

INSIDE JEB

Listening antlions drop to evade dining bats



A 3D microCT scan of an antlion. Photo credit: Marc Holderied.

In the arms race between bats and their prey, stealthy bats should have the whip hand when their victims are deaf. Yet, their ultrasonic navigation system can betray them. Marc Holderied from the University of Bristol, UK, explains that some nocturnal creatures can hear, and tune into, the bats' navigation system in advance of an attack to take evasive action. One insect, which would seem to be doomed, was the antlion: '[They] were considered completely deaf', says Holderied. However, he was not so sure. Wondering whether antlions (such as *Myrmeleon hyalinus*, *Myrmeleon formicarius* and *Scotoleone carrizonus*) may be able to outwit bats by listening in to their ultrasonic echolocation cries, Holderied and his colleagues Liam Thomas, also from Bristol, and Carmi Korine from Ben-Gurion University of

the Negev, Israel, went hunting for antlions to test their hearing.

When the trio recorded the insects' reactions to ultrasound (25 kHz) while flying about Ben-Gurion University's Sede Boqer campus, it was clear that the antlions could hear and were getting the message; they speeded up and dropped down, with some headed for cover in vegetation while others spiralled to the ground for safety. 'None dropped ... passively with closed wings', says Holderied. And when the team scrutinised the insects' reactions to ultrasound in the lab overnight, the insects' wings froze in a horizontal position as soon as the ultrasound tones were played to them, with some animals flexing their abdomens to touch their thoraxes, 'just like a rear rudder can bring an aircraft's nose down to initiate a dive', says Holderied.

After establishing that the insects react when they pick up ultrasound, Holderied and his colleagues then tested the antlions' hearing over a range of frequencies from 20 to 100 kHz. They found that the insects were most tuned to sounds ranging from 70 to 80 kHz, although they could also pick up frequencies down to 40 kHz and up to 100 kHz. However, the insects were not particularly cooperative. Explaining that antlions are not strong flyers, rarely reaching heights of more than 3 m, Holderied found that the lab-bound animals were even less enthusiastic. 'Of over 200 tested individuals ... only 20 completed all frequencies' says Thomas.

But could the insects pick up an impending attack with sufficient warning to take evasive action? Having measured the sound pressure levels (volume) where the insects could no longer hear ultrasound of a particular pitch, the team calculated the distances that sounds produced at the volume of a bat call could travel before falling below the antlion's hearing threshold. It turns out that antlions can pick up bats that are within 2–9.6 m, giving them sufficient time to fall out of range when a bat decides to drop by for dinner.

10.1242/jeb.192559

Holderied, M. W., Thomas, L. A. and Korine, C. (2018). Ultrasound avoidance by flying antlions (*Myrmeleontidae*). *J. Exp. Biol.* **221**, jeb189308.

Kathryn Knight
kathryn.knight@biologists.com