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Data credibility



Focus on outcome evaluation



- Emphasis on quantitative data
- Emphasis on natural sciences
- Emphasis on effectiveness
- Emphasis on strength of evidence
- Emphasis on data quality
- Perspective of systematic reviewer

Common Issues



- The confidence with which we can interpret data in the context of our questions depends upon data quality and the strength of the evidence that they provide.
- Is the measured effect real and can we attribute the effect to the interventions we have put in place?

What does quality mean?



- The extent to which the study design limits the influence of error and bias.
- Inversely proportional to the likelihood of misinterpretation.
- The extent to which data sets can be combined in a meta-analysis

Methodological development: Stages of a systematic review



- Formulate a question (stakeholder engagement)
- Generate a protocol (peer reviewed)
- Systematic search
- Study selection
- Data quality assessment (critical appraisal)
- Data extraction
- Synthesis of data (meta-analysis)
- Report on evidence base and implications
- Active dissemination and information sharing

Guidelines now published as Pullin & Stewart 2006. Conserv. Biol.

Appraising methodology?



- There is no such thing as a perfect study, all studies have weaknesses, limitations, biases
- Interpretation of the findings of a study depends on design, conduct and analysis
- A third of ecological papers are pseudoreplicated!
- About 80% of research findings are false!

Ioannidis JPA (2005) Why most published research findings are false. PLoS Med 2(8): e124.

Susceptibility to Bias



- Selection Bias
- Performance Bias
- Detection Bias
- Attrition Bias

Dealing with Effect Modifiers



- Key problem for attribution
- Poor quality studies will suffer from confounding variables
- Synthesis of good quality studies can examine influence of effect modifiers under different conditions.
- Differences in methodological quality can be explored as an explanation for heterogeneity in study results

Are bracken control methods effective?



Stewart, G.B. Pullin, A.S. & Tyler, C. (2007) The effectiveness of asulam for bracken (*Pteridium aquilinum*) control in the united kingdom: A meta-analysis. *Environmental Management* 40, 747-760



Lesson – variable data availability may prevent meaningful comparison of effectiveness.

Variable outcome measures



- Key problem for synthesis of multiple studies
- Rarely consensus on what is the most valid measure

Do in-stream devices increase salmonid populations?



Pseudoreplication



- Big issues for site-based ecology
- Provided problem is transparent it can be dealt with

Do Marine Protected Areas work?



Internal v External validity



- Does eliminating variables make the data more or less credible?
- Internally valid experiments should be of higher quality but may be less fit for purpose.

Are *Rhododendron* control methods effective?



Tyler, C., Pullin, A.S. & Stewart, G.B. (2006) Effectiveness of management interventions to control invasion by *Rhododendron ponticum*. *Environmental Management* 37, 513- 522.



Improving data credibility



- Controlled – randomised - replicated
- Multiple stakeholder involvement in design
- Transparency of method
- Accessibility of data

Collaboration for Environmental Evidence

systematic reviews for conservation and environmental management



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Welcome

The Collaboration for Environmental Evidence is a partnership between scientists and managers working towards a sustainable global environment and the conservation of biodiversity. The collaboration seeks to synthesise evidence on issues of greatest concern to environmental policy and practice.

Syntheses take the form of [systematic reviews](#) providing rigorous and transparent methodology to assess the impacts of human activity and effectiveness of policy and management interventions. This website contains a small but fast growing [Library of Environmental Evidence](#) in the form of systematic reviews.

The Collaboration is not for profit and relies on the dedication and enthusiasm of scientists and managers to provide a reliable source of evidence to continuously improve the effectiveness of our actions.

Please browse our website to find out more and do not hesitate to [contact us](#) with any questions or suggestions you might have.

*****Stop press...** Documents submitted to the Environmental Evidence Library must first undergo a period of consultation and peer review. All draft review documents are now handled by the [Centre for Evidence-Based Conservation](#). Those interested in providing feedback on current review and protocol drafts should visit their website to see which documents are [currently available](#) for consultation. To find out more about the systematic review process and how to author a review, please see our "Information for..." section.***

News Headlines

December 2007 News...

- New-look CEE website now online!
- Updates - information posted on CEE [Review Groups](#) & [Board](#).

Recently added...

- Systematic review: "[What are the effects of salmonid stocking in lakes on native fish populations and other fauna and flora? Part A: Effects on native biota](#)". Browse our library of systematic reviews.

- Finalised protocols: "[The effectiveness of plant introductions as a method for mitigating extinctions](#)" and "[Are](#)

