



UNIVERSIDAD SAN FRANCISCO DE QUITO  
COLEGIO: CIENCIAS BIOLÓGICAS Y AMBIENT.  
CURSO: [ECL0375E](#)

**Techniques of Marine Research II**

Semester: **Fall 2019**, NRC: 1221

Times: **Mon-Fri 9-12 (GAIAS) unless otherwise stated in syllabus**

**Professor:** [Alex Hearn](#)

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Office: [Galapagos Science Center](#)

Office Hours: [Afternoons](#)

**Teaching Assistants:**

**Course Credits:** 4

**Pre-requisites:** [SCUBA certification and insurance](#)

**Co-requisites:** [None](#)

**DESCRIPTION AND OBJECTIVES**

The overall goal of this class is to provide students with the opportunity to actively participate in scientific marine research while they improve their diving skills or snorkeling skills. There will be three general themes to the course: tracking studies, sub-tidal biodiversity monitoring, and fisheries monitoring.

Part of the class includes monitoring several sites by SCUBA diving. We will learn how to estimate marine biodiversity, focusing on calculating the relative abundance of fish, mobile macro invertebrates and sessile organisms as well as a characterization of habitat complexity and environmental factors that affect the abundance, distribution and dynamics of marine communities (temperature, water flow, wave action). For part of the course we will join with the GIS group and learn about marine animal movements and how to track them and map their movements. We will touch briefly on fisheries monitoring, how this occurs in Galapagos, and work up some real datasets to evaluate the state of invertebrate fisheries in the marine reserve.

**SPECIFIC COURSE LEARNING OUTCOMES**

Number	Learning Outcome	Level
1	Improve ability to conduct research underwater	Medium
2	Perform standard methods in the field and learn good field practices	Medium



3	Critically evaluate the results of the research conducted by acquiring analytical skills to manage and interpret data	Medium
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**COURSE CONTENT**

GIS, tagging and tracking studies, ecological monitoring, dive techniques, fisheries, marine zoning.

**METHODOLOGY FOR THE INTEGRATION OF THEORETICAL AND PRACTICAL CONTENT**

The teaching methodologies used to teach USFQ courses, following the philosophy of Liberal Arts, foster dialogue and facilitate the construction of knowledge through the continuous exchange of ideas and experiences between professors and students. It is expected that in all courses the theoretical concepts will be linked to the professional practice and work contexts where students will perform in the future, with the intent to integrate activities and simulations of a diverse nature that promote the understanding of practical and realistic contexts.

**COURSE EVALUATION:**

Category	Number	Percentage of the final grade
Class Participation	1,2	5
Ex. 1: Critique of research methodologies	3	10
Ex. 2: Shark Map	2,3	5
Paper discussion	3	10
Ex. 3: Fisheries Analysis	3	10
Scientific Paper	1,2,3	10
Group Presentation	1,2,3	10
Mid term exam	3	20
Final take home Exam	3	20

**DESCRIPTION OF COURSE EVALUATION CATEGORIES**

- 1. Participation in class and in the field (5 points).** I like to see a lot of discussion and participation in class and in the field, so I will be evaluating you on your inputs to various themes we will discuss, and of course will be looking at how you perform as a



team in the field (note that I will take into account your dive experience for this, so don't panic if you are a novice diver!)

2. **Exercise 1 Critique of population abundance methods (10 points)** Students will be asked to critically review three contrasting methods to determine population abundance and/or trends of large pelagic species in marine protected areas: Peñaherrera (2015), White et al (2014) and Salinas et al (2016). All articles will be made available to the students at the start of the course.
3. **Exercise 2 (5 points)** A map of shark tracks from real data taken in the Galapagos Marine Reserve.
4. **Paper Discussion (10 points)** Show a good grasp of the article and its strengths/weaknesses. Lead a discussion on application to Galapagos
5. **Exercise 3 (10 points).** I will take you through some fisheries monitoring data analysis exercises that you will be expected to complete in your own time
6. **Scientific paper (10 points)** Students will produce a group scientific report that evaluate and interpret the data collected in the field. This report will have the format of a scientific paper (no more than 10 pages double space) with a small summary, an introduction, methods, results, discussion, conclusions and references to the relevant literature you used during the elaboration of the document. (Cite at least 10 papers, following the format used by the Ecological Society of America journals <http://esapubs.org/esapubs/journals/ecology.htm>).
7. **Presentation (10 points)** Each group will give a 10-minute presentation about the results of their particular topic. Groups to focus on:
  - a. Demersal fish
  - b. Macro-invertebrates
  - c. Large pelagics
8. **Mid term exam (20 points)** There will be an exam which will cover all the material learned during the course to date.
9. **Final take-home exam (20 points)**

### COURSE POLITICS

All students of this course respond to the code of honor of Universidad San Francisco de Quito. Observe and respect all the regulations of the Galapagos National Park. Honesty and respect within all persons and to wildlife as well as respect to the Campus and its regulations are mandatory. Disrespect of the code of honor of USFQ or any other regulations will be sanctioned by the corresponding authorities and could result in the loss of this course.

### GRADING SCALE

Percentage	Grade	Consideration Points	
91-100%	A	Excellent	4
81-90%	B	Good	3
71-80%	C	Intermediate	2
61-70%	D	Deficient	1
-60%	F	Failed	0



**Assistance** (Come to class on time)

**Excursions are mandatory.** In the case of disease or any other justified cause, students can be relieved from the excursion and cover the qualification with additional tasks. At any site in the Galapagos, the National Park rules have to be accepted. Animals are not to be approached, handled or scared off.

#### **MAIN BIBLIOGRAPHY:**

No textbook is required for this class; however, the following book was used to prepare the presentations and will be in the Library for general consults:

DANULAT & EDGAR (EDS) 2002. LINEA BASE DE LA RESERVA MARINA DE GALAPAGOS. FUNDACION CHARLES DARWIN Y SERVICIO PARQUE NACIONAL GALAPAGOS, ECUADOR, 448P

#### **MATERIALS**

For excursions ALWAYS bring slates for field notes, snorkeling gear, camera, id guides.

#### **POLITICS ABOUT ACADEMIC DISHONESTY**

The code of honor will be strictly observed, copying or other academic offenses will be sanctioned in any case observed and the respective tasks or exams will be qualified as 0.

All courses are governed by the USFQ Student Manual, which can be downloaded at [Manual del Estudiante](#)

#### **OFFICE HOURS**

Set an appointment

#### **PROFESSORS**

**Alex Hearn** PhD is professor of GAIAS/ COCIBA—USFQ. I received my PhD from Heriot-Watt University in fisheries ecology. I then spent almost a decade working in Galapagos leading up the fisheries research unit at the Charles Darwin Foundation. From 2008 onwards I have focused more on movement of marine and estuarine species, both in California and in Galapagos. My current focus is on the migratory behavior and conservation of sharks in the region.



**SCHEDULE OF ACTIVITIES:**

Note that shark research may be scheduled once the module begins and we can judge the tides/sea state etc.

Day	Topic	Exercises/Evaluations
1	<p><b>Lecture:</b> Diving as a tool to monitor benthic biodiversity</p> <p><b>Discussion Session:</b> How to monitor pelagic species – a review of several methods and setting the scene for Exercise 1.</p>	
2	<p><b>Lecture:</b> The ecological subtidal monitoring program of the Galapagos Marine Reserve</p> <p><b>Fieldwork Prep:</b> datasheets, accessories for field trip <a href="#">Prepare paper outlines</a></p> <p><b>Paper Discussion 1. Ward-Paige &amp; Lotze 2011</b></p> <p><b>Afternoon</b></p> <p><b>2 pm Lecture:</b> A framework for animal movement, and introduction to aquatic biotelemetry (with GIS group)</p> <p><b>4 pm GIS LAB:</b> Spatial Awareness in a GIS context (Leo Zurita)</p>	
3	<p><b>Lecture:</b> Main marine groups found in the subtidal, identification and role.</p> <p><b>Paper Discussion 2. Edgar et al 2011</b></p>	
4	<p><b>Afternoon</b></p> <p><b>2 pm GIS LAB:</b> Importing your data from yesterday and creating tracks from the points, automating track data in GIS (Leo Zurita) Exercise 2 setup</p>	
5	<p><b>Lecture:</b> Characterizing the seabed</p> <p><b>Paper Discussion 3. Bradley et al 2018</b></p>	
6	Travel to Santa Cruz	
7	DIVE IN SANTA CRUZ	
8	DIVE IN SANTA CRUZ	



9	<b>Return to San Cristobal</b>  <b>Afternoon</b>  <b>2pm Lecture:</b> Satellite technology for tracking in aquatic environments (with GIS class)  <b>Paper Discussion 4. Lennox et al 2017</b>	
10	<b>Lecture:</b> The MigraMar network  <b>Lecture:</b> Case study whale sharks  <b>Paper Discussion 5. Bouchet &amp; Meeuwig 2015</b>  <b>Mid term test</b>	<b>Exercise 1 due</b>
11	<b>Lecture:</b> Fisheries Monitoring in the Galapagos Marine Reserve  <b>Exercises:</b> Data workup from lobster/sea cucumber monitoring ( <b>in-class exercise</b> )  <b>Paper Discussion 6. Pauly et al 2002</b>	<b>Exercise 2 due</b>
12	<b>Discussion Session:</b> Artisanal Fishing in the Galapagos Marine Reserve (with local fisher Marco Escarabay)  <b>Paper Discussion 7. Dureuil et al 2018</b>	
13	<b>Lecture:</b> Using aerial methods for marine surveys  <b>Paper Discussion 8. Rieucan et al 2018</b>	
14	<b>Exercise 1 feedback</b> and Citizen Science discussion  <b>Group Presentations</b>	<b>Exercise 3 due</b>  <b>Final paper due</b>  <b>Scientific papers due</b>
15	<b>Fly back to mainland Ecuador</b>	

This syllabus was reviewed and approved by the academic coordinator of the major/department, such that all sections should follow this syllabus. If it is necessary to make changes/adjustments to the syllabus, please ask the academic coordinator so that the approved changes/adjustments are reflected in the Curriculum Design system.

**THIS SYLLABUS MAY BE SUBJECT TO CHANGE**