DEAD WOOD CHARACTERISTICS INFLUENCING MACROFUNGAL DIVERSITY IN SG. MENYALA FOREST RESERVE AND KENABOI FOREST RESERVE, NEGERI SEMBILAN

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By

ATIKAH BINTI CHE ISMAIL

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DEDICATION

For my beloved family:

Che Ismail bin Che Seman

Che Munah binti Che Musa

Also my siblings.

To my supervisor,

Thanks you for your encouragements and supports

And the sacrifices that you have given.

Thank you for everything.

ABSTRACT

Macrofungal has a significant role in the forest ecosystem by decomposing wood and organic matter. This study was done to examine the abundance and richness of macrofungal, type of substrate, wood position, size, and decay stages that was affected by macrofungal in Sg. Menyala Forest Reserve (HSSM) and Kenaboi Forest Reserve (HSK). Macrofungal identification using macrofungal identification guideline was used to identify the macrofungal specimen. A several linear models and Two-sample Poisson test was used for statistical analysis. In this both study areas, there were 13 types of substrate namely branch, dead trunk, fallen dead tree, fallen leaves, buttress, fruit seed, living tree, soil, standing dead tree, stump, twig, wood debris and bamboo culm. Size, position and decay stage of dead wood are important factors to measure the macrofungal diversity. Size of dead wood was recorded according to three classes; Class 1 (dead wood with diameter size less than 2.5 cm), Class 2 (dead wood with diameter size between 2.5 cm to 15 cm) and Class 3 (dead wood with diameter size more than 15 cm). The position of dead wood occurred was recorded as vertical or horizontal position, while decay stage was recorded according to three stages; Stage 1 (fresh dead wood with the bark still intact), Stage 2 (dead wood with bark removed) and Stage 3 (dead wood almost completely decomposed). Both study areas show a highly significant difference of macrofungal abundance, morphospecies richness, and type of substrate. The results showed that the type of substrates affects the macrofungal abundance and composition. It can conclude that the efforts to conserve both forests are necessary since it provides the conducive environment for macrofungal diversity.

ABSTRAK

Makrofungi mempunyai satu peranan yang penting dalam ekosistem hutan dengan menguraikan kayu dan bahan organik. Kajian ini dijalankan untuk mengkaji bilangan dan kepelbagaian makrofungi jenis substrat, kedudukan kayu, saiz, dan tahap reputan kayu mati yang terjejas oleh makrofungi dalam Hutan Simpan Sg. Menyala (HSSM) dan Hutan Simpan Kenaboi (HSK). Pengecaman makrofungi menggunakan garis panduan pengecaman makrofungi digunakan untuk mengenal pasti spesimen makrofungi. Beberapa model linear dan ujian "Two-sample Poisson" digunakan untuk analisis statistikal. Dalam kedua-dua kawasan kajian, terdapat 13 jenis substrat iaitu dahan, batang pokok mati, pokok tumbang mati, daun gugur, banir, biji benih buah, pokok hidup, tanah, pokok berdiri mati, tunggul, ranting, serpihan kayu dan batang buluh. Saiz kayu mati telah dicatatkan berdasarkan tiga kelas; Kelas 1 (kayu mati dengan diameter kurang dari 2.5 cm), Kelas 2 (kayu mati dengan diameter 2.5 cm kepada 15 cm) dan Kelas 3 (kayu mati dengan diameter lebih dari 15 cm). Kedudukan kayu mati yang berlaku telah dicatatkan sebagai kedudukan menegak dan melintang manakala, tahap kereputan kayu telah dicatatkan berdasarkan tiga peringkat; Tahap 1 (kayu mati dengan kulit kayu masih kuat), Tahap 2 (kayu mati dengan kulit kayu terbuka) dan Tahap 3 (kayu mati hampir terurai sepenuhnya). Kedua-dua kawasan kajian menunjukkan kesan yang significant perbezaan yang sangat tinggi terhadap bilangan makrofungi, kepelbagaian makrofungi dan jenis substrat. Saiz, kedudukan dan tahap reputan kayu mati merupakan faktor penting mengukur kepelbagaian makrofungi. Keputusan itu menunjukkan bahawa jenis substrat memberi kesan kepada kelimpahan makrofungi dan komposisi. Kesimpulannya, usaha memulihara kedua-dua hutan adalah perlu sejak ia memberikan persekitaran kondusif untuk kepelbagaian makrofungi.

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APPROVAL SHEET

I certify that this research project report entitled "Dead Wood Characteristics Influencing Macrofungal Diversity In Sg. Menyala Forest Reserve And Kenaboi Forest Reserve, Negeri Sembilan" by Atikah binti Che Ismail has been examined and approved as a partial fulfilment of the requirements for the Degree of Bachelor of Wood Science and Technology in the Faculty of Forestry, Universiti Putra Malaysia.

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Date : January 2019

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LIST OF ABBREVIATIONS

HSSM   Sg. Menyala Forest Reserve

HSK   Kenaboi Forest Reserve

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CHAPTER 1

INTRODUCTION

1.1 Background

In the forest, dead wood is an important stabilizing component because it serves as the substrate for plants and also fungi, facilities nutrient cycling and energy flow preserves hydrology and soil retention in most forest ecosystem (Harmon et al., 1986; Huntington and Ryan, 1990). Numerous studies showed that macrofungal has the significant role in a forest ecosystem. The role of macrofungal is not only keeping our forest healthy by decomposing wood and other living matter, but also maintain the suitable temperature by giving out carbon dioxide to the surrounding (Harmon et al., 1986). Some studies discovered that branch, twig, and wood debris considered as deadwood characteristics that consist the type of substrate that will affect macrofungal diversity (Dvořàk et al., 2017). Deadwood at later stages of decay supports the greatest abundance of fungi and greatest diversity of fungi (Kwaśna et al., 2017). Most macrofungal in Malaysia is rich and abundant in the unmanaged forest due to the undisturbed state. There are many factors affecting macrofungal diversity. The most significant environmental factors related to macrofungi species richness and abundance in the forest are canopy cover, humidity, and temperature (Engola et al., 2007).

A long time ago, people had realized the importance of dead wood in stabilizing and maintaining forest health. Not only the dead wood decomposed and return to the soil, but it also functions in maintaining healthy

.forest ecosystem. Decomposition is done with the aid of macrofungal especially saprophytic fungi due to its natural role which is life, and feed on the dead or decomposing matter.

A study revealed by Sefidi and Etemad (2015) found that size, position and decay stage of the dead wood affect macrofungal diversity in forested areas. For example, Polyporus fungi usually grow on dead trees (Penttilä et al., 2006). There are also study reported that the position of logs either downed logs, leaning snags or standing snags influence macrofungal diversity in forested areas. According to Lindblad, (1995), the highest number of fruiting species was found on intermediately decayed logs and on logs lying in touching base with the ground.

1.2 Problem Statement

Deadwood characteristics such as position and size of dead wood influence macrofungal diversity in the natural forest and some fragmented forests (Kamaliah, 2018). Information on the dead wood characteristic that is suitable to grow certain types of macrofungal is scarce. In temperate countries, many studies were done on dead wood characteristics such as size and position that affect macrofungal abundance and richness (Sefidi and Etemad, 2015). Meanwhile, in tropical countries especially in Malaysia, a study of macrofungi was reported in Perak, in terms of its Macrofungal distribution (Seelan et al., 2014,). Shuhada and co-workers (2016) quantified and reported differences on the macrofungal diversity at three different landscapes which were peat swamp forest, monoculture oil palm smallholding and polyculture oil palm

smallholding. However, studies about decay stages particularly in the tropical forest is still lacking. Most of the previous studies focused on forested areas or forest plantation, but there is limited study reported on dead wood characteristics in fragmented forest areas.

1.3 Justification

Fungi represent one of the largest groups of living organisms with approximately 100,000 described species (Blackwell, 2011). Fungi are the key organism in maintaining forest ecosystems as prime decomposer. Thus, it is important to study fungi diversity in secondary and fragmented forest in Malaysia and know what are the factors that affect the macrofungal diversity. This study will help the relevant authorities including the Forestry Department of Peninsular Malaysia to have better knowledge and understanding of the nation's fungi resources and its effect to forest conservation.

1.4 Objectives

The objectives of this study are:

1. To determine the dead wood characteristics such as log or wood position, size, and decay stages that was colonized by macrofungal in Sg. Menyala Forest Reserve (HSSM) and Kenaboi Forest Reserve (HSK).

2. To compare the macrofungal abundance, morphospecies richness and type of substrate in Sg. Menyala Forest Reserve (HSSM) and Kenaboi Forest Reserve (HSK).

1.5 Hypothesis

The hypothesis of this study are:

1. Macrofungal abundance, morphospecies richness and substrate richness differ between both forests.
2. Dead wood characteristics such as size, position and decay stage give different macrofungal diversity.

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