# BIO 2560: TROPICAL MARINE ECOLOGY

**PROF. PAUL A. BILLETER**

**Spring 2010 A.D.**

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A Field Biology Course:

*Classes meet 10:00am-3pm on three Sundays: 2/7, 2/14 and 2/21 (Room ST-225 at the LaPlata Campus)*

The Sunday classes meet 10:00-2:30 Lunch will be provided if budget permits (Pizza)

*(You are encouraged to go to a CSM pool if you’d like to practice snorkeling. Pool Hours)*

The remainder of the course is conducted at the TREC Marine Biology Field Station in Belize.

*The travel dates for Belize are 12-21 March 2010.*

Final Projects etc. are due at end of Spring Semester (~2 May 2010)

Our phone # in Belize at Clarissa Falls (12-14 Mar) is 011.501.824.3916

Our phone # in Belize at TREC (14-21 Mar) is 011.501.226.3389

The address of TREC is: Box 117, Grouper St. San Pedro, Belize

## COURSE OUTLINE

**LINK TO BELIZE TRAVEL STUDY WEBSITE**

I recommend that you register with the US Embassy in Belize. Click [here](#).

I recommend that you read the Belize Consular Information Sheet. Click [here](#).

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This syllabus is on line at: [http://www.itc.csmd.edu/bio/paulb](http://www.itc.csmd.edu/bio/paulb)

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## A. CONTACTING PROFESSOR BILLETER:

**OFFICE:** Room ST-212 Charimonti Science And Technology Bldg.

**OFFICE HOURS:** Spring 10 [click]

**OFFICE PHONE:** (24 hrs 7 days) 301.934.7815; **HOME PHONE:** 301.934.9629

**BIO DEPT.** 301. 934.7843

**E-MAIL:** College- paulb@csmd.edu or Home- pbill@verizon.net

## B1. TEXTBOOKS

A. A Field Guide to the Coral Reefs of Florida and the Caribbean by E. H. Kaplan

B. A Field Guide to Southeastern and Caribbean Seashores by E. H. Kaplan

*(You may choose a buddy in the class and each buy ONE of these books and then share.)*

[http://www.houghtonmifflinbooks.com/peterson/seashore.cfm](http://www.houghtonmifflinbooks.com/peterson/seashore.cfm)

C. Many additional field guides to the organisms of Belize are available at the lab. The Reef Life Series By Paul Humann (3 books) will be on reserve at the libraries at LaPlata, Leonardtown, and Prince Frederick.
B2. FIELD NOTEBOOKS
A. Some students like to get waterproof field notebook. "Rite in the Rain" #393 or 393N Journal Style are good ones.

You should get one that is at least 4x7 inches, has a polyethylene cover. The #390 journal-style is a good one too. The "Rite in the Rain" space pen is a good idea too. You can get a paper notebook in Belize if you like. It costs about $1 but might be doomed if it gets wet. Most students in the past have used these "el-cheapo" notebooks with no problem.

C. TENTATIVE COURSE OUTLINE

<table>
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<tr>
<th>DATE</th>
<th>LECTURE TOPIC / LAB TOPIC</th>
<th>REFERENCE</th>
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<tr>
<td>Sun 2/7, 10:00a</td>
<td>Lect. Marine Ecology I: Ocean Structure, Primary Productivity / Lab: Bio-Systematics</td>
<td>Lecture Notes</td>
</tr>
<tr>
<td>Sun 2/14, 10:00a</td>
<td>Lect. Marine Ecology II: The Coral Reef Ecosystem / Lab: Bio-Systematics</td>
<td>Lecture Notes</td>
</tr>
<tr>
<td>Sun 2/21, 10:00a</td>
<td>Lect. Marine Ecology III: Coral Reefs and Adjacent Ecosystem / Lab: Bio-Systematics / LAB EXAM</td>
<td>Lecture Notes</td>
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<tr>
<td>FRI 3/12 Belize (Cayo)</td>
<td>TRAVEL DAY, Maryland to Belize / Arrive International Airport; clear Belize Customs; stop at the Belize Natio travel to Cayo District / Check in at Clarissa Falls in San Ignacio region.</td>
<td>Lecture Notes</td>
</tr>
<tr>
<td>SAT 3/13 Belize (Cayo)</td>
<td>Spanish Market / ActunTunichil Muknal Cave - hiking, spelunking - Maya pottery and skeletons in situ. / Trek stop - lunch / Dinner: &quot;A Taste of Belize&quot; (Chena) / Evening: Explore downtown San Ignacio</td>
<td>Lecture Notes</td>
</tr>
<tr>
<td>SUN 3/14 Belize (Cayo/TREC)</td>
<td>AM: Depart Clarissa Falls: Cahal Pech &amp; Xunantunich Maya Archaeological Sites / Travel to Municipal Airport and fly to San Pedro on Maya Island Air / Arrive TREC. / Dinner Quiz: The geography of Belize, Central America and the Caribbean Region / Eve. Lect: Orientation to TREC &amp; Dangerous Marine Organisms. (Kenny)</td>
<td>Lecture Notes</td>
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<tr>
<td>MON 3/15 Belize (TREC)</td>
<td>AM Lecture: Turtle Grass Ecosystem and SAV's (Paul) / Field Trips: Turtle Grass; Tres Cocos; Pillar Coral / PM: Group Work/Projects / Eve. Lecture: Fishes of Belize 1 (Kenny)</td>
<td>Lecture Notes</td>
</tr>
<tr>
<td>TUE 3/16 Belize (TREC)</td>
<td>All Day Field Trip: Back Reef, Patch Reefs, Reef Flats (Mexico Rocks, Mexico Cave, Playa Blanca) / PM: Group Work/Projects / Eve. Lecture: Invertebrates 1 (Paul)</td>
<td>Lecture Notes</td>
</tr>
<tr>
<td>Date</td>
<td>Location</td>
<td>Schedule/Activities</td>
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| WED 3/17  | Belize (TREC)      | AM Lecture: The Mangrove Ecosystem (Paul)  
All Day Field Trip: -- Mangroves, Coral Gardens  
PM: Group Work/Projects  
Eve: Beach barbecue OR el Fagon Belizean Restaurant / Chicken Drop / Explore San Pedro | Lecture Notes  
Text B, Ch 4, 9  
Field Guides @ TREC |
| THUR 3/18 | Belize (TREC)      | AM: All-Day Trip to Caye Caulker. Wreck dive, North Cut, Protected Carbonate Beaches  
PM: Group Work/Projects  
Eve: Lecture: Fishes of Belize 2 (Kenny)  
Eve: Night Seine (sampling the shoreline fishes with beach seine)  
Group Work/Projects | Text A, Ch. 12  
Text B: Ch. 4  
Lecture Notes  
Field Guides @ TREC |
| FRI 3/19  | Belize (TREC)      | AM/PM Field Trips: Tuffey/Cypress Gardens/ Rocky Shore  
Late afternoon free time. Group Work/Projects  
Eve. Lect: Invertebrates 2 (Paul)  
Night Snorkel at back reef: Tuffey  
Night Lect/Lab/Demo: Plankton (Paul) (tentative as time permits) | Text A, Ch 7-9  
Lecture Notes  
Field Guides @ TREC |
| SAT 3/20  | Belize (TREC)      | AM: Field ID Exam, underwater @ Back Reef Site;  
AM: Turtle Rocks  
PM: Hol Chan Marine Reserve, Shark Ray Alley  
Eve. Lect. Human Impacts on the Reef Ecosystem (Kenny)  
Dinner at TREC (or optional night out on your own, TBA) | Lecture Notes  
Text A. Ch. 13  
Field Guides @ TREC |
| SUN 3/21  | Belize (TREC)      | TRAVEL DAY (deport San Pedro about noon)  
Bio 2560 Field notebooks due before you leave BWI airport |                |

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**D. COURSE OBJECTIVES:**

Biology 2560 is an introductory, college-level, field marine ecology course for both non-majors and majors. This course will examine the kinds (taxonomy) of organisms found in the tropical marine environment and analyzes: (1) how they are adapted (morphology, physiology and behavior) for survival in the ocean, (2) how they interact with each other, their environment and man (ecology, natural history and fisheries and environmental degradation) and (3) how scientists figured out some of that.

The course has a lecture/lab component taught at the LaPlata campus and a field studies/lecture/lab component taught at The Tropical Research & Education Center (TREC) in San Pedro, Belize.

**E. COURSE REQUIREMENTS**

1. Attend all classes.
2. Master and be tested on the taxonomy of the marine organisms of Belize. There will be a classification exam on the 3rd Sunday in LaPlata. (2/21)
3. Geography of Central America, Belize and the Caribbean Region. See Handout. Quiz in Belize (3/14)

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>>>Friday 3/29/2010 is the last day to withdraw without a grade or to switch between audit & credit.<<<

>>>Population Growth Project due Friday 09 April 2010<<<

>>>Photo Journal and Take-Home Exam due Saturday 24 April 2010<<<
4. Organism Identification Exam, Part 1, underwater at Hol Chan, Part 2, slide show at TREC (3/20)
5. Maintain a daily journal describing sites visited and species encountered. (due 3/21 at BWI Airport)
7. Prepare a photo journal containing photos, drawings and descriptions of 30 marine organisms of Belize. (due 4/24)
8. Complete a take-home essay exam (due 4/24)

F. TESTS, JOURNAL, ETC.

A. Lab Practical in Laplata.
Classification of marine animals. (10%) (see handout)
You will be tested on the taxonomy of several animals studied in the labs. ALL organisms must be classified to phylum. Additionally, Echinoderms and mollusks and annelids must be classified to Phylum and Class; Arthropoda must be classified to Phylum, subphylum and class; Cnidaria must be classified to Phylum, class, subclass and species (Latin name); and fish must be classified to Phylum, subphylum, Class, Family (common name) and species (common name).

B. Lab Practical in Belize.
Classification of marine organisms: animals, plants, Protista. (10%) (see handout)
You will be required to classify several organisms at the species level, Latin names for corals and common names for all others. Many organisms have no widely accepted common names. For these, such as Halimeda, Sargassum, Homotrema, etc., you will learn the Latin name of the genus. Part of this exam will be conducted underwater and part in the lab at TREC.

C. Daily Journal (10%) due at the airport.
Your journal must contain a short description of each site visited or activity conducted (plankton collection, shore seining, etc.). This should include minimally, a) local name of region, b) an ecological designation for each site (turtle grass flats, back reef, mangrove swamp, etc.); c) precise latitude and longitude, weather conditions, salinity, secchi disc reading, air and water temperatures in both C° and F°, and a list of species observed at the site. You must work diligently on these daily; they will be collected on the last day in Belize.

D. Photo Journal/Reef Organism Project (25%) due April 24th.
The class will be divided into two groups. Each group is responsible for finding, classifying and photographing 130 organisms from "The List". Each group will have 2 or more digital underwater cameras to take their photos. Each group will also have one digital underwater camera supplied by the biology department.

Your will be taking photos of at least 100 organisms encountered on the field trips (see handout). Most of these will be underwater photos but you may also take photos of shells etc. found on the beach, marine birds algae (seaweeds), etc. Each organism must be classified minimally to the higher categories required under "A" above (see handout) and all must be classified to species listing both common and Latin name. Labeled drawings illustrating anatomy or other interesting/salient features of the organisms will add to your grade. Some notes on the biology, ecology, anatomy, behavior of each species must be included. The local name and ecological designation of the collection or photo site, (see "C" above) should be included as well. [sample journal page]

E. Take-home Exam (15%) due April 24th.
Compose thoughtful essays answering the following 3 questions. Each answer should neither be less than 2 typed pages (500 words) nor more than 4 typed pages (1000 words).

1. Compare and contrast the ecology and organisms of the mangrove ecosystem and the turtle grass ecosystem.
2. Discuss the ecology of hermatypic corals concentrating the coral-zooxanthellae symbiosis.
3. Research the present status of the world's coral reef ecosystems and discuss several reasons/factors contributing the alarming decline of coral reefs around the world.
F. Geography Test (10%) (See Handouts. To be taken in Belize)

G. Exponential Population Growth Exercise: (10%) Due 4/09
Download this exercise here. The idea of exponential growth of natural populations of ANY species of organism is fundamental to the study of ecology. Like many of the aspects and requirements of this course this one may seem “scary” to some of you because of the arithmetic. But like many of the requirements and aspects of this course you will be pleasantly surprised that you actually can accomplish some seemingly insurmountable problems. All you need to complete this exercise is a scientific calculator like the TI calculators required for most math courses at CSM and a moderately logical brain of the sort possessed and often used by most college freshmen. The exercise explains how to do the arithmetic; you must supply your own thoughtful opinions about the world you inhabit (and the one you will inhabit in the future).

H. Participation: (10%)

G. FINAL LECTURE GRADE: [top]
The 8 items above will determine your final grade.

<table>
<thead>
<tr>
<th>The grading scale is:</th>
<th>90's = A;</th>
<th>80's = B;</th>
<th>70's = C;</th>
<th>60's = D;</th>
<th>less than 60 = F</th>
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<tr>
<td>&quot;A&quot; = &quot;excellent&quot;;</td>
<td>&quot;B&quot; = &quot;Good&quot;;</td>
<td>&quot;C&quot; = &quot;Average&quot;;</td>
<td>&quot;D&quot; = &quot;Poor&quot;;</td>
<td>&quot;F&quot; = &quot;Fail&quot;</td>
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H. ACADEMIC HONESTY: [top]
All forms of dishonesty, including cheating and plagiarism, will not be tolerated. A GRADE OF ZERO (0) will be given for any exam, quiz, exercise, project, etc., on which the student cheated or used plagiarized material. In addition, the student shall be subject to disciplinary action, as set forth under “Judicial Procedures” in the CSM Student Handbook. This may result in dismissal from the college. Honor in academia is a cornerstone of higher education and we consider breaches of this trust to be serious and respond accordingly.

I. RESPONSIBILITIES AND MISCELLANY [top]
1. MONDAY, MARCH 29 2010 IS THE LAST DAY TO WITHDRAW WITHOUT A GRADE OR TO CHANGE BETWEEN AUDIT AND CREDIT.
2. STUDY HARD, LEARN A LOT, HAVE FUN LEARNING, AND EARN THE GRADE OF YOUR CHOICE!
3. IF YOU NEED HELP...ASK!!
4. IN ALL COURSE ACTIVITIES (REQUIRED/OPTIONAL, ON-CAMPUS OR IN BELIZE, ACCOMPANIED BY AN INSTRUCTOR OR NOT) YOU ARE EXPECTED TO CONDUCT YOURSELF IN A MATURE, CIVIL, POLITE AND RESPONSIBLE MANNER!!!! ALL RULES AND REGULATIONS OUTLINED UNDER "PROSCRIBED CONDUCT" IN YOUR CSM STUDENT HANDBOOK PERTAIN TO ALL COURSE ACTIVITIES. YOU REPRESENT THIS COLLEGE AND ME. DON’T EMBARRASS ME, I’M QUITE CAPABLE OF DOING THAT FOR MYSELF. I HOPE YOU ENJOY THIS CLASS AND HAVE A LOT OF FUN LEARNING. I HOPE YOU DO NOT DO ANYTHING OR BEHAVE IN ANY WAY THAT JEOPARDIZES THE CONTINUED SUCCESS OF THE CSM BELIZE TRAVEL EDUCATION PROGRAM.
5. NO ONE MAY ATTEND CLASSES AT LAPLATA UNLESS THEY ARE OFFICIALLY REGISTERED FOR THAT CLASS. MY DEPARTMENT CHAIRMAN AND MY DEAN (i.e. MY BOSSES) HAVE ORDERED ME, TO ORDER YOU, TO LEAVE THE CLASSROOM IF YOU ARE NOT OFFICIALLY REGISTERED. YOU MAY NOT BRING YOUR FRIENDS, KIDS, PETS (EXCEPT FISH), ETC. TO CLASS...SORRY!
6. READ ALL THE MATERIAL PERTAINING TO TRAVEL STUDY IN BELIZE AND HAVE ALL YOUR DOCUMENTATION AND REQUIRED WAIVERS AND FORMS FOR TRAVEL-STUDY COMPLETED AND TURNED IN BEFORE WE DEPART FOR BELIZE.
7. GO ONLINE AND REGISTER YOURSELF WITH THE US EMBASSY IN BELIZE.
8. READ THE US STATE DEPARTMENT CONSULAR SHEET HERE.
SOME TIPS ON THE NOBLE ART OF ESSAY WRITING AND THE USE OF THE ENGLISH LANGUAGE FOR COMMUNICATING IDEAS

INTRODUCTION
Many of the approaches and specific problems which we will discuss in this course cannot be adequately tested with any form of objective question and, for this reason, each of you will be asked to write essays on the examinations. As many of you will probably have never received any instructions in essay writing in examinations, these few notes should be of some use to you.

GENERAL COMMENTS
1. A feature characteristic of answers which receive bad marks is that they simply do not answer the question. Look at the question carefully and preferably spend a few moments scribbling a few really important ideas which should be brought out. Carefully decide exactly what are the parameters of the question. You are never required to write everything you have ever heard about a subject; you will simply be asked to utilize certain of the factual data in an intelligent fashion.

2. Length, per se, is very, very, very rarely a sign of a good essay. On the other hand, do not omit an essay question entirely "because you didn’t have enough time." If you plan your time carefully, you should have no difficulty in completing the exam.

ARRANGEMENT
The correct format for an essay is exactly that which would form a basis for a statement in a debate, a political address, or a letter to the press. There should be an introductory paragraph or sentence indicating that you understand the problem and defining the approach you are going to follow (tell them what you are going to tell them). Then should follow the body of the argument; this part requires care and discrimination in choice of material. Illustrate where necessary; don’t waste time describing something in detail and then drawing it (tell them). Then should come a conclusion. This should not be a summary; it may contain some of the elements of a summary, but it should finalize the argument you have followed, perhaps contain a speculation idea of your own (tell them what you told them).