



UNIVERSITI PUTRA MALAYSIA

**IMMEDIATE EFFECTS OF SELECTIVE LOGGING ON
UNDERSTOREY BIRDS IN ULU MUDA FOREST RESERVE,
KEDAH, MALAYSIA**

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KEDAH, MALAYSIA**

By

ZAMRI BIN ROSLI

**Thesis Submitted in Fulfilment of the Requirement for the
Degree of Master Science in the Faculty of Forestry
Universiti Putra Malaysia**

November 2001



DEDICATION

*Teristimewa Buat:
Isteri Tercinta (Zainah Mukhtar)
Terima kasih di atas pengorban dan kesebarannya
Sepanjang pengajian abang
Juga buat puteri tersayang Ummi Syafiqah Aysa*

*Bonda (Hasni), Ayahanda (Rosli) dan Mertua sekeluarga
Jasa dan budi kalian akan tetap dalam ingatan...
Moga harapan dan doa kalian di makbulkan tuhan..amin*

*Buat kakak (Mastura dan keluarga, Rohaya dan keluarga, Romzi) dan
adik-adik (Rohana dan keluarga, Mohd. Asri dan keluarga, Rohani,
Mohd. Isa, Mohd. Hasli, Rohayu dan Mohd. Hafis)
Jadikan kejayaan ini sebagai anugerah buat kita sekeluarga*

*Ikhlas dari:
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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in
fulfilment of the requirement of the degree of Master of Science

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November 2001

Chairman: Mohamed Zakaria Hussin, Ph.D.

Faculty: Forestry

This study was carried out to determine understorey bird species composition before and immediately (less than one year) after logging. The main objectives were to determine: (i) the trophic structure related to the feeding guild, (ii) the diversity in terms of species diversity, species richness and species evenness) and (ii) to generate a species list for understorey bird population before and immediately after logging. The study was conducted in compartment 28/29, Ulu Muda Forest Reserve, Kedah, Malaysia. This area is a hill forest covering an area of 791.2 ha. It was harvested using selective logging method in 1997 and harvesting was completed at the end of 1999.

Mist-netting method was used to obtain the information on understorey bird species. A total of 75 species with 175 individuals were recorded before logging and 61 species with 385 individuals were recorded immediately after logging. The Babblers group decreased immediately after logging. However, the bulbuls and spiderhunters increased immediately after logging.

The Insectivore group was found to dominate the forest before logging followed by insectivore/frugivore and frugivore groups. However, the insectivore/frugivore group dominated the area immediately after logging, followed by insectivore and nectarivore/insectivore/frugivore groups. The analysis of feeding guild also showed that the arboreal foliage gleaning insectivore guild dominated the primary forest in terms of species composition and number of individuals, but their numbers decreased immediately after logging. The arboreal foliage gleaning insectivore/frugivore was found to be higher in terms of the number of species and individuals immediately after logging.

The values of species diversity index (H'), species richness index (R) and species evenness index (E) were also significantly higher before logging compared with the values immediately after logging.

The changes in forest vegetation and microclimate were the main factors which affected the composition and diversity of understorey bird species. Thus, logging has changed the composition, the trophic and feeding guild structures as well as the diversity of understorey bird species.

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

**KESAN SEGERA PEMBALAKAN TERPILIH KE ATAS BURUNG
PERINGKAT BAWAH DI HUTAN SIMPAN ULU MUDA, BALING,
KEDAH, MALAYSIA**

Oleh

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Fakulti: Perhutanan

Pembalakan dikatakan memberi kesan kepada taburan dan jumlah sumber makanan hutan yang menjadi keperluan hidupan liar. Kajian ini dijalankan secara umumnya adalah untuk menilai komposisi spesies burung peringkat bawah sebelum dan sejurus (kurang dari satu tahun) selepas pembalakan. Objektif utama adalah untuk; (i) menilai struktur tropik berkaitan dengan kumpulan pemakanan (ii) menilai kepelbagaian (kepelbagaian spesies, kekayaan spesies dan keserataan spesies) dan, (iii) untuk mendapatkan senarai populasi burung peringkat bawah sebelum dan sejurus selepas pembalakan. Kajian telah dijalankan di kompartmen 28/29, Hutan Simpan Ulu Muda, Kedah, Malaysia. Kawasan ini merupakan hutan bukit meliputi kawasan seluas 791.2. Kawasan ini telah dibalak menggunakan kaedah pembalakan terpilih sejak awal 1997 dan pembalakan telah berakhir pada akhir 1999.

Kaedah jaring kabut telah digunakan untuk mendapatkan maklumat mengenai burung peringkat bawah. Sejumlah 75 spesies dengan 175 individu telah direkodkan sebelum pembalakan dan 61 spesies dengan 385 individu telah direkodkan sejurus selepas pembalakan. Kumpulan rimba menunjukkan penurunan sejurus selepas pembalakan. Walaubagaimanapun, kumpulan merbah dan kelicap menunjukkan pertambahan sejurus selepas pembalakan.

Kumpulan Insektivor didapati mendominasi hutan sebelum dibalak diikuti oleh insektivor/frugivor dan kumpulan frugivor. Kumpulan insektivor/frugivor mendominasi hutan sejurus selepas pembalakan diikuti oleh kumpulan insektivor dan nektivor/insektivor/frugivor. Analisa struktur pemakanan juga menunjukkan bahawa hutan primer didominasi oleh spesies dari 'arboreal foliage gleaning insectivore' berdasarkan kepada komposisi spesies dan jumlah individu, jumlah mereka menurun sejurus selepas pembalakan. 'Arboreal foliage gleaning insectivore/frugivore' telah didapati bertambah dari segi komposisi spesies sejurus selepas pembalakan.

Nilai index kepelbagaian spesies (H'), index kekayaan spesies (R) dan index keserataan spesies (E) juga tinggi sebelum pembalakan berbanding dengan nilai sejurus selepas pembalakan.

Perubahan terhadap vegetasi hutan dan iklim mikro merupakan faktor utama yang memberi kesan kepada komposisi dan kepelbagaian spesies burung

peringkat bawah. Oleh yang demikian pembalakan telah didapati mengubah komposisi, struktur tropik dan kumpulan pemakanan serta kepelbagaian spesies burung peringkat bawah.

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May Allah Bless us all

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LIST OF ABBREVIATIONS

Dbh	-	Diameter at Breast Height
C28/29	-	Compartment 28/29
DOA	-	Department of Agriculture
FAO	-	Food and Agriculture Organisation
DWNP	-	Department of Wildlife and National Park
FDPM	-	Forest Department of Peninsular Malaysia
UNEP	-	United Nations Economic Plan
Sp	-	Species
Sg.	-	Sungai
MUS	-	Malayan Uniform System
SMS	-	Selective Management System

CHAPTER I

INTRODUCTION

The tropical rainforest has the most diverse and richest assemblage of plant and animal species in the world. Most wildlife species in the tropical regions depend on the forest for their existence. The forest ecosystem provides the basic necessities such as shelter, refuge and feeding and breeding grounds for them to survive and reproduce.

A large proportion of the forested areas remaining are either logged-over or degraded forest (secondary forest) (Anon, 1990). The size of the primary tropical rainforest is shrinking at a rapid rate. Primary forest is being destroyed at an alarming rate of 1.28 million ha per year. On the other hand, the size of secondary forests is expanding (Lambert, 1992). It is thus important to understand the effects of habitat disturbance or changes on the population of wildlife in secondary forest (logged forest).

Mammals and avians are particularly vulnerable to forest disturbances and clearings for several reasons: a majority of these species depend on primary or tall secondary forests for their existence (Medway, 1983; Stevens, 1968). Many species require extensive areas of forest because of their large home range and all species must maintain their gene pools to a sufficient size as to

ensure their existence in the future. Eighty-four percent of endemic birds (birds that are not found anywhere else) are found in natural forests. Natural forests also make up eighty percent of the endemic bird area.

One of the important impacts of primary forest destruction on bird population is a decrease in species number and change in bird community (Nordin and Zakaria 1997, Blankespoor, 1991). Understorey species have been suggested to be affected mostly when the forest structure is altered (Nordin and Zakaria, 1997). This is because understorey species are highly sensitive to high temperature and light intensity. Johns (1988) reported that a number of large bird species such as hornbills has also been shown to decline in logged forest. This was probably due to the decrease in their preferred big trees that supply them with food and nesting sites. In the process of timber felling and extraction many mature fruit-bearing trees were likely to be damaged (Johns, 1988).

The high demand for timber offers an opportunity to enhance the timber quality of typically overstocked and low quality of forest land in Peninsular Malaysia. However, intense felling, homogeneous felling, removal of potential cavity trees could substantially alter composition and structure of the forest. The destruction of forest habitat will affect avian communities such as bird species composition. It is essential to identify the effects of logging activities on bird communities so that more effective forest and wildlife management strategies and decisions can be made.

Problem of Statement

Issues relating to forest degradation and its effects on wildlife conservation in tropical forests have become a worldwide debate (Anon, 1990). Over exploitation of forest and uncontrolled deforestation are among the main factors contributing to these issues. Land development such as plantations, dam sites, agriculture and the need for timber, has forced the government to obtain land from forest reserve areas with such vigour that these forests, which at one time appeared vast, are in danger of being reduced to fragments. As a result, the wildlife composition is affected and many wildlife species become endangered. For example, in Tekam Forest Reserve, more than seventy-two percent of bird species that occur in the primary forest disappeared after logging ceased (Johns, 1987). Furthermore, some big mammals such as Malayan sun bear (*Helarctos malayanus*), and Malayan tiger (*Panthera tigris*) are seriously affected by logging (Collins et al. 1991).

The forests of Peninsular Malaysia has 10.4 km of road constructed for every square kilometre of logged forest (Burgess, 1973). Some areas, especially in the northern border of Peninsular Malaysia, such as the Ulu Muda Forest Reserve in Kedah, have hardly been studied since the surrender of communists in 1985. It has an area of 29,987.62 ha and was originally gazzeted in September 24, 1932 as a forest reserve in Peninsular Malaysia. The forest was logged in the middle of 1997 and the remaining area was planned to be logged based on the controlled logging method early in the

year 2000. Studies on wildlife in this area started in the year of 1995. It is important to know the status of wildlife species and the immediate effects (less than one year) after logging particularly on avian species.

Justification

There have been many studies on the effects of logging on bird species in this region, such as those conducted by Johns (1987, 1988 and 1989), Dayang (1995), Nordin and Zakaria (1997), Wong (1985), Zakaria (1994) and Zakaria and Francis (1999). However, most of these studies were carried out a few years after the logging had ceased. The studies conducted by Mat Desa (2000) and Jamalul (2000) in Sungai Lalang Forest Reserve were the most recent studies conducted in two different compartments: five-year-old and ten-year-old logged forest. Both studies stated that certain species of understorey birds (e.g. Babblers and Flycatchers) decreased in logged areas. However, the studies also showed that species such as bulbul (e.g.: *Pycnonotus brunneus*, *P. simplex* and *P. erythrophthalmus* and spiderhunter (e.g.: *Arachnothera longirostra*) increased in great numbers after five and ten years after logging. It is important to improve our knowledge on understorey bird species because it will help us to monitor their status, especially those belonging to the category of rare species. Surprisingly, most of understorey birds belong to the insectivore group (e.g.: Babblers and Flycatchers) that feed mainly on insects (Zakaria, 1994). Thus, these species help to control the insect population in the forest (Wong, 1985). The decreasing number of

understorey insectivores will thus affect the balance in the forest ecosystem due to the increase in insect population (Saunders, 1995). Consequently, many trees were destroyed by the insects. The knowledge and continuous research on bird species will help us determine the status of the avians. Moreover, it provides the information for the proper management and planning of the avian species, particularly, the understorey bird species.

Objectives

The general objective of this study is to determine the species composition of understorey birds before and immediately after (less than one year) logging.

The specific objectives of the study are:

- i) To determine the trophic structure related to the feeding guild of understorey birds before and immediately after logging.
- ii) To determine the diversity (species diversity, species richness and species evenness) before and immediately after logging and
- iii) To generate a species list of understorey bird population for further research and knowledge.

CHAPTER II

LITERATURE REVIEW

General Introduction

Tropical rainforest covers about 12 percent of the total global land surface and known as the most suitable habitat for various plant and wildlife (Anon, 1990). Tang *et al.* (1981) estimated 25,000 species of flowering plants which is about 10 percent of the world's flora. One hectare of tropical forest may contain 400 trees of different species while a typical temperate forest contains a mere 10 to 15 trees per ha (Anon, 1990). There are about 1200 species of birds, 293 species of mammals, 294 species of reptiles, 171 species of amphibians and 449 species of fresh water fishes in Malaysian rainforest (Groombridge (1996). About ninety percent of mammals and nearly 9000 species of birds in the world can be found in the tropical rain forest (Davison (1990). Destruction of the tropical rainforest is an irreversible process and if a large area is removed or destroyed, most of the plant and animal species would disappear forever (Bierregaard *et al.*, 1992).

The tropical rainforest of South-East Asia is the oldest and most complex plant society with a very stable equilibrium among the various components of plants and wildlife. It is the most species-rich terrestrial ecosystem in the

world (Ashton, 1989; Good, 1964 and Whitmore, 1975). Tropical rainforests have between 400-1000 individuals of trees above 10.0 cm diameter at breast height per ha. (Soepadmo and Kira, 1977). Almost thirty percent of trees in tropical rainforests are considered as fruit trees, such as those belonging to the families Anacardiaceae (*Mangifera spp.*), Moraceae (*Artocarpus spp.*), Fagaceae (*Lithocarpus spp.*), Lauraceae (*Canarium spp.*) and Euphorbiaceae (*Pithecellobium spp.*). In addition, tropical rainforests are rich in medicinal plants (at least 6,500 species) and ornamental species such as Orchidaceae (nearly 850 species) (Collins *et al.*, 1991).

Malaysia is endowed with extensive areas of valuable natural tropical rainforest, which is extremely rich in species with complex ecosystems as compared to similar areas in Africa and South America. For example, 176 families and nearly 8,500 species of flowering plants can be found in Peninsular Malaysia (Whitmore, 1984). Strange and Jeyarajasingam, 1993 reported that about 638 species of birds and 216 species of mammals, including 81 species of bats can be found in Peninsular Malaysia ().

Lowland Rain Forest

The lowland rainforest has the most diverse and complex ecosystem compared to other forest types. This forest can be classified into five vertical zones, namely ground storey, lower storey, middle storey, upper storey or canopy and emergent. The characteristics of these five zones are different

from each other. The species from the family of Dipterocarpaceae such as *Dipterocarpus oblongifolius* is the most common genus in this forest whereas the *Shorea* species such as *Shorea leprosula* and *S. curtisii* is the most dominant one (Zamri, 1998). Moreover, the distribution of tree species also shows the difference according to their ecological range. Many of the lowland dipterocarp forest tree genera are present in lowland rainforests but with different species composition.

Most of the wildlife species such as birds (babblers, flycatchers and broadbills), big mammals (tigers, elephants and rhinoceros) and primates (gibbons, macaque and langurs) in the tropical rain forest prefer to occupy the lowland rainforests as their primary habitat (Johns, 1983b, 1986, 1987 and 1997; Medway, 1983; Zakaria and Nordin, 1998). Although most of the primary forest in the world is being destroyed everyday and will become a secondary forest, the regeneration rates will remain a long time, however, the forest is still able to provide food source and shelter for many wildlife species to survive (Zakaria, 1994). The destruction of this lowland forest could decrease the number of population of those species.