INTRODUCTION TO META-ANALYSIS IN ECOLOGY
PLB 809, SECTION 433

Instructor:
The primary instructor will be Prof. Craig W. Osenberg (osenberg@uga.edu), University of Georgia. This course is based on one that was developed and taught at the Hopkins Marine Lab (2016) in collaboration with Drs. Joachim Claudet CRNS, France; http://www.joachimclaudet.com/) and Fiorenza Micheli (Stanford University; https://michelilab.stanford.edu/) It has been enhanced by online modules developed in conjunction with a NSF grant, led by Osenberg, James Bence, and Scott Peacor (MSU Fisheries and Wildlife).

Dates: July 22-26, 2019

Location: WK Kellogg Biological Station, Michigan State University, Hickory Corners, MI

Course context, aims, and objectives:
Meta-analysis is the quantitative synthesis and analysis of a collection of (somewhat) independent studies. It provides a more objective and powerful way of summarizing evidence across studies than descriptive reviews. The importance and utility of this quantitative method for answering ecological questions and synthesizing existing results is demonstrated by the dramatic increase in the number of studies using meta-analysis in the past fifteen years.

The course will provide an introduction to all elements of meta-analysis. The emphasis of the course is on both the conceptual understanding and practical use of this method, as applied to ecological questions. It will consist of lectures, on-line learning modules, discussions, and practical exercises. Students will gain hands-on experience, so that after the course they will be able to conduct their own meta-analyses, informed by knowledge of the strengths and limitations of the approach.

Course outline:
Lectures and on-line modules:

- Introduction: Definition of meta-analysis, qualitative review vs. quantitative synthesis, history, approaches.
- Performing a meta-analysis: Defining the question(s), effect sizes, data extraction, research and publication bias, data analysis (e.g., fixed and random effects models), weights, non-independence, heterogeneity and effects of moderators.
- Presentation and interpretation of meta-analysis results.
- Applications: Overview and discussion of different case studies utilizing meta-analysis.

Individual and group activities:

- Practical: Students will walk through all the steps and calculations with examples that emphasize data extraction, data summaries, effect size, and analysis.
- Application: Using example datasets provided by the instructors, students will conduct meta-analyses. We will compare results and interpretations among different student groups to evaluate the process and challenges in doing meta-analyses.
- Putting it all together: Students will propose meta-analysis projects. Research groups will be formed and meta-analyses will be conducted during the workshop with presentations made at the end of the week by each research group.

[Analyses will be conducted in R, although prior experience with R is not required.]