

## Population status of Rhesus monkey (*MACACA MULATTA*) and their menace: A threat for future conservation

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### ABSTRACT

Rhesus macaques *Macaca mulatta* are protected by schedule III of Wildlife Protection Act. However, they are losing conservational support with the rapid increase in their number as well nuisance activities. To investigate this, a study on their population distribution and monkey-menace was conducted in Aligarh district during May – September 2010. Aligarh district is located in western Uttar Pradesh (India) between 27°53`North latitude and 78°4`East longitude and situated 126 km away from Delhi on Delhi-Calcutta railways. Population estimation of rhesus monkey was done by surveying the area mainly along the different roads leading towards other townships situated within administrative boundaries of Aligarh district. These roads were considering as transects and covered by motor-vehicle keeping the speed 10-15 km per hour. The identified monkey groups were visited during dusk or dawn and visual counts of each group were made carefully from close distance. To know the attitudes of local people towards monkey menace, questionnaire based “opinion survey” was conducted. Eighty four groups of rhesus monkeys comprising of 4051 individuals were recorded from different types of habitat. Group size ranged from 15 individuals to 155, with an average of 48. Opinion survey revealed that monkeys are becoming danger for public health, crop and property. Eighty nine percent of the local people agreed that monkeys are responsible for disease transmission among human being, whereas, 61% people were convinced that monkeys are damaging properties and crops. Therefore, 86% people of the area are convinced that monkey should be trapped and translocated to somewhere else.

**Keywords:** *Macaca mulatta*, monkey menace, population distribution, translocation.

### 1. Introduction

India has traditionally been considered as heartland of rhesus monkeys. It is distributed throughout the northern India upto some extent of central India, in a wide variety of habitat including tropical moist deciduous forest to subtropical pine belt of sub Himalayas, semidesert of Rajasthan, Mangrove swamps of Sunderban, West Bengal (Prakash & Krishna 1960; Mandal 1964; Mukherjee & Gupta 1965; Nevelle 1968; Imam 2000). In urban areas of India, they are found on roadsides, canal banks, in railway stations, villages, towns, and temples. In 1953, Corbett reported that 10 million of rhesus monkeys were present in Uttar Pradesh state (a state located in northern India). Southwick et al. (1961) conducted the first ever survey of northern India and reported that there were less than 1 million rhesus in Uttar Pradesh. In 1979 the Zoological Survey of India estimated the total rhesus population to be 183,000. Rhesus macaques were once seriously threatened by the rate of capture and export

for use in biomedical research. In the 1960s, about 50,000 juveniles of rhesus macaques were trapped and shipped from India per year, crippling the population growth of rhesus in India.

In 1978, a total ban on rhesus export was the first step in reestablishing the population, and the numbers in India have more than doubled since the 1970s. There are still some rhesus macaques trapped and used for research within India, but the effect of the population is negligible compared to previous levels of usage. In 1988, Southwick & Siddiqui estimated the total rhesus population to have increased due to the ban on trapping instituted by the Government of India in 1978 and to be in the vicinity of 410,000 - 460,000 individuals. As there have been no country wide censuses after that there are varying opinions about the current rhesus population in India. Southwick & Siddiqui (1994) believe that more than three millions of rhesus monkeys were present in India and out of which 86 % were living near to human habitation.

Aligarh district may be considered as one of the known ancient sites of rhesus monkey populations in Northern India. Over the past 50 years, population of rhesus monkeys in Aligarh district has shown significant and spatial distribution in terms of numbers. In 1959 there were 337 rhesus monkeys spread over in 17 groups which increased to 403 individuals in 21 groups by 1962. The population after that declined irregularly and even alarmingly to a low point of only 163 individuals in 1970 (Southwick & Siddiqui 1983). This happened probably due to deforestation and commercial trapping for import. However, the rhesus population recovered after a ban was imposed in 1978 on commercial trapping. Since 1978, the population registered 48.5% growth and increased to 651 individuals during 1995 (Imam 2000).

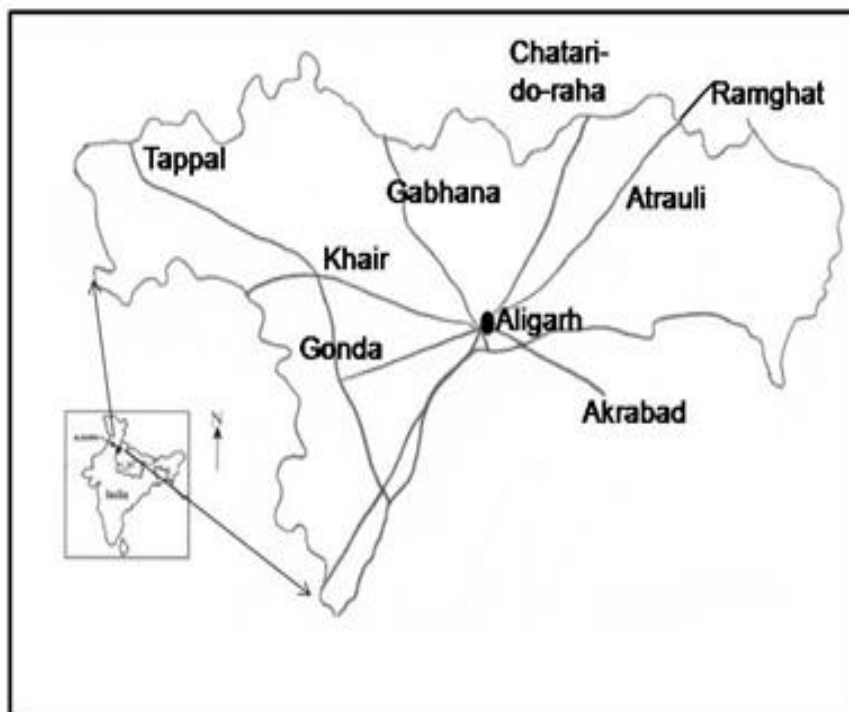
There has been a regular observation of Aligarh district rhesus population by Southwick et al. till 1990s (1962, 1965, 1977, 1983, and 1988). After this, except for Imam and Yahya (1995, 2001) no study has been done on distribution and population estimation of rhesus monkey groups in Aligarh district. Considering this, the present study was conducted to fill the information gap.

In the absence of natural predator and very high birth rate, the population of rhesus monkey is multiplying every year (Imam 1995). This has led to increase in commensal monkey population and so the man-monkey conflicts. Basically the problem of monkey nuisance lies in their attempts to fetch food and space in human habitats. This is only because of destruction of forests and their natural habitat. With the expansion of human settlements and consequent decline of the habitats most of the monkeys of the country' have been compelled to become ecological refugees (Mitra 2000). Attracted by food, water and shelter, monkey troops invade croplands, settlements and often destroy property, gardens, household furnishing and parked cars. Angered by their destructive activities, irate humans resort to hitting monkeys with stones and sometimes even shooting them. In response monkeys become over-aggressive. They threaten people with snarls, snatch food boxes, spectacles, and handbags and very frequently bite human beings. Several cases of monkey bites and other nuisance problems have been reported from various parts of India like Delhi, Mussorie, Agra, Mathura, Aligarh, etc (Imam & Malik 2006). Similarly, the nuisance created by rhesus monkeys in Vrindaban (Mathura, UP) were so severe that the senior citizens and spiritual leaders of the town submitted a petition to the government to revive the practice of monkey trapping. Later on, Imam et al. (2002) trapped more than 600 monkeys from Vrindaban and translocated them in other safe habitat (Imam et al. 2002). Monkeys are reported to be in hostile range of humans not only because they are damaging crops and house-hold, but also vectors of various diseases. Aligarh Muslim University campus, academic staff college, girl's

hostel and other localities of Aligarh city is also grabbed by the similar types of monkey menace. Above all so many incidences of monkey menace are unreported. However, it is true that monkey menace is becoming severe day by day and so the conflicts with human being. Since, monkey problem is directly related with the people's life, health and property, and has a great social relevance, it is very important to undertake this problem as a subject matter for further investigation. Keeping this in mind this study was undertaken.

## 2. Study area

Aligarh districts of western Uttar Pradesh is located between 27°53' North latitude and 78°4' East longitude (Fig. 1). It is situated along Delhi-Calcutta railways and 126 kms away from Delhi and 1408 kms from Calcutta. District covers an area of 38.29 sq km and total human population was 3,673,849 (Census 2011). Topographically, the district represents a shallow trough, formed by river Ganga in north east and Yamuna in north-west. The district experiences tropical monsoon type climate. Temperature ranges from 46°C to 4°C. Monsoon occurs from mid June to mid October and rainfall ranges from 116 to 260 mm. However, this year fairly good downpour was recorded during the monsoon. There is no natural forest left in the district. The main planted trees include sheesham (*Dalbergia sissoo*), peepal (*Ficus religiosa*), banyan (*Ficus bengalensis*), imli (*Tamarindus indicus*), jamun (*Syzgium cuminii*), babool (*Acacia nilotica*). The dominant fauna include mongoose, fruit bat, squirrel and a great variety of birds both migratory and resident.



**Figure 1:** Map of study area (Aligarh district & adjoining)

## 3. Methodology

The study was divided into two phases; (i). Survey of Aligarh district for the identification of Monkey groups(s) and their population estimation and (ii). Opinion survey of local people to know their attitudes towards monkey menace.

### **3.1. Rhesus monkeys' Population survey**

In the initial three months, literature survey and questionnaire preparation was done. After that a thorough survey of study area was started. The survey was conducted mainly along the different roads leading to different townships within the administrative boundaries of Aligarh district (Fig. 1). These roads were covered by motor-vehicle (Taxi) keeping the pace at 10-15 km per hour. Enquiries were made after every 5 km to know the occurrence of monkeys in nearby areas. To confirm their occurrence, the exact location was visited. The identified groups were revisited during dusk or dawn during the months of May – September, 2010, just after the birth season.

Visual counts of each group were made carefully from close distance. A binocular (10x30) was also used whenever required. To facilitate the population estimation monkeys were also counted by offering them food. Frequently, monkeys were fed (Bananas and grams were used as feeds) to get them together which facilitated counting. Individual characteristics such as permanent injury marks, missing digits of feet etc; were recorded to minimize the possibilities of recount.

The Aligarh city was also surveyed for monkey population estimation after modifying the survey techniques. The entire area of city was divided into different sectors. Adjacent sectors were monitored on separate days to avoid counting the same monkeys more than once. Roads and lanes were used as transects and, on the days that they were surveyed, each sector was monitored around dawn or dusk, the time when monkeys were most active. Surveys were conducted on a motorbike, which was driven slowly (10-15 km h<sup>-1</sup>) and halted whenever a group of monkeys was encountered.

### **3.2. Opinion survey**

To know the attitudes of local people towards monkey menace, “opinion survey” was conducted following “Quota Sampling method”. Initially study was designed for two years and it was considered to interview people from ten monkey sites. However, due to financial constraint, only three sites; Khair, Aligarh city and Chatari-do-raha were selected for questionnaire survey to know the monkey-menace and attitudes of people towards monkey. From each selected site 100 respondents were identified and out of these, 20 individuals representing different sects like shop keepers, housewives, pedestrian, devotees and farmers were selected using purposive sampling method. Variables mentioned in table 2 were considered while doing the questionnaire survey. Analysis of certain important variables was done to highlight the opinion of public regarding monkey menace and the damage done to the property and crops in their localities.

## **4. Results**

During the survey of Aligarh-Chatari-do-raha road, seven monkey groups were located at different places/localities/villages. Their total estimated population was 482. Maximum numbers of monkeys (155) were recorded from Satha Sugar mill premises, whereas only 25 individuals were seen in Jawan, a small town located 20 km away from Aligarh. The average population size of this road was 69 (Table 1).

The road leading from Aligarh city to Delhi was surveyed upto the district boundary of Aligarh (near Gabhana) using motor vehicle. Five monkey groups comprising of 222 individuals were recorded at different locations on this road. The maximum population of

rhesus monkey was found in Gabhana (70), near bus stand, where they fetch more food from passengers and passerby, whereas Alka factory group-2 recorded minimum number of monkeys (30). Average group size of monkeys found on this road was 44 (Table 1).

The Aligarh-Tappal road was surveyed upto the district boundary of study area. On this road Khair, Jatari, Gomat chauraha and Tappal are the main sites where monkeys are found in good number. Enquiries regarding presence of monkey groups were made upto Tappal city. About 754 monkeys were estimated in sixteen groups of macaques (Table 1). Maximum numbers of monkeys were recorded near Khair bypass chouraha (112 individuals). On the other hand Khandela recorded only 15 individuals of monkey. The average group size of this road was calculated 47 individuals.

The road leading towards Gonda from Aligarh city was surveyed upto the district boundary of Aligarh (near Gonda). Three monkey groups comprising of 165 individuals were recorded at different locations on this road (Table 1). The maximum population of rhesus monkey was found near petrol pump (75), whereas Nyavas (Gonda city) recorded minimum number of monkeys (35). Average group size of monkeys found on this road was 55.

During the survey of Aligarh-Atrauli road, sixteen monkey groups were located at different places/localities/villages. Their total estimated population was 603 (Table 1). Maximum numbers of monkeys (81) were recorded from “Khatri Para Mandir area, Atrauli”, whereas only 18 individuals were seen in Purani Police Choki, Atrauli. The average population size of this road was analysed 38.

The Aligarh city was also surveyed for monkey population estimation using method mentioned above. Monkeys were also counted in places where they were being fed by devotees. Twenty three monkey groups comprising of 1228 individuals were recorded at different locations in the city area (Table 1). The maximum population of rhesus monkey was found near Barahdwari-Guria bagh-Nandan cinema road (140), whereas, Dhorra Mafi (wandering group) recorded minimum number of monkeys (19 individuals). Average group size of monkeys found in city area was 53.

Monkey survey was made on Aligarh-Nanau-Kanpur road upto Akrabad. Akrabad is situated almost at the border of Aligarh district. Fourteen monkey groups with a total population of 597 were estimated along this road at different places/localities/villages (Table 1). The largest group of 105 was located in Nanau market; whereas, Sawli was the smallest group inhabiting only 18 individuals. The average population size of monkey groups along this road was 43.

**Table 1:** Monkey groups and their population in Aligarh district, India during 2010

S N	Name of Transect /Road	No. of Group s	Populatio n size range	Average Group Size $\pm$ SE	Total Populatio n
1	Aligarh-Jawan - Chatari-do raha- road	07	25 - 155	69 $\pm$ 15.4	482
2	Aligarh-Gabhana-Delhi Road	05	30 - 70	44 $\pm$ 6.8	222
3	Aligarh-Khair-Tappal road	16	15 -112	47 $\pm$ 6.6	754
4	Aligarh-Gonda road	03	35 - 75	55 $\pm$ 11.5	165
5	Aligarh- Atrauli road	16	18 - 81	38 $\pm$ 5.2	603
6	Aligarh city	23	19 - 140	53 $\pm$ 6.9	1228
7	Aligarh- Nanau-Akrabad road	14	18 - 105	43 $\pm$ 6.4	597
		<b>Grand Total population</b>			<b>4051</b>

## 4.2. Opinion Survey

As discussed above “quota sampling” was done for opinion survey. People from different sects of the society viz; shopkeepers, housewives, pedestrian, pujaris (devotees) and farmers were identified for questionnaire based opinion survey. Analysis of variables mentioned in table 2 was done to highlight the opinion of public regarding monkey menace and the damage done by them to the property and crops in their area.

**Table 2:** Opinion Survey of monkey menace from Aligarh city, Chatari and Khair

SN	Variables	Categories	Sites selected for opinion survey		
			Aligarh	Chatari-do-raha	Khair
1	Perceived increase in monkey population	Yes (%)	90	93	95
		No (%)	10	7	5
2	Increase in monkey pop during last 5 - 10 yrs	Double (%)	32	41	35
		More than Double (%)	68	59	65
3	Types of problems faced by respondents due to monkey menace	Monkey bites	60	53	45
		Damage to property	54	22	30
		Food snatching/stealing	85	50	70
		Crop /garden damage	14	26	32
		Accidents due to fear	35	15	26
4	Disturbance of mental peace (1-5 points on Likert's scale)	Bearable (1 point)	12	52	48
		Less Bearable (3 points)	36	12	30
		Unbearable (5 points)	52	36	22
5	Religious attachment with monkeys	Yes (%)	85	76	80
		No (%)	15	24	20
6	Have you ever seen these mentioned symptoms in monkey? Yes (%)	Regular coughing	62	42	40
		Running nose/sneezing	30	20	36
		Diarrhoea	35	15	10
		Itching/skin disease	78	66	57
7	Possibilities Diseases transmission from monkeys to humans	Yes (%)	15	7	10
		No (%)	85	93	90
8	Public opinion regarding the damage to property / crops by monkeys	Low intensity damages	30	18	25
		Medium intensity Damages	56	62	66
		High Intensity Damages	14	20	9
9	Perceived measures for minimizing the monkey menace yes (%)*  * shows multiple response	Patrolling by dogs	17	26	30
		Use of crackers	20	29	24
		Use of stick / fire	48	50	56
		Use of Iron Grills to fence the house	26	35	40
		Trapping by Government agency (non-scientific)	80	88	90
		Culling	3	0	2
		Others	5	8	0

Table 2 presents the analysis of opinion given by 300 participants. Based on this opinion survey, inference was drawn for other parts of the study area regarding monkey menace and people's attitudes towards monkeys. Out of 300 respondent, on average ninety three percent

people are agreed that population of rhesus monkey has increased manifold in Aligarh district during last 5-10 years. People, right from rural to urban areas are facing problems created by monkeys. Eighty five percent of respondents from city area feel that food snatching, especially from children and women, are the main problem created by monkeys, where as 60% people consider that monkey bite in city area is one of the severe problems. On the other hand 54% of people consider that property damage by monkeys are another problems faced by local people. Crop damage is one of another problems created by monkeys, however, only few peoples are agree with this (14-32%). About 52% of respondent consider that monkey menace is unbearable and it has just stolen the mental peace of the local people. Monkeys are not only creating social problems but may be carrier for many communicable diseases. Sixty two percent of respondent have seen that monkeys are suffering from cough and cold, whereas, 78% reported that some of the monkeys are having skin problem. Diarrhea is also reported by 35% of respondent. People from local area have been fading up with the problems continuously created by monkey; therefore, they need some solution. About 17-56% of respondent are agreed that people are using some of non-destructive measures; like patrolling by dog, use of cracker and fencing the house premises by iron grills to minimize the monkey problems. But 80-90% of respondents feel that Government must take some permanent measures to solve the monkey menace, therefore, they favour trapping of monkeys from their area and shifting them to elsewhere. However, inspite of unbearable problems created by monkeys, local people does not support killing or culling of monkeys (Imam and Yahya, 2002).

## **5. Discussion**

Over the past 50 years, population of rhesus monkeys in Aligarh district has shown significant and spatial distribution in terms of numbers and groups. In 1959 there were 337 rhesus monkeys spread over in 17 groups which increased to 403 individuals in 21 groups by 1962 (Southwick & Siddiqi 1983). The population after that declined irregularly and even alarmingly to a low point of only 163 individuals in 1970 (Southwick & Siddiqi 1983). This happened probably due to deforestation and commercial trapping of rhesus for import. However, the rhesus population recovered after a ban was imposed in 1978 on commercial trapping, and population increased to 669 individuals in 1991 showing a growth of 48.4% (Imam & Yahya 1995). Further an increase was observed in rhesus population during 1993 and 1995 when 963 and 1337 monkeys were recorded in the district respectively (Imam, 2000). After a gap of 15 years (1995-2010) a remarkable change in population of rhesus monkey was observed in Aligarh district. Since 1995, the rhesus population has registered a growth of 203% and at present there were 4051 individuals. While comparing the number of groups, 14 monkey groups were recorded in the district during 1995 (Imam 2000), which increased to 84 (in 2010) showing a remarkable growth of 500% during the last 15 years. The reason for such a high rate of growth in monkey population as well as in their group number may be due to absence of natural predator and high natality rate. This idea is also advocated by Imam (2000), who conducted similar study in some parts of Aligarh district and found 91.6% of average natality and only 2.1% of mortality. Probably these are the reasons because of that population and group sizes of rhesus monkey have increased manifold.

During the present study 84 groups of rhesus monkeys were identified and a total of 4051 monkeys were estimated from different localities. If we compare the total population of rhesus monkey in Aligarh district from 1959, it increased 12 times (from 337 individuals to 4051 individuals), whereas, due to limitation in habitat expansion, number of groups increased only upto 4.9 times (from 17 groups to 84 groups).

Results shown in Table 3 revealed that rhesus are distributed in diverse categories of habitat; from road side to temple premises. It can be observed that maximum numbers of rhesus were found in urban areas. Aligarh city supports 1988 individuals of rhesus monkey distributed in 43 groups. It seems that people of urban areas are well aware about the protection provided to rhesus monkeys by wild life protection act (WPA, 1972), so that they don't want to hurt or kill them. Rhesus macaques are kept in schedule III of WPA (1972) and its killing/hunting is punishable. However, other habitats are also supporting fairly good number of rhesus monkeys. Besides high natality and low mortality, religious attachment of local people with rhesus is one of other reasons for their high population. Orthodox Hindus consider monkeys to be sacred animals, to be revered and protected. This reverence stems partly from the role of the monkey god, hanuman, in the *Ramayana* Hindu Sanskrit epic. This may be the reason that even six monkey groups comprised of 366 individuals were protected in the temple premises. It was observed that people visiting the temple, offer foods to monkeys residing in the temple premises. Furthermore, study revealed that villagers and farmers have developed tolerance attitudes towards monkey menaces and crop damages, and due to this people are accepting monkey presence in their village surroundings and croplands. About 270 monkeys (in 4 groups) were recorded from agriculture area where as 328 (in 10 groups) from village side. Since canal and road side provides shelter and supplement food supply from by passers, monkeys have made these sites as their home and probably due to these reasons 382 monkeys were found on canal side and 647 on road side. Not only this, even 70 monkeys were recorded during survey from railway station also. However, this group can be considered as strolling group and they may have come to this site in search of new pasture.

**Table 3:** Habitat wise distribution of rhesus monkey groups in Aligarh district during 2010

HABITAT							
Road side	Agriculture land	Canal side	Railway station	Town area	Temple premises	Village side	Total pop
Pop (No of grp)	Pop (No of grp)	Pop (No of grp)	Pop (No of grp)	Pop (No of grp)	Pop (No of grp)	Pop (No of grp)	Pop (No of grp)
647(14)	270(4)	382(6)	70(1)	1988(43)	366(6)	328(10)	4051(84)

Throughout their range in India, rhesus inhabits in the vicinity of human being and getting up to 93% of their diet from human sources, either from direct handouts or from agricultural sources. This has led man and monkey into unavoidable competition for space and other resources (Imam et al. 2002). Monkeys are reported to be in hostile range of humans not only because they are damaging crops and house-hold, but also vectors of various diseases. One of the most common threats for human health is monkey bites, which may cause rabies. Monkeys are also suspected of maintaining and disseminating *Mycobacterium*, which are the causative agents of tuberculosis. *Giardia* and *Entamoeba histolytica*, causing diarrhea and dysentery, respectively are the two important protozoan parasites of monkeys which may also transmit to the human-beings (Tiwari and Shukla, 1984). *Trichaphyfon menfagrophytes* is the most common ringworm affecting all primates and a threat for human beings. A few species of lice, mites and flies infect monkeys causing skin diseases characterized by scaling, are highly dangerous to man. In this way infected and latent carrier monkeys are potentially hazardous to human health when they come in close contact (Imam et al. 2001; Imam &



Malik 2006). Though no disease outbreak within any human community in India has ever been linked to monkey-human contact so far, the potential for such mishap exist.

Monkey menace is not only true for India, but it is reported from other parts of the world also. Researchers around the world are currently engaged in studying the man and primate interface. Tappen (1960) reported that in Sierra Leone, the monkey problem was so severe that Government considered eliminating their population from agricultural lands and approximately 19,000 primates were destroyed in different phase. It has been reported that baboons are highly adaptable to humans in rural and semi urban setting, and are capable of creating conflicts with humans (Forth man- Quick 1986). During 2000, Hill studied that red-tailed guenons (*Cercopithecus ascanius*), L'Hoest's guenons (c. *Ihoesti*), olive baboons (*Papio anubis*), gray langurs and macaques were frequent visitors to farm lands, therefore, considered as major threat to their livelihood. In a similar study Lee and Priston (2005) reported that east African patas monkeys are in conflict with human due to their participation in crop raiding. Similarly Chism (2005) reported that baboons are in severe conflict with farmers in Ghana and Kenya. Results of anthropocentric surveys on people's opinion also suggest that primates are in conflicts with people from Uganda. It was found that 82% of the people believed that population of primates had increased over the years, and 95% informed that the primates damage crops, therefore, most of the primates (67%) are considered as pests. People also consider purple-faced langurs as menace due to their garden and house damaging activities (Dela 2007; Riley 2007; Rudran & Eisenberg 2007).

## **6. Conclusion and recommendation**

The present study revealed that population of rhesus monkey is thriving although their natural habitats are destructed. Probably it is due to absence of natural predator, high natality and people's religious attachment with monkeys. Ban on rhesus export and their adaptability to human-disturbed environments may be another cause of their prosperity. Like other wildlife, increase in monkey population may not necessarily be positive because in areas where rhesus macaques are in contact with humans they are menaces: threatening or biting children and the elderly, stealing food from people, raiding crops and damaging property. These menace leads to decreased tolerance and persecution of rhesus macaques in some areas. This is one rare case where the destruction of habitat and replacement with agricultural land has led to an increase in the number of primates, but at a serious social cost. These social problems will only be exacerbated if habitat destruction does not stop and will likely force government control measures, like trapping and relocation, to decrease the population for the health and safety of humans in India. Therefore, it is recommended that some measures should be taken to control the monkey population and their menace, otherwise people may consider rhesus as vermin than as species for conservation importance, which may hamper the ongoing research projects on other primates at large.

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