



RESEARCH PAPER

OPEN ACCESS

Does provisioning initiate more grooming interaction in primates : a study on Assamese macaque

Prabal Sarkar*

Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas University, Bilaspur, Chhattisgarh, INDIA (Present address)

Article published on March 15, 2014

Key words: Assamese macaque, *Macaca assamensis*, activity profile, grooming.

Abstract

A comparison of grooming interactions within forest and the provisioned groups were studied in order to find out the effect of provisioning on grooming interaction on Assamese macaque. For this, two groups of Assamese macaque - one received provisioned food at the Tukreshwari temple, Goalpara and another, which was fully dependent on forest habitat at Jokai RF of Assam, India were selected. A 5 minutes *Scan Sampling* method was used to study the grooming interactions in both the provisioned and the forest groups. Data on the types of grooming behaviour and their age-sex variation, groomer-groomee relationship were also recorded. Study found higher grooming interaction both annually and seasonally in the provisioned group compared to the forest group irrespective to age-sex class. As the supplementary feeding involved higher agnostic interaction, a higher grooming interaction in the provisioned group further suggested its function as “*tension reduction mechanism*”.

*Corresponding Author: Prabal Sarkar ✉ prabalsarkarindia@gmail.com

Introduction

The motivation to possess a resource and the nature of that resource together seems to determine the frequency of the agnostic interaction amongst the individuals of the same troop and amongst the members of different troops. Aggression likely disrupts the social context within the troop and consequently, the resource may remain under utilised or lost.

The type of relationship with the animal object of the competition and its eventual behaviour can therefore inhibit the initiator of the competition from displaying aggression. Normally, the primates may compete to groom other group members in order to obtain support from them (Seyfarth, 1977) and / or to avoid future aggression by them (Silk, 1982). Thus, the grooming must have some correlation with the provisioning.

Species specific study of the grooming behaviour has been carried out in both old world monkeys and new world monkeys. Grooming behaviour was well studied in rhesus macaque (Boccia, 1983; 1986; Bernstein *et al.*, 1977; Drickamer, 1976; Linburg, 1973; Michael and Herbert, 1963; de Waal, 1984; Missakian, 1974; Sade, 1972), stump-tailed macaque (Lopez-Vergara *et al.*, 1989; Goosen, 1974), Pig-tail macaque (Boccia *et al.*, 1989; Boccia, 1989; Troisi *et al.*, 1989); Bonnet macaque (Boccia, 1989; Silk, 1982), Long-tailed macaque (Troisi *et al.*, 1989), cebeles or crested black macaque (Hadidian, 1980), Japanese monkey (Mehlman and Chapais, 1988; Turillazi *et al.*, 1982; Rinaldi, 1985, Furuya, 1957; Oki and Maeda, 1973), Java monkey (Troisi and Schino, 1987), hanuman langur (McKenna, 1978; Borries *et al.*, 1992; Moore, 1985), Titi monkey (Kinzey and Wright, 1982), Hamadryas baboons (Coelho *et al.*, 1983), chaema baboon (Saayman, 1971), cebus monkey (Bernstein, 1965), vervet monkey (Seyfarth, 1980; Seyfarth and Cheney, 1984) and chimpanzees (Simpson, 1973). No such attempt has been made to study the grooming behaviour of the Assamese macaque.

The duration and the frequency of grooming depend on absolute and relative characteristic of the individuals involved, such as sex, age, rank, kingship, and reproductive state. Many of the studies involving various aspect of grooming were carried out based on behaviour mainly in the captive colonies and only a few from the free-ranging population of primate. However, not much scientific work has been designed for a comparative prospective among the free ranging primate troops between the provisioned food and natural forest situation particularly with regard to the socially integrating factor - the grooming. This component could have properly exposed the importance of grooming in integrating and maintenance of strong social fabric in various situations available in the degraded forests in developing countries. Therefore, an attempt has been made to study the effect of provisioning (i.e. supplementary feeding) on grooming interaction of the Assamese macaque.

Methodology

Two groups of Assamese macaque, one inhabiting forest at Jokai RF and one temple habitat at Tukreshwari of Assam, India were selected. The forest group had a group size of 31 individuals comprising of 4 adult males, 6 adult females, 2 sub-adult males, 8 young females, 4 Juvenile-II, 3 Juvenile-I and 4 infants. The provisioned group had a group size of 64 individuals comprising of 10 adult males, 13 adult females, 3 sub-adult males, 12 young females, 9 juvenile-II, 10 juvenile-I and 7 infants.

A 5 minutes *Scan Sampling* (Altmann, 1974) method was used to study the grooming interactions in both the provisioned and the forest groups. Data on the types of grooming behaviour and their age-sex variation, groomer-groomee relationship were recorded.

Grooming behaviour : Manipulating fur and skin of another individual with finger, mouth and teeth to remove bits of dirt, dead skin, ectoparasites, blood from wounds, etc.

Auto-grooming :The groomer is being groomed by itself.

Allo-grooming : The type of the grooming where both groomer and groomee are involved and also two or more individuals may take part.

Groomer :The individual which actively groom other during allo-grooming.

Groomee : The individual which receives grooming during allo-grooming.

Rate : Time spent per hour in grooming proximity.

Result

Time allocation

The comparative study of the forest and the provisioned group of Assamese macaque showed a distinct variation in grooming activity pattern. The forest group was found to spend 10% of their total annual time on grooming as compared to 24% by the provisioned group (Fig-1).

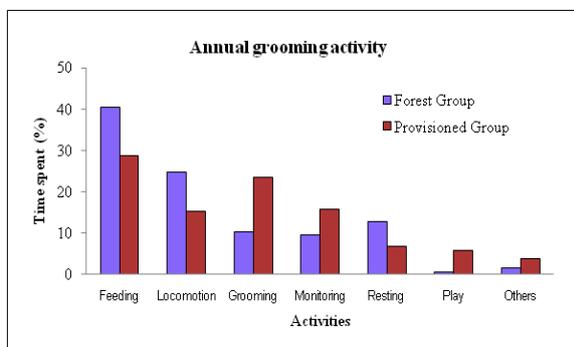


Fig. 1. Comparative annual activity profile showing time spent on grooming interaction.

The seasonal variation of the grooming behaviour also showed similar trend. The time spent on grooming by the forest group was 9% whereas 17% by the provisioned group in pre-monsoon; 6% by the forest group and 25% by the provisioned group in monsoon; 12% by the forest group and 26% by the provisioned group in retreating monsoon and 14% by the forest group and 26% by the provisioned group in winter respectively. This indicates that the forest group on an average spent 13% (range 8-19%) less time on

grooming than the provisioned group irrespective of the seasons (Fig-2).

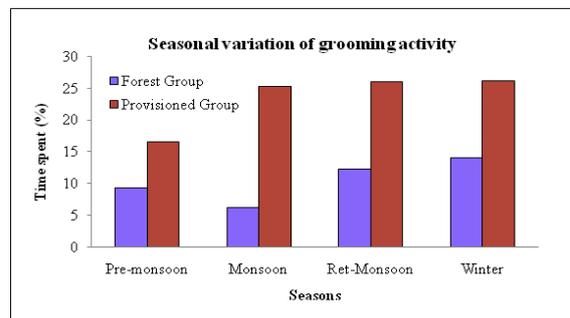


Fig. 2. Comparative seasonal variation of grooming interaction.

Age-sex variation in grooming interaction

The annual inter-habitat variation on grooming interactions showed that the forest group of Assamese macaque spent less time on grooming interactions than the provisioned group irrespective of age-sex class. While the adult males of the forest group had annually 52 episodes per hour in grooming interactions, it was only 77 episodes per hour in the forest group. The adult females of the forest group had 109 episodes per hour compared to 262 episodes per hour by the provisioned group; the sub-adult males of the forest group had 13 episodes per hour but 27 episodes per hour were recorded in the provisioned group. The young females of the forest group had 15 episodes per hour compared to 79 episodes per hour in the provisioned group; juvenile-II of the forest group had 23 episodes per hour, while it was 76 episodes per hour in the provisioned group. Juvenile-I of the forest group had as low as 24 episodes per hour, while it was 128 episodes per hour in the provisioned group, and infants of the forest group had 15 episodes per hour, while it was 33 episodes per hour in the provisioned group (Fig- 3).

Seasonal Variation

The grooming activity of the forest group in comparison to the provisioned group varies not only with respect to season but also with different age – group. The present study reveals that the provisioned group spent more time on grooming activities irrespective of season and age –group.

The adult males of the forest group showed grooming activity of 10.12 episodes per hour in pre-monsoon whereas the adult male of provisioned group showed 17.44 episodes per hour. During monsoon, the grooming activity of the adult male of the forest group was 6.63 episodes per hour compared to 16.63 episodes per hour in provisioned group. In the forest group, it was observed that during retreating monsoon, the grooming activity of the adult male was 14.19 episodes per hour whereas in case of provisioned group it was 14.7 episodes per hour. During winter, the grooming activity was 20.98 and 28.31 episodes per hour for the adult male in the case of forest and provisioned groups respectively (Fig-4). So it was noted that the adult males of the provisioned group spent more time on grooming activity irrespective of the seasons.

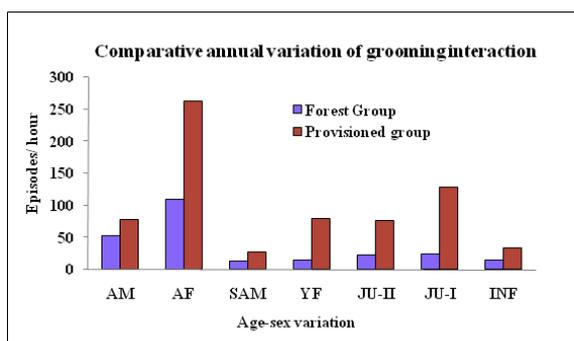


Fig. 3. Comparative age-sex variation of annual grooming interaction.

The adult females of the forest group spent 24.24 episodes per hour on the grooming activity and the adult females of the provisioned group spent 82.4 episodes per hour during pre-monsoon. In monsoon, the grooming activity of the adult females of the forest group was 37.25 episodes per hour whereas for the adult females of the provisioned group, it was 80.36 episodes per hour. In forest group, the grooming activity of the adult females was 26.63 episodes per hour whereas in case provisioned group, it was 65.77 episodes per hour during retreating monsoon. In winter, it was 19.97 episodes per hour and 33.05 episodes per hour for the adult females of the forest and provisioned groups respectively (Fig-5). Again it was found that the adult female of the provisioned group spent more time on grooming activity

compared to the forest group irrespective of the season.

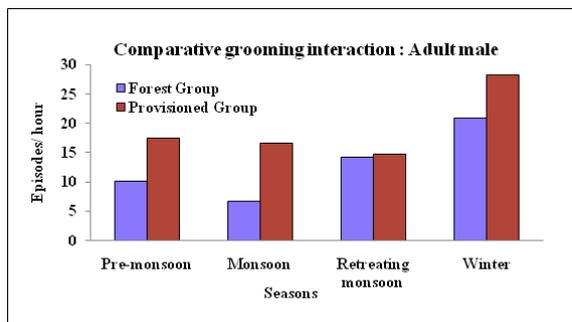


Fig. 4. Comparative seasonal variation of grooming interaction of adult males.

The sub-adult males of the forest group spent 0.95 episodes per hour on grooming activity as compared to 2.71 episodes per hour by the provisioned group. During monsoon, the grooming activity was 2.29 and 3.1 episodes per hour for the sub-adult males of the forest and the provisioned groups respectively. In retreating monsoon, the grooming activity of the sub-adult males belonging to the forest group was 5.21 episodes per hour whereas in case of the provisioned group, it was 3.63 episodes per hour. It was 6.16 episodes per hour of the forest group and 3.35 episodes per hour of the provisioned group for the sub-adult males in the month of winter (Fig-6). This clearly indicates that the sub-adult males of provisioned group spent more time on grooming activity compared to the forest group irrespective of season.

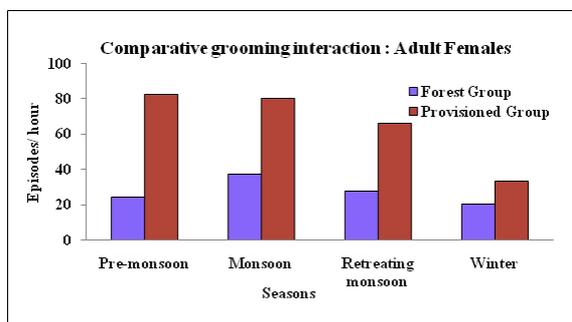


Fig. 5. Comparative seasonal variation of grooming interaction of adult females.

It was observed that the grooming activity of the young females of the forest group was 1.82 episodes per hour whereas in case of the provisioned group it

was 14.14 episodes per hour during pre-monsoon. In monsoon, the grooming activity of the young females belonging to the forest group came to be 1.77 episodes per hour in compared to 22.7 episodes per hour of the provisioned group. It was 5.21 and 29.97 episodes per hour in the forest and the provisioned groups respectively of the young females during retreating monsoon. It was further observed that the young females of the forest group spent 5.89 episodes per hour on grooming activity whereas the young females of provisioned group spent 12.64 episodes per hour during winter (Fig-7). It indicates that the young females of the provisioned group also spent more time on grooming activity as compared to the provisioned group irrespective of season.

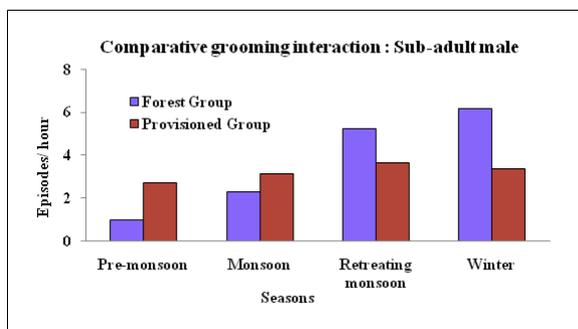


Fig. 6. Comparative seasonal variation of grooming interaction of sub-adult males.

In case of juvenile-II, the time spent on grooming activity by the forest group was 4.42 episodes per hour and 23.77 episodes per hour by the provisioned group in pre-monsoon. During monsoon, it was 3.77 and 20.33 episodes per hour for juvenile-II of the forest and provisioned groups respectively. The juvenile-II of the forest group spent 5.53 episodes per hour and the provisioned group 24.72 episodes per hour during retreating monsoon. The grooming activity was 8.8 episodes per hour for the forest group and 7.61 episodes per hour for the provisioned group during winter (Fig-8). This clearly indicates that the juvenile-II of the provisioned group spent more time on grooming activity during all the season under study except that of winter.

During the study, it was found that the juvenile-I of the forest group spent 4.97 episodes per hour on

grooming activity compared to 35.07 episodes per hour by the provisioned group during pre-monsoon. In monsoon, the grooming activity of the juvenile-I of the forest group showed 4.8 episodes per hour and 33.88 episodes per hour for the provisioned group. During retreating monsoon, for the juvenile-I, it was observed that the forest group had 8.41 episodes per hour as compared to 43.49 episodes per hour in the provisioned group. It was 6.25 and 15.18 episodes per hour for the juvenile-I belonging to the forest and the provisioned groups respectively in winter (Fig-9). It indicates that the juvenile-I of the provisioned group also spent more time on grooming activity as compared to the provisioned group irrespective of season.

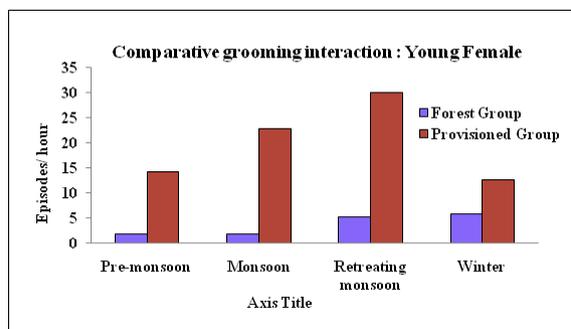


Fig. 7. Comparative seasonal variation of grooming interaction of young females.

The present study indicates that the infants of the forest group spent 0.16 episodes per hour during pre-monsoon compared to 5.62 episodes per hour of the provisioned group. During monsoon, the grooming activity of the infants of the forest group came to be 3.4 episodes per hour and 10.38 episodes per hour in the case of the provisioned group. In retreating monsoon, the infants of the forest group spent 6.41 episodes per hour on grooming activity whereas the provisioned group spent 10.5 episodes per hour. It was 5.01 and 6.58 episodes per hour for the infants of the forest and the provisioned group respectively during winter (Fig-10). It also indicates that the infant of the provisioned group also spent more time on grooming activity as compared to the provisioned group irrespective of season.

Discussion

A relationship between aggressive interactions and distribution of food resources has already been established. On the lines of similar argument that the feeding on provisioned food may result into higher rate of aggressive interactions, it was presumed that the clumped food resources reduces the inter-individual distance (proximity) and thus, increases the probability of physical contact and increased tensions and aggression. Study found that the provisioned group spent 51% of their total feeding time on provisioned food items which are clumped in distribution. On the contrary, animals of the forest group spent over 31% of their total feeding time on leaves which are randomly distributed in nature and not clumped (Sarkar, 2000). The observations on group spread suggest that the average inter-individual distance is significantly reduced in the provisioned group compared to the forest group. These findings support the presumptions that provisioned food not only increases the aggressive interactions between individuals but is also clumped in distribution. Additionally, inter-individual distance is reduced in provisioned population.

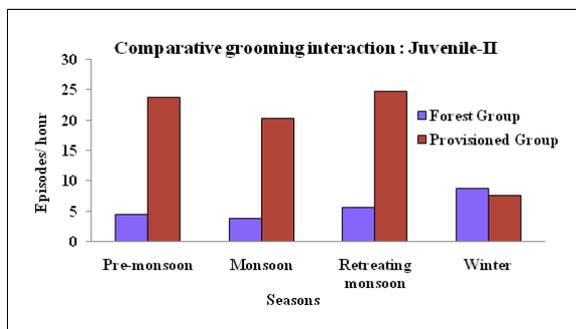


Fig. 8. Comparative seasonal variation of grooming interaction of juvenile-II.

The higher frequency of grooming interactions (28%) in the provisioned group compared to the forest group (10%) suggests relationship of grooming behaviour with food distribution. This trend hold true for all the categories of age classes for both males and females. It is worth mentioning here that the time saved from the expensive foraging activity (searching, finding and obtaining food is not an easy task) due to provisioning is invested in higher grooming interactions. Therefore, the primary function of

grooming in provisioned group may be to reduce tension. The total time spent in grooming, the proximity factor and nature of food distribution and its proportion in their diet are in general agreement with the “*tension reduction mechanism*” hypothesis. Similar findings have also been reported for other primate species.

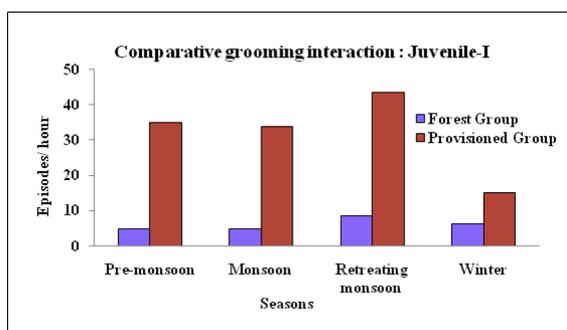


Fig. 9. Comparative seasonal variation of grooming interaction of juvenile-I.

According to this hypothesis, allo-grooming serve the function of reducing the “*tension*” amongst the members of the group. This hypothesis has been tested for pig-tailed macaque (*Macaca nemestrina*) (Boccia, 1987) and for Java macaque (*Macaca fascicularis*) by Schino *et al.* (1988) with quantitative data. Boccia (1987) monitored heart rate in a female pigtail monkey in different social contexts and found that receipt of grooming reduced the heart rate and hence, reduce tension, a physiologically measurement. Schino *et al.* (1988) on other hand showed that an increase in female allo-grooming results in a decrease in male displacement activity rate. Similar results have also been obtained for hanuman langur (McKenna, 1978), Japanese macaque (Turillazzi *et al.*, 1982), apes (de Waal, 1982), rhesus macaque (de Waal, 1984) and Java macaque (Schino *et al.*, 1988).

These findings in Assamese macaque focused that there is a relationship between grooming interactions and provisioning. A higher frequency of provisioning must increase the frequency of grooming interactions in order to reduce inter-individual tension and to stabilize the primate social system. The relationship between provisioning and aggression in the

provisioned group is supposed to fracture the social setup leading to the formation of new sub-group. But, in reality, the grooming factor play a very significant and crucial role to keep the “social fabric” intact, which is a survival need attained through evolution.

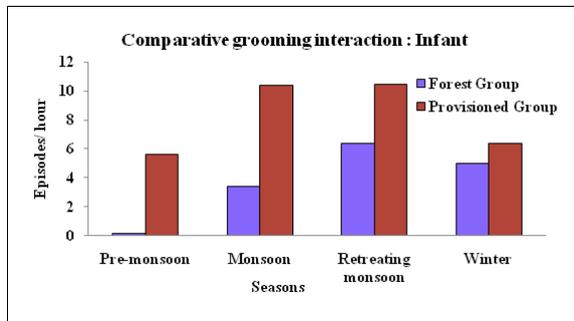


Fig. 10. Comparative seasonal variation of grooming interaction of infant.

Acknowledgement

My gratitude and special thanks to Prof. S.M. Mohnot, Prof. P.C. Bhattacharjee, Dr. Arun Srivastava, Prof. I. S. Bernstein, Prof. Charles H. Southwick, Dr. David Ferguson and Dr. R. Horwich for their technical help during this study. Special thank also goes Dr. Dilip Chetry, Dr. Joydeep Bose, Ms. Farzana Begum, Dr. Jayanta Das, Dr. Jihosuo Biswas, Dr. Rekha Medhi, Dr. Anil Chhangani and Dr. Mathew Kooper. This study was part of the grant received from U.S. Fish and Wildlife Service (Grant No. INT/FWS-22).

References

Altmann J. 1974. Observational study of behavior sampling methods. *Behaviour* **49**, 227-267. <http://dx.doi.org/org/10.1163/156853974X00534>.

Bernstein IS. 1965. Activity patterns in a cebus monkey group. *Folia Primatologica* **3**, 211-224.

Bernstein IS, Rose RM, Gordon TP. 1977. Behavioural and hormonal responses of male rhesus monkeys introduced to females in the breeding and non-breeding season. *Animal Behaviour* **25**, 609-614.

Boccia ML, Rockwood B, Novack M. 1982. The

influence of behavioral context and social characteristics on the physical aspects of social grooming in rhesus monkeys. *International Journal of Primatology* **3**, 91-108.

Boccia ML. 1983. A functional analysis of social grooming patterns through direct comparison with self-grooming in rhesus monkeys. *International Journal of Primatology* **4**, 399-418.

Boccia ML. 1986. Grooming site preferences as a form of tactile communication and their role in the social relations of rhesus monkeys. In : *Current Perspectives in Primate Social Dynamics* (ed. by Taub DM, King FA), Van Nostrand Reinhold, New York. 505-518 p.

Boccia ML. 1987. The physiology of grooming: A test of the tension reduction hypothesis. *American Journal of Primatology* **12**, 330.

Boccia ML. 1989. Comparison of the physical characteristics of grooming in two species of macaques (*Macaca nemestrina* and *M. radiata*). *Journal of Comparative Psychology* **103**, 177-183.

Boccia ML, Reite M, Laudenslager M. 1989. On the physiology of grooming in a pigtail macaque. *Physiology & behaviour* **43**, 667-670.

Coehlo AM, Turner SA, Bramblett C. 1983. Allogrooming and social status: An assessment of the contributions of female behavior to the social organization of hamadryas baboons (*Papio hamadryas*). *Primates* **24(2)**, 184-197.

De Waal FBM. 1982. Chimpanzee politics : power and sex among apes. Jonathan Cape, London.

De Waal FBM. 1984. Coping with social tension : sex differences in the effect of food provision to small rhesus monkey group. *Animal Behaviour* **32**, 765-773.

- Drickamer LC.** 1976. Quantitative observations of grooming behaviour in free-ranging *Macaca mulatta*. *Primates* **17**, 323-335.
- Furuya Y.** 1957. Grooming behaviour in the wild Japanese monkeys. *Primates* **1**, 47-68.
- Goosen C.** 1974. Some causal factors in autogrooming behaviour of adult stump-tailed macaques (*Macaca arctoides*). *Behaviour* **49**, 45-63.
- Hadidian J.** 1980. Yawning in an old world monkey *Macaca nigra* (Primates: Cercopithecidae). *Behaviour* **75**, 133-147.
- Kinzey WG, Wright PC.** 1982. Grooming behaviour in the titi monkey, *Callicebus torquatus*. *American Journal of Primatology* **3**, 267-75.
- Lindburg DG.** 1973. Grooming behavior as a regulator of social interactions in rhesus monkeys. In : *Behavioral Regulators of Behavior in Primates* (ed. by Carpenter CR), Buckwell University Press, Lewisburg, Pa. 124-148 p.
- Lopez-Vergara L, Santillan-Doherty AM, Mayagoitia L, Mondragon-Ceballos R.** 1989. Self and social grooming in stump-tailed macaques: Effects of kin presence or absence within the group. *Behavioural Processes* **18**, 99-106.
- Mehlman PT, Chapais B.** 1988. Differential effects of kinship, dominance, and the mating season on female allogrooming in a captive group of *Macaca fuscata*. *Primates* **29**, 195-217.
- McKenna JJ.** 1978. Biosocial functions of grooming behavior among the common Indian langur monkey (*Presbytis entellus*). *American Journal of Physical Anthropology* **48**, 503-510.
- Michael RP, Herbert J.** 1963. Menstrual cycle influences grooming behavior and sexual activity in the rhesus monkey. *Science* **140**, 500-501.
- Missakian EA.** 1974. Mother-offspring grooming relations in rhesus monkeys. *Archives of Sexual Behavior* **3**, 31-40.
- Moore J.** 1985. Demography and sociality in Primates. Ph.D. Thesis, Harvard Univ., Cambridge.
- Oki J, Maeda Y.** 1973. Grooming as a regulator of behavior in Japanese macaques. In : *Behavioral Regulators of Behavior in Primates* (ed. by Carpenter CR), Buckness University Press, Lewisburg, Pa. 249-163 p.
- Rinaldi F.** 1985. *Attività di spostamento del Macaco del Giappone (Macaca fuscata), Tesi di Laurea, Università di Roma La Sapienza.*
- Saayman GS.** 1971. Grooming behaviour in a troop of free-ranging chacma baboons (*Papio ursinus*). *Folia Primatologica* **16**, 161-178.
- Sade DS.** 1972. Sociometrics of *Macaca mulatta* I. Linkages and cliques in grooming matrices. *Folia Primatologica* **18**, 196-223.
- Sarkar P.** 2000. Ecology and dynamics of social relationship of Assamese macaque, *Macaca assamensis* (McClelland, 1839), Ph.D. Thesis, Gauhati University, India.
- Schino G, Scurechi S, Maestripietri D, Turillazi PG.** 1988. Allogrooming as a tension-reduction mechanism : A behavioral approach. *American Journal of Physical Anthropology* **16**, 43-50. <http://dx.doi.org/org/10.1002/ajp.1350160106>
- Seyfarth RM.** 1977. A model of social grooming among adult female monkeys. *Journal of Theoretical Biology* **65**, 671-698.
- Seyfarth RM.** 1980. The distribution of grooming and related behaviours among adult female vervet monkeys. *Animal Behavior* **28**, 798-813.

Seyfarth RM, Cheney DL. 1984. Grooming, alliances and reciprocal altruism in vervet monkey. *Nature* **308**, 541-43.

Silk JB. 1982. Altruism among female *Macaca radiata* : explanations and analysis of patterns of grooming and coalition formation. *Behaviour* **79**, 162-188.

Simpson MJA. 1973. Social grooming of male chimpanzees. In : *Comparative ecology and behaviour of primates*, ed. Crook JH, Michael RP. Academic Press, New York.

Troisi A, Schino G. 1987. Environmental and social influences on autogrooming behaviour in a captive group of Java monkeys. *Behaviour* **100**, 292-303.

Troisi A, Schino G, Aureli F. 1989. Allogrooming and interindividual proximity in two species of macaques (*Macaca fascicularis* and *M. nemestrina*). *Behaviour* **86**, 196-207.

Turillazi PG, Marchini S, Alessandroni P, Baldo N, Campanella C, Trucchi D. 1982. Social grooming in *Macaca fuscata*. In : *Annali Dell'istituto Superiore Disanita'* **18**, 239-266.