

BAT SIGNS AND PROJECTS

Notes for facilitators

Catching and handling bats requires a lot of training and should be only undertaken as part of a research programme organized by an experienced scientist. BUT that doesn't mean that nature groups or students can't observe and learn about bats, and even design a project of their own.

These projects are suitable for children over 14 years old and for adult naturalist groups. Each project starts simply and then provides suggestions on how to develop the project over a longer time period. The projects require little equipment, although 'Project 1: Aerial hunters' is enhanced by the use of a bat detector.

PROJECT 1: AERIAL HUNTERS

LOOK UP! Aerial hunters in action.

Watch in the garden at dusk, just as it starts to get dark. Lots of insectivorous bats feed in the open spaces above trees or houses, along the edge of trees, in and around garden trees. Another good place to see bats hunting is around lights in more rural areas, or in parks. The lights attract the insects, and the insects attract the bats. There are often lots of insects over water, so watch for bats hunting over ponds, lakes or streams. There are so many insects around at dusk that the bats soon eat their fill, so you haven't got long to watch for them, maybe 30 minutes to an hour, so be ready as the sun starts to fade! Once you get your eye in, you can start thinking about designing a project - use these questions to help you.

- **How many different species can you see?** Try and guess from the different shapes of the wings, from the size, from how they are flying (fast/slow, direct/wandering) and from where exactly they are flying (how close to the vegetation do they get - are they always in the open or do they duck in amongst the trees?).
- **Can you hear them?** There are one or two species that it is just possible, if you have sharp ears, to hear as they echolocate.
- **Watch for several nights** - do they always come out at the same time? What is the weather like each night, and what time does the sun officially set? Which bats arrive first? Is it the same species each night?
- **Compare two sites.** If you get really good at bat-spotting at one site, maybe try another - do you think you have the same species at both sites? How do the sites differ? Think about the vegetation, distance to water, distance to buildings.

BAT DETECTORS - Listening in on the world of bats!

If you have a bat detector it's even easier to find insectivorous bats, especially the species that forage at the edge of the forest, or high overhead, or in towns and villages. Rivers and streams are also superb places to listen for bats with your detector. See how many different species you can pick up - each species should have a characteristic

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frequency where the signal is loudest. Again, you can find out how many species are in the area, if this changes from night to night, and what sorts of habitats seem to have most bats.

Many of the species that are specialised to forage inside the forest are more difficult to detect because they use very high frequencies that don't travel far, or because their calls are very quiet. There are some exceptions - tune your bat detector to 53 kHz and take a walk through the forest - if you hear a persistent 'beeping' you are on the trail of a trefoil horseshoe bat (*Rhinolophus trifolius*). You might even be able to find where he is perching in the understorey! Change the frequency to 60 kHz and you might pick up a diadem roundleaf bat (*Hipposideros diadema*).

PROJECT 2: FINDING FRUIT BATS - Food and shelter.

Chew, suck, swallow and spit! Fruit bats in the Old World eat a lot of fruits that have a large number of seeds, like figs, or tough, fibrous flesh. There is not much nutritional value in these parts of the fruit, and they would soon fill the bat up completely! So the bats chew up the fruits as best they can, suck the mouthful as hard as possible, swallow the juices and spit out the rest! The bits that are spat out are called rejecta pellets; they have been sucked so hard that they are quite dry and hold the shape of the bats' mouth - you can even see holes where the teeth were! Do you recognize the fruits? Sometimes if the pulp or seeds are very distinctive, you might. Look out for rejecta pellets in forests or gardens - there are often clusters of them near a fruiting tree. If you go back to that tree at night, you might well hear or see the bats feeding.

Look out for tent roosts, especially in palm trees and banana plants. If a relatively young leaf has collapsed around the sides, have a look up under it. If it is a tent roost, the supporting veins will be severed, and if you are very lucky bats like the short-nosed fruit bat (*Cynopterus brachyotis*) may be roosting there. *Cynopterus brachyotis* is quite a common species in gardens and suburbs and will also make the most of man-made roosts like quieter outbuildings and sheds.

FRUIT BAT DIETS - an extensive menu!

If you find a fruit bat roost then you can find out for yourself what they eat in your area. Collect the droppings, rejecta pellets and large seeds that fall beneath the roost - the best way is to make a tray of netting (to let rain through) that is on short legs. Place the tray beneath the roost and check it every few days to once a week (always be as quiet as possible so as not to disturb the bats). Droppings and rejecta pellets will collect on the tray, and you can then sort through them for the seeds that the bats have been eating.

- **Species diversity** - How many different species of plant do you think the bats are visiting? Do you recognise any of the seeds or fruit fragments? Are any of them in your garden? You can compare large seeds to those found in fruits in your garden or neighbourhood.

- **Seasonal variation** - if you can monitor the roost throughout the year, find out if the colony uses different species of plants at different times of year.
- **Seed viability** - do you think that the small seeds that have passed through the bat are more or less likely to germinate or than those from the ripe fruit, or in the rejecta pellets? Find out:

Seed viability - germination

1. First see if the seeds in the droppings will germinate.
2. Sort through the droppings for seeds of the same type - use the size and shape of the seed to distinguish them (you may need to use a magnifying glass or binocular microscope if they are very small).
3. Prepare a Petri dish lined with moistened filter paper. Space out the seeds about 1 cm apart in rows on the filter paper (25 - 50 seeds is a good number) - try and get the same number in each dish that you use so it is easier to count and compare them. Make sure each dish has the same kinds of seeds in it. Put the lid of the Petri dish on. If you can't get hold of a Petri dish and filter paper you can use a shallow dish or saucer covered in cling film (plastic wrap) and lined with moistened blotting paper.
4. Leave the dish in an area where there are natural conditions of temperature and day length.
5. Check the seeds for signs of germination every 1 to 3 days - germination times will vary with the type of seeds from 2-3 days to up to 14 days.

- **Germination rates** - Did any of the seeds germinate? If so, what percentage of the seeds germinated? How many days did it take for germination? If you have several different kinds of seeds being tested, did the germination rates (the percentage that germinated) differ? Did the time it took to germinate differ?

- **Comparison with rejecta pellets** - If you have found rejecta pellets with seeds in, repeat this experiment with seeds from rejecta pellets. Compare your results with the germination rates of seeds from the droppings. Do more seeds germinate if they have passed through the bat, do less seeds germinate, or is it about the same?

- **Comparison with fresh seeds** - Small seeds often come from figs - if you can match the seeds from the droppings with those from a fig in your garden or neighbourhood, repeat the experiment with seeds from a ripe fig. How does the germination rate of seeds from the fruit compare with that of the seeds from droppings and from rejecta pellets?

FRUIT BAT SEEDLING NURSERY - grow your own bat forest!

If your germinated seeds are doing well, you can plant them out into small tray with some soil. As the seedlings grow, it becomes easier to tell the different plants apart. How many different fruits do you think your fruit bats are eating? How does this compare to your estimates from the seeds and fragments under the roost. If you can collect seeds throughout the year, you can see if the food plants change through the year.

If your seedlings survive for several months, you may even be able to compare them to seedlings found in your neighbourhood or gardens. Look closely at the leaves - but be careful, the leaves of seedlings often aren't the same as those of the adult plants so you can only really compare seedlings with seedlings.

If you are a really gifted gardener and your seedlings survive to have several leaves, transplant them to a small pot, and maybe eventually even to your garden!

PROJECT 3: MONITORING ROOSTS – a bat conservation project

Lots of bats use buildings and caves to roost in, and this provides a good opportunity to see how well a local population is doing. BUT if you disturb the bats by entering the cave or making too much noise by the building-roost, they may abandon the roost and be homeless. Instead, wait outside and watch as the bats come out at dusk – that way you may see hundreds of bats going about their nightly routine. What time did they come out? Can you count how many? So many wrinkle-lipped bats (*Tadarida plicata*) live in Gomantong Caves in Sabah that it can take over an hour for them all to leave! If you and your bat group have a cave or roost nearby then you could start a monitoring project, by counting the bats at different times of year, and maybe, eventually, over many years. That way you can tell if the numbers are increasing or decreasing.

How to count bats.

If the colony is small, then it is often possible to count each individual bat as it emerges from the roost. If the colony contains hundreds or thousands of bats, then this isn't usually possible. Instead we have to estimate the numbers by sampling the colony for shorter periods. So, count how many bats leave during exactly one minute. Then repeat this one-minute count several times during the emergence. If your emergence counts were 27, 36, 34, and 23 what is the average? If the emergence took 20 minutes how many bats would that be? (20 x your average for 1 minute); this is your approximate colony size. It's a good idea to spread out your emergence counts, and to make sure that the start and end of emergence include at least one count each.

BAT ACTION LINK: If you do find a roost somewhere, tell us about it! Email the MBCRU at tigga@bu.edu. Remember to include the following information:

- Location – as precise a geographical location as possible.
- Roost type: where the bats are roosting – start with general information like a house and then get more specific e.g. under the tiles in a roof facing South.
- How many bats are roosting there (approximately)
- How long have you known about the roost? If it has been there for many years, are bats in it all year round?

DANGER: DO NOT HANDLE BATS!

Bats in the hand can become frightened and bite in self-defence. Think about it - if you were suddenly captured by a strange creature that was more than 5000 times bigger than you, you might try and escape somehow too! Scientists who work with bats are trained to hold them so that they are less scared and can't bite. Any bat that can be caught may also be sick, and its bite could be dangerous, so always leave them alone.