18. Design of Sound Propagation Experiments – an introduction

Ole Næsbye Larsen, Biology, SDU, DK

In order to answer questions regarding sound communication between individual animals, the researcher needs to know what kind of changes occur in broadcast sound signals propagating through relevant routes in the biotope. If the biotope were acoustically homogeneous, time invariant, and linear one needed only to calculate a transfer function and the fate of all sounds could be calculated from that. Biotopes, howewer, are acoustically strongly inhomogeneous, time variant, and may even have non-linear characteristics. Therefore, measurements become a bit more complicated. For a start, the researcher should make himself thoroughly familiar with the acoustic habits of the study animal such that characteristic types of habitat and typical sender positions for the speaker and typical receiver positions for the mikcrophone can be chosen for the measurements. Then relevant sound signals must be chosen and put together in sequences that allows for statistical analysis. Relevant sender and receiver equipment must be chosen (a medium for storage of the sound sequences to be played back, a suitable amplifier and a suitable speaker with relevant frequency response and directionality, a reliable microphone with relevant frequency response, an amplifier and a storage medium for the rerecorded sounds). And the researcher should not forget to acquire relevant devices for measuring positions and distances and the meteorological conditions during play-back. In the field, the researcher must calibrate the equipment as carefully as possible such that the emitted sounds are known and can act models to compare with the re-recoded sounds. Finally, the play-back can be performed using relevant sender and receiver positions - and a lot of repetitions because something went wrong or an airplane passed by and overloaded the microphone. Sound propagation experiments are good fun but requires much patience.

19. Quantification of habitat-induced sound degradation – a practical analysis

Torben Dabelsteen, KU, Denmark

Sounds that propagate through a terrestrial habitat are degraded to different extents. This includes at least four aspects: a blurring of the sounds' frequency and amplitude patterns over time, an elongation by "tails" of echoes, attenuation (spreading loss of 6 db/dd + some excess attenuation (EA)), and a reduction of their signal-to-noise ratio (SNR). Blurring and elongation may be quantified as a blur ratio (BR) and a tail-to-signal ratio (TSR), respectively. The four measures, EA, SNR, BR and TSR will be briefly discussed and it will be demonstrated how they may be quantified using the program SIGPRO (written by Simon Boel Pedersen).

The methods are described in
Dabelsteen et al. 1993, J. Acoust. Soc. Am. 93, 2206-2220, and
Holland et al. 2001, Bioacoustics 12, 3-20.