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Searching for Solutions: The Evolution of an Integrated Approach to Understanding and Mitigating Human–Elephant Conflict in Africa

HOLLY T. DUBLIN

RICHARD E. HOARE

IUCN/SSC African Elephant Specialist Group
Nairobi, Kenya

Human–elephant conflict (HEC) is widespread in Africa and occurs across all biogeographical regions of the species range. HEC involves not only agricultural losses, but also a complex social dimension in the most affected sector, subsistence farming. Agricultural losses involve damage to food crops, cash crops, and even food in storage, with absorption of any loss at the individual household level. The associated social costs are intangible, difficult to quantify, and highly significant. Elephants are a convenient medium for widespread and persistent complaint from rural communities against wildlife conservation initiatives. HEC displays complex spatial dynamics across landscapes. Nearly a decade of investigation coordinated by the IUCN AfESG has revealed several key principles for HEC mitigation. The approach to dealing with this problem needs to be applied at a variety of management scales and is as much an art as a science.

Keywords *African elephant, human–wildlife conflict, research, management, mitigation*

Introduction

Although a broad conflict of interest today exists between human activity and the conservation of many taxa of wildlife, some species have a particularly high profile as pests. The elephant in both Africa and Asia is an extreme case. The paradox is that so many people simultaneously view the elephant so differently. It can be a charismatic icon of conservation, a key species in terrestrial ecosystems, a valuable and exploitable resource, or a dangerous and destructive agricultural pest. The future of the African elephant (*Loxodonta africana*) is now inextricably linked to its interactions with the people who share its range, and the ability of two of the world's longest living species to co-exist is one of the greatest

challenges facing the management of this species (Dublin, McShane, & Newby, 1997) and countless others that fall under the elephant's conservation "umbrella." This scenario is made even more difficult by the realities of modern Africa. Many parts of the world's poorest continent suffer from problems such as rampant poverty, civil instability, rapid human population growth, and increasing fragmentation and loss of wild habitats by conversion of land to agriculture or via unsustainable logging practices.

It is the mission of experts belonging to the World Conservation Union (IUCN) Species Survival Commission's (SSC) African Elephant Specialist Group (AfESG) "to promote the long-term conservation of Africa's elephants throughout their range" (www.iucn.org/afesg) by giving technical advice and support to initiatives involving elephants. As elephants presently range in 37 African countries, the AfESG is among the largest (50–60 members) and most active of the IUCN's specialist groups. In the last decade, the AfESG has actively concerned itself with trying to understand and help mitigate the problem that has become known as "human–elephant conflict" (HEC). In the present context, HEC usually means *direct* conflict with humans (i.e., incidents involving damage to crops, injuries and deaths to people and livestock, or retaliatory injuring and killing elephants themselves). But equally, targeted research has attempted to investigate underlying interactive or competitive processes in which the two species require and use natural resources. The AfESG first established a temporary sub-group called the Human-Elephant Conflict Taskforce (HECTF) in 1996; in 2002 this was transformed into a permanent body (Human Elephant Conflict Working Group— HECWG) to reflect the serious, widespread, and persistent nature of the problem.

A Stepwise Approach to Tackling Human–Elephant Conflict

The history of the HECWG work has followed a stepwise approach, sequentially trying to gain technical understanding of HEC dynamics and then translating this into management and mitigation applications. It has been a long, but steady route in which the AfESG has done much of the work itself, but also tried to provide vision and act as a catalyst for others. Progress has been achieved in several different ways through voluntary work by AfESG members themselves; specific studies commissioned to group members or outside consultants; or via a wide network of partner individuals, NGOs, and government agencies who keep contact with the AfESG on HEC matters.

The process began by conducting a broad scale survey of reported HEC across elephant range states, which revealed that the problem occurred *to some degree* at almost every interface between elephant range and human settlement, even in areas with very few remaining elephants and regardless of the availability of formally protected refuges for the species. Shortly thereafter, a number of "priority topics" related to HEC were identified and special initial studies were commissioned to investigate them. Over the last eight years, these and the following

themes have been expanded and refined in subsequent applied research by the AfESG and its partners:

1. Quantifying elephant damage systematically;
2. Comparing quantifiable agricultural damage from elephants with that from other agricultural pest species and examining the "social dimension" of HEC;
3. Researching the idea of "habitual problem" individual elephants;
4. Investigating the problems with spatial analysis of HEC data;
5. Documenting and advising on official policy toward problem elephant control in several countries;
6. Providing wildlife managers with "tools" to mitigate HEC;
7. Working with communities suffering from HEC and in particular helping rural farmers take more responsibility for their elephant problems and explore innovative low-tech ways to counter the threat; and
8. Collecting and annotating all available HEC-related literature.

All this information is disseminated free of charge both via the Internet and in hardcopy (French and English) where documents have been produced. This article summarizes these aspects of HEC and how they collectively form a picture of this phenomenon.

Quantifying Elephant Damage

Quantifying elephant damage consists of: (1) a standardized data collection protocol for HEC incidents (Hoare, 1999a), and (2) a training package for selected local people to act as enumerators collecting these data (Hoare, 1999b). These were initially developed from experiences in community conservation in Zimbabwe and have become some of the AfESG's most widely used HEC management "tools." A simple and inexpensive scheme that uses local people to systematically collect HEC data in their own areas immediately gets communities affected by elephants involved in wildlife management. This scheme provides jobs and training in places where formal employment is rare and is the only way to overcome the many deficiencies of anecdotal reporting of elephant damage by those affected or claiming to be affected. The scheme also filters bogus from genuine claims and distinguishes serious from minor incidents. Monthly and annual summaries and analyses of the results are easily accomplished locally and crucially to allow valid comparison of one area's problems with another. Geo-referenced and fully recorded damage incidents by village enumerators yield primary data of sufficient quality for further computerized analysis by researchers. These schemes should be run for at least three years in one area in order to capture between-year variation. The key person in these programs is a conscientious supervisor of the enumerators, without whom data continuity and quality rapidly declines.

Later studies showed that a compromise between keeping such a reporting scheme within manageable logistic limits (e.g., approximately 10 employees)

and obtaining statistical validity from results could be achieved if the area fully covered was around 1500 km^2 (930 mi^2) (Sitati, Walpole, Smith, & Leader-Williams, 2003).

The Relative Menace of Elephants

HEC has often taken on a political dimension at the local and national levels. The number of complaints about elephants is often grossly disproportionate to the real level of direct damage attributable to them, especially relative to other pest species. Distortion and exaggeration is probably ultimately linked to a needy local populace looking for solutions to the overwhelming demands of their impoverished rural economies. Serious study of the human dimensions of elephant problems began in Uganda (Naughton, Rose, & Treves, 1999). This and subsequent work has uncovered proximate reasons why rural people tend to focus their complaints on this species (Hoare, 2000). Elephants are large, intimidating, and resourceful adversaries to subsistence farmers. Although the overall proportion of farms affected is usually low, the potential for suffering massive individual losses, especially near harvest time, is a major factor influencing the attitudes of rural communities.

Conservation agencies that have persisted in working with communities in an environment hostile or indifferent to conservation (e.g., specific projects in Ghana, Burkina Faso, Kenya, Zimbabwe, Botswana, Namibia) have provided many lessons and these understandings of "conflict psychology" can help to put the elephant problem in a realistic conservation context (Hoare, 2001b).

Habitual Raiders in Elephant Populations

The idea that conflict incidents are attributable to relatively few individual elephants that are "habitual raiders" has been put forward as a hypothesis (Hoare, 1999c, 2001a). Recently, some evidence to support this view has emerged in elephant populations in Uganda. Also, it appears that a not-unexpected behavioral difference may exist between crop raiding by genetically distinct forest and savanna elephants with behavior being more opportunist in forests and more intentional in savannas (Hoare, 2000).

Spatial Analysis of HEC Data

Fairly early in the study of HEC, evidence emerged that the phenomenon is strongly spatial in nature, often apparently having little to do with elephant densities at a local scale (Hoare, 1999c). These spatial complexities have been examined (Smith & Kasiki, 1999) and spatial analyses of some HEC dynamics at the site level utilizing sophisticated GIS techniques have been attempted (Sitati et al., 2003). There is much more, however, to be done in this field of research.

Official Response to Problem Elephants

An initial survey of policy toward problem elephants within wildlife authorities in southern African countries (where community conservation policy and practice are relatively advanced) revealed reliance on inadequate and outdated methods of elephant control, but also a real willingness to admit this and a desire to improve management techniques. In many countries, HEC is being "managed" in the absence of policy, let alone legal frameworks. As such, HEC may have an association, as yet un-quantified, with illegal killing of elephants. Clear official policy on dealing with problem species of wildlife is now recognized as vital for any government to make headway on maintaining credibility in the rapidly changing circumstances in African wildlife conservation. The AfESG has strong credibility with senior wildlife officials in many range states and is renewing efforts to assist their governments. Presently, AfESG is examining how a full "in-country HEC management program" can work in both Anglophone and Francophone states by trying to develop a model in two countries (Tanzania, Burkina Faso).

HEC Mitigation Tools

Early on, it became obvious that although the studies and investigations increased the understanding of HEC among technical people, field managers still had little in the way of practical assistance for tackling its mitigation. The AfESG uses the term "mitigation" because most HEC could never be entirely eliminated, but only reduced. Reduction should aim to reach the local "tolerance level" existing toward elephants. Thus, a product was generated that: (1) produced a synthesis of African experiences with HEC and (2) offered a series of options for wildlife managers to address the problem under their particular site circumstances with their own, often very limited, available resources. The resultant flagship of the AfESG HEC work to date is a "decision support system for HEC situations" (DSS) (Hoare, 2001b), a document allowing practitioners to work through a logical sequence of questions in order to arrive at reasonable answers to the problem on the ground. This DSS document (available in English, French, and Portuguese) has been widely distributed to practitioners and researchers in Africa and beyond. Although primarily designed for use at the field manager level, the DSS can be a major help to national management authorities, in research studies, for potential financial donors, and as a reference work on HEC. It has, however, been difficult to ensure that copies of the DSS get to where they are most needed for practical field testing. The DSS must be considered a "living product" to be updated and adapted through use.

Extra emphasis was given to some HEC mitigation techniques that have been either: (1) widely used or (2) newly introduced as innovations. In the category of older measures, experiences with wildlife damage compensation schemes

and the use of fencing against elephants were re-evaluated. The following inno-vations were introduced: improving "traditional" elephant defenses by farmers; the establishment of local "conflict resolution committees" in rural villages; and mapping requirements for quantifying HEC, including the use of satellite imag-ery. Summary findings and recommendations on these topics have been posted as "technical briefs" alongside other HEC information on the AfESG's website (Hoare, 2001b). Two of these innovations in mitigation are currently under development and try to promote some transfer of responsibility for HEC mitiga-tion from centralized wildlife agencies to local communities themselves, in both institutional and practical terms.

Conflict Resolution Committees

One of the most fundamental questions surrounding HEC is "whose responsibil-ity is it?" The answer may vary between countries and sites, but a new experience in a few African countries (Kenya, Ghana, Guinea) has shown that a good way to begin the process of HEC mitigation is to form conflict resolution committees in affected areas. These committees acknowledge the responsibility for HEC to be both mandated to and shared by a local partnership of stakeholders. Through structures such as these, wildlife authorities and local communities begin to find ways to overcome the mutual antagonism that traditionally tends to characterize their interactions on human–wildlife conflict.

Adaptive, Locally Developed, Community-Based Mitigation Techniques

A growing body of evidence suggests that subsistence farmers can greatly improve the success of their defenses against problem elephants by combining improved cooperation in night-time vigilance with simple low-cost fencing made from local materials and supplementing these with the strategic deployment of low-tech olfactory repellents based on *capsicum* (chilli) (Osborn & Parker, 2002a, 2002b). Given that early results from Zimbabwe, Zambia, and Kenya are encouraging, this approach has been developed into a package that rural African villages in elephant range can implement easily. A further recent development is a short training course in HEC mitigation held at a southern African venue where field practitioners from all over the continent can be sent. The course curriculum will carry an AfESG certification.

Literature Collection and Information Dissemination

The findings of the first phase of investigation produced a worrying catalogue of HEC characteristics and case studies and a rich history over the past three to four decades of attempts to ameliorate the negative side of human–elephant inter-actions across the continent. A database on all documentation both published and in the grey literature was compiled. This collection now forms a professionally

abstracted subset of the larger African Elephant Library that can be accessed through the AfESG website.

The AfESG website (www.iucn.org/afesg) is one of the most frequently visited sections of its IUCN host site. There are several sub-sections and HEC-related information can be found in three locations: (1) a dedicated HEC section with expanded details of all topics in this article, (2) the African elephant library (AEL) literature collection; and (3) *Pachyderm*, the bi-annual journal of the AfESG that has its entire 20 years of published content available for download.

General Lessons Learned in the Mitigation of HEC

After almost nine years as a connecting point in a worldwide HEC network, the AfESG has hopefully used its expertise to foster a long-term "institutional memory" of the problem. The AfESG has learned that quantification of direct elephant damage is relatively straightforward in comparison to gauging the intangible costs of living near the threat of elephants. It knows that community perception of HEC is of primary concern for its management despite systematic gathering of information revealing large differences between the *perceived* and *actual* levels of the problem. Although local participation in HEC management is essential, wildlife managers must also be supported by clear policies and legal frameworks at the national level, preferably involving land-use policy and planning that includes considerations for people and elephants.

HEC mitigation involves using many apparently unrelated measures in a "package" and working with both people and elephants. Largely ineffectual if used alone, but when used together, many disparate countermeasures definitely produce "synergy" (Hoare, 2001b). Management authorities and practitioners on the ground should always aim to reduce the problem to tolerable levels rather than expect to eliminate the problem altogether. In all cases, HEC management requires solid support from all levels of government, strong commitment on the part of wildlife management authorities, the development and implementation of integrated land-use plans, informed use of available tools and methods, and a climate of trust between the diversity of negotiating parties on the ground.

Appreciating, planning, funding, and implementing the diverse measures required to address HEC is very complex. During the long journey of understanding in which there is still much to learn, the AfESG has come to appreciate that HEC and its mitigation are as much an art as a science.

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