Field Studies in Marine Biology (Biol 444/544): A Study Abroad Course

Instructor: Dr. Mark J. Butler
Phone: (757) 683-3609w/469-0343c Email: mbutler@odu.edu Office: 310 MGB

Course Objectives & Overview

The objective of this course is to train students in the conduct of science in marine biology from an *in situ* perspective - that is, in the field. Through lectures, discussions of the scientific literature, and field trips students will become familiar with tropical marine habitats and organisms unlike those in the USA. In addition, students will be trained in basic experimental design, statistical analyses, and common quantitative ecological field techniques useful in addressing scientific questions in marine biology. Students will also gain practical experience by working in groups on independent field projects whose findings will be reported in written reports and video documentaries. Interactions with Belizians and travel within the country will also instill in students a better appreciation of other cultures as well as the challenges that developing countries face in managing and protecting marine environments.

The course begins with a series of on-campus lectures on experimental design and statistical methods. Then the class travels together to a marine laboratory on an isolated island in Belize where we will spend the next two weeks. There, we will begin each morning with a briefing of the days activities followed by field work (AM), lunch, more field work (PM) and finally dinner, after which there will either be a lecture, discussion of scientific papers, a night snorkel, or free time. The trip ends with a trip to the jungle on the Belize mainland and a zip-line adventure. Upon return from abroad, students will work independently on their projects for the remainder of the summer to complete the written report and video documentary of their project. During the first week of the fall semester, we will meet once more to show the videos to the class.

Course Grading

The final grade for this course will be determined from class-based laboratory reports, a lab exam, and the independent project written and video reports. The grading breakdown is:

Laboratory Practical Exam: Organism ID	10%
Class Laboratory Report I: Seagrass	15%
Class Laboratory Report II: Coral Reef	15%
Independent Project Written Report:	30%
Independent Project Video Report:	30%

Exam

Lab Exam: This will take place during the field trip and will be a field-based organism identification exam, wherein we will snorkel through different marine environments while I point out organisms that you must then identify by scientific name on underwater data sheets.

Lab Reports

Two good references on scientific writing and the presentation of scientific results: ***The Elements of Style*** (many editions; W. Strunk & E.B. White, Pearson Longman Press) and ***How to Write and Publish a Scientific Paper*** (2006, 6th Ed., by R.A. Day, Oryx Press)

Seagrass Project Report – Due Friday, June 19th

Overview: For this project, students will analyze the entire dataset collected by the class and each student will write up their own short (3-5 pages) description of the results. The report

should be submitted electronically to Dr. Butler via email (mbutler@odu.edu). Points will be deducted for late submissions, for poor or inappropriate analyses or conclusions, and for poor writing.

Format of Report: Do not write this as a scientific paper. Instead, please include the following sections: (1) Objectives, (2) Data analysis methods only (there is no need to rewrite the field methods description), (3) Results, (4) Conclusions. The Results section should include text and figures and/or tables with summarized results, not raw data.

Data Source: All of the class seagrass data will be merged into a single class datafile that will be made available on an Excel spreadsheet on Dropbox on the shared class site within the DATA folder; the filename will be: Seagrass Data – 2015.xlsx

Coral Reef Assessment Assignment – Due Friday, July 17th

Overview: For this project, students will analyze only the data that they and their field partner collected at both the South Water Caye patch reefs and the Whale Shoal patch reefs. Then, one short report (5-8 pages) from each student group will be submitted electronically to Dr. Butler via email (mbutler@odu.edu). Points will be deducted for late submissions, for poor or inappropriate analyses or conclusions, and for poor writing.

Format of Report: Do not write this as a scientific paper. Instead, please include the following sections: (1) Objectives, (2) Data analysis methods only (there is no need to rewrite the field methods description), (3) Results, and (4) Conclusions. The Results section should include text and figures and/or tables with summarized results, not raw data. Your paper must include analyses of data on fish, macroinvertebrates, benthic coverage, algal height, and reef relief and comparisons between the two study sites.

Data Source: You are only analyzing your own group's data, so YOU are the data source. However, YOU MUST ALSO TURN IN AN ELECTRONIC COPY OF YOUR DATA ON THE EXCEL SPREADSHEET TEMPLAT. That template is available on Dropbox on the shared class site with the DATA folder; the filename is: AGGRA Belize Data Template.xlsx

Data Analysis: Among your other analyses you must also compute and compare between the study sites the % cover of the benthic organism categories listed on the data sheet template. Those data were recorded in digital photographs taken with your GoPro cameras. You should determine the % cover (mean and standard deviation or mean and 95% confidence intervals) of these groups for the two study sites using the benthic point count program, which can be downloaded from the class Dropbox site within the PROGRAM folder; the filename is: *cpce41_setup-full.exe.*

A detailed description of the use of this program can be found in the paper by Kohler and Gill (2006), which also can be downloaded from the class Dropbox site within the ORGANISM GUIDES & METHODS folder; filename is *Kohler and Gill 2006 benthic point count program.pdf.*

To use the program, you will have to download it from Dropbox then open the program within Windows to install it. It is a Windows-based program only; you can use it on a Mac if you open and install the program within Fusion or Parallels (if you have either of those emulator programs and Windows installed within them).

Independent Project Report – Due Tuesday, August 25th(12:30PM; MGB 353)

For this assignment, students will work with their research partner and will produce a single written and video report (details below).

Written Report: The format of the written report should follow that of the journal ***Marine Ecology Progress Series*** (see their website for detailed information about the journal and instructions to authors: www.int-res.com/journals/meps). In brief, the written reports will generally be 15-20 pages in length and must follow the standard format for scientific papers: Abstract, Introduction, Methods, Results, Discussion, and Literature Cited. The ***Abstract*** summarizes the entire report in a brief (no more than 250 words) paragraph covering the objectives, methods, results, and implications of the study. At the bottom of the Abstract you should provide key words and phrases useful for electronic search engines. The ***Introduction*** should summarize the objectives and necessary background information and literature. The ***Methods*** section should describe the location and methods employed in sufficient detail that someone else could duplicate the study. The ***Results*** section should include a verbal, statistical, and graphical description of the data. The ***Discussion*** section should focus on your interpretation of what the data indicate – that is, the biological implications of your results. Finally, you should include a ***Literature Cited*** section where all of the literature resources you cite within the rest of the paper are listed alphabetically. The majority of these citations should be from the primary scientific literature – not from books, the internet, or technical bulletins. You must reference at least 10 other scientific papers.

If you would like Dr. Butler to review and edit your Abstract and Introduction prior to the final submission of your report, you must submit those via email by Monday, August 3rd. Those will be returned to you with suggested changes within one week of submission; no grade will be assigned to these pre-submissions and they are optional.

Examples of graded (grades ranging from A - D), past independent project papers are available on the class Dropbox site in the folder: "Example independent project papers".

Video Report: Each student group will edit the footage that they collected and produce a short documentary film (5 - 10 min in length) suitable for one of the following types of audiences that you must specify to me: (1) grade school, middle school or high school students (pick one), (2) an educated, but non-scientific audience, or (3) a scientific audience. **The film's goal is to explain in a creative, entertaining, yet informative way the importance and results of your independent project as appropriate for the target audience.**

Tips on producing a video documentary can be found on the class Dropbox site in the "Class Projects" folder under the filename: *tips on making a video documentary.doc*

Instructions on the use of the GoPro editing software can also be found on the class Dropbox site in its own folder: "GoPro User Guide".

Examples of videos produced by previous students in the class can be downloaded from the class Dropbox site and appear in the folder: "Student videos".

Bring your video on your computer or on a thumbdrive or external drive to class on August 25th to show the whole class. Your grade on this assignment will be determined from my review of your film (50% of grade) and the average review score of the other students in the class (50%).

Tentative* Class Schedule

(* in fact, the schedule is very tentative depending on weather & vessel availability)

Monday, May 18	1 - 3PM	Lecture: Experimental Design & Ecological Statistics (MGB 125)
Tuesday, May 19	1 - 3 PM	Lecture: Experimental Design & Ecological Statistics (MGB 125)
Wednesday, May 20	1 - 3 PM	Lecture: Experimental Design & Ecological Statistics (MGB 125)
Thursday, May 21	AM	Travel Day: Norfolk departure at 6:00AM. Be at airport by 4:00am.
	PM	Travel Day: arrive at IZE; orientation & tour; unpack
	EVENING	Free time
Friday, May 22	AM	Lecture: Overview of activities & coral reef overview Field: snorkeling practice & patch reef habitat introduction
	PM	Field: forereef boat trip
	EVENING	Scientific Paper Discussion: Conducting Science
Saturday, May 23	AM	Lecture: Seagrass Ecology & project Field: seagrass experiment setup (part 1)
	PM	Field: seagrass experiment setup (part 2)
	EVENING	Scientific Paper Discussion: Seagrass Ecology
Sunday, May 24	AM	Dive?
	PM	Dive?
	EVENING	Free: movie night
Monday, May 25	AM	Lecture: AGRRA Protocols, fish ID & training on land Field: snorkeling at South Beach - fish ID practice
	PM	Lecture: AGRRA coral ID Field: snorkeling at Whale Shoal - AGRRA coral ID practice
	EVENING	Scientific Paper Discussion: Coral Reef Ecology
Tuesday, May 26	AM	Field: AGRRA project at South Beach
	PM	Field: AGRRA project at Whale Shoal
	EVENING	Free
Wednesday, May 27	AM	Pelican Keys Trip (boat trip)
	PM	Pelican Keys Trip (boat trip)
	EVENING	Lecture: Independent Project Planning Movies: Past student documentary videos & BTWFF
Thursday, May 28	AM	Dive?
	PM	Dive? Student Independent Project Preparation
	EVENING	Scientific Paper Discussion: Coral Reef Fish/Invertebrate Ecology
Friday, May 29	AM	Student Independent Projects
	PM	Student Independent Projects
	EVENING	Scientific Paper Discussion: Coral Reef Connectivity
Saturday, May 30	AM	Student Independent Projects
	PM	Student Independent Projects
	EVENING	Free
Sunday,	AM	Student Independent Projects
	PM	Student Independent Projects

May 31	EVENING	Scientific Paper Discussion: Coral Reef Management
Monday, June 1	AM	Student Independent Projects
	PM	Student Independent Projects
	EVENING	Scientific Paper Discussion: Coral Reef Invasive Species
Tuesday, June 2	AM	Field: Seagrass Experiment Break-down
	PM	Student Independent Projects
	EVENING	Lecture: Video editing & Coral Point Program Use
Wednesday, June 3	AM	Field: Lab Practical Exam: in-water Organism ID
	PM	Student independent projects
	EVENING	Free Time & pack for AM departure
Thursday, June 4	AM	Depart IZE & boat trip to mainland; free time in Hopkins Village
	PM	Mama Noots: check in, zip line, & hike in rainforest
	EVENING	Free time & pack for AM departure
Friday, June 5	AM/PM	Travel Day: Bus to Belize City then flight to Norfolk