Accounting for Multilevel Data Structures in Fisheries Data using Mixed Models

ABSTRACT: Multilevel data structures are those that have a hierarchical structure, in which response variables are measured at the lowest level of the hierarchy and modeled as a function of predictor variables measured at that level and higher levels of the hierarchy. For example, a multilevel data structure may consist of measurements taken on individual fish (lower level) that are nested within lakes or streams (higher level). Multilevel data structures are a common feature in fisheries research. We provide simulated fisheries data examples, similar in structure to other published studies, to illustrate the application of multilevel models and discuss how hypothesis testing and inferences can be incorrect if multilevel data structures are ignored. Ignoring multilevel data structures has implications for the use of commonly-used ordinary least squares (OLS) approaches to test hypotheses and to make inferences. Multilevel models are an alternate approach that circumvents problems associated with traditional OLS methods and allows valid inferences to be made.

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