



BAT BUDDY EXPLORER DAY: MEET THE BATS

by Paula Rodríguez de la Vega, April 2019

Target audience: 5 to 12 years old Nature Kids BC members and their families.

Location: Outdoors, preferably in natural area or indoors with large playing area.

Duration: Leaders can choose which bat concepts and activities they want to do. If all activities are done, the Explorer Day would be about 2 hours long.

Objectives: By the end of the Explorer Day, Nature Kids will be able to;

- Understand that bats are nocturnal, flying mammals
- Picture the anatomy of the wings of a bat
- Understand that bats drink water while flying
- Name 3 types of insects that BC bats eat (diet)
- Define echolocation
- Name 2 habitats that bats use in BC
- Understand the life cycle of bats of BC
- Name 2 types of bats
- Know that they should NEVER touch a bat
- Understand that bats are important.
- Understand that bats are in trouble and they need our help.

Please choose which concepts and activities you want to do for your Bat Explorer Day. You can also share this with guest leaders and nature mentors, so they can get an idea of what kind of activities work for this younger age group. Some of the activities need materials. Some of the materials are easier to find than others. In addition, you can also break up this Explorer day into two days – one can be your bat introduction and the other one can be in combination with a bat count. Most importantly, remember to have fun!

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WARM UP

Activity: HOW MUCH DO YOU KNOW ABOUT BATS? QUIZ

Duration: As Nature Kids arrive.

Materials: Copies of 'How Much Do You Know About Bats?' and pencils.

Print out the "How Much Do You Know About Bats?" Quiz.

Hand out the *How Much Do You Know About Bats?* Quiz as families arrive. Encourage them to answer the questions to see how much they already know about bats.

Funders require that we do a pre- and post- program assessment. Please collect sheets after the exercise. It will also help you gauge how much kids already know about bats. Don't tell them the answers until the end of the program and by then they will hopefully know the answers.

Warm-up Activity: How much do you know about bats?**Your name:** _____*Circle True or False:*

Bats can fly because they are related to birds.	True	False
The bats that live in B.C. eat insects and fruit.	True	False
Bats use echolocation to find their food at night.	True	False
The place where bats sleep is called a roost.	True	False
Bats are rodents like mice and rats.	True	False
Bats like to fly into people's hair.	True	False
Vampire bats eat blood.	True	False
We have vampire bats around here.	True	False
Bats are wild animals and when they are scared, they can bite.	True	False
You should never touch a bat with bare hands.	True	False
Some bats roost in house attics and it's OK to let them stay.	True	False

How many different bat species live in British Columbia?

2 5 15 50

How many bat species exist in the World?

50 500 over 1000

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INTRODUCTION

Duration: 5-10 minutes

Materials: None

- ✓ Welcome, my name is...
- ✓ We are at ... Who has been here before?
- ✓ Safety – stay on trails, stay behind the leader, etc.
- ✓ We're here to learn about bats. Who likes bats?
- ✓ Who doesn't like bats or is a little scared of bats? It's OK to be scared of bats. Bats have been made out to be scary in some movies, tv shows, and stories. Who can think of some shows where bats are scary? (Vampires, Halloween, etc.). These depictions are not real.
- ✓ Bats are awake at night when we are sleeping. It's difficult to see them. A long time ago, people didn't have flashlights and it was difficult to follow bats at night and learn about them. (Note: Electricity was invented only 140 years ago). So, people made up stories and myths about bats.
- ✓ Biologists know a lot about bats now. They have discovered that bats are important for many reasons. Hopefully by the end of today, you will start to like bats and maybe even want to be a bat buddy. Let's find out more about bats and why they are so important in the world.

BATS ARE MAMMALS

Activity: BATS OF BRITISH COLUMBIA

Duration: 15 minutes

Materials: Bat poster “Bats of the Pacific Northwest” and Bat ID cards.

Introduce bats.

- ✓ Only flying mammals on earth (Note: flying squirrels glide, they don't flap wings and can't fly upwards)
- ✓ What does it mean to be a mammal?
 - Fur (not scales or feathers)
 - Give birth to live young
 - The young drink milk from mother
 - Warm-blooded (can control their body temperature)
- ✓ Order Chiroptera (means “hand wing”). Can you say ‘Chiro-ptera’? ‘Chiro’ means hand, and ‘ptera’ is wing (e.g. pterodactyl is a winged dinosaur). Bats are not rodents (Order Rodentia includes mice, rats, beavers that have big gnawing front teeth. Bats cannot gnaw or chew like rodents, instead bats have sharp little teeth that crunch hard-bodied insects like beetles and flies.)
- ✓ There are over 1200 different species of bats in the World. Here in BC, we have 15 species. Let's learn a bit more about them.

Hand out the 8 Bat ID cards. If you have more kids than cards, have the kids pair up. Ask them to read the card they have in detail. Then ask each person to tell the group the name of the bat and one interesting thing about it (it can be their diet, or size, speed, habitat, etc.). As they are doing this, you can also bring out the bat poster and find that bat on the poster, so everyone can see a photo of it.

There are fifteen different species of bats in BC, but only **8 are featured** in the Bat ID cards.

Spotted Bat	Western Small-footed Myotis
Townsend's Big-eared Bat	Northern Myotis
Big Brown Bat	Little Brown Myotis
Eastern Red Bat	California Myotis
Pallid Bat	Fringed Myotis
Hoary Bat	Long-legged Myotis
Silver-haired Bat	Long-eared Myotis (includes Keen's Myotis)
Yuma Myotis	

For more detail on the bats of BC, please see Appendix A.

Western Small-footed Myotis

Myotis ciliolabrum



The smallest bat in BC weighing as little as a loonie.

Diet: Small insects like caddisflies, midges, mosquitoes

Habitat: Cliffs, rock out-crops, river banks, riparian

Roost: Rock crevices and erosion holes along river banks

BC range: Arid areas of the interior

Hibernates in mines and cliffs.



Cory Olson

Hoary Bat

Lasiurus cinereus



The biggest bat in BC with a wingspan of 40cm (15.7"). Fast and long-distance flier.

Diet: Large moths, dragonflies, beetles

Habitat: Deciduous and coniferous forests, grasslands

Roost: 'Tree bat' – branches and leaves of trees

BC range: All of BC

Migrates to southern USA and Mexico.



Cory Olson

Pallid Bat

Antrozous pallidus



Gleans insects from the ground. It appears to be immune to scorpion venom.

Diet: Scarab beetles, moths, crickets, scorpions

Habitat: Open arid areas

Roost: Rock crevices, trees, cliffs

BC range: South Okanagan

Hibernates sites unknown.



Cory Olson

Little Brown Myotis

Myotis lucifugus



Commonly roost in buildings and bat boxes with colonies of up to 2000 bats. Endangered in Canada due to white-nose syndrome.

Diet: Aquatic insects like caddisflies and mosquitoes, beetles, spiders

Habitat: Forests and grasslands

Roost: Buildings, bat boxes, old trees, rock-crevices, bridges

BC range: All of BC

Hibernates in caves, mines, rock crevices, tree root wads.



Cory Olson

Big Brown Bat

Eptesicus fuscus

An excellent forager and can fill its stomach in less than an hour after evening emergence.

Diet: Larger moths, beetles, carpenter ants, termites, lacewings, various flies

Habitat: Forests and grasslands

Roost: Buildings, big bat boxes, wildlife trees, cliffs, rock crevices

BC range: All of BC

Hibernates in buildings, mines, rock crevices



Cori Lausen



Spotted Bat

Euderma maculatum

The only bat in BC whose echolocation calls can be heard by people without the aid of a bat detector. Calls sound like high-pitched, metallic clicks.

Diet: Moths and beetles

Habitat: Arid grasslands

Roost: Cliffs

BC range: Dry interior as far north as Williams Lake

Hibernates in cliffs and mines.



Margi Chantler

Townsend's Big-eared Bat

Corynorhinus townsendii

One of 3 species of BC with enormous ears. It commonly roosts in buildings with large open spaces and are easily disturbed.

Diet: Moths and beetles

Habitat: Forests and grasslands

Roost: Large open attics, big bat boxes, boulder fields, caves, large tree cavities

BC range: Southern two-thirds of province

Hibernates in caves, mines, rock crevices



Cory Olson



Long-eared Myotis

Myotis evotis

Flies slowly and low to the ground. This allows them to roost down low in tree stumps and under boulders and rock piles.

Diet: Moths, beetles, flies, spiders

Habitat: Forests and grasslands

Roost: Cliffs, snags, stumps, talus slopes, rocky areas, mines, bat boxes

BC range: All of BC

Hibernates in mines and rocky areas



Cory Olson

BATS ARE NOCTURNAL

Activity: DAY TIME – NIGHT TIME GAME

Duration: 10 minutes

Materials: Print out DAY and NIGHT sheets of paper.

Find a place where there are several trees, bushes, or a wall and it is safe to lie down on the ground beside them. Explain that bats sleep upside down. Do bats sleep at night or during the day? Play the game – Hold up 'NIGHT' sign – kids pretend to fly around and hunt for beetles and mosquitoes. Hold up 'DAY' sign – kids find a tree or bush, and lie down next to it, with feet up in the air and pretend to sleep. Keep switching it up a few times. If you don't have a sign, you can call out 'night' or 'day'.

DAY

NIGHT

BAT WINGS

Activity: MEET OTIS, THE BAT

Duration: 10 – 15 minutes

Materials: Folksmanis mini bat finger puppet, a loonie, and a metal dinner fork.

You can either speak as the puppet or introduce your friend the bat. Suggested names - If a boy, "Otis" or girl "Lucy" for Latin name *myotis lucifugus* – Little Brown Myotis.

HANDS ON MY WINGS

Use the puppet to show off the wings. Anatomically you can see the hand bones on this puppet. "Can you see my thumb? It has a nice sharp claw. What do you think I use it for?" "I use it to hang on when I land on a tree or a bat box entrance. I land right side up, and then push my legs up and flip around to hang on with my two back feet." "Once I get comfortable I relax my muscles and lock my feet, so I don't have to think about hanging on. I can fall asleep upside down."

SLEEP UPSIDE DOWN

Why do bats like sleeping upside down? "I can sleep up high on trees, or attic rafters, or on roof of a cave. Predators aren't as likely to get me when I'm up that high." "Sometimes a weasel, rat, even house cats can enter my roost and try too eat me. But I'm ready... just drop down and fly off."

HOW DO BATS FLY?

"Notice how my wing is attached to my ankle and my tail! So, when I fly I must move all 4 limbs. Can you try that?" Imagine having wings... Stretch your arms out, and pretend your fingers are really long, except for your thumb. It has a claw on it. Then pretend that you have a thin layer of skin that is attached between the tip of each of your fingers. The wing goes from the tip of your pinkie all the way down to your ankle. Balance on left leg and flap your wings (by moving both right arm and right leg at the same time). Switch sides.

BATS DRINK WHILE FLYING

Take out puppet again. "Ha, ha, that was pretty good boys and girls. I hear you are all pretty good at walking and running. Is that true?" "We bats don't like to spend time on the ground. I can't really walk very well, and definitely cannot run. I avoid being on the ground at all costs. Do you know that I don't even land to have a drink of water?" "I drink while flying, like this." Show puppet skimming water.

This links to activity "I'm thirsty. How long is my pond?"

Little Brown Myotis – needs open water like ponds or pools that are 3m long x 1m wide to drink.

Big Brown Bats – need 15m long stretch of open water.

Hoary Bat – needs up to 30m of open water.

HOW BIG ARE THE BATS OF BC?

Fly to the next stop along your trail. "Most of the bats of BC are small. I'm about average size and weight. My wings are 26cm wide stretched out, and my body and tail are about 13cm long. *(measure your mini-bat finger puppet and make sure it's the same dimensions as the one I'm using!)*

The smallest bat in BC is the Western Small-footed Myotis, their body is only 8 cm long, and its wings only 22cm long. They weigh about the same as a loonie.

The biggest bat is the Hoary Bat with a body that is 14cm long, and wings almost 40cm long. They weigh as much as a dinner fork. Want to see how much I weight?" Pass bat around. This puppet weighs about the same as a medium size BC bat. If you have a loonie and a dinner fork, you can pass those around too.

WHAT DO BATS NEED TO SURVIVE?

Activity: FOOD, WATER, SHELTER, OR SPACE?

Duration: 10 minutes

Materials: a cloth or grocery bag, empty water bottle, small toy house, toy insects (beetle, fly, moth, cricket, mosquito, scorpion), toy tree, cave, rock cliffs, mine. If you don't have these toys you can print out the 'Food, water, shelter, or space?' activity sheet provided and cut it out.

All living organisms need 4 basic things to survive. Do you know what they are? Food, water, shelter, and space. We're going to play a mystery connection game. You reach into the bag and pull out one item. Figure out what the item is and whether it is food, water, shelter or space.

Make a connection. Get kids to make a connection between how we live and survive and how bats live and survive.

Tips:

Here is some dialogue on some of the items;

Water bottle – can bats get a drink of water from a water bottle? No. What do they need to drink water? Open ponds, lakes, pools.

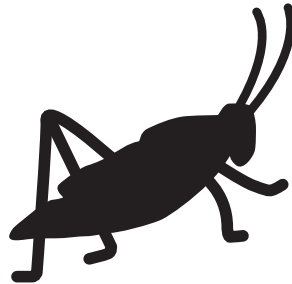
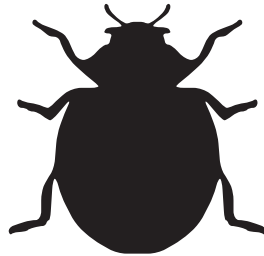
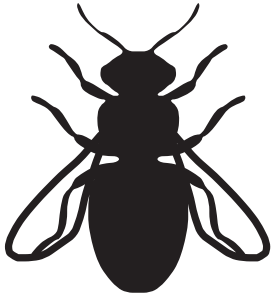
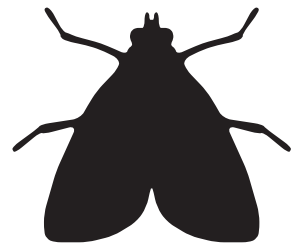
Toy house – What do you do in your house? Sleep, make food in kitchen, eat, rest, play. So, is a house food, shelter, water, or space? Where do bats make their home? Do bats live in houses? Some do, but not ones they build! Five out of the 15 bats in BC commonly roost in barns, or attics of houses or cabins. Some bats sleep in trees – either hiding behind loose bark, in old woodpecker cavities, or hanging from the branches. Other bats live in rock crevices, cliffs, caves, or mines.

Insects – Food. Some bats hunt aquatic insects near waterbodies, some hunt forest insects along tree tops, or grassland open areas, others forage along cliffs and rocky slopes. Pallid bats glean for scorpions and centipedes along the ground or on plants. Bats usually eat nocturnal insects, not insects that sleep at night like bees and butterflies.

Creek, forest, lake – Space. All living organism need space to survive and thrive. You do too...Would you be happy if you were stuck in your bedroom all the time?

Food, Water, Shelter and Space?

Activity Sheet - Print and cut out.



FOOD**Activity: WHAT'S FOR DINNER?****Duration:** 15 minutes**Materials:** "What's for dinner?" Activity sheet

All 15 species of bats that we have in BC eat insects and arachnids. Bats eat hundreds to thousands of insects every night. In a lab setting, one Little Brown Myotis ate 600 mosquitoes in an hour. Some bats eat about half their body weight in insects every night. How many burgers would you have to eat each night to eat the same amount as a bat? Burgers weight about 0.5 lbs. (Example: If a child weighs 50 lbs, need 25lbs of food. Burger are half pound, so to eat 25 pounds worth, double it, so need to eat 50 burgers.)

Bats eat all kinds of nocturnal insects. Let's play a game to figure out what kind of insects different species of bats eat.

Activity: The players are bats and they must find their corresponding insect to eat, as per the "What's for dinner?" activity sheet.

You will need as many bat cards and insect cards as you have kids. For example, if you have 10 kids, print out 10 bat cards and 10 of the corresponding insect cards. If you have a very young group, you can simplify it by only doing one bat species with only one kind of insect to eat.

This game is a little like musical chairs but instead of chairs there are insect cards to sit beside and instead of music you call out "Foraging time" and clap while the kids fly/walk around the cards. Then stop clapping and call out "Dinner time". When the clapping stops the bats must sit beside their specific insect card.

Set up: Lay out the insect cards in a row. Spread them out so they are about 2 to 3 feet apart and in random order. Give each Nature Kid one bat card. Kids should read their own card and figure out what they eat. Have the kids walk around the line of insect cards when you call out "Foraging time". Suddenly, call out "Dinner time". Bats must sit down and touch the closest insect card to them that they would eat. Only one bat can touch each insect card.

Play: Once they understand the game, remove one insect card so there is now one less insect than there are bats. Repeat the game. If a bat did not get to eat, it goes to the 'night roost' (designated spot) to rest. Remember to remove an insect card after each round. The winner is the bat that gets the last insect. You can play again, but have kids switch so they are different kind of bat.

Information on bat cards:

Name of bat	One of insects that it eats	Where is it found?
Little Brown Myotis	midges	All of BC
Hoary Bat	large moths	All of BC
Townsend's Big-eared Bat	beetles	Everywhere in BC but Skeena, Omineca, and Peace.
Western Small-footed Myotis	caddisflies	Okanagan, Thompson, Kootenay, Cariboo
Pallid Bat	centipedes	Okanagan

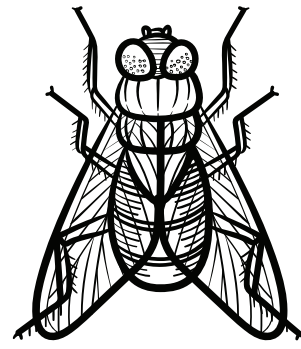
The larger bat species generally eat larger moths and larger hard-bodied beetles (although not exclusively). Smaller bats generally eat smaller insects like midges (tiny flies), caddisflies, and mosquitoes. One bat in the Okanagan, the Pallid Bat, eats scorpions and centipedes by gleaning them off the ground.

Note: This game features 5 different species of bats, and thus works best if you have at least 15 players. If you have less players, decrease the variety of bat species. So, for example, if you only have 5 players, just do one species of bat (e.g. Print out 5 Little Brown Myotis cards and 5 corresponding midge cards.)

Little Brown Myotis

I like to eat tiny flies called midges near lakes.

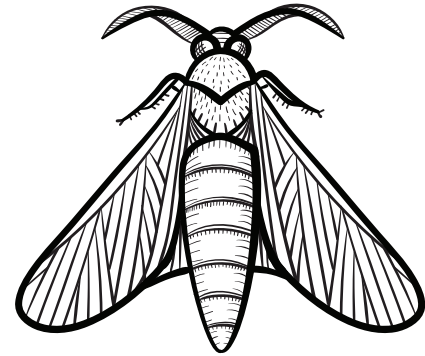
Midge (tiny fly)



Hoary Bat

I like to eat large moths.

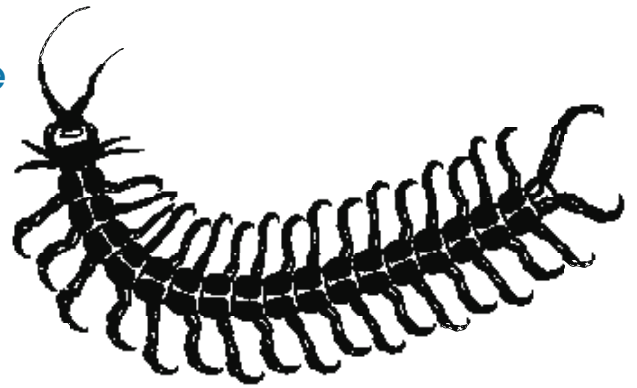
Large moth



Pallid Bat

I like to eat centipedes.

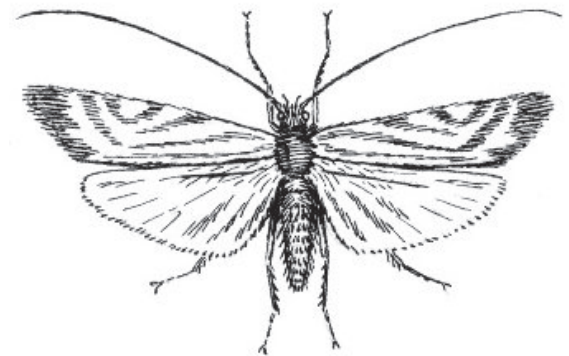
Centipede



Western Small-footed Myotis

I like to eat caddisflies close to creeks.

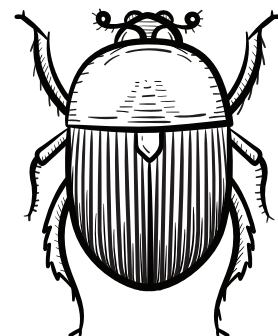
Caddisfly



Townsend's Big-eared Bat

I like to eat beetles.

Beetle



SHELTER**Activity: WHERE DO BATS LIVE?****Duration:** 15 minutes**Materials:** None. Need a natural area with habitat components.

Go for walk in search of bat habitat. Explain that bats need food, water, shelter and space. Take a walk and point out where bats could be found. Look for habitat components where bats could roost or hibernate or that they need for their survival. See Appendix A for more information.

FOOD – where would bats get insects around here? Look for places where insects are found, like streams, ponds, lakes, forest edges, cliffs, rock outcrops.

WATER - Drinking water: Where would a bat get water to drink? Wetlands, lakes, ponds, creeks, pools, troughs.

SHELTER – Where do bats sleep? Roosts. Some bats are very specific about where they roost, others are flexible depending on what is available in the environment. Look for good hiding spots up high where there are cracks big enough to slide your thumb into.

- **Tree Roosts:** wildlife trees (dead and alive) and stumps. Look under thick bark, behind peeling bark, knot holes, old woodpecker cavities, frost cracks, splits, breakage, and tree cavities. Tree-roosting bats like Hoary Bat and Eastern Red Bat hang on branches and hide among the foliage of larger living trees.
- **Rock Roosts:** In rocky areas, look for;
 - Cracks and crevices of cliffs, canyon walls, and boulders
 - Under slabs of rock along rock-faces
 - Cavities in scree of talus slopes or other rock piles
 - Volcanic rock formations
 - Erosion cavities of rock or solidified mud
 - Caves and mines
- **Bridge Roosts:** If it's safe to do so, walk under highway bridges or cement underpasses. Look for crevices that are deep and narrow (1.9 – 2.5 cm wide and 30cm deep).
- **Building Roosts:** Not all bat species will occupy buildings. Little Brown Myotis, Yuma Myotis and Big Brown Bat are the three species that commonly use buildings. Look around the roof line, soffits, chimney, or attic. Barns and log homes. Bat boxes. Wood piles.

SPACE - Habitat: forests, grasslands, riparian areas, talus slopes, canyon walls, boulders. Contrary to myth, few bats in Canada roost in caves during the summer, but they do use them to hibernate in winter.

WATER**Activity: I'M THIRSTY, HOW BIG IS MY POND?****Duration:** 10 minutes**Materials:** 30-metre-long measuring tape, if possible.

Water is essential for bat survival. Bats require open, standing water for drinking as they drink while flying. Studies show water must be close (i.e., less than 2 Km) to their summer roosts). Breeding females get especially dehydrated while nursing young in hot maternity roost. One of the first thing bats do when they leave the roost at nightfall is find a water source to drink.

Not all water sources are available to bats. Different bats species approach water differently. If they are large and built for speed, they are not very maneuverable and need long straight-line flight paths to approach water for drinking. Smaller bats are more maneuverable and slower fliers. They can drink from smaller puddles and may not like large open water bodies due to the increased predation risk out in the open.

Activity: Get the kids to lay out the measuring tape along the ground. Pretend the ground is a small pond or a large lake. Measure how far these distances are and talk about the importance of open water for drinking.

Western Small-footed Myotis	Needs 1m stretch of open water. A small pond or even a trough.
Little Brown Myotis	Needs 3m long x 1m wide space of open water.
Big Brown Bat	Needs 15m long stretch of open water.
Hoary Bat	Needs 30m long stretch of open water. Biggest bat in BC, fast flyers.

ECHOLOCATION

Activity: SEE THE SOUND WAVES

Duration: 10 minutes

Materials: Slinky

Bats have night time superpowers. Bats not only have good eyesight, but they also use echolocation to navigate and hunt for insects. Anybody know what echolocation is? *The location of an object by reflected sound.* In other words, they can find their prey or navigate in the dark by listening for their echo.

Bats make very high-pitched sounds that we can't hear or see, and they listen for the echoes. Most bats in BC make high pitched calls at frequencies much higher than our human ears can detect. Have kids sing the highest "eeee" that they can. Humans can detect sounds with frequencies up to 20 kilohertz. Bat echolocation calls generally range from 20 to 120 kilohertz.

Activity: You need two volunteers – one is the bat, one is the moth. Have the bat stand next to you, and the moth about 5 metres away.

"Sound travels in waves that we can't see, and it bounces back when it hits something. Have you ever heard an echo? We're going to pretend that this slinky is the sound wave."

Give one end of the slinky to the bat, while you keep holding on to the other end. "Bats make very high-pitched calls that we can't hear, but with the slinky we're going to pretend we can see how the bat uses the high-pitched calls to hunt. This is echolocation."

CLICK AND ECHO

Bat holds the slinky close to their mouth and makes 'clicking' sound. You take the other end of the slinky and stretch it out towards a nearby tree, bush, or wall. The slinky bounces back to the bat (you walk with it) while saying 'echo, echo, echo, tree, tree, tree'. The bat is listening for the echo with its big ears. "Ah that's a tree, I have to fly this way".

AVOIDANCE

Repeat...but this time slinky goes towards a person and bounces back "echo, echo, echo, person, person, person". The bat hears the echo when you walk back with the slinky. "Ah, that's a person. I don't want to bump into them. I'll fly this way instead".

CATCH A MOTH

Repeat...this time face towards the 'moth'. Bat calls out, you walk the slinky to the moth. Slinky bounces back 'echo, echo, echo, moth, moth, moth'. The bat hears the echo of the moth and thus knows where dinner is.

Explain that “From the echo, the bat can get an accurate picture in its head of the insect. It can tell how big or small the insect is, whether it’s hard-shelled like a beetle, or softer like a moth. It can tell if the moth is flying up, down, left, or right, and how fast it is going. This bat can then decide if it wants to eat the moth.” Pretend that bat then catches the moth for dinner.

ECHOLOCATION

Activity: FEEL THE SOUND WAVES

Duration: 5 minutes

Materials: None, just your hands.

Sound travels in waves that we can’t see, and it bounces back when it hits something. We’re going to do an exercise to show you how sound waves could feel like. First, make a puffing sounds by sounding out the letter “p” without using your voice (so just the p and not the ‘e’). Second, cup your hands together as if you were trying to hold a glass ball in your hands. Bring your cupped hands up to lips. Thirdly, make the puffing sound while holding hands close to lips. You should be able to feel the puff of air bounce back to your face. Keep ‘puffing’, and then start moving your cupped hands away from your face slowly. How far can you get from your face before you can’t feel the ‘puff’ anymore?

ECHOLOCATION

Activity: BAT AND MOTH GAME

Duration: 15 – 20 minutes

Materials: blindfold

Designate boundaries and have some adults stand along boundaries. This game is a little like ‘Marco Polo’. One person is the ‘bat’. Blindfold them. They call out ‘bat, bat’ or ‘click, click’. The rest of the kids are ‘moths’ and they are bat food. Every time the bat calls out ‘bat, bat’, the moths must reply loud and clear with a ‘buzz, buzz’. Objective is for bat to try to catch the moths just by listening.

Game rules:

- ✓ Moths must respond if the bat calls.
- ✓ Moths must walk. If they run, they are out of the game. Or you might need to impose another rule where moths can only take a maximum of 3 steps at a time.
- ✓ When a moth is tagged, they go to the bat cave (designated area) until the next round.

HIBERNATION OR MIGRATION

Activity: DEEP SLEEP

Duration: 15 minutes

Materials: Your heartbeat and a watch

Bats are small and have relatively poor insulation. Normal body temperature is 40 degrees Celsius and their heart rate at rest is 100-200 beats per minute (for a Little Brown Myotis). When food is scarce, like during a stormy night or during winter, fuel consumption goes down. When this happens, bats can lower their metabolic rate and body temperature. Over short periods of time, this is called torpor; over long periods it's called hibernation.

	Little Brown Myotis	Human child
Resting heart rate	100-200 beats per minute	80-100 beats per minute
Heart rate when active	>1000 bpm (when flying)	Up to 200 bpm
Normal body temperature	40° Celsius	37° Celsius
Torpid or hibernating body temperature	5° Celsius	-

Activity:

We're now going to talk about what bats do in the winter. Can anyone tell me what happens to the insects in winter? There are very few, if any insects. Can bats find insects to eat in winter? No. Since there is no food, bats have two options. Anyone know what these are? Hibernate or migrate south to warmer areas where there are insects in winter.

HIBERNATION

Let's talk about hibernation first. Bats can lower their body temperature and heart rate until they are in a deep sleep.

Heart rate:

- Can everyone find their pulse? (show them how – on neck or wrist – once they find it, see if they can count it for 30 seconds or one minute). Now I want everyone to jump or run for one minute. Then find pulse and count it again. What happened to your pulse rate? Heart rate for child is 80-100 beats per minute at rest and can be up to 200 bpm when exercising.
- Compare to a bat: resting heart rate 100-200bpm, and when exercising it goes up to 1000bpm. That's 16 beats in one second. (You can simulate heart beat by tapping hand on chest. Try to do 1 beat per second vs. 16 beats every second). When bats go into hibernation, their heart beats go down to less than 5 beats per minute. (If tapping hand on chest, that's about one beat every 11 seconds).

Body temperature:

- Does anybody know what our body temperature is? 37°C. Bats are a bit warmer at 40°C.
- When a bat goes into hibernation, it lowers its temperature to 5 °C. Water freezes at zero Celsius. Food in the refrigerator is about 2°C.

Waking up from hibernation:

- When a bat wakes up from hibernation, it must increase its heartbeat and shiver to increase its body temperature. This takes about 30 minutes and then it can fly away. This takes a lot of energy. Once a bat is awake, it becomes hungry and thirsty.
- If a bat gets disturbed in a cave during hibernation, it uses up energy to raise its heartrate and warm itself up. When it wakes, it is hungry and thirsty. But it is winter time, are there insects for them to eat? No. Can they get water to drink? Not always, water is frozen. It's very important to leave bats alone in winter, so they can conserve their energy until spring.

Note: Do you know that bats can go into a mini-hibernation at any time even in summer, to save energy? If there is a storm or it gets cold outside and they need to save energy, they go into torpor. They lower their heartrate and body temperature and sleep until the weather improves.

MIGRATION

There are 2 kinds of bats in BC that migrate. Who can tell me what migration is? *Seasonal movement from one place to another.* What is another animal that migrates? Birds.

Two bat species migrate south where insects are abundant over winter:

- Hoary Bat – likely fly south to southern United States and Mexico
- Red Bat – likely southeastern United States

The Silver-haired Bat and in places, the Hoary bat, seem to use a combination of both strategies, they migrate to a different winter range and hibernate there until spring.

EXTRA INFORMATION:

Breeding females do not go into torpor as much as males, as they need to think about fetal development and high milk production. This is the reason why females choose warmer roosts than males. It is thought that males enter torpor more frequently than females.

Most BC bats hibernate in winter. Before hibernating, some have accumulated as much as 40% of their summer weight in fat to use as energy in winter.

LIFE CYCLE**Activity: BAT PLAY ALONG****Duration:** 15 minutes**Materials:** 'Lifecycle of bats in British Columbia' diagram

Show diagram of life cycle. Talk about each season briefly, then do a play-along (pretend to be a bat and follow the leader – you). You can use the diagram to see what the bat does in each season.

Form a circle. Tell the Nature Kids that you are now all bats. Lay down on ground and put your feet up. Pretend to be roosting/sleeping upside down. Deep in sleep. Deep in hibernation.

SPRING: Spring is coming. You feel it's warming up. Start to shiver to warm up your body temperature from 5°C to 40°C (pretend it will take you 30 minutes to warm up). Your heart beat starts beating faster (from 5 beats per minute to 100 beats per minute). Once awake, you stretch your wings, clean your fur by licking (all upside down!). Then fly out of the cave. Follow the leader (have the kids follow you). Hunt for insects. Pretend you are looking for maternity roost – perhaps a big tree, under the bark, in a rock crevice, a bat box, or the eaves or attic of a building.

SUMMER: Form a circle. Pretend you are nice a warm in roost. You are female bat that is pregnant. It's now June, and you give birth to one pup. If you have older boys in group, you can say "If you don't want to pretend to be a female bat, you can be a male bat roosting under the bark of tree, keeping an eye on the maternity roost." Mama Bats - Each night you leave your pup with a babysitter (another adult female), and you go hunting for insects. Pretend come back to roost to your pup, and to sleep.

Pretend you are now the pup! Pup is clumsy. Pups born with eyes closed, ears are limp, no fur so you are naked like a baby. Can't fly. Tiny. Curl up with mom to drink breast milk. Pup is now 3 weeks old. It has opened eyes, ears are up, fur has grown in. Let's learn to fly. Off you go. Follow the leader again. Can't fly very well. Bump into tree. End up on floor. You have to climb up the tree to get enough height to be able to then turn around and use gravity to fly off. Fly again. Back to roost. Oh dear, I'm tired. And guess what? I just lost my baby bat tooth! (yes, baby bats lose their milk teeth and grow adult bat teeth when ready to wean). Fall asleep.

FALL: Pup is now 3 or 4 months old and all grown up. Very good flier. Off you go to hunt for insects. Leave your maternity roost where you were born. Find other bat friends. Go explore and fatten up. (Pups don't mate until their second autumn). Nights are getting colder.

WINTER: - Find a cave to hibernate in.

You have fattened up to 40% your spring weight. How much is 40%? Ask kids how much they weigh. So, for kids: if you weighed 50 lbs in spring, you are now 70 lbs. 60lbs you are now 84 lbs. 70 lbs you are now 98lbs. If you were 100 lbs, you are now 140 lbs.

You lower your body temperature from 40C to 5C, and your heartbeat from 100 beats per minute to 5 beat per minute. Now hibernating until spring.

Note: Average child weights (+ or – 15 lbs)

5-year-old = 40 lbs

6-year-old = 47 lbs

7-year-old = 50 lbs

8-year-old = 57 lbs

9-year-old = 65 lbs

10-year-old = 72 lbs

Lifecycle of bats in British Columbia

- Bats return to BC or wake up from hibernation
- Hungry and thirsty
- Females pregnant
- Find summer roost

JasonOndreicka, istock



JAH, istock



- Females gather in maternity roosts
- Pups are born
- Pups learn to fly in late summer
- Males usually roost by themselves

J. Craig



Christian Gronau

Noel Reynolds, CC



David J. Thomas, CC



C. Lausen



JasonOndreicka, istock



cheri131, istock



through-my-lens, istock



- Hibernate (13 out of 15 BC species)
- Live in southern USA and Mexico (2 out of 15 species)

- Leave the summer roost
- Mating
- Find hibernacula or migrate south



JAH, istock

CONCLUSION

Activity: HOW MUCH DO YOU KNOW ABOUT BATS? QUIZ

Duration: 10 minutes

Materials: 'How much do you know about bats?' Quiz that kids filled out at the beginning, pencils, and quiz answer sheet.

We're near the end of our program. Let's see how much you learnt about bats.

Hand out their warm up quiz. Give them 5 minutes to read thru the warm up activity quiz. Don't let them erase their original answer. This time get them to underline the answer instead of circle it.

Then go thru the right answer with the whole group.

How many people learnt something during the Explorer Day?

ANSWERS TO WARM UP ACTIVITY: How much do you know about bats?

Bats can fly because they are related to birds.

True False

No, bats are mammals not birds.

The bats that live in B.C. eat insects and fruit.

True False

No, the bats in BC only eat insects and arachnids. Fruit-eating bats live in tropical areas where they can find fruit year-round.

Bats use echolocation to find their food at night.

True False

Yes, and they also have great night vision.

The place where bats sleep is called a roost.

True False

Yes, and some are day or night roosts depending on when they use them.

Bats are rodents like mice and rats.

True False

No, bats are chiropterans, not rodents.

Bats like to fly into people's hair.

True False

No, bats have excellent navigation skills and they fear people. However, if you are walking thru a grassy field at dusk, you might be stirring up insects that then fly around your head.

Bats might be trying to catch those insects.

Vampire bats eat blood.

True False

Yes, there are 3 species of vampire bats that drink blood. They usually bite the legs of sleeping cows or chickens. Their saliva has anti-coagulant. The tiny trickle of blood runs out and the bat laps the blood up. They do not suck blood. They don't kill the animal they bite.

We have vampire bats around here.

True False

No, they live in Central and South America.

Bats are wild animals and when they are scared, they can bite.

True False

Yes, treat bats like you do other wild animals. They will likely be scared of you. Most will be very shy, but some can bite in self-defence.

You should never touch a bat with bare hands.

True False

Kids should be taught to never touch a bat...always tell an adult. Although very rare, there is potential to contract rabies from a bat bite or scratch. Rabies is a virus that occurs at very low levels in bat populations throughout BC (about one in every thousand bats). If a bat is in a place where pets or people might be tempted to pick it up, it should be moved. Thick leather gloves must be worn to protect yourself from bat bites. Use the 'box and cardboard' method (much like removing a bee – gently cover the bat with a small box and slip the cardboard underneath carefully to trap the bat). Release the bat at base of a tree. Tip box over as bat will not be able to climb out of a box. Visit www.bcbats.ca for more information.

Some bats roost in house attics and it's OK to let them stay.

True False

Yes, if bats are being managed, it is perfectly safe to co-exist with bats in your attic. Bats should not be allowed to enter the living quarters of a home. Bats can quite often safely use portions of a building where human contact will not occur.

How many different bat species live in British Columbia?

2

5

15

50

How many bat species exist in the World?

50

500

over 1000

APPENDIX A. Bat species in BC and their summer and winter roosts.

TABLE 1. BAT SPECIES FOUND IN EACH REGION OF BRITISH COLUMBIA

	Scientific Name	Status	BC Ministry of Environment Region									
			Vancouver Island	Lower Mainland	Sunshine Coast	Thompson	Kootenay	Cariboo	Skeena	Omineca	Okanagan	Peace
Spotted Bat	<i>Euderma maculatum</i>	SC ¹ ; Blue (BC)				x		x			x	
Pallid Bat	<i>Antrozous pallidus</i>	T ¹ ; Red (BC)									x	
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	Blue (BC)	x	x	x	x	x	x			x	
Hoary Bat	<i>Lasiurus cinereus</i>	Not at risk	x	x	x	x	x	x	x	x	x	x
Eastern Red Bat	<i>Lasiurus borealis</i>	Red (BC)					?				x	x
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	Not at risk	x	x	x	x	x	x	x	x	x	x
Big Brown Bat	<i>Eptesicus fuscus</i>	Not at risk	x	x	x	x	x	x	x	x	x	x
Yuma Myotis	<i>Myotis yumanensis</i>	Not at risk	x	x	x	x	x	x	x		x	
Californian Myotis	<i>Myotis californicus</i>	Not at risk	x	x	x	x	x	x	x		x	
Western Small-footed Myotis	<i>Myotis ciliolabrum</i>	Blue (BC)				x	x	x			x	
Northern Myotis	<i>Myotis septentrionalis</i>	E ¹ ; Blue (BC)					x	x	x	x		x
Long-legged Myotis	<i>Myotis volans</i>	Not at risk	x	x	x	x	x	x	x	x	x	x
Little Brown Myotis	<i>Myotis lucifugus</i>	E ¹	x	x	x	x	x	x	x	x	x	x
Fringed Myotis	<i>Myotis thysanodes</i>	Blue (BC)	?	?	?	x	x	x			x	
Long-eared Myotis²	<i>Myotis evotis</i>	Not at risk	x	x	x	x	x	x	x	x	x	x
Canyon bat	<i>Parastrellus hesperus</i>										(x) ³	
Mexican Free-tailed Bat	<i>Tadarida brasiliensis</i>		(x) ³	(x) ³	(x) ³							

¹ COSEWIC Status (federal): E = Endangered, T = Threatened, SC = Special Concern, ² Long-eared Myotis (*Myotis evotis*) includes the species formally known as Keen's Myotis because genetic evidence indicates these are the same species. ³ Acoustic records only; currently considered Accidental in BC.

Modified from: Craig, V.J., and S. L. Holroyd. 2004. Bat Conservation Strategy for BC and Alberta. Draft. Prepared for BC Ministry of Water, Land and Air Protection. 112 pp.

Excerpt from BC Community Bat Program. 2018. *Bat-Friendly Communities: A guide for managing and enhancing bat habitat in BC*. www.bcbats.ca.

TABLE 2. SUMMER AND WINTER ROOSTS USED BY BRITISH COLUMBIA BATS

Common Name	Summer Roosts			Winter Roosts
	Buildings	Bat House User	Natural roosts	
Spotted Bat			Cliffs	Cliffs, mines (assumed)
Pallid Bat	Potentially		Cliffs, rock outcrops, snags	Rock crevices?
Townsend's Big-eared Bat	Common	Big ones	Cliffs, caves, mines	Mines, caves, rock crevices
Hoary Bat			Foliage of trees	Migrates
Eastern Red Bat			Foliage of trees	Migrates
Silver-haired Bat			Trees, snags (cottonwoods)	Snags, live trees, mines, buildings, wood piles, rock crevices
Big Brown Bat	Common	Yes	Snags, cliffs, rock crevices	Buildings, mines, rock crevices
Yuma Myotis	Common	Yes	Snags, rock crevices, mines, bridges	Mines, rock crevices, caves
Californian Myotis	Occasional	Yes	Snags, mines, bridges, rock outcrops & crevices	Buildings, mines, caves, rock crevices, tree root wads
Western Small-footed Myotis	Occasional		Cliffs, rock crevices, mines,	Mines, cliff crevices
Northern Myotis	Rarely		Snags	Mines, caves, rock crevices
Long-legged Myotis	Occasional		Cliffs, rock crevices, snags, stumps	Mines, caves, rock crevices
Little Brown Myotis	Common	Yes	Snags, rock crevices, cliffs, mines	Mines, caves, rock crevices, tree root wads
Fringed Myotis	Occasional		Cliffs, rock crevices, trees, mines	Mines, rock crevices
Long-eared Myotis	Occasional	Yes	Cliffs, snags, stumps, talus slopes, rock outcrops, crevices, mines	Mines, buildings, rock crevices
Canyon Bat ¹			Cliffs, rock crevices	Rock crevices, caves?
Mexican Free-tailed Bat ¹	Common	Yes	Trees, Caves	Migrates?

¹ Canyon Bat and Mexican Free-tailed Bat only detected acoustically in BC; extent of habitat use in BC is unknown.

Excerpt from BC Community Bat Program. 2018. *Bat-Friendly Communities: A guide for managing and enhancing bat habitat in BC*. www.bcbats.ca.

APPENDIX 2. List of materials needed for the activities.

Concept	Activity	Materials
Introduction	How much do you know about bats? Quiz	Print and cut out quiz. One quiz per participant. Pencils for each participant.
Bats are Mammals	Bats of British Columbia	Bat poster, print and cut out one set of Bat ID Cards.
Bats are Nocturnal	Day time – night time game	Print DAY and NIGHT pages or make your own.
Bat Wings	Meet Otis, the bat	Folkmanis bat mini puppet
What do bats need to survive?	Food, water, shelter, or space?	Cloth bag, water bottle, toy house, toy insects (beetle, fly, mosquito, moth), spider, centipede, scorpion, toy tree, toy cave. Or print and cut out activity sheet.
Food	What's for dinner?	Print bat and insect sheet. You need a bat and corresponding insect for each player, so you may need to print out several copies of this sheet.
Shelter	Where do bats live?	None. Played in natural area.
Water	I'm thirsty. How big is my pond?	Measuring tape, 30 meters long if possible.
Echolocation	See the sound waves	Slinky
Echolocation	Feel the sound waves	None. Just need your hands.
Echolocation	Bat – moth game (like Marco Polo)	Blind fold
Hibernation/Migration	Deep Sleep	A watch and your heartbeat.
Life cycle	Play along	Print Life Cycle diagram.
Conclusion	Bat quiz answers	Print out the answers to the quiz.