

Subsistent Behavioural Patterns of Rhesus Macaque, *Macaca mulatta* (Zimmermann, 1780) in Yedagun Taung (Hill), Patheingyi Township, Mandalay Region

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Abstract

Observation conducted on behavioural patterns of rhesus macaque *Macaca mulatta* in Yedagun Taung, using instantaneous and scan sampling method, revealed five categories, each behaviour accounting to; feeding 19%, grooming 18%, moving 32%, resting 28% and mating 3% respectively. Among the five categories, moving and resting behaviours were predominant compared to other behaviours. The frequency of feeding and grooming behaviours were nearly the same. Feeding behaviour and moving behavior have positive correlation, and then grooming behaviour and resting behaviour have positive correlation. It was recorded that feeding and moving behaviours were more frequent in the early morning and evening. Resting and grooming behaviour were more in the midday. Mating behaviour was found from October to February and mounting was seven to over twenty times during this period.

Keywords: Rhesus macaque, Behaviours, Yedagun Taung

Introduction

Behavioural activity is influenced by environmental constraints such as food resources and their seasonal availability, plant species diversity, and physiological constraints such as individual food requirements and thermoregulation (Agetsuma and Nakagawa, 1998; cited by Jaman and Huffmann, 2012). Animals need to proportion their days, regardless of any limiting factors, to find enough food to fulfill their nutritional requirement to survive, maintain good body condition and develop, as well as reproduce. Studies of activity budgets can provide a basic understanding of an animal's interaction within a group and which behaviours are prioritized, based on species characteristics and life history.

Isbell &Young (1993), stated by definition, diurnal species perform 'active' behaviours largely during daylight hours during which, nutritional requirements must be met, therefore restricting their activity budget. Activity budgets allow investigation of the association between group size and time spent moving or resting, in relation to their food preferences. Seth (1986) reported that both climate and season affect the timing of the onset of daily activities as well as the type of activities undertaken. In the warmest time resting of the year, rhesus macaques spend more time resting than during more temperate

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months. Across all habitat types, feeding and resting are the major activities of the rhesus macaques day and they spend the rest of their time traveling, grooming, playing, and other activities. Nang Wah Wah Min (2006) stated that hierarchical behaviour was recorded in the population of monkeys especially during their movement from the sleeping site to feeding site. The group of monkeys is usually led by a strong adult male or female. Lactating mothers and juveniles following the leader are further protected by strong males and females following them. The alert guard monkey is always on the lookout for approaching enemies. Yedagun Taung is one of the existed rhesus macaque groups in Myanmar. It has many habitats for *Macaca mulatta*. This site embodies a number of microhabitat such as small forest area, semi-forest area, clusters of trees, bushy area, bare ground, caves, temple, pagoda and monasteries. Therefore, Yedagun Taung was chosen for study the subsistent behavioural patterns of rhesus macaque.

The aims of this study are;

- to examine activities and fundamental subsistent behaviours of the patterns
- to determine the time it spends on each activity
- to investigate which behaviour is more dominance in its daily activities

Materials and Methods

Study Area

Yedagun Taung (Hill) is located in Patheingyi Township, Mandalay Region. Yedagun Taung lies between $21^{\circ} 57.955' - 21^{\circ} 57.938' N$ and $96^{\circ} 12.809' - 96^{\circ} 12.671' E$. The highest peak of Yedagun Taung has an elevation of 212 m above sea level and the base of hill has 108 m. The hill is a natural lime-stone, steep and also found with forested area. Temples and pagodas have also constructed on the hills (Fig.1. a, b).

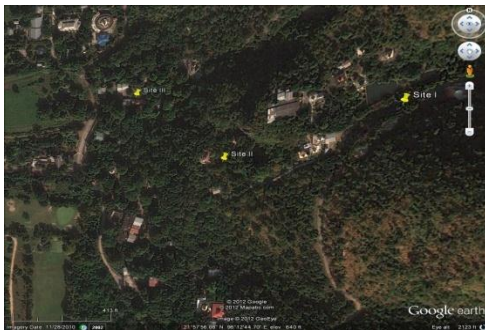


Figure 1(a). Map of study area



Figure 1 (b). Scenic view of Yedagun Taung

Study Site and Study Period

To study subsistent behavioural patterns of rhesus monkey, middle of the hill (Site II) was selected to avoid anthropogenic factors. The study was conducted during the period from September 2012 to February 2013.

Behavioural Observation and Data Collection

Data were collected twice a month from June 2012 to February 2013. Five behaviours; grooming, moving, feeding, resting and mating were categorized and, the particular behaviour was counted when it lasted for at least 5 second. Instantaneous and scan sampling were used for recording the state of behaviours in every 9 minutes from 6:00am to 6:00pm. Recording time for behaviour pattern lasted only one minute. Infants were not included in behavioral observations as they are too dependent on their mother. Instantaneous and scan sampling method were used according to Martin and Bateson, (2007).

Description of behaviour

Feeding – searching for and manipulating of food, handling or consuming food, as well as foraging (including movement during feeding and drinking water). **Moving** – any movement which covers any distance; walking, climbing, running, jumping, not accompanied by any one form of the above activities. **Resting** – inactive and stationary, sitting, lying, standing or sleeping without any further activity (including vigilance behaviour where the environment was being scanned). **Mating** – a male elicits mounting a female before the male was lured by a female, followed by copulation, a sequence of two or more mounts by the male, involving intromission and pelvic thrusts by the male completed the coitus. **Grooming** – between two or more animals where one cleans the fur and skin of another by removing foreign objects such as insects, ectoparasites, dead skin, leaves and dirt (De Ruiter, 1986)

Result

Daily fundamental subsistent behaviours were recorded twice a month and, behavior was categorized into five categories feeding, grooming, moving, resting and mating within the study period of September 2012 to February 2013. In this study, feeding comprised 19%, grooming 18%, moving 32%, resting 28% and mating 3%. According to the data, mating behaviour was not found in September but the highest frequency of mating behaviour (21) was found in December. The highest frequency of feeding behaviour (69) was found in November and the lowest number (34) was found in September. The highest number of grooming frequency (76) was found in January and the lowest number (34) was found in February. The highest number of moving frequency (101) was found in January and the lowest number was found in (68) September. The highest number of resting

frequency (105) was found in January and the lowest number (46) was found in September (Table. 1, Figure. 2).

During the study period, total frequency of feeding behaviour was 299, that of mating behaviour was 523, that of resting behavior was 440, that of mating behaviour was 47 and that of grooming behaviour was 298 (Table. 1). Among five categories of behaviour, the highest frequency was moving and the second was resting behaviour. Feeding and grooming were observed nearly the same frequent in this study. Mating behaviour was the least frequency except September. According to time budget data, it was observed that the behaviour patterns were and activities were not found to uniform and consistency. Some activities were observed in a certain period of the day but other patterns were recorded with instability (Figure 3). The highest number of feeding frequency was found to be 89 and it was mainly observed from 6:00am to 9:00am. Similarly, it was also recorded again from 3:00pm to 6:00am and it was recorded to be 101. The highest number of grooming behaviour (105) was found after 12:00pm. Resting behaviour was found to be the second highest pattern in this study area (139). Resting was mainly found after 12:00pm. The resting behaviour continued before they left the feeding ground to their sleeping quarters. Moving behaviour was mostly recorded from 6:00am to 9:00pm and from 3:00pm to 6:00pm. The highest number of this behavioural pattern was found (134) times in the morning and (176) times in the afternoon (Table.2).

Table 1. Monthly behavioural frequency of *Macaca mulatta* at Yedagun Taung from September 2012 to February 2013.

| Month | Feeding | Grooming | Moving | Resting | Mating |
|-----------|---------|----------|--------|---------|--------|
| September | 34 | 41 | 68 | 46 | 0 |
| October | 52 | 37 | 88 | 56 | 5 |
| November | 69 | 60 | 94 | 77 | 10 |
| December | 38 | 50 | 99 | 90 | 21 |
| January | 58 | 76 | 101 | 105 | 8 |
| February | 48 | 34 | 73 | 66 | 3 |
| Total | 299 | 298 | 523 | 440 | 47 |

Table 2. Five categories of behaviour of *Macaca mulatta* base on 6:00am to 6:00pm from September 2012 to February 2013.

| Time | Feeding | Grooming | Resting | Moving | Mating |
|-----------------|---------|----------|---------|--------|--------|
| 6:00am- 9:00am | 89 | 42 | 61 | 134 | 11 |
| 9:00am- 12:00pm | 59 | 74 | 113 | 124 | 14 |
| 12:00pm-3:00pm | 30 | 105 | 139 | 98 | 13 |
| 3:00pm- 6:00 pm | 101 | 77 | 137 | 176 | 13 |

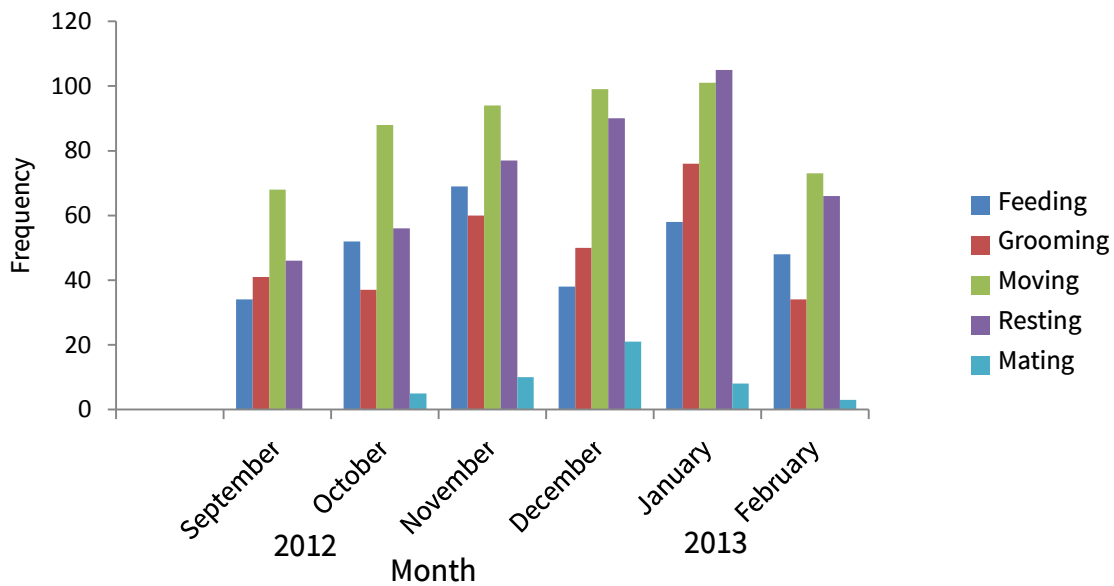


Fig. 2 A comparison of monthly behavior of *Macaca mulatta*.

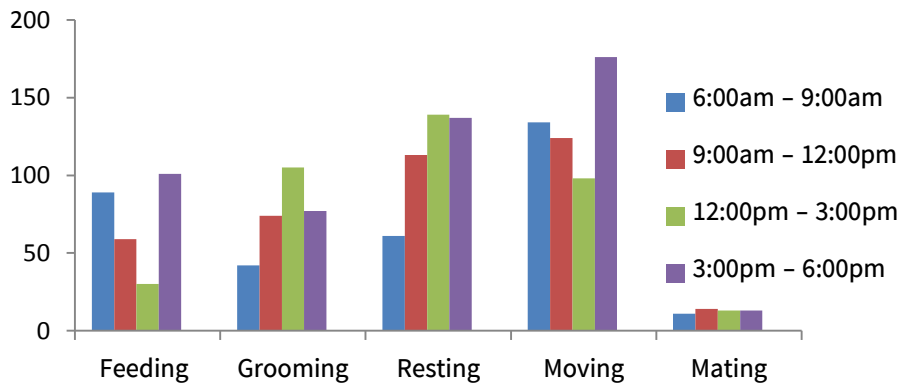


Fig. 3 A comparison of five categories behavior base on 6:00am to 6:00pm during the study period.



A. Feeding on bark of the tree



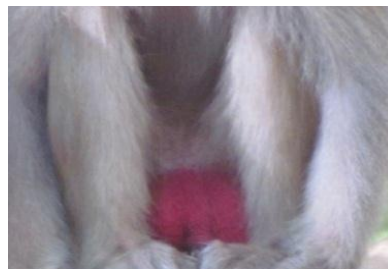
B. Arboreal moving on the tree



C. Resting in leaning posture



D. Social grooming behaviour



E. Reddish colour in anogenital



F. Mating on the rock

Discussion

Linburg (1971) described rhesus macaques live in social groups of a few adult males and many adult females and their offspring. The matrilineal structure of rhesus groups result from sex-specific patterns of dispersal and philopatry. Males emigrate from their natal group at puberty and join a new group, whereas females remain in their natal group throughout their life. Fleagle (1988) stated that the rhesus macaque consumes leaves, fruits, flowers, berries, insects, grains, grass, ground herbs and algae. Wolfe (1992) also recorded that common foods of macaque in temples include bread, bananas, peanuts, seeds, other fruits and vegetables. Fooden (2000) marked in less human-influenced areas, they feed on fruits, flowers, leaves, seeds, gums, buds, grass, clover, roots, bark. In present study, rhesus macaques consume leaves, fruits, flowers, grains, grass, ground, herbs, bark, insects, seeds and saps (not including artificial food) and they mainly feed twice a day, during early morning from 6:00hr to 8:00hr and evening before they return to their night sleeping site.

In the mating season, the estrous cycle of *M.mulatta* is not accompanied by major changes in the female's genital region. There is only minor swelling and redness double their normal size during the breeding season but the testicles of male rhesus monkeys

become enlarged and swollen. The increase in size of their testicles is probably related to the number of times a male can copulate over a short period of time (Buscovitch, 1993; Nowak, 1991; Parker, 1990). Moreover, it is also a manner of promiscuous mating pattern (Elgar, 2005). In the present study, it was also observed that the buttocks and faces of both male and female macaques become red during the mating season. The skin of the perineal region becomes reddened when the female was in estrous. The aliphatic acid also plays a main role for the red colour around the buttocks (Hrdy and Whitten, 1987). In fact, during the study period too, a presence of reddish face and buttocks appeared as good evidence for a potential chemical cue to their state of fertility and also act as a visual stimulus to the males, so that displayed their hindquarters to males before coitus. In the previous works, Lindburg, 1971; Quet *et al.*, 1993 stated rhesus macaque in North India the mating season lasted for 3 months from October to December. Vandenberg and Vessey, 1969 recorded *Macaca mulatta* in La Parguerathe mating period lasts from mid – October until late February. In the study site, rhesus macaques in Yedagun Taung showed their mating behaviour from in October to February. Furthermore, male and female rhesus macaques are promiscuous breeders, mating multiple times with multiple mates (Linburg, 1971). The male macaques need multiple mounts in order to achieve ejaculation during coitus (Gordon 1981; Wilson *et al.*, 1982).

During studying six months in Yedagun Taung, it was observed that male *M. mulatta* mounted seven to over twenty times to achieve ejaculation. Moreover, a male macaque was recorded for consuming some of its semen around the anogenital region after coitus. Dyad macaques always search a secure site before starting copulation and it can avoid some disturbance of other members. According to the data, among the five behavioural activities, moving and resting were more predominant than others and mating behaviour was the least recorded during the study period. According to the data, the frequency of feeding behaviour was 34 times in September, while mating was not recorded then. But when the feeding behavior rose to 52 in October, mating was encountered only 5 times.

Feeding behaviour frequency reached a peak 69 in November, while mating frequency also climbed to 10. In December, when feeding behaviour frequency decreased to 38, mating increased to 21. It is a quite strange event between mating and feeding among macaque population in Yedagun Taung. However, feeding frequencies were 58 and 48 while mating were 8 and 3 in January and February respectively. So, the highest frequency of mating behaviour was recorded in December but the feeding behaviour was only 38. The highest frequency of feeding behaviour was in November but mating was then 10. Therefore, feeding and mating behaviour do not have a relationship. Nang Wah Wah Min (2006) recorded that the resting time of rhesus monkey during the day was from 12:00pm to 3:00pm in Popa mountain Park. In this study site, according to data, they started to be

active in their daily life in the early morning approximately 6:00am as they moved down to feeding site from their sleeping quarters. But in the midday from 12:00pm to 3:00pm, they seek a refuge place in order to shun the heat of sunlight during a hot day for resting and grooming. And then, monkeys were active again after 3:00pm for feeding. On the way back to their sleeping quarters, macaques consumed vegetation and they left the feeding ground gradually before the sunset. Rhesus macaques, in general, emerge their sleeping quarters places to the feeding ground relatively late in cold season and leave the foraging site earlier than in the rainy season. Therefore, the day length seemed to influence the emergence time and leaving from the feeding ground during this study. Bulletin (2001) reported that grooming was often performed between adult male and female, mother to her offspring and among closely related individuals. Rhesus macaques groom mostly during midday, and the frequency decreases as foraging begins, after the midday rest. The major attention during grooming was given to the head, face and dorsal side of the body of an individual. In this study, the grooming activity was divided in to heterosexual, homosexual, self, mother and her offspring. It is recorded that grooming sites were found to be face, head, chest, belly, genital, back, arms, legs and tail during this study.

The highest number of feeding frequency was found from 6:00am to 9:00am and 3:00pm to 6:00pm. Moving was found from 6:00am to 9:00am and from 3:00pm to 6:00pm; therefore feeding behavior and moving behavior have a relationship. And then, the highest number of grooming behavior was found from 12:00pm to later while resting behavior was found from 12:00pm to 3:00pm. This is in agreement with the previous works as grooming behavior was mainly observed during the periods of relaxed behavior. Although other behaviors showed specific period for a certain behavior, the mating did not occur at a particular period. A dyad macaque monkeys sought an opportunity for copulation according to the situation of the surrounding especially a secure place, so grooming and resting behaviors have a relationship.

Feeding behaviour was significantly different with to moving, resting and making but not grooming. In fact, moving and resting behaviour were needed for foraging. During the mating period, macaque needed energy because they used to do multiple mounting so feeding was concerned with mating. Grooming behaviour was significantly different with mating, resting and moving. Before mating, the male courted female and than groomed. During the resting time, grooming behaviour was mostly found within the social group. Moving behaviour was significantly different with feeding, grooming and mating. In this research, rhesus macaque was found moving in the morning and the evening for foraging. For mating, the courting couple moved frequently from one place to another for avoidance of the disturbance. Resting behaviour was significantly different with feeding, grooming and mating. When they come back to the sleeping site in the evening, feeding and resting behaviours were observed. They moved slowly and searched for the food because they

were waiting for other group members. Observation revealed that rhesus macaque in Yedagun Taung spend most of their time for moving, followed by resting, grooming, feeding and the least is mating. A large portion of daily activity budget for all study groups was locomotion. Whealt, 1980 described that long tailed macaques move out from their home range when there was a shortage of food sources. This is true as locomotion pattern is greatly influenced by food sources distribution. In the study site of Yedagun Taung, the most observed behaviour was moving because macaque are diurnal animals that are active during where they use one full day to travel from one day to another searching for food. This study is important in order to understand clearly the subsistent behaviour of *Macaca mulatta* in the study area which can lead to the effective management and conservation of this species in the future.

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