

# The Bat Pack

COMMUNITY AND EDUCATOR BAT RESOURCE



BAT BOOKS, ACTIVITIES  
AND LINKS



MULTIMEDIA KIT FOR,  
EDUCATORS



LESSONS, PROPS AND  
MORE...





# Going Batty...



## Bats in the Classroom and Beyond

### To kids, bats are one of the coolest creatures on earth.

They put the “bat” in *Batman* and “spooky” in halloween. They excite kid’s emotions and fill their imaginations. They are the only mammal that can fly, they use sonar to hunt and can catch and eat over 1000 insects in an hour. How cool is that? And best of all? Adults are scared of them. No wonder kids love bats.

### Why Teach about Bats?



Other than being an attention grabber, why are bats a good choice for the classroom and beyond?

“Bats are vital to healthy ecosystems and human economies worldwide. As primary predators of night-flying insects, bats consume enormous quantities of agricultural pests and reduce the need for chemical pesticides. Yet these wonderfully diverse and beneficial creatures are among the least studied and most misunderstood of animals. Bats are threatened worldwide, and their colonies and habitats are destroyed — both intentionally and inadvertently — because of myths, misinformation, and lack of scientific knowledge and understanding.”

In other words, bats need our help and we as educators can make a huge difference for this misunderstood animal and its relationship with humankind. Our survival may depend upon it.



### What is the Bat Pack?

The bat pack is a one-stop resource for educators to help develop and enhance lessons, PBLs and other programs about bats, their role in the ecosystem and their plight for survival.

### What's Inside?

- \* Picture and chapter books about bats
- \* Multimedia Discovery kit for educators
- \* “How to build a bat house” instructions
- \* Bat lesson props and models
- \* Inspiring links and activities about local bats and so much more...





# The Bat Pack:

## Batty Teaching Ideas and Resources



**A lot of what we know about bats is based on fiction rather than fact. The whole vampire thing has given bats a bad rap. However, this makes bats a very interesting topic for students and teachers. Why do we perceive some animals as “good” and others as “bad”?**

**Where do our perceptions of animals come from and do they/can they change? Before starting your bat projects/lessons have your students brainstorm all they know and feel about bats. Then, when the unit/projects are complete, brainstorm again. Did their perceptions change? Why/why not?**

With their special adaptations, their integral role in our ecosystem and their need of our help - Bats are the perfect subject for our “Big Ideas” and can help answer our “Big Questions.” Bats are an intriguing subject or platform for Project Based Learning. And, since bats are local wildlife, we can easily create lessons, activities and projects that are both place-based and authentic.

***BAT PBL EXAMPLE:** Students research local bat species/bat topics and a bat naturalists is invited to do a bat presentation for the class. Following their research, students create projects/plays/stories/posters etc. about their bat topics (dispelling the myths, white-nose syndrome, bats of Squamish, etc.).*

*Students write articles for the school newspaper/website/Facebook page or local newspaper about their bat topic. Students go to other classes/schools/seniors homes etc. to present their projects/plays/short films. The class works together to build a bat house for the school or local park (get permission from municipality or land owner before hand). Don't forget to contact the media!*

*Students have a “Batty” event to help raise money for bats and show off their projects and bat house. Students could also create interpretive sign/s for the bat house. Students research how to make educational signage, what materials to use, how big it should be, how much it will cost and then design and install the sign near the bat house.*

*Upkeep and monitoring of the bat house for scientific research could be completed every year, as could the projects and presentations to help keep the public and school informed.*





## What's In The Bat Pack? CHECKLIST:

\*Bat Pack Binder with Introduction, links and Handouts

\*Props:

\* Incased bat

\*Incased bat skeleton

\*Toy bat

## Books:

\* *Discover Bats! - Multimedia Education Kit About Bats* - Bat Conservation International, Inc.

\* *Discover Bats! - Quick Start Guide* (laminated)

\* *The Magic School Bus - The Truth About Bats*, by Joanna Cole (chapter book)

\* *It's a Good Thing There Are Bats*, Joanne Mattern

\* *Fly Guy Presents: Bats*, Ted Arnold

\* *Bats in Trouble*, Pamela McDowell (chapter book)

\* *Silverwing*, Kenneth Oppel (chapter book)

\* *Bats*, Gail Gibbons

\* *Bat Loves The Night*, Nicola Davies

\* *Shadows of Night - The Hidden World of the Little Brown Bat*, Barbara Bash

\* *Stellaluna*, Janell Cannon

\* *The Adventures of Echo The Bat*, Ginger Butcher

\* *Bats*, National Geographic Kids, Elizabeth Carney

\* *Bats of the World*, Little Golden Guide, Gary L Graham

**Pamphlets:** South Coast Bat Conservation Society - White Nose Syndrome, Gardening for Bats, Installing a Bat House, Steps to successfully build your bat house, BAT WATCH, Bats in Your Attic.



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**Although this “Bat Pack” is crammed** with resources and information there is still a lot more out there for you and your students to discover about bats. New things are being learned and discovered constantly. There are also many local bat organizations that could help. Your class could even be part of an authentic research or monitoring project. Please see the links below to help guide you deeper into your bat teaching and learning.

### Local Bat Links



Community Bat Programs of BC: <http://www.bcbats.ca/>

South Coast Bat Conservation Society: <https://scbats.org/>

Bats of British Columbia (E-Fauna BC): <http://ibis.geog.ubc.ca/biodiversity/efauna/BatsofBritishColumbia.html>

Bats of British Columbia: Web Portal to Information and Programs: <https://scbats.org/>

Habitat Acquisition Trust: <http://www.hat.bc.ca/index.php/>

[bats/about-our-program](#)

### International Bat Links



Bat Conservation International: <http://www.batcon.org/>

Bat World Sanctuary: <https://batworld.org/>

The Save Lucy Campaign: <http://savelucythebat.org/>

BatsLive: <https://batlive.pwnet.org/index.php>

### On-line Video Links



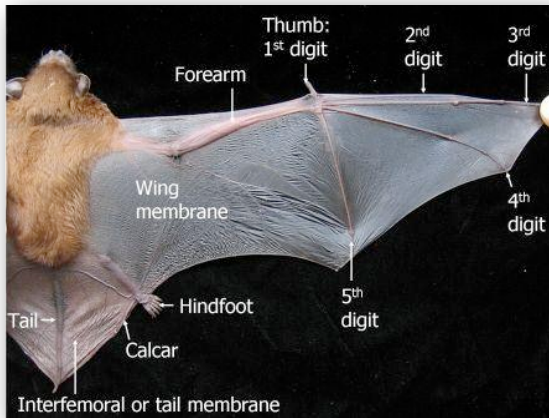
National Geographic: Hanging Out With Bats: <https://video.nationalgeographic.com/video/wd-ep9-bats>

Echolocation Music Video: [https://www.youtube.com/watch?v=bAvoz\\_ofoeo](https://www.youtube.com/watch?v=bAvoz_ofoeo)

Smithsonian Channel -What Echolocation Sounds Like, Slowed Down: <https://www.youtube.com/watch?v=qJloliWvB8>

All About Bats for Kids: <https://www.youtube.com/watch?v=9FVoTMOorXA>





## Other Teaching Links:

### Bat Lesson Plans, Activities, Projects and Field Trips:

**LESSONS/PROJECTS:** BatsLive Website <https://batslive.pwnet.org/>. Click on **Edubat**. Incredible activities and curriculum for all grades, elementary, middle and high school. Please check this site out! Authentic, Place-based, PBL's etc. Direct link to **Edubat**: <https://batslive.pwnet.org/edubat/curriculum.php> See example in Appendix.

**Inside Education:** Little Brown Bat Lessons: Student and teacher Guides: <http://www.insideeducation.ca/education/little-brown-bat/>

**The Teachers Guide:** Lesson plans and units about bats and the book Stلالuna: <http://www.theteachersguide.com/batslessonplans.htm>

**Education World:** Bats in the Classroom: Activities AcrossThe Curriculum: [https://www.educationworld.com/a\\_lesson/lesson/lesson031.shtml](https://www.educationworld.com/a_lesson/lesson/lesson031.shtml)

**FIELD TRIP:** Stanley Park Ecological Society: Beautiful Bats: <http://stanleyparkecology.ca/wp-content/uploads/downloads/2012/03/Beautiful-Bats-Teacher-Information-Package.pdf>

**SPEAKER/WORKSHOPS:** South Coast Bat Conservation Society: Bat House Building Workshops and education programs that come to you: <https://scbats.org/>



### Bat Research and Monitoring Opportunities for Students

**The South Coast Bat Conservation Society and the BC Community Bat Program** are seeking volunteers to help with Annual Bat Counts.

Roosts have been identified in Squamish and we are requesting volunteers to help monitor it.

Counts are easy, no special skills are needed, you can be any age, and you can relax in a deck chair while counting. Counts take 1 hr, but we ask volunteers to arrive 10-15 minutes prior to sunset to record basic information on weather conditions and the location.

Annual counts are scheduled to begin in June. Ideally, two counts are done between June 1 and 21 before pups are born, and two more between July 11 and August 5 when pups are flying. It is important to get the first count done, as sites can be shared between volunteers to ensure four counts are completed at the roost each summer.

Completing annual bat counts is even more crucial now than ever as North America bats are in peril. A deadly fungus, known as White-nosed syndrome (WNS), has killed more than 7 million bats since it was first introduced. Volunteers helping with the Annual Bat Counts provide bat biologists with very important scientific information needed to help with the conservation and management of bats in BC. By helping bats, we help the environment.

If you would like to help, phone 604-754-3220 or email [vancouver@bcbats.ca](mailto:vancouver@bcbats.ca) for more information.



[illegible]

# Bat True or False

1. Bats are blood thirsty villains. F

(Vampire bats weigh only two ounces, and while these Central and South American natives have been known to bite people, they primarily feed on cattle like a mosquito. "They lick about a spoon's worth of blood, and have an anticlotting enzyme in their saliva that helps keep the blood flowing. That enzyme is being used to develop anti-blood-clotting medication called ... wait for it... [draculin](#).)

2. Bats are Blind. F (Bats can see as well or better than humans – the bigger bats can see up to 3X better.)

3. The world's smallest bat weighs less than a penny. T (The Kittie's hog-nosed bat or "Bumblebee Bat" is the smallest bat and maybe smallest mammal in the world.)

4. Bats like to fly into your hair. F (They are usually trying to catch mosquitoes that are flying around your head. So they are helping you, not trying to hurt you or your new hairstyle.)

5. All BC bats eat insects. T (Fruit bats and Vampire bats are not found in BC.)

6. Bats feed their babies milk. T (Bats are mammals)

7. Bats fly with their hands. T (Show picture or model)

8. Bats are more closely related to you than mice. T (Bats are not rodents, they are of the order, Chiroptera)

10. A little brown bat can eat 120 mosquitoes in an hour. T

11. Some bats can live for over 30 years. T

12. Baby bats are called batlings. F (They are called pups.)



# **BATTY FACTS**

- \* Approximately a quarter of all mammals are bats. There are more than 1,300 species of bats in the world.
- \* The average bat will probably outlive your pet dog. The average lifespan of a bat varies, but for many species the average lifespan can be more than 20 years.
- \* For their size, bats are among the slowest reproducing mammals on Earth. Bats have only one pup a year, making them very vulnerable to declines in their populations.
- \* At birth, a bat pup weighs up to 25 per cent of its mother's body weight, which is like a woman giving birth to a 31 pound baby!
- \* Offspring typically are cared for in maternity colonies, where females congregate to bear and raise the young.
- \* Male bats do not help to raise the pups.
- \* All bats in Canada are insectivorous, eating moths, beetles, gnats, mosquitoes, midges and mayflies, among others.
- \* A single little brown bat can catch around 1,200 mosquito-sized insects in one hour.
- \* A nursing little brown bat mother can eat more than her body weight nightly (up to 4,500 insects).
- \* An anticoagulant found in vampire bat saliva, that is used to keep blood from clotting in bats, has been made into a medication to help prevent strokes in people.

# **BAT MYTHS**

**BATS ARE RODENTS.** Nope! Bats aren't even related to rodents. In fact, they're more closely related to primates and lemurs than they are to mice or rats. Bats are part of their own order of mammals called Chiroptera which means hand-wing.

**BATS ARE BLIND.** Bats can see very well, thank you very much. I think people most often get confused on this point because they know most bats are reliant on echolocation to make their way. Since most bats can't see in the dark, when they are most active, they rely on their built in sonar system to navigate at incredibly high speeds in absolute darkness!

**BATS WILL FLY INTO YOUR HAIR.** Where did this one come from, anyway? Bats don't have much interest in humans. So if a bat is swooping around your head, he's probably after the mosquito about to take a bite out of you.

**BATS SUCK BLOOD.** The only bats that do drink blood are vampire bats found in Mexico as well as Central and South America. They lick blood off of cows, chickens and other animals. Did you notice that I used the word lick? They don't bite! So please stop worrying about bats. The bats that live here in Canada eat insects (take that mosquitos!), and play an important role in pest control.

**BATS HAVE RABIES.** Okay, we should probably clear something up here. Bats can get rabies. But seeing that less than one per cent of bats actually contract rabies, the threat against humans is incredibly small. Of course, we're not encouraging you to head out to a cave and try to handle these animals — they're wild so they're likely to bite out of self-defense.



# BASIC FACTS ABOUT BATS

**Bats are the only mammals capable of true flight. With extremely elongated fingers and a wing membrane stretched between, the bat's wing anatomically resembles the human hand. Almost 1,000 bat species can be found worldwide. In fact, bats make up a quarter of all mammal species on earth!**

## DIET

70% of bats consume insects, sharing a large part of natural pest control. There are also fruit-eating bats; nectar-eating bats; carnivorous bats that prey on small mammals, birds, lizards and frogs; fish-eating bats, and perhaps most famously, the blood-sucking vampire bats of South America.

## POPULATION

While some bat populations number in the millions, others are dangerously low or in decline.

## RANGE

Bats can be found almost anywhere in the world except the polar regions and extreme deserts.

## BEHAVIOR

### Echolocation

Some bats have evolved a highly sophisticated sense of hearing. They emit sounds that bounce off of objects in their path, sending echoes back to the bats. From these echoes, the bats can determine the size of objects, how far away they are, how fast they are traveling and even their texture, all in a split second

Bats find shelter in caves, crevices, tree cavities and buildings. Some species are solitary while others form colonies of more than a million individuals.

### Overwintering

To survive the winter some species of bat migrate, others hibernate, and yet others go into torpor (regulated hypothermia that can last from a few hours to a few months).

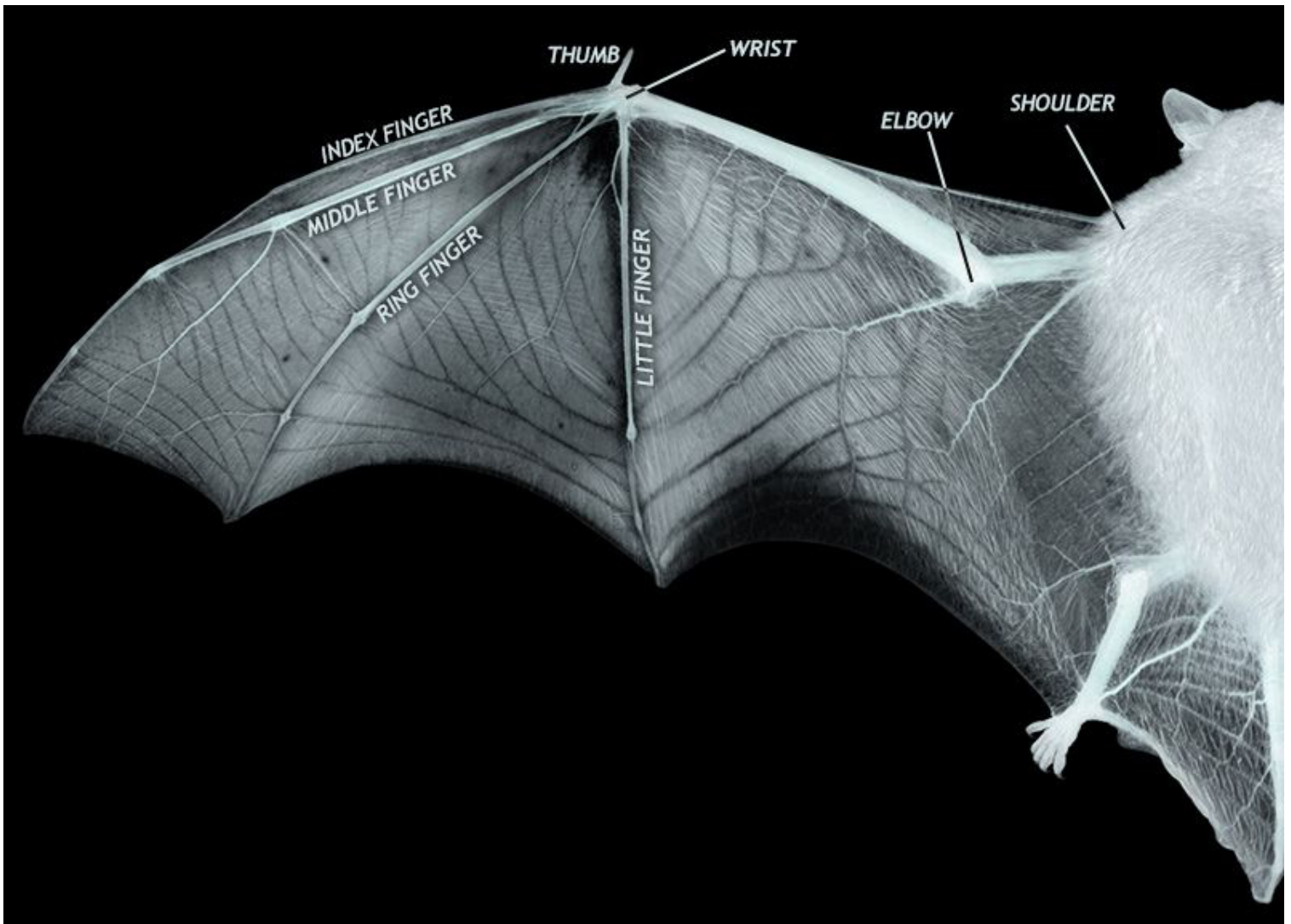
## REPRODUCTION

**Gestation:** 40 days - 6 months (bigger bats have longer gestation periods)

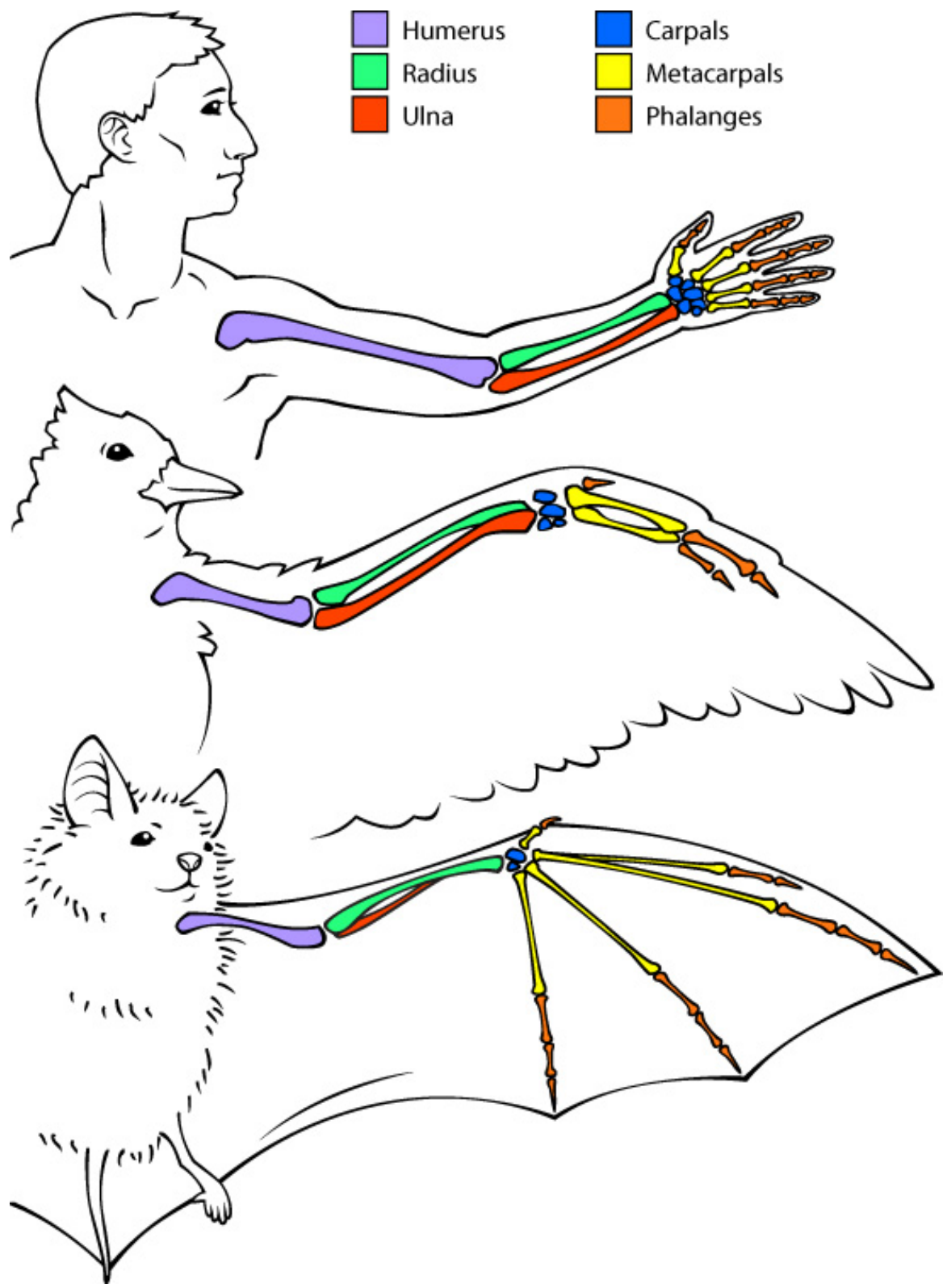
**Litter Size:** Mostly one pup. For their size, bats are the slowest reproducing mammals on Earth. At birth, a pup weighs up to 25 percent of its mother's body weight, which is like a human mother giving birth to a 31 pound baby! Offspring typically are cared for in maternity colonies, where females congregate to bear and raise the young. Male bats do not help to raise the pups.

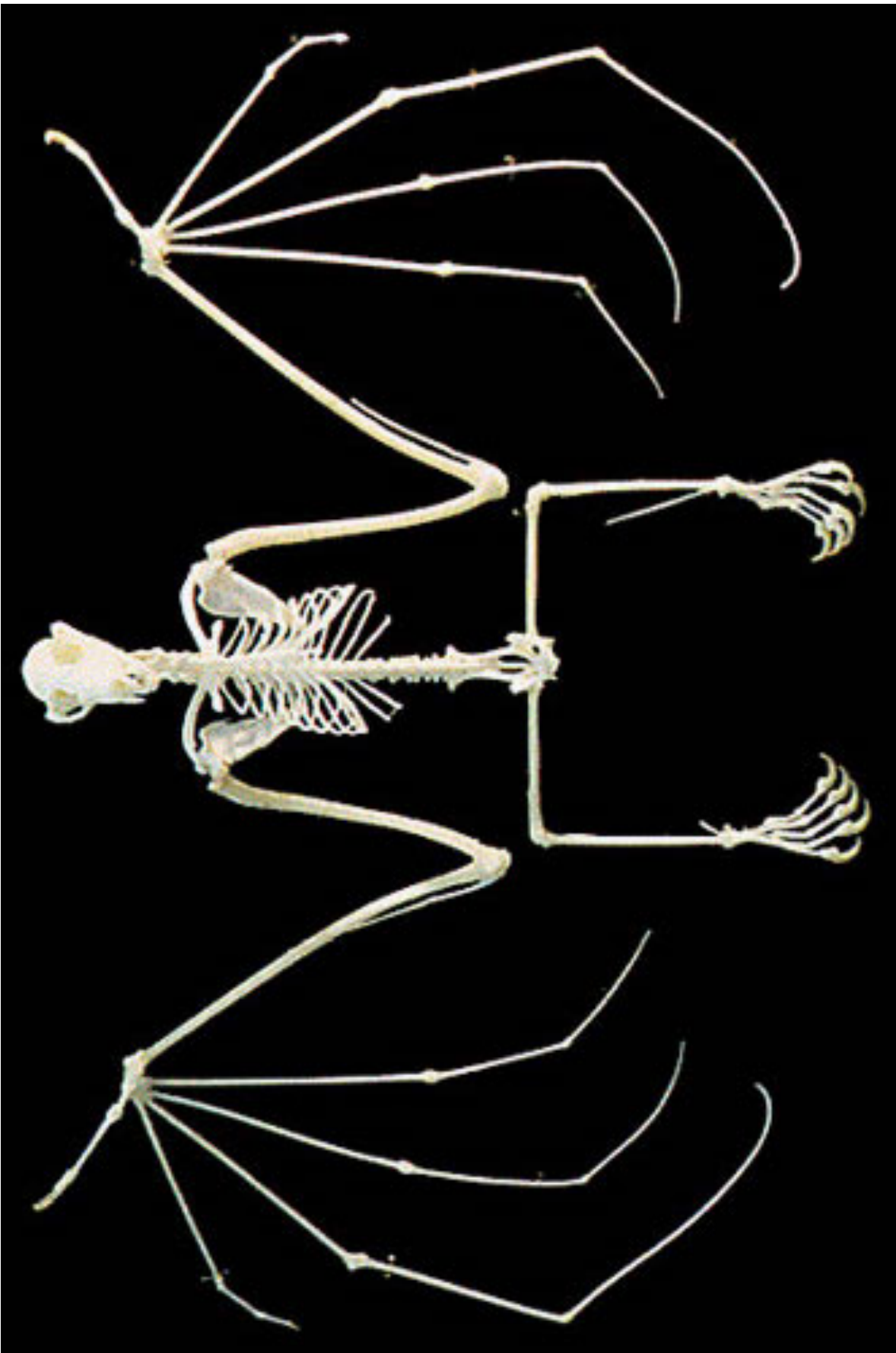
**Did You Know?** A single little brown bat can eat up to 1000 mosquitoes in a single hour, and is one of the world's longest-lived mammals for its size, with life spans of almost 40 years.

# X-ray of Bat's Wing





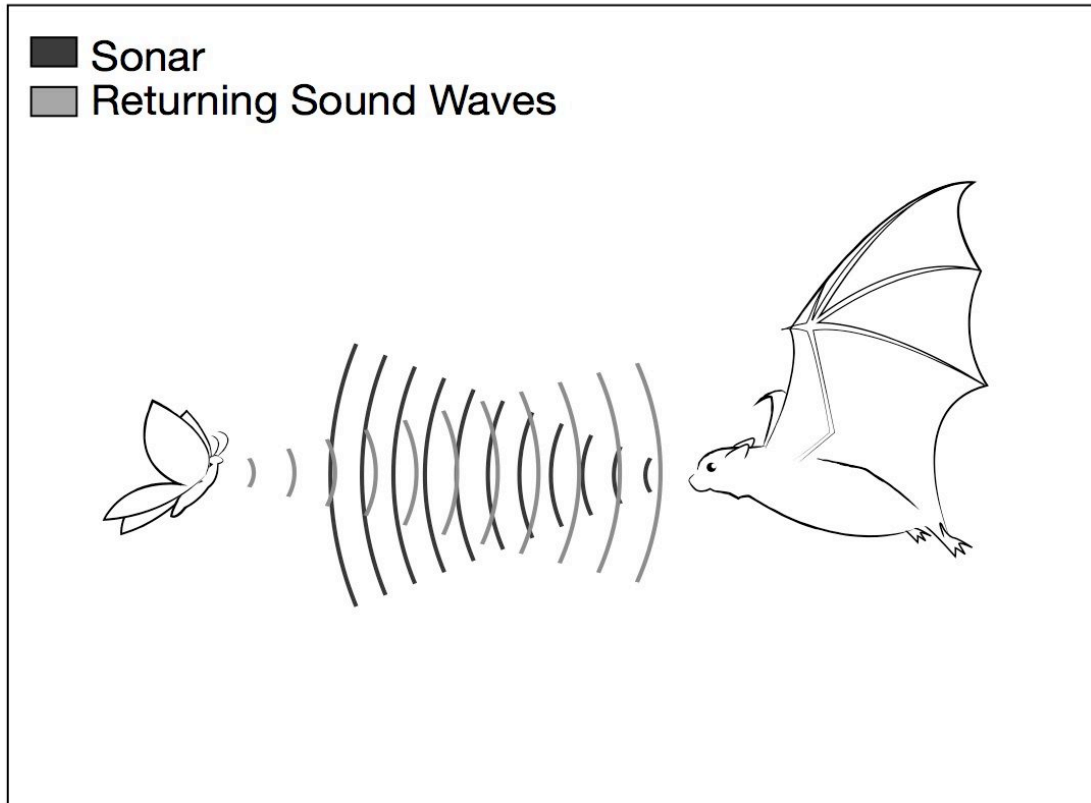






## Echolocation Diagram

When animals use echolocation, they make sounds that reflect off surfaces and return to their ears. This information is interpreted by the animal so it can understand its environment and what action to take next.

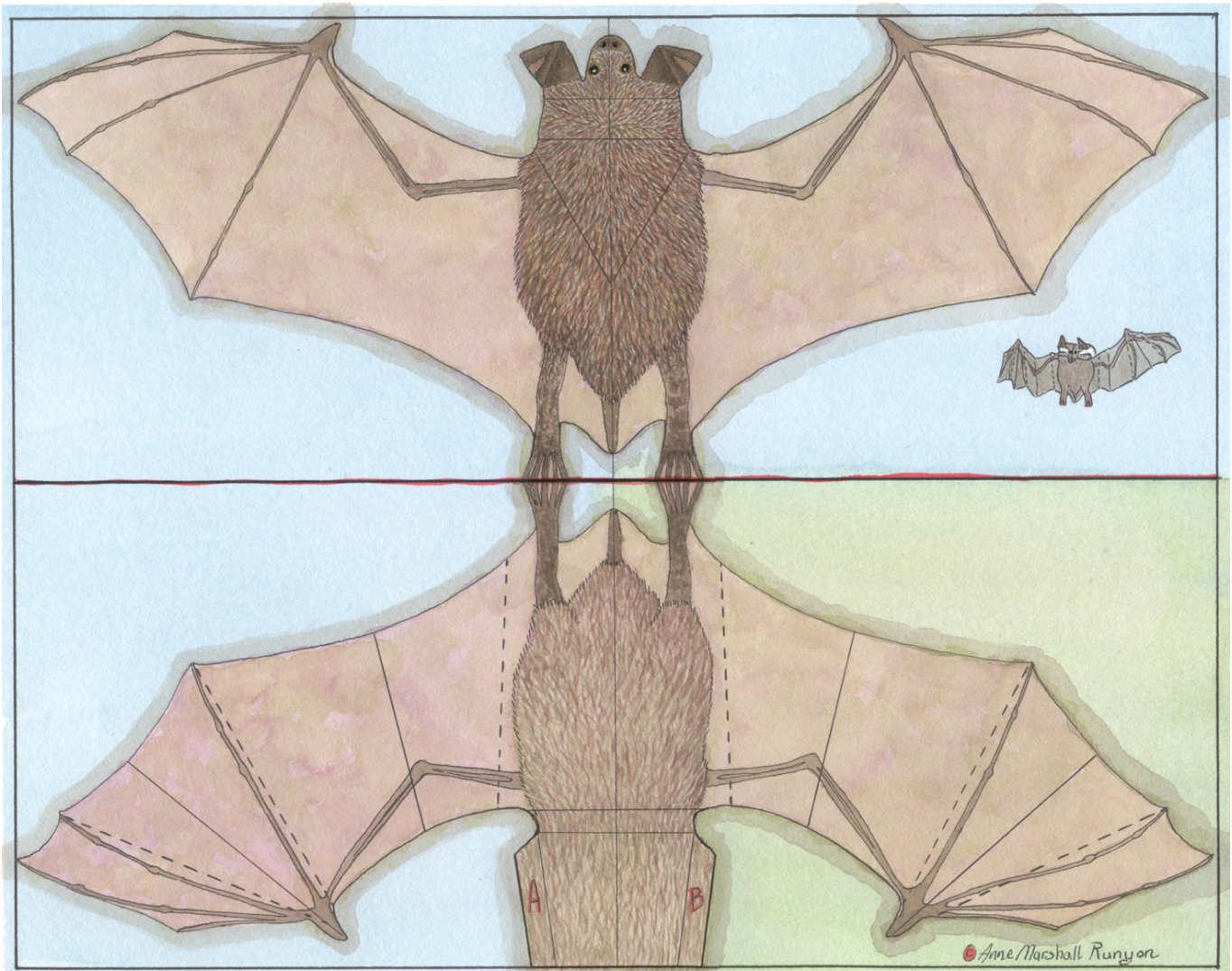


© 2014 National Geographic Society

## Make a Paper Sculpture of a Little Brown Bat

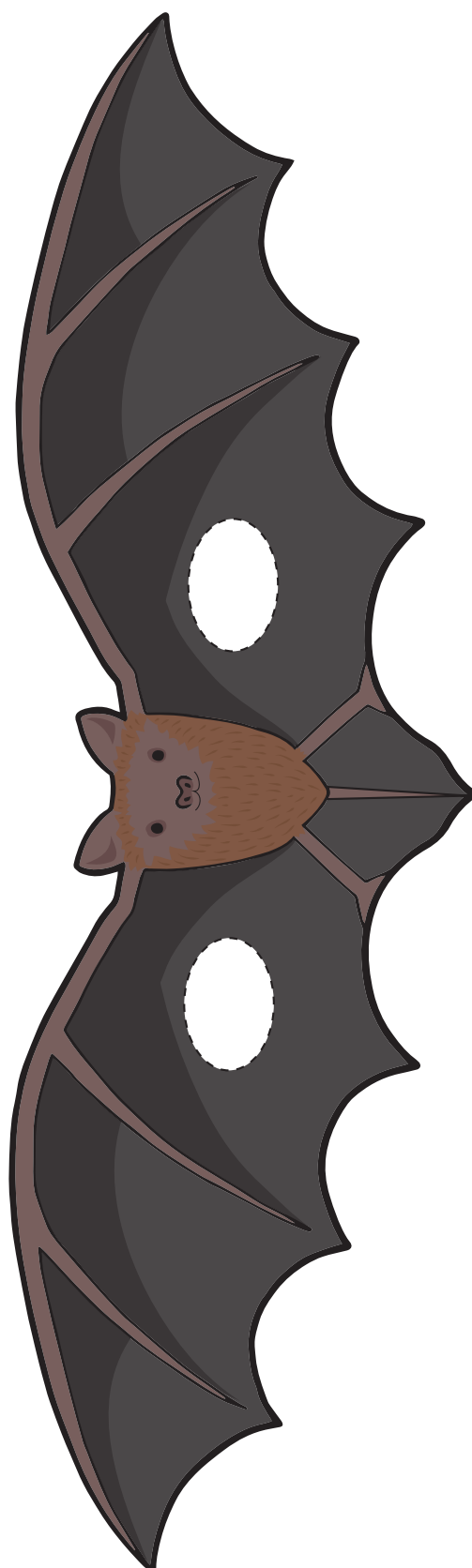
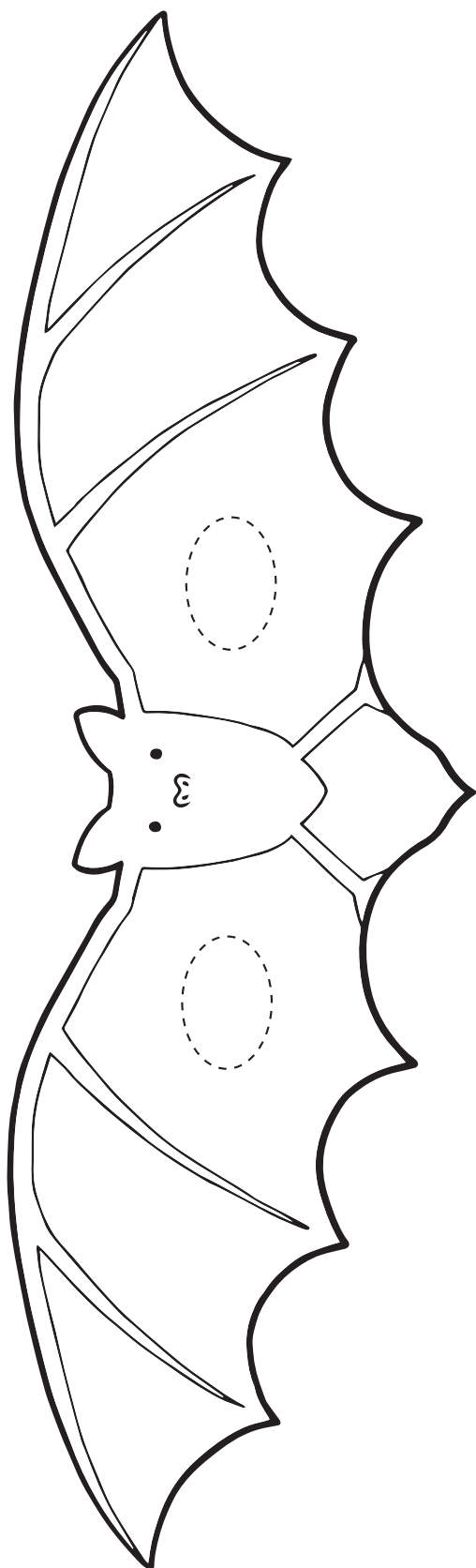
- 1) Cut out and fold box in half lengthwise along the red line.
- 2) Fold your bat in half, green background on top.
- 3) Cut away green, cutting through all four layers.
- 4) Unfold and cut away blue around your bat's face.
- 5) Back of bat - Crease down lines on bat's shoulders.  
Fold inner ears down and glue in place. Bend ears up slightly.  
Fold neck and face down.
- 6) Belly of bat - Fold down lines at chest and neck. Fold down A and B,  
forming a box under chest. This gives body volume.
- 7) Line up and glue together, first one wing, then the other.
- 8) Lay on back. Carefully fold up along solid lines,  
and down along dashed lines, folding wings shut.

Insert a stick through feet and let her hang upside down to sleep.  
Or open her wings, slide her off the stick, and she can fly!



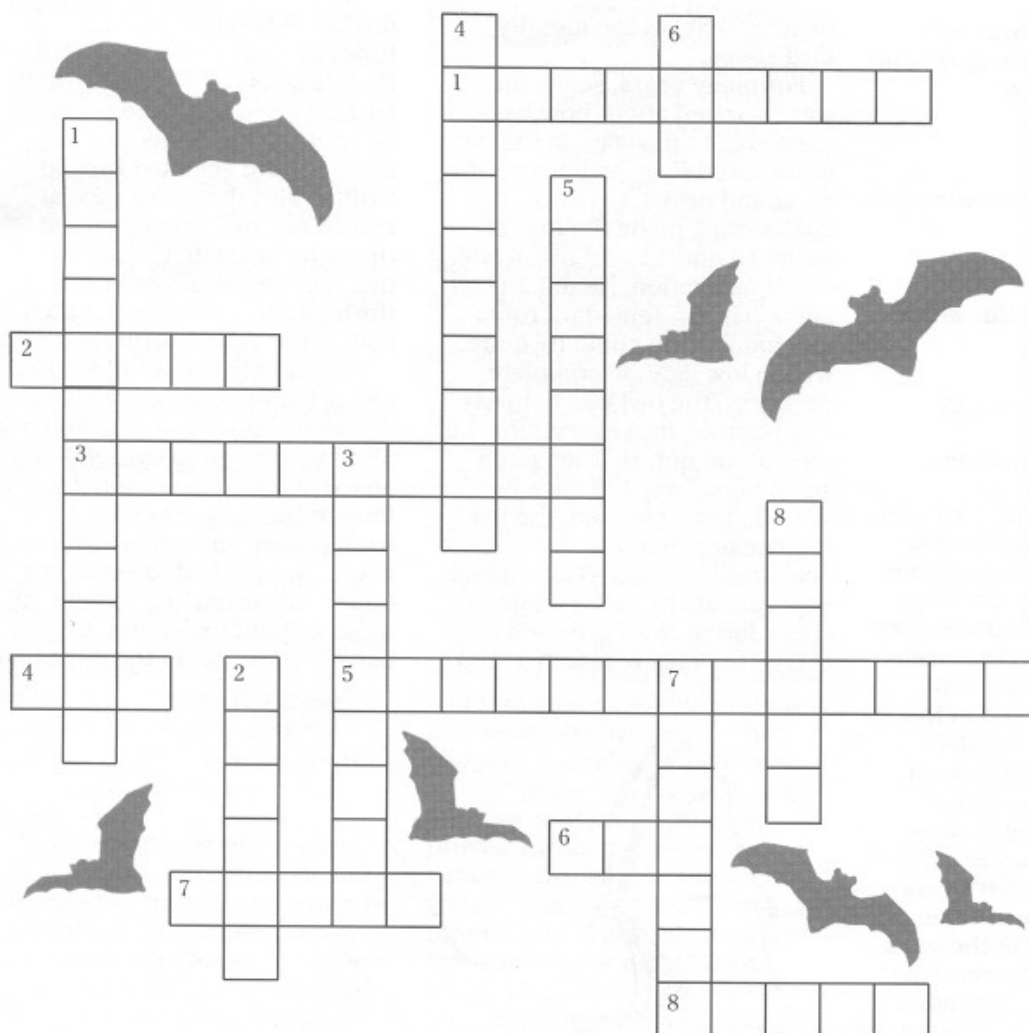


# Bat Masks





## BAT CROSSWORD PUZZLE B



### Answers

colony  
caves  
one  
thousand  
fox  
endangered  
chiroptera  
pollinate  
pup  
insectivorous  
mammal  
insects  
blind  
nocturnal  
echolocation  
sonar

### Across

1. An animal that is active at night is called \_\_\_\_\_.
2. All bats can see; no bats are \_\_\_\_\_.
3. The scientific name for bats, which means hand-wing, is \_\_\_\_\_.
4. The kind of bat whose face looks like a dog is a flying \_\_\_\_\_.
5. A bat that feeds on insects is called \_\_\_\_\_.
6. Most mother bats produce \_\_\_\_\_ (how many) baby a year.
7. Many bats spend part of the year living in \_\_\_\_\_.
8. Echolocation used by bats is a kind of \_\_\_\_\_.

### Down

1. The process of navigating and locating food using sound is called \_\_\_\_\_.
2. A bat is a \_\_\_\_\_.
3. Nectar bats \_\_\_\_\_ flowers, just like hummingbirds.
4. An animal that is disappearing is said to be \_\_\_\_\_.
5. There are nearly a \_\_\_\_\_ (how many) kinds of bats.
6. A baby bat is called a \_\_\_\_\_.
7. About 70% of all bats eat \_\_\_\_\_.
8. A group of bats living together is called a \_\_\_\_\_.

## BAT WORD SEARCH

E R R T V U R S N F Q H K U K  
I C U O D Z W B S H Y I A X J  
G R H F O A R U R P H B I M D  
A I F O R S G C N C K E F O I  
Z V B M L A T F I M H R Z R U  
M D I G R O D L G S L N X I M  
D N E T S Z C Q H Y B A K N C  
G S F H F K O A T T Q T F X S  
R O T C E T E D T S H I J L P  
H E C C O P N E A I I O H U L  
R Z O F E B E I W T O N P D W  
R Z S W V S I O U O T N N G D  
T O R P O R N Z Q Y X K N D M  
Z E T A B B Z I T M D P H G P  
R Y Y W Y F Y O A S R G W U Y

Find the bold words in the word search above and learn about bats as you go by reading each definition below.

1. **Bat:** the only flying mammal
2. **Detector:** a device used to hear the ultrasonic calls of bats
3. **Echolocation:** a technique used by bats and cetaceans to locate food. Bats send out high frequency sound in pulses and listens for echoes. These echoes help them find insects as small as 1mm!
4. **Hibernation:** a state of inactivity during winter. Bats are in a coma-like state during hibernation. They lower their heart rate from 100-200 beats per minute (bpm) to as low as 5 bpm and lower their body temperature from 40C to 2-5C!
5. **Insects:** the diet of all Canadian bats. All bats eat flying insects but some bats will also eat non-flying insects that are found on plants.
6. **Myotis:** a small brown bat; six of 10 Vancouver bat species belong to this group.
7. **Night:** bats are only active from sunset to sunrise.
8. **Pup:** a baby bat. Only 1 is born to a female each year in the summer.
9. **Roost:** a place where bats go to rest during the day or the night.
10. **Swarming:** when male and female bats come together in fall to mate.
11. **Torpor:** a state of inactivity that occurs from spring to fall. During torpor, bats lower their body temperature from 40C to 20C to save energy. Bats will use torpor during rainy nights or during any period with low insect activity.
12. **Tragus:** the inner ear flap of bats. The tragus helps pick out the echoes from insects and is used to tell the bats where the insect is in relation to their position.

To learn about the 10 species of bats that live within the Lower Mainland visit the South Coast Bat Conservation Society's website at <https://scbats.org/>.



# Sample of “Edubat” Lesson



## Calculate the Value of Bats

### Background

#### EXPLORATION QUESTION

“Why are bats important to our economy and to our natural world?”

#### MATERIALS

- Pencils
- Activity Sheets A and B
- Calculator (optional)

#### OVERVIEW

There are many reasons for students to care about bats. They are fascinating and beautiful animals. In this activity, students will use math skills to learn about the ecological and economic impacts of bats. Students will also use communication skills to convey the importance of bats to our economy and natural world and the potential effects of White-Nose Syndrome.

#### VOCABULARY

Adaptation, gravity, mammal, membrane, wingspan

#### GROUP SIZE

Any

#### AGE

10-14

This activity is adapted from *Discover Bats*, a publication of Bat Conservation International. Used with permission. [www.batcon.com](http://www.batcon.com)

One of the best ways to persuade people to protect bats is to explain how many insects bats can eat. Scientists have discovered that some small bats can catch up to 1,000 or more small insects in a single hour. A nursing mother bat eats the most – sometimes catching more than 4,000 insects in a night.

Little brown bats (*myotis lucifugus*) eat a wide variety of insects, including pests such as mosquitoes, moths, and beetles. If each little brown bat in your neighborhood had 500 mosquitoes in its evening meal, how many would a colony of 100 bats eat? By multiplying the average number eaten (500) times the number of bats in the colony (100), we calculate that this colony would eat 50,000 mosquitoes in an evening ( $500 \times 100 = 50,000$ )!

Using a calculator and multiplying 50,000 mosquitoes times 30 days (the average number of days in a month), you can calculate that these same bats could eat 1.5 million mosquitoes in a month ( $50,000 \times 30 = 1,500,000$ ), not to mention the many other insects they would catch!

#### *Do bats really eat billions of bugs?*

Bracken Cave, just north of San Antonio, Texas, is home to about 20 million Mexican free-tailed bats. How many insects do you think 20 million bats can eat in a night or a month? We know that one mother Mexican free-tailed bat can eat approximately 10 grams of insects (equal to the weight of two nickels) in a night. That doesn't sound like much, but for the whole colony it actually adds up to 220 tons of insects – the approximate weight of 55 elephants!

#### *Why do we need bats and other animals to eat insects?*

Most insects are highly beneficial. Fewer than one in 100 species is a pest that attacks crops or bites people. Nevertheless, the few species that become pests are normally those that reproduce the most rapidly. Without predators, they would soon cause great damage to whole ecosystems and threaten our own survival. Bats, birds, and other predators help keep insect populations in balance. When these animals are able to do their jobs, we get to benefit from the helpful insects without being harmed too much by those that become pests.

Insect pests that attack farmers' crops can lay hundreds of eggs in just a few hours or days. This means that if a bat eats a female insect before she lays eggs, the bat is actually protecting local farmers from hundreds of this insect's offspring – the grubs and caterpillars that eat crops and gardens.

If a mosquito can lay 200 eggs that take a week to hatch and become new adults, and half (100) of those new adults are females, within just one month that one mosquito's eggs, along with those of her daughters and their daughters, could result in 100,000,000 ( $100 \times 100 \times 100$ ) new female mosquitoes (adults die soon after

laying eggs). Imagine, if none of those mosquitoes were eaten by predators like bats, how many mosquitoes would there be in two months or a year!

Now you see why we need to be kind to the animals that keep pest insects in check. These animals include bats, birds, frogs, toads, lizards, shrews, spiders, fish, and predatory insects such as ladybird beetles, wasps, and praying mantises. All these animals and insects tend to feed on different kinds of insects at different times, keeping the pest insect numbers in check. While birds and other animals eat countless millions of insects by day, bats do the same at night.

### **Are bats really economically important?**

To assess the economic value of bats, you can research their impact on agriculture throughout the world. Bats are our most important natural predators of night-flying insects consuming mosquitoes, moths, beetles, crickets, leafhoppers, chinch bugs, and much more! Many of these insects are serious agricultural or forests pests, and others spread disease to humans or livestock. Every year bats save us billions of dollars in pest control by simply eating insects.

An article in Science, “The Economic Importance of Bats in Agriculture” estimates that bats provide between 3.7 and 22.9 billion dollars each year in pest control services in North America. The article also mentions that a single colony of 150 big brown bats in Indiana has can eat nearly 1.3 million insects that are agricultural pests each year. For these reasons, it is important to have healthy bat populations.

Recently, a unique field experiment was implemented to assess the ecological and economic effects of bats in corn agriculture (see resources list). This study found that bats not only decreased pest numbers and crop damage, but they also indirectly suppressed the presence of fungus growing on the corn. In plots of land where bats were prevented from entering, roughly 60% more corn earworm larvae were gnawing on the ears of corn. Corn is an essential crop for many farmers and is grown on more than 370 million acres worldwide. Annually, bats prevent nearly a billion dollars in pest damage to corn around the world! Even walnut growers in California are

beginning to install bat houses along their orchards to attract bats that can eat codling moths and prevent spraying of pesticides.

### **How has white-nose syndrome affected bats?**

White-nose syndrome (WNS) is a disease that is killing bats as they hibernate in caves and mines. The disease was named for the white fuzzy fungus that appears on the muzzle, ears, and wings of affected bats. Scientist identified a previously unknown species of cold-loving fungus *Pseudogymnoascus destructans* as the cause of WNS. *P. destructans* thrives in low temperatures (40-55 F) and high humidity – conditions commonly found in caves and mines where bats hibernate.

The white powdery fungus is not always visible on affected bats. Sometimes bats with WNS simply display unusual behavior such as flying outside during the day in near-freezing weather or clustering near the entrances of hibernacula.

First documented in New York in the winter of 2006-2007, WNS has spread rapidly across Canada and the United States. White-nose syndrome killed over 6 million bats in just six years. Bats have been found sick and dying in unprecedented numbers in and around caves and mines. In some hibernacula, 90 to 100 percent of bats have died.

Scientists around the world are urgently studying WNS. Many field and laboratory projects are underway as scientist try to discover how WNS is killing our bats, what we can do to fight it, and how to protect our surviving bats.

### **Get Ready -Background Activities**

1. Have the students and/or the teacher read: Calculating the Value of Bats: Background Information.
2. Show your classroom the short video, "Battle for Bats: Surviving White-Nose Syndrome" (available at <http://vimeo.com/76705033>).
3. Lead a discussion or have student groups use a jigsaw strategy to briefly summarize each section of the background information for the entire class.

### **Get Set – Hand Out Materials**

1. Provide each student a copy of Activity Sheets A and B.
2. If desired, provide calculators for students. Calculators will be helpful, but are not necessary.

### **Go! – Calculate the Value of Bats**

1. Give students time to calculate their answers on the two activity pages.
2. Have students can exchange papers to check answers. Teachers and/or student volunteers can pick problems to present and explain.
3. Lead a further discussion of the implications of insect consumption by bats, which might include the following topics: Noting the numbers of insects that bats eat and the number of eggs those insects would lay could lay is a good introduction to a discussion on the importance of predators in maintaining the balance of nature. You can also relate these numbers to the total number of people living in your town or city. Further, the answers to the problems provide a good opportunity to discuss unusually large numbers. For example, students might enjoy discussing what it would mean to be a millionaire or a billionaire.

Without a wide variety of predators such as minnows, larger insects, spiders, and bats, insects such as mosquitoes could multiply at astonishing rates and cause far more serious problems. Would it be easier to control the insects using just bats or just minnows, or might we be more successful by helping as many natural predators as possible? When we spray pesticides for mosquitoes, do we only kill mosquitoes? The answer is no. The chemicals we use to kill mosquitoes can also impact and sometimes kill their predators, such as bats.

Comparatively, the natural enemies or predators of insects often reproduce far more slowly. For example, bats typically have only one or two young per year. In the long run, the loss of bats will benefit pests such as mosquitoes and we have to use stronger insecticides which could cause greater risk to people and our environment.



## **Reflect – Student Assessment**

1. Solve math questions correctly?
2. Persuasively describe how important bats are in balancing the number of insects in the ecosystem.
3. Accurately describe what happens if a large number of bats die.
4. Discuss the effects of White-Nose Syndrome.

## **Extensions – Continue the Lesson**

How can you creatively and persuasively convey the importance of the quantities of insects a bat can eat in a single night, month, or whole summer season? For example, you could create interesting bat facts similar to the “55 elephants” statistics stated in the background information. You could also create a physical model or demonstration.

Research bat species that live in your region and province. Write a report or lead a discussion on specific topics. For example, “How are bats beneficial?” or “What environmental issues affect bats?”

Write a persuasive argument about how white- nose syndrome might change the magnitude of the economic and ecosystem value of bats in Canada. What challenges do bat biologists face in trying to provide information to support your argument? What can students and teachers do to help bats and bat biologists?

Most bats eat insects, providing essential pest-control services to fields, forests, and farms. Worldwide, bats are also important seed dispersers and pollinators.



### Bats Protect



beets



citrus



coffee



rice



tomatoes



pecans



peppers



cotton



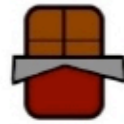
corn



strawberries



### Bats Propagate



cacao



figs



black pepper



### Bats Pollinate



agave



wild bananas

Learn more about bats and  
how to protect them @  
[batcon.org](https://batcon.org).



# What Bat is That?

British Columbia has more bats than any other province. Sixteen different types of bats live in BC and 10 of them call the south coast home.

## **Have students pick a species below, research it and:**

- \*deliver a presentation about their bat to the class/other classrooms/parents
- \*organize a fundraiser for bat conservation
- \*design an information brochure
- \*make a science project
- \*create an art project

**Little Brown Myotis** - *Myotis lucifugus*

**Big Brown Bat** - *Eptesicus fuscus*

**California Myotis** - *Myotis californicus*

**Hoary Bat** - *Lasiurus cinereus*

**Keen's Long-eared Myotis** - *Myotis keenii*

**Long-legged Myotis** - *Myotis volans*

**Silver-haired Bat** - *Lasionycteris noctivagans*

**Townsend's Big-eared Bat** - *Corynorhinus townsendii*

**Western Long-eared Myotis** - *Myotis evotis*

**Yuma Myotis** - *Myotis ymanensis*



# Little Brown Bat

(*Myotis lucifugus*)



# Big Brown Bat

(*Eptesicus fuscus*)





# California Myotis

(*Myotis californicus*)





# Hoary Bat

(*Lasiurus cinereus*)



# Keen's Long-eared Myotis

(*Myotis keenii*)



# Long legged Myotis

*Myotis volans*





# Silver Haired Bat

*Lasionycteris noctivagans*



# Townsend's Big-eared Bat

*Corynorhinus townsendii*



# Western Long-eared Myotis

*Myotis evotis*



# Yuma Myotis

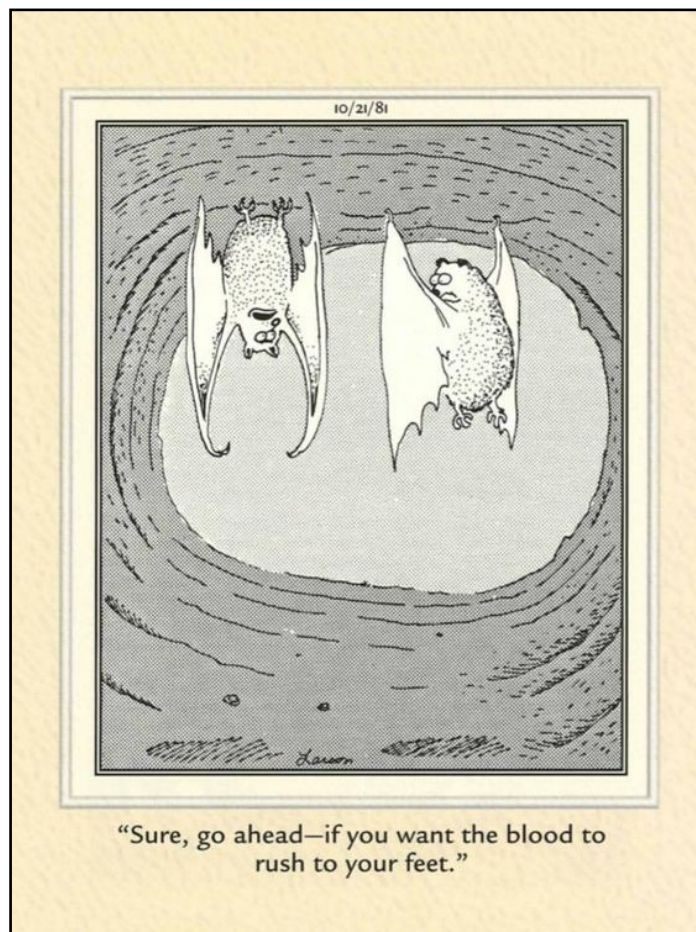
*Myotis yumanensis*





# **Bat Gratitude and Appreciation**

**To the Squamish River Watershed Society, South Coast Bat Conservation Society and TD Friends of the Environment for all your support and expertise in creating this valuable resource.**



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