



UNIVERSIDAD SAN FRANCISCO DE QUITO

SCHOOL: CIENCIAS BIOLÓGICAS Y AMBIENTALES

COURSE: BIO- ORIGIN OF SPECIES AND ISLAND BIODIVERSITY

Semester: Spring 2020 (second semester 2019–2020)

Schedule: LMMJV 09:00–11:50 (GAIAS, San Cristóbal, Galápagos)

PROFESSOR INFORMATION

Name: Elisa Bonaccorso, PhD

E-mail:

Office: GAIAS

Office hours: Every day after class or Monday to Friday (14:00–17:00) with previous appointment.

COURSE INFORMATION

Credits: 4

Prerequisites: One semester of General Biology or similar

COURSE DESCRIPTION

Islands are among the most exciting scenarios for understanding the evolutionary and ecological processes that shape biodiversity. Thus, this course uses the setting of the Galapagos islands to illustrate how evolution generates biodiversity and the consequences of this process in terms of diversity patterns, endemism, and vulnerability to human-induced impact and natural phenomena.

In this course, students will receive an introduction to evolutionary biology, learn about the particularities of island biogeography and biodiversity, and how to apply this knowledge in the context of the Galapagos islands. Also, students will use theoretical knowledge acquired during lectures as bases for the discussion of different case studies available in the literature, and for developing an original project or project proposal to approach a research question in the realm of evolutionary biology and island life. Finally, we will address how human activities are affecting the dynamics of species' biodiversity and evolutionary patterns on islands.

SPECIFIC COURSE LEARNING OUTCOMES:

Number	Learning Outcome	Level
1	Reviewing the scientific theory of evolution that provides the necessary framework to understand evolution and diversification processes	Initial
2	Developing an understanding of the historical and ecological factors that shape species' distributions and evolutionary change on island systems	Medium
3	Understanding how island biotas are responding to the changes caused by human activities	Medium



4	Studying examples from the Galapagos Islands that illustrate evolutionary processes, including speciation and extinction, as well as conservation strategies	Medium
5	Understanding and applying the scientific method through hands-on projects or project proposals that will apply the biogeography concepts and data into a real scenario in the Galapagos Islands.	Final

COURSE CONTENT:

- Introduction to evolutionary biology: What Darwin learned from the Galapagos?
- The origin of species: How species arise
- What is the tree of life and how it can be used to understand evolution
- Particularities of islands and island environments
- Adaptation, speciation, and extinction on islands systems
- Effect of human activities on island ecosystems
- The scientific method applied to understanding island systems

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	Details	Percentage of the final grade
Attendance and participation	During lectures	10%
Paper discussions	Lead discussion of scientific papers (10%); participate on discussion of scientific papers (10%)	20%
Species checklist	1 checklist	20%
Research project oral presentation	1 presentation	10%
Research project written report	1 written report	20%
Final test	1 cumulative test	20%
	TOTAL	100%



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

DESCRIPTION OF THE EVALUATION CATEGORIES

Assistance and Participation: students are expected to assist and participate in class, either through questions or open discussion.

Paper discussions: each student will lead at least one paper during the class. All students are required to read all articles, preparing at least three questions/comments for each paper. The student leading the discussion will prepare a summary of all the main components of the article and provide his/her perspective on the major contributions of the study. Articles will be provided by the professor.

Species list: Each student will have to complete a species lists for a taxonomic group (see Appendix 1: Species List Guidelines).

Research project: Students will formulate and execute a project during the class, receiving constant input from the professor and other students. The subject for each research project will be defined during the second week of class, depending on the students' interests. The final report will be delivered to the professor in electronic format at the end of the course (see Appendix 2: Project Galapagos Research Project or project proposal).

Final exam: an exam covering the fundamental concepts reviewed in class, including those discussed during paper analyses.



Field excursions: The class includes mandatory field trips in San Cristobal, Santa Cruz, Seymour, and Isla Lobos.

MAIN BIBLIOGRAPHY:

Dawkins R. 2009. The Greatest Show on Earth: The Evidence for Evolution. Free Press, Transworld.

Whittaker, R. J. & J. M. Fernández-Palacios. 2007. Island Biogeography. Oxford University Press.

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

ABOUT ELECTRONIC EQUIPMENT: Cell phones, Ipods and other devices must be switched off in class. You may use IPAD/computers only for taking notes.

ASSISTANCE: Come to class on time. Field excursions are mandatory. In the case of illness or any other justified cause, students can be relieved from the excursion and cover the qualification with additional tasks.

MATERIALS

For field trips bring notebooks/slates, snorkeling gear, camera, hat, sunblock, **closed waking shoes**, **allergy medication (if needed)**. Also, ideally, students should have field guides (see above) for the plants and animals of the Galapagos Islands.



***SCHEDULE OF ACTIVITIES:**

*Subject to change

Week 1

Monday	Tuesday	Wednesday	Thursday	Friday
<p>Class Introduction</p> <p>Introduction to evolutionary biology: What Darwin learned from the Galapagos?</p> <p>Guidelines for research projects. Scientific method and hypothesis testing.</p>	<p>Paper discussion 1</p> <p>The origin of species: How species arise</p> <p>What is the tree of life and how it can be used to understand evolution?</p>	<p>Exploring the islands I:</p> <p><u>Isla Lobos:</u> Walk around the island, snorkeling nearby</p>	<p>Paper discussion 2</p> <p>Particularities of islands and island environments</p>	<p>Exploring the islands II:</p> <p><u>San Cristóbal:</u> Trip to El Junco and Hacienda Guadalupe with Milton Aguas (lunch at Hacienda Guadalupe)</p>

Week 2

Monday	Tuesday	Wednesday	Thursday	Friday
<p>Paper discussion 3</p> <p>The origin of species on islands</p>	<p>Exploring the islands III:</p> <p>Santa Cruz: Visit to Charles Darwin Foundation. Trip to Reserva de Tortugas El Chato</p>	<p>Exploring the islands IV:</p> <p>Seymour: Walk around the island (long trail) Snorkeling</p>	<p>Return from Santa Cruz to San Cristóbal (no class)</p> <p>Work on developing your project ideas</p>	<p>Paper discussion 4</p> <p>Workshop/Discussion of research project ideas, hypotheses, and predictions (at least 2 ideas per group).</p>



Week 3

Monday	Tuesday	Wednesday	Thursday	Friday
Effect of human activities on island biodiversity	Visit to Kicker Rock (marine environments on islands)	Review of concepts, and final projects Turn in field notebook with checklist assignment	Final projects: Oral presentations of research projects	Final Exam Written Final reports of research projects (upload to D2L until Sunday 23:30h)

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.



APPENDIX 1

ORIGIN OF SPECIES AND ISLAND BIODIVERSITY - 2020

Species checklist - Guidelines

Species checklist (Use your field notebook, 20% of grade)

- Learning how to ID and observe species in nature is a fundamentally important skill in field biology.
- The goal of the “species checklist assignment” is to provide you with hands on experience in this important skill.
- You will focus on identifying one taxonomic group (e.g., reptiles, insects, plants, fish, birds).
- When you see a species in your taxonomic group, you need to record the following in your field notebook:
 - ✓ Species name to the finest taxonomic resolution possible, including both common name and Latin binomial.
 - ✓ Date and time observed
 - ✓ Where observed (island, locality, elevation, habitat, and microhabitat)
 - ✓ Observed characteristics you used to identify the species. Draw the species in your field notebook, pinpointing the traits that helped you to identify it.
- Since different taxonomic groups have differing species diversity and differ in the ease of finding/seeing them, the minimum number of species that you need to document in your species checklist will vary by taxonomic group as follows:
 - ✓ Minimum number of reptile species: 10
 - ✓ Minimum number of fish species (or genera): 15
 - ✓ Minimum number of invertebrate species (or genera): 15
 - ✓ Minimum number of plant species (or genera): 15
 - ✓ Minimum number of bird species: 20 (plus 5 species of any other group)

Pick an endemic genus or species and, based on the literature, write a short paragraph about what is known about the evolution of that genus in the Galápagos (at the end, include the references for that information).

Turn in field notebook with checklist assignment **by February 20th, 2019.**



APPENDIX 2

ORIGIN OF SPECIES AND ISLAND BIODIVERSITY - 2020

Galapagos Research Project or project proposal - Guidelines

Research project or project proposal (30% of the grade)

- Students will design or execute a research project, and communicate their results orally and in writing (details provided below)

Research project proposal Oral Presentation (10% of grade)

- 15 min + 5 min for questions
- Introduction: What was previously known about the topic; present your research question, hypothesis(es), prediction(s)
- Methods
- Expected results (or results and discussion if project was executed)

Research project (20% of grade)

- 10 pages **maximum** including title page, references, and figures (double-spaced, Times New Roman 12, standard margins).
- Similar format to presentation, but some differences
- Page 1: Title page (whole first page, including paper title, author (s) name, date)
- ~ Pages 2-3: Introduction
 - o First paragraph: Put your question in the context of big questions in ecology and evolution, particularly in the tropics
 - o Second paragraph: narrow down the narrative towards your research subject (e.g. in the Galápagos, for a particular taxonomic group, etc.)
 - o Third paragraph: State your question, hypotheses, and predictions
- ~ Pages 4-5: Methods
 - o First paragraph: Provide general explanation of the approach you used to address your question
 - o Next 1-2 paragraphs: Describe how you would collect or collected your data (and explain your experiment or sampling design)
 - o Last paragraph: Explain how you would visualize or visualized your data and made inferences
- ~ Pages 6-7: Expected results (including figures)
- Page 8: Literature cited (cite any books/papers that you refer to in your paper)

- OR, if you executed your project...
- ~ Pages 6-7: Results (including figures)
 - o Succinctly describe your results (but don't discuss results yet)
 - o Provide sample sizes and state whether your predictions hold or not (and therefore if your hypotheses are rejected or supported)
 - o Embed figures showing your results
- ~ Pages 8-9: Discussion
 - o Explain what you can conclude from your study
 - o Explain the broader significance of your study
 - o Provide future directions to investigate question further



- Point out additional interesting questions that came up
- Page 10: Literature cited (cite any books/papers that you refer to in your paper)

Schedule for research projects

- Tuesday February 15th

- Oral presentation of research ideas (questions, hypotheses, predictions). At least two ideas per group/student

- Thursday February 22th

- Final Oral presentation of research projects.

- Friday, February 23th

- Final research project submitted via electronically (upload to D2L by 23:55 h).