Biology 3316 / 5416: Tropical Marine Biology: Belize
Fall Semester 2017 and Intersession 2018

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Office Hours: Monday and Wednesday 12:15 – 12:45; Tuesday 2:00 – 4:00.

Course Prerequisites: Permission of instructor and at least 1 year of Introductory Biology with laboratory (Biology 1111/2112 or equivalent with a "C" or better). Courses in ecology and invertebrate biology are useful, but not required.

Course Location: Temple University (Biology-Life Sciences Room 332) and Belize Marine Tropical Research & Education Center (Ambergris Caye, Belize, Central America)

Class Meeting Time at Temple: During Fall semester, class meets Mondays, Wednesdays & Fridays, 11:00 -11:50 am. The "lab" section of the course will be at TREC in Belize. There may be an additional class meeting for field trip planning during the scheduled exam.

Belize and Additional Costs: We leave for Belize on January 3 and return on January 10, 2018. Dates will be finalized in September. ROUND TRIP AIRFARE PER PERSON IS IN ADDITION TO THE COURSE FEE. *However, the price cannot be confirmed until we are ready to book flights in October.*

Other costs for passport, snorkeling gear, books, etc. are also additional to the course fee.

Course Description and Purpose:
This course is an intensive, integrated introduction to the biology and ecology of tropical marine ecosystems with a focus on coral reefs. There will be a series of lectures at Temple University and field experiences/project in Belize, Central America. Oral and written presentations on an appropriate subject and based on current scientific literature are required. The purpose is to provide a first-hand experience of the biological structure and functions of a high biodiversity ecosystem that is under threat worldwide. I expect the course to familiarize students with a reef biome, to instill an appreciation of the potential loss of resources and beauty, and to give experience in synthesis of data.

Course Goals and Learning Outcomes: The primary goals are for students to:

(1) understand the biotic and abiotic processes that affect distributions of plants and animals associated with tropical marine shorelines;
(2) recognize the structural and biological similarities and differences of the various tropical marine ecosystems;
(3) appreciate the challenges, anthropogenic and others, to these systems especially coral reefs;
(4) interpret biological data via reading and discussing current scientific literature;
(5) gain ability to recognize and identify a variety of tropical marine organisms during the field component of the course
(6) synthesize concepts and findings related to the marine science.

Texts:

At least one of the books in the "Reef Set" by Humann must be taken to Belize by each student for use in identification of reef organisms. They are expected to be shared. Dr. Sanders is able to get a significantly reduced price for the class from the publisher (depending on number purchased), so don't buy these new. Okay to go used if you can get them for <$15. Humann, P. 1994. *Reef Fish, Reef Creatures,* and *Reef Coral* are available separately or as The Reef Set (3 Vol., Plastic Spiral, $107 new @ amazon.com).

Though not required reading, other useful books include: Kaplan, E.H., S.I. Kaplan, R.T. Peterson. 1999. *Field Guide to Coral Reefs: Caribbean & Florida* (Peterson Field Guides). ISBN: 0618002111 ($40.00 new @ amazon.com). Sheppard, C.R.C., S.K. Davy, G.M. Pilling. 2009. *The Biology of Coral Reefs*. Oxford University Press ($45.00)

Grades and Attendance: Grades for 3316 are based on the distribution below. Graduate students will have additional work and a different distribution. There will be two written lecture tests before the trip to Belize, field and lab identification tests in Belize, a field journal to be maintained daily in Belize, and a research paper and presentation based on current literature.

Lecture Tests	40%	(Temple)
Field Journal & Species List	20%	(Belize)
Field and I.D. Exam	3%	(Belize)
Classroom Identification Exam	4%	(Belize)
Scientific Paper Synopses & Participation	8%	(Temple & Belize)
Paper & Presentation	25%	(Temple)

***Field Journal*:** Each student will keep a journal during the trip to Belize. It should be updated daily and should include a summary of each day's activities, biological specimens (species) that you saw and could identify that day ("new" to you, very common, especially interesting behaviors), and what you thought were important learning experiences. At the end of the journal you should complete a species list organized taxonomically (to class or phylum as a minimum). The species list must include scientific & common names. It's due upon return at the Philadelphia airport.

***Field and Lab ID exams*:** A field exam will be given that requires identification of common organisms encountered. The lab exam will involve identification of organisms, including invertebrates and fishes, from photographs or preserved samples, as well as other aspects of marine biology discussed during the trip.

***Scientific Papers*:** Articles from scientific journals will be made available through *Blackboard* as reading assignments to supplement lecture material throughout the semester. A typewritten, one-page summary (synopsis) of the paper is due at the end of the class period in which the paper is discussed.

***Paper and Presentation*:** Students will work in alone or pairs on a topic approved by the instructor. The oral presentation (20 minutes) will be given as a team using PowerPoint. *Individual* 10-page papers based on the project topic & in the format of a scientific journal article will complete the required coursework.
Further details will be handed out in class.

Requirements prior to departing for Belize: Passport (exp. date after JULY 10, 2018); *if you are **not a U.S. citizen you may require a visa from Belize***. Another requirement is **snorkeling gear** (mask, snorkel, fins, perhaps a wetsuit). Although not required, the Centers for Disease Control recommends that travelers to Belize get Hepatitis 'A' vaccine and take a malarial preventative (Aralen®phosphate [chloroquine] is less expensive and has fewer side effects than Lariam® [mefloquine], but check with your physician). A tetanus booster is a good idea. A list of supplies to bring to Belize will be distributed in class.

Responsibility and Behavior in Belize: Show common courtesy and respect to your classmates, instructors, guides, and local citizens. This includes being on time to meetings and boat departures. Be flexible and use common sense; in any field course something is bound to change from the original plan, particularly the weather. Drug use will not be tolerated and will result in a failing grade. Even more seriously, laws governing drug possession in Belize are very strict and are enforced.

Disability Disclosure: Any student who has need for accommodation based on the impact of a documented disability, including special accommodations for access to technology resources and electronic instructional materials required for the course, should contact Dr. Sanders privately to discuss the specific situation as soon as possible, and contact Disability Resources & Services at 215-204-1280.

Academic Rights & Responsibilities: Freedom to teach and freedom to learn are inseparable facets of academic freedom. The University has a policy on Student and Faculty and Academic Rights and Responsibilities (Policy #03.70.02) and Student Code of Conduct ((Policy #03.70.12) should be accessed at: http://policies.temple.edu/search_toc.asp?42=expand#chap42

Preliminary Lecture Schedule: Classes on main campus will meet in room 332 of the Biology Life-Sciences Building from 11:00 am -11:50 pm. Presence at lectures is required. Unexcused absences will negatively affect the participation portion of a student's grade. Lecture topics and snorkeling excursions may vary from this schedule. Readings will include handouts plus papers on various topics from scientific journals.

Date	Topic
August 28	Organization; Introduction to Coral Reefs and Belize; Reef Structure/ Zones.
August 30	Minimal Oceanography - Oceans, Currents, Properties of Seawater
September 1	Ecological Principles.
September 4	***No Class – Labor Day Holiday***
September 6	Invertebrate Taxa 1: Porifera.
September 8	Invertebrate Taxa 2: Ctenophores, Cnidaria.
September 11	Invertebrate Taxa 3: Worm-like Phyla.
September 13	Invertebrate Taxa 4: Molluscs.
September 15	*Discussion of assigned paper – 1* ***Last Day to Drop***
September 18	Invertebrate Taxa 5: Arthropods, snorkeling gear.
September 20	Invertebrate Taxa 6: Echinoderms.
September 22	Abiotic Controls on Coral Distribution - Coral Biology 1.

September 25	Reproduction in Corals - Corals 2.
September 27	*Symbiodinium* & Anthozoa - Corals 3.
September 29	Deep Sea Corals – Carlos Gomez, Lecturer
October 2	*Discussion of assigned paper 2*
October 4	"Higher" Marine Plants – Seagrasses
October 6	Review.
October 9	**Test 1.**
October 11	Marine-Associated Non-Fish Vertebrates
October 13	Prokaryotic Phototrophs.
October 16	Microbial Ecology of the Reef.
October 18	Fish I – General Biology of Chondrichthyes
October 20	*Discussion paper 3*
October 23	Fish II – Ostreichthes (bony fish) ***Last Day to Withdraw***
October 25	Fish III – Behavior: coloration/mimicry, reproduction, life history.
October 27	Reef Fish IV – incl. symbiotic relationships.
October 30	More symbiosis.
November 1	*Discussion of assigned paper 4*
November 3	Mangroves I.
November 6	Mangroves II; Threats to Coral Reefs.
November 8	More Threats to Coral Reefs.
November 10	Land Plants & Animals.
November 13	Management of reefs
November 15	*Discussion of assigned paper 5*
November 17	Films
November 20	***Fall Holiday***
November 22	***Fall Holiday***
November 24	***Thanksgiving Holiday***
November 27	Review.
November 29	**Test 2.** Fisheries, Aquaculture and Management.
December 1	Presentation Preparation
December 4	Presentations.
December 6	Presentations.
December 8	Presentations.
December 11	Presentations. Research Papers due.
Exam Week	Possible organizational meeting; 10:30 am – 12:30 pm
Jan. 2 (Wed)	Fly to Belize; Beach Walk
Jan. 3 (Thu)	Snorkel at Tres Cocos and Mexico Rocks
Jan. 4 (Fri)	Snorkel at Coral Garden; Night Beach Seine
Jan. 5 (Sat)	Snorkel at Mangrove Islands
Jan. 6 (Sun)	Snorkel at Mexico Rocks; Night snorkel @ Tres Cocos
Jan. 7 (Mon)	Snorkel at Hol Chan and Shark Ray Alley.
Jan. 8 (Tues)	Snorkel at Mexico Rocks; free afternoon.
Jan. 9 (Wed)	Return to Philadelphia. We may arrive in Phila. after midnight
Jan. 16 (Tues)	Spring classes begin

Typical Schedule in Belize:

7:30 Breakfast
8:15 Lecture introducing the day's field trip
9:00 Snorkeling trip, lunch on boat, field-based lecture, more snorkeling
4:30 Free time
6:30 Dinner
8:30 Most nights there will be an evening lecture, demonstration, or activity (night snorkel, beach seine); other evenings will be free time to work on journals & your project.