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Research Article

Checklist and Assessment of Pteridophytes in Amai Manabilang, Lanao Del Sur, Philippines

Jay Ann L. Bada*, David John D. Bierneza, Fulgent P. Coritico, Victor B. Amoroso

Central Mindanao University, Musuan, Bukidnon, Philippines, Musuan, Maramag, Bukidnon 8710, Philippines.

***Corresponding author:** jayannbada2@gmail.com
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Abstract

The species of ferns and lycophytes in Municipality of Amai Manabilang are documented here in a checklist, along with information on their morphological characteristics, and conservation status. A series of field surveys in two barangays in Amai Manabilang determined the lycophytes and ferns, namely Frankfort and Sumugot. A total of 56 species were recorded, belonging to 18 families and 36 genera. Of these species, 50 are ferns and 6 are lycophytes. The highest number of species was observed in Sumugot (42 species) followed by Frankfort (26 species). Thirty-one species are terrestrial, 19 are epiphytes, 1 tree fern and 5 species have more than one growth form. The number of species is approximately about 5% and 9% of the total number of pteridophytes species in the Philippines and Mindanao, respectively.

Keywords: Amai Manabilang; Frankfort; Sumugot; transect walk; pteridophytes

Introduction

Ferns and fern allies are collectively called 'pteridophytes' (Smith et al., 2006) because of their shared life cycle as spore-dispersing vascular plants (Amoroso et al., 2016) dating back to 360 million years. The Philippine archipelago has an estimated 1,100 ferns and lycophytes spread across 154 genera and 34 families (Coritico et al., 2020; Amoroso et al., 2016). Furthermore, 202 species are reported as threatened (Fernando et al., 2008) and 266 species are endemic (Pelser et al., 2011).

With coordinates of 7°47′07″N 124°40′56″E, Frankfort has the highest elevation of 900 masl, and 7° 45' 12" N, 124° 38' 24" E, Sumugot has the highest elevation of 1,200 masl and is one of the remaining forest ecosystems in Lanao del Sur. So far, there are no studies about the flora and fauna in Amai Manabilang. The absence of research is of significant value to the current study as it impedes a

comprehensive understanding of the biodiversity and ecological dynamics of the area.

This study seeks to provide foundational information for the area by conducting an inventory of ferns and lycophytes found in the municipality of Amai Manabilang through a checklist, classifying and identifying their diagnostic morphological characters, and assessing the conservation status of these ferns and lycophytes found in the area. This is the first documented study of ferns and lycophytes in Lanao del Sur. Providing essential baseline data for future research and conservation efforts in the area.

Materials and Methods

Species inventory

An inventory of ferns and lycophytes was conducted through a series of transect walks (1200–1900 m) from base to the highest point of Sumugot, (1200 masl) and Frankfort, (900 masl) from October to November 2021. Another field inventory was conducted from March to April 2022.

Collection, Processing, and Identification of Specimens

A minimum of two fertile fronds of each species were collected by using pruning shears. Small ferns were collected by uprooting the whole plant, removing the soil, and pressing the plant intact. For the tree ferns, each entire frond was collected and cut into five parts: the leaf apex, middle pinna, lower pinna, basal pinna, and stipe (Amoroso et al., 2016).

All specimens were processed using the wet method (Hodge 1947) "wet method" is a technique used to preserve plant specimens by storing them in a liquid solution (denature alcohol or formalin) to maintain their physical features and enable accurate study and documentation of their characteristics in botanical research. The specimens are the first collections of ferns and lycophytes in the area as no collections for herbarium vouchers have been done in the past.

Species identification was performed by referring to the following monographs, floras, and other publications: the book of Smith (2006), Co's Digital Flora of the Philippines (2013), and Copeland's Fern Flora of the Philippines (1958–1961).

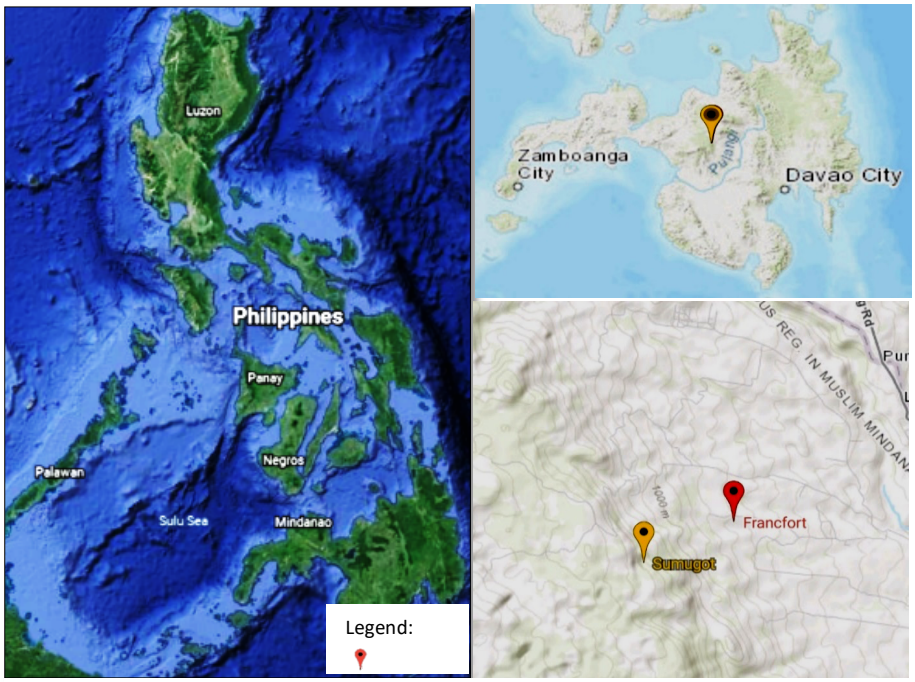

Figure 1. Location Map showing the two selected areas in Amai Manabilang, Lanao del Sur, Philippines.

Assessment of Conservation Status

The conservation status of the species is recorded based on the National List of Threatened Plants of the Philippines (DENRDAO 2017), and using the criteria of the International Union for Conservation of Nature (IUCN 2021). This information can form the basis for government agencies that set the environmental policies of DENR and local government units (LGUs) to monitor and protect threatened and endemic species, both in the forest area and its surroundings.

Results and Discussion

Species Richness

Fifty-six species, belonging to 36 genera and 18 families, were documented. Of these, 50 are ferns and 6 are lycophytes. The families with the highest number of species are Polypodiaceae & Pteridaceae (10 species), Thelypteridaceae (6), Aspleniaceae (4), and Nephrolepidaceae & Tectariaceae (3), the rest have less than 2 families. The lycophytes were represented by Lycopodiaceae and Selaginellaceae with 1 and 5 species, respectively (**Table 1 & 2**). These are also

the families which have the largest number of species in the country. (Salgado 1990). This family is also common and widely distributed in Mindanao (Amoroso et al. 2009, 2012, and 2015).

Table 1. A total number of genera and species of ferns and lycophytes were recorded from Amai Manabilang.

Family	Number. of Genera	Number of Species
Aspleniaceae	2	4
Athyriaceae	2	2
Blechnaceae	2	2
Cyatheaceae	1	1
Dryopteridaceae	2	2
Gleicheniaceae	1	1
Hymenophyllaceae	1	1
Hypodematiaceae	1	1
Lindsaeaceae	1	1
Lycopodiaceae	1	1
Lygodiaceae	1	1
Marattiaceae	2	2
Nephrolepidaceae	1	3
Polypodiaceae	7	10
Pteridaceae	4	10
Selaginellaceae	1	5
Tectariaceae	1	3
Thelypteridaceae	5	6
TOTAL	**36**	**56**

Table 2. Checklist and conservation status of ferns and lycophytes found in Amai Manabilang, Lanao del Sur.

Family/Species	Collection number	Growth form
Aspleniaceae		
Asplenium affine Sw.	60/63	TE
Asplenium persicifolium J.Sm. ex Mett	37 / 35	EP
Asplenium sp.	29	EP
Hymenasplenium excisum (C.Presl) S.Linds.	17	EP
Athyriaceae		
Diplazium sp.	24	TE
Deparia petersenii (Kunze) M.Kato	71/86	TE
Blechnaceae		
Austroblechnum patersonii (R.Br.) Gasper & V.A.O. Dittrich	46	TE
Blechnopsis orientalis (L.) C.Presl	48	TE
Cyatheaceae		
Sphaeropteris glauca (Blume) R.M.Tryon	08/106	AR
Dryopteridaceae		
Bolbitis heteroclita (C.Presl)	19/27	TE/LI
Dryopteris sp.	40	TE
Gleicheniaceae		
Dicranopteris linearis (Burm.) Underw.	21/49	TE
Hymenophyllaceae		
Vandenboschia auriculata (Blume)	35/50	EP

Hypodematiaceae		
Leucostegia immersa (Wall.) C.Presl	30/10	TE
Lindsaeaceae		
Odontosoria chinensis (L.) J.Sm.	09	TE
Lycopodiaceae		
Palhinhaea cernua (L.) Vasc. & Franco	45	TE
Lygodiaceae		
Lygodium japonicum (Thunb.) Sw.	03	TE
Marattiaceae		
Angiopteris evecta (G.Forst.) Hoffm.	18	TE
Ptisana sylvatica (Blume) Murdock	16	TE
Nephrolepidaceae		
Nephrolepis cordifolia (L.) C.Presl	05/42	TE/EP
Nephrolepis biserrata (Sw.) Schott	23/97	TE
Nephrolepis falcata (Cav.) C.Chr.	44	EP
Polypodiaceae		
Drynaria quercifolia (L.) J.Sm.	20	EP
Drynaria rigidula (Sw.) Bedd.	43	EP
Microsorum punctatum (L.) Copel.	41/61	EP
Lepisorus zippelii (Blume) C.F.Zhao	28	EP
Goniophlebium persicifolium (Desv.) Bedd	62	EP
Goniophlebium pseudoconnatum (Copel.) Copel.	15	EP
Phymatosorus scolopendria (Burm.f.) Pic.Serm.	38/70	EP
Pyrrosia longifolia (Burm.f.) C.V.Morton	47	EP
Pyrrosia piloselloides (L.) M.G.Price	67	EP
Prosaptia sp.	34	EP
Pteridaceae		
Adiantum philippense L.	94	TE
Antrophyum callifolium Blume	39	EP
Antrophyum plantagineum (Cav.) Kaulf.	32	EP
Antrophyum sp.	95	EP
Pityrogramma calomelanos (L.) Link	02	TE
Pteris biaurita L.	11	TE
Pteris ensiformis Burm.f.	90	EP
Pteris mertensioides Willd.	99	TE
Pteris tripartita Sw.	64/89	TE
Pteris sp.	51	TE
Selaginellaceae		
Selaginella biformis A.Braun ex Kuhn	04	TE/LI
Selaginella delicatula (Desv.) Alston	06	TE
Selaginella involvens (Sw.) Spring	31	TE/LI
Selaginella sp. 1	07	TE
Selaginella sp. 2	26	TE/LI
Tectariaceae		
Tectaria melanocaulos (Blume) Copel.	72	TE
Tectaria sp. 1	36	TE
Tectaria sp. 2	22	TE
Thelypteridaceae		
Abacopteris nitida (Holttum) S.E.Fawc. & A.R.Sm.	25/87	TE
Christella dentata (Forssk.) Brownsey & Jermy	01/14	TE
Cyclosorus terminans (J. Sm. ex Hook.) KH Shing	12	TE
Cyclosorus unitus (L.) Ching	13	TE
Macrothelypteris polypodioides (Hook.) Holttum	38/74	TE
Strophocaulon unitum (L.) S.E.Fawc. & A.R.Sm.	78	TE

(LEGEND: Growth forms: AR – arborescent; EP – epiphytic; LI – lithophytic; TE – terrestrial)

The species richness estimate in Amai Manabilang is comparable to that of the Mount Agad-Agad, Lanao del Norte, and Kampo Uno, Katipunan, Davao-Arakan Valley Road, North Cotabato. It is higher than that of the gold-mine areas in Tumpagon, Cagayan De Oro City, Adams in the area of Northern Luzon and University of Mindanao, Matina Campus of Davao City. However, it is evidently lower than Mt. Hamiguitan, and (CEDAR) at Impalutao, Impasug-ong, Bukidnon Province (**Table 3**). Several factors may affect species richness in the Philippines such as the size of the area sampled, climatic conditions, soil type, and geographic location (Amoroso et al. 2009; 2016). Human activities such as the conversion of forests to agricultural or industrial lands, as well as pollution, have an impact on species richness. With the increase in land use and natural resources, many of these threatened taxa are expected to become even rarer, more susceptible, and endangered, and in some cases, local extinction, as a result of disturbance or imbalance in their tightly constrained ecosystems (Chandra et al., 2008).

During the 2000s and up to the present, a significant portion of the region's land has been subjected to a traditional farming practice known as 'kaingin.' This practice involves the clearing of land through vegetation cutting, burning, and cultivation. However, it has raised environmental concerns due to deforestation and soil degradation. The rapid conversion of forest lands into agricultural areas has further resulted in the disappearance of the lowland forest.A combination of factors such as population growth, agricultural activities, developing tourism, and potential forest conversions pose a significant threat not only to the flora but also to the entire biodiversity of the area (Chandra et al., 2008).

Table 3. Total number of ferns and lycophytes in different locations in the Philippines.

Location	Total Number of Species	References
Gold-mined areas in Tumpagon, Cagayan De Oro City	36	Ascaño II et al., 2016
Adams, Northern Luzon	47	Magtoto & Austria, 2017
University of Mindanao, Matina Campus, Davao City	28	Morales, 2018
Kampo Uno, Katipunan, Davao-Arakan Valley Road, North Cotabato	60	Abas, 2017a
Mount Agad-Agad, Lanao del Norte	56	Coritico et al., 2020
Mt. Hamiguitan Range Wildlife Sanctuary, Davao Oriental	74	Amoroso et al., 2018
(CEDAR) at Impalutao, Impasug-ong, Bukidnon	87	Abas 2017b

Figure 2. Some ferns and lycophytes: *A.) Antrophyum callifolium* Blume, *B.) Tectaria sp. C.) Abacopteris nitida* (Holttum) S.E.Fawc. & A.R.Sm., *D.) Asplenium persicifolium* J.Sm. ex Mett., *E.) Bolbitis heteroclita* (C.Presl) Ching, *F.) Vandenboschia auriculata* (Blume) Copel., *G.) Leucostegia immersa* (Wall.) C.Presl, *H.) Selaginella involvens* (Sw.) Spring, *I.) Antrophyum plantagineum* (Cav.) Kaulf.

Growth form and Assessment

Majority of the ferns and lycophytes are terrestrial (31 species, 55.36 %), followed by epiphytes (19 species, 33.93 %), and arborscent (1 species, 1.79 %) (Tree fern) and other species were observed to have more than one growth form (5 species, 8.92 %). The growth form showed that the ferns and lycophytes in the area are mostly terrestrial and epiphytes. Some species like *Bolbitis heteroclita* (C.Presl), *Nephrolepis cordifolia* (L.) C.Presl can be terrestrial and epiphytes on trees, while *Selaginella biformis* A.Braunm, *Selaginella* sp. and *Selaginella involvens* (Sw.) Spring can also grow terrestrially and lithophytes. The outcome was predictable given that two-thirds of the pteridophytes were

terrestrial and one-third were epiphytes (Schuettpelz and Pryer, 2009). *Sphaeropteris glauca* (Blume) R.M.Tryon is the only species recorded from Sumugot as endangered and *Angiopteris evecta* (G.Forst.) Hoffm. is the only species found in Frankfort and is considered a threatened species. (**Table 2**). All documented species of ferns and lycophytes are broadly distributed in different countries.

Conclusion

Municipality of Amai Manabilang is home to 56 species of ferns and lycophytes belonging to 36 genera and 18 families. Species richness of ferns and lycophytes in the area is estimated to be 5% of the total number of pteridophyte species in the Philippines and nearly 9% of the total number in Mindanao Island. The preferred habitats of the ferns and lycophytes are recorded, with 31 species being terrestrial, followed by 19 species which are epiphytes, and 1 arborescent. There is presence of endangered species, such as Sphaeropteris glauca, in Sumugot and Frankfort. Other threatened species, Angiopteris evecta, found in Frankfort reinforces the urgency for local governments to take immediate measures to preserve and protect the remaining forest fragments, ensuring the long-term conservation of these invaluable species.

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