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Data credibility







- 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.





- 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

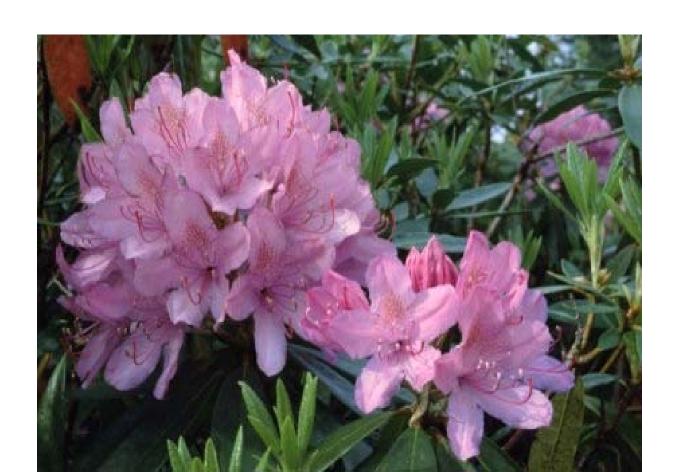
 Does eliminating variables make the data more or less credible?

 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

www.environmentalevidence.org

Collaboration for Environmental Evidence

systematic reviews for conservation and environmental management



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
- 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