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Tuning in with a Bat Detector
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The echolocation calls of most bat species are beyond the range of human hearing. A bat detector, however, can make these signals audible to humans. High intensity echolocation calls are especially conspicuous, providing people with an excellent way of "eavesdropping" on bats.

A bat detector microphone is sensitive to sound beyond the range of human hearing. The circuitry within the detector converts the input into signals audible to our ears and broadcasts it over a small speaker. Human beings are exceptional among mammals because they cannot hear a broad range of high frequency sounds. Like birds, reptiles, and amphibians, humans hear best at frequencies below five kilohertz (KHz); most of our conversations are conducted below three kHz. A bat detector permits you to eavesdrop on sounds in the 10 kHz to 200 kHz range, including those of other mammals and many insects.

In addition to being important research tools, bat detectors are also an excellent way to introduce people to bats during interpretive programs. Many bat enthusiasts use them for sheer enjoyment as well. With a bat detector, you can collect information about two aspects of animal sounds--the frequencies of the calls and the rates at which they are produced. By listening carefully, you also can gain information about the amount of energy the calls contain at different frequencies.

On a typical summer evening in many North American cities, you will hear bat echolocation calls when you tune the instrument to between 25 kHz and 60 kHz. In many areas, the bats producing these signals will be big brown bats (*Eptesicus fuscus*), a common species. These bats typically produce echolocation calls lasting from five to 10 milliseconds (ms=thousandths of a second). As you listen, notice that the rate at which bats are producing their calls varies according to the situation.

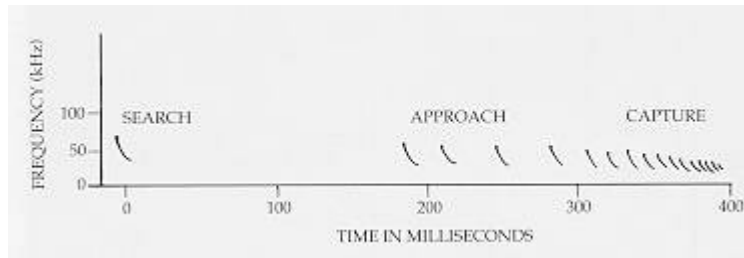
A big brown bat cruising along and looking for an insect produces a call every 50-100 ms (10-20 calls per second), but as it approaches its target it increases its call rate to 200 per ms, reducing the time between calls to about five ms. These high-pulse repetition rates occur either when the bat attacks an insect (a "feeding buzz"), or when it approaches an obstacle (a "landing buzz"). As the bat closes in on its target, notice how it shortens its individual calls. If you are listening in on 30 kHz, for example, the sound will change from a "putt" to a "click," reflecting the shorter calls and relative amounts of energy used at different frequencies.

Watching bats and insects around a bright streetlight will yield even more information, because you will be able to associate the bat's behavior with its calls. Watch as it chases a moth. Listen to the difference in the signals as it approaches, and then catches, its prey. Now close your eyes and listen. Chances are you will know what the bat is doing merely by the repetition rate of its calls.

Not all bat species will sound the same, and when you become proficient, you can often

identify a species by the tone of its call, just as bird watchers identify birds by their songs. The degree of resolution depends on the bats, but in many places in North America, a bat detector giving tone-like chirps at 40 kHz signals a red bat (*Lasiurus borealis*), a tree-roosting species. Tick-like sounds at 40 kHz suggest a *Myotis*, a common genus that includes one of our most abundant bats, the little brown bat (*Myotis lucifugus*). Tone-like chirps at 20 kHz usually indicate a hoary bat (*Lasiurus cinereus*), another tree-rooster.

Echolocation is clearly one of the most fascinating aspects of the biology and behavior of bats. If you want the thrill of listening in, get a bat detector, find a light with a lot of insect activity, and tune in on the action! You will be richly rewarded.



With the aid of a bat detector, a bat's ultrasonic echolocation calls become audible to the human ear. This sonogram illustrates the timing and sequence of calls produced by a big brown bat as it searches for, detects, and attacks a flying June beetle. Each call starts at a higher frequency and sweeps to a lower one. Note that as the bat closes in on its prey, it produces shorter calls at a more rapid rate, terminating in what is called a "feeding buzz." The entire sequence lasts less than a half a second.

Mini-2 bat detectors are available through the BCI catalogue for \$250.00 (member price), plus \$10.00 for shipping and handling.

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