Using AD Model Builder for spatially explicit capture-recapture inference with passive detectors

Ben C. Stevenson and **David L. Borchers**

Centre for Research into Ecological and Environmental Modelling
University of St Andrews
St Andrews
Fife
United Kingdom
bcs5@st-andrews.ac.uk

Abstract: AD Model Builder (ADMB) is a software suite designed to carry out efficient and stable numerical optimisation of a complex likelihood function. Although it was originally developed with fisheries stock assessment models in mind, it is beginning to gain popularity outside fisheries science. One such area in particular is that of animal abundance and density estimation; currently ADMB plays a significant role in both distance sampling and spatially explicit capture-recapture (SECR) software development. This talk will focus on the utility and performance of ADMB in the latter. SECR extends traditional capture-recapture methods by using known locations of traps where animals were (and were not) captured. This information is then used to account for between-animal heterogeneity in detection probability due to differences in individuals' home range centre locations. SECR also allows abundance and density estimates to be obtained from a single sampling session when animals are detected passively (e.g., acoustically or visually by microphones, cameras, or human detectors) rather than by physical capture. The R package `admbsecr` fits models to SECR data collected with passive detectors, and uses ADMB to obtain maximum likelihood parameter estimates. We illustrate by using `admbsecr` to estimate animal density from a number of different kinds of passive acoustic survey.