

ENY 6203 and ENY 6203L -- INSECT ECOLOGY and LABORATORY
Fall 2018, Section 02E2/3E01 and Section 02E6/3E02

Lecture: Monday, Wednesday and Friday, Period 3 (9:35 a.m.- 10:25 a.m.), Room 1027

Laboratory: Wednesday, Periods 7 and 8 (1:55 - 3:50 p.m.), Room 3118

Instructor:

Dr. Heather McAuslane
Room 2109, Entomology-Nematology Bldg.
Bldg. 970, Natural Area Drive
P.O. Box 110620
TEL 352-273-3923
FAX 352-392-5660

Office Hours:

Office hours are 1 hour immediately following the lecture or by arrangement. You can also stop by my office at other times but I suggest you call or email me for an appointment first so that you don't miss me if I've stepped out. I am in the CALS Dean's office every Monday and Friday afternoon, every Tuesday morning, and all day on Thursday.

Course Description:

This course is an introduction to the concepts in ecology with emphasis on insects. The relationships of insects with their biotic and physical environments, along with the roles of insects in nature, will be emphasized. The basics of ecological research will also be covered.

Objectives and Goals:

To understand concepts in ecology; to understand the roles of insects in ecosystems; to examine examples and current issues in insect ecology.

Prerequisites:

ENY 3005C, Principles of Entomology, or equivalent

Textbooks:

Lecture: Speight, M. R., M. D. Hunter and A. D. Watt. 2008. Ecology of Insects: Concepts and Applications. 2nd ed. Wiley-Blackwell. Available as a e-book for checkout from UF libraries.

Lab: Henderson, P. A. 2003. Practical Methods in Ecology. Blackwell Publishing.

Class Website

Go to UF e-Learning (<http://elearning.ufl.edu/>) and choose Canvas Login. You should see ENY 6203 and 6203L in your courses list. I have the same syllabus on both sites as I consider this one course, with a lecture and lab.

The lecture site has PowerPoint outlines for the lectures if you want to print them out before coming to class. Readings other than the textbook will be there. The lab site will have descriptions of the laboratories (methods, videos, assignments etc...). Please see the website before each lab to do the assigned readings, read over the methods, and see if there is anything else you need to do to prepare for class.

Topics to be Covered in Lecture

Text Readings to Prepare for Class

(other readings may be assigned on the web page)

| | |
|--|---|
| Overview and importance of insect ecology | Speight, Chapter 1 |
| Insects and climate | Speight, Chapter 2, Chap. 7 (7.4-7.7) |
| Insect herbivores <ul style="list-style-type: none">• Introduction to herbivory• Plant defenses and insect counteradaptation | Speight, Chapter 3 |
| Resource niche and competition | Speight, Chapter 4 |
| Natural enemies and insect population dynamics <ul style="list-style-type: none">• Natural enemy behavioral ecology• Predator-prey and host-parasite interactions | Speight, Chapter 5 |
| Evolutionary ecology <ul style="list-style-type: none">• Mutualisms• Pollination• Life history strategies | Speight, Chapter 6, Chap. 7 (7.1-7.3, 7.8-7.10) |
| Insects in ecosystems <ul style="list-style-type: none">• Ecosystem fundamentals• Insects and ecosystem function | Speight, Chapter 8 |
| Biodiversity <ul style="list-style-type: none">• Measuring community structure• Factors affecting community structure | Speight, Chapter 9 |

Laboratory Schedule

| | | |
|----|----------|---|
| L1 | Aug. 22 | Reading and writing scientific literature |
| L2 | Sept. 29 | Influence of temperature on insect development and measuring microclimate variables important in insect ecology |
| L3 | Sept. 5 | Measuring plant herbivory |
| L4 | Sept. 12 | Discussion of L2 and L3 (microclimate presentation and assignment due) |
| L5 | Sept. 20 | Presentation and discussion of plant defense theories |
| L6 | Sept. 27 | Marking techniques |
| L7 | Oct. 4 | Discussion of L3 and L6 (midterm review) |
| L8 | Oct. 10 | Midterm I |

| | | |
|-----|----------|---|
| L9 | Oct. 17 | Life tables/population dynamics (in computer lab) |
| L10 | Oct. 24 | Class presentations (Insect Ecology in the News) |
| L11 | Oct. 31 | Class presentations (Insect Ecology in the News) |
| L12 | Nov. 5/7 | Sampling methods |
| L13 | Nov. 14 | <i>Entomological Society of America annual meeting – no class</i> |
| L14 | Nov. 21 | <i>Thanksgiving holiday – no class</i> |
| L15 | Nov. 28 | Litter/soil arthropod communities |
| L16 | Dec. 5 | Midterm II |

Required readings to supplement laboratories:

- L1 Losey, J. E., L. S. Rayor, and M. E. Carter. 1999. Transgenic pollen harms monarch larvae. *Nature* 399: 214.
- Tschenn, J., J. E. Losey, L. Hansen Jesse, J. J. Obrycki and R. Hufbauer. 2001. Effects of corn plants and corn pollen on Monarch butterfly (Lepidoptera: Danaidae) oviposition behavior. *Environ. Entomol.* 30: 495-500.
- L2 Dent, D. R. 1997. Quantifying insect populations: estimates and parameters, pp. 57 - 109. *In* Dent, D. R. and M. P. Walton [eds.], *Methods in Ecological and Agricultural Entomology*. CAB International, New York. (section 4.4 only for this laboratory exercise).
- L3 McAuslane, H. J., and H. T. Alborn. 1998. Systemic induction of allelochemicals in glanded and glandless isogenic cotton by *Spodoptera exigua* feeding. *J. Chem. Ecol.* 24: 399-416.
- O'Neal, M., Landis, D. A., and R. Isaacs. 2002. An inexpensive, accurate method for measuring leaf area and defoliation through digital image analysis. *J. Econ. Entomol.* 95: 1190-1194.
- L4 None – Discussion of labs 2 and 3
- L5 Stamp, N. E. 2003. Out of the quagmire of plant defense hypotheses. *Quart. Rev. Biol.* 78: 23-55.
- L6 Hagler, J. R., and C. G. Jackson. 2001. Methods for marking insects: current techniques and future prospects. *Annu. Rev. Entomol.* 46: 511-543.
- Henderson, P. A. 2003. Mark-recapture methods for population size estimation, pp. 48-59. *In* *Practical Methods in Ecology*, Blackwell Publishing, Oxford, UK.
- L7 None - Discussion of labs 3 and 6 (midterm review?)
- L8 None - **midterm I**
- L9 Dent, D. R. 1997. Quantifying insect populations: estimates and parameters, pp. 57 - 109. *In* Dent, D. R. and M. P. Walton [eds.], *Methods in Ecological and Agricultural Entomology*. CAB International, New York. (the rest of the chapter)

Henderson, P. A. 2003. Life-tables and population budgets, pp. 108-114. *In Practical Methods in Ecology*, Blackwell Publishing, Oxford, UK.

L10 None – class presentations of Insect Ecology in the News

L11 None – class presentations of Insect Ecology in the News

L12 Henderson, P. A. 2003. Planning and preliminary considerations, pp. 1-14. *In Practical Methods in Ecology*, Blackwell Publishing, Oxford, UK.

Henderson, P. A. 2003. Sampling a unit of habitat – estimating absolute population number, pp. 23-47. *In Practical Methods in Ecology*, Blackwell Publishing, Oxford, UK.

Henderson, P. A. 2003. Comparing the magnitude of populations – trapping and other relative abundance methods, pp. 76-94. *In Practical Methods in Ecology*, Blackwell Publishing, Oxford, UK.

L13 None – Entomological Society of America meeting

L14 None - Thanksgiving

L15 Henderson, P. A. 2003. Alpha diversity, species richness, and quality scores, pp. 115-128. *In Practical Methods in Ecology*, Blackwell Publishing, Oxford, UK.

Coleman, D.C., and D.A. Crossley, Jr. 1996. Chapter 4 - Secondary Production: Activities of Heterotrophic Organisms -- The Soil Fauna. Pp. 51-108 *in Fundamentals of Soil Ecology*. Academic Press, San Diego.

L16 None – **midterm II**

Assignments and Methods by which the Student will be Evaluated and Grades Determined:

Lecture course (ENY 6203 - 3 credits)

The grade will consist of:

- Two midterm exams (250 points x 2 = 500 points). Exams are not cumulative and will consist of short definitions, short paragraph, and longer essay answers.
- A 10-minute oral PowerPoint presentation on an insect ecological topic in the news (see description on p. 9) (150 points).
- Two-page critical analysis of the paper that is presented as Insect Ecology in the News (150 points).
- An oral presentation on plant-herbivore interaction theories (200 points). This will be a 10-minute oral PowerPoint presentation on one of the main theories proposed to explain the pattern of plant defense observed in nature. The instructor will assign students to groups and each group will be assigned one theory. The students in a group will read the primary literature and meet to digest and discuss that theory. Each group will search the literature published since the proposal of their assigned theory to determine whether the theory has been substantiated, disproved, or neither. All students must help in preparing the presentation but one student may act as the presenter for each group if the group decides that is most effective (see description on p. 10-11).

Laboratory course (ENY 6203L - 1 credit)

- Assignments – (5 x 100 points = 500).
- Participation in lab discussions – 100 points.
- One laboratory report written in the style of a scientific manuscript – 400 points. Each student will independently write a manuscript that includes title, abstract, introduction, materials and methods, results, discussion, cited references, and tables and figures for laboratory 3 (Measuring Plant Herbivory).

The manuscript should be in the style of Environmental Entomology, a publication of the Entomological Society of America (<http://www.entsoc.org/Pubs/Publish/Style/index.htm>). I will return the reports with comments and corrections within one week. A second corrected report will be due two weeks after the original due date. Students will ask a class mate to review the manuscript between the time of the first and second submission. I will grade the second submission.

Grading:

Grades will be based on the following scale:

| | |
|----|--------|
| A | 93-100 |
| A- | 90-92 |
| B+ | 87-89 |
| B | 83-86 |
| B- | 80-82 |
| C+ | 77-79 |
| C | 73-76 |
| C- | 70-72 |
| D | 60-69 |
| E | <60 |

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Policy Related to Class Attendance:

Attendance is not mandatory; however, the student will miss important discussions that may arise during class. Such material may be asked on exams.

Policy Related to Assignments:

Late assignments will lose 25% of their score per day, including weekend days. Thus, if the assignment is more than four days late, the grade for the assignment will be zero.

Policy Related to Make-Up Exams or Other Work:

Arrangements for a makeup midterm exam (required because of attendance at a scientific meeting or other valid reason) must be made at least one week prior to the exam. If the student misses an exam due to a medical or family emergency (accompanied by a note from a medical professional), a makeup exam will be scheduled as soon as the student returns to class.

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

Class Demeanor Expected by Instructor:

Be kind, considerate and respectful of others; clean up after yourself in the laboratory. Cell phones turned off and no texting please.

Critical Dates:

| | |
|-------------------|--|
| September 7 | See instructor for approval of Insect Ecology in the News presentation topic |
| September 12 | Microclimate presentations and assignment due |
| September 19 | Team presentation on plant defense theories |
| October 3 | Marking techniques lab assignment due |
| October 10 | Exam I (in lab period) |
| October 12 | <u>First draft</u> critical analysis of Insect Ecology in the News article due |
| October 24 and 31 | Class presentations of Insect Ecology in the News |
| October 26 | <u>First draft</u> of herbivory lab report due |
| November 5 | <u>Final draft</u> of critical analysis of Insect Ecology in the News article |
| November 7 | Population dynamics lab due |
| November 28 | Sampling lab assignment due |
| November 30 | <u>Final draft</u> of herbivory lab report due |
| December 5 | Diversity lab assignment due |
| December 5 | Exam II (in lab period) |

Plagiarism: Please understand that my purpose in bringing to your attention the matter of plagiarism is to help train you to be ethical scientists, not to impugn your character.

Plagiarism is a serious problem in academia today, especially with the ease of obtaining information from the World Wide Web. Plagiarism is defined as representing the words or ideas of another person as one's own, without attribution to the source. All words and ideas must be attributed to a source unless they are considered common knowledge (i.e., widely known by many people and found in many different sources). There are many kinds of plagiarism (<https://www.bowdoin.edu/studentaffairs/academic-honesty/common-types.shtml>). One of the most common forms is insufficient paraphrasing. Even with attribution, you may be guilty of insufficient paraphrasing because your sentence too closely follows the content and structure of the cited author's sentence. Please look at this reference to learn about ways to avoid plagiarism (<https://www.bowdoin.edu/studentaffairs/academic-honesty/avoiding-plagiarism.shtml>).

Plagiarism is unethical, unacceptable in science, and prohibited by the UF Student Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>). The consequences for plagiarism while at the University of Florida range from receiving a grade of zero for the plagiarized assignment or a failing grade for the course, to, for repeated offenses, expulsion from the university. Plagiarism after graduate training calls into question one's scientific integrity and can lead to banning of publication in journals and the loss of jobs/careers.

In some countries, it is an acceptable practice to write in a manner that faculty members at the University of Florida consider being plagiarism. Students studying in our university and with plans to publish their research in the English language need to know what plagiarism is and how to avoid it.

Students who plagiarize will be caught and consequences will be applied. I check all written assignments using anti-plagiarism software called Turnitin®. Students who plagiarize will receive a grade of zero on the assignment. The second instance of plagiarism in the course will result in an automatic failing grade in the course.

Additional General Information

The following information applies to all courses at the University of Florida.

Academic Honesty

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class

Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student. Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc/Default.aspx>, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department, 392-1111 (or 9-1-1 for emergencies). <http://www.police.ufl.edu/>

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <http://www.crc.ufl.edu/>

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Services for Students with Disabilities

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

Insect Ecology in the News

1. Visit the web sites below and choose a recent article (within the last year) that deals with insect ecology. **Please confirm your choice of scientific article on or before September 7.**
2. Read the abbreviated article, written for the lay public, and then find the original journal article, usually referenced at the bottom of the article.
3. Oral presentation (150 points) - Develop a 10-minute PowerPoint presentation describing the scientific journal article, similar to what you may have seen/heard at a national, regional or state entomology meeting. Your presentation will have a title, introduction, objectives or hypotheses, materials and methods, results, and significance/conclusions/implications sections. You may decide to incorporate portions of your critical analysis of the paper (below) into the presentation. You will have 2 minutes, after your 10-minute presentation, for questions from the audience so you should probably know a little bit more about the subject than you will get from just reading that one paper.
4. Critical analysis (150 points) – Write up a critical analysis of the paper. The first draft is due **October 12** for editorial comment. The final draft is due **November 5**. In five short paragraphs (about 2 pages), address the following questions:
 - a. State the main hypothesis and the over-arching larger scientific area examined in this paper.
 - b. State the main results and conclusions.
 - c. How convincing were their results and do they support the conclusions? (i.e., did they set up the experiments and analyze the data correctly?)
 - d. What you would have done differently, if anything?
 - e. What is the next direction this research group should take based on these results?

Current science web sites

Science Daily http://www.sciencedaily.com/news/plants_animals/insects_and_butterflies/
(you can also try the Agriculture & Food and Ecology links on the Science daily web page)

Science Magazine <http://news.sciencemag.org/category/plants-animals>

The New York Times <http://topics.nytimes.com/topics/news/science/topics/insects/index.html>

General Comments on Presentations

1. Use all of your time.
2. I am the only one who knows what you're talking about (I've seen your critical analysis) so explain well why you are reporting on this research and how it was done.
3. Allow at least 2-3 min for introduction – Why is this research important? What is the bigger picture? Introduce well this particular study system and the objectives or hypotheses to be tested.
4. Explain the methods in good detail. If we don't understand the methods, we won't understand the results.
5. Only put things on the slide that you want the audience to read or see. If you want them to read or see the material, make it large enough to read or see.
6. Explain each figure, table or diagram in the results. Use figures, tables and diagrams, rather than just words to present the results.
7. Strike a balance between clean and simple slides which might be rather boring, and colorful and busy slides which might be distracting.

Presentation and Discussion of Hypotheses on Plant-Herbivore Interactions

Objectives

- Gain experience in, and an appreciation for the difficulty of teaching abstract scientific concepts.
- Critically analyze an hypothesis, supporting or refuting it.
- Experience group dynamics and cooperative learning.
- Compare the coverage of a concept in a textbook and the original literature.
- Gain an appreciation for the diversity of insects and plants and the limitations of theory to explain patterns in the variation of plant-herbivore interactions.

To prepare for the assignment

All students should read the paper by Nancy Stamp (2003) to prepare for this assignment, in addition to the paper(s) that have been assigned to each group.

Exercise

The assignment for this discussion is for students, in groups of three or four, to read the primary literature for one of the plant-herbivore interaction hypotheses listed below. As a group, you will decide on the salient features of the theory for which you are responsible and will develop a short PowerPoint presentation to teach and defend/refute this theory to the class. You should also search the literature since the publication of the theory and see whether published literature has supported or refuted these theories. The presentation should be 10-12 minutes and you might decide to break up the talk 50:50 (theory:later research) or decide to spend less time describing the theory if it is easily explained. Some questions you should address are:

- How was the hypothesis developed (based on what experiments)?
- How convincing was its description in these articles?
- How well has this theory been supported by subsequent research?

You will be expected to answer questions from other students and the instructor on how well your plant-insect interaction hypothesis explains what is seen in nature.

One or all of the group members may present the hypothesis and your discussion, but all must be involved in deciding how to teach the concept and in developing the presentation. Use figures, diagrams, or photos (obtained from electronic or print sources and used citing the photographer or source) to enhance the presentation.

In the first hour, groups will present their hypotheses. Other groups should be taking notes on how their hypothesis' strengths and weaknesses compare to the others.

When all groups are finished presenting, we'll have one round of additional questions before the class divides into new groups based on which hypothesis individuals think is the most convincing, based on the presentations. The new groups will have 5-10 minutes to talk and then defend their decision to the instructor, TAs and other students.

We will conclude with a discussion of how the theories complement and/or contradict each other.

Theories on plant-insect interactions

- Plant apparency and resource availability theories were developed to explain interspecific evolutionary differences in plant defense against herbivores.
- Optimal defense or key tissue theory was developed to explain the evolutionary differences in defense allocation within a plant.

- Carbon-nutrient balance hypothesis, growth/differentiation hypothesis and induced defense theories were developed to explain intraspecific phenotypic differences in plant quality for herbivores.

Present one of these theories:

Resource availability (=growth rate hypothesis)

Coley, P. D., J. P. Bryant, and F. S. Chapin III. 1985. Resource availability and plant antiherbivore defense. *Science* 230: 895-899.

Optimal defense theory

McKey, D. 1974. Adaptive patterns in alkaloid physiology. *Am. Nat.* 108: 305-320.

Rhoades, D. F. 1979. Evolution of plant chemical defense against herbivores, pp. 3-54. In Rosenthal, G. A. and D. H. Janzen (eds.), *Herbivores: their interaction with secondary plant metabolites*. Academic Press, New York.

Carbon-nutrient balance hypothesis

Bryant, J. P., S. Chapin and D. R. Klein. 1983. Carbon/nutrient balance in boreal plants in relation to vertebrate herbivory. *Oikos* 40: 357-368.

Growth/differentiation balance hypothesis

Harms, D. A. and W. J. Mattson. 1992. The dilemma of plants: to grow or defend. *Quart. Rev. Biol.* 67: 283-335.

Loomis, W. E. 1932. Growth-differentiation balance vs. carbohydrate-nitrogen ratio. *Proc. Am. Soc. Hort. Sci.* 29: 240-245.

Grading

This is a graded class assignment and counts for 20% of the course grade. The members of the class and the instructor will score the presentation and provide written constructive comments to the presenting group. The grade given for the presentation will be the average of all the scores and all members of a group will receive the same grade. So group members should have their parts of the presentation done early enough that all members can comment on the final version of the presentation before it is presented.