9:55–10:10 Break

10:10

3aAB8. Comparisons of song perception in male and female songbirds utilizing cardiac responses. Maki Ikebuchi (Human Information System Labs., Kanazawa Inst. of Technol., Hakusan, Ishikawa 924-0893, Japan, mikebuch@his.kanazawa-it.ac.jp) and Kazuo Okanoya (RIKEN Brain Sci. Inst., Wako, Saitama 351-0198, Japan)

In most songbirds, males sing to defend territories and to attract females, and females evaluate the quality of males based on songs. This should lead to differences in song perception between the sexes, but it has been difficult to devise an assay that can evaluate song perception without introducing motivational bias. For example, the copulation solicitation assay is useful for evaluating female perception of songs, but this assay cannot be utilized for males. We found that birds react to a sound of interest by increasing the heart rate, and this response was used to compare song perception in Bengalese and zebra finches. We used conspecific and hetero-specific songs as stimuli and these were presented in a planned order. In Bengalese finches, only females responded to the changes in conspecific song repertoire. In zebra finches, both males and females reacted to such changes. Bengalese finches are a domesticated species and males do not establish breeding territories. Conversely, male zebra finches establish a small territory when breeding. In both species, songs are an important trait by which females select males. These ecological differences concur with the species and sex differences in the cardiac response. [Work supported by JSPS and JST.]

10:25

3aAB9. Detection of objects in complex environments by echolocating big brown bats. Caroline M. DeLong, Sarah A. Stamper, and James A. Simmons (Dept of Neurosci., Brown Univ., Box 1953, Providence, RI 02912)

In previous psychophysical experiments, big brown bats detected or discriminated objects (monopole and dipole targets comprised of 15 mm diameter cylinders) presented standing on smooth surfaces with little clutter. Performance was determined by mutual masking of echoes from the targets themselves. In new experiments, bats did two-alternative (left/right) forced choice tasks to detect a two-cylinder dipole target in complex, cluttered environments. In experiment 1, the targets were set inside 14-mm-deep, 20-mm-diam holes in a layer of foam 25 mm thick. Cylinders of different heights protruded 13, 5, or 2 mm above the surface of the foam, or were recessed 1 mm below the surface. The bats performance varied as a function of protruding height. In experiment 2, the dipole target was embedded within arrays of distractor objects that varied in shape, size, orientation, and material. Both experiments explore how bats isolate the echoes from the dipole target from the mixture of echoes returning from the clutter—whether distractor objects or echoes from the sides of the holes. Big brown bats must engage in this acoustic scene analysis when catching insects, such as beetles, against a backdrop of foliage.

10:40

3aAB10. The sonar beam of big brown bats (*Eptesicus fuscus*) during landing. Jens C. Koblitz, Peter Stilz, Wiebke Pflästerer, Mariana Melcon, and Hans-Ulrich Schnitzler (Tierphysiologie, Universität Tübingen, Auf der Morgenstelle 28, 72076 Tübingen, Germany, jens.koblitz@web.de)

The parameters signal duration, pulse interval, and frequency have previously been used to describe the approach behavior of landing bats. An array with 16 microphones was used to investigate additional parameters during the approach flight of landing big brown bats (*Eptesicus fuscus*). For each signal emitted the position of the landing bat in relation to the microphone array was determined using a 3-D video system, and the width, maximum intensity, and aiming direction of the sonar beam were calculated. The approach to the landing site begins at a distance of about 1.4 m when the bats pick up the landing site with their sonar beam. This focusing on the landing site is indicated by a clear decrease of the deviation between beam aiming and direction to the landing position. The maximum intensity of the sonar beam is reduced by about 6 dB per half distance during the last 2 m of the approach, which indicates a gain control mechanism. The width of the sonar beam remains constant throughout the whole approach.

10:55

3aAB11. Spatial release from masking of aerial tones in a California sea lion (*Zalophys californianus*). 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 co-located. Sea lions forage in the water, breed on land, produce airborne vocalizations that are associated with social and reproductive activities, and possess highly reduced pinnae. In this study, SRM was measured at 1, 8, and 16 kHz in a California sea lion who had to detect an aerial tone in the presence of an octave band of white noise centered at the tone frequency. Testing was conducted in a hemianechoic chamber. 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. Masked thresholds were lower by as much as 12 dB at 1 kHz when the signal and masker were separated by 90 deg. These results were compared with those of a harbor seal who, like all true seals, naturally lacks pinnae. Performance differences between the two subjects at the highest frequency likely reflect variations in pinna anatomy.

11:10

3aAB12. Underwater noise and zones of masking with respect to hopper dredging and manatees in the St. Johns River in Jacksonville, FL. Edmund R. Gerstein, Joseph E. Blue (Leviathan Legacy Inc., 1318 SW 14th St., Boca Raton, FL 33486), Gerard F. Pinto, and Seth Barr (Jacksonville Univerisity, Jacksonville, FL 32211)

Underwater noise radiating from dredging can effectively obscure or mask biological and other important sounds. This study recorded underwater acoustic characteristics of hopper dredging in the St. Johns River, Jacksonville, FL, to evaluate noise impacts in the waterway with respect to the endangered West Indian manatee. Of particular interest was the extent and range that dredging noise may mask the sounds of approaching commercial and recreational vessels. Vertical hydrophone arrays and a multichannel PC-based recording system were used to measure dredging noise at various distances. Ambient noise surveys, active propagation of calibrated sources, and controlled boat noise measurements were conducted along the waterway. These data were integrated with behavioral hearing data to estimate zones of masking surrounding dredging. Three discernable noise sources that masked boat noise were (1) cavitation from dredge propellers, (2) draghead vacuuming, and (3) noise from submerged slurry pipelines. Sustained high ambient noise levels from dredging can significantly increase the risk of manatee-boat collisions by masking the sounds of approaching vessels over large radii (up to 2.5 miles). Mitigations suggested include ship quieting, reducing propeller cavitation, insulating or elevating slurry pipelines, and minimizing transects to pump out stations. [Work funded by the City of Jacksonville Waterways Commission.]