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CONSERVATION MEASURES FOR MONKEY (*Macaca mulatta*) AND LANGUOR (*Presbytis entellus*)

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Abstract: The rhesus macaque (*Macaca mulatta*), is one of the best-known species of Old World monkeys. It is listed as Least Concern in the IUCN Red List of Threatened Species in view of its wide distribution, presumed large population and its tolerance of a broad range of habitats. Rhesus macaques are exceptionally adapted to coexisting with humans and thrive near human settlement, in both urban and agricultural areas. It is impossible to characterize their natural diet without considering the impact of humans. Langour (*Presbytis entellus*) is a lanky, long-tailed monkey with bushy eyebrows and a chin tuft. It has a small slender body with long tail and long hands. Langour has a lifespan of about 25 years. The people living in the surrounding area and employee of the company would be motivated towards the protection of the animal. People come to see such attractions as Monkeys can be very entertaining. Breeding programs are also part of the conservation efforts. This is to help many of the species get their populations to increase. Hopefully many of them can one day be released successfully back into the wild. The conservation measures to protect monkey and langour are discussed in this article.

Keywords: Conservation; Ecological impact; Flora and Fauna; Wild life.

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INTRODUCTION

Floristic and Faunistic pattern of the area was studied based on opportunistic survey (personal observation), inquiries from the local people and forest officials and secondary data. The biodiversity we see today is the fruit of billions of years of evolution, shaped by natural processes. The vast array of interactions among the various components of biodiversity makes the planet habitable for all species, including humans. There is a growing recognition that, biological diversity is a global asset of tremendous value to present and future generations. At the same time, the threat to species and ecosystems has never been as great as it is today. Species extinction caused by human activities continues at an alarming rate. Protecting biodiversity is in our self-interest. Ecological impact assessment (EclA) is used to predict and evaluate the

impacts of development activities on ecosystems and their components, thereby providing the information needed to ensure that ecological issues are given full and proper consideration in development planning. Environmental impact assessment (EIA) has emerged as a key to sustainable development by integrating social, economic and environmental issues in many countries. EclA has a major part to play as a component of EIA but also has other potential applications in environmental planning and management (Kumar, 2014). Ecological Impact Assessment provides a comprehensive review of the EclA process and summarizes the ecological theories and tools that can be used to understand, explain and evaluate the ecological consequences of development proposals. At the 1992 Earth Summit in Rio de Janeiro, world leaders agreed on a

comprehensive strategy for sustainable development to meet our needs while ensuring that we leave a healthy and viable world for future generations. One of the key agreements adopted at Rio de Janeiro was the Convention on Biological Diversity. Article 14 of Convention on Biodiversity (Impact Assessment and Minimizing Adverse Impacts), stressed the need to Introduce appropriate procedures of environmental impact assessment for proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects. Environmental impact assessments have become an integral part of development projects in India ever since 1994, to formulate policies and guidelines for environmentally sound economic development. Proper assessment of biological environment and compilation of its taxonomical data is essential for the impact prediction (Kumar, 2013; Kumar *et al.*, 2013; Kumar and Aggarwal, 2013a; b; Kumar, 2014).

MONKEY

The rhesus macaque (*Macaca mulatta*), is one of the best-known species of Old World monkeys. It is listed as Least Concern in the IUCN Red List of Threatened Species in view of its wide distribution, presumed large

population, and its tolerance of a broad range of habitats. Native to South, Central and Southeast Asia, troops of *Macaca mulatta* inhabit a great variety of habitats from grasslands to arid and forested areas, but also close to human settlements (IUCN, 1994; 2001; 2003; 2008; 2010).



Figure 1. *Macaca mulatta*

Classification

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia

Order: Primates

Family: Cercopithecidae

Genus: *Macaca*

Species: *M. mulatta*

Conservation Status

IUCN: Others (LC) ver 3.1.

IWPA: Schedule II.

CITES: Not listed.



Local names: Bandar, Monkey, Rhesus monkey.

Life span: 25 Years.

Gestation: 5.5 Months (164 days).

Height: 531.8 mm (M), 468.8 mm (F).

Weight: 7.7 Kg (M), 5.34 Kg (F).

Native: Afghanistan; Bangladesh; Bhutan; China; India; Lao People's Democratic Republic; Myanmar; Nepal; Pakistan; Thailand; VietNam.

Geographical Distribution: The species as a whole is found throughout most of southern Asia, in eastern Afghanistan, Bangladesh, Bhutan, central and southern China (Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei,

Henan, Hubei, Hunan, Shaanxi, Sichuan, Tibet, and Yunnan, as well as the island of Hainan), northern and central India (in the states of Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkand, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, Sikkim, Tripura, Uttaranchal, Uttar Pradesh and West Bengal), Lao PDR, Myanmar, Nepal, northern Pakistan, northern Thailand and Viet Nam (Wilson and Reeder, 1993; 2005).

Habitat: Because they are found in such a broad geographic area, it is difficult to concisely summarize the types of habitats rhesus macaques populate. In the most general terms, they are found in both tropical and temperate habitats including semi-desert, dry deciduous, mixed deciduous and bamboo, and temperate forests as well as in tropical forests and mangrove swamps, usually at elevations from sea level to 2000 m (6561 ft), but they have been seen at elevations up to 4000 m (13,123 ft) in China and northeastern India. Rhesus macaques are also found in areas close to humans in urban settings or near cultivated fields. The habitat includes primary and secondary tropical and dry evergreen forests and bamboo forests. In India, rhesus macaques are found in flat, cultivated areas, where agricultural fields dominate the landscape and in the plains, foothills and mountainous regions where habitat includes cultivated fields, tropical forests and dry, deciduous forests. During the hottest parts of the year, groups in the Himalayan region of India migrate to higher elevations where cooler temperatures persist throughout the summer months. In urban areas of India, they are found on roadsides, canal banks, in railway stations, villages, towns, and temples. It is estimated that 48.5% of rhesus macaques in northern India live in villages, towns, cities, temples and railway stations where they are in close and frequent contact with people at all times. About 37.1% of the population lives with some human contact on roadsides and canal banks and only 14.4% of the rhesus macaques in the northern part of the country live in isolation from humans and do not rely on them at all for food (Wilson and Reeder, 2005).

Ecology: Rhesus macaques are exceptionally adapted to coexisting with humans and thrive near human settlement, in both urban and agricultural areas. It is impossible to characterize their natural diet without considering the impact of humans. Because they are found in higher densities in areas of human disturbance compared to forests, in some areas rhesus macaques derive, both directly and indirectly, a substantial part of their diet from human activities. In fact, up to 93% of

their diet can be from human sources, either from direct handouts or from agricultural sources. Rhesus macaques are omnivores and feed on a wide array of plant and invertebrate products. By raiding crops, they have access to a huge variety of cultivated fruits and vegetables, and in highly urban areas, they forage by picking through garbage. Throughout their range and especially in India, they inhabit temples and are fed as a form of worship by local people. Some of the most common foods given to rhesus macaques in temples include bread, bananas, peanuts, seeds, other fruits and vegetables, and assorted miscellaneous foods like ice cream and fried bread. In less human-influenced areas, they focus on fruits, flowers, leaves, seeds, gums, buds, grass, clover, roots, bark, and they supplement their diet with termites, grasshoppers, ants, beetles, and mushrooms. Rhesus macaques also eat bird eggs, shellfish, and fish. During the driest parts of the year, they may even eat the dirt from termite mounds. At higher elevations, where seasonal snowfall restricts food sources, rhesus macaques are restricted to eating the leaves of evergreen trees and bark as well as a few berries that grow in winter. During the winter months at high elevations, rhesus macaques suffer from food and climate stress and have higher levels of mortality if the cold weather lasts too long.

Home range size and day range length is dependent on habitat in rhesus macaques. Temple, village, and urban rhesus macaques have small home ranges between 0.01 and 3.0 Km² (0.004 and 1.16 mi²) in size because they derive almost all of their food from human visitors leaving offerings, crop raiding, or opportunistic foraging on human byproducts. The day ranges for these urbanized areas are variable but the average is about 1.15 Km (0.715 mi). In more forested areas of India, home range size can be up to 15 km² (5.79 mi²), but rhesus monkeys only move, on average, 1428 m (0.887 mi) per day. Both climate and season affect the timing of the onset of daily activities as well as the type of activities undertaken. In the warmest times of the year, rhesus macaques spend more time

resting than during more temperate months. Home ranges of rhesus macaques overlap and groups have high frequencies of intergroup contact, which is characterized by generally mild social interactions. Across all habitat types, feeding and resting are the major activities of the rhesus macaques' day and they spend the rest of their time travelling, grooming, playing, and other activities. Potential predators of rhesus macaques include raptors, dogs, weasels, leopards, tigers, sharks, crocodiles and snakes.

Social Organization and Behavior: Rhesus macaques live in large, multi-male/multi-female groups that have an average of 10 to 80 individuals, regardless of habitat type. Groups may number in the hundreds in mountainous areas and areas of high human food subsidization or agricultural habitats. Rhesus groups are characterized by female philopatry and male dispersal; females remain in their natal groups and form dominance hierarchies according to their matrilineal kinship while males emigrate from their natal groups at the beginning of the breeding season shortly before puberty, and may transfer groups throughout their lives in search of mating opportunities. Female rhesus macaques very rarely leave their natal groups. Among females, rank remains relatively stable over a lifetime and is passed on to female offspring. Each female rises in rank above her older sister, and therefore when old, high-ranking females disappear or die, they are usually replaced by their youngest daughters. One of the benefits of dominance for a rhesus macaque is priority access to food and space. High-ranking females have greater access to feeding sites because they displace lower-ranking females and they are less likely to be disturbed during feeding compared to subordinates. Because they have cheek pouches, though, low-ranking females do not consume less food than high-ranking females, they simply store as much as they can into their cheek pouches and then move away from the group to eat. This method of feeding is more energetically expensive than remaining in the same area while feeding, so low-ranking females may be consuming the same amount

but using more energy to consume it. Dominance status and rank among males is not stable over a lifetime, compared to female rhesus macaques. Immature males inherit the rank of their mothers, but as they mature, their status changes based upon a combination of social and aggressive skills. Aggression is sometimes used to establish and reinforce social position, though, and aggressive behavior seen in macaques includes slapping, pushing, pulling fur, tail yanking, and biting as well as other non-contact behaviors such as displays and threats. Once males attain dominant status, they enjoy this rank for an average of two years before being displaced by another male.

Reproduction: Females reach puberty around age three while males are sexually mature by age four. The ovarian cycle lasts for 28 days and is characterized by the darkening of the skin surrounding the anogenital region accompanied by menstruation. Estrus lasts for eight to 12 days, with the day of ovulation occurring at the midpoint of the estrus period. Females have increased sexual activity during ovulation, exhibiting the highest number of copulations seen during the ovarian cycle. Females reproduce from three until about 20 years of age. Males reach puberty between three and 3.5 years of age but do not reach adult body size until about eight years old. Though males are capable of reproducing by age four, they are not reproductively successful until after age eight, or when they reach adult size. During this time between becoming sexually mature and when they begin to mate, young rhesus macaques are learning the social skills, including fighting ability that will influence their success throughout their lives. Both males and females reach sexual maturity sooner in captivity. There is marked birth seasonality in rhesus macaques, with the majority of mating occurring in October through December and births coinciding with the end of the rainy season, or during the period of highest food abundance. High-ranking males have more opportunities to mate with females than low-ranking males, but do not always sire a disproportionate number of infants. Lower-ranking males may have similar reproductive

success compared to high-ranking males because they are new immigrants and are more attractive to females because of this. From one breeding season to the next, females will drastically reduce the amount of mating they do with familiar males and over a period of three years, they try not to mate with any familiar males given the opportunity to mate with unfamiliar males. During the breeding season, females enter into consort ships with one or more males. An individual female will spend longer amounts of time in contact with, grooming, and mating with these males. Males and female rhesus macaques are promiscuous breeders, mating multiple times with multiple mates. Both males and females initiate these consort relationships and competition for access to mates is related to the high levels of aggression seen in rhesus macaque groups during this time of year. Gestation lasts 164 days in rhesus macaques and the interbirth interval is between 12 and 24 months. If a female does not have a successful pregnancy or her infant dies in the first year of life, she is more likely to give birth the following season than a female who successfully rears an infant.

Parental Care: While the majority of parental care is the responsibility of the mother, rhesus infants are also handled by close female relatives and protected by adult males. In the first few days, the infant is carried ventrally and protected from other group members by the mother. Ventral clinging is the position most frequently adopted during travel for the first four months of life, but rhesus infants begin to ride dorsally for short periods during the second week. By six weeks of age, locomotor skills are developed enough for the infant to move independently, but they do not move very quickly at this age, and if the mother is travelling too quickly, she will pick up the infant and carry it. Some young rhesus is carried until they reach one year of age, though it is rare. During early infancy, rhesus macaques nurse exclusively for the first two weeks of life, after which they begin to experiment with solid food. At about four months of age, rhesus mothers begin to resist the attempts of their offspring to nurse, and young rhesus macaques are fully weaned by the birth of their next sibling.

Exploration off of the mother begins as early as five days old and continues to increase so that by the third week, the infant breaks physical contact with the mother as frequently as possible. During this time, juvenile and adolescent females are intensely interested in the infant and will approach the mother and groom her in an attempt to get near the infant. When an infant is off the mother, a young rhesus female will touch the infant and try to carry it, but the mother is watchful of this interaction and any sign of distress from the infant may elicit an aggressive response from the mother towards the younger female. Mother rhesus macaques show differential investment in their offspring depending on the sex of the infant.

Communication: Vocal and gestural communication is important in rhesus macaques. Facial expression, body postures, and gestures are all forms of non-vocal communication among rhesus macaques and are important in interactions between individuals at short distances. One facial expression that is seen throughout macaque species and is one of the most common expressions in rhesus macaques is the silent bared teeth face. Among rhesus macaques this is seen between individuals of differing rank with the lower-ranking or submissive animal performing the silent bared teeth face to the dominant animal. Another common facial expression used in dominance interactions include a fear grimace accompanied by a scream, heard in frightened animals and used to appease or redirect aggression. Dominant animals use a silent open mouth stare as a threat to other animals; this is accompanied by the tail sticking straight out behind the body with the monkey standing quadrupedally. Another common visual communication signal is the present rump, where the tail is raised and the genitals are exposed to the more dominant individual. Vocalizations of rhesus macaques include coos and grunts, which are commonly heard expressions during group movement, during affiliative interactions, and when one animal approaches another to groom. Warbles, harmonic arches, and chirps, are heard in the context of finding high-quality, rare food items.

The most common alarm call heard among rhesus macaques, the shrill bark, is emitted in threatening situations and is consists of a single, loud, high-pitched sound. Vocalizations made during aggressive interactions include screeches, screams, squeaks, pant-threats, growls and barks. Infants have their own repertoire of vocalizations which include geckers, which are harsh staccato sounds heard during weaning conflict. It is usually heard along with convulsive jerks of the body, and looks and sounds much like a human child's temper tantrum (World Conservation Monitoring Centre, 1988).

Threats to Monkeys

Human-Induced Habitat Loss and Degradation: Problems of habitat destruction do not seem to affect rhesus macaques like other primates; they are well adapted to life near humans and can thrive in highly disturbed environments. Because of the cessation of export and the rhesus macaque's adaptability to human-disturbed environments, the Indian population is increasing. This increase 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 leading 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 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.

Harvesting (Hunting/Gathering): Rhesus macaques were once seriously threatened by the rate of capture and export for use in biomedical research. In the 1960s, often 50,000 juvenile 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 re-establishing 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.

Persecution: In orthodox Hindu tradition, monkeys are sacred animals to be revered and protected, but as humans and animals begin to compete for similar resources or monkeys become nuisances, causing not only property damage, but also injury to humans, the traditional bond is degraded. In some areas of India, rhesus macaques are subjected to stoning, trapping, and shooting because they are such pervasive, destructive pests. Over 95% of the local people in one region of India felt harassed by the rhesus macaques either because of bites, stealing of household items, or other reasons. Though their populations continue to expand, the deterioration of traditional beliefs that leads to their persecution could have an effect on rhesus macaque conservation in the future. If the conservation ethic connected to deifying rhesus macaques is lost, it will be difficult to rekindle in the future if the population stops growing or decreases.

Conservation measures

The root cause of conflict between humans and rhesus macaques is the eradication of natural habitat, forcing monkeys into proximity with humans. Though they excel in human-disturbed environments, rhesus macaques living in forested areas are usually healthier, eating a better diet and in overall better condition than urban macaques. Restoration of their natural habitat in densely populated areas may decrease conflict, but given that they will likely move into areas where humans make food readily available, this may not be a permanent solution. In the long term, management will be necessary to conserve healthy populations of rhesus macaques and prevent persecution by humans from being a threat to their survival. Translocation of large numbers of monkeys may be one management option to remove rhesus macaques dependent on human sources of food. Mitigating human-rhesus conflict is necessary to prevent the change in attitudes towards rhesus macaques

that could lead to further persecution and population decline. Translocating particularly problematic rhesus monkeys or entire groups has been successful, but is not a widespread option because there simply are not enough suitable forest patches in which large numbers of rhesus can live. Perhaps innovative engineering could lead to monkey-proof containers in which people can store household items and food and prevent local rhesus from raiding their kitchens. Deterrent fencing or other protective measures could also be established around gardens and agricultural crops to prevent rhesus macaques from crop raiding. Decreasing opportunities for conflict between local humans and rhesus macaques will lead to maintained tolerance of these monkeys that have nowhere to retreat from human encroachment (World Conservation Monitoring Centre, 1988; 2000).

Education and Awareness: This is the most important aspect of wild life conservation. People will be educated regarding the importance of wild life conservation through mass publicity by installing sign-boards, conducting audio visual classes and distributing literature in respective villages in the buffer zone. Experts in the field of wild life

conservation will also be invited to deliver talks through slides.

People Participation: With the help of the local people and employees of the Company watch will be kept on the wild life as well as illegal tree felling. Forest and police department will be informed if such incident occurs, to take legal action against the offenders. For this they will be trained for motivation.

LANGUOR

Languor (*Presbytis entellus*) is a lanky, long-tailed monkey with bushy eyebrows and a chin tuft. It has a small slender body with long tail and long hands. Languor means having a long tail.

Kingdom: Animalia

Phylum: Chordata

Class: Nimalia

Order: Primates

Family: Cercopithecidae

Genus: *Presbytis*

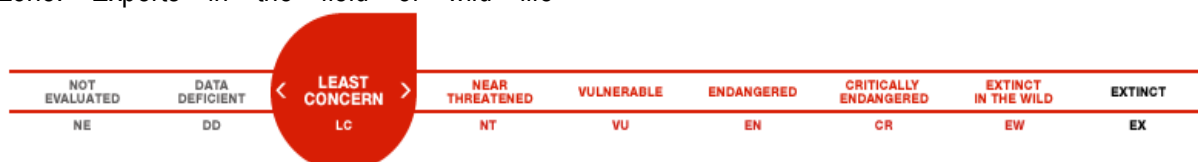
Species: *entellus*

Conservation Status

IUCN: Least Concern ver 3.1

Wildlife (Protection) Act 1972: Schedule II.

CITES: Not listed



Geographical Distribution: It is found in India, Tibet, Nepal, and Sri Lanka.



Figure 2. Languor

Habitat: It lives in humid forests, mangrove swamps, and wooded country.

Food: The Languor's main diet consists of leaves, seeds, grain fruit and berries. Their

natural food consists of leaves, fruit and insects from time to time. Many primate species once considered herbivorous are now known to expand the animal-matter portion of their diet to high levels when it is possible to do so. The amount of insect matter in most primate diets is small, but may expand to more than 90% of the diet when insects are abundant and easily captured. Since palatable and accessible prey species often occur only seasonally, the amount of animal matter in primate diets can change dramatically throughout the year. They are programmed to eat rapidly, often indiscriminately, depending upon bacteria in their fore-stomachs to break down any toxins they may have ingested. This is perhaps the reason for the wide success and distribution of this species. They also obtain salt, mineral and

trace elements by licking rocks, termite mounds and salt licks. Being wasteful feeders, they drop large quantities of food to the forest floor, which is picked up by deer feeding below.

Behaviour: Languors live in groups; the group consists of many females and one or two dominant males. Males chase each other to defend their territory and to establish mating rights. Langurs don't like water and cannot swim. They can jump up to 10 meters, and cross small rivers and streams. They sleep on trees and come down to ground for foraging and to drink water. They are excellent climbers and can jump from tree to tree when threatened. Also they travel on ground from place to place in small groups (World Conservation Monitoring Centre, 1988; 2000).

Lifespan: It has a lifespan of about 25 years.

Threats: Leopards and sometimes tigers are the main threats to languors. Leopards, using their speed and climbing ability can bring down the Languors quite easily. Nonspecific threat is an important selective pressure influencing languor group size and composition, suggesting that this selective pressure should be evaluated more widely as a factor influencing composition of animal groups. People's feelings, perceptions and attitudes toward them point to an incipient man-monkey conflict and erosion of conservation ethics. However, The Languor population in India is quite high and hence they are not so threatened (World Conservation Monitoring Centre, 2000).

Conservation: The people living in the surrounding area and employee of the company would be motivated towards the protection of the animal. Motivation will lead to timely information to the concerned authorities about any threat to wild life or any cases of pouching/hunting.

Table 1. Conservation Activity for Monkey and Languor

#	Activity
1.	Plantation of fruit bearing trees for creation for natural habitat
2.	Deterrent fencing
3.	Education and Awareness among the public
4.	Database generation of Languor
5.	Development of Monitoring system

CONCLUSION

The monkey and languor is religious mammal as per Hindu mythology. Trees, grasslands, mountains, forests and high plains are the most common habitat for both of them. Monkeys make peace and express affection with others by grooming each other. Even with strong conservation efforts in place there is still no way of knowing if many of the different species will have the help they need for ultimate survival. Monkeys do seem to do well in captivity though. This is why they are part of many zoos and conservation locations. People come to see such attractions as Monkeys can be very entertaining. Breeding programs are also part of the conservation efforts. This is to help many of the species get their populations to increase. Hopefully many of them can one day be released successfully back into the wild. These two mammals should be protected in natural habitat and public should aware about the importance of the animals.

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