Moving Beyond EC_{20}s in Sediment Weight-of-Evidence Assessments

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Topic for Discussion

- How can we improve contaminated sediment risk assessments?
- Specifically, are there implications of using a sequential WOE that emphasizes toxicity testing versus a simultaneous WOE that includes toxicity testing and benthic community analyses?

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Decision Criteria for Toxicity Testing

Three influences

- Tier I Risk Assessment Guidance
  - Report the full concentration-response curve with appropriate EC_X (use EC_{20} for aquatic)
- Volume III (Sediment Guidance Manuals)
  - Statistically significant reduction relative to reference or control sediment
- Derivation of $SEDQC_{SCS}$ and $SEDQC_{TCS}$
  - 20 and 50% probability of observing a statistically significant (roughly a 20% reduction) in survival relative to negative control

Common approaches

- Statistically significant and/or greater than 20% reduction
- 50% reduction category often included

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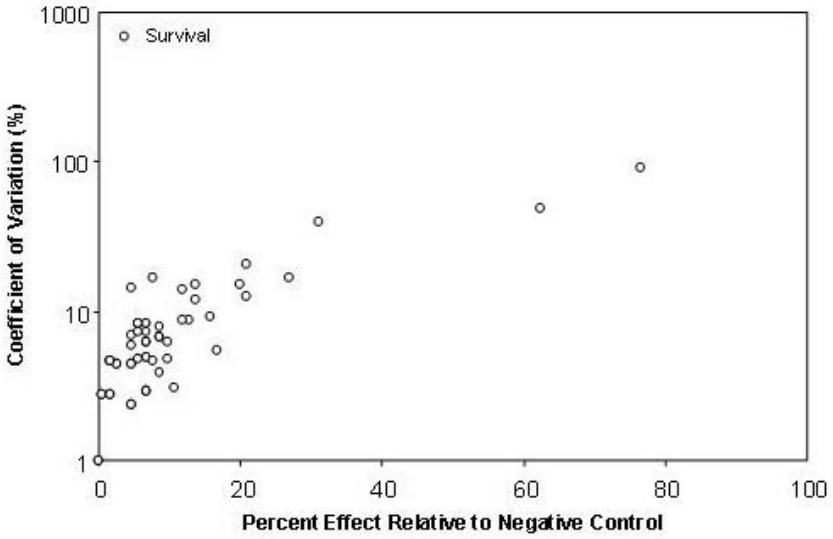
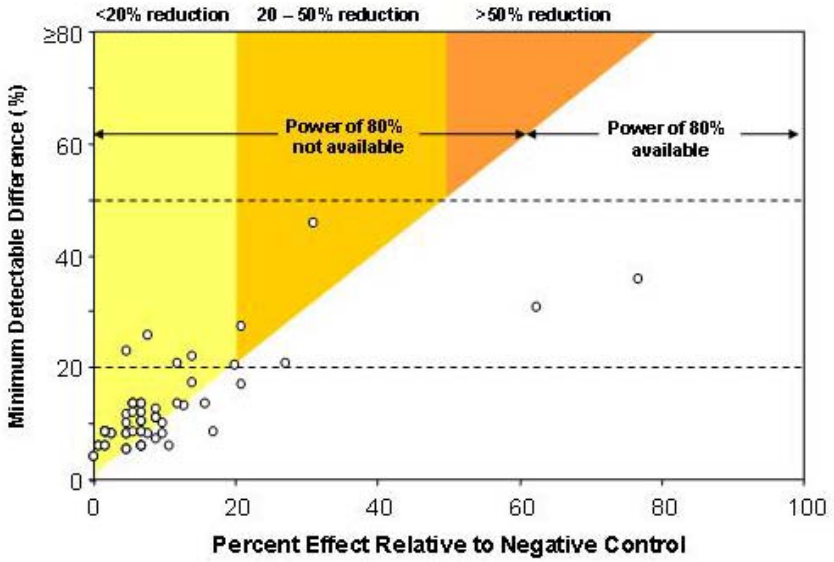
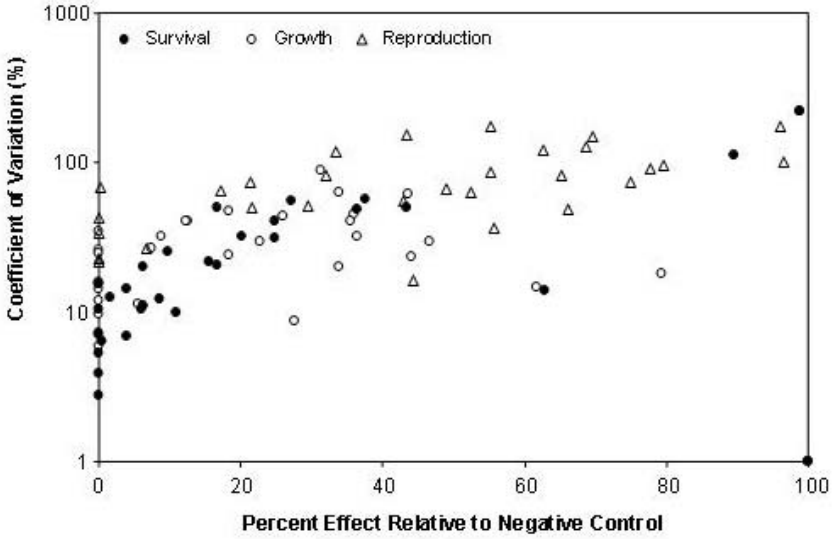
from DeBruyn and McDonald (2006)

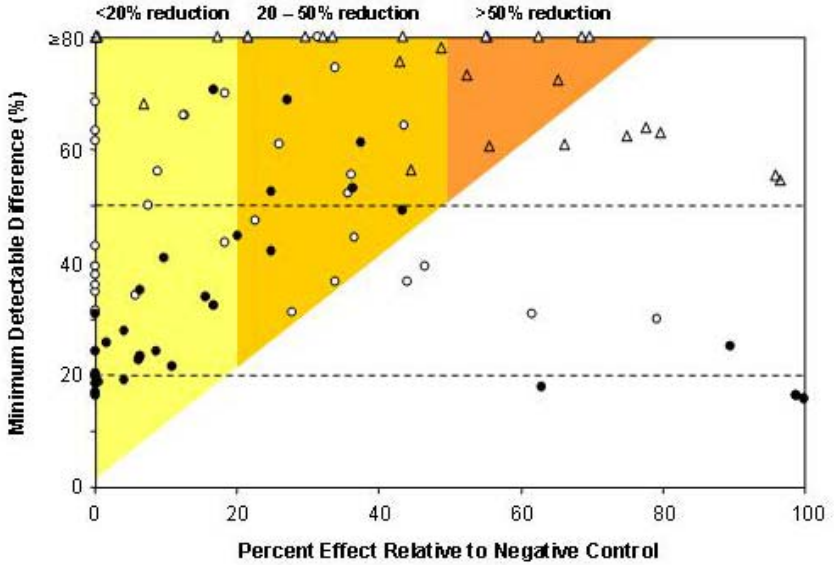
10-d amphipod (*Eohaustorius estuarius*)





28-d amphipod (*Leptocheirus plumulosus*)





What are the challenges?

1. Toxicity tests with 5 replicates can have high variability which limits ability to:
   - Accurately determine if a statistically significant difference is present
   - Correctly classify the sample in terms of <20, >20 or >50% reductions
2. Assumptions about power and variability from acute toxicity tests are not necessarily applicable to chronic tests
3. Organisms respond to different samples in different ways:
   - No silver bullets in terms of relative sensitivity

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Things for Consideration

Decisions are often made on toxicity testing alone due to phasing a WOE:

- What is the value of making comparisons to the negative control versus reference samples?
  - Designation of acceptable “contaminated” reference areas would be beneficial
- Should statistical comparisons be based on $p = 0.80$ and $\alpha = 0.05$?
  - Lower power? Higher alpha? Increased replication?
- Should a 20% reduction criteria be applied to all tests and endpoints as a default?
  - What is the ecological relevance of different levels of effect?

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Concluding Thoughts

- We are not suggesting that toxicity testing is not relevant for site management
  - Decision to use toxicity testing alone needs to consider the level of certainty needed for management decision
- Increased discussion of these issues in the uncertainty analyses is warranted
  - Decisions based on policy and common practice should be explicitly identified
- Multiple lines of evidence provide a means to balance strengths and limitations
  - Battery of toxicity tests
  - Inclusion of benthic community and bioaccumulation data

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