkins	150-850	dry/wet	delos Angeles 6174 (PBDH)

Table 2. (Continued).

Class	Order	Family	Scientific name	Altitudinal Distribution Range	Dry/Wet Season	Exsicatta
		Athyriaceae	<i>Diplazium esculentum</i> (Retz.) Sw	550-650	wet	delos Angeles 6193 (PBDH)
		Thelypteridaceae	<i>Christella parasitica</i> H. Lev.	350-550	dry/wet	-
			<i>Pneumatopteris nitidula</i> (C. Presl) Holttum	300-350	dry/wet	-
			<i>Spaeropteris heterocarpus</i> (Blume) Holttum	650-950	wet	-
			<i>Cyclosorus heterocarpus</i> (Blume) Ching	550-1100	dry/wet	delos Angeles 6183 (PBDH)
			<i>Cyclosorus terminans</i> (J. Sm. Ex Hook.) K.H. Shing	350-450	wet	delos Angeles 6915 (PBDH)
	Polypodiinae (Eupolypods I)	Dryopteridaceae	<i>Bolbitis heteroclita</i> (C. Presl) Ching	150-650	dry/wet	delos Angeles 6169 (PBDH)
			<i>Bolbitis sinuata</i> (C Presl) Hennipman	650	dry/wet	delos Angeles 6172 (PBDH)
			<i>Bolbitis</i> sp.	150	wet	-
			<i>Polystichum stenophyllum</i> Christ.	750	wet	delos Angeles 6180 (PBDH)
			<i>Polystichum obtusum</i> J Sm. Ex C Presl	800	dry/wet	-
		Nephrolepidaceae	<i>Nephrolepis cordifolia</i> (L.) C. Presl	450	dry/wet	delos Angeles 6928 (PBDH)
			<i>Nephrolepis biserrata</i> (Sw.) Schott	750	dry/wet	-
			<i>Oleandra neriiformis</i> Cav.	1,000	wet	-

Table 2. (Continued).

Class	Order	Family	Scientific name	Altitudinal Distribution Range	Dry/Wet Season	Exsicatta
		Tectariaceae	<i>Pleocnemia macrodonta</i>	350	dry/wet	delos Angeles 6922-6931 (PBDH)
			<i>Tectaria beccariana</i> (Cesati) C Chr	650	dry/wet	delos Angeles 6191 (PBDH)
			<i>Tectaria siifolia</i> (Wild.) Copel.	550	dry/wet	delos Angeles 6198 (PBDH)
			<i>Tectaria</i> sp.	350	dry/wet	delos Angeles 6200 (PBDH)
		Davalliaceae	<i>Davallia menophylloides</i> (Blume) Kuhn	750-850	dry/wet	delos Angeles 6175 (PBDH)
		Polypodiaceae	<i>Microsorium heterocarpum</i> (Blume) Ching	550-850	dry/wet	delos Angeles 6177 (PBDH)
			<i>Microsorium longissimum</i> J.Sm. ex Fee	300-450	wet	-
			<i>Phymatosorus membranifolius</i> (R.Br.) S.G. Lu	500-600	wet	delos Angeles 6933 (PBDH)
			<i>Phymatosorus scolopendria</i> (Burm.f.) Pic. Serm.	350-450	wet	delos Angeles 6934-6935 (PBDH)

found during the wet season and 28 fern species could be found during the dry season. It should be noted that there were more fern species in the wet season as compared to the dry season; this was due to moisture. Moisture is important especially during sexual reproduction in ferns since moisture is required for the flagellated male gametes of ferns to fertilize the egg.

Notable Fern Species

Among the threatened fern species is *Phymatosorus membranifolius* (R.Br.) S.G. Lu (Fig. 3) which could be found at an elevation of 500–600 masl both at the wet and the dry season. *Angiopteris evecta* (G. Forst.) Hoffm. is categorized as other threatened species based on the DAO 2017-11. It was listed as



Figure 3. Fertile fronds of *Phymatosorus membranifolius* (R.Br.) S.G. Lu



Figure 4. Habit and fertile frond of *Angiopteris evecta* G. (Forst.) Hoffm.

Angiopteris palmiformis (Fig. 4). The tree fern or *Cyathea* sp. is another group of fern species which are threatened. It could be found at an altitude of 600 – 1,000 masl. The fern species *Oleandra neriiformis* Cav. (Fig. 5) and *Histiopteris incisa* (Thunb.) J. Sm. (Fig. 6) was found nowhere else on the mountain but at an altitude of 1,000 masl.

SUMMARY AND CONCLUSION

Forty-eight species belonging to 30 genera and 18 families. The families with the greatest

numbers of species were Dryopteridaceae (6 spp.), Selaginellaceae (5 spp.), Tectariaceae (5 spp.), Thelypteridaceae (5 spp.), and Pteridaceae (4 spp.). Threatened fern species were found on the mountain among which included Threatened fern species were found on the mountain among which included *Angiopteris evecta* (G. Forst.) Hoffm. and *Phymatosorus membranifolius* (R. Br.) Ching.

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Figure 5. Mature fronds of *Oleandra neriiformis* (Cav.)



Figure 6. Mature and young fronds of *Histiopteris incisa* (Thunb.) J. Sm.

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