Ecology: Humans are scarier than lions

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In Africa, nothing inspires fear more than lions. They are large, hunt in groups, and kill prey much larger than themselves. Yet, evidence suggests that wildlife are more afraid of humans than anything else that moves across the African savanna.

Walking at night in the African savanna can be terrifying. During the new moon, the distance that you can see is limited to a few metres. Thus, to determine what is around, you must rely on your hearing and to some degree your sense of smell. You may hear the sounds of antelope feeding on the grass off to your left, or the sound of branches scraping along the sides of elephants (*Loxodonta africana*) as they silently push their way through a clump of trees behind you. Then, the light breeze may bring the smell of freshly deposited rhino dung in a midden (i.e. communal latrine) on the path up ahead. Yet, it is the things that do not make noise that we are worried about. The silent killers that may be watching- lions (*Panthera leo*), leopards (*Panthera pardus*), and spotted hyena (*Crocuta crocuta*). All three extremely accomplished predators. However, we are not alone in our fear of these predators, especially lions[1-6].

Within African savannas, lions are the apex predator. They hunt a wide range of prey varying in size from small blue duiker (*Philantomba monticola*; ~3 kg) up to young elephants (~1600 kg)[7]. Moreover, they are so feared that their mere presence causes both prey and other large predators to make both temporal and spatial adjustments to limit potential interactions

with them[2,5]. In fact, lions do not even have to be hunting to cause fear in their prey. The mere sound of a lion's roar, which they do not do when hunting, can cause greater anti-predator responses (e.g. vigilance) from prey species compared to the alarm calls of conspecifics, a generally reliable indicator of risk[5]. However, in their recent study, Zanette et al.[8] suggest that lions are not the scariest things on the savanna, rather humans are.

African animals have evolved with humans and thus are aware of the danger we represent[9]. As human population growth excels, we move further into wild areas[10] leading to greater contact with, and the killing of, large mammals. In fact, we kill large mammals at rates that far exceed that of other mammalian predators mainly due to our sheer numbers and our ever-advancing hunting technology such as guns, camera traps, hunting apps, and night-vision equipment[11,12]. This unenviable achievement leads to humans being classified as 'super predators'. However, to animals that live in African savannas, are we truly scarier than lions?

To answer this question, Zanette et al.[8] conducted their study at 21 water holes in the Kruger National Park, South Africa, home to one of the largest lion populations on the continent. They explored the reactions of 18 species of ungulates (e.g. elephants, kudu (*Tragelaphus strepsiceros*), impala (*Aepyceros melampus*), Burchell's zebra (*Equus burchellii*)) and carnivores (e.g. leopard, spotted hyena), plus a single category of mesocarnivores comprising eight species (e.g. black-backed jackal (*Canis mesomelas*), white-tailed mongoose (*Ichneumia albicauda*)) to playbacks of lion snarls and growls, both men and women talking in several South African languages (e.g. English, Afrikaans, Zulu), hunting sounds (i.e. gun shots and dogs), and used local bird calls as a control. To record these reactions, Zanette et al.[8], used an ingenious automated camera-speaker system that once triggered by an animal coming into the range of the camera, it played one randomly selected playback and recorded videos of the species before and after hearing the playback.

From these videos, Zanette et al. [8] found that the animals' reactions to human voices were far greater than those elicited in response to lion snarls and growls, dogs, and even gun shots. In fact, both predators (e.g. leopards, hyenas) and prey (elephants, white rhinoceroses (*Ceratotherium simum*), giraffe, Burchell's zebra, kudu, warthog (*Phacochoerus aethiopicus*), impala) were twice as likely to run and 40% more likely to abandon the water holes upon hearing human voices compared to when they heard the lion snarls and growls. Moreover, this response was comprehensive in that it was displayed by 95% of the species recorded. Yet, what is important to remember is that these species were not responding to people yelling or sounding threatening, rather they were reacting to the sound of normal, non-aggressive conversation. In addition, these reactions were in a protected area where the vast majority of these animals are not hunted by people but are hunted by lions. The different species did display fear in response to the sounds associated with humans hunting (i.e. gun shots and dogs), but somewhat surprisingly these reactions were weaker than or simply equal to the responses to lions. As such, it seems that the different species considered human speech as a more reliable indicator of an immediate threat compared to the sounds associated with people hunting.

A good example of the different reactions to the playbacks of lions and humans came from elephants, where they displayed very different behaviours upon hearing the different playbacks. In response to lions, the elephants displayed typical anti-lion behaviour by coming together as a group, moving the young to the middle, and then aggressively moving towards and even attacking the speaker playing the lion calls. Checkout the videos in the supplementary material[8] to see this first hand. By contrast, they did not bunch together to defend themselves after hearing the human voices. Rather, they rapidly moved away indicating that even the largest terrestrial mammal fears humans more than they fear lions.

The results of this study[8] add to a growing body of evidence that demonstrates that the indirect impacts of humans on wildlife go far beyond African savannas. Similar studies exploring wildlife's reaction to human speech have been conducted in Asia, North America, and Europe[13-17], all of which show that the human 'super predator' is feared by wildlife worldwide. However, these results are not all negative, as it may be possible to use the fear of human voices as a tool to shift animals away from specific areas. For example, by using random playbacks of human conversation it might be possible to move those species targeted by poachers, such as white rhinos, away from areas where they are under the greatest threat. In addition, playbacks could be used to shift predators away from livestock, and elephants away from subsistence farmers' crops, thus helping to reduce human wildlife conflict.

Nevertheless, humans are responsible for a multitude of large-scale impacts on the planet including climate change, pollution, habitat loss, and overutilisation of natural resources[18,19]. However, the results of Zanette et al. [8] highlight that human impacts can be much more subtle. The mere sound of our voices has the power to shift animals away from areas, cause predators to abandon their kills (watch the supplementary videos for an example of this), impact ecological processes, and ultimately shape community dynamics at multiple trophic levels[13,20]. As we move more and more into the wild spaces, it may not be the sound of our cars, chainsaws, guns, or dogs that change animal behaviour, and space use. Rather, it may simply be the sound of a single person talking that will be enough to initiate large-scale ecological impacts, and that is a scary thought.

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