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A STUDY ON ACTIVITY PATTERNS OF CLOUDED LEOPARD AND MARBLED CAT IN TEMENGOR FOREST RESERVE, HULU PERAK

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ABSTRACT

A camera trapping study was conducted in Temengor Forest Reserve, Hulu Perak from June 2007 till August 2008. This study is an attempt to document basic findings of mammal species in the study area. Forty-seven images of five feline species were recorded during the 2813 trapping nights. Photographed images of felids obtained were the Malayan Tiger (*Panthera tigris*), Clouded Leopard (*Pardofelis nebulosa*), Asiatic Golden Cat (*Catopuma temmincki*), Marbled Cat (*Pardofelis marmorata*) and the Leopard Cat (*Prionailurus bengalensis*). Activity patterns analysis of the most presented (n>10 photos) feline species which are the Clouded Leopard and the Marbled Cat were conducted. The study reveals that both Clouded Leopard and the Marbled Cat are partly nocturnal with 58% (n=11 photos) of nocturnal activities for the Clouded Leopard and 50% (n=5 photos) of nocturnal activities for the Marbled Cat.

Keywords: Camera trapping, felids, Clouded Leopard, Marbled Cat, activity pattern.

INTRODUCTION

Tropical rainforests of Peninsular Malaysia support seven species of wild cats (Lim, 1999). Four of them are categorized as small cats (Medway, 1983; Corbet & Hill, 1992), reclassified into three genera, namely Prionailurus, Pardofelis and Catopuma (Wilson & Reeder, 1993). The genus Pardofelis was assigned to the Clouded Leopard (*P. nebulosa*) and the Marbled Cat (*P. marmorata*) meanwhile the genus Prionailurus was designated to two smaller-size cats, the Leopard Cat (*P. bengalensis*) and the Flat-headed Cat (*P. planiceps*). The intermediate size cat, the Asiatic Golden Cat was assigned to the genus Catopuma (*Catopuma temmincki*).

Most of the studies on wild cats done in Peninsular Malaysia concentrated on the Malayan Tiger (*Panthera tigris*), thus the smaller cats which are less spectacular than the big cats receiving little or no attention at all (Lim, 1999). Information of these smaller cats was scattered, usually specimens being found on road kills, in captivity (Hemmer, 1968; Yamada & Durrant, 1989), sightings reports and camera trappings (Lim & Abdul Rahman Omar, 1961; Davies, 1990; Saharudin & Azmi, 1995; Kawanishi *et* al., 1999; Sirka & Annette, 2000; Laidlaw, 2000; Saharudin, 2001; Ghose, 2002; Kawanishi & Sunquist, 2004; Azlan & Lading, 2006; Kawanishi & Sunquist, 2008).

Camera trapping was introduced to aid in wildlife population census where data collected from indirect signs alone can be fraught as it depends on the knowledge of the tracker. It is the

least intrusive method to obtain permanent records of the presence of multiple taxa, day and night for a long period of time (Kawanishi, 2001), individual identification, estimating wildlife population (Karanth, 1995), collecting species inventories (Maffei *et al.*, 2002; Silveira *et al.*, 2003; Trolle, 2003*b*; Srbek-Araujo & Garcia, 2005; Azlan & Lading, 2006), studying activity patterns (Kawanishi & Sunquist, 2004; Gomez *et al.*, 2005; Azlan & Sharma, 2006; Azlan & Lading, 2006; Kawanishi & Sunquist, 2008) and estimating animal density (Mace *et al.*, 1994; Karanth & Nichols, 1998; Sweitzer *et al.*, 2000; Trolle & Kery, 2003; Silver *et al.*, 2004; Rowcliffe *et al.*, 2008).

This study was conducted to document the fundamental information on biology of small felids in Temengor Forest Reserve utilizing camera trapping method, that later will facilitate much more comprehensive studies for these least known carnivores in Peninsular Malaysia.

Study Site

The study was conducted within a 40 km^2 area in Temengor Forest Reserve, Hulu Perak. Temengor Forest Reserve constitute a total area of 148,870 hectares has been recognized as an Important Bird Area (BirdLife International, 2008) where it hosts globally threatened Plain-pouched Hornbill (*Aceros subruficollis*), considered as the last refuge for at least 14 globally threatened mammals such as Sumatran Rhinoceros (*Dicerorhinus sumatrensis*), Malayan Tiger (*Panthera tigris*) and home to countless flora species including Rafflesia (the world's largest flower). Temengor Forest Reserve is also known as an important water catchment area for major rivers in Perak.

MATERIALS AND METHODS

Camera traps

A total of 11 custom-made Sony tracking cameras were utilized in this study. These camera traps are powered by 1.5 and 9 volt alkaline batteries, equipped with active infrared motion detector, master lock @ Python lock, Pelican waterproof casing and 1 gigabyte Memory Stick Pro. The delay between each consecutive photograph was set to 10 seconds. Camera traps were deployed along the animal's main trails identified earlier from the rapid survey conducted and the distance between each camera trap approximately 1.5 to 2 kilometers. Camera traps were mounted on trees for at least 0.3 m above the ground and were deployed continuously for a minimum period of 1 month without breaks for monitoring or changing the batteries.

Photo Analysis

Identification of photographed animals was determined based on description and illustrations by Mohamad Momin Khan (1992). Exposures of felids were examined further to determine the species and their activity level. Photographs of other wildlife species were not included for the analysis.

Activity Patterns

The time and date imprinted on photographs of felids were used to calculate the activity levels of respective species (Wong *et al.*, 2003). Photo records of small felids with less than 10 photographs which were categorized as underrepresented were not included in the analysis. The percentage of

activity levels was used to indicate whether the felids species are nocturnal or diurnal. Activities recorded between 1900 hr to 0700 hr were classified as nocturnal and those between 0700 hr to 1900 hr were classified as diurnal.

RESULT AND DISCUSSION

A total of 631 photographic images of mammals were recorded for 2813 trapping nights. 47 exposures were images of five species of felids which are the Malayan Tiger (*Panthera tigris*), Clouded Leopard (*Pardofelis nebulosa*), Marbled Cat (*Pardofelis marmorata*), Asiatic Golden Cat (*Catopuma temmincki*) and Leopard Cat (*Prionailurus bengalensis*). The number of photographs obtained for each respective felid species is noted in Table 1.

Table 1: Total number of photographs for each respective felid species recorded in Temengor Forest Reserve from June 2007 till August 2008.

No.	Common Name	Scientific Name	Photo records
1.	Tiger	*Panthera tigris*	4
2.	Clouded Leopard	*Pardofelis nebulosa*	19
3.	Marbled Cat	*Pardofelis marmorata*	10
4.	Golden Cat	*Catopuma temmincki*	4
5.	Leopard Cat	*Prionailurus bengalensis*	7

Tiger was categorized as big cats, thus photographic images of this species were excluded from the activity pattern analysis as well as two underrepresented small felids (n<10 photos) which are the Golden Cat and the Leopard Cat. The activity patterns of the remaining two species of small felids (Clouded Leopard & Marbled Cat) are illustrated in Figure 1 and 2.

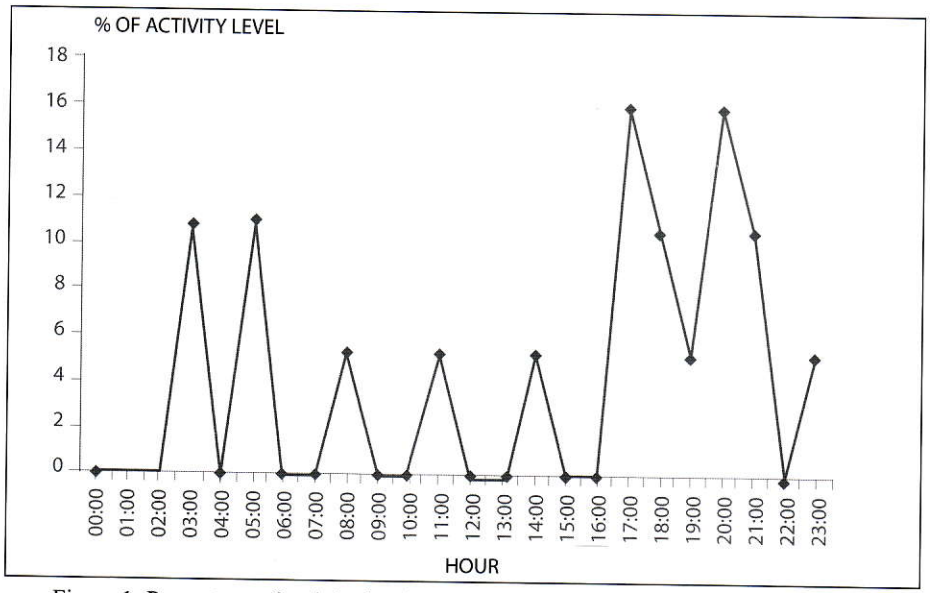

Figure 1: Percentage of activity levels for Clouded Leopard (*Pardofelis nebulosa*) in Temengor forest Reserve from June 2007 till August 2008 (n=19 photos).

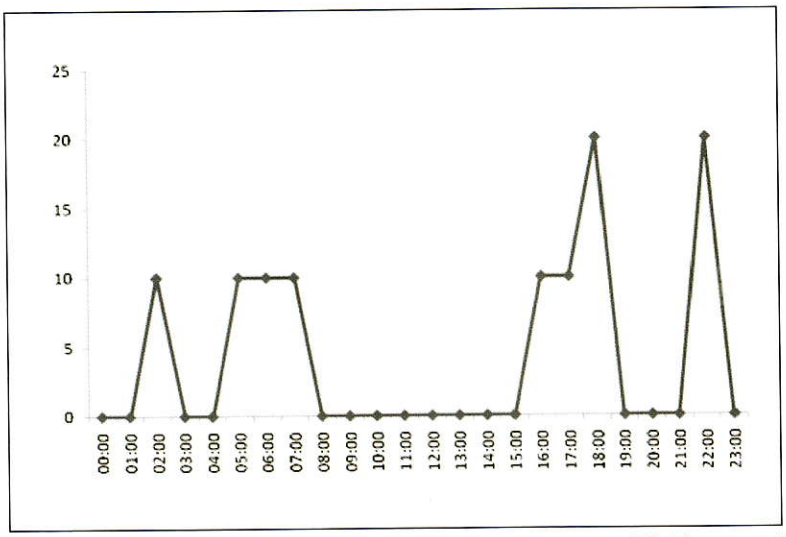

Figure 2: Percentage of activity levels for Marbled Cat (*Pardofelis marmorata*) in Temengor forest Reserve from June 2007 till August 2008 (n=10 photos).

Clouded Leopard

The Clouded Leopard is listed as vulnerable by the IUCN and included in CITES Appendix I. The name "Clouded Leopard" refers to their distinctive cloud-like fur pattern (Nowell & Jackson, 1996). Some described the Clouded Leopard as strictly arboreal (Pocock, 1939; Wood, 1949) but the later findings noted that this species can be found regularly on the ground (Robinowitz *et al.*, 1987). Their patchy distribution, low densities, partly nocturnal and far-ranging behavior (Davies & Payne, 1982; Santiapillai, 1986; Austin & Tewes, 1999; Grassman *et al.*, 2005) making them extremely difficult to study and monitor.

This study is a fundamental attempt to record information on Clouded Leopard as no thorough study on this species has ever been done in Peninsular Malaysia. From the activity pattern analysis conducted for this study, it is noted that Clouded Leopard is partly nocturnal with 58% (n=11 photos) of nocturnal activities and 42% (n=8 photos) of diurnal activities. Clouded Leopard is most active between 1600 hr and 2200 hr with 11 bouts of activities.

Having this figure, we compared the activity pattern of the most presented (n>10 photos) and potential prey for the Clouded Leopard which is the Barking Deer, *Muntiacus muntjak* obtained during the study period to explain this behavior (Figure 3). Barking Deer tends to be crepuscular in the study area with 61% (n=35 photos) of diurnal activities with peak level noted between 1600 hr and 2100 hr compared to 39% (n=22 photos) of nocturnal activities. This strongly suggests that the activity level of the Clouded Leopard correlates with those of their most presented prey, such as the Barking Deer (Grassman *et al.*, 2005) as noted in the study area.

Marbled Cat

The Marbled Cat remains perhaps the most enigmatic small felid of mainland South-East Asia (Grassman *et al.*, 2005). It appears to be relatively rare, based on historical encounters and recent records (Nowell & Jackson, 1996; Kawanishi *et* al., 1999; Sunquist & Sunquist, 2002; Grassman *et al.*, 2005; Azlan & Sharma 2006). The Marbled cat is categorized as vulnerable in the IUCN 2008 Red List and listed under CITES Appendix I. It has never been studied, although Grassman *et al.* (2005) made a preliminary home range estimate of 5.3 km² for an adult female which was radio-collared and tracked for one month in Thailand›s Phu Khieo National Park (Hearn *et al.*, 2008).

Marbled Cat appears to be partly nocturnal with both 50% (n=5 photos) nocturnal and diurnal activities recorded during the study period. No occurrence was recorded between 0800 hr till 1500 hr and the peak activity level were observed during 1800 hr and 2000 hr. Individual identification of the Marbled Cat through its natural markings cannot be made since the camera traps were not set on both flanks. All photos of the Marbled Cat were recorded at high elevation (1000-1200 meters above sea level) in the study area.

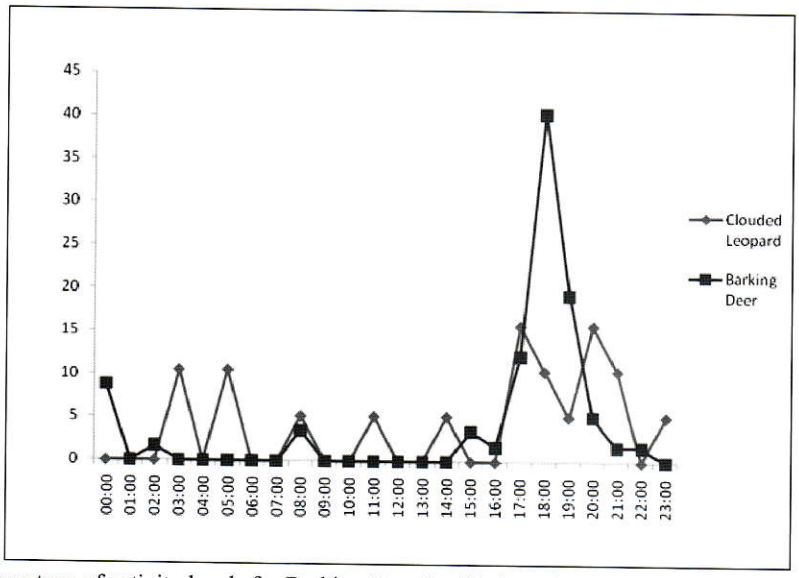

Figure 3: Percentage of activity levels for Barking Deer (n=57 photos) and Clouded Leopard (n=19 photos) in Temengor forest Reserve from June 2007 till August 2008.

CONCLUSION

This fundamental study on small and medium-size felids hopefully will add in biological information for this group of species since there was no thorough study done for this species in Peninsular Malaysia. Much larger effort through surveys and camera trapping are critically needed for continuous observation and conservation of these feline species.

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