Dissertation abstract of David Luther

The environment in which an animal lives has a profound influence on the ways in which it communicates and the evolution of the structure of its signals. The importance of these signals in reproduction implicates them in the processes of speciation and sexual selection. Signals are thought to have evolved under selection pressure for optimal transmission, yet many animals communicate in situations that make errors likely, either because of ambient noise that masks relevant signals or because relevant and irrelevant signals differ only slightly. Such errors, which would reduce the benefits of correct signal detection, could have fundamental consequences for the evolution of communication. Errors include responses to inappropriate signals, which could result in mating with the wrong species, or failures to respond to appropriate signals, either because a signal is misidentifed or because it is not detected.

In depauparate avian communities, there are relatively few species, and there should be many ways in which different species signals differ from one another other. In speciose communities, such as the Amazon, many more species need to fit their signals into the acoustic space, leaving less room for variation. As a result, differences between acoustic signals should be smaller. In these communities signals and signaling behavior should evolve to minimize the effects of interference from other species signals by partitioning the signal space in which they broadcast their signals. In addition, signal space could become saturated, thus limiting the number of signals broadcast at the same place and time.

In this study, I will test the hypothesis that signal space is partitioned and make predictions about the partitioning of frequency and timing parameters of species signals within a community. I will also test the hypothesis that signal space is saturated. These questions will be investigated with acoustic samples collected in the field. The samples will be analyzed for acoustic patterns of partitioning and saturation using discriminate function analysis, null models, and other statistical techniques. Based on the results of these analyses, specific predictions about signal space partitioning and saturation will be tested with playback experiments.