2023: Costa Rican Biodiversity Studies and Research
Biol 285: Field Biology January 1-15, 2024

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Course Description and Goals: Students will gain a broad understanding and exposure to Neotropical biodiversity as well as conservation issues in Costa Rica. We will visit and study all the major ecosystems in this country including seasonally dry tropical forest, mangroves, estuaries and tidal pools, cloud forest, and lowland wet/moist forest. Students will be directly involved in the monitoring of an important leatherback sea turtle nesting site at Las Baulas National Marine Park. Data will be collected on adults, nest size, egg nest temperatures, and survivorship. We will also visit the lowland forest habitats found in Cocorvado National Park as well as the reefs found in Isla del Caño National Park. The last week will be spent in a cloud forest preserve called Cloudbridge conducting research projects on biodiversity.

Required textbook: None

Suggested books (follow your interests):

1. **Costa Rican Natural History, D.H. Jansen, Editor (1983)- good broad overview of diverse topics**
2. **Tropical Nature. Forsyth and Miyata (1984)- My favorite for a good summary**
3. **A Neotropical Companion. Kricher (1997)- similar to #2 but more detail**
4. Peterson Field Guide: Insects (1970)
5. Mammals of Belize, Fiona Reid (2001)
6. **The Birds of Costa Rica - Garrigues, Richard/ Dean, Robert (2007) or equivalent.**
7. **Neotropical Rainforest Mammals, A Field Guide L.H. Emmons (1997**)
8. Costa Rican Fruit Chaffers (2004) by Angel Solis.
9. Sealife (1996) by Waller, Dando, and Burchett, ISBN# 1560986336
10. An Introduction to the Biology of Marine Life (1996) by Sumich, ISBN# 0697159906
11. Reef Fish (1980) by Thresher, ISBN# 0915096099
12. Coral Reef Fishes (2002) by Sale, ISBN# 0126151857
13. Reef Life: Natural History and Behaviors of Marine Fishes and Invertebrates (2001) by Tackett and Tackett, ISBN# 1890087564
14. Marine Invertebrates and Plants of the Living Reef (1990) by Colin, ISBN#0866228756
15. **Tropical Plants of Costa Rica 2007 by Zuchowski- nice overview of important plants**
16. Mammals, Amphibians, and Reptiles of Costa Rica: A Field Guide Carrol L. Henderson (2010)
17. Field Guide to the mammals of Central America and Southeast Mexico
18. **The Mammals of Costa Rica A Natural History and Field Guide (2007), by Wainwright**
19. Tropical Rain Forest Ecology, Diversity, and Conservation (2010) by Jaboury Ghazoul and Douglas Sheil, ISBN13: 978-0-19-928588-4ISBN10: 0-19-928588-8
20. **Lieske, E. and R. Myers**, **1994. Collins Pocket Guide. Coral reef fishes**. Indo-Pacific & Caribbean including the Red Sea. Haper Collins Publishers, 400 p.

List of Required Equipment:

Field boots- not old ones that will fall apart during the trip
Headlamp (and small flashlight perhaps)
Insect repellant (small bottle of high concentration liquid deet)
Sunscreen (note use as little as possible when swimming in the ocean- make sure coral reef safe)
Hat (full brim is best- keep sun off ears and neck (no redneck buildup))

Spending Money- extra spending money is needed for meals not provided through the program cost (on average of one meal per day that is not covered). Additional money needed for souvenirs and other activities. Use ATM in Costa Rica.

Suggested Equipment:

Binoculars
Camera/cell phone for photos
Mask, snorkel and fins (try out in a pool before trip if possible). I may have some spare pairs if needed (contact me if you want to borrow) and some at Goldring- but not enough for all. Equipment will be supplied for Cano Island dive.
Rain Coat…?

Weather: Playa Grande will be bone dry. Corcovado could be some rain but hot temperatures. Cloudbridge variable- sometime mist and a bit of rain typically in the afternoon or night.

COURSE LOCALITIES AND ACTIVITIES:

Goldring Marine Biological Station:
SEE: http://www.goldringmarinestation.org/Goldring-Gund/Home.html

Goldring-Gund Marine Biology Station is located in Guanacaste Province. The station has been an influential center for research on the exceptional local biodiversity since it was founded in 2004. Primarily this has focused on the turtle population found in **Las Baulas National Marine Park** (Parque Nacional Marino Las Baulas), which hosts the highest nesting density of the critically endangered leatherback turtle in the eastern Pacific. Over the past 20 years these populations have declined by over 95% and this severe decrease is jointly attributed to both the poaching of eggs and the impacts of fisheries by-catch. In collaboration with EarthWatch, on-site scientists and international volunteers have strived to conserve this species before it is driven to extinction.

Our activity here will mainly be patrolling Playa Grande looking for nesting turtles. We will also survey hatched nests and monitor the hatchery. Hatchlings will be weighed and measured before release at night. Research (current and past) includes studies on various studies on different species of sea turtles, crocodiles, vegetation, and billfish in the region.

Guest lecture: Dr. Frank Paladino, Station Director (and Jack Schrey?), Indiana University-Purdue University OR ???

Side Day Trips: **Tidal pools and reef at Playa Carbón, Estuary tour, and a trail walk by the estuary. A side trip to Santa Rosa National Park or Palo Verde National Park is possible but not likely due to time constraints.**

Cloudbridge Nature Reserve:
SEE: http://vimeo.com/34552818 and http://www.cloudbridge.org/

Goals of the Preserve:

1. To **preserve** a precious part of the tropical world forever.
2. To help **reforest** those areas which had been converted to cattle pasture.
3. To **protect the biodiversity** for which the Neotropical forests, and those in Costa Rica in particular, are so famous.

Cloudbridge is composed of cloud forest- this is a rain forest without the deluges. It is a highland forest characterized by nearly 100% humidity throughout the year. Clouds are constantly drifting through the valleys and treetops. The forest gathers water through evapotranspiration — the accumulation of water vapors on the floor of the cloud forest and in the aerial plants known as epiphytes. The foliage harbors a wide diversity of epiphytes. Some, like "old man's beard" (the lichen *Usnea*) draped on branches and vines, act as a huge net to capture moisture. Tree trunks are almost always covered with mosses, bromeliads, ferns, and other plants. Intact cloud forests play an extremely important role in the hydrology of certain regions of the planet; they capture, store, and filter water that feeds into local communities and large rivers hundreds of miles away.

Adjacent to Cloudbridge is Chirripó National Park. This park spans the most biologically diverse area in Costa Rica and, together with its neighbor La Amistad N.P., comprises the largest unspoiled forest in the country. An astonishing number of habitats — produced by the differences in altitude, soil, climate and topography — can be found, including paramos, marshlands, oak forests, madrono forests, fern groves and mixed forests. Chirripó peak is the highest mountain in the country, reaching a height of 3,821 meters. The paramos of this elevation contain many varieties of stunted Andean-type woodland, consisting of shrubs, grasslands and perennial herbaceous plants. The fauna is astonishingly varied too, with 263 species of amphibians and reptiles and about 400 types of birds observed to date. The largest concentration of tapirs in the country can be found here, plus the puma, jaguar, ocelot, jaguarundi, white-lipped peccary and cacomistle (a small nocturnal raccoon-like creature). Birds include the resplendent quetzal (beautiful, but endangered), mot-mot, crested eagle, red-tailed hawk, volcano hummingbird, black guan, crowned wren-thrush, elegant trogon, and acorn woodpecker.

Cloudbridge Nature Reserve is just beyond San Gerardo de Rivas in the mountains of Costa Rica's southeastern interior. In this first week of the trip, activities will center on daily research activities at Cloudbridge. Some afternoons will be filled with further discussions and observations on this diverse ecosystem. Students will be assigned to research teams that will study projects in the cloud forest ecosystem of the Cloudbridge Nature Reserve, adjacent to the Chirripo National Park. Research projects will be from the following choices:

RESEARCH GROUPS and leaders:

Butterfly Diversity study (?)
Bird Survey of Cloudbridge (?)
Tree Diversity, Carbon Sequestration, and Climate Change (?)
Beetle Diversity study (Keith)

Currently Suspended Research:

- Distribution Pattern of *Heliconias* plants
- Hydrology, morphology, and biodiversity of stream drainages
- Endosymbionts of *Gunnera* plants (*Gunnera-Nostoc* Symbiosis)
- Mammal diversity studies

Evening walks (each student must participate on at least one) will occur on several nights. The last full day we will hold the **9th Annual Gatton Academy Research Symposium at Cloudbridge**. Each team will make a 15 minute powerpoint presentation of their research to attendees.

Resplended Quetzel- one of the most beautiful birds in the world and only found in high elevation forests. You can possibly see one - early morning is the best time. Hear their song at https://www.xeno-canto.org/species/Pharomachrus-mocinno

Corcovado National Park:

Corcovado National Park (*Parque Nacional Corcovado*) is located on the Osa Peninsula in southwestern Costa Rica (~9° North, 83° West), which is part of the Osa Conservation Area. It was established on 24 October 1975, and encompasses an area of 425 km² (263 mi²). It is widely considered the crown jewel in the extensive system of national parks and biological reserves spread across the country. The ecological variety is quite stunning. National Geographic has called it "the most biologically intense place on Earth in terms of biodiversity."

The park conserves the largest primary forest on the American Pacific coastline and one of the few remaining sizeable areas of lowland tropical rainforests in the world. Corcovado is home to a sizable population of the endangered Baird's Tapir and even a small population of the very rare Harpy Eagle. The park's rivers and lagoons are home to populations of both the American crocodile and Spectacled Caiman, along with Bull sharks. Corcovado is also one of the final strongholds of the Jaguar within Central America and several other felines are also present, including Ocelot, Margay, Jaguarundi, and Puma. All four Costa Rican monkey species can be seen within the park, including the endangered Central American Squirrel Monkey, White-faced Capuchin, Mantled Howler, and Geoffroy's Spider Monkey. Other mammals present include Two-toed and Three-toed Sloth, Collared Peccary, Northern Tamandua and Silky Anteater.

Poison dart frogs and several species of snake (including the venomous Fer-de-Lance and Bushmaster) are also common within the park.

The abundance in wildlife can in part be explained by the variety of vegetation types (at least 13) including montane forest (more than half the park), cloud forest, jolillo forest (palm swamp), prairie forest, alluvial plains forest, swamp forest, freshwater herbaceous swamp and mangrove, together holding over 500 tree species, including purple heart (tree), poponjoche, nargusta, banak (tree), cow tree, espave and crabwood (tree). Another reason for the diversity (as with all of Costa Rica) is that it lies on a north-south corridor for flora and fauna; part of the "land bridge" and wildlife corridor that links the large continents of North America and South America.

We will stay near the park at Poor Man's Paradise, located on the Amaya homestead along the magnificient Pacific Coast of the Peninsula de Osa, the last frontier of Costa Rica. Due to the lack of roads, this magical corner of the world has maintained its natural beauty. We will arrange park entry here to **Sirena Station** and will explore trails to observe wildlife.

Isla del Caño National Park:

Isla del Caño is where students can study coral reef ecosystems over deeper water. Students will depart for Caño Island from a river town and travel downriver to the ocean, travelling through Central America's largest mangrove swamp. Out at sea, Humpback Whales and other cetaceans may be spotted. At Caño Island, students will snorkel (and possibly scuba if certified) to explore the reef life that includes white tip reef sharks, rays, moray eels, sea turtles, and numerous other types of fish and invertebrates.

Paramo Vegetation hike via Cerro de la Muerte:

We will stop on the way back to San Jose (weather permitting) at kilometer 98 along the highway known as the highway of death (Cerro de la Muerte). This is an amazing place above 11,000 feet that has unique endemic vegetation in particular, including members of the blueberry and gooseberry plant families as well as orchids. There is also scrub oaks and a strange bamboo understory. The oaks and other low trees are festooned with moss and lichens and is a truly unique elfin cloud forest habitat.

STUDENT RESEARCH PAPERS:

Before the trip, students are required to familiarize themselves with two Neotropical organisms or one organism and another broader aspect of Costa Rican biodiversity via two 1,000 word papers.

Organisms include any found in Costa Rica terrestrial or aquatic ecosystems. As an alternative to one of the organism papers, students can select as a second topic any other aspect of Costa Rican biodiversity such as: climate; geology; tidal effects on reefs; pelagic environments; planktonic organisms; coastal environments; trophic interactions; reef ecosystems; animal behavior; and biodiversity and conservation in Costa Rica.

The papers should also include a literature cited section (with at least two references from a scientific journal). Cite these references (use a format of your choice) within your paper

NOTE: STUDENT RESEARCH PAPER TOPICS REQUIRE INSTRUCTOR APPROVAL. This is largely to avoid duplication.

DUE DATE: These must be completed BY THE DAY BEFORE the trip and brought to Costa Rica to be used for informal presentations to the group.

Send me your papers as doc files attached to my email- keith.philips@wku.edu, BY THE DAY BEFORE THE TRIP. This will also give you a copy in your sent folder as a backup.

After dinner we will meet during the evening (Cloudbridge and Poor-Mans-Paradise) for a few student paper presentations and discussions.

ATTENDANCE POLICY:

All students are required to participate in all scheduled activities. A penalty will be imposed for failing to attend any event.

EVALUATIONS:

Students will be evaluated in the following manner:	(% of overall course grade):
Daily journal entries describing species encountered, behaviors observed, environmental conditions experienced, reflections on the day's happenings, etc.	**20%**
Tests	**25%**
Research project including pp presentation at Cloudbridge	**25%**
Background Papers and paper presentations: BEFORE WE LEAVE, students will generate two 1,000 word papers on one organism and a second topic on some other aspect of Costa Rican biodiversity OR on two Neotropical organisms. (NO Leatherback sea turtle as a topic). Organisms include any found in Costa Rica terrestrial or aquatic (fresh or salt) ecosystems. As an alternative to one organism, students can select as a second topic on any other aspect of Costa Rican (or tropical) biodiversity such as: climate; geology; tidal effects on reefs; pelagic environments; planktonic organisms; coastal environments; trophic interactions; reef ecosystems; animal behavior; biodiversity; or conservation. The papers will also include a literature cited section (with at least two references from a scientific journal). Please submit both papers to me BY THE DAY BEFORE WE LEAVE FOR THE TRIP	**20%**
Participation	**10%**

Grading:

90-100	**A**
80-89	**B**
70-79	**C**
60-69	**D**
< 60	**F**

2022 update
POTENTIAL SPECIES TARGET LIST for COSTA RICA:

PLANTS:

Crop Plants: oil palm, banana, beans, cacao, citrus, coconut, coffee, corn, mango, papaya, pineapple, rice, sugarcane, yucca (=cassava/manioc/tapioca…)
Climbers, stranglers (*Ficus* and *Clusia*), parasites and saprophytes.
Bromeliads (*Tillandsia*, *Bromelia* [CAM plants])
Club mosses
Ferns: basket, maidenhair…
Tree ferns
Dieffenbachia/*Philodendron*
Lantana- West Indian origin probably
Orchids – pseudobulbs, sex mimics
Heliconia – lobster-claw, wild plantain and false bird-of-paradise- hummingbird pollinated
Rattlesnake plant – understory plant with elongate inflorescent that looks like a "rattle"
"North American" genera – *Alnus, Quercus, Pinus, Viburnum*
Mahogany tree family
Legume trees
Sensitive Mimosa
Balsa wood
Chicle Tree- *Manilkara* spp.- not in Costa Rica
Cassia trees
Cecropia trees
Mangroves, red, tea, black…
Milk tree- *Brosimum* - can drink the latex
Kapok tree- *Ceiba*
Palms- fan etc.
Cacti- columnar (2 spp. Playa Carbon)
Cacti- watch especially for epiphytic species along road near Crocodile Bridge.
Effects of Pleistocene mammal extinctions on plants.

FUNGI:

Stinkhorn fungi
Odd Ascomycota, Basidiomycota

ANIMALS:

Amphibians:
Tree frogs
glass frogs
Cane toad
Caecilians
Salamanders- never seen

Reptiles:

Sea turtles- Leatherback, Olive Ridley, Black (aka Green), Hawksbill
American Crocodile (Tarcoles bridge)
Caiman (Sierpe wetlands- never seen)
Basilisk Lizard = Jesus Christ Lizard
Speckled Lizard
Iguana/ Ctenosaur
Skinks
Anoles
Geckos
Whiptail Lizards
Night Lizard
Boa Constrictor
Chunk-headed Tree Snake
Fer-de-lance – Terciopelo *(Bothrops*)
Talamancan Palm-pit Viper (*Bothriechis nubestris*) – described in 2016
Black-speckled Palm-pit Viper (*Bothriechis nigroviridis*)

Eyelash Viper (Bothriechis schlegelii)
Black-headed Bushmaster
Cat- eyed snake
Rough Earth Snake (*Haldea striatula*)
Coral Snake
Common Mussurana
Rattlesnakes (Guanacaste – never seen in CR)

Mammals:
Humpback Whale
Pilot Whale (never seen)
Brydes (pronounced Broo-duz) Whale (never seen)
Dolphins/porpoises – spotted, spinner,
BATS: Vampire, fishing, fruit
Paca –larger (20 lbs) and spotted
Agouti – smaller (10 lbs) and solid colored
Peccary (2 spp.) - biggest 50 lbs
Tapir (up to 450 lbs)

MONKEYS in Costa Rica:
Central American Spider Monkey
Squirrel Monkey
Mexican Black Howler Monkey
White-faced Capuchin Monkey

Mexican Hairy Porcupine (prehensile tail)
Silky or pygmy anteater – golden ball in lianas during the day
Kinkajou
Cacomistle
Northern Olingo
Raccoon - Crab-Eating and Common

Tayra

CATS in Costa Rica
Jaguar - 120 – 250 lbs
Puma - 55 to 150 lbs
Jaguarundi - 7.7–15.4 lbs
Ocelot – 20 to 40 lbs
Margay - 5.7 to 8.8 lbs

Coati (Pizote)
Tamandua (anteater)
Armadillo
Opossums (4 spp.)
Deer (white-tailed and red brocket)
Sloths (3 and 2 toed- aka Perizoso)
Manatee (Atlantic side only)

Birds:
Harpy Eagle (Osa – never seen)
Osprey
Common Black Hawk
Crested Owl
Scarlet Macaw
Parakeet
Toucan
Black-throated Trogon
Quetzal
Great Curassow
Black Guan
Chachalaca
Quail
Potoo
Nighthawk
Motmot (like a Kingfisher with an awesome tail)
Frigate bird
Brown Pelican
White Ibis
Roseate Spoonbill
Oropendola (blackbird that nests like a weaver bird)
Tinamou

Fish:
sharks (bull, hammerhead, silky, white tip reef, nurse, whale (if lucky))
rays (spotted eagle, cownose, southern, mobula/ devil ray, manta)
groupers
barracuda
rooster fish
snapper

angel fish
puffer fish
butterfly fish,
parrot fish
jacks
machete
damsel fish
needle fish
moray eel (green, spotted)
tuna
Four-eyed Fish (*Anableps*) – in the brackish water in the estuary at Playa Grande

Invertebrates:
Tailless whipscorpion
Onychophora (velvet worm)
Human Bot fly
Assassin bug
Peanut-head bug/ lantern "fly"
Nasute termites
Black witch moth, Owl butterfly
Leaf-cutting ants, Azteca (Cecropia ants), Acacia ants, Army ants
Giant metallic wood boring beetle, Elephant beetle, long-horned beetles
Gold or silver beetles (*Chrysina* spp.)
Orchid bees
Coral Reef inverts.
- Spiny lobster
- Anenomes
- Corals
- Jellyfish
- Sea stars
- Tunicates
- Octopus

Etc.