

SEMESTER AT SEA COURSE SYLLABUS

Colorado State University, Academic Partner

Voyage:	Fall 2019
Discipline:	Botany/Zoology
Course Number and Title:	BZ 349 Tropical Ecology and Evolution
Division:	Upper
Faculty Name:	Dr. Kate Huyvaert
Semester Credit Hours:	3

Prerequisites: One (1) introductory evolution course.

COURSE DESCRIPTION

The region of the globe straddling the equator from 23°N to 23°S – the ‘tropics’ – is home to the widest diversity of plants and animals on the planet. This course will provide students with a broad introduction to the array of terrestrial, freshwater, and marine tropical organisms as well as an understanding of the similarities and differences in patterns of diversity between tropical and temperate regions. Building on this foundation, we will examine hypotheses explaining variation in biological diversity across the latitudinal gradient and we will explore the ecological and evolutionary processes that generate and maintain tropical biodiversity. This Semester-at-Sea voyage will give students an amazing opportunity to experience the diversity of the tropics first hand, to learn about the threats facing tropical diversity, and to deepen their understanding the importance of tropical ecosystems for global sustainability.

LEARNING OBJECTIVES

- 1) Identify similarities and differences between tropical and temperate patterns of biodiversity and ecological and evolutionary processes explaining those patterns.
- 2) Provide examples of the ‘latitudinal diversity gradient’.
- 3) Describe and critically evaluate hypotheses for the ‘latitudinal diversity gradient’.
- 4) Classify types of and describe the natural history of organisms that are representative of the variety of tropical ecosystems around the world.
- 5) Recognize the threats facing the tropics and the importance of tropical ecosystems for global sustainability.

REQUIRED TEXTBOOK

AUTHOR: John Kricher

TITLE: Tropical Ecology
PUBLISHER: Princeton University Press
ISBN #: 978-0-691-11513-9
DATE/EDITION: 2011/ 1st

Supplies: Small (4"x6" or 4 5/8"x7") Rite-in-the-Rain or similar field notebook/journal

TOPICAL OUTLINE OF COURSE

Depart Amsterdam, The Netherlands – September 9

B1–September 12:

Topic: What and where are the tropics? History of tropical discovery and exploration

Readings: Kricher Ch. 1 (pp. 6-19)

Assignment: Upcoming: Field journal set up

B2–September 14:

Topic: Biogeography of the tropics

Readings: Kricher Ch. 2 (pp. 38-51)

Assignment: Field journal set up (in class)

Gdansk, Poland – September 15-20

B3–September 22:

Topic: Evolution in the tropics: The latitudinal diversity gradient

Readings: Kricher Ch. 2 (pp. 51-78)

Assignment: Upcoming: Conservation Issue choice

B4–September 24:

Topic: Tropical climates & ecosystems

Readings: Kricher Ch. 1 (pp. 19-37)

Assignment: Conservation Issue choice (in class)

Lisbon, Portugal – September 26-28

Cadiz, Spain – September 29 – October 1

B5–October 2:

Topic: How a rainforest functions (structure)

Readings: Kricher, Ch. 3

Assignment: Upcoming: Natural history 'sketch' organism choice

B6–October 4:

Topic: How a rainforest functions (disturbance & dynamics)

Readings: Kricher, Ch. 6

Assignment: Natural history 'sketch' (in class)

Dubrovnik, Croatia – October 6-10

B7–October 11:

Topic: Tropical plants & animals: estimating biodiversity I
Readings: Kricher, Ch. 4 (pp. 109-123)
Assignment: none

B8–October 13:

Topic: Tropical plants & animals: estimating biodiversity II
Readings: Erwin 1982; May 1992
Assignment: none

Casablanca, Morocco – October 15-20

B9–October 21:

Topic: Tropical plants & animals: tree species richness
Readings: Kricher Ch. 5
Assignment: none

B10–October 23:

Topic: EXAM 1
Assignment: EXAM 1

B11–October 26:

Topic: Biodiversity in the tropics of western Africa: Focus on Ghana
Readings:
Assignment: Field Class prep; Upcoming: Field class reflection

Tema, Ghana – October 28-30

Takoradi, Ghana – October 31 – November 1 – Field Class, Friday 1 November, 2019

B12–November 2:

Topic: Co-evolutionary interactions in rainforests
Readings: Kricher Ch. 7
Assignment:

B13–November 5:

Topic: Predator-prey interactions in the tropics
Readings: Kricher Ch. 8
Assignment: Field class reflection due

Community Programming - November 6 (No Class)

B14–November 7:

Topic: Tropical ecosystems: Savannas & dry forests
Readings: Kricher Ch. 11
Assignment:

B15—November 9:

Topic: Tropical ecosystems: Rivers, The Amazon

Readings: Kricher Ch. 12 (446-463); *River of Doubt*, Ch. 12

Assignment:

Salvador, Brazil — November 10-15

B16—November 17:

Topic: Tropical ecosystems: Montane systems

Readings:

Assignment: Kricher Ch. 12 (pp. 422-446)

B17—November 19:

Topic: Tropical island ecosystems: biogeography

Readings:

Assignment:

Community Programming – November 21 (No Class)

B18—November 22:

Topic: Evolutionary ecology of tropical island ecosystems: Trinidad's guppies,

Readings: Yong 2018

Assignment:

Port of Spain, Trinidad and Tobago — November 24

B19—November 25:

Topic: Tropical coastal ecosystems

Readings: Kricher Ch. 12 (pp. 463-468)

Assignment:

B20—November 27:

Topic: Causes of the latitudinal diversity gradient, Part 1

Readings: Kricher Ch. 4 (pp. 123-153)

Assignment:

B21—November 30:

Topic: Evolutionary ecology of tropical island ecosystems: Galapagos

Readings: De Roy Ch. 1 (Geist) & Ch. 14 (Grant & Grant)

Assignment: Natural history 'sketches' due

Guayaquil, Ecuador — December 2-7

B22—December 8:

Topic: Causes of the latitudinal diversity gradient, Part 2

Readings: –

Assignment: Upcoming: Conservation Issue presentations

B23—December 10: Conservation Issue Presentations

Topic: Conservation Issue Presentations

Assignment: Conservation Issue Presentations

Puntarenas, Costa Rica — December 11-15

B24—December 17: Conservation Issue Presentations

Topic: Conservation Issue Presentations

Assignment: Conservation Issue Presentations; Field journal/multimedia list due

B25—December 19: Final Exam

Arrive San Diego, California — December 23

FIELD WORK

Semester at Sea field experiences allow for an unparalleled opportunity to compare, contrast, and synthesize the different cultures and countries encountered over the course of the voyage. In addition to the one field class, students will complete independent field assignments that span multiple countries.

Field Class

The field class for this course is on **Friday, 1 November 2019, in Takoradi, Ghana.**

Field Class attendance is mandatory for all students enrolled in this course. Do not book individual travel plans or a Semester at Sea sponsored trip on the day of your field class. Field Classes constitute at least 20% of the contact hours for each course, and are developed and led by the instructor.

Tropical Forest Ecology: The Sky Above, The Trees Below

We will head from Takoradi to Kakum National Park in Ghana to explore the tropical forest from up above and down below. When we arrive at Kakum National Park, we will hike through primary and secondary forests making stops along the way to talk about the ecological and evolutionary factors that drive the differences among the moist, swamp, and riverine forests. We'll keep our eyes out for forest elephants, forest buffalo, civets, galago, pangolin, and over 250 bird species during our visit to Kakum so that we can compare our records to surveys conducted in the early 1990s. We will also climb up above the trees to walk along the Kakum Canopy Walkway, a unique perspective that will allow us to talk about the abiotic factors that shape tropical forests – a natural segue to finish the day considering climate change and other threats to the conservation of tropical ecosystems.

Objectives: The objectives of this field class will be to: 1) document the factors differentiating the three different forest types found in an African tropical moist forest; 2) experience a tropical forest from the canopy to better understand the processes that drive tropical forest ecology and evolution; and 3) conduct a survey/make a catalog of the fauna of Kakum to compare to data collected in a biodiversity survey in the early 1990s.

Independent Field Assignments:

Tropical Ecology Field Journal and Reflection

Students will keep a field journal to track their observations while in the field while on the field class excursion and throughout the voyage to track observations about their conservation issue. The field journal will also be an appropriate place to keep their 'voyage list' and field notes about the organism that will be the focus of the natural history 'sketch' assignment. We will have a field class reflection essay assignment which will be due on November 4, 2019. The field journal and reflection essay will constitute 20% of the final grade.

METHODS OF EVALUATION

Multimedia 'Voyage List'

Keeping lists of the organisms one sees during a field excursion, on a weekend trip to a park, or over a lifetime provides a valuable source of natural history information that can be used to track changes in biodiversity over time and in light of global change. For this assignment, students will keep their own natural history 'list' of a group of organisms (e.g., birds, trees, insects, etc.) that they observe throughout the voyage. Because many organisms will be new to students, the list should include photo or video documentation of each of the organisms observed for later consultation to confirm species identification. Towards the end of the voyage, we will use these lists as a source of data to evaluate predictions of hypotheses explaining the latitudinal diversity gradient.

Natural History 'Sketch'

Each student in the class will select a focal organism to develop a one- to two-page 'sketch' about their natural history including a written description of elements of the organism's life history and sketches or photographs of the organism. We will see several examples of these sorts of sketches throughout the semester and additional details will be provided in class.

Conservation Issue Presentation

Over the course of the semester, everyone will select and track an issue about tropical conservation. Students will use their field journal to record observations about their conservation issue. The assignment will culminate with students presenting their conservation issues findings in an IGNITE-style talk at the end of the semester.

<u>Assignment</u>	<u>% Final Grade</u>
Exams (2@ 15% each)	30%
Multimedia 'BioBlitz' list	15%
Natural History 'Sketch'	15%
Conservation Issue Presentation	15%

Field Journal and Class Reflection	20%
Participation and Attendance	5%

GRADING SCALE

The following Grading Scale is utilized for student evaluation. Pass/Fail is not an option for Semester at Sea coursework. Note that C-, D+ and D- grades are also not assigned on Semester at Sea in accordance with the grading system at Colorado State University (the SAS partner institution).

Pluses and minuses are awarded as follows on a 100% scale:

<u>Excellent</u>	<u>Good</u>	<u>Satisfactory/Poor</u>	<u>Failing</u>
97-100%: A+	87-89%: B+	77-79%: C+	Less than 60%: F
93-96%: A	83-86%: B	70-76%: C	
90-92%: A-	80-82%: B-	60-69%: D	

ATTENDANCE/ENGAGEMENT IN THE ACADEMIC PROGRAM

Attendance in all Semester at Sea classes, including the Field Class, is mandatory. Students must inform their instructors prior to any unanticipated absence and take the initiative to make up missed work in a timely fashion. Instructors must make reasonable efforts to enable students to make up work which must be accomplished under the instructor's supervision (e.g., examinations, laboratories). In the event of a conflict in regard to this policy, individuals may appeal using established CSU procedures.

LEARNING ACCOMMODATIONS

Semester at Sea provides academic accommodations for students with diagnosed learning disabilities, in accordance with ADA guidelines. Students who will need accommodations in a class, should contact ISE to discuss their individual needs. Any accommodation must be discussed in a timely manner prior to implementation.

A letter from the student's home institution verifying the accommodations received on their home campus (dated within the last three years) is required before any accommodation is provided on the ship. Students must submit this verification of accommodations to academic@isevoyages.org as soon as possible, but no later than two months prior to the voyage. More details can be found within the Course Registration Packet, as posted to the [Courses and Field Classes page](#) no later than one month prior to registration.

STUDENT CONDUCT CODE

The foundation of a university is truth and knowledge, each of which relies in a fundamental manner upon academic integrity and is diminished significantly by academic misconduct. Academic integrity is conceptualized as doing and taking credit for one's own work. A pervasive attitude promoting academic integrity enhances the sense of community and adds value to the educational process. All within the University are affected by the cooperative commitment to academic integrity. All Semester at Sea courses adhere to this Academic Integrity Policy and Student Conduct Code.

Depending on the nature of the assignment or exam, the faculty member may require a written declaration of the following honor pledge: "I have not given, received, or used any unauthorized assistance on this exam/assignment."

RESERVE BOOKS FOR THE LIBRARY

AUTHOR: Edward O. Wilson, Editor; Frances M. Peter, Associate Editor
TITLE: *Biodiversity*
PUBLISHER: National Academy Press
ISBN #: 0-309-03739-5
DATE/EDITION: 1988/1st

AUTHOR: John Kricher
TITLE: *The New Neotropical Companion*
PUBLISHER: Princeton University Press
ISBN #: 978-0-691-11525-2
DATE/EDITION: 2017 /2nd (revised edition of *A Neotropical Companion*)

AUTHOR: Marco Lambertini (Translated by John Venerella)
TITLE: *A Naturalist's Guide to the Tropics*
PUBLISHER: The University of Chicago Press
ISBN #: 0-226-46828-3
DATE/EDITION: 2000/ Originally published as *Guida alla natura tropicale* in 1992

AUTHOR: Richard T. Corlett and Richard B. Primack
TITLE: *Tropical Rain Forests*
PUBLISHER: Wiley-Blackwell
ISBN #: 978-1444332551
DATE/EDITION: 2011/2nd

FILM REQUEST

None

ELECTRONIC COURSE MATERIALS

AUTHOR: Candice Millard
ARTICLE/CHAPTER TITLE: Chapter 12, *The Living Jungle*
JOURNAL/BOOK TITLE: *The River of Doubt: Theodore Roosevelt's Darkest Journey*
VOLUME: not applicable
DATE: 2006
PAGES: 147- 159

AUTHOR: Terry L. Erwin
ARTICLE/CHAPTER TITLE: *Tropical Forests: Their Richness in Coleoptera and Other Arthropod Species*
JOURNAL/BOOK TITLE: *The Coleopterists Bulletin*
VOLUME: 36, No. 1
DATE: March 1982
PAGES: 74-75

AUTHOR: Dennis Geist
ARTICLE/CHAPTER TITLE: *Islands on the Move: Significance of Hotspot Volcanoes*
JOURNAL/BOOK TITLE: *Galapagos: Preserving Darwin's Legacy* (Tui De Roy, Editor)
VOLUME: not applicable
DATE: 2009 (ISBN #: 978-1-86953-709-8)
PAGES: Chapter 1 (pp. 28-36)

AUTHOR: B. Rosemary Grant and Peter R. Grant
ARTICLE/CHAPTER TITLE: *Darwin's Finches: Studying Evolution in Action*
JOURNAL/BOOK TITLE: *Galapagos: Preserving Darwin's Legacy* (Tui De Roy, Editor)
VOLUME: not applicable
DATE: 2009 (ISBN #: 978-1-86953-709-8)
PAGES: Chapter 14 (pp. 122-129)

AUTHOR: Yong 2018;
ARTICLE/CHAPTER TITLE: *This Fish's Eyes Turn Black When It Gets Mad*
JOURNAL/BOOK TITLE: *The Atlantic*
VOLUME: not applicable
DATE: June 4, 2018
PAGES: web URL: <https://www.theatlantic.com/science/archive/2018/06/guppy-eyes-they-feel-the-anger-between-you-and-i/561899/>

AUTHOR: Robert M. May
ARTICLE/CHAPTER TITLE: *How many species inhabit the Earth?*
JOURNAL/BOOK TITLE: *Scientific American*
VOLUME: 267 (Issue 4)
DATE: October 1992
PAGES: first article

ADDITIONAL RESOURCES

None