Session 3pAB

Animal Bioacoustics: Animal Psychophysics

Peter M. Scheifele, Chair
Univ. of Connecticut, Dept. of Animal Science, 850 Bolton Rd., Storrs, CT 06269-1085

Contributed Papers

1:00

3pAB1. Impaired frequency resolution in canaries with hereditary high-frequency hearing loss. Amanda Lauer, Robert Dooling (Dept. of Psych., Univ. of Maryland, College Park, MD 20742), and Marjorie Leek (Natl. Ctr. for Rehabilitative Auditory Res., Portland, OR 97207)

Belgian Waterslager canaries (BWS), bred for a distinct low-pitched song, have an inherited high-frequency hearing loss related to hair cell abnormalities. Many hair cells are missing or damaged, and many of the remaining hair cells have abnormal stereocilia bundles. To investigate how the hair cell abnormalities affect frequency tuning along the BWS basilar papilla, we measured psychophysical tuning curves (PTCs) in BWS and normal-hearing non-BWS canaries using operant conditioning procedures. Non-BWS canaries showed relatively symmetrical tuning curves that became more narrowly tuned with increasing center frequency. Despite near-normal hearing at low frequencies, PTCs in BWS were elevated for all center frequencies tested. The sharpness of tuning was normal in BWS for PTCs with a center frequency of 1000 Hz and broader than normal at higher frequencies. The shapes of the PTCs were abnormal in BWS, particularly at higher frequencies. The abnormal tuning properties in the BWS are consistent with changes in the impedance characteristics of the basilar papilla due to structural damage. [Work supported by NIH DC01372 and DC04664.]

1:15

3pAB2. Spatial release from aerial masking in a harbor seal. Marla M. Holt and Ronald J. Schusterman (UCSC Long Marine Lab., 100 Shaffer Rd., Santa Cruz, CA 95060)

Spatial release from masking (SRM) occurs when a signal and masker are spatially separated, resulting in improvement of signal detection relative to when they are spatially coincident. Harbor seals feed in the water but haul out on land for a variety of activities. There have been no SRM investigations conducted on harbor seals in air. In this study, SRM was measured at 1, 8, and 16 kHz in a harbor seal (*Phoca vitulina*) who had to detect an aerial tone in the presence of an octave band of white noise centered at the tone frequency. While the masker always occurred in front of the subject (0 deg), the tone occurred at 0, 45, or 90 deg in the horizontal plane. Absolute thresholds were also measured at these angles to account for differences in hearing sensitivity based on source azimuth. Current data show that the largest masking level differences (MLDs) of 7 dB occurred at 1 kHz when the signal was projected at 90 deg. MLDs reported here on an amphibious carnivore are larger than those measured under water, are consistent with measurements collected on terrestrial animals, and have important implications for noise effects on free-ranging animals.

1:30

3pAB3. A comparison of behavioral and auditory brainstem response measurements of absolute and masked auditory thresholds in three species of birds. Isabelle C. Noirot (Dept of Psyc., Univ. of Maryland, College Park, MD 20742, and Univ. of Liege, Bat B6c, 4000 Liege, Belgium, inoirot@psyc.umd.edu), Elizabeth F. Brittan-Powell, Robert J. Dooling, and Lindsay Montgomery (Univ. of Maryland, College Park, MD 20742)

Auditory brainstem responses (ABRs) were used to measure auditory thresholds for pure tone in quiet and in noise for three species of birds: budgerigars (*Melopsittacus undulatus*), canaries (*Serinus canarius*), and zebra finches (*Taeniopygia guttata*). ABRs were recorded in response to 5-ms pure tones at frequencies between 500 and 8000 Hz. Results showed that the shape of ABR audiograms generally paralleled the shape of behavioral audiograms but ABR thresholds were generally 20 to 40 dB higher than those obtained behaviorally. ABR thresholds in noise were also measured at frequencies between 1000 and 4000 Hz. Three different levels of broadband white noise were used and critical ratios (CR; signal-to-noise ratio at masked threshold) were calculated. In general, CRs were independent of the level of the masking noise, in good correspondence with behavioral data. While CRs across a wide variety of vertebrates show a 3-dB/octave increase, CRs in these birds were similar or better at 2860 Hz than 2000 Hz, and worse at 4000 Hz. To the extent that these relationships between behavioral and ABR thresholds are generalizable across species, ABR measurements can be used to calculate audiograms and CRs in species that cannot be tested behaviorally. [Work supported by DC00198, DC04664 to R.J.D.]

1:45

3pAB4. Comparative analyses of canine hearing using event-related potentials. Peter M. Scheifele, Michael Darre, Michelle G. Pinto, Frank E. Musiek (Univ. of Connecticut, Unit 4040, 3636 Horsebarn Hill Rd. Ext., Storrs, CT 06269-4040), and John Preece (NYU, New York, NY 10010)

The hearing of three dogs was tested using auditory brainstem response (ABR) and distortion product oto-acoustic emissions (DPOAE) tests. The three subject dogs included one with known normal hearing, one congenitally deaf dog, and one dog with presbycusis. ABRs were run using a 100-s click stimulus at a repetition rate of 19.7 Hz at 90, 60, and 40 dB nHL. Based on the combined analysis of ABR and DPOAE, differences in canine hearing of dogs with presbycusis and congenital (Waardenburg syndrome) are evident. These results continue to be compared with those of other dogs of known otology and audiology in an effort to develop canine norms for ABR and to readily detect these pathologies in companion animals to assist veterinarians in the diagnosis and treatment of hearing loss in dogs.