

## Marine Larval Ecology Research Experience Part 2 (BIOL 596) Spring 2009

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### Syllabus

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Instructor: Dr. Brian Hentschel      Lecture & Discussion: Tu, Th: 9:30-10:45  
Office: PS 147      Lab schedule: TBA (150 min per week)

Phone: 619-594-0358  
Email: hentsche@sunstroke.sdsu.edu  
Office hours: Tu: 2:00-3:00 *and* by e-mail appointment

Required texts: Day & Gastel. 2006. How to Write and Publish a Scientific Paper.  
Anholt. 2005. Dazzle 'Em With Style: The Art of Oral Scientific Presentation.

Course web site:

<https://blackboard.sdsu.edu/webapps/login>

### **Prerequisites**

Biol 596 Marine Larval Ecology Part 1 (Fall 2008) and Permission of Instructor.

### **Innovative Course Concept**

This course is part of an innovative integration of teaching and research supported by a 5-yr, \$0.5 Million grant from the National Science Foundation: OCE 0548190 “CAREER: Consequences of short-term food variability during the development of marine invertebrate larvae.” Students will experience all aspects of scientific research; studying the effects of food variability on the development of invertebrate larvae merely provides the context within which students will develop and refine their research skills. The year-long program is divided into two one-semester courses. The fall-semester course will introduce students to the classic knowledge and lab techniques of larval ecology, developing new hypotheses, designing experiments, writing a research proposal, and evaluating proposals in peer-review formats. This companion course in the spring semester will be a project-based effort in which teams of students refine proposals, perform guided larval-ecology experiments, and present their results in a variety of formats. Students who enroll in the fall-semester course do not necessarily need to enroll in the spring-semester course, but the fall-semester course and permission of the instructor are prerequisites for this spring-semester course.

### **Course Description (Spring Semester)**

This spring-semester course will focus on collaboratively selecting which proposals created during the Fall 2008 course will be developed further and which larval-ecology experiments will be performed by teams of 4-5 students. During the spring semester, teams of students will revise the proposed work plans, perform the controlled experiments, and communicate the results in several forums. Several student products will emerge from the spring-semester course (see Course Goals and Student Learning Outcomes):

### **Required Textbook and Additional Readings (Spring Semester)**

Two inexpensive paperback books will be effective guides for effectively communicating results of the small-group research projects:

Day, R.A. and B. Gastel. 2006. How to Write and Publish a Scientific Paper, 6th Edition. Greenwood Press.

Anholt, R.R.H. 2005. Dazzle 'Em With Style: The Art of Oral Scientific Presentation, 2<sup>nd</sup> Edition. Academic Press.

Dr. Hentschel also will make copies of the following two books available to students to provide different perspectives on how to communicate scientific research:

Alley, M. 1998. The Craft of Scientific Writing, 3<sup>rd</sup> Edition. Springer.

Alley, M. 2005. The Craft of Scientific Presentations: Critical Steps to Succeed and Critical Errors to Avoid, 3<sup>rd</sup> Edition. Springer.

In addition, the required texts for the fall-semester course will continue to be valuable resources as students write their papers and prepare their presentations.

Young, C.M. 2002. Atlas of Marine Invertebrate Larvae. Academic Press.

Strathmann, M. F. 1987. Reproduction and development of marine invertebrates of the northern Pacific coast. Data and methods for the study of eggs, embryos, and larvae. University of Washington Press.

### **Course Goals and Student Learning Outcomes**

- Students will collaboratively develop several group projects. The review of individual proposals created during the fall-semester course will reveal many lessons that students will then apply to create effective group projects. Each team will spend the first 2 wk of the spring semester planning the details of their collaborative experiment (i.e., ordering supplies, scheduling, etc). Teams will develop a contract to formalize the agreed responsibilities of each member.
- Each team of 4-5 students will complete a replicated, controlled experiment that yields data and conclusions. The next 7-9 wk of the semester will be devoted to carrying out the experiment(s) as a team.
- Each team will then analyze their data and communicate the results in five formats: a paper, a poster, an oral presentation, a presentation to a high-school biology class, and a video journal. Each team will designate one student to be the primary author of each project, but all team members will contribute to each of the five products significantly as secondary, *collaborative* co-authors.
  - 1) The paper will take the form of an article in a scientific journal article. Each team will write a paper that will be peer reviewed by three students from other teams. Co-authors

will revise papers before the semester ends. All papers will be posted on a website to showcase students' work and disseminate the valuable ecological data. Some papers might be suitable for a real journal (Dr. Hentschel will edit papers for submission).

2) The poster will take the form of those presented at a scientific meeting. Each team will prepare a poster that follows the format for June meetings of the American Society of Limnology & Oceanography. This meeting has sessions devoted to undergraduate research, and the abstract deadline will occur when some teams might have enough data to submit an abstract to present their results at this international meeting. All posters will be displayed in the halls of the SDSU Biology Dept during the year after each course.

3) The oral presentation will take the form of a 15-min talk at a scientific meeting. Each team will prepare an oral, Power-Point presentation for a scientific audience. During the final week of instruction, each team will designate a speaker to present their collaborative research in a public symposium advertised to other SDSU students, faculty, and staff. In addition, Dr. Hentschel will encourage the authors of outstanding presentations to speak at the Western Society of Naturalists Meeting the following November.

4) Each team of students also will prepare and deliver a 30-min oral presentation to a high-school biology class. One of the greatest challenges many scientists face is effectively communicating their research to a more general audience. Several high-school teachers will be collaborating with Dr. Hentschel and will help advise the SDSU Larval-Ecology students in developing appropriate presentations.

5) Each team will compile a video journal of their activities. These will provide an "inside view" of each team's activities and problem-solving skills during the spring semester.

6) Each individual student will design a follow-up experiment to apply what he/she has learned from the instructor-guided, team experiment to design a more open-ended and original follow-up study. These will take the form of a 2-page written pre-proposal. Students who wish to carry out their follow-up experiments can do so during the summer in Dr. Hentschel's research lab.

## **Grading**

Because this course is designed around activities that engage small groups of students as cooperative teams, much of the grading will occur on a group basis. Dr. Hentschel does, however, recognize that some individuals might excel beyond others. Some of the grading will, therefore, provide recognition of individual achievement on the major products (i.e., the group's paper, talk, poster, H.S lecture, and video journal: *see details above and below*). For example, each team member can earn up to 100 points for their written paper, but the individual student who took on extra responsibility can earn an additional 25 points for the written paper. It's important to note that, even though one team member has the extra responsibilities of the "primary author" for one of the five major products, a "primary author" does not have sole responsibility; the group projects should be complete *collaboratively*. Accordingly, a significant portion of each student's grade will be based on *peer evaluations* of other team members. To make it a bit easier for students to evaluate the participation and relative contributions of their team members, separate peer evaluations will be performed for each major assignment and activity (see attached Peer Evaluation Form for a general example).

The following major assignments and activities will be graded by Dr Hentschel according to detailed Scoring Rubrics that will be distributed during the first week of the semester and by peer evaluations.

Written Paper (whole group)	100 pts
Written Paper (primary author)*	25 pts*
Written Paper (participation: peer evaluations)	40 pts
Poster Presentation (whole group)	100 pts
Poster Presentation (primary author)*	25 pts*
Poster Presentation (participation: peer evals)	40 pts
15-min Oral Presentation (whole group)	100 pts
15-min Oral Presentation (primary author)*	25 pts*
15-min Oral Presentation (participation: peer evals)	40 pts
High-School Biology Presentation (whole group)	100 pts
High-School Biology Presentation (primary author)*	25 pts*
H.S. Bio Presentation (participation: peer evals)	40 pts
Video Journal (whole group)	100 pts
Video Journal (primary author)*	25 pts*
Video Journal (participation: peer evaluations)	40 pts
Individual Written Follow-Up Pre-Proposal	35 pts
Written Peer Review of other group's draft Paper	25 pts
Written Peer Review of other group's draft Poster	25 pts
Written Peer Review of other group's PPT Slides	25 pts
General Participation in Team Lab Expt (peer evals)	40 pts

\* = a different student will be the primary author on each one of the 5 major items

**TOTAL POSSIBLE FOR EACH INDIVIDUAL IN A TEAM OF 5 = 875 pts.**

Grades will be based on the percentage of total points earned on the assignments and activities

A = 90-100%; B = 80-89%; C = 70-79%; D = 58-69%; F < 58%

Dr. Hentschel will use plus/minus grading within the upper or lower 2% of each letter-grade category. At his discretion, Dr. Hentschel may modify the percentages for each grade downward if he concludes that the scores should be adjusted based on the class average and general class performance. Please remember that long-standing University policy considers a grade of A to represent exemplary performance, indicative of "outstanding achievement; available only for the highest accomplishment," while a grade of B indicates a "praiseworthy performance; definitely above average." Dr. Hentschel hopes all students will strive to earn As!

## Lecture, Discussion, and Lab Schedule

Week	Date	Topic(s)	Assigned Readings
1			
	Th Jan 22	Course Introduction	
2	Tu Jan 27	Refining team proposals & Ordering lab supplies	
	Th Jan 29	Refining team proposals & Ordering lab supplies	
	Lab TBA	Spawning of possible target species	
3	Tu Feb 3	Review principles of experimental design	
	Th Feb 5	Discussion of Data Management	
	Lab TBA	Teams initiate experiments (collect adults, culture food, TBD)	
4	Tu Feb 10	Review common statistical analyses and software	D&G Ch 1-6
	Th Feb 12	Overview of writing a good a scientific paper	
	Lab TBA	Teams initiate experiments (collect adults, spawn gametes, TBD)	
5	Tu Feb 17	Discussion of any problems with experiments	D&G Ch 27; Anholt Ch 1,2
	Th Feb 19	Overview of developing and presenting a good oral presentation	
	Lab TBA	Teams continue larval-culturing experiments	
6	Tu Feb 24	Discussion of any problems with experiments	D&G Ch 28; Anholt p. 108-18
	Th Feb 26	Overview of developing and presenting a good poster presentation	
	Lab TBA	Teams continue larval-culturing experiments	
7	Tu Mar 3	Teams continue larval-culturing experiments	
	Th Mar 5	Teams continue larval-culturing experiments	
	Lab TBA	Teams continue larval-culturing experiments	
8	Tu Mar 10	Discussion of any problems with experiments	D&G Ch 11
	Th Mar 12	Writing a good Methods Section	
	Lab TBA	Teams continue larval-culturing experiments	
9	Tu Mar 17	Discussion of any problems with experiments	D&G Ch 12,16,17; Anholt Ch 3
	Th Mar 19	Writing a good Results Section & effective Figures & Tables	
	Lab TBA	Teams continue larval-culturing experiments, Analyze Data?	
10	Tu Mar 24	Discussion of any problems with experiments	D&G Ch 13
	Th Mar 26	Writing a good Discussion Section	
	Lab TBA	Teams continue larval-culturing experiments? Analyze Data	
11	Tu Mar 31	Spring Break * Some experiments might require attention by team members	
12	Tu Apr 7	Discussion of any problems with experiments	D&G Ch 9,10
	Th Apr 9	Writing a good Introduction & Abstract	
	Lab TBA	Teams complete larval-culturing experiments, Analyze Data	
13	Tu Apr 14	Discussion of any problems with experiments Drafts of Methods for papers, posters, and PowerPoint slides DUE	Anholt Ch 4
	Th Apr 16	Developing a good presentation for a High-School Biology Class	
	Lab TBA	Data analysis, writing, presentation development	
14	Tu Apr 21	Drafts of Results for papers, posters, and PowerPoint slides DUE	
	Th Apr 23	Discussion of issues concerning papers, posters, and PowerPoint	
	Lab TBA	Writing & presentation development	
15	Tu Apr 28	Discussion of issues concerning papers, posters, and PowerPoint	D&G Ch 30,31,32,33
	Th Apr 30	Complete drafts of papers, posters, and PowerPoint slides DUE	
	Lab TBA	Prepare High-School Presentations	
16	Tu May 5	Peer Reviews of papers, posters, and PowerPoint slides DUE	
	Th May 7	Final preparation & discussion of High-School Presentation	
	Lab TBA	SDSU Symposium of Oral Presentations (day & time TBD) High-School Presentations (day & time TBD)	
17	Tu May 12	Complete drafts of Video Journals DUE	
Final Exam	Tu May 19 10:30-12:30	Revised Papers & Posters due Individual papers describing Follow-Up Experiment DUE	

**PEER EVALUATION FORM (after C.F. Herreid)**

Your Name: \_\_\_\_\_ Team Name: \_\_\_\_\_

Please assign scores that reflect how you really feel about the extent to which the other members of your collaborative research team contributed to your learning and the group's performance on the activity. Six separate peer evaluations will be completed for each major activity (written paper, 15-min oral presentation, poster, presentation for a H.S. Biology, video journal, and the general completion of the lab experiment over 1-2 months). Keep in mind that, if you assign everyone the same score, you are hurting those team members who contributed the most and helping those who contributed the least.

**Instructions:**

In the space below, please rate each of the other members of your research team by doing the following:

- 1) List the name of each team member other than yourself.
- 2) Assign an average of 10 points to each person other than yourself. If your team has 4 members, for example, you will be assigning a total of 30 points. If your team has 5 members, you will be assigning a total of 40 points.
- 3) You must differentiate between individuals' relative contributions by assigning at least one score greater than 10 and one score less than 10. However, no one individual should be assigned more than 15 points (even if you think they did *all* the work).
- 4) You do not necessarily need to assign all of the points. The following unlikely extreme example illustrates this. If you are assigning 40 points to four team members other than yourself, but only one of them made any contributions (the other three never participated), you probably would assign scores of 15, 0, 0, and 0 points.

Name of Team Member	Score
1.	
2.	
3.	
4.	
5.	

**Additional Feedback:**

Please briefly describe your reasons for your highest and lowest ratings. These comments, *but not information about who provided them*, might be summarized if students request feedback about their overall peer evaluation scores. Also, please informally rate yourself and explain why you gave yourself this rating relative to your peers.

1. Reasons for your highest rating.

2. Reasons for your lowest rating.

3. Don't include yourself in the table above, but In theory, if you were to assign yourself points on the same relative scale(average = 10 pts, 15 pts max), what do you feel you would deserve? Please briefly explain your reasoning.