**7.431 The Biology and Ecology of Coral Reefs**

**Instructors:** Ann Tarrant, Jesús Pineda, and Simon Thorrold

(atarrant@whoi.edu; Redfield 232, x3398; jpineda@whoi.edu; MRF 211, x2274; sthorrold@whoi.edu; MRF 223, x3366)

**Meeting:** (Usually) Smith Conference Room, Thursdays 1:00-2:30.

9/11, 10/16, 11/13, 11/20 Redfield 204

10/23 Blake Conference Room

**Course website:** [**http://www.whoi.edu/sbl/liteSite.do?litesiteid=29552&articleId=49518**](http://www.whoi.edu/sbl/liteSite.do?litesiteid=29552&articleId=49518)

**Summary:** Coral reefs are highly productive and diverse ecosystems that are threatened by factors ranging from local point-source pollution to overfishing and global climate change. This course will introduce key aspects of both the biology of reef-building corals and the ecology of tropical coral reefs. Classes will include both physiological and ecological components. The goals are to examine the adaptations of corals to reef environments, the natural and environmental processes that affect coral physiology and reef structure and function.

**Grading and expectations:** Students are expected to attend all classes, to read and be prepared to discuss assigned readings. Class will typically begin with an introductory lecture to provide a foundation and context for the discussion. A student will then be selected (typically randomly but ensuring everyone gets a chance) to lead the discussion. The discussion leader will summarize the paper, pose questions and otherwise lead discussion. Discussion and participation will comprise 50% of the grade. The other half will be based on two written assignments (25% each). The first will be a critical evaluation of one of the assigned readings in the context of related literature. Each student will select a different week for this assignment. The second will be a 15 minute oral presentation on a topic selected by the student, which will include a synthesis of recent literature.

**Missed classes:** Classes missed due to illness or unavoidable conflicts can be made up in one of two ways: (1) you may read the assigned material and prepare a short (1-2 page) summary and discussion of the material or (2) if the instructor is available, you may arrange to separately discuss the paper and related material.

**Tentative schedule of lectures:**

Sept 4 Structure, distribution and diversity of coral reefs (Tarrant)

Sept 11 Coral-algal interactions (Tarrant) **Redfield 204…no videoconference**

1. Barrott KL, Williams GJ, Vermeij MJA, Harris J, Smith JE, Rohwer FL, Sandin SA. 2012. Natural history of coral-algae competition across a gradient of human activity in the Line Islands. Mar Ecol Prog Ser 460: 1-12.
2. Hoey AS, Bellwood DR. 2011. Suppression of herbivory by macroalgal density: a critical feedback on coral reefs? Ecology Letters 14:267-73.

And an introduction to symbiosis

**Sign up for Assignment #1 topic/weeks**

Sept 18 Symbiosis and coral bleaching (Tarrant)

Sept 25 Phase shifts, resilience and recovery (Tarrant)

Oct 2 Coral calcification and OA (Tarrant)

Oct 9 Adaptation, acclimation and variation (Tarrant)

Oct 16 The “coral” holobiont (Tarrant) **Redfield 204, no video conference**

Oct 23 Oceanography and Circulation (Pineda) **Blake conference room, no video conference**

Oct 30 Coral reproduction and population structure (Tarrant)

Nov 6 Larval transport and recruitment (Pineda)

**Assignment #2 topic due (1 paragraph)**

Nov 13 Coral reef fish ecology (Thorrold) **Redfield 204, no video conference**

Nov 20 Ecogeochemistry and food webs in coral reef habitats (Thorrold) **Redfield 204, no VC.**

Dec 4 The Role of Marine Protected Areas in Coral Reef Conservation (Thorrold)

Dec 11 To be announced (Tarrant) will include brief **student presentations (Assignment 2)**

**Assignment 1**

Write a paper (3-5 pages double spaced) discussing an assigned article in the context of related literature. Summarize the major objectives and findings of the paper. Discussion points may include strengths and weaknesses of the study design, evaluation of controversial aspects of the interpretation and discussion and suggestions for future research. Consider the contribution of the assigned article in relation to other published studies. This may include “classic” papers that provided a foundation for the current study, papers that provide contradictory results, related studies conducted in other environments or taxa, etc. Papers referenced by the authors are a good starting place, but do not feel limited by these. This is an opportunity to make new comparisons and bring diverse material into the discussion.

Assigned readings will be posted 1-2 weeks before the deadline/class date.

Choose among the following topics/deadines (we will sign up during class on September 11). Papers are due on the day of the related class. Please select 2 possible topics of interest (to ensure a more even distribution).

Sept 25 Phase shifts, resilience and recovery

Oct 2 Coral calcification and OA

Oct 9 Adaptation, acclimation and variation

Oct 16 The “coral” holobiont

Nov 6 Larval transport and recruitment

Nov 13 Coral reef fish ecology

**Assignment 2**

1. Select a topic of interest to you that is related to coral reef research. This could be something we have discussed in class where you would like to go into more detail, or something that we have not covered. The idea is to learn something new, so the topic should not be closely related to your own thesis research (we can discuss this on a case-by-case basis).
2. Write a few sentences proposing the topic due by Nov 6 (sooner is fine). The purpose of this deadline is try to minimize overlap among presentations and to allow the instructors to provide suggestions.
3. Prepare a 15 minute oral presentation (using appropriate visual aids, such as powerpoint) on your chosen topic, to be given on December 11. The presentation should be targeted toward members of the class (who have different scientific backgrounds) and should include direct reference to primary literature (e.g., including figures taken directly from published papers, much as the instructors do during lecture).