



Study of the impact of tourists and local visitors / feeders on free-ranging Hanuman langur population in and around Jodhpur, Rajasthan (India)

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Abstract: The Jodhpur city of Rajasthan has many tourist places where Hanuman langurs habitually feed on the food given by the visitors to them. The interactions were studied between Hanuman langurs and the visitors in and around Jodhpur by means of interviewing the visitors and direct observations of the behaviour of Hanuman langurs and visitors. Most (82.2%) of the observed interactions involved the presence of food; only in 17.8% of the interactions we observed langurs threatening or chasing the visitors. Some differences, however, emerged between what the visitors reported in the interviews and what we observed. Most respondents (76.1%) reported in the interviews that hostile interactions were started by monkeys, whereas analysis of the direct interactions showed that 47.3% of such interactions were initiated by visitors and only 39.6% by Hanuman langurs. Moreover, 83.9% of the visitors affirm them to feed Hanuman langurs, while 70.2% of them report having seen other visitors feeding them. On the basis of the above results, it would be beneficial to establish an educational program, providing information about the behaviour of Hanuman langurs and the consequences that feeding them could have on their behaviour and on their interactions with visitors.

Keywords: *Semnopithecus entellus*, Jodhpur, Man-monkey relations

INTRODUCTION

Human population growth and activities like deforestation, agriculture and urbanization lead to an ever-increasing encroachment on wildlife habitats. Reduction of wild animals' natural habitats forces species, unable to adapt to altered habitats, into small marginal patches. In contrast, species with a high degree of flexibility can adapt to living in or near areas inhabited by man, where in some cases they end up using easily accessible food resources, like human cultivations and garbage, for example primates (Box, 1991); coyotes (Ellins *et al.*, 1983); birds and small mammals (Diamond, 1986; Gabrey, 1997); and hooded crows (Vuorisalo *et al.*, 2003). Conflicts often occur when non-human primates raid crops (Forthman Quick, 1986; Siex and Struhsaker, 1999; Hill, 2000) or when humans provision groups of primates for example, *Semnopithecus entellus* (Hrdy, 1977); *Macaca sylvanus* (O'Leary and Fa, 1993); *M. radiata* (Schlotterhausen, 1998) and *M. mulatta* (Gupta, 2002). Moreover, increasingly more primates worldwide are creating problems by supplementing their natural diet with food stolen from people or with garbage found around forest reserves, picnic sites and suburban areas. In the latter cases, monkeys have reduced fear and sometimes become aggressive towards humans. Due to their great behavioural flexibility and learning capacities,

Hanuman langurs are able to adapt to varying environmental conditions.

Jodhpur langurs have been living in the areas of the parks, temples, and roof-tops of houses since last 35 years. On these sites langurs have been observed to receive food from visitors or to take food remains from garbage bins. More recently however, the situation has reached a point where in some cases Hanuman langurs were aggressive towards people. The aims of present study were: (1) to assess the visitors' attitudes towards Hanuman langurs and wild life by means of interviews. (2) to study the actual interactions between visitors and Hanuman langurs by directly observing them. (3) to suggest appropriate ways of intervention to prevent conflicts between visitors and langurs. The two-fold approach, based on interviews and on direct observation, allows to obtain a better insight on how conflicts between visitors and Hanuman langurs arise and to suggest appropriate ways of intervention.

MATERIALS AND METHODS

Study area: The study was conducted in and around Jodhpur, India. The Jodhpur city (altitude 241m, 26 18' N and 73 08' E) is situated on the eastern edge of the Great Indian Desert. In its vicinity, a 26 km long diagonal ridge runs from the village Arna in the west to Daijar in the northeast passing through the Jodhpur fort. This ridge

forms a plateau with an area of about 150 km² reaching a maximum breadth of 5-6 km. The arena is covered with open scrub dominated by *Euphorbia caducifolia* and *Anagysus pendula* in the rocky and *Prosopis juliflora*, *P. cineraria*, *Acacia senegal* and *Ziziphus numilaria* on the plains. The climate of Jodhpur is characterized by uncertain and variable rains, with an annual mean precipitation of 390 mm restated to the monsoon months of July to September, a hot dry summer with max temperature reaching 48°C and a cold dry winter with the min falling below 5°C.

The langurs are easy to observe since they are not shy and spend most of the day time on the ground (Mohnot, 1974; Roonwal and Mohnot, 1977; Rajpurohit, 1987). They feed on about 240 natural and cultivated plant species. For religious reasons local people provision most of the groups with wheat/ millets flour preparations, vegetables, fruits and nuts. Around Jodhpur provisioning accounts for one-third of total feeding time with considerable variation among groups. Some groups raid the groups and orchards, but because they are considered to be sacred, they have never been hunted. Apart from feral dogs, jackals and wolves are also seen as natural predators.

There are many parks and temples in and around Jodhpur which have been visited by many hundred people every day. Mandore garden and lake Kailana are most popular picnic spots. Visitors mostly frequently visit and eat in the area of the park and enjoy themselves. All the interviews and observations were conducted in and around Jodhpur city.

Subjects:

Interviews: We interviewed a total of 300 visitors at different sites of Jodhpur. Visitor's age ranged between 14 and 70 years. Socio-demographic characteristics of the interviewed subjects are presented.

Human - Langur interactions: There are about 35 bisexual troops, 13 all male bands and about 2000 langurs living in and around Jodhpur. Many visitors visited almost all the sites of langurs, most of them being feeders. Others are feeders out of which 52 % are regular and feed the langurs as their daily or alternate day routine.

Procedure:

Interviews: The survey was undertaken during the months of September–December, 2006. Pilot observations suggested that different kinds of visitors are found at Mandore at different times of the day. Therefore, to capture the entire variability of the visitor population, we interviewed the visitors in three different periods: morning, afternoon and evening. For each period we conducted 100 interviews.

The questionnaire had a section on the socio-demographic characteristics of the visitors (sex, age, profession, scholarship, etc.), in addition to which it

consisted of four more sections aimed to assess visitor's: (1) frequency of visits and reasons for visiting the park. (2) attitude towards domestic and wild animals. (3) attitude towards Hanuman langurs. (4) knowledge about some aspects of langurs biology and behaviour. (5) interaction with Hanuman langurs.

The questionnaire had a total of 20 questions and took about 5 - 7 minutes to be completed. Instead of having the visitors fill in the questionnaire themselves six interviewers explained and administered the questionnaire, approaching visitors randomly, and filling it in with the visitor's responses. The only disadvantage with this method was that the questionnaire was not anonymous and the visitor may tend to give "socially desirable" answers.

Human - langur interactions: Observations were made using the *ad libitum* sampling method (Altmann, 1974), from a vantage point and trying to minimize the effect of the observer's presence. We observed 400 interactions between human beings and langurs in Jodhpur between September 2006 and April 2008.

Various parameters were recorded in the observations. These included; the initiator of the interaction (human or Hanuman langurs), age and sex of the human and the langur, the density of people around the interacting individuals, the minimum distance between them, the interaction type, if food was present and if or how the langurs eventually obtained it, if the Hanuman langurs showed aggressive behaviour, and the visitors' response to the interaction with the Hanuman langurs.

During the same period 479 episodes of Hanuman langurs eating leftovers taken from garbage bins or from the ground in the Jodhpur area were also observed using the *ad libitum* sampling method.

RESULTS

Interviews:

Frequency and reasons for visiting the Park: A quite high percentage (45.2%) of the interviewed visitors said that they visit the parks and langur's site frequently with more than 3 times a month. In general, visits were concentrated during weekends (62.4%) than the all week round (37.6%). Reasons for visiting the park varied significantly with annual frequency of visits. Majority (65.3%) of frequent visitors visited the parks/sites to practice open air activities such as jogging, swimming and for giving food to Hanuman langurs., while more occasional visitors also came for relaxation, amusement and to see the animals. The annual cost of food calculated was approximately Rs. 70,00,000 in and around Jodhpur.

Attitudes towards animals: The attitude of visitors towards animals was investigated by asking them their liking towards domestic animals, wild animals and

Table 1. Responses percentage (%) of visitors to Hanuman langurs around Jodhpur.

S. No.	Category	%
(1)	Like nature	26.7
(2)	Amusing	23.0
(3)	Intelligent	17.3
(4)	Cute	12.6
(5)	Interesting	10.4
(6)	Indifferent	8.6
(7)	Others (eg. Free ranging and social animals)	8.3
(8)	Negative answers (eg. Aggressiveness and harmful)	6.2
(9)	Similar to human being	4.5

Hanuman langurs on a scale from (great dislike) to Socio-demographic characteristics in which the visitors differ significantly. The response of their attitude towards Hanuman langurs is summarized in Table 1.

In general, visitors showed a similar positive attitude towards wild animals (75.9%). Each visitor choose one or more attributes for his liking/disliking towards Hanuman langurs. The majority of the answers (63.2%) assigned positive attributes to Hanuman langurs, believing them as God. Whereas only 6.2% of the answers assigned them negative attributes, such as aggressiveness, disgusting or thieves etc. Rest of the visitors responded differently and said that they like and love to nature.

Knowledge about Hanuman langurs behaviour and biology: The majority of visitors (87.9%) did not know the other name of the Hanuman langurs (*Semnopithecus entellus*). Regarding their food in the wild, each visitor could choose one or more food items in a list. The majority of food items selected by visitor were only provisioning food, fruits and vegetables. Only 5.3% of the visitors could not select any of the items on the list. Overall, 84.7% of the visitors thought that Hanuman langurs are vegetarian feeding exclusively on fruits and plant matter, while according to 15.3% they were omnivorous.

Roughly 79% percent of the visitors did not consider Hanuman langurs dangerous, 10.0% considered them dangerous, whereas 11% did not have an opinion about it. Hanuman langurs were considered of shy nature but sometimes they were thought to have potential aggressiveness towards humans.

Visitors' responses to whether they feed the Hanuman langurs or did they see others feeding the Hanuman langurs was 83.9 % and 70.2% visitor, respectively.

Percentage of interacting individuals for Hanuman langurs and visitors divided as per age and sex revealed that mainly age group of above 40 was more in visitors.

Most of the interactions involved the presence of food. Type of the food offered to Hanuman langurs during the interactions compared to natural and provisioned food

is Tabulated in Table 2.

The survey revealed that in Jodhpur, Hanuman langur mainly eat fruits; however they also eat other foods like potato chips, ketchup, mayonnaise, etc., both taken from visitors and/or found in the garbage bins. In 36.4% of the interactions; visitors handed, threw or left food for the langurs, while in 9.5% of the interactions langurs robbed the visitors; and in 3.4% of the interactions, visitor(s) did not give food to the approaching langurs. The 20.5% of the interactions were not related to food but these interactions consisted of visitors taking pictures, langurs stealing items other than food, or pursuing and threatening those visitors who approached langurs (16.4%).

The overt aggressions (e.g., biting) was never noticed in the langurs. On the basis of visitors' verbal and non-verbal behaviour during the interactions, their responses to the interaction were classified as negative (26.0%), positive (31.1%), neutral (28.6%) and others as unclear.

DISCUSSION

Interviews: In general, visitors have a positive attitude towards Hanuman langurs and consider them intelligent and attractive. Although many visitors witnessed episodes of stealing, very few reported having experienced negative interactions themselves. Most visitors ignore the Hanuman langur's common name and they are partially aware of what these wild langurs eat; as visitors are probably aware that feeding the animals is forbidden (in the Jodhpur there are a few panels that warn the visitors not to feed the animals). It is suggested that a "social desirability effect" accounts for the above results, i.e., visitors tended to give what they thought were the "correct" answers.

Overall, from our observations and results it seems that a higher scholarship and a higher frequency of visits to the visiting place do not lead to better knowledge about wildlife and the ways to approach it. Given this, it is advisable to start an educational program about the ecology and sociobiology of Hanuman langur in this area.

Human – Langurs interactions: Most of the interactions involve, males of both Hanuman langurs and humans. Langur females seemed to be less involved in the interaction as compared to the males, even though there were marked individual differences. Usually males seem to be opportunistic foragers, and prone to take risky actions during foraging, whereas females feed on more

Table 2. Percentage (%) of Different food items offered to Hanuman langurs during the interactions with visitor.

Food offered	Percentage
Fruits	55.2
Cooked food	15.4
Sweets	17.3
Mixed food	8.3

reliable food sources.

Adult humans interacted more than the other age classes, though youngsters also participated in many interactions. The finding that adult and young langurs interact more than infants is not surprising, since infant langurs are dependent on mothers, being always in close proximity to them, and therefore rarely approach human beings. Moreover, although visitors often tried to single out animals of all ages, it was much easier to get closer to older and more dominant animals. Though we expected more interactions involving children, because of the natural attraction that children have towards animals, our findings showed that most of the interactions of Hanuman langur with children were mediated by adults that typically encouraged children to approach or feed the monkeys. In the majority of interactions, Hanuman langurs and visitors were within a meter or less of each other. This clearly indicates that Hanuman langurs are accustomed to be in proximity with humans, and that they are not afraid of them. Hanuman langurs have gradually learnt that proximity to human beings can be advantageous since they can receive food, or increase their chances of stealing it. Humans are indeed attracted to the monkeys, but do not seem to understand the meaning of their facial expressions, vocalizations and body postures. Visitors' responses to interaction with the monkeys were mainly classified as positive or neutral. These neutral responses occurred mainly when the visitors handed, threw, or left food for the monkeys; during which it looked as if feeding the monkeys was something very natural.

Our observational findings are similar to those reported for other primate species living in close contact with humans (Forthman Quick, 1986; Lee *et al.*, 1986; O'Leary and Fa, 1993; Saj *et al.*, 1999). However, it should be noted that the questionnaire and the direct observation of the interactions between humans and wild animals gave somewhat different results. In fact, most visitors reported in the interviews that Hanuman langurs are responsible for starting interactions, while our observations indicate that the majority of interactions were started by human visitors. Furthermore, only a few visitors admitted feeding the Hanuman langur, and majority report had witnessed other visitors feeding them. The latter result, fully supported by our direct observations, is in clear contrast with the results of the questionnaire, where the majority of visitors affirm they never feed the Hanuman langurs. The finding that food was involved in most of the interactions shows that Hanuman langurs are interested in visitors because of food. From other observations it emerged that Hanuman langur spent 35.9% of their time in this study area in proximity with visitors (e.g. some park and city sites). Other studies have shown that provisioning decreases

monkeys' motivation to forage in their natural habitat, reduces their ranging pattern and may lead to ingestion of unhealthy food (Forthman Quick, 1986; Saj *et al.*, 1999). From the human point of view, since Hanuman langurs are very attractive, it is difficult to refrain from feeding them.

Although Hanuman langur have not yet been aggressive towards humans, their level of aggressiveness could rise regardless of whether provisioning continues or stops. If provisioning continues, interactions between Hanuman langur and visitors may become more frequent, and the probability of aggression may become higher. This has been reported in other sites where monkeys were in close contact with humans (Lee *et al.*, 1986; Zhao and Deng, 1992), and they constantly harass or bite visitors, occasionally with serious consequences. If provisioning suddenly stops, Hanuman langur may approach visitors trying to obtain food in an aggressive way.

An effective strategy is to improve the design of the garbage bins to make them "langur proof". In addition, it is necessary to monitor visitors' behaviour better and especially change their attitude towards wildlife. In particular, it might be advisable to establish an educational program on the biology and the behaviour of langur monkeys, on how to behave in their presence, and on the reasons why not to feed them. With proper management, Hanuman langurs could act as a tourist attraction, and contribute to a more respectful attitude towards wildlife.

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