

# HOW DO I COMPARE?

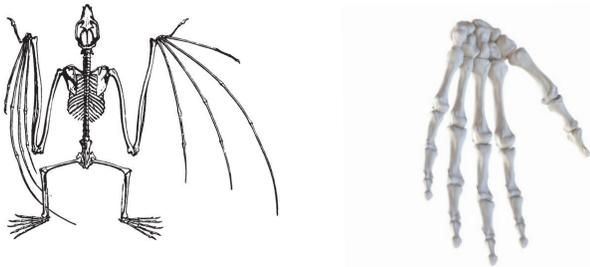
## Challenge

Investigate how the anatomy, physiology, and behavior of bats compares to humans as you move from station to station. Record your observations on your Bat Discovery Log.

### Station 1: Hand Anatomy

- bat skeleton ● human hand skeleton
- “How do I Compare to a Bat” graphic

Write down the number of fingers that you have on one hand. Look at the bat skeleton and “How Do I Compare to a Bat” illustration and compare the bones of your hand to those of a bat.



*A bat's wing is actually a modified hand. The wing bones are greatly elongated fingers. This elongation of the bones is required to support the wing membrane. The bat's thumb, usually with a sharp claw, is not attached in the wing membrane but remains free. This helps the bat crawl around on rough surfaces. The membrane of a bat's wing is living tissue similar to the tiny flaps of skin joining the bases of our human fingers. Because the membrane of skin joins their long fingers from the bases to the tips, a bat's fingers cannot flex independently. The muscles in the arm open up the hand/wing. The structure of the wing membrane, the arrangement of the bones supporting it, and the positioning of the muscles provide the bat with the lightness and maneuverability necessary for catching insects, hovering above flowers, or quickly avoiding obstacles*

### Station 2: Wingspan & Height

- tape measure

Using a tape measure, have your partner measure the length of your “wingspan.” You will need to stretch out your arms. Your partner will measure the distance from the fingertips on your right hand to the fingertips on your left hand. Write down the length of your wingspan and then switch places with your partner. Then, have your partner measure your height in inches. Write down your height and then switch places with your partner.

*Bat wingspans in the Western United States vary from about seven inches (the canyon bat) to over 22 inches (the greater bonneted bat/Western bonneted bat – found in southwestern United States). The species evaluated in this activity include the canyon bat and the big brown bat (wingspan up to 13 inches). The big brown bat was selected because it is much more widely distributed than the greater bonneted bat.*

### Station 3: Weight

- gram scale ● pounds scale (not provided) ● calculator
- coins

Step on the scale and take your own weight. You will need to convert your weight to grams. Remember that one pound equals 453.6 grams. Once you have written down your weight in pounds and grams, let your partner do the same steps. Using the gram scale, add coins to a small bag and determine how many coins equal the same weight as a canyon bat. How many equal the same weight as a big brown bat? Are you surprised how little these bats weigh?

*Most bats in the Western United States are very small. The smallest, the canyon bat (formally called the western pipistrelle), weighs only 3 to 6 grams. Our largest bat, the greater bonneted bat, weighs up to 70 grams. The species evaluated in this activity include the canyon bat and the big brown bat (weighs up to 25 grams).*

## Station 4: Lifespan

- photo of person
- photo of mouse
- photo of bat

Write down what you think is the average lifespan of a human. Pick up the photo of the person and look at the back to see if you answered correctly. Record the correct answer and compare this to the average lifespan of a bat. Also look on the back of the photo of the mouse. How long do they live on average?

*The average lifespan for a human is 74 years. Among young bats, mortality is very high. If they can make it to adulthood, bats can live relatively long lives. Small bats like those found in the United States tend to live about 6-10 years. Banding records have shown that some insectivorous bats live up to 30 to 40 years; however, this is not very common. For their size, bats are among the longest-lived animal which is important since most bats only have 1 or 2 pups a year. For comparison, most mice have a lifespan of only about two years.*

## Station 5: Wing Beats per Minute



- stopwatch

To determine wing beats per minute, you will have to flap your arms like a bat for thirty seconds. Be sure to count the number of times you flap out loud so that you don't lose track. Your partner will tell you when to begin and when to stop using a stopwatch or clock. You will need to multiply the number of wing flaps times two to find the rate per minute. Remember to record your answer. How does your rate compare to the bats? Why do they need to move their wings so quickly?

*To support a body in the air and overcome the force of gravity, a flying animal must beat its wings very quickly to maintain altitude. Statistics for the little brown bat indicate that this bat flaps its wings about 12 times a second.*

## Station 6: Dietary Needs

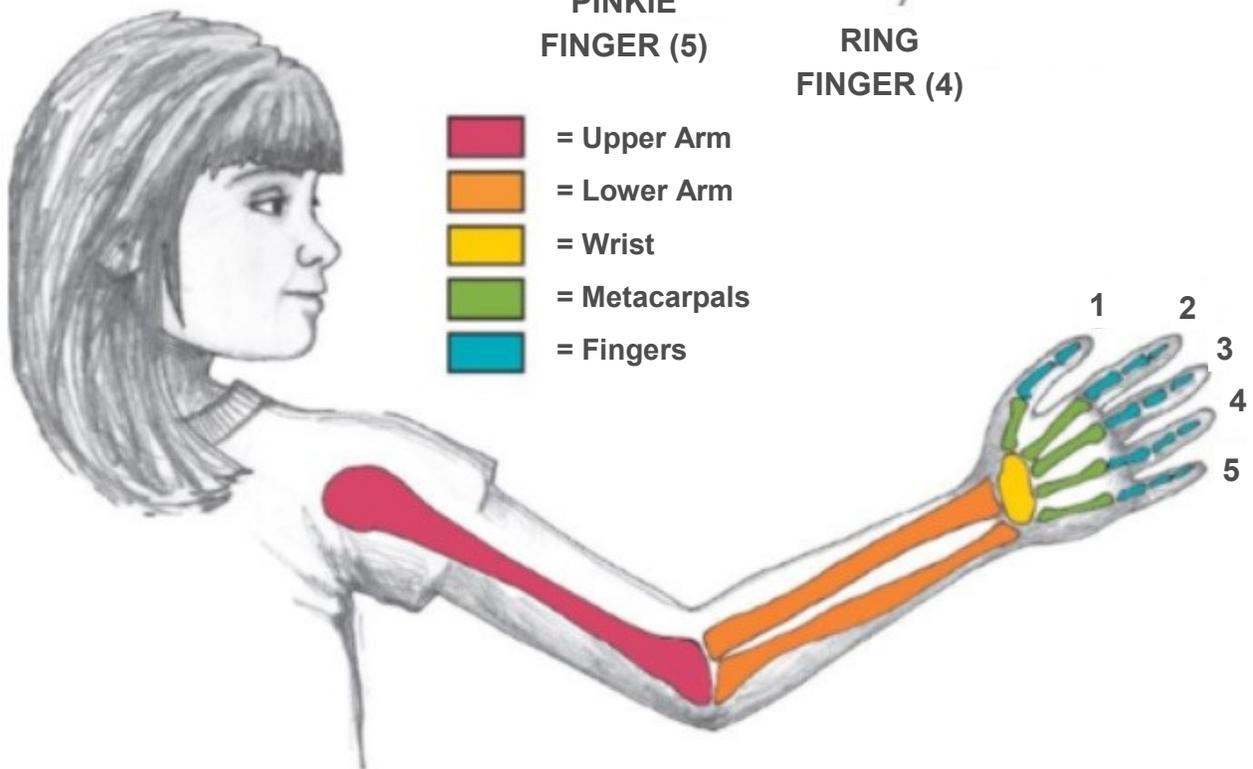
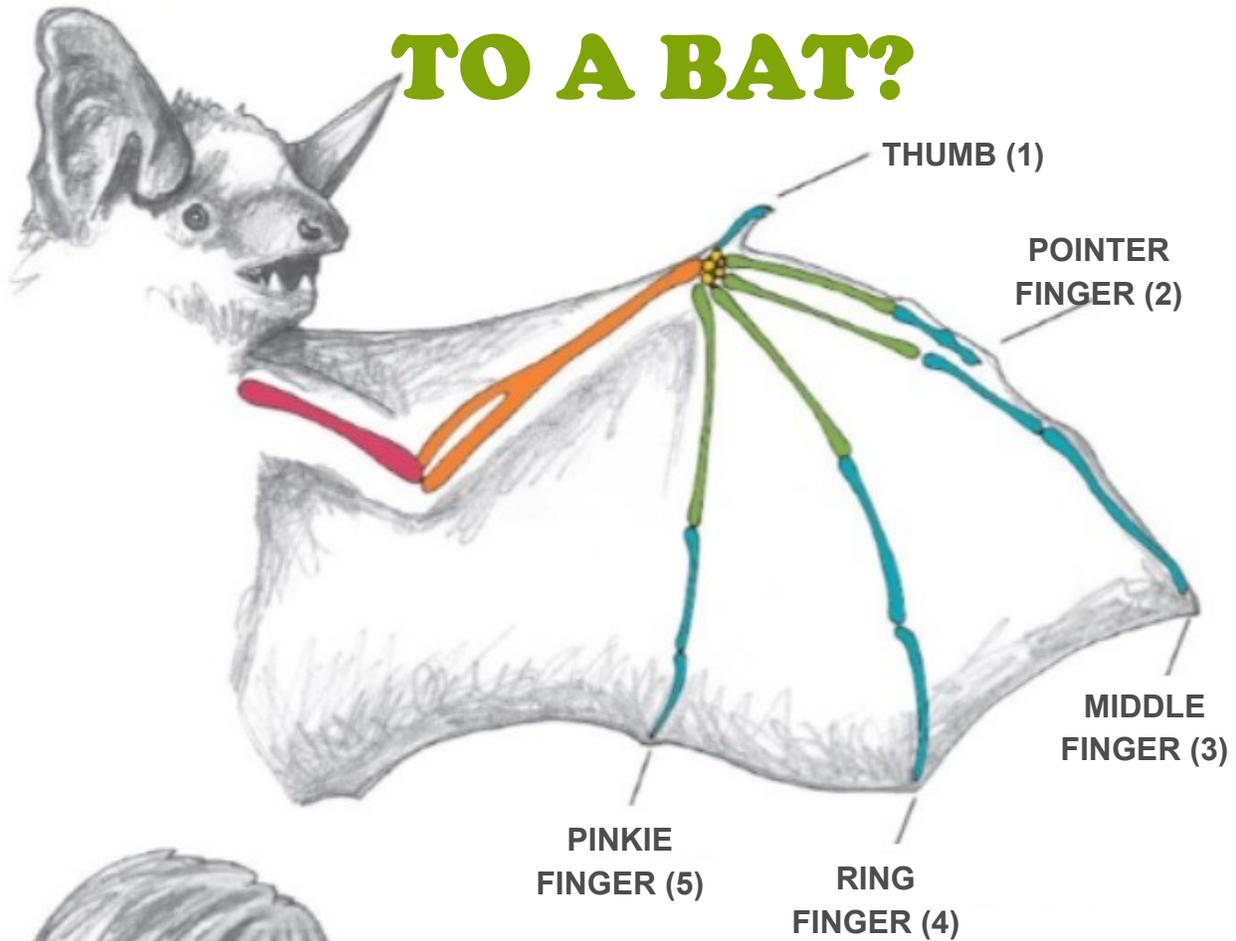
- tape measure

Bats eat an incredible amount of insects each night. In fact, they can eat about half of their weight in insects each evening. How many Big Macs would you have to eat each night to eat the same amount of food as a bat? Hint, a Big Mac weighs about 0.5 lbs. Show your work and be sure to write down your final answer. Think about trying to eat that amount of food in a single evening.

*Scientists have discovered that many small bats can catch up to 1,000 or more small insects in a single hour.!*



# HOW DO I COMPARE TO A BAT?



Characteristic/Measurement	YOU	Eastern Small-Footed Bat	Big Brown Bat
Kingdom	Mammal	Mammal	Mammal
Drink as a Baby	Milk	Milk	Milk
Number of Fingers		4 fingers and 1 thumb	4 fingers and 1 thumb
Wingspan		8.2- 10.2 inches	up to 13 inches
Height/Body Length		2.9 to 3.4 inches	4 to 5 inches
Weight		3.5 to 6 grams	up to 25 grams
Average Lifespan		6-10 years	6-10 years
Wings Beats Per Minute		About 720	About 720

1. How much do you weigh in grams? Remember that one pound equals 453.6 grams, so your weight X 453.6 = your weight in grams. Show your work!

2 Bats can eat about 1/2 their body weight in insects each night! How many Big Macs would you have to eat each night to eat the same amount of food as a bat? Hint, a Big Mac weighs about 0.5 lbs.