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HUMAN MONKEY CONFLICT IN GUWAHATI CITY OF ASSAM

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Abstract: With the decreasing forest cover the conflict between human and wild animals is always increasing in India. The conflict between the human and Rhesus macaque is also increasing in the city of greater Guwahati, Assam as the species is highly adaptable to man-made habitat. This species Rhesus Macaque *Macaca mulatta* (Zimmermann, 1780) is listed on CITES Appendix II and least concerned (LC) according to IUCN red list. The present study was carried out during the year 2021-2023 with the primary objectives to find out the human monkey conflict areas in Guwahati City, evaluation of cause of the conflict and perception of the people about the cause.

The Study area is located in 26˚12´53.60˚-26˚04´56.42 ˚ North latitude and -91˚53 ´36.31 ˚-91˚34 ´36.18 ˚ East longitude with an average altitude of 55 meter above mean sea level and covering a geographical area of 216.79 sq km. The study area is densely populated with a human population of 8, 14,575 (as per census 2001). The study involves extensive field visits to the Rhesus monkey habitats in the study area. Activity budgets were done to understand the behaviour of the Rhesus macaque along with the interview of the affected people in the conflict to evaluate their perception.

The study concluded that the major human monkey conflict area in the Guwahati city are the Kamakhya temple, Nabagraha temple, Basistha temple, Maligaon area, Assam State zoo surrounding area, Gauhati University campus along with several other areas. The causes revealed by the people during the period of study were destruction of forest, change of food preferences of the rhesus monkey, availability of easy food from devotees, throwing of remaining food into uncovered areas by the households, population increase of rhesus macaque. As the mitigation measures the perception of people were-removal of the total population of rhesus macaque to the forested areas, provisioning of food plants, discouraging the devotees to provide food for the macaque, plantation to increase the forest area in the study area. In recommendation emphasis should be given to aware the people to the mitigation measures which can be taken up individually by not providing easy food to the monkey, not providing food to these monkeys in the temples etc.

Index terms: Human-Monkey conflict, Rhesus macaque, food, decreasing forest cover.

Introduction

Human-wildlife conflict (HWC) is fast becoming a critical threat to the survival of many globally endangered species, in particular to large and rare mammals such as the Sumatran tiger (*Panthera tigris sumatrae*) and the Asian lion (*Panthera leo persica*), but also to less endangered species such as the snow leopard (*Uncia uncia*) and the Red colobus monkey (*Procolocus kirkii*). The numerous cases from countries all over the world demonstrate the severity of human-wildlife conflict and suggest that an in-depth analysis is essential to understand the problem and support the conservation prospects of threatened and potentially endangered species. However, what is the exact definition of HWC, when and where does it usually occur? The ranging of these species overlaps with those of human populations, creating costs to residents and wild animals. Direct contact with wildlife occurs in both urban and rural areas, but it is generally more common inside and around protected areas, where wildlife population density is higher and animals often stray into adjacent cultivated fields or grazing areas. HWC has far reaching environmental impacts. Species most exposed to conflict are also shown to be more prone to extinction. These can be either accidental, such as road traffic and railway

accidents, capture in snares set for other species or from falling into farm wells, or intentional, caused by retaliatory shooting, poison or capture. Such human-induced mortality affects not only the population viability of some of the most endangered species, but also has broader environmental impacts on ecosystem equilibrium and biodiversity preservation. Human-wildlife conflicts also undermine human welfare, health and safety, and have economic and social costs. Nuisance encounters with small animals, exposure to zoonotic diseases, physical injury or even death caused by large predators' attacks have high financial costs for individuals and society in the form of medical treatments to cure and prevent infections transmitted from animals. Humans can be economically affected through destruction and damage to property and infrastructure (e.g. agricultural crops, orchards, grain stores, water installation, fencing, pipes), livestock depredation, transmission of domestic animal diseases, such as foot and mouth. Negative social impacts include missed school and work, additional labour costs, loss of sleep, fear, restriction of travel or loss of pets Elephant Conflict Working Group, HECWG). This chapter reviews a selection of species-site specific cases to provide a better understanding of HWC worldwide and to highlight common problems across local, regional and national levels. The case studies cover Europe, Africa, North America and Asia and demonstrate that HWC is more intense in the tropics and in developing countries where livestock holdings and agriculture are an important part of rural people's livelihoods and incomes. In these regions, competition between local communities and wild animals, for the use of natural resources, is particularly intense and direct and resident human populations are very vulnerable. Of course, the relative impact of wildlife damage on farm production and household income varies greatly according to the amount of land.

All over the world primates are under varying degrees of human influence which is affecting the population status and behaviour of these species (Hill 2000; Lee and Priston 2005; Scott and Lockard 2006; Plumptre and Cox 2006; Mittermeier et al. 2007; Eudey 2008; Hanya et al. 2008; Isabirye-Basuta and Lwanga 2008; Mori et al. 2008; Nahallage et al. 2008; Struhsaker 2008; McCarthy et al. 2009; Pirta 2009). The human-monkey conflict is a pervasive phenomenon (Hill 2000; Imam and Yahya 2002; Lee and Priston 2005; Estrada 2006; Sprague and Iwasaki 2006; Berman et al. 2007; Marchal and Hill 2009), and the issue was highlighted much earlier by Pirta and Gadgil (1988) in the context of western Himalayas.

The present study was carried out during the year 2021-23 with the primary objective to find out the human monkey conflict areas in Guwahati City, evaluation of cause of the conflict and perception of the people about the cause.

Study Area

The study area for the present study is the Guwahati city in Kamrup Metro District. The study area is present within the latitude N 26°12´53.60 °- N26°04´56.42 ° and longitude -E 91°53´36.31 °-E 91°34´36.18 °with an average altitude of 55 msl. With a geographical area of 216.79 sq.km. It is surrounded by river Brahmaputra in the north, Rani CD Block and Rani Reserved Forest in the west, Digaru river and a part of Dimoria CD Block in the east and Garbhanga Reserved Forest and the state of Meghalaya in the south. Human population 8,14,575 (Census 2001) (presently it may be doubled). There are 19 reserved forest and 2 wildlife sanctuary in and near the Guwahati City. They are Amchang Wildlife Sanctuary and the Deeporbeel Wildlife Sanctuary.

Vegetation of the study area

The vegetation compositions of the terrestrial zones have comprises, viz., Pakori-*Ficus rumphii*, Acacia-*Acacia auriculiformes*, Sagina-*Moringa oleifera*, Amlakhi-*Phylanthus ambilica*, Bhimkol-*Musa balbasiana*, Atlas-*Annona squatamosa*, Owtenga-*Dillenia indica*, Jatibanh-*Bambusa tulda*, Aam-*Mengifera indica*, Kadam-*Anthrocephalus cadamba*, Ahot-*Ficus religiosa*, Bot Goch-*F. bengalensis*, Indian Rubber-*Ficus elastica*, Simul-*Bombax ceiba*, Gamari-*Gmelina arboria*, Narikol-*Cocos nucifera*, Jolphai-*Elaeocarpus fleribundus*, Segun-*Tectona grandis*, Ghoranim-*Melia azedarach*, Deodaru-*Polialthia longifolia*, Satiana-*Alstnia scolaris*, Amita-*Carica papaya*, Kathal-*Artocarpus heterophyllus*, Bogori-*Zizyphus jujuba*, Siris-*Albizia lebek*, Ranga Kanchan-*Bauhinia purpurea*, Krishnasura-*Delonix regia*, Karash-*Pungamia pinnata*, *Areca catechu*, Bijuli Banh-*Bambusa pallida* and Tambul- *Areca catechu etc.* The other important terrestrial plants included viz., Jati bet- *Calamus erectus*, Dubari Ban- *Cynodon dactylon*, Locosa Ghanh- *Hemarthia compressa*, Birina- *Vetiveria zizanoides*, Khagori- *Phragmites karka*, Ulukher- *Imperata cylindrica*, Hankher-*Pollinia ciliata*, Kahua- *Saccharum sponteneum and* Borota Kher- *Saccharum elephantinus, Eucalyptus, Raintree etc*.

The main climbers comprise the species of *Stephania harnondifolia* (Tubuki Lata), *Zanthoxylum hamiltonianum* (Tej-muri), *Illegeria khasiana* (Kerkeri Lata), *Dioscorea hamilttoni* (Bonoria Alu), *Smilax macrophylla* (Tikoni Boral), *C. gracilis* (Wahing Bet), *C. latifolius* (Motha bet), *Pinaga gracitis* (Raidang Bet), *Pothos cathcartii* (Hati-poita) and *P. scandens* (Kawri Lata) etc.

Climate

The study area is in the Brahmaputra valley of Assam has a meso-thermal climate, characterized by high humidity and moderate temperature. The temperature ranges between 10.6°C to 36°C. The annual average precipitation is 3000 to 4000 mm. Most rainfall is occurring during monsoon period (May-September). The pre-monsoon season (March-May) has a maximum temperature of 27° C and minimum of 24° C, and relative humidity between 50.5-76.8%. Although the weather is dry for the greater part of the period, occasional hailstorms and heavy showers are not uncommon. The monsoon season (May -September) has a maximum temperature of 32°C and minimum of 27.3°C. The relative humidity is 82.5%. Warm humid and cloudy weather (it may continue for weeks) is characteristics for this season. The retreating monsoon covers the period from September to October with maximum and minimum temperatures of 27° and 25° C respectively. The relative humidity is 82% and the rainfall gradually decreases to average as the season advances, when the morning mist and fogs start appearing. The winter season begins in November and continues until January. The average field temperature during this period remains at 20 ± 2°C and the relative humidity measures about 77.5%. This season also experiences occasional rainfall due to the west monsoon. January is the coldest month, with a lowest temperature of 17.6°C.

Methods

The methods applied during the period of the study are as follows

Population Count

Total counting was applied for population counting. Each of important night stay site of the rhesus monkey was surveyed and counted early in the morning to get the count of total population. The counted animals were divided into Adult Males, Adult Females, Sub adult male, Sub adult Female, Juveniles, Infants.

Behaviour Study

Down to dusk sampling of Rhesus monkey, the scan animal sampling (Altman, 1974) and Ad. Libitum sampling (Altman, 1974) applied to study the behaviour like Feeding Strategy, Habituation to humans, Harassment of Monkeys, Man-made Hazards,

Habitat Use

Habitat use by the rhesus monkey was also studied by the use of scan animal sampling (Altman, 1974) and Ad. Libitum sampling (Altman, 1974). The use of water source, use of different forested Land, forested disturbance on habitat, status of habitat, types of urban land used by the rhesus macaque

Anthropogenic Survey

Anthropogenic household was also carried out to know the impact of rhesus monkey and human conflict such as death of human, injury to human, damage to household properties, food Stealing, chasing by rhesus monkey, death of rhesus monkey, injury to rhesus monkey, destruction of habitat and loss of food bearing trees.

Results

1. Population

The population of the rhesus monkey in the entire Guwahati City was found to be 1299 individuals (Table 1). A total of 58 groups of rhesus monkey was found during the period of survey. The average group size of the rhesus monkey was found to be 22.4 (SD= ±7.26). The adult sex ration of the rhesus macaque is 1:2.30 (Male: Female). The average group density of rhesus macaque is 0.26 groups/Sq.Km and has a density of 10.26 individuals /Km^2.

Table: Population and Group Composition of Rhesus monkey in Guwahati City

		Group Composition (n=58)					
Group Size		Adult Males	Adult Females	Sub adult male	Sub adult Female	Juveniles	Infants
Group Size	22.4	1.81	4.21	2.12	5.14	4.99	4.13
SD(±)	7.26	0.87	2.34	2.28	2.35	2.54	2.31
Range	1-52	1-3	7-18	3-9	6-11	5-17	2-17
Total No of Individuals	1299	76	176	89	215	209	174
Adult Sex Ratio (Male: Female)		01:02.3					
Density in 216 sq. Km.		0.26 groups/Sq.Km 10.26 individuals/Sq. Km					

2. Main Features of the habitat of Rhesus Monkey

a. Water Source

The rhesus monkey was found to utilize the polluted water (45.41 %) mostly, which is followed by lake/pond (33.78 %), tap water (17.56 %) and least used river/stream (3.24 %) (Table-2).

b. The rhesus monkey was found to utilize unprotected forest (64.61 %) mostly, which was followed by other forest (21.17 %), sacred forest (14.22 %) and least by protected forest (0 %) (Table-2).

c. The rhesus monkey habitat is disturbed by the human settlement (40.51 %) mostly, which is followed by developmental forest clearance (26.58 %), social forestry Plantation (19.47 %) and least by gazing/lopping (13.45 %) (Table-2).

d. The most of the habitat is characterized by depleted (49.33 %) forest, which is followed by dense (20.85 %) forest, forest edge (16.71 %) and least by regenerating forest (13.11 %) (Table-2).

e. The rhesus monkey were found to utilize the habitat in the temple/ public area (37.31%) mostly, which is followed by residential area (28.57 %), market area (22.74 %), outskirts of city (8.16 %) and least by other types (3.21 %) of habitat(Table-2).

Table-2: Habitat Characteristics of Rhesus Monkey

Habitat Parameters	Types	Percentage
Water Source	River/Stream	3.24
	Lake/Pond	33.78
	Tap Water	17.56
	Polluted water	45.41
Forested Land	Protected forest	0
	Sacred forest	14.22
	Unprotected forest	64.61
	Other forest	21.17
Forested Disturbance	Developmental Forest Clearance	26.58
	Human Settlement	40.51
	Gazing/Lopping	13.45
	Social Forestry Plantation	19.47
Forest Status	Dense	20.85
	Depleted	49.33

	Forest edge	16.71
	Regenerating forest	13.11
Urban Land	Temple/ Public area	37.31
	Market area	22.74
	Residential area	28.57
	Outskirts of City	8.16
	Others	3.21

3. Human Influence on rhesus monkeys

a. The most of the food is acquired from scavenging/provisioned (41.25%), natural (26.43 %), snatching/stealing (19.81 %) and least by crop raiding (12.44 %).

b. Rhesus monkey in Guwahati shows their behavior habituated to human being mostly and routinely commensal (51.92 %), habituated (32.04 %), semi-habituated (16.02 %), rarely they were remained wild.

c. The rhesus monkeys were found harassed intensely (60.15%) by human being followed by disturbance in occasion specific (33.45%), minimal disturbance (16.39 %) and they were found rarely undisturbed by human.

d. Rhesus monkeys were found impacted by man-made hazards moderately (60.07%), extremely (32.91%), partially (6.92%) rarely remained impacted no hazards.

Table 3: Human Influence on Rhesus Monkey in Guwahati City

Factors	Categories	Percentage
Feeding Strategy	Natural	26.43
	Crop raiding	12.44
	Scavenging/Provisioned	41.25
	Snatching/Stealing	19.81
Habituation to humans	Wild	0
	Semi-habituated	16.02
	Habituated	32.04
	Habituated and routinely commensal	51.92
Harassment of Monkeys	Undisturbed	0
	Minimal	6.39
	Occasion Specific	33.45
	Intense	60.15
Man-made Hazards	No Hazards	0
	Partial	6.92
	Moderate	60.17
	Extreme	32.91

4. Impact of human Monkey Conflict

a. On Human

Due to human monkey conflict in most of the areas of the Guwahati City human were found to impacted mostly by food stealing (44.25 %), which is followed by chasing by rhesus monkey (32 %), damage to household properties (15.62 %) and there was rare case of human death due to human monkey conflict.

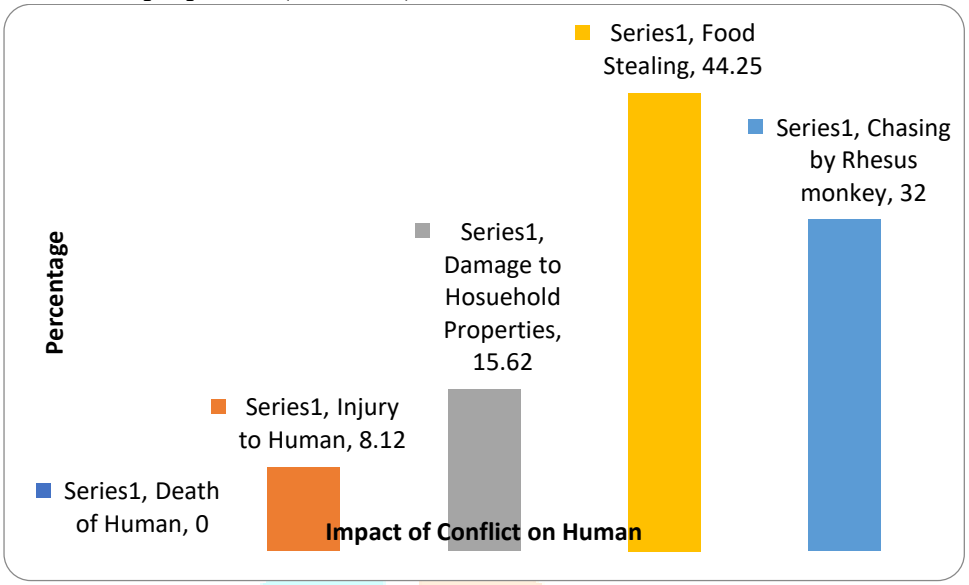

Fig 1: Showing the Impact of Human Rhesus Monkey Conflict in Guwahati City on Human.

b. On Rhesus Monkey

Due to human monkey conflict this was found that the population of rhesus macaque in Guwahati city is impacted by destruction of habitat (32 %), Loss of food bering trees (23.62 %), Chasing by human (19.5 %), injury to rhesus monkey (11.12 %) and least by the death (3.49 %).

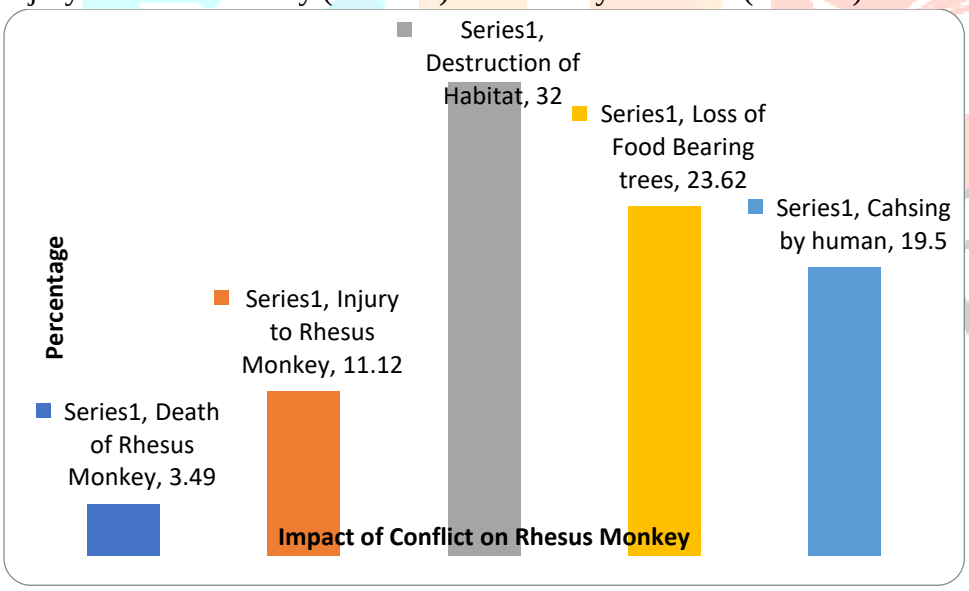

Fig 2: Showing the Impact of Human Rhesus Monkey Conflict in Guwahati City on Rhesus monkey.

Discussion

The population of the rhesus monkey in the entire Guwahati City was found to be 1299 individuals. To accommodate this large population in natural forest there must be sufficient cover of good forest cover, which are lacking in Guwahati City. As average group size of the rhesus monkey was found to be 22.4 (SD= ±7.26) the foraging requirements and food requirement should be large for a single group which is lacking in Guwahati city. The habitat features like water is crucial factor for the survival of species. The rhesus monkey was found to utilize the polluted water (45.41 %) mostly, which is followed by lake/pond (33.78 %), tap water (17.56 %) and least used river/stream (3.24 %) (Table-2). The rhesus monkey was found to utilize unprotected forest (64.61 %) mostly, which was followed by other forest (21.17 %), sacred forest (14.22 %) and least by protected forest (0 %) (Table-2). Hence there is importance of unprotected forest in Guwahati city for the survival of the Rhesus macaque in their natural habitat. But most of the rhesus monkey habitat is disturbed by the human settlement (40.51 %), which is followed by developmental forest clearance (26.58

%), social forestry Plantation (19.47 %) and least by gazing/lopping (13.45 %) (Table-2). Hence the unplanned human settlement of emerges as one of the potential threats to the survival of of rhesus macaque. The most of the habitat of rhesus macaque is characterized by depleted (49.33 %) forest, which is followed by dense (20.85 %) forest, forest edge (16.71 %) and least by regenerating forest (13.11 %) (Table-2).

If we look and the impact human on the behavior, then it was clear that most of the food is acquired from scavenging/provisioned (41.25%), natural (26.43 %), snatching/stealing (19.81 %) and least by crop raiding (12.44 %). Hence food provision or availability of easy food in the houses ignites the probability of intense human rhesus monkey conflict in near future. Rhesus monkey in Guwahati shows their behavior habituated to human being mostly and routinely commensal (51.92 %), habituated (32.04 %), semi-habituated (16.02 %), rarely they were remained wild. As none of the rhesus monkey remained wild in Guwahati city, the possibility of sending them into their wild habitat will be problem and will remain as major contributing factor towards more intense human monkey conflict. The rhesus monkey were found harassed intensely (60.15%) by human being followed by disturbance in occasion specific (33.45%), minimal disturbance (16.39 %) and their were found rarely undisturbed by human. Rhesus monkey were found impacted by man-made hazards moderately (60.07%), extremely (32.91%), partially (6.92%) rarely remained impacted no hazards. As in Guwahati City human were found to impacted mostly by food stealing (44.25 %) by rhesus macaque which is followed by chasing by rhesus monkey (32 %) . These two types of disturbance will make the people not to support conservation and management efforts of rhesus macaque in their present occupation areas. In Guwahati city population of rhesus macaque is impacted by destruction of habitat (32 %), Loss of food bering trees (23.62 %) mostly. Hence there is need of conservation efforts to maintain the habitat quality and cover in Guwahati which will be a tough challenege for the conservationist and also to start a plantation drive of the food providing trees for the rhesus macaque.

Hence there is need of comprehensive conservation efforts to save this primate species and also to manage the human- monkey conflict in Guwahati City.

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