

FEEDING ECOLOGY, DAILY ACTIVITY BUDGET AND PRIMATOURISM OF
SCHLEGEL'S BANDED LANGUR (*Presbytis neglectus*) (SCHLEGEL,1876) IN
KOTA TINGGI JOHOR

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DEDICATION

I dedicate this thesis for my beloved parents, Mr. Faudzir and Mrs. Raba'iah.



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ABSTRACT

Schlegel's banded langur, *Presbytis neglectus*, is an endemic leaf-eating monkey distributed in Johor but faced lack of concern on its conservation aspect. It has the potential to be a primate-based tourism product called PrimaTourism (read: primate tourism) which is able to offer a sustainable approach in balancing the importance of conservation and local economic development. Yet, the data for feeding ecology and daily activity budget for *P. neglectus* for development of PrimaTourism are non-existent. Thus, this study aimed to document record on feeding ecology and daily activity budget of *P. neglectus* in Kg. Johor Lama, Kota Tinggi, subsequently transforming the data to PrimaTourism product. Scan sampling method was employed from February 2018 to February 2019 for 15 days per month during daytime from 0700 h to 1900 h. Identification of plants consumed by *P. neglectus* was made using dichotomous key, local name and based on published record. 29 species of plants were recorded from 18 families with leaves constitute the majority of diet (54%), followed by fruits (33%), seed (10%), and flower (3%). The Schlegel's banded langur spent most of its time resting (43%), moving (26%), feeding (26%), socialising (4%) and doing others activities (1%). Long resting time was related to fermentation process in the gut as its major food preferences are leaves and also related to low diversity of plants consumed by *P. neglectus* in the area. 'Wild Primate Peek™' module and primate trail feature were successfully developed based on behaviour and ecology data of *P. neglectus* and the feedback from qualitative and quantitative survey. The potential of *P. neglectus* as PrimaTourism product was aligned with seven criteria of organism-based tourism proved the viability of the product. As a conclusion, based on the ecology study, feedbacks from local guides and visitors proved that both, *P. neglectus* and PrimaTourism are viable in Kg. Johor Lama.

ABSTRAK

Lutong cenekah Johor, *Presbytis neglectus*, adalah primat pemakan daun yang endemik tetapi kurang diberi perhatian terhadap isu-isu pemuliharaannya. Ia dilihat berpotensi untuk dijadikan produk pelancongan berasaskan primat atau dinamakan PrimaTourism (baca: primate tourism) yang mana ia mampu menawarkan pendekatan yang mampan dalam mengimbangi diantara kepentingan pemuliharaan dan pembangunan ekonomi setempat. Walaubagaimanapun, data untuk ekologi pemakanan dan aktiviti seharian bagi lutong cenekah masih tiada dalam rekod. Maka objektif kajian ini adalah untuk mengkaji ekologi makan dan aktiviti seharian lutong cenekah Johor seterusnya mengolah data tersebut menjadi produk PrimaTourism. Kaedah pencerapan imbasan digunakan untuk merekod kelakuan haiwan bermula dari bulan Februari 2018 hingga Februari 2019 untuk 10 hari setiap bulan selama 12 jam sehari dari 0700h hingga 1900h petang. Pengenalpastian tumbuhan yang dimakan lutong cenekah telah dibuat menggunakan kunci dikotomi, nama tempatan dan rekod yang telah diterbitkan. Sebanyak 29 spesis tumbuhan telah direkodkan dari 18 buah keluarga dengan pemakanan dedaun menjadi sebahagian besar diet (54%) diikuti oleh buah-buahan (33%), bijian (10%), dan bunga (3%). Lutong cenekah Johor menghabiskan sebahagian besar masa seharian dengan berehat (43%), diikuti dengan bergerak (26%), makan (26%), bersosial (4%) dan lain-lain (1%). Tempoh berehat yang lama adalah disebabkan proses fermentasi di perut yang datang dari pemakanan dedaun yang banyak dan diversiti tumbuhan makanan yang rendah. Sebuah modul 'Wild Primate Peek™' dan trek 'Primate trail' berjaya dibangunkan untuk berdasarkan data ekologi dan kelakuan *P. neglectus* dan maklumbalas dari kaji selidik kualitatif dan kuantitatif. Potensi *P. neglectus* mampu hidup sebagai produk PrimaTourism kerana selari dengan tujuh kriteria pelancongan berasaskan organisma. Sebagai kesimpulan, berdasarkan kajian ekologi, maklum balas dari pemandu pelancong dan para pelancong, telah berjaya membuktikan *P. neglectus* dan PrimaTourism mampu hidup di Kampung Johor Lama, Kota Tinggi Johor.

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LIST OF ABBREVIATIONS

Bil.	-	Billion
CBD	-	Convention on Biological Diversity
DWNP	-	Department of Wildlife and National Parks, Peninsular Malaysia
H	-	Hours
IBA	-	Important Bird Area
IUCN	-	International Union for Conservation of Nature
Kg.	-	Kampung
KTP	-	Knowledge transfer program
LGM	-	Malaysia Rubber Board
MPOC	-	Malaysia Palm Oil Council
MYA	-	Million years ago.
MyBis	-	Malaysia Biodiversity Information System
TIES	-	The International Ecotourism Society
UNEP	-	United Nation Environment Programme
UNWTO	-	United Nation World Tourism Organisation
WTTC	-	World Travel and Tourism Council

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LIST OF PUBLICATIONS

Journals:

- (i) **Najmuddin, M. F.**, Norazlimi, N., Haris, H., Md-Zain B. M., Mohd-Ridwan A. R., Shahrool-Anuar R., Husna, H. A., Abdul-Latiff M. A. B. (2019). 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. *Journal of Sustainability Science and Management*. (in press)

Proceedings:

- (i) **Najmuddin, M. F.**, Haris, H., Shahrool-Anuar, R., Norazlimi, N., Md-Zain, B. M., & Abdul-Latiff, M. A. B. (2019, July). PrimaTourism: Plant selection by Schlegel's Banded Langur *Presbytis neglectus* in Johor. In *IOP Conference Series: Earth and Environmental Science* (Vol. 269, No. 1, p. 012036). IOP Publishing.
- (ii) Abdul-Latiff, M. A. B., **Najmuddin, M. F.**, Haneef, S. K., Nabil, A., Shahrool-Anuar, R., & Md-Zain, B. M. (2019, July). PrimaTourism: Preliminary study on activity budget of *Presbytis neglectus* with insights on local people perception on the product's potential economic value in Johor. In *IOP Conference Series: Earth and Environmental Science* (Vol. 269, No. 1, p. 012006). IOP Publishing.
- (iii) Abdul-Latiff, M. A. B., **Najmuddin, M. F.**, Haneef, S. K., Nabil, A., Shahrool-Anuar, R., & Md-Zain, B. M. (2019, July). Transforming

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- (i) Silver Medal. Primatourism: Transforming Local Economy and Sustainable Conservation of Critically Endangered Banded Langur in Johor. 2-4 May 2019. 30th International Invention, Innovation & Technology Exhibition 2019, Kuala Lumpur, Malaysia.
- (ii) Best Poster Award. Transforming ecological data of *Presbytis femoralis* in Kg. Johor Lama, Kota Tinggi, into Primate-Based Tourism. Seminar Ekologi Malaysia at PWTC, Putrajaya on 8 November 2018, organized by Persatuan Ekologi Malaysia.
- (iii) Deputy Vice Chancellor Special Award. PrimaTourism: Transforming Local Economy and Sustainable Conservation of Critically Endangered Banded Langur in Johor. RISE 2018 at Universiti Tun Hussein Onn Malaysia, UTHM, Parit Raja, Johor on 12-13 November 2018
- (iv) Gold Medal, PrimaTourism: Transforming Local Economy and Sustainable Conservation of Critically Endangered Banded Langur in Johor. RISE 2018 at Universiti Tun Hussein Onn Malaysia, UTHM, Parit Raja, Johor on 12-13 November 2018.

CHAPTER 1

INTRODUCTION

1.1 Background and rational of study

According to Ape Alliance (2018), primate tourism is defined as “In which people travel and see wild primates in their natural environment that has the potential to make a significant contribution to the conservation of endangered primate species”. Russon and Wallis (2014a) classified the form of primate tourism to only primates living free in native habitat, that is as wildlife or nature tourism and another form which is commonly promoted as a conservation tool. This is proven in Africa such as ‘Baboon Walk’ Program in Kenya where the Maasai community members were hired to be tour guides in the baboon site and the encouragement to buy product from the Maasai community as well as the cultural visits to their village (Strum & Nightingale, 2014). In this study, PrimaTourism (read: primate tourism) is introduced in order to create a benchmark of a research-based, ecocentric and community-based primate tourism.

Malaysia is one of megadiverse countries in term of biodiversity and is also listed as a hotspot in Sundaland region (Mittermeier *et al.*, 2011). Hotspots can be described as regions collectively hold no fewer than 0.5% or 1,500 of the world plant species as endemics and had lost 70% or more of its primary forest (Myers *et al.*, 2000). Malaysia is currently listed in the 34 hotspots globally since 1988 until now and faced the threat of forest loss tremendously (Myers, 1988; Myers, 1990; Myers *et al.*, 2000; Mittermeier *et al.*, 2011). The forest loss had direct impact towards the viability of wildlife including mammals. Amongst 306 species of mammals roamed in Malaysia, 20 recognized species of primates were under the threats of habitat loss (CBD, 2014).

Primates of Malaysia are clustered into 4 distinct families which are Hominidae (i.e. orangutan), super family Cercopithecoidea (macaque, langurs), Lorisidae (slow loris), and Tarsiidae (tarsier) (Groves, 2001). The family Cercopithecoidea has two sub-families which are Cercopithecinae and Colobinae. Subfamily Colobinae is the most diverse subfamily of primates in Malaysia that consists of genera *Presbytis*, *Trachypithecus* and *Nasalis*, (Groves, 2001). Genera *Presbytis* and *Trachypithecus* are commonly known as langurs, leaf monkeys, surili or locally known as ‘lutong’ (Md-Zain & Ruslin, 2012). There are five species of langurs in Peninsular Malaysia which are Dusky leaf monkey (*Trachypithecus obscurus*), Silvered leaf monkey (*Trachypithecus cristatus*), banded surili (*Presbytis siamensis*), Banded langur (*Presbytis femoralis*) and Schlegel’s Banded langur, (*Presbytis neglectus*) (Groves, 2001; Roos *et al.*, 2014).

P. neglectus is an endangered Colobine (Primate) in Johor and can be found ranging in southern part of Pahang and a small population found in Singapore (Md-Zain, 2004, Abdul-Latiff *et al.*, 2019). The population has been recently reported with fewer than 500 individuals in the selected areas; Ayer Tawar, Gunung Pantii, and Endau-Rompin National Park in Johor (Md-Zain *et al.*, 2008; Vun *et al.*, 2011; Abdul-Latiff *et al.*, 2019). Previously classified as subspecies *Presbytis femoralis femoralis*, *P. neglectus* was elevated as distinct species using molecular approach (Abdul-Latiff *et al.*, 2019; Abdul-Latiff *et al.*, 2017a). Generally, *P. neglectus* are herbivores but also consume fruits and seeds as well (Caton, 1990; Dolhinow & Fuentes, 1999; Nijboer & Clauss, 2006). However, Schlegel’s banded langur is rapidly decreasing largely due to the threat of habitat fragmentation, land use change, habitat degradation and exploited as bushmeat (Abdul-Latiff *et al.*, 2019). On top of these threats, Abdul-Latiff *et al.* (2019) stated that *P. neglectus* behaviour and ecology remained unknown. Information such as behavioral data on daily activities, feeding ecology, and population assessment are the fundamental knowledge needed for conservation and management purpose.

Feeding ecology is an essential knowledge for any conservation effort. The knowledge on the species plants, part of plants, and daily feeding pattern are the necessary details to be determined in feeding ecology topic. The langur is mainly known to be folivores, frugivores and granivore (Nijboer & Clauss, 2006; Dolhinow & Fuentes, 1999). Langurs diet usually consists of young leaves, flowers, fruits, seeds (Nijboer & Clauss, 2006). Feeding ecology data is important for the purpose of understanding basic physiological needs of any living creature. This knowledge can be

applied for conservation purpose whether *in situ*, *ex situ*, or captive situation. Conservation nowadays is progressively becoming the major concern of many parties across the globe.

Conservation of wildlife classically controlled by the authority in the state or country can have benefits to the wildlife yet it may have negative effects to the local communities (Hill, 2002). Centralized control for conservation effort has made it easier for policy making and law enforcement. However, it had effects on the local communities such as the display of pest behaviour by neighboring wildlife, the risk of disease transmission and bound to the law of conservation to the species (Hill, 2002). Effort such as establishment of protected area had led to conservation of species and again, had impacted the rural communities neighboring to the protected areas. They had to bear the burden of the costs of conservation which are loss of land, loss of access to resources, and threat of damage to crops, property, and human life (Bell, 1987). Alternatives to the dilemma is sustainable conservation or Integrated Conservation and Development Projects (ICDP). ICDPs distinguish themselves from other approaches by setting a dual and equal focus on biological conservation and human development (Alpert, 1996). Recent development in the methodology of conservation is merging the primate conservation effort with primate tourism activity.

Primate tourism in world has helped a lot of developing country in conservation of primates as well as generating income for the locals. The most lucrative instance is Gorilla Tourism in Volcanoes National Park, Rwanda where they had generated \$19.2 million USD to Rwanda that comes from 1.7 million visitors in 2018 (Bizimungu, 2019). The mountain gorilla (*Gorilla beringei beringei*) was also reported to finally reached 1,000 individuals with 604 individuals from Virunga Volcano National Park, Rwanda and 400 individuals from Bwindi Impenetrable National Park, Uganda (Max Planck Institute for Evolutionary Anthropology, 2018). The gorilla tourism did help in conservation in term of financial, awareness and community empowerment (Hatfield, 2005; Goldsmith, 2014). Local example of PrimaTourism is proboscis monkey ecotourism in western Sabah of Klias River and eastern Sabah of Lower Kinabatangan River (Bernard & Hamzah, 2006; Leasor & McGregor, 2014). The river cruise industry in Klias River involving proboscis monkey and fireflies proved to improve the local awareness and economy about the wildlife (Nasir & Hanafiah, 2017).

1.2 Problem statement

The fundamental problem and main motivation of this study is the absence of data on *P. neglectus* in Malaysia. The most recent data for langurs feeding ecology and behaviours are in Selangor (Ruslin *et al.*, 2019). MacKinnon and MacKinnon (1980) studied on feeding ecology of banded surili, *P. siamensis* in Kuala Lompat, Pahang but the study was done almost 40 years ago and differed from the main subject of this study which is *P. neglectus*. Therefore, the data is definitively very scarce.

Apart from that, the status of *P. neglectus* is nearly threatened based on IUCN, but with rapid conversion of land and habitat fragmentation of Johor, the status should be reviewed. Abdul-Latiff *et al.*, (2019) renounced that the population are massively fragmented and believed to survive more in the eastern part of Johor (Abdul-Latiff *et al.*, 2019). the only data available on population of *P. neglectus* in Malaysia are in Ayer Tawar (100 individuals), Kota Tinggi (58 individuals), Gunung Panti (18 individuals), and Endau-Rompin National Park (17 individuals). This proves that the population is uncommon to be found (Abdul-Latiff *et al.*, 2019). If further actions such as translocation to *ex-situ* site to be taken, the action will be reckless as no knowledge had been developed for the ecology and behaviour of *P. neglectus* prior to the action.

Not every forest constitutes of the same trees, nor every population of *P. neglectus* has of the same diet range. Studying the feeding ecology and behaviour can give insight on the list of plants selected as food, feeding ranging behaviour, part of plants eaten, and their daily activities and how *P. neglectus* behave according to their environment. The population selected in this study is that ranging in Kg. Johor Lama, Kota Tinggi, Johor. This population was chosen based on three main reasons; (1) the population is habituated to presence of human as the habitat is neighboring the village, (2) Kg. Johor Lama had been administered under Department of Museums Malaysia since 1970 which the land will take no further mega buildings and (3) there is report of rare pale morph of *P. neglectus* in the area (Department of Museum Malaysia, 2007). These reasons strengthen the rational of the study. In National Ecotourism Plan 2016-2025, Johor had been listed in the 60 proposed ecotourism cluster (MOTAC, 2017). Kg. Johor Lama was included in the regional cluster of Kota Tinggi-Sungai Johor-Desaru-Sedili (MOTAC, 2017). By developing PrimaTourism in the area, it will enhance the ecotourism industry in Sg. Johor. Comparing with the local case in Sabah, the villagers were willing to work with tourism sector (80%), value the proboscis

monkey (85%), and did not felt that proboscis monkey as bother to that village (90%) (Leasor & Macgregor, 2014). With reference to Borneo case, we would like to test the model of PrimaTourism in Kg. Johor Lama of Peninsular Malaysia. Furthermore, the area is already a tourism spot for heritage tourism and recreational fishing spot that gives a warm start for introducing PrimaTourism.

1.3 Objectives of the Study

- (i) To determine daily activity budget and feeding ecology of Schlegel's banded langur, *P. neglectus* in Kg. Johor Lama, Kota Tinggi, Johor, Malaysia
- (ii) To formulate PrimaTourism module using ecological data.
- (iii) To assess the perception on PrimaTourism from local community, nature guides and visitor in Kg. Johor Lama.

1.4 Scope of study

The scope of study covered the behaviour and feeding record of *P. neglectus* in Kg. Johor Lama, Kota Tinggi, Johor with an area of 19.3 km² using scan sampling method (Altman, 1974; Department of Irrigation & Drainage, 2016). The sampling started in February 2018 until February 2019 with 15 sampling days every month. The focal group of *P. neglectus* in Kg. Johor Lama, called Dara group will be explained further in Chapter 3. Study of daily activity budget and feeding ecology were based on active observation methodology covering the whole village area. No aerial supervision using drone was applied during the study.

Development of PrimaTourism for this study will cover quantitative and qualitative approaches. The quantitative survey was based on the model of assessment by Ismail *et al.* (2018) covering the visitor's reaction to Primate Trail product and the economic impact of tour guides before and after the initiation of PrimaTourism in Kg. Johor Lama. Qualitative approach was done by interviewing 5 selected nature guides on the development of PrimaTourism of Kg. Johor Lama following the methods by Curtin (2010). The interview was recorded in a written form. The development of PrimaTourism module was based on the ecological and behaviour data gained from this study by following the model by Kueh (2004) and

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