Detached gecko tails dance to their own tune

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Phelsuma cepediana visiting a Trochetia flower for nectar. Photograph by Dennis Hansen

Geckos and other lizards have long been known for their incredible ability to shed their tails as a decoy for predators, but little is known about the movements and what controls the tail once it separates from the lizard's body.

Anthony Russell of the University of Calgary and Tim Higham of Clemson University in South Carolina are closer to solving this mystery as outlined in a paper they co-authored published in the journal *Biology*

Letters.

The scientists demonstrate that tails exhibit not only rhythmic but also complex movements, including flips, jumps and lunges, after the tails are shed. Although one previous study has looked at movement of the tail after it is severed, no study up to this point has quantified movement patterns of the tail by examining the relationship between such patterns and muscular activity.

The new findings are significant because Higham and Russell's discoveries indicate that the lizard tail can provide a model for studying the complex functions of the spinal cord and the effects of spinal cord injuries.

"Much is known about the ecological ramifications of tail loss, such as distracting predators, storing energy reserves and establishing social status but little is known about the pattern and control of movement of automized gecko tails," says Russell a biological sciences professor at the U of C. "What we've discovered is that the tail does not simply oscillate in a repetitive fashion, but has an intricate repertoire of varied and highly complex movements, including acrobatic flips up to three centimetres in height."

Higham, a former U of C student and now an assistant professor of biological sciences at Clemson, says more study needs to be done.

"An intriguing, and as yet unanswered, question is what is the source of the stimulus is that initiates complex movements in the shed tails of leopard geckos," says Higham. "The most plausible explanation is that the tail relies on sensory feedback from the environment. Sensors on its surface may tell it to jump, pivot or travel in a certain direction."

The ability of an animal, or part of an animal, to move without the active control of higher centres in the brain is well known, but this generally occurs as a result of traumatic physical injury. Tails of lizards are shed under the animal's own control. Because of this, the behaviour of the shed part has adaptive evolutionary importance and its actions are programmed to assist in the owner's survival. The movements are coordinated by the part of the spinal cord that is housed in the tail. The isolated tail serves as a vehicle for studying the ways that nerves and muscles act together to generate controlled but complex outputs in the absence of the influence of the brain.

"The automized gecko tail may be an excellent model for understanding the spontaneous activity that is sometimes observed following partial or complete spinal cord injury," says Russell.

The new study shows that the signals responsible for movements of the shed tail begin at the very far end of the tail, indicating that there is a control centre located there that is likely overridden by higher centres until the tail is shed, at which point its potential is realized.

More information: The scientists' paper will be published in the journal *Biology Letters* on Wed., Sept. 9. It can be found online at: rsbl.royalsocietypublishing.org/

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