



ELEPHANTS AND BEES

Could honey bees be effective deterrents for Asia's crop-raiding elephants?

TEXT AND PHOTOGRAPHS BY DR. LUCY E. KING

As our ancient jeep bucked and jolted to a stop on the steep bank, I caught a glimpse of the thickly forested edge of Wasgamuwa National Park and wondered, not for the first time on this trip, if some of the wild elephants that inhabited this part of the island were surreptitiously watching our arrival. We waited silently for a flicker of elephant movement. Compared with my Samburu study site in Kenya, where elephants are plentiful and habituated to my vehicle, I was unused to the need to exercise such patience, so I enjoyed the time mulling over all that I had learnt about Sri Lanka's elephants.

It was the last day of our two-week visit to Sri Lanka. I had arrived with two main aims: first, to learn from the ecologists, scientists and field researchers about this sub-population of some 5,000 Asian elephants, and establish what impact an ever-increasing human footprint is having on their habitat and conservation; and second, I wanted to assess whether my beehive fence design could be used as a conflict mitigation tool by Sri Lanka's poorest farmers.

Joining me on the trip were Andrea Crosta, the dynamic Italian CEO from Elephant Action League, and Kylie Butler, an Australian student working with me in Kenya to increase our understanding of elephant behaviour around protective beehive fences.

EARLIER... IN AFRICA

In 2006, I arrived in Kenya's Samburu National Reserve to join the research team of 'Save The Elephants', led by Dr. Iain Douglas-Hamilton. Although I was then a Master's student from



ABOVE *The beehive fences consist of beehives linked one to another every 10 m. around a farm boundary. Should an elephant try to push through to access the crops, all the beehives swing and release the bees. This has proved effective at reducing harmful elephant crop-raids.*

FACING PAGE *An elephant head-shaking in response to bee playbacks. The author and her team discovered that elephants turn away when confronted by the sound of angry bees and as they retreat they emit a unique, low frequency or 'infrasonic' alarm call that warns other elephants in the area to retreat as well.*

Oxford University, my childhood had been spent in rural Africa so I immediately felt at home in Samburu's dry bush country. My early research into the potential use of honeybees as a natural elephant deterrent proved fascinating. Sure that I had discovered a unique, and as yet unknown example of inter-species behaviour, I spent the following four years testing out my hypotheses and completing my PhD research with help from my professors, Fritz Vollrath and Anna Lawrence, a bio-acoustic expert from Disney's Animal Kingdom, Joseph Soltis, and some selected tribal farmers and field assistants.

Together, we made the significant discovery that African elephants 'know about' African honeybees. How do we know this for sure? Well, not only do elephants run away when confronted by the sound of angry bees, but as they retreat they emit a unique, low frequency or 'infrasonic' alarm call that warns other elephants in the area to retreat too. The discovery of this behaviour was groundbreaking and helped us to improve our understanding of how elephants respond and communicate to each other about the presence of threats in their environment.

Although the elephants in Samburu retreated to our playback of bee sounds, my thesis data confirmed that if elephants are exposed to repeat playbacks of bee sounds for a short period of time, they take longer to respond and move a shorter distance away. However, if there was a gap of five weeks or more between playbacks, no such habituation was observed. This suggests that bee sounds, as a stand-alone deterrent, may have a limited but select use as an audio deterrent. Perhaps if bee sounds were mixed and matched with different deterrent sounds over a period of time, they might deter some elephants from entering an area.

However, finding sufficient acoustic deterrent sounds to vary the 'threat' continues to be a challenge for these highly intelligent animals. Without negative conditioning from such acoustic deterrents, repeat visits by the same elephant will eventually lead to habituation. Additionally, the logistics of providing speakers, batteries and iPods



TOP Dr. Lucy King has conducted various beehive fence workshops in Kenya to demonstrate and promote this effective bio-deterrent system in areas where elephants raided crops.

ABOVE Tried and tested, beehive fence systems are helping to protect small farms and to change attitudes of participating farmers who once hated elephants with a passion.

to rural farmers is unrealistic and costly. It quickly dawned on us that it would be much better to offer farmers live honeybees in real beehives.

I knew from an earlier experiment that simply placing beehives around a farm would rarely deter approaching elephants. From my experience in Samburu, I had established that elephants would only run away from a beehive if the hive was disturbed and the bees agitated. African bees *Apis mellifera scutellata*, are notoriously defensive about their hives, perhaps because the conditions are so harsh

that they vigorously need to defend their honey stores and brood from potential honey thieves. Hence I designed a wire fence that linked beehives around a field boundary.

BIO-DETERRENT?

Quite simply, a number of beehives are hung 10 m. apart between two posts and shaded from the sun by a loose thatch. Each beehive is connected to the next by a piece of plain fencing wire until the field or small farmstead is encircled. Should an elephant be bold enough to pass between two of the

beehives on its way to ravage the crop, the connecting wire will push against its chest, causing the beehives on either side to swing outwards. Such agitation will disturb and release the hive's guard bees, whether it is night or day, and a swarm of angry bees will drive away the elephant targeting sensitive places like the tip of the trunk, behind the ears and around the eyes. The fence is designed so that all the beehives are connected and, even with low occupancy, the likelihood is that at least one beehive will be disturbed by an intruding elephant. I named my rustic, swinging, simple invention a 'Beehive Fence'.

I have no doubt at all that beehive fences work as a deterrent system during the day. I know this because a group of farmers and I accidentally tried it for ourselves in my main community trial site in Ngare Mara, just south of Samburu National Reserve. Two farmers, trying to repair one of the beehive's thatched roofs, accidentally dropped it on top of the live hive. The bees erupted into the air and, although the farmers were wearing full bee suits, they panicked and ran at full pelt across the farm, directly into the wire connecting the beehives on the other side of the farm. This disturbed two more occupied hives and triggered their colonies to swarm into the air too. After a moment of sheer admiration that our system really did work, we all ran for our lives to the safety of my old Land Rover!

A WIN-WIN SUCCESS STORY

Although the design of the beehive fence has been marginally tweaked over the years, the fundamental design of interconnecting hives around farm boundaries has been consistently effective from day one, and the number of crop-raids in beehive fence-protected fields has dropped significantly. Through distribution of our free Beehive Fence Construction Manual we have helped and encouraged farmers in Kenya, Tanzania, Uganda, Mozambique and Botswana to set up their own beehive fence trial sites. Due to different materials and logistics at each site, each beehive fence is slightly different and at least five different types of

beehives have been successfully used so far in the interlinking system. It appears that it is not the beehive that elephants avoid, it really is the live bees that they fear. Occasionally, a beehive is knocked down by an elephant. Perhaps, he didn't recognise the shape, or stumbled into it in the dark when the bees are quietest during their rest and cleaning phase (contrary to common belief, worker bees don't sleep at night). However, as the elephants don't seem to return to the fence, perhaps this is a necessary learning experience and, as we know, elephants never forget. As 95 per cent of our data is collected from night-time crop-raid attempts, it seems that elephants can and do learn to avoid these swinging, creaking, buzzing beehive fences.

In Kenya, we have created our own brand of 'Elephant-Friendly Honey' from the beehive fences that is so popular we are not yet able to meet the demand. As our project develops, we hope to enhance this beekeeping side of the project and really boost the income potential that beehive fences offer to our rural farmers.

Finally, we are also starting to record a change in attitude from our participating farmers. Before the beehive fence trial our farmers hated elephants with a passion and held the local wildlife office in poor regard due to their inability to stop elephants from entering the community. Now, elephants are still entering the community but remain outside of the ploughed farms, foraging on trees and bushes and not crop-raiding as they once did. One farmer actually admitted to me recently that he "quite enjoys watching them" and felt that his family "were safer" behind their beehive fences than before the project started.

If we are going to have any success at improving farmers' attitudes and perceptions towards elephants, we in the scientific community need to offer practical, low-cost solutions to farmer-elephant conflict situations. Beehive fences are by no means the complete answer to eradicating all crop-raiding in Africa, but they are one viable contribution to the toolbox of options for reducing conflict for small-scale farms.

CAN WE REPLICATE IT ELSEWHERE?

As the train wove its way back to Colombo from the pretty hill town of Kandy, I contemplated how my experiences with elephants and bees in Kenya could help inform my decisions about whether beehive fences could be effective against Sri Lankan crop-raiding elephants. There is no doubt that the Asian honeybee *Apis cerana*, is less aggressive than the African honeybee. I stuck my head into one of the beehives outside of Uda Walawe National Park and was astonished not to have even one guard bee try to sting my nose. However, beekeepers in Sri Lanka do get stung when disturbing hives for honey harvesting, and there is very little biological difference in the stinging mechanism between the two bee species. I expect that the extreme disturbance and stinging behaviour generated by honey harvesting wouldn't be unlike the disturbance caused by an elephant knocking into a beehive fence structure.

Beekeeping is also widely regarded as one of the most important activities for rural farmers. Not only do the bees increase pollination and yield production through foraging activities, but they also provide a rich source of

honey, beeswax, pollen and royal jelly that can be sold for a profit. Honey is widely enjoyed by most indigenous communities and often contributes to important cultural roles in society. Such additional benefits from adopting a beehive fence may go some way to compensate farmers for any successful crop-raids.

So, what are my final thoughts about introducing beehive fences to farmers in Sri Lanka, or indeed the rest of Asia? Well, even if the stings of Asian honeybees prove too gentle to scare away all of the crop-raiding Asian elephants, the farmers will still benefit from the health and financial benefits of beekeeping. It seems to me that any investment risks are far outweighed by such numerous benefits. 🐝

Dr. Lucy King is the leader of The Elephants and Bees Project that functions under the support of Save the Elephants and Oxford University. Based in Nairobi, Kenya, she continues her applied research as well as helping projects all around Africa set up trial Beehive Fences. All The Elephants and Bees Project publications, including the Beehive Fence Construction Manual, can be downloaded for free from the project website www.elephantsandbees.com.



Dr. King conducting a bee playback experiment with a known population of elephants in Samburu National Reserve, Kenya. Save the Elephants have spent two decades here conducting applied research to understand elephant behaviour, migration patterns and space needs.