BIODIVERSITY

Special Guest Lecture

Monday, April 22, 2013 – 11:00 a.m.

Royal Ontario Museum – Thomas Kierans Boardroom

Dr. Emanuel C. Mora

Faculty of Biology, Havana University, Havana, Cuba

Evolution of the heteroharmonic strategy for target-range computation in the echolocation of Mormoopidae bats

The estimation of target-range is a crucial perceptual task for the echolocating bat. By computing the time delay between the emitted call and the returning echo, auditory neurons in the bat's brain register the distance to the target. Across bat species, delay-tuned neurons respond either to the same frequency-modulated (FM) harmonic in the call and the echo (i.e. the homoharmonic computation strategy), or to the FM component of the first harmonic in the call and one of the higher harmonic FM components in the echo (i.e. the heteroharmonic computation strategy). The latter strategy was only known for the horseshoe bat *Rhinolophus rouxi* and for the mormoopid *Pteronotus parnellii*. Both species emit echolocation calls at high duty cycles (HDC) and convergently evolved Doppler-sensitive sonar based on the long constant frequency component (CF) of the call. Only recently another mormoopid, *P. quadridens*, which does not use long-CF calls, HDC echolocation, or Doppler shift compensation (DSC), was discovered to compute target-range by the heteroharmonic strategy. This unexpected result and several other recent findings on the diversity of echolocation behavior in mormoopids provide cues to explore the evolution of their heteroharmonic biosonar systems. In my talk I will review those recent findings and link brain adaptations, distinctive characteristics of calls -and echoes- and phylogenetic relationships to search for common principles leading to the acquisition of the heteroharmonic target-range computation strategy in Mormoopidae. The main hypothesis of our current work at Havana University is that this mechanism for target-range estimation predates the evolution of CF calls, HDC and DSC. The strategy may have been of advantage to categorize prey size, hunt eared insects and live in large conspecific colonies. I will make five specific, testable predictions that might guide future investigations to decipher the evolution of the heteroharmonic echolocation in Mormoopidae and other families.