

THE BATS OF INDIA

The key to protecting India's bats is learning more about their ecology and behavior; new studies are only beginning to reveal how important bats are to India's diverse ecosystems . .

Mistry, Shahroukh

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BY SHAHROUKH MISTRY

MY FIRST ENCOUNTER with bats occurred when I was in high school. I grew up in a small city in western India, and though I was interested in natural history at the time, bats just were not my cup of tea. My real inter-est was bird-watching. I would spend hours gazing through my binoculars, looking for that additional species to put on my checklist. Birds in India are so numerous and so common that I could often sit in my room and watch them in the trees and shrubs outside.

One lazy summer afternoon I sat near the window, gazing at a group of babblers playing on the neem tree outside when, all of a sudden, a volley of shrill calls emanated from behind the window. A five-striped squirrel (about the size of the common American chipmunk) jumped out and dashed away. I went to get a closer look at the source of all the noise. There, behind the window, where it swung open and was pressed against the outside of the building, were a couple of insectivorous bats vociferously declaring that niche to be their home. The squirrel had tried to oust them so that it could build its own nest there, and though it tried again on many occasions, it never succeeded in driving the bats away.

It was to be many more years before I started studying bats, but I remember that occasion quite well, for to a certain extent, it signifies what I believe to be one of the salient features of bats in India: their need to share resources. The word *India*, almost by definition, conjures up images of crowded, bustling cities, cows roaming the streets, snake charmers, elephants, and people□ lots and lots of people. While snake charmers and elephants may not occur on every street corner, you most certainly will find many people. And it is within the midst of all these hundreds of millions of people that bats, and all other creatures, must find their home and survive.

India is renowned for its majestic wildlife, and studies of its natural history abound, but the bats of India are hardly ever mentioned, and very little is known about them. With at least 109 species, India has an incredible diversity of bats. This includes one of the largest in the world, the Indian flying fox (*Pteropus giganteus*); one of the most colorful, the orange and black painted bat (*Kerivoula picta*); and one of the rarest, Salim Alis fruit bat (*Latidens salimalii*). The habits of India's bats are as diverse as the habitats they live in. From high in the Himalayas, to the deserts of the Northwest, to the tropical forests of the East and South, there are bats that feed on fruit, nectar, insects, frogs, and even other bats.

One of the key features of the Indian subcontinent that allows for so many species to coexist *is* the diversity of habitats. Most of the country consists of low plains with a few hills. Although much of it is used for agriculture and is heavily populated, it still has large tracts of deciduous forests. In the Northeast and the West are large mountain ranges that provide lush tropical and high-altitude forests. A large part of this area remains relatively untouched, and it is here that many of the uncommon bat species are found. India also has a vast coastline, numerous offshore islands, and a large desert in the Northwest.

Most of the subcontinent experiences a strong monsoon season from June to September but is dry throughout the rest of the year. This strong seasonality results in annual peaks in insect and fruit abundance that the bats track and adapt to through local migrations. The southern and northeastern mountains often experience rain throughout the year. Because of the rainfall, these regions remain lush and green, and food is always available.

It is the Northeast that provides important clues to understanding bat distributions in India. The majority of Indian bats (over 70 species) show taxonomic affinity to bats of the southeast Asian region (i.e., Burma, Thailand, Malaysia). Their ranges often extend from these countries through the northeastern states and across the Indian subcontinent. India thus represents the western limit of almost all these species, and the northeastern states form a narrow bottleneck connecting the two major parts of the range. These states therefore constitute an important link in preserving the continuity of bat distributions in this part of the world. India's remaining bats have their origins in western Asia and are primarily arid-climate species such as the tomb bats (*Taphozous* sp.) and mouse-tailed bats (*Rhinopoma* sp.).

India has 12 species of flying foxes. Only three, the Indian flying fox, the fulvous fruit bat (*Rousettus leschenaulti*), and the short-nosed fruit bat (*Cynopterus sphinx*) are common throughout the country. The remaining species are rare and are found only in the mountains of southern and northeastern India or on the Andaman and Nicobar islands near Thailand. Two of them specialize on nectar and are both long-tongued fruit bats (*Eonycteris spelaea* and *Macroglossus sobrinus*). The other flying foxes are also known to visit flowers for nectar and pollen, but they feed primarily on fruits.

MUCH OF THE WORK on Indian bats during the past few decades has been restricted to studying either their distribution or their physiology. Until recently, very little had been done to document their ecological roles. My own research has centered on understanding the role of fruit bats as seed-dispersal agents in Indian forests and how such dispersal aids in forest growth and regeneration patterns. The tropical forests in India are dry and deciduous, quite different from the moist rain forests of the Neotropics.

One of the things I was curious about was whether such differences would create unique dispersal patterns.

In the Neotropics, fruit bats are known to be highly effective in the regrowth of disturbed and deforested areas. Many of the plant species that they disperse are the small-seeded pioneer plants that are first to arrive in areas of disturbance. But in my forest sites in India, I found just the opposite: fruit bats are more often responsible for dispersal of old growth and canopy species. In India's deciduous forests, colonization of disturbed habitats is often through abiotic modes, such as wind and water. The role of fruit bats as seed-dispersers may vary with the type of forest that they inhabit, but in each they play a vital role in the preservation of forest trees.

Part of the explanation of the difference between seed-dispersal patterns in Old and New World species is that fruit bats in India are much larger than their counterparts in the Neotropics. The smaller ones average around 70 grams (about two and a half ounces), while the largest flying foxes exceed one kilogram (a little over two pounds). The large size of these bats allows them to feed on a much wider range of flowers and fruits, from small eucalyptus flowers to large mangoes and guavas. Thus, their seed dispersal activity is not limited to plants with smaller fruits and often includes large trees from old-growth forests.

A recent survey of their feeding habits indicates that the three common fruit bats alone aid in the pollination and seed dispersal of more than 114 species of plants. Many of these are of great economic, ecological, medicinal, and even religious importance. Essential wild varieties of bananas, guavas, and other fruits are dependent on bats to maintain natural populations. Fig trees are such favorites of fruit bats that one can often see a carpet of "spats," or chewed fruits, on the ground near the trees. Such ecologically important trees are considered keystone species because numerous animals utilize them as a resource.

Less is known about the insectivorous bats of India. In spite of the fact that there are almost a hundred species, only distributional information on a few species is available. Much of rural India is covered by fields that provide

numerous benefits for farmers by consuming insects, many of which are crop pests. These bats have had to adapt to the presence of humans; many live in close proximity to people, often using the eaves and crevices of huts and buildings for roosts. (Within a year of my parents' moving into their new apartment building, a colony of tomb bats had found a place to roost there.) In villages and rural areas, insect-eating bats are invariably found flitting around cow sheds and fields.

At one of my study sites, insectivorous bats were so numerous that almost every time I went to check on my nets there would be a new hole where a sharp-toothed bat had chewed its way through. One night, as I was doing my rounds, I illuminated a net from a distance to see a fulvous fruit bat in the net. I walked closer and reached up to disentangle the bat and start collecting data. Then I realized that it was not a fruit bat at all, but was in fact a huge leaf-nosed bat (*Hipposideros armiger*) that weighed over 100 grams (nearly a quarter of a pound).

While many of these species are solitary or roost in small groups, there are some, such as the bent-winged bat (*Miniopterus schreibersi*), that form large maternity colonies in caves very similar to those of the New World Mexican free-tailed bats (*Tadarida brasiliensis*).

Insectivorous bats also inhabit many of the ancient temples, caves, and ruins that can be found throughout the subcontinent.

DESPITE THE IMPORTANCE of India's bats to diverse ecosystems, they receive no official protection. All 12 fruit bats have been classified as vermin under India's Wildlife Protection Act and thus can be actively persecuted. No monitoring of their population levels has been done in the past and, therefore, little is known about their actual status. Yet without this information□ and without thorough documentation of the ecological values of these bats□ it is difficult to convince the government to protect them.

A recent survey that I conducted on flying fox roosts suggests that these animals are declining dramatically. Almost half the roosts surveyed had decreasing populations. Historically, flying foxes lived in large colonies, often in the thousands; now the average size is 500 or fewer. The average age of the colonies-also an indicator of roost disturbance-is quite low, with the majority of colonies less than 15 years old. Over 70 percent of the roosts faced some kind of threat, with nearly 40 percent affected by tree cutting and other human disturbances. Most of the smaller fruit bats roost in colonies of fewer than 10 individuals. The largest flying foxes, however, roost in large colonies in trees and are therefore vulnerable to destruction by humans.

As elsewhere in the Old World tropics, fruit bats and farmers in India sometimes come into conflict. In spite of the fact that the bats feed primarily on overripe fruits, they are often perceived by farmers as pests simply because they visit the orchards. And because bats are not protected by the government, their roosts are often disturbed and the bats destroyed.

In this land of numerous religions and even more gods, where else but to the gods could the bats turn for help? Fig trees, which also have considerable religious significance, are the most common roost trees for flying foxes. They are often planted near temples and offer a protected sanctuary for flying foxes. Insectivorous bats that roost in old temples and ruins are not always so fortunate; these bats are often killed or forcibly removed, causing great concern among biologists. Insect-eating bats may also be in trouble because of the heavy use of pesticides by the agricultural industry, but how this practice has affected the biology of the bats is unknown.

Recently the Chiropterological Society of India was formed to aid bat biologists in India by providing a means to coordinate and communicate their research ideas and to address the need for bat conservation and research. Certainly we need to know a great deal more about Indian bats and about their status. It is hoped that the formation of this organization will be a starting point for a forum to address future questions relating to bats and their conservation. The government of India has also recently shown signs of affording greater protection for fruit bats and is considering removing them from the vermin category of India's Wildlife Protection Act. But even if these measures become law, there is still the question of enforcement and the willingness of the authorities to educate

people about the benefits of bats. Ultimately, it will take substantial grassroots efforts to change public opinion about bats.

Biologists studying ecology and conservation in developing countries often end up asking themselves if, with the relentless pressures of human civilization, there is much hope for the survival of natural habitats and their inhabitants. Bats in India face the grim reality that their habitats and resources are in constant decline. Resources that once exclusively belonged to one species now have to be shared. And it is the willingness of humans to share our limited environment that will eventually determine if other species can coexist with us.

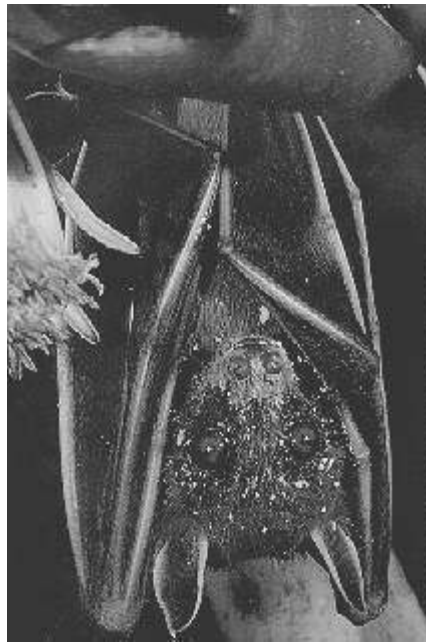
In my hometown in India, there is a small grove of trees where, just as during my birding days over ten years ago, flying foxes still arrive every day at dawn to roost on branches that only a few minutes before had been the night roost of hundreds of egrets and ibis. Perhaps we too will someday learn to share resources and to let these wonderful creatures live within our midst.

(Bio)

Shahrourkh Mistry recently received a PhD in biology from the University of New Mexico. He has been studying the ecology of India's bats for the past five years.



The Indian flying fox is one of India's 12 species of flying foxes. Even though they are still relatively common throughout the country, they are declining. Biologists are only beginning to understand how their role as seed dispersers and pollinators benefits diverse ecosystems.



Above: Short-nosed fruit bats are important pollinators in India. Together with two other common flying foxes, they are responsible for the pollination or seed dispersal of some 114 plants.



Below: India's mountainous and rainy Northeast provides lush tropical habitat for flying foxes year-round. This area, which was one of the author's study sites, is also a key link in preserving the distribution of bats in this part of the world.



Even less is known about India's insectivorous bats. Leaf-nosed bats like this can often be seen flying over agricultural fields hunting for insects.



The author's studies indicate that India's flying foxes are declining. Bats like this fulvous fruit bat are often blamed for orchard damage, but in reality they feed on fruit that is too ripe to be commercially marketable. Because bats are not protected in India they are often indiscriminately killed.

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