

Introduction to tropical ecosystems –

Costa Rica, May 2017

I. Course details

The primary focus of the course is to familiarize students with a variety of tropical ecosystems, their biota, and the processes that structure these systems. Costa Rica is unusual in having a huge diversity of ecosystems, from alpine tundra, to alpine dwarf forests, to cloud forests, to low elevation rain forest, to deciduous dry forests. We will visit and hike through many of these systems in reserves or national parks. In a few places, we will stay at private reserves where we can do some more detailed studies on private land (we can basically only hike through the national parks – but that in itself is nothing short of fabulous).

Typically we require one travel day on our bus getting to a park or reserve, while making brief visits along the way. During travel we have an opportunity to see typical examples of tropical agriculture and agroforestry as well as some ecosystems that we will visit only briefly (e.g. high elevation forest).

After arriving at a site, we typically spend a day walking the trails to observe wildlife and vegetation, and to talk about the ecology of the sites. At most sites, early in the morning of the second day (before breakfast) you will split into small groups and try to identify the birds that you see. We will develop species lists for each site, and compare the avian diversity at different sites. Later in the day, we will do transects in the forest in which we measure and describe the physical structure of the trees, the epiphytes, the types of leaves, light intensity, etc. Finally, in the evenings, we put up light traps, and we examine the insect assemblages at the different sites.

While you are hiking, or while we are doing transects in the forest, we should be able to see a large number of tropical birds, and a good selection of neotropical mammals, herptiles and insects. There will be numerous brief teaching demonstrations, including discussions of tropical life forms, examples of ethnobotanically used species, life history strategies, plant-animal interactions, tropical plant families, concepts of nutrient cycling, forest diversity and dynamics, etc.

At certain sites, we will also carry out small ecological studies. To a degree, these will depend upon what we find along the way. As examples, we often do a study of aggression among hummingbirds (inter-specific aggression and inter-sex aggression. Who wins? The biggest? The most brightly coloured? The males?). We may study leaf-cutter ants: can they distinguish between leaves with high levels of secondary defensive compounds versus those without? We may do a study of island biogeography using tidal pools, or perhaps by catching geckos.

Finally, in the last days of the trip, we will be at a field station where you will be able to carry out a small research project that you will design. We will be happy to help with experimental design, but you will have to come up with the ideas. The only equipment that will be available is

the equipment that we use for the transects (which is very limited), and anything you can scrounge.

Evaluation and pre-field trip assignments

The course grade will be based upon the following activities:

Preparatory reading (5%)

Your trip will be more interesting if, in at least some areas, you know what to look for when you are in the field. So, first, we ask you read the book *Tropical Nature* by Adrian Forsythe. This is a short, fun read. There are copies available from Amazon and Chapters, and there are probably copies in most university libraries. There will be a short quiz on the book at the beginning of the course (i.e., you must read it in advance).

If you would like to get a more advanced flavor for tropical ecosystems, John Kricher's 1997 *A Neotropical Companion* is very good. Les Beletsky's *Wildlife Guides Costa Rica* is a nicely illustrated, informative guide to the common fauna of Costa Rica, including some interesting ecological notes. There are also several tropical ecology textbooks, such as Kricher's *Tropical Ecology* (2011) or Ghazol and Shiel's (2010) *Tropical Rain Forest Ecology, Diversity and Conservation*, and T. C. Whitmore's (1998) *An Introduction to Tropical Rain Forests* is an introduction to the ecology of tropical forests that we have used in courses at U. of Ottawa. *Costa Rican Natural History* (D. Jantzen) is something of a classic in the field, but it is not a fun read. There are several other recent books on Costa Rican ecology as well.

Oral presentation during the field course (15%)

We would like each student to become, in a small way, our local expert on some area of the biology, culture, history, etc. of Costa Rica. We would like each of you to prepare a 10-15 minute talk that will be presented to the group on an evening when we have no other planned activities. You will find below a list of possible topics, although if you would like to propose one of your own, you are welcome to do so. **Please contact D. Currie with at least 3 choices, indicating your order of preference.** I will allocate the projects on a first come, first served, basis, giving you the available project that is highest ranked on your list.

There will be NO audiovisual equipment available. In some sites, if we have lights, we are lucky. You can bring a short handout to distribute to the group, if you like. If so, bring a total of 18 copies.

In preparing these presentations, please focus specifically on Costa Rica. Presentations should include information about things that we are likely to see in the field. A passable

presentation (a grade of D or C) goes over the Wikipedia article on the subject. Better presentations include some discussion of recent topics of research in the area. The best presentations include examples from the primary literature.

Participation, retention (20%)

Along the trail, I will present many mini-lectures and discussions. We will expect you to be able to participate intelligently in these. Having read Forsythe's book will help you do that. At numerous points in the course, we will have impromptu re-cap discussions of points that have been covered along the way. Half of your participation grade will be based on retention of this material, and your ability to discuss it: have you been paying attention along the way?

The second half of the participation grade will be based upon your actual participation in the group activities: when the group is gathering data, are you actively involved, or are you standing around talking? When the bus is ready to leave in the morning, do we have to wait for you? When things need to be done, do you pitch in, or do you make yourself scarce?

Final exam (20%)

There will be a written exam at the end of the course, done at the last field station. The exam will be based on material presented along the trail. It will almost certainly involve specimens that I have gathered from the field, and I will ask you about the ecology of what you see.

Report on the structure and diversity of tropical ecosystems (20%)

At each site, the group as a whole will observe and record data on the structure and diversity of the forest, and the diversity of the avian communities. We will share all the data, and you will independently write a report on these data. More details to follow later.

4) Mini-research project. (10%)

We will carry out two or three small projects. You will be asked to write a brief (3 or 4 pages max) report on one of the projects.

5) Independent research project (10%)

You will also carry out a small, independent research project at the last field site. You will be asked to write a brief (3 or 4 pages max) on this project.

Some concepts that we will discuss and illustrate in the field:

- Elevational and latitudinal climatic gradients
- Plant responses to climatic gradients
- Major tropical biomes
- Primary and secondary succession
- Species diversity and the factors that drive it
- Nutrient cycling in tropical forests
- Carbon in tropical forests
- Mangrove ecology
- Island biogeography
- Life history strategies of plants in tropical forests
- Herbivory and defences against it
- Flowering and pollination strategies
- Major groups of birds and their life history strategies
- Competition
- Beaks and feeding guilds in birds
- Allelopathy
- Effects of agriculture on biodiversity
- Tropical architecture
- History of Central America