LEWIS AND CLARK COLLEGE

CLASS: ECUADOR´S BIODIVERSITY

Instructor: Ernesto Arbeláez Ortiz & Amanda Vega Toral

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Class Time: 3:00PM to 4:30PM in Amauta School and Amaru Bioparque Zoológico Cuenca; two meetings per week: Tuesdays and Thursdays.

Office Hours: Tuesdays 2:30 to 3:00 PM.

Main textbooks to be use by the teachers:

• Biota Maxima, Ecuador Megadiverso de Oliver Dangles (2010). Pontificia Universidad Católica del Ecuador y el Instituto para el Desarrollo de Francia IRD.

• Tropical Rain Forest Ecology, Diversity and Conservation de Jaboury Ghazoul y Douglas Sheil, Oxford Biology, 2010.

• A Primer of Conservation Biology, Richard B. Primack, 2008, Fourth Edition, Sinauer Associates Inc. USA.

The students can check this books in the library of Amauta school

Course Description:
The course will be taught using simple language to reach students who have a different educational background. The intention of the instructor is to open up the ecological awareness of how much wealth we have in this country and how much concern for the care and conservation of wild species we must have. Se introducirá a los estudiantes a utilizer el método cientpifico y estadistica básica para diseñar investigaciones con la naturaleza. There are **nine learning methods** in the design of the course. These are:

1. - Explanation of content by the instructor for all classes.

2. - Class lectures of small reading articles.

3. - Scientific exercises in lab.

4. - Tasks and exercises in class.

5. - Programming schedule of readings and content analysis of articles or books. (Own Journals)

6. - Preparation of final research projects.

7. - Academic field trips.

8. - Scheduled talks with researchers.

9. - Pre-programmed evaluations.

In readings the instructor will serve as a discussion leader.

This course will explore **five central themes** that we expect students to understand in depth by the end of the course.

1. The mega biodiversity of Ecuador is regulated by the country's special location and great forces of nature such as the Andes, ocean currents, and solar radiation among others.

2. What is Biodiversity: its diversity processes of evolution and adaptation of species.

3. What is an ecosystem: how they work, status and the variety of ecosystems in Ecuador.

4. What are the values of biodiversity and threats to which it is subject. Relationship of humans to the biodiversity and the threats it faces.

5. How to do science: Generating and testing hypotheses

Course Goals:

• To provide a solid foundation in the existing concepts of Biodiversity & Conservation.

• To teach you how to read and analyze the primary scientific literature and scientific concepts.

• To develop your critical thinking skills.

• To expand your problem solving skills.

Following is a schedule of the dates and location of classes, academic travel and the content to be taught:

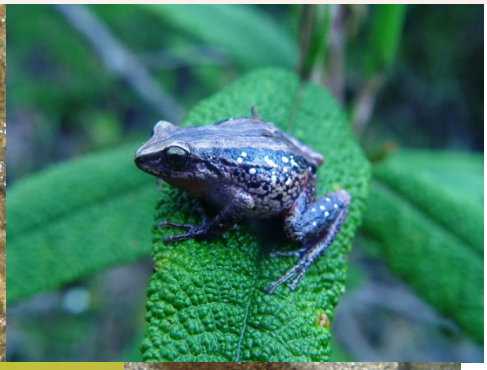
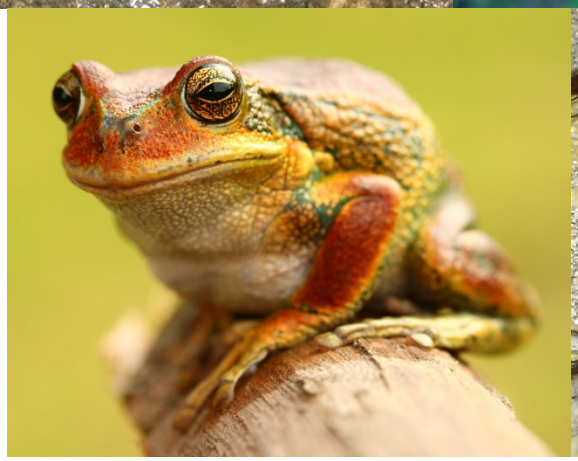
Date	Location	Theme	Observations
Tuesday, Jan 20	Fundación Amauta	Presentation of the teachers, students and course organization and planning	Syllabus presentation Revisions of the Amaru Webs Mission, Vision and concept of the Project Amaru Zoológico & Bioparque de Cuenca.
Thursday, Jan 22	AMARU Zoológico & Bioparque de Cuenca	Presentation and visit to Amaru, organization and planning of the in-situ course.	Homework: Lecture of the BioLab Manual of Dr. Clifton
Tuesday, Jan 27	Fundación Amauta	Introduction and organization of the field research and education conservation final projects Study of basic concepts, rain of ideas for the conceptual plan and scientific methods Organization of groups	Discussion of lecture Homework: Lecture of the World Conservation Strategy in Zoos and Aquariums.
Thursday, Jan 29	AMARU Zoológico & Bioparque de Cuenca	30 min: Continuation of the Bioparque Amaru visit. Observation of the labs, Quarantine areas, Talk and explanation of our projects of conservation. 60 min: Development of the master plan for the education conservation final project in the field	Lectura of articles about: The Andes Biodiversity and major ecosystems of Ecuador, Ecuadorian ecosystems, Paramo, dry forest, wet forest, cloud forest, montane forest, and coastal mangroves.
Tuesday, Feb 03	Fundación Amauta	60 minutes of class: ANDES a source of biodiversity. Altitudinal gradients and a laboratory of evolution of species. Main ecosystems or ecological zones along the altitudinal gradient of continental Ecuador - Amazonian tropical rainforests (World Biodiversity Epicenter) Homework: Create messages for the education conservation final project.	In class lecture: of articles about Altitudinal gradients. BIOTA MAXIMA. And the book article Tropical Rain Forest Ecology, Diversity and Conservation.
Thursday, Feb 05	AMARU Zoológico & Bioparque de Cuenca	60 min: Lab exercises: Measuring growth of endangered captive management native frogs 30 min: Revision of homeworks and development of more structured ideas for the messages of conservation	Lectura of articles about: The Andes Biodiversity and major ecosystems of Ecuador, Ecuadorian ecosystems, Paramo, dry forest, wet forest, cloud forest, montane forest, and coastal mangroves Homework: Development of a final idea of the master conceptual plan for the education conservation final project.
Tuesday, Feb 10	AMARU Zoológico & Bioparque de Cuenca	60 minutes of class: Island, Coastal and Mangroves ecosystems. Galapagos ecosystem. 30 minutes: Revision and definition of the final version of the master conceptual plan for education conservation project.	Distribute content to enhance knowledge about the ecology of the Galapagos, Andeas and Amazonian ecosystems, their conservation, endemism and native species details.
Thursday, Feb 12	AMARU Zoológico & Bioparque de Cuenca	Construction of education conservation final project in the field	Homework: Develop of a final documents were will be explained all the strategy of education and interpretation

			for the displays.
Tuesday, Feb 17		**CARNAVAL**	
Thursday, Feb 19	AMARU Zoológico & Bioparque de Cuenca	30 min of field class in how we classify and study species? The scientific methods to measure and understand biodiversity. 60 min in development of field research scientific final project: "Quantifying amphibian, reptiles and invertebrates diversity on protected and unprotected forest of Cuenca, Yanayacu and Shiripuno" Work on a protected area of forest in Cuenca	Students will need to bring field clothes and shoes, photographic cameras to work inside the forest. Will be provide a data sheet
Tuesday, Feb 24	Fundación Amauta	50 min of class: ECUADOR Megadiverse Country: Hotspots, How many species of animals and plants are there in Ecuador, molecular tools for assessing biodiversity. 40 min for the **First Evaluation of class content** and revision of the progresses and homework done in the education conservation project.	**1st Evaluation** In class lectures of: Articles on Hot Spots and on Ecuador numbers of species.
Thursday, Feb 26	AMARU Zoológico & Bioparque de Cuenca **Class from 18h30pm to 20h00pm**	The scientific methods to measure and understand biodiversity. 60 min in development of field research scientific final project: "Quantifying amphibian, reptiles and invertebrates diversity on protected and unprotected forest of Cuenca, Yanayacu and Shiripuno" Work on a unprotected area of forest and farm fields in Cuenca	**Night Walk for surveys of amphibians** Students will need to bring field clothes and shoes, photographic cameras to work inside the forest. Will be provide a data sheet
Saturday, Feb 28 to Mar 08	Yanayacu Scientific Station & Shiripuno Ecological Reserve	**ACADEMIC FIELD TRIP** Development of field research scientific final project: "Quantifying amphibian, reptiles and invertebrates diversity on protected and unprotected forest of Cuenca, Yanayacu and Shiripuno"	Students will need to bring field clothes and equipment, to work inside the forest. Information and the methodology about this trip will be provide opportunely
Tuesday, Mar 10	Fundación Amauta	45 min of class: Strategies for Biodiversity Conservation: Scientific research, in-situ and ex-situ management of forests and species, environmental education, BIOPHILIA: Love for Nature. 45 min to analyze the data obtained for the field scientific project, development of more ideas about hypothesis Homework: Development of educative representations of animals for the education conservation project	The teacher will bring the materials to build the models for the educative conservation project Homework: Lecture of an scientific article about the role of ethograms in the management of rescue wild animals
Thursday, Mar 12	AMARU Zoológico & Bioparque de Cuenca	50 min: work on the construction of the educative expositions. 40 min: Explanation of the use of Ethograms and realization of the first exercise develop by the students over rescue animals managed in the	Homework about: Goods and Ecosystem Services examples Data sheet of an ethogram will be provide for the class. Bring video Cameras

		Bioparque Amaru	
Thursday, Mar 17	Fundación Amauta	Spiritual and Economic Value of Biodiversity, Goods and Ecosystem Services Homework: Development of educative representations of animals for the education conservation project	The teacher will bring the materials to build the models for the educative conservation project
Thursday, Mar 19	AMARU Zoológico & Bioparque de Cuenca	50 min: work on the construction of the educative expositions. 40 min: Realization of the second exercise develop by the students over rescue animals managed in the Bioparque Amaru use of enrichment activities	Bring video Cameras Data sheet of an ethogram will be provide for the class..
Tuesday, Mar 24	Fundación Amauta	60 min of class about Charismatic and Flag species. 30 min for the Second Evaluation of class content	**Second Evaluation**
Thursday, Mar 26	AMARU Zoológico & Bioparque de Cuenca	90 min: work on the construction of the educative expositions.	Deadline for Final Construction of the educative conservation expositions
Tuesday, Mar 31	Fundación Amauta	60 min: Main threats of Ecuadorian biodiversity 30 min: Assistance in the development of the written, photographic and video report about the conservation education final project	For this class is necessary to bring the written report related with the education conservation final projetc
Thursday, Apri 02	AMARU Zoológico & Bioparque de Cuenca	90 min in development of field research scientific final project: "Quantifying amphibian, reptiles and invertebrates diversity on protected and unprotected forest of Cuenca, Yanayacu and Shiripuno" Work on a unprotected and protected area in Cuenca	
Tuesday, Apri 07	Fundación Amauta **15h00 – 17h00**	Presentation of the Field Research Scientific Visual Presentations and scientific written articles (reports).	Students will present this day their digital expositions about their results and their results in a scientific written article.
Thursday, April 09	AMARU Zoológico & Bioparque de Cuenca **15h00 – 18h00**	Presentation of the Education Conservation Final Project Oral, video and document explanation of the work done on the construction of the interactive educational displays about the threats of Biodiversity	The students present their final projects to invited guests and public visitors.
Tuesday, Apri 14	Fundación Amauta	FINAL ACCUMULATIVE EXAM Conclusions of the Class & Chao Chao	**Final Exam**
Thursday, Apri 16	Fundación Amauta	Turn in grades, journals and qualifications. Revision of questions, volunteer programs, etc	Turn in notes to school address.

Research Scientific Project

We will develop a research project on "Quantifying amphibian, reptiles and invertebrates diversity on protected and unprotected forest of Cuenca, Yanayacu and Shiripuno. This project will be done using two common methods for quantifying densities of forest organisms: Transects and Quadrats. The goal of this project will be to develop a data base in the long term of the diversity, abundance and status of conservation of the communities of amphibian, reptiles and invertebrates of three different ecosystems. This project will encourage students to think critically and also to identify potential hypothesis about patterns or correlations related with the fauna or the quality of the habitats.

Final Education Conservation Project

One of the main goals of the modern zoos and wildlife santuaries is to educate people about the importance and status of conservation of biodiversity and how the humans could help to protect it.

Education for conservation helps people of all ages to understand and appreciate nature and learn how to take care. The goal is to develop critically minds so it will be easier to understand the complex ecologically problems and find a way to find more accurate solutions. The philosophy of education for conservation is to connect people with nature with multisensorial activities.

This year the goal of our education conservation final project will be to develop and build three educative expositions about some of the main threats of biodiversity and the environment, one exposition will be focus in create an educative interactive trail about deforestation and burning of native forests. The second exposition will be focus in develop a diorama about pollution and global warming. The third educative exposition will be built to educate about the threats of illegal hunting and trade of wild life.

This project will be done in groups and will have both research and field work. Each group will have to turn in a written report including the conceptual master plan of the educative display, all the activities that where done to achieve the construction of the display and the messages that visitors will see during their visit. The students will need to develop a photographic and video report of the different efforts related with the construction of the expositions.

To prepare the contents of this project there are suggested literature sources: books and articles for review and there will be readings of scientific articles related to the threats of biodiversity and nature.

La exposición sobre el comercio ilegal de especies silvestres mostrará los suplicios a los que son sometidos todo tipo de especímenes que son normalmente decomisados en la región y educará a los visitantes sobre los riesgos de adquirir animales, plantas o productos ilegales de vida silvestre. Se montará en un área estratégica al final del parque esta estación en la que se dispondrán escenas recreadas, material decomisado, fotografías y carteles informativos sobre el tráfico ilegal de especies.

La exposición temática sobre cacería ilegal explicará y hará reflexionar a los visitantes sobre cómo este problema afecta a las poblaciones naturales de diferentes especies animales que están en riesgo de extinción y que son nativas de los ecosistemas presentes en el cantón Cuenca. Para esto montaremos un área estratégica en al recorrido del parque en la que se dispondrá material decomisado producto de la cacería, fotografías y carteles informativos sobre esta amenaza y sus consecuencias.

La exposición temática sobre incendios forestales y deforestación será recreada en un área de bosque del Bioparque Amaru, será completamente de inmersión e interactiva y hará comprender a los niños y visitantes sobre cómo estas amenazas afectan a la dinámica, salud y sobrevivencia de bosques, especies y ecosistemas. Se ubicará en un área de 10 m x 15 m entre el bosque del bioparque, la gente podrá observar y sentir las consecuencias de las quemas, se dispondrán también gráficos, fotografías y carteles informativos sobre esta grave amenaza para la salud de la biodiversidad.

Exams:

There will be two intermediate evaluations and a final accumulative exam. Exams assess all content reviewed during classes such as readings, analysis of scientific articles reviewed during practice or class field trips. The exams will contain a mixture of questions: objective questions about specific content, some essays to assess understanding of concepts, multiple-choice questions, analysis of true or false concepts and the approach to some problems that require analysis of information not seen previously.

Text sources:

- Biota Maxima-Ecuador Megadiverso by Oliver Dangles (2010). Pontificia Universidad Católica del Ecuador y el Instituto para el Desarrollo de Francia IRD.
- Tropical Rain Forest Ecology, Diversity, and Conservation, Jaboury Ghazoul and Douglas Sheil, 2010. Oxford University Press Inc., New York, USA.
- A Primer of Conservation Biology, Richard B. Primack, 2008, Fourth Edition, Sinauer Associates Inc. USA.
- GEO Ecuador 2008: informe sobre el estado del medio ambiente. United Nations Environment Programme. Oficina Regional para América Latina y el Caribe, FLACSO (Organization). Sede Ecuador, Ecuador. Ministerio del Ambiente, 2008.
- ECOLAP y MAE. 2007. Guía del Patrimonio de Áreas **Naturales** Protegidas del **Ecuador**.
- ECOFUND, FAN, DarwinNet, IGM. Quito, **Ecuador**
- Etnobotánica del Ecuador, L. de la Torre, *et al* 2006.

Web Sources:

0.- Natural Regions of Ecuador, Regiones Naturales del Ecuador:

http://zoologia.puce.edu.ec/Vertebrados/Anfibios/AnfibiosEcuador/regionesNaturales.aspx

1.- Bosques Secos en Ecuador y su Diversidad http://www.beisa.dk/Publications/BEISA%20Book%20pdfer/Capitulo%2011.pdf

2.- Bosques Secos en Ecuador y sus plantas útiles

http://www.beisa.dk/Publications/BEISA%20Book%20pdfer/Capitulo%2012.pdf

3.- The Nature Conservancy: Bosques Secos Ecuador

http://espanol.tnc.org/dondetrabajamos/ecuador/lugares/

4.- Los Páramos ecuatorianos http://www.beisa.dk/Publications/BEISA%20Book%20pdfer/Capitulo%2006.pdf

5.- La Biodiversidad de los Páramos en el Ecuador http://www.banrepcultural.org/blaavirtual/geografia/congresoparamo/la-biodiversidad.pdf

6.- Gente y Ambiente de Páramo, Realidades y Perspectivas en el Ecuador,

http://www.ecociencia.org/archivos/gente_paramo-091128.pdf

7.- The Palm Flora of the Maquipucuna Montane Forest Reserve, Ecuador

http://www.palms.org/principes/1998/vol42n4p218-226.pdf

8.- Bosques Andinos del Sur del Ecuador, Clasificación, Regeneración y Uso

http://www.scielo.org.pe/scielo.php?pid=S1727-99332005000200006&script=sci_arttext

9- Journal of Tropical Ecology: Nutrient availability at different altitudes in a tropical montane forest in Ecuador

http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=1924472

10.- Naturaleza y Cultura Internacional: Protegiendo los Bosques Nublados de los Andes del Sur de Ecuador

http://www.naturalezaycultura.org/spanish/htm/ecuador/areas-andes.htm

11.- Scientific Paper: Journal Selbyana 2000 Vol. 21 No. 1/2 pp. 137-143

Bromeliad communities in isolated trees and three successional stages of an andean cloud forest in Ecuador.

http://www.cabdirect.org/abstracts/20023088123.html

12.- Scientific Conference: The Panorama of Neotropical Cloud Forest - Biodiversity and conservation of Neotropical montane forests. Proceedings of a symposium, New York Botanical Garden, 21-26 June 1993.

http://www.cabdirect.org/abstracts/19960608626.html

13.- Los Bosques Tropicales Rain Forest: General Basic Information

http://www.jmarcano.com/bosques/tipos/tropicales.html

http://es.mongabay.com/rainforests/0201.htm

http://www.ucm.es/info/ecologia/Descriptiva/BosqueTro2/RESUMEN2/RESUMEN2.htm

http://en.wikipedia.org/wiki/Rainforest

http://es.wikipedia.org/wiki/Bosque_tropical

14.- Rain Forest Conservation: Naturaleza y Cultura Internacional

http://natureandculture.org/countries/ecuador

15.- Shuar Communities of Yacuambi (Project Summary, just for general information)

http://natureandculture.org/1302/shuar-communities/

16.- General Information related to Amphibian Conservation:

http://www.amphibianark.org/

http://www.amphibianark.org/featured-institutions/

http://www.amphibianark.org/news/aark-newsletter/

17.- Animal Diversity in Ecuador

17.1.- Amphibians of Ecuador

http://www.anfibioswebecuador.ec/anfibiosecuador.aspx

http://zoologia.puce.edu.ec/Vertebrados/Anfibios/AnfibiosEcuador/Introduccion.aspx

18.- Conservation and Ecology of Amphibians of Ecuador:

http://zoologia.puce.edu.ec/Vertebrados/Anfibios/AnfibiosEcuador/Conservacion.aspx

18.- Atelopus nanay – Jambato Negro del Cajas example:

http://www.anfibioswebecuador.ec/fichaespecie.aspx?Id=142

19.- Reptiles

http://zoologia.puce.edu.ec/vertebrados/reptiles/reptilesEcuador/Introduccion.aspx

http://zoologia.puce.edu.ec/vertebrados/reptiles/reptilesEcuador/Default.aspx

20.- Fish

Lo conocido y desconocido de la biodiversidad marina en el Ecuador (Continental e Insular) http://www.scielo.cl/pdf/gayana/v67n2/art10.pdf

Diversidad de la ictiofauna en el rìo Cuyabeno chico y los distintos esteros a lo largo del campo Cuyabeno de Petroecuador, provincia de Sucumbíos-Ecuador.

http://repositorio.eppetroecuador.ec/handle/20000/94

Peces Dulceacuicolas Colombianos (Example of a vecinity amazonían country) http://redalyc.uaemex.mx/redalyc/pdf/491/49170101.pdf

21.- Mammals of Ecuador

http://zoologia.puce.edu.ec/Vertebrados/Mamiferos/MamiferosEcuador/Introduccion.aspx

22.- Birds of Ecuador

http://zoologia.puce.edu.ec/Vertebrados/Aves/AvesEcuador/Default.aspx

http://zoologia.puce.edu.ec/Vertebrados/DivisionAves.aspx?Id=1

23.- Plants Diversity of Ecuador

Catálogo de Plantas Vasculares del Ecuador – (3013 species of Orquids in Ecuador): http://www.mobot.org/MOBOT/Research/ecuador/resultssp.shtml

24.- THREATHS OF BIODIVERSITY OF ECUADOR:

24.1.- LOS IMPACTOS DE LA EXPLOTACION PETROLERA EN ECOSISTEMAS TROPICALES Y LA BIODIVERSIDAD

http://scholar.googleusercontent.com/scholar?q=cache:3T31HgzfGEcJ:scholar.google.com/+diversidad+de+peces+amazonicos&hl=es&as_sdt=0,5&as_vis=1

24.2.- Assessing biodiversityconservation priorities: ecosystem risk and representativeness in continental Ecuador (Abstract)

http://www.sciencedirect.com/science/article/pii/S0169204602000063

24.3.- Oil and Gas Projects in the Western Amazon: Threats to Wilderness, Biodiversity, and Indigenous Peoples
http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0002932

25.- EFFORTS ON CONSERVATION OF BIODIVERSITY:

25.1.- PROPUESTA DE ECUADOR PARA LA FORMULACIÓN DE LA ESTRATEGIA NACIONAL DE BIODIVERSIDAD: VIDA SILVESTRE http://www.ibcperu.org/doc/isis/7800.pdf

25.2.- Biodiversity HotSpots for Conservation Priorities

http://se-server.ethz.ch/staff/af/Fi159/M/My042.pdf

25.3.- Biodiversity and Conservation in Tumbesian Ecuador and Perú

http://www.birdlife.org/news/news/2007/05/biodiversity_and_cons_in_tumbesian_ec_and_peru.pdf

Evaluation System:

First and Midterm exams	15 Pts
Final Test	15 Pts
Lectures of articles and Homework Assignments	10 Pts
Biology lab exercises (5)	10 Pts
Participation in Academic Field Trip	10 pts
Final Research Field Project (written scientific article, photographic and formal presentation)	20 pts
Final Educative Conservation Project (written report, photographic, video and in-situ presentation)	20 Pts
Total:	**100 pts**

Grade Scale: LEWIS AND CLARK COLLEGE

EQUIVALENTES:	100-94:	A
	93- 90:	A-
	89-88:	B+
	87-85:	B

84-80:	B-
79-76:	C+
75-72:	C
71-70	C-
69-68:	D+
67-66:	D
65- y menos	F