Injuries of free ranging African elephants *(Loxodonta africana africana)* in various ranges of Kenya

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Abstract

Incidences of injuries to the free ranging African elephants (*Loxodonta africana africana*) are common but are rarely analysed to determine the magnitude and their effects on elephant health at population level. We analysed data derived from Kenya Wildlife Service records of reported incidences of injured elephants over a ten-year period (1998-2007) from all conservation areas in Kenya. A total of 397 elephants were reported with different types of injuries. Human inflicted injuries were the most prevalent (66.2%) and consisted of deep intra-dermal gashes. The most affected parts were the forelegs with 37.2% of the injury incidences. Adult males were predominantly injured with 84% prevalence, compared to 17% for females. This preliminary study shows that injuries on elephants are prevalent, with those inflicted by humans being life threatening. However, the effects of the injuries on the population viability and social behaviour need to be investigated further.

Résumé

Les incidents de blessures des éléphants africains (*Loxodonta africana africana*) vivant librement sont fréquents mais sont rarement analysés pour en déterminer l'ampleur et leurs effets sur la santé des éléphants au niveau de la population. Nous avons analysé les données provenant des registres du Département Vétérinaire du Service Kenyan de la Faune sur les incidents des éléphants blessés dans toutes les régions de conservation au Kenya rapportés sur une période de 10 ans (1998-2007). Un total de 397 éléphants a été rapporté ayant différents types de blessures. Les blessures causées par l'homme prédominaient (66,2%) et consistaient en des entailles intradermiques profondes. Les parties les plus affectées étaient les pattes antérieures avec 37,2% des incidents de blessure. Les mâles adultes étaient en majorité les plus souvent blessés avec 84% de prédominance, comparés à 17% pour les femelles. Cette étude préliminaire montre que les blessures aux éléphants sont courantes et que celles infligées par les hommes peuvent être mortelles. Cependant, il faut étudier davantage les effets des blessures sur la viabilité de la population et sur le comportement social.

Introduction

Apart from infectious diseases that may lead to significant population deaths, there are non-infectious conditions that affect the health and welfare of wild animals. In these days that habitat and population viability is overwhelmingly threatened (Kapustka et al. 2004; Wilson 1999) and regarded as a core factor in the current global biodiversity crisis (Singh 2002), disease plays a critical role in shaping population dynamics. Although many agents that cause disease may not result to conspicuous illnesses in wild animals, these agents still have a cost to the animal that may be important to the biology of the species (Yuill 1987). It is in this context that we define disease as an impairment that negatively affects the long-term persistence of populations and the ability of healthy populations to fulfil their ecological roles

in an ecosystem (Deem et al. 2001). The Veterinary Department of the Kenya Wildlife Service (KWS) attend to reported cases of wildlife diseases, injuries and mortality events all over Kenya. According to the field case data at KWS, injuries are common events affecting all wildlife species. Elephants, regarded as 'flagship species', are susceptible to various kinds of injuries as reported in African and Asian countries such as Kenya, South Africa, Thailand, Bangladesh, Indonesia and China (Fowler and Mikota 2006). Few reports tend to highlight the plight of free-ranging elephant injuries compared to the detailed analysis of injuries on captive elephants. Perhaps the challenge in most elephant endemic countries is lack of wildlife veterinarians and/or lack of records. It is against this backdrop that we focused our analysis of injuries sustained by African elephants (*Loxodonta africana africana*) in Kenya within a ten-year period of 1998 – 2007. We aim to determine the prevalence of these injuries and their occurrence in the sex and age structure of the elephant populations. Distributions of these injuries on the elephant body will be described and common causes of the injuries will be evaluated.

Materials and methods

The Veterinary Department of the KWS provides veterinary services to all wildlife conservation areas including those under private and community management all over Kenya. We collated information for analysis from the veterinary field case records at the department. Only reported incidences that were followed by veterinary interventions were used for analysis. This was important so as to define the type of injury, area affected, the prognosis and possible cause of the injury. The scope of the activities of the department provided an understanding of the magnitude of the elephant injuries at a national level. We categorised the injuries into three groups (A, B & C) based on the cause in order to allow for a critical analysis of the injuries. Type A injuries, which were deemed serious, referred to those resulting from inter-species fights, predatory attacks and terrain (e.g. sprains, joint dislocations and limb fractures). Types B injuries, deemed life threatening, referred to those resulting from human causes through sharp objects (spears, arrows), snares and bullets. Types C injuries were considered as minor injuries due to unknown aetiology manifested as localised firm (fibrotic) swellings in any part of the body. We analysed data to determine the proportions of all the injuries that occurred in either sex. Animals were categorized into three broad age groups namely juveniles (<4 years), sub-adults (4-8 years) and adults (>8 years). Data were evaluated based on the age sets to determine prevalence. We were also interested in determining which part of the elephant body was more vulnerable to injuries. For this purpose, the injuries on the elephant body were grouped into four regions namely the limbs (fore and hind), the trunk, the body (chest, abdomen, rump and back) and the head and ears. The data were analysed in Excel 2003 to generate graphs and charts.

Results

Injured elephants that were given veterinary services and had records for the year under review were 397. Analysis of types of injuries (fig. 1) showed that type B (human inflicted) injuries were the most prevalent with 66.2% (263/397) followed by type C (unknown disorders) with 18.3% (73/397) and lastly by type A with 15.3% (61/397). Joint dislocations, sprains, limb fractures and abrasions characterised type A injuries. In type B injuries sharp objects, arrowheads, spears, bullets and wire snares caused the injuries. These were the most severe wounds that were life threatening, at times leading to euthanasia. Analysis of injuries in terms of age groups (fig. 2) showed adult elephants were the most susceptible age group with a prevalence of 84.3% (335/397). Sub-adults and juvenile elephants had an injury prevalence of 7.8% (31/397) and 7.5% (30/397) respectively. Analysis of injuries based on elephant sex (fig.3) showed predominantly male elephants were injured with 84% prevalence (328/397) compared to the females with 17% (69/397). Analysis

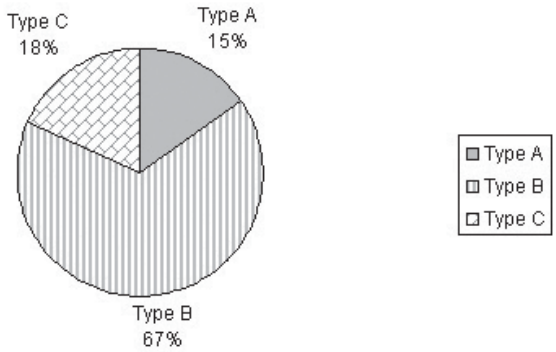

Figure 1. Proportion of types of elephant injuries (1998 - 2008).

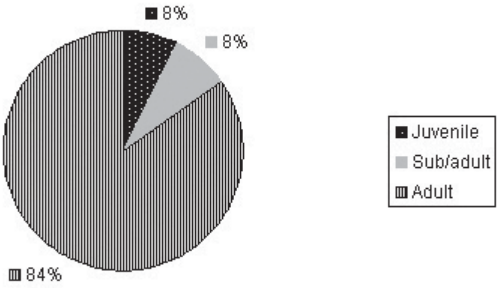

Figure 2. Proportion of injury incidences in elephant age groups (1998-2007).

of the locations of the injuries (fig.4), front legs were the most susceptible with a prevalence of 37.2% (148/397) followed by hind leg injuries representing 29.2% (116/397). The body injuries at 18.6% (74/397) were the third most prevalent followed by head and ear injuries at 11.5% (46/397) and lastly the trunk at 3.2% (13/397). Out of curiosity, we noted that front leg injuries were predominantly located on the right front leg with 56.7% (84/148) prevalence compared to those on the left front leg with 43.2% (64/148).

Discussion

Veterinarians, ecologists and conservationists agree that emerging infectious diseases in wildlife are a threat to global biodiversity. However it is not only infectious disease that poses a risk to biodiversity. Equally important are non-infectious conditions that include diseases caused by genetic disorders, malnutrition, traumas, degenerative changes, contaminants and natural toxins (Wobeser 2006). This study describes the extent of injuries in free ranging African elephant populations, and the findings suggest possible effects on the population dynamics.

Frequency of type A injuries was relatively low (fig.1). They are mostly associated with periodic events such as young elephant fights, perhaps to exert their social dominance resulting in superficial wounds (Hall-Martin and De Boom 1979), or when adult males in musth tend to fight other males to exert mating dominance (Fowler and Mikota 2006). Predatory attacks on elephants were also quite rare as the young, sick and injured elephants are usually protected from predators by other elephants or herd members (Fowler and Mikota 2006). Nevertheless, there were isolated cases of injuries on the tails of young elephants suspected to have been inflicted by hyenas. Such incidences do occur when young elephants are orphaned or strayed from the herd.

Injuries associated with terrain may have resulted from falling or stepping on sharp objects. Injuries sustained from such incidences included joint dislocations and fractures, sprains and abrasions. Puncture wounds on the sole slipper of the elephant may lead to ulcerative pododermatitis, a life threatening secondary infectious condition (Fowler and Mikota 2006). The condition was observed in some 13 bulls in Kruger National Park, apparently caused by penetrating injuries from dry wooden stumps (Keet et al. 1997).

The high prevalence of type B injuries (those inflicted by humans) may correlate to incidences of the human elephant conflicts (HEC). It is during such conflicts that elephants sustain some of the most horrendous injuries. Wounds and injuries sustained by elephants during HEC indicate that people commonly use sharp objects, spears, arrowheads and firearms to harm elephants as a means of defense or to chase the invading elephants. Such weapons were commonly used in various areas of intense HEC, including other countries such as Bangladesh where they use in addition to our list poison-tipped arrows, homemade bombs and battery acids (Fowler and Mikota 2006). The weapons cause deep wounds that may become ulcerative, develop into painful abscesses and progress to septicemia. There were some reported cases of wounds heavily infested with maggots suggestive of a chronic nature and in other cases the wounds become gangrenous. In cases of penetrating wounds into the joints, more so in the stiffle and fetlock joints, the injuries inflicted on the joint cartilages and joint capsule may become septic and cause arthritis that is very painful, and impair animal mobility. Apart from weapons used during HEC, wire snares of the self-tightening type indiscriminately injure elephants. These snares contribute significantly to foot injuries where they inflict sore wounds and in some cases the snares amputate the limbs. Some elephants were also recorded as having amputated trunks due to wire snares.

The severity of the injuries and its impact on elephant welfare and survival depend on the part affected (fig.4). The forelegs of the elephants seem to be the most vulnerable part of the elephant anatomy, yet they bear 60-65% of the elephant weight (Fowler and Mikota 2006). This implies that injuries located

on the forelegs greatly affect the animal's movement, feeding trends, and may exacerbate other ill effects. Trunks were the least prevalently injured and the few that occurred were due to snare wires and intra-species fights. Snare wires caused deep gashes whereas fights resulted in superficial wounds.

Adult elephants were susceptible to injuries compared to juveniles and sub-adults (fig. 2). This may be due to those high risk behaviors associated with crop raids. In such incidences, the young elephants tend to be more protected by the massive sizes of the adults, such that any weapon hurled at the herd will most likely injure the adults.

The high prevalence of injuries to male elephants compared to females (fig. 3) concurs with a report by Fowler and Mikota (2006), which can be related to a high preponderance of male elephants' involvement in HEC as reported in both Africa and Asia (Hoare 1995; Sukumar 1991). Even where family groups were involved in crop raiding, mature bulls accompanied them (Smith and Kasiki 1999) and were likely to linger longer in the farm to the point of being forcefully driven out. Male elephants have also been reported to be habitual fence breakers (Thouless and Sakwa 1995), behaviour that results in a high rate of injuries. This behaviour is explained by the optimal foraging theory (Hoare 1999; Sukumar 1990) ascribed to the male elephant strategy of risk-taking that maximizes reproductive success through better nutrition (Sukumar and Gadgil 1988). Therefore, male elephants range extensively in a preferential search for palatable and nutritious plants that will boost the reproductive position.

These findings indicate that elephant populations are burdened by injuries caused by humans. The impact of these traumatic conditions at the population level is often difficult to measure, as opposed to death, which has been used to evaluate disease in wild animals. Put in the context of this study, disease, when appropriately measured in terms of impairment of functions rather than by the death of individuals (Wobeser 2006), suggests that not all dysfunctions lead to death. Therefore, measuring the extent of injuries to elephants is critical as they lead to impairments that may be vital to the biology of the species (Yuill 1987). In this case, we consider that injuries caused physiological dysfunctions that had energetic consequences, energy being used as a measure of cost of disease (Delahay et al. 1995). Injured elephants move less, are under-nourished, with consequential energy loss. Mounting immune response towards injuries costs energy and affects the ability of the animal to respond appropriately to infectious agents, and infections may compound or confound the effects of abiotic factors (Wobeser 2006). Injured and weak bulls may be unfit to mate and reproduce thereby dominant genes may be lost in the population.

We believe these effects of disease raised awareness in the recent past of naturally occurring infectious agents and non-infectious causes as fundamental in shaping many aspects of wildlife behaviour and ecology (Yuill 1987; May 1988). This study highlighted the prevalence of the injuries in elephants, however the effects of such injuries in shaping behaviour, social dominance or being detrimental to population viability or conservation need further investigation.

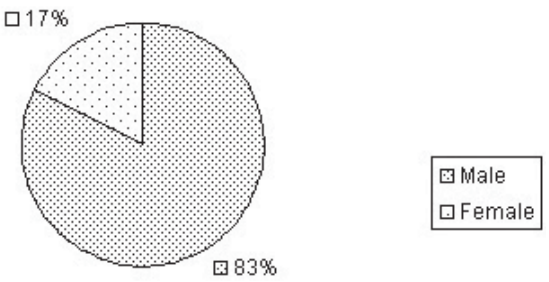

Figure 3. Proportion of injured male and female elephants (1998 - 2007).

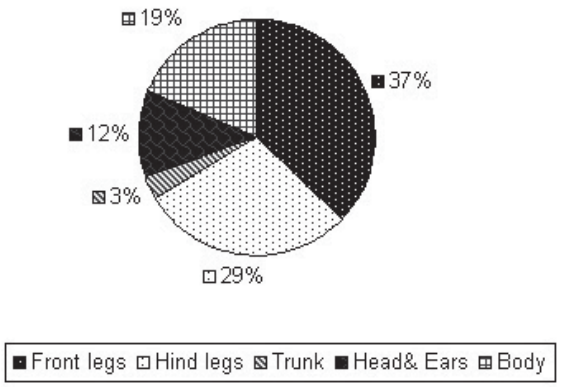

Figure 4. Distribution of injuries on elephant body (1998 - 2007).

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