VEGETATION ASSOCIATION AT MONTANE FORESTS IN CAMERON HIGHLAND, PAHANG, MALAYSIA

HAZIQ SYAHMI BIN ROHAIZAT

FH 2018 124

VEGETATION ASSOCIATION AT MONTANE FORESTS IN CAMERON HIGHLAND, PAHANG, MALAYSIA

By

HAZIQ SYAHMI BIN ROHAIZAT

A Project Report Submitted in Partial Fulfillment of the Requirements for the Degree of Bachelor of Forestry Science in the Faculty of Forestry Universiti Putra Malaysia

2018

DEDICATION

In The Name of Allah, The Most Benevolent and The Most Merciful

Beloved Family:

My father Rohaizat Bin Zakaria,

My mother Hanisah Binti Mat Daud,

My sister Nur Athirah,

Younger brother, Hilmi Zhafri,

Younger sister, Nur Nadhirah and Nur Ain Zafirah.

Also to all my friends,

For the encouragement, inspirations, understanding

and constant prayers throughout to course of my study in

University Putra Malaysia and the sacrifices that you have given.

May Allah the Almighty bless themselves.

Love You All Very Much.

ABSTRACT

The study was done in primary montane forest area of Cameron Highland to obtain the information particularly the vegetation type, coverage and abundance of flora in that area. Two forest areas namely Sungai Terla and Batu Gangan Forest Reserve, Cameron Highland, Pahang that located at elevation of 1300 m and above from sea level chosen. The work principle and concept of vegetation science in which plants will be treated as several communities and analysed using matrix table to classify plant community. A total of ten plots and 345 species of plants were recorded. Mostly, these species were known as intermediate The characteristic of the whole group of plots were represented by the species with high constancy, while those species which have very low constancy were most probably not included in the characteristic groups of plots and the last one is the Differentiated table which is to rearranging the plots based on the new sequence. At the same time, the species in every group of associated species were arranged based on descending order which were from high constancy. The second ordinated partial table might be constructed to avoid confusion due to the existence of many plots. The final differentiated table will display the plots which contain species that have been arranged according to their particular associations. Field studies have released output on the richness of montane forest species in the Sungai Terla B Forest Reserve and the Batu Ganggan Forest Reserve in Cameron Highland, Pahang, Malaysia. Among the species recorded in all the inventory plots have shown the richness of the community species of montane forest in Cameron Highland. The dominant species of montane forest are *Selaginella willdenowii – Engelhardtia roxburghiana.* Due to this community group has shown that this community plays an important role in the forest stratum that inhabit the surface of the forest that can affect the growth of other septic plants, thus contributing to the species of animals inhabiting the area. Percentage rates of vegetation in this mountain forest can be clearly seen when the sub-community growth that is backed up to this mountain forest, *Lindera pipericarpa - Syzygium javanicum* and *Syzygium javanicum - Carallia euginioides*. In addition, this density of fertility can also be seen when a species of trees with different canopy sizes varies from one another.

ABSTRAK

Kajian kekayaan vegetasi di hutan gunung Cameron Highland adalah bertujuan untuk mendapatkan data mengenai tumbuhan utama yang tumbuh dikawasan hutan gunung. Kajian ini juga untuk mendapatkan maklumat tentang status hutan gunung semula jadi di Sungai Terla dan Hutan Batu Gangan di Cameron Highland, Malaysia. Objektif kajian ini adalah untuk mengenalpasti kelimpahan tumbuhan utama yang meliputi hutan gunung di Cameron Highland. Kedudukan tempat kajian adalah setinggi 1300 m dari aras laut. Sebanyak 345 spesies pokok yang telah dicatatatkan untuk kesepuluh plot yang telah dibuat inventori. Kajian tumbuhan Fitosociologi atau sains tumbuhan telah digunakan dalam kajian ini. Kajian tumbuhan Fitosociologi adalah klasifikasi komuniti tumbuhan. Kaedah ini dilakukan dengan menggunakan kaedah Sintesis Klasifikasi Vegetasi. Kemudian, Jadual Data yang bertujuan untuk membuat jadual data mentah untuk menyusun data yang telah dikumpulkan semasa di lapangan. Jadual separa adalah langkah seterusnya untuk menggunakan kumpulan spesies yang menggambarkan komuniti tumbuhan yang telah dikenal pasti. Kebanyakannya, spesis ini dikenali sebagai kesinambungan perantaraan. Ciri-ciri keseluruhan kumpulan plot diwakili oleh spesies yang mempunyai ketahanan yang sangat rendah mungkin tidak termasuk dalam kumpulan ciri-ciri plot dan yang terakhir ialah Jadual Perbezaan yang menyusun semula plot berdasarkan turutan baru. Pada masa yang sama, spesies dalam kumpulan spesies yang berkaitan telah diatur berdasarkan turutan yang menurun. Jadual separa koordinasi kedua dibina untuk mengelakkan kekeliruan kerana kewujudan plot yang banyak. Jadual pembezaan akhir akan memaparkan plot yang mengandungi spesies yang telah diatur mengikut kumpulan tertentu. Kajian lapangan yang telah mengeluarkan output tentang kekayaan spesies hutan gunung yang ada di Hutan Simpan Terla B dan Hutan Simpan Bt. Ganggan di Cameron Highland, Pahang. Antara spesies yang telah dicatatkan di kesemua plot yang dibanci telah menunjukkan kekayaan spesies yang menjadi komuniti di hutan gunung di Cameron Highland. Spesies pokok yang menjadi dominan kepada kehijauan hutan semulajadi diantaranya adalah *Selaginella willdenowii* - *Engelhardtia roxburghiana*. Disebabkan oleh pertumbuhan yang majoriti daripada kumpulan komuniti ini telah menunjukkan bahawa komuniti ini sangat memainkan peranan yang penting kepada strata hutan yang mendiami permukaan hutan yang boleh mempengaruhi sesuatu pertumbuhan spesis tumbuhan lain seterusnya menjadi kesinambungan kepada spesies-spesies haiwan yang mendiami kawasan tersebut. Kadar peratusan sesuatu vegetasi di hutan gunung ini dapat disaksikan dengan jelas apabila tumbuhnya sub-komuniti yang menjadi sandaran kepada hutan gunung ini iaitu, *Lindera pipericarpa* - *Syzygium javanicum* and *Syzygium javanicum* - *Carallia euginioides*. Selain itu juga, kepadatan vegetasi ini juga dapat dilihat apabila sesuatu spesies pokok yang mempunyai saiz kanopi yang berbeza-beza di antara satu sama lain.

ACKNOWLEDGEMENTS

Alhamdulillah, praise to Allah, The Almighty with all Gracious and His Merciful, I successfully completed my thesis for my Final Year Project Program on time. The honours and appreciation words given to the Faculty of Forestry. A special thanks to my supervisor Assoc. Prof. Dr. Mohamad Azani Bin Alias from Faculty of Forestry for given an opportunity to get involved in Project of "Restoration Selective Management" (3RSM) in Cameron Highland, Pahang. Never forgotten, I would like to express my sincere gratitude to my supervisor for given guidance and constructive comments during the completion of this project and I gain a lots of knowledge related in the field of research. In fact, they has also contributed a lot of energy, views and ideas during the process of this project is carried out.

Besides, a lot of appreciate and thankful to Forest Department of Peninsular Malaysia (FDPM) especially Forest Departrment District of Cameron Highland, Pahang and Forest Department District of Raub, Pahang give their support and gain their helps during the running of this project. Next, I want to express my deepest appreciation to my parents, Rohaizat Bin Zakaria and Hanisah Binti Mat Daud because their unstoppable moral boost, a lot of support and encouragement during the study. I am truly grateful to my parents for their immeasurable love and care. Next, I dedicated as well to my beloved friends especially my team in this project for willingness to help and giving me a lot of encouragement that push me to the limit to complete this project.

APPROVAL SHEET

I certify that this research project report entitled “Vegetation Association at Montane Forests in Cameron Highland, Pahang, Malaysia” by Haziq Syahmi Bin Rohaizat has been examined and approved as a partial fulfillment of the requirements for the Degree of Bachelor of Forestry Science in the Faculty of Forestry, Univeristi Putra Malaysia.

_____

Assoc. Prof. Dr. Mohamad Azani Bin Alias
Faculty of Forestry
Universiti Putra Malaysia
(Supervisor)

_____

Prof. Dr. Mohamed Zakaria Bin Hussin
Faculty of Forestry
Universiti Putra Malaysia
(Dean)

Date: MAY 2018

TABLE OF CONTENTS

	PAGE
DEDICATION	i
ABSTRACT	ii
ABSTRAK	iii
ACKNOWLEDGEMENTS	iv
APPROVAL SHEET	v
TABLE OF CONTENTS	vi
LIST OF TABLES	viii
LIST OF FIGURES	Ix
LIST OF ABBREVIATIONS	X
CHAPTER	
1 INTRODUCTION	
1.1 General Background	1
1.2 Problem Statement	3
1.3 Aim and Objectives	3
2 LITERATURE REVIEW	
2.1 Phytosociological Study	4
2.2 Vegetation Composition	6
2.3 Vegetation Structure	8
2.4 Description of Forest Type of Cameron Highland	9
3 MATERIALS AND METHODS	
3.1 Study Location	11
3.2 Research Method and Data Analysis	13
3.3 Phytosociological Vegetation Studies	13
3.4 Synthesis and Vegetation Classification	18
3.4.1 Table of Raw Data	18
3.4.2 Frequency table	19
3.4.3 Partial table	19
3.4.4 Differential table	20
4 RESULTS AND DISCUSSION	
4.1 Vegetation Information	21
4.2 Common Species and Families	23
4.3 Profile Diagram of Vegetation Samples (Relevés)	23
4.4 Species Richness	25
4.5 Vegetation Association	27
4.6 Vegetation Layer of Montane Forest	29

5 CONCLUSION AND RECOMMENDATION
5.1 Conclusion 32
5.2 Recommendations 33

REFFERENCES 34

APPENDICES 36

LIST OF TABLES

TABLES		PAGE
2.1	History of Forest Reserve in Cameron Highland	10
3.1	Vegetation layers in the forest	15
3.2	Total estimate cover and abundance in the forest	15
3.3	Sociability levels in the forest	16
4.1	Information table of the samples vegetation relevés	21
4.2	The number of species in each class in all plots	25
4.3	Partial table	28

LIST OF FIGURES

FIGURES		PAGE
3.1	Show study location in Sungai Terla and Batu Gangan Forest Reserve in Cameron Highland, Pahang, Malaysia	12
3.2	Show the circular plot 10 m radius	14
3.3	Total estimate of cover and abundance patterns and sociability patterns	17
4.1	Flow chart of the entire synthesis procedure for vegetation samples data	22
4.2	Profile diagram of vegetation samples P1	24
4.3	Species richness polygon for every plots	26
4.4	The height and coverage of montane	30
4.5	Continued	31

LIST OF ABBREVIATIONS

M	Meter
FR	Forest Reserve
LDF	Lower Density Forest
HDF	High Density Forest
LMF	Lower Montane Forest
UMF	Upper Montane Forest
CM	Centimeter
DBH	Diameter Breast Height
Freq	Frequency

CHAPTER 1

INTRODUCTION

1.1 General Background

The term vegetation is utilized as a part of nature to portray the general qualities of plant cover in a zone by alluding to predominant plant development shapes or auxiliary attributes, e.g., bluff vegetation, ice vegetation; or, alluding to particular plant groups, e.g., peat swamp. Vegetation is a more extensive term than verdure, which alludes particularly to the plant decent variety of a region. Spatially, vegetation can be thought of as the mosaic of plant groups over the scene. Vegetation is also the standing tree and as the ground surface cover in the forest.

Association the basic unit for classifying plant cover and representing the aggregate of uniform phytocoenoses with the same structural and specific composition and with similar relationship both between the organism and between them and the environment. Each association is closely related to certain environmental condition, such as climate and soil, as well as the animal life that in habits. An association is characterized by a definite productivity (supply and increment) of the plant mass. Association change in environmental conditions and composition of the flora.

Vegetation association study at the primary montane forest of Cameron Highland is done to obtain the vegetation that was growth in primary montane forest area. Evergreen forest above 1000 m altitude is called “hill evergreen forest” by most foresters and botanists. In the literature, the same vegetation type is referred to in various ways, e.g. temperature evergreen forest (Robbins & Smitinand, 1996), lower montane forest (Ohsawa, 1991), montane evergreen forest, primary evergreen seasonal forest and highland forest (Gardner et al. 2000). This is how related between forest reserved in Cameron Highland based on the climate zone system, this eco region falls in the tropical wet climate zone. This Eco region contains several distinct montane habitat blocks. The most extensive is the main range, which encompasses Malaysia's largest remaining area of pristine montane rain forest, reaching about 2,180 m around Cameron Highlands.

Most of Peninsular Malaysia's remaining forests are limited to the high, steep areas of this Eco region. Approximately two-thirds of these forests remain intact, mainly in two large blocks of primary forest that cover the Main Range (Titiwangsa Mountains) and the East Coast Range in the states of Kelantan and Terengganu (IUCN, 1991).

1.2 Problem Statement

Montane forest has the richness of association species and a lot of species that growth in forest reserve areas. The richness of the vegetation from different species was gave the advantages for all flora and fauna especially. In the other side, Climate changes and climate oscillations were associated with changing precipitation and drought regimes, flooding, siltation, landslides, etc.

1.3 Aim and Objectives

This study is obtained information on the natural montane forest in Sungai Terla and Batu Gangan Forest Reserve, Cameron Highland, Pahang, Malaysia. The aim of this study was to identify the coverage and abundance of main vegetation in montane forest in those Forest Reserve.

REFFERENCES

Barbour, M. G., & Burk, J. H. and Pitts, W. D. (1987). *Terrestrial Plant Ecology.* New York: The Benjamin Cummings Publ. *Co.*

Braun-Blanquet J (1964) Planzensoziologie. Grunzuge der Vegetationskunde. Wien, Springer.

Campbell, G. S. & Norman, J. M., (1989). The Measurement of Plant Canopy Structure in G. Russel, B Marshall & P. G. Jaris, eds., *Society for Experimental Biology, seminar series 31 : Cambridge : 1-19*

Damgaard, C., R. Ejrnæs, and C. J. Stevens. (2013). Intra-Specific Spatial Aggregation in Acidic Grasslands: Effects of Acidification and Nitrogendeposition on Spatial Patterns of Plant Communities. *Journal of Vegetation Science,* 24: 25–32.

Dorren et al., 2004 L.K.A. Dorren, F. Berger, A.C. Imeson, B. Maier, F. Rey.

Ediriweera, S., Singhakumara, B. M. P., & Ashton, M. S. (2008). Variation in Canopy Structure, Light and Soil Nutrition Across Elevation of a Sri Lanka Tropical Rain Forest. *Forest Ecology and Management*, *256* (6), 1339-1349.

Gardner, J. P., Brown, T. M., & Ferguson, H. C. (2000). Ultraviolet Galaxy Counts from Space Telescope Imaging Spectrograph Observations of The Hubble Deep Fields. *The Astrophysical Journal Letters*, *542* (2): L79.

IUCN, U. (1991). WWF (1980) World Conservation Strategy: Living Resource Conservation for Sustainable Development, *IUCN, (Gland).*

Kent, M. and P. Coker (1992). *Vegetation Description and Analysis*, Belhaven, London.

Mueggler, W. F. 1985. Vegetation Associations. In: DeByle, Norbert V.; Winokur, Robert P., editors. Aspen: Ecology and Management in the Western United States. USDA Forest Service General Technical Report RM-119. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo. p. 45.

Muhammad Said, A. H., Mohd Zaki, H., Zahari, I., Nazre, M. S., Arifin, A., Ismail Adnan, A. M., & Hazandy, A. H. (2014). Identification of Potential Species to be Planted in Poor Forests of the Central Forest Spine (CFS) Wildlife Corridor Gerik, Perak. *Malaysian Forester*, *77*(2): 147–160.

OHSAWA M. (1991) Structural Comparison of Tropical Montane Rain Forest Along Altitudinal and Altitudinal Gradients in South and East Asia. *Vegetation,* 97: 1-10.

Parmenter, R. R., Yates, T. L., Anderson, D. R., Burnham, K. P., Dunnum, J.L., Franklin, A. B., & Parmenter, C. A. (2003). Small-Mammal Density Estimation: a Field Comparison of Grid-Based vs. Web-Based Density Estimators. *Ecological monographs*, *73* (1): 1-26.

ROBBINS R.G. & SMITINAND T. (1996) A Botanical Ascent of Doi Inthanon. *Natural History Buletin of the Siamese Society* 21: 205-227.

Ruiz-Jae´n, M.C., Aide, T.M., 2005. Restoration success: How is it Being Measured? Restoration – Ecology 13 (3-5).

SANTISUK T. (1988), *An Account of the Vegetation Northern Thailand* - Stuttgar Franz Steiner Verlag Weisbaden GMBH.

Soepadmo E. 1995. Plant Diversity of the Malesian Tropical Rain Forest and it Phytogeographical and Economic Significance. In: Primack RB, Lovejoy The (eds), Ecology Conservation and Management of Southeast Asian Rain Forests: 19–40. London Yale University Press, New Haven.

Van der Maarel, E. (1975). The Braun-Blanquet Approach in Perspective.*Vegetation*, *30* (3): 213-219.

Whitmore, T. C. (1973). Euphorbhiaceae, Pp. 34-136 in Whitemore, T. C. (Ed). *Tree Flora of Malaya.* Longman, Kuala Lumpur.

Sherzad, O. H., Mohd Zaki, H., Hazandy, A. H., Mohamad Azani, A., & Noordin, W.D. (2015). Growth and Physiological Responses of *Shorea materialis* Ridl.Seedlings to Various Light Regimes and Fertilizerlevels Under Nursery Condition. *Malaysian Forester*, *78* (1–2): 133-150.