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SPECIES DIVERSITY AND DISTRIBUTION OF ANURAN AT SIMILAJAU NATIONAL PARK, BINTULU, SARAWAK, MALAYSIA

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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May 2018

Chairman : Marina Mohd Top @ MohdTah, PhD
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Tropical heath forest occurs widely in many places of Borneo. Similajau National Park is one of the locations with heath forest. Because of insufficient data on the anurans of heath forest in Similajau National Park, a survey was carried out beginning August 2014 until January 2015. The objectives of the study are compare the anuran species diversity between two different study plots and to determine anuran species microhabitat preferences. Sampling involved a 300m transects line and 240 quadrats method at both study sites. A total of 23 species of frogs (299 individuals) belonging to six frog families were detected. The study site was dominated by Dicroglossidae (48.8%) followed by Rhacophoridae (24.7%), Ranidae (17.7%), Ceratobatrachidae (4.7%), Microhylidae (1.3%) and Bufonidae (2.7%). In addition four endemic Borneo frogs namely *Ingerophyrus divergens*, *Limnonectes ingeri*, *Kalophrynus intermedius*, and *Philautus tectus* were also captured in this study. The Shannon Wiener Diversity Index, *H'* at forest site was higher (2.48 ± 0.06) compared to non-forest site (1.77 ± 0.05).However, no dominant species at forest sites, which reflected the lowest Simpson Index, *D* was 0.091 (±0.01). In contrast, *D* at non forest sites was higher with 0.201 (±0.04) although the presence of *Fejervarya cancrivora*, with 59 individuals were recorded as dominance species for about 19.73% of the total frog sampled. The result of this study indicated that the species composition and diversity at Similajau National Park is still relatively higher than elsewhere. A study on habitat preference should be concluded that different species have their own associated microhabitats. It can also be concluded that the occurrences of individual's species and richness depends on rainfall, relative humidity and temperature.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

KEPELBAGAIAN DAN TABURAN SPESIS KATAK DI TAMAN NEGARA SIMILAJAU, BINTULU SARAWAK, MALAYSIA

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Hutan kerangas tropical wujud secara meluas di kebanyakkan tempat di Borneo. Taman Negara Similajau adalah salah satu lokasi dengan jenis hutan ini. Kerana data yang tidak mencukupi mengenai kewujudan katak di Taman Negara Similajau, terutamanya dalam habitat hutan kerangas, satu kajian telah dilaksanakan bermula Ogos 2014 sehingga Januari 2015. Terdapat dua objektif dalam kajian ini iaitu untuk mengenalpasti kehadiran spesis katak dan kepelbagainnya di dua jenis hutan yang berbeza iaitu di bukan hutan dan hutan kerangas. Kaedah persampelan 300m transet line dan 240 kuadrat dilakukan di kedu-dua lokasi kajian. Jumlah keseluruhan adalah 23 spesis katak (299 individu) direkodkan. Famili Dicroglossidae (48.8%) mendominasi kawasan kajian, diikuti oleh Rhacophoridae (24.7%), Ranidae (17.7%), Ceratobatrachidae (4.7%), Microhylidae (1.3%) dan Bufonidae (2.7%). Tambahan, terdapat empat spesis katak yang endemik di Borneo direkodkan di kawasan kajian iaitu *Ingerophyrus divergens*, *Limnonectes ingeri*, *Kalophrynus intermedius*, dan *Philautus tectus*. Indek kepelbagaian Shannon Wiener, *H'* dikawasan hutan adalah tinggi (2.48 ± 0.06), berbanding kawasan bukan hutan (1.77 ± 0.05). Walaubagaimanapun, tiada spesis dominan direkodkan di kawasan hutan, dimana ia mempunyai Indek Simpson, D 0.091 (±0.01) adalah rendah. Manakala, D di kawasan bukan hutan adalah tinggi 0.201 (±0.04) dimana ia menunjukkan spesis *Fejervarya cancrivora* direkodkan sebagai spesis dominan dengan sebanyak 59 individu dan 19.73% jumlah keseluruhan sampel katak yang direkodkan. Hasil kajian ini menunjukkan bahawa komposisi dan kepelbagaian spesies di Taman Negara Similajau masih agak tinggi berbanding di tempat lain. Satu kajian terhadap keutamaan habitat perlu disimpulkan bahawa spesies yang berbeza mempunyai mikrohabitat yang berkaitan. Ia juga boleh membuat kesimpulan bahawa kejadian spesies dan kekayaan individu bergantung pada hujan, kelembapan relatif dan suhu.

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CHAPTER 1

INTRODUCTION

1.1 General Background

Tropical heath forest occurs widely in many places of Borneo where they are called kerangas, but occur in small areas in Peninsular Malaysia (Whitemore, 1990). Similajau National Park is one of the locations with heath forest. Heath forests are a type of seasonal lowland tropical rain forests that occur extensively in dry land sites; on flat sites, inter-digitations occur correlated with predominantly podzolized, highly acidic and sandy soils (Bruning, 1974; Ghazoul & Sheil, 2010; Whitmore, 1984). Many previous studies In Borneo, especially in Sarawak and Brunei, focuses on their ecology, plant community compositions, soil, litter, and environmental characteristics (Miyamoto, Rahajoe, Kohyana, & Mirmanto, 2007; Newbery, 1991; Proctor, 1999), but less on anurans diversity.

Tropical heath forests are distinctive in their forest structure compared to lowland mixed dipterocarp forests that are more dominant throughout Borneo. There are several factors that contribute to the distinct characteristic of this forest type. First factor is caused by periodic droughts such as decreasing soil depth and increasing variability of water supply under favourable conditions that would create vegetation types similar to the dipterocarp forests (Bruning, 1974). Second includes the striking structural and physiognomic features, such as lower roughness of canopy surface, smaller mean leaf size, steeply inclined leaves and twigs, and shorter and unbuttressed trees (Din, Metali, & Sukri, 2015; Whitemore, 1990; Wong, Ahmad, Low, & Kalat, 2015).

1.2 Anuran Families

Nowadays, anurans population and species are representatives of the general loss of biodiversity worldwide (Alford, Dixon, & Pechmann, 2001; Houlahan, Findley, Schmidy, Meyer, & Kuzmin, 2000). According to (IUCN, 2008) 5,532 species of anurans drive the average threat level for amphibians as a whole with 31.6% representing 1,749 species either threatened or extinct about 28 families of anurans are found around the world. In Malaysia, there are 16 families in Peninsular Malaysia, where 12 families of frogs that have been recorded which are Bufonidae, Centrolenidae, Dendrobatidae, Discoglossidae, Hylidae, Hyperolidae, Leptodactylidae, Microhylidae, Pseudidae, Ranidae, Rhacophoridae, and Rhinophrynidae (Norhayati, Juliana, & Lim, 2005). In Borneo, eight families of frogs have been recorded which are Bombinatoridae (Firebellied Toads), Bufonidae (True Toads), Ceratobratrachidae (no vernacular name), Dicroglosidae (True Frogs I), Megophyridae (Litter frogs), Microhylidae (Narrow-Mouthed Frogs), Ranidae (True Frogs II) and Rhacophoridae (Afro-Asian Tree Frogs) (Haas, Das, Hertwing, Min, & Jankowski, 2018; Inger & Stuebing, 2005).

1.3 Research Justification

Studies on the effect of different types of land used in local landscape levels of Borneo are insufficient. There is a need to study species diversity of anurans. In addition, there are insufficient data on the anurans of Similajau National Park, especially in tropical heath forest habitat. Previous research about frogs in Similajau National Park is confined to the characteristics of *Hylarana sp.* (Ramlah, Hasnizam, & Mustafa, 2011). The reason of selection of this area is based on the lack of scientific data and research that has not been systematically examined. The proposed study will provide information about species diversity and their abundance which is important for future conservation plans and also for the determination of habitat preferences which can be used for conservation of species in captivity programs.

1.4 Hypothesis

1. The pattern of frog assemblage including their diversity and presence of dominant species are significantly different in two different habitat types (forest plot and non-forest plot).
2. There is significant difference in species association with microhabitat structures.
3. The microclimate influences the frog species occurrence in the study conducted.

1.5 Objectives

The objectives of the study are:

1. To compare the anuran species diversity between two different study plots, in relation to the effect of reduced habitat cover of Similajau National Park.
2. To determine anuran species microhabitat preferences in association with the study plots.

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