Bats

Flying Fox Fruit Bat
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Lake Shelbyville Eco-Meet

2024 Junior Varsity

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BACKGROUND AND CHARACTERISTICS

What do you think of when you hear the word *bats*? Do you think of creepy, blind, blood-sucking animals that fly into your hair? Or do you think of cute, winged mammals that use a type of sonar to navigate and locate insects? Many of the things that people believe about bats are untrue. Because bats are shy and fly at night, they are often seen as mysterious. It is said that people fear the most what they understand the least. This lack of understanding, along with deliberate destruction of bats and their habitats, has caused a worldwide decline in bat populations.

Bats are mammals—they are warm-blooded and have fur. In addition, their young are born alive and are fed milk from their mothers. They also have rather complex brains.

Approximately 1,000 species of bats have been identified in the world. Bats can be found on every continent except Antarctica. However, most bats live in the tropics. Of the 1,000 species, approximately 42 live in North America. Illinois is home to 12 species of bats.

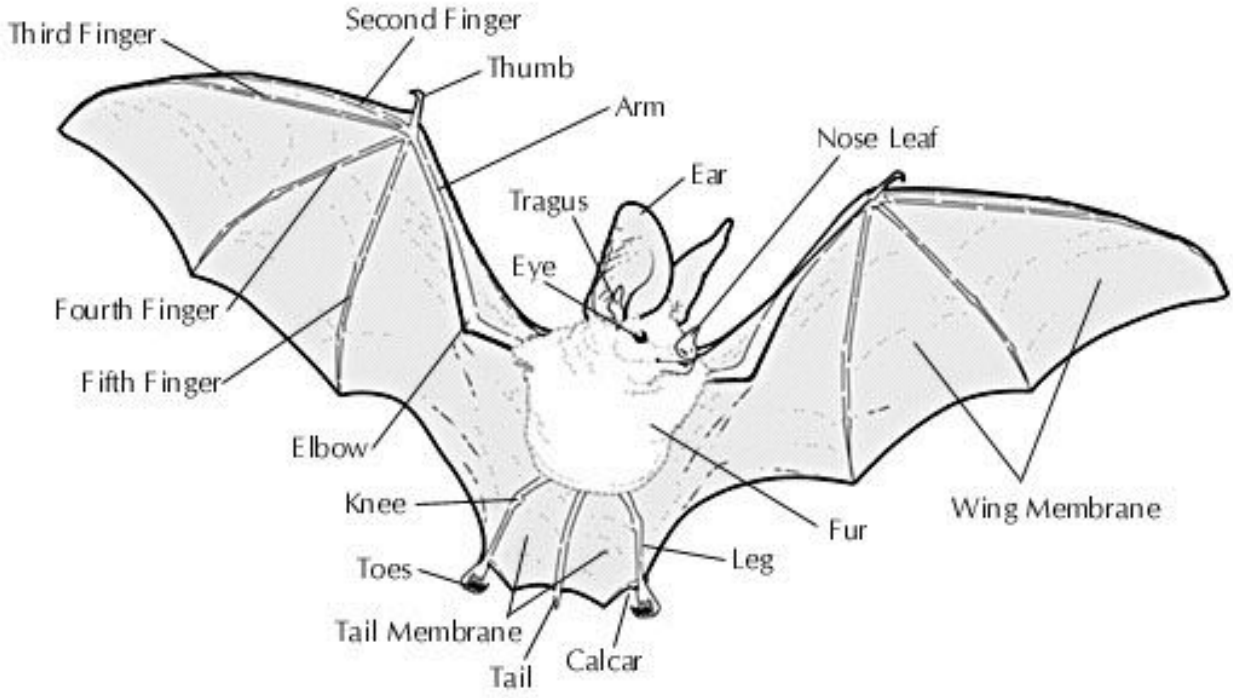
Bats range in size. The largest bats in the world are the Flying Foxes of Australia and Southeast Asia. These fruit- and nectar-eating bats have furry, fox-like faces and 6-foot wingspans. The smallest bat, and the smallest mammal, in the world is the bumblebee-sized Kitti's Hog-Nosed Bat from Thailand. It weighs less than a dime, and its body is slightly larger than a jellybean. Most Illinois bats are 2 to 3 inches long and weigh ¼ to ½ of an ounce.

Bats are the only mammals that can actually fly. Their forearm and hand evolved into a "hand-wing," which is the meaning of the order's name, Chiroptera. Their wings are made of thin sheets of muscle and elastic fibers covered by skin. The bones of the arm, second to fifth fingers, and back leg support the wing. The first finger, or thumb, is like a claw. It is used for crawling, grooming, holding and catching food, and fighting.

Most bats, including all Illinois bats, are nocturnal, meaning they are active at night. They rest during the day by hanging upside down by their toes. The weight of their bodies causes their toes to automatically lock into place. Bats even give birth while hanging upside down.

Contrary to popular belief, bats are not blind. Bats have good eyesight. In fact, bats can see better than humans in the dark. Despite their good eyesight, insect-eating bats use a type of sonar called echolocation to navigate and locate prey. Fruit-eating bats do not use echolocation. Instead, they rely entirely on their vision when flying in search of food.

BAT ANATOMY



FEEDING AND LOCATING PREY

Of the 1,000 species of bats in the world, 70% are insectivorous. All Illinois bats are insectivores. Prey for Illinois bats includes mosquitoes, mayflies, beetles, and moths. They forage above streams and ponds (or even swimming pools), along forest edges, and around street lamps and yard lights. They are active at night, hunting for food. They do not use their eyes to find their food. Instead, they use echolocation.

A bat's sonar system works in the following manner:

1. As a bat flies, it sends out high-pitched squeaks through its mouth and nose that the human ear cannot detect. The squeaks are sent out at a rate of 10 to 20 per second and travel through the air as sound waves.
2. When a sound wave hits an object in the bat's path, part of the wave bounces back to the bat. This is the echo that the bat picks up in its highly sensitive ears.
3. The bat's brain quickly checks the tone and loudness of the echoes and comes up with a great deal of information. Within milliseconds, the bat knows these facts: the location of the object, the speed and direction in which the object is moving, and the type, size, and nature of the object.
4. If the object is an insect, the bat increases the rate of its squeaks. As the bat closes in on the insect, it may be sending out as many as 200 squeaks per second.

Bat echolocation systems are very accurate, allowing them to detect insects as small as gnats. They can also detect very thin wires and objects as fine as a human hair. Bats can distinguish one type of insect from another. They can determine if it is a fat, hairy caterpillar or a hard-shelled beetle. Bats can echolocate tree branches, buildings, automobiles, people, and other large objects from up to 50 feet away.

Some moths can hear the high-pitched squeaks that are put out by bats and therefore have a better chance of escaping. Several moths can even create sounds in the same high-pitched frequency that is used by bats. If they hear a bat, they send out bursts of sound and "jam" that bat's navigation system.

Bats catch and swallow insects without a break in flight. Sometimes, the bat catches the insect in its mouth. Other times, the bat reaches out with its wing tip and snatches the insect from the air. The prey is then quickly placed in the bat's mouth. The bat's small razor-sharp teeth then finish it off.

It takes a lot of energy to fly around and catch insects. Therefore, it is necessary for bats to eat a lot. One bat eats up to 6,000 insects in one night. (A colony of 20 million Mexican free-tailed bats in central Texas eats up to half a million pounds of insects every night.)

There are many other bats living throughout the world that do not eat insects. Throughout the tropics, fruit-eating bats are very important in seed dispersal. Nectar eating bats are absolutely necessary for the pollination of countless trees and shrubs. Forty percent of tree species depend on bats for seed dispersal or pollination. On the savannahs of East Africa, the giant baobab is known as the "Tree of Life," because so many other plants and animals depend on it for their survival. But, the tree itself is dependent on bats. Its showy white flowers (pictured) open only at night and are specially adapted to be pollinated by bats. Without bats, the baobab could die out, triggering a chain of extinctions. In the Sonoran Desert of the southwestern United States, long-nosed bats play a similar role in the lives of several cactus species. Bananas, avocados, dates, figs, peaches, mangos, guavas, cashews, cloves, and tequila are all products that depend on bats for pollination and, thus, their survival.

There are also bats that feed on blood. These are called vampire bats. There are no vampire bats in Illinois; they all live in tropical America. They do not feed on human blood. Instead, they feed on blood from large birds and mammals (pigs and cattle). Contrary to popular belief, they do not sink their teeth into a mammal's jugular vein. Instead, they scratch the skin open and lap up the blood with their tongue. A chemical in

their saliva prevents the blood from clotting. Vampire bats will feed on the blood for 20 to 30 minutes and then retreat to their roost. Their nightly meal consists of about 2 tablespoons of blood. The host animal usually does not wake up during the bats' feeding. Bats drink water by skimming along streams and ponds while in flight.

ROOSTING, HIBERNATION, AND MIGRATION

Bats use a variety of daytime roosting sites. Some roost in old buildings, caves, and abandoned mines. Others use trees, roosting inside cavities or underneath bark, or by hanging among the leaves. Females and their pups roost in either solitary family groups or large maternity colonies. Males roost singly or in small bachelor colonies.

As autumn approaches, bats are not able to find the food necessary to survive, so they migrate to hibernation sites (hibernacula), which are primarily caves or abandoned mines. In preparation for hibernation, bats accumulate large quantities of body fat, which allows them to survive winter in a torpid (inactive) state. Bats remain in hibernation for at least six months, but they arouse intermittently to drink moisture from cave walls and condensation droplets on their fur. They may even emerge and hunt for insects during warm spells. A bat's heart rate can be 1000 beats per minute during flight, but during hibernation, it drops to 5 beats per minute. Also, its body temperature drops from over 100 degrees Fahrenheit to 40 degrees Fahrenheit. Other bats migrate far enough south to remain active all winter. In the spring, bats return to their summer home where they will again feed at night and rest during the day. May 15th to August 15 th is considered to be the length of their stay during summer in Illinois, depending on whether they live in the northern or southern zone. A colony of Indiana bats in Cass County, Illinois, was documented to stay in its summertime roost until October 4th.

Little brown bats are the most common bats in our area. As with all bats, they mate in the fall but do not become pregnant until April. After a winter of hibernation, little brown bats begin their migration to summer roosting sites and may live in maternity colonies of 300 to 600 females. They give birth in June or July to one pup. The pup immediately uses its large thumbs to climb up to drink its mother's milk. The baby will not open its eyes for two days. At dusk, mothers leave their young behind in the roost and return between feedings to nurse their young. They are able to recognize their baby among several hundred others by its smell and individual chirping call. In about 3 weeks, the young bats are ready to fly. They will still nurse for one week while they learn how to hunt.

THE RABIES MISCONCEPTION

One of the most common misconceptions about bats is that they are all rabid or carry rabies. This statement is very untrue. It is estimated that less than one-half of one percent of all bats contract rabies. Cats, skunks, foxes, and raccoons are more likely to carry the disease. Over the last four decades, only 15 people in the United States and Canada have contracted rabies from bats. More people die annually from dog attacks, bee stings, or even being struck by lightning. Bats that are found on the ground are usually sick or injured and should be left alone, as any wild animal should. People are in danger when they try to foolishly pick up a bat, which may bite in self-defense.

BAT CONSERVATION

Bats are among the most gentle and necessary animals on this earth. They inhabit almost every habitat throughout the world, consuming insects, pollinating plants, and dispersing seeds. Bat research has helped in the design of navigational devices for the blind and has also aided in the development of vaccines and other medical advances. The droppings of bats (guano) are collected and used as fertilizer. For these reasons and more, bats are important to humans. However, bats suffer from habitat loss, pollution, poisoning, and predators, as many other animals do. Predators, such as hawks and owls, eat bats, but humans are by far their worst enemies. Destruction of rainforests and caves and the spraying of insecticides threaten the survival of many bat species. Fear and ignorance has resulted in the unwarranted destruction of bats for centuries.

In Illinois, three of the twelve species of bats are listed as threatened or endangered. The Northern Long-Eared Bat is listed as threatened, while the Gray Bat and the Indiana Bat are both listed as endangered. State and federal endangered species laws protect endangered bats. In addition, all bats are protected under the Illinois Wildlife Code. To protect individual species, it is necessary to protect their habitat. Protecting caves is a high priority. The Illinois Department of Conservation has posted signs at several caves restricting access when bats are present. In Illinois and elsewhere, Bat Conservation International has installed metal gates at the entrance of several important bat caves. They allow entrance by the bats that use the caves while restricting entry by humans. There is also an effort to prevent the sealing of abandoned mines used by bats. Likewise, the preservation of forested areas is important. If bats survive the many problems that they face, they can live to be 25 to 30 years old.

You can become involved by not disturbing bats during critical times when they are hibernating or rearing young, by educating others of the importance of bats, and by supporting efforts by government agencies and conservation organizations, such as Bat Conservation International, devoted to helping the preservation of bats.

People can also construct bat houses to provide additional roosting sites for bats. Bats roosting in crevices or those that are found in buildings and under bridges are likely tenants for these houses. A bat house is similar to a birdhouse, but the opening is in the bottom.

Some sources say that a purple martin can eat up to 1,000 mosquitoes a day. A single big brown bat can eat 3,000 to 7,000 mosquitoes each night. Since bats are such an important form of natural control for insect pests like mosquitoes, it is in our own best interest to perpetuate them. This is already being done in much of Europe where bats are totally protected and where people build bat houses much like we build martin houses.

The most likely occupants of bat houses in Illinois are the big brown bat and little brown bat. The most critical dimension is the ¾ inch width of the entry space. All inner surfaces must be roughened with a chisel or saw cuts to permit bats to climb on them with ease. Rough outer surfaces are also preferred.

Daytime temperatures in the bat house must be very hot—about 80°F to 90°F. One way to achieve this is to cover the bat house on top and extending a couple inches down the sides with two or more layers of tarpaper. The dark color of the tar paper absorbs heat from the sun and helps protect bats from the rain. The tar paper may be hard to attach and may weather badly. Another alternative would be to paint the bat house black so it would absorb heat from the sunlight.

Bat houses should be securely fastened to a tree trunk or the side of a building, roughly 12 to 15 feet above the ground. Preferably, they should be placed on the east side of the tree or building where they will receive the morning sun but will be shaded during the afternoon. Bats also seem to prefer sites that are protected from the wind.

The best habitat for bat houses is relatively near rivers, lakes, bogs, or marshes where insect populations are high. The closer bat houses are to such places, the greater probability they have of being used. Those located more than a half mile from these habitats have a low probability of being used.

Bat houses should be placed by early April, but it may take a year or two for bats to find the house. Once used, it does not need to be cleaned. Chances of occupancy are better if bats already live in nearby buildings.

Sometimes bats create severe problems for people by establishing huge colonies in the attics of homes. The best way to solve this problem is to hire a carpenter in the winter to exclude bats at the holes where they enter the house. Since most bats migrate, it is possible to exclude the bats while they are not present.

BATS OF ILLINOIS

Illinois bats are divided into two categories: tree bats and cave bats.

Tree Bats

Tree bats are more solitary than cave bats. They roost singly or in small family groups. They migrate in response to cold weather but seldom enter caves to hibernate. The fur of tree bats seems much more colorful than that of cave bats. In addition, there is fur on the membrane between the legs and tail.

HOARY BAT

Lasiurus cinereus

1.0 oz; 13-16 inch wingspan; hair tips are white giving a frosted (hoary) appearance These are the largest and most colorful bats in Illinois. They are strong, fast flyers that often migrate in large groups. Hoary Bats usually have two pups.

RED BAT

Lasiurus borealis

0.5 oz; 11-13 inch wingspan; bright red-orange to yellow-brown fur

Red Bats are very common and are found in nearly every county in Illinois during the summer. They are solitary and roost in low leaves of trees. Red Bats typically have one to five pups.

SILVER-HAIRED BAT

Lasionycteris noctivagans

Less than 0.5 oz; 11-13 inch wingspan; bear-like face and dark, silver-tipped fur on its back

These bats are found sporadically throughout Illinois in forested habitats. Silver-Haired Bats usually have two pups.

Cave Bats

Cave bats hibernate during winter in caves or abandoned mines. They are also social, often forming groups of thousands. Even during summer roosting, they tend to live in large groups called maternity colonies. These bats have no hair on the membrane between their legs and tail. In general, these bats are less colorful than the tree bats.

EVENING BAT
Nycticeius humeralis
0.4 oz; 10-11 inch wingspan; brown fur with black membranes and ears
These bats closely resemble Big Brown Bats, though they are much smaller. They typically have two pups.

LITTLE BROWN BAT

Myotis lucifugus

0.35 oz; 9-11 inch wingspan; fur ranges in color from pale tan to reddish or dark brown These are perhaps the most common bats in Illinois. They far outnumber any other hibernating bat in Illinois during winter, with groups consisting of tens of thousands. Little Brown Bats usually have one pup.

GRAY BAT

Myotis grisescens

0.3 oz; 11-13 inch wingspan; uniformly gray in color

Gray Bats are not common in Illinois; they are listed as endangered. Typically, they have one pup.

EASTERN PIPISTRELLE

Pipistrellus subflavus

0.2 oz; 8-10 inch wingspan; orangish-tan tipped black fur

These bats are the smallest bats in Illinois. They are rarely seen because of their small size. Eastern Pipistrelles usually have two pups.

INDIANA BAT

Myotis sodalis

0.25 oz; 9-11 inch wingspan; fur is dull black-charcoal at the base with cinnamon at the tips These bats may be confused with Little Brown Bats. However, they are much less common and rarely seen. Indiana Bats are listed as endangered, mainly due to the disturbance of their hibernation sites and the destruction of their summer habitat. They typically have one pup.

Comparison: Indiana Bat on the left. Little Brown Bat on the right.

SOUTHEASTERN BAT

Myotis austroriparius

0.25 oz; 9-11 inch wingspan; wooly, dark fur with orange tips; fur on under parts is more whitish; nose is pinker than other bats

The Southeastern Bat usually has twin pups.

NORTHERN LONG-EARED BAT

Myotis septentrionalis

0.2 oz; 9-11 inch wingspan; brownish fur; overall small in size with larger ears

The Northern Long-Eared Bat is listed as threatened. Typically, they only have one pup.

BIG BROWN BAT

Eptesicus fuscus

0.4-0.8 oz; 13-16 inch wingspan; second in size only to the Hoary Bat

Big Brown Bats are one of the most common bats in Illinois. They are frequently found in houses and are the most likely species to occur in urban areas. Usually, they have two pups.

RAFINESQUE'S BIG-EARED BAT

Corynorhinus rafinesquii

0.33 oz; 10-12 inch wingspan; graying fur with whitish under parts

Rafinesque's Big-Eared Bats are easily distinguished from other bats by large conspicuous ears. Distribution of this species is limited. Typically, they have only one pup.

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The Illinois Department of conservations and Dr. Merlin D. Tuttle of the Milwaukee Public Museum in Milwaukee, Wisconsin, provided the bat house information.

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