Session 4pAB

Animal Bioacoustics, Psychological and Physiological Acoustics and ASA Committee on Standards: Frequency Weighting For Animal Species

Larry L. Pater, Cochair
U.S. Army Engineering Research and Development Ctr., 2909 Farber Dr., Champaign, IL 61822

Ann E. Bowles, Cochair
Hubbs Sea World Research Inst., 2595 Ingraham St., San Diego, CA 92109

Chair's Introduction—1:00

Invited Papers

1:05

4pAB1. The 60-dB rule for birds: An example of the application of a weighting function in environmental impact mitigation. Ann E. Bowles (Hubbs-SeaWorld Res. Inst., 2595 Ingraham St., San Diego, CA 92109) and Sheyna Wisdom (URS Corp., San Diego, CA 92108)

Over the last decade U.S. Fish and Wildlife Service managers in California have required millions of dollars in added expenditure for NEPA consultation, mitigation barriers, and project delays to reduce the effects of noise from construction activities on endangered passerine birds when the hourly A-weighted Leq is expected to exceed 60 dB. The rule was originally intended to prevent masking of species-typical songs of endangered birds such as the Coastal California Gnatcatcher. However, no research is available to demonstrate the effectiveness of the rule for any noise-related impact. Although A-weighting is probably a conservative estimator of bird exposure in the range from 125 Hz to 8 kHz, it may underestimate exposure at very low frequencies. Its utility as a weighting function has not been tested against other possible weighting procedures, such as use of the species-typical auditory threshold function. Additionally, where sources are intense but intermittent, Leq is unlikely to be a useful metric. These issues should receive more technical scrutiny before the 60-dB rule becomes entrenched in law. It is in widespread use for NEPA consultations, and is already being extended to other species, including large mammals.

1:35

4pAB2. The problem of frequency weighting functions and standards for birds. Robert Dooling, Elizabeth Brittan-Powell, Amanda Lauer (Dept of Psych., Univ. of Maryland, College Park, MD 20742), Micheal Dent (Univ. at Buffalo, Buffalo, NY 14260), and Isabelle Noirot (Univ. of Maryland, College Park, MD 20742)

Frequency weighting functions in humans are widely used as a single-figure guess to assess noise problems and aid in making decisions with regard to noise limitations when no other data exist. However, this use of frequency weightings invariably results in a loss of precision in assessing the likelihood of a sound to produce hearing damage or sound annoyance. There is a growing interest in developing frequency weighting functions in animals presumably to assist in judging the risk of hearing damage, interference with acoustic communication, or habitat suitability. Laboratory studies reveal many parallels between humans and animals on a variety of psychoacoustic measures, such as equal loudness contours. However, differences between humans and animals on specific tests argue against using standards developed for humans to gauge the effect of noise on animals. Here we review data which show this same problem exists among birds. That is, the differences in the effects of noise among bird species can be as large as the differences between humans and birds. These results suggest that whereas frequency weighting functions and acoustic standards for a specific species might be useful, generalizing across species is likely not practical.

2:05

4pAB3. Source levels of northern elephant seal vocalizations in-air. Stephen J. Insley (Long Marine Lab., UCSC, 100 Shaffer Rd., Santa Cruz, CA 95060, sinsley@ucsc.edu) and Brandon L. Southall (NOAA Fisheries Acoust. Program, Silver Spring, MD 20910)

Accurate measurements of vocalization sound-pressure levels are necessary to determine the acoustical active space of animals in natural and human-altered ambient noise conditions. Despite this basic need, such data are limited or nonexistent for most species. Our study characterized aerial ambient noise and vocalization source levels for northern elephant seals during the breeding season. Subjects were adult males, lactating females, and dependent offspring (pups) at Año Nuevo State Reserve. Source level measurements were made using a Type 1 sound level meter and calibrated microphones on-axis: (1) at 1 m; (2) at several known distances (laser measured); and (3) simultaneously at 1 m and a second known distance. Concurrent ambient noise conditions were measured *in situ* (non-weighted 5 min Leq integrated averages) and recorded for later spectral analysis. Measurements were made at two sites, one relatively noisy and the other relatively quiet, to determine whether animals compensate for higher noise conditions by increasing source levels (Lombard effect). Results indicate a wide range in signal strength, particularly for adult males whose vocalization source levels appear to be correlated with dominance rank and related to ambient noise conditions. The Lombard effect was not observed for adult females or elephant seal pups.