Improving the welfare of female African elephants (*Loxodonta africana*) in zoos

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Introduction

As the largest land mammal, African elephants (*Loxodonta africana*) present zoos with greater challenges than most other species. The issues and controversies surrounding elephants in zoos are multi-factorial and include health problems, lack of space, training techniques, confinement and appropriate social groupings. Many zoos no longer have elephants, but those that do can improve their welfare by using research on captive and wild elephants to identify where improvements can be made. This essay will describe three recently published articles that offer new information on female elephant society and behaviour. Two articles investigate the social structure of wild elephant groups, while the third reports on a small group of captive elephants. These studies should inform best practice to ensure the welfare of elephants held in zoos.

Discussion

The idea that African elephants live in a fission-fusion society is not new. Archie *et al*. (2006a) took this theory one step further when they investigated whether the patterns of fission and fusion were linked to genetic relatedness. Data were collected over a five-year period on 236 Kenyan elephants in the Amboseli National Park. Patterns of association were collected on an opportunistic basis using scan sampling. Genetic material was retrieved from faecal material or other tissue. The study found that 'core' groups of elephants were mainly composed of related individuals but that, within these groups, individual elephants usually associated with just a few other individuals and their calves. These were almost always first-order maternal relatives (i.e., mother, daughters and maternal sisters). Currently most elephants in zoos are unrelated (Wiese and Willis, 2006) and therefore are not living in a 'natural' social structure. The evidence from this study shows that to replicate natural society in captive elephants it is more important to get group composition right before worrying about having larger numbers of elephant.

A further implication of this study concerns the practice of moving elephants between zoos. It was found that associating core groups were mainly composed of members with the same mitochondrial DNA halotype. Thus elephants in the wild consistently associate with related or at least well-known females even outside their core group. This finding was backed up by Thouless (1996), who found that unrelated groups of elephants would not approach each other closer than 2km. In captivity the introduction of unknown elephants has been found to increase corticosteroid concentrations (Burks *et al*., 2004), so introducing a strange female to a group must cause stress to both the group and the introduced elephant. Zoos should avoid this practice where possible and instead build up maternal groups.

The first study was carried out across a single Kenyan population, which represents a limitation. That said, it does support previous research showing that the most important social partners for females are maternal kin (Garai and Kurt, 2006).

A second study by Archie *et al*. (2006b) states that, due to their size and the potential for injury during disputes, elephants would be expected to have well-defined dominance relationships. The nature of these relationships was explored on a population of elephants in Amboseli National Park in Kenya from 1999 to 2003 and Tarangire National Park in Tanzania from 1993 to 2000. When elephants were located, data were collected on their association patterns, with agonistic interactions recorded between the focal animal and any other female. The authors discovered that dominance rank relationships among elephants were not nepotistic but that older, larger females consistently dominated younger, smaller females. Groups of zoo elephants are generally smaller than groups in the wild and consist of individuals of similar ages (Schulte *et al*., 2007). Yet hierarchies are still important to limit injury and conflict (Bernstein, 1981). Without the natural age

cues to inform hierarchy, zoo elephants may struggle to work out their position in a closely aged group. Additionally, similarly aged individuals may miss the chance to learn from older females about how to function within a herd and how to reproduce successfully (Veasey, 2006). Providing a natural range of ages could be the cornerstone for effective management of elephants.

The final study, by Wilson *et al*. (2006), was undertaken over a three-month period, on a group of three 18-year-old African elephants living at Zoo Atlanta. Data on their nocturnal behaviour was recorded for a total of 161 hours, with observers working in 3-hour shifts. The elephants were unchained and had access to indoor and outdoor enclosures. One aim of the study was to record affiliatory and agonistic behaviours that could guide a management decision on night-time housing. The study found that the elephants interacted on average 1.4 times per hour and most interactions were affiliative. Aggression was rare and usually only involved pushing. The elephants used all the areas available to them during the night. A limitation of this study is that only three individuals were available to researchers and so further studies on other captive elephant groups would improve the study's scientific validity. The rationale given for chaining elephants includes preventing bullying, physical injury and food stealing directed at sub-dominant animals (Brockett *et al*., 1999). However, the roaming behaviour and lack of aggression can be used tentatively to recommend that those zoos which still chain or lock-up their elephants at night (Garai and Kurt, 2006) should cease this practice. If elephants move around at night and engage in social behaviour without aggression, then confinement is unnecessary and potentially detrimental to their welfare. Facilities to cope with unrestrained animals are needed, though.

Conclusion

Zoos must manage elephants in a practical manner. The challenge for zoos exhibiting African elephants is to create more natural groups, consisting of related females of varying ages. This is achievable by breeding from adult females and not moving the young to other groups. If movements occur between zoos, mother and daughter should be moved together. Furthermore, keeping elephants chained or boxed at night may be unnecessary and their welfare could be improved by allowing them to interact with the group and to roam freely at night.

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