



Bat World Sanctuary

Bats

Separating Fact from Fiction

Presenter's Guide

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Bats: Separating Fact from Fiction

Introduction

This presenter's guide and the companion PowerPoint presentation are appropriate for use by teachers and civic groups, as well as bat rehabilitators, who wish to give educational presentations about bats to a mixed audience. The content is appropriate for children in grade 3 and up.

Bats, the only members of the mammalian order *Chiroptera*, comprise approximately 22.5% of all mammal species on earth – there are an estimated 1,450 species of bats in existence today (2020), and 6,450 mammal species in total. That 6,450 is every mammal species from aardvarks to zebras, including humans! New species of bats are identified quite often – advances in DNA technology, combined with mapping of the complete bat genome, have resulted in a number of previously-identified species being split based on genetic variances.

Within the order *Chiroptera*, there exist two subgroups – megabats and microbats. The megabats are the flying foxes, and as the name suggests, these are the large fruit bats that live in Old World habitats of the southern/eastern hemisphere – Africa, Australia, the Middle East, southeast Asia, and island chains such as Indonesia and the Asian/South Pacific Islands. Conversely, the microbats are tiny, generally consume insects, and occupy habitats on all of the continents and many of the major island chains.

Why Bats?

Of the estimated 1,450 existing bat species, roughly 70% are insect-eating microbats. Another 29% of the total number of species are fruit and nectar feeders – both megabats and microbats fall into this group. The final one percent is made up of carnivorous bats, which consume small fish, lizards, and occasionally other bats, and the three species of vampire bats.

Bats are the only mammals capable of true, powered flight. They roost upside down in trees, caves, rocky outcroppings, and, sometimes, human-built structures such as houses, barns, and sheds. Until recently, biologists were mystified by the fact that bats roost upside down. Physiologically, roosting upside down makes sense for bats. They are lightweight (the largest bats rarely weigh more than 2.5 pounds as adults) and have a very small blood volume compared to humans, so they don't get the same headache and dizziness that we do when inverted. They have specialized tendons in their toes that enable them to grip the roosting surface securely while they sleep, which keeps them out of reach of predators. And when they are ready to leave, they just spread their wings and let go with their toes – a much more energy-efficient method than flapping frantically or running to get airborne.

Bats are responsible for pollinating, propagating through seed dispersal, or protecting important crops such as corn, cotton, bananas, mangos, avocados, coffee, and chocolate. Through their feeding activities, they contribute to the production of over 450 commercial products that we use every day – such commonplace items as soap, shampoo and conditioner, chewing gum, twine, perfumes and cosmetics, and rubber for the tires on our cars and bicycles and the soles of our shoes. Over 90% of the prepared, packaged foods we purchase in grocery stores contains some form of corn. Corn is also used in livestock and small animal feeds, and is the source of the ethanol that is added to gasoline.

Byproducts of the processes for separating various parts of the corn plant are used to make fertilizers and insecticides, absorbent materials for oil and hazardous waste, biodegradable plastics, and penicillin. Mexican freetail bats are essential to the production of corn, because they feed on the corn earworm moth, one of the most destructive crop pests on the planet. A university research study estimates that bats contribute over \$20 billion per year to the American agricultural industry by preventing crop pest depredation.

Old Wives' Tales

There are many myths and misconceptions about bats, and it seems that new exaggerated claims of bats' propensity for evil emerge every year.

Bats in Global Cultures

Historically, bats have been perceived as harbingers of death or disaster in some cultures. There is a specific prohibition against eating bats in Deuteronomy 14:18, the Hebrews were prohibited from eating bats as "unclean birds"; however, in other cultures bats are consumed as a tasty snack or even as a staple source of bush meat. Mesoamerican cultures worshipped a bat deity as a god of the underworld, while Native American tribal lore depicts the bat as representing rebirth or starting over. Bats are described as turncoats in a battle between the birds of the air and the animals of the land, ultimately abandoning both sides – which explains why they roost in caves and come out at night.

Vampire Bats

The three species of vampire bat (the common, hairy-legged, and white-winged vampire bats) have perhaps suffered more than any other bat species when it comes to myths, misconceptions, and negative portrayals. They are accused of willfully biting humans and turning them into immortal evildoers in eastern Europe, and are held accountable for livestock and human deaths throughout Central and South America. They are portrayed as huge, red-eyed flying monsters with dripping fangs. In reality, they are small, with most weighing less than 1.5 ounces as adults – about the same as a common house mouse. They do not exist at all in any part of the world except Central and South America; the common vampire bat is the only species that feeds primarily on mammal blood (mostly cattle, pigs, goats and primates), while the other two generally prefer to feed on birds.

Bats and Rabies

A common misconception is the belief that all bats 'carry' rabies. In fact, less than ½ of one percent of bats is infected with rabies at any given time. Rabies is transmitted through a bite or scratch from an infected animal, allowing saliva or nerve tissue/fluids to come into contact with blood or mucous membranes. Simply being near a bat, touching an object that was touched by a bat, or coming into contact with bat urine, feces, blood, or fur does not constitute exposure to rabies. (*more about bats and rabies later*)

Bats are Flying Mice

Bats are no more closely related to rats and mice than humans are. Theories about relationships between bats and other species abound, and have changed over time. The current line of scientific thought is that bats may be peripherally related to species such as whales and pangolins, but so far a definitive answer eludes us. Bats belong to their own order, *Chiroptera*, which means "hand-wing", and

only the +/- 1,450 species of bats belong to that order. Fossil evidence shows that bats have existed, essentially unchanged, for over 50 million years.

Bats are Blind

While insectivorous bats use echolocation to find their prey, they are by no means blind. In fact, most bats see as well as humans do. Fruit bats see in color, which enables them to identify fruits that are too ripe for harvesting. By consuming these over-ripe fruits, the fruit bats protect crops from fruit fly infestations. Bats are nocturnal, and their eyesight is adapted to low light situations, similar to cats.

Bats Get Tangled in Hair

A perennial nightmare for individuals who prefer “big” hair is the fear that a bat would fly in, get caught, and build a nest. Aside from the fact that bats don’t build nests, there are a few other points to be made.

- As discussed previously, insectivorous bats use echolocation to hunt. They also use echolocation to avoid obstacles such as elaborate hairstyles
- Bats are such agile fliers that engineers and scientists are attempting to build drones, helicopters and airplanes that fly the way bats do
- Scientists modeled Doppler® radar on bat echolocation
- If a bat is flying near your head, it isn’t interested in your hair. It’s hunting the swarm of tiny flying insects (gnats, mosquitoes, and ‘no-seeums’ that are hovering around your head

Echolocation

Put simply, echolocation is the process of using hypersonic signals (echoes) to “see” objects that are too small or too far away to be seen with the eyes. Bats emit a series of signals with the larynx, increasing the frequency with which they emit these signals as they get closer to their prey. In order to eliminate confusion, they have the ability to close their ears to the sounds they are emitting, opening them up again to receive the return signal, as often as 10 times per second.

A handful of humans have developed the ability to echolocate. Most notable was Ben Underwood, who taught himself to echolocate after he lost both his eyes to cancer at the age of three. He participated in a number of research studies on echolocation before his untimely death in 2009. Perhaps the most interesting finding is that echolocation signals are processed by the visual cortex of the brain, painting an image that can be interpreted much the same way that a sighted individual processes what they see with their eyes.

Bats and COVID-19

There has been a lot of hysteria globally about bats and their role in the COVID-19 pandemic of 2020-2021. People have panicked, afraid to be anywhere near bats for fear they will be infected with SARS-CoV2, the causative virus for COVID-19. In Peru, citizens destroyed several bat colonies, despite the fact that there is no evidence that South American bat species are a reservoir for the virus. In North America, research involving bats, and bat rehabilitation, were suspended out of fear that bats might either be infected and contract COVID-19 or become new reservoirs for SARS-CoV2. Thus far, there is no evidence substantiating this risk. There is nothing to suggest or support the idea that the virus can be transmitted directly from bats to humans or from humans to bats.

The prevailing theory, as of late December 2020, is that the virus originated with a species of horseshoe bat that is commonly found in China. However, genetic studies suggest that the virus mutated between 40 and 70 years ago and adapted itself to a new reservoir host. The presumed “ground zero” point of transmission to the first human patient was a live market (aka “wet market”) in Wuhan, China. These markets are, in some respects, similar to the farmers’ markets of the U.S, but with the addition of live domestic, exotic, and wild animals which are housed in close proximity to one another. Despite their best efforts, researchers have as yet been unable to identify what species may have become the new reservoir host, with or without developing illness, after exposure to urine, feces, or other bodily fluids or tissues from the original host species. Over time, the virus mutated again within the new intermediate reservoir, ultimately becoming able to infect humans. With no natural immunity to the virus, a global pandemic was born.

Bats and Rabies

As previously stated, less than ½ of one percent of bats is likely to be infected with rabies. Globally, approximately 55,000 people die of rabies each year, with over 99% of cases involving unvaccinated domestic or stray dogs and cats. In the U.S., on average, two or three people die of rabies each year, and the majority of those are also the result of contact with rabid dogs or cats in other countries. Rarely, an encounter with a rabid wild animal goes untreated, and the patient demonstrates symptoms of rabies prior to their death.

- It is not possible to contract rabies from a piece of fruit that was licked or bitten by a bat
- It is not possible to contract rabies because a bat flew near you
- It is not possible to contract rabies by touching an object that may have been touched by a bat
- It is not possible to contract rabies through contact with bat urine, guano, blood, or fur
- It is not possible to contract rabies from a water source where a bat took a drink

Disappointing Truths

- ‘Bat Boy’ is not real
- Bats do not lay eggs
- The real “Count Dracula” did not turn into a bat
- Bats are not harbingers of doom or death
- Bat guano will not make you crazy
- Mascara and eyeliner are not made from bat guano

What Do You Know About Bats Now?

*This is an opportunity to explore additional myths/misconceptions or answer questions from the audience. We recommend reading other resource materials, including www.batworld.org, [*The Essential Bat*](#) (Rugroden and Lollar, Bat World Sanctuary) and [*America’s Neighborhood Bats*](#) (Tuttle) prior to presenting this program. If there are questions you are unable to answer, write them down along with your guest’s email address, and contact Bat World. You can contact your guest and provide an answer.*