

Human-Elephant Conflict—What Can We Learn from the News?

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Introduction

Human-elephant conflict (HEC) poses the single greatest threat to the survival of wild Asian elephants. HEC is not a new phenomenon. Humans and elephants have been utilizing the same space for thousands of years (Sukumar 1989, 2003; Fernando *et al.* 2005; Fernando & Leimgruber in press). However, human populations in Asia elephant range countries now constitute ~26% of the world's population (1.79 billion excluding China. Source: U.S. Census Bureau 2009) and there is fierce competition for space and resources between people and elephants. HEC results in injury and death to humans, crop raiding, damage to villages and huts, and an increased resentment of elephants (Hedges *et al.* 2005; Fernando *et al.* 2005, 2008a). Despite widespread reverence for wild elephants, poisoning and electrocution of elephants are increasing as local people attempt to protect their livelihoods (Uryu *et al.* 2008; Perera 2009). In the last two decades, the situation has worsened because elephant habitat is not only lost to small-scale subsistence agriculture but also to broad-scale conversion of vast natural areas into industrial plantations for sugar, tea, paddy, and palm oil (Flint 1994; Sodhi *et al.* 2004; Koh & Wilcove 2008; Uryu *et al.* 2008).

Relatively, little hard data is available on extent, contributing factors, spatial patterns, and consequences of HEC across Asia (Hedges *et al.* 2005; Fernando *et al.* 2005). A recent review (Perera 2009) and an IUCN workshop at the 2009 annual meeting of the Society for Conservation Biology in Beijing, indicate HEC usually is only recorded at local but not at national or regional levels. Yet, HEC is widely recognized as the main driver for the continued decline of the species

(Santiapillai & Jackson 1990; Leimgruber *et al.* 2003; Sukumar 2003; Hedges 2006; Choudhury *et al.* 2008). The little data that exist are not standardized and difficult to locate and access because they are deemed too sensitive to be shared widely. Meanwhile, news outlets throughout Asia are continually reporting on HEC and this information is readily available via the Internet. The Kenya-based organization Save the Elephant (STE) is compiling news items on elephants and providing them to a wide audience via a listserv news service. We used the STE listserv archive to compile and analyze HEC reports from the news media and to address three questions:

1. What level of HEC is reported in the news media across the Asian elephant range?
2. What are the causes of conflict based on the information from news media?
3. Can reports in the news media be used to monitor HEC across Asia?

Methods

STE has been providing a free email news service on Asian and African elephants since 2000 (<http://www.savetheelephants.org/elephant-news-service.html>). The service has >1,000 subscribers and disseminates daily news stories, publications, and other information. Using STF's archive, we extracted 193 news stories on HEC in Asia for the period from August 18, 2003 to July 29, 2009. We augmented this information by including 13 news items that we found in the Elephant News Listserv (<http://www.elephant-news.com/>) for the period from November 2, 2006 to March 2, 2008. We included news reports on HEC and elephant poaching. Almost all of the poaching reported in the news, occurred close to conflict areas. In these poaching reports,

Table 1. Classification of HEC outcomes and causes of elephant mortality.

Outcomes/Causes	Definition
Crop raiding	Elephants raiding agricultural fields
Village attack	Elephants entering village and raiding crops, destroying huts or other property, or killing people
Huts destroyed	Number of live-in structures destroyed during crop raiding or village attack
Human mortality	Number of people killed
Elephant mortality	Number of elephants killed
Poaching	All elephant deaths attributed to poaching by local authorities. In all cases tusks or body parts were removed. However, all poaching in the news reports we included, occurred in or close to HEC areas.
Culling	All elephant deaths in which government officers shot an elephant perceived to cause problems
Conflict	All elephant deaths that resulted from direct or indirect conflict with local people. Includes intentional shooting, poisoning, and electrocution, as well as unintentional electrocution or accidents.
Trains	Elephants killed by trains

often the motives for killing elephants seem to be both, a response to HEC and the intent to acquire and sell ivory or elephant body parts. Thus, for the purpose of our analysis we regarded all news reports on poaching as conflict. We did not include HEC involving working, temple, or zoo elephants. Using Google Earth (<http://earth.google.com/>), we mapped HEC locations for all news articles that provided a geographic reference (town, village, district, etc.).

To assess HEC patterns reported in news media across Asia, we summarized the type of HEC, people and elephants killed, causes of elephant deaths, and methods used to kill elephants (Table 1). Countries with large wild populations might be expected to experience more HEC, and countries with more HEC may have higher human and elephant mortalities. To test for these patterns we calculated Spearman rank correlation coefficients between elephant population size and HEC, and between HEC and human and elephant mortality respectively. We also tested whether a country's human population size was significantly correlated with the number of HEC incidents.

Results

We found 206 incidents of HEC throughout Asia, resulting in the deaths of 226 people

and 87 elephants. More than half of the HEC incidents ($n=118$, 57%) were located outside of the geographic elephant ranges provided by the IUCN (Fig. 1). Crop raiding was the most common HEC type (36%), followed by village attacks (26 %) and the destruction of human habitations (27%; Table 2).

India had the highest number of HECs ($n=110$), and the highest mortalities for humans and elephants (Table 2). Agricultural-related conflicts (38%) were the most common type of HEC. In

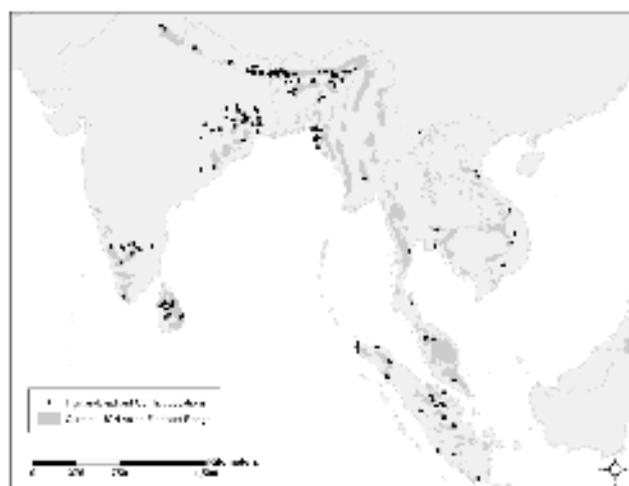


Figure 1. HEC locations (black points) in Asia relative to geographic range of Asian elephant range (gray polygons). Source: <<http://www.iucnredlist.org/apps/redlist/details/7140/0/rangemap>> accessed Oct. 2009.

Table 2. HEC incidents reported in the news media and their consequences.

Country	# HEC Reports	Crop raiding	Village attacks	Huts destroyed	# people killed	# elephants killed	Wild population rank ¹
Bangladesh	18	4	12	13	41	1	4
Bhutan	1	1	0	0	0	0	5
Cambodia	0	0	0	0	0	0	6
China	1	0	1	0	0	0	3
India	110	42	32	29	113	49	13
Indonesia	23	13	3	3	16	20	10
Laos	0	0	0	0	0	0	7
Malaysia	4	3	0	1	0	1	8
Myanmar	1	0	0	1	1	0	11
Nepal	22	3	7	5	45	4	2
Sri Lanka	16	4	1	1	8	11	12
Thailand	4	0	0	0	2	1	9
Vietnam	6	5	0	2	0	0	1
Total	206	75	56	55	226	87	

¹Populations were ranked by relative size with 13 being the largest remaining wild population. Rankings were developed by adjusting estimates in Sukumar (2003) based on other published work (Blake & Hedges 2004; Choudhury *et al.* 2008; Leimgruber *et al.* 2008; Perera 2009).

Bangladesh, HEC most commonly resulted attacks on villages and huts. In Indonesia, 57% of HEC stems from agricultural crop raids by elephants. We found no news reports on HEC for Cambodia and Laos.

Human mortalities from HEC were highest in Bangladesh, Nepal and India (18%, 20% and 50%, respectively; Table 2). Indonesia overall has very little HEC, but the country's elephant mortality from HEC constitutes 23% of all reported HEC-related elephant deaths in Asia. All of these elephant mortality results from poaching and conflict with villagers. Bangladesh had only one reported case of elephant mortality, but all HEC for Bangladesh involved the death of a person.

Primary causes for killing elephants in HEC included, poaching (22%), culling by government officers (8%), killed during crop raiding (43%), or killed in train accidents (29%; Table 3). Poaching and conflict killing of elephants were highest in

India and Indonesia. Elephant mortality from train accidents were reported only from India, Sri Lanka, and Malaysia.

Poached elephants usually were shot (58%, Table 4), but we found three cases in which elephants were poisoned before tusks and body parts were removed. In three additional killings, poachers used explosives that were packaged inside food and were probably intended for the killing of smaller animals. All three elephants died slow deaths from the wounds inflicted inside their mouths.

Poison was the most frequently used method for killing elephants in agricultural conflict (62%), followed by electrocution (19%) and shooting (16%). Poisoning and shooting is always intentional. Electrocution may sometimes be accidental.

Countries with higher levels of HEC had significantly higher human and elephant

Table 3. Causes of elephant deaths reported in news media.

Country	Poaching	Culling	Conflict	Trains	Total
Bangladesh	-	1	-	-	1
India	11	4	20	14	49
Indonesia	6	-	14	-	20
Malaysia	-	-	-	1	1
Nepal	1	2	1	-	4
Sri Lanka	1	-	1	9	11
Thailand	-	-	1	-	1
Total	19	7	37	25	87

Table 4. Methods used to kill for elephant deaths from poaching and human-elephant conflict.

Country	Poaching				Conflict			
	Shot	Poisoned	Electro-cuted	Explosives	Shot	Poisoned	Electro-cuted	Other
India	8	1	-	2	4	9	6	1
Indonesia	4	2	-	-	-	14	-	-
Others	1	-	-	1	2	-	1	-
Total	11	3	-	3	6	23	7	1

mortalities. ($r=0.84$, $DF=11$, $p=0.003$; $r=0.88$, $DF=11$, $p=0.002$; respectively). The estimated size of wild elephant populations did not affect the number of HEC incidents ($r=0.20$, $DF=11$, $p=0.471$). However, countries with large human populations have significantly higher levels of HEC ($r=0.56$, $DF=11$, $p=0.05$).

Discussion

Overall numbers of HEC detected in the news media via online news services are lower than numbers reported from other sources (Sukumar 1990; Nyhus *et al.* 2000; Hedges *et al.* 2005; Perera 2009). In India alone, HEC may cause ~300 human deaths and ~200 elephant deaths each year (Bist 2002) and in Sri Lanka ~50-70 human deaths and ~150 elephant deaths (Perera 2009)! In a recent summary of HEC patterns based on published data and expert information, Perera (2009) showed higher levels of HEC based on estimates of human fatalities for India (~300 vs. 113 in our study), Sri Lanka (50-70 vs. 8), Nepal (66 vs. 45), Vietnam (26 vs. 0) and lower levels for Bangladesh (38 vs. 41) and Indonesia (3 vs. 16). Remarkably, while news media coverage represents an underestimate, the relative patterns are very similar to the ones described by Perera (2009). HEC incidents, as well as human and elephant mortality, highest in two hotspots: South Asian and Sumatra. India has the highest overall HEC numbers. News media coverage of HEC, thus, cannot be used to determine actual levels of HEC, but may indicate ongoing patterns.

Despite obvious biases, news media information also provides some potential new insights. Sumatra has much higher HEC incidents than described by Perera (2009). Partly, this is explained by the fact that Perera (2009) relied on published information from localized studies (e.g. Hedges *et al.* 2005), rather than information

covering all of Sumatra. Also, news media information indicates significant differences in HEC patterns between the two hotspots, with many more *human fatalities/HEC event* in South Asia and many more *elephant fatalities/HEC event* in Sumatra.

South Asian countries have the highest human population densities in the region and also support some of the largest elephant populations remaining in the wild (Leimgruber *et al.* 2003; Sukumar 2003; Choudhury *et al.* 2008). The combination of these factors increases the probability for negative interactions between people and elephants and the probability for human fatalities. The comparatively low number of elephant deaths is probably the result of a combination of religious and cultural inhibitors to killing animals, a deep-rooted appreciation of the species by people, and the existence of comparatively well-functioning protection systems. HEC in South Asia has been high for a long time and also may be accepted as a natural condition by farmers.

Our results along with other publications indicate increases in HEC in Sumatra during the last 2-3 decades that resulted in unparalleled numbers of elephant killings (Hegdes *et al.* 2005; Uryu *et al.* 2008). Uryu *et al.* (2008) found that >200 elephants disappeared or were killed during conflict from expanding palm oil plantations between 2000 and 2006 in Riau alone. An additional 224 elephants were removed from conflict areas by elephant capture teams. Elephant populations declined from 1342 in 1984 to 210 in 2007 (Uryu *et al.* 2008). Poaching or poisoning were among the most common causes of elephant deaths and these deaths were often located near or around an agricultural area. Many of the news sources indicate that villagers have been frustrated with the lack of compensation for crops lost to elephant

raiding. As frustration is increasing, farmers are retaliating against the presence of elephants and escalating HEC by laying out fruit laden with poison, such as cyanide-laced pineapples, to kill raiding elephants (The Times of India 2009).

Ultimately, the HEC increase in Sumatra can be attributed to the explosive and rapid land cover and land use changes that have been occurring since the 1980s. The region has experienced some of the highest deforestation rates globally due to logging and agricultural conversion (Kinnaird *et al.* 2003; Uryu *et al.* 2008; Hansen *et al.* 2009). For example, in only 25 years Riau province has lost 65% of its forests (Uryu *et al.* 2008). Similarly, 40% of all lowland forest in Sumatra and Kalimantan was cleared between 1990 and 2005 (Hansen *et al.* 2009). Such forest loss rates are only paralleled by deforestation rates in the Brazilian Amazon (Hansen *et al.* 2009). The major driving force behind this environmental and conservation catastrophe is the conversion of forest ecosystems to oil palm plantations. The consequences of dramatic forest loss for mammals in Indonesia, and elephants especially, are well-documented (Kinnaird *et al.* 2003; Hedges *et al.* 2005; Uryu *et al.* 2008).

In addition to the deforestation patterns and increased frustration levels, lack of previous experience in HEC by the local population, as well as the absence of cultural or religious inhibitors to killing animals, may have contributed to the incomparably high number of elephants poisoned and shot from HEC in Sumatra. With historically much lower HEC rates, there may also be a conspicuous lack of traditional mitigation knowledge and techniques for HEC.

Notably missing from the news reports about HEC in Sumatra is the removal of “problem” elephants into Elephant Training Centers (Lair 1997; Nyhus *et al.* 2000; Mikota *et al.* 2006). Created by the Indonesian government in 1986, these camps were intended to manage and train elephants removed from HEC areas with the intension of later using them for logging or ecotourism. The camps have received hundreds of elephants despite significant problems in their management and care (Mikota *et al.* 2006).

Generally, HEC throughout Asia is driven by expanding human populations and agricultural development. Not surprisingly, we found a significant relationship between human population size and HEC. Countries with high human population densities had the highest number of HEC incidents. Some of these countries, especially India and Sri Lanka, also have the largest remaining populations of wild elephants. Together these two countries may hold as much as 45-54% of all living wild Asian elephants (based on Sukumar 1989). However, we did not find a significant correlation between HEC and estimated elephant population sizes at the country level, suggesting that human overpopulation and overexploitation of land plays a more important role in determining HEC intensity than elephant abundance.

Much of the HEC (57%) reported by newspapers is found outside the geographic range for Asian elephants (Fig. 1). This is a surprising finding and we have three possible explanations: 1) HEC may be more common in places where remnant elephant populations or even individuals are living in human-dominated landscapes well away from currently mapped wild elephant populations; 2) the recently established range map by IUCN AESG is incomplete and is omitting several elephant areas; 3) the current range map is based on habitat and population assumptions that are not correct for elephants; and 4) the news reports did not include accurate spatial information or our mapping technique was too coarse. All four explanations probably play a role in explaining the spatial pattern and it is difficult to assess their relative importance. However, if these assessments are correct there may be significant numbers of elephants outside the currently mapped geographic range.

The prevalence of elephant deaths from railroad accidents in new media reports was surprising. Likely these events attract more media attention, resulting in over-emphasize of this problem. Overall train and traffic accidents probably are much less of a threat to wild elephant populations than death during crop raiding and poaching (see Perera 2009).

Conclusion

The lack of information on the extent of and patterns in HEC throughout Asia is a serious problem that impedes development of region-wide conservation strategies for Asian elephants. It also reduces the ability of the conservation community as well as national and international agencies to monitor Asian elephant declines effectively. This is further exacerbated by the fact that conservation organizations and agencies have invested large sums of money to collect and synthesize existing information, and to monitor illegal killing of elephants throughout the region via the CITES MIKE Asia program. Recent IUCN workshops on the current status of Asian elephants in Cambodia (November 2008) and HEC in Beijing (August 2009) have attempted to collate some of this information and to provide guidance on how to systematically collect this data in the future. The judgment on the efficacy of these workshops is still out as we are awaiting reports of the results.

A fundamental problem may be that the responsibilities for monitoring and reporting HEC have not been assigned. Maintaining such a monitoring effort is expensive and requires long-term commitment, institutional capacity, infrastructure, and support from local and national governments. As a consequence the responsibility should probably reside with the appropriate natural resource agency in the different countries. However, which agency likes to report the frequency of management problems? Unfortunately, conservation NGOs lack many of the requirements for the effective long-term monitoring of HEC, specifically long-term persistence and institutional capacity.

Information gleaned from news media, i.e. civil society, may be one tool to use to try and capture changes and increases in the patterns of HEC. As is obvious from our research, such data has significant biases but it may be used to initiate discussions and additional research and monitoring to reduce HEC and conserve Asian elephants. However, based on the current experience it seems that the best strategy to monitor further elephant losses to HEC might

be a strategy that involves civil society; i.e. citizens in elephant range countries that take it upon themselves to collect information on the problem.

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