World Journal of Pharmaceutical and Life Sciences
WJPLS
www.wjpls.org
SJIF Impact Factor: 5.088

SURVEY OF VASCULAR EPIPHYTES IN SELECTED AREAS IN ZAMBOANGA CITY, PHILIPPINES

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Article Received on 06/05/2018 **Article Revised on 27/05/2018** **Article Accepted on 17/06/2018**

ABSTRACT

Epiphytes are considered to be as one of the most important component in a forest since they accumulate biomass, serve as habitat for some animals, help in water and other nutrient cycle and possess aesthetic value. However, trees in the forests face different threats like illegal logging, thus epiphytes are also affected, since they live in the bark surface of the trees. There are limited studies in epiphytes, specifically in Asia because of their hardly habitat and methods to use. This study aims to make an inventory and baseline data of vascular epiphytes in Zamboanga Peninsula. The study was carried in La Paz Tree Park (Site 1) and Pasonanca Natural Park (Site 2). A purposive sampling was carried in the selection of host trees, since the study sites are considered as secondary forest. The sampled trees were identified by an expert. Closed observation was used in counting of vascular epiphytes grow in the base and trunk of the trees. While the counting of vascular epiphytes which grow in the branches of the host trees was aided through the use of binoculars. Vascular epiphytes were identified through photograph, sample leaves and flowers. When data subjected for cluster analysis, Bagtikan (sample 3) has the unique vascular epiphytes in site 1 while Acacia (samples 8 and 10) has the unique vascular epiphytes in site 2. The most abundant species in site 1 is *Pyrrosia lingua*, while the least abundant is the *Dryopteris sparsa* and *Epipremnum pinnatum.* While in site 2, the most abundant species is the *Pyrrosia lingua*, while the least abundant is the *Nephrolepis exaltata*. Site 1 obtained high value in Margalef's Index of Richness (1.929) and Shannon's Diversity Index (2.319), while site 2 obtained high value in Simpson's Index of Dominance (0.1229). The two sites obtained a similarity index of 0.57.

KEYWORDS: *Biodiversity Indices, Cluster Analysis, Similarity Index, Vascular Epiphytes.*

INTRODUCTION

Epiphytes are essential component of the tropical forest due to its number of species they represent and they accumulate biomass (Arevalo, 2006). More so, epiphytes play an important role in tropical forest. It serves as habitat for some unique animals and maintains water balance and nutrient cycles of the forest (Shahrudin, et al, 2017; Benzing 1990, Hietz et al.2002). Some vascular epiphytes is being used for medical purposes. For instance, in Malaysia, bird's nest fern is being used for depurative. Epihytes has also ornamental value like ferns and orchids**, which** are being used in landscaping.

Epiphytes are plants with true root system that lives in the bark surface of the trees, either in trunks, branches and twigs without harming the host trees (Ellis, et al., 2015). Hsu and Wolf (2013) divided vascular epiphytes species into three subgroups: (1) holo-epiphytes: epiphytes that complete their entire life cycle without touching the forest floor (Benzing, 1990); (2) Hemi-epiphytes: epiphytes that complete part of their life cycle as terrestrial plants. Primary hemi-epiphytes begin their life cycle as epiphytes and eventually send their roots to the ground (e.g. strangler figs), whereas secondary hemi-epiphyte seedlings germinate terrestrially to become epiphytic secondarily when their rooting shoots decompose (e.g. aroids); and (3) Facultative epiphytes: species in which some individuals are terrestrial. Epiphytes comprises the 30% of vascular plants species in certain biodiversity hotspot (Kuper, 2004). Vascular plants mostly exist in tropical areas, and most species are found at mid-elevation on mountains (Wolf and Flamenco-S, 2003). Some vascular epiphyte species grow in mangroves (De Sousa and Colpo, 2016).

However, continues destruction of forests due to human activities, have a negative effect on vascular epiphytes, hence they need physical support (FAO, 2003; Hietz, et.al, 2006; Adeleye 2017). Continues extraction of commercially valuable vascular epiphytes will make the species endangered in the wild. These are only some of

the reasons which threatens biodiversity, thus, it became a springboard for the Philippine government to create some laws to make an area as natural parks. Natural parks are relatively large area, which are not materially altered by human activity where extractive uses are not allowed, and maintained to protect outstanding natural and scenic areas of national significance for scientific, educational and recreational use. Some of these includes Republic Act No. 9125: Northern Sierra Madre Natural Park Act; Republic Act No. 9154: Mt Kanlaon Natural Park Act; and Republic Act No. 9237: Mt Apo Protected Area Act.

Up to date, only few inventories were conducted on epiphytes, especially in Asia, probably due to their hardly habitat and of the methods being used (Hsu and Wolf, 2013; Palacio and Franco, 2001; Kuper 2004). Thus, a survey of vascular epiphytes was conducted in natural parks in Zamboanga City. The data generated in this study can be used as a reference for future researchers who wants to study epiphytes in Zamboanga Peninsula region. This will also bring awareness that conservation of forest is a must, because not only trees and animals are being affected if there will be continues of disturbance in the forest but also epiphytes community in general.

MATERIAL AND METHOD

Description of the Study Site This study was conducted in Zamboanga City, specifically in La Paz Tree Park and Pasonanca Natural Park. La Paz Tree Park (Figure 1.a.) has a distance of 18.5 km from the city proper. It has a temperature which can drop down close to 18˚C. Moreover, the soil in La Paz Tree Park is mainly loam type with its reddish-brown to dark color. Thus, these physical parameters makes it a good place for the growth of different trees and other plants. It is under the supervision of the La Paz Barangay Council.

Pasonanca Natural Park (Figure 1.b.) has a distance of 5.3 kilometres north from the city proper. It has a temperature ranges from 24 to 32˚C. Moreover, the soil in Pasonanca Natural Park is mainly loam type with its reddish-brown to dark color. Thus, these physical parameters allows the growth of different trees and other plants. Pasonanca Natural Park is protected and under the management of the Department of Environment and Natural Resources - Protected Area Office (DENR-PAO) and Zamboanga City Water District (ZCWD).

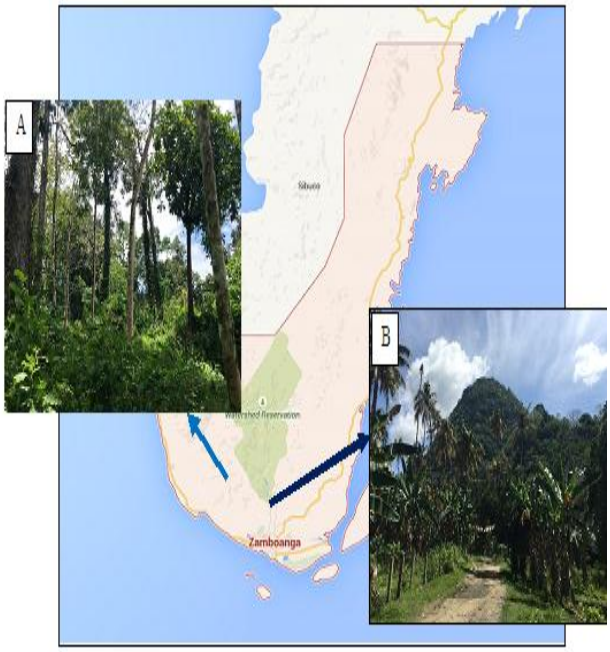

Figure 1: The study sites (a) La Paz Tree Park and (b) Pasonanca Natural Park.

Data Collection: The data was collected within April, 2018. A permit was secured from the barangay chairman of La Paz and DENR-PAO. In the study sites, the researcher used purposive sampling in the selection of trees, since the study sites are considered as secondary forest. The selected host trees was identified by the forester. In the host trees, vascular epiphytes present in the bases and trunks were counted through close observation, while counting of vascular epiphytes present in the branches was facilitated by the use of binocular. Photograph, sample leaves and flowers (if available) were taken, and brought in the Western Mindanao State University - College of Science and Mathematics for classification.

Data Analysis: All data were subjected to cluster analysis to identify homogenous groups and were quantitatively analysed by frequency and density. The species richness of the vascular epiphytes was calculated using Margalef's Index of Richness. Species diversity and dominance were evaluated using Shannon's Diversity Index and Simpson's Index of Dominance. Sorenson's Index of similarity were computed to determine the similarities of the two sites. The computations were assisted using PAST and programmed excel.

RESULTS AND DISCUSSION

Cluster Analysis. In La Paz Tree Park, there were a total of 8 trees sampled. These trees were classified as Bagtikan (*Parashorea malaanonan Merr*), Cabo negro (*Arenga saccharifera*), Lauan (*Shorea contorta*), and Mayapis (*Shorea palosapis*). In those trees, there were a total of 13 vascular epiphytes spotted. These vascular epiphytes were classified as *Asparagus asparagoides*,

Asplenium drepanophyllum, Asplenium nidus, Dryharia sparsisora, Dryopteris sparsa, Epipremnum aureum, Epipremnum pinnatum, Ficus Pumila, Nephrolepis exaltata, Philodendron scandens oxycardium, Pothos scandens, Pyrrosia lingua, and *Pyrrosia nummularifolia.*

Using cluster analysis (see Figure 2), it was noted that there were two clusters within the resemblance distance of 1.5. Cluster A is composed of Mayapis and Bagtikan (sample 1), and cluster B is the Cabonegro (sample 2 and 3). At a resemblance distance of 2.0, there were another 2 cluster obtained. Cluster C is composed of cluster A with the addition of Lauan, and cluster D is composed of cluster B with the addition of Cabo negro (sample 1). At a resemblance distance of 3.0, there were 3 additional clustered obtained. Cluster E is composed of Bagtikan (sample 2) as an addition to cluster C, cluster F is composed of clusters D and E and cluster G is composed of cluster F with the addition of Bagtikan (sample 3). This implies that unique vascular epiphytes were spotted in Bagtikan (sample 3). However, it does not denote that there were tree specific vascular epiphytes.

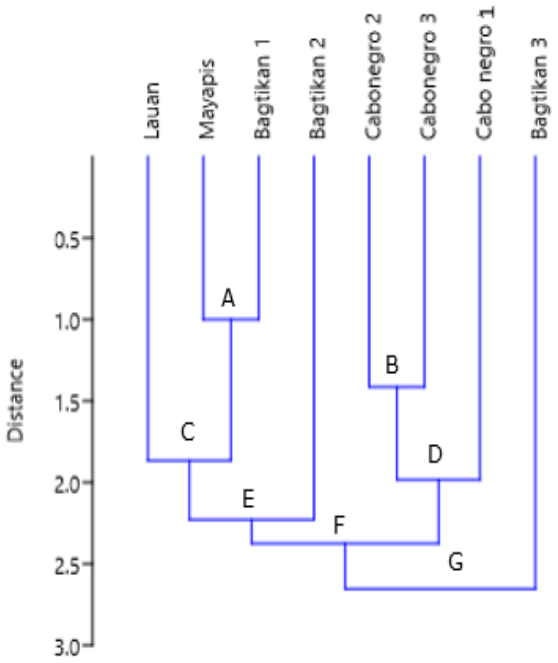

Figure 2: Cluster Analysis in La Paz Tree Park.

In Pasonanca Natural Park, there were a total of 14 trees sampled. These trees were identified as Acacia (*Samanea saman merr*), Narra (*Pterocarpus indicus*), Dao (*Dracontomelon dao*) and Yakal (*Shorea astylosa*). In those trees, there were 8 vascular epiphytes identified namely *Asplenium nidus, Collospermum hastatum, Dendrobium phalaenopsis, Dryharia sparsisora, Dryopteris sparsa, Epipremnum pinnatum, Nephrolepis exaltata* and *Pyrrosia lingua.*

When the trees grouped using cluster analysis (Figure 3), there were 3 clusters obtained at a resemblance distance of 1.0. Cluster A is composed of Acacia (samples 1, 6 and 9), cluster B is composed of Acacia (samples 2 and 11) and cluster C is composed of Acacia (sample 5), Narra and Dao. At a resemblance distance of 1.4, there were 4 clusters obtained. Cluster D is composed of Acacia (sample 3 and 4), cluster E is composed of clusters A and B, cluster F is composed of Acacia (sample 7) with cluster C and cluster G is composed of cluster F and Yakal. At a resemblance distance of 2.0, there were 4 clusters obtained. Cluster H is composed of cluster Acacia (sample 10) and cluster D, cluster I is composed of Acacia (sample 8) and cluster G, cluster J is composed of clusters H and E and cluster K is composed of cluster I and J. Results shows that unique vascular epiphytes were identified in Acacia (sample 8 and 10). However, it does not denote that there were tree specific vascular epiphytes.

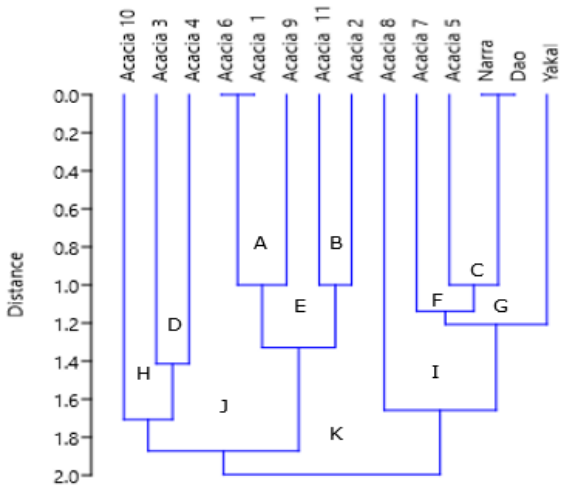

Figure 3: Cluster Analysis in Pasonanca Natural Park.

Frenquency and Distribution. Table 2 shows the frequency and density of vascular epiphytes in La Paz Tree Park. Data reveals that P*yrrosia lingua* was the most abundant species with a frequency of 91 and density of 11.38, while the least abundant was the *Dryopteris sparsa* and *Epipremnum pinnatum* with a frequency of 5 and density of 0.63

Table 2: Frequency and Density of Vascular Epiphytes in La Paz Tree Park.

Species	Frequency	Density
Asparagus asparagoides	80	10.00
Asplenium drepanophyllum	53	6.63
Asplenium nidus	36	4.50
Dryharia sparsisora	49	6.13
Dryopteris sparsa	5	0.63
Epipremnum aureum	40	5.00
Epipremnum pinnatum	5	0.63
Ficus Pumila	57	7.13
Nephrolepis exaltata	7	0.88
Philodendron scandens oxycardium	26	3.25

Pothos scandens	22	2.75
Pyrrosia lingua	91	11.38
Pyrrosia nummularifolia	32	4.00

Moreover, table 3 shows the frequency and density of vascular epiphytes in Pasonanca Natural Park. Data reveals that Pyrrosia lingua was the most abundant species with a frequency of 247 and density of 30.88, while the least abundant was the Nephrolepis exaltata with a frequency of 15 and density of 1.88.

Table 3: Frequency and Density of Vascular Epiphytes in Pasonanca Natural Park.

Species	Frequency	Density
Asplenium nidus	34	4.25
Collospermum hastatum	38	4.75
Dendrobium phalaenopsis	21	2.63
Dryharia sparsisora	215	26.88
Dryopteris sparsa	16	2.00
Epipremnum pinnatum	45	5.63
Nephrolepis exaltata	15	1.88
Pyrrosia lingua	247	30.88

Moreover, in terms of the common vascular epiphytes in the two sites, *Pyrrosia lingua* is the most abundant species while *Dryopteris sparsa* is the least abundant.

Biodiversity Indices: Data of the both study sites where subjected for biodiversity indices (see Table 4). In Margalef's Index of Richness, La Paz Tree Park obtained a value of 1.929, while Pasonanca Natural Park obtained a value of 1.086. This implies that La Paz Tree Park has high species richness compare to Pasonanca Natural Park. Furthermore, there were 13 vascular epiphytes species found in La Paz Tree Park, while there were 8 epiphytes species found in Pasonanca Natural Park.

In terms on Shannon's Diversity Index, La Paz obtained a value of 2.319, while Pasonanca obtained a value of 1.544. This implies that La Paz Tree Park is more diverse than Pasonanca Natural Park. It further implies that La Paz Tree Park has a species richness and evenness compare to Pasonanca Natural Park the physical factors like low temperature in La Paz Tree Park accounts for its high diversity.

In terms on Simpson's Index of Dominance, La Paz Tree Park obtained a value of 0.1119, while Pasonanca Natural Park obtained a value of 0.1229. This implies that Pasonanca Natural Park has high species dominance than La Paz Tree Park since the total number of individual vascular epiphytes in Pasonanca Natural Park is 631, while in La Paz Tree Park is 503. This further implies that since Pasonanca Natural Park is well protected than in La Paz Tree Park, so the place is less disturb from any human activity.

Table 4: Biodiversity Indices of the Vascular Epiphytes.

Sites	Margalef's Index of Richness	Shannon's Diversity Index	Simpson's Index of Dominance
La Paz Tree Park	1.929	2.319	0.1119
Pasonanca Natural Park	1.086	1.544	0.1229

Similarity Index: When the data of the both study sites were subjected for Sorenson's Index of Similarity, it obtained a value of 0.57. This implies that there was a 57% similarity between the La Paz Tree Park and Pasonanca Natural Park, hence there were 5 species present in the both sites. These species were *Asplenium nidus, Dryharia sparsisora, Dryopteris sparsa, Epipremnum pinnatum, Nephrolepis exaltata* and *Pyrrosia lingua.*

CONCLUSION

This study was able to make an inventory of vascular epiphytes in La Paz Tree Park and Pasonanca Natural Park. There were 13 species identified in La Paz Tree Park, while 8 species identified in Pasonanca Natural Park. There were 5 species common in both sites. La Paz Tree Park is more diverse than Pasonanca Natural Park. More so, the 2 sites is 57% similar to one another.

ACKNOWLEDGEMENT

The researcher would like to thank the Department of Science and Technology – Science Education Institute for the study grant, Barangay Captain Dalisay and DENR – PAO for allowing this study to be conducted in the study sites and Joaquin and Adelina Molina for the technical supports.

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