

PREDATION OF DOMESTIC DOGS (*Canis lupus familiaris*) ON SCHLEGEL'S BANDED LANGUR (*Presbytis neglectus*) AND CRESTED HAWK-EAGLE (*Nisaetus cirrhatus*) ON DUSKY LEAF MONKEY (*Trachypithecus obscurus*) IN MALAYSIA

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Abstract: Predations on primates are rarely documented despite being an important survival challenges for such animal. In Johor, Malaysia, Schlegel's banded langur (*Presbytis neglectus*) and dusky leaf monkey (*Trachypithecus obscurus*) are not exempted from the present threats. Here we describe the predation of Schlegel's banded langur (*P. neglectus*) by domestic dogs (*Canis lupus familiaris*) and unsuccessful predation of dusky leaf monkey (*T. obscurus*) by crested hawk-eagle (*Nisaetus cirrhatus*). Our observation reported two chasing attempts followed by two successful predations of banded langur by domestic dogs and an unsuccessful predation on dusky leaf monkey (*T. obscurus*) juvenile by crested hawk-eagle (*N. cirrhatus*). This is the first ever report on predation of banded langur (*P. neglectus*) by terrestrial animal and act as a significance standpoint in ecology and conservation of langurs.

Keywords: Langur, predator, Malaysia.

Introduction

Predation of primates are rarely documented and reported in terms of actual predation or attempt (Alexander, 1974; Cheney & Wrangham, 1987; Miller & Treves, 2007). Miller and Treves (2007), in their review on predation of primates, had listed an updated case of predation on primates from previous works (Treves 1999; Boinski *et al.*, 2000) importantly stating that primates tend to change their foraging pattern, sleeping habit, group cohesion and other behaviours that could reduce risk of predator's encounter. Hart (2007) also made a review on predation on primates using biogeographical analysis which highlight five categories of predators, which are; felids, raptors, canids and hyaenids, small carnivore and reptiles; then compared the occurrence of predator-primate interaction in four major regions of Asia, Africa, Madagascar and

Neotropics (Hart, 2007). In the African region, the example of predator-primate interaction are between chimpanzees (*Pan troglodytes ellioti*) on Preuss's colobus monkey (*Procolobus preuss*), leopards (*Panthera pardus*) and Chacma baboon (*Papio ursinus*), and between black-backed jackal (*Canis mesomelas*) and Patas monkey (*Erythrocebus patas*) (Morgan *et al.*, 2012; Burnham & Riordan, 2012; Jooste *et al.*, 2012). In the Madagascar region, the predation of Lemur is by Red-fronted lemur (*Eulemur fulvus rufus*), Fossa (*Cryptoprocta ferox*), Civet (*Civettictis civetta*), Feral cat (unknown) (Jolly *et al.* 2000; Goodman *et al.*, 1993). Neotropical primate from genus *Cebus*, was reported to be the prey to Harpy eagle (*Harpia harpyja*), Guianan crested eagle (*Morphnus guianensis*), Boa constrictor (*Boa constrictor*), and Tyra (*Eira barbara*) (Fowler & Cope, 1964; Defler, 1980; Terborgh, 1983; Philips, 1985; Izor,

1985; Chapman, 1986). From the Asian region, proboscis monkey, *Nasalis larvatus* was reported to be the prey for clouded leopard (*Neofelis diardi*) and false gharial (*Tomistoma schlegeli*) (Jackson & Nowell, 1996; Yeager, 1991; Matsuda et al., 2008).

Langurs from genera *Presbytis*, *Trachypithecus* and *Semnopithecus* were recorded to be preyed by python (*Python reticulatus*), jackal (*Canis aureus*), leopard (*Panthera pardus*), tiger (*Panthera tigris*) and crested hawk-eagle (*Nisaetus cirrhatus*) (Seidensticker, 1983 ; Stanford, 1989; Karanth & Sunquist, 1995; Shine et al., 1998; Ramakrishnan et al., 1999; Andheria et al., 2007). Other potential predators of langur are Brahminy kite (*Haliastur indus*), dhole (*Cuon alpinus*), dogs (*C. l. familiaris*), and Binturong (*Arctictis binturong*) (Streck, 2002; Francis, 2008; Hambali et al., 2016). In Gunung Pantii, Johor, Malaysia, one successful predation of a juvenile Schlegel's banded langur *P. neglectus* (~2 kg) by a changeable hawk-eagle (*Spizaetus cirrhatus*) was reported (Fam & Nijman, 2011). However, the report of predation of langurs are still uncommon due to multiple anti-predatory strategies adopted by langurs such as, vocalization, freezing, startle response and fleeing routes and it proved to be effective measure as based on the report of predation attempt (Hart, 2007; Nijman & Nekaris, 2012).

In Johor, Schlegel's banded langur (Schlegel, 1876) or locally known as 'Lutong cenekah Johor' was recently elevated to distinct species classification by Abdul-Latiff et al. (2019a) based on molecular approach. *P. neglectus* was previously known as *Presbytis femoralis femoralis* and currently reported to have fewer than 100 individuals of *P. neglectus* in selected areas such as Ayer Tawar (58 individuals), Gunung Pantii (18 individuals), Endau- Rompin National Park (17 individuals), and Johor Lama (16 individuals) (Md-Zain et al., 2008; Vun et al., 2011; Abdul-Latiff et al., 2019a; Abdul-Latiff et al., 2019b; Abdul-Latiff et al. 2019c). Schlegel's banded langur was recently reported to feed on 27 species of plants from 17 families in Kota Tinggi, Johor (Najmuddin et al., 2019).

Another species of langurs that can be found in Johor is dusky leaf monkey, *T. obscurus* which are distributed from southern Myanmar to Peninsular Malaysia (Groves, 2001; Abdul-Latiff et al. 2017a; Siti-Kauthar et al., 2019). Although classified as Near Threatened (NT) by International Union for Conservation of Nature (IUCN) for both *P. neglectus* and *T. obscurus*, both of them faced threats from land conversion, habitat loss and pet trade (Boonratana et al., 2008; Nijman et al., 2008; Ch'ng & Md-Zain, 2009; Ruslin et al., 2019; DWNP, 2010; Abdul-Latiff et al., 2014). In this report, we describe incidences of predation on *P. neglectus*, an endemic species to Johor by *C. l. familiaris* and the predation attempt on sympatric *T. obscurus* by *N. cirrhatus* in Kota Tinggi, Johor, Malaysia.

Materials and Methods

This study was conducted in Kota Tinggi, Johor, Malaysia. The study area setting has mangrove forest at river edges, palm oil plantation, fruit orchard, and abandoned rubber plantation with nearby Malay village with houses scattered around (Figure 1). The mean maximum and minimum temperature are 32°C and 21°C respectively with average annual precipitation of 2470-mm (Othman & Amin, 2018). Focal animal sampling method (Altman, 1974) employed by Ruslin et al. (2019) was used for observation of the predation on langurs. *P. neglectus* in the study area are divided into two groups, group Dara and group Bonda. Both of the groups ranged independently in different sites of the village but had been observed reunited several times throughout the study. The group Dara was an all-male band which consists of four identified members. Another *P. neglectus* group was named Bonda consist of 12 individuals lead by one alpha male, seven adult and sub adult females, and 4 infants. The dusky leaf monkey group was detected ranging sympatrically along with widely distributed long tailed macaque (*Macaca fascicularis*) (Abdul-Latiff et al., 2017b) in the area. The observation begins in July 2017 and ongoing into April 2019. We report here observations related to predatory



Figure 1: The setting of the study area in Kota Tinggi depicting various landscape mosaic such as mangrove forest at rivers edge (A), palm oil plantation (B), abandoned rubber tree plantation converted into orchard (C) and (D) show Malay common house in patches along Sungai Johor.

behaviour occurring to Schlegel's banded langur that was recorded during our long-term behavioural observations in the area. This is the first long term continuous observation on the Schlegel's banded langur in Asia.

The dog in the village is of common domestic dog. Owned domestic dogs were residing in the shrimp pond neighboring the village as they placed guarding the pond to deter smooth-coated otter (*Lutra perspicillata*) foraging in the area. The owned dogs were specialised and trained hunter for the agile and smart smooth-coated otters. The stray domestic dogs group in the village consisted of three individuals (Figure 2). The stray domestic dogs (*C. l. familiaris*) frequently portrayed their aggression towards human in the area, long-tailed macaque (*M. fascicularis*), dusky leaf monkey (*T. obscurus*), and Schlegel's banded langur (*P. neglectus*). However, no contact or direct attack was encountered between human and the stray domestic dogs so far.

Several raptor species were available in that area which are white bellied sea eagle (*Haliaeetus leucogaster*), Brahminy kite (*Haliastur indus*), Black shouldered kite (*Elanus axillaris*), Osprey (*Pandion haliaetus*) and Crested serpent eagle (*Spilornis cheela*). Saltwater crocodile (*Crocodylus porosus*) was also present at the Sungai Johor, the largest river in the district of Kota Tinggi.

Results

Observation 1. Attempt of Aggression and Chasing by Stray Domestic Dogs

On 14th March 2018, NMF (Najmuddin Mohd Faudzir) entered the field on 0830 hours to follow the focal group Dara for routine ethological observation. On 0900, loud, continuous barking sound was heard near entrance of orchard. Tailing the barking sounds, 3 stray domestic dogs were found chasing a running group Dara. After all the langurs had ascended further up into the trees, agonistic behaviour was shown by Schlegel's

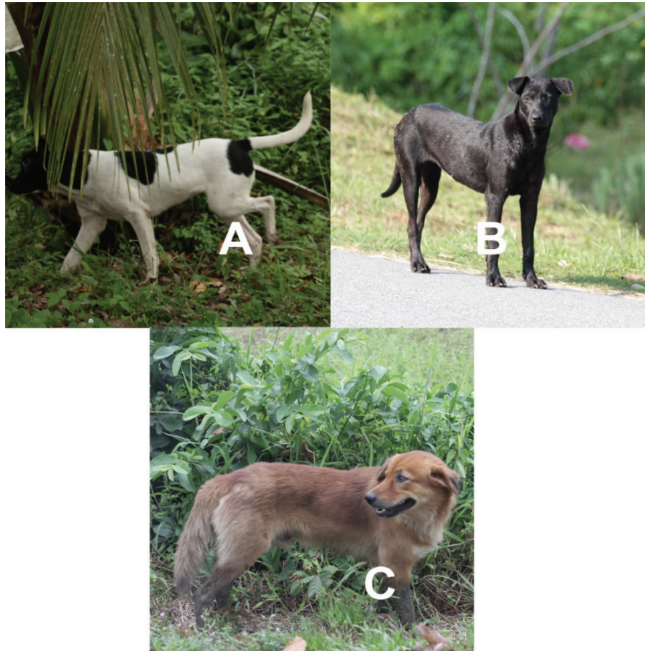


Figure 2: Three stray domestic dogs (*C. l. familiaris*) that prey on Schlegel’s banded langur in the area.

banded langurs (tapping the tree branch). As the author moves towards the dogs, the dogs moved away into the intact mangrove area.

Observation 2. Unsuccessful Attacks by Crested Hawk-eagle on Infant Dusky leaf monkey

On 29th April 2018, NMF started observation of the focal group Dara of Schlegel’s banded langurs starting from morning in 0800. On 1815, focal group Dara had returned to their nesting site at primate trail. NMF also found a group of *T. obscurus* made up of 8 individuals with one juvenile clung to one adult female. After the group startled by the author presence, the group moved to durian trees beside their resting site. Suddenly a crested hawk-eagle (Figure 3) entered the higher branch of the same durian tree silently. When the crested hawk-eagle suddenly descended to approach the dusky leaf monkey then loud squeak came from the crested hawk eagle. At the same time little reciprocal call of alpha male *T. obscurus* was heard with aggressive behavior towards the crested hawk-eagle. After two seconds approximately, the alpha male charged towards crested hawk-

eagle and the crested hawk-eagle flew away with loud repeating squeaks. The scene lasted approximately two minutes and soon after that the *T. obscurus* ascend further the durian (*Durio zibethinus*) tree and disappear from sight.

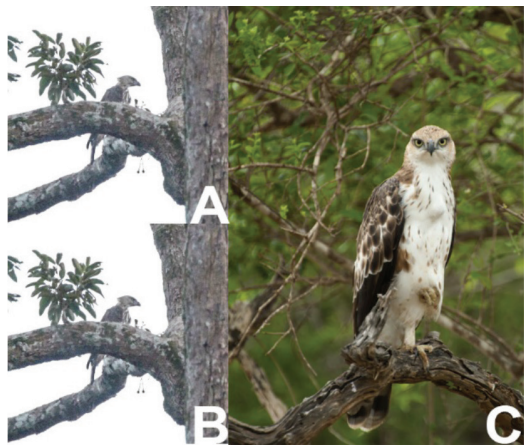


Figure 3: Crested hawk eagle (*N. cirrhatus*) predating on dusky leaf monkey (A and B) in study area. Picture C is the accurate shot crested hawk eagle in Sri Lanka by Thomas.

Observation 3. Unsuccessful Pack Hunting by Three Stray Domestic at Settlement

On 22nd September 2018, NMF and HH (Hidayah Haris) followed group Dara beginning from 0740 hours. At 1617, 3 stray domestic dogs resting beside a house. *P. neglectus* were also present on the location. After the dogs saw NMF and HH, the dogs moved away from researchers and towards the banded langurs. Realizing the presence of banded langurs, the dogs barked and start circulating the house where banded langurs rest on the roof. Barking from different angle was one of the dog's strategies to confuse its prey. Aswad (black sub-adult Schlegel's banded langur) descended from the house and started canter on its four legs towards nearby electric pole. Aswad was chased by the black dog from the group with series of continuous barking. After the event, NMF and HH decided to chase away the dogs as it interrupts the observation process.

Observation 4. Predation by Domestic Dogs on Adult Banded langur

The report from our field assistant, Mr. Khir, on the attack on one adult by the dogs on 4th March 2019. The report was based on observation behind an abandoned house at 1530 in the afternoon. The attack was by dogs which are familiarly found in the village. Based on his observation, loud barking was heard around the village at the backside of abandoned house at range of 70-100 meters from him. The attack was not static at one place but moved into deeper bush and eventually thicker forest. After approximately 15 minutes, 3 stray domestic dogs were not heard anymore and the dead Schlegel's banded langur was found. On the same evening after the report, we (NMF and ALMAB) arrived at the location and retrieved the carcass for photographic evidence and burial. Detailed photo of the carcass can be seen in figure 4. The banded langur was identified to be Aswad, one of the members in our focal group Dara. We suspected that the banded langur was attacked while feeding on palm oil fruits on the ground because its mouth is still filled with chewed palm oil fruits (Figure 4).



Figure 4: Carcass of Aswad, an adult male Schlegel's banded langur (*P. neglectus*) from group 1 in the study area after being attacked by 3 stray domestic dogs (*C. l. familiaris*). Part A show the mouth of Aswad filled with chewed palm oil fruits. Part B show bite mark at left thigh. Part C show the backside of Aswad. Part D show the overview of Aswad's carcass.

Discussion

Result from our discovery show uncommon predation of arboreal langur by ground dwelling canine. Pack hunting strategy of canine showed effectiveness only if the primates were not proficient while on the ground. Past studies showed that jackal (*C. aureus*) for example, had been observed to cooperatively attack capped langur (*Presbytis pileatus*) in Bangladesh (Stanford, 1989). Despite a rare occasion as the langurs are arboreal, the attack successfully kills



Figure 5: Carcass of Pening, a sub-adult Schlegel's banded langur (*P. neglectus*) from group 2 in the study area. Pening also attacked by 3 stray domestic dogs (*C. l. familiaris*). Part A show major injury on the head of Pening and blood stains. Part B show overview of Pening's carcass. Part C show the injury at the side stomach of Pening, note that exposed intestine of Pening due to the attack. Part D show the left arm of Pening with bite mark and scar.

one adult female of capped langur (Stanford, 1989). Hanuman langur (*Semnopithecus entellus*) was recorded also to be the prey of jackal (*C. aureus*) in Kanha National Park, India (D'Cunha, 1996). Another arboreal primate, black capuchin monkey (*Cebus nigritus*) was reported to be the prey of two domestic dogs (*C. l. familiaris*) in Parque Estadual Serra do Brigadeiro (PESB), Minas Gerais, Brazil (Oliveira et al., 2008). Domestic dogs have been observed to have more cases with primate in previous cases as in Table 1 and two cases had the same setting as in our findings; primate habitat neighboring human settlement (Oliveira et al., 2008; Riley et al., 2015). In other occasion of great ape, Chimpanzees (*Pan troglodytes schweinfurthii*) in Issa valley, Tanzania were

recorded to have encounter with African wild dogs (*Lycaon pictus*) (McLester et al., 2016).

Opportunistic and frantic, canine had total advantage in hunting primate while on the ground. It is as the same case as dingo (*Canis lupus dingo*) in hunting which required more individuals in increasing the succession of hunting (Thompson, 1992). Only two over six attacks by solitary dingo was successful compared to 23 of 31 attacks by a pack of dingoes successful in one study (Thompson, 1992). Wolves (*Canis lupus*) proved to be more successful when hunting in open habitats and might often exhausts larger prey by chasing them over long distances (Kleiman and Eisenberg 1973; Wells and Bekoff 1982; Wikenros et al., 2009). Comparing to our case, the 3 stray domestic dogs hunt in packs, in an open habitat and drag the killing time up to 20 minutes before the carcass of Schlegel's banded langur was found.

Langur adapted to predatory pressure had developed its own anti-predatory approach and strategy. Banded langur (*P. neglectus*) produce long call, a strident "churr-r-r, churr-r-r, ka-ka-ka", which gives this species its local Malay name of "cenekah" (Curtin, 1980). Our observation also had the same reaction during first two month of observation. Their strategy executed by the adult male by facing the approaching human or perpetrator and displays himself along with the loud call while the other members of the groups diverges to other direction (Curtin, 1980). Dusky leaf monkey (*T. obscurus*) will have an adult male staying at canopy level to watch for possible threats (Md-Zain & Ch'ng, 2011; Ch'ng & Md-zain, 2009; Curtin, 1980). The successful predation of Schlegel's banded langur in this report may be associated with frequent descend to the ground (Figure 5) compared to dusky leaf monkey. The photo in figure 6 show banded langur eating rubber seeds (*Hevea brasiliensis*) on the ground around cemetery. Based on our observation, although the cemetery area was open and exposed to risk of predation, Schlegel's banded langurs spent most of its time foraging in that

Table 1: Previously recorded predation attempts by stray domestic dogs on primates.

Species	Country	Prey	Description	Age	Reference
Domestic dogs (<i>C. l. familiaris</i>)	Brazil	Black capuchin (<i>Cebus nigrinus</i>)	Successful predation	Adult	Oliviera <i>et al.</i> , 2008
	Brazil	<i>C. nigrinus</i> and <i>Aluotta guariba</i>	Possible predation	UN	Galleti and Sazima, 2006
	Brazil	<i>C. nigrinus</i>	Three domestic dogs preying on <i>C. nigrinus</i>	UN	Ludwig <i>et al.</i> , 2006
	Brazil	Titi monkey, <i>Callicebus personatus</i>	Dogs pursuing titi monkeys	UN	Srbek-araujo and Chiarello, 2008
	Sri lanka	Toque monkey, <i>Macaca sinica</i>	Five death of toque monkey involved dogs	UN	Dittus, 1975
	Sri lanka	Hanuman langur, <i>Semnopithecus entellus</i>	Attempt of catching	UN	Dittus, 1975
	Malaysia	Long tailed macaque, <i>Macaca fascicularis</i>	No description	UN	Hock and Sasekumar, 1979
	Madagascar	Brown mouse lemur,	A village dog found taking mouse lemur in second dary forest in dusk.	UN	Goodman <i>et al.</i> , 1993
	Singapore	Long tailed macaque, <i>M. fascicularis</i>	Domestic dogs killed and take away juvenile long tailed macaque	Juvenile	Riley <i>et al.</i> , 2015
	India	Phayre's leaf monkey, <i>Trachypithecus phayrei</i>	Aggression behaviour between two adult males Phayre's leaf monkeys towards domestic dogs	Adult male	Deb <i>et al.</i> , 2015

area. This terrestrial behaviour was also found in Maroon langurs (*Presbytis rubicunda*) in Borneo, which utilised the ground for travelling and feeding (Cheyne *et al.*, 2018). *P. rubicunda* observed to be more terrestrial to disturbed and logged habitat which had the same case as *P. neglectus* in our study in Kota Tinggi where it is highly disturbed habitat with oil palm plantation, human settlement and fruit orchard.

Predation pressures also come from different species of raptors and saltwater

crocodile in the area. Mixed type of habitat (Figure 1) in Kota Tinggi had provided species of potential predator raptors for the Schlegel's banded langur and dusky leaf monkey. The existence of saltwater crocodile (*C. porosus*) in Kota Tinggi had completed triple threats to langurs from the sky, land and river. Compared to riverine predation pressure of proboscis monkey (*N. larvatus*) by false gharial (*T. schlegeli*), and saltwater crocodile (*C. porosus*) in Sabah, river in Kota Tinggi is only populated by the apex predator saltwater crocodile (*C. porosus*)



Figure 6: A Schlegel's banded langur was eating rubber seeds (*H. brasiliensis*) on the ground around cemetery.

(Matsuda *et al.*, 2008a, Matsuda *et al.*, 2008b). These predation pressures may subsequently change the behaviour of banded langur in Kota Tinggi in order for them to survive (Miller & Treves, 2007).

Predation of *P. neglectus* by terrestrial animal gave a new knowledge on the threats to look upon after raptors and crocodile. From conservation aspects, we can reduce the risk of predation by controlling the population of predators specifically in this case where the domestic dogs are introduced by human. Furthermore, it is suggested for reforestation in study area for reducing *P. neglectus* terrestrial behaviour and enriching secondary forest through enrichment planting as what have been done in neotropics (Shanee and Shanee, 2009).

Conclusion

This is the first report on the predation of banded langur (*P. neglectus*) by cooperatively hunting domestic dog (*C. l. familiaris*) and unsuccessful attempt of predation on dusky leaf monkey by crested hawk-eagle in Malaysia. Although

this report evaluate significant predation event towards langurs population, we also see the challenge of demonstrating this impact clearly to the langurs behaviour and ecology. Rather than concluding mutually exclusive hypotheses on the behaviour of langurs only, we suggest an extensive study that focuses on predator's behaviour as well as human impact to the ecosystem holistically.

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