

## **FISH/BIOL/OCEAN 479 – Research in Marine Biology General Information for Students, Faculty, & Workplace Supervisors**

### **Summary:**

This independent research course provides marine biology minors with opportunities to work on individual marine biology research projects conducted under the supervision of faculty in Oceanography, Aquatic & Fishery Sciences, Biology, or related departments.

Each enrolled student works with a faculty supervisor to design a research project that includes a paper and presentation. Students receive academic credit for their work with the faculty members, but can combine research from various marine biology research activities with a FISH/BIOL/OCEAN 479 paper and presentation project for credits. Typical examples of activities combined with FISH/OCEAN/BIOL 479 credits include:

- Internships, such as summer internships with NOAA.
- Volunteer hours, such as volunteer work in the Seattle Aquarium.
- Work in faculty labs, then adding a paper and presentation component onto lab duties.
- Study abroad trips, such as adding an independent research project onto a UW marine science Exploration Seminar.

Students may also build an independent research project based on student and faculty interests and needs.

### **Papers:**

We encourage students and faculty to work within two writing structures, the literature review or the scientific report, depending on which one fits best with the student's work in the faculty lab, internship, or under faculty mentorship. Students who take FISH/BIOL/OCEAN 479 for three credits should expect to write a 7-10 page paper.

- 1) **Literature Review** – looks at all the literature available on a particular subject. Students summarize and synthesize/interpret the information, organizing their review chronologically, thematically, or methodologically. Typical literature reviews involve these three sections:
  - a. **Introduction** with thesis that describes the topic and your argument/thesis that shows your interpretation of the literature.
  - b. **Literature Review** that includes subheadings organizing your summary and analysis into topics.
  - c. **Conclusion** that reiterates your thesis and brings the topic into a larger picture or perspective.
  - d. **Work Cited**

**When to Choose a Literature Review:** A literature review might be appropriate for students who are doing a small task in an on going study such as data entry. For example, a student interning at NOAA over the summer converting printed media from marine cruises that collected fish eggs and larvae in the Bering Sea during the 60s and 70s to an electronic format and writing cruise summaries might consider taking three credits of FISH/OCEAN/BIOLOGY 479 and also writing a literature review on the topic of ichthyoplankton studies in the Bering Sea from 1940-present.

Students who can't find a position in a faculty lab, might also consider working on a literature review with a faculty mentor on a topic that they or the faculty member are interested in exploring. For example, a marine biology student taking the FISH 323 – Conservation and Management of Aquatic Resources might pursue the faculty about extending the lab on short-tailed albatross (*Phoebastria albatrus*) on the island of Torishima off of Japan into a 3 credit literature review about related topics.

**Guidelines for Literature Reviews:**

[http://www.unc.edu/depts/wcweb/handouts/literature\\_review.html](http://www.unc.edu/depts/wcweb/handouts/literature_review.html)

**Samples of Literature Reviews:**

[http://www.fish.washington.edu/research/oldenlab/pdf/2006/GlobalEcolBiogeog\\_2006.pdf](http://www.fish.washington.edu/research/oldenlab/pdf/2006/GlobalEcolBiogeog_2006.pdf)

2) **Scientific Research Paper** – culminates a scientific experiment or study. It discusses the background and topic of the study, describes the experiment so that other scientists would be able to reproduce it, and discusses the experiment/study findings. Typical scientific research papers involve these sections:

- a. **Abstract**, briefly answers what, how, why, and so what. It is typically written at the end of the paper to summarize the report.
- b. **Introduction** that gives background on your topic and sets up your hypothesis, states hypothesis, and can also include a literature review.
- c. **Materials & Methods** that describe the experiment design, how you tested that hypothesis, what equipment you used, defines formulas and symbols, identifies the statistical approach.
- d. **Results** that provide raw uninterrupted data in charts and tables and describes that data in words.
- e. **Discussion** that explores whether your data supports your hypothesis, experiment design limitations, and implications of your results.
- f. **Works Cited**

**When to Choose a Scientific Research Paper:** A scientific research paper also might be appropriate for students doing a small task in an on-going study or for students working on their own projects in faculty labs or internships. For example, a student analyzing geoduck histology slides and recording the gonad mass of each sample in an ongoing study that examines the possible effects of the current prevalent geoduck aquaculture techniques and practices on the natural environment in and around Puget Sound, might choose to do a scientific paper using the small data set that they create while analyzing the slides. In this case, a literature review already exists as part of the larger experiment. The student can use this review when writing the introduction to their paper.

Students might also use a scientific research paper structure for research projects that they design. For example, an Ocean major exploring how shore currents affect sediment patterns in a particular estuary for their senior thesis, might also decide to do a marine biology research project that uses their thesis data.

**Guidelines for Scientific Papers:**

[http://www.unc.edu/depts/wcweb/handouts/lab\\_report\\_complete.html](http://www.unc.edu/depts/wcweb/handouts/lab_report_complete.html)

**Samples of Scientific Papers:**

Explore marine biology faculty papers by following the links here,  
<http://depts.washington.edu/marbio/who/people.html>

**Presentations:** Students should present their findings from their research project at the end of the quarter. This can be at a range of venues such as the Mary Gates Undergraduate Research Symposium, but students can also schedule a time to present to members of their lab group. Our goal is that students have an opportunity to practice scientific presentations. Presentations should be 10-15 minutes.

**Presentation Resources:** <http://www.unc.edu/depts/wcweb/handouts/speeches.html>

**Goals and Objectives:**

- To design and plan an individualized research project on a topic in marine biology with a faculty supervisor.
- To meet with the faculty supervisor for project mentorship throughout the quarter.
- To collect data and/or literature for analysis that ideally includes laboratory and/or field work.
- To analyze data and test hypothesis using experimental methods, comparative methods, and modeling.
- To write a paper of findings that includes a literature review and examinations of outcomes through a broad multi-perspective lens pertaining to Oceanography, Aquatic & Fishery Sciences, and Biology.
- To present findings in a public setting, ideally at a venue such as UW's Undergraduate Research Symposium

**Requirements:**

All students enrolled in FISH/OCEAN/BIOL 479 should have taken FISH/OCEAN/BIOL 250 and Q SCI 381. Students should also be familiar with analysis software Matlab and/or Excel. Previous experience from coursework with data collections, hypothesis testing, literature reviews, and writing across disciplines is also important.

**Meeting Times:**

Students will arrange meetings with their faculty supervisor for project mentorship throughout the quarter. These meetings are recommended to be weekly or bi-weekly and used to assess project progress, reading lists, and drafts of the paper.

**Readings:**

Students ideally will develop a reading list for the literature review portion of their papers and verify this with their faculty supervisors.

**Grading:**

Grades ideally will be based on data collection, data analysis, final paper, and presentation, but this is ultimately decided by the faculty supervisor.

**Sample Grading Scheme:**

Data collection, library research, research duties performed 40%

Paper 45%

Presentation 15%