

Environmental influences on acoustic communication in frogs

Peter M. Narins, *Departments of Integrative Biology & Physiology, and Ecology & Evolutionary Biology, UCLA, Los Angeles, California, 90095 USA, pnarins@ucla.edu*

Many species of animals, including man, face the formidable task of communicating in naturally noisy environments. The effects of noise on both the calling behavior of frogs and the temporal and spectral filtering ability of the amphibian auditory pathway are discussed. Moreover, the role of spectral, temporal and spatial separation in minimizing background noise masking will be examined. Behavioral evidence is presented suggesting that environmental noise may act as a strong selective force in sculpting the communication systems of two species of Old World frogs. A torrent frog (*Odorrana tormota*) is found calling from vegetation along fast-flowing mountain streams in Central China. These streams produce high-level, broadband noise spanning the human hearing spectrum. In addition to the high-pitched audible components, the males' calls contain prominent ultrasonic harmonics. Another frog, *Huia cavitympanum*, lives in a very similar habitat in Borneo. Unlike *O. tormota*, *Huia* can modulate its call spectrum to produce purely ultrasonic calls. We believe the upward shift of the call frequencies of *O. tormota* and *H. cavitympanum* and the upper limit of sensitivity in *Odorrana tormota* is in response to the selection pressure from the noisy habitat.

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