POPULATION SIZE AND OCCUPANCY STATUS OF THE LEOPARD (*Panthera pardus* L.) IN A SECONDARY FOREST OF THE AYER HITAM RESERVE, SELANGOR

By

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

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I dedicate my attempts to my beloved parents because of all what I have today

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To Mowlana (Persian philosopher, 1207 – 1273) because of all I have learned from him.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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Very little is known about the leopard (*Panthera pardus*), its food and habitat in South-east Asia particularly Malaysian tropical rain forests where intensive deforestations have taken place in recent years. Current study has been carried out in a highly fragmented secondary forest namely Ayer Hitam Forest Reserve and its neighboring farm located within Malaysia's fastest growing agglomeration (Klang Valley). This study has brought the first understanding on the status of this large territorial predator in a fragmented Malaysian tropical rain forest using a combination of various methodologies. The main objectives of the study were to estimate (i) population size of leopards, (ii) detection and

occupancy probabilities of the leopard and *priori* known potential leopard prey species in the study area, (iii) effects of human and natural factors on occupancy status of leopards and their priori identified prey species and (iv) the existence of any unknown potential prey species in the study area. Data collection was started from February, 2008 over a period of 13 months. Detection/non-detection data from leopards, their four *priori* identified prey species that were wild boar, lesser mouse deer, long tailed macaque and pig tailed macaque, a feral species (i.e. stray dogs) and human factors such as deforestation, plantation, local and indigenous people camping and construction activities have been recorded over the study span. Results revealed that at least four individuals of leopard were resident in the study area with a high degree of overlap among their roaming areas. Wild boar was recognized as the main prey species of leopards in the study area followed by monkeys and mouse deers. The area was completely occupied by these species and there was no evidence of lack of prey sufficiency in this logged over and isolated secondary tropical rain forest. However, wild boar and macaque species were mostly affected by construction activities while lesser mouse deer was mainly affected by deforestation. Single-season occupancy models developed from detection/non-detection data signified that although the whole area is occupied by leopards, presence/absence of wild boar and settlement status are the principle factors affecting leopard movements.

Jacob's preference index demonstrates leopards prefer forest rather than more open areas in the vicinity. The research revealed that stray dogs are not the principle competitor for the leopards. They also did not affect the occupancy rates by leopard individuals. However, their presence in the area was disturbing for leopards as the study showed that leopards avoided the grouping life style of stray dogs. Probability of detection of leopards in most of sampling occasions was lower than 50%. Probability of detection of wild boar (more than 0.72 in all the surveys) and macaque species (more than 0.64 in 92% of surveys) was higher than those of mouse deer (0.24-0.72 in all the surveys). In general, probability of detection of prey species through indirect signs and direct observations was much higher than detection through camera trappings. Findings of this study could be used to design a suitable conservation and management plan for the study area with leopard as the top flagship.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah master sains.

SAIZ POPULASI DAN STATUS PENEMPATAN HARIMAU KUMBANG (*Panthera pardus* L.) DI HUTAN SEKUNDER HUTAN SIMPAN AYER HITAM, SELANGOR

Oleh

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Terlalu sedikit diketahui tentang harimau kumbang (*Panthera pardus*), makanan dan habitatnya di Asia Tenggara terutamanya hutan hujan tropika di Malaysia dimana pembalakan intensif telah berlaku dalam tahun-tahun kebelakangan ini. Kajian ini telah dilaksanakan di hutan sekunder yang amat terpecah iaitu Hutan Simpan Ayer Hitam dan ladang yang terletak dalam pengaglomeratan paling cepat berkembang di Malaysia (Lembah Klang). Kajian ini telah membawa pemahaman pertama berkaitan status pemangsa yang mempunyai wilayah besar dalam hutan hujan tropika Malaysia terpecah melalui beberapa kombinasi kaedah iaitu pengelasan tapak harimau kumbang tidak diselia, permodelan

kependudukan dan aktiviti pemerangkapan kamera. Objektif utama kajian ini ialah untuk mentaksir (i) saiz populasi harimau kumbang, (ii) kemungkinan kependudukan mereka serta pengesanan potensi spesies mangsa harimau kumbang yang telah dikenal pasti dalam kawasan kajian, (iii) kesan gangguan manusia dan faktor semula jadi terhadap kadar dan status kependudukan spesies mangsa yang telah dikenal pasti dan (iv) menyiasat kewujudan spesies mangsa potensi yang tidak dikenali dalam kawasan kajian. Pengumpulan data telah dimulakan mulai Februari, 2008 bagi tempoh 13 bulan. Melalui data pengesanan/tidak pengesanan bagi harimau kumbang, empat spesies mangsa yang telah dikenal pasti iaitu babi hutan, pelanduk, kera dan beruk, satu spesies jalang (cth. anjing liar) dan faktor manusia seperti pembasmian hutan, perladangan, aktiviti perkhemahan dan pembinaan orang pribumi dan tempatan telah dirakamkan di sepanjang jangkamasa kajian. Pengelasan tidak diselia tapak harimau kumbang mendedahkan bahawa sekurang-kurangnya empat individu harimau kumbang adalah pemastautin dalam 1,411 ha kawasan kajian dengan tahap tinggi pertindihan antara kawasan keliaran mereka. Babi hutan telah dikenali sebagai spesies mangsa utama harimau kumbang dalam kawasan kajian diikuti oleh monyet dan pelanduk. Kawasan ini telah sepenuhnya diduduki oleh spesies ini dan tidak ada bukti kekurangan kecukupan mangsa dalam kawasan hutan yang telah dibalak dan hutan hujan

tropika sekunder terpencil ini. Bagaimanapun, spesies babi hutan dan monyet kebanyakannya dipengaruhi oleh aktiviti-aktiviti pembinaan manakala kekurangan pelanduk sebahagian besarnya terjejas kerana pembasmian hutan. Model kependudukan musim tunggal yang dibangunkan melalui data pengesanan/tidak pengesanan menandakan bahawa walaupun keseluruhan kawasan diduduki oleh harimau kumbang, status kehadiran/ketiadaan babi hutan dan kawasan penduduk adalah faktor prinsipal yang mempengaruhi harimau kumbang. Indeks Keutamaan Jacob menunjukkan harimau kumbang lebih memilih hutan daripada kawasan terbuka di sekitar. Penyelidikan mendedahkan bahawa anjing-anjing liar bukan pesaing prinsipal untuk harimau kumbang. Mereka juga tidak menjejaskan kadar kependudukan individu-individu harimau kumbang. Bagaimanapun, kehadiran mereka di kawasan itu mengganggu harimau kumbang kerana kajian menunjukkan harimau kumbang mengelak anjing-anjing liar yang mempunyai gaya hidup berkumpulan. Kebarangkalian pengesanan harimau kumbang dalam kebanyakan daripada peristiwa pensampelan adalah lebih rendah daripada 50%. Kebarangkalian pengesanan babi hutan (lebih daripada 0.72 dalam semua survei) dan spesies monyet (lebih daripada 0.64 daripada 92% survei) adalah lebih tinggi daripada pelanduk (0.24-0.72 dalam semua survei). Secara umum, kebarangkalian pengesanan spesies mangsa melalui tanda tidak langsung dan

cerapan langsung adalah lebih tinggi daripada pengesanan melalui pemerangkapan kamera. Penemuan-penemuan kajian ini boleh digunakan untuk mereka cipta pelan pemuliharaan dan pengurusan yang sesuai bagi kawasan kajian dengan harimau kumbang sebagai keutamaan.

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