

Nocturnal Terrestrial Mammals Population in Sabah Forest Industries (SFI) Forest Plantation, Sipitang

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Abstract

Biodiversity conservation has been given a significant emphasis in recent years in forest plantation establishment. This study investigates the terrestrial nocturnal mammals in the forest plantations of *Acacia mangium*, Sabah Forest Industries Sdn. Bhd. Sipitang, Sabah under the FMU 7. The main objective of this study was to conduct a preliminary assessment of nocturnal terrestrial mammals. Two methods that were used for the study were walk spotlight counts and vehicle spotlight counts. Data was analysed using Shannon-Weiner (H') and Simpson's Index of Diversity (1-D). King's census method was used to calculate the population density. The study was conducted from the 1st -21st August 2015. There were no sightings during the walk spotlight counts survey. During the vehicle spotlight counts survey, three common palm civets and one smooth tooth palm civet were recorded. Results from the diversity index that was obtained from vehicle spotlight counts survey was $H'=0.56$ and $1-D=0.5$. The encounter rate with hunters during the night survey were much higher as compared to the observed terrestrial mammals. The population density of nocturnal mammals was very low in our study site. The high encounter rate of hunters during the study indicates high hunting pressure that might primarily cause the observed results. There is a need to initiate the conservation of nocturnal mammals in the site, as it contributes to the ecosystem balance in forest plantations.

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Introduction

Anthropogenic activities bring significant impacts to our earth biodiversity. Conversion of natural forests to forest plantations cause loss biodiversity (OCED, 2002). Wild mammals that live in the forests and highlands have been threatened by illegal logging and plantation agriculture (Conover, 2002). The shrinking natural habitat compelled wild mammals to migrate to other dwellings place such as human residential area, plantation area and agricultural areas to seek food, shelter and for breeding (Conover, 2002). The world demand for timber, pulp and paper pays a heavy toll on primary forest. As such, forest plantations are established to meet this demand and at the same time conserve the natural forests (Morelli, 2013).

Sabah Forest Industries Sdn Bhd (SFI) is one of the earliest Forest Plantation company established in Sabah. It is recognized under the Sabah Forest Management Unit (FMU) 7, of which it is being managed under the Natural Forest Management license and Industrial Tree Plantation license.

In recent years, biodiversity conservation has been given due emphasis now in Forest Plantation establishment in order to ensure that sustainability is taken into account accordingly, as underlined by Forest Stewardship Council. In order to meet the FSC and Malaysia's Forest Management Certification (Principle 9), SFI is undertaking High Conservation Value and Critical Habitat Assessment in the forest management activities. Nocturnal mammals play a significant role in maintaining the ecosystem balance in forest plantation. To date, there is no published information on the status of nocturnal mammals in Mendulong Estate, SFI. This study was conducted to make a preliminary assessment of the species of nocturnal mammals found in Mendulong Estate, SFI, Sipitang.

Study area

The study site was at Mendulong located at SFI, Sipitang district (Figure 1). The compartments that were covered during this study were of L39, L40, L41, L44 and L45 that were adjacent to each other. *Acacia mangium* and *Eucalyptus sp.* were planted in the study site. The ground elevations ranges from 342 to 415 metres above sea level.

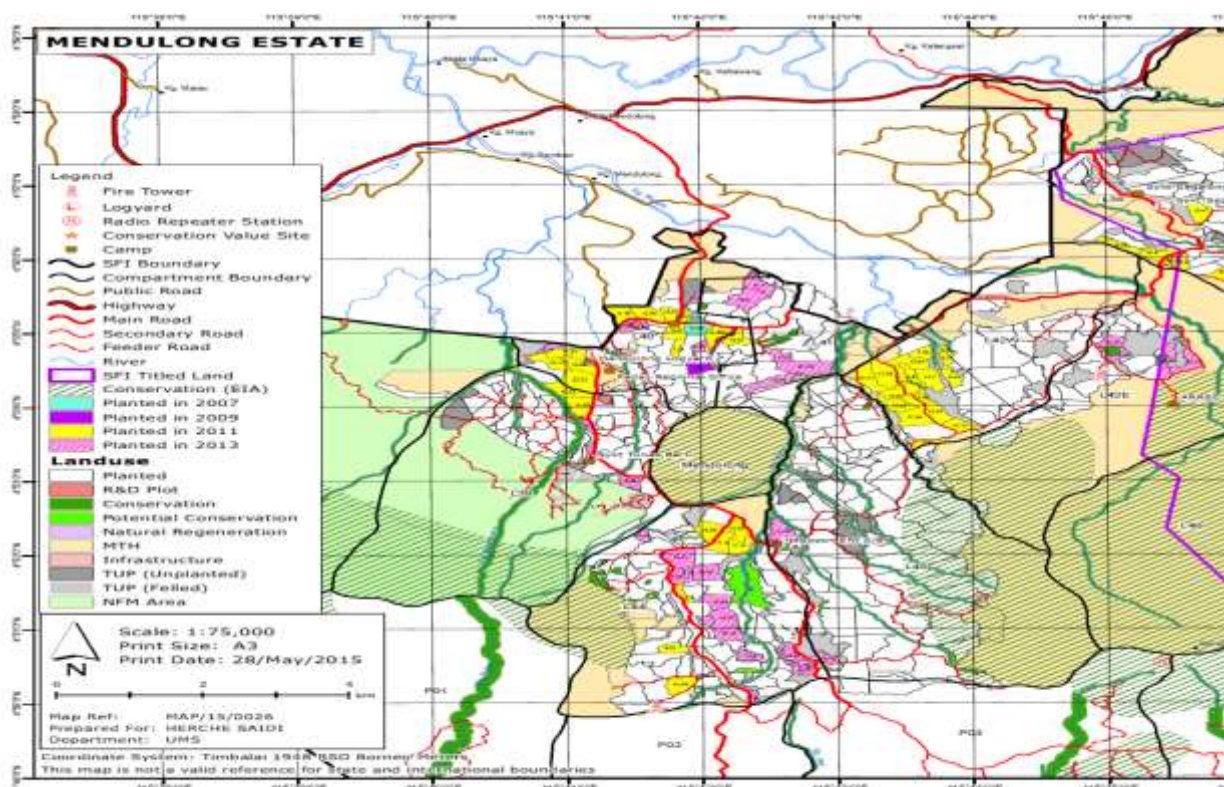


Figure 1. Map of Mendulong Estate in Sipitang, Sabah (Sabah Forest Industries 2015)

There were two prominent features found at compartment L40 that were the SFI Padas regional office and Mendulong log yard. The Padas Regional office compound consists of the administration office, the nursery, executive, staff quarters and workers buildings. The Mendulong log yard was located adjacent to the Padas Regional office where the logs were gathered before they were transported to the SFI Mill. SFI Concession Area consists of 183.316 hectares of forest plantations. The average annual rainfall of SFI is 3,757mm (Sabah Forest Industries, 2015).

Sampling methods

There were two methods that were conducted for the nocturnal surveys. These two surveys were employed to obtain a wide range of nocturnal terrestrial mammal species that occurs in the forest plantation as well as the road side within the plantation. These two standard methods were Walk Spotlight Counts and Vehicle Spotlight Counts. The night surveys were conducted based on phases of moon. There were no night surveys carried out during full moon as the chances detecting nocturnal mammals were very slim. The survey was also not conducted during rainy night. The study was conducted from 1st to 21st of August 2015.

Walk spotlight counts

Walk spotlight counts was carried out at night 20:00 to 23:00 (Smith & Nydegger, 1985). Three transect lines with 1000 metres long for each transects were established in the forest plantation of different age class, of which were four years, two years and one year *Acacia mangium* plantation. Flagging tapes were marked at every 10 metres in each of the transect. The night walk was conducted by slowly walking on that trail and the observers stopped at each 10m interval for 30 seconds to detect terrestrial nocturnal mammals. By doing this, the observers maintain the desired speed of 0.5km/h. At each station, mammal's eye-shine was detected using a strong headlight. Then observers scan 180 ° from left to right to detect nocturnal mammals (Franzetti *et al.*, 2011). When a mammal was spotted, a 10 x 40 binoculars was used to identify it. The type and number of mammal species that found in the surroundings of *Acacia mangium* forest plantations were recorded in a standard data form. Identification of mammals was conducted using field guide book by Payne and Francis (2007). The perpendicular distance sighting from the mammals to the transect line was measured with a laser rangefinder.

Vehicle spotlight counts

Vehicle spotlight counts were also conducted at night 22:00 to 01:00 (Smith & Nydegger, 1985). The study was conducted within the perimeter of *Acacia mangium* plantations and riparian forest in Mendulong Estate. The existing main road in the plantation was used as the transect survey (as follows Smith & Nydegger, 1985). The survey was conducted on a four wheel vehicle where one person drives the vehicle and two observer stands at the back of the vehicle to scan for nocturnal mammals. The driver drove slowly on a road with a constant speed (5km/h), while the observers scan

the road and roadside with a spotlight looking for eye shine (Caley & Morley, 2002). Whenever a mammal was detected, usually with bright eyes, the driver stopped for the observer to identify, count and record the type and number of mammal species that have been found. A binoculars (10 x40) was also used to facilitate the observation and identification. All nocturnal mammals were identified using a field guide as described by Payne and Francis (2007). The distance of the animals to the observer was measured using a laser rangefinder and the angle measured with compass (Peres, 1999).

Data for the nocturnal mammals were analysed using Species diversity indices; Shannon-Weiner (H') and Simpson Diversity index (1-D). The estimate for population density was calculated using King's Census method (Rabinowitz, 1993).

Result and discussion

A total of 10 kilometres of walk spotlight count and 80 kilometres of vehicle spotlight counts were conducted during the study. Figure 2 presents the overall results for the study. The walk spotlight counts methods did not record any terrestrial nocturnal mammal. However, for vehicle spotlight counts, there were four individuals were recorded. The species that were sighted were three common palm civet (*Paradoxurus hermaphroditus*) and one small-toothed palm civet (*Arctogalidia trivirgata*).

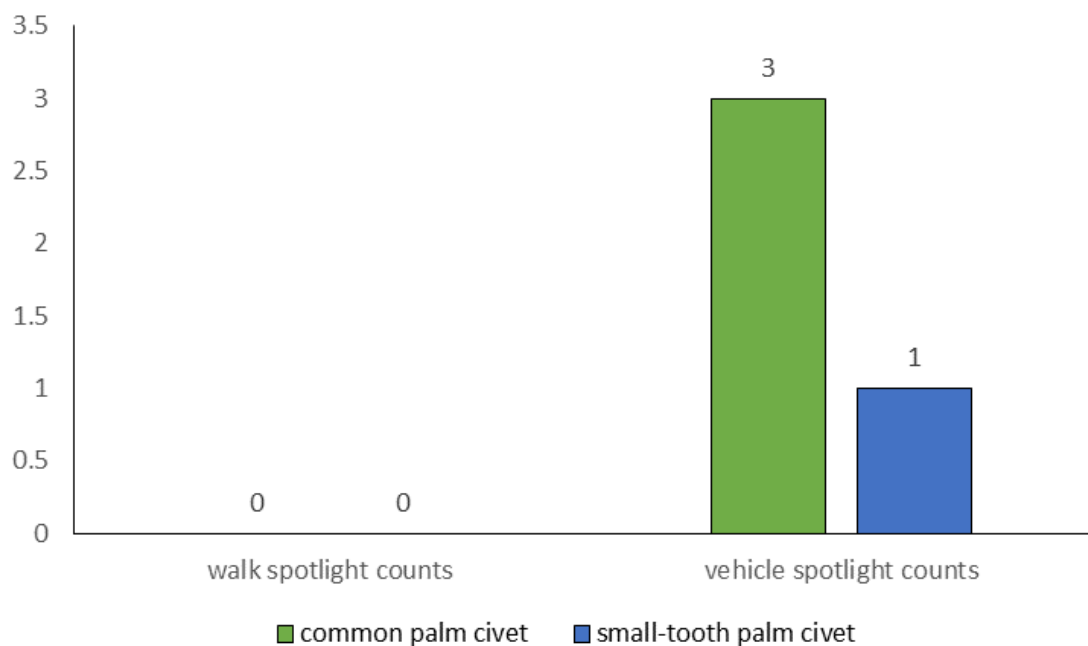


Figure 2. Total number of terrestrial nocturnal mammals obtained by Walk Spotlight counts and Vehicle spotlight counts

Vehicle spotlight counts obtained 0.56 of Shannon-Weiner index. Simpson's Index for the vehicle spotlight counts was 0.5. The estimated population density of mammals obtained from the vehicle spotlight counts was 4.5 individual/km². The diversity indices and the estimate for population density for nocturnal mammals using walk spotlight counts were not calculated as there were no

observation obtained using that method. Mathai *et al.* (2013) also noted in that Vehicle spotlight counts has higher detection rate as opposed to walk spotlight counts.

The result of this study was compared with other past research. Nakabayashi *et al.* (2014) conducted a night survey in Tabin Wildlife Sanctuary along the road side for 78 km and obtained 51 encounters of nocturnal mammals with 11 species. Eng (2011) conducted a study in *Acacia mangium* plantation at Bintulu, Sarawak. He conducted night survey along the road for about 80km and obtained 9 encounters of nocturnal mammals with four species. Eng (2011) recorded four Malay Civets, one common palm civet, two leopard cats, and two small-toothed palm civets. Malay civet and leopard cat was not detected in this current study. In comparison from the past studies with the results obtained from this study, the population of nocturnal terrestrial mammals in SFI was very low, as reflected by the low encounter rate during the field data collection, i.e., 4 encounters in 80km with only 2 species, of which, all were civets. Most of civets found in the riparian forest in this study.

Food availability is one of the factors that determine the populations of wildlife. Lack of food will cause starvation and death that leads to wildlife population decline (Yarrow, 2009). Wildlife that is in good and healthy condition has higher reproductive rates, more resistant to disease and makes them more alert to escape from their natural predators (Yarrow, 2009). The forest plantations of *Acacia mangium* at SFI have sufficient food sources such as wild banana trees, wild fruits and insects. The riparian forest at Mendulong Estate was rich with shrubs and fruit trees. Therefore, the lack of food is not the main factor that was affecting the low population density for nocturnal terrestrial mammals in Mendulong Estate, SFI.

It was learnt during our field data collection in Mendulong Estate that the hunting activities there were very active. Bennett *et al.*, (2000) has recorded in their survey that was conducted in 1992-1994 that hunting was active across Sabah and Sarawak as wild meat provide animal protein for the communities. Wild meat is often eaten by rural people in Sabah as wild meat can provide protein nourishment to them (Robinson & Bennett, 2000). The percentage of rural population in Sabah that eat wild meat during evening meals were 13.9%, wild fish is 21.3% and 58.5 % from other forms of animal protein (Bennett *et al.*, 2000).

Table 1. The encounter of hunters during the 18 days surveys.

Date	Time	Appearance of Hunter
10/8/2015	9:15 p.m.	One person riding a motorcycle with a shotgun
12/8/2015	9:08 p.m.	Two hunters riding a motorcycle and one hunter driving a four wheel drive car. They brought along their pack of hunting dogs
14/8/2015	11:30 p.m.	Two men and dogs riding a motorcycle
14/8/2015	12:34 a.m.	Two men riding two motorcycle with their two hunting dogs
20/8/2015	10:47 p.m.	Two men riding two motorcycle with their two hunting dogs
20/8/2015	12:18 a.m.	A family accompanied by four hunting dogs.

The main road in Mendulong SFI can be easily accessed by outsiders as it connects with the existing remote villages surrounding the plantation. The encounter rate of hunters was higher than the nocturnal terrestrial mammals during our field data collection. Table 1 shows the number of encounter with hunters during our night surveys. The hunters came at night in a group (2 or 3 people) and were accompanied with their hunting dogs enter SFI. Within 18 days of the study, there are 6 groups of hunters that were encountered.

Rao *et al.* (2010) highlighted the importance of hunting as a source of income for local residents. Hunting activities are usually conducted as a source of food, income, medical, cultural and recreational (Bennett *et al.*, 2000; Rao *et al.*, 2010). Amongst the mammals that were hunted in our study site were pangolins, wild boars, porcupines and deer. For example, pangolin is used as traditional medicine. One kilogram of pangolins meat can be sold at a RM80 till RM 150 and most of the pangolins meats were sold to Chinese traders. Pangolin has been listed as a critically endangered species of the International Union for Conservation of Nature due to excessive commercial harvesting of pangolins for food and medicine and international trade (Li *et al.*, 2015). Pangolin is one of the favourite targets of hunted mammals in our study site, where the hunters will use their hunting dogs to locate and capture the animal.

Excessive hunting negatively influences the diversity and density of mammals. The study conducted by Bennett *et al.* (2000) that investigated the ecological impact of hunting in Sabah and Sarawak shows that the population density and diversity of mammal decreases as the hunting pressure increases. If the situation is allowed to continue, terrestrial mammal populations will decrease further and eventually will face extinction (Robinson & Bennett, 2000). As such, there is a need to initiate conservation of the nocturnal mammal population in Mendulong Estate SFI, as it contributes to the ecosystem balance in the forest plantations.

Conclusion

The population density and diversity of terrestrial nocturnal mammals in Mendulong Estate in SFI, Sipitang was very low. The high encounter rate of hunters during the study indicates high hunting pressure that might primarily cause the observed results.

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