UNIVERSITI PUTRA MALAYSIA

SPECIES COMPOSITION OF SMALL MAMMALS IN MENCHALI FOREST RESERVE AND BUKIT RIDAN FOREST RESERVE

SYARIFAH NURSYAAKIRAH BT SYED MOHAMAD

FH 2016 73

SPECIES COMPOSITION OF SMALL MAMMALS IN MENCHALI FOREST RESERVE AND BUKIT RIDAN FOREST RESERVE

SYARIFAH NURSYAAKIRAH BT SYED MOHAMAD

FACULTY OF FORESTRY
UNIVERSITI PUTRA MALAYSIA
2016

SPECIES COMPOSITION OF SMALL MAMMALS IN MENCHALI FOREST RESERVE AND BUKIT RIDAN FOREST RESERVE

By

SYARIFAH NURSYAAKIRAH BT SYED MOHAMAD

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

2016

DEDICATION

Specially dedicated to my:

Father,

(Syed Mohamad Saed Hamid)

Mother,

(Nik Norashimah Mat Rashid)

My Dearest Brothers and Sisters,

Dato Sri Maznah Mazlan,

PERHILITAN Rompin,

and

Rompin District Forest Department

ABSTRACT

Forest habitat lost and disturbance have affected many fauna species. The study was conducted in two types of forest, Menchali Forest Reserve and Bukit Ridan Forest Reserve, Pahang. The objectives were to compare the species composition of small mammals in hill forest (Bukit Ridan Forest Reserve) and lowland forest (Mechali Forest Reserve) and to determine their diversity, species richness and species evenness. Total number of live traps as 20 and in total 280 trap days was conducted at each forest area (two weeks in Menchali and two weeks in Bukit Ridan). Six lines were established and every single line was positioned with 10 traps. A total of 11 individuals comprising of seven species and two families were recorded. All of the species were from the order Rodentia. This consists of four murids and three sciurids. Lowland forest recorded more individuals (7) compared to hill forest (4). The main factors affecting the species composition and abundance in both study sites was the topography or condition of the forest. Other factor might be because of human disturbance in both areas.

ABSTRAK

Kemusnahan habitat dan gangguan terhadap hutan akan menjejaskan spesis fauna. Kajian ini telah dijalankan di dua jenis hutan, Hutan Simpan Menchali dan Hutan Simpan Bukit Ridan, Pahang. Objektif kajian ini adalah untuk mengetahui perbandingan komposisi mamalia kecil di hutan bukit (Hutan Simpan Bukit Ridan) dan hutan tanah rendah (Hutan Simpan Menchali) dan juga untuk mengenalpasti kepelbagaian spesis, kekayaan spesis dan keserataan spesis mamalia kecil di kedua-dua tempat. Jumlah keseluruhan perangkap adalah 20 dan 280 hari perangkap telah digunakan di setiap kawasan kajian (dua minggu di Menchali dan dua minggu di Bukit Ridan). Sebanyak enam baris laluan telah di lakukan dan setiap baris terdapat 10 perangkap. Keseluruhan 11 individu yang telah direkodkan merangkumi daripada tujuh jenis spesis dan dua famili. Kesemua spesis adalah dari order Rodentia. Termasuk juga empat spesis tikus dan tiga spesis tupai. Terdapat tujuh individu hutan tanah rendah berbanding hutan bukit yang hanya mempunyai empat hasil tangkapan. Faktor utama yang mempengaruhi jumlah bilangan mamalia kecil di kawasan kedua-dua kawasan kajian adalah bentuk topography atau keadaan hutan tersebut. Faktor lain daripada gangguan manusia juga turut mempengaruhi.

ACKNOWLEGDEMENTS

First of all, praise the Almighty of Allah s.w.t the most merciful and give me strength to complete this project on the title “Species Composition of Small Mammals in Menchali Forest Reserve and Bukit Ridan Forest Reserve.” Next, special thanks to my beloved parents and family for their priceless love and support from before and until the completion of this project.

I would like to express my upmost thanks to my supervisor, Professor Dr. Mohamed Zakaria Bin Hussin also to my co-supervisor, Dr Marina Bt Mohd. Top @ Mohd. Tah for their invaluable support and guidance. I wish to convey my sincere gratitude to Dato’ Sri Maznah binti Mazlan, ADUN Muadzam Shah, Pahang for her kindness in sponsor and helped me throughout this project. Besides, Rompin District Forest Department specially Mr. Nazri bin Husin, District Forest Officer (DFO), Mr. Muhammad Rohaizad Bin Ramli @ Ramlee (ADFO I), Mr. Mohamad Shahril Bin Zulkifli (ADFO II), Mr Mohamad Ridzuan bin Razak, Mr Mohd Hassibbullah bin Isa and Mr Rozaidi bin Ruslan. PERHILITAN District Rompin, Mr Shahril Edzham bin Jemali, Mr Zainudin bin Abd Rahman, Mr Azmi bin Tan, and Mr Mohd Syafawi bin Ibrahim.

Last but not least, deepest appreciation to my friends Sharifah Nur Ain Mahiyuddin, ‘Izzah Hafizah Johari, Muhamad Aliff Bin Man and Muhammad Amsyar Nor Azlan, for their willingness to helping me during completing this project.

APPROVAL SHEET

I certify that this research project report entitled “Species Composition of Small Mammals in Menchali Forest Reserve and Bukit Ridan Forest Reserve” by Syarifah Nursyaakirah Bt Syed Mohamad 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, Universiti Putra Malaysia.

Approved by:

_____

Professor Dr. Mohamed Zakaria Hussin
Faculty of Forestry
Universiti Putra Malaysia
(Supervisor)

_____

Professor Dr. Mohamed Zakaria Hussin
Dean
Faculty of Forestry
Universiti Putra Malaysia

Date: 22 June 2016

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.1 Small Mammal

Small mammals can be defined as species weighing about 5 kg or less and dominate the Class Mammalia (Stoddart, 1979). The family Muridae consists of rats, mice, and their relatives currently includes 5 subfamilies. These subfamilies further diversified into 150 genera and 730 species from multiple radiations that occurred in Asia during the Miocene, making it the largest mammal group (Lecompte et al., 2008). Small mammals can be categorized as mammals with smaller size such as rat, treeshrew, and squirrel. They can be divided either volant which is flying small mammal or non-volant which is non-flying small mammals (Singh et al., 2013). Volant small mammals include from family Chiroptera which are bats.

Small mammals captured in both primary and secondary forests were generally positively associated with higher density of fallen logs, twigs, rock piles, a number of tree stumps, and vegetative cover at the understory and canopy level (Bernard, 2004). They used these areas as their habitat, shelter from bad weather, predator avoided, refuge site and foraging areas which are closely linked to food sources. Kemper & Bell (1985) reported that small mammals negatively associated with five others (layers, bertam, sedges, pig damage, flooding). The destruction caused by pigs is thought to be a major factor since it reduces litter and food availability over wide areas.

Small mammals have been one of the most intensively studied groups regarding to their characteristics (e.g. abundant, diverse, widespread, response to disturbance and easy to sample) and potential as a good bioindicator (Norfahiah et al., 2009). Other than small mammals, birds and frogs are good bioindicator also because they respond to any changes in their habitat quality.

1.2 Forest

Peninsular Malaysia is one of the richest and oldest rainforest in the world with many unique animals and plants (Junoh, 1998). The flora and fauna of Malaysia were conservatively estimated about 12,500 species of flowering plants, and more than 1,100 species of ferns and fern allies in Malaysia. The diversity of fauna in the country is also great. There are about 300 species of wild mammals, 700-750 species of birds, 350 species of reptiles, 165 species of amphibians and more than 300 species of freshwater fish (Napis, 2001).

However, tropical lowland rainforests are currently facing an unprecedented destruction by human activities. This habitat loss and disturbance have resulted in the expiration of many lowland rainforest flora and fauna (Diamond et al., 1987). The level of deforestation in Southeast Asia is the highest among tropical areas (Achard et al., 2002). Total deforestation in Malaysia has been running about 250,000 hectares per year, less than 0.1 percent of total land area, and about 1 percent of total forest area (Gillis, 1981).

Several factors affecting the present level of tropical deforestation are identified. Among these are population growth and population density (Rudel & Roper, 1997), national debt (Kahn & McDonald, 1994), increased fuelwood demand, burning and grazing, construction of penetration roads, and weak forest protection institutions (Repetto & Gillis, 1988). The negative consequences of habitat loss and fragmentation to different aspects of biodiversity have been shown by a large number of theoretical and empirical studies, in different environments, and for a large array of taxa (Fahrig, 2003).

In general, after the isolation existing species richness declines overall in the resulting fragments (Willis, 1974). As a result, Condit *et al.* (2002); Hill & Hamer (2004) had mentioned that our current knowledge of the impact of habitat degradation on small-mammal assemblages is still poor in many areas, particularly in dipterocarp rain forests. Most studies in the dipterocarp rain forests of Southeast Asia have included only two sites (logged vs. unlogged) and no replication, although it is becoming increasingly evident that the effects of habitat degradation on species diversity and animal dynamics are strongly dependent on the spatial scale of sampling and landscape heterogeneity These aspects, thus require multi-site approaches and a larger sampling effort (Wells et al., 2007).

1.3 Problem Statement

Small mammals are the most numerous group of mammals on earth (90% of the 5,416 known mammal species) and provide services that are invaluable to ecosystem functioning. Most species of small mammals are rarely studied and new species are still being discovered. It is therefore important to focus research efforts on small mammals at a global scale (Merrick, 2012). However, because most past studies of mammal emphasized systematics and taxonomy, little ecological information is available especially on community structure, habitat utilization and diversity patterns of the diverse small mammals. The need to gather these ecological data has become increasingly urgent as rain forest destruction has increased, exacerbating the need for appropriate conservation measures to maintain fauna diversity (Nor, 2001).

Furthermore, not much information on small mammal species was available due to lack of study. Most of the previous studies were basically related to the ecology of birds and big mammals. The destruction of forested area in both study sites were severely affected the habitat of flora and fauna. Thus, it is important to understand the differences in fauna species composition between lowland and highland forest habitats. Information obtained from this study will assist relevant agencies particularly wildlife and forestry departments in planning for future management of the habitats.

1.4 Objectives

The study was conducted in two areas which were in the Menchali Forest Reserve and Bukit Ridan Forest Reserve. The specific objectives of this study were:

i. To compare the species composition of small mammals in hill forest (Bukit Ridan Forest Reserve) and lowland forest (Mechali Forest Reserve)

ii. To determine the diversity, species richness and species evenness of small mammal species in the Bukit Ridan Forest Reserve and Mechali Forest Reserve.

REFERENCES

August, P. V. (1983). The role of habitat complexity and heterogeneity in structuring tropical mammal communities. *Ecology*, *64*,1495-1507.

Adler, G. H. (2000). Tropical tree diversity, forest structure and the demography of a frugivorous rodent, the spiny rat (Proechimys semispinosus). *Journal of Zoology, 250*(01), 57-74.

Achard, F. (2002). Determination of deforestation rates of the world's humid tropical forests. *Science, 297*(5583), 999-1002.

Aplin, K., Lunde, D. & Musser, G. (2008) Maxomys surifer. The IUCN Red List of Threatened Species. Retrieved from http://www.iucnredlist.org/details/full/12905/0 on April 19th, 2016.

Aplin, K., Lunde, D. & Ruedas, L. (2008). Maxomys whiteheadi. The IUCN Red List of Threatened Species. Retrieved from http://www.iucnredlist.org/details/full/12905/0 on April 19th, 2016.

Aslam, M. (2009). Diversity species richness and evenness of moth fauna of Peshawar. *Pakistan Entomology, 2,* 99-102.

Bernard H,. (2004). Effect of selective logging on the microhabitat-use patterns of non-volant small mammals in a bornean tropical lowland mixed-dipterocarp forest. *Nature and Human Activities, 8*, 1-11.

Condit, R., Ashton, P. S., Baker, P., Bunyavejchewin, S., Gunatilleke, S., Gunatilleke, N., & Lee, H. S. (2000). Spatial patterns in the distribution of tropical tree species. *Science, 288*(5470), 1414-1418.

Condit, R., Pitman, N., Leigh, E. G., Chave, J., Terborgh, J., Foster, R. B., & Muller-Landau, H. C. (2002). Beta-diversity in tropical forest trees. *Science, 295*(5555), 666-669.

Caro, T. M. (2001). Species richness and abundance of small mammals inside and outside an African national park. *Biological Conservation, 98*(3), 251-257.

Cook, R. P. (2001). Small mammals, big role. Retrieved from https://www.nps.gov/caco/learn/nature/upload/SmallMammalsBigRole-2.pdf on April 15th, 2016.

Conservation Assessment & Management Plan (C.A.M.P). (2005). Status of South Asian non-volant small mammals. Retrieved,from http://zooreach.org/downloads/ZOO_CAMP_PHVA_reports/2005 Rodent CAMP report.pdf on April 22th, 2016.

Davis, D.D. (1962). Mammals of the lowland rainforest of North Borneo. *Bulletin of the Raffles Museum, Singapore, 31,* 1–129.

Diamond, J. M., Bishop, K. D., & Balen, S. (1987). Bird survival in isolated Javan woodland: island or mirror? *Conservation Biology, 1*(2), 132-142.

Denslow, J. S. (1995). Disturbance and diversity in tropical rain forests: the density effect. *Ecological applications, 5*(4), 962-968.

Death, R. (2008). Margalef's index. Retrieved from http://www.sciencedirect.com/science/article/pii/B9780080454054001178 on March 29th, 2016.

Duckworth, J.W., Meijaard, E., Lee, B. & Tizard, R.J. (2008) Rhinosciurus laticaudatus. The IUCN Red List of Threatened Species. Retrived from http://www.iucnredlist.org/details/42460/0 on March 29th, 2016.

Duckworth, J.W., Lee, B. & Tizard, R.J. (2008a) Callosciurus notatus. The IUCN Red List of Threatened Species. Retrived from http://www.iucnredlist.org/details/3600/0 on March 29th, 2016.

Duckworth, J.W., Lee, B. & Tizard, R.J. (2008b). Callosciurus nigrovittatus. The IUCN Red List of Threatened Species 2008. Retrieved from http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T3599A9967361.en on May 22th, 2016.

Dan, H. (2014). The news for squirrels. Retrieved from http://newsforsquirrels.blogspot.com/ on May 1th, 2016.

Fahrig, L. (2003). Effects of habitat fragmentation on biodiversity. *Annual review of ecology, evolution, and systematics, 34*, 487-515.

Francis, C. M. (2008). A field guide to the mammals of South-East Asia. *London: New Holland*, 22-72.

Gillis, M. (1988). Malaysia: public policies and the tropical forest. *Public policies and the misuse of forest resources*, 115-64.

Gaunle, K. (n.d.). How to calculate species evenness. Retrieved from http://classroom.synonym.com/calculate-species-evenness-2851.html on March 22th, 2016.

Heip, C. (1974). A new index measuring evenness. *Journal of the Marine Biological Association of the United Kingdom J. Mar. Biol. Ass., 54*(03), 555.

Heip, C. H., Herman, P. M., & Soetaert, K. (1998). Indices of diversity and evenness. *Oceanis Paris, 24*(4), 61-87.

Hill, J. K., & Hamer, K. C. (2004). Determining impacts of habitat modification on diversity of tropical forest fauna: The importance of spatial scale. *Journal of Applied Ecology, 41*(4), 744-754.

Junoh, A. (1998). Small mammal species composition in lowland forest of Air Hitam Forest Reserve, Puchong Selangor. Unpublished final year project, University Putra Malaysia, Serdang, Selangor.

Kemper, C., & Bell, D. T. (1985). Small mammals and habitat structure in lowland rain forest of Peninsular Malaysia. *Journal of Tropical Ecology, 1*(01), 5-22.

Kahn, J. R., & Mcdonald, J. A. (1995). Third-world debt and tropical deforestation. *Ecological Economics, 12*(2), 107-123.

Lawton, J. H. (1983). Plant architecture and the diversity of phytophagous insects. *Annual review of entomology, 28*(1), 23-39.

Lecompte, E., Aplin, K., Denys, C., Catzeflis, F., Chades, M., & Chevret, P. (2008). Phylogeny and biogeography of African Murinae based on mitochondrial and nuclear gene sequences, with a new tribal classification of the subfamily. *BMC Evolutionary Biology, 8*(1), 199.

McCoy, E. D., & Bell, S. S. (1991). Habitat structure: the evolution and diversification of a complex topic. *Habitat structure. Springer Netherlands,* 3-27.

Malcolm, J. R. (1994). Edge effects in central Amazonian forest fragments. *Ecology, 75*(8), 2438-2445.

Munns Jr, W. R. (2006). Assessing risks to wildlife populations from multiple stressors: overview of the problem and research needs. *Ecology and Society, 11*(1), 23.

Merrick, M. (2012). Why we should care about small mammals: A global perspective. Retrieved from https://mjmerrick.wordpress.com/2012/03/01/why-we-should-care-about-small-mammals-a-global-perspective/ on April 23th, 2016.

McGinley, M. (2014a). Species richness. Retrieved from http://www.eoearth.org/view/article/156216 on May 24th, 2016.

McGinley, M. (2014b). Conservation biology biodiversity ecology. Retrieved from http://www.eoearth.org/view/article/156211/ on May 24th, 2016.

Napis, S., Salleh, K. M., Itam, K., & Latiff, A. (2001). Biodiversity databases for Malaysian flora and fauna. Retrieved from http://www.ukm.my/pakdin/paper/BiodiversityIWS2001.pdf on May 30th, 2016.

Nor, S. M. (2001). Elevational diversity patterns of small mammals on Mount Kinabalu, Sabah, Malaysia. *Global Ecology and Biogeography Global Ecol Biogeography, 10*(1), 41-62.

Norfahiah M,. Azema I,. Marina M.T,. And Zakaria M.(2009). A Survey on Presence of Wildlife (Non-Volant Small Mammals, Birds and Frogs) in Planted Forest and Secondary Forest of UPM Bintulu Campus, Sarawak. *Natural Resources in the Tropics (NRtrop3)*, 416-423.

Peet, R. K.. (1974). The Measurement of Species Diversity. *Annual Review of Ecology and Systematics, 5, 285–307.* Retrieved from http://www.jstor.org/stable/2096890 on May 22th, 2016.

Payne, J., & Francis, C.M. (2007). A field guide to the mammals of Borneo. *The Sabah Society, Kota Kinabalu,* 35-64.

Repetto, R., & Gillis, M. (1988). Public policies and the misuse of forest resources. *Cambridge University Press,* 156-161.

Rudel, T., & Roper, J. (1997). The paths to rain forest destruction: Crossnational patterns of tropical deforestation, 1975–1990. *World Development, 25*(1), 53-65.

Ruedas, L., Lunde, D. & Aplin, K. (2008). Sundamys muelleri. The IUCN Red List of Threatened Species 2008. Retrieved from http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T21152A9252355.en on May 23th, 2016.

Stoddart, D. M. (1979). Ecology of Small Mammals. *London: Chapman and Hall.*

Sieg, C. H. (1987). Small mammals: pests or vital components of the ecosystem. Retrieved from http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1097&context=gpwdcwp/ on May 28th, 2016.

Singh, P., Tripathi, R. S., & Sharma, B. K. (2013). Non-Volant Small Mammals of Rajasthan: Faunal Heritage of Rajasthan, *India Springer New York, 549-561.*

Schnitzer, S. A., & Carson, W. P. (2001). Treefall gaps and the maintenance of species diversity in a tropical forest. *Ecology, 82*(4), 913-919.

Small Mammal Specialist Group. (n.d.). Rodents: Family. Retrieved from http://www.small-mammals.org/small-mammals-2/rodents/rodents-family-muridae/ on April 22th, 2016.

Small Mammals Conservation and Research Foundation. (n.d.). List of mammals upon which research and conservation. Retrieved from http://www.smcrf.org/SMCRF's%20list%20of%20Small%20Mammals.pdf on May 23th, 2016.

Taylor, W. P. (1936). Some effects of animals on plants. *The Scientific Monthly, 43,* 262-271.

Tews, J., Brose, U., Grimm, V., Tielbörger, K., Wichmann, M. C., Schwager, M., & Jeltsch, F. (2004). Animal species diversity driven by habitat heterogeneity/diversity: the importance of keystone structures. *Journal of biogeography, 31*(1), 79-92.

Tingga, R. C. T., Anwarali, F. A., Ridwan, A. M., Senawi, J., & Abdullah, M. T. (2012). Small mammals from Kuala Atok, Taman Negara Pahang, Malaysia. *Sains Malaysiana, 41*(6), 659-669.

The IUCN Red List .(2001). Categories & Criteria (version 3.1). Retrieved from http://www.iucnredlist.org/static/categories_criteria_3_1 on May 7th, 2016.

Willis, E. O. (1974). Populations and local extinctions of birds on Barro Colorado Island, Panama. *Ecological Monographs, 44*(2), 153-169.

Wells, K., Kalko, E. K., Lakim, M. B., & Pfeiffer, M. (2007). Effects of rain forest logging on species richness and assemblage composition of small mammals in Southeast Asia. *Journal of Biogeography, 34*(6), 1087-1099.