

Estimating animal abundance from passive acoustic data: where we are and what can statistics do for us?

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Estimating animal abundance is an active field in ecological statistics and has been a fertile field for statistical developments over the last few decades. By acknowledging the fundamental step of estimating detectability, distance sampling methods, capture recapture and spatially explicit capture recapture methods have taken central roles. Traditionally, animal abundance estimation methods have considered visual detections as the primary source of data. Nonetheless, in the last decade we have observed a development of methods dedicated to estimating animal abundance from passive acoustic data. This presents several advantages under many scenarios, notably at sea for animals like cetaceans that spend a large proportion of their time submerged yet produce frequent sounds that can be detected. Much as it has happened for visual methods, methodological developments have started at sea but are now transitioning to land. In this talk we will present the main methods and how these have been adapted to cope with acoustic data. We discuss some of the current challenges from a statistical perspective, including survey design, accounting for false positive detections, estimation of acoustic cue rates, automatic detection of sounds of interest and dealing with animal movement. We anticipate that methods to address all these challenges will continue to be developed in the coming years. We will conclude discussing an anticipated game changer: despite being traditionally estimated discretely, say for a survey or for a given month, animal density or abundance are quantities that evolve continuously over time. Using passive acoustics, these are now possible to be monitored continuously. It seems just a matter of time until methods that explicitly account for this continuity are developed.

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