

Ultrasonic sensitivity in an arboreal frog: Response to selection pressure from the natural habitat?

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Abstract Among the vertebrates, only microchiropteran bats, cetaceans and some rodents are known to produce and detect ultrasonic (US) frequencies for the purpose of communication and/or echolocation, suggesting that this capacity may be restricted to mammals. We have recently provided the first evidence of ultrasonic communication in an amphibian - the concave-eared torrent frog, *Amolops tormotus* (Ranidae) from Huangshan Hot Springs, China. Males of *A. tormotus* produce diverse bird-like melodic calls with pronounced frequency modulations that often contain spectral energy in the US range. Acoustic playback experiments conducted in the animal's natural habitat confirmed that the audible as well as the US components of an *A. tormotus* call could effectively evoke males' vocal responses. Electrophysiological recordings from the auditory midbrain confirmed the US hearing capacity of these frogs and that of a sympatric species facing similar environmental constraints. This extraordinary upward extension into the ultrasonic range of both the harmonic content of the advertisement calls and the frog's hearing sensitivity is likely to have coevolved in response to the intense, predominately low-frequency ambient noise from local streams. Because amphibians are a distinct evolutionary lineage from microchiropterans and cetaceans, US perception in these animals represents a novel example of independent evolution. James Beatty, Director of the National Institute of Deafness and Other Communication Disorders (NIDCD) recently said about this work: **"The more we can learn about the extraordinary mechanisms that *Amolops* and other animals have developed to hear and communicate with one another, the more fully we can understand the hearing process in humans, and the more inspired we can be in developing new treatments for hearing loss."**

Keywords *A. tormotus*, playback studies, ultrasound, frequency modulation, torus semicircularis