

Field Research Methods in Tropical Diseases
(*Duke University - BIO 281L*)

Class Meeting

Lectures and activities for this course take place mainly in weeks 2-3, 5-6 and 8-14 at La Selva. A detailed calendar with topics, instructors, times, and assignment deadlines is provided in the document “Day by Day”. However, scheduling is subject to change due to unforeseen circumstances typical of a field course (e.g. weather, last-minute cancellations, etc.). Meeting locations and available work space(s) will be specified upon arrival at each biological station or field site.

OTS Staff and Invited Faculty

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Instructors' Expectations and Philosophy

We believe that education should engage, challenge, and encourage students to question and make meaning of “knowledge” within their own contexts. In doing so, we recognize that students have many experiences that shape their interests and desire to learn. Each student’s lens is a unique and valuable addition to the learning community.

We ask that students take part in and ownership of their education as a co-educator, rather than being a “student” in the more traditional and passive sense. While we recognize that this shift from receiver of knowledge to producer of knowledge can seem unfamiliar and uncomfortable at times, it is the hallmark of critical thinking and a thriving learning community.

It is our expectation that as co-educators and producers of knowledge students will:

- Participate actively and thoughtfully at all times, which includes being free from technological and other distractions during class time.
- Have the conviction to ask and respond to difficult questions, take what may seem to be unpopular positions, and admit when they do not know.
- Be open to constructive criticism from mentors as part of the scientific process. For example, scientific papers are never written one time, but always require multiple re-writings.
- Respect others and have the patience to listen. Allow themselves to be persuaded and be willing to change their mind.
- Think, write, and engage with their peers in a professional and scholarly manner. Foster a professional and collegial learning environment that is purposeful, open, just, disciplined, caring, and celebrative.
- Take responsibility for their own learning.

Statement of Accessibility

This class represents an environment that is open and welcoming to all students. If you believe you may need accommodations during this class that may not traditionally be available, please contact any of the instructors within the first week of the course to plan a way to meet these needs within the potential logistical restrictions posed by a field course. Please communicate with us openly and recognize that accommodations are collaborative efforts between students and faculty.

Course Description

The Field Research Methods in Tropical Diseases is a research and writing-intensive course designed to provide applied, action-oriented, experiential opportunities for undergraduate research. Through structured field and/or laboratory research experiences in Costa Rica, this course is designed for students to gain advanced, practical skills in relevant, community-based research exploring topics in health in the broadest sense (i.e. centering on human, animal, or ecosystem health). Each research project will include the application of theory and methods consistent with students' interests in tropical diseases, environmental change and ethnobiology. This course makes use of select lectures and workshops to introduce students to information and tools necessary to carry out successful scientific investigations (i.e. study and research instrument design, basic data analysis, and scientific writing). However, the majority of the course consists of hands-on work on research project design, data collection, analysis, and written and oral presentations of results. Students are expected to be proactive in developing a project in consultation with their mentor, take the lead in reviewing scientific papers to compare methods employed by different authors, and be open-minded to the fact that often there exists ambivalence in scientific methods. The scientific experience implies a "trial and error" approach, which is very different from a laboratory demonstration during class teachings.

Specific Goals

Upon successful completion of this course, students will demonstrate progress in the following:

1. Understand the labor intensive process of conducting good quality research and the measures that must be taken to ensure ethical conduct in research.
2. Engage in responsible investigation and good data collection practices such as repetitive data sampling reviewing and citing the relevant literature and keeping detailed field notes.

3. Critically and constructively evaluate the scientific literature for the development of a research study.
4. Make observations, ask sound research questions, generate hypotheses, and identify the most appropriate methods according to the specific research context to solve the chosen problem.
5. Design and conduct sound field and/or laboratory health research studies.
6. Learn to incorporate comments and suggestions from peer review and approach research criticism constructively..
7. Collect and manage data, perform basic data analysis, and appropriately interpret findings for discussion and recommendations.
8. Communicate scientific findings in written, visual and oral form, including reviewing, critiquing, and editing others' writing.
9. Adapt to the dynamics of conducting research in interdisciplinary teams and in a foreign context.
10. Develop an appreciation for scientific thinking, creativity, and problem-solving.

Course Evaluation

| Type of Evaluation | Grade (%) | Points |
|----------------------------------|------------|-------------|
| Participation | 5 | 50 |
| Journal entries | 15 | 150 |
| Blog entries | 10 | 100 |
| FLP group report outline | 10 | 100 |
| FLP group oral presentation | 10 | 100 |
| FLP group report final | 10 | 100 |
| IRB for IP group protocol | 5 | 50 |
| IP independent research proposal | 10 | 100 |
| IP independent report final | 15 | 150 |
| IP group poster | 10 | 100 |
| Total | 100 | 1000 |

Grading

| Course grade (%) | Letter grade |
|------------------|--------------|
| 97-100 | A+ |
| 93-96.99 | A |
| 90-92.99 | A- |
| 87-89.99 | B+ |
| 83-86.99 | B |
| 80-82.99 | B- |
| 77-79.99 | C+ |
| 73-76.99 | C |

Course Requirements and Assignments

Participation (5%)

Students are expected to actively participate in all the scheduled activities for this semester abroad experience. This goes from doing things that every researcher does, like helping to move boxes with research equipment during the different field trips, but also showing active interest about the lectures by asking questions after the lectures, and being able to verbally express different insights from this study abroad experience during daily wrap up sessions or to answer questions about the main topics learned on any given day. The goal of this activity is to encourage students to reflect about all the different aspects of doing research abroad.

Journal entries (15%)

Great naturalists like Charles Darwin and Alexander Von Humboldt took notes about what they observed and experienced when in the field. Those notes were fundamental for their intellectual contributions to biology. After each field trip, students are expected to reflect on their experiences in the form of short (0.5 - 1 page), written journal entries. Each entry will contain the date and location of the field trip, a very brief summary of the activity, and a record of your thoughts, impressions, reactions, problems you identify, proposed solutions to said problems, or responses to or questions about the activities. Journal entries should be a personal account of your learning experience (rather than a "listing of events"). Similarly, you are expected to write your thoughts about any article from the journal club when you participate as a member of the audience, and a more comprehensive summary when you lead a discussion (see above the section on journal club). You may write your entries in any style you are comfortable with, as long as it is easily legible, clearly written and sensible, and you will not be graded on poor writing or grammar (as long as it is understandable). You will find that journal entries may serve as useful notes for debriefing discussions scheduled after field trips and for your blog entries (see Research Methods class).

Moreover, you will notice that this exercise is a habit that could help each of you on any kind of professional pathway you follow after college, as a useful exercise to think and reflect on what you see and experience. Basic journaling notebooks will be provided, which you will be required to take with you on field trips. Journals will be collected at random several times during the semester and will be evaluated for completeness (brief record of all field trips and journal clubs, clarity and thoughtfulness of entries).

Blog entries (10%)

A part of good scientific inquiry is learning to communicate your science and connecting to the broader public in a fun and non-traditional way. The goals of this feature of the semester are for you to become familiar with making observations and sharing them through writing. You will learn to develop a journalistic storytelling style of writing that is interesting and understandable to non-scientists, keeps their attention, and communicates your experiences in a professional manner. Blogging will allow you to gain experience with reflective journaling, which requires you to engage in continuous self-appraisal and self-critique. The blog provides a forum for you to document your experiences, examine how they are shaping your learning and research process, and publicize your experiences. **You must submit 4 blog entries throughout the semester** following activities, site visits, or discussions that inspire you. You may write about your experiences, what you learned, what you are taking home from a particular experience, what you liked or disliked and how you could improve an experience, activity, or your own actions if given another opportunity, and how your experience will impact your future life, your thoughts, or your career. Each blog entry is no more than one page long (approximately 500 words). The semester consists of four blocks; **you may only submit one blog entry per block**. After each block, the course instructors will select several entries and post them to the course website. Each student is guaranteed publication of at least one blog post per semester. Submission is 10pm on the due dates.

Blog entries must follow the exact instructions outlined below and must be submitted via e-mail to the following address: tropicaldiseases.ots@gmail.com

Instructions and formatting for blog posts:

- 1) **Title:** the first line of your blog must be a descriptive title
- 2) **Location:** The first sentence of your blog **MUST include the name of the station or the place** that you are going to talk about, for example: “OTS, La Selva Research Station”
- 3) **Choice of subjects:** You are free to choose your blog topic as long as it is within the academic material and learning experiences (including field trips, student discussions, and other scheduled activities). You may **not** select topics associated with activities outside of the course (for example in your free time).
- 4) **Format:** Microsoft Word document; 1-page maximum; Times New Roman; 12 pt font; 1 inch margins; 1.5-line spacing; **Left** justified; ½ inch indent for first and all subsequent paragraphs
- 5) Save each blog text as a MS Word document as follows: “your name_Blog #” (e.g. Adriana-Baltodano_Blog 1). Please **do not** submit as .pdf files!
- 6) **Photos:** You must include **at least one but no more than two photos**. Ideally photos will be taken by you, but a peer’s photos are fine too as long as appropriate credit is given. Photos downloaded from the internet are **not acceptable!** Each photo file size should be **less than 250kb**. Use some type of standard figure format: .jpg, .png, IMG_, DSCF etc. Please **do not** attach figures as .pdf files!
- 7) Save photos as “your name_Blog #_Pic #” (e.g. Adriana-Baltodano_Blog 1_Pic 1) and submit them as separate attachments in the same e-mail as your written entry. Please **do not** insert the figures into your text.
- 8) **Photo captions:** Figure captions are helpful for the reader, but not mandatory at this time. Include figure captions or legends in the same document at the end of your text and use the same format as for the remainder of the document (see above).
- 9) **How to post:** Attach your Word document and your picture(s) saved as instructed above to a single e-mail and submit to tropicaldiseases.ots@gmail.com by the deadline. The blog administrator(s) will review and publish your blogs.
- 10) **Where to find it online:** Blog: <http://tropical-diseases-semester.blogspot.com/>
From the OTS webpage: <http://education.tropicalstudies.org/en/education/undergraduate-opportunities/programs/tropical-diseases-environmental-change-and-human-health-semester-in-costa-rica.html>

At the beginning of the semester, you will be asked to sign the following disclosure and release form regarding the course blog:

“The course staff -Jessica Arias, Mauricio Lascano, and Ina Vandebroek- will make every reasonable effort to monitor ethical conduct on the Tropical Diseases weblog (aka ‘blog’) in order to maintain a positive learning community. Please support the same professional and positive approach. Integrity is the cornerstone of credibility.

Material posted will be honest and fair in gathering, reporting and interpreting information, never plagiarized, and where possible include links to internet sources. The content of weblog entries will not misrepresent, take images or statements out of context, or publish information known to be inaccurate or manipulated. If publishing questionable information, make it clear that its quality is in doubt. Cite copyrighted material in postings.

Ethical bloggers treat sources and subjects as human beings deserving of respect in order to minimize potential harm. Material posted should show compassion for those adversely affected by weblog content. In particular, use special sensitivity when dealing with children and inexperienced subjects. Material will be in good taste and inoffensive.

This weblog will be published directly onto the internet, a public domain. You are representing yourself, your family, your university and OTS. Be accountable for your statements, and admit mistakes and correct them promptly.

For our own security, please avoid specific comments about our locations and schedules that would be seen by outsiders. No trash-talk, inappropriate language, personal insults, profanity, spam, racist, sexist or discriminatory remarks or threatening comments will be tolerated. No participant may share their log-in information with people or entities outside of the Trop DI class. No posting or comment may facilitate or promote illegal activity.”

Faculty-Led Projects (FLPs) (30%)

As part of the course, you will engage in three faculty-led research projects (FLPs) throughout the semester. All students will participate in field and/or lab work and data collection associated with each of the three projects. However, one group of students will be assigned to each project and will be responsible for data compilation, analysis, interpretation, as well as written and oral presentation of the project and results.

FLP Report Outline (10%)

During the week of FLP data collection, students will be responsible for working as a group to outline their final, scientific manuscript-style FLP report. The final report will consist of the following elements: Title, Abstract (in English and Spanish), Introduction, Materials and Methods including Ethical Considerations, Results, Discussion, Acknowledgments, Literature Cited (APA format), Tables, Figures, Appendices (if any).

The day before data collection (day 0), students will review the literature associated with their assigned research project and will develop a bibliography consisting of at least six relevant scientific sources. In addition to the full citation (APA format), four sources must be briefly annotated (~25-50 words) and include a description of the main purpose of the article, a summary of its content, any special or unique findings of the study, and its relevance to your project. On this day each group will submit an outline of the FLP. On day 1 of data collection, your group will work an outline of the Introduction (including clearly stated hypothesis and study objectives) and Materials and Methods sections of your FLP report. On day 2, you will outline the Results section, including a list of relevant figures and/or tables that you plan to include in your report. On day 3 you continue working on your project and presentation. On day 4, you will submit the complete draft of your report including the Discussion. The complete FLP report outline is due at 6 pm. The FLP outline will be evaluated for content, quality, completeness and timely submission of each section and will be returned to you with edits and comments before the deadline for your FLP report.

FLP Presentation (10%)

As a group, you will present and discuss the findings of your faculty-led research project. Each person will participate actively and equally in the oral presentation of the project. Presentations are open to the public and should follow a professional meeting presentation format. Students will provide background and context for the research question(s), briefly explain the study design and methods, clearly present and interpret study results and discuss their meaning, and provide recommendations for future work. Each group will have 10 minutes to present with 5 minutes for Q&A.

A few guidelines for project presentations:

The goal of oral presentations is to give you practice in how researchers present their results at scientific meetings. Often, meetings last several days and can include several hundred talks. In any given session of a meeting, 10-15 minute talks are scheduled one after the other frequently starting at 8 am and running until 5 pm. Obviously, in a forum such as this, you need to plan a presentation that captures people's attention and conveys information to talk-weary brains. So you have to be clear, and concise, and enthusiastic.

- Each section (background, objectives, methods, results, discussion, conclusions, recommendation) should be well-organized, logical and with sufficient information. Yet, each section should include only relevant information and be concise.
- Make slide headings informative. Don't label slides as "Methods" or "Results" etc. It will be obvious to everyone that results are results. Instead, use questions or principal findings/messages as slide headings.
- Be able to field questions. This means considering ahead of time what sorts of questions might come up, what kinds of assumptions you are making, and be prepared to address those issues. Read up on your topic!
- Visual aids (graphs, tables, photos) should be just that, namely helpful! Make them clear, concise, and informative, and VISIBLE to your audience. Interact with your graphs and figures. Set up your axes on graphs, explain headers in tables, and lead the audience through diagrams or images. Cover what is in your graphs and figures. If you won't talk about it, leave it out.
- Present the data positively, regardless of whether your hypothesis was supported.
- Regardless of potential limitations (every study has them!), you have the data you collected and need to work with them. These are still results even if they do not show you what you expected or 'wanted'. Be proud of your data and interpret them honestly. In your discussion you can discuss potential improvements that could be made if you were to repeat the same study, but in your results present what you found this time.
- If you feel a method was imprecise, then consider whether it introduced a bias or noise into the data set. In other words, does the method drive a positive result, or does it obscure a pattern that really is there? Discuss such limitations at the end of your presentation and use them to fuel recommendations for future work.
- Present complete statistics, not just the p-value. Indicate which statistical tests were used, either on the slide, or orally. But, don't spend too much time on your data analysis (unless you are presenting a modeling or math study). Your analysis is a tool, not the main point of your study.
- Speak clearly, audibly, and face the audience. Don't mumble. Don't talk to the screen, the floor, or your fellow project presenters. Don't bounce around or fidget.
- Know who in your group is going to cover what section/slides, and plan what will be said.
- Practice!! Don't speak extemporaneously. But, don't overload your slides with text. Text on slides should be used to emphasize points, not to provide all the information that you want to convey. You can have discrete notes on what you want to say, but don't read off a written text, your tablet, computer, or class notebook, and don't read off a slide. This is a scientific presentation, not a class lecture.
- Don't interrupt each other while presenting, and don't jump in with additional information. This can wait until the Q&A at the end.
- Timing: 10 min presentation, 5 min for questions. Be concise, stay within the time limit. We will time you, just as in a scientific meeting. Practice, practice, and practice your talk!
- During the Q&A, repeat/rephrase each question before answering! This will help everyone in the audience understand what is being asked, but will also make sure you are understanding the question correctly.
- Important: Acknowledge the people and organizations who helped you with the project and/or funded the work.

FLP Research Paper (20%)

In order to demonstrate and develop your ability to work in a collaborative research environment, each student will contribute to one of the three FLP written reports (one paper per group project). In your group, you will write a professional journal manuscript-style report summarizing your project. The format adheres to the guidelines set forth in "How to write a paper for USAP OTS" (Appendix 1). The score awarded for this paper is divided between work on a first draft (10%) and a revised final version (10%).

Individual Projects (IPs).

During the second half of the course, you will develop and carry out a final individual research project using the skills you have acquired during the FLP. During block 3, the class will be presented with several potential study topics in tropical diseases and ethnobiology. As a class, you will then select 3-4 topics and divide into groups based on individual research interests thereby assigning yourself to a project. As a group, with the guidance from your instructors, you will develop your specific research questions for these final research projects in form of a formal research proposal. Due to logistical constraints, the research methods used (i.e. study design, data collection instrument, data analysis plan), completing the Duke University Institutional Review Board (IRB) application as well as data collection and analysis, the final report and the final poster presentation are a group effort. However, writing of research proposals and final reports are individual tasks, although peer review and group discussion are encouraged.

IP Research Proposal (10%)

Prior to beginning your independent research project, each student will produce a written research proposal. The written proposal will serve as the basis for your final IP report (see details below). You will develop your methods and your data collection instrument(s) as a group (your IP group), but you will write your abstracts, introduction, expected results, implications, and final literature cited sections on your own. The required format and content is that of a formal research proposal and is outlined in the rubric below. The proposal should include a budget with a detailed supplies list and logistics plan for your work in the community and/or the field, and it should follow procedures for conducting research with human or animal subjects. All methods that include data that require local permits and prior approval by the Institutional Review Board (IRB) at Duke. All groups will complete a Duke IRB form (see assignment description below).

IRB protocol (5%)

Any research requires prior approval by the Institutional Review Board (IRB) at Duke University. Before developing your IP proposal, each student will complete online modules in ethics to attain necessary certification for work with human subjects. Each IP group will also complete an undergraduate IRB protocol that includes a project rationale, methodology, all survey tools and instructions for implementation, oral or written consent scripts, and any other necessary documents. One IRB protocol will be developed per IP group and will be submitted for approval by the Institutional Review Board at Duke University. The IRB protocol will be graded for completeness and timely submission.

IP Research Paper (15%)

After collecting data as an IP group, each student will be responsible for writing their own manuscript in journal format that presents the results of their IP project as per the "How to write a paper for USAP OTS" guidelines (Appendix 1). Each student will submit an individual paper. The abstract (English and Spanish), introduction, results, discussion, acknowledgments, and literature cited sections will be written by each student individually. The methods sections (including all data collection tools) will be the same within each group.

IP Research Poster Presentation (10%)

After completing your Individual Project you will design and create a poster and hold a symposium for the members of the biological station (including scientists, workers, and visitors). The poster should be delivered in a professional, interactive way, similar to a poster presentation at a scientific meeting, but considering carefully the target audience of your findings. Posters will be designed and constructed by students and presented in English. More information on the required format and the poster session will be provided closer to the date.

Late Submissions:

Late submissions will not be accepted.