INTEGBI 178 – Plant-Animal Interactions
University of California Berkeley
3 Credit hours – Fall 2022

Course meeting time and location

Lecture: Tuesday & Thursday at 11:00 AM - 12:30 PM; Room: TBD
Discussion: One hour per week, Date & Time TBD; Room: TBD

Instructor's contact information

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Graduate Student Instructor (GSI)

TBD
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Description

This course will present a broad overview of the diverse interactions between plants and animals, including antagonistic and mutualistic interactions as well as interactions involving multiple species and across trophic levels. It will emphasize macro-level interactions in various ecosystems. We will consider both ecological and evolutionary aspects of the mechanisms and impacts of these interactions, incorporating basic knowledge with advanced and applied approaches. Students will improve their knowledge on how plant-animal interactions shape patterns of biological diversity and influence the functioning of ecosystems as a whole and be able to analyze and predict how current environmental changes affect these interactions.

Prerequisites

Bio 1B or consent of instructor.

Instructional Method

Lecture: The instruction is designed to facilitate active participation. It will be structured as team-based learning and will emphasize critical thinking, analytical skills, and communication ability.

Discussion section: This section is designed to complement the information covered during lecture through discussion of scientific articles, review of lecture materials, and practice field observations of plant-animal interactions in natural environments around campus.

Required textbook and materials

Textbook: "Plant-Animal Interactions: Source of Biodiversity" by Del-Claro and Torezan-Silingardi eds. 2021. Springer. A pdf version can be downloaded here for free.
Additional required reading will be made available on bCourses (see list at the end of the syllabus).

Course Website

We will use bCourses extensively for assignments, schedules, announcements, etc. You should frequently check the course website site for updates. All assignments must be submitted on bCourses and should not be emailed to me unless otherwise stated. I suggest you become familiar with this program early in the semester and ask for assistance if you have any questions.

Course Goals

The goals of this course are to:

1. Familiarize students with the mechanisms and conceptual bases of plant-animal interactions
2. Promote in-depth understanding of species interactions and their outcomes at the population, community, and ecosystem levels
3. Stimulate conversation about research and conservation work around species interactions

Student Learning Outcomes

At the end of the course (and beyond), students will be able to:

1. Explain key ecological and evolutionary theories and concepts about plant-animal interactions
2. Describe the mechanism driving the interaction between two or more organisms
3. Identify the outcomes of species interactions at multiple levels
4. Frame intriguing questions for further inquiry
5. Synthesize current literature on a specific topic

Evaluation Procedures

The final grade will be based on the following assessments (for a total of 500 points):

Assignment	Number	Points each	Max points	%	Notes
Exams	3	60	180	36%	
In-class assignments	10	2.5	25	5%	12 assigned. Two lowest dropped
Case study analyses	5	10	50	10%	6 sessions. One lowest dropped
Field observation reports	2	40	80	16%	
Research proposal	1	90	90	18%	
Proposal review	1	25	25	5%	
Activities in discussion section	10	5	50	10%	13 assigned. 3 lowest dropped

The final letter grade will be determined based on a percentage of total points earned throughout the semester and attributed according to the following scale:

Percentages	Grade
97-100%	A+
93-97%	A
90-93%	A-
87-90%	B+
83-87%	B
80-83%	B-
77-80%	C+
70-77%	C
60-70%	D
0-60%	F (fail)

Assignment details

Exams **–** We will have three exams, which will include different topics covered during the lecture period and in the assigned readings. The exam format will be mixed, including matching, fill-in, drawing, multiple-choice, and short answers. Exams will focus on understanding concepts, reasoning, interpreting graphs, and problem-solving. Exam review: Before each exam, you will prepare with the GSI a study guide to help you review for the exam. To do so, you will submit at least two questions for possible use on the exam. The purpose of this activity is to give you an opportunity to assess your understanding and review what is lacking.

In-class assignments **–** Throughout the semester, we will have several assignments in class to apply what you have learned, engage more with the lecture materials, and learn more about the different topics. Your participation in these activities is highly expected and will contribute to your grade. Activities include quizzes on assigned readings, polls, think-pair-share, small-group discussions, or minute reflective writing.

Case study analyses **–** Students will read, analyze and discuss scientific articles relevant to the studies of plant-animal interactions. This activity will provide an opportunity for students to learn more about current advances in research related to plant-animal interactions and develop an in-depth understanding of certain concepts and the techniques & approaches used to address scientific questions and hypotheses. By critically analyzing the articles, students will also enhance their critical thinking ability and identify the applications of the scientific results. The class will be divided into small groups to discuss different papers. Each group will then report to the whole class.

Before the session, each student will:

- read the assigned article
- prepare a summary of the article, including the research questions, the data to address each question, the approach used to analyze the data, the main findings & conclusions
- formulate at least five questions and/or comments as starting points to discuss in class
- submit the summary and questions/comments in bCourses and bring a copy (electronic or hard copy) for use in class

When in class, a student will lead small-group discussions. All students (discussion leaders and non-leaders) are expected to:

- ask and answer questions (own questions formulated beforehand, or new questions based on comments from peers)
- engage intellectually in the discussion
- actively participate in the discussion

The grade for this activity will be based on the quality of the summary, depth of the questions & comments, active participation in the discussion, and intellectual engagement in the discussion.

Field observation and report **–** You will observe and report plant-animal interactions in nature. You can do this activity at a nearby park, the landscaping in front of an apartment complex, your backyard, or even the UC Berkeley main campus. You will be required to do this activity twice, one due in mid-semester and the second one due before the end of the semester. Since species interactions may happen at any time, you may want to be observant of the nature around you whenever you walk around and always bring a field notebook so that you will not miss an important opportunity to record the observations. Record any information that will address the points below for your report.

You will write a report of 600-800 words (double spaced, 12 pt Times New Roman font, 1" margins) with the following details:

- The site with a brief description of an aspect of the environment
- Identification (to genus and species) of the interacting organisms. You can use the app *Seek*, *iNaturalist,* or any other resource to get help with the identification
- Description of the interaction (type, behavior, possible outcomes for each organism, etc.)
- Discuss how the interaction you observed is linked to a concept covered in class and how their environment might influence the interaction. Also, discuss how you think anthropogenic activities might affect such interaction and how this would negatively affect the interacting species
- A photo illustrating the observed interaction (using your phone camera is fine)

Research proposal – Students will work in teams (2-3 students per team) to develop a research proposal addressing a scientific question relative to plant-animal interaction. Think about this exercise as if you were planning to propose a research project to a funding agency and try to convince them why they should fund it. To better prepare you in the preparation of a proposal, we will have a special session mid-semester to learn more about how to write a research proposal

Each team will use the knowledge acquired throughout the semester and information from their own reading of scientific articles (read at least 10) to determine the topic, research question, related hypotheses, methodologies, and expected results. The team will then write a proposal containing the following details (with the appropriate subheadings, single-spaced, 12 pt Times New Roman font, 1" margins):

1. Background and Relevance (250 words max)
   Introduce your project by providing a context to your topic based on current knowledge and the significance of the topic. Tell us why this topic is important to the field more broadly. Review previous work done on this topic, citing relevant literature.
2. Goals and Objectives (250 words max)
   Present what you plan to accomplish. Also, present your research question(s) and the hypotheses that you will test to answer these questions
3. Methodology (750 words max)
   Detail the methods you will use to complete your proposed project. Note any tools and equipment you may need and the field, lab, analytical or computational techniques you plan to use. List and describe any steps you will take. Cite relevant literature.
4. Expected results (250 words)
   Summarize the relevant outputs you expect to produce
5. Literature cited
   List here the references you cited in the text to support the research, scientific evidence, and methods presented. You should have at least 10 references from primary literature.

The proposal is due on the last Friday of the semester. Each student will then review, score and provide feedback on one proposal (that is not their own) based on the following criteria:

- Quality of the proposal
- Clarity of the objectives and hypotheses
- Feasibility and soundness of the proposed plan

The proposal, and the review, will constitute the final project in lieu of a final exam.

***Discussion section activities* –** These include discussion of scientific articles, review of lecture materials, and practice field observations of plant-animal interactions in natural environments around campus.

Getting help outside of the classroom

You are encouraged to meet with me to ask questions. I am always willing to take the time to help you better understand the materials.

NOTE: This syllabus is subject to change. Topics and assignments in the tentative schedule may change both in content and date.

Tentative Course Outline/Schedule

Day	Date	Topic / Activity	Pre-class reading
Th	25-Aug	Introduction to the class & topic	
Tue	30-Aug	Overview of plant-animal interactions	
Th	1-Sep	Evolutionary perspective on plant-animal interactions	Ch 1
Tue	6-Sep	Case study analysis #1	Article 1 & 2
Th	8-Sep	Plant-herbivore interactions	Ch 4
Tue	13-Sep	Plant resistance against herbivores	Ch 3
Th	15-Sep	Plant defenses against herbivores	Ch 5
Tue	20-Sep	Case study analysis #2	Article 3 & 4
Th	22-Sep	Exam 1	
Tue	27-Sep	Pollination ecology	Ch 6
Th	29-Sep	Frugivory and seed dispersal	Ch 7
Tue	4-Oct	Case study analysis #3	Article 5 & 6
Th	6-Oct	Ecological and evolutionary impacts of mutualism	Ch 11
Tue	11-Oct	Ecological and evolutionary impacts of mutualism	Ch 12
Th	13-Oct	Case study analysis #4	Article 7 & 8
Tue	18-Oct	How to write and review a grant proposal	
Th	20-Oct	Exam 2	
Tue	25-Oct	Complex networks of plant-animal interactions	Ch 10
Th	27-Oct	Plant-animal interactions as ecosystem services	Ch 9
Tue	1-Nov	Above & Belowground interactions	Ch 8
Th	3-Nov	Case study analysis #5	Article 9 & 10
Tue	8-Nov	Plant communications	Ch 2
Th	10-Nov	Impacts of defaunation on plant-animal interactions	Ch 13
Tue	15-Nov	Case study analysis #6	Article 11 & 12
Th	17-Nov	Research proposal idea discussion (2nd field observation report due)	
Tue	22-Nov	Exam 3	
Th	24-Nov	Thanksgiving Break	
Tue	29-Nov	Conservation aspect of plant-animal interactions	
Th	1-Dec	Frontiers in plant-animal interactions. Summaries, feedback, questions	
Fri	2-Dec	(Research Proposal Due)	
Fri	9-Dec	(Proposal Review Due)	

"Ch" refers to the chapter in the textbook.

***Tentative Reading List**

Article 1 Chapman, C.A. and Chapman, L.J., 2002. 18 Plant–Animal Coevolution: Is it Thwarted by Spatial and Temporal Variation. *Seed Dispersal and Frugivory: Ecology, Evolution, and Conservation*, p.275.

Article 2 Herrera, C.M., 1985. Determinants of plant-animal coevolution: the case of mutualistic dispersal of seeds by vertebrates. *Oikos*, pp.132-141.

Article 3 Aide, T.M., 1988. Herbivory as a selective agent on the timing of leaf production in a tropical understory community. *Nature*, *336*(6199), pp.574-575.

Article 4 Weber, M.G. and Agrawal, A.A., 2014. Defense mutualisms enhance plant diversification. *Proceedings of the National Academy of Sciences*, *111*(46), pp.16442-16447.

Article 5 Potter, A. and LeBuhn, G., 2015. Pollination service to urban agriculture in San Francisco, CA. *Urban Ecosystems*, *18*(3), pp.885-893.

Article 6 Jordano, P., García, C., Godoy, J.A. and García-Castaño, J.L., 2007. Differential contribution of frugivores to complex seed dispersal patterns. *Proceedings of the National Academy of Sciences*, *104*(9), pp.3278-3282.

Article 7 Bello, C., Culot, L., Agudelo, C.A.R. and Galetti, M., 2021. Valuing the economic impacts of seed dispersal loss on voluntary carbon markets. *Ecosystem Services*, *52*, p.101362.

Article 8 Mokany, K., Prasad, S. and Westcott, D.A., 2014. Loss of frugivore seed dispersal services under climate change. *Nature Communications*, *5*(1), pp.1-7.

Article 9 Albrecht, J., Berens, D.G., Jaroszewicz, B., Selva, N., Brandl, R. and Farwig, N., 2014. Correlated loss of ecosystem services in coupled mutualistic networks. *Nature communications*, *5*(1), pp.1-8.

Article 10 Dupont, Y.L., Padrón, B., Olesen, J.M. and Petanidou, T., 2009. Spatio-temporal variation in the structure of pollination networks. *Oikos*, *118*(8), pp.1261-1269.

Article 11 Genes, L. and Dirzo, R., 2022. Restoration of plant-animal interactions in terrestrial ecosystems. *Biological Conservation*, *265*, p.109393.

Article 12 Pires, M.M., Rindel, D., Moscardi, B., Cruz, L.R., Guimarães Jr, P.R., dos Reis, S.F. and Perez, S.I., 2020. Before, during and after megafaunal extinctions: human impact on Pleistocene-Holocene trophic networks in South Patagonia. *Quaternary Science Reviews*, *250*, p.106696.

GENERAL COURSE POLICIES

Late work policy

All assigned If you have a personal circumstance that prevents you from handing in work on time, please let one of the instructors know. An alternate due date can be arranged.

You have three passes, with no question asked and no excuse required, for turning in late assignments but not more than three days after the due date. Late work outside these passes will lose 10% of the total point value per day. In the case of group assignments being handed in late, all group members will be penalized similarly.

Technical issues with bCourses are not a valid excuse for late assignments. If you are unable to submit your work through the course website, you must instead email it to the GSI or instructors before the due date.

The **final exam must be handed in on time**, with no exceptions, due to grade submission deadlines.

Missed work policy

Your lowest score will be automatically dropped on some of the assignments, as indicated in the grading section. This policy is intended to give you some flexibility if you have personal circumstances that prevent you from attending class. You do not need to provide an excuse or reason to drop/skip one of these assignments. However, we will not accept non-emergency excuses for missed deadlines beyond these limits.

There are NO make-up assignments except in cases of religious obligations. Vacations, sports, other exams, and work conflicts are not considered valid emergencies. You can contact the instructors if you want to discuss rescheduling an assignment for these reasons. Late assignments will be penalized, as described above; otherwise, missed exams will be given a zero score.

If you miss an in-class exam due to an emergency, you must contact the instructors immediately. In these cases, the instructor will determine whether you will drop your score for that exam or take an alternate exam at a later date, which may be an in-person oral examination.

Group work policy

You will be working in small groups throughout the semester. You will develop and sign a team contract with your peers to clarify expectations, the preferred method of being contacted, and other related topics. You must **include a short author contribution statement at the end of each submitted group assignment** (< 1 paragraph; a few sentences are more than sufficient). You will lose 10% of the assignment score if you do not include an author contribution statement. This statement should clarify which people contributed to each component of the project. For example: "PersonA ran the simulation. PersonB made the graph. Everyone discussed the question together." or "PersonA and PersonB contributed equally, but PersonC did not participate".

We will also seek your confidential feedback on your own contribution to the group, as well as the contributions of your peers. If any group member is clearly not contributing, we will intervene, and if necessary, mediate the situation and/or move the student to another group (possibly with no other group members to work with).

In the case of an isolated situation where a group member misses contributing to an assignment, notify the GSI by email (cc'ing all group members) detailing the situation. If a group member has not participated, they will receive no points for the assignment, but all other group members will.

If a group is unable to work together productively over the course of the semester, we will meet with all students in the group together. Outcomes may include a plan to improve group dynamics, separation of one or more students from the group (e.g., a student who does not contribute is put in a group of one and no longer has peers to share work with), or a combination of multiple groups.

Classroom Code of Conduct

You are expected to be engaged with the class, be courteous, and demonstrate respect for the course instructor and your classmates, to be on time and present for the entire duration of each class session. Examples of discourteous or unprofessional behavior include, but are not limited to, disturbing other students, talking during class, texting during class, use of social media, internet surfing, non-constructive criticism, etc. Lack of courtesy in the class towards instructors or other students is taken seriously and frequently manifested in grade performance.

Late to Class

All members of the class should make every effort to arrive on time. If I am going to be late to class, due to circumstances beyond my control, I will, if possible, notify the department and ask that someone be sent to apprise you of the situation. If such notification is not possible, please remain in the class for 15 minutes beyond the scheduled start time. If I have not yet arrived by then, and if no emissary of the department has informed you, the class will be canceled, and you will be free to leave.

Use of an electronic device during class

You may use your laptop or tablet to take notes in class, but you should refrain from texting, using social media, or anything else that would distract you & your classmates from learning.

Disability resources

UC Berkeley is committed to creating a learning environment that meets the needs of its diverse student body, including students with disabilities.

The purpose of academic accommodations is to ensure that all students have a fair chance at academic success. Disability, or hardships such as basic needs insecurity, uncertain documentation, and immigration status, medical and mental health concerns, pregnancy and parenting, significant familial distress, and experiencing sexual violence or harassment, can affect a student's ability to satisfy particular course requirements. Students have the right to reasonable academic accommodations, without having to disclose personal information to instructors. For more information about accommodations, scheduling conflicts related to religious creed or extracurricular activities, please see the Academic Accommodations hub website: https://evcp.berkeley.edu/programs-resources/academic-accommodations-hub#accommodations. This website also provides a range of helpful campus resources.

If you anticipate or experience any barriers to learning in this course, please feel welcome to discuss your concerns with us. If you have a disability, or think you may have a disability, you can work with the Disabled Students' Program (DSP) to request an official accommodation. The Disabled Students' Program (DSP) is the campus office responsible for authorizing disability-related academic accommodations, in cooperation with the students themselves and their instructors. You can find more information about DSP, including contact information and the application process here: http://dsp.berkeley.edu/. If you have already been approved for accommodations through DSP, please meet with us so we can develop an implementation plan together.

Academic integrity policy

Class assignments are structured around critical examination of your own ideas and synthesizing ideas and skills within your group. Please use this opportunity to develop your thinking. All assignments also will be automatically checked for plagiarism. You must be original in composing the writing assignments in this class. To copy text or ideas from another source (including your own previously, or concurrently, submitted course work) without appropriate reference is plagiarism and will result in a failing grade for your assignment and usually further disciplinary action. For additional information on plagiarism, self-plagiarism, and how to avoid it, see, for example: http://www.lib.berkeley.edu/instruct/guides/citations.html#Plagiarism

UC Berkeley's honor code states "As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others." Anyone caught cheating on a quiz or exam will receive a failing grade and will also be reported to the University Office of Student Conduct. In order to guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during the quizzes and exams.

Classroom climate

We are all responsible for creating a learning environment that is welcoming, inclusive, equitable, and respectful. If you feel that these expectations are not being met, you can consult your instructor(s) or seek assistance from campus resources (see https://evcp.berkeley.edu/programs-resources/academic-accommodations-hub#accommodations).