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Research Article

An explorative study on visitor's behaviour and their effect on the behaviour of primates at Chittagong zoo

Das Gupta, M.[1], Das, A.[2], Sumy, M. C.[3] and M. M. Islam[4]*

[1]Department of Microbiology and Veterinary Public Health, [2]Department of Genetics and Animal Breeding, [3]Department of Agricultural Economics and Social Sciences, [4]Department of Animal Science and Nutrition, Chittagong Veterinary and Animal Sciences University, Khulshi, Chittagong-4225, Bangladesh.

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** Corresponding Author :*
Cell: +8801675 438402
Email:mukta_as@yahoo.com

ABSTRACT

Visitors are vital components of a zoo and their importance has led to a research area dedicated to understanding the visitor-animals relationship. To study the influence of 'visitor presence' on captive primates, a behavioural study was conducted on four species of the monkey at Chittagong zoo. The behaviour of the visitors was studied and found that they use to tease the monkey during their visit. Among these people about 40% tease rhesus monkey, 30% tease the capped langure, 20% tease the pigtailed macaque and 10% tease the olive baboon on an average. All of these effects are consistent with an interpretation that visitors are a source of stressful excitement rather than of enrichment. The behaviour of monkey in response to visitor's activity was recorded independently when 'on-exhibit' in enclosures. In presence of visitors, primates were found less affiliative, more active, and more aggressive. These changes were particularly marked in arboreal monkeys, especially in smaller species. Detailed observations of a group of primates indicated that with increasing numbers of visitors the monkeys showed a linear increase in attention to visitors, in activity, and in stereotyped behaviour. Visitor presence was thus found to influence the behaviour of captive monkey in a negative way suggesting that 'visitor presence' might adversely affect their welfare.

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1. INTRODUCTION

The major goals of a modern zoo are animal welfare, conservation, education, research and entertainment, and the goals are interrelated (AZA, 2008; Anderson et al., 2003; Reade and Waran, 1996). However, a greater part of zoo visitors comes, at least in part, for entertainment rather than attain the first four goals (Altman, 1998; Reade and Waran, 1996). To uphold these four goals a zoo keeper should provide the facilities to attract and entertain the zoo visitors (Fernandez et al., 2009). An experience of entertainment for zoo visitors influences their subsequent visits to the same zoo, which results in better revenue for general animal care, welfare, conservation efforts and research, ultimately promotes the zoo's reputation.

There are three different possible consequences of a 'visitor effect', firstly, that a human visitor can be stressful (negative), secondly, enriching (positive) or of no effect (Hosey, 2000). In many species particularly

primates, stressful consequences can be induced by proximity to and social interactions with zoo visitors (Fernandez et al., 2009). Many different species show a variety of behaviours to unknown people (Claxton, 2011), while other do not show any abnormal behaviours, however, they should be cautiously handled when considering consequences (Hosey 2008). Knowing visitor effects on primate behaviour would be helpful in three different ways, firstly as an instrument for the welfare, secondly by providing insight for visitors experience in zoo and lastly by precise evaluation of any research performed within a zoo (Hosey, 2008). Therefore, it is important to know, the effect of the visitor's presence on zoo animals, what that might be, whether positive, negative or neutral.

The first studies to understand the relationship between visitors and zoo animals were carried out in the 1970's and by the late 1980's a set of studies discovered that zoo visitors did have an effect on the behaviours of captive animals to a greater degree than was previously anticipated (Davey, 2007). By reviewing the literature it is apparent to witness that there are numerous likely effects that human visitors can have on zoo animals with much yet to still be revealed and understood. There has been a good amount of research carried out looking into areas such as reactions in non-human primates and behavioural differences in many countries. However, visitor effects in non-human primate species in Bangladesh have been ignored. Therefore, the objective of this study was to find out the effects of zoo visitors activities on the behaviour of exhibited primates. The study revealed the factual animal-visitor interactions at Chittagong zoo, thereby help to find out possible interventions intended to maintain or improve both visitor satisfaction and animal welfare.

2. METHODOLOGY

2.1. The Chittagong zoo

The study was performed at Chittagong zoo. The zoo is located beside the Foy's lake at Khulshi thana of Chittagong Metropolitan Area. The total area of the zoo is about six acres. Total land of the zoo is hilly area and the drainage facilities are good enough. There are about 67 species and the total number of animals is about 320.

2.2. Study population

The behavioural data were collected from 350 visitors. Visitors were randomly selected for observation by choosing every fifth person to enter the Zoo. The behaviour of primates in response to visitor's behaviour were studied in four species of monkey, rhesus monkey *(Macaca mulatta)*, olive baboon *(Papio anubis)*, capped langure *(Presbytis pileatus)* and pig tailed macaque *(Macaca numestrina)*.

2.3. Observation schedule

A 10 week observational study was conducted. Observations were scheduled so that the data for each exhibit would have equal representation across all times of a day, 7 days per week. Four different monkey exhibits were observed in a varying sequence for a total of 120 minute time blocks each day for the total observation period.

Visitor's behaviours were observed for eight hours between the time of zoo opened in the morning i.e. 9:00 hrs to the time they closed i.e. 17:00 hrs. The behaviour was recorded using record sheet. Each sampling time block was for every five minutes.
Behaviours of primates were also recorded for eight hours between the time of zoo opened in the morning i.e. 9:00 hrs to the time they closed i.e. 17:00 hrs. Behaviour was sampled using record sheet every 15 minutes during the sampling period throughout the day to get different behaviours exhibited by the primates.

2.4. Behavioural ethogram and observation of behaviours

The display of behavioural states, as recorded in the recording sheet, expressed as percentage time spent in particular states to the total time that an individual was observed. Data for different individuals in each group were also pooled at the end of the observation period to obtain group averages. A behavioural ethogram was followed to guide the investigation of visitor's behaviours (Table 1).

Table 1. Behavioural ethogram of visitors

Behaviour	Description
Watch monkey	Visitors are showing visual attention to the monkey exhibit.
Interact with interpretive	Visitors are visually or manually engaged with interpretive signage. Reading signboard containing description of the animal, taking photographs etc.
Undesirable behaviours	1) Visitors hits or knocks the enclosure partition with hand or object 2) Making noise around the enclosure 3) Throwing stone/stick/ ..... on animal 4) Picking the animal with the stick/..... 5) Offer food to the animal
Other behaviours	Visitors are sitting, standing, walking, or running but not visually engaged with animal exhibits or interpretive signage. For example, may be speaking to other visitors, waiting for companions, eating, writing or reading.

All behaviours not otherwise defined were grouped into the category "other." The density and intensity of the visitors were also recorded at the end of each sampling time block. The intensity levels and density levels are noted in Table 2.

Table 2. Levels of visitors and codes

Level	Rating	Definition
Quiet	1	Quiet whispers, no loud talking
Low	2	Quiet talking, two or fewer bouts normal talking
Moderate	3	Normal talking, no shouting
High	4	Normal talking, two or fewer bouts shouting
Extreme	5	Loud talking and/or more than two bouts shouting

Different types of effects caused by zoo visitors on animal behaviours are presented in the Table 3. These guidelines were followed to investigate the behavioural change in the four species of monkey.

Table 3. The effect of visitors on animal behaviour

Type	Behaviour	Description
Positive/Desirable	Play behaviour	This is a sign of good welfare as animal perform it if other considered as good (e.g. if they are not stressed). However it occurs mainly in young animals and therefore it may not be a very useful indicator for older animal.
	Non aggressive interaction	In circumstances where animals are housed with conspecifics non-aggressive interactions between them, such as social grooming, may be essential to the physical and Psychological well-being of the individuals. Care must be taken when interpreting this behaviour though, as in some species social grooming may also occur more frequently after period of aggression as reconciliation.
	Sign of interest to the visitors	Vigilance and other information gathering behaviours aimed at visitors, without sign of fare, aggression or begging may indicate an enriching effect. For example, watching visitors play on climbing frame may be interesting to animals.
	Greeting behaviour	If shown in response to visitors could indicate that there is a benefit to the animal.
Negative/ undesirable	Stereotype	Defined as repetitive, nonfunctional behaviour, they can take many form.
	Locomotion/ inactivity	Improper level of locomotion or inactivity can indicate a problem with welfare.
	Vigilance	Repeatedly looking towards the visitors may indicate that the animal is not comfortable with the situation.
	Avoidance	Actively avoiding the visitors may show a need to escape from this stimulus.
	Aggression	Tension caused by a stressful stimulus can results in increased intra group aggression, or even aggression directed to human.
	Self-directed behaviour	Increased scratching in some species. as well as other less frequent behaviour such as excessive grooming or self-biting would be considered to be negative.
	Fear vocalizations	May be emitted if suddenly frightened by the appearance of visitors

2.5. Data analysis

All data collected for this research was entered into Microsoft Excel 2010 sheet. Descriptive statistics for different variables were analysed using Analysis Toolpack from Excel. Other statistical analyses were performed using GraphPad Prism version 7.00 for Windows, GraphPad Software, La Jolla California USA, www.graphpad.com".

3. RESULTS

3.1. Behaviours of visitors

Visitor activities at primate exhibits are presented in Table 4. Visitors spent a good part of their visiting time (children 54.3% and adults 62.1%) by watching exhibits; however, visitors also spent a significant amount time (children 34.9% and adults 29.7%) with undesirable activities to primate exhibits.

Table 4. Visitor activities at primate exhibits in Chittagong Zoo

Age Group	Activity/category	Average time spent (s) (and % of total visit)
Children (n=128)	Watching exhibits	255.5 (54.3%)
	Attending to interpretives	50.5 (10.7%)
	Others behaviours	1.6 (0.03%)
	Undesirable	164.4 (34.9%)
Adults/elderly (n=222)	Watching exhibits	337.3 (62.1%)
	Attending to interpretives	45.0 (8.3%)
	Others behaviours	0.4 (0.01%)
	Undesirable	161.2 (29.7%)

In total 65% visitors showed undesirable behaviours to the primates (Figure 1). The degree and type of undesirable behaviour were found variable depending on the age and sex of the zoo visitor, the type of social group of the zoo visitors, the size of the crowd in the exhibit area and the nature of the exhibit itself (including the type of species exhibited).

Figure 1. Behavior of visitors towards the primates at Chittagong zoo

A clear majority of the zoo visitors exhibiting undesirable behaviour were of the juvenile age groups, with most of these being males. On the whole, male visitors exhibited more undesirable behaviour than female visitors at Chittagong zoo. However, this was not consistent across all age categories.

At Chittagong zoo a very few zoo visitors exhibited undesirable behaviour when alone, however, undesirable behaviour was not more prevalent in excessively large crowds. Family groups supervised by both parents exhibited more undesirable behaviour than family groups supervised by only one parent. There were no consistent peak hours or diurnal trends in the frequency of the undesirable behaviour.

Undesirable behaviour showed by visitors includes distracting, teasing, smoking during watching the monkey, spitting, offering food, shouting or making other noise,, beating the animal with the stick, throwing stones or another object and ignoring animals. The percentages of these behaviours towards the monkey are shown in the Figure 2.

During the study period, it was found that the visitors teased monkeys in different ways on their visit. Among the visitors the highest proportion (40%) have teased rhesus monkey, whereas 30%, 20%and 10% of visitors have teased capped langure, pig tailed macaque and olive baboon, respectively (Figure 3).

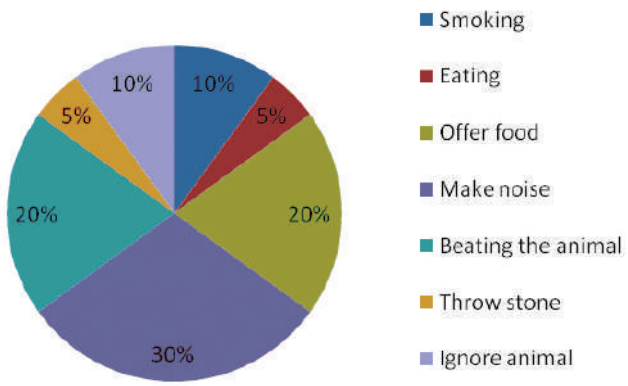

Figure 2. Distribution of types of undesirable behaviour of visitors

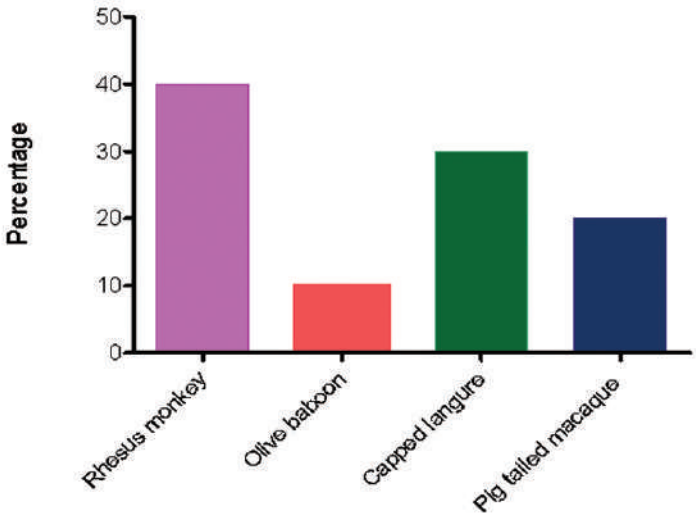

Figure 3. Distribution of percentage of animal being teased

3.2 Behaviours shown by primates

In response to visitors, primates were found less affiliative, more active, and more aggressive. The abnormal behaviour patterns observed in primates include begging from humans, floating limb, self-clasping and stereotypic pacing, hair-plucking and self-scratching, intra-specific (between cage-mates) aggression and inter-specific (human directed) aggression. Of the observed animals, 46% of the non-human primates behaved abnormally (Figure 4) while the remainder did not show any signs of disturbance. The juvenile show more abnormal behaviour than the adult animals. Undesirable behaviours were found more extended to rhesus monkey (45%), followed by capped langure (25%), pig tailed macaque (20%) and 10 % in olive baboon on an average (Figure 5). A rise in visitor numbers was found to cause intensifies the rates of abnormal behaviours, such as stereotypical behaviours, begging and self-biting.

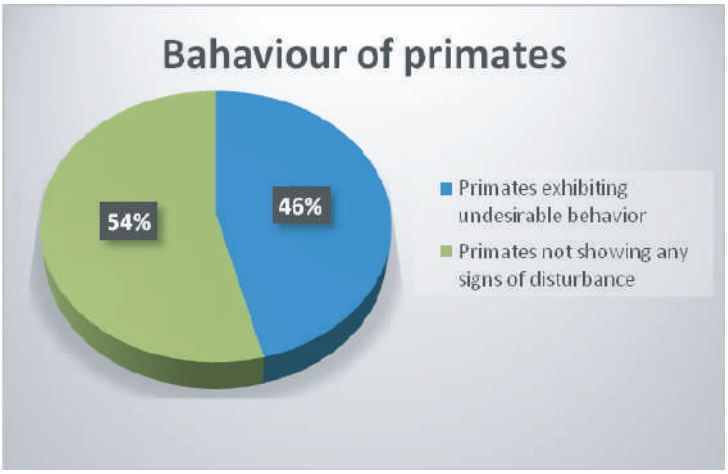

Figure 4. Behaviour of non-human primates in response to visitor's behaviours at Chittagong zoo

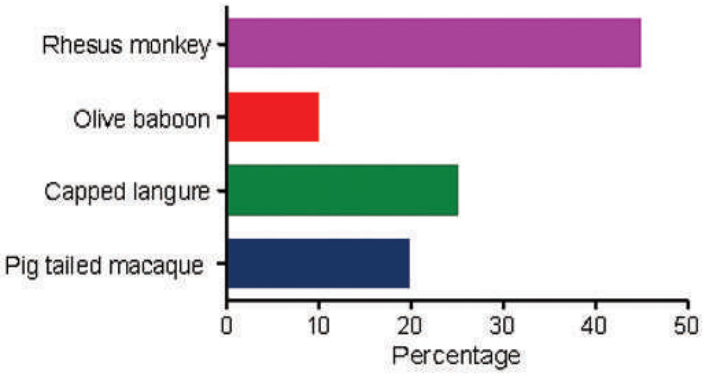

Figure 5. Abnormal behaviours shown by different species of monkey

4. DISCUSSION

In Bangladesh, recent studies performed on zoo and zoo animals were based on perspective of captive breeding (Uddin, 2017), zoo management (Uddin, 2017$_a$, conservation and biodiversity (Ahasan and Azam, 2007), ecotourism (Shinwary et al., 2009), animal introduction (Ahasan et al., 2006) and mostly on disease prevalence in captive animals (Khatun et al., 2014; Ahasan et al., 2013; Kanungo et al., 2011; Kanungo et al., 2010). However, visitor effects on zoo animals, a useful instrument to ensure welfare have been ignored. This study was the first study of that kind by revealing visitors activities and their effects on captive non-human primates in Bangladesh.

This study shows 65% visitors exhibited undesirable behaviours towards primates in captivity. Previous studies on visitors behaviour agree that visitors are of a stressful influence for some primates (Hosey, 2000), (Wells, 2005) and (Fernandez et al., 2009). In general, this proof shows itself in the manifestation of differences in behaviour related to visitors (Carder and Semple, 2008).

In response to visitors behaviours 46% primates showed abnormal behaviours. This finding was in line with the majority of the previous researches on visitors effects on zoo animals (Hosey, 2000; Hosey, 2008; Fernandez et al., 2009; Hosey et al., 2010). In lesser extent, these abnormal behaviours are not surprising as many diverse species have been found to show a variety of reactions to unknown people (Claxton, 2011). On the other hand, these negative effects are a part of the human induced stress. Hosey

et al., (2010) reported a similar behavioural indicators of stress in zoo animals. These types of stressful behaviours may lead to immunosuppression thereby would be harmful to the long-term health of the captive animals (Morgan and Tromborg, 2007).

Figure 4 shows 54% of the primates did not show any signs of disturbance with the presence of zoo visitors and visitor's undesirable behaviour. This result of neural response should be considered cautiously because they may just not be expressing it through changes in their behaviours (Hosey, 2008) but internal states. In this study, it was found that an increase in the numbers of visitors resulting in increased activity and stereotyped behaviour. Mallupur et al. (2005) reported a similar observation. An increased activity and stereotyped behaviour could have important implications for their welfare.

As a result of the study, several possible ways of improving the problem of undesirable behaviour in the zoo became apparent. Controlled public feeding, issuing self-quiz sheets as an alternative behaviour, and increased public education could be the best possible ways to prevent the undesirable behaviour and thereby confer welfare of zoo animals. Limitations of this work include independence between research areas and the minority status of the field.

5. CONCLUSIONS

The study was performed to know the effect of visitor's behaviour on the behaviour of monkey in captivity at Chittagong zoo. It was found that visitor variables such as visitor presence, activity and density are associated with animal behavioural and to a lesser extent physiological changes. This study revealed that primate prefers a moderate number of visitors with the positive attitude. Crowding and disturbance are much annoying to them. Undesirable behaviours of visitors induce human directed aggression in captive animals. Understanding the effect of visitors is important in improving animal welfare, achieving zoo conservation goals and increasing visitor education. As a human being we should take care of this species of wild life for improving animal welfare. In short, animals should be provided with more seeming control over their interactions with zoo visitors in order to fulfill the entangled goals of entertaining and educating the public while benefiting the welfare and conservation of the animals.

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