DIVERSITY OF MICROCHIROPTERAN BATS IN FOREST FRAGMENTS AND RIPARIAN ZONES IN AN OIL PALM PLANTATION ESTATE

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Oil palm is one of the world's most rapidly increasing crops, and covers over 13 million ha in Southeast Asia. Sumatra has a relatively long history of commercial oil palm cultivation, and many plantations have replaced rain forest. Typically these monoculture plantations support much fewer species than do forest, however there is very little information available for bats. We sampled insectivorous bats in West Sumatra in a mature oil palm plantation where some forest cover was retained in forest fragments on hills and along rivers. Using a total of 180 harp trap nights we compared the bat community in three habitat types: forest patches, riparian zone and plantation area. In total we captured 1108 bats representing 21 species and 5 families, and the majority of these (in terms of species and abundance) were found in forest fragments. Oil palm plantation was found to be a poor habitat for bats – only four individuals of two species were captured. Riparian areas supported intermediate diversity, and might be important as wildlife corridors between forest fragments.

Key: Diversity, Microchiropteran Bats

I. INTRODUCTION

Bats constitute the second most species-rich order of mammals (Wilson and Reeder, 2005) and up to half of mammal species in tropical forests (Findley, 1993). They are divided into two sub orders, the Megachiropteran and Microchiropteran. Megachiropteran (Old World Fruit bat) has important roles, they serve as pollinators, seed dispersers, and Microchiropteran bats serve as predator of insects as well as small vertebrates (Findley, 1993; Altringham, 1996). Microchiropteran bat has large number of species than Megachiropteran. Microchiropteran has 834 species and Megachiropteran has 167 species (Hutson *et al*., 2001).

In recent decades, bat populations have experienced global declines, a trend linked to extensive, recent habitat loss (Mickleburgh *et al*., 2002). In Southeast Asia, 20% of bat species are predicted to become extinct by 2100 (Lane *et a*l., 2006). Nonetheless, bats are frequently overlooked in biodiversity assessments and fragmentation research, possibly because they are widely perceived to be at low risk of extinction due to their ability to fly (Struebig *et al*., 2008).

PT. Kencana Sawit Indonesia (KSI) has three habitat type, they are forest patches, riparian zone and plantation area. Hall *et al*. (2004) suggested most of bats occupy various types of habitat. The high diversity of habitat and various ecological structures resulted in high diversity of bats especially on primary forest or closed habitat while in the open habitat which are described as secondary habitat, the bats diversity tend to be low.

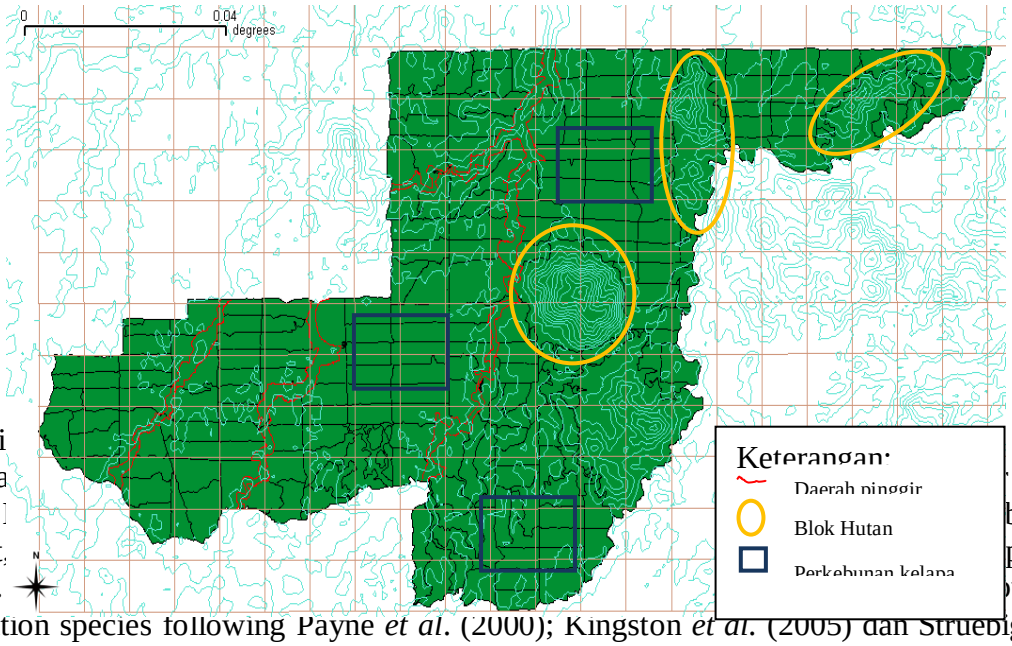
In the establishment of the oil palm itself, large area of forest, which form the habitat for the bats, are destroyed and thus removing their food source and roosting site that bats depend on and this may have serious consequences on bats diversity (Timoh, 2006). Little information about Microchiropteran bats in fragmented habitat and plantation area. Study about that will be gave much information to conserve bat and hope can reduce the rate of extinction. The aims of this study are to explore the species richness, diversity, abundance of Microchiropteran bats in forest patches, riparian and plantation area

II. METHODS

a. Study area

The study was conducted at Oil Palm Plantation Estate PT. KSI (ZSL Indonesia Research Station), Solok Selatan, West Sumatra, Indonesia. Captured bats in three different habitat types.

Forest patches around oil palm estate of PT KSI is a fragmented forest with an area of ± 300 ha. Struebig, *et al*. (2008) classify an area of 200-500 ha has a medium forest fragments. Some fragments show the abundance and species richness of bats is higher compared to continuous forest. Nevertheless, the decline may continue to occur in the future because of the effects of fragmentation in a long time. Riparian zone stretches along both sides of the river contained in the PT. KSI. This area has various topographies. Harp traps placed at locations that ramps topography with a clear trail forest. For plantation area, harp trap was setting in mature oil palm tree based on not too close to the riparian and forest patches.



b. Speci

Ba each location. beled. After that, pecial character. unch. Identification species following Payne *et al*. (2000); Kingston *et al*. (2005) dan Struebig dan Sujarno (2006).

c. Data Analysis

This research analyzed on species richness with species accumulation graph following Ludwig and Reynolds, 1988 *cit*. Estrada and Estrada 2001. Bat diversity estimate analyzed with Shannon Wiener index (H') following Stilling, 2002; Struebig dan Sujarno, 2005. Species abundance shown with rank abundance graph Whittaker plots following Stoner, 2005.

RESULT

a. Bats captured in three habitat types in an oil palm plantation estate

Table1. Number of captures Microchiropteran species in three habitat types in PT KSI

Family/Taxon	Species code	Redlist Status[a]	Category[b]	Number captures[c]			Σ
				F	R	P	
Hipposideridae							
Hipposideros bicolor	Hibi	LC	E	134	10	2	146
Hipposidderos cervinus	Hice	LC	E	755	65		820
Hipposideros cf. diadema	Hidi *cf*	LC	A		1		1
Hipposideros cineraceus	Hici	LC	A	1			1
Hipposideros diadema	Hidi	LC	A			1	1
Hipposideros galeritus	Higa	LC	D	16	4		20
Hipposideros larvatus	Hila	LC	B	4			4
Megadermatidae							
Megaderma spasma	Mesp	LC	A	1			1
Nycteridae							
Nycteris tragata	Nytr	NT	A	1			1
Rhinolophidae							
Rhinolophus acuminatus	Rhac	LC	D	7	7		14
Rhinolopuhus affinis	Rhaf	LC	B		4		4
Rhinolophus borneensis	Rhbo	LC	B	2			2
Rhinolophus lepidus	Rhle	LC	E	57	3		60
Rhinolophus luctus	Rhlu	LC	B	2	3		5
Rhinolophus pusillus	Rhpu	LC	D	11			11
Rhinolophus sedulus	Rhse	NT	A	1			1
Rhinolophus stheno	Rhst	LC	B	3	1		4
Rhinolophus trifoliatus	Rhtr	LC	C	6	2		8
Vespertilionidae (Kerivoulinae)							
Kerivoula papillosa	Kepa	LC	A	1			1
Vespertilionidae (Vespertilioninae)							
Myotis muricola	Mymu	LC	A			1	1
Vespertilionidae (Murininae)							
Murina suilla	Musu	LC	B	2			2
TOTAL				1004	100	4	1108

[a] IUCN red list status following review by IUCN 2010 (accessed on Januari 2011): LC, Least Concern; NT, Near Threatened

[b] Spesies categori based on number individual were captured: A, rare species (1); B, relative rare species (2-5); C, relative common species (6-10) ; D, Common species (11-50); E, most common species (>50).

[c] Number capture each habitat types : F, Forest patches; R, Riparian; P, Plantation.

b. Bat species richness in three habitat type in an oil palm plantation estate

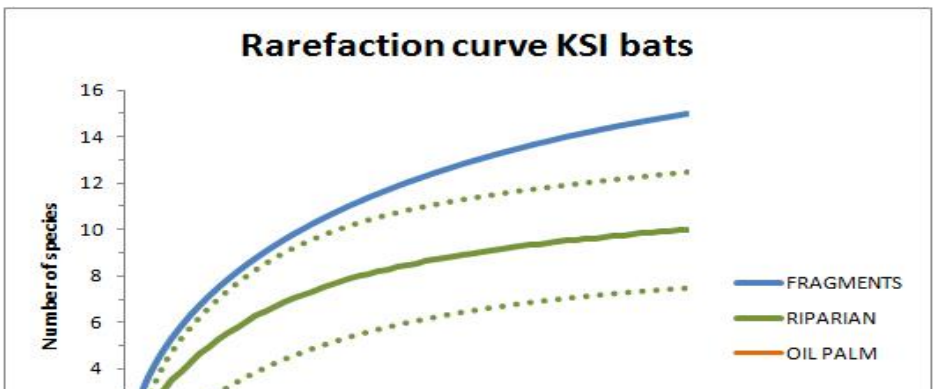


Figure 1. Rarefaction curves for insectivorous bats captured in three habitat types.

c. Bats diversity in three habitat types in Palm oil plantation estate

Table2. Diversity index of insectivorous bats in each habitat types

Habitat type	Diversity index
Forest patches	0,94
Riparian	1,36
Plantation	1,04

d. Bats abundance in three habitat types in Oil palm plantation estate

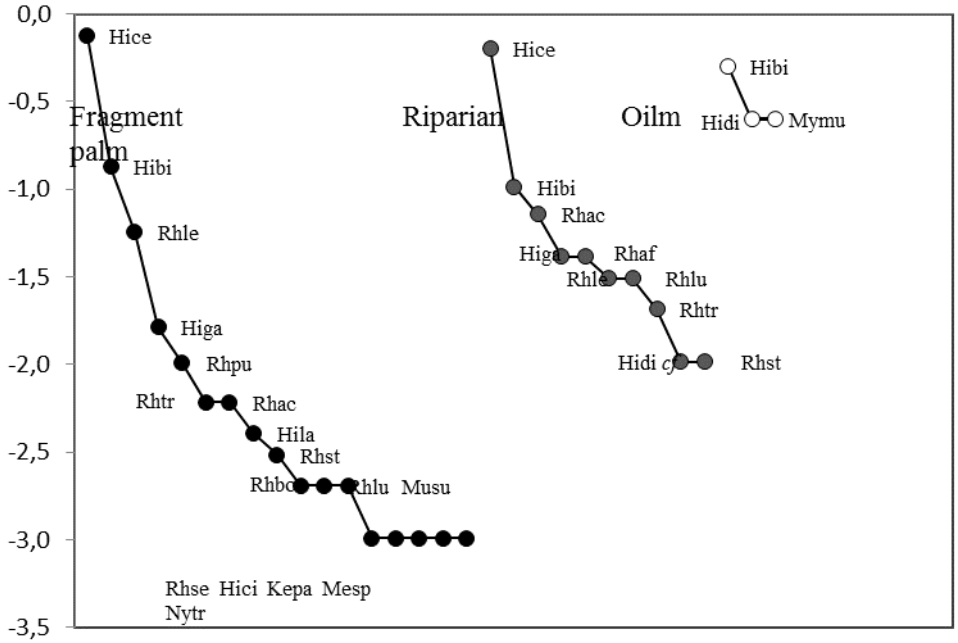


Figure2. Rank abundance (Whittaker) plots for insectivorous bats in three habitat types in the Oil palm plantation estate. Species are ranked according to the abundance of each species (n) and the total abundance of all species for each habitat types (N).

CONCLUSION

Our surveys indicate, as forest patches is a good habitat for insectivorous bats. That there is a highly species richness and abundance, but less diversity index because ratio number of individual one species and number of individual of all species (Pi) has less than do riparian and plantation. Besides that, forest patches also supported many rare species. Riparian zone is an important habitat for insectivorous bats because of highly diversity index and intermediate species richness and abundance. Plantation area is not good habitat for insectivorous bats because of intermediate diversity index and less species richness and abundance. Design an oil palm plantation estate with provide forest fragment and forest riparian is good solution for decrease rate of animal extinction, especially for bats.

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