The influence of anthropogenic noise on the evolution of communication systems

Peter Narins*[1]

[1]University of California Los Angeles (UCLA) – Departments of Integrative Biology Physiology, and Ecology Evolutionary Biology, 621 Charles E. Young Drive S., Los Angeles, CA, 90095, United States

Abstract

Many species of animals, including man, face the formidable task of communicating in noisy environments. In this talk, I shall discuss the effects of anthropogenic noise on the calling behavior of anuran amphibians. Moreover, the role of spectral, temporal and spatial separation in minimizing masking by background noise will be examined. For example, presenting high-level, periodic tones at the male's Co-note frequency to males of the Puerto Rican treefrog, Eleutherodactylus coqui results in a clear shift in their calling pattern such that they avoid acoustic overlap with the interfering playback stimulus. Moreover, even if the interfering tones are aperiodic (that is, if a sequence of interfering tones of short and long duration are presented randomly), males of this species are capable of initiating their calls in the gaps between the interfering tones. Amphibians also have a remarkable ability to shift their call timing in response to small intensity shifts in the background noise. Males of E. coqui are capable of reliably detecting a change in interfering tone intensity as small as 2-4 dB. Finally, I shall present behavioral evidence that anthropogenic noise may act as a strong selective force in sculpting the acoustic communication systems of several species of Old World frogs. In response to airplane flyby noise and playbacks of low-frequency motorcycle sounds, three species of actively calling species (Microhyla butleri, Rana nigrovittata and Kaloula pulchra) significantly decreased their call rates. Yet under the identical stimulus regime, Rana taipehensis consistently increased its call rate. These results, coupled with the natural calling behavior of these species, suggest that anthropogenic acoustic interference affects anuran choruses differentially and indirectly, by suppressing calling behavior of one set of species which in turn, stimulates calling in other species. Supported by grants from the NIDCD (no. DC-00222), and the UCLA Academic Senate (3501).

Keywords: acoustic interference, amphibians, frogs, playback experiments

*Speaker