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ESTIMATING SUNDA SCOPS OWL (Otus lempiji Horsfield) DENSITY BASED ON DISTANCE SAMPLING AND CALL PLAYBACK, PENINSULAR MALAYSIA

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ESTIMATING SUNDA SCOPS OWL (*Otus lempiji Horsfield*) DENSITY BASED ON DISTANCE SAMPLING AND CALL PLAYBACK, PENINSULAR MALAYSIA

By

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

ESTIMATING SUNDA SCOPS OWL (*Otus lempiji Horsfield*) DENSITY BASED ON DISTANCE SAMPLING AND CALL PLAYBACK, PENINSULAR MALAYSIA

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February 2016

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Nocturnal birds in the tropics remain little studied primarily due to the logistical difficulties of surveying these birds at night. While call playback has been widely employed in the temperate regions, its practicality has not been adequately demonstrated on tropical owl species. This study aimed to test the feasibility of estimating the density of the Sunda Scops Owl (*Otus lempiji*) in a lowland forest in Peninsular Malaysia based on distance sampling and call playback. From a total of 58 detections of the owl species from October 2012 to May 2013, 72.41% (42 detections) were made when the birds were breeding. The densities of the owl were estimated at 0.17 ± 0.04 or 0.28 ± 0.06 individuals/ha based on spontaneous and provoked calls (i.e. before and after call playback), respectively. Broadcasting of the calls significantly increased the numbers of detections ($\chi 2 = 16.038$, $P < 0.001$) during both breeding and non-breeding seasons of the birds. Based on logistic regression analysis, the probability of detections was also significantly associated with the owl's breeding period. The combination of call playback and distance sampling can be potentially applied on other little known and threatened owl species in Southeast Asia.

Abstrak tesis yang dikemukan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Sarjana Sains

PENGANGGARAN KEPADATAN BURUNG HANTU REBAN (*Otus lempiji Horsfield*) MELALUI KAEDAH PANGGILAN DAN PERSAMPELAN JARAK, SEMENANJUNG MALAYSIA

Oleh

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Kajian terhadap burung malam adalah amat kurang dikawasan tropika disebabkan oleh kesukaran logistik dalam melakukan pemantauan burung berkenaan pada waktu malam. Walaupun penggunaan kaedah panggilan telah digunakan secara meluas dikawasan beriklim sederhana, namun kaedah ini masih belum dipraktikkan secara meluas bagi spesies burung hantu dikawasan tropika. Kajian ini bertujuan untuk menentukan kepadatan burung hantu reban (*Otus lempiji*) di kawasan hutan tanah rendah di Semenanjung Malaysia dengan menggunakan kaedah persampelan jarak dan panggilan. Daripada jumlah keseluruhan 58 pengesanan melalui panggilan bermula daripada Oktober 2012 sehingga May 2013, sebanyak 72.41% (42 pengesanan panggilan) diperolehi dalam musim burung membiak. Kepadatan burung hantu adalah dianggarkan sebanyak 0.17± 0.04 atau 0.28 ± 0.06 individual per hektar berdasarkan bunyi secara spontan dan kaedah panggilan (sebelum dan selepas kaedah panggilan dilakukan). Melalui kaedah panggilan burung, ianya telah meningkatkan jumlah respon burung yang diperolehi secara ketara (χ^2 = 16.038, P < 0.001) semasa musim membiak dan diluar musim membiak bagi burung tersebut. Berdasarkan analisis regresi logistik, kebarangkalian untuk menerima respon burung adalah berhubungkait dengan musim membiak burung hantu. Kombinasi kaedah panggilan dan persampelan jara kini boleh diaplikasikan kepada spesies burung hantu yang kurang diketahui dan terancam dikawasan Asia Tenggara.

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

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LIST OF ABBREVIATIONS

AIC	Akaike Information Criterion
AUC	Area Under The Curve
a.s.l.	Above Sea Level
CI	Confident Interval
CV	Coefficient of variation
dB	Decibel
EDR	Effective Detection Radius
GPS	Global Positioning System
RISC	Research Information Standard Committee
ROC	Receiver Operating Characteristics
SE	Standard Error

CHAPTER 1

INTRODUCTION

1.1 General introduction

The main nocturnal bird groups found in tropical rainforests of Peninsular Malaysia are owls (Strigiformes), frogmouths and nightjars (Caprimulgiformes) (Wells, 1999). In Malaysia, a total of 20 owl species have been recorded, of which 17 species are from the Strigidae family and three are from the Tytonidae family (MNS-BBC, 2005).In forest habitats, nocturnal birds are difficult to detect and capture (Kemp et al., 2009). Their inconspicuous behaviour and cryptic plumage have made them difficult to be located and identified in the field (Sheldon et al., 2001). One reliable way to detect most owl species at night is by assessing their vocalizations (Springer, 1978, Forsman, 1983, Smith 1987).

Tropical owl species are less studied in terms of their ecology unlike their counterparts from the temperate regions. Currently, only several studies have been published on owl species in Malaysia (e.g.Lenton, 1984; Wells, 1986; Duckett, 1991; Hafidzi et al., 2003; Puan et al., 2006), while others were carried out elsewhere in Southeast Asia (e.g. Becking, 1994; Khwang et al.,1999; Nijman, 2004; Muchtar and Setiawan, 2005). Discoveries of species and subspecies have also been made in the archipelago in Indonesia (i.e Johnstone and Darnell, 1997; Lambert and Rasmussen, 1998; Rasmussen,1999; Lee and Riley, 2001; Olsen et al.,2002, Indrawan and Somadikarta, 2004).

1.2 Owl species in Malaysian tropical forests

Rainforests in Malaysia are a diverse ecosystem which houses various flora and fauna. Major forest types in Malaysia can be classified according to elevation ranging from lowland dipterocarp, hill dipterocarp, upper hill dipterocarp, oak-laurel, montane, ericaceous, peat swamp to mangrove forests. Malaysia has a high forest biodiversity and most of the lowland forests in Malaysia are dominated by trees from the Dipterocarpaceae family and thus these forests are often generally known as dipterocarp forests. These forests typically have trees with canopy reaching 30-50 m while emergent trees can reach about 70 m or more. The tropical forest comprises of several strata, i.e. canopy, middle storey, understorey, and forest floor.

Marcot (1995) stated that there are a few owl species that are associated with the tropical lowland forests, e.g. the Oriental Bay Owl (*Phodilus badius*), Reddish Scops Owl (*Otus rufescens*), White-fronted Scops Owl(*Otus sagittatus*) and Barred Eagle Owl (*Bubo sumatranus*).Although classified as Least Concern (BirdLife International, 2001), Wells (1999) described that the Oriental Bay Owl

appeared to occur at low density in the lowlands. Reddish Scops Owl that is classified as Near Threatened (BirdLife International, 2001) is distributed from the southern part of Thailand to Peninsular Malaysia, Java and Borneo. Often recorded in the primary logged and secondary forest (Duncan, 2003), the survival of Reddish Scops Owl is said to be depending on the orderly and open structure of primary forests (Meijaard et al., 2005).

The Sunda Scops Owls (*Otus lempiji*) is known for their persistence in disturbed habitat, including urban habitat (Marcot, 1995; Puan et al., 2006). Some studies indicated that the species (Wells, 1999; Puan et al., 2006) may coexist with the Reddish Scops Owls (Marcot, 1995). The Sunda Scops Owl is listed as Least Concern (BirdLife International, 2001) and a common resident that is distributed in Southeast Asia Malay Peninsula, Sumatra (including Bangka and Belitung), Borneo (including North Natuna Islands), Java and Bali (including Kangean Island) (König et al., 1999). In spite of that, the understanding of their ecology is still lacking.The Sunda Scops Owls inhabit dry evergreen forests, evergreen forests, hill evergreen forests, grasslands and fruit orchards. Their breeding season usually occurs from February until April (König et al., 1999).

Three owl species, i.e. RajahScops Owl (*Otus brookei)*, Mountain Scops Owl (*Otus spilocephalus*) and Collared Owlet (*Glaucidium brodiei*) are restricted to montane forest habitat at an elevation of more than 700 m. Some records of the latter species, however, were also obtained from lower elevations (Smythies and Davison, 1999; Sheldon et al., 2001). Although frequently found in disturbed forests, little information is available for both Mountain Scops Owl and Collared Owlet on their biology, behaviour, ecology and habitat requirements. There is also a difference in vocalizations of a Collared Owlet on Borneo from those of mainland Asia (Smythies and Davison, 1999; Wells 1999) implying the need of taxonomic inference to verify the species.

Although often found at higher altitude or montane forests, the Brown Wood Owl (*Strix leptogrammica)* may also be found elsewhere in lowland forests. The species is primarily associated with a dense and old forest (Marcot, 1995) and also occurs in deep temperate, dry tropical, subtropical and tropical rainforests in subtropical to temperate mountain zones, commonly up to 4000 m in Nepal (Duncan, 2003).Recorded from Gunung Dulit and Mulu (König et al., 1999, Smythies and Davison, 1999) and Kinabalu (Jenkins et al., 1996; Sheldon et al., 2001) on Borneo and on Sumatra, Rajah Scops Owl is endemic to Greater Sundas. As it is only known from two specimens collected from Sarawak in the nineteenth century and possibly two in Sabah towards the end of the twentieth century (Jenkins et al., 1996; Sheldon et al., 2001), the owl is a rare resident of the mountain forests of Borneo and was listed as Least Concern (BirdLife International, 2001).

1.3 The biology of Sunda Scops Owl

The Sunda Scops Owl is from the order Strigiformes, family Strigidae, and subfamily Striginae (Marks et al., 1999). The species is monogamous (Marks et al., 1999). According to International Union for Conservation of Nature (IUCN), the species is not globally threatened and is listed as a common species. It is a medium-sized owl (20 to 23 cm) with sandy-brown in colour, rounded wings, ear tuffs and indistinct collar on its hind neck (Duncan, 2003). Their main diet includes large insects comprising large beetles, crickets, mantids, moths, cockroaches, grasshoppers and sometimes small birds (Marks et al., 1999; Wells, 1999). Generally, the Sunda Scops Owlfeeds on nocturnal reptiles (such as geckos) and rodents which are particularly abundant in Southeast Asia (Marks et al., 1999). The Sunda Scops Owlis considered as a resident species and is commonly found in the forest-edge habitat (Wells, 1998). The bird mainly hunts their prey from a perch such as tree branches or house roofs. Main habitats of the species include in middle and lower strata of forest and the bird is often attracted to human habitation occasionally in plantations, villages and larger towns containing suitable trees at which they find cover as well as roost and nest (Duncan, 2003). The bird is also common in cultivated sites due to abundance of food prey, i.e. geckos, insects and rodents (Marks et al., 1999). In Sumatran, the local name for the Sunda Scops Owl is “kuas cirit ayan” which refers to “fowl’s excrement owl” because it preys on insects that attracted to cow and poultry dungs (Duncan, 2003).

1.4 Problem statement

Most owl species that inhabit tropical forests are little known and there is insufficient information available on their ecology and distribution (Clark et al., 1978; Newton, 2010). Owls are carnivorous birds that prey on both invertebrates and vertebrates ranging from insects, rodents, geckos and hares. Relatively little is known about the abundance and population trends of most owl species in the Malaysian tropical forest. In Malaysia, most published owl studies mainly emphasize on Barn Owl (*Tyto alba javanica*), due to their economic interest in providing biological control on agricultural rodent pests (e.g. Lenton, 1984; Duckett, 1991; Hafidzi et al., 2003; Puan et al., 2011). Due to the lack of information on other tropical owl species, this study mainly focused on an owl species, i.e. Sunda Scops Owl (*Otus lempiji*) which was found in an isolated forest, i.e. Ayer Hitam Forest Reserve located in Peninsular Malaysia. Among the four species recorded in the Ayer Hitam Forest Reserve, i.e. Sunda Scops Owl, Reddish Scops Owl, Brown Boobook and Oriental Bay Owl, the Sunda Scops Owl is the most abundant owl species in the area. Thus, this had provided a good opportunity to study the distribution and density of the bird since such information is unavailable for the species.

The call playback method or broadcast survey method has been widely used to locate and survey owls (Smith, 1987; Mosher et al., 1990). It has been used extensively in temperate regions to determine the presence or occupancy of nocturnal species such as owls. However, the call playback approach to estimate owl density is relatively new in Southeast Asia and has yet to be conducted in the Malaysian forests. To date, most information on bird composition and ecology in the Malaysian forests were obtained by using mist-nets or direct observation. Although, mist-netting has been widely used, it has several disadvantages. For instance, setting the net, handling and release of captures can be time-consuming and laborious. Nets must be checked frequently to avoid mortality either due to stress or predation.

From previous studies, the use of the broadcast survey method had been demonstrated to increase the detection rate in bird surveys (Johnson et al., 1981; Rosenfield et al., 1985; Johnson and Dinsmore, 1986; Kaufmann, 1988; Swift et al., 1988; Sliwa and Sherry, 1992). In this research, a method for estimating population density was introduced using call playback and point transect sampling (Buckland et al., 2001). Call playback has often been used to evaluate species presence or absence in an area particularly for avian. The practicality of using call playback method will serve as an alternative to study birds, especially in nocturnal species such as owls. The call playback method is more practical as nocturnal species are often not easily observed during night time, yet their presence can be detected based on calls.

The tropical owl species are known to have different calls and singing tones. The sound produced by most species can be easily differentiated and recognized. In relation by playing their calls in a survey, their response to the call playbacks can

be used to estimate their density in an area (Fuller and Mosher, 1981; Mosher et al., 1990). Given that Sunda Scops Owls display a territorial vocal behaviour (Najmi-hanis et al., 2016), playbacks are expected to be feasible to increase encounter rates during their population surveys. Although many studies have documented the territorial behaviour of birds and factors contributing to this behaviour (Krebs 1971; Evans 1980; Boal and Bibles, 2001), most aspects of territoriality in Sunda Scops Owls are poorly understood. Therefore, the study of owls based on call playback could provide important insights on their density estimation based on vocal response and also the effectiveness of using the method in the Malaysian forests.

1.5 Objectives

The primary objective of the study was to determine the density of the Sunda Scops Owls and factors affecting their vocal response at the Ayer Hitam Forest Reserve, Puchong, Selangor. The specific objectives were as follows:

i. To estimate the density of Sunda Scops Owl using distance sampling and call playback method,
ii. To examine the relationship between vocal detection of the species and environmental variables, and
iii. To compare the detection of the owls between breeding and non-breeding periods.

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