

Social Behaviors and Nuisance Activities of *Trachypithecus Obscurus* in Bukit Juru Penang, Malaysia

Karimullah*, Shahrul Anuar, Hafiz Muhammad Bakhsh, Abdul Ghafoor, and Taimur

Abstract—*Trachypithecus obscurus* are widely dispersed animals around the world. Their range and the geographical distribution are stretched from India to Peninsular Malaysia that requires special consideration from the perspectives of research and management. The behaviors of Dusky leaf monkeys were studied in the vicinity of the Kuala Juru Penang Malaysia in view to find out the daily activity budget and nuisance behaviors in the area. The field survey was conducted from March 2012 to May 2013 inclusive of intensive direct observation by using the scan sampling method. The chi-square test and Mann–Whitney *U* test demonstrated that the behaviors of *Trachypithecus obscurus* significantly fluctuate during the daily activity budget. This study revealed that *Trachypithecus obscurus* spend most of their time for eating (30%), followed by locomotion (22%), grooming (12%), fighting (9%), playing (8%), vocalization (4%), jumping (6%), nuisance (6%) and sexual behavior (3%). The qualitative results found that the Dusky leaf monkeys come down to the villages in search for food, pick items from the houses and disperse the rubbish bins as well. The *Trachypithecus obscurus* cause interruption in these areas by disturbing the local people. The rarely seen a strange type of nuisance behavior of these species is the entering into the houses in the early morning especially before the dawn. The relevant managements of the areas are encouraged to control these species and their behaviors for preserving and organizing the species both in forests and villages.

Keywords—Bukit Juru Penang, Management, Scan Sampling, *Trachypithecus obscurus*.

I. INTRODUCTION

THE Dusky leaf monkeys belong to the sub - family of Colobinae. These species are mostly arboreal [1-3]. The range of the geographical distribution of *Trachypithecus obscurus* is stretched from India to Peninsular Malaysia [4]. Dusky Leaf Monkeys are known as a spectacled leaf monkey because of their white color that surrounds their eyes like spectacles. *Trachypithecus obscurus* is known as Lotong Bercelak or Lotong mata puteh and Cengkong by the locals due to their distinctive physical characters [5]. The subspecies of *Trachypithecus obscurus* are *Trachypithecus obscurus halonifer*, which is the most common species of Peninsular Malaysia that cover the range from the northern part of Malaysia to Thailand [4].

Previously most of the primate research was concerned with an aspect of molecular study in support of human primate and non-human primates [6]. The specie of *Trachypithecus* was given more consideration for molecular systematics in Malaysia [7]. In Thailand, these studies were found incorporated part of *Trachypithecus obscurus* [8]. In Malaysia, the primate population studies were not given much attention due to previous research studies that dealt with genetics, ecology and molecular biology [6]. Most of the primatologist were also given a great impact on the ecology and behavior of primates both in open space and cages [9, 10].

The purpose of the current survey is to find out the social behaviors of free ranging specie of primate such as *Trachypithecus obscurus* in Bukit Juru Penang, Malaysia. For this purpose, a census of scientific investigation was taken on social behaviors of free ranging of Dusky leaf monkeys and compared with the previously assessed scientific research. The free ranging primates of Bukit Juru Penang were engaged in their daily activities in the natural ecological environment.

In Northern Region of peninsular Malaysia, these species are widely distributed, especially in the tropical rain forest across the island. Particularly these surviving species are found in a number of the hilly areas of Bukit Juru Penang, Malaysia. It has been observed that the natural activities of these primates take place in the open spaces and move freely. It is noticed that there is no comprehensive studies carried out on the macaques nuisance problem in Malaysia [11]. By undertaking this research, it has tried to examine the social behaviors of *Trachypithecus obscurus* in Bukit Juru Penang, Malaysia.

II. MATERIALS AND METHODS

A. Study Area

The study area of research was selected Bukit Juru, Penang, Malaysia (The geographical coordinates are 5°19'35.91"N and 100°24'31.89"E). Juru is a small manufacturing settlement in Central Seberang Perai, Penang, Malaysia. It is situated southwest of Bukit Mertajam and Perai. The township is served by the North–South Expressway Northern Route and connects the town to Butterworth and Georgetown where the latter is situated in Penang Island. The data were collected in the vicinity of the three main places in Bukit Juru Penang that is 1) Kampong Kuala Juru, 2) Kampong Sungai Semilang, and 3) Kampong Bukit Kecil. The free ranging species of *Trachypithecus obscurus* are available in abundance in this tropical rain forest and they use to enter into the villages and the human settled areas. The hill of Bukit Juru is surrounded by two villages such as Kampong Sungai Semilang and

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Kampong Kuala Juru. The Kampong Kuala Juru is situated adjacent to Hutan Rizab Bukit Juru at one side and Kampong Sungai Semilang on the other side. The Hutan Rizab Bukit

Juru is the dense forest area of Bukit Juru and it is difficult for people to enter the thick bushes and opaque forest (Fig I).



Fig. 1 A satellite map represents the location of Bukit Juru Penang, Malaysia (Adapted from Google Earth).

B. Study Subjects

This survey was carried out in March 2012 to May 2013. The species of *Trachypithecus obscurus* are found in search of food from different corners of the three human interaction sites known to be the research specified villages. The two troops of *Trachypithecus obscurus* were found in research areas, group one was composed on 16 individuals, and the members of group two were 13 individual. The detail about

the individuals, their descriptions and groups are given in table I. The group 1 was considered as habituated group, because of its individuals were not running or hiding in the bushes during data collection [12]. But the members of group 2 were not habituated as they were observed feeling shyness and entering into the jungle in the presence of the observers. So, it was not easy for the observers to record their behavior in the field [13].

TABLE I
THE OBSERVED GROUPS AND INDIVIDUALS OF *TRACHYPITHECUS OBSCURUS* IN BUKIT JURU PENANG.

Category	Groups	Description	No of individuals
Infants	1 & 2	Hanging to the abdomen of their mother	1 & 1
Juveniles	=	Smaller body size to sub-adults and active	7 & 3
Sub-adults	=	Comparatively smaller than adults	3 & 4
Adult Males	=	Bigger in body size	2 & 1
Adult Females	=	Relatively larger body size than sub-adults	3 & 4

C. Field Methods

First of all a round survey was carried out in the arrangement to familiarize with research subjects and to determine the types of activity patterns of the study subjects [14]. The first month was spent in first round survey to find out the area, where these primates existed. Scan sampling observation was used in thorough assessment for relatively more than one year. The data were collected from 0800h to

1800h where h represent the hour, 10h per day excluding a 1.5h break. Most of the data was recorded during the weekend. Each sampling sub-session was 15m (minutes)/h with 15 observations limited to scan sampling while the required time was used to write a brief note on the behaviors of the subjects. The observer was facing difficulties during the follow up of the group in a dense jungle and the arboreal movement of the study subjects. Most of the troops appearance was occurring in the early morning and the late evening. Focal animal

samplings were also employed on some of the occurrences to precisely collect the irregular trials to know the behavioral personas experienced as difficult to record during scan sampling [14].

D. Data Analysis

The observed data was recorded into the Microsoft Excel. The Percentages and frequencies were prepared among different behaviors with the use of pivot tables in Excel. Then the data was transferred to the Statistical Package for Social Sciences (SPSS) version 20, to test the statistical significances of the variables. The significant value of the findings was fixed as the P-value should must be less than 0.05 ($p < 0.05$). A non-parametric Chi-square test was used for the probabilities of variables as this non-parametric test is appropriate to analyze the significance of variables, which does not follow the normal distribution [15].

The regularity assumption was not met in the researchers' data set; therefore we used the two tailed Mann–Whitney *U*-test to compare the values for forest and villages with the activity budget of *Trachypithecus obscurus*. Partial correlation of activities was taken in the normal distribution and the relationship between the behaviors.

III. RESULTS

The study was carried out about the social behaviors and nuisance of *Trachypithecus obscurus* in Bukit Juru Penang, Malaysia that exhibited different behaviors during the survey as shown in the Figure II. These behaviors of *Trachypithecus obscurus* such as eating, locomotion, grooming, playing, jumping, nuisance, vocalization, sex and fighting were found. The frequency of the highest behavior was found eating (30%) and the lowest behavior was sex (3%) (Fig II).

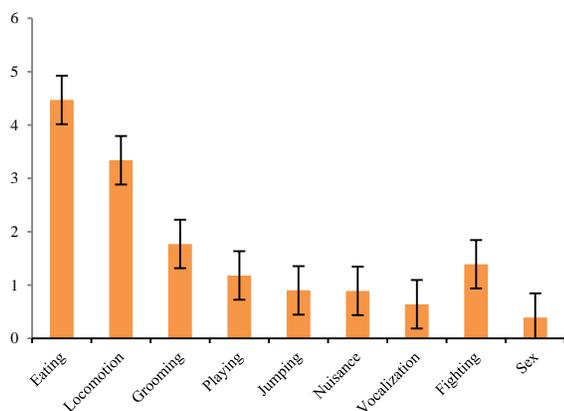


Fig . 2 Frequencies and standard error of the behavior of *Trachypithecus obscurus* in Bukit Juru, Penang, Malaysia

All the behaviors of *Trachypithecus obscurus* were found significant in the areas of data collection as the p-value were found < 0.05 . The total value of the Chi-square for the behaviors of *Trachypithecus obscurus* were found $X^2 = 675.73$. The highest number of mean was found in the behavior of eating (4.47) and the less number of means were calculated for the behaviors of sex (0.39) (Table II). It was

found that *Trachypithecus obscurus* occur frequently in both of the areas as eating was found significant (Mann – Whitney *U* test: $Z = -2.69$, $p < 0.01$), followed by Moving (MW *U* test: $Z = -2.623$, $p < 0.01$), Grooming (MW *U* test: $Z = -3.581$, $p < 0.01$), Playing (MW *U* test: $Z = -1.777$, $p = 0.07$), Jumping (MW *U* test: $Z = -4.339$, $p < 0.01$), Nuisance (MW *U* test: $Z = -2.279$, $p = 0.02$), Vocalization (MW *U* test: $Z = -3.393$, $p < 0.01$), Fighting (MW *U* test: $Z = -0.346$, $p = 0.73$) and Sex (MW *U* test: $Z = -1.707$, $p = 0.08$) (Table III).

Table IV, shows the partial correlation among different behaviors of *Trachypithecus obscurus* in Bukit Juru Penang, Malaysia. The partial correlation gives the values of two types of partial correlation such as, 1) Negative partial correlation and 2) Positive partial correlation. The negative partial correlation explains the opposite direction, such as (Decreasing) between two behaviors and the positive partial correlation explain the similar direction (Increasing). For example, the nuisance behavior was found negative partial correlation with eating (-0.329) and highly significant. The Moving was found as (-0.427) and highly significant, Playing (-0.072) and sexual behavior was observed as (-0.100). The positive partial correlation was found in the form of Jumping as (0.562) and highly significant. The Grooming was found (0.017) and the Vocalization (0.470) and highly significant. In addition, the behavior of Fighting was found at (0.001) (Table IV).

IV. DISCUSSION

The activity budget of *Trachypithecus obscurus* is comparatively insufficient due to its shyness, greater stealth, less predictable behaviors and dispersive abilities [13]. Previously the studies of primates were typically concerned molecular aspects in favor of human primates and non-human primates in Malaysia [11]. Ernie-Muneerah, Ahmad [7] pointed out that the studies on molecular systematics of Malaysian primates were also given attention at the specie of *Trachypithecus*,

Therefore, it is evident that the current study is concerned with the activity budget and nuisance behaviors of *Trachypithecus obscurus* in Bukit Juru Penang, Malaysia. It was found that the eating behavior approximately covered one third of the daily activities budget of *Trachypithecus obscurus* in Bukit Juru Penang. The percentage calculated was 30% as shown in (Figure II) with highest mean 4.47 (Table II) compared to other activities. The behavior of eating has negative impact on the other activities such as the increasing behavior of eating is the cause of decreasing the other activities. This behavior was found significant in the area of forest and villages. Scholars such as (Md-Zain & Ch'ng, 2011) analyzed the eating behavior of *Trachypithecus obscurus* which was 39% of their total activity budget and explained that during feeding the other activities were declining. As made known that the previous studies have supported the current research. Another study found about the monkeys that adult males spent 22% time in feeding, adult females 52% and juveniles of both sexes 58%. These time periods were spent on both the areas of forested and in-town areas [16]. So, these studies have close proximity to the current study.

TABLE II
STATISTICAL TEST: CHI-SQUARE VALUES OF BEHAVIORS OF *TRACHYPITHECUS OBSCURUS* IN BUKIT JURU PENANG, MALAYSIA.

Behaviors	Mean	Std. Deviation	Chi-square	P-value*
Eating	4.47	3.24	102.69	<0.01
Locomotion	3.34	2.32	017.77	0.02
Grooming	1.77	1.49	023.80	<0.01
Playing	1.18	0.87	056.96	<0.01
Jumping	0.90	0.83	032.85	<0.01
Nuisance	0.89	0.88	032.85	<0.01
Vocalization	0.64	0.93	110.16	<0.01
Fighting	1.01	1.26	089.74	<0.01
Sex	0.39	0.88	208.92	<0.01

* $X^2 = 675.74$, $p < 0.01$

TABLE III
STATISTICAL ANALYSIS OF BEHAVIORS AND THEIR COMPARISON BETWEEN FOREST AND VILLAGE AREAS.

Behaviors	Areas	Mean	Std. Deviation	Mean Rank	Z - value	p-value*
Eating	Forest	4.47	3.24	54.25	-2.690	<0.01
	Village			38.34		
Locomotion	Forest	3.34	2.32	43.79	-2.623	<0.01
	Village			59.58		
Grooming	Forest	1.77	1.49	43.00	-3.581	<0.01
	Village			63.22		
Playing	Forest	1.18	0.87	45.64	-1.777	0.07
	Village			55.83		
Jumping	Forest	0.90	0.83	40.84	-4.339	<0.01
	Village			65.58		
Nuisance	Forest	0.89	0.88	44.72	-2.279	0.02
	Village			57.69		
Vocalization	Forest	0.64	0.93	54.98	-3.393	<0.01
	Village			36.86		
Fighting	Forest	1.01	1.26	48.35	-0.346	0.73
	Village			50.31		
Sex	Forest	0.39	0.88	46.54	-1.707	0.08
	Village			54.00		

*Mann-Whitney *U* test

TABLE IV
THE PARTIAL CORRELATION OF DIFFERENT BEHAVIORS WITH RESPECT TO FOREST AND VILLAGES.

Behaviors	Locomotion	Grooming	Playing	Jumping	Nuisance	Vocalization	Fighting	Sex
Eating	-0.089	-0.338**	-0.170	-0.501**	-0.329**	0.580**	-0.202*	-0.249*
Locomotion	-	-0.042	-0.371**	-0.308**	-0.427**	-0.162	-0.358**	-0.137
Grooming	-	-	0.118	0.150	0.017	-0.048	-0.202*	-0.094
Playing	-	-	-	0.328**	-0.072	0.142	-0.064	-0.149
Jumping	-	-	-	-	0.562**	0.352**	-0.074	-0.065
Nuisance	-	-	-	-	-	0.470**	0.001	-0.100
Vocalization	-	-	-	-	-	-	0.173	0.000
Fighting	-	-	-	-	-	-	-	0.521**

*Correlation is significant at the 0.05 level

**Correlation is highly significant at the 0.01 level

The locomotion behavior was found the second highest behavior of *Trachypithecus obscurus* in Bukit Juru Penang along with the percentage of 22% out of the total activity budget. An observation has revealed that the monkeys used most of their time for moving with the percentage of 20.27% [17]. The present survey was closely related to these behaviors along with their percentages. Another behavior was grooming, in which the percentage was found as 12% of the total activity budget and the mean was calculated 1.77. The mean rank was found as $Z = -3.58$ in the forest and in the human settled areas. The behavior of grooming was found highly significant at $p < 0.01$ and was positively correlated with other three activities such as, 1) Playing, 2) Jumping, and 3) Nuisance. A research carried out by [18] showed that maximum number of macaques groom each other throughout the activity budget. However, [19] observed that macaques expend lesser time of their activity budget for grooming; the variation could be due to the data collection method. The method used to collect data in the previous research is seasonal.

The playing and jumping behavior of *Trachypithecus obscurus* was examined at 8% and 6% respectively. The behavior of playing was found to correlate positively with jumping and vocalization and the *Trachypithecus obscurus* was observed jumping on each other during play and exhibited vocal calls. A study by [17], explained that monkeys spend 10.50% time on playing. Juvenile and infant were found frequently in this activity.

The Jumping was found significant ($Z = -4.339$, $p < 0.01$) and has a positive correlation with playing, grooming, nuisance and vocalization. Social behaviors of the Dusky leaf monkeys contain wrestling, sham-biting, jumping on or over, run after, fleeing, and tail erecting. This happens when a member jump in front of group members and kicks another one or several times. This activity serves to communicate aggression [10]. The study has closed proximity to present research.

The percentages of nuisance and vocalization behaviors were calculated as 6% and 4% respectively. These activities were found significant and the correlation was positive and highly significant between these two behaviors. Trull and Prinstein [6] supported and categorized the nuisance behavior of monkeys such as picking up items from trash bin, 2) Leave trash around, 3) Enter a room take something, 4) Disturbed people, 5) Damages facilities and 6) Enter a cafeteria. This is approximately similar as happened in the present survey. Vocalization has positive correlation with playing of *Trachypithecus obscurus* in Bukit Juru Penang. Macaques repeatedly produced vocalization at the time of playing. This study is comparable to [6, 20, 21] who found that the vocalizations were given by monkeys during their playing behavior. The monkeys also observed to produce vocalizations during sexual behavior. This study was supported by previous research that observed the vocalizations of monkeys during copulation and associated with the reality that during sex females produced vocal calls which is a hormonal effect [22].

The fighting activity of *Trachypithecus obscurus* was observed 9% of the study sites. This behavior has positive correlation with sexual behavior. These findings conflicted with the previous research which was carried out by [6] who

observed that sexual behavior is the activity that take place during fighting. Fighting behavior of the *Trachypithecus obscurus* in Bukit Juru Penang, is frequently performed to grab food and partners for sex. This study was supported by [23] who observed that the fighting activity take place to get food and partners. Male macaques are considered to be more aggressive in fighting than female.

This adds to the conclusion that the reason of such aggression is the desires of males to dominate and wish to become the leader of the troops [24].

The researchers found the sexual activity as the last behavior that was observed and the percentage was found very least such as (3%) as compare to other activities. Females were observed with desire only dominant males to mate. The reason is that female wants to give birth to a healthy infant and security under the dominant males [25]. This support can strengthen further with the study of [26] who found that dominant males were the father of approximately all the infants in their troop. Males of *Trachypithecus obscurus* were observed to smell the female sexual organ before the sexual behavior. It is to make sure that the females give preference to mate or not. This study was supported by [24] who observed that male macaques frequently exhibit mating behavior more than females.

V. CONCLUSION

It is concluded that the presence of *Trachypithecus obscurus* in the villages caused lots of problems to human especially, to the local residents of the nearest villages of Bukit Juru. A new behavior of Dusky leaf monkeys was found in the data collection locale, this species stealing the thing and food from houses that are situated near around the forest before the dawn.

According to the achieved results of the current survey, the most frequent daily activity budgets of the *Trachypithecus obscurus* were eating, moving and grooming. Sexual behavior was rarely observed at the study sites. In addition, the importance of the study delivers the instructions and understandings about the daily activity budget of *Trachypithecus obscurus* to guiding the successful organizations for further protection of this specie. It is recommended that the management should continue their efforts to control these species regarding the disturbance of the social lives of the local residents.

ACKNOWLEDGMENT

We would like to thank the School of Biological Sciences, Universiti Sains Malaysia for providing the field work transportation facilities. The heartfelt appreciation goes to the University Sains Malaysia for the University Grant Scheme (RU-PRGS, USM). We are thankful from the bottom of our hearts to the Commonwealth Scholarship and Fellowship Plan provided by the Ministry of Higher Education Malaysia. The researchers are indebted to Mr. Mohd Anwar, Mr. Qaisar Khan and Mr Sajid Khan for their invaluable advices and expertise in research methods and other relevant subjects on carrying this research work.

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