Public Abstract
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The hearing system of the katydid genus Neoconocephalus has two functions: intraspecific communication and predator (bat) avoidance. Male calls and bat cries differ in spectrum (pitch) and temporally. To respond appropriately, katydids must be able to recognize and discriminate between signals. We categorized bat avoidance behaviors and examined temporal and spectral recognition of bat cries behaviorally during tethered flight in several species of Neoconocephalus.

In response to simulated bat approaches, Neoconocephalus katydids performed four behaviors; steering, wingbeat interruption, dives and leg kicks. The first three could be triggered by a single pulse of ultrasound and were amplitude dependent while the final behavior was pulse-rate dependent. Behaviors were emphasized differently among species. Steering and leg kicks were performed consistently in all species but wingstop (wingbeat interruption or dive) occurred much less often in N. robustus, N. bivocatus and N. exciliscanorus, all larger species of katydid.

We also tested how katydids recognize model bat cries. Experiments using single sound pulses showed that katydids respond best to pulses with relatively short rise times and a minimum duration. Spectral experiments showed that N. exciliscanorus and N. bivocatus were relatively insensitive to higher frequencies (>30 kHz) while N. robustus, N. retusus and N. ensiger were sensitive to these frequencies. Among these three species, spectral selectivity differed with, N. ensiger being insensitive to 13 kHz while N. retusus and N. robustus were sensitive. We discuss how species-specific differences such as call type, habitat and body size explain these differences in bat avoidance behaviors.