



STUDY ON ECO-CHARACTERISTICS OF BATS IN ECOLOGICAL BALANCES

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ABSTRACT

Bats pollinate and disperse the seeds of hundreds of plant species. According to a Thai study, pest bio-control given by just one species of bat averted the loss of 2900 tons of rice every year (or) a \$1.2 million savings, or 26,200 meals per year. Bat droppings (guano) are widely employed as a fertilizer for agricultural crops as they include high amounts of nitrogen and phosphorus. Bats are the second most diverse and abundant order of mammals with great physiological and ecological diversity. They play important ecological roles as prey and predator, arthropod suppression, seed dispersal, pollination, material and nutrient distribution, and recycle. They have great advantages and disadvantages in economic terms. The economic benefits obtained from bats include biological pest control, plant pollination, seed dispersal, guano mining, bat meat and medicine, aesthetic and bat watching tourism, and education and research. Even though bats are among gentle animals providing many positive ecological and economic benefits, few species have negative effects. They cause damage on human, livestock, agricultural crops, building, and infrastructure. They also cause airplane strikes, disease transmission and contamination, and bite humans during self-defense. Bat populations appear to be declining presumably in response to human induced environmental stresses like habitat destruction and fragmentation, disturbance to caves, depletion of food resources, overhunting for bat meat and persecution, increased use of pesticides, infectious disease and wind energy turbine. As bats are among the most overlooked species in spite of their economical and ecological importance, their conservation is mandatory.

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INTRODUCTION:

Imagine dusk in our rural heartland. Groups of people returning to their homes from farms, factories and forests, and at the same time, hordes of winged mammals called bats (nearly 128 species in India, over 1200 species world wide) emerge from their roots in trees, caves, rock ledges, temples, buildings. Bats and humans have cohabited since the time immemorial. Throughout the night, these bats devour insects, fields, forest grasslands and around our homes, including agricultural pests and disease causing mosquitos. Some bats sips nectar, pollinate flowers, eat fruits and spread the seeds of many important trees species

including wild varieties of bananas, guava, cashew, mango, figs and other fruits. A study in Thailand has shown that pest biocontrol provided by just one species of bat prevented the loss of 2900 tons of rice per year, savings of \$1.2 million and meals for 26,200 people annually. Bat dropping (guano) mined from caves are wildly used as a fertilizer for agricultural crops as they have high concentration of nitrogen and phosphorus. Unfortunately, despite those 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 SARS, COV₂ virus



that caused covid-19 originated in bats, they are growing fears of the disease transmission from bats. A significant and unique feature of bats is that they are known or suspected to be the natural reservoir for many novel and recently emerged pathogenic virus such as Nipah, ebola and the corona virus 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. So, 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 virus in infected humans, ensures they do not over react to viral infections and protect them from multiple chronic age related diseases. In other words, bats are 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 can carry because they could spill over to us. But such spill overs are responsible for the transmission of pathogens from their natural host or reservoirs to novel hosts such as humans and are unusual and rare events, and tend to occur when there is contact between humans and natural hosts. Over the last several hundred years, humans have significantly modified the landscapes around them. Cutting of forests, clearing of land for agriculture development resulting in disturbances to bat and forcing them to change their homes activities such as mining destroy natural cave system 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 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. The study of how bats and human can co-exist in certain areas 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 virus shed by bats throughout the year or only seasonally?

STUDY OF HUMAN –BAT INTERFACE:

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. Bomrr clan in Nagaland for example, has traditionally celebrated the annual bat harvest for many years. They gather at place called minito smoke, a cave full of bats and as bats exist there, they 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. To understand how and why the Bomrr are immune to the virus in the bats, National Centre for Biological Science (NCBS – TIFR), an aided center and Department of Atomic Energy (DAE) are carrying out sero-ecological studies on this human bat interface. There are exploring microbial diversity associated with the bats, and also serology (Antibody response known viral families) to investigate which part of this diversity is potentially pathogenic. So far, they have found genetic pre-valence /detection (between 3%-10% of bats) of several bacterial and viral families and gathered evidence that both bats and humans have shared antibody response to some viral families, indicative of the spillover.

The NCBS is also in the process of sequencing whole genomes of bat virus. This study could help build a bank of virus genomes to be prepared for any possible future outbreaks. Local practices and traditions could serve as



a guide for us to understand how we should minimize risk of infections, disease spillover from bats in future. The rich biodiversity and cultural diversity in India serves as an excellent and unique place for such studies.

FEW PRECAUTIONS: 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 minimize over 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 the 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 a greater contact with, and increasing stressing out animals that many harbour emerging infections.

CONCLUSION:

In India, many people are dependent on the ecosystem they live in, and various services those ecosystems provide, for example, water, clean air, 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, witness increased incidences of other diseases such as those transmitted by mosquitoes and one without malaria, too across North America. Bats play a vital role in both natural and managed ecosystems. Bats are key predators of night flying insects that cost American farmers and foresters a billion dollars annually. They are pollinators of

several keystone desert plants in the American South West Mexico.

Bats are vital components of the natural world, providing key ecosystem services (the advantages that humans derive from healthy ecosystems). We are only now beginning to comprehend the impact of population decreases and extinctions because ecosystem services have received little attention until recently. Bats are among the most misunderstood and underappreciated species in the world. Bats are amazing and immensely fascinating creatures for wildlife ecologists. Yet, people's views about bats are generally negative, possibly because bats are so mysterious. Unfortunately, bat-related concerns and superstitions endanger conservation, biodiversity, and the entire ecosystem. Bats are the most diversified and widely distributed group of living mammals. They provide a variety of ecological services as well as biological pest crop management agents. Their abundance may reflect changes in arthropod prey species populations. Furthermore, bats have tremendous potential as bio indicators, demonstrating quantitative responses to climate change and habitat loss and causing large-scale consequences on the biological systems.

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