Building a Better Bat Detector

Author: Cohn, Jeffrey P.

Source: BioScience, 57(7) : 640

Published By: American Institute of Biological Sciences

URL: https://doi.org/10.1641/B570718

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Deborah Buecher studies bats in the Sabino Canyon Recreation Area and the San Pedro River Valley, both near Tucson, Arizona. Instead of using mist nets to capture the bats, however, Buecher—a graduate student in wildlife biology at the University of Arizona—uses a microphone and tape recorder to capture the calls bats make while echolocating, and a special software program to transfer those sounds via flash cards to a computer or PDA (personal digital assistant).

Buecher and other bat researchers employ tools known as bat detectors to identify which bats are using an area by the calls they emit. The researchers can then determine how many bats use an area and how they use it—for flying through, for catching flying insects, or for finding drinking water, for example. And they can learn the habitat needs—riparian, woodlands, grasslands, or desert—of individual bat species, information that land managers can use to help them manage resources.

"We can use bat detectors to answer specific research questions in ways mist nets alone cannot be used," says Susan Loeb, a research ecologist with the US Forest Service's Southern Research Station at Clemson University. Detectors "give me the kind of data I need to identify species over a broad area. You can't do that with random sampling."

Bat detectors have been around since the 1970s, says Christopher Corben, an independent bat researcher in Columbia, Missouri, and a self-described techno-freak. Developing microphones, amplifiers, and recorders was no problem; the hard part was figuring out ways to make acoustic information available so it can be seen, analyzed, and used. It was not until good personal computers came into use in the mid-1980s that truly effective bat detectors became possible, Corben says. By 1990, he had designed equipment and a software package that could capture bat calls, convert them to a digital signal, store them for later study, and transfer them to a computer on which they could be seen and studied. Known as AnaBat, Corben's system could be bought off the shelf, carried easily, preset to record at specific times, and then left at a research site for days, weeks, or even months.

But AnaBat is not the only bat detection system available now, nor do all researchers consider it the best. "AnaBat was a brilliant solution to the problem of recording high-frequency calls," says Joseph Szewczak, an associate professor of biology at Humboldt State University in Arcata, California, "but it has limitations."

"I don't know a single person today who studies bat echolocation using AnaBat," adds Brock Fenton, professor and chairman of biology at the University of Western Ontario in London, Canada. "Other systems detect more calls, show their strength, and allow more data to be more accurately analyzed."

The problem, Szewczak says, is that the calls of some bats are hard to distinguish from those of others. Furthermore, AnaBat does not detect the full range at which different bats call. Nor does it provide data on the harmonics, frequency, or other details of bat sounds. "The computers of the 1990s could not supply the extra sound content in bat calls," he says. "Those of today can."

To address those problems, Szewczak and his colleagues designed equipment and software that provide more data on bat calls, enabling researchers to better identify bats. The equipment, made by Pettersson, a Swedish electronics firm, and accompanying software (called SonoBat) allow computers to receive and store greater amounts of data. That requires additional memory capacity and larger hard drives, which computers now possess.

Still another bat detection system uses binary acoustics to record and analyze bat sounds. "I originally built the equipment so I could sit in my back yard and hear bats," says Mark Jensen, president of Binary Acoustics Technology in Tucson. Jensen's system is especially useful for recording bat sounds at great distances. It has been used to study the effect of wind towers on bat populations in the eastern United States and for other projects.

For her part, Loeb uses AnaBat to study how forest management affects bats at the Savannah River Site and Congaree National Forest in South Carolina. Surprisingly, she found that bats are much more active in sections of forest that have been thinned or burned. She thinks the bats can maneuver more easily in the more open areas than in the denser forest.

"We need a good understanding of which bats use the river," says William Childress, manager of the Bureau of Land Management's San Pedro National Conservation Area. Research by Buecher and others using bat detectors "will let us document the species that live here. That will help us manage the habitat for bats and other wildlife."

Jeffrey P. Cohn (e-mail: jeffcohn@sbcglobal.net) is a freelance science writer living in Takoma Park, Maryland.

doi:10.1641/B570718
Include this information when citing this material.