

BATting FOR AN IMPORTANT YET MISUNDERSTOOD SPECIES

Relevant for: Environment | Topic: Biodiversity, Ecology, and Wildlife Related Issues

Imagine dusk in our rural heartland, groups of people returning to their homes from farms, factories and forests. At the same time, hordes of winged mammals called bats (nearly 128 species in India; over 1,200 species worldwide) emerge from their roosts in trees, caves, rock ledges, temples and buildings. Bats and humans have cohabited since time immemorial. Throughout the night, these bats devour insects in farms, fields, forests, grasslands and around our homes, including agricultural pests and disease-causing mosquitoes.

Some bats sip nectar, pollinate flowers, eat fruits, and spread the seeds of many important tree species including wild varieties of bananas, guava, cashew, mango, figs, mahua and other fruits. A study in Thailand has shown that pest biocontrol provided by just one species of bat prevented the loss of 2,900 tons of rice per year — or a savings of \$1.2 million, and meals for 26,200 people annually. Bat droppings (guano) mined from caves are widely used as a fertilizer for agricultural crops as they have high concentrations of nitrogen and phosphorous.

Unfortunately, despite these critical roles bats remain among the most misunderstood of all animals. In India, we have almost no studies on the ecosystem services that bats provide. With scientific evidence mounting that the SARS-CoV2 virus that causes COVID-19 originated in bats, there are growing fears of further disease transmission from bats.

A significant and unique feature of bats is that they are known or suspected to be the natural reservoirs for many novel and recently emerged pathogenic viruses such as Nipah, Hendra, Marburg, Ebola and the coronaviruses that cause severe acute respiratory syndrome. Despite being reservoirs for viruses, bats never fall sick. Flying is a very stressful business, and results in toxic by-products which could damage cell contents. Bats have evolved mechanisms to avoid such damage by suppressing their immune systems. Scientists think that such suppression results in a continuous auto-immune response which helps them combat infections and control virus propagation. Interestingly, this ability to limit excessive inflammatory response (which is responsible for the adverse effects of such viruses in infected humans), ensures they do not over react to viral infections and protects them from multiple chronic age-related diseases.

In other words, in gaining the ability to fly long distances, bats have also inherited an immune system that protects them from viruses. The same immune system also makes them age slower, and live longer. They are among the longest lived mammals for their body size.

Due to COVID-19, we have suddenly become aware of the several viruses bats carry because they could spill over to us. But such spillovers — the transmission of pathogens from their natural host or reservoirs to novel hosts such as humans — are unusual and rare events, and tend to occur when there is increased contact between humans and wild hosts.

Over the last several 100 years, humans have significantly modified the landscapes around them — cutting of forests, clearing of land for agriculture and development — resulting in disturbances to bat roosts, and forcing them to change their 'homes'. Activities such as mining destroy natural cave systems that bats live in. Scientists have shown that when bats are disturbed, they become stressed and could shed viruses that they carry, increasing the risk of spillover. This suggests that human habitat destruction makes bats move closer to human habitation, resulting in stressing them, and in turn viral shedding.

The COVID-19 pandemic has compelled us to look back on the mistakes made in destroying this fine ecological balance, and study how bats and humans can co-exist in certain areas. This is as important as searching for the cure for SARS. Yet, we still do not know too much about the ecology of bats, even in the context of viruses. Are chances of spillover higher in areas with more bat species? Are viruses shed by bats throughout the year or only seasonally?

Several indigenous people had understood the importance of giving enough space to all animals including bats whilst staying with them. Some have isolation practices such as quarantine following hunting. They are dependent on animals and nature, and have achieved a balance without any harm to both sides. The Bomrr clan in Nagaland, for example, have traditionally celebrated the annual bat harvest for many years. They gather at a place called Mimi to smoke a cave full of bats and as bats start exiting, kill them for consumption. In the process, the bats bite them or scratch them. Yet, there has been no major disease outbreak among the Bomrr clan. To understand how and why the Bomrr are immune to the viruses in the bats they interact with, the National Centre for Biological Sciences (NCBS-TIFR), an aided Centre of Department of Atomic Energy (DAE) are carrying out sero-ecological studies on this human-bat interface. They are exploring microbial diversity associated with the bats, and also serology (antibody response to known viral families) to investigate which part of this diversity is potentially pathogenic. So far, they have found: genetic prevalence/detection (between 3%-10% of bats) of several bacterial and viral families and evidence that both bats and humans have shared antibody response to some viral families, indicative of a spillover.

The NCBS is also in the process of sequencing whole genomes of bat viruses. This study could help build a bank of virus genomes as baselines to be prepared for any possible future outbreaks. Local practices and traditions could serve as a guide for us to understand how we should minimise risk of infectious disease spillover from bats in the future. The rich biodiversity and cultural diversity in India serves as an excellent and unique place for such studies.

But the fact remains that bats carry many viruses. So how can we continue to co-exist with them? We could take a few sensible precautions that minimise our direct interactions with bats — such as avoiding handling or eating bats, and not eating fallen fruits gnawed by bats or fruits likely to be contaminated by bat fluids. This would greatly reduce the risk of spillover. In the longer term, we should work towards restricting and reversing land-use change practices that are bringing us in greater contact with, and increasingly stressing out, animals that may harbour ‘emerging infections’.

In India, many people are dependent on the ecosystems they live in, and the various services those ecosystems provide, for example water, clean air and pollination. Over the last few decades, habitat destruction and land-use change has impacted most of India. We can regain this balance with nature and animals through a combination of habitat restoration and co-existence with wildlife such as bats. Integrated approaches such as One Health, where human health is linked to that of the environment and animals can result in the best possible outcomes. Any such future will require a global commitment to reduction of habitat loss, and the preservation and restoration of our natural habitats and biodiversity. A world with fewer bats around us will be one that suffers greater crop losses to agricultural pests, witnesses increased incidences of other diseases such as those transmitted by mosquitoes, and one without mahua, too.

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