



EG 396 MARINE ECOLOGY
IES Abroad Quito/Galapagos

DESCRIPTION:

The Galapagos Archipelago is influenced by cold and warm ocean currents providing a variety of marine ecosystems and abundant fauna including endemic species, such as Galapagos sea lions, marine Iguanas and Penguins. By combining field work, where students can observe marine wildlife, students will learn the fundamentals of marine ecology. Throughout the course different aspects of ecosystems will be discussed: the structure of marine communities and the processes that affect the patterns of abundance and distribution of marine biodiversity in intertidal, subtidal and deep oceans. Studies will focus on rocky shores, rocky subtidal communities, coral reefs, mangroves, seamounts and hydrothermal vents. This class will have a strong experimental component in the field where students apply research techniques and learn how to answer their research questions on Galapagos marine life.

CREDITS: 3

CONTACT HOURS: 40

LANGUAGE OF INSTRUCTION: English

PREREQUISITES: None

ADDITIONAL COST: None

METHOD OF PRESENTATION:

The teaching methodology used in all courses at USFQ follows the liberal arts philosophy: encourage dialogue and enable learning through opportunities to exchange ideas among teachers and students. It is expected that all the theoretical content courses explore potential applications to professional practice and work contexts through the integration of diverse activities and simulations that foster the contextualized understanding of concepts using reality and professional practice as frames of reference.

COURSE CONTENTS:

Marine biodiversity and ecosystem functioning, larval ecology, trophic cascades, facilitation, oceanic currents, upwelling, climate change, hydrothermal vents, rocky shores, rocky subtidal communities, coral reefs, rocky reefs, mangrove forests, fish ecology, sea birds, marine reptiles and marine mammals, Human impacts.

REQUIRED WORK AND FORM OF ASSESSMENT:

The final grade is determined according to the following percentage assigned to each component of this course:

- Course Participation – 10%
- Research article discussions – 15%
- Research Project Proposal – 25%
- Research Project Manuscript – 25%
- Final Exam – 25%

CLASS PARTICIPATION GUIDELINES

Students are encouraged to participate as much as possible in all academic activities. This includes both inside the classroom and in the field excursions. It is appreciated if students share their own experiences related to the marine environment in their homeland and how do they contrast to the reality in the Galápagos. Students are also expected to use the class as a space to share their own experiences and engage in discussions.



DESCRIPTION OF ASSESSMENT CATEGORIES

Research Article Discussion Guidelines

After every lecture there will be a scientific paper discussion led by students working as a team. The goal of these activities is to encourage students to explore primary literature in depth and analyze different research methods. All students are required to read the articles prior to class and should be prepared to discuss the paper and topic. As discussion leaders, students will use the article to identify and explore issues in marine ecology. A brief introduction and appropriate background information on the organisms and/or systems may be helpful, students are welcome to use slides, to help themselves with a brief presentation about the paper. Debate leaders should engage the rest of the class with specific questions about the paper that addresses issues and concepts of the topic of the day. Students may wish to **follow up on additional papers** in the same topic area to see how the field has advanced, opinions have changed, or if there is disagreement within the scientific community.

Guidelines for Research Project Proposal Presentation

Students will have the unique opportunity to observe natural processes on the campus doorsteps these experiences add to the theoretical framework acquired from lectures and scientific paper discussions should contribute to the student's ability to identify a marine ecology/conservation research question in the Galápagos Marine Reserve. Students develop a research proposal which they will present to the class. The research proposal should focus on a topic of their choice and be based on observational research only. (No handling or manipulating experiments).

Presentations should include the following:

- **Introduction** (must include a sound theoretical background, research question, and significance);
- **Methods** (How would you answer your question? What special equipment or software would be useful? In this section the sky is the limit, remember it is a theoretical exercise);
- **Expected Results** (in this section it should be pointed out what is the Contribution of the study to Marine Ecology/Conservation)
- **Literature Cited** (The last(s) slide(s) of the presentation should include all the sources that you used for your work, it should include at least 10 references).

Presentations **cannot** be longer than 10 minutes plus 5 minutes for questions and comments.

Guidelines for the Research Project Presentations

Data to answer research questions can be collected anywhere in the intertidal or subtidal zone close to the campus. Data collection is by observations (handling, modification methods are excluded) and must adhere to the National Park regulations about interactions with wildlife.

Results can be presented as tables and/ or figures to visualize the outcome of the study.

A discussion of the results, methods applied gives insight into the outcome of the study in terms of similar studies in Galapagos and elsewhere. The value of the results in terms of conservation and management shall be highlighted.

Final Exam

At the end of the class, students can show everything they learned during the course by a final exam including all material covered during this course including research projects, field trips and article discussions.

COURSE LEARNING OUTCOMES:

- Gain a broad understanding of ecological processes in marine ecosystems with emphasis in the Galápagos Marine Reserve
- Empower students to be critical thinkers and capable of synthesizing theoretical concepts
- To identify threats to the conservation of marine ecosystems
- To propose ecological research in marine environments based on original observations in nature



POLICIES:

All students taking courses at USFQ must follow the rules for ethics of learning, research, and behavior detailed in the [USFQ's Code of Honor and Coexistence](#). All courses should follow the policies stated in USFQ's [Manual del Estudiante](#)

ABOUT ELECTRONIC EQUIPMENT:

Cell phones, Ipods and other devices must be switched off in class. Students are allowed to use IPAD/computers only for taking notes.

CONTENT:

January	Activity	Readings	Time
Monday	Galapagos and Oceanographic settings of the Galapagos Marine Reserve. Introduction to Marine Ecology;	Gosnell & Gaines 2012	9:00-12:00
	Ocean Currents and Primary Productivity; Larval Ecology	Edgar et al. 2017	14:00-16:00
Tuesday	Coastal habitats (Sandy beaches, rocky shores, Mangroves)	Hughes et al. 2017	9:00-12:00
	Outdoor class: Snorkel at Punta Carola		14:00-16:00
Wednesday	Subtidal habitats (Coral reefs, rocky reefs, hydrothermal vents)	McLeod et al. 2015	9:00-12:00
Thursday	Excursion to Interpretation Center, Tijeretas, Darwin Cove		9:00-12:00
Friday	Fish Diversity and Fish of the Galapagos Research Proposal presentations	Pauly et al 2003	9:00 – 12:00
Saturday	Free time, work on research projects		
Sunday	Excursion, Kicker Rock		
Monday	Marine Megafauna: sharks and rays, birds and sea turtles	Harrison 2018	9:00-12:00
	Sea lion Observations at Playa Mann/ Carola	Serratos et al 2020	14:00-16:00
Tuesday	Marine megafauna: marine mammals	Schulz et al 2022	9:00 – 12:00
Wednesday	Excursion to Santa Cruz Puerto Ayora Bay		9:00 – 12:00
Thursday	Excursion to Santa Cruz, Tortuga Bay	N/A	
Friday	Free day		
Saturday	Human Impacts in Marine Ecosystems; Climate Change; Pollution	Halpern et al 2008	9:00-12:00
Sunday	Excursion, El Junko, Puerto Chino	N/A	
Monday	Research project presentations Farewell Dinner	N/A	9:00-12:00
Tuesday	Transfer to the Airport and Quito		



READINGS:

Note: No textbook is required for this class; however, the following books were used as references to prepare the lectures and are available at the USFQ library for further topic exploration:

- Nybakken JW, Bertness MD. 2006. *Marine biology: An Ecological Approach*. 6th Edition, San Francisco: Pearson/Benjamin Cummings, 579 pg.
- Bertness MD, Bruno JF, Silliman BR and JJ Stachowicz. 2014. *Marine Community Ecology and Conservation*. Sinauer Associates, Inc. Sunderland, MA. 566 pg.

COURSE BIBLIOGRAPHY (for reading discussions):

- Gosnell, JS & Gaines, SD, (2012) Keystone intimidators in the intertidal: non-consumptive effects of a keystone sea star regulate feeding and growth in whelks. *Marine Ecology Progress Series*, 450, pp.107–114.
- Hughes TP, Barnes ML, Bellwood DR, Cinner JE, Cumming GS, Jackson JB, Kleypas J, van de Leemput IA, Lough JM, Morrison TH, others (2017) Coral reefs in the Anthropocene. *Nature* 546:82–90.
- McLeod, I. et al., 2015. Latitudinal variation in larval development of coral reef fishes: implications of a warming ocean. *Mar Ecol Prog Ser*, 521, pp.129–141.
- Edgar GJ, Alexander TJ, Lefcheck JS, Bates AE, Kininmonth SJ, Thomson RJ, Duffy JE, Costello MJ, Stuart-Smith RD (2017) Abundance and local-scale processes contribute to multi-phyla gradients in global marine diversity. *Science advances* 3:e1700419.
- Carr LA, Gittman RK and JF Bruno (2018) Temperature influences herbivory and algal biomass in the Galápagos Islands. *Frontiers in Marine Science* 5:279, doi: 10.3389/fmars.2018.00279.
- Borstein, SR et al., (2019) Reef fish functional traits evolve fastest at trophic extremes. *Nature ecology & evolution*, 3(2), pp.191–199.
- Anderson, AB et al., (2019) Habitat use of five key species of reef fish in rocky reef systems of southern Brazil: Evidence of MPA effectiveness. *Marine Biodiversity*, 49(2), pp.1027–1036.
- Paltán, HA et al., (2021) Climate and sea surface trends in the Galapagos Islands. *Scientific Reports*, 11(1), pp.1–13.
- Frisch AJ, Rizzari JR (2019) Parks for sharks: human exclusion areas outperform no-take marine reserves. *Frontiers in Ecology and the Environment* 17:145–150.