Newly discovered insect 'Supersonus' hits animal kingdom's highest-pitch love call

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Female Supersonus

(Phys.org) —In the rainforests of South America, scientists have discovered a new genus and three new species of insect with the highest ultrasonic calling songs ever recorded in the animal kingdom.

Katydids (or bushcrickets) are insects known for their acoustic communication, with the male producing sound by rubbing its wings together (stridulation) to attract distant females for mating.

Scientists from the universities of Lincoln, Strathclyde and Toronto located a new genus with three new species of katydid in the rainforests of Colombia and Ecuador. These insects were found to produce the highest ultrasonic calling songs known in nature, with males reaching 150 kHz. The calling frequencies used by most katydids range between 5

kHz and 30 kHz. The nominal human hearing range ends at around 20 kHz. For this reason, the new genus has been named Supersonus.

Dr Fernando Montealegre-Z, from the School of Life Sciences, University of Lincoln, UK, said: "To call distant females, male katydids produce songs by 'stridulation' where one wing (the scraper) rubs against a row of 'teeth' on the other wing. The scraper is next to a vibrating drum that acts like a speaker. The forewings and drums are unusually reduced in size in the Supersonus species, yet they still manage to be highly ultrasonic and very loud.

"Using a combination of state-of-the-art technologies, we found that Supersonus creates a 'closed box' with its right wing in order to radiate sound. Human-made loud speakers also use this system to radiate sound. Large speakers radiate low frequencies, while small speakers emit high frequencies. So, these reduced wings are responsible for tuning their calling songs at such high frequencies."

These insects have lost the ability of flight due to their reduced wing size, so the adoption of extreme ultrasonic frequencies might play a role in avoiding predators, such as bats. Bats can detect their prey's movements using echolocation but can also eavesdrop and detect the calls of singing animals like katydids and frogs. Rainforest katydids have learned to avoid bats by reducing the time spent singing and by evolving an ear that can detect the ultrasonic echolocation calls of the bats. Although some bats can detect 150 kHz, by singing at extreme ultrasonic frequencies, the katydid calls degrade faster with distance so that a flying bat will find it harder to hear the signal.

Dr James Windmill, from the Centre of Ultrasonic Engineering, University of Strathclyde, added: "These insects can produce, and hear, loud ultrasonic calls in air. Understanding how nature's systems do this can give us inspiration for our engineered ultrasonics."

The paper 'Shrinking wings for ultrasonic pitch production: hyper intense ultra-short-wavelength calls in a new genus of neotropical katydids (Orthoptera: Tettigoniidae)' has been published in the international journal *PLOS ONE*. The research was supported by a grant from the National Geographic Society Global Exploration Fund, a regional grant program for residents of Northern Europe.

"We are delighted that the National Geographic Society's research grant has made it possible for the team to make new scientific advances in the study of bushcrickets. Projects like this give us a better understanding of the insect world," said Joakim Mornefält, Executive Director of the National Geographic Society Global Exploration Fund Northern Europe.

More information: Sarria-S FA, Morris GK, Windmill JFC, Jackson J, Montealegre-Z F (2014) "Shrinking Wings for Ultrasonic Pitch Production: Hyperintense Ultra-Short-Wavelength Calls in a New Genus of Neotropical Katydids (Orthoptera: Tettigoniidae)." *PLoS ONE* 9(6): e98708. DOI: 10.1371/journal.pone.0098708

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