



## RESEARCH PAPER

## OPEN ACCESS

## Ferns and lycophytes in Sambonotan Watershed, Dinagat Island, Philippines

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Article published February 26, 2019

**Key words:** Dinagat Island, Mindanao, Monilophytes, Pteridophytes, Tropical botany.

### Abstract

Dinagat Island is considered as one of the areas in the Philippines characterized by ultramafic outcrops, and has a unique faunal and floral composition, with a high level of endemism. However, knowledge on the fern and lycophyte flora of the island is poorly known and relatively still undocumented. This study presented the survey of ferns and lycophytes in Sambonotan Watershed, Tubajon, Dinagat Island, Philippines. Floristic surveys revealed a total of 26 species belonging to 17 families and 23 genera. Out of 26 recorded pteridophytes, five are threatened Philippine plant species. These are *Adiantum hosei*, *Blechnum egregium*, *Drynaria quercifolia*, *Osmunda banksiifolia* and *Sphaeropteris glauca*. This pioneer pteridophyte inventory represents the floristic diversity and will serve as baseline information for future researches in the area.

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## Introduction

Pteridophytes, also known as lycophytes and monilophytes, are group of non-flowering vascular plants found in almost every ecosystem, but with highest species richness in humid tropical mountains (Smith *et al.*, 2006; PPG I, 2016). There are approximately 11,916 species worldwide and the number is continually increasing as new species and varieties continued to be found. At present, the Philippines harbours approximately 1,100 species of pteridophytes classified into 3 families of lycophytes and 34 families of ferns (Pelser *et al.*, 2011; Amoroso *et al.*, 2016).

The presence of 34 families of ferns out of the 48 families recognized by the Pteridophyte Phylogeny Group I and all three families of lycophytes is an indication that the country possesses a rich pteridophyte flora (Cristenhusz and Chase, 2014; PPG I, 2016; Magtoto and Austria, 2018). However, given the increasing pace of forest destruction and habitat loss, most of these plants are becoming threatened by extinction. Furthermore, due to their great economic importance to floral and pharmaceutical industries, many species have been over-collected and poached. Dinagat Island is the third largest Island in the Mindanao biogeographic sub-region located in the north of northeastern Mindanao (Villanueva, 2009).

The island is considered as one of the areas in the Philippines characterized with ultramafic outcrops together with Palawan, Samar, Zambales, Zamboanga, Mindoro, and Sulu.

It has a unique faunal and floral composition, with a high level of endemism (Lillo *et al.*, 2018). However, to date, knowledge on the fern and lycophyte flora of the aforementioned island is poorly known and relatively still undocumented. Thus, this study was undertaken to provide a preliminary checklist and to determine the conservation status of pteridophytes present in Sambonotan Watershed, situated in the Municipality of Tubajon, Dinagat Island, Philippines. This local species documentation further contributes

to the baseline data of Philippine pteridophytes, especially on their distribution. Furthermore, taxonomic and ecological data of the plants are important information for an efficient biological resource management for the said study area.

## Materials and methods

An extensive survey was carried out in November 2018 in the Sambonotan watershed, situated in barangay Mabini, municipality of Tubajon, Dinagat Island, with highest elevation of 285 m above sea level. Sambonotan watershed is an interesting area with an intact forest community and is characterized by three vegetation types: agroecosystem, dipterocarp forest and montane forest.

Following the established mountain trail, a transect walk (5 m both sites) and opportunistic sampling were done from the base to the peak of the mountain. One to two fertile individuals were collected using a shear for voucher specimens and for further identification of the species. All specimens were processed following the wet method (Hodge, 1947). Voucher specimens were then deposited at Mindanao State University—Iligan Institute of Technology (MSU—IIT) herbarium. Identification of the recorded species were done using the following monographs, floras and other publications: Copeland (1958a, b, c), Holttum (1959a, b, c, 1978, 1981), Zamora and Co (1986), and digitized plant specimens available in Global Plants on JSTOR. The classification systems used were those of Smith *et al.* (2006) and Rothfels *et al.* (2012). The conservation status of the species was determined based on DENR Administrative Order No. 2017-11.

## Results and discussion

Results of the floristic study conducted in Sambonotan Watershed revealed twenty-six (26) species, belonging to seventeen (17) families and twenty-three genera (23) (Table 1; Fig. 1). Out of the 26 taxa recorded, 22 of them are identified to species level. Some of the unidentified species are sterile, which prevented identification to species level.

Most of the species are terrestrial (73%) and few are epiphytic (15%) or terrestrial to epiphytic (12%) (Table 2). The families represented by the greatest number of genera are Lindsaeaceae with three (3)

genera, and Blechnaceae, Hymenophyllaceae, Polypodiaceae and Pteridaceae with two (2) genera (Table 1).

**Table 1.** Total number of genera and species of ferns and lycophytes recorded from Sambonotan Watershed, Dinagat Island.

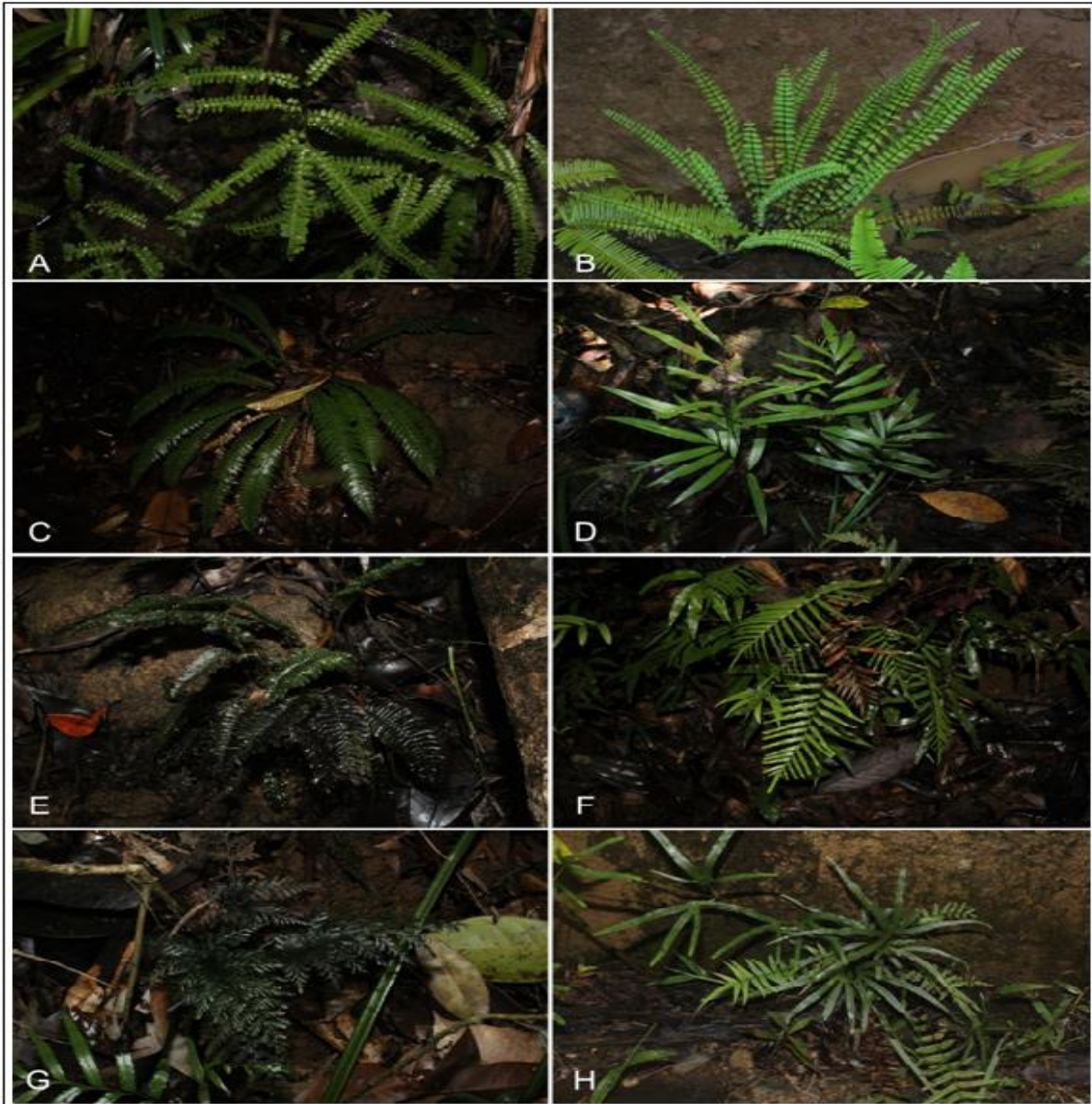
Family	Number of genera	Number of species
Lycophytes		
Lycopodiaceae	1	1
Selaginellaceae	1	3
Monilophytes		
Aspleniaceae	1	1
Athyriaceae	1	1
Blechnaceae	2	3
Cyatheaceae	1	1
Davalliaceae	1	1
Dennstaedtiaceae	1	1
Gleicheniaceae	1	1
Hymenophyllaceae	2	2
Lindsaeaceae	3	4
Lygodiaceae	1	1
Nephrolepidaceae	1	1
Osmundaceae	1	1
Polypodiaceae	2	2
Pteridaceae	2	1
Thelypteridaceae	1	1
TOTAL	23	26

**Table 2.** Checklist of ferns and lycophytes in Sambonotan Watershed, Dinagat Island.

Species name	Habit	Conservation status
<i>Abrodictyum obscurum</i> (Blume) Ebihara & K. Iwats.	Terrestrial	Other Wildlife Species
<i>Adiantum hoseri</i> Baker	Terrestrial	Vulnerable
<i>Asplenium</i> sp. 1	Terrestrial to epiphytic	-
<i>Blechnum egregium</i> Copel.	Terrestrial	Vulnerable
<i>Blechnum finlaysianum</i> Hook. & Grev.	Terrestrial	Other Wildlife Species
<i>Cephalomanes atrovirens</i> C. Presl.	Terrestrial	Other Wildlife Species
<i>Davallia solida</i> (G. Forst.) Sw.	Terrestrial to epiphytic	Other Wildlife Species
<i>Dicranopteris linearis</i> (Burm.) Underw.	Terrestrial	Other Wildlife Species
<i>Diplazium cordifolium</i> Blume	Terrestrial	Other Wildlife Species
<i>Drynaria quercifolia</i> (L.) J. Sm.	Epiphytic	Vulnerable
<i>Lindsaea lucida</i> Blume	Terrestrial	Other Wildlife Species
<i>Lindsaea pulchella</i> (J.Sm.) Mett. ex Kuhn.	Epiphytic	Other Wildlife Species
<i>Lygodium circinnatum</i> (Burm.) Sw.	Terrestrial	Other Wildlife Species
<i>Lycopodiella cernua</i> (L.) Pic.-Serm.	Terrestrial	Other Wildlife Species
<i>Nephrolepis exaltata</i> (L.) Schott	Terrestrial to epiphytic	Other Wildlife Species
<i>Odontosoria retusa</i> (L.) J. Sm.	Terrestrial	Other Wildlife Species
<i>Osmunda banksiifolia</i> (C. Presl.) Kuhn	Terrestrial	Other Threatened Species
<i>Pteridium aquilinum</i> (L.) Kuhn	Terrestrial	Other Wildlife Species
<i>Selaginella</i> sp. 1	Terrestrial	-
<i>Selaginella</i> sp. 2	Terrestrial	-
<i>Selaginella</i> sp. 3	Epiphytic	-
<i>Sphaeropteris glauca</i> (Blume) R.M. Tryon	Terrestrial	Endangered
<i>Sphaerostephanos unitos</i> (L.) Holttum	Terrestrial	Other Wildlife Species
<i>Stenochlaena palustris</i> (NL Burm.) Bedd.	Epiphytic	Other Wildlife Species
<i>Taenitis blechnoides</i> (Willd.) Sw.	Terrestrial	Other Wildlife Species
<i>Tapeinidium pinnatum</i> Cav. (C. Chr.)	Terrestrial	Other Wildlife Species

The genera represented by the largest number of species are *Selaginella* with three (3) species and *Asplenium*, *Blechnum* and *Lindsaea* with two (2) species each. The remaining genera are represented by single species (Table 2).

Some of these families and genera are also the ones with the highest number of species and are widely distributed in the entire Philippine archipelago (Pelser *et al.* 2011; Amoroso, 2016).



**Fig. 1.** Some species of ferns in Sambonotan Watershed, Dinagat Island, Philippines. A. *Adiantum hosei* B. *Lindsaea lucida* C. *Blechnum egregium* D. *Taenitis blechnoides* E. *Cephalomanes atrovirens* F. *Tapeinidium pinnatum* G. *Abrodictyum obscurum* H. *Lygodium circinnatum*. Photos by: M.A.K. Naive.

According to Kessler (2010), several factors may affect the species richness in the Philippines such as the size of the area sampled, climatic conditions, soil type, and geographic location. Species richness could also be affected by anthropogenic activities such as

grazing, conversion of forests to agricultural lands and pollution (Amoroso *et al.*, 2016). Furthermore, the low species richness of the area could be attributed to the fact that the forest was burnt last July 2018 with an unknown cause.

Among the 26 species of ferns and lycophytes recorded, four are listed as threatened Philippine plants (DENR Administrative Order No. 2017-11). *Sphaeropteris glauca* is listed as endangered (EN), *Adiantum hosei*, *Blechnum egregium* and *Drynaria quercifolia* are categorized as Vulnerable (VU) while *Osmunda banksiifolia* is listed as other threatened species (OTS).

At present, numerous pteridophytes species in the Philippines are becoming rare in the wild and are threatened with extinction due to forest degradation or even a total destruction of their habitats. There are still numerous species to be discovered in the aforementioned area. Furthermore, the number of recorded species will certainly increase, with additional research and the opening up of other inaccessible locations.

### Conclusion

The floristic survey conducted in Sambonotan Watershed documented a total of 26 species belonging to 17 families and 23 genera. These include five threatened taxa namely, *Adiantum hosei* (VU), *Blechnum egregium* (VU), *Drynaria quercifolia* (VU), *Osmunda banksiifolia* (OTS) and *Sphaeropteris glauca* (EN).

This benchmark data presented can be utilized for future monitoring of ferns and lycophytes populations and conservation initiatives of threatened species in Sambonotan watershed. It is highly recommended that a thorough exploration be made in the area so that the real profile of pteridoophytes in the Sambonotan watershed will be further established. It is also recommended to maintain monitoring to avoid the risk of biodiversity loss and increase abundance of fern species.

### Acknowledgements

The authors would like to acknowledge the local government unit of barangay Mabini & Alagad sa Kinaiyahan ug Kalambuan Inc. (AKKI) for their support during the fieldwork, PENRO–DENR,

Dinagat Island most especially to Mr. Rolly Caballero for their support in the processing of gratuitous permit, Jim Cootes for the English critic and Mrs. Cindy Grace Abas for her assistance in species identification. The first, second, third, fourth, fifth, sixth, seventh and eighth authors would like to thank the Department of Science and Technology – Science Education Institute for their scholarship grant.

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