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Research Article

Do Rhesus monkeys (*Macaca mulatta*) damage the unpalatable crops during conflict with human? A case study from Rampur village of Narsingdi District in Bangladesh

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Abstract

Human-Rhesus monkey conflicts were studied in the Rampur Village of Narsingdi District in Bangladesh. The village supports good homestead vegetations where three troops of Rhesus monkeys are living. Monkeys consumed plant parts of 10 species. Betel leaf vein (*Piper betel*), an unpalatable plant species of the monkey, was greatly damaged by them in this area but it is the main economic source for the local people. As a result, it is the major issue for human-Rhesus conflicts in this area. Local people are aggressive towards monkeys for damaging their major economic crops. For mitigating conflicts with monkeys, 60% people opined to strike them with stick and 30% preached to throw stones towards them. From this study, it indicates that unpalatable crops are not only damaged by Rhesus monkeys but also monkeys are injured during human-Rhesus conflicts. Scarcity of food and human aggression influence monkeys to invade and damage unpalatable crop of human settlements areas.

Keywords: Human-Rhesus monkey conflict, unpalatable crops, Bangladesh.

Introduction

The distribution of macaques is in the tropical and subtropical areas of the world including deciduous, rain and conifer forests, mangrove swamps, temples and human settlements. However, Rhesus monkeys are distributed among forest and non-forest areas in Bangladesh and in urban areas; they are mostly found in near to the Hindu community's areas (Hasan *et al.* 2013). Bangladesh is a developing country with increasing human population and has greater demand for natural resources. As a result, natural habitat has intense competition with food with other animals resulting in various conflicts. Human non-human primates (there after primates) conflict are increasing to the developing counties than developed countries due to greater biodiversity and lack of prevention measures such as farm fences, livestock guard (Seoraj-Pillai and Pillay 2016). In addition, behavioral adaptability of the Rhesus monkeys facilitates to invading human settlement, and as a result conflicts occur. However, the interaction between the primates and people is referred to as human primate's conflict, which has negative impact on the resources, habitats of both primates and people (Hill *et al*. 2002, Hockings and Humle 2009, Khatun *et al.* 2013, Ahsan and Uddin 2014).

Crop raiding primates is the example of human- primates' conflicts, where most of the local people are subsistence farmers (Hill 1988). Crop raiding is a major issue for human-primates' conflict and conservation of primates (Hill 1988, Ahsan and Uddin 2014). Human primates' conflicts are increasing because of conversion to agricultural lands to human settlements as a result primate invade human settlement for food and damage crops that are mostly eaten by them. In some cases, primates especially baboons damage unpalatable crops

that they don't eat but destroy as their own entertainment (Hill and Webber 2010).

But literature survey reveals that no published paper is available on the damage of unpalatable crops by macaques during human-primates conflict. The local people perceptions are important factor during human primates' conflicts.

Local people are more aggressive towards primates when they find economic loss due to crop damage by primates (Beisner *et al.* 2015). Palatable and unpalatable crops are damaged by primates and it depends on the availability and scarcity of food in the areas. Also, the aggressive human behaviors influence the primates to damage unpalatable crops (Khatun *et al.* 2013, Beisner *et al.* 2015). In Bangladesh, conflict between human and primates are increasing due to increased population and primates tried to coexist with human settlement areas. So human primates' conflicts are increasing; however, there is no published paper except Ahsan and Uddin (2014) on Rhesus monkeys and Khatun *et al.* (2013) on common langur. The present study reveals the crop damage by Rhesus monkey of the human settlement areas during conflict with local people in Rampur village of Monohardi Upazila at Narsingdi district in Bangladesh. The major objectives of this study were to: 1) investigate crop damage by Rhesus monkeys and their damage preferences 2) investigate human aggression towards primates due to crop damages.

Material and methods

Study area

The study was conducted at the Rampur village under the Monohardi Upazila in Narsingdi district (24º14.226' N and 90º43.250' E) of Bangladesh (Figure 1). Monkeys are mainly living in Rampur village but also frequently move surrounding villages of Rampur. These villages are mainly covered with homestead vegetations and bamboo patches. Most of the people of these villages are farmers and their main economic income and livelihood depend on the cultivation of banana, rice and betel leaf. According to the census report of 2011, the density of population of this Upazila is 1176 person /km^2 (B.B.S. 2011).

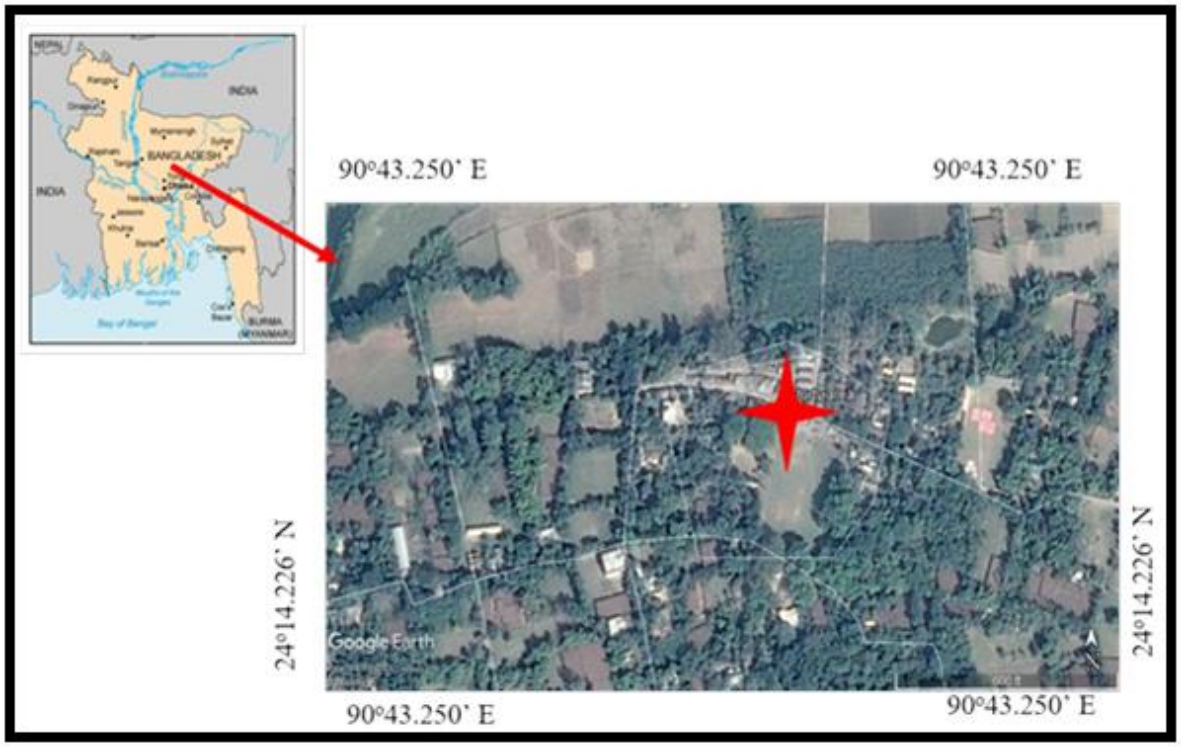

Figure 2. Geographical map of the study area

Data collections

The data of damaged crops by monkeys and their food preferences were collected through asking question to the local people, taking picture of damaged crops, field study through binoculars and following monkeys' movement in their home range areas. In addition, we interviewed 40 people with self-prepared questionnaire (Appendix 1) for the collection of human -primate conflict date and their perception towards monkeys. The interviewees were household head, the wife of the household head or with resident adults (>18 years), who were willing to participate in an interview as a representative of the family. Each interview was conducted in the Bengali language. It took 10-20 minutes to complete one questionnaire.

Results and Discussion

Damaged crops and preferences

The major damaged crop fields by the Rhesus macaques in the study area were: (1) betel leaf fields (*Piper betle*), (2) paddy fields (*Oryza sativa*), (3) inflorescence of banana (*Musa* spp.), (4) inflorescence of bamboos (*Bambusa vulgaris*), (5) brinjal fields (*Solanum melongena*), (6) potato fields (*Solanum tuberosum*), (7) jackfruit (*Artocapus heterophyllus*) and (8) inflorescence of pumpkins (*Cucurbita maxima*).Thus Rhesus monkeys are largely vegetarian and their diet includes leaves, flowers, fruits, seeds, grasses etc. Except betel leaf, all other damaged crops are their major food in this area. In addition, 40 different plant species were consumed by Rhesus monkeys including leaves of 37 species, flowers of 27 species, buds of 20 species, stipules of 6 species, juice of 4 species, petioles (Pulvinus) of 3 species, shoot and seed of 1 species (Ahsan 1984). However, during human Rhesus conflict the damaged crops are mainly their food. Table 1, shows that damaged crops is mainly their food during human Rhesus monkey conflict around the world. But in Rampur village the damaged crops were not their consumed food (Figure 2).

Figure 2. Unpalatable crops (betel leaf) damaged by Rhesus monkeys in the study area.

Table 1. Damaged crops by monkeys around the world during human monkey's conflict

Country	Species	Damaged crops	Reference
Bangladesh	Rhesus monkey	Mature Jackfruit, Pineapples and bananas	Miah *et al.* 2001, Aziz and Feeroz 2007
Uganda	Vervet monkey	Sweet potato, corn, bananas, mangoes and peanuts.	Saj *et al.* 2015
Indonesia	Rhesus monkey	Coco plantation, sweet potato and maize.	Riley and Fuentes 2011
India	Rhesus monkey	Mango, rice field and bananas.	Devi and Saikia 2008
Sri Lanka	Rhesus monkey	Potato, maize, cereals Bulk wheat and millet	Regmi *et al.* 2013

It indicates that Rhesus monkeys damage unpalatable crops during conflict. Though previous study reported that unpalatable crop was only damaged by baboons (Hill and Webber 2010).

This is due to human aggression and scarcities of food are main reason for damaging palatable and unpalatable crops during conflict with human. Local people perceptions towards primates are also responsible for crop damage preference and people are more aggressive when primates do economic loss to the local people (Khatun *et al.* 2013, Beisner *et al.* 2015). In addition, crop damage also depends on the living distance between primates from the crops field and size of the edge crop fields (Regmi *et al.* 2013). As Rhesus monkeys are living in a small village within the human settlement areas resulting lesser edge than the large forest areas which also influence monkeys to damage main economic crops in the studied area.

From the local people opinion, 80% of the respondents claimed that betel leaf vines were the highest damaged plants by moneys. In addition, 60% affirmed banana as the second highest and 50% said vegetables was the lowest damage crops by moneys.

Human aggressions toward primates

In the study area, local people are highly aggressive towards primates, the survey indicates that 60% local people stroked with stick to primates during the interaction with them especially when the primates are in their crop fields or damaging crops. In addition, 30% people claimed that throwing stone were also elicited behavior from local people towards primates when they are roaming around houses of the local people for stealing food. Furthermore, facial feared expression also applied towards primates when primates are far away from the houses of local people. The human aggressions towards primates are relied on the potential economic loss by primates and primates' aggression is influenced by the human behavior (Beisner *et al.* 2015). Therefore, less land holding farmers are more aggressive towards primates as their perceptions to primates is not conservative (Khatun *et al.* 2013). However, Hindu people are more tolerant to primates; they consider primates as a religious God.

In addition, fruiting season and provision of food also changed the aggression intensity as well as crop damages intensity of primates and humans vice versa (Khatun *et al.* 2013, Beisner *et al.* 2015).

Conclusion

From this study, it is concluded that Rhesus monkeys damage unpalatable crops during conflict with humans. In addition, human aggressive behaviors have influence on monkeys to damage unpalatable crops. Availability and scarcity of food also influence to damage unpalatable crops. Overall, to mitigate conflict and conserve this monkey in the human settlement areas, provision food in a regular basis and imposing awareness program in the local area.

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