

EEB 8990: Bioacoustics

Spring 2009

Instructor: Mark A. Bee, mbee@umn.edu, 612-624-6749 (office)

Time & Place: Fridays, 10am – 12pm, Room 505 Ecology

Readings: PDF File Packet

Objectives

This course has two broad objectives. The first is to survey some of the most important papers and concepts in the field of animal acoustic communication. This aim will be accomplished through “journal-club-style” presentations by students that cover readings from the primary and secondary literature over the first 11 weeks of the semester. ***All of these readings represent things that every student of bioacoustics should read early in their careers!*** This course provides a structured format for doing so with like-minded peers. (Take advantage of this opportunity!) These papers should give you the correct “pair of eyes” for reading papers in this field in the future. The second objective of this seminar is to provide students with some collective, hands-on experience in recording and analyzing animal sounds and in the design, execution, and analysis of field playback experiments. To accomplish this aim, participants will work as a team to design a project on a spring breeding frog, with the aim of carrying out the project during the final 4 weeks of the semester.

Tentative Course Schedule

TRY TO PRE-READ THE FOLLOWING ARTICLE SOMETIME BEFORE OUR DISCUSSION IN WEEK 9:

Hurlbert, S. H. 1984. Pseudoreplication and the design of ecological field experiments. *Ecological Monographs*, **54**, 187-211.

BETH – Jan 23 – Week 1: Sound and Sound Analysis

(Ch. 2) Bradbury, J. W. & Vehrencamp, S. L. 1998. *Principles of Animal Communication*. Sunderland, MA: Sinauer Associates.

(Ch. 3) Bradbury, J. W. & Vehrencamp, S. L. 1998. *Principles of Animal Communication*. Sunderland, MA: Sinauer Associates.

Supplemental Reading - (Appendix 2) Gerhardt, H. C. & Huber, F. 2002. *Acoustic Communication in Insects and Anurans: Common Problems and Diverse Solutions*. Chicago: Chicago University Press.

LISA – Jan 30 – Week 2: Sound Production

(Ch.4) Bradbury, J. W. & Vehrencamp, S. L. 1998. *Principles of Animal Communication*. Sunderland, MA: Sinauer Associates.

Supplemental Reading - Fitch, W. T. & Hauser, M. D. 2003. Unpacking "honesty": Vertebrate vocal production and the evolution of acoustic signals. In: *Acoustic Communication* (Ed. by Simmons, A. M., Popper, A. N. & Fay, R. R.), pp. 65-137. New York: Springer.

KAT – Feb 6 – Week 3: Sound Perception

(Ch. 6) Bradbury, J. W. & Vehrencamp, S. L. 1998. *Principles of Animal Communication*. Sunderland, MA: Sinauer Associates.

ALEJANDRO – Feb 13 – Week 4: Signal Detection Theory

Wiley, R. H. 2006. Signal detection and animal communication. In: *Advances in the Study of Behavior, Vol 36*, pp. 217-247.

BETH – Feb 20 – Week 5: Sound Propagation

(Ch. 5) Bradbury, J. W. & Vehrencamp, S. L. 1998. *Principles of Animal Communication*. Sunderland, MA: Sinauer Associates.

Supplemental Reading - (Appendix 3) Gerhardt, H. C. & Huber, F. 2002. *Acoustic Communication in Insects and Anurans: Common Problems and Diverse Solutions*. Chicago: Chicago University Press.

EMILY – Feb 27 – Week 6: Habitat Acoustics

Wiley, R. H. & Richards, D. G. 1978. Physical constraints on acoustic communication in the atmosphere: Implications for the evolution of animal vocalizations. *Behavioral Ecology and Sociobiology*, 3, 69-94.

Richards, D. G. & Wiley, R. H. 1980. Reverberations and amplitude fluctuations in the propagation of sound in a forest: Implications for animal communication. *American Naturalist*, 115, 381-399.

Supplemental Reading - Dabelsteen, T., Larsen, O. N. & Pedersen, S. B. 1993. Habitat-induced degradation of sound signals: Quantifying the effects of communication sounds and bird location on blur ratio, excess attenuation, and signal-to-noise ratio in blackbird song. *Journal of the Acoustical Society of America*, 93, 2206-2220.

LISA – Mar 6 – Week 7: Signal Design I

Morton, E. S. 1975. Ecological sources of selection on avian sounds. *American Naturalist*, 109, 17-34.

Morton, E. S. 1977. Occurrence and significance of motivation structural rules in some bird and mammal sounds. *American Naturalist*, 111, 855-869.

ALEJANDRO – Mar 13 – Week 8: Signal Design II

Ryan, M. J. & Kime, N. M. 2003. Selection on long distance acoustic signals. In: *Acoustic Communication* (Ed. by Simmons, A. M., Fay, R. R. & Popper, A. N.), pp. 225-274. Berlin: Springer Verlag.

EMILY – Mar 27 – Week 9: The Pseudoreplication and External Validity Controversy

Don't freak out...many of these are pretty short papers! It's best to read them in the following chronological order.

Kroodsma, D. E. 1989. Suggested experimental designs for song playbacks. *Animal Behaviour*, **37**, 600-609.

Searcy, W. A. 1989. Pseudoreplication, external validity and the design of playback experiments. *Animal Behaviour*, **38**, 715-717.

Kroodsma, D. E. 1989. Inappropriate Experimental-Designs Impede Progress in Bioacoustic Research - Reply. *Animal Behaviour*, **38**, 717-719.

Catchpole, C. K. 1989. Pseudoreplication and External Validity - Playback Experiments in Avian Bioacoustics. *Trends in Ecology & Evolution*, **4**, 286-287.

Kroodsma, D. E. 1990. Using appropriate experimental designs for intended hypotheses in 'song' playbacks, with examples for testing effects of song repertoire sizes. *Animal Behaviour*, **40**, 1138-1150.

McGregor, P. K., Catchpole, C. K., Dabelsteen, T., Falls, J. B., Fusani, L., Gerhardt, H. C., Gilbert, F., Horn, A., Klump, G. M., Kroodsma, D. E., Lambrechts, M. M., McComb, K. E., Nelson, D. A., Pepperberg, I. M., Ratcliffe, L., Searcy, W. A. & Weary, D. M. 1992. Design of playback experiments: The Thornbridge Hall NATO ARW consensus. In: *Playback and Studies of Animal Communication* (Ed. by McGregor, P. K.), pp. 1-9. New York: Plenum.

Kroodsma, D. E., Byers, B. E., Goodale, E., Johnson, S. & Liu, W. C. 2001. Pseudoreplication in playback experiments, revisited a decade later. *Animal Behaviour*, **61**, 1029-1033.

KAT – Apr 3 – Week 10: Recording Animals (Readings + Hands-on Tutorials)

Gerhardt, H. C. 1998. Acoustic signals of animals: Recording, field measurements, analysis and description. In: *Animal Acoustic Communication: Sound Analysis and Research Methods* (Ed. by Hopp, S. L., Owren, M. J. & Evans, C. S.), pp. 1-25. Berlin: Springer.

MARK – Apr 10 – Week 11: Conducting Playback Studies

Gerhardt, H. C. 1992. Conducting playback experiments and interpreting their results. In: *Playback and Studies of Animal Communication: Problems and Prospects. NATO Advanced Research Workshop* (Ed. by McGregor, P. K.), pp. 59-77. New York: Plenum Press.

McGregor, P. K. 1992. Quantifying responses to playback: One, many, or composite multivariate measures? In: *Playback and Studies of Animal Communication* (Ed. by McGregor, P. K.), pp. 79-96. New York: Plenum Press.

Weeks 12-15: Field Playback Project with *Pseudacris maculata*

*The following publications represent much of what is known about the vocal behavior of the boreal/western chorus frog (*Pseudacris maculata* formerly *P. triseriata*). They are not “required” reading, but they will be useful in project planning:*

Cocroft, R. B. & Ryan, M. J. 1995. Patterns of Advertisement Call Evolution in Toads and Chorus Frogs. *Animal Behaviour*, **49**, 283-303.

Lemmon, E. M., Lemmon, A. R., Collins, J. T., Lee-Yaw, J. A. & Cannatella, D. C. 2007. Phylogeny-based delimitation of species boundaries and contact zones in the trilling chorus frogs (*Pseudacris*). *Molecular Phylogenetics and Evolution*, **44**, 1068-1082.

Moriarty, E. C. & Cannatella, D. C. 2004. Phylogenetic relationships of the North American chorus frogs (*Pseudacris* : Hylidae). *Molecular Phylogenetics and Evolution*, **30**, 409-420.

Owen, P. C. & Tucker, J. K. 2006. Courtship calls and behavior in two species of chorus frogs, genus *Pseudacris* (Anura : Hylidae). *Copeia*, 137-144.

Platz, J. E. 1989. Speciation within the Chorus Frog *Pseudacris-Triseriata* - Morphometric and Mating Call Analyses of the Boreal and Western Subspecies. *Copeia*, 704-712.

Platz, J. E. & Forester, D. C. 1988. Geographic-Variation in Mating Call among the 4 Subspecies of the Chorus Frog - *Pseudacris Triseriata* (Wied). *Copeia*, 1062-1066.

Roble, S. M. 1985. Observations on Satellite Males in *Hyla-Chrysoscelis*, *Hyla-Picta*, and *Pseudacris-Triseriata*. *Journal of Herpetology*, **19**, 432-436.