UNIVERSITI PUTRA MALAYSIA

PHENOLOGY AND AVAILABILITY OF FRUIT TREES AND THEIR INFLUENCE ON THE ABUNDANCE OF SELECTED ANIMALS IN LOGGED AND PRIMARY FOREST OF SUNGAI LALANG FOREST RESERVE, SELANGOR

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By

ROMEO M. LOMOLJO

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of Requirements for the Degree of Master Science

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DEDICATION

This Piece of Work is dedicated to; my late father Jorge C. Lomoljo

And Mother Anicita M. Lomoljo and to my Dearest

Wife Eva and Children Maruxa Linda

And Marcella MIA

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in Fulfilment of the requirements for the degree of Master of Science

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Chairman: **Associate Professor Mohamed Zakaria Hussin, Ph.D.**

Faculty: **Forestry**

The abundance of fruit tree species as food source for wildlife in logged and primary forest was evaluated. The phenological data collection was carried out from September 1999 to October 2000 in Sungai Lalang Forest Reserve, Semenyih, Selangor, Malaysia. The general objective of this study is to determine the fruit tree species that serves as food source for wildlife in logged and primary forest. The specific objectives are: to compare the availability of fruits to animals in three different compartments. To compare fruit trees distribution in three compartments within block. And to correlates the abundance of animals in relation to food availability. Three different Compartments were selected namely: Compartment 24 (VJR), Compartment 33 (10-year-old logged forest) and Compartment 18 (5-year-old logged forest). Within each Compartment,

three blocks were established in different location (e.g. ridge top, mid-slope and valley bottom). All trees bigger than 10 cm dbh were tagged and identified and monitored every month for leafing, flowering and fruiting activities. The Duncan's test indicated that the leafing pattern in Compartment 24 (VJR) was significantly different ($P < 0.05$) from Compartment 33 (10-year-old logged forest) and Compartment 18 (5-year-old logged forest) ($P < 0.05$). The flowering pattern however, showed no significant difference among the three different Compartments. The percentage of fruiting was significantly lower in Compartment 18 (5-year-old logged forest) than in the primary forest (VJR) ($P < 0.05$).

In general, the availability of the food sources such as leaves, flowers and fruits was almost similar in primary and the two-logged forest, however only the primary forest (VJR) tends to provide more food to wildlife. This study showed that less trees or fruit trees meant less food; likewise more fruit trees meant more food. This indicated that the survival of the animals in the forest especially the logged forest fully depended on the fruit trees left after the logging activities. Logging activity influenced the distribution and availability of food sources and it is frequently correlated with the behaviour pattern of animal species.

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

FENOLOGI DAN KEDAPATAN POKOK BERBUAH DAN PENGARUH KEATAS LIMPAHAN HAIWAN TERPILIH DALAM HUTAN SELEPAS PEMBALAKAN DAN HUTAN ASLI HUTAN SIMPAN SUNGAI LALANG, SELANGOR

Oleh

ROMEO M. LOMOLJO

October 2003

Pengerusi: Professor Madya Mohamed Zakaria Hussin, Ph.D.

Fakulti: Perhutanan

Sejumlah spesis pokok berbuah sebagai sumber makanan untuk hidupan liar di hutan selepas dibalak dan hutan asli telah dinilai. Pengumpulan data fenologi telah dijalankan daripada September 1999 hingga Oktober 2000 di Hutan Simpan Sungai Lalang, Semenyih, Selangor, Malaysia. Oleh yang demikian objektif umum kajian ini adalah untuk mengenal spesis pokok berbuah yang merupakan sumber makanan untuk hidupan liar di hutan selepas dibalak dan di hutan asli. Objektif utama adalah untuk membuat perbandingan jumlah buah yang terdapat dengan kehadiran haiwan di tiga kompatmen yang berbeza, yang dinamakan; Kompatmen 24 (VJR), Kompatmen 33 (10 tahun selepas pembalakan) dan Kompatmen 18 (5 tahun selepas pembalakan). Pada setiap kompatmen, tiga blok telah dibuat di lokasi yang berbeza (cth: Cerun atas, Lereng tengah dan Lembah). Kesemua pokok lebih besar daripada 5 cm dbh

akan dikenalpasti, ditag, dicamkan dan dinilai setiap bulan samada dari segi jumlah daun, pembungaan dan pengeluaran buah. Keputusan menunjukan bahawa corak pengeluaran daun di dalam Kompatmen 24 (VJR) perbezaan bererti ($P < 0,05$) berbanding dengan Kompatmen 33 (hutan 10-tahun selepas pembalakkan) dan Kompatmen 18 (hutan 5-tahun selepas penbalakkan) ($P < 0,05$). Walaubagaimanapun, corak pembungaan tidak menunjukkan perbezaan yang ketara di antara ketiga – tiga Kompatmen. Peratusan pengeluaran buah meneunjukan perbezaan bererti di Kompatmen 18 (hutan 5- tahum selepas pembalakkan) berbanding dengan hutan primer (VJR) ($P < 0.05$). Secara amnya, kehadiran sumber – sumber makanan seperti daun, bunga dan buah adalah hampir sama dengan hutan primer dan kedua – dua hutan yang telah dibalak, walaubagaimanapun hanya hutan primer (VJR) yang menyumbankan lebih makanan kepada hidupan liar.

Kajian ini menunjukkan bahawa kurangnya pokok – pokok atau pokok buah bermakna kurang makanan, dan sebaliknya lebih pokok buah, lebih makanan. Ini menunjukkan bahawa kemandirian hidupan di dalam hutan terutamannya hutan yang telah dibaik adalah bergantung sepunuhnya kepada pokok buah – buahan yang tinggal selepas activiti pembalakkan. Kegiatan pembalakkan mempengaruhi dan kalempahan sumber- sumber makanan dan ia biasanya dihubungkaitkan dengan corak kelakuan sepsis hidupan.

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Finally, to my loving wife Eva and my two daughters En-En and Barbie for the love and support they unselfishly give to me. And above all, praise and glory to the heavenly father "Jehovah".

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Archbu	*Archedendron bubalinum*
Artoin	*Artocarpus integer silvistries*
Artolan	*Artocarpus lanceifolius*
Artonit	*Artocarpus nitidus graffethii*
Bacmin	*Baccaurea minor*
Bacret	*Baccaurea reticulata*
Bouop	*Bouea oppositifolia*
Canlit	*Canarium litorale purpurescene*
Canruf	*Canarium litorale rufom*
Canpil	*Canarium pilosum*
Caschef	*Castanopsis schefferiana*
Calatro	*Callerya atropurpurea*
Diamain	*Dialium maingayi*
Diaplat	*Dailium platysepalum*
Elatap	*Elateriospermum tapus*
Garmal	*Garcinia mallaccensis*
Garscor	*Garcinia scortechii*
Garpy	*Garcinia pyrifera*
Manggra	*Mangifera grasilipes*
Mangqua	*Mangifera quadrifeda*
Nepcus	*Nephelium Cuspidatum*
Nepin	*Nephelium intermedium*
Nepmain	*Nephelium maingayi*
Parspec	*Parkia speciosa*
Sapbac	*Sapium bacatum*
Sanlae	*Santeria laevigata*
Dacros	*Dacryodes rostata*
Xeroin	*Xerospermum intermedium*
Xeronor	*Xerospermum noronhianum*
C24	Compartment 24
C33	Compartment 33
C18	Compartment 18
VJR	Virgin Jungle Reserve

CHAPTER ONE

INTRODUCTION

The tropical rainforest is one of the most complex ecosystems in the world. The forest plays an important role not only in the production of timber but most importantly in providing environmental services, which include the maintenance of biological diversity, soil and watershed protection, regulation of climate and nutrients cycle. However, for development purposes many forested areas in the tropical region are cleared and used for agricultural production, industrial estate and human settlements.

Many tropical countries especially in Southeast Asia are concerned with the effects of selective logging on fauna and flora. The issue is important because there is a decreased in forested areas and there is a need for greater public awareness. There are a few major problems facing wildlife conservation at a global level today, and among them is the increasing rate of habitat loss due to human pressure on the environment especially the core wildlife habitat such as tropical forest. The tropical hardwood for example, is an extremely valuable economic resource for the Southeast Asian countries. However, the increasing rate of forest exploitation will cause extensive tropical forest of the region to become secondary forest by the beginning of the twenty-first century (Myers 1980).

In Malaysia alone, it is extremely rich in both plants and animal species (Tho 1993). Its high diversity offers a wide variety of natural habitats for flora and fauna. It is estimated that Malaysia has ca. 8000 flowering plant of which ca. 2,650 are tree species. There are also over 800 species of non – flowering plants that have been recorded. The animal is equally diverse with ca. 1000 species of vertebrates and an estimated 20-80 thousand invertebrate's species. Many of these species are indigenous and can be found only in peninsular Malaysia. The destruction of wildlife habitats especially forest areas has reduced the number of wildlife in the forest (John 1986). Many birds and other animals left the logging area as soon as the logging activities begin. Logging and other human activities have destroyed most of their feeding and breeding habits considering that their existence in the forest is highly governed by their food supply. Thus, any form of destruction to their habitat has decreased the food supply and eventually affected their existence in the forest.

Problem Statement

It is unlikely that any single factor limits the density of an animal population (Leighton 1983). Although food resources availability may be ultimately limiting. Distribution and abundance of food frequently correlated with the behaviour pattern of animal species (Dawson 1979). Changes in distribution of food types occurring as a result of selective logging will cause the changes

of feeding on a certain food. Animals feed more on leaf materials in logged and primary forest like primate species, which may be correlated with a reduced availability of flowers and fruits.

This study focused on the phenology and availability of fruit trees and their influence on the abundance of selected animals in logged and primary forest in three different compartments such as Virgin Jungle Reserve (VJR), ten-year-old logged forest (C33) and five-year old logged forest (C18). The reason of choosing this three study sites:

The Compartment 24 (VJR) and the two logged forest study were selected for the following reasons: I) The compartment 24 (VJR) forest areas have been established and is presently used by some researchers working in botany. References to work in the area are readily available and the present work will form part of an integrated research program. Ii) The study area are adjacent to each other, increasing the likelihood that pre-logging conditions (diversity and composition of flora and fauna) in the compartment 33 (10 year old logged forest) and in the compartment 18 which is (5 year old logged forest) were similar to those in the unlogged site. This similarity is crucial if comparisons of phenology activities in relation to different animals of the areas are to be made. Iii) Both areas were far from any human settlements and hunting was almost unknown, increasing the possibility that changes to the plant and animal populations were due only to logging activities.

Justification

Most of the forest areas in Peninsular Malaysia especially the lowland forest had been logged and become degraded and formed into secondary forest. This effect is very much dependent on the intensity of logging destruction and volume of timber extracted and this might be severed to certain species of animals or birds (especially understorey birds) but not the other animals. The indirect effects of logging towards animal's population are the reduction of food and shelter (Johns 1986). For the primate's species, the logging activities seemed to cause less impact on their populations (Sundai 2000). This is probably because, the removal of higher number of dipterocarp trees during logging had cause less impact to their population because dipterocarp are less preferred as food resources by the primates (Chivers 1977a, 1977b; Johns 1986). In addition, the removal of emergent trees and the opening of the canopy cover would increase the amount of sunlight reaching the forest floor. This will encourage the growth of smaller trees especially for non-dipterocarp species, which could provide a potential food sources (e.g. leaves flower and fruits) for the primates. Thus, there is an urgent need to determine the extent of this disturbance towards the fruit tree species that serves as food for animals in the forest. It is important to note that the information gained will become the basis or guide line in formulating the effective management plan on forest utilization and forest operation to ensure the survival and to see these animals in the future.

Objectives of the Study

General Objective

The main objectives of the study were to identify the fruit tree species and determine the food resources for selected animals in logged and primary forest.

Specific Objectives

The specific objectives of this study were

1. To study the phenology of fruit trees, which serve as food resources for selected animals in 10-year old logged forest, 5-year old logged forest and VJR (primary forest).
2. To compare the food resources for selected animals in 10-year old logged forest, 5-year old logged forest and VJR (primary forest).
3. To compare the fruit trees distribution in three compartments within plots.
4. To correlates the abundance of selected animals in relation to fruits available in three different study sites namely; 10-year-old logged forest, 5-year-old logged forest and VJR (primary forest).