ASSOCIATIONS OF ODONATA WITH VEGETATION STRUCTURE IN DIFFERENT AGRICULTURAL LANDSCAPE

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FACULTY OF FORESTRY
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ASSOCIATIONS OF ODONATA WITH VEGETATION STRUCTURE IN DIFFERENT AGRICULTURAL LANDSCAPE

By

MEGAT NAQIUDDIN LUTFIE BIN ISMAIL

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

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DEDICATION

For my beloved family:

Ismail Bin Nosi

Raja Khaizon Binti Raja Kamaruzaman

Also my siblings.

To all my friends,

Thank you for your encouragements supports

And the sacrifices that you have given.

Last but not least,

I dedicated this dissertation to Arlixcya Vinnisa Anak Empidi

Who has encouraged me, helped and give so much support during conducting this research and in my study.

Thank you for everything. May Allah Bless All of us.

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ABSTRACT

Natural forest conversion into agricultural landscapes caused negative impacts on overall biodiversity. Agriculture landscapes, however, may have different impacts on biodiversity due to landscape heterogeneity. The present study investigated the abundance and species richness of dragonflies and damselflies (Insecta: Odonata) between monoculture and polyculture plantations. Three different agricultural landscape namely; oil palm and rubber for monoculture plantations and orchard for polyculture plantations were assessed for Odonata communities in Kampung Sungai Lalah, Pedas, Negeri Sembilan. Orchard, oil palm and rubber plantation visited in this study shared the same water source, Sungai Lalah, which makes it convenient to compare Odonata composition. Odonata sampling was conducted using visual observations in 15 sampling points that have close proximity to river in each agricultural landscapes (total 45 sampling points). We encountered 797 individuals belonging to 20 species and 5 families of Odonata. Orchard had the greatest Odonata abundance (51%) and species richness (44%) followed by oil palm and rubber plantations. Polyculture practise in orchard showed significantly greater vegetation cover, relative humidity and temperature that are more favoured by Odonata. The findings indicate that polyculture practices in orchard provide more intricate resources due to greater habitat heterogeneity. Variety of vegetation cover can serve as food resources and habitats for Odonata. In conclusion, polyculture landscape can sustain diverse Odonata communities compared to monoculture landscape. Therefore, it is important to conserve and manage agricultural landscapes towards polyculture practise for Odonata species conservation.

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ABSTRAK

Perubahan hutan semulajadi ke landskap pertanian menyebabkan kesan negatif kepada biodiversiti keseluruhan. Walau bagaimanapun landskap pertanian mungkin mempunyai kesan yang berbeza terhadap kepelbagaian biologi disebabkan oleh kepelbagaian lanskap. Kajian ini menyiasat kelimpahan dan kekayaan spesies pepatung dan pepatung jarum (Insecta: Odonata) antara perladangan monokultur dan polikultur. Tiga landskap pertanian yang berbeza iaitu; kelapa sawit dan getah untuk ladang monokultur dan dusun untuk ladang polikultur telah dinilai untuk komuniti Odonata di Kampung Sungai Lalah, Pedas, Negeri Sembilan. Perladangan dusun, kelapa sawit dan getah yang digunakan untuk kajian itu berkongsi sumber air yang sama, iaitu Sungai Lalah, yang menjadikannya mudah untuk membandingkan komposisi Odonata. Pensampelan Odonata dijalankan menggunakan pemerhatian visual dalam 15 titik persampelan yang mempunyai jarak dekat dengan sungai di setiap landskap pertanian (jumlah 45 titik pensampelan). Pada keseluruhannya, kami menemui 797 individu yang terdiri daripada 20 spesies dan 5 keluarga Odonata. Dusun mempunyai kelimpahan Odonata terbesar (51%) dan kekayaan spesies (44%) diikuti ladang kelapa sawit dan getah. Amalan polikultur di dusun menunjukkan perlindungan tumbuhan yang ketara, kelembapan relatif dan suhu yang lebih disukai oleh Odonata. Penemuan menunjukkan bahawa amalan polikultur di dusun menyediakan sumber yang lebih rumit kerana heterogeniti habitat yang lebih besar. Pelbagai jenis tumbuhan boleh berfungsi sebagai sumber makanan dan habitat untuk Odonata. Sebagai kesimpulan, landskap polikultur dapat mengekalkan komuniti Odonata yang pelbagai berbanding landskap monokultur. Oleh itu, adalah penting untuk memulihara dan mengurus lanskap pertanian ke arah amalan polikultur untuk pemuliharaan spesies Odonata.

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APPROVAL SHEET

I certify that this research project report entitled “Associations of Odonata with Vegetation Structure in Different Agricultural Landscape” by Megat Naqiuddin Lutfie Bin Ismail 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.

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Date: June 2018

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
FAO	Food and Agriculture Organization of the United Nations
HSD	Tukey's Honestly Significant Difference
IUCN	International Union for Conservation of Nature
KKK	Kuala Lumpur Kepong Berhad Company
WRI	World Resources Institute

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CHAPTER 1

INTRODUCTION

1.0 Background of Study

Habitat degradation of natural ecosystem is a major concern of biodiversity declines specifically insects. Human activities, especially conversion and degradation of forest area lead to the destruction of natural habitat causing negative impacts on ecosystems functions and services. Along these lines, while tropical forest possess just 7% of the world's cover surface they are thought to contain over portion of the half of the species on the planet (Oldeman, 2002).

Nevertheless, it provide natural habitat for almost 50% - 90% species of plants and animals globally. Deforestation in the tropics has become the major driver of biodiversity losses. Recent survey conducted by International Union for Conservation of Nature (IUCN) (2017) shows since the 1960s, over half of the tropical forests worldwide have been decimated and every second, more than one hectare of tropical forests is crushed. In Malaysia, the encroachment of tropical rainforest without sustainable silvicultural practices have destroy flora and fauna species with the assumption that these species do not have high economic value causing drastic changes in the structure and diversity of forests.

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Changes in land use characteristics from natural forest into agricultural landscape are a major loss of important Odonata species. Insects such as Odonata (dragonflies and damselflies) are suitable model organism to assess the effects of anthropogenic impact as they are sensitive to changes in environmental condition. Miguel et al. (2017) reported that the order Odonata is important bioindicators for environmental assessment as they are aquatic as larvae and terrestrial as adults.

Even though, there are others bioindicator species as shown in previous ecophysiological (Atobatele et al., 2005; Arimoro et al., 2007a, Arimoro & Ikomi, 2009), the structure of Odonata communities may shift predictably with response to changes in environmental conditions. Vegetation structure has a direct impact on the structure of adult Odonata communities together with ambient temperature that influence species occurrence and breeding cycle. Odonata breeding behaviors and ovipositional sites are also dependent on the structure and diversity of riparian (De Marco and Resende, 2004; Miguel, Oliveira-Junior, Ligeiro and Juen, 2017).

The present study aims to determine the effect of different agricultural landscape (monoculture versus polyculture) that can have different impact on Odonata species richness and abundance. The present study will be conducted in Negeri Sembilan (Sungai Lalah, Pedas) that comprise of different agricultural landscapes with monoculture (oil palm and rubber plantation) and polyculture (orchard plantations).

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1.1 Problem Statement

Forest conversion into agricultural landscape leads to major loss of Odonata communities. In addition, different agricultural landscape (monoculture vs polyculture) can have different impact on Odonata species richness and abundance due to habitat complexity. Odonata persistence under different agricultural landscapes is unpredictable as their survivals are associated with many factors, including vegetation structure. Figure 1.1 show how human disturbance can give different impact on ecosystem and environment. Human activities related to modify agriculture and land cover that make ecological degradation in vegetation structure and bring result from increases in nutrients and fine sediments and hydromorphological alterations (Dudgeon et al., 2006; Vörösmarty et al., 2010; Carpenter et al., 2011).

Vegetation structure alters light and temperature regimes, provides food for fauna and woody debris source or streams (Pollock et al., 1998). Odonata taxonomic composition and abundance may change with vegetation structure, structure along with the different type of water bodies (Smith et al., 2007). In addition, female Odonata may show preferences for ovipositional sites according to habitat features such as water speed, water body dimensions and the presence of vegetation structure. Thus, changes in these habitat characteristics can alter the behavior and success rate of Odonata populations.

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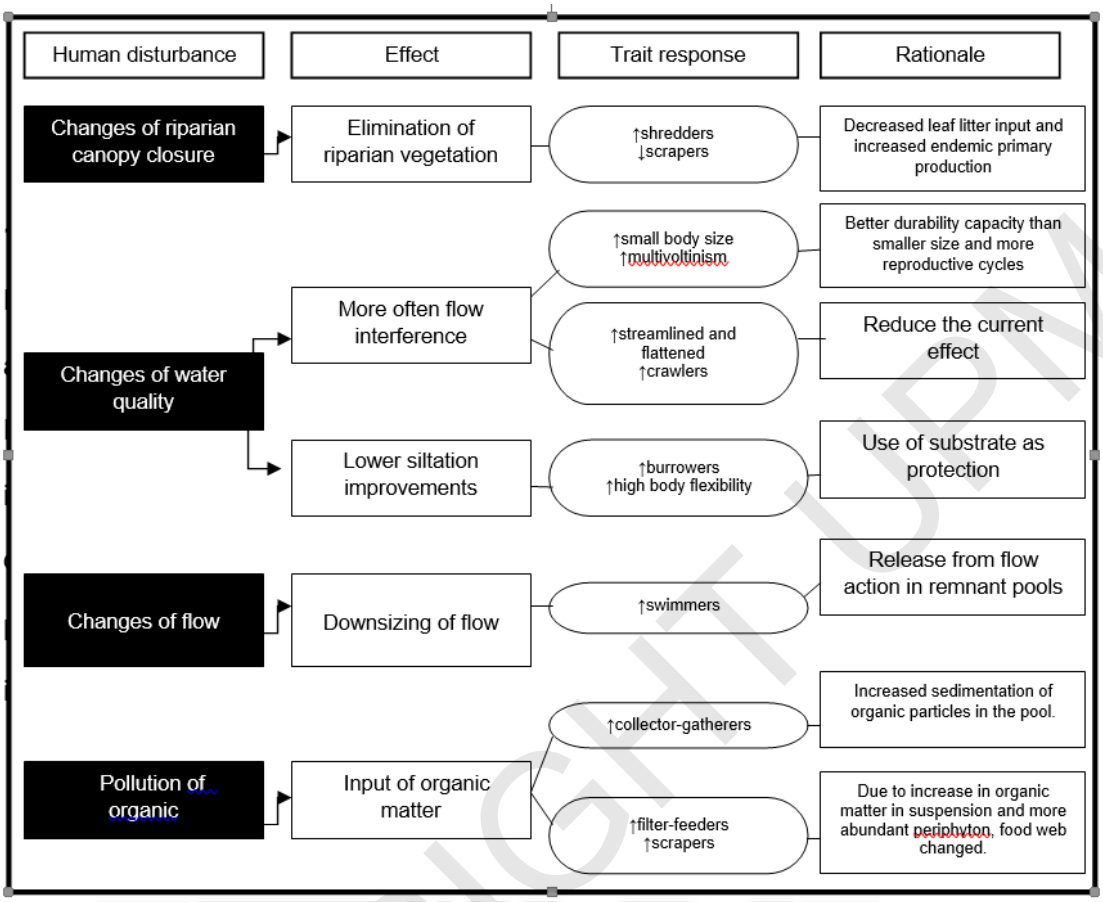

Figure 1.1: Graphical framework showing predictions for trait category responses to human impacts. Impacts may decrease (↓) or increase (↑) the relative abundance of a single trait category (Statzner and Bêche, 2010; Feio and Dolédec, 2012).

1.2 Justification

Vegetation structure plays an important determinant factor for Odonata distribution and diversity due to their function to provide refuge and food resource availability. However, there is a lack of information on how different vegetation structure can influence Odonata assemblages. The information on the effect of land degradation or deforestation on riparian vegetation and its influence on Odonata communities will provide further information whether agriculture management practices can be improved for biodiversity conservation.

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1.3 Research Objectives

The main objective of the study is to identify the effects of vegetation structure in agricultural landscape on Odonata community. The specific objective is to determine whether species richness and abundance of Odonata species might differ in different agricultural landscapes between polyculture and monoculture practices.

1.4 Research Questions

The following research questions are used for the study to determine the effects of vegetation structure on Odonata community; (i) is there any differences in Odonata assemblages between different vegetation structure?, (ii) how different agricultural practices (polyculture vs monoculture) affect Odonata species composition? and (iii) can Odonata become a good indicator for biodiversity friendly practices in agricultural landscape?

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