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Species diversity of the monocotyledonous vegetation of Mt. Pangasugan, Leyte, Philippines

Pamela M. Po-Abit and Norma O. Aguilar

Department of Biological Sciences, Leyte State University, Baybay, Leyte, Philippines; Institute of Biological Sciences, University of the Philippines at Los Baños, Laguna, Philippines.

ABSTRACT

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The species diversity of the monocotyledonous vegetation of Mt.Pangasugan (1,158 m ASL) was described. Four sites (sites 1-91 to 300 m ASL; site 2-301 to 600 m ASL; site 3-601 to 901 m ASL; site 4-900 to 1,158 m ASL) were established to take an inventory of the monocotyledonous flora of the western side of the mountain.

A total of 516 monocotyledonous species representing 51 genera, 76 species belonging to 14 families were recorded. Family Palmae comprised the most number of species whereas Hypoxidaceae and Apostaciaceae had the least number. *Scleria scrobiculata* (Cyperaceae) was observed to be the most abundant species.

Results revealed that the species diversity of the monocotelydonous vegetation of Mt. Pangasugan is affected by altitude. Higher species diversity was observed at lower altitudes than at higher altitudes.

Keywords: Monocotyledons, altitude, Mt. Pangasugan, diversity

Correspondence: P.M. Po-Abit *Address*: Department of Biological Sciences (DBS), Leyte State University, Baybay, Leyte 6521-A Philippines. *E-mail*: uvoli@yahoo.com. *Fax*:(053)335-2601. *Tel. No.*(053) 335 2629.

INTRODUCTION

Monocotyledons are angiosperms characterized by seeds having a single cotyledon, their leaves for most part having parallel veins and flower parts normally in threes or multiples of three. They are among the plant types exploited for cultivation as ornamentals, for food, shelter and clothing. The importance of knowing the monocotyledonous vegetation has been heightened by the awareness of the endangered status of these plants in the wild due to commercial exploitation. Synge (1980) stressed that among monocots, many are endangered especially at the generic level in the rainforest of Southeast Asia. Since most monocots are annual and herbaceous, they are easily propagated by vegetative methods and are vulnerable to overcollection and exploitation. Thus, the conservation of this plant group requires information on their composition, distribution and ecology so that their habitat can be protected.

Floristic composition and plant diversity are affected by several factors and one of which is altitude. Paijmans (1976) stated that numbers of individuals of certain taxa as well as its flora change with altitude. Beaman and Beaman (1990) added that the highest species diversity of flora apparently results from a combination of factors and among which is altitudinal change from near sea level to the summit. Hence, this study aimed to describe the monocotyledonous flora and determine their diversity at different altitudes as well as their similarity across sites.

MATERIALS AND METHODS

Selection of sampling site

A preliminary survey of the various sites in Mt. Pangasugan was conducted to establish representative sampling sites at different altitudes as follows: 90 m-300 m ASL, 301 m- 600 m ASL, 601 m-900 m ASL and 901 m-1,158 m ASL. An altimeter was used to determine the altitude. The sampling

sites were representatives of homogenous vegetation and undisturbed area. The sampling was limited to the western side of the Mt. Pangasugan. Details of the physical characetristics of the study sites are reported in Po-Abit and Aguilar (this issue).

Vegetation sampling

The Belt transect method was used to collect the vegetation data wherein at least 20 transects were laid out upslope within each sampling site. Following the method used by Iskandar and Kotanegara (1995), the transects measured 100 sq. m. (25 m x 4 m) and a total of 32 quadrats were randomly placed acrosss the sampling area in each site. Details of the methodology are found in Po-Abit and Aguilar (this issue).

Fresh representative samples of species tallied were collected in preparation of herbarium specimens for a thorough and detailed examination and description. For documentation, illustrations and photos were taken. Herbarium specimens were kept at the LSU herbarium, Department of Biological Sciences, Leyte State University, Baybay, Leyte and the Museum of Natural History Botanical Herbarium at University of the Philippines at Los Baños.

Calculation of measurements for describing monocotydenous vegetation at different altitudes

Ecological indices such as diversity index (species richness, evenness index, Shannon index of general diversity); index of dominance, and index of similarity between two sampling sites were analyzed using the computer software Ecostat.

RESULTS AND DISCUSSION

General description and identification of the monocotyledons in Mt. Pangasugan

A total of 516 monocotyledonous plants representing 51 genera, 76 species belonging to 14 families were recorded (Table 1). Family Araceae comprised the most number of genera followed by Orchidaceae, Zingerberaceae and Palmae. Commelinaceae and Marantaceae had similar number of genera (4) while Graminae and Cyperaceae are the same with 3 genera. Pandanaceae, Liliaceae and Dioscoreaceae had 2 genera each while Musaceae, Hypoxidaceae and Apostasiaceae had 1 each. Family Palmae had the most number with 14 species followed by Araceae having 13 species and Zingerberaceae with 10 species.Orchidaceae, Commolinaceae and Pandanaceae had relatively the same number of species (6-7) while Cyperaceae, Liliaceae and Musaceae were also similar with 3 species each. Hypoxidaceae and Apostasiaceae had the least number of species (Figure 1).

Table 2 shows the most abundant species of the monocotyledonous flora in Mt. Pangasugan. These ten abundant species constitute 50% of the total number of monocots observed. *Scleria scrobiculata* of Cyperaceae was observed to be the most abundant species. The other 67 species,which comprised the other 50% of the total plant individuals collected , were represented by 1-2%.

Table 3 reveals the total number of individuals, species and genera number and family composition in the four sampling sites . Site 1 started at 90 m ASL because the vegetation near sea level is used as an agricultural experimental field. A total of 233 monocotyledons were collected from the site representing 41 species belonging to 12 families. The total number of individuals recorded in site 2 totaled 222 belonging to 12 families by 50 species. Sites 1 and 2 were both dominated by aroid species.In site 3, 34 plant individuals representing 16 species belonging to 7 families were observed with zingebers and aroids dominating the area. There was a reduction in the number of individuals observed in site 4 of which has only 27 belonging to 6 families and representing 9 species.

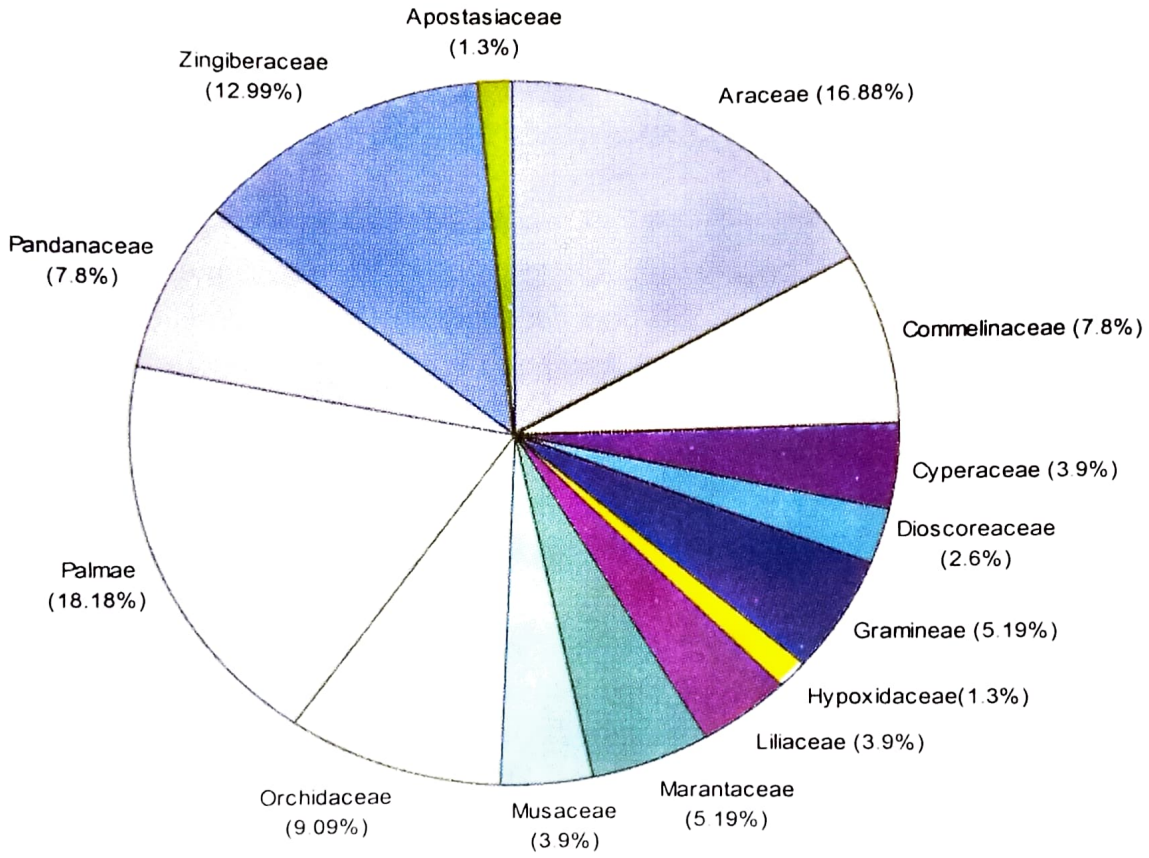

Figure 1. Percentage of total number of monocotyledonous species per family in Mt Pangasugan.

Table 1. The number of families and species of monocotyledons in Mt. Pangasugan

Family	No. of Genera	No. of Species	No. of Individuals
Araceae	9	13	117
Graminae	3	4	21
Zingiberaceae	6	10	63
Cyperaceae	3	3	54
Commelinaceae	4	6	56
Orchidaceae	7	7	32
Dioscoraceae	2	2	4
Musaceae	1	3	8
Hypoxidaceae	1	1	20
Apostasiaceae	1	1	1
Marantaceae	4	4	28
Palmae	6	14	75
Pandanaceae	2	6	33
liliaceae	2	2	4
Total No. of Families:	14		
TOTAL	51	76	516

Table 2. Ten most abundant monocotyledonous species found in Mt. Pangasugan

Plant Species	Family	No. Individuals	Percentage
Scleria scrobiculata	Cyperaceae	40	7.75
Schismatoglottis calyptrata	Araceae	36	6.98
Homalomena philippinensis	Araceae	27	5.23
Languas haenki	Pandanaceae	27	5.23
Dictyospermum vitiense	Commelinaceae	23	4.46
Pinanga maculata	Palmae	23	4.46
Spathoglottis sp.	Orchidaceae	22	4.26
Pandanus sp.	Pandanaceae	21	4.07
Molineria capitulata	Hypoxidaceae	20	3.88
Aglaonema oblongifolium	Araceae	17	3.29
Other species (67)		260	50.39

Table 3. Number of species and individuals per site according to family of monocotyledons in Mt. Pangasugan

FAMILY	SITE											
	1			2			3			4		
	# of Genera*	# of Sp **	# of Ind ***	# of Genera	# of Sp	# of Ind	# of Genera	# of Sp	# of Ind	# of Genera	# of Sp	# of Ind
Gramineae	2	4	15	1	1	3	1	1	1			
Araceae	5	7	77	8	12	33	3	4	4			
Zingiberaceae	4	5	13	5	9	42	3	5	8	1	1	4
Cyperaceae	1	1	1	2	2	33	1	1	7	3	3	15
Commelinaceae	3	5	46	2	2	10						
Orchidaceae	1	1	1	4	4	21	2	2	6	1	1	4
Dioscoreaceae	2	2	4									
Hypoxidaceae	1	1	11	1	1	9						
Marantaceae	3	3	18	4	4	10						
Musaceae	1	3	8									
Palmae	5	6	33	6	10	36	2	2	5	2	2	1
Pandanaceae	2	3	6	2	3	22				1	1	1
Liliaceae				1	1	2	1	1	1	1	1	1
Apostasiaceae				1	1	1						
Total	30	41	233	37	50	222	13	16	38	9	9	26
Total No. Families		12			12			7			6	

* Number of genera per site
** Number of species per site
***Number of individuals per site

Cyperaceae was the family observed to have the highest species number in site 4. The population, family composition and species number of the monocotyledons were observed to decrease with an increase in altitude. Paijmans (1976) reported that floristic composition of the forest changes with increasing altitude and in higher parts of the zone the total number of species decreases although the number of individuals in certain taxa increases.

Species diversity and dominance

Diversity measures take into account two factors: species richness, that is the number of species; and evenness, that is how equally abundant the species is. Dominance measures are weighed towards the abundance of the commonest species (Magurran, 1988).

Figure 2 summarizes the species diversity (species richness index, evenness index and Shannon diversity index) and dominance indices of the monocotyledonous species in Mt. Pangasugan. Site 2 had the highest diversity (H=3.43). This is reflected by its high species richness (d=9.07) and evenness index (J=0.88) compared with the other sites. Site 1 ranked second in diversity (H=3.22) with species richness of 7.33 and evenness index 0.87. The least diverse site was observed in site 4 (H=1.93, d=2.42, J=0.88). The relatively low diversity in site 3 (H=2.52) compared with sites 1 and 2 is indicated by its low richness index (d=3.97). Dominance is the reciprocal of diversity, hence, the low dominance values observed in sites 3 and 4 compared with sites 1 and 2 imply and that species diversity decline gradually with an increase in altitude. Whittaker *et al.* (1968) observed the same results.

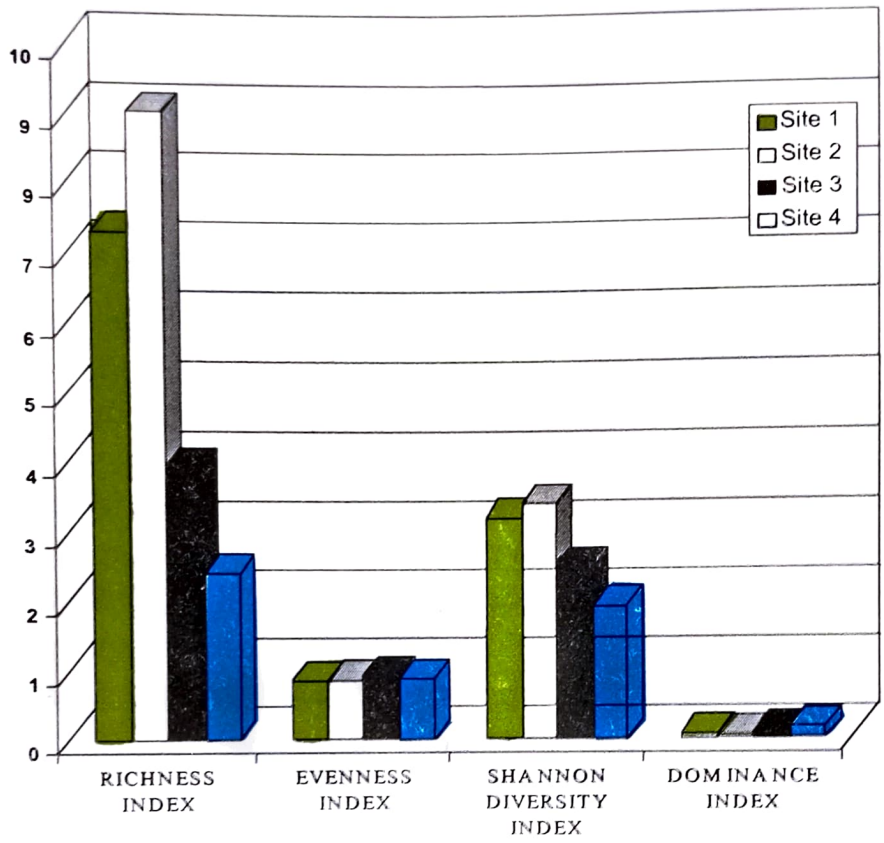

Figure 2. Species richness (d), diversity (H), dominance (C), evenness (J) indices of monocotyledons in Mt.Pangasugan

Similarity of the monocotyledonous vegetation in Mt. Pangasugan

Using Sorenson's similarity coefficients (Figure 3), the monocotyledonous flora in sampling site 2 showed the highest similarity with that of site 1 (0.48) while sites 1 and 3 and sites 2 and 3 showed the same similarity coefficients (0.32 and 0.37, respectively). Site 4 showed the lowest similarity with all sample sites. It was observed that similar or closely similar sites are those which lie side by side or are near each other in the low and middle altitudes while those sites nearer to the higher altitudes were the least similar. This could be due to differences in environmental conditions between sites of different altitudes. These results suggest that altitude influences species diversity and dominance of the forest.

Table 4 reveals the species common to all sites and this was used in calculating the similarity coefficients of two sites using Sorenson's formula. It was found that aroids like *Aglaonema oblongifolium*, *Rhaphidophora pinnata* and *Schimastoglottis calyprata* were common to sites 1 and 2 while *Alocasia heterophylla*, *Alocasia zebrina* and *Homalomena philippinensis* were common in sites 1, 2, and 3. Monocots which were only common to sites 1 and 2 were *Dictyospermum vitiense*, *Molineria capitulata*, *Donax cannaeformis*, *Phacelophrynium interruptum*, *Phrynium philippinensis*, *Areca ipot*, *Caryota cumingii*, *Pinanga maculata*, *Pandanus sp.*, and *Kolowratia congesta*. On the other hand, *Schizostachyum diffusum*, *Globba marantina*, *Languas haenkei* and *Languas illustris* were common to sites 1,2, and 3. *Scleria scrobiculata* was the only species found in all four sites. *Dianella caerulea* and *Catimbium speciosum* were common to sites found in sites 2 and 3. A palm, *Heterospathe philippinensis* was the lone species found in 1, 3 and 4. In sites 2 and 4, *Hypolytrum latifolium* and *Languas sp.* were the species observed.

Site	1	2	3	4
1				
2	0.48			
3	0.32	0.37		
4	0.08	0.07	0.17	

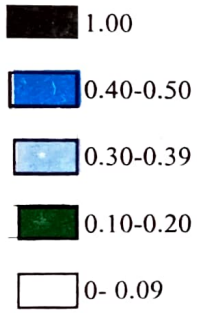

Figure 3.Index of similarity of monocotyledons (Sorenson's Measure).

Table 4. List of monocotyledonous species found in at least two sites in Mt. Pangasugan

Family	Plant species	Site			
		1	2	3	
Araceae	*Aglaonema oblongifolium*	x*	x		
Araceae	*Alocasia heterophylla*	x	x	x	
Araceae	*Alocasia zebrina*	x	x	x	
Araceae	*Homalomena philippinensis*	x	x	x	
Araceae	*Rhaphidophora sp.*	x	x		
Araceae	*Rhapidophora pinnata*	x	x		
Araceae	*Schismatoglottis calyptrata*	x	x		
Commelinaceae	*Dictyospermum vitiense*	x	x		
Cyperaceae	*Hypolytrum latifolium*		x		x
Cyperaceae	*Scleria scrobiculata*	x	x	x	x
Graminae	*Schizostachyum diffusum*	x	x	x	
Hypoxidaceae	*Molineria capitulata*	x	x		
Liliaceae	*Dianella caerulea*		x	x	
Marantaceae	*Donax cannaeformis*	x	x		
Marantaceae	*Phacelophrynium interruptum*	x	x		
Marantaceae	*Phrynium philippinense*	x	x		
Orchidaceae	*Spathoglottis sp.*		x	x	
Palmae	*Areca ipot*	x	x		
Palmae	*Caryota cumingii*	x	x		
Palmae	*Heterospathe philippinensis*	x		x	x
Palmae	*Pinanga insignis*		x	x	
Palmae	*Pinanga maculata*	x	x		
Pandanaceae	*Pandanus sp.*	x	x		
Zingerberaceae	*Catimbium speciosum*		x	x	
Zingerberaceae	*Globba marantina*	x	x	x	
Zingerberaceae	*Kolowratia congesta*	x	x		
Zingerberaceae	*Languas haenkei*	x	x	x	
Zingerberaceae	*Languas illustris*	x	x	x	
Zingerberaceae	*Languas sp.*		x		x

* Indicate the presence of the species

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