Salisbury UNIVERSITY *Department of Biological Sciences*

Tropical Biodiversity

BIOL 399-901 (3 credits) Winter 2019

Class time and place	**TBD: January 2020**
Instructor name	**Eric Liebgold**
Instructor office/phone	**Henson 230E 410-543-6499**
Instructor email	ebliebgold@salisbury.edu Website: http://faculty.salisbury.edu/~ebliebgold/
Instructor office hours	Pretty much the whole trip

Course description: This course will teach students how to investigate and expand on their knowledge of biodiversity and compare the ecology of tropical forests and other ecosystems, using the diverse habitats in Costa Rica as an example. The emphasis will be on understanding why particular tropical ecosystems have much higher biodiversity than other ecosystems. Field studies in forests of Costa Rica will build on lectures by teaching students to identify tropical wildlife and to utilize techniques for surveying wildlife. Then students will use this knowledge to survey biodiversity of organisms, including birds and mammals, record this data, calculate biodiversity indices, compare them among habitats and levels of human disturbance, as well as teach them to report this data. The goal of this class is to help students understand and appreciate a unique part of the natural world, focusing on how and why the tropics are so diverse and also understanding threats to tropical ecosystems.

Prerequisites: At least one 200+ level Biology course and an enthusiastic attitude and desire to learn about the Biodiversity of Costa Rica.

Department and Course Learning Outcomes

This course provides students practice with several of the Core Concepts and Core Competencies required of practicing biologists as outlined by the *Vision and Change* framework (AAAS, 2011). See a list of these department-level learning outcomes at the end of this syllabus.

Course-specific Learning Outcomes

- To experience ecotourism in a foreign country and understand its impacts on wildlife
- To become familiar with the principles and basic concepts of ecology
- To be able to identify fauna with and without field guides
- To be able to collect field data and take scientific field notes
- To understand how animals in the tropics interact with their abiotic and biotic environment
- To be able to measure and analyze species diversity
- To recognize why tropical ecosystems need to be conserved
- To write about and lead a group presenting species diversity data

Required texts

- ***Biodiversity*** (edited by EO Wilson) (free online text)

- ***Amphibians and Reptiles of Costa Rica: A Pocket Guide*** by Chacon and Johnston https://www.amazon.com/Amphibians-Reptiles-Costa-Rica-Publications/dp/0801478693/ref=sr_1_1?ie=UTF8&qid=1512142126&sr=8-1&keywords=Amphibians+and+Reptiles+of+Costa+Rica%3A+A+Pocket+Guide+by+Chacon+and+Johnston

- ***The Birds of Costa Rica*** by Garrigues & Dean **https://www.amazon.com/Birds-Costa-Rica-Tropical-Publications/dp/0801479886/ref=sr_1_1?s=books&ie=UTF8&qid=1512142148&sr=1-1&keywords=-+The+Birds+of+Costa+Rica+by+Garrigues+%26+Dean**

- ***The Mammals of Costa Rica*** by Mark Wainwright https://www.amazon.com/Mammals-Costa-Rica-Tropical-Publications/dp/0801473756/ref=sr_1_1?s=books&ie=UTF8&qid=1512142186&sr=1-1&keywords=-+The+Mammals+of+Central+America+by+Mark+Wainwright

- *Rite-in-the-Rain #391 horizontal lined notebook* or similar notebook (**5x7 inches**) required https://www.amazon.com/Rite-Rain-Notebooks-Horizontal-391/dp/B00AN9K2TC/ref=sr_1_1?s=books&ie=UTF8&qid=1512142254&sr=8-1&keywords=Rite-in-the-Rain+%23391 or if you want to buy as a group they are cheaper in 3s: https://www.amazon.com/dp/B00YDGV73G/ref=sxbs_sxwds-stvp_2?pf_rd_m=ATVPDKIKX0DER&pf_rd_p=3341940462&pd_rd_wg=Ag7wE&pf_rd_r=AP52QV6Y4BJPPW5Q5DCG&pf_rd_s=desktop-sx-bottom-slot&pf_rd_t=301&pd_rd_i=B00YDGV73G&pd_rd_w=xptaM&pf_rd_i=rite+rain+391&pd_rd_r=e11540d3-dc9c-48ca-aba2-99b2f156a3c4&ie=UTF8&qid=1512142302&sr=2

- *Binoculars* (but can be borrowed from the Biology Department with signed agreement)

Class Web site

Everyone registered for this class is automatically registered for our campus classroom management system, **MyClasses@SU**. MyClasses @ SU is where I will post your assignments, reading materials, etc. This is important for the week on campus. To use this system, go to the site (http://myclasses.salisbury.edu or click on the "My Classes" link at the top of the SU Homepage) and log in using your username and password. Your username and password will be either the same ones you use to check your e-mail in Groupwise (SU students) or those provided to you by the SU Center for International Studies (students from other universities). You must have access to MyClasses @ SU for this course **before and after** our trip.

Grading:

Quizzes 25%
Field Notebook 25%
Participation & data collection 25%
Final presentation 25%

Quizzes/pre-departure research (25%): Pre-departure in Salisbury, in country, or when we return, there will be a total of 3-4 quizzes on the material we covered: the importance of tropical biodiversity, field techniques, methods for species identification, biodiversity indices, threats to tropical biodiversity. These quizzes will help us appreciate and understand the work we do in the field. One of the 'quizzes' will be your research into an organism we may see in Costa Rica due at the start of the trip (as an oral presentation to the class without powerpoint). Another quiz will be identifying wildlife in the field in Costa Rica.

Field Notebook (25%): All students will be required to maintain a Field Notebook. Rite-in-the-rain notebook or other **4x6 or 5x7** inch (NOT 3x5) notebook is required. Prior to departure, we will go over what is required for collecting data (biological observations, weather, and other parameters) in a field notebook. The goal is to create a permanent record of your observations and collect data while on the trip. Thoughtful reflections on the day's activities will likewise be required.

Participation & data collection (25%): Participation in in-class discussions of selected chapters from the text and articles read in class goes towards this grade as does participation in field activities in Costa Rica. Data collection on datasheets in groups also counts towards this grade.

Final presentation (25%): After we return from Costa Rica, students, in small groups, will use their knowledge of tropical biodiversity (notes from pre-trip and in trip lectures and discussion as well as the text), field notebooks, and data collection and analysis (calculation of biodiversity indices), to present a report comparing biodiversity of different tropical forest habitats of birds, mammals, or reptiles (e.g. lowland rainforest vs cloud forest) in the scientific format (introduction, methods, results, discussion). BIOL 399 students will take a lead role in their group in collating, calculating and presenting species diversity data as well as performing literature searches to investigate and understand similar studies.

GRAND TOTAL 100%

Grading: Grades will be assigned as follows: 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, < 60% = F

Tentative class schedule: January 3-19, 2020
Fall meetings: Lectures, discussions, activities calculating biodiversity indices, and tutorials on use of binoculars and wildlife field identification.

Day 0: Pre-departure **quiz** on readings from the textbook and final preparations

Trip to Costa Rica January 3-13, 2020
Day 1: Pre-departure **take-home quiz** on readings from the textbook and animal presentations due. Travel to Costa Rica. Initial introduction to the country, its people & culture, and tropical environments. Visit somewhere cool if time permits or just relax. Overnight in San Jose.

Day 2: Travel to and survey for wildlife on boat ride to Torteguero National Park (Caribbean lowland rainforest) including birds, sloths, monkeys, turtles, and crocodiles. Set up camera traps. Scientific literature discussion on tropical species diversity. Overnight in Torteguero.

Day 3: Boat wildlife tour through the Tortuguero Canals. Hiking and wildlife surveys through Tortuguero National Park. Take down camera traps. Overnight in Torteguero.

Day 4: Remove camera traps. Transfer to Sarapiquí region. Chocolate Tour and wildlife observations at Tirimbina Biological. Data management and calculation of species diversity indices. Set up camera traps. Overnight in Sarapiqui area.

Day 5: Wildlife surveys and ecological research at La Selva Biological Station, one of the most important tropical research stations and home to over 400 bird species. Discussion of current and previous research at La Selva. Optional whitewater rafting. Night hike at Tirimbina Biological Reserve. Overnight in Sarapiqui area.

Day 6: Travel to Monteverde Cloud Forest via La Fortuna town. Evening wildlife walk (tonight or tomorrow). Set up camera traps tonight or tomorrow morning. Overnight in Monteverde.

Day 7: Surveys of forest canopy on Canopy Tour. Set up camera traps if not yet done. Bird walk in Santa Elena Reserve. Scientific literature discussion on the impacts of ecotourism on biodiversity. Night hike if not on Day 6. Overnight in Monteverde.

Day 8: Hiking and wildlife surveys in the Monteverde Reserve (early morning and late afternoon) looking for birds and other wildlife. Overnight in Monteverde.

Day 9: Take down camera traps. Travel to Guanacaste. Use boats and hiking to survey wildlife of a grassland/lowland dry forest. Overnight in Guanacaste.

Day 10: Boat wildlife surveys in Pacific dry forest of Palo Verde National Park to compare and contrast dry and rainforest habitats. Snorkeling tour in afternoon to observe marine wildlife & diversity. Overnight in Guanacaste.

Day 11: Fly back to USA. **Field notebooks due when we land**.

SU classes after trip: January 16-18:
Camera trap identifications, statistical analyses and biodiversity indices. Final **quiz** and group **Powerpoint Presentations** on species diversity of a birds, mammals, or reptiles (organisms to be selected during the trip) of different Costa Rica ecosystems and human impacts on that taxon.

Academic Integrity
Make sure that you understand the expectations of SU students regarding lying, cheating, misappropriation of course-based intellectual property, and plagiarism. In the event of academic misconduct, faculty are required by the university to submit a Misconduct Incident Report Form, even if only a warning is given. See the definitions and procedures outlined in the Student Handbook and www.salisbury.edu/provost/AcademicMisconductPolicy

Center for Student Achievement
The Center for Student Achievement offers students opportunities to make the most of their out of class study time. Students are encouraged to participate in structured study such as Supplemental Instruction and Tutoring. Students looking for additional assistance with study strategies and time management should make an appointment for an academic coaching session. The CSA offers a comfortable space to study and engage in study groups with peers. For more information and hours of operation visit www.salisbury.edu/achievement.

University Writing Center
At the University Writing Center (UWC), trained peer consultants are available to work with students at any stage of the writing process. Located on the second floor of the Guerrieri Academic Commons, the UWC offers a place where writers can meet to talk about their papers and projects. In addition to the important writing instruction that occurs in the classroom and during office hours, students are also encouraged to make use of this important service. For more information and to make appointments, visit the UWC's website at:
www.salisbury.edu/uwc.

Students with Disabilities
The Disability Resource Center (DRC), located in the Guerrieri Student Union Building, Room 263, provides guidance, access to resources, and coordinates accommodations for students with documented disabilities. Such disabilities include: learning disabilities, deaf/hard of hearing, blind/low vision, mobility limitations, attention deficit disorder (ADD/ADHD), psychiatric disorders, and medical disabilities. Any student who wishes to arrange for accommodation should begin by contacting the Disability Resource Center: 410-543-6070 (voice); 410-543-6083 (TTY); www.salisbury.edu/students/drc/register or visit the Guerrieri Student Union, Room 263. Note that testing accommodation request forms need to be submitted **at least 3 days prior to exams.**

Campus Emergencies and Inclement Weather
Information concerning University closure will be given to all local radio and television stations. Students can receive information concerning cancellations by listening to local stations or by calling the Gull Line at 410-546-6426. Those who have signed up for texts through SU's emergency notification registration system also will receive messages on their cell phones. Those who have not already signed up may do so by following the instructions at www.salisbury.edu/news/article (a salisbury.edu email address and GullNet account are required). Students must exercise their best judgment about whether they attend class. If class is cancelled, check your e-mail for information on out-of-class assignments, schedule adjustments etc.

SU Biology Department Learning Outcomes Practiced in Biol 310

These learning outcomes align with the *Vision and Change* Biology Core Concepts and Competencies (AAAS, 2011).

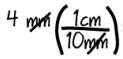
Codes: **0** = not practiced in course; **1** = practiced in only one or two classes or activities; **2** = practiced multiple times during course.

Part I: Core Concepts for Biological Literacy

Core Concepts	Learning Outcomes	1	2
Evolution The diversity of life changes through time and is related by common ancestry. 	**E1**: Define biological evolution.	x	
	E2: Describe evidence that supports the theory of evolution.		
	E3: Compare selection, mutation, genetic drift, and gene flow as processes of evolution.		
	E4: Explain how evolutionary fitness is determined by the interaction of genes and environment.	x	
	E5: Explain how evolution is limited by constraints and trade-offs.		
	E6: Explain how isolating barriers contribute to speciation.	x	
	E7: Explain how species are defined and identified.	x	
	E8: Analyze a phylogeny and infer the relationships among taxa.		
	E9: Explain how evolution and extinction have shaped the diversity of life on Earth.	x	
	E10: Describe human evolution in the context of other life on Earth.		
Structure and function Basic units of structure define the function of all living things. 	**F1**: Explain how biological entities are organized in hierarchical levels from molecules to biosphere.	x	
	F2: Explain how the structure of molecules affects biological function.		
	F3: Explain how the structure of cells affects function and survival.		
	F4: Explain how the structure of tissues and organs affect function and survival.	x	
	F5: Explain how the structure of individuals, populations, and communities affect ecological function.		x
	F6: Explain how biological structures and functions are constrained by chemistry and physics.		
	F7: Explain how biological structures and functions are constrained by evolution.		
	F8: Explain how structure and function can be dynamic and responsive to conditions.	x	
Information flow, exchange, and storage The growth and behavior of organisms are activated through the expression of genetic information in context. 	**I1**: Describe how genetic information is stored.		
	I2: Describe the flow of genetic information during gene expression.		
	I3: Describe how gene expression is regulated.		
	I4: Describe mechanisms that produce genetic variation.	x	
	I5: Describe how genetic information is transmitted.		
	I6: Explain how changes in alleles and epigenetic modifications can affect phenotype and fitness.	x	
	I7: Deduce information about alleles, genotypes, and phenotypes from analysis of genetic crosses.		
	I8: Describe how intracellular and extracellular signaling affects cellular responses.		
	I9: Describe how transfer of information among organisms affects survival and ecosystem function.		x
Pathways and transformations of energy and matter Biological systems grow and change by processes based upon chemical transformation pathways and are governed by the laws of thermodynamics. 	**P1**: Explain why a constant input of energy is needed to sustain life.	x	
	P2: Explain how energy can be transformed from one form to another to enable biological activity.	x	
	P3: Explain how matter is recycled through the rearrangement of bonds in chemical reactions.		
	P4: Explain how enzymes affect chemical reactions.		
	P5: Describe how energy and matter are transformed during life cycles.		
	P6: Describe the flow of energy through ecosystems.		x
	P7: Describe the cycling of matter through ecosystems.		x
	P8: Explain how limitations in energy and matter lead to trade-offs.	x	
Systems Living systems (at different scales from molecules to ecosystems) are interconnected and interacting. 	**S1**: Explain how the function of a biological system emerges from the combination of components.		x
	S2: Describe how system components interact in ways that vary in time, space, and intensity.		x
	S3: Explain how one component of a system can have direct or indirect effect on others.		x
	S4: Explain how internal feedback mechanisms regulate the function of systems.		x
	S5: Explain how biotic and abiotic factors influence the structure and function of biological systems.		x

Codes: **0** = not practiced in course; **1** = practiced in only one or two classes or activities; **2** = practiced multiple times during course.

Part II: Core Competencies (Skills) for the Practice of Biology

Competency	Learning Outcomes 0	1	2
Process of science Biology is evidence based and grounded in the formal practices of observation, experimentation, and hypothesis testing. 	**PS1**: Evaluate the reliability of source information.		x
	PS2: Ask research questions.		x
	PS3: Pose hypotheses including null or alternate hypotheses.		x
	PS4: Design observational and experimental studies.		x
	PS5: Collect qualitative and quantitative data using lab and/or field tools and techniques.		x
	PS6: Analyze and interpret qualitative and quantitative data.		x
	PS7: Identify variables and assumptions required by a study.		x
	PS8: Place scientific findings into a larger intellectual/contextual framework.		x
Quantitative reasoning Biology relies on applications of quantitative analysis and mathematical reasoning. 	**QR1**: Perform basic calculations.	x	
	QR2: Manage and organize data sets.		x
	QR3: Use data sets to generate appropriate graphs.		x
	QR4: Apply appropriate descriptive and inferential statistical methods to a data set.	x	
	QR5: Analyze and interpret quantitative data in tables and graphs.		x
	QR6: Use mathematical formulas to reason about biological processes.	x	
Modeling and simulation Biology focuses on the study of complex systems. 	**MS1**: Interpret visual models correctly.	x	
	MS2: Interpret mathematical models correctly.		
	MS3: Describe the assumptions used to make a model.		
	MS4: Create a model to represent relationships and/or processes.		
	MS5: Use a model to predict the outcome given a change in one or more variables.		
	MS6: Explain the role of probability and uncertainty in biological models.	x	
Interdisciplinary nature of science Biology is an interdisciplinary science. 	**ID1**: Draw conclusions about a complex problem by combining examples, facts, and theories from more than one biological field of study.		x
	ID2: Draw conclusions about a complex problem by combining examples, facts, and theories from more than one scientific field of study.		x
Communicate and collaborate Biology is a collaborative scientific discipline. 	**CC1**: Communicate ideas clearly in writing.		x
	CC2: Communicate ideas clearly in speech.	x	
	CC3: Communicate ideas clearly in visual presentations.	x	
	CC4: Use appropriate conventions of organization, content, and style in scientific communication.		x
	CC5: Correctly cite high-quality, relevant sources to support arguments.		x
	CC6: Work efficiently and professionally in teams.		x
Science and society Biology is conducted in a societal context. 	**SS1**: Explain how societal context has influenced the history and practice of biology.		x
	SS2: Explain how biological insights can be used to solve societal problems.		x
	SS3: Evaluate the ethical implications of biological research.	x	

Part III: Personal Development as a Learner

Competency	Learning Outcomes	1	2
Learning how to learn With practice, students develop from novice to expert learners.	**LL1**: Plan, monitor, and evaluate your own learning (that is, demonstrate metacognition skills).		x
	LL2: Develop and practice active learning strategies for studying alone and in groups.		x
	LL3: Identify university resources and gain access to support.	x	
	LL4: Identify and participate in discipline-related activities outside of the classroom.		x