



## Batting for misunderstood species

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**(MainsGS3:Science and Technology- developments and their applications and effects in everyday life & Conservation, environmental pollution and degradation, environmental impact assessment.)**

### Context:

Bats provide some direct benefits to humans but due to their physiology, bats are one type of animal that acts as a natural reservoir of many pathogens and since they are highly mobile, social, and long-lived, they can readily spread diseases.

### About the Bats:

- Bats are nocturnal mammals of the order Chiroptera. With their forelimbs adapted as wings, they are the only mammals capable of true and sustained flight.
- Bats are present throughout the world, with the exception of extremely cold regions.
- They are important in their ecosystems for pollinating flowers and dispersing seeds; many tropical plants depend entirely on bats for these services.
- Many bats are insectivores, and most of the rest are frugivores (fruit-eaters) or nectarivores (nectar-eaters).

### Ecological importance:

- Bats directly and indirectly impact human life as 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 phosphorus.

#### **Act as disease carrier:**

- Bats are natural reservoirs for a large number of zoonotic pathogens and their high mobility, broad distribution, long life spans, substantial sympatry (range overlap) of species, and social behaviour make bats favourable hosts and vectors of disease.
- 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.
- Bats act as 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.

#### **Autoimmune response:**

- Flying is a very stressful business, and results in toxic by-products which could damage cell contents.
- Despite being reservoirs for viruses, bats never fall sick as 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, their 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.

#### **Human interference:**

- Over the last several 100 years, humans have significantly modified the landscapes around them resulting in disturbances to bat roosts, and forcing them to change their 'homes'.
- 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.

### **Case study:**

- Several indigenous people had understood the importance of giving enough space to all animals including bats whilst staying with them.
- For example, the Bomrr clan in Nagaland 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.

### **Human-bat interface**

- In the process of the bats' bite and the Bomrr clan interaction, there has been no major disease outbreak among the Bomrr clan.
- Thus 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.
- 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.

### **Cultural diversity helps:**

- The NCBS is 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.

### **The precautions:**

- As the bats carry many viruses scientist 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 as 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'.

### **Restore the balance:**

- 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.
- 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.

### **Conclusion:**

- 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.