



***THE ABUNDANCE OF MALAYSIAN GIANT ANT IN URBAN FOREST  
PATCHES IN RELATION TO MICROCLIMATE***

**MUHAMMAD FARHANJAFNI BIN JOHARI**

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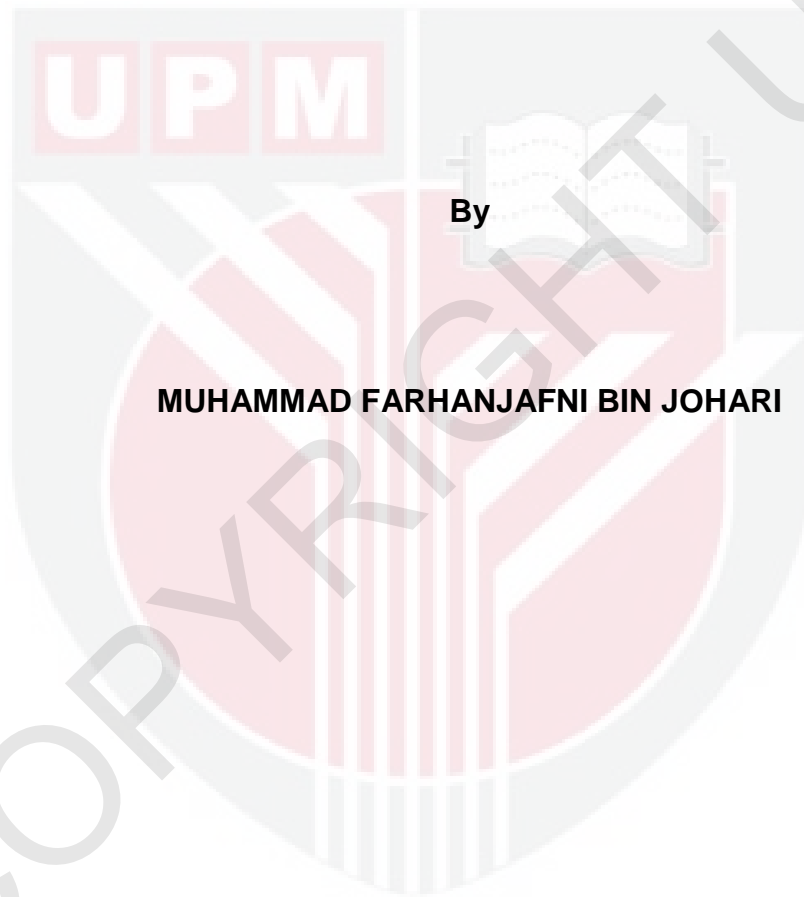


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**FACULTY OF FORESTRY  
UNIVERSITI PUTRA MALAYSIA**

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By

**MUHAMMAD FARHANJAFNI BIN JOHARI**

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**Faculty of Forestry**

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**DEDICATION**

**ALHAMDULILLAH**

**This thesis is especially dedicated to my beloved**

**Father and Mother**

Johari Bin Ishak and Zaitun Binti Hussien

**Brothers**

Muhammad Zulhusni Bin Johari

Muhammad Faiz Jafni Bin Johari

**My Supervisor**

Dr. Ruzana Adibah Binti Mohd Sanusi

**My Co- Supervisor**

Dr. Badrul Azhar Bin Md. Sharif

**And All My Friends**

**Thank You and May ALLAH S.W.T bless all of you.**

## ABSTRACT

In Malaysia, forest fragmentation has become a great concern which resulted environmental degradation. Forest fragmentation occurs when original large and continuous forest is divided into small forest patches. Forest fragmentation gives an effect to the forest fauna diversity such as the Malaysian Giant Ant. Therefore, this study was conducted to investigate the abundance of the Malaysian Giant Ant within four fragmented forests in Selangor. Located within urban landscape the four fragmented forest reserves were Sungai Lalang Forest Reserve (SLFR), Ayer Hitam Forest Reserve (AHFR), Bukit Cerakah Forest Reserve (BCFR) and Bangi Forest Reserve (BFR). Point transect survey was used with thirty sampling points at all sites. AHFR was recorded the highest abundance of Malaysian Giant Ant compared to other sites. This result is somewhat contradictory with previous studies that suggested large sized forest had a high abundance of species. The findings may due to other factors that affected more the abundance of Malaysian Giant Ant such as food resources, number of predator and rate of disturbance at the sites. For habitat quality, abundance of the Malaysian Giant Ant was affected by relative humidity, canopy cover and the number of palms. Therefore from these results, increase in the abundance of Malaysian Giant Ant can assist in conserving the biodiversity and balancing the ecosystem since this species plays important roles in the urban forest ecosystem.

## ABSTRAK

Di Malaysia, pemecahan hutan menjadi kebimbangan besar yang mengakibatkan kemusnahan alam sekitar. Pemecahan hutan berlaku apabila hutan besar dan berterusan asal dibahagikan kepada kelompok kecil hutan. Pemecahan hutan memberi kesan kepada kepelbagaian fauna hutan seperti *Malaysian Giant Ant*. Oleh yang demikian, kajian ini dijalankan untuk menyiasat bilangan *Malaysian Giant Ant* dalam empat hutan terpisah di Selangor yang mana merupakan Hutan Simpan Sungai Lalang (SLFR), Hutan Simpan Ayer Hitam (AHFR), Hutan Simpan Bukit Cerakah (BCFR) dan Hutan Simpan Bangi (BFR). Kaedah transek titik digunakan sebagai kaedah untuk kajian ini. Tiga puluh pensampelan disediakan untuk semua tapak kajian. AHFR telah direkodkan sebagai hutan yang mempunyai bilangan *Malaysian Giant Ant* tertinggi bebrbanding tiga hutan yang lain. Hasil ini agak bertentangan dengan kajian terdahulu yang menyatakan bahawa hutan besar menyokong jumlah yang banyak populasi. Sebab utama hasilnya adalah kerana faktor faktor lain yang mungkin lebih mempengaruhi bilangan *Malaysian Giant Ant* seperti bilangan pemangsa, sumber makanan dan kadar gangguan terhadap hutan hutan tersebut. Untuk kualiti habitat, ia menunjukkan bahawa bilangan *Malaysian Giant Ant* dipengaruhi oleh kadar kelembapan, penutup kanopi dan bilangan palma. Kesimpulannya, peningkatan bilangan *Malaysian Giant Ant* boleh membantu dalam memulihara biodiversiti dan menyeimbangkan ekosistem kerana spesies ini memainkan peranan yang penting dalam sesuatu ekosistem.

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## APPROVAL SHEET

I certify that this research project report entitled “The Abundance of Malaysian Giant Ant in Urban Forest Patches in Relation to Microclimate” by Muhammad Farhanjafni bin Johari 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.

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## LIST OF ABBREVIATIONS

FAO	Food and Agriculture Organization
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
AHFR	Ayer Hitam Forest Reserve
BFR	Bangi Forest Reserve
TBSA	Taman Botani Shah Alam
SLFR	Sungai Lalang Forest Reserve
GPS	Global Positioning System
GLMs	Generalized Linear Models
ANOVA	One Way Analysis Variance
RH	Relative Humidity

## CHAPTER 1

### INTRODUCTION

#### 1.1 General Background

Forest ecosystem in the tropics accommodates at least two-thirds of the earth's terrestrial biodiversity and provides significant local, regional and global human benefits through the provision of economic goods and ecosystem services (Al-Shami et al., 2017). From all tropical forest on earth, about 15% of the world's tropical forests are located in Southeast Asia. In Malaysia, there were approximately 20 456 000 ha of forested area in Malaysia in year 2011 (Stibig et al., 2014). However, according to FAO (2011), Malaysia lost an average of 96,000 ha or 0.43% per year between 1990 and 2010 due to deforestation. As a result from the deforestation, the continuous forests are divided into smaller fragment and more isolated fragment.

Tropical forest fragmentation in developing countries is a critical concern as the pressure from rapid urbanization to encourage economic development of an area (Abdullah & Nakagoshi, 2007). According to Rusak (2003), forest fragmentation occurs when large area of forest divided into smaller block for roads, agriculture, urbanization, or other development and in term of ecological, patches of 200 hectares are considered the minimum size for a forest ecosystem to recover from disturbance events such as wind-throw, fires, or insect and disease infestations. The deforestation and fragmentation of the

forest influence the composition, structure and functioning of forest ecosystems that may lead to species mortality, disruption of trophic interactions and increased susceptibility to logging, fires and invasive species (Laurance et al., 2002).

In addition, the conversion of natural habitats has also changed the structure and composition of the existing landscapes, with the forest fragmentation of a previously continuous habitat bringing in more and smaller patches, with more edge-affected habitats and decreased connectivity among the patches (Dodonov et al., 2016). Debinski & Holt (2000) state that smaller patch of forest generally contain fewer species than larger patch. Edge-affected habitat gives greater influence by an increase in predator and invasive species, a reduction in biodiversity, and the degradation of vegetation (Copp- edge et al. 2001; Tuner et al. 2003; Godefroid & Koedam 2003).

This fragmentation strongly influences species diversity, destroys the ecosystem energy balance and material flow (Ren et al., 2017). As patch size decreases, the abundance and richness of the fauna species may decrease (Bennett & Saunders, 2010) because patches have become smaller in size than the minimum territory required for sustaining populations or individuals of species with larger range requirements (Nol et al., 2005). Consequently, with smaller

patches, many species may be absent as it is expected that an increase in patch isolation causes a reduction of species diversity (Fahrig, 2003).

The abundance of insects will be affected because insect is a key ecosystem process in ecosystem services (Maguiere et al., 2015). Since forest is the largest habitat for the terrestrial organisms and represents a major hot spot for diversity, insect species that maybe affected by the forest fragmentation is Malaysian Giant Ant (*Camponotus Gigas*) (Selvi et al., 2016). This species is one of the largest ant species in the world and living in the South-East Asian rain forests, from Sumatra to Thailand (Pfieiffer & Linsenmair, 2000). Since the Malaysian Giant Ant is a native species, the data on abundance of the species will reflect the biotic response of the entire tropical forest ecosystem (Tiede et al., 2017).

## **1.2 Problem Statement**

Deforestation and fragmentation affected the ecosystem of forest and in the same time changed the original vegetation structure and floristic composition (Struebig et al. 2013; Woodcock et al. 2013). This may also influence the abundance of the insect species in the forest area since insects respond to environmental changes in dramatically altered ecosystem conditions (Schowalter, 2016). Some insect species might survive in habitat patches but



when the size of the patches becomes smaller, it is difficult for the species to sustain their endurance of population for a long time (Laurance & Bierregaard, 1997). When the abundance and species richness in a forest reduce, the biodiversity value of the forest will also be reduced since insects occupy various types of ecosystems and perform many important ecological functions (Sodhi et al., 2010). According to Ketzler, Comer, & Twedt (2017), insects are playing big role in maintaining the health and diversity of forest ecosystem through pollination, defoliation and nutrient cycling process.

*Camponotus gigas* Latreille 1802 (subgenus *Dinomyrmex*) is one of the largest ant species of the world living in the South- East Asian rain forests, from Sumatra to Thailand where its habitat ranges from peat swamps of the mangrove forests up to the mountain forests at 1500 m above sea level (Pfeiffer & Linsenmair, 2000). The large size of this species caused them to open the new niches within their forest that are characterized by a great diversity of other ant species (Floren & Linsenmair, 1997). Different in size of patches might alter the habitat quality and directly can influence the abundance of the Malaysian Giant Ant. Moreover, since this species is native, the information on the abundance of Malaysian Giant Ant is important to determine the biodiversity value of the forest patches. From the data on the abundance of Malaysian Giant Ant, the major factors that influence the Malaysian Giant Ant abundance can be determined. This because, most of the previous studies are more to the

behavior of the species instead of finding the factors that affects the abundance of Malaysian Giant Ant in forest patches.

### **1.3 Objectives**

Therefore, the objectives of this study were to:

- I. Determine the abundance of Malaysian Giant Ant in four urban forest patches.
- II. Determine the relationships between vegetation structure and the abundance of Malaysian Giant Ant in four urban patches.

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