



Original research article

Tourism-induced disturbance of wildlife in protected areas: A case study of free ranging elephants in Sri Lanka



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ARTICLE INFO

Article history:

Received 27 April 2015

Received in revised form 30 October 2015

Accepted 30 October 2015

Available online 14 November 2015

Keywords:

Protected areas

Wildlife based tourism

Disturbance

Elephant behavior

ABSTRACT

Tourism-induced disturbance is a growing concern in wildlife conservation worldwide. This case study in a key protected area in Sri Lanka, examined the behavioral changes of Asian elephants in the context of elephant watching tourism activities. Observations of different age–sex–group classes of elephants were conducted focusing on the feeding activity of elephants in the presence vs. absence of tourists. Frequency and duration of alert, fear, stress and aggressive behaviors of elephants were significantly high in the presence of tourists and these behaviors occurred at a cost of feeding time. Tourist behavior, vehicle noise, close distances and time of the tours were closely associated with the behavioral changes of elephants. It is important to monitor tourism effects on endangered species such as Asian elephants and to take proper measures including controlled tourist behavior and vehicle activity in protected areas in order to reduce disturbance of wildlife behavior.

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1. Introduction

Protected areas are attractive settings and resources for wildlife-based tourism. However, the relationship of wildlife-based tourism to conservation has not always been a positive one and there are increasing concerns about the environmental sustainability of tourism in protected areas. Target species for wildlife-based tourism happen to be the most threatened or endangered species in many countries (Green and Higginbottom, 2001; Eagles et al., 2001; Wight, 2002; Constantine et al., 2004; Dyck and Baydack, 2004; Blanc et al., 2006). The immediate response of wildlife to disturbance is changes in behavior, and its long-term effects include altered behavior, altered vigor and altered productivity of individuals, changes in abundance, distribution and demography of populations and effects on species composition and interactions of communities (Knight and Cole, 1995).

This study aimed to investigate the tourism-induced disturbance on the feeding behavior of free ranging Asian elephants. Feeding is identified as highly important for large herbivores as they are required to spend a high percentage of their time on feeding to be healthy (Stockwell and Bateman, 1991). Disturbance from tourism activities can cause decrease in feeding time and increase in energy expenditure of animals, which degrade the health condition of animals and their reproductive ability (Reynolds and Braithwaite, 2001). Human impact on free ranging elephants is often studied and revealed based on elephant death or injury caused by human–elephant conflict because such impacts are extreme as well as recognizable and comparably easy to measure. Consequently, less attention is paid on issues of non-consumptive use of elephants such as tourism disturbance on elephants.

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Sri Lanka is home to 10% of the wild Asian elephant population (Perera, 2009) and elephants are flagship of tourism in the country (Buultjens et al., 2005). The number of foreign tourists to wildlife parks in Sri Lanka increased from 70,688 in 2009 to 325,153 in 2013 and the number of local tourists increased from 364,114 in 2009 to 719,069 in 2014 (SLTDA, 2014). However, these tourism activities have been carried out without monitoring the negative effects on elephant behavior even though some parks are already faced with issues such as overcrowding (Buultjens et al., 2005). Therefore, we examined the changes of feeding behavior of free ranging elephants in the context of elephant watching activities in Sri Lanka. The results of this study can be used as a baseline to understand tourism effects on elephant behavior and to plan strategies to reduce tourism-induced disturbance on elephants in protected areas.

2. Study site

The study site is Udawalawe National Park (UWNP), a key protected area located approximately between the latitudes 6°25' and 6°35' N and longitudes 80°45' and 81°00' E, an altitude of 118 above sea level in the southern part of Sri Lanka. UWNP was established in 1972 to provide habitat for wildlife displaced by the construction of the Udawalwe reservoir and to protect the catchment area of the reservoir. The land area of UWNP is about 308 square kilometers. UWNP provides habitat to a large number of wildlife species, out of these wildlife species Asian elephant (*Elephas maximus maximus*) is the predominant animal species. Recent records indicate that the elephant population of the park is over 1000 elephants (De Silva et al., 2011). UWNP is one of the best places to view wild elephants in Sri Lanka, because of its easy visibility and high probability of sighting elephants during any time of the year due to large open areas as well as high elephant population density compared to other parks in the southern region. The number of foreign and local tourists to UWNP and the revenue from tourism has increased in recent years. In 2012, about 76,077 local and foreign tourists visited UWNP and it is the third most visited wildlife park in the country (SLTDA, 2013). Several biological and ecological studies have been conducted in the park such as the demography of Asian elephants (e.g. De Silva et al., 2011), however, there is little research done on the tourism aspect of the park. Therefore, considering the conservation value, expansion of tourism and lack of research, UWNP was chosen as the research site to find out tourism effects on the elephant behavior in protected areas.

3. Methods

This study observed elephant behavior in relation to elephant watching tourism activities in order to identify tourism disturbance on feeding activity of free ranging elephants. Four types of elephant behavior; alert, fear, stress and aggression were chosen as indicators of disturbance on feeding elephants because each behavior caused a cost on feeding. "Alert" was characterized as gaze fixedly at tourists, or adopt a guarding position. 'Fear' was defined as run away from the tourists. "Stress" was when elephants flap ears fast, toss soil, repetitively sway the head and shoulders, even the whole body from side to side while standing in one place or circling. 'Aggression' was defined as run towards the tourist vehicle/s, attack tourists or tourist vehicles. Thirty minutes focal animal sampling was initiated to record the frequency and length of the selected behaviors. The sample period of thirty minutes was decided based on the average elephant watching time of tourists, which was about 15–20 min per elephant group. Frequency of behavior was the number of occurrence of each behavior during a sample period and length was the duration that a behavioral indicator of disturbance lasted (for example alert duration means the time from the occurrence of an alert behavior until returning to feeding behavior or another behavior such as aggression). Vehicle-based observations were conducted because the park did not have any watch posts or allow getting off the vehicles. Individual elephants of different sex–age–group classes were targeted. Male and females could be identified from the body parts and body shape (males, especially adult males have a long body with a downward slant at the back and females have a flat or box-shaped body). Age was identified by the body size and in comparison to an adult female. The age classes chosen for this study were adult male, adult female, sub adult male and sub adult female. Male group categories include solitary, male pair, male group. Female group categories include small cow–calf group (<5 elephants), medium cow–calf group (5–10 elephants), large cow–calf group (10–15 elephants) and very large cow–calf group (>15 elephants). Further, individuals in male–female groups were also included in the comparison of elephant group categories. Photographs of elephants were taken in order to individually identify the elephants based on the various physical features of elephants. Observation of elephant behavior was carried out in the presence of tourists as well as in the absence of tourists. "Absence of tourists" refers to the situations when only the research vehicle was present. 100–150 m distance was maintained between research vehicle and elephants except for few occasions of 50–100 m. Minimum of a one-hour interval was kept between the samples.

Elephant behavior was compared with some assumed causes of tourism related disturbance, which included tourist behavior (calm-do not talk, loud-talk with each other, extreme-talk, clap, wave, try to feed, play music), distance, number of vehicles, vehicle noise (whether the engine was on or off) and the time of the day. Observations were conducted minimum of four days a month during 0600 h to 1800 h from January 2013 to August 2013.

Statistical analysis

Wilcoxon rank sum test was applied to examine whether a difference of elephant behavior in the presence of tourist vehicles vs. absence of tourists existed as well as to determine a difference among male and female behavior in the presence

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