

New study finds elephants show risk-avoidance behaviour in response to human-generated seismic cues

June 30 2021



Credit: Save the Elephants

Researchers at the University of Oxford and Save the Elephants have found evidence that African elephants (*Loxodonta africana*) listen and react to ground vibrations created by human activity.

Elephants' heavy footsteps and their rumbling low-frequency calls are so powerful that they can create seismic waves—vibrations that travel

through the ground and along its surface. As a result, elephants have evolved sensitivity to these ground-traversing [sound waves](#), in part because it helps them communicate with one another across thousands of metres. The animals have an inner ear, as well as pressure-sensitive nerve endings in their feet called Pacinian corpuscles, and scientists believe that these help them detect seismic vibrations.

Now, researchers at the University of Oxford and Save the Elephants have found evidence that African elephants (*Loxodonta africana*) also listen and react to ground vibrations created by human activity.

The study, published today in the *Proceedings of the Royal Society B*, shows that when elephants perceive such human-generated seismic waves, they often retreat away from them, apparently as a risk-avoidance strategy. Previous studies have found they avoid the acoustic sounds of bees, tiger growls, human voices, and other elephants' alarm calls. But whether they could also identify and discriminate between different ground-based sounds was unclear.

Conservationists are concerned that man-made noises may interfere with signals that elephants receive from the natural world and impact their survival. A profusion of low frequency noise is a particular concern in Samburu, where this study was carried out, since it is close to an artillery firing range. Elephants may also be sensitive to seismic blasting for oil exploration, which is currently taking place in Kavango in Namibia.

To study how they detect and respond to seismic waves generated from different sources, Dr. Beth Mortimer, a zoologist at the University of Oxford, her colleagues and a team from Save the Elephants played seismic recordings of elephants and human-generated [white noise](#), as well as a combination of both, to wild elephants in Samburu National Reserve and Buffalo Springs National Reserve in northern Kenya.

When the researchers played human-generated noise (alone or in combination with elephant sounds), the wild elephants often froze and appeared to listen vigilantly to the strange sounds. They also moved farther away from the sources of human-generated noise than they did from elephant-generated noise, suggesting they associated the human noises with risk.

Dr. Beth Mortimer, said: 'Human-generated seismic noise is something the elephants were retreating from. That leads us to the conclusion that they're associating it with risk. We don't know why—there could be many reasons that they're choosing to retreat.'

Dr. Mortimer said she was surprised to find that the elephants picked up on human-generated noise even when it was combined with elephant sounds overlaid on it: 'I was expecting them to respond to elephant-generated cues only, and for that noise to mask the human sounds. But they picked up on the human-generated part in the combined recording and retreated from it.'

'It was a surprising outcome, but very important in terms of showing that they get information from human-generated vibrations. It's not just elephant-generated seismic vibrations that are relevant to them.'

Human-generated noise pollution is ubiquitous—and it is only increasing, along with [human activity](#). Dr. Mortimer said: 'The more of it there is, and the louder and closer it is, the more it's going to be affecting the elephants.'

Even in the relative tranquility and remove of protected areas such as the National Reserves, the ground carries human-generated noise from vehicles, generators, gunfire, and other sources, which according to the new study's findings could be enough to disrupt elephants' behaviour.

Dr. Mortimer said: 'We've shown through this study that elephants can detect and respond to human-generated vibrations. We observed the retreat response to such noise, and so we know that human noise poses challenges to elephants because they are so sensitive to ground-based vibrations.'

Ultimately, Mortimer says more research is needed to understand how human-generated vibrations affect their welfare: 'This study helps show that elephants use seismic vibrations for a wider variety of information—not just communication,' she said. 'We know that seismic vibrations are only going to increase over time, and we need to be aware of how that is impacting elephants.'

Chris Thouless, Save the Elephant's Head of Research said: 'We still know very little about how elephants use infrasound to communicate with each other and to appreciate their environment. They operate in a sensory world that is very different from our own, 'hearing' low frequency noises through their feet. They may detect other elephants, distant thunderstorms, and noises of human activities at great distances. This skill helps them to survive in a complex environment, but man-made noises may overwhelm the more subtle signals from the natural world.'

Key findings from the study include:

- Elephants can detect human-generated seismic vibrations, even when such [noise](#) is mixed with elephant-generated vibrations
- Elephants show vigilant behaviour and retreat from human-generated ground vibrations, suggesting they are reacting to it with risk-avoidance
- Man-made noises may interfere with signals [elephants](#) receive from the [natural world](#) and impact their survival.

More information: Beth Mortimer et al, Noise matters: elephants show risk-avoidance behaviour in response to human-generated seismic cues, *Proceedings of the Royal Society B: Biological Sciences* (2021). [DOI: 10.1098/rspb.2021.0774](https://doi.org/10.1098/rspb.2021.0774)

Provided by University of Oxford

Citation: New study finds elephants show risk-avoidance behaviour in response to human-generated seismic cues (2021, June 30) retrieved 25 April 2024 from <https://phys.org/news/2021-06-elephants-risk-avoidance-behaviour-response-human-generated.html>

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