Challenges of density and abundance estimation from sparsely distributed acoustic instruments

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There has been a marked increase in passive acoustic monitoring in both terrestrial and marine environments over recent years. Animal abundance and density estimation methods have been adapted and extended to accommodate various forms of passive acoustic data. Several methods rely on the same acoustic detection being recorded across multiple instruments. For example, multiple instruments are generally required to estimate the range of the detected animal for use in distance sampling, or to generate capture histories for acoustic spatial capture-recapture. Here, I will discuss various analysis options for abundance and density estimation from acoustic data when detections across an array of multiple instruments is not possible or limited, illustrated by examples from blue whale (Balaenoptera musculus sp.) and fin whale (Balaenoptera physalus) monitoring. Suggested methods include using simulation-based approaches to estimate detection probability, a key parameter of abundance and density estimation methods. I will also discuss the possibility of combining data from (a) the same instruments with different capabilities or (b) different surveying platforms, to make best use of sparsely distributed acoustic instruments.