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Preliminary Reporton Ferns and Lycophytes at Kampo Uno, Katipunan, Davao-Arakan Valley Road, North Cotabato

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Abstract

An updated species list and conservation assessment of ferns and lycophytes at Kampo Uno, Katipunan, Davao-Arakan Valley Road, North Cotabatowere provided on the basis of recent field survey and examination of herbarium specimens. Among the 60 identified species in the area, 50 % are rare in terms of local assessment. On the other hand, 25 % are abundant and the remaining 25 % are very abundant. Out of the 60 species four are endangered, which belong to the family Cyatheaceae. On the other hand, 12 species are vulnerable and the rest of the species belong to Other Wildlife Species (OWS) and Other Threatened Species (OTS).

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Introduction

Ferns and their allies, collectively called as 'Pteridophytes' are group of non-flowering vascular plants dating back to 360 million years and thus proves to be one of the earliest land encroachers (Chandra, 2000). Ferns are one of the oldest land plant groups in our earth's surface. Compared with other groups of plants, ferns are usually neglected by the researchers. But the ferns are becoming important for their beauty and economic uses (Bandyopadhyay and Mukherjee (2014). Traditionally, pteridophytes include the so-called ferns and fern allies because of their shared life cycle as spore-producing plants. Recently, molecular data show that pteridophytes are paraphyletic. They are now recognized as the lycophytes and ferns, the latter of which includes

horsetails, whisk ferns, and all eusporangiate and leptosporangiate ferns (Amoroso et al., 2016). They do not produce seeds but reproduce through spores (Wilson, 2010). They are widely distributed both in the tropic and temperate regions especially at higher elevations (Oloyede and Odu, 2011).

The diversity of Philippines vascular plants includes an estimated 1,100 species of ferns and lycophytes distributed among 154 genera and 34 families, according to recent classifications (Smith et al. 2006). This estimate continues to increase because of new species discoveries and new records in the Philippines (Amoroso et al. 2009; Barcelona et al. 2013).A specific sub-urban community at Katipunan, Marilog District, Calinan, Davao City is an ecological community of interesting forest structure and dynamics as it is considered to belong to a sub-urban area.

In order to contribute to the materialization of coming up with baseline data regarding this is area, this study aims to conduct a preliminary inventory of ferns and lycophytes. Specifically it seeks to determine the species richness, conservation assessment and to provide a checklist of ferns and lycophytes in the area.Nonetheless, there is no published checklist of ferns and lycophytes for the reserved forest. Here, such checklist is provided, along with a species conservation assessment of ferns and lycophytes in the area.

Research Method

Sampling Site

Preliminary fern assessment was conducted at the newly developed resort named Mig Camp at Kampo Uno, Katipunan, Davao-Arakan Valley Road, North Cotabato. It is an interesting ecological community with a partial intact forest communty.Visible vegetation types in the area include agro-forest and lower montane forest. It has an elevation of 1097 masl.

Figure 1. Transect Inventory (yellow line) in Kampo Uno, Katipunan, Arakan Valley, North Cotabato.

Species Inventory

An inventory of ferns and lycophytes was conducted through series of transect walks from the entrance of Mig Camp Resort in Katipunan up to its peak. The transect walk continued going down from Dila Falls down to the opposite side of Cedar's entrance going to their Training Hall.

Collection, Processing, and Identification of Specimens

A minimum of four fertile fronds of each species was collected with a shear and trimming cutter. Small ferns were collected by uprooting the whole plant, removing the soil, and pressing the plant intact. All specimens were processed using the wet method (Hodge 1947). Herbarium specimens were deposited at the Central Mindanao University Herbarium (CMUH). Species identifications are based on the specimens deposited at CMUH and were performed by consulting the following monographs, floras, and other publications: Copeland (1958- 1961); Holttum (1959a, b, c, 1978, 1981, and 1991);Zamora and Co (1986) and digitized plant specimens available in Global Plants on JSTOR. The classification systems used are those of Smith et al. (2006, 2008) and Rothfels et al. (2012).

Assessment of Conservation Status

Assessments of the endangered and conservation status of the species recorded are based on the national list of threatened Philippine plants (Fernando et al. 2008) which follows the criteria of the International Union for the Conservation of Nature. This information serves as a basis for governmental agencies that set environmental policy (Protected Area Management Board (PAMB), Department of Environment and Natural Resources (DENR) and Local Government Units (LGU's)) for monitoring and protecting threatened species, both within the sanctuary and beyond.

Results and Analysis

Sixty species belonging to 30 genera and 16 families were recorded. Of the 60 species, 56 species are ferns and four are lycophytes (Tables 1 & 2). The families with the highest number of species are Polypodiaceae (12 species), Dryopteridaceae (9), and Aspleniaceae (6).

Table 1. Total number of genera and species of ferns and lycophytes documented from CEDAR

	Family	Number of Genera	Number of Species
1	Aspleniaceae	1	6
2	Cyatheaceae	2	4
3	Davalliaceae	1	3
4	Dennstaedtiaceae	1	2
5	Dryopteridaceae	5	9
6	Gleicheniaceae	2	2
7	Lindsaeaceae	2	2
8	Lomariopsidaceae	1	3
9	Marattiaceae	1	1
10	Polypodiaceae	6	12
11	Pteridaceae	1	4
12	Selaginellaceae	1	4
13	Tectariaceae	1	1
14	Thelypteridaceae	3	4
15	Vittariaceae	1	1
16	Woodsiaceae	1	2
	TOTAL	**30**	**60**

In these inventory results, one can imply that elevational gradients are suitable in investigations related to patterns of biodiversity because they provide a natural experimental setting along which environmental conditions change continuously within relatively short distances specifically within few tens of km. This abiotic factor is considered to be analogous to latitudinal gradients, but they have the advantage of not being affected by dispersal limitations (Salazar et al., 2012). Compared to the species richness in Mt. Hamiguitan and other sampling sites with relatively higher elevation, the species richness of ferns and lycophytes in Katipunan with and elevation of 1, 102 MASL is lower. Furthermore, the vast majority of a certain ecosystem's biodiversity including ferns would have been associated with that forest cover (Monterossa and Monro, 2008). Thus, ferns' species richness is also directly affected by the percentage of disturbance occurring in the forest.

In addition, several factors may affect local montane species richness in the Philippines such as the size of the area sampled, climatic conditions, soil type, and geographic location (Amoroso et

al., 2016). Species richness is also affected by human activities such as the conversion of forests to agricultural or industrial lands and pollution. With increasing utilization of land and natural resources, it is feared that many of these threatened taxa will become yet rarer, more vulnerable and endangered, and in several cases may finally become extinct, as any disturbance or imbalance in their narrowly confined ecosystems is liable to lead to their extermination (Chandra et al., 2008).

Table 2. Checklist and Assessment of ferns and lycophytes at Kampo Uno, Brgy. Katipunan, Arakan Valley, North

	Species Name	Number of Individulas	Local Assessment	Conservation Status
Aspleniaceae	*Asplenium apoense* Copel.	1 to 5	Rare	OWS
	A. baileyanum (Domin.) Watts	1 to 5	Rare	OWS
	A. longgissimum Blume	1 to 5	Rare	OWS
	A. nidus Linn.	1 to 5	Rare	OWS
	A. phyllitidis Don.	1 to 5	Rare	OWS
	A. tenerum Forster	1 to 5	Rare	OWS
Cyatheaceae	*Alsophila fuliginosa* Christ lurida (Blume) Hook.	10 <	VA	Endangered
	Sphaeropteris glauca (Blume) R.M.Tryon	10 <	VA	Endangered
	S. lepifera (J.Sm. ex Hook.) R.M.Tryon	10 <	VA	Endangered
	S. polypoda R.M.Tryon	10 <	VA	Endangered
Davalliaceae	*Davallia denticulata* (Burm.) Mettenius	10 <	VA	OTS
	D. solida (Forst.) Sw	10 <	VA	OTS
	D. trichomanoides Blume	10 <	VA	OTS
Dennstaedtiaceae	*Microlepia biformes*	1 to 5	Rare	OWS
	Microlepia speluncae (Linn.) Moore	1 to 5	Rare	OWS
Dryopteridaceae	*Arachnoides aristata* Forster	1 to 5	Rare	OWS
	Bolbitis heroclita (C.Presl) Ching	1 to 5	Rare	OWS
	Bolbitis sp.	1 to 5	Rare	OWS
	Dryopteris sparsa (Bon) O. Kuntze	1 to 5	Rare	OWS

	Elaphloglossum angulatum (Blume) Moore	1 to 5	Rare	OWS
	E. callifolium (Blume) Moore	1 to 5	Rare	OWS
	E. petiolatum (Swartz) Urban	1 to 5	Rare	OWS
	Pleocnemia irregularis (C.Presl) Holttum	6 to 10	Abundant	OWS
	P. macrodonta (Fée) Holttum	6 to 10	Abundant	OWS
Gleicheniaceae	*Dicranopteris linearis (Burm) Underwood*	1 to 5	Rare	OWS
	Gleichenia laevigata (Wild.) Presl	1 to 5	Rare	OWS
Lindsaeaceae	*Lindsaea cultrata Willd* (Phylogr.)	1 to 5	Rare	OWS
	Tapeinidium luzonicum (Hook.) K.U.Kramer	1 to 5	Rare	OWS
Lomariopsidaceae	*Nephrolepis bisserata (Sw.) Schott*	10 <	VA	OWS
	N. cordifolia (L.) C.Presl	10 <	VA	OWS
	N. hirsutula	10 <	VA	OWS
Marattiaceae	*Angiopteris evecta* (G.Forst.) Hoffm.	10 <	VA	OWS
Polypodiaceae	Cyclosorus ensifer	10 <	VA	OWS
	Drynaria quercifolia (L.) J.Sm.	6 to 10	Abundant	Vulnerable
	Drynaria sp.	6 to 10	Abundant	Vulnerable
	*Drynariopsis heracleai (Runze)*Ching	6 to 10	Abundant	Vulnerable
	Goniophlebium subauriculatum (Blume) Presl.	6 to 10	Abundant	Vulnerable
	Goniophlebium sp.	6 to 10	Abundant	Vulnerable
	Microsorum alternifolium Wild.	6 to 10	Abundant	Vulnerable
	M. punctatum (L.) Copel.	6 to 10	Abundant	Vulnerable
	Mircosorum sp.	6 to 10	Abundant	Vulnerable
	Pyrossia adnacens	1 to 5	Rare	Vulnerable
	P. sphaerosticha (Mett.) Ching	1 to 5	Rare	Vulnerable
	P. pelosilloides (Linn.) Price	1 to 5	Rare	Vulnerable
Pteridaceae	*Pteris glaucovirens* Goldman	1 to 5	Rare	OWS

	P. longipinnula Wallich	1 to 5	Rare	OWS
	P. mutilata	1 to 5	Rare	OWS
	P.oppositpinata	1 to 5	Rare	OWS
Selaginellaceae	*Selaginella longipina*	5 to 10	Common	OWS
	S. *usterii*	5 to 10	Common	OWS
	S. engleri Hieron	5 to 10	Common	OWS
	S. cupressina (Willd.) Spring	5 to 10	Common	OWS
Tectariaceae	*Tectaria meyanthidis*	5 to 10	Common	OWS
Thelypteridaceae	*Christella parasitica (Linn.) Lev*	1 to 5	Rare	Vulnerable
	Phronephrium aspersum Sheiland Tsai	1 to 5	Rare	OWS
	Sphaerostephanos unitus	10 <	VA	OWS
	Sphaerostephanos sp.	10 <	VA	OWS
Vittariaceae	*Vittaria ensiformes* Swartz.	1 to 5	Rare	OWS
Woodsiaceae	*Diplazium esculentum* (Retz.) Sw.	10 <	VA	OWS
	Diplaziopsis javanica (Blume) Christ.	1 to 5	Rare	OWS

Among the 60 identified species in the area, 50 % are rare in terms of local assessment. On the other hand, 25 % are abundant and the remaining 25 % are very abundant. Based on the published research of Fernando et al. in 2008, out of the 60 species four species are endangered, which belong to the family Cyatheaceae. On the other hand, 12 species are vulnerable and the rest of the species belong to Other Wildlife Species (OWS) and Other Threatened Species (OTS). In terms of Ecological status 11 species are found in the book of Amoroso on Medicinal ferns and Lycophytes.

The results on local assessment can be attributed to the fact that Mig Camp resort contributed to the degree of disturbance in forest cover since anthropogenic pressures since it has been gradually developed into a recreational resort. It is also adjacent to the fact that the tropical montane forests suffer from increasing fragmentation and replacement by other types of land-use (Winkler, 2011).

The terrestrial environment that provide 98 % of food and accounts up to 95 % of the world's natural resources is affected by human activities including agriculture (Paoletti et al., 1992). The intensity of the disturbance may have a direct effect on specific diversity, because environmental variation in these ecosystems decreases habitat stability. In addition, irradiance patterns caused by vegetation structure and atmospheric conditions are responsible for changes in vegetation dynamics. Ferns and lycophytes are seedless plants, whose reproduction success depends on high humidity levels. Fern richness is influenced by temperature, precipitation and relative humidity, so anthropogenic changes in the physical environment have a negative effect on their diversity. Because of this fact, they usually serve as indicators of climate conditions (Lozano et al. 2017).

Conclusion (12pt)

There were sixty seven species belonging to 16 families and 30 genera recorded in the inventory of Mig Camp, an agroforest ecosystem which is currently developed for recreation. Of the total 60 species recorded, 50 % have >5 number of individuals and with a conservation assessment of few. On the other hand, 25 % have 5 to 10 number of individuals and a conservation assessment of common. The remaining 25 % have < 10 number of individuals and therefore are considered abundant.

Recommendations

In the mentioned findings and conclusions above, the researchers recommend the following:

1. It is highly recommended that a thorough exploration must be made in order to conduct a re-inventory on the species of both ferns and lycophytes in the area so that the real profile of the recreational park of the forest will be established.

2. Based on the findings, it is further recommended that the area should be maintained protected to avoid loss and acquire abundance of fern species.
3. Species-specific conservation management strategy should be applied to avoid the risk of extinction of fern species.
4. Formulate Barangay ordinance that will regulate human activities, create public awareness and to ask officials to conserve properly the area.
5. A monitoring program in charge of determining changes of fern species density CEDAR must be created to determine the population dynamics if these species and the exploitation of economically important species would be regulated.
6. As a future conservation biologist, one must promote conservation strategies especially on ferns.

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