NEOTROPICAL HERPETOLOGY

June 15 through July 10

ITEC Field Station
Isla Colón, Bocas del Toro Archipelago, Republic of Panama

COURSE SYLLABUS

This course is designed to offer undergraduate and graduate students a sound conceptual foundation in evolution, ecology, and field techniques as applied to Neotropical amphibians and reptiles. The material covered is equivalent to a university upper-level course in herpetology. Students will develop hands-on familiarity with most of the major reptile and amphibian clades (groups) of Panama and adjacent Costa Rica; we normally encounter over 50 species. Our pedagogy includes classroom lectures, informal field lectures, readings and critiques, group projects, and a capstone individual research project for each student. We emphasize conservation principles and practitioner-oriented skills relevant to many postgraduate biology careers.

INSTRUCTORS:

Adam G. Clause, Ph.D.

Research Associate, Institute of the Environment and Sustainability, UCLA
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Expertise: biogeography, systematics, tropical ecology, conservation science, human dimensions, herpetology, anguid lizards

AND

Peter N. Lahanas, Ph.D.

Institute for Tropical Ecology and Conservation, 2911 NW 40th Pl., Gainsville, FL 32605
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Expertise: Neotropical herpetology, forest ecology, animal behavior, biogeography, marine turtle genetics

COURSE STRUCTURE AND PHILOSOPHY

The course is roughly divided into four modules, each lasting approximately one week. The first module (orientation) will be spent getting acquainted with the trail systems and many habitats available around the ITEC field station. Students and faculty from concurrent field courses typically join us for these walks, offering a chance for socialization and interdisciplinary learning. After this introductory period, students will work on group projects covering various herp species or assemblages. Each project will involve data collection, analysis, and usually a brief research report or in-class presentation. Half-day or full-day excursions to nearby mainland and island destinations are also integrated into the schedule during this time. Simultaneously, with faculty guidance, each student will develop their own independent research project idea. Students will submit a full research proposal for faculty review and feedback midway through the course. Immediately thereafter we will travel to the Panamanian interior for several days, touring the Pacific cloud forests of Boquete, Pacific dry forests, and Caribbean lowland rainforest at Finca Sylvestre. After returning to the station, students will gather data for their independent research project, analyze their data, and prepare a technical research report. On the final day of the course, each student will present their results as part of a station-wide symposium.

This is a *field course* in herpetology. We will be spending a great deal of time outdoors in forests, swamps, streams, ponds, and other habitats. Much of our work will be done during the day. However, we will also make frequent nighttime forays to wetlands and along forest trails because many herpetofaunal species, especially amphibians, are best encountered at night. Expect to get wet and muddy during any or all of these outings. Mosquitos and other biting insects are to be expected.

Our faculty recognize, and value, student diversity in learning preferences. We rely upon a mixture of classroom lectures, informal lectures and discussions, and experiential field exploration—including plenty of group activities and small collaborative projects. When possible, we try to offer students leeway to choose study topics that are most relevant to their specific post-graduation aspirations.

Students must be prepared to live and work in close proximity with faculty and students from concurrent courses. Field station coursework offers a special set of interpersonal rewards and challenges. Students are expected to approach this environment with a collegial attitude and professionalism. We are committed to a fun and respectful community atmosphere for all.

With this general framework in mind, we pursue the following learning outcomes in this course:

1) To understand the evolutionary history and relatedness of herpetofauna

2) To examine the ecology of herpetofauna, and consider how their natural history has facilitated their remarkable diversification in the Neotropics

3) To learn the identifying features of most families, and many species, of Panamanian and Costa Rican herpetofauna

4) To practice standard, best-practice methods of capture, documentation, monitoring, and measuring herpetofauna in a field context

5) To hone scientific writing ability, independent and collaborative research skills, and practice applying the scientific method

6) To study conservation issues related to herpetofauna, and discuss solutions to help address these issues and move human societies toward greater sustainability

REQUIRED TEXTS

Readings will be assigned from the following reference texts. These readings reinforce lecture subjects and field exercises. Additionally, students will read and critique primary literature provided by faculty. Students may also submit readings of their own choosing to faculty for consideration. For students unable to afford required books, please contact your instructor(s). Copies may be available for loan at the ITEC field station on a first-come, first-served basis.

Vitt, Laurie J. & Janalee P. Caldwell. 2014. Herpetology: An Introductory Biology of Amphibians and Reptiles, 4th edition. Elsevier Inc.

Note: Every student is required to bring a copy of Vitt & Caldwell 2014. Both digital and hard copy formats are available for purchase. However, a free pdf version can also be downloaded on the internet…

Köhler, Gunther. 2008. Reptiles of Central America, 2nd edition. Herpeton Verlag Elke Köhler.

Köhler, Gunther. 2011. Amphibians of Central America, 2nd edition. Herpeton Verlag Elke Köhler.

Savage, Jay M. 2002. The Amphibians and Reptiles of Costa Rica: A Herpetofauna Between Two Continents, Between Two Seas, 2nd edition. University of Chicago Press.

Note: Every student is required to bring either BOTH Köhler books OR just the Savage book. We sympathize that these are expensive texts, but no cheaper equivalents exist. We will use these books on an almost daily basis. Furthermore, they are indispensable to students that pursue further herpetological work in Central America. The Köhler field guides offer more up-to-date taxonomy, more relevant geographic coverage, more comprehensive identification keys, and more photographs. The Savage book, on the other hand, is a true reference work enriched with highly detailed species accounts and a wealth of ecological information.

The following texts are relevant, but not required, supplemental sources for students to consider. The Kricher book is especially useful for those with little prior experience in tropical rainforests.

Kricher, J. 2017. The New Neotropical Companion. Princeton University Press.

Leenders, Twan. 2017. Amphibians of Costa Rica: A Field Guide. Comstock Publishing Associates.

Ray, Julie M. 2017. Snakes of Panama: A Field Guide to All Species. CreateSpace Independent Publishing Platform.

TRADITIONAL AND INFORMAL LECTURES

Throughout the course, faculty will deliver traditional lectures (usually in the afternoon and evening) to introduce topics that will be reinforced in the field. These lectures will take place in the classroom, using a combination of chalk board and PowerPoint presentation. Unless otherwise noted, lectures will be at 7:30 pm each evening. Having lectures at this time in the summer may not be ideal, but it is preferable to taking up daylight hours that could be better used for fieldwork. Plus, it allows us to do things like talk about caiman…and then go catch a caiman! Additional lectures, primarily those that introduce group research projects, will be presented just prior to the onset of the project.

Informal lectures will be provided periodically during orientation walks (when you first arrive), during group field projects, and in discussion groups. These will cover a wide variety of topics and will generally be prompted by what we encounter in the field, or by the direction taken during group discussions. Note that we will commonly adjust the tentative lecture schedule to accommodate local biotic events.

Lecture topics may include:

- Evolution of amphibians and reptiles
- Taxonomy and nomenclature of amphibians and reptiles
- Identification of amphibians and reptiles
- Historical biogeographic relationships
- Reproductive strategies and mating systems
- Reproduction and genetics in marine turtles
- Cloud forest and dry forest herpetofauna
- Island biogeography and color polymorphism in poison dart frogs
- Physiological ecology of amphibians and reptiles
- Feeding ecology in amphibians and reptiles
- Standard herpetological sampling techniques
- Herp-human mythology and interactions
- Conservation issues in herpetology

GROUP FIELD PROJECTS AND EXCURSIONS

These are instructional projects designed by the faculty and worked on by groups of two to six students. The purpose of these exercises is to familiarize students with sampling techniques, software programs, and equipment commonly used in herpetological field studies. They also necessitate working collaboratively and communicating results, which are key abilities in any biological profession. With help from faculty, students will set up projects, collect and analyze data, and briefly present the results in class and/or write a short report. In the event of a large class size, student groups will rotate through all projects so that every student receives equivalent experience. During the report writing phase, each student will usually be responsible for one section (introduction, methods, results, etc.), and such reports are normally less than five pages long. In the evening before each project, student groups will meet with their respective project leader to discuss aspects of the next day's project. Data collection for each group project will take place the following morning directly after breakfast (usually 8 am), but these starting times are subject to change. There will be three to six group projects. One or two students will be designated project write-up secretary for each project.

Integrated into these projects, but sometimes operating as stand-alone trips, are short half-day or full-day excursions to nearby destinations. These mini-expeditions will expose students to habitats and species absent from the immediate surroundings of the field station, offering further opportunities for experiential study. On these trips, we will encounter mainland herpetofauna that never reached Isla Colón (such as eyelash palm pitvipers and glass frogs), and practice surveying for herpetofauna adapted to special environs (like sandy beaches and rivers).

Group field projects and excursions may include:

- Forest night hikes
- Tail flicking behavior in geckos
- Comparative study of leaf litter herpetofauna
- Nesting behavior in leatherback sea turtles
- Arboreal herpetofauna using canopy access techniques
- Herpetofaunal biodiversity analysis
- Building maps in GoogleEarth and/or QGIS
- Population ecology in poison dart frogs
- Morphological analysis of gymnophthalmid lizards
- Isla Bastimentos and/or Isla Solarte: dart frog polymorphism
- Soropta Canal: iguanas, caiman, crocodiles
- Renacimiento Creek: aquatic anoles and glass frogs
- Mimitimbi: cave and riverine herps
- Isla Pajaros (Bird Island)

INDIVIDUAL RESEARCH PROJECTS

Working closely with faculty, students will be responsible for designing and completing an original research project of their choosing. The project can deal with any topic as long as it relates to Neotropical herpetology. At the end of the second week, students will submit a written project proposal (typically 2–5 pages) to the faculty for evaluation in terms of conceptual validity, analytical design, and feasibility within the timeframe of the course. Students will then have approximately 7–10 days for data collection. During the final week of the course, students will write and orally present their findings to the class. Final reports must be submitted by 9 July, no exceptions.

GRADING

Up to 6 units of credit will be given, 3 for the lecture portion and 3 for the field portion. A letter grade will be assigned based on exams, reports, proposals, attendance at lectures, and overall professionalism (which includes criteria such as personal attitude, motivation, and contribution to the course). A letter reporting a grade will be made available to the student and the student's institution. Arrangements must be made for this by the student well in advance of arriving in Panama. Students are personally responsible for providing their university with evidence of course participation (e.g., lecture notes, reports, exam, etc.).

For students taking the course for credit at their home institution, a single written exam is required. This exam will contain a mix of multiple-choice and short answer questions. It will be taken shortly after return from the mainland trip near the end of the course.

In addition to the core course requirements, students will have the opportunity to practice strategic communication by submitting one or more "Herp-of-the-Week" mini-assignments. These are short pieces (150–200 words) that introduce a species of herp encountered by the student during the course. One or more photos *must* be included for credit. All Herp-of-the-Week submissions must be written in an engaging style appropriate for a non-herpetologist popular audience. Each student may submit up to five Herp-of-the-Weeks during the course, worth a total of up to 5% of their course grade. Herp-of-the-Week submissions will be accepted until 9 July.

GRADING GUIDELINES

Requirements	*Percentage*	*Due Date*
Group Project Products & In-class Presentations	20%	TBD
Independent Research Project Proposal (First Draft)	Optional	June 24
Independent Research Project Proposal (Final Draft)	15%	June 26
Exam	15%	July 5
Independent Research Project Final Report	20%	July 9
Independent Research Project Presentation	10%	July 9
Professionalism	20%	N/A
Herp-of-the-Week *(Extra Credit, up to five per student)*	Up to 5%	Anytime

TENTATIVE COURSE SCHEDULE

M = mornings (8 am–12 noon)
A = afternoon (1 pm–6 pm)
E = (7:30 pm–9 pm)

Day	Activity	Lecture Subject	Readings
June 15			
M	arrive at ITEC		
A	arrive at ITEC		
E	lecture	ITEC policies, safety & etiquette	none
June 16			
M	orientation walk		
A	orientation walk		
E	lecture	Introduction to herpetology	none
June 17			
M	orientation walk		
A	orientation walk		
E	**Renacimiento Creek trip**		Vitt & Caldwell, Ch. 1
June 18			
M	orientation walk		
A	lecture	*Oophaga pumilio* evolution in Bocas del Toro Archipelago	
E	nocturnal orientation walk		none
June 19			
M	**Isla Solarte trip**		
A	**Isla Bastimentos trip**		
E	lecture	Evolution of Neotropical herpetofauna	none
June 20			
M	group projects		
A	group projects		
E	lecture	Herpetofaunal systematics & field identification	Köhler/Savage
June 21			
M	group projects		
A	group projects		
E	lecture	Herpetofaunal systematics & field identification	Köhler/Savage

Day	Activity	Lecture Subject	Readings
June 22			
M	group projects		
A	group projects		
E	lecture	Herpetofaunal systematics & field identification	Köhler/Savage; Vitt & Caldwell, Ch. 3
June 23			
M	finish group projects		
A	write up projects		
E	write up projects; **submit optional proposal draft (6pm)**	no lecture	none
June 24			
M	present project results		
A	proposal research & write-up		
E	lecture	Physiological ecology of herpetofauna	Vitt & Caldwell, Ch. 6, 7
June 25			
M	proposal research & write-up		
A	proposal research & write-up		
E	lecture; **submit final proposal (6pm)**	Cloud forest & dry forest herpetofauna	none
June 26			
M	**Finca Sylvestre trip**		
A	**Finca Sylvestre trip**		
E	**Finca Sylvestre trip**	no lecture	none
June 27			
M	**Finca Sylvestre trip**		
A	drive to Boquete		
E	Hotel Fundador; stream herps	no lecture	none
June 28			
M	**Boquete cloud forest trip**		
A	**Boquete cloud forest trip**		
E	Hotel Fundador; free time	no lecture	none
June 29			
M	**Tropical dry forest trip**		
A	petroglyphs, hotsprings		
E	Hotel Fundador; free time	no lecture	none

Day	Activity	Lecture Subject	Readings
June 30			
M	free time		
A	return to ITEC station		
E	free time	no lecture	none
July 1			
M	individual research		
A	individual research		
E	lecture	Biogeography of neotropical herpetofauna	none
July 2			
M	**Soropta Peninsula trip**		
A	individual research		
E	lecture	Herpetofaunal life history: reproduction	Vitt & Caldwell, Ch. 5
July 3			
M	individual research		
A	individual research		
E	lecture	Herpetofaunal life history: feeding ecology	Vitt & Caldwell, Ch. 10
July 4			
M	individual research		
A	individual research		
E	lecture	Herpetofauna-human interactions	none
July 5			
M	individual research		
A	individual research		
E	lecture	Herpetofaunal conservation issues	Vitt & Caldwell, Ch. 14
July 6			
M	individual research		
A	individual research		
E	**EXAM**	no lecture	none
July 7			
M	**Isla Pajaros trip**		
A	project write-up		
E	project write-up	no lecture	none

Day	Activity	Lecture Subject	Readings
July 8			
M	project write-up		
A	project write-up		
E	prepare presentation	no lecture	none
July 9			
M	prepare presentation		
A	deliver presentation		
E	**End of course party**		
July 10			
M	**Depart for Panama City and home**		