

Coral Reef Ecology, Health, and Conservation Lab/Field Experience Spring 2020

EVPP 505-005 (CRN 18255)/BIOL 508-003 (CRN 21494)

Exploratory Hall, Room 2602

Thursdays, 1:30-4:10 p.m.

Instructors: Dr. Esther Peters, Dr. Thomas Wood
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Office Hours: Dr. Peters: Thursdays (4:30–5:30 p.m.) or BY APPOINTMENT
Dr. Wood: BY APPOINTMENT (please send an email request)

Prerequisites

Permission of the instructor (contact Dr. Peters)

Additional Requirements

A previous course in coral reef ecology or registration in one of the concurrently offered 3-credit lecture course sections for Coral Reef Ecology, Health, and Conservation.

Course Description/Overview

Students will learn about current coral reef ecology and conservation knowledge and efforts, as well as the environmental and anthropogenic stressors threatening coral reefs and the organisms that inhabit them. This 1-credit field experience course allows students to experience in person the beauty, biodiversity, productivity, and demise of coral reefs by participating in (1) additional on-campus sessions to learn about reef species identifications, underwater research methods, and scientific writing, and (2) an off-campus 7-day Spring Break trip to the Caribbean island of Roatán. There, students will study the natural and societal aspects of coral reefs, reef evolution, research being conducted on Caribbean reefs, and the diversity of approaches to conserve reef resources. They will stay at Anthony's Key Resort and participate in the educational program at the Roatán Institute for Marine Sciences (RIMS), be introduced to the reef biota and apply reef organism identification skills as they practice collecting reef condition data through SCUBA diving or snorkeling on nearby reefs, learn about marine mammals and interact with the Atlantic bottlenose dolphins in the dolphin Encounter program, and visit the RIMS coral nursery to learn about coral husbandry

and reef rehabilitation programs. In addition, advanced SCUBA divers will learn skills to complete training as scientific divers under George Mason University's American Academy of Underwater Sciences (AAUS) program. This international field component will deliver real-world experience during a semester-long course that provides the intellectual basis for understanding this unique ecosystem.

Learning Objectives

On completion, students will be able to:

1. Understand the complexity of coral reefs and their conservation through witnessing the current condition of the reefs in Roatán.
2. Describe the geology of these ecosystems and their relationship to other ecosystems such as mangroves and sea grass beds.
3. Identify different types of corals, as well as families of fishes and other reef creatures and discuss the symbiotic and ecological relationships they have with one another.
4. Apply scientific reasoning to conservation issues and collect, record, and process information associated with their observations.
5. Discuss global and local threats affecting Roatan's reef organisms and how they impact the ecosystem and are linked to human health (as related to the 'One Health' concept)

Instructor Expectations

Class participation will be required of each student, according to the course schedule below. Students are expected to read books and journal articles, study supporting materials, and prepare assignments outside of class. Students are required to organize material logically and communicate effectively orally and in writing. Students will be expected to participate in all activities, behave properly, and must adhere to all policies and rules during the Roatán field experience, which will also involve more strenuous physical activities of SCUBA diving or snorkeling.

Attendance in classroom sessions before and after the field trip is required. Tardiness and absenteeism should be limited to illness or emergencies. Dr. Peters should be notified PRIOR to the start of class if a student will not be in attendance. Students should come to class ready to participate in all activities with assignments and readings completed prior to class, behave in a mature and professional manner, and abide by the GMU honor code.

Field Experience Assignments

Students will gain skills pertinent to working in environmental science and conservation, including:

(1) Reef Study Methods

To understand different reef habitats and detect changes in the species present and their health, scientists measure numerous environmental parameters and collect samples of organisms for further chemical, geological, physical, and biological laboratory analyses. Students will examine recent peer-reviewed literature on coral reef monitoring methods and prepare tools to use in collecting data for one protocol, the Atlantic and Gulf Rapid Reef Assessment, while in Roatán.

(2) Reef Organism Identification

Students will review text and online taxonomic keys and images to learn how to identify corals, fishes, and other organisms with the instructors. They will be exposed to many of these species on the trip to Roatán. A species' identification quiz will be given prior to the trip. Graduate students will learn how to correctly identify 60 species of fishes and 20 species of corals

(3) Journaling

During the field trip to Roatán, students will be immersed in the environment and making observations on the habitats and organisms present on this Caribbean island. They will perform coral reef survey techniques by snorkeling or SCUBA diving and compare the condition of different reef sites based on fish, coral, and benthic organism (plant and animal) populations. They will also make observations on societal, economic, political, and other factors related to coral reef conservation. To assist learning through these observations, students will keep two journal sections: The first is Front Line journaling, the second is Reflective journaling. More information will be provided during the course.

Readings

(1) Required Books (Selected chapters will be assigned):

1. *Roatan Institute for Marine Sciences' Instructors Manual: Planning a Field Course*, will be provided by the professor.
2. *Caribbean Reef Life: A Field Guide for Divers*, 3rd edition. Mickey Charteris, 2017. Mill City Press, purchase online.
3. *Healthy Reefs for Healthy People*, www.healthyreefs.org/cms/publications. The Healthy Reefs for Healthy People Initiative (HRI), *A Guide to Indicators of Reef Health and Social Well Being in the Mesoamerican Reef Region* (2007) and *Quick Reference Guide* (2008)
4. Atlantic and Gulf Rapid Reef Assessment, www.agrra.org

(2) Other recommendations:

1. Towards Reef Resilience and Sustainable Livelihoods: A Handbook for Caribbean Coral Reef Managers (Download at <http://www.researchstationcarmabi.org/>).
2. *Coral Reefs in the Anthropocene*, ed. Charles Birkeland, Springer, 2015. Available online from the GMU library.
3. *The Coral Reef Era: From Discovery to Decline, A History of Scientific Investigation from 1600 to the Anthropocene Epoch*. James Bowen, Springer, 2015. Available online from the GMU library.
4. *A Guide to the Coral Reefs of the Caribbean*. Mark Spalding, 2004, University of California Press, Berkeley, CA. (Amazon, \$14.95)

(3) Assigned Readings (ALL STUDENTS):

- All assigned readings are listed in the course schedule, posted on Blackboard, and should be completed PRIOR to class.

Additional Resources:

Study guides and resources for helping with identification are provided on Blackboard and will be presented in class. These focus on coral, fish, and invertebrate identification.

Grading

Class Participation	25%
Organism ID Quiz	25%
<u>Field Journal</u>	<u>50%</u>
Total	100%

For graduate students, the final grade will be based on this scale: A = 100–90%, B = 89–80%, C = 79–70%, F < 69%. A CURVE WILL NOT BE APPLIED.

Course Materials

See required textbooks under Readings, above. Students will need SCUBA or snorkeling equipment for the field study, which may be rented at Anthony’s Key Resort (mask, snorkel, fins of their own are recommended; Dr. Wood will discuss options), and should provide their own sun protection (e.g., lycra diveskin or 3-mm wetsuit, or yoga pants and rash guard, booties, hat or hood), and sturdy closed-toe walking shoes (in addition to waterproof sandals, flipflops are not recommended).

Additional Areas of Mention (University Policies, Resources, etc.)

WRITING CENTER: A114 Robinson Hall; (703) 993-1200; <http://writingcenter.gmu.edu>

COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS): (703) 993-2380; <http://caps.gmu.edu>

The University Catalog, <http://catalog.gmu.edu>, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at <http://universitypolicy.gmu.edu/>. All members of the university community are responsible for knowing and following established policies.

Student communication of e-mail information:

<https://provapps.gmu.edu/hb1app/>.

Notes:

COURSE SCHEDULE* AND ASSIGNED READING (to be completed PRIOR to class):

**The schedule is subject to change based on weather conditions or other unforeseen events.*

Week	Date	Topics	Readings for Next Class
1	January 22	<p>Introductions, explain preparation and plans for spring break field trip, assigned readings and learning objectives, course focus, journaling and participation, snorkeling and dive training overview</p> <p>Introduction to field research, coral reef organism identifications: What do we need to know about coral reefs, why, and how? Structure vs. function, diseases of reef organisms.</p>	<p>Caribbean Reef Life, identifying reef organisms</p> <p>Journal article(s) on reef monitoring (individual or by groups) to report on next week</p> <p>Atlantic and Gulf Rapid Reef Assessment protocols (http://www.agrra.org), indicators and training tools</p>

2	January 30	Lecture and discussion, 1:30–2:45 p.m.: Monitoring protocols for coral reefs 2:45–4:15 p.m.: Move to EXPL 3301 to hear ESP Seminar Speaker Dr. David Shiffman discuss sustainable shark fisheries (important for coral reefs!)	Study fish, coral, and other species identifications, applications in monitoring coral reef condition
3	February 6	Introduction to concepts lecture: Conservation Medicine and One Health Movie: Corals in Crisis Discuss organism indicators of reef condition Design AGRRA reef monitoring tools and practice species identifications	Study fish, coral, and other species identifications, applications in monitoring coral reef condition
4	February 13	WATER TIME – Swim evaluation session at the GMU Aquatic and Fitness Center	Study fish, coral, and other species identifications
5	February 20	GEO Breakout Session for Roatán: Review travel information, room assignments, safety procedures, etc. Review of coral and fish species identifications with Dr. Peters and Dr. Wood Build AGRRA tools and copy data sheets	Study fish, coral, and other species identifications
	February 21	GEO SPRING BREAK TRAVEL (All Programs) PRE-DEPARTURE ORIENTATION	Time and location to be announced
6	February 27	WATER TIME – Snorkeling and SCUBA diving training or checkouts at the GMU Aquatic and Fitness Center	Study fish, coral, and other species identifications
7	March 5	Final preparations for field trip Practice AGRRA surveys: QUIZ on identifying fish, corals, and other species	PACK FOR ROATÁN TRIP!

8	Spring Break Field Trip to Roatán March 7–14	Saturday	Fly to Roatán, unpack, welcome dinner, journaling
		Sunday	RIMS orientation, dive/snorkel checkout and reef trip, RIMS lectures, reef trip to practice species identifications, journaling
		Monday	Dive/snorkel reef trip on way to Maya Key for picnic and tour of Animal Sanctuary and Rescue Center, dive/snorkel reef trip on return, journaling
		Tuesday	RIMS mangrove lecture and snorkeling trip to see mangroves, beach snorkel/dive to conduct reef survey, RIMS Dolphin Lecture I, journaling
		Wednesday	RIMS lecture on reef threats, beach snorkel/dive to conduct survey, boat trip to snorkel/dive at RIMS Coral Restoration Nursery, Dolphin Lecture II, BBQ, Fiesta, journaling
		Thursday	Beach snorkel/dive to conduct reef survey, Dolphin Swim, RIMS Night Dive Lecture, night dive, journaling
		Friday	Trip to Blue Harbor Arboretum & Hydroponic Garden, RELAX, PACK
		Saturday	Fly home
9	March 19	<i>No meeting this week</i>	
10	March 26	Trip debrief discussions and plan poster(s) for COS Research Symposium	
11	April 2	Work on posters	
12	April 9	Work on posters	
13	April 16	Work on posters	
14	April 23	Present posters	
15	April 30	No class this week and NO FINAL EXAM!	