

HUMAN–LONG-TAILED MACAQUE INTERACTIONS AND ECOTOURISM POTENTIAL IN THE GUNUNG KERIANG RECREATIONAL PARK, KEDAH, PENINSULAR MALAYSIA

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ABSTRACT

The long-tailed macaque (*Macaca fascicularis*) is among the Cercopithecidae primates that can be found in Gunung Keriang Recreational Park (GKRP), Kedah, Peninsular Malaysia. Its population size, human–primate interactions, and public perceptions have never been revealed. This study aimed to estimate the population size, evaluate interactions between macaques and visitors, determine the perception of visitors and locals toward primates, and assess the potential of GKRP as ecotourism site. The population size of long-tailed macaques was estimated through census walk, whereas the interactions between visitors and macaques were evaluated through scanning sampling technique. The perception of visitors and local people and the potential of GKRP as ecotourism site were determined through a questionnaire. Results indicated that 72 individuals of *M. fascicularis* were found ranging in GKRP. The interactions between visitors and macaques in GKRP were primarily constituted of positive interactions. Contrast perceptions between visitors and local people toward GKRP primates were obtained that were due to different experiences with primates encountered by both respondent groups. Visitors were inclined to accept macaques, whereas a majority of locals dislike them. GKRP has a potential to become an established ecotourism site considering values this recreational park has given to the visitors. Research findings were anticipated to increase the knowledge on human–primate interactions and ecotourism management that ultimately contributed toward the management of long-tailed macaques and their natural habitat.

Keywords: *Macaca fascicularis*, long-tailed macaques, human–primate interaction, ecotourism

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INTRODUCTION

As the human population increases exponentially over time, there is an obvious need for space for more human settlements. Thus, deforestation can indirectly cause the available ranging domain for most primates to be reduced (Fuentes and Hockings, 2010). Reduction of primary food and limitation of safe habitat forced primates to live in human vicinity (Fuentes and Hockings, 2010). This adversity has also affected Malaysian Cercopithecidae primates as they are often observed to adapt and live in anthropogenic areas (Md Zain *et al.*, 2010a; Md-Zain and Ch'ng, 2011; Hambali *et al.*, 2014).

Cercopithecidae or Old World Monkey can be classified into two major subfamilies, namely, Cercopithecinae and Colobinae. In Peninsular Malaysia, many studies on Cercopithecidae particularly the long-tailed macaque (*Macaca fascicularis*) and the dusky langur (*Trachypithecus obscurus*) have been conducted to document their population status (Karuppannan *et al.*, 2014; Md-Zain *et al.*, 2010b), social organization (Anuar

and Karimullah, 2011), activity budget (Md-Zain *et al.*, 2010b), habitat use and ranging pattern (Hambali *et al.*, 2014; Hambali *et al.*, 2016; Mohd-Daut *et al.*, 2021), feeding ecology (Ruslin *et al.*, 2019; Mohd-Daut and Md-Zain, 2021), and population genetics (Abdul-Latiff *et al.*, 2014a,b). As for the context of interactions between human and primates, studies were generally conducted on the human–primate conflict (Hambali *et al.*, 2012; Md-Zain *et al.*, 2014; Abdul-Nasir *et al.*, 2021), monkey school (Ruslin *et al.*, 2017), and social interactions between human and primate (Md-Zain *et al.*, 2010a). Relatively, the occurrence of human–primate interactions is inevitable when human and primate live within the same area especially in the human-influenced landscape (Sha and Hanya, 2013). Hence, this study is anticipated to contribute in refreshing the studies of human–primate interactions and the potential primate ecotourism in Malaysia.

Primate ecotourism has been incorporating primates as main attractions for visitors (Matheson, 2017). Primate tourism has been viewed as an ecotourism provided that the endeavor occurs in an undisturbed

natural area in addition to involving the experiences of tourist with wildlife and the rationale of tourist for traveling to such place (Matheson, 2017). Primate tourism is a product of community-based conservation initiative along with the potential to attain primate conservation goals in conjunction with financial and educational benefits for local communities (Berman *et al.*, 2007; Hill, 2002).

Macaca fascicularis is the most common Cercopithecinae in Peninsular Malaysia (Anuar and Karimullah, 2011). The long-tailed macaques adopt a semi-terrestrial lifestyle and can be commonly found near the coastal lowland forest; primary or secondary forest and mangrove swamp (Ruslin *et al.*, 2019). As they occupy a wide range of habitat, the long-tailed macaques are ecologically opportunistic and have adapted particularly well in living sympatrically with human (Gamalo *et al.*, 2019). In Peninsular Malaysia, several primate ecotourism sites have been identified and studied including Bukit Malawati Kuala Selangor (Hambali *et al.*, 2014; Mohd-Daut and Md-Zain, 2021) and Penang Botanical Gardens (Md-Zain and Ch'ng, 2011). However, human-primate interaction survey at a recreational park based on geopark site in Peninsular Malaysia has yet to be revealed. Gunung Keriang is one of the best geopark attraction sites for visitors in Kedah as the hill is composed of limestone aged from Early

Permian to Early Triassic and the presence of free long-tailed macaques (Metcalf, 1984). Thus, this study aimed to determine the population size of long-tailed macaques (*M. fascicularis*) as well as the human-primate interactions that occur in Gunung Keriang Recreational Park (GKRP). In addition, visitors' and locals' perception toward the free-ranging primates and values that they perceived at GKRP were evaluated.

MATERIALS AND METHODS

Study site and focal group: Primate survey was focused at GKRP, Kedah, Peninsular Malaysia (Figure 1). GKRP has become a popular recreational park and interface zone for human and primates. This park has convenient tracks for the observers to perform the behavioral data collections as long-tailed macaque (*M. fascicularis*) and dusky langur (*T. obscurus*) were commonly identified to be free-roaming. The primate group size was obtained through census walk along the existing roads in GKRP. All the primate group was named according to the zone (Zone A and Zone B) where they are commonly found. Zone A is situated near the main entrance where the Muslim graveyard, crystal shops, and medium-sized field are located, whereas Zone B comprises a playground, larger field, food stalls, and a man-made pond.



Figure 1. The Gunung Keriang site attracts tourists to its recreational park and long-tailed macaques.

Data collections were obtained through direct sighting in the morning (0800–1200 h) and in the evening (1500–1800 h) from April to September 2019. To ensure that the data acquired were accurate, repeated census and tally counter were used during the counting. Individual characters such as the shape of the face and any visible defects or injuries were used to differentiate among individuals and to avoid multiple counting. Sex and age were recorded based on body size assessment, genitalia, and level of development of primary and secondary sex organs (Sha *et al.*, 2009). A relative age scale and sex determination for *M. fascicularis* were based on Schillaci *et al.* (2007).

Behavioral interaction data collections: Human–primate interaction survey was focused only on long-tailed macaques. Dusky langurs were not seen to be involved in any interactions with human that fit their native shy behavior (Md-Zain and Ch'ng, 2011). The observation was slow as the time of waiting for the interaction to occur was extended in which the interface event commonly happens in the evening when visitors started to visit the park. Behavioral interaction was observed using scan sampling technique (Altman, 1974) for every 30 s for 10 min with 5 min rest. Observations on all macaques were only possible when the study groups are present within the GKR. The macaques sometimes spent their time on the limestone mountain that was inaccessible for the observer. Observation was stopped when the macaques were out of sight. Two different categories of human–primate interactions that were recorded comprised macaques-to-visitors and visitors-to-macaques. The categories of social behaviors included monitoring and watching, approaching, feeding, avoidance, and aggressive behavior (Hanson and Riley, 2017; Kaburu *et al.*, 2019; Md-Zain *et al.*, 2010a). Behavioral data collections were collected along selected routes following the presence of high human and macaque activities that include two zones (Zone A and Zone B) in GKR. Data were analyzed using Kruskal–Wallis test to determine the statistical differences.

Questionnaire survey: Questionnaires were distributed to visitors and local residents in GKR. The questionnaires were constructed to evaluate i) rationale for visiting GKR, ii) perception and attitudes toward the free-ranging primates, and iii) opinions on the potential of ecotourism in GKR. As for the rationale of visiting the park, the section was only administered to the visitor respondents. The answers for the questions were constructed according to Likert scale: strongly agree, agree, moderately agree, disagree, and strongly disagree. Additionally, the aspect of knowledge regarding primates that interest respondents is investigated. As for the perception and attitude toward primates' section,

questions were assigned into five dimensions according to previous studies on human–primate interactions (Kumara *et al.*, 2018; Lee and Davey, 2015; Sengupta and Radhakrishna, 2018; Thanh An *et al.*, 2018). A total of 14 questions were posed to measure the perception and attitude toward macaques in which items 1–2 belong to the dimension of knowledge, items 3–4 belong to the dimension of the value of enjoyment, items 5–7 belong to the dimension of fear and expectation, items 8–11 belong to the dimension of nuisances, and items 12–14 belong to the dimension of attitude toward the macaques. A total of 100 feedbacks were collected from the visitor group, whereas only 51 feedbacks were collected from the local group.

RESULTS

Cercopithecidae of GKR: Two groups of *M. fascicularis* were identified to be roaming in GKR. The survey counts for *M. fascicularis* in Zone A were 44 individuals, whereas 28 individuals were in Zone B (Table 1). Both social units are multimale–multifemale and habituated to human and anthropogenic food sources. The accounted age structure of the long-tailed macaques in both zones was 26.4% adults, 25% sub-adults, 36.1% juveniles, and 12.5% infants. It was calculated that the sex ratio was 1.71 adult females per adult males. Immature macaques that constituted of sub-adults, juveniles, and infants accounted for 73.6% of the population, with the ratio of immature individuals per adult of 2.79. Only one group of *T. obscurus* was identified to be roaming around in GKR. There were 35 dusky langurs counted that constituted of 31.4% adults, 25.7% sub-adults, 34.3% juveniles, and 8.6% infants. The ratio of the immature individuals to the adults is 2.18 with 68.6% of immature langurs living in GKR and 1.2 of adult females per group. The group often split up into a few small groups in the morning to forage when there is less visitor in the park.

Interaction between macaques and visitors: The interactions between visitors and macaques happened inconsistently and usually occurred in the evening. The Kruskal–Wallis one-way analysis of variance (ANOVA) test showed significant variations ($p < 0.00$, $p = 62.37$, $df = 4$, $\alpha = 0.05$) between the distribution of frequency and the behavior elicited by macaques during the interface event with human. During the presence of visitors, macaques were observed to elicit monitoring and watching behaviors the most with 55.36%, followed by feeding (22.7%) and approaching (20.77%) (Figure 2). Avoiding and aggressive behaviors were accounted as the least produced interactions by macaques with 1.07% and 0.11%, respectively.

Table 1. Long-tailed macaque and dusky langur individual ages around the Gunung Keriang.

Social unit ID	Adult male	Adult female	Sub Adult	Juvenile	Infant	Total
Long-tailed macaque (ZONE A)	4	6	15	14	5	44
Long-tailed macaque (ZONE B)	3	6	3	12	4	28
Total	7	12	18	26	9	72
Dusky langur	5	6	9	12	3	35

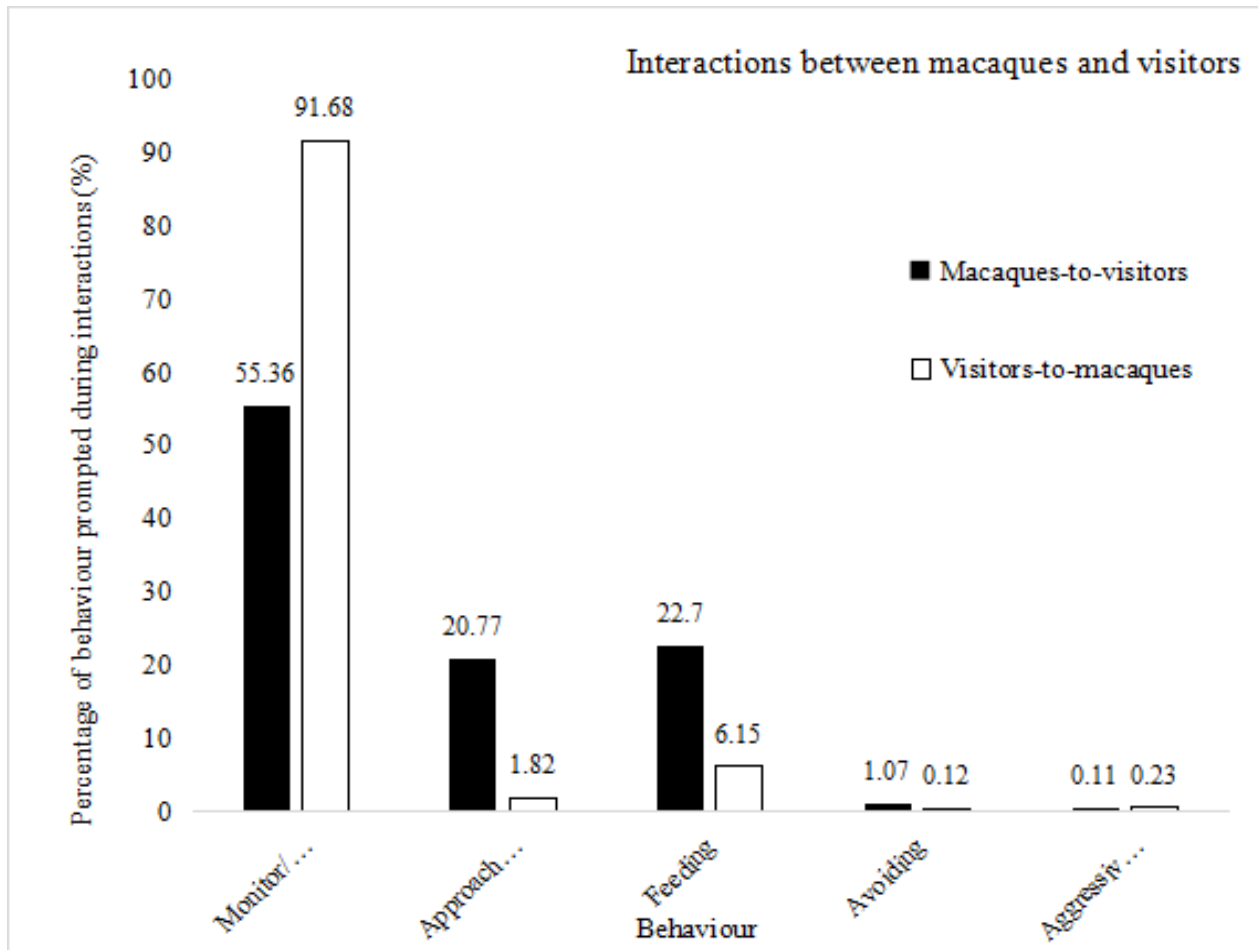


Figure 2. Long-tailed macaques' behavior during interactions of macaques and visitors.

There was also a significant difference between the distribution frequency and the behavior elicited by visitors during the interface event with macaques ($p < 0.00$, $p = 62.04$, $df = 4$, $\alpha = 0.05$). The prevalent social interactions prompted by the visitors toward the macaques were monitoring and watching (91.68%), whereas feeding, approaching, and aggressive behavior were allocated for 6.15%, 1.82%, and 0.23%, respectively. In addition, visitors were observed to show 0.11% of avoiding interactions toward macaques that denote avoiding as the least frequent interactions prompted by visitors toward macaques. Additionally, a statistically positive weak correlation between the frequency of macaques-to-visitors interactions and the

frequency of visitors-to-macaques interactions was found ($r = 0.336$, $n = 11200$, $p < 0.001$, Figure 3). This suggests that the increase in the frequency of visitor-to-macaque interactions corresponded with the increase of macaque-to-visitor interactions.

Perception toward macaques: Cronbach's alpha for all questions in this section scored 0.887 that suggests that the items have relatively high internal consistency. Kruskal–Wallis one-way ANOVA describes that there were significant differences between groups of respondents with several items enquired. All dimensions except the attitude toward macaques contained at least

one item that was significantly different between groups of respondents (Table 2).

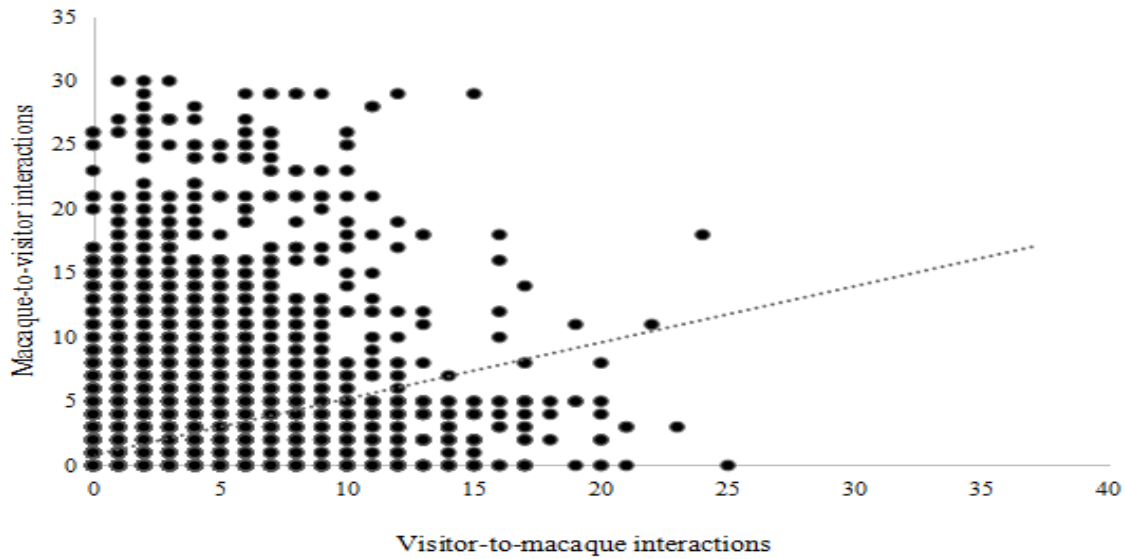


Figure 3. Positive relationship between the frequency of macaques and visitors' interactions.

Table 2. Perception and attitudes toward macaques across groups.

Item (Cronbach's alpha: 0.887)	Median (IQR)		Kruskal-Wallis	
	Visitor	Local residents		p-value
I am aware of the presence of macaques in Gunung Keriang.	5 (1)	4(1)	6.23	0.013*
I can recognize macaques very well.	3 (1)	4(2)	7.66	0.006*
I like the presence of macaques in Gunung Keriang.	4 (2)	2(2)	48.57	0.000*
I like the response prompted by the macaques when they were provisioned with food.	4 (2)	4(2)	5.96	0.015*
I am not afraid of macaques in Gunung Keriang.	4 (2)	3(2)	16.35	0.000*
I can cross a group of macaques without fear.	4 (1)	3(2)	2.14	0.143
The macaques in Gunung Keriang are tame.	3 (1)	3(2)	1.71	0.191
I did not observe any nuisances of macaques at Gunung Keriang.	4 (2)	2(2)	33.69	0.000*
I have never been disturbed (chased or bitten) by macaques in Gunung Keriang.	4 (2)	4(2)	6.02	0.014*
I have never seen other people being disturbed (chased or bitten) by macaques in Gunung Keriang.	4 (2)	2(1)	25.88	0.000*
My stuff has never been stolen by macaques.	4 (2)	2(2)	12.61	0.000*
I think people should feed macaques in Gunung Keriang.	4 (2)	3(2)	6.96	0.008*
I always bring food to feed the macaques.	3.5 (2)	3(2)	4.56	0.033*
I feed the macaques in Gunung Keriang.	4 (3)	3(2)	4.40	0.036*

Most of the respondents indicated agreement that they were aware of the presence of macaques in GKRP (Visitor: Mdn = 5, IQR = 1; Local: Mdn = 4, IQR = 1). However, there were disparities between groups of respondents in which most visitors stated that they were unsure (Mdn = 3, IQR = 1), whereas local residents generally agreed (Mdn = 4, IQR = 2) that they can discriminate *M. fascicularis*. Opinions were also divided among respondents in which many visitors expressed agreement (Mdn = 4, IQR = 2), whereas local respondents showed disagreement (Mdn = 2, IQR = 2) in denoting likeness toward the presence of macaques. In

perceiving that macaques hold the value of enjoyment, both groups of respondents stated agreement that they like the responses elicited by macaques during food provisioning activity (Visitor: Mdn = 4, IQR = 2; Local: Mdn = 4, IQR = 2).

With respect to fear, most of the visitors (Mdn = 4, IQR = 2) were not afraid and can cross macaque troops without fear (Mdn = 4, IQR = 1), whereas local residents were mostly neutral (Mdn = 3, IQR = 2). However, in signifying that macaques were tame, both groups of respondents appeared unsure (Visitor: Mdn = 3, IQR = 1; Local: Mdn = 3, IQR = 2). As for the aspect of nuisances,

results indicated that macaques did not cause disturbances to the park in which most visitors agreed (Mdn = 4, IQR = 2), whereas local residents stated otherwise (Mdn = 2, IQR = 2). Both visitors and locals admitted never been chased or bitten by macaques (Visitor: Mdn = 4, IQR = 2; Local: Mdn = 4, IQR = 2). Opinions were also split between visitors and locals in denoting that their things have not been stolen by macaques in which most visitors agreed (Mdn = 4, IQR = 2).

Many visitors believed (Mdn = 4, IQR = 2), whereas half of local respondents were uncertain (Mdn = 3, IQR = 2) that the macaques should be provisioned with food. Despite that, both respondent groups showed indecisiveness in prepared food to be given to macaques (Visitor: Mdn = 3.5, IQR = 2; Local: Mdn = 3, IQR = 2). With respect to proclaiming that the respondents fed the free-roaming macaques, the result was polarized among the visitors, although most of them agreed in doing that

(Mdn = 4, IQR = 3). As for the local respondents, they were discovered to be neutral in denoting that they have been feeding the macaques before (Mdn = 3, IQR = 2).

Ecotourism potential in GKRP: Kruskal–Wallis test shows no significant differences measured on motivation and rationale of respondents in deciding to come to GKRP (Table 3). A large group of respondents agreed that their motivation of going to the park was to indulge in the natural environment as well as to get away from a busy life. They were also aware about the presence of macaques prior to coming to the park (Mdn = 4, IQR = 1). Many visitors agreed in visiting the park to see the free-roaming macaques (Mdn = 4, IQR = 2). With respect to outdoor and recreational activities as the motivation in coming to GKRP, the responses given by most of the visitors strongly agreed (Mdn = 3.5, IQR = 1). Moreover, almost all of the respondents noted that their visitation to the park was voluntary (Mdn = 5, IQR = 0).

Table 3. Visitor’s rationale visiting Gunung Keriang Recreational Park.

Item	Median (IQR)	Kruskal-Wallis	
		p-value	
I visit Gunung Keriang to see the natural environment.	4(1)	1.13	0.889
I visit Gunung Keriang to see the macaques.	4(2)	4.69	0.321
I visit Gunung Keriang for relaxation and to get away from a busy life.	4.5(1)	2.99	0.560
I visit Gunung Keriang for hiking/exercise.	3(2)	4.52	0.340
I visit Gunung Keriang voluntarily, not forced by anyone.	5(0)	8.41	0.078

Kruskal–Wallis one-way ANOVA described significant differences across groups of respondents on every query in the questionnaires (Table 4). Cronbach’s alpha for the items addressed in this section was 0.801 that indicates a reliable scale. The majority of visitors strongly agreed, whereas locals appeared to indicate agreement that the presence of primates does not destruct the sight in GKRP (Visitor: Mdn = 5, IQR = 1; Local: Mdn = 4, IQR = 2). Both groups also agreed that it is worthwhile to visit the park and watch the wild primates

(Visitor: Mdn = 4, IQR = 1; Local: Mdn = 4, IQR = 2). As for proclaiming that the park has the potential to be a primate tourism site, both groups agreed about the matter (Visitor: Mdn = 5, IQR = 1; Local: Mdn = 4, IQR = 0). The respondents from both visitor and local groups also agreed visiting the park again (Visitor: Mdn = 5, IQR = 1; Local: Mdn = 4, IQR = 0). Both groups of respondents also agreed on the necessity to preserve the natural environment for future generations to see wild primates (Visitor: Mdn = 5, IQR = 1; Local: Mdn = 4, IQR = 0).

Table 4. Perception of visitors and local residents on Gunung Keriang Recreational Park.

Item	Median (IQR)		Kruskal-Wallis	
	Visitor	Local residents	p-value	
The presence of macaques and langur does not spoil the view at Gunung Keriang.	5(1)	4(2)	32.74	0.000*
It is worth visiting Gunung Keriang to see the macaque’s and langur’s behavior.	4(1)	4(2)	20.13	0.000*
Gunung Keriang might be a potential primate tourism site.	5(1)	4(0)	30.36	0.000*
I will visit Gunung Keriang again in the future.	5(1)	4(0)	8.24	0.004*
If we do not preserve the natural environment well, the chances for our future generations to see wild primates (e.g., macaques and langurs) will progressively decrease.	5(1)	4(0)	29.70	0.000*

Note: * signifies significant differences across groups (group = visitors, local residents) (alpha = 0.05).

Respondents’ interest is varied on the long-tailed macaques of GKRP. They wanted to know more on the behavior of the primates (N = 72, 47.68%) and human–primate relationships (N = 41, 27.15%). Other aspects that constituted of human’s effect, primates’

relationships among each other, threats, and reason why primates are roaming in the area scored 3.31% (N = 5), 7.28% (N = 11), 5.3% (N = 8), and 9.27% (N = 14), respectively (Figure 4).

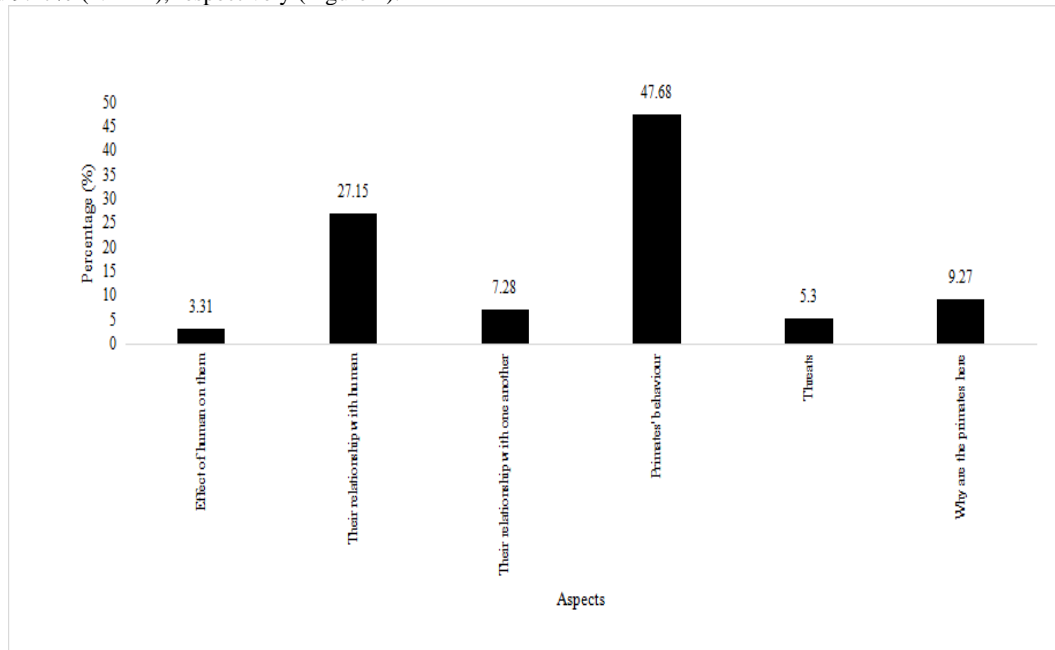


Figure 4. Respondents' interest regarding primates in Gunung Keriang Recreational Park.

DISCUSSION

Primates of GGRP: The 72 accounted macaques for both groups were not considered as high-density group. This is probably influenced by the GGRP size that is a small fragmented recreational park. The average individual of wild non-provision *M. fascicularis* was accounted to be an average of 30 individuals with few cases exceeding 40 individuals (Van Schaik *et al.*, 1983). A group size of macaques that has approximately 100 individuals is extremely large, and this generally occurs due to the high density of accessible and provisioned anthropogenic food (Hansen *et al.*, 2015). *M. fascicularis* has been acknowledged to adapt living in an area within human vicinity and human-impacted landscapes (Hambali *et al.*, 2012; Sinha and Vijayakrishnan, 2017), and this circumstance did occur in GGRP. Both macaque and langur groups adopted a sympatric lifestyle in GGRP and adapted in tolerating each other's presence in the same habitat (Ruslin *et al.*, 2019). No hardly any conflicts were observed between the long-tailed macaques and dusky langurs in GGRP. Interspecific competition on resources could induce conflicts between different species in the same habitat. Ruslin *et al.* (2019) demonstrated dietary overlap between these two groups that then suggested that the reason for low resources competition was due to different food alternatives. *T. obscurus* could easily shift to eating leaves, whereas *M. fascicularis* could shift to anthropogenic food, although both species adopted similar dietary preferences on fruits (Ruslin *et al.*, 2019).

Human–primate interactions: The macaques were inclined to roam in the park when there were food provisioned activity and presence of visitors. This shows that the adaptation of macaques being concurrent with the presence of visitors was likely led by the food provisioning activity. However, macaques in GGRP were not entirely dependent on the anthropogenic food as the park is located along the edge of the limestone hills that bear natural food. As an opportunistic primate, macaques can still majorly rely on their natural food and adjusted to feed on anthropogenic food when the opportunity came up (Yeager, 1996). Provisioning that is generally being associated with visitors was believed to be the factor of human–primate interactions (Fuentes *et al.*, 2008; McCarthy *et al.*, 2009). Zhao (2005) believed that macaques have adapted to condition themselves in seeing visitors as food resources. In conjunction to this, it was suggested that the long-tailed macaques in GGRP have been accustomed to associate food with visitors in their vicinity. This is pertinent with the finding in which monitoring and watching visitors became the most prevalent behavior shown by the macaques.

As feeding and approaching being the second and the third behavior mostly demonstrated, this shows that the act of long-tailed macaques monitoring and watching visitors was linked with the tendency of macaques to anticipate food from visitors. Macaques' feeding activity indeed happened during the human–macaque interactions. The association of long-tailed macaques with human presence has been established in

previous studies (Fuentes *et al.*, 2008; McCarthy *et al.*, 2009; O'Leary and Fa, 1993). O'Leary and Fa (1993) found that macaques at Gibraltar tend to spend less time being on the ground when they were not in the vicinity with visitors. Macaques were inclined to adjust their activity pattern in accordance with the visitation routines by human (O'Leary and Fa, 1993). Macaques tend to come out from their natural roaming area and travel to the area with visitors for food before returning to the forest (Qingming *et al.*, 2012).

In GKR, food provisioning was not as common as watching and monitoring behavior. It was also hard to see aggressive behavior of macaques in GKR. High density of natural food around the area may have contributed to less aggression. Macaques do not entirely depend on the anthropogenic food. Reduced aggressive behavior was also correlated with the increased number of visitors that is associated with a large amount of provisioned food during human-macaque interactions (Hansen *et al.*, 2015). However, in other cases, increased provisioned activity can also induce the agonistic behavior of macaques (Fa, 1992; Hsu *et al.*, 2009). These varying findings on the connotation of aggression with the number of visitors and food provisioning described that macaques' aggression can be influenced by many factors.

As for visitor-to-macaque interactions, visitors also demonstrated least aggression toward macaques in GKR. This was correlated with the least aggression prompted by the macaques during interactions. Most visitors indicated that they have not encountered losing a belonging to macaques that eliminate the need for them to be aggressive to macaques. Generally, long-tailed macaques' aggression was influenced by the act of aggression demonstrated by human, whereas human aggression toward macaques was influenced by the potential of belongings being damaged (Beisner *et al.*, 2015).

Although GKR has become the interface zone of human-primate interactions, food provisioning activity accounted for only 6.15%, and this was considered very low compared to other studies. O'Leary and Fa (1993) found that the activity of feeding the macaques accounts for half of the entire interactions recorded. Compared to the activity of watching macaques that occurs frequently in this study, feeding activity was not even accounted a third of the total percentage of interactions recorded. This could also justify the lack of aggressive behavior shown by macaques during the human-macaque interactions in GKR. The more intense the food provisioning activity, the more aggressive behavior could be elicited by the macaques. Hsu *et al.* (2009) found the correlation of increased food provisioning with the increased agonistic behavior.

Perceptions toward primate: Both groups of respondents relatively have different perceptions over macaques in GKR. Visitors generally showed positive perception toward macaques, whereas a majority of residents dislike the primates. This is due to the different circumstances that have been encountered by both visitors and residents. Contrast perception between visitors and locals was consistent with the finding in China (Qingming *et al.*, 2012) and Singapore (Sha *et al.*, 2009). Most visitors encountered less negative interactions or nuisances from the macaques as they only visit the park for only a few hours. Generally, visitors were regarded as a group of people who travel to a place other than their usual environment without staying there (McIntyre, 1993). In contrast, the residents who lived along the edge of GKR are confronted with the nuisances caused by the primates. The nuisances include stolen crop and poultry eggs as well as annoyances since the macaques were commonly noticed to have jumped from roof to roof and creating noises. Although it was not observed during this study, the locals indicated that the macaques would occasionally enter their home and steal food. This is relevant with the feedbacks obtained from the questionnaires. According to the locals, long-tailed macaques were also accountable for the damage of properties and facilities around the area.

As the visitors of GKR showed positive perceptions toward macaques, this could be justified with the aesthetic values that were associated with animals in their natural habitat (Qingming *et al.*, 2012). Based on the behavioral observations, the frequent behavior demonstrated by visitors during the interface was watching and monitoring. This type of behavior does not have a direct impact on the provocation that could be demonstrated by the macaques, hence explaining the positive perceptions given by the visitors to the macaques. The perception of visitors could also be linked with the indications given by them that describe that the free-roaming macaques are tame as most of them have not encountered an attack from the macaques. In addition, primate energetic characteristics were known to have the capabilities in giving wonders and enjoyment to the visitors, thus inducing the visitors' approval toward the primates (Lee and Davey, 2015).

Most visitors admit that they fed the macaques, although they did not initially bring or prepare food for the macaques beforehand. It can be implied that the thought of feeding the macaques came after seeing the macaques roaming in the GKR and waiting for visitors to give them food. As the park was recognized as a recreational park, there were food vendors and mini restaurants operating there where the visitors were believed to obtain the food before directly feeding the macaques. In other places, it has been established that the visitors have also been inclined to feed primates and feel satisfied in doing so as the activity was considered as

enjoyment (Dittus *et al.*, 2019; Marechal, 2016; Sengupta and Radhakrishna, 2018).

Despite the dislike, most locals denote neutral response in approving feeding the free-roaming macaques in the area or supporting the act. It was suggested that the visitors perceived that by giving a solid answer on either agreeing or disagreeing that they have been feeding the macaque as a cumbersome answer especially considering that most of them dislike the primates. In addition, the lack of knowledge and awareness was believed to contribute to the indecisiveness of residents on how food provisioning and nuisances behavior of primates were corresponding with each other.

Ecotourism potential: Most of the visitors who participated in the survey indicated that the reason for visiting GKRK was to indulge with the natural environment and to see the free-roaming primates, consistent with the finding found by Lee and Davey (2015). Opportunity to see wildlife in their habitat and being in the natural environment have often been the most important features behind the visitation to the ecotourism area (Moscardo and Saltzer, 2004). There was a residential area along the park and Gunung Keriang; the area was not considered to be severely fragmented and still sustains the value of its natural elements. Natural elements have the potential of providing the value of healing and happiness to human (Stalhammar and Pedersen, 2017), hence justifying the anticipated value of relaxation sought by the visitors of GKRK. Additionally, satisfaction of the visitors on the mentioned values obtained during the visitation can be measured by the indication of the visitors about making a return visit to GKRK in which the majority of them agreed to do so.

Interpretations obtained by the visitors as well as the residents through the interaction with either primates or natural elements in GKRK were believed to make them aware of the importance of conserving the natural environment for the benefit of future generations. However, it could be supposed that the enlightenments on the importance of conservation have already been comprehended before the visitation. Visits to an ecotourism area that have the potential of rewarding environmental education could induce or heighten the awareness on the significances of protecting nature that then implicitly taught the visitors about the commitment that the public can do to help the effort (Mondino and Beery, 2018).

The majority of respondents were interested to know more about the behavior of primates in GKRK. Although environmental and wildlife education encompassed a plethora of aspects that can be anticipated to learn by the visitors, the experiences of direct interactions and seeing the lifestyle of primates in their innate habitat were believed to encourage them to sought information on the primates' behavior. Visitors were

inclined to enjoy watching the primates and describe their experiences with primates as enjoyment (Lee and Davey, 2015). Thus, it was believed that this factor instigated the motivation to learn more regarding primates' behavior among respondents.

Conclusion: GKRK has become a place for human-primate interactions and *M. fascicularis* living particularly well in the vicinity of human. It was found that the human-primate interactions in GKRK primarily constituted of positive interactions. Both visitors and residents have different perceptions toward the free-roaming primates in GKRK. This was due to the different experiences faced by both groups of respondents that greatly influenced their perceptions and attitudes toward the primates. GKRK is believed to have the potential to become a popular ecotourism site considering the values the place has been given to the visitors. GKRK provides aesthetic values to the visitors especially when the place keeps its natural elements with the majestic limestone mountains along with the presence of free-ranging primates. Although GKRK is not yet an established ecotourism place, it is worth to note that people approved on the values that GKRK bears that include the preserved natural element of Gunung Keriang and the presence of free-ranging primates. GKRK should be managed by the local authority to be as an effective ecotourism place where the locals can have the opportunity to grasp benefits.

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