



Rhesus Macaque, *Macaca mulatta* (Zimmermann, 1780) issues and Solution in India- a case Study of Human-wildlife Interface Management

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ABSTRACT: The most difficult problem that India's forest, human habitation and wildlife managers are currently dealing with is rhesus monkey management. Rhesus Monkeys are important to culture, science, and the economy, yet they are also a major annoyance in modern society. Due to the human interference by serving food to them on the roadside of forests, around temples, worship them, there is drastic changes in their feeding habits due to now availability of easily accessible and delicious food in the human habitations. Among other species of Monkeys in India, only the Rhesus Macaque is not having fear of humans or facing any threat from human. Due to getting easily available food in and around human habitations, they are continuously migrating in troops from forests to urban, semi-urban and rural human habitats damaging crops, orchards and creating so many nuisance by their activities to humans. Today, the conflict between humans and Rhesus monkeys has grown significantly in most of the states of Northern India in and around human habitations. The various practices used for the management of human-monkey conflicts involves the use of bioacoustics, which creates distress noise and scares away the monkeys, vaccinations, immunocontraceptives, sterilization to stop the increase of the rhesus monkey population, live/appropriate fence to protect agricultural crops and orchards, oral contraceptives may be provided with food will be one of the future management options, among other measures, but none of the measures had given fruitful results to resolve the problem. As the Human-Monkey Conflict is mainly due to human interference by feeding them, therefore there is urgent need to follow do's and don'ts by humans in and around Rhesus Monkeys natural habitats or in human habitations in India, immediately to stop feeding/serving them with any kind of food materials, to develop slight fear among them, so that they will move towards their natural habitats for feeding, breeding and survival. The study indicates that the Rhesus Macaque populations those living in their natural habitats in the protected areas in India are living in the harmony of Nature, having balanced population, surviving and no threat to anyone.

Keywords: Rhesus Macaque, Issues, Solution, Management, India.

INTRODUCTION

The most discussed wildlife topic in the world today is the conflict between humans and animals and in India the conflicts of human is increasing day by day with wild animals *i.e.* Asiatic Elephant, Wild boar, Tiger, Leopard, Blue bull, Monkeys *etc.* Monkeys are important in science, mythology, history, and culture, their anatomy and physiology are extremely similar to those of humans, and in that the Rhesus macaque in particular has been used to study many facets of human physiology and anatomy. According to Indian mythology, the monkey is an incarnation of Lord Hanuman, who is revered for his unwavering loyalty and devotion to Lord Rama and is the supreme commander of the army of monkeys during the Thretha Yuga. As a result, the monkeys are offered food out of devotion and that attracts them further close to human habitation, making them more and more human dependent. Rhesus macaques and hanuman langur often live in and around temples and towns, where they are

worshiped, provisioned and protected by local people (Rajpurohit *et al.*, 2006), as they are considered the image of God Hanuman (Jolly, 1985). However, due to their crop raiding they are disliked in the areas of intensive agriculture, horticulture, and plantations (Roonwal & Mohnot 1977). However, within the last fifteen or twenty years, there have been negative stories about monkeys, particularly Rhesus.

Out of all the monkey species that can be found in India, people now consider the Rhesus macaque to be a major problem to the humans. A horde of Rhesus macaques not only engages in direct confrontation with humans but also consumes bird eggs and other food sources, leading to a multitude of ecological diseases. Rhesus's damage of crops is currently the major problem. Intensification of agriculture and reduction of habitat heterogeneity has led to a reduction of food sources for macaques in the non-reserve matrix across many parts of India (Sinha, 2001). With their extensive repertoire of cooperative behaviour, opportunistic life-

style and non-specialized omnivorous diets, macaques are highly adaptable and take readily to living alongside humans in rural or urban settings (Hill, 2000). According to the Agriculture Department's 2011 report on crop losses, around 1609 Panchayats in Himachal Pradesh are impacted by monkeys alone, while another 1169 Panchayats are affected by other wild animals. It has been estimated that the loss to vegetables and grains is approximately 150 crores annually. In a similar vein, the 2011 Horticulture Department Report suggests that horticultural crops were evaluated for a loss of almost 105 crores between 2006 and 2010. Farmers that dare to defend their crops must spend more money than they make, since they need to send out guards to keep an eye on the crops. The Rhesus macaque was previously protected from killing by law as listed animal under Schedule II Part I of the Wildlife (Protection) Act, 1972, but now it has been removed from protection till December, 2022. This has caused the man-monkey dispute to reach a new high, and people want it to be settled peacefully. Nowadays, the residents of hamlets affected by the monkey's nuisance desire that the monkeys be taken from the area surrounding their homes and released somewhere else; however, this is merely a band-aid solution that moves the problem from one location to another. Studies on human-macaque conflict in India have largely focused on their ecological dimensions or focused on conservation interventions (Imam *et al.*, 2002; Medhi *et al.*, 2007), and cultural aspects are relatively unaddressed (Pirta *et al.*, 1997).

Prominent Indian Primatologist Malik recommends creating parks for primates, enhancing their habitats, and planting fruit trees that are preferred by monkeys, and establishing trees that serve as the monkeys' homes could be one of the likely answers to this problem (Iqbal Malik *et al.*, 1984). Other options include sterilizing the monkeys, both male and female, and using sound devices to annoy the monkeys. Rhesus macaques and Bonnet macaques were sent from India to America and Europe up until 1977, when they were kept for scientific purposes. However, this was then stopped in 1977, and Bangladesh was next to follow in 1979 (McGreal, 2007) due to allegations that they had been subjected to cruel treatment while being transported, handled, and studied. Owing to variety of habitats, forests, grasslands, wetlands and deserts, a number of monkey's species are distributed in India from evergreen forests of Western Ghats and North East to dry forests of Rajasthan and Gujarat. The following species of monkeys are found in India *i.e.* the Capped Macaque (*Trachypithecus pileatus*), the Rhesus Monkey (*Macaca mulatta*), the Bonnet Macaque (*Macaca radiata*), the Assam Macaque (*Macaca assamensis*), the Arunachal Macaque (*Macaca munzala*), the Stump Tailed Macaque (*Macaca arctoides*), the Pig Tailed Macaque (*Macaca leonine*), the Lion Tailed Macaque (*Macaca silensis*) etc. Certain species are uncommon and threatened, but the population of others exceeds the target threshold. Therefore, the present study made an efforts to provide

compiled information on Rhesus Macaque issues and solution in India.

METHODOLOGY

This is a synthesis of information and data collected by the author on direct observations in different parts of Northern India and also from different open sources such as published research papers, articles, reports and other sources such as google scholar, science direct, research gate *etc.*

Rhesus Macaque Issues. Many monkey species found in India are docile, shy and restrict themselves to forests except a few spp. of macaques. The Indian monkey species have become commensal, primarily because of religious protection, the delicious food provided to them, and their adaptability to a range of habitats *i.e.*, rhesus macaque (*Macaca mulatta*), the bonnet macaque (*Macaca radiata*), and also the Hanuman langur (*Semnopithecus entellus*). Without a doubt, conflicts between humans and monkeys exist in all of the locations where they are found. However, the primary macaque species involved in the conflict between humans and monkeys is the Rhesus Macaque, and voices are primarily raised against rhesus macaque alone. However, in addition to Rhesus Macaque, many issues are also being caused by bonnet and grey langur. According to accounts, Assamese macaques are reportedly starting to act similarly, snatching handbags and other items, frightening people when they approach residential areas, tearing garments, and occasionally attacking people. Sometimes conflicts also occurs in the forests beyond in the regions where people live. In addition to crop-raiding, biting, and panic psychosis, the monkey problem also involves destroying electrical bulbs, busting water pipes, biting chimneys, chewing through internet and electric wires, and spreading fatal illnesses like tuberculosis.

Management Strategies. To minimize human-monkey conflict, the human-wildlife interface management implementation is necessary by understanding the problems and finding solutions to maintain the balance in the nature. Assessment of public opinion is needed for effective management of man-monkey conflict (Marchal & Hill 2009; Isabirye *et al.*, 2008; Eudey, 2008). In India, especially in northern India, the rhesus monkey can be managed using the following techniques. It incorporates management techniques that are both proactive and reactive. Since this is the most problematic species, Rhesus macaque management strategies have been primarily discussed.

(a) Stop Feeding of monkeys. Behavioural biologists and primatologists narrate that offering food is to accept the dominance of a species and monkeys are strongly guided by this principle. Rhesus macaques derive, both directly and indirectly, a substantial part of their diet from human activities (Richard *et al.*, 1989). In fact, up to 93% of their diet can be from human sources, either from direct handouts or from agricultural sources (Southwick & Siddiqi 1994). According to the research, monkey's dominance is mainly because of the food provided by people to feed monkeys.

Then the monkeys begin to dictate tous. Primate scientists all oppose feeding monkeys in public areas outside of parks or permanent shelters that are specifically made for them. However, as of right now, there is no legislation prohibiting feeding monkeys in public areas or on roadways. In Shimla, though during 2004, feeding of monkeys in public places, except temple premises was prohibited within Shimla municipal limits, under section 302 of Municipal Corporation Act, but even the same is not applicable in other parts of the H.P. Thus, people feed the monkeys on the roadsides with bread, bananas, and gram. This frequently leads to accidents and traffic bottlenecks. Sometimes, in some cases a troop of monkeys hidden nearby would attack and kill individuals who get out of their cars to help the injured monkeys has also been observed. At times, this even leads to human fatalities. In light of this, there is a growing consensus among the populace that feeding monkeys outside of approved areas is illegal under the Indian Penal Code, 1860. On the other hand, the Hon'ble courts have begun to intervene in matters pertaining to monkeys. In the case of New Friends Colony Residents Welfare Association Vs. Union of India and Others, the Honorable High Court of Delhi issued an order on March 14, 2007, stating that no one is permitted to feed or provide food to monkeys in public spaces. However, in addition to the plant species that monkeys use for food and shelter, the Hon'ble High Court of Delhi has also mandated that managers feed the monkeys in their care. The Honorable Court has further requested that food offered by followers be gathered at feed collection locations, and that arrangements be made to transfer said food to monkeys that are housed. The Department of Forests and Wildlife, Government of NCT Delhi, has issued a public notice prohibiting feeding monkeys in public areas in compliance with the direction of this Hon'ble Court. The Delhi government has set up monkey feed collection locations for the devotees, from where the food is conveyed by MCD arrangement, despite the fact that feeding monkeys is a religious concern.

(b) Habitat improvement. The reversal of habitat conditions with the overall objectives of ecosystem management holds the key to reducing the monkey problem both in rural and in urban areas. It has also been observed that the monkeys consume a variety of climbers, bushes, and herbs. It is necessary to identify, multiply, and plant these species in order to improve the ecosystem. Monkeys are attracted to certain trees, such as Bargad or Barh (*Ficus benghalensis*), Sacred fig/Peepal (*Ficus religiosa*), Cluster Fig/Gullar (*Ficus glomerata*), Wild Fig/Anjir (*Ficus carica*, *F. palmata*), Kadamb (*Neolamarckia cadamba*= *Anthocephalus cadamba*), Lasora (*Cordia myxa*), Wild Mango (*Mangifera indica*), and Mulberry (*Morus alba*) are among the trees that monkeys adore.

(c) Using the Optimal Foraging Theory. According to the theory of optimal foraging, which was first put forth by MacArthur and Pianka in 1966, animals whose behavioural methods maximise their net calorie intake per unit time spent foraging are favoured by natural selection. The notion was first developed in an effort to

explain why animals frequently limit their diet to a few favorite varieties while having access to a large variety of foods. It simply refers to the option of choosing between foods that are higher or lower in nutrients. In the forest, rhesus monkeys spend the entire day looking for food. On the other hand, they can locate wholesome food in less than ten minutes when they approach populated areas. They thus devote more time to reproducing (Anupam, 2015). Thus, it is necessary to cultivate nutrient-rich edible plants found in the actual forest. Planting a few banana trees as a test plot in swampy forest areas is perfectly acceptable- a method of managing habitat and luring monkeys back to their natural environments.

Use of langurs. Although it hasn't been proven scientifically, it's thought that Rhesus was terrified of langur. As a result, some individuals and groups intimidate monkeys by using langurs. However, as per the Indian Wildlife Protection Act, 1972, roping or holding langurs in captivity is considered hunting and not permitted to do so. Therefore, this approach cannot be utilized to lessen conflict between humans and Rhesus monkeys. Even though it's thought that Rhesus fears lamb, there appears to be a shift in Rhesus' behavior. There are visuals of Langur and the Rhesus army moving in unison, showing no signs of fear or hostility.

(d) Use of monkey calls. There are Indian villages that emulate the sounds of alpha males. They thus let out a loud ah, ah, ah, and then ooh, ooh. They run away from this fear. But this is only a stopgap measure. They begin to cause comparable issues elsewhere.

(e) Developing Live fences. Since thorns frighten monkeys, live fences can be erected to protect crops, vegetables, and orchards. Opuntia is the ideal species for this use. However, in terms of other advantages, this plant is not very helpful. It is important to choose a species for the live fence that benefits the community economically as well. The best choices for live fence are Gray Nicker (*Caesalpinia bonduc*) and Christ's thorn (*Carissa carandus*). They are rich in food and therapeutic properties, in that order. These species provide excellent monkey protection when planted at the edge of the fields.

(f) Use of oral contraceptives. Releasing monkeys back into forests after a vasectomy and capture procedure is not only laborious but also expensive and time-consuming. The process of catching a monkey is time-consuming. In addition to the possibility of harm, the monkeys are also highly susceptible to contracting zoonotic diseases, such as tuberculosis, as per multiple accounts, which are spread by Rhesus monkeys. Therefore, research is being done on the idea of creating oral contraceptives. Contraceptives can be given to monkeys together with food if they emerge successfully (Nelson, 2013). However, it is not very helpful because the oral contraceptives must be provided to the same monkey consistently in order for it to work, which is also impractical.

(g) In-situ sterilization. Once the animal has been put to sleep, the immuno-contraceptive vaccine Porcine Zuna Pellucida (PZP) can be administered. In fact, over

time, this vaccination lowers monkey fecundity. The layer of proteins called zona pellucida actually shields mammalian oocytes. PZP injection stops fertilization, which in turn stops pregnancy (Singh *et al.*, 2005).

(h) Trapping monkeys. In India, handling monkeys has long been done this way. According to records from the Chamba Circle and the early Chamba Princely State, monkeys were taken outside of the town to provide a break for the populace. There are people in India who have historically made their living by catching monkeys. For a while, those in the region where they are caught get respite. The primates are captured in one location and released in another. This is merely a means of spreading the issue from one location to another. If they are let loose in the forest, they either soon go to the neighboring habitations or create more stress to the forest. The removal of problem animals and their release in other places has occurred in many parts of India, sometimes without the consent or awareness of people living near the locality of release (Athreya, 2006), or without following appropriate rehabilitation protocols (Panwar & Mishra 2004). The major disadvantage of relocation is that it could lead to a transfer of conflict and affect human lives near the site of release. Conservationists thus argue that it might be better to find in situ solutions to conflict rather than use relocation as a mitigation tool (Linnell *et al.* 1997).

(i) Export of Rhesus monkeys. Rhesus monkeys were exported from India to the USA and Europe for use in scientific research up until 1977. Between 1956 and 1960, India was the second-largest supplier of rhesus to the United States, bringing in an average of 1,20,000 (one lakh twenty thousand) rhesus per year. Rhesus exports from India to the United States peaked annually up to the late 1950s. Up until the late 1950s, up to 2,00,000 (two lakhs) rhesus were sold each year to the United States, however decreased by 1978, the year that India outlawed the export of primates (Schofield, 1983). Before 1978, India was the largest exporter of monkeys, exporting 60-70 thousands monkeys per year (Southwick & Siddiqi, 2001). Due to ban on their export in 1978 and their adaptability to human-disturbed environments, the Indian population of rhesus macaque is increasing (Rao, 2003). Various body parts of monkeys are still used as an effective experimental medium for characterization of various human pathogens (Ahamed *et al.*, 2004; Mehedi *et al.*, 2002; Shafee & AbuBakar 2011) and lifting the ban on export of monkeys from India would help control their population. Numerous farmer associations are raising their voices to allow the export of rhesus after the Indian Wildlife Protection Act, 1972 is appropriately amended. On this matter, there are differing views, nevertheless. According to one group, it's the only realistic way to deal with the Rhesus monkey problem in India peacefully. Animal rights activists and primatologists, on the other hand, disagree with this. It is alleged that young monkeys, between three and five months of age, were being exported. The parents used to become angry as a result of being cut off from their children. They then made their way into human settlements, which is why monkeys are now

considered a threat there. According to experts on primates, two requirements must be met before monkeys can be exported: first, they must come from their natural habitat and, second, they must be disease-free. Conversely, the issue is with communal and semi-communal monkeys, who require translocation in order to be exported, yet a large number of them are sick and hence unsuitable for export. As a result, we might conclude that this solution is not very feasible.

(j) Culling. Animal activists claim that the Indian constitution protects all living things, including Rhesus macaque monkeys, and that it is inappropriate to discuss the eradication of monkeys. Every citizen is obligated by Article 51A (g) of the Constitution to have "compassion for living creatures." It is the duty of the nation's citizens to respect the living world. All living things are endowed with inherent dignity, the right to a peaceful existence, and the right to defend their well-being, which includes defense against torture, beatings, kicks, reckless driving, overloading, and other forms of physical or mental harm. However, the Wildlife Protection Act, 1972 included a clause allowing the State's Chief Wildlife Warden to issue a shooting permit in the event that a wild animal poses a threat to people or property. However, the majority of the impacted groups concur that culling ought to be the very last measure used in dire circumstances when all other forms of control have failed.

(k). Don'ts & Do's with Monkeys

(i). Don'ts - When coexisting with monkeys, we must refrain from doing the following to lessen conflicts between humans and monkeys. Among them are:

1. Avoid making direct eye contact with monkeys since they may view it as a challenge or a minor threat.
2. Not to bring plastic bags because they believe they hold food.
3. Using monkey-proof trash cans to dispose of food.
4. Avoid eating or holding food close to monkeys, especially with young children.
5. Refrain from approaching the mother monkey who is holding her baby.
6. Never purposefully agitate monkeys. Coughing, sneezing, yawning, laughing, and even holding your palm or fingers in front of your mouth are all interpreted by monkey behavioral biologists as serious threats, to which the monkeys will respond. It will either react violently or issue a counter threat, or it will submit in terror.
7. When you make noise, the monkeys perceive it as a serious threat and get frightened. Behavioral biologists see it as a very risky circumstance. Attacks are more often than not, particularly when the monkeys are traveling in a troop. The best course of action in this case would be to distract the monkeys. Their focus will be drawn elsewhere by what someone else is doing on the opposite side.

(ii). Do's - The behavioral biologists emphasize how important it is to comprehend monkey mood. Lowering one's gaze is said to be the greatest approach to show respect for monkeys.

Although the body language and facial expressions like those of monkeys, they differ from those of humans in

that they may make it difficult to interpret the mood of the monkeys. For monkeys, smiling is a rude gesture. Make sure to respect the space of wild monkeys and avoid interacting with their young. Disturbing juvenile monkeys can provoke defensive behaviors from adult monkeys.

DISCUSSION AND CONCLUSION

The human-monkey conflict in India presents a multifaceted challenge that demands careful management strategies. The long-term issues related to *Macaca mulatta* in India encompass human-monkey conflicts, rabies transmission, and urban adaptation challenges. While monkeys hold cultural and scientific significance, their increasing presence in urban and rural areas poses various problems ranging from crop damage to public safety concerns. Addressing this conflict requires a combination of proactive and reactive measures. Preventive measures such as discouraging the feeding of monkeys in public areas, enhancing their natural habitats, and using optimal foraging theory to guide habitat management can help mitigate the conflict. Additionally, techniques like the use of langurs to deter monkeys, employing monkey calls, and constructing live fences can provide temporary relief. Long-term solutions involve research into in-situ sterilization to control monkey populations without resorting to more drastic measures like culling or export. Wildlife SOS provides rescue services for distressed monkeys, highlighting the need for better animal management and public education to mitigate these issues. Despite challenges like the use of langurs, efforts by organizations like Wildlife SOS focus on rescue, treatment, and education to combat human-monkey conflicts. The Indian government has taken several initiatives to address the issues related to *Macaca mulatta* such as sterilization programs for population control, declaring macaques as "vermin", translocation of problem macaques, habitat creation, waste management, public education, bioacoustics to deter monkeys, immunocontraceptive vaccines and protective fencing for agriculture. These strategies aim to minimize crop raiding, property damage, and financial losses caused by macaques, especially in urban and agricultural areas. Additionally, the visibility of macaques in agroecosystems affects human-macaque relationships, potentially leading to negative perceptions and actions against the species.

Over time, sustained conflict may disrupt local ecosystems, affecting biodiversity and agricultural sustainability in affected regions. Implementing guards in agricultural settings, planting buffer crops, and educating the public on not feeding monkeys are practical approaches to reduce conflict and promote co-existence. The outcomes of government initiatives to address *Macaca mulatta* issues in India are mixed and indicate a need for more comprehensive and effective strategies. Despite sterilization efforts in states like Himachal Pradesh, the behavior of sterilized monkeys has changed, necessitating the establishment of monkey shelter homes. The Delhi government has expressed

helplessness in addressing the monkey menace due to ineffective sterilization and a shortage of monkey catchers, highlighting the lack of clear strategies to mitigate the conflict. Translocation of problem macaques in urban areas has been employed as a non-lethal solution to human-macaque conflicts, but this requires keeping the animals in captivity for a long time, which may trigger behavioral changes and make them susceptible to diseases. The creation of suitable habitats for macaques in states like Odisha, Kerala, and Telangana is underway, but the lack of mechanisms to assess the impact of these initiatives hinders the evaluation of their effectiveness.

If the humans will not disturb them, stopped providing them easy food, stop occupying their natural habitats, they are happy to live for their survival in their preferred habitats natural forests like other Primates species. The human interference is clear threat to Rhesus Macaque, the humans themselves responsible for the problems or issues they are facing currently due to movement of Rhesus Macaque. Stop Feeding Rhesus Macaque, don't throw household food materials in open dumping yard in the village, town/city, the easy food made them habitual to move fearless in human habitation, develop minor fear to them from human, stop entertaining, the problem of Rhesus Macaque will slowly resolve.

However, the feasibility and ethical implications of these methods need thorough consideration. Ultimately, fostering coexistence between humans and monkeys requires understanding monkey behavior and respecting their space while implementing sustainable management strategies that safeguard both human interests and wildlife conservation. By adopting a holistic approach that balances ecological, social, and ethical considerations, in India we can strive towards peaceful and sustainable cohabitation with its primate inhabitants.

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