



Elephants on the edge fight back

After years of trauma at the hands of humans, could Africa's elephants be nursing a grudge?

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TWO years ago the people of Bunyaruguru in western Uganda would think nothing of cycling to the nearby township of Katwe to meet friends and do business. Then one day a herd of elephants paid them a visit. They came from the bush, knocked down huts and garden plots, then left with nothing to show but a trail of destruction. Now elephants regularly block the road to Katwe, and villagers are too afraid to cycle past.

Across Africa, elephants seem to be turning on their human neighbours in ever increasing numbers. Although such attacks are nothing new, they have always been seen as a side effect of elephants competing for food and land, either as a result of population explosions or because people have encroached on elephant territory. But that may not be the whole story.

"Elephant numbers have never been lower in Uganda. Food has never been so abundant," says Eve Abe, who studied elephant aggression in Uganda at the time of the Bunyaruguru attack in 2003 and now works as a wildlife and tourism consultant based in London. "There is no reason for this to be happening. In the 1960s elephant densities were very high and there were few reports of aggression. Now the elephants are just so wild."

What has happened to everyone's favourite gentle giant? It may sound far-fetched, but a growing number of scientists are lending their support to the theory that elephants are taking revenge on humans for years of abuse. Last year a group of eminent elephant researchers described an "elephant breakdown" occurring all over Africa, with elephants suffering serious psychological problems after witnessing the death of family members or being orphaned by poaching or culls (*Nature*, vol 433, p 807).

Elephants are well known for being intelligent, sociable and affectionate. Females and their young live in tight matriarchal groups, forging strong social bonds that last a lifetime. Calves learn the ways of the world from their mothers, aunts and cousins and, most importantly, the matriarch - the most experienced female in the herd. Sadly, the days when elephants were left to live in peace are long gone. Since the 1970s and 1980s, when the ivory trade decimated wild elephant populations in Africa, poaching, culls and translocation programmes have made their mark on generation after generation.

Juvenile delinquents

In Uganda, poaching has slashed elephant numbers in the Queen Elizabeth National Park, which borders Bunyaruguru, by 90 per cent over the past 30 years. Now only 400 animals remain, a third of them under 5 years old and many of them orphans. Across the continent, many herds have lost their matriarch and have had to make do with a succession of inexperienced "teenage mothers" who have raised a generation of juvenile delinquents. Meanwhile a lack of older bulls has led to gangs of hyperaggressive young males with a penchant for violence towards each other and other species (*Nature*, vol 408, p 425). In Pilanesburg National Park, South Africa, for example, young bulls have been attacking rhinos since 1992, and in Addo National Park, also in South Africa, 90 per cent of male elephants are killed by another male - 15 times the "normal" figure.

Could it be that traumatised elephants have also grown up harbouring a grudge against humans? Joyce Poole, research director at the Amboseli Elephant Research Project in Kenya, was one of the authors of the elephant breakdown paper. "They are certainly intelligent enough and have good enough memories to take revenge," she says. Poole suspects the way the authorities are dealing with the situation may be making it worse. "Wildlife managers may feel that it is easier to just shoot so-called 'problem' elephants than face people's wrath. So an elephant is shot without realising the possible consequences on the remaining family members, and the very real possibility of stimulating a cycle of violence."

Poole and her colleagues claim that many African elephants are suffering from post-traumatic stress disorder (PTSD) brought on by experiencing stress at an early age. Experiments and observations of captive animals suggest that stress experienced during their youth can lead to neurological and behavioural changes that resemble PTSD in humans. "[This] could explain a suite of behaviours that have been common in captivity but sadly now are becoming part of wild elephant behaviour," says the paper's lead author Gay Bradshaw from Oregon State University. This may well be the first diagnosis of PTSD in a wild animal.

It is a challenging idea, but worth considering, according to Felicity de Zulueta, a consultant psychiatrist at the Maudsley Hospital in London who specialises in trauma therapy and grew up in Uganda with an orphaned elephant as a pet. She points out that one cause of PTSD in humans is the failure of a child to bond or "attach" properly with

its primary carer. Even if bonding does occur but is weak, or is later severed, children may grow up with severe psychological problems including delinquency. "Prematurely separating an elephant from the family tribe will have very powerful effects in terms of the attachment system. One of these effects would be aggression," she says. The damage is thought to occur because bonding is vital for the healthy development of the corticolimbic region of the brain's right hemisphere. If neurons there are not stimulated at an early age they are lost, leaving infants unable to regulate their emotions, vulnerable to the effects of stress and more likely to become violent. "Elephants have a long childhood like us, so the effect may well be similar," says de Zulueta.

Could this explain the seemingly unprovoked attack on the people of Bunyaruguru? Abe believes it might. She compares the behaviour of Uganda's delinquent elephants to that of young men from her own tribe, the Acholi of northern Uganda, whom she studied for her PhD. Having witnessed genocide in the 1970s during the Ugandan civil war, which selectively removed the male elders from society, the children of the Acholi were left to wander alone, traumatised and with no adult guidance. Many of these children have grown into violent men. "This is a perfect example of family destruction," says Abe. "Trauma persists over generations." She believes that elephants are responding to stress in a similar way. "Either through social learning or through neurobiology, elephants are changing over decades of intensive and extensive stress and disturbance."

Still, it is a leap from traumatised elephants to elephants bent on revenge - for many experts, a leap too far. "I'm sure disturbance of elephant herds can lead to more aggressive behaviour, but as far as the root causes of human/elephant conflicts in Africa today, I wouldn't rank it as a top issue," says Leo Niskanen, programme manager of the World Conservation Union (IUCN) African Elephant Specialist Group. "Generally the main issues are things like elephant range being fragmented, corridors being destroyed, more people settling near protected areas." Put simply, elephants and humans just keep bumping into each other. And bumping into 5 tonnes of elephant - hyperaggressive or not - is always going to cause problems.

Richard Lair, an Asian-elephant researcher at the National Elephant Institute based in Thailand, agrees. The same story is being told in India, where villagers, particularly in West Bengal, live in constant fear of male elephants that the villagers claim attack the village for one reason only - to kill humans. In Asia, at least, Lair puts the problems down to too many humans and too little land, leading to competition for resources and more encounters between elephants and humans. "I think it comes down to encroachment," he says. "In wilderness areas where wild elephants have no contact with human beings they are, by and large, fairly tolerant. The more human beings they see, the less tolerant they become."

In Thailand, where papers carry regular reports of rogue animals, the explanation is probably even more straightforward, according to Lair. When the Thai government banned logging in the 1980s, large numbers of elephants were made redundant. Some were sold across the border to Burma and Laos where logging still takes place, but

most now carry tourists into the forest on treks, or work in cities where they are dressed up to entice people to buy bananas and sugar cane to feed them. It's a lucrative business and the lure of the tourist dollar has attracted less experienced mahouts to sign up and have a go, often with disastrous consequences for those who do not know how to deal with unpredictable animals. "It's now a real issue," says Lair, "not just for the safety of the mahouts, and thereby the public, but also for the welfare of the elephants."

The idea that elephants are suffering from PTSD and taking it out on humans is undoubtedly controversial. Nevertheless, there is a growing awareness that elephant psychology and their social structure must be taken into account in future attempts to manage the animals in the wild. With elephant numbers reaching carrying capacity in many of Africa's national parks, Niskanen and his colleagues at the IUCN have been prompted to come up with guidelines for translocations. They recommend that herds be monitored long before they are moved, to ensure that the entire family is taken. That won't be easy or cheap to implement, admits Niskanen, especially since the measure is voluntary. "In many cases governments just don't have the resources," he says. "In vast parts of Africa we have no idea how many elephants there are, let alone understanding of the intricacies of their family structures."

Even where governments do follow IUCN recommendations, elephants may still be left traumatised, according to Bradshaw. She is particularly concerned about the fate of elephants in the Kruger National Park, where the population is more than double the park's carrying capacity. Passions are running high over the South African government's plans to cull some of the animals. No decision has yet been made, and the park's research manager Ian Whyte is keen to point out that any cull would remove entire families, and that leaving behind one or two family members would be unthinkable. Bradshaw is not convinced. "It would be like taking out a district of London and thinking the rest of the city will be fine," she says. "Do you think they're not going to know and be affected by what has happened to the herd next door?"

Talk of keeping elephant families united and happy may sound like a cruel joke to anyone who has lost a loved one, had their home destroyed or crops trampled. Like the people of Bunyaruguru, they probably just want the elephants to go away. But as both human and elephant populations increase, the two will have to learn to live together, and anything that can reduce conflict must surely be embraced. Keeping elephant social groups intact may be the best way to avoid making a bad situation worse, and to be sure we don't end up with a monster of our own making.