

**COURSE:** Summer 2010, FISH 7960/8960, Special Problems in Fisheries and Allied Aquacultures

**TOPIC:** Meta-analysis: Concepts, Limitations, and Possibilities

**LECTURE:** TBD (one two-hour class per week), Swingle 303, 2 credit hours

**OFFICE HOURS:** Available by appointment

**REQUIRED PREREQUISITES:** Graduate level students, instructor approval

**INSTRUCTOR:** Dr. Alan Wilson, Swingle 321, wilson@auburn.edu, 334-844-9321

**FIELD OF STUDY:**

Meta-analysis is a quantitative approach for synthesizing results from diverse research studies that address a similar hypothesis. Effect sizes calculated from individual studies are combined to elucidate general patterns across studies. Like most approaches, meta-analysis has limitations (e.g., file drawer problem, dealing with varying publication quality). However, the technique can be a power option for identifying patterns in disciplines where the availability of large, underanalyzed datasets is common, such as ecology, psychology, medicine, and education.

**COURSE OBJECTIVES & STUDENT LEARNING PHILOSOPHY:**

The course objectives represent a variety of tasks and skills that I expect students to have developed and mastered by the end of the course. Through participating in this course, you will (1) practice and develop your critical thinking skills (through in-class group discussions and presentations), (2) learn how to read and interpret the scientific literature, (3) broaden your understanding of meta-analysis, and (4) conduct your own meta-analysis.

**REQUIRED MATERIALS (PROVIDED BY INSTRUCTOR):**

Articles from the peer-reviewed literature (see complete list at end of syllabus)

**GRADING:**

Course grades are based on each student's cumulative performance for the following assignments:

<u>Activity</u>	<u>Points</u>	<u>Grading scale</u>
Participation	20	A = 90-100%
Paper discussion	30	B = 80-89%
Project presentation	50	C = 70-79%
		D = 60-69%
		F = 0-59%
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Total points		100

## **STUDENT EXPECTATIONS:**

The course grade will be based on participation in lecture, discussion leading of important papers in meta-analysis, and a final project presentation as described below:

- (1) PARTICIPATION: Discussion is vital to an effective learning environment and participation grades will reflect student attendance and involvement during classroom activities. In order to participate, you need to be at class on-time and prepared (i.e., perused readings, practice with software).
- (2) PAPER DISCUSSION: All students will be required to lead the discussion of a series of articles from the peer-reviewed literature during one or two class periods (depending on class size).
- (3) PROJECT PRESENTATION: All students will be required to present a 20 minute lecture describing a meta-analysis that they conduct during the course. Brief 1 page outlines of the project will be due by the third week of the course so that I can assist with project development. The students are expected to use the primary literature as references and data sources for this presentation. Students producing successful projects will be strongly encouraged to submit their papers to a peer-reviewed journal.

## **FEEDBACK & EVALUATION:**

This course is for you to learn important fundamental concepts and ideas on which to build your understanding of meta-analysis. Course evaluations will be completed by students at the middle and end of the semester so that course changes can be made to enhance the learning experience for this class and future classes. Finally, students are always welcome to schedule a meeting with me to talk more about topics discussed in class.

## **COURSE CHANGES:**

Although I expect to cover all the topics described in the syllabus, course changes will likely occur - especially based on feedback from the students. Consequently, I reserve the right to modify the course to enhance the learning experience where I deem appropriate. Course changes will be described verbally during class and/or in writing via email and/or handouts.

## **ACADEMIC HONESTY:**

Title XII, Chapter 1200 of the SGA Code of Laws clearly defines the Auburn University student academic honesty code (available at <http://auburn.edu/tigercub/>) which states "*In accordance with those virtues of Honesty and Truthfulness set forth in the Auburn Creed, I, as a student and fellow member of the Auburn family, do hereby pledge that all work is my own, achieved through personal merit and without any unauthorized aid. In the promotion of integrity, and for the betterment of Auburn, I give honor to this, my oath and obligation.*"

## **ACCOMMODATIONS FOR DISABILITIES:**

If you have a disability and/or a special need that requires accommodations, please inform me immediately so that I can develop a plan to work with you and arrange an appointment with a campus disabilities counselor.

## LECTURE SCHEDULE AND ASSOCIATED READINGS (CITATIONS FOLLOW):

<b><u>Date</u></b>	<b><u>Lecture topic</u></b>
<b>Week 1</b>	<b>Introduction to meta-analysis; historical overview</b> Arnqvist and Wooster 1995, Cooper et al. 1990; Finney 1995; Glass 1976; Gurevitch et al. 2001; Osenberg and St. Mary 1998
<b>Week 2</b>	<b>Limitations of meta-analysis</b> Bailar 1997; Eysenck 1984; Eysenck 1994; Lecky et al. 1996; Møller and Jennions 2001
<b>Week 3</b>	<b>Student project proposal presentation; Where to find data? How to choose data?</b> Englund et al. 1999; Slavin 1995
<b>Week 4</b>	<b>Statistics and meta-analysis; (ir)relevance of null hypotheses &amp; <i>P</i>-values</b> Fernandez-Duque 1997; Gurevitch and Hedges 1999; Johnson 1999
<b>Week 5</b>	<b>How to choose an effect size metric?</b> Hedges et al. 1999; Osenberg et al. 1997; Osenberg et al. 1999
<b>Week 6</b>	<b>Introduction to Meta-Win 2.0</b> Rosenberg et al. 2000
<b>Week 7</b>	<b>Meta-analysis examples</b> Benayas et al. 2009; Brett and Goldman 1996; Downing et al. 1999; Halaj and Wise 2001; Koricheva et al. 2004; Sarnelle 1992; Schmitz et al. 2000; Shurin et al. 2002; Worm et al. 2002
<b>Week 8</b>	<b>Independent project preparation</b> none
<b>Week 9</b>	<b>Group critique and review of peer presentations</b> none
<b>Week 10</b>	<b>Final student presentations</b>

## **CITATIONS:**

- Arnqvist, G., and D. Wooster. 1995. Meta-analysis - synthesizing research findings in ecology and evolution. *Trends in Ecology and Evolution* **10**:236-240.
- Bailar, J. C. 1997. The promise and problems of meta-analysis. *New England Journal of Medicine* **337**:559-561.
- Benayas, J. M. R., A. C. Newton, A. Diaz, and J. M. Bullock. 2009. Enhancement of biodiversity and ecosystem services by ecological restoration: a meta-analysis. *Science* **325**:1121-1124.
- Brett, M. T., and C. R. Goldman. 1996. A meta-analysis of the freshwater trophic cascade. *Proceedings of the National Academy of Sciences of the United States of America* **93**:7723-7726.
- Cooper, S. D., S. J. Walde, and B. L. Peckarsky. 1990. Prey exchange-rates and the impact of predators on prey populations in streams. *Ecology* **71**:1503-1514.
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- Englund, G., O. Sarnelle, and S. D. Cooper. 1999. The importance of data-selection criteria: Meta-analyses of stream predation experiments. *Ecology* **80**:1132-1141.
- Eysenck, H. J. 1984. Meta-Analysis - an Abuse of Research Integration. *Journal of Special Education* **18**:41-59.
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- Finney, D. J. 1995. A Statistician Looks at Met-Analysis. *Journal of Clinical Epidemiology* **48**:87-103.
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- Hedges, L. V., J. Gurevitch, and P. S. Curtis. 1999. The meta-analysis of response ratios in experimental ecology. *Ecology* **80**:1150-1156.
- Johnson, D. H. 1999. The insignificance of statistical significance testing. *Journal of Wildlife Management* **63**:763-772.
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