10:00–10:10 Break

10:10

5aAB4. Estimating loudness in animals. Micheal L. Dent (Dept. of Psych., 361 Park Hall, Univ. at Buffalo-SUNY, Buffalo, NY 14260, mdent@buffalo.edu)

Although auditory acuity experiments in animals are valuable, this is not how animals typically encounter real world sounds. It is also important to know how animals respond to stimuli at more ''realistic'' intensities. The perception of above-threshold level sounds has been well documented in humans, but is much less studied in animals, where acoustic communication is important for survival. In humans, equal loudness contours are used to show that loudness does not increase with intensity equally at all frequencies. Loudness is a subjective experience, however, and much harder to measure in animals. Reaction time is one untrained response that can be used to gauge how different or similar two stimuli are: high intensities yield short and low intensities yield long reaction times. Comparing reaction times across frequencies (equal latency contours) in birds and mammals show results that are similar to equal loudness contours obtained in humans. At low SPLs equal-latency contours closely parallel threshold curves, while at high SPLs the contours flatten and all frequencies are perceived as being about the same loudness. These results in animals should be considered when thinking about aspects of acoustic communication such as sound transmission, vocal signals designs, and sound-attenuating properties of the environment.

10:30

5aAB5. Animal behavioral psychoacoustics: Issues related to methodology and interpretation. David Kastak, Ronald Schusterman, Brandon Southall, Marla Holt (UCSC Long Marine Lab., Santa Cruz, CA 95060), and Colleen Kastak (UCSC Long Marine Lab., Santa Cruz, CA 95060)

A brief survey of the literature in animal behavioral psychophysics shows that researchers use numerous methods to obtain information on sound detection, discrimination, and identification. Behavioral methodology in animal psychoacoustics includes both classical and operant conditioning, go/no-go or multiple alternative forced-choice tasks, and various methods of estimating detection and discrimination thresholds. Recent emphasis on comparing data across subjects, species, and media (e.g., hearing in air versus water), as well as investigations into the effects of age, noise, and ototoxins on auditory perception highlight the need for methodological standardization. In this paper we will discuss several important issues related to behavioral audiometrics, focusing primarily on marine mammals. These issues include variability among species, individual subjects, and laboratories; experimental concerns such as time constraints; adaptive versus non-adaptive psychophysical methodology and threshold reliability; signal detection theory versus threshold models of audition and the search for unbiased estimates of auditory performance; and measurement and interpretation of subject response bias. Standards for animal psychoacoustic methodology should be sensitive to each of these factors.

10:50

5aAB6. Body size and assessment of auditory function: A comparative conundrum. Edward J. Walsh, JoAnn McGee (Boys Town Natl. Res. Hospital, Omaha, NE 68131), John Rosowski, and William Peake (Harvard Med. School, Boston, MA 02115)

One goal of the bioacoustics community is to compare auditory function among species representing the entire animal kingdom, including terrestrial mammals. As an alternative to behavioral measures, it is frequently necessary, and/or desirable, to assess auditory function using electrophysiological approaches. Body size is an important factor that can effect the distribution and amplitude of evoked brain potentials (EP) measured from the surface of the head and the ranges of body mass and size within *Mammalia* are extensive. Consequently, the development of comparison protocols must include consideration of factors affected by size differences, e.g., the distance between EP generators and recording electrodes and the thickness of the skull. Ultimately, these factors, along with the acoustical character of the recording environment itself, affect acquired signal-to-noise ratios (SNR). In this context it is notable that the SNR associated with large animals are reduced relative to those observed in smaller animals, making the comparison of results from one species to another complex. This procedural challenge is further complicated by the requirement to acquire data efficiently and rapidly in recording environments that are non-optimal from an acoustic perspective. These issues will be addressed by considering auditory brainstem responses in tigers, bobcats, manuls, sandcats and rodents.

11:10

5aAB7. Psychometric data and standards for the estimation of noise exposure for animals. Ann E. Bowles (Hubbs-SeaWorld Res. Inst., 2595 Ingraham St., San Diego, CA 92109, annb1@san.rr.com)

ASA standards are used in the estimation of noise exposure for humans. The approaches pioneered for humans can be used as a model for animal standards, but a number of differences must be considered. First, animal standards will normally be applied across multiple taxa rather than to a single, monotypic species. Thus, it will be essential to find defensible methods for generalizing across taxa. Second, samples of subjects and measurement conditions are often inadequate in animal studies (e.g., measurements on a single animal, noisy testing conditions), but may be the only data available. Therefore, standards are needed for specifying the limitations of various data sources. Third, taxa may have very different psychoacoustic capabilities (e.g., best sensitivity, temporal integration time, and loudness perception). Therefore, comparative measures will be essential. For example, while weighting functions for humans are standardized to zero at 1 kHz, there are advantages to developing weighting functions for animals with an appropriate correction for taxon-specific sensitivity. Although the differences between standards for animals and humans represent a significant challenge, the development process and research in support of animal standards will yield valuable new perspectives that could be applied to humans in the future.