

Ecological Studies on Food and Feeding Habits and Daily Feeding Time Schedule of Rhesus Monkey, *Macaca mulatta* (Zimmermann, 1758)

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Abstract: The present study was carried out from February, 2008 to July, 2008 to record the food habits as well as daily feeding time schedule of Rhesus monkey in Saraswati Plantation Wildlife Sanctuary (SPWS), Haryana (India). Selected three troops (T-I, T-II, T-III) of Rhesus monkey were found to feed on leaves/inflorescences/pods/fruits/bark/ gum/seeds/sucking juices of young stems of 13 species of trees (*Acacia nilotica*, *Albizia lebbek*, *Butea monosperma*, *Delbergia sissoo*, *Eucalyptus sp.*, *Ficus religiosa*, *Morus alba*, *Prosopis juliflora*, *Cordea dichroma*, *Ficus religiosa*, *Syzygium cuminis*, *Ziziphus mauritiana*, *Terminalia arjuna*), 2 species of shrubs (*Ziziphus nummularia*, *Capparis sepriaria*) and 7 species of herbs (*Brassica compestris*, *Oryza sativa*, *Triticum aestivum*, *Saccharum officinarum*, *Trifolium alexanderium*, *Chenopodium album*, *Cynodon dactylon*). In all, 72 sighting of feeding were recorded. Feeding was mostly restricted to morning and evening phases of the day. T-I group was noticed to feed for minimum time, i.e., 2.25 hrs (in February, 2008) to maximum time of 4.41 hrs (in July, 2008); T-II group fed for minimum time of 2.28 hrs (in February, 2008) to maximum time of 4.37 hrs (in June, 2008) and T-III group was observed to feed for minimum time of 2.13 hrs (in February, 2008) to maximum time of 4.44 hrs (in July, 2008).

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1. Introduction

Among mammals, Rhesus monkey, an old world monkey, belongs to Order- Primates, Family- Cercopithecidae, Genus- *Macaca* and Species- *mulatta* (Wilson, 2007). It is distributed ubiquitously throughout mainland Asia, from Afghanistan to India, Pakistan, Bangladesh, Bhutan, Nepal and Thailand to Southern China (Ferris *et al.*, 1980; Rowe, 1996; Groves, 2001; Smith and Mc Donough, 2005). In India, it is found in good numbers in north and north-west regions (Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Uttar Pradesh, Rajasthan, Gujrat), central region (Madhya Pradesh), eastern region (Bihar, West Bengal and Assam) and peninsular region (Seth *et al.* 2001). In the state of Haryana, rhesus monkey is found in different habitats including villages, road side forests, towns, temples and near agricultural fields (Hunger, 2004). Rhesus macaques are dusty brown in color with little or no fur on their reddish-pink faces. The species is sexually dimorphic. Due to scanty information available on the various aspects of ecology and behavior of rhesus monkey in Haryana, in particular, the proposed study was planned in Saraswati Plantation Wildlife Sanctuary in district Kurukshetra, Haryana (India).

2. Materials and Methods

2.1 Study area

Food and feeding habits of *Macaca mullatta* were studied in Saraswati Plantation Wildlife Sanctuary (76° 27' -76° 33' E latitude and 29° 56'-30° 01' N longitude) having substantial macaque population. The study site is located in two districts (Kurukshetra and Kaithal) of Haryana (India), having an area of 11,003 acres. The climate of area is subtropical, semi- arid type and contains alkali soil. Annual rain fall in the area is 516 mm and average temperature is 32.4° C (Dagar *et al.*, 2001). The vegetation of the Saraswati Plantation Wildlife Sanctuary is categorized as "Sub-group 5B tropical deciduous forest" (Champion and Seth, 1968). The dominant flora of the area includes *Acacia nilotica*, *Albizia lebbek*, *Butea monosperma*, *Eucalyptus sp.*, *Dalbergia sissoo*, *Prosopis juliflora*, *Morus alba*, *Ficus bengalensis*, *Ficus glomerata*, *Syzygium cumini* and many species of herbs and shrubs (Dagar *et al.*, 2001). The dominant avian and mammalian fauna of the Saraswati Plantation Wildlife Sanctuary is presented in Table 1.

To study daily feeding time schedule and food and feeding habits of rhesus monkey, direct contact method (Barwer, 1971) was followed. Three troops of rhesus monkey, *Macaca mulatta* were selected and assigned the number in roman digits as T-I, T-II, T-III (Fig. 1). Each troop was silently followed and monitored in three phases of the day, i.e., morning phase (6.00 AM - 11.00 AM), noon

phase (11.00 AM - 3.00 PM) and evening phase (3.00 PM - 7.00 PM) on specific days. The feeding sites of rhesus monkey were marked and subsequently scanned to identify the feeding objects (plant parts, *i.e.*, bark, gum, leaves, inflorescences etc. or animals,

if any). The time taken by rhesus monkeys for feeding activities was also recorded. The collected data was later on statistically analyzed.

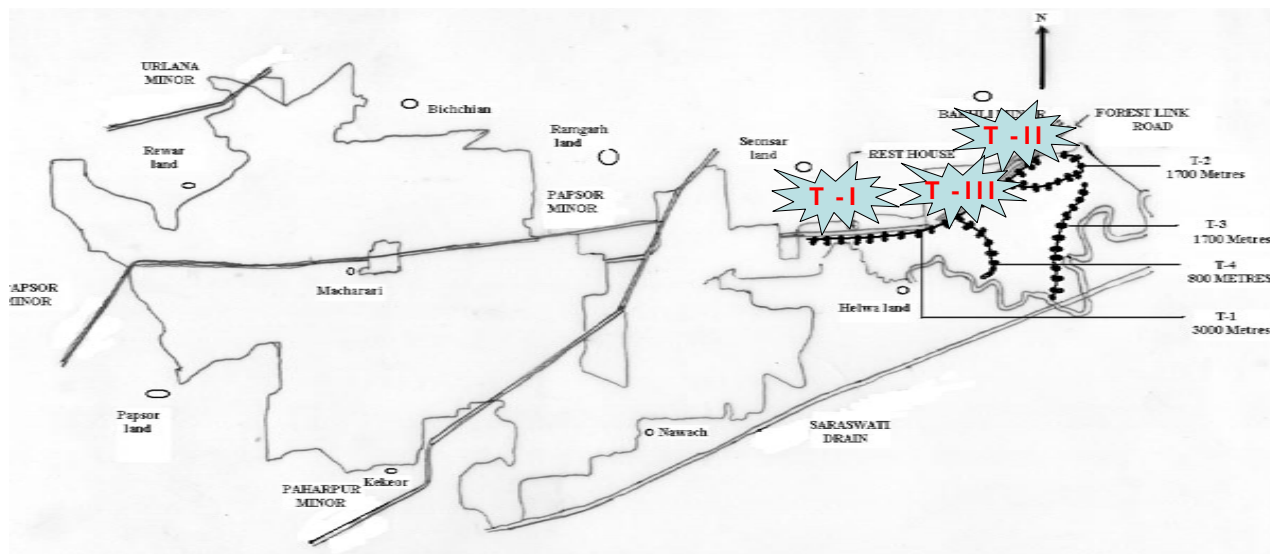


Fig.1 Selected Rhesus monkey troops in Saraswati Plantation Wildlife Sanctuary in district Kurukshetra, Haryana (India).

3. Results and Discussion

Rhesus monkey is considered as omnivorous in its feeding habits as it was reported to feed on eggs, termites and moulds in addition to plants (Lindburg, 1971). In human influenced areas, macaques focus on fruits, flowers, leaves, seeds, gums, buds, clover, roots, bark and also they supplement their food diet with termites, grasshopper, ants, beetles and mushrooms (Fooden, 2000; Wolfe, 2002). In some areas, rhesus macaques depend, directly as well as indirectly, on parts of their diet from human activities (Richard et al. 1989; Southwick and Siddiqi, 1994). In the present study, no animal objects or remains were recorded to be the components of diet of Rhesus macaques. These were observed to feed only on different parts of 13 species of trees, 2 species of shrubs and 7 species of herbs (Table 1). Southwick *et al.* (1985) earlier have observed 25 species of plants in Tawang district (Arunachal Pradesh) on which rhesus monkey were found to feed. Among these plants species, *E. parvifolia* and *E. arborescence* composed 80% diet of Rhesus monkey. Presently, *Macaca mulatta* was recorded to feed on leaves of 9 species of trees (*Acacia nilotica*, *Albizia lebbek*, *Butea monosperma*, *Delbergia sissoo*, *Eucalyptus sp.*, *Morus alba*, *Cordea dichotoma*, *Syzigium cumini*, *Ziziphus mauritiana*, *Terminalia arjuna*), 2 species

of shrubs (*Ziziphus nummularia*, *Capparis sepiaria*) and 5 species of herbs (*Oryza sativa*, *Triticum aestivum*, *Trifolium alexanderium*, *Chenopodium album*, *Cynodon dactylon*). It was also observed to consume inflorescence of 6 species of trees (*Acacia nilotica*, *Albizia lebbek*, *Eucalyptus sp.*, *Ficus reliogiosa*, *Cordea dichotoma*, *Syzigium cumini*, *Terminalia arjuna*) and 1 species of shrub (*Capparis sepiaria*). In addition, rhesus macaques were also seen feeding on pods/fruits of 5 species of trees (*Butea monosperma*, *Cordea dichotoma*, *Ficus bengalensis*, *Syzigium cumini*, *Ziziphus mauritiana*), 1 species of shrub (*Ziziphus nummularia*) and 1 species of herb (*Brassica compestris*). Beside feeding on leaves, inflorescence, pods/fruits of plants, Rhesus macaques were also observed to feed on bark of 5 species of trees (*Acacia nilotica*, *Delbergia sissoo*, *Morus alba*, *Prosops juliflora*, *Terminalia arjuna*), gum of 1 species of tree (*Acacia nilotica*), juicy stem of 1 species of herb/grass (*Saccharum officinarum*) and seeds of 3 species of herbs *i.e.*, *Oryza sativa*, *Triticum aestivum*, *Saccharum officinarum* (Table 1). Since all these troops were stationed deep inside the forest area, the macaques were dependent on natural available foods. Elsewhere, Wolfe (1992) has described about food given to the rhesus macaques in temples which included bread, bananas, peanuts,

seeds, fruits, vegetables, and assorted miscellaneous foods like ice creams and fried bread etc. continuous parts of their daily food.

Lindburg (1971) observed variations in the daily activity cycles of the forests group of rhesus macaques with respect to the pattern, frequency and intensity during the natural cycle of the warm-wet season (July-October), the cool season (November-February) and hot-dry season (March and June). In the present study, a total number of 72 sightings of feeding of 3 troops of rhesus macaques were recorded. The results revealed that Troop I fed for minimum of 2.25 hrs in February, 2008 (winter season) to maximum of 4.41 hrs in July, 2008 (autumn season); Troop II was observed feeding for minimum of 2.28 hrs in February, 2008 (winter season) to maximum time of 4.37 hrs in June, 2008 (autumn season), and Troop III was observed to feed for minimum of 2.13 hrs. in February, 2008 (winter

season) and for maximum time i.e., 4.44 hrs in July, 2008 (autumn season). On an average, individuals of troop I, troop II and troop III devoted 3.36hrs, 3.43hrs and 3.25hrs respectively for feeding activity. Bernstein (1972) recorded maximum frequencies of different activities (travel, feeding, play, sex and agonist) at the time of sunset and these activities were also influenced by temperature, weather and replacement of alpha male. Seth and Seth (1986) and Seth (2000) have reported that climate, season and photoperiod (sunset, sunrise) affect the timing of daily feeding time schedule of rhesus macaques and the latter spent more time resting in the noon phase. In the present study also, rhesus monkeys spent comparatively more time for feeding in the morning and evening phases of the day and stayed idle (resting activity) during noon phase thereby supporting earlier findings of Southwick et al. (1985), Hauser (1999) and Menon (2003).

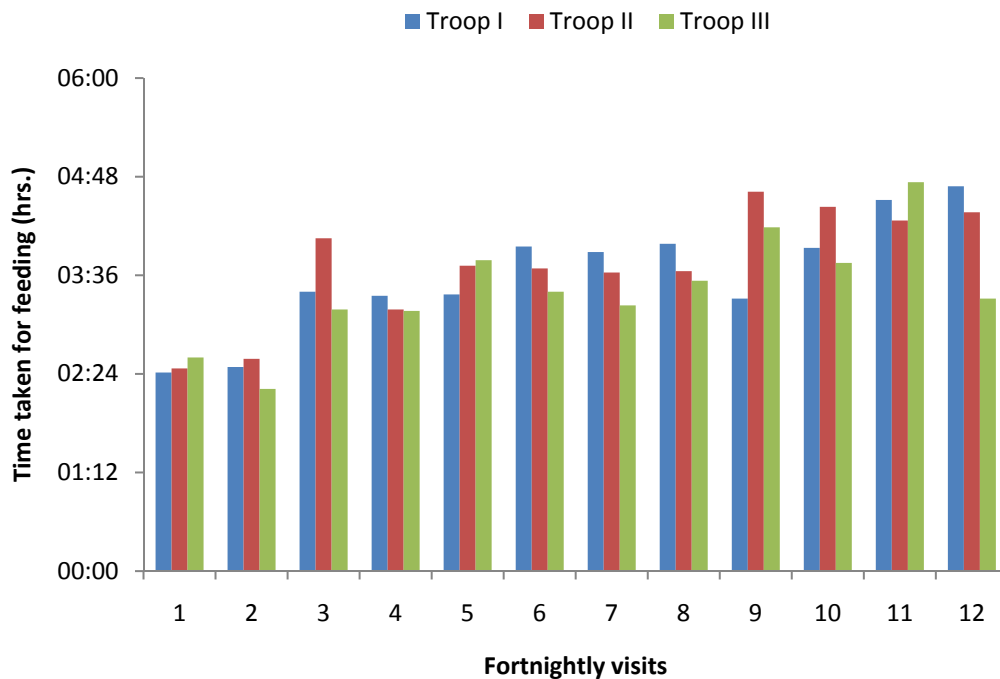


Fig. 2 Time devoted for feeding by various troops of rhesus monkey in Saraswati Plantation Wildlife Sanctuary, Haryana (India).

Table 1. Vegetables and reproductive parts of different species of plants used by *Macaca mulatta* as food in Saraswati Plantation Wildlife Sanctuary (SPWS).

Sr. No.	Tree species	Comman name	Family	Plant parts
1	<i>Acacia nilotica</i>	Babool	Fabaceae	L,B,I,G
2	<i>Albizia lebbek</i>	Siris	Fabaceae	L,I,I
3	<i>Butea monosperma</i>	Dhak	Fabaceae	L,F
4	<i>Delbergia sissoo</i>	Shisham	Fabaceae	F,L,B
5	<i>Eucalyptus sp.</i>	Safeda	Myrtaceae	L,B,I
6	<i>Ficus religiosa</i>	Peepal	Maraceae	I,F
7	<i>Morus alba</i>	Shahtoot	Moraceae	F,L,B
8	<i>Prosops juliflora</i>	Valaiti kikar	Fabaceae	P,B
9	<i>Cordea dichroma</i>	Lasora	Boraginaceae	F,I,L
10	<i>Ficus bengalensis</i>	Bargad	Moraceae	F
11	<i>Syzigium cuminiv</i>	Jamun	Myrataceae	F,I,L
12	<i>Ziziphus mauritiana</i>	Ber	Rhamnaceae	F,L
13	<i>Terminalia arjuna</i>	Arjun	Combretaceae	L,B,I
	Shrubs			
1	<i>Ziziphus nummularia</i>	Jharber	Rhamnaceae	F,L
2	<i>Capparis seipia</i>	Caper bushes	Capparidaceae	L,I
	Herbs/grasses			
1	<i>Brassica campestris</i>	Sarson	Brassicaceae	F
2	<i>Oryza sativa</i>	Dhan	Poaceae	S,L
3	<i>Triticum aestivumv</i>	Gehun	Poaceae	S,L
4	<i>Saccharum officinarum</i>	Ganna	Poaceae	S,St
5	<i>Trifolium alexandrium</i>	Barseem	Bebaceae	L
6	<i>Cheanopodium album</i>	Bathua	Amarnathaceae	L
7	<i>Cynodon dactylon</i>	Dubh	Poaceae	L

L- Leaves, I- Inflorescences, P/F- Pod/Fruit, B-Bark, G-Gum, St-Stem, S-Seed

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