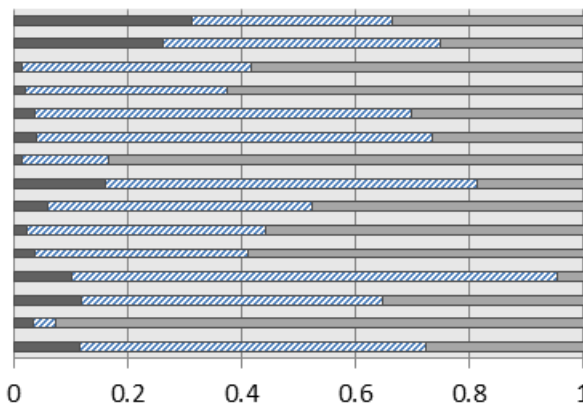




Influence of pseudoreplication on meta-analysis inferences

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These 15 variance decompositions from meta-analyses show that a large proportion of variation in observed effect sizes is from among papers (grey), rather than just real variation among effects within papers (hatched) or measurement error (dark). This indicated observations from the same paper were not independent.

Goal: Commonly individual source papers contribute multiple effect sizes to ecological meta-analyses. We sought to discover if ignoring this was influencing inferences made in actual ecological meta-analysis studies.

Objectives:

1. Determine if conclusions of statistical inference were generally inflated in ecological meta-analyses because of pseudoreplication due to multiple effect sizes per paper.
2. Evaluate whether the simple procedure of adding a random paper effect to an analysis solved problems.

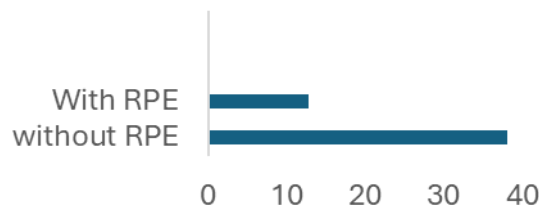
Management Implications: Meta-analysis studies are influential syntheses in fisheries and more widely, e.g. to combine estimates of hooking mortality. Our results emphasize the importance of accounting for non-independence arising from multiple observed effects from individual source studies.

Methods:

- Obtain data from published ecological meta-analyses.
- Repeat original analyses many times with a new factor randomly assigned but at the level of paper rather than individual observation.

Key Findings:

- Factors with treatments assigned at random were significant 38% of the time (at the 0.05 level) rather than the 5% expected for valid approaches.
- The fraction of significant results was less when analyses included a random paper effect but still exceeded 5%.



Percent of times a new factor added to analysis was significant, both with and without a random paper effect (RPE) also being added. If there were no problems with the analyses the percentage would be 5%.

Deliverables: Peacor, S.D., C. Song, J.R. Bence, A.A. Briggs, E.A. Hamman, and Craig W. Osenberg . 2025. Ecological meta-analyses often produce unwarranted results. Ecology.106(12): e70269

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