

Daytime Activity Patterns and Mother-Infant Interaction of Rhesus Monkey (*Macaca Mulatta*) in Yangon Zoological Garden, Myanmar

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Abstract:- Daytime activity patterns and mother infant interaction of rhesus monkey *Macaca mulatta* in Yangon Zoological Garden were investigated during July, 2016 to January, 2017. Observation was also conducted on mother-infant relationship during the study period: the categories of observed behaviour revealed the durations to be bodily contact (16.28%), within arm (17.04%), playing (47.74%), grooming (12.28%), restraining (2.96%) and rejection (3.10%) during the observation time. The frequency and duration of playing behaviour were predominant in infant - mother pair compared to other behaviours. The frequency of within arm was second highest. However, bodily contact and within arm behaviours gradually declined monthly with the infants age. Playing and grooming behaviour were more frequently observed. Although restraining behavior by mother declined, rejection behaviour appeared to become more discreet from 1-2 month infant's age to 7-8 month of age. Restraining behaviour had a negative correlation whereas rejection behaviour was positively correlated with the infant's age.

Keywords:- Daytime Activity; Rhesus Monkey; Mother-Infant; Behavioural Patterns.

I. INTRODUCTION

Primates, the closest living relatives to humans, are the most social of all animals. The primates being important models for the evolution of mankind, their diversity is closely related to the overall biodiversity of an area. Primates are represented in mainland Southeast Asia by lorises, the true monkeys (including macaques and leaf monkeys), the gibbons and humans [6].

Rhesus monkeys are one of these species belonging to the genus *Macaca*. Rhesus macaques (*Macaca mulatta*) are Asian primates with a current geographic distribution that encompasses many countries such as Afghanistan, India, Thailand, China, Pakistan, Bhutan, Myanmar, Nepal, Bangladesh, Laos and Vietnam [8].

Myanmar is also home to 15 species of non-human primates, comprising gibbons, leaf monkeys, macaques and one species of 'wet-nosed primate'. One species of prosimians, Asian slow loris (*Nycticebus bengalensis*); five species of macaques, assamese (*Macaca assamensis*), stump-tailed (*Macaca arctoides*), rhesus (*Macaca*

mulaatta), long-tailed (*Macaca fascicularis*) and pig-tailed macaques (*Macaca leonina*); six species of leaf monkeys, including capped leaf monkey (*Trachypithecus poleatus*), phayre's leaf monkey (*Trachypithecus shorridgei*), dusky leaf monkey (*Trachypithecus obscurus*) and banned leaf monkey (*Presbytis femoralis*), three species of gibbons western hoolock gibbon (*Hooloc khoolek*), eastern hoolock gibbon (*Hoolock leuconedys*) and white-handed (*Hylobates lar*) [11].

Monkey mothers, of course, provide their infants with massive amounts of patterned and variable stimulation, as compared with that received from inanimate surrogates. Part of this stimulation occurs during highly structured interactions between mother and infant, and part of it occurs as a mere consequence of the fact that the infant is in intimate contact with a moving body [14].

Females reach puberty at 3-4 years of age, while males do so 6-12 months later. Female reproductive rates decline with old age, but it is unclear whether menopause occurs. Pregnancy in rhesus macaques lasts about 5.5 months. Rhesus macaques usually produce single offspring but free-ranging animals sometimes have twins [1].

The species *Macaca mulatta* are popular Zoo animals because of their innate curiosity and active life style [12]. However, in research was ever been done on behaviour of the macaque in Yangon Zoological Garden. The objectives of this study were:

- to study the composition of rhesus monkey population
- to examine activities and fundamental behaviour patterns in infants
- to observe the interaction of mother and infant

II. MATERIALS AND METHODS

Yangon Zoological Garden, the study area, is located at Longitude 95° 09' 34.01" East and Latitude 16° 47' 34.90" North. It is situated in Mingalataungnyunt Township, Yangon City. The Monkey Village of Yangon Zoological Garden is chosen as our research site. The present study was conducted during the period from July, 2016 to January, 2017. The identification of the macaque was made after [13][4][6]. Data were collected twice a month in the Monkey Village from July, 2016 to January,

2017. Observation on frequency and duration of each behavior was conducted using ten minutes scan sampling at five minutes intervals from 7:00am to 5:00pm on adult and sub-adult females. Recording was made on the interaction of four pairs of infant with their mother during seven months of infant's life; Scan sampling method was used according to [9]. Behaviours of macaques were observed and recorded with the aid of a field binocular and a digital camera. The recordings of the frequency and duration of each behaviour were made. Duration of bodily contact, within arm (embrace), playing and grooming behaviours in infant-mother relationship were recorded in minutes and durations of restraining and rejection behaviours were recorded in seconds. Description of behaviour in mother – infant interactions are Bodily contact (BC) (time spent in ventro- ventral contact and other bodily contact), within arm, embracing (WA) (time spent in proximity (within arm's reach)), maternal grooming (G) (time spent in contact in which the mother groomed her infant), maternal restraining (RES) (mother prevent infant from breaking contact by pulling its leg or tail), maternal rejection (REJ) (mother prevents contact or infant access to nipple by holding the infant a distance with an arm) and playing (P) playing with mother or peer or kin. The correlations were made using linear regression (Microsoft Excel, 2010 version) between duration of behaviour and infant age. Present significant difference of collected data from different events was analysed using appropriated statistical methods in Statistical Package for Social Science (SPSS) Version 16.0.

III. RESULTS

The rhesus populations of 41 monkeys were recorded in Yangon Zoological Garden. The age group composition was recorded as 13 adult females (31.71%), four sub-adult females (9.75%), eleven juvenile (26.83%) and 13 infants (31.71%).

A. Mother-Infant Relationship of *Macacamulatta*

Behavioural development of infants (*Macacamulatta*), together with their mother, in the first seven months of their age was recorded four days per month in the study site. Behaviours recorded would be categorized into six patterns: bodily contact, within arm, playing, grooming, restraining and rejection during the study period from July, 2016 to January, 2017.

Infant were categorized based on their hand hair, body colour and facial characters. Within the seven months of infancy, the frequency of bodily contact was 16.28% of total

activity, within arm was 17.04%, playing was 47.74%, grooming was 12.88%, restraining was 2.96% and rejection was 3.10 % of total six behaviours (Fig 1 and Table 1).

The total frequency of bodily contact behaviour was 220, within arm behaviour was 230, playing behaviour was 645, grooming behaviour was 174, restraining behaviour 40 and rejection behaviour was 42. Among the six behaviours, the highest frequency was playing behaviour, the second highest was within arm behaviour and the lowest frequency was restraining behaviour (Table 1).

The total duration of bodily contact behaviour was 1191 min, within arm behaviour (1643 min), playing behaviour (3915 min) and grooming behaviour (870 min) (Table 4.3). The restraining behaviour lasted 160 sec and rejection behaviour was at 85 sec (Table 2).

In the 1-2 month of infant's life, within arm (68) and bodily contact behaviours (44) were most frequent, and rejection was not observed during the study period. During the 2-3 month of infant, the highest frequency was within arm (55) and the second highest was playing (46). During the 3-4 month, the playing behaviour (70) was significantly increased, within arm behaviour and restraining behaviour were decreased. Similarly, the playing behaviour was significantly increased in 4-5, 5-6, 6-7 and 7-8 months of infant's life. During the 6-7 and 7-8 months of infant, playing behaviour (135 and 155) was most frequently observed and restraining behaviour was not found. Within arm behaviour (9 and 7) were decreased (Fig 2 and Table 2).

During the study period from July, 2016 to January, 2017, duration of seven infant's ages, the highest durations of within arm behaviour (370 min) and bodily contact behaviour (170 min) was found in 1-2 month infant but the lowest durations of within arm behaviour (20 min) and bodily contact behaviour (29 min) were found in 7-8 month infant. The longest duration of playing behaviour (450 min) was observed in 7-8 month infant and the shortest duration of playing behaviour (80 min) was observed in 1-2 month old infant. Grooming was found at total (140 min) in 7-8 month old infant, and 19 min in 1-2 month old infant (Table 2).

Although restraining behaviour (60 sec) was observed in the 1-2 month of infant but was not found in 6-7 and 7-8 month old infants, rejection behaviour was not recorded in 1-2 month old infant but was recorded at 25 sec in 7-8 month infant (Table 2).

| Infant's age (month) | Behavior categories | | | | | | Total |
|----------------------|---------------------|------------|------------|------------|-----------|-----------|-------------|
| | BC | WA | P | G | RES | REJ | |
| 1-2 | 44 | 68 | 20 | 5 | 15 | 0 | 152 |
| 2-3 | 40 | 55 | 46 | 8 | 12 | 2 | 163 |
| 3-4 | 38 | 41 | 70 | 15 | 6 | 4 | 174 |
| 4-5 | 35 | 34 | 103 | 32 | 4 | 6 | 214 |
| 5-6 | 27 | 16 | 116 | 36 | 3 | 7 | 205 |
| 6-7 | 20 | 9 | 135 | 38 | 0 | 11 | 213 |
| 7-8 | 16 | 7 | 155 | 40 | 0 | 12 | 230 |
| Total | 220 | 230 | 645 | 174 | 40 | 42 | 1351 |

Table 1:- Frequencies of six categories of behaviour occurring in mother and infant pair from July, 2016 to January, 2017

BC=Bodily contact behaviour, WA = within arm behaviour, P = Playing behaviour, G = Grooming behaviour, RES = Restraining behaviour, REJ = Rejection behaviour

grooming behaviour ($r = 0.940$) and rejection behaviour ($r = 0.992$) were positively correlated with infant age (month) (Fig. 3).

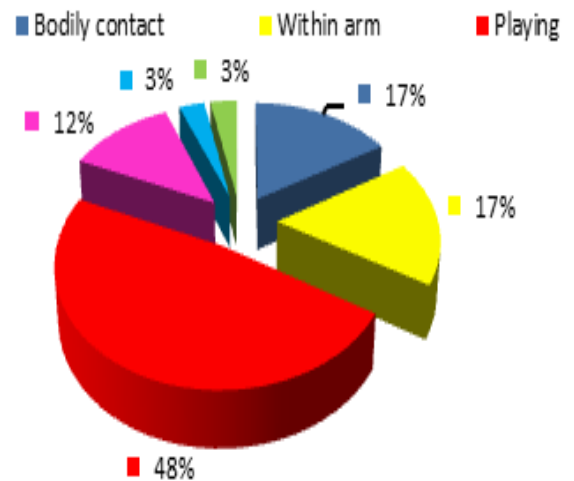


Fig 1:- Proportion of Frequency (Percentage of Six Behaviour Patterns) Between Mother and Infant from July, 2016 to January, 2017

| Infant's age (month) | Behaviour categories | | | | | | Total |
|----------------------|----------------------|-------------|-------------|------------|------------|-----------|-------------|
| | BC | WA | P | G | RES | REJ | |
| 1-2 | 170 | 370 | 80 | 19 | 60 | 0 | 640 |
| 2-3 | 146 | 300 | 163 | 30 | 48 | 4 | 640 |
| 3-4 | 122 | 237 | 215 | 65 | 24 | 8 | 640 |
| 4-5 | 98 | 113 | 308 | 120 | 16 | 12 | 640 |
| 5-6 | 69 | 60 | 376 | 134 | 12 | 14 | 640 |
| 6-7 | 52 | 40 | 410 | 137 | 0 | 22 | 640 |
| 7-8 | 29 | 20 | 450 | 140 | 0 | 25 | 640 |
| Total | 686 | 1140 | 2002 | 645 | 160 | 85 | 4480 |

Table 2:- Durations of BC, WA, P and G Behaviour (Min) and RES and REJ Behaviour (Sec) In Mother and Infant Pair from July, 2016 to January, 2017 (Observation Time = 640 Min)

BC=Bodilycontact behaviour,WA= Within arm behaviour, P=Playing behaviour,G = Grooming behaviour, RES = Restraining behaviour, REJ = Rejection behaviour

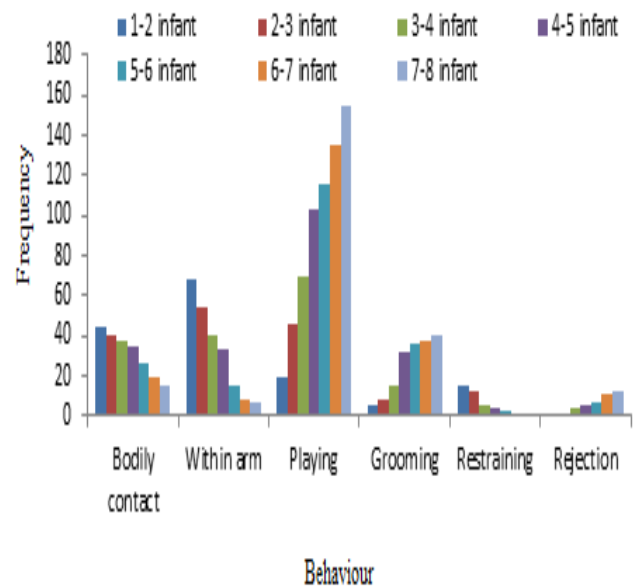


Fig 2:- Comparison on monthly frequencies for the six behaviour patterns between mother and infant from July, 2016 to January, 2017

B. Correlation Between Mother and Infant Behaviour

According to the linear regression analysis, the durations of bodily contact behaviour ($r = -0.992$), within Arm behaviour ($r = -0.973$) and restraining behaviour ($r = -0.940$) were negatively correlated with infant age (month). However, the durations of playing behaviour ($r = 0.991$),

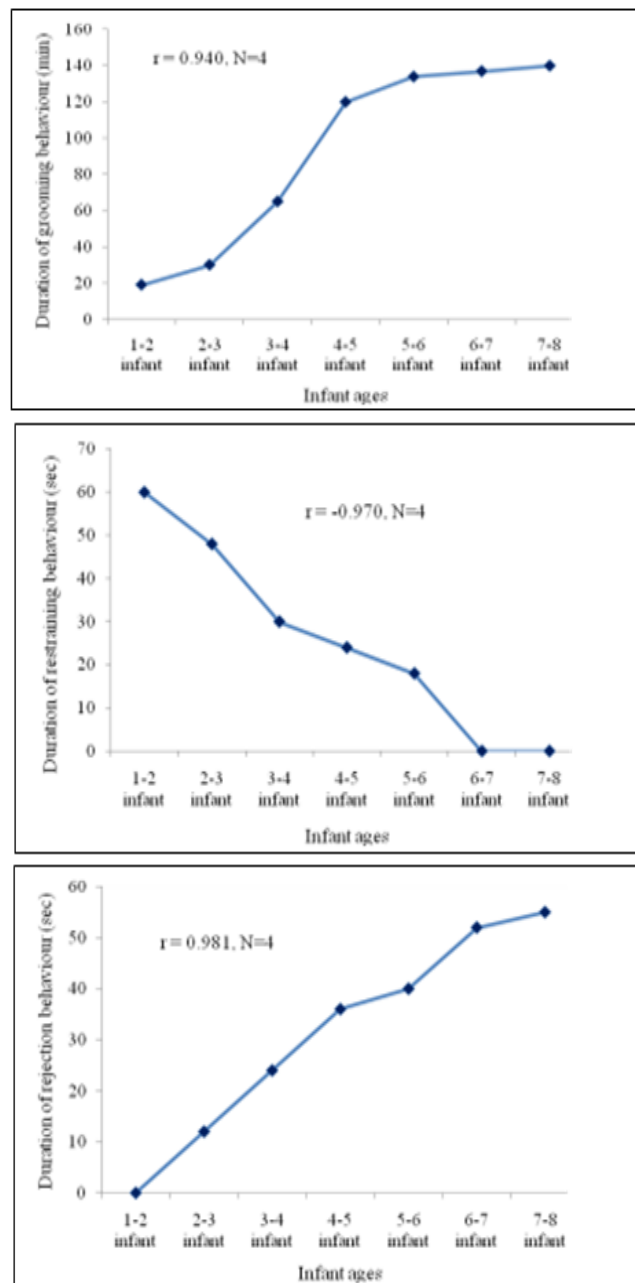
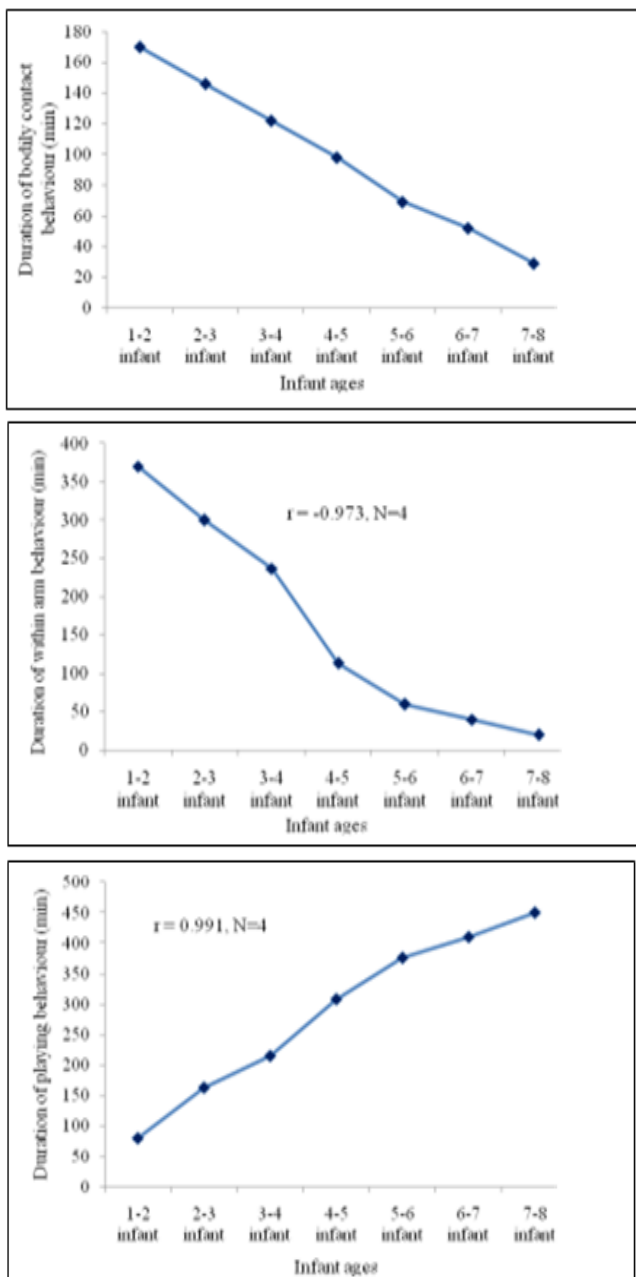


Fig 3:- Monthly Duration of Bodily Contact, within Arm and Playing Behaviours in Mother and Infant Pair from July, 2016 to January, 2017

Fig 4:- Monthly Duration of Grooming, Restraining and Rejection Behaviour in Mother and Infant Pair from July, 2016 to January, 2017

IV. DISCUSSION

Daytime activity patterns of rhesus monkeys were conducted in Yangon Zoological Garden from July 2016 to January 2017. In the present study, the highest frequency of bodily contact behaviour (44) occurred in the 1-2 month of infant and within arm occurred of (68). The lowest frequency of bodily contact behaviour was (16) and within arm behaviour was at (7) during the 7-8 month of infant’s age. During the study period, behavioural frequency of playing increased monthly at about two twice in magnitude and grooming was gradually increased. It might be suggested that the infant’s early interactions with mother had more affected than their other behaviour.

The infant's time of physical separation from their mothers had significantly increased, and often they could remain outside their mother's immediate vicinity in the second month of life [5].

In the study area, durations of bodily contact behavior was found more frequently in 1-2 month infant and the lowest duration was found in 7-8 month infant. Duration of playing and grooming behaviours were increased steadily from 6-7 month to 7-8 month of infant age. The duration of playing behaviour was predominant in 5-6, 6-7 and 7-8 month infant.

Numerous studies carried out in both field and captive environments had found that monkey mothers tend to spend more time in ventral contact with their first-born infants, wean them later, and punish them less often during weaning than they do with their subsequent offspring [2][3].

In the seven months of study on mother-infant pair, restraining behaviour frequency was only recorded at 15 (sec) in 1-2 month infant, 12 sec in 2-3 month old infant, 6 sec in 3-4 month old infant, 4 sec in 4-5 month old infant, 3 sec in 5-6 month infant and it was not observed in 6-7 and 7-8 month old infant. It had been observed that the frequency of restraining was gradually decreased and rejection frequency was increased during the 6-7 and 7-8 month of infant's age in the present study.

Although duration of restraining behaviour was not found in 7-8 month old infant, the longest duration of rejection behaviour was found in 7-8 month old infant. Otherwise, duration of rejection behaviour was not found in 1-2 month infant but the restraining behaviour duration was the highest (60) at that age. Therefore, duration of restraining behaviour steadily declined, while rejection behaviour rose in durations.

Although changes in maternal behaviour in relation to infant age were observed in all mothers, individual mothers differed from one another in the frequency with which they cradled or groomed their infants, made or break contact with them or restrained or rejected them [7]. Maternal rejection was positively correlated with duration of time infants spent with other individuals across the majority block comparisons [10].

The results of the present study also indicated that there existed a strong bondage between the infant and mother with intensive parental care in *Macaca mulatta*.

V. CONCLUSION

Daytime activity patterns of female rhesus monkey *Macaca mulatta* in Yangon Zoological Garden were investigated during July, 2016 to January, 2017. Primates attract attention of many researchers because they are closely related to human in terms of human social behaviour. Primates are social animals and most of them interact with each other in their species. According to data, mother-infant relationship, duration of all behaviour was positively correlated with infant age (month). In addition commensal rhesus macaques show a high degree of behavioural flexibility in response to habitat and resource variability, and knowledge of these differences is important for the conservation and management of highly commensal primate.

ACKNOWLEDGMENTS

We would like to express our deep appreciation to Professor Dr. Thidar Lay Thwe, Head of the Department of Zoology, University of Yangon for her keen interest and encouraged for publication of this research paper. We are also extended my gratitude to Professor Dr. Aye Mi San, Professor, Department of Zoology, University of Yangon for her encouragement. We would like to greatly indebted to Professor Dr. Khin Maung Swe (Retired), Head of the Department of Zoology, Dagon University for his encouragement and permission to carry out this research.

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