UNIVERSITI PUTRA MALAYSIA

EFFECTS OF DISTANCE FROM FOREST EDGE ON UPPERSTOREY BIRDS IN AYER HITAM FOREST RESERVE, MALAYSIA

ZAMRI BIN ROSLI

FH 2012 19

EFFECTS OF DISTANCE FROM FOREST EDGE ON UPPERSTOREY BIRDS IN AYER HITAM FOREST RESERVE, MALAYSIA

By

ZAMRI BIN ROSLI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirement for the Degree of Doctor of Philosophy

February 2012

DEDICATION

Specially dedicated to my wife Zainah Hj Mukhtar, my daughter, Ummi Syafiqa Aysha and Ummi Syafiqa Ameera. My sons, Muhd Harith Ziyad and Muhammad Haziq Aiman. Thank you for your encouragement, prayers and support in my career. Without your patient and understanding I wouldn't reach this point in my life. My love will always be with all of you.

To my parents, Rosli Kelali and Hasni Deni, thank you for giving me life, taught me since I was born, and truly understand me every time I need you. Only ALLAH know how I love both of you and my ALLAH bless both of you. To my brothers and sisters, thank you for support me.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

EFFECTS OF DISTANCE FROM FOREST EDGE ON THE UPPER STOREY BIRDS IN AYER HITAM FOREST RESERVE, MALAYSIA

By

ZAMRI BIN ROSLI

February 2012

Chair: Associate Professor Mohamed Zakaria Hussin, PhD

Faculty: Forestry

Tropical rainforest has lost much of its natural biodiversity due to deforestation. This activity leads to the creation of numerous forest patches and thus causes edge effects. Although several studies have examined the effects of edges on bird populations, little is known about effects of the forest edge on the upper storey birds in the isolated forest especially in tropical rainforest. Thus, a study was conducted in the isolated Ayer Hitam Forest Reserve (AHFR), Puchong, Selangor to; (i) examine the species composition, abundance, density and diversity of the upper storey birds at different distances from forest edge, (ii) detect any correlations in the upperstorey birds with microhabitats and microclimates factors, (iii) to identify which group and species of the upper storey bird that was affected

by the edge effects and iv) to determine which micro-environmental factors have strong effects on the upper storey birds.

This study was conducted in a 1,248ha of isolated AHFR for about 20 months (December 2006 – July 2008). The information on the upper storey birds and micro-environmental variables were recorded using point sampling method. Altogether a total of 113 species from 3,226 observations of birds were recorded of which 61 species (45.86%) and 1,618 observations (50.15%) were classified as the upper storey birds. Results showed that 48 species (78.67%) of the total upper storey birds observed were considered as rare species, while four species namely *Phaenicophaeus javanicus*, *Calyptomena viridis*, *Dinopium rafflesii* and *Psittinus cyanurus* are among the rarest forest interior species. Feeding guild analysis indicated that sallying insectivore, arboreal foliage gleaning frugivore and arboreal foliage gleaning insectivore/frugivore showed a significant difference at different distances from the forest edge. The density of upper storey birds along edge-interior gradient showed that the forest interior had a higher density of the upper storey birds compared to the forest edge. Based on response of the upper storey birds to the micro-environmental variables, number of trees between 10-20cm dbh, 30-40cm dbh, > 60cm dbh and humidity had a positive correlation with the group of barbets, broadbills, flycatchers and malkohas. The observations of these groups were higher at the forest interior compared to the forest edge.

Results from this study indicated that large sized of the upper storey birds such as barbets, broadbills and malkohas tend to forage at the forest interior and infrequently observed at the forest edge. Changes in micro-environmental variables such as number of trees, light intensity, temperature and humidity had a significant effect on the upperstorey birds. Therefore, the upperstorey bird populations and their habitats in the isolated AHFR should be monitored and conserved since most of them depended on the forest interior to survive especially the 'extreme rare species'.

Abstrak yang dikemukakan kepada Senat Unversiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KESAN JARAK DARIPADA PINGGIR HUTAN KE ATAS BURUNG PERINGKAT ATAS DI HUTAN SIMPAN AYER HITAM, MALAYSIA

Oleh

ZAMRI BIN ROSLI

Februari 2012

Pengerusi: Profesor Madya Mohamed Zakaria Hussin, PhD

Fakulti: Perhutanan

Hutan hujan tropika telah kehilangan banyak biodiversiti aslinya disebabkan oleh kemusnahan hutan. Aktiviti ini membawa kepada penghasilan banyak tompokan hutan dan menyebabkan kesan pinggiran. Walaupun beberapa kajian telah dilakulan untuk menilai kesan pinggiran ke atas populasi burung, hanya sedikit yang diketahui tentang kesan pinggiran hutan terhadap burung peringkat atas di hutan terpencil terutama sekali di hutan hujan tropika. Oleh itu, satu kajian telah dijalankan di Hutan Simpan Ayer Hitam yang terpencil, Puchong, Selangor untuk; (i) untuk memeriksa komposisi, kelimpahan, kepadatan dan kepelbagaian spesies burung peringkat atas pada jarak yang berbeza dari pinggir hutan, (ii) untuk mengesan adanya hubungkait pada burung peringkat atas dengan faktor habitat mikro dan iklim mikro, (iii) untuk mengenalpasti kumpulan dan spesies burung peringkat atas manakah

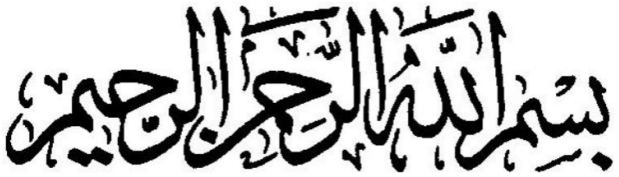
mendapat akibat daripada kesan pinggiran dan (iv) untuk menentukan faktor persekitaran-mikro manakah yang mempunyai kesan yang kuat terhadap burung peringkat atas.

Kajian ini telah dijalankan dalam kawasan seluas 1,248ha di Hutan Simpan Ayer Hitam yang terpencil selama hampir 20 bulan (Disember 2006 – Julai 2008). Maklumat tentang burung peringkat atas dan pembolehubah persekitaran mikro telah direkodkan menggunakan kaedah pensampelan titik. Keseluruhannya sebanyak 113 spesies daripada 3,226 pemerhatian ke atas burung telah direkodkan di mana 61 spesies (45.86%) dan 1,618 pemerhatian (50.15%) diklasifikasikan sebagai burung peringkat atas. Keputusan menunjukkan bahawa 48 spesies (78.67%) daripada keseluruhan burung peringkat atas diperhatikan di hutan simpan terpencil ini dikenalpasti sebagai spesies yang jarang ditemui, manakala empat spesies bernama *Phaenicophaeus javanicus*, *Calyptomena viridis*, *Dinopium rafflesii* dan *Psittinus cyanurus* merupakan antara spesies hutan dalam yang paling sukar ditemui. Analisis kumpulan pemakanan penyambar serangga, 'arboreal foliage gleaning frugivore' dan 'arboreal foliage gleaning insectivore/frugivore' menunjukkan perbezaan bererti pada jarak yang berbeza daripada pinggiran hutan. Kepadatan burung peringkat atas sepanjang bahagian pinggiran-dalam telah menunjukkan bahawa bahagian dalam hutan mempunyai kepadatan yang tinggi berbanding dengan pinggiran hutan. Berdasarkan kepada tindakbalas burung peringkat atas terhadap pembolehubah persikataran-mikro, bilangan pokok antara 10-20cm

dbh, 30-40cm dbh, >60cm dbh dan kelembapan mempunyai perkaitan positif dengan kumpulan rakit, takau, sambar dan cenuk. Pemerhatian ke atas kumpulan burung ini adalah tinggi di bahagian dalam hutan berbanding bahagian pinggiran hutan.

Keputusan kajian ini menunjukkan burung peringkat atas yang bersaiz besar seperti rakit, takau dan cenuk lebih cenderung untuk mencari makanan di bahagian dalam hutan dan jarang diperhatikan di bahagian pinggiran hutan. Perubahan pembolehubah persekitaran-mikro seperti bilangan pokok, intensiti cahaya, suhu dan kelembapan mempunyai kesan bererti ke atas burung peringkat atas. Oleh yang demikian, populasi burung peringkat atas dan habitat mereka di Hutan Simpan Ayer Hitam yang terpencil seharusnya diberi perhatian dan dipelihara kerana kebanyakan daripada mereka bergantung kepada bahagian dalam hutan untuk hidup, terutama sekali 'spesies terlampau jarang'.

ACKNOWLEDGEMENTS



'In the name of ALLAH with HIS mercy and gratitude'

Alhamdulillah, I would like to extend my gratitude to my friendly and electrifying mentor, chairman of my Supervisory Committee, Associate Professor Dr. Mohamed Zakaria Hussin, for his guidance, encouragement, valuable commentary and sharing of important ideas from the beginning of this research to the completion. May Allah bless you sir. To my Supervisory Committee, Associate Professor Dr. Abdullah Mohd and Dr. Ebil Yusof, thank you for your valuable commentary and support. To my dearest friends, Hossien Varasteh Moradi, Saber, Rajpar Nawaz, Suziana Hassan, Darishawati Daud, Suzilawati Japar, Karl and Geremy, thank you for your kind helping during the preparation of study site and data collection. To my wife, Zainah Hj Mukhtar, my daughter, Ummi Syafiqa Aysha and Ummi Syafiqa Ameera. To my sons, Muhd Harith Ziyad and Muhammad Haziq Aiman. Thank you the patientness and understanding towards my career. To my parents Rosli Kelali and Hasni Deni as well as my brothers and sisters, thank you for your support, and finally, thank you to the Universiti Putra Malaysia for giving me opportunity to further my study and thank you ALLAH for giving me life and time to accomplish my PhD.

APPROVAL

I certify that a thesis Examination Committee has met on 29 February 2012 to conduct the final examination of Zamri Bin Rosli on his his thesis entitled "Effects of Distance from Forest Edge on Upper Storey Bird in Ayer Hitam Forest Reserve, Malaysia" in accordance with the Universities and University College Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

Members of the Examination Committee were as follows:

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently submitted for any other degree at University Putra Malaysia or other institutions.

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ZAMRI BIN ROSLI

Date: 29 February 2012

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