Bats found to produce longer and more intense calls when crowded by other bats

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Big eared townsend bat (Corynorhinus townsendii) Credit: Public Domain

(Phys.org)—A trio of researchers with Tel-Aviv University has found that bats produce calls that are longer and more intense when among a crowd of others of their own kind as a means to hear themselves among the din. In their paper published in the journal *Proceedings of the Royal Society B*, Eran Amichai, Gaddi Blumrosen and Yossi Yovel describe lab

experiments they conducted with trained bats to learn more about how bats contend with noise from surrounding bats.

Bats famously use echo-location to avoid colliding with objects while flying and to zero in on moving prey such as insects, but how do they recognize their own echoed pings when traveling or hunting with a large group of other bats, all of whom are sending out pings of their own, creating a lot of competing noise? That is what the researchers with this new effort sought to learn. Some have suggested that the bats simply change the frequency of their tone, so that it can be differentiated from other bats, but no one had ever tested this theory.

To learn more, the researchers trained several bats to land on a roost on command, and then set up speakers connected to a bat-sound emitting source next to the roost to mimic different numbers of bats in the area. They then listened in as the test bats changed their tones in response to the noise levels they encountered. The researchers found that the bats tended to increase the duration of the calls they made and to make them more intense when there were many competing tones from other bats, which the team termed severe interference. And contrary to conventional theory, they found little evidence of spectral shifts—when they did occur they did not decrease overlap with competing tones. The researchers refer to the noise made by several bats emitting noise at the same time as jamming, because, quite naturally it could lead to problems with individual bats hearing their own tones, which could be problematic during such events as landing—the researchers found that when the bats attempted a landing on a quiet roost, they generally produced short calls to ensure a soft landing. When approaching a noisy roost, on the other hand, they shifted to producing near continuous high intensity calls.

More information: Eran Amichai et al. Calling louder and longer: how bats use biosonar under severe acoustic interference from other bats, *Proceedings of the Royal Society B: Biological Sciences* (2015). DOI:

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Abstract

Active-sensing systems such as echolocation provide animals with distinct advantages in dark environments. For social animals, however, like many bat species, active sensing can present problems as well: when many individuals emit bio-sonar calls simultaneously, detecting and recognizing the faint echoes generated by one's own calls amid the general cacophony of the group becomes challenging. This problem is often termed 'jamming' and bats have been hypothesized to solve it by shifting the spectral content of their calls to decrease the overlap with the jamming signals. We tested bats' response in situations of extreme interference, mimicking a high density of bats. We played-back bat echolocation calls from multiple speakers, to jam flying Pipistrellus kuhlii bats, simulating a naturally occurring situation of many bats flying in proximity. We examined behavioural and echolocation parameters during search phase and target approach. Under severe interference, bats emitted calls of higher intensity and longer duration, and called more often. Slight spectral shifts were observed but they did not decrease the spectral overlap with jamming signals. We also found that pre-existing inter-individual spectral differences could allow self-call recognition. Results suggest that the bats' response aimed to increase the signal-to-noise ratio and not to avoid spectral overlap.