Tiger moths: Mother Nature's fortune tellers

June 3 2013

When it comes to saving its own hide, the tiger moth can predict the future. A new study by researchers at Wake Forest University shows *Bertholdia trigona*, a species of tiger moth found in the Arizona desert, can tell if an echo-locating bat is going to attack it well before the predator swoops in for the kill – making the intuitive, tiny-winged insect a master of self-preservation.

Predators in the night

A bat uses sonar to hunt at night. The small mammal emits a series of ultrasonic cries and listens carefully to the echoes that return. By determining how long it takes the sound to bounce back, the bat can figure out how far away its prey is.

Aaron Corcoran and William Conner of Wake Forest previously discovered *Bertholdia trigona* defends itself by jamming its predators' sonar. Conner, a professor of biology, said the tiger moth has a blister of cuticle on either side of its thorax called a tymbal. It flexes this structure to create a high-pitched, clicking sound.

The moth emits more than 4,500 clicks per second right when the bat would normally attack, jamming its sonar.

"It is the only animal in the world we know of that can jam its predator's sonar," Conner said. "Bats and tiger moths are in the midst of an evolutionary arms race."

The new study published May 6 in the journal *PLOS ONE*, shows that tiger moths can tell when it is time to start clicking by listening for a telltale change in the repetition rate of the bat's cries and an increase in sound intensity. The combination of these two factors tells the moth that it has been targeted.

Conner's team used high-speed infrared cameras to create 3D maps of the flight paths of bats attacking tiger moths. They then used an ultrasonic microphone to measure the rate of bat cries and moth clicks.

Normally, a bat attack starts with relatively intermittent cries. As it gets closer to the moth, a bat increases the rate at which it produces cries —painting a clearer picture of the moth's location.

Conner's team found that soon after the bats detected and targeted their prey, moths increased their rate of clicking dramatically, causing the predators to veer off course. The sonar jamming works 93 percent of the time. When the tymbal is removed, Conner says the bat will catch the tiger moth 83 percent of the time.

He said this is the first quantitative study to show an animal can trigger defensive behaviors by measuring ultrasonic signals provided by predators during an attack.

Provided by Wake Forest University